COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1966/208

BOWEN BASIN AEROMAGNETIC AND RADIOMETRIC SURVEY,

QUEENSLAND 1961 - 1963

by

R. WELLS and J.S. MILSOM

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SUMMARY

