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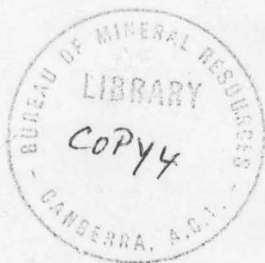
DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1969 / 110

007802

Progress of the Reconnaissance Gravity Survey of Australia



by

F. Darby and K.R. Vale

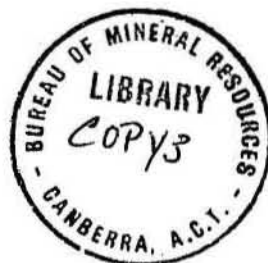
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Record 1969/110

PROGRESS OF THE RECONNAISSANCE GRAVITY SURVEY
OF AUSTRALIA

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SUMMARY

A Bouguer anomaly map of Australia which incorporates the available data at the end of 1967 is presented. A network of gravity and elevation control stations has been established throughout Australia and it is anticipated that all gravity surveys in Australia will eventually be on the same datum. The reconnaissance (1 station per 50 square miles or better) gravity survey of mainland Australia is expected to be completed by 1973, and attention is now being given to extension to the continental shelf and slope. The Bouguer anomaly features of Australia have been classified into provinces and units (i.e. regions of common gravity characteristics) and their geological significance is outlined.

Note: A Bouguer anomaly map of Australia at a scale of 1 inch to 40 miles is available separately. It may be purchased from:

Production Section,
Commonwealth Printing Office,
Wentworth Avenue,
Kingston, A.C.T. 2604
AUSTRALIA.

INTRODUCTION

At the 1965 ECAFE Symposium on the Development of Petroleum Resources of Asia and the Far East, K.R. Vale reported on the progress at that time of the gravity survey of Australia, and presented a Bouguer anomaly map based on the data available at the end of 1964. This report presents a revised map up-dated to the end of 1967 and shows the status of the survey at 1 June 1969.

The land area of Australia is currently (1.6.69) about 65% covered by reconnaissance gravity survey. 300,000 square miles of the continental shelf are also covered. Contributions to this survey have been and are being made by numerous exploration companies, State Mines Departments (notably South Australia and New South Wales) and the Commonwealth Bureau of Mineral Resources, Geology and Geophysics (BMR). BMR is the largest contributor, spreading its effort over the entire continent and extending to external territories and the continental shelf. The other organizations confine their surveys to more restricted areas but establish a denser network of stations.

To ensure that the results of these various independent surveys can be integrated and presented on a common gravity datum, BMR has established nine calibration ranges and numerous gravity base stations throughout the country - the Australian National Gravity Network (ANGN) - (Plate 1 and Dooley, 1965). Elevation control is maintained by a network of third order level control traverses. Many of the independent surveys in Australia, especially those conducted prior to the Isogal Survey (Dooley, 1965), have different and in some cases uncertain gravity and elevation datums. Results of 1968 BMR surveys covering large areas of New South Wales, Queensland, South Australia, Western Australia, and the north-west continental shelf are available separately but were not available in time for inclusion in this map and report.

COMPILATION

The base map of the Tectonic Map of Australia (1 inch to 40 miles) was used for the compilation of computed Bouguer anomalies to facilitate a direct comparison between Bouguer anomalies and known regional geological structure. This Bouguer anomaly map is too large for inclusion in this report but may be purchased separately. A reduced version (1 inch to 270 miles) is presented in Plate 2.

In the 1 inch to 40 miles compilation the Bouguer anomalies used are as originally computed from individual surveys. The different assumed density values used and the areas to which they refer have been marked on the 1 inch to 40 miles map.

The ANGN has been used as the gravity datum and the national network of third order level control traverses as the elevation datum for all surveys. However, as mentioned previously, some problems still exist and it will probably be necessary to make additional ties to some surveys to ensure that the correct datum has been used.

Many of the base maps used for individual surveys do not conform to the latest 1:250,000 base maps, but the mapping was of sufficient standard to fit on to the 1 inch to 40 miles map. However, in some cases further work is needed for consistent detailed presentation.

Before the Gravity Map of Australia is presented, all surveys will be reduced to common elevation and gravity datums, have consistent base mapping, and be reduced with a common density. This is the subject of another continuing project; but for the present map less rigorous standards have been adopted, especially in areas where there is a paucity of gravity data.

DESCRIPTION AND INTERPRETATION OF BOUGUER ANOMALIES

Plate 2 is a Bouguer anomaly map of Australia prepared at 1 inch to 270 miles. Contour interval is 10 milligals.

The gravity features are classified into 'provinces' and 'units'. The detail of the gravity data is adequate for a further division into 'subunits' consisting of local 'highs', 'lows', 'gradients', etc. on the 1 inch to 40 miles scale. Plate 3 shows the province and unit boundaries.

A gravity province is a region over which the Bouguer anomaly pattern exhibits one or more distinctive characteristics, such as trend or change of mean level, that mark it off from surrounding gravity provinces. The size of a province can vary considerably - the smallest is about 6,000 square miles (15,500 sq km) (the Springvale Regional Gravity Ridge, Province 17) and the largest about 100,000 square miles (260,000 sq km) (the Georgina Regional Gravity Shelf, Province 43). A province may contain one or more gravity units.

A gravity unit is an area of major feature within a gravity province, the Bouguer anomaly pattern of which has characteristics distinguishing it from other parts of the province.

In general, provinces and units have been adapted from the work of previous authors who have dealt with the results of individual surveys over discrete areas. Some of their divisions have been revised in the light of added data from the surrounding areas.

Appendix A presents a brief description of the gravity features of each province and a brief interpretation in terms of their correlation with known or postulated geology.

The outstanding features of the Bouguer anomalies of Australia are:

1. High Bouguer anomaly values occur in the following places:
 - (a) up to 200 miles (320 km) offshore in the northwest of the continent,
 - (b) along the east coast of the continent, and
 - (c) along the northern New Guinea coast.

These high Bouguer anomalies are thought to be associated with the thinning of the continental type crust. This type of Bouguer anomaly feature is known worldwide. The high values on the northeastern coast of the eastern tail of Papua are associated with an ultramafic belt that may be an exposed intrusion of mantle material.

2. Pronounced Bouguer anomaly lows presumably associated with major downwarping of the crust occur in the Perth Basin*, Amadeus Basin, and Timor Trough.
3. The most rhythmical large-scale variations in Bouguer anomaly occur in central Australia, where there is a series of east-trending highs and lows with an amplitude up to 160 mgals and a wavelength up to 130 miles (210 km). These features generally cannot be accounted for by known geological structure. The Bouguer anomaly gradients indicate a shallow crustal source for the features and may involve major intrusions of mantle material.

* The major geological features of Australia are shown on Plate 4.

4. The most complex series of Bouguer anomaly features occurs along the eastern margin of the Australian mainland - over the Tasman Geosyncline, where metamorphosed and intruded sediments occur. Surface geology can be directly correlated with Bouguer anomaly features in parts of the geosyncline only.

ACKNOWLEDGMENTS

It would not be practicable to give individual acknowledgment to all persons who have contributed to the compilation of the present Bouguer anomaly map of Australia. However, special mention must be made to the untiring efforts and co-operation of the Gravity Drafting Group of BMR in preparing the maps for presentation.

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*VALE, K.R., 1965 - Progress of the reconnaissance gravity survey of Australia. (Presented at 1965 ECAFE Conference, Tokyo, Japan).

WHITWORTH, R., (in prep.) - Helicopter gravity survey, Arnhem Land, (N.T.) and the Kimberleys (W.A.), 1967, Bur. Miner. Resour. Aust. Rec.

*Vale (1965) includes all major references for work completed before 1965.

APPENDIX A

DESCRIPTIONS OF BOUGUER ANOMALY PROVINCES

PROVINCE 1

NATURALISTE REGIONAL GRAVITY HIGH

A partly defined gravity province that is open in three directions towards the sea. On land the trend is predominantly to the north. Bouguer anomaly values range from zero to +40 mgals.

This province corresponds to the outcropping Archaean basement of the Naturaliste Block at the southwestern margin of the Perth Basin. It also corresponds to a pronounced magnetic province whose eastern boundary swings sharply west-northwest farther north.

PROVINCE 2

PERTH REGIONAL GRAVITY LOW

A 500-mile-long, generally narrow, gravity province extending from Byro in the north to Pemberton in the south. The province is open to the sea between Dongara and Busselton; otherwise it is bounded by steep gravity gradients and Bouguer anomalies range from zero to - 130 mgals. The province has been divided into 6 units.

Corresponds with the Perth Basin, which is bounded by the Darling Fault in the east. The Tertiary and Mesozoic cover over most of this Basin gave little indication of a deep basin, and the concept of a shallow basin was held until the late 1940's. The first gravity readings indicated that this concept needed revision. It was predicted that there would be 30,000 feet (10000 m) of sediments. Subsequent seismic work and drilling tend to confirm this prediction.

UNIT 2A Byro Gravity Low

A small Bouguer anomaly low in eastern Byro Basin. The gravity

The concept of the Byro and Coolcalalaya Basins, as an extension of the Perth Basin

coverage is too sparse for good definition of the feature.

UNIT 2B Coolcalalaya Gravity Low

An elongate Bouguer anomaly low that is generally bordered by steep gravity gradients. The gravity coverage is too sparse for good definition of the feature.

UNIT 2C Watheroo Gravity Depression

A well-defined Bouguer anomaly low bounded on its landward sides by steep gravity gradients.

UNIT 2D Beagle Gravity High

A Bouguer anomaly high, open to the sea, to the west of the Watheroo Gravity Depression. The extent of this high is unknown.

UNIT 2E Mandurah Gravity Rise

A Bouguer anomaly feature, open to the sea, to the south of the Watheroo Gravity Depression.

rather than the Carnarvon Basin, is substantially based on gravity interpretation. Seismic evidence tends to confirm the appropriateness of the concept. However, the Byro Basin appears to have stratigraphic affinities with the Merlinleigh Basin.

Undoubtedly corresponds to thick sediments within the Perth Basin.

Corresponds with the Beagle Ridge discovered by aeromagnetism and confirmed by drilling. Its complete definition seawards may be very important in outlining the western extent of the Perth Basin.

Although thick sediments have been indicated by seismic surveys, the sediments are probably thinner than in the areas of the Watheroo and Bunbury Gravity Depressions.

UNIT 2F Bunbury Gravity Depression

An intense Bouguer anomaly low. Its seaward extent is not known.

Seismic results have indicated thick sediments. It is bounded by the Darling Fault in the east and by Archaean gneiss of the Dunsborough Block in the west.

PROVINCE 3 AJANA REGIONAL GRAVITY HIGH

The western margin of this province is open. Bouguer anomaly features within the province are poorly defined due to the paucity of gravity stations. The Bouguer anomalies range from zero to +55 mgals.

The province corresponds in part with Lower Palaeozoic and Archaean basement outcrop, which dip under Tertiary or Mesozoic cover. It is postulated that high-standing Archaean basement extends north, south, and west from outcrop. To the north it connects with the Wandagee Ridge by way of the Meedo Gravity Platform.

PROVINCE 4 CARNARVON REGIONAL GRAVITY LOW

A gravity province relatively ill-defined because of the paucity of gravity stations in the area. The main trend appears to be northerly. Bouguer anomaly values range from -50 mgals to +10 mgals. The eastern boundary of the province is not easily delineated from the present gravity pattern. Gravity coverage is too sparse to allow good definition of

Corresponds with the Carnarvon Basin. It is not easy to distinguish the Basin's eastern boundary from the gravity results. Subsequent drilling and seismic surveys indicate that unit boundaries correlate well with structural boundaries.

gravity units, but four have been tentatively proposed.

UNIT 4A Merlinleigh Gravity Depression

The eastern boundary of the unit is not defined, except in one place.

The unit corresponds with Palaeozoic outcrops on the eastern side of the Carnarvon Basin. Subsequent drilling and seismic work justify definition of a Merlinleigh Basin. Where defined, the eastern margin of this feature correlates with the edge of the basin.

UNIT 4B Wandagee Gravity Ridge

A narrow north-trending Bouguer anomaly high bounded by relatively steep gravity gradients.

A high-standing basement ridge, the Wandagee Ridge, separates the Merlinleigh Basin from the Gascoyne Basin, and was predicted largely as a result of gravity interpretation. Subsequent seismic surveys and drilling have confirmed its existence. The extension of the ridge by way of the Meedo Gravity Platform to connect with the Ajana Block is predicted. There is seismic evidence to support this.

UNIT 4C Gascoyne Gravity Depression

A broad Bouguer anomaly low characterized by low gravity gradients and ill-defined trends.

Corresponds to the Gascoyne Basin. Generally an area of Tertiary and Mesozoic cover. Except in the far north, drilling indicates that this cover

rests on Silurian and Ordovician rocks. The eastern margin of the basin is defined, and high-standing basement under the Meedo Gravity Platform is indicated. Gravity coverage is too sparse to indicate structure within the basin.

UNIT 4D Meedo Gravity Platform

An area of relatively high Bouguer anomalies with irregular closures and steep gradients.

Largely corresponds with Tertiary cover and Archaean outcrops in the northeast. It is postulated that it outlines a high-standing basement area linking the Wandagee Ridge and the Ajana Block, and separating the Byro and Coolcalalaya Basins from the Gascoyne Basin. Some seismic evidence indicates shallow basement.

PROVINCE 5

PILBARA REGIONAL GRAVITY COMPLEX

This province is incompletely defined and only its northern margin has been mapped. The Bouguer anomaly pattern is characterized by steep gradients. Bouguer anomaly values range from -45 mgals to +50 mgals.

This province corresponds to Archaean outcrops of the Pilbara Block and to the southwestern onlap of the Canning Basin. It is suggested that Bouguer anomaly features with strong gradients and relief will characterize the entire area of the Pilbara Block and may be used to distinguish between areas of acid and basic rocks.

PROVINCE 6

ANKETELL REGIONAL GRAVITY HIGH

This province is only well defined in the northwest, although its seaward extension is not yet defined. Its linear dimensions to the southeast are also unknown but it is probably connected to the Blackstone Regional Gravity High (Province 38). The province is marked on its northeast and southwest boundaries by steep Bouguer anomaly gradients. Bouguer anomaly values range from -10 mgals to +50 mgals.

If the Anketell and Blackstone Regional Gravity Highs are connected, then the linear dimensions of this feature would indicate its representing an axis of major tectonic activity which possibly played an important role in the development of the Canning, Amadeus, and Officer Basins. Magnetic work indicates a shallow basement in the coastal area and this has been confirmed in bore holes.

PROVINCE 7

MUNRO REGIONAL GRAVITY PLATFORM

This province is an area of moderate Bouguer anomaly variation and has been divided into three units.

UNIT 7A La Grange Gravity Plateau

This unit consists of five prominent linear Bouguer anomaly highs and lows trending southeast. Bouguer anomaly values range from zero to -25 mgals.

Corresponds to an area of flat-lying Mesozoic sediments. From seismic and drilling results, basement appears to be a consistent 4000-5000 feet (1200-1500 m) deep. The Bouguer anomaly features therefore probably correlate with intrabasement density variations parallel to the Anketell Regional Gravity High.

UNIT 7B Oasis Gravity Depression

This unit is a large Bouguer anomaly low with two important culminations. Gradients within the unit are low. The northeast and southwest boundaries are intense gradients. Bouguer anomaly values range from -10 mgals to -40 mgals.

Interpretation of aeromagnetic data suggests that up to 12,000 feet (3700 m) of sediments could be present. This Bouguer anomaly feature is considered to confirm the sedimentary development, although density variations within the basement are likely to contribute as much as half of the Bouguer anomaly variation.

UNIT 7C Joanna Gravity Ridge

This unit is an east-trending Bouguer anomaly high with Bouguer anomaly values ranging from zero to -20 mgals.

This unit could correlate with an intra-basement effect or a basement ridge. The latter is preferred because of the steep marginal gradients.

PROVINCE 8

SOUTH CANNING REGIONAL GRAVITY LOW

A large province that is relatively ill defined because of sparse gravity data. The boundaries of this province, especially with provinces to the south, are largely speculative at this stage. No overall pattern within the province is obvious. Bouguer anomaly values range from -10 mgals to -55 mgals.

Corresponds to an area of very poor outcrop. Includes the Kidson Basin in the south. This Basin was initially defined by an aeromagnetic survey and has since been confirmed by seismic and drilling results. It is postulated that sedimentary thickness can be predicted from the gravity results, and the discovery of the Kidson Basin confirms the postulate.

PROVINCE 9

FITZROY REGIONAL GRAVITY COMPLEX

A southeasterly elongated province in which many of the Bouguer anomaly features have the same trend. The gradients within most of the province are generally steep. The Bouguer anomaly values range from -40 mgals to +45 mgals. The province has been divided into five units.

Correlates with the Fitzroy Basin, a major Palaeozoic basin within the more extensive Canning Basin. Generally, relative high and low Bouguer anomaly values correspond with known tectonic high and low areas except towards the coast, where thick sediments extend into the area of the Yeeda Gravity Platform.

UNIT 9A Napier Gravity Depression

A narrow feature on the boundary between the Fitzroy Regional Gravity Complex and the Kimberley Regional Gravity Platform.

In part correlated with a syncline within Devonian sediments flanking the northeast margin of the Fitzroy Basin. This unit is postulated to correlate with thick Lower Palaeozoic sediments.

Unit 9B Oscar Gravity Ridge

A narrow zone of high Bouguer anomalies showing a southeastern trend.

Precambrian rocks crop out at the southeastern end and the unit is postulated to correlate with a high-standing basement ridge. Its southwestern margin is a gradient which corresponds with the Pinnacle Fault.

UNIT 9C Noonkanbah Gravity Trough

A broad area of relatively low Bouguer anomalies. Generally the gradients are not steep. The Bouguer

Corresponds to a sedimentary trough (20,000 feet; 6000 m) - the Fitzroy Trough - within the Fitzroy Basin, and

anomaly values range from zero to -40 mgals.

the Jurgurra Terrace. Gradients on its northeast and southwest margins correspond to the Fenton and Dampier Faults.

UNIT 9D Yeeda Gravity Platform

In this unit, unlike others in the province, features do not exhibit a pronounced northwest trend: They are generally circular.

Corresponds to the northwestern continuation of the Fitzroy Trough. However, the Permian is much thinner and the Carboniferous contains thick basic igneous intrusions. This combination possibly accounts for the relatively high Bouguer anomaly values.

UNIT 9E Broome Gravity Ridge

A southeast elongate Bouguer anomaly high along the southwest margin of the province.

The northeast margin of the ridge is a prominent gradient representing the Fenton/Dampier fault system. A high basement ridge is well established by bores and seismic results at its western end. The whole of the unit is thought to represent a basement ridge, the gravity results showing the composite effect of the basement uplift and a basement density change.

PROVINCE 10

ASHMORE REGIONAL GRAVITY GRADIENT

Only the southeastern portion of this province has been defined. The contours show a marked northeasterly

The major trend agrees with the general structural trend as shown by bathymetric, seismic, and aeromagnetic data. The

trend, on which several small closed highs are superimposed. Bouguer anomaly values range from +40 to +165 mgals.

rapid rise in Bouguer anomaly values to the northwest undoubtedly corresponds to crustal thinning; for example, towards the south of the province the contours maintain their strong northeast direction while crossing a strong bathymetric and seismic feature at right angles. The smaller superimposed features appear to have structural significance.

PROVINCE 11

TIMOR REGIONAL GRAVITY LOW

Only portions of this large negative Bouguer anomaly province have been defined. The province has an east-northeast trend and is bounded by steep gradients. The Bouguer anomaly values range from -50 mgals to +60 mgals.

The axis of the Bouguer anomaly low is situated between the axis of the Timor Trough and the island of Timor. The Timor Trough is postulated to have been formed during the Eocene while Timor was being uplifted to form an island. The large negative Bouguer anomalies result from the crustal thickening that developed during the orogen.

PROVINCE 12

CARTIER REGIONAL GRAVITY SHELF

A province elongated northeast which shows no distinct trend direction. The southern boundary of the province has not been defined. The Bouguer anomaly values range from +15 mgals to +60 mgals.

The province lies almost entirely on the continental shelf. There is no obvious correlation of the Bouguer anomaly features with sedimentary thickness, although part of the low can be correlated with a prominent syncline.

PROVINCE 13

SAHUL BANK REGIONAL GRAVITY RISE

A prominent arcuate province which is over the continental shelf. The trend is east-northeast in the west and nearly east in the east. The trends of individual Bouguer anomaly features tend to follow the trend of the province, although there are north-south tendencies in the west and east of the province. The Bouguer anomaly values range from +50 mgals to +80 mgals.

The province corresponds to a bathymetric feature, the Sahul Rise. The Sahul Rise has been postulated to correspond to areas of relatively shallow Precambrian rocks and this has generally been confirmed by aeromagnetic and seismic results. The steep Bouguer anomaly gradient which marks the southern boundary of this province corresponds well in detail with a major fault, downthrown to the south; for most of its length this fault is along the Malita Shelf Valley.

PROVINCE 14

BONAPARTE REGIONAL GRAVITY DEPRESSION

The most obvious feature of this large province is the central zone of high Bouguer anomalies surrounded by a peripheral Bouguer anomaly low. On the basis of this the province has been divided into 5 units:

UNIT 14A North Bonaparte Gravity Shelf

UNIT 14B Wickham Gravity High

UNIT 14C West Bonaparte Gravity Low

UNIT 14D South Bonaparte Gravity Low

The North Bonaparte Gravity Shelf corresponds, in area, to the Bonaparte Depression (a bathymetric feature), which also contains the thickest sedimentary succession of the offshore Bonaparte Gulf Basin. The smaller Bouguer anomaly features within this unit show no obvious correlation with geological structure. There is obviously some genetic relationship between this unit and the Wickham Gravity High, which is also related to thick sedimentary development. The shape of the

UNIT 14E East Bonaparte Gravity Low

The Bouguer anomaly values in the province range from -20 mgals to +75 mgals.

Bouguer anomaly gradients on the flanks of the Wickham Gravity High indicate that the source of the anomaly is within the sedimentary section and is postulated to arise from a body of relatively high density material, perhaps limestone or volcanogenic material.

The peripheral lows form a prominent V-shaped series of gravity units, and trends within them closely follow the seismic, aeromagnetic, and bathymetric trends. Their outer margins mark the steep flanks of the Bonaparte Gulf Basin offshore. Obviously the anomalous aspect of this province is the reversal of correlation between the Bouguer anomalies and thickening sedimentary section across the Wickham Gravity High and North Bonaparte Gravity Shelf.

PROVINCE 15

WEST ARAFURA REGIONAL GRAVITY PLATFORM

An east-trending gravity province, the eastern boundary of which is open. The southern boundary is a steep Bouguer anomaly gradient, increasing northwards. The Bouguer anomaly values range from +30 mgals to +60 mgals.

Seismic results have indicated that Mesozoic-Tertiary sediments thicken to the south. The smaller features within the province, however, show no obvious correlation with seismic results.

PROVINCE 16 KIMBERLEY REGIONAL GRAVITY PLATFORM

There is no well defined Bouguer anomaly trend within the province, although there appears to be an alignment of the broader gravity features with the nearest boundary of the province. The anomalies are generally of small amplitude and long wavelength. The Bouguer anomaly values range from -25 mgal to +30 mgal.

This gravity province can be correlated with the Kimberley Block, which consists of sub-horizontal Upper Proterozoic and undifferentiated Proterozoic sediments and volcanics. The broad downwarps in these sediments generally correlate with broad Bouguer anomaly lows. The alignment of features parallel to the boundaries of the block indicates post-depositional warping of a flat-lying basin. The considerable faulting within the province has little effect on the Bouguer anomaly pattern indicating a fairly uniform density within the sediments.

UNIT 16A Durack Gravity Low

This unit is a broad northeast-trending low of small amplitude along the southeast margin of the province. The Bouguer anomalies range from zero to -10 mgal.

This unit correlates reasonably well with the eastern basin of the Kimberley Block.

UNIT 16B Glenroy Gravity Low

A Bouguer anomaly low along the southwest margin of the province in which the Bouguer anomaly values range from -10 mgal to -25 mgal.

This unit is probably correlated with a small basin abutting the King Leopold Complex.

UNIT 16C Hann Gravity Shelf

There is no well defined trend within this unit. The Bouguer anomaly values range from -20 mgal to +5 mgal.

This unit coincides with the western basin within the Kimberley Block but there does not appear to be much correlation between the regional geology and the gravity.

UNIT 16D Archipelago Gravity Rise and

UNIT 16E Berkeley Gravity Ridge

These two units are two broad gravity highs along the northwest and northeast margins of the province. The Bouguer anomalies range from zero to +30 mgal.

These features may well be related to the upwarping of the Lower Proterozoic metamorphics along the edges of the Kimberley Block. They are too far from the continental margin to be interpreted as a thinning of the crustal granitic layer.

PROVINCE 17

SPRINGVALE REGIONAL GRAVITY RIDGE

This is a small but very distinctive Bouguer anomaly high which is aligned north-northeast. The amplitude of the feature is about 85 mgals and it is flanked by very intense gradients of up to 7 mgal per mile. The southern limits of the province are ill defined. The Bouguer anomaly values range from -30 mgal to +65 mgal.

This province corresponds to the southern part of the Halls Creek Complex - a north-northeast-trending zone of highly metamorphosed, deformed, and intruded rocks. The surface geology shows the zone extending northwards to Darwin, but the gravity pattern does not conform with this.

UNIT 17A McIntosh Gravity Ridge

This unit comprises the more intense features within the province. The Bouguer anomalies range from zero to +65 mgals.

This feature is so intense that known structure within the metamorphic rocks cannot explain it. The feature could indicate a very large gabbroic intrusion.

UNIT 17B Halls Creek Gravity Ridge

An ill defined unit, except on its eastern and southern margins, with no dominant trends. The Bouguer anomaly values range from -30 mgal to zero.

The eastern and southern margins can be correlated with the Old Halls Creek Fault and the Pinnacle Fault respectively. Isolated gravity lows within the unit are probably correlated with granitic intrusions.

PROVINCE 18 ORD REGIONAL GRAVITY DEPRESSION

The province is arcuate, trending west in the south and north-north east in the north. The Bouguer anomaly values range from -20 mgal to -60 mgal, with moderate gravity gradients predominating. Four distinct Bouguer anomaly lows are present and the province has been divided into four units on this basis.

The Hardman Gravity Low coincides with the major development of the Ord Basin, although slightly offset. The Cambrian Ord Basin is thought to be a post-depositional feature containing approximately 1000 feet (3000m) of sediment. The Bouguer anomaly feature indicates that up to 10,000 feet (3000 m) of sediments could be present and it is postulated that the Basin contains Proterozoic sediments.

UNIT 18A Rosewood Gravity Low

UNIT 18B Hardman Gravity Low

UNIT 18C Flora Gravity Low

UNIT 18D

Mt Bannerman Gravity Depression

The Mt Bannerman Gravity Depression crosses the edge of the Canning Basin at right angles, and this has been interpreted as indicating a thick development of Proterozoic sediments or low-density

UNIT 18D

Mt Bannerman Gravity Depression

intrusions, most probably the former. The paucity of geological knowledge over much of this province is a major handicap in interpretation, but it is postulated that the province can be correlated with a major Proterozoic-Palaeozoic Basin.

PROVINCE 19 VICTORIA REGIONAL GRAVITY SHELF

The boundaries between this and adjacent provinces is somewhat arbitrary. The Bouguer anomaly values range from zero to -30 mgals and no significant trends are evident.

This province corresponds geologically to the Victoria River Block, an area of thick sub-horizontal Proterozoic sediments. The Bouguer anomaly features could correspond to variation in depth of the basement rocks, but there is little evidence to support this hypothesis. There is no evidence of the Halls Creek Complex on the western border of the province.

PROVINCE 20 WANGITES REGIONAL GRAVITY RIDGE

The province forms a prominent north-trending positive Bouguer anomaly lineament with an average width of approximately 50 miles (80 km). The maximum value along the crest of the ridge decreases southward from +75 mgals to +10

There is some indication that the province is correlated with the Halls Creek and Pine Creek mobile belts. However, the surface geology does not appear to correlate closely with the Bouguer anomaly pattern. The province appears to be related to deep-seated density variations within the

mgals. The margins are characterized by high gradients which decrease to the south. within the crust. The maximum Bouguer anomaly occurs at the junction of the two mobile belts, where movement could be expected to be most intense. Wavelength analysis indicates that the top of the body generating the province is not deeper than 8 km and so an upwarp in the mantle would seem to be excluded, leaving an upfold of deeper crustal material as the most likely interpretation.

PROVINCE 21

TIPPERARY REGIONAL GRAVITY LOW

This province is a low-amplitude feature with a fairly erratic axis and Bouguer anomaly values ranging from +25 mgals to -20 mgals.

The low correlates quite well with the Daly River Basin, although its culmination is offset to the west of the axis of the basin. The most likely cause of the feature is a thickening of the Proterozoic sediments by approximately 3000 feet (1000 m).

PROVINCE 22

MARY REGIONAL GRAVITY SHELF

This wedge-shaped province is bounded by well defined gradients to the north and west, but the eastern margin is rather indistinct. The Bouguer anomaly values range from +15 mgals to +40 mgals.

The province has been divided into
2 units.

UNIT 22A Marrakai Gravity Plateau

A broad Bouguer anomaly high in
the southern part of the province.

The simple gravity pattern over this part
of the Pine Creek geosyncline indicates
little density contrast between the granites
and metamorphics.

UNIT 22B Van Diemen Gravity Low

A broad north-northeast-trending
Bouguer anomaly low characterized
by low gravity gradients.

The low is postulated to be related to an
increase of 1500 feet (450 m) in the thick-
ness of Mesozoic sediments overlying
Proterozoic basement.

PROVINCE 23

OENPELLI REGIONAL GRAVITY COMPLEX

The province is marked by fairly
intense features which show no
marked trend. The boundaries of the
province are not well defined. The
Bouguer anomaly values range from
zero to +50 mgals, but the amplitude
of the features is less than this as
there is a gradual northward increase
in the average Bouguer anomaly.

Correlation with geology is poor. The
outcropping Upper Proterozoic rocks
would appear to give a more complex
Bouguer anomaly pattern than the Lower
Palaeozoic metamorphic rocks in the
Mary Regional Gravity Shelf (Province 22).
The only positive correlation between
Bouguer anomaly and geology is in the
north, where Archaean metasediments
correlate with a Bouguer anomaly high.
Other known geology cannot be correlated
with the Bouguer anomaly features.

PROVINCE 24

ARNHEM REGIONAL GRAVITY PLATFORM

The average Bouguer anomaly value over this province is approximately zero mgals and an undulating Bouguer anomaly pattern is evident. The local features are more intense than in the geologically similar Kimberley Block. No regional trends are obvious. The Bouguer anomaly values range from +20 to -10 mgals.

There is no obvious correlation between the geology and the Bouguer anomaly results. A Bouguer anomaly low in the northeast may be related to granite outcrops and indicate a series of batholiths at depth. Most of the province can be correlated with Upper Proterozoic sediments, but the Bouguer anomaly features do not correspond to the known structures within them.

PROVINCE 25

ELCHO REGIONAL GRAVITY HIGH

A subcircular province which is not yet defined to the north; its remaining boundaries are well defined by steep gradients. The Bouguer anomaly values range from +20 to +70 mgals.

The province is correlated with sub-horizontal faulted Upper Proterozoic sediments. It is suggested that the province is the result of a basic intrusion associated with the zone of faulting.

PROVINCE 26

DUNMARA REGIONAL GRAVITY LOW

The northern and eastern boundaries of this province are well defined, but the western margin is a gradual change into the Buchanan Regional Gravity Platform. The Bouguer anomaly values range from zero to -45 mgals. The predominant trend

Unit A corresponds to an area of thin Palaeozoic sediments, too thin to account for the 10 mgals relief of this feature. It is postulated that there is a local thickening of Upper Proterozoic sediments by some 2000 feet (600 m). Unit B has 25 mgals of relief and is far more pro-

is to the north and a median ridge divides the province into 2 units.

UNIT 26A Elsey Gravity Low

UNIT 26B Amungee Gravity Low

nounced than Unit A. Its origin is presumably similar to that of Unit A except that 6000 feet (1800 m) of Pre-cambrian sediments would be indicated.

PROVINCE 27

BUCHANAN REGIONAL GRAVITY PLATFORM

The dominant trend within the province is northerly in the west and centre but is not discernible in the north and east. Gradients are generally small within the province and the Bouguer anomaly values range from -20 to +20 mgals. Three units have been defined:

UNIT 27A Inverway Gravity Ridge

UNIT 27B Canfield Gravity Complex

UNIT 27C Murranji Gravity Shelf

Much of the area covered by this province is covered by Recent sediments and the geology is poorly known. Unit A could possibly be caused by a structural ridge of Lower Proterozoic rocks under a considerable thickness of Upper Proterozoic sediments. The more complicated Unit B has similarities with the Victoria Regional Gravity Shelf (Province 19) and the Ooratippra Gravity High, a unit of the Georgina Regional Gravity Shelf (Province 43). The Bouguer anomaly pattern becomes less elongate and loses its northwesterly trend northwards. The Ooratippra Gravity High corresponds to the metamorphic area of the Warramunga Geosyncline, and the Victoria Regional Gravity Shelf is an area of thick sub-horizontal sediments. This suggests that Unit B is a transition zone between the

two, where the metamorphic rocks become buried under the thickening sediments. Unit C corresponds to an area of thin Palaeozoic sediments, but Proterozoic sediments are probably present beneath the Palaeozoic rocks, and gradually thicken from the metamorphic ridge in the west towards a postulated basin in the east.

PROVINCE 28 TANAMI REGIONAL GRAVITY COMPLEX

This province is only partly defined and consists of a series of intense Bouguer anomaly features with west-northwest and north-northeast trends predominant. The Bouguer anomalies range from -40 mgal to +10 mgal.

The province correlates reasonably well with the Tanami Complex, which comprises metamorphosed Lower Proterozoic and other Precambrian sediments. The gravity pattern shows that the Tanami Complex is not continuous with the King Leopold Complex on the west and the Warramunga geosyncline on the east.

PROVINCE 29 LANDER REGIONAL GRAVITY LOW

The southern margin of this province is a steep gravity gradient; the western margin is defined by a change in Bouguer anomaly trend. The Bouguer anomalies range from -25 mgal to -75 mgal.

This province coincides with a sand-covered area almost devoid of outcrop. At the southeast extremity of the low it correlates with outcrops of Lower Palaeozoic sediments, and it is suggested that the main part of the low correlates with an extension of the same sediments into the Wiso Basin. The presence of Upper Proterozoic sediments cannot be

ruled out, but there is no direct evidence for their existence.

PROVINCE 30 PEDESTAL REGIONAL GRAVITY LOW

The southern and northern margins of this province are fairly steep gradients. Several small closures of about 30 mgals amplitude occur, but no well defined trend is evident.

The feature seems to coincide with a small Proterozoic - Palaeozoic basin on the edge of the Canning Basin. The small closures may be caused by small granite intrusions, which are fairly common in the area.

Excluding the effect of these small closures, the low could correspond to about 5000 feet (1500 m) of sediments.

PROVINCE 31 WILLOWRA REGIONAL GRAVITY RIDGE

The western margin of the province is not yet defined. The province is slightly arcuate, and both the southern and northern margins exhibit high gradients that decrease from east to west. The Bouguer anomaly values range from -40 mgals to +5 mgals.

The northern gradient is probably caused by faulting along the southern margin of the Wiso Basin. The position of the southern margin, which is also the northern margin of the Yuendumu Regional Gravity Low, is somewhat arbitrarily placed. In the east the province corresponds to a mineralized zone and so an extensive zone of mineralized metamorphic rocks of the Archaean Arunta Complex may extend to the west. The general easterly trend of the province indicates that the area was involved in the orogenies associated with the present form of the Ngalia and Amadeus Basins.

PROVINCE 32

YUENDUMU REGIONAL GRAVITY LOW

This province is one of the most significant in Central Australia in that its origin is critical in the understanding of the tectonic history of the area. It is slightly arcuate in form, concave southwards; its western extent is not yet defined. The southern boundary is characterized by very high gradients that decrease gradually to the west. In the north the bounding gradient is extremely steep in the east but becomes moderate westwards. The Bouguer anomaly values range from -30 mgals to -100 mgals. Two units have been defined.

UNIT 32A Trever Gravity Low

UNIT 32B Napperby Gravity Low

Within each of these units there are two separate Bouguer anomaly closures.

It has been postulated that granitic intrusions are the cause of this province, but it is difficult to believe that intrusions would occur on such a large scale. The size, trend, and boundary features of the province are very similar to the Bouguer anomaly features occurring over the Amadeus Basin. The Ngalia Basin is within the borders of the province, but it occurs within the southern gradient, not at the nadir. Crustal warping would produce very large scale undulations in the base of the crust and would still not account for the high boundary gradients. The most favoured interpretation at this stage is that the province correlates with the Ngalia Basin. This interpretation means that the geologically mapped boundaries of the basin must be extended beneath the Recent sediments to the north. Large scale overthrusting from the north is also postulated.

PROVINCE 33

PAPUNYA REGIONAL GRAVITY RIDGE

An intense elongate feature about 350 miles (550 km) long and 60 miles (100 km) wide. The gradients on its

Several interpretations of this feature have been advanced:

(i) Archaean and Proterozoic rocks

northern and southern flanks are high, averaging 5 mgals/mile for considerable distances. Two separate culminations are obtained - one having a maximum value of +25 mgals and the other of +50 mgals. The Bouguer anomaly values range from -60 mgals to +50 mgals.

overfolded southwards on the edge of the Amadeus Basin.

(ii) Faulting that brought ultrabasic rocks close to the surface to produce the high gradients.

(iii) A fundamental density change within the crust.

(iv) Crustal warping, with the mantle brought close to the surface.

Analysis of the feature indicates that the top of the body cannot be deeper than 13 km, which probably indicates that crustal warping is not the main cause of the feature.

PROVINCE 34 AMADEUS REGIONAL GRAVITY LOW

This province is a major east-trending Bouguer anomaly low and is characterized by many small individual closures at both its east and west margins. The Bouguer anomalies range from -20 mgals to -145 mgals.

This gravity province corresponds with the greater portion of the Amadeus Basin, but includes some Archaean rocks on its northern edge. A major basement overthrust from the north is postulated, but this does not appear to offer sufficient explanation for the offset of the geological and Bouguer anomaly features. Intra-basement density contrasts and possibly major crustal warping are also postulated.

UNIT 34A MacDonald Gravity Shelf

The northern margin of this unit has not been mapped. The Bouguer

This unit is an area largely covered by alluvium, but it could represent a western

anomalies gradually become more negative towards the southeast.

There are many closures, but no well defined trends. Bouguer anomalies range from -20 mgals to -90 mgals.

shelf area of the Amadeus Basin with significant though relatively thin sediments.

UNIT 34B Hermannsburg Gravity Depression

This is one of the major units on the Australian continent. It is an east-trending Bouguer anomaly low bordered by a steep gravity gradient to the north. Bouguer anomalies range from -40 mgal to -145 mgal.

Apart from the Archaean rocks mentioned above this corresponds with an area underlain by a great thickness of sediments. Known stratigraphy and seismic evidence confirm this.

UNIT 34C Maryvale Gravity Shelf

A unit characterized by many small closures; the major trend is east-northeast. The Bouguer anomalies range from -55 mgal to -85 mgal.

There is seismic evidence for thick sediments in the south, but it is postulated that a substantial portion of the Amadeus Basin sediments are missing.

UNIT 34D Todd Gravity Terrace

A small unit at the eastern end of the Hermannsburg Gravity Depression. The Bouguer anomalies range from -20 mgal to -80 mgal.

An area of Archaean outcrop overlain to the south by Upper Proterozoic sediments.

PROVINCE 35 OLGA REGIONAL GRAVITY RIDGE

A narrow, elongate, east-trending relative Bouguer anomaly high.

The western boundary of this feature is not defined. The Bouguer anomalies are very negative and range from -80 mgals to -40 mgals. Two units have been defined.

UNIT 35A Bloods Range Gravity Ridge

UNIT 35B Angas Downs Gravity Ridge

This province covers areas of Upper Proterozoic and Ordovician outcrops. It is postulated as representing a high basement ridge marking the southern edge of deposition of the Amadeus Basin sequence. Crustal configuration could possibly have some effect on the feature. Unit A lies largely outside the geologically defined Amadeus Basin; Unit B lies within it.

PROVINCE 36 AYERS ROCK REGIONAL GRAVITY LOW

An intense Bouguer anomaly low, the southern margin of which is not yet defined. The trends in the west of the province are to the northwest, and in the central and eastern parts to the east. The province is well defined by steep gravity gradients. It is possibly an easterly extension of the Cobb Regional Gravity Low. Bouguer anomaly values range from -50 mgals to -130 mgals.

The area covered by the province contains Archaean rocks to the south and a veneer of alluvium or Mesozoic to the north, with some Upper Proterozoic sedimentary outcrops. The province is postulated to correspond to an area of thick sediments with a large overthrust from the south. It appears that crustal downwarping may be a contribution to some of the Bouguer anomaly low.

PROVINCE 37 COBB REGIONAL GRAVITY LOW

The trends within the province are easterly in the east and northwesterly

The area covered by this province contains metamorphosed Lower Proterozoic rocks

in the west. The province is bounded by steep gradients in the south and west. The Bouguer anomaly values range from -30 mgals to -105 mgals.

in the east. The northwest is covered by alluvium with Cretaceous and Permian veneer, but there is some evidence of diapiric folding. The area of the Bouguer anomaly low is very extensive and there are highly negative Bouguer anomaly values. The low must be partly caused by an intrabasement, crustal, or sub-crustal mass deficiency, but it is postulated that there may be thick sediments, particularly in the northwest. These could be mostly Upper Proterozoic.

PROVINCE 38

BLACKSTONE REGIONAL GRAVITY HIGH

A narrow zone of intense Bouguer anomaly highs. The southern and northern limits of the province are undefined. It appears that this province may be connected to the Anketell Regional Gravity High. Individual anomaly features within the province tend to be subcircular in form. The Bouguer anomaly values range from -60 mgals to +60 mgals.

An area of outcropping Archaean rocks in the southern and eastern parts. It is postulated that the relative high and low Bouguer anomaly features within the province respectively indicate relatively more basic and acid rocks. If this feature is connected to the Anketell Regional Gravity High then these two provinces form a major lineament which could be of major significance in the tectonic evaluation of the area. This lineament may determine the structural boundaries of the Canning and Officer Basins.

PROVINCE 39

GIBSON REGIONAL GRAVITY LOW

A large province which is only defined on the northeastern margin. Major trends within the province are rather obscure, but there is a tendency for northwesterly trends to predominate. Bouguer anomaly values range from -35 mgals to -80 mgals.

The area is covered with Tertiary, Cretaceous, or Permian veneer. In the northeast are some Upper Proterozoic salt domes. Upper Proterozoic occurs to the west and southwest. The northern and southern extensions of this province, when defined, will possibly suggest the depositional or tectonic connexion, if any, between the Canning, Officer, and possibly Amadeus Basins.

PROVINCE 40

OODNADATTA REGIONAL GRAVITY LOW

A small, incompletely defined province. The Bouguer anomaly values range from -20 mgals to -60 mgals. Three units have been defined.

UNIT 40A Abminga Gravity Depression

A narrow northeast-trending Bouguer anomaly low. It is defined on its east and west flanks by steep gradients. Bouguer anomaly values range from -40 mgals to -55 mgals. The southern limits of this province are not yet defined.

This unit corresponds to an area of acid metamorphic and igneous rocks, together with outcrops of Proterozoic sediments. The density contrast between these rocks and the more dense basic igneous rocks of the Musgrave Block to the west is the most likely explanation for this gravity unit.

UNIT 40B Hamilton Gravity Rise

An irregular gravity unit in which there are tendencies for both northeast and northwest trends. The Bouguer anomaly values range from -20 mgals to -40 mgals.

Aeromagnetic and seismic data suggest that sedimentary thickness increases from west to east. Magnetic basement is 6000 feet (1800 m) deep. It is postulated that the unit corresponds to basement denser than that of Unit A, and shallower than that of Unit C.

UNIT 40C Dalhousie Gravity Depression

A narrow northwest-trending unit, composed of a large closure in the north and a smaller closure in the south. These two lows are en echelon. The Bouguer anomaly values range from -20 mgals to -60 mgals.

Magnetic basement in this area attains a maximum depth of 12,000 feet (3600 m), and seismic results also indicate a thick sedimentary section. It is postulated that the unit corresponds to a thick pre-Mesozoic sedimentary section. The southern closure, being the more intense, could correspond to a graben.

PROVINCE 41 FINKE REGIONAL GRAVITY RIDGE

A narrow northeast-trending province. The southwestern boundary is not yet defined. The northwestern boundary is defined by a steep gravity gradient. Trends within the province are mainly to the northeast. Bouguer anomaly values range from -20 mgals to -55 mgals.

The province corresponds to an area of Recent and Mesozoic cover, with Archaean rocks cropping out in the southwest. This province provides a distinct boundary to the southeast of the Ayers Rocks (Province 36) and Amadeus (Province 34) Regional Gravity Lows. It is postulated that the province represents a basement ridge that marks the eastern limit of the

Amadeus Basin, even though the Amadeus Basin sediments may overlap onto it.

PROVINCE 42 ILLOGWA REGIONAL GRAVITY HIGH

The component features of this province have a predominantly northwest trend. The Bouguer anomalies range from -40 mgals to +15 mgals.

The province is divided into three units:

UNIT 42A Hay Gravity Low

UNIT 42B Caroline Gravity Ridge

UNIT 42C Hale Gravity Platform

Archaean rocks crop out to the northwest, and Mesozoic rocks underlie sands of the Simpson Desert to the southeast. It is postulated as generally an area of shallow basement. Generally the relatively high and low Bouguer anomalies reflect varying acidity in the basement. The northwesterly extent of the Caroline Gravity Ridge suggest that it is joined to the Willowra Regional Gravity Ridge (Province 31).

PROVINCE 43 GEORGINA REGIONAL GRAVITY SHELF

This province is a complex of Bouguer anomaly features, and trends are not well defined over much of the area. The Bouguer anomalies range from -55 mgal to +15 mgal.

This province corresponds to the Georgina Basin and the Davenport Geosynclinal Zone. In general, with the exception of the Toko Syncline there appears to be so little density contrast between the basement and sediments that we cannot predict areas of different sedimentary thickness.

UNIT 43A Renner Gravity Plateau

An area of rather weak Bouguer

The geological significance of this unit

anomaly features in which southwest and southeast trends are recognized. The Bouguer anomaly values range from -20 mgal to zero.

UNIT 43B Ooratippra Gravity High

A unit of relatively high Bouguer anomalies which have a marked northwest trend, though in the southeast individual features show a northeast trend. The Bouguer anomalies range from -40 mgal to +15 mgal.

UNIT 43C Frewena Gravity Shelf

This unit is characterized by gentle gravity gradients and generally the features show a northeast trend. The Bouguer anomalies range from -35 mgal to -10 mgal.

UNIT 43D Wonarah Gravity Low

A northeast-trending Bouguer anomaly low which becomes more intense towards the south. The Bouguer anomalies range from -10 mgal to -55 mgal.

is not fully understood, but the general remarks on the province above appear to apply.

The area covered by this unit corresponds in general with a discontinuous zone of metamorphics of the Davenport Geosyncline. It is postulated that the unit defines the metamorphics beyond outcrop, and trend directions are possibly more important than anomaly magnitudes in defining the metamorphics.

There is no evidence to suggest that the Georgina Basin sediments vary in thickness in this area. The Bouguer anomaly variations are thought to be due to density variations within the basement.

In the south the low appears to correlate with outcropping Lower Palaeozoic granite, while in the north it correlates with Upper Proterozoic sediments of the South Nicholson Group.

UNIT 43E Lingaree Gravity Ridge

A northeast-trending Bouguer anomaly high; the Bouguer anomalies range from +5 mgal to -20 mgal.

This unit correlates with an area of flat-lying Cambrian limestone and dolomite, except at its northern end, where Lower Proterozoic rocks crop out. It is postulated that the ridge delineates the subsurface trend of the Proterozoic rocks.

UNIT 43F Ammaroo Gravity Depression

A small unit which is composed of numerous small Bouguer anomaly features. Both northwest and northeast trends are apparent. The Bouguer anomaly ranges from -20 mgal to -50 mgal.

This unit corresponds with the Ammaroo Basin and may indicate a relatively thick sequence of Lower and Middle Palaeozoic sediments. However, it is adjacent to the Hay Gravity Low (Unit 42 AP) which appears to be controlled by acid basement rocks.

UNIT 43G Sandover Gravity Low

A broad north-trending Bouguer anomaly low in the north, gradually becoming more irregular and intense to the south. The Bouguer anomaly values range from -10 mgal to -35 mgal.

The eastern margin of the low correlates fairly well with the eastern margin of the Georgina Basin. However, the Cambrian sediments are relatively dense and it is postulated that the low culminations are caused by relatively thick sediments of Upper Proterozoic age. The gradient which forms the eastern boundary of the low is thought to mark the eastern extent of thick Upper Proterozoic sedimentation.

UNIT 43H Tobermory Gravity Shelf

A unit of generally indistinct Bouguer anomaly features. The Bouguer anomalies range from 5 mgal to -30 mgal.

Bouguer anomaly features do not appear to correlate with sedimentary development.

UNIT 43I Toko Gravity Trough

An intense Bouguer anomaly low at the southeastern margin of the province. The trend is to the southeast and the Bouguer anomalies range from zero to -35 mgal.

This unit corresponds at its northern end with outcropping rocks of the Toko Syncline. Farther north, older and denser rocks of the syncline crop out and the gravity feature disappears. Sand and Mesozoic rocks cover the area to the southeast. It was postulated on the basis of the gravity results that the Toko Syncline continues to plunge to the southeast under the Mesozoic sediments. This has been confirmed by seismic survey.

PROVINCE 44

McARTHUR REGIONAL GRAVITY HIGH

Bouguer anomaly values range from -35 mgals to +40 mgals. The northern margin of this province is in the Gulf of Carpentaria and is not yet defined.

This province to a large extent correlates with the Proterozoic rocks of the McArthur Basin.

UNIT 44A Boorooloola Gravity High

An extensive unit in the western part of the province.

In general the culminations correlate with outcrops of Lower Proterozoic rocks of the Tawallah Group, which are dense metamorphic rocks.

UNIT 44B Creswell Gravity Low

A subcircular feature attaining a minimum of -35 mgals. The southern boundary of the feature was the steepest gradient.

The gradient forming the southern margin of the feature correlates with exposures of granite. The low correlates in a general way with sediments of the McArthur Group (Upper Proterozoic). The low could either be due to an extensive buried granite or a thick accumulation of McArthur Group sediments or a combination of the two.

UNIT 44C Murphy Gravity Ridge

A west-southwest-trending gravity high along the southern margin of the province.

The eastern part of the ridge correlates with Lower Proterozoic rocks and it is postulated that the western part delineates the subsurface extension of these rocks beneath the Georgina Basin.

UNIT 44D Burketown Gravity Platform

An area of relatively small gravity relief in which the Bouguer anomaly values range from 0 to +40 mgals. The northern margin, beneath the Gulf of Carpentaria, has yet to be defined.

Mesozoic sediments of the Carpentaria Basin cover most of the area. Density determination from basement penetrated in boreholes are inconclusive in deciding whether the granitic or metamorphic rocks are the more dense. Bouguer anomaly

variations are due to density changes beneath the Carpentaria Basin and not to changes in Mesozoic sedimentary thickness.

UNIT 44E Murgullah Gravity Depression

A small arcuate gravity feature in which the Bouguer anomalies range from -20 mgal to +10 mgal.

The relatively low Bouguer anomalies are probably caused by a granite but may also be due to thick Upper Proterozoic sediments under the Mesozoic cover.

PROVINCE 45

PELLEW REGIONAL GRAVITY HIGH

Only the western part of this feature has been outlined. A subcircular feature with Bouguer anomaly values ranging from zero to +50 mgals.

No definite correlation with geology is observed. The feature correlates with outcropping metamorphic rocks of the Tawallah Group, so possibly there is a structural high within the Tawallah Group. Another possible interpretation is that the feature is caused by a dense intruded body.

PROVINCE 46

CLONCURRY REGIONAL GRAVITY HIGH

A large province over which the Bouguer anomalies have a general north-northwest trend in the south swinging to north in the north, and range in value from -25 mgal to +50 mgal.

This province corresponds in part with the exposed Cloncurry Fold Belt, an area of metamorphosed Lower Proterozoic sediments including numerous granite intrusions. Lower Palaeozoic dolomite etc. of the

Georgina Basin crop out in the south and extensively in the west. Mesozoic rocks of the Great Artesian Basin cover the area in the southeast and north. The subsurface extension of the Cloncurry Fold Belt at relatively shallow depth to correspond with the extent of the gravity province is predicted. Many Bouguer anomaly lows exhibit close correlation with particular granite intrusions whose continuance beyond outcrop may be predicted.

UNIT 46A Mt Oxide Gravity Shelf

This unit is characterized by Bouguer anomalies which have a general northerly trend and range in value from -10 to +20 mgal.

The unit corresponds to outcrops of Lower Proterozoic metamorphic and granitic rocks. The western margin of the unit is a gravity gradient which delineates the eastern boundary of the Georgina Basin.

UNIT 46B Kajibbi Gravity Ridge

This unit covers an area 250 miles (400 km) long by 65 miles (100 km) wide and has Bouguer anomaly values ranging from zero to +45 mgal. Most of the features have a northerly trend.

This positive feature indicates the northern extension of the Cloncurry Fold Belt under a thin Mesozoic sedimentary cover. The high Bouguer anomaly values in the centre of the unit appear to correlate with the Naraku granite.

UNIT 46C Julia Creek Gravity Shelf

An area characterized by northeast-trending Bouguer anomaly features which range in value from zero to -25 mgal.

This area is covered by thin Mesozoic sediments. Water bores indicate the basement to be deepening to the northeast. The features within this unit are believed to be caused by intrabasement density contrasts.

UNIT 46D Glenormiston Gravity Shelf

This unit is characterized by numerous irregular Bouguer anomaly highs and lows with a general north-northwest trend. The Bouguer anomaly values range from -15 mgal to +20 mgal.

This unit is located where the Georgina Basin sediments onlap onto the Cloncurry Fold Belt.

UNIT 46E Boulia Gravity Ridge

UNIT 46F Kaldadoon Gravity Low

UNIT 46G Bourke River Gravity Complex

These three units are characterized by north to north-northwest-trending elongate intense Bouguer anomaly highs and lows. The Bouguer anomaly values range from -25 mgal to +30 mgal.

These three units are closely identified with basement variations and structure in the north. Some Georgina Basin and Great Artesian Basin sediments cover their southward extension. It is predicted that the northern basement features continue at shallow depth in the south.

UNIT 46H Mackunda Gravity Platform

This unit is characterized by generally low gravity gradients with one major Bouguer anomaly low, with a north-northwest trend, in the centre of the area. The Bouguer anomaly values range from -15 mgal.

This area also has basement cropping out in the north. The major part of the area is covered with Mesozoic sediments thickening gently to the southeast and reaching a thickness of some 4000 feet (1200 m). In spite of this thickening of relatively low density sediments, it is believed that intrabasement structure and rock types are dominant in determining the Bouguer anomaly features.

UNIT 46I Field Gravity Spur

A small gravity unit to the west of the main part of the province with a Bouguer anomaly range of zero to +15 mgal.

Upper Proterozoic sediments occur in the northwest of the unit and Mesozoic sediments to the southeast. It is postulated that more basic metamorphic or igneous rocks occur at shallow depth.

UNIT 46J Bedourie Gravity Ridge

This unit consists of many small Bouguer anomaly features with trends varying between northeast and northwest. The Bouguer anomalies range from +5 mgal to +25 mgal.

Characterized by Mesozoic sediments thickening gently to the south. The Bouguer anomalies do not obviously reflect the thickening Mesozoic sediments. It is postulated that the area is underlain by relatively dense basement with few if any granite intrusions.

PROVINCE 47 CARPENTARIA REGIONAL GRAVITY PLATFORM

This province consists of a region of Bouguer anomalies which range from -25 mgal to +25 mgal. The individual features are not sharp and tend to be somewhat rounded.

This province coincides with a large part of the onshore Carpentaria Basin. There is some suggestion of a positive ridge corresponding to the Euroka Ridge, which is the subsurface divide between the Eromanga and Carpentaria Basins. Most of the Bouguer anomaly features are probably related to density changes in the basement. Aeromagnetic surveys have indicated that magnetic basement lies as deep as 10,000 feet (3000 m) in the Normanton area, but gravity or seismic work do not indicate such a thick sedimentary section.

PROVINCE 48 MITCHELL RIVER REGIONAL GRAVITY COMPLEX

This province consists of a series of northerly-trending Bouguer anomaly highs and lows. The Bouguer anomaly values range from -25 mgal to +45 mgal.

The western part of the province is correlated with the Mesozoic rocks of the Carpentaria Basin and the eastern part with the Precambrian rocks which form the eastern boundary of the basin.

UNIT 48A Aurukun Gravity High

This is a coastal feature, the western margin of which is not defined. The Bouguer anomaly values range from +10 mgal to +35 mgal.

This unit may correlate with a basement rise which could be the western margin of a postulated area of thick Mesozoic sedimentation, indicated by the Archer River Gravity Low (Unit 48B).

UNIT 48B Archer River Gravity Low

This unit is a narrow north-trending feature that extends for 240 miles (400 km). There is a subsidiary low to the east of the main feature. The Bouguer anomalies range from -10 mgal to +25 mgal.

Aeromagnetic work has indicated an area within this unit where magnetic basement is indicated at a depth of 5000 feet (1500 m). This Bouguer anomaly low supports an interpretation of relatively light sediments and delineates the areal extent of the possible sediments.

UNIT 48C Inkerman Gravity High

This small unit consists of two almost circular Bouguer anomaly highs. The Bouguer anomaly values range from zero to +25 mgal.

This unit could possibly be due to either intrabasement density changes or shallow basement. It is separated from the Aurukun Gravity High (Unit 48A) by a small easterly extension of the Archer River Gravity Low (Unit 48B).

UNIT 48D Strathway Gravity Ridge

This unit consists of a series of high Bouguer anomaly features with a northerly trend. The Bouguer anomaly values range from zero to +45 mgal.

This unit is possibly related to dense Precambrian rocks which crop out in the east and which are much more widespread than is apparent on the surface. It indicates an extension of these dense rocks farther west under the Mesozoic rocks of the Carpentaria Basin.

UNIT 48E Kooltah Gravity Shelf

This unit consists of a series of small Bouguer anomaly highs and lows which display no well defined trend. The Bouguer anomaly values range from -10 mgal to +25 mgal.

The Bouguer anomaly features of this unit are probably related to basement density changes. The area consists of flat-lying Mesozoic rocks and very little is known of the subsurface structure.

UNIT 48F Ebagoola Gravity Low

This unit is a narrow, north-trending low with Bouguer anomaly values ranging from -15 mgal to +10 mgal.

Most of the surface rocks in the area are elements of the Peninsula Precambrian Complex, but just east of this unit Palaeozoic granite crops out. The Bouguer anomaly low may be caused by an extensive granite mass.

PROVINCE 49

WEIPA REGIONAL GRAVITY SHELF

This province is an area in which the Bouguer anomalies range from -5 mgal to +25 mgal; it extends towards the Arafura Sea.

This province occurs close to the north-eastern margin of the Mesozoic Carpentaria Basin. The main feature of the province is a Bouguer anomaly high, centred north of Weipa. It is suggested that this high corresponds to a basement high, which has also been indicated by aeromagnetic work. West of this feature is a Bouguer anomaly low that could be continuous with the Peninsula Gravity Trough (Unit 50B).

PROVINCE 50 CAPE YORK REGIONAL GRAVITY HIGH

This province extends from latitude 16° S north to Papua. The western and southern margins are defined. The eastern margin is beyond the limits of the present gravity coverage and the northern termination is not well defined owing to the lack of data in Torres Strait. The Bouguer anomalies range from zero to +80 mgal. The major trends are parallel to the coast for most of the region.

This province cannot be correlated with any major geological feature and extends across many quite difficult geological units.

UNIT 50A Thursday Island Gravity High

This unit extends from the northern tip of Cape York across the Torres Strait to Papua. The Bouguer anomalies range from +15 mgal to +70 mgal, but individual gravity features are ill defined owing to the paucity of gravity stations.

Little is known of the geology of this area. On Cape York the Bouguer anomaly high is probably caused by dense basement rocks near the surface. In Papua there is some indication of a Bouguer anomaly feature associated with the Morehead Basin but additional gravity coverage is required.

UNIT 50B Peninsula Gravity Trough

This unit trends east-northeast and the Bouguer anomaly values range from +15 mgal to +40 mgal.

The offshore eastern end of this unit coincides with a suggested basement trough delineated by aeromagnetic surveys. The aeromagnetic surveys indicate up to 6000 feet (1800 m) depth to magnetic basement. The onshore extent of the postulated trough is delineated by the gravity unit.

UNIT 50C Weymouth Gravity High

The Bouguer anomalies in this unit range from +20 mgal to +55 mgal. The general trend is north, but there is a suggestion of an east-trending re-entrant in the northern part of the unit.

This area of positive Bouguer anomalies may be due to basement rocks near the surface under a thin Mesozoic cover. The Olive River Basin, indicated by seismic work, is within the area defined by this high. The basin probably contains a sequence of sediments of Lower Mesozoic or Palaeozoic age and may be the cause of the lower Bouguer anomalies of the east-trending re-entrant.

UNIT 50D Laura Gravity Plateau

The Bouguer anomalies range from zero to +45 mgal and no major trends are shown.

The individual Bouguer anomaly lows appear to correlate with the deepest Mesozoic sedimentation in the Laura Basin, and the highs are related to the Devonian-Carboniferous rocks of the Hodgkinson Formation. The Chillagoe Shelf corresponds to a gravity gradient in the southwestern part of the unit.

UNIT 50E Melville Gravity Gradient

Bouguer anomaly values range from +40 mgal to +80 mgal. The trend of the Gradient more or less follows that of the coast, but lack of gravity data prevents the accurate delineation of the Gradient along its entire length.

This gradient is probably due to the proximity of the continental margin, which it parallels. In part it corresponds with the North Coast Structural High, but this does not appear to have any noticeable correlation with variations in the Bouguer anomalies.

PROVINCE 51 ATHERTON REGIONAL GRAVITY LOW

This is a large province of irregular Bouguer anomaly features ranging from +10 mgal to -45 mgal. The trends of the Bouguer anomalies vary from north to west-northwest.

The western part of the province coincides with the Georgetown Precambrian Complex. There is some correlation between granites and low Bouguer anomaly features. Some positive features correspond with dense intrusives, but these correlations do not hold throughout the province. The Hodgkinson Basin does not seem to be correlated with any Bouguer anomaly feature.

PROVINCE 52 CAIRNS REGIONAL GRAVITY HIGH

The province follows a narrow coastal strip and extends out to sea. The Bouguer anomalies run parallel to the coast and range from zero to +55 mgal. Near Cairns the maximum gradient is 3.3 mgal per mile.

It is postulated that the gradient near the coast is due to the proximity of the continental margin. The edge of the continental shelf in the Cairns area is parallel to and only 40 miles (65 km) east of the coast.

PROVINCE 53 BURDEKIN REGIONAL GRAVITY SHELF

The Bouguer anomaly contours tend to be circular, and there is no well defined-trend. The Bouguer anomaly values range from -35 mgal to +30 mgal.

The province has been divided into two units:

Inspection of the Bouguer anomalies shows a considerable discrepancy across latitude 20°S. This is due to the different densities used in the Bouguer anomaly calculations on either side of this latitude and the relatively high elevations in this area. Part of the complexity of the Bouguer

UNIT 53A Townsville Gravity Shelf

UNIT 53B

Charters Towers Gravity Complex

anomaly pattern in the Charters Towers Gravity Complex is probably due to the choice of 1.9 gm.cm^{-3} as the reduction density. This value is undoubtedly low, as the main rocks which crop out in the area are granites and Lower Palaeozoic metamorphosed sediments. The Bouguer anomaly highs and lows in this province are probably caused by masses of metamorphic rocks and granites respectively.

PROVINCE 54

FLINDERS REGIONAL GRAVITY LOW

The northern part of the province is characterized by small, short wavelength features and the southern part by gentle gravity gradients. Bouguer anomalies range from zero to -45 mgal.

It was originally postulated that areas of small Bouguer anomaly features with steep gradients indicated shallow basement beneath the Mesozoic rocks of the Great Artesian Basin and areas of low Bouguer anomalies and gentle gradient indicated thick sediments. Recent seismic work, however, indicates that there is a gentle basement dip to the southwest with no substantial variations in sedimentary thickness. The relative Bouguer anomaly low is therefore probably caused by intrabasement density variations.

UNIT 54A Nonda Gravity Depression

This unit consists of small north to

The Bouguer anomaly trends tend to be

northeast-trending features with a Bouguer anomaly range of -15 mgal to -35 mgal.

related to surface geological trends, but the seismic evidence suggests that there is no thick sedimentary sequence in the area.

UNIT 54B Richmond Gravity Shelf

This unit also consists of many small features which have a north-east trend in the south but are rounded in the north, with no definite trend. The Bouguer anomalies range from -45 mgal to -10 mgal.

It is postulated that this area is underlain by metamorphics similar to those in the Charters Towers area.

UNIT 54C Tangorin Gravity Depression

This unit is a broad northwest-trending low and can be subdivided into three smaller minima. The Bouguer anomalies range from zero to -30 mgal.

It was originally postulated that thick sediments were associated with this gravity depression. However, recent seismic work and bore-holes have indicated that the low is probably associated with a granite basement at relatively shallow depth.

PROVINCE 55

MUTTABURRA REGIONAL GRAVITY RIDGE

This province trends northwest but the trends of the individual features do not in general parallel the regional trend. The province has been divided into four units. The Bouguer anomalies range from -25 mgal to +5 mgal.

This province occurs over a portion of the Great Artesian Basin that is not distinguishable at the surface from province 54. There is bore evidence suggesting that the basement is generally around 4000 feet (1200 m) deep. It was originally thought that this province marked an area of

UNIT 55A

The Manuka Gravity Embayment

UNIT 55B

The Winton Gravity Plateau

UNIT 55C

The Longreach Gravity Spur

UNIT 55D

The Aramac Gravity Platform

shallow basement relative to the Tangorin Gravity Depression, but recent evidence suggests that basement is generally at the same depth in both cases. Extensive Bouguer anomaly features within the province probably represent changes in basement type. Local gravity features may represent local structure. This, in fact, has been confirmed in some cases.

PROVINCE 56

ANAKIE REGIONAL GRAVITY HIGH

This province is a broad north-trending regional high upon which are superimposed numerous smaller culminations. The Bouguer anomalies range from -20 mgal to +25 mgal.

The area includes outcropping metamorphics of the Anakie Inlier within the Tasman Geosyncline. These dip under the Middle and Upper Palaeozoic Drummond Basin on the west, the Upper Palaeozoic Bowen Basin on the east, and the Mesozoic Great Artesian Basin to the south. It is postulated that to the east and south the relatively high Bouguer anomalies outlining the province indicate the extent of the Anakie Inlier at relatively shallow depth. To the west, however, the substantial thickness of sediments in the Drummond Basin has only minor effect in shifting the mean level of Bouguer anomaly.

UNIT 56A Drummond Gravity Shelf

An elongate unit in which the individual features have a north-north-

This unit corresponds largely with the outcropping rocks of the Drummond Basin.

west trend. The major features are in the centre of the unit. The Bouguer anomaly values range from zero to +25 mgal.

It is suggested that the relative highs and lows might be correlated with areas of thin and thick sediments respectively. However, the possibility of density reversal in this basin cannot be ignored as there appears to be an inverse correlation between the gravity and estimations of magnetic basement depth.

UNIT 56B Clermont Gravity Ridge

A well defined north-northwest-trending Bouguer anomaly high with a few associated lows. The Bouguer anomaly values range from -20 mgal to +20 mgal.

Most of the outcropping Anakie Metamorphics occur within this area. It is postulated that this unit provides definition of the Anakie Inlier beyond outcrop, and shows the connexion with the Nebine Ridge. Bouguer anomaly lows within this unit are associated with granites.

PROVINCE 57 BOWEN REGIONAL GRAVITY LOW

The main trends within the province are north to north-northwest, but superimposed upon these are several features with an easterly strike. The Bouguer anomaly values range from -25 mgal to +15 mgal.

This area includes most of the outcrop of the Bowen Basin sediments. Other outcrops occur to the east in the Coastal Regional Gravity Complex, but they have been subject to more severe tectonic activity and igneous intrusion. Bouguer anomaly features have been shown to relate to structure in a number of locations. It is postulated that trends in the Bouguer anomalies correlate with structural trends.

Around the margins the presence of granite in the basement rocks may upset predictions.

UNIT 57A Emerald Gravity Shelf

This unit consists of features generally of small amplitude, which exhibit both north and east trends. Bouguer anomaly values range from -15 mgal to +10 mgal.

In general the relative Bouguer anomalies reflect the thickness of sediments and/or volcanics above the basement of Anakie Metamorphics. In particular the Comet Platform-an area of known shallow basement - and the Denison Trough to the west are both well defined.

UNIT 57B Springsure Gravity Shelf

A unit showing very broad low-amplitude Bouguer anomaly features with no major trends. The Bouguer anomalies range from zero to -25 mgal.

It is postulated that this may be an area of relatively shallow basement, with granite the cause of relatively low Bouguer anomalies.

UNIT 57C Shotover Gravity Depression

A series of north-northwest-trending gravity lows, the intensity of which increases to the north. The Bouguer anomaly values range from zero to -20 mgal.

This unit is postulated as outlining the deepest part of the basin, except in the north, where it clearly relates to granite outcrop. The Mimosa Syncline correlates well with the southern part of the unit.

UNIT 57D Devlin Gravity Terrace

The main feature of this unit is a

In general this unit marks the eastern limit

north-northwest-trending gravity gradient. Many small features, evident either as closures or spurs, interfere with the continuity of this gradient. The Bouguer anomalies range from -10 mgal to +15 mgal.

of the present day Bowen Basin. The gradient is postulated to be the eastern hinge-line of the basin and is probably a major tectonic feature. Smaller Bouguer anomaly features superimposed on the gradient can usually be correlated with surface structural features.

PROVINCE 58

COASTAL REGIONAL GRAVITY COMPLEX

This province consists of a complex series of generally intense Bouguer anomaly highs and lows, most of which have a north to northwest trend. The province has been divided into nine units. The intensely negative and positive units in general correspond to areas of granite and ultrabasic intrusives respectively, whilst the intermediate units correspond to metamorphic, volcanic, or sedimentary sequences. The Bouguer anomalies range from -30 mgal to +60 mgal.

UNIT 58A Eungella Gravity Ridge

UNIT 58B Repulse Gravity Depression

UNIT 58C

Llewellyn Gravity Platform

UNIT 58D

Marlborough Gravity Ridge

This province covers the area of out-cropping metamorphic and igneous rocks of that part of the Tasman Geosyncline east of the Bowen and Surat Basins. Within this area are a number of substantial sedimentary basins, including the Middle Palaeozoic Yarrol Basin, the Maryborough Basin, and the Clarence-Moreton Basin. Except perhaps in the Clarence-Moreton Basin and a Tertiary sedimentary trough running offshore from Proserpine the Bouguer anomalies on a reconnaissance scale offer little assistance as a guide to sedimentary thickness. Bouguer anomaly features do, however, bear a close relation to igneous and tectonic features, and may frequently be used to predict their continuation beyond observed outcrop. The Maryborough Basin contains basic igneous intrusives in its section and this may explain its lack of expression in Bouguer anomaly

UNIT 58E Baffle Gravity High

UNIT 58F Gympie Gravity Platform

UNIT 58G Brisbane Gravity Plateau

UNIT 58H Kingaroy Gravity Embayment

UNIT 58I Clarence Gravity Shelf

PROVINCE 59

THOMSON REGIONAL GRAVITY LOW

This province is a complex of Bouguer anomaly features in which the lows tend to be dominant. North-east and northwest trends predominate. The Bouguer anomalies range from -45 mgal to zero.

Mesozoic sediments of the Great Artesian Basin cover the entire area. There is substantial evidence that Bouguer anomaly features may frequently correlate with sedimentary development and structure, but this is not consistently so. The most important known development is the Palaeozoic Adavale Basin, which can be correlated with the Quilpie Gravity Depression (59F).

UNIT 59A Vergemont Gravity Depression

The dominant feature is a narrow elongate Bouguer anomaly low with a northeast trend. This low is bordered on its northwest side by a major gravity gradient. The Bouguer anomaly values range from -10 mgal to -35 mgal.

It was first postulated that this unit may represent thick sediments. However, recent drilling suggests that basement density rather than basement depth is the controlling factor in defining the feature. This feature probably marks the southeastern limit of the subsurface extension of the rocks comprising the Cloncurry Fold Belt.

UNIT 59B Warbreccan Gravity Ridge

A well defined zone of northeast-trending relatively high Bouguer anomalies which range from -35 mgal to zero.

Major anticlines are known to occur at the southwestern end of this unit.

UNIT 59C Barrolka Gravity Depression It is suggested that these units outline

UNIT 59D Jundah Gravity Depression

These two units form a major north-east-trending Bouguer anomaly low. The individual features in the former have a northwest trend and in the latter a northeast trend. The Bouguer anomalies range from -20 mgal to -45 mgal.

an area of relatively thick sediments, including Palaeozoic.

UNIT 59E Blackall Gravity Platform

A series of predominantly northeast-trending Bouguer anomaly highs. Bouguer anomaly values range from -10 mgal to -35 mgal.

This unit is postulated to reflect an area of shallow basement.

UNIT 59F Quilpie Gravity Depression

An irregular series of Bouguer anomaly lows which have northwest, north, and northeast trends. The Bouguer anomalies range from -20 mgal to -45 mgal.

This area includes the known Adavale Basin and Cooladdi Trough, which correspond with low Bouguer anomaly features. The more negative Bouguer anomaly features were an aid to outlining areas of significant pre-Mesozoic sedimentary

thickness. The Bouguer anomaly features of all sizes are useful for predicting structure.

UNIT 59G Tobermory Gravity Terrace

A unit of little Bouguer anomaly variation with Bouguer anomalies ranging from -15 mgal to -25 mgal.

This unit is postulated as an intermediate zone with basement type playing an increasing part from west to east in causing the relatively low Bouguer anomaly features.

UNIT 59H Charleville Gravity Platform

This unit consists of a series of northeast-trending elongate Bouguer anomaly highs and lows. The Bouguer anomalies range from -5 mgal to -45 mgal.

There is no known significant thickness of pre-Mesozoic sediments in this area. It may be that the relatively low Bouguer anomalies reflect thicker sediments. However, intrabasement density changes are considered to be more likely.

PROVINCE 60 NEBINE REGIONAL GRAVITY HIGH

This province is a relative Bouguer anomaly high consisting of a series of circular Bouguer anomaly features. The province is divided into two units on the basis of geological correlation rather than differing gravity characteristics. The Bouguer anomalies range from -25 mgal to +10 mgal.

UNIT 60A. Eulo Gravity Platform

The area covered by this province has outcropping granite basement of the Eulo Shelf to the south and includes the Nebine Ridge, a basement ridge considered to divide the Great Artesian Basin into the Eromanga Basin in the west, and the Surat Basin in the east. The feature connects to the Anakie Regional Gravity High (Province 56) in the north and it is postulated that the Nebine Ridge is continuous between the Eulo Shelf in the south and the Anakie

UNIT 60B Morven Gravity Ridge

Inlier in the north.

PROVINCE 61

SURAT REGIONAL GRAVITY LOW

The gravity mapping of this province is incomplete to the south. The province is characterized by relatively low gravity gradients exhibiting a general northerly trend. The province is characterized by relatively low gravity gradients exhibiting a general northerly trend. The province is bounded to the east by a gravity gradient which separates it from the Coastal Regional Gravity Complex (Province 58). The Bouguer anomalies range from zero to -50 mgal.

To the extent that this gravity province has been mapped, it coincides fairly closely with the Mesozoic Surat Basin. The Bowen Basin is known to continue southward under the Surat Basin. The thickest sediments lie under the Meandarra Gravity Rise and relatively shallow granitic basement occurs in the area of the Roma Gravity Depression. This then is an area of reverse correlation. The gradient on the eastern margin of the province correlates with the geological edge of the Surat Basin and is probably related to the known Goondiwindi Fault Zone.

UNIT 61A Roma Gravity Depression

A series of northerly-trending negative Bouguer anomaly closures with a Bouguer anomaly range of -20 mgal to -50 mgal.

It is postulated that this gravity unit is related to acid basement rocks rather than pre-Mesozoic section. Many bore-holes in the area have penetrated granite basement at relatively shallow depth.

UNIT 61B Meandarra Gravity Rise

A north-trending elongate Bouguer anomaly high with Bouguer anomaly values ranging from -5 mgal to -30

This correlates with the deepest part of the Surat Basin. The thickening of the sediments is mainly due to one formation - the

mgal.

Cabawin Formation. It is postulated that this formation has a higher bulk density than the basement, and is responsible for the reverse correlation between Bouguer anomaly and structure.

UNIT 61C Tara Gravity Depression

A zone of relatively low Bouguer anomalies which is bounded on its eastern side by a steep gravity gradient. The Bouguer anomalies range from zero to -40 mgal.

The eastern side of the unit apparently coincides with the eastern side of the Bowen-Surat Basin Complex, but within the unit the high-standing Cabawin basement feature coincides with relatively low Bouguer anomalies on the flank of the Meandarra Gravity Rise. This feature straddles a zone where relative Bouguer anomalies swing from reverse to direct correlation with basin structure. Provided the gravity surveys are linked with seismic and drilling control the Bouguer anomalies can be a useful guide to structure.

PROVINCE 62

DIAMANTINA REGIONAL GRAVITY SHELF

The main features of the province are a series of mainly east-trending Bouguer anomaly lows. Bouguer anomaly values range from zero to -40 mgal. The province is defined to the south by an arcuate Bouguer anomaly high.

The province covers a large portion of the southwestern part of the Great Artesian Basin. Structures are generally masked by a veneer of Recent and Mesozoic sediments. The Bouguer anomaly high defining the southern margin of the province coincides with local outcrops of Precambrian

metamorphic and igneous rocks. The Bouguer anomaly features within the province can be correlated with both sedimentary structure and intrabasement density contrasts.

UNIT 62A McDills Gravity Platform

The main trends are northwest, with the regional Bouguer anomaly values increasing towards the east.

Minor features appear to reflect sedimentary structure where checked by seismic survey.

UNIT 62B Noolyeana Gravity Ridge

An irregular shaped unit of small gravity relief.

Related to shallow basement.

UNIT 62C Cowarie Gravity Depression

A subcircular unit consisting of at least three separate minimum closures.

The two northern closures are postulated to reflect thick sedimentary sequence; the southern one, owing to its intensity and proximity to outcropping basement, is thought to represent a granitic intrusion in shallow basement.

UNIT 62D Cacoory Gravity Depression

A large unit, the main features of which are a series of en echelon lows in the east and an intense triangular low in the centre.

The limited seismic and drilling evidence within this unit suggests that the relatively low Bouguer anomaly features relate to intrabasement density changes, although the largest low in the southeast

could reflect a thickening of Middle Palaeozoic sediments.

UNIT 62E Durham Gravity Ridge

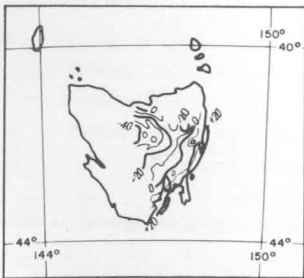
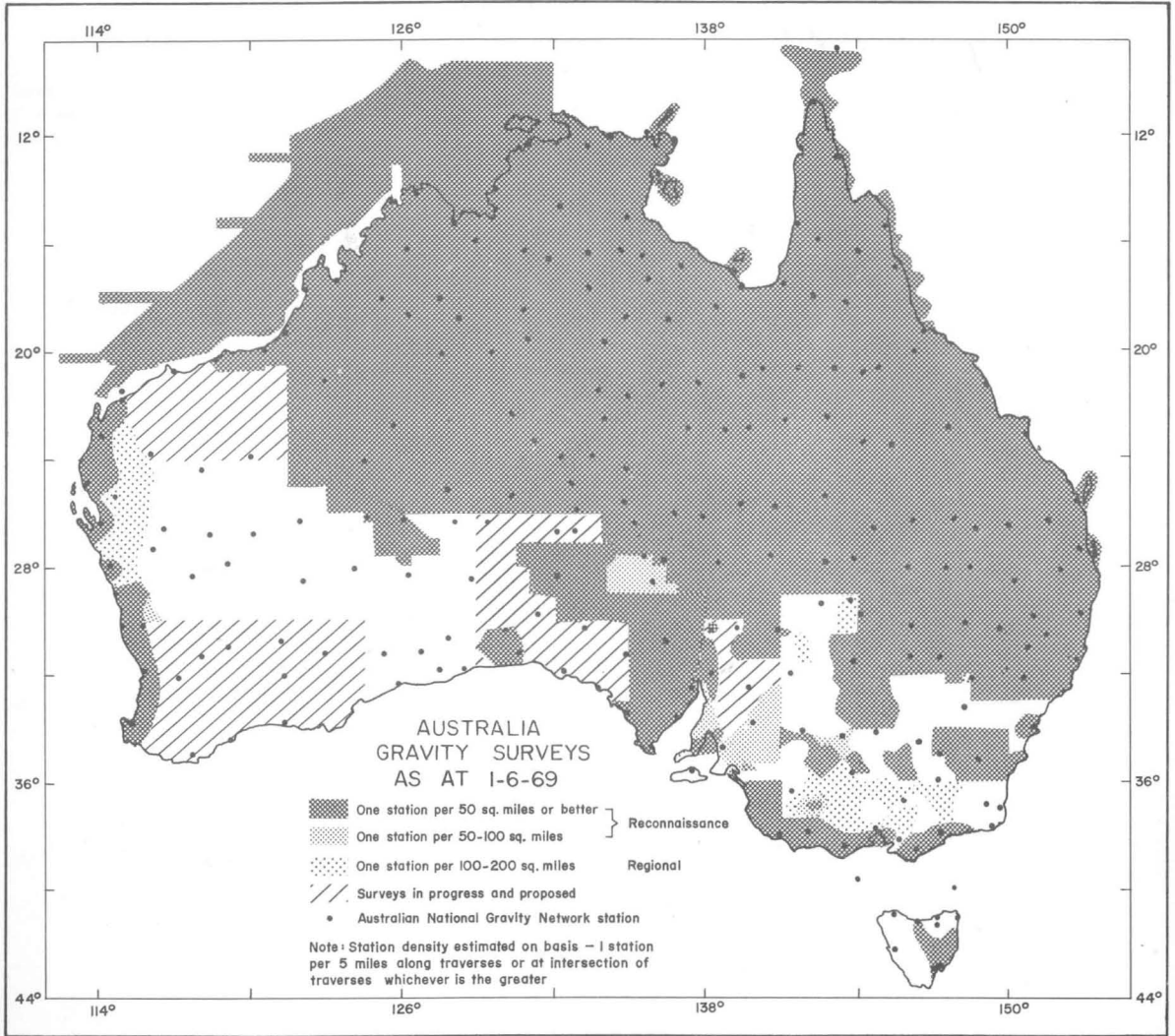
UNIT 62F Nappermerrie Gravity Low

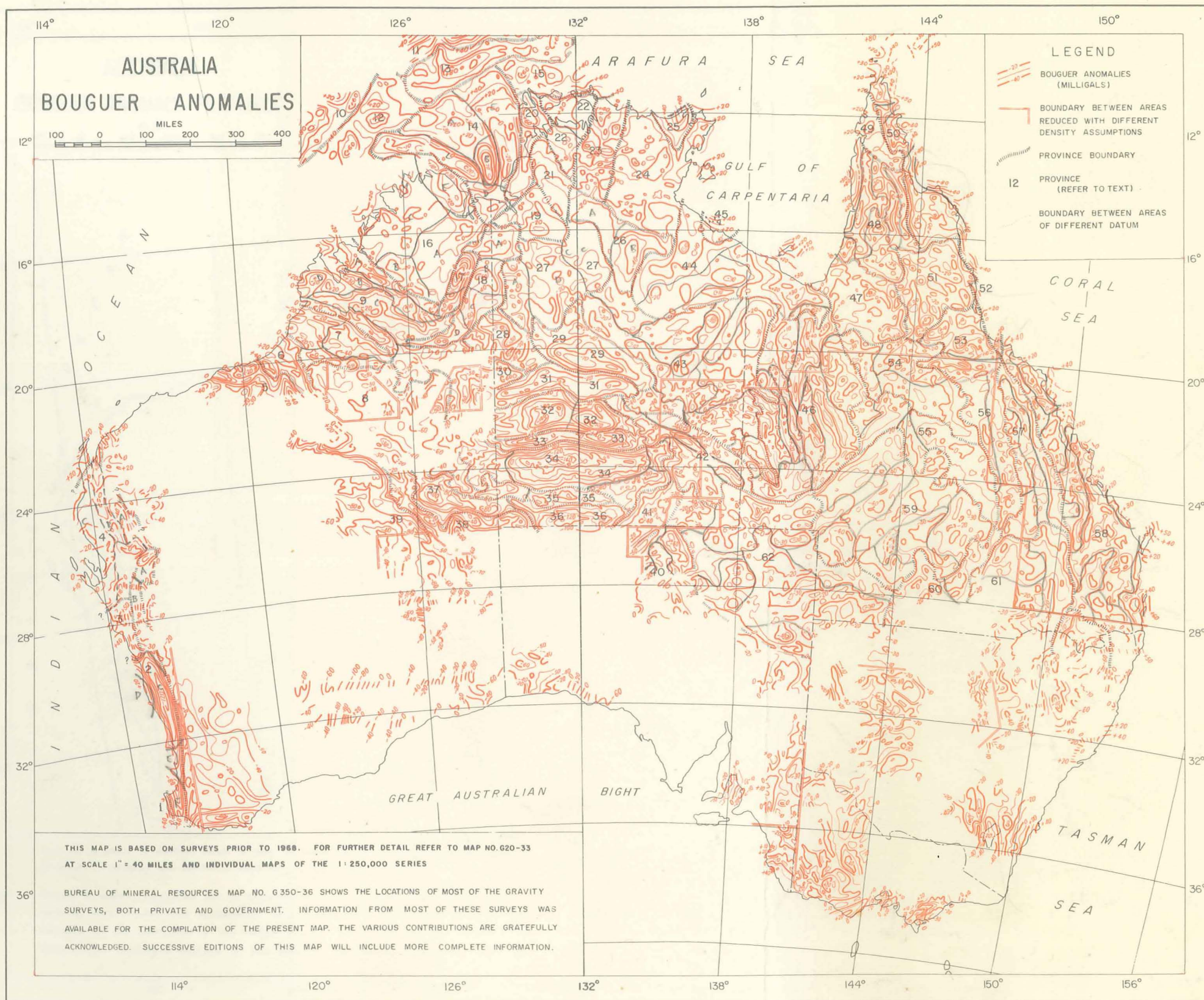
A correlation between relative Bouguer anomaly value and sedimentary thickness as revealed by seismic survey and drilling has been established in a number of places. The central low in Unit 62F can be correlated with the Coopers Creek Basin - a large trough containing thick Upper Palaeozoic sediments.

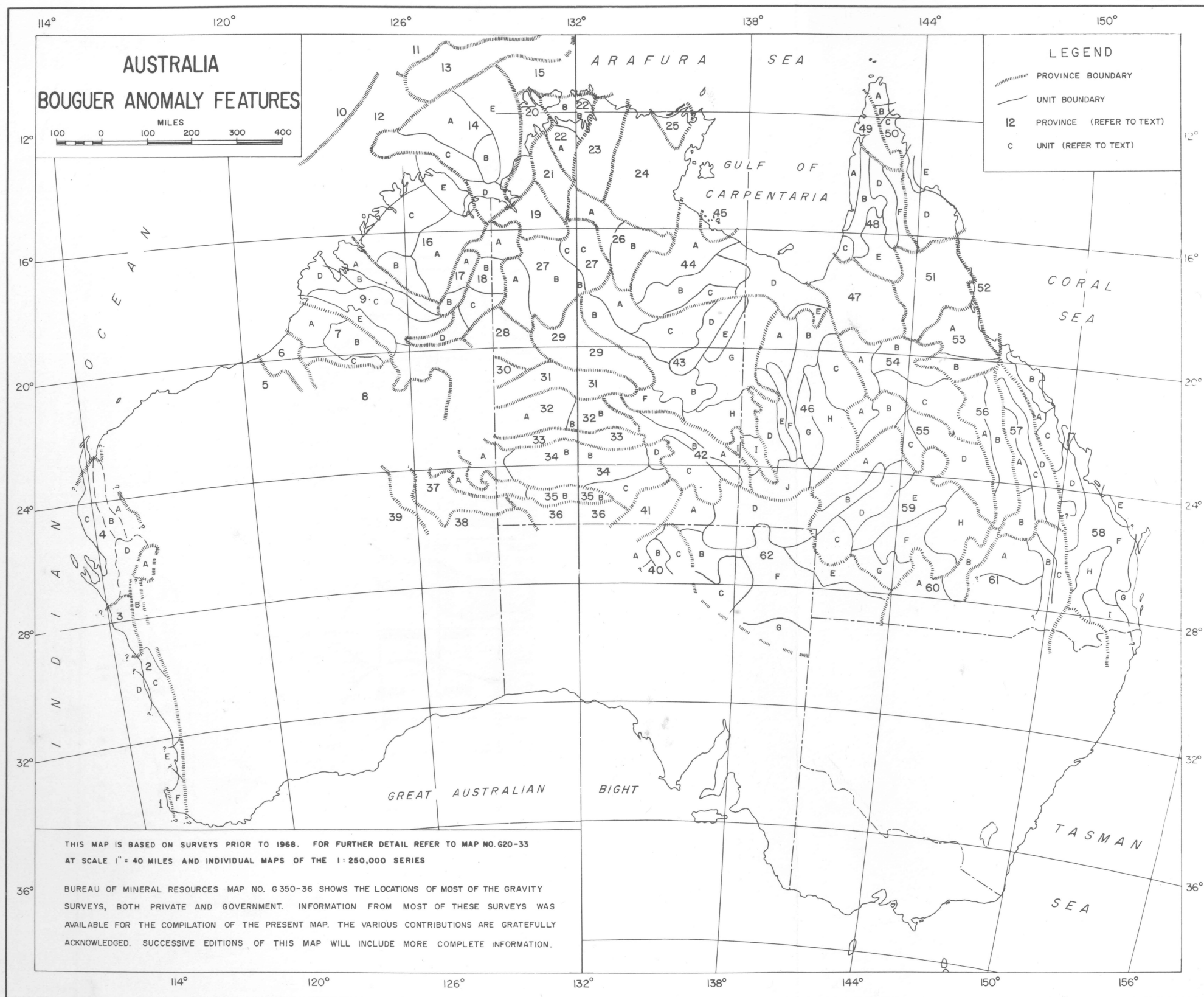
UNIT 62G Callabonna Gravity Low

The main feature is an intense sub-circular Bouguer anomaly low.

This unit is thought to represent shallow basement, with the main low reflecting a granitic intrusion. Precambrian metamorphic and granitic rocks crop out to the south of this feature.







SEDIMENTARY BASINS OF AUSTRALIA AND NEW GUINEA

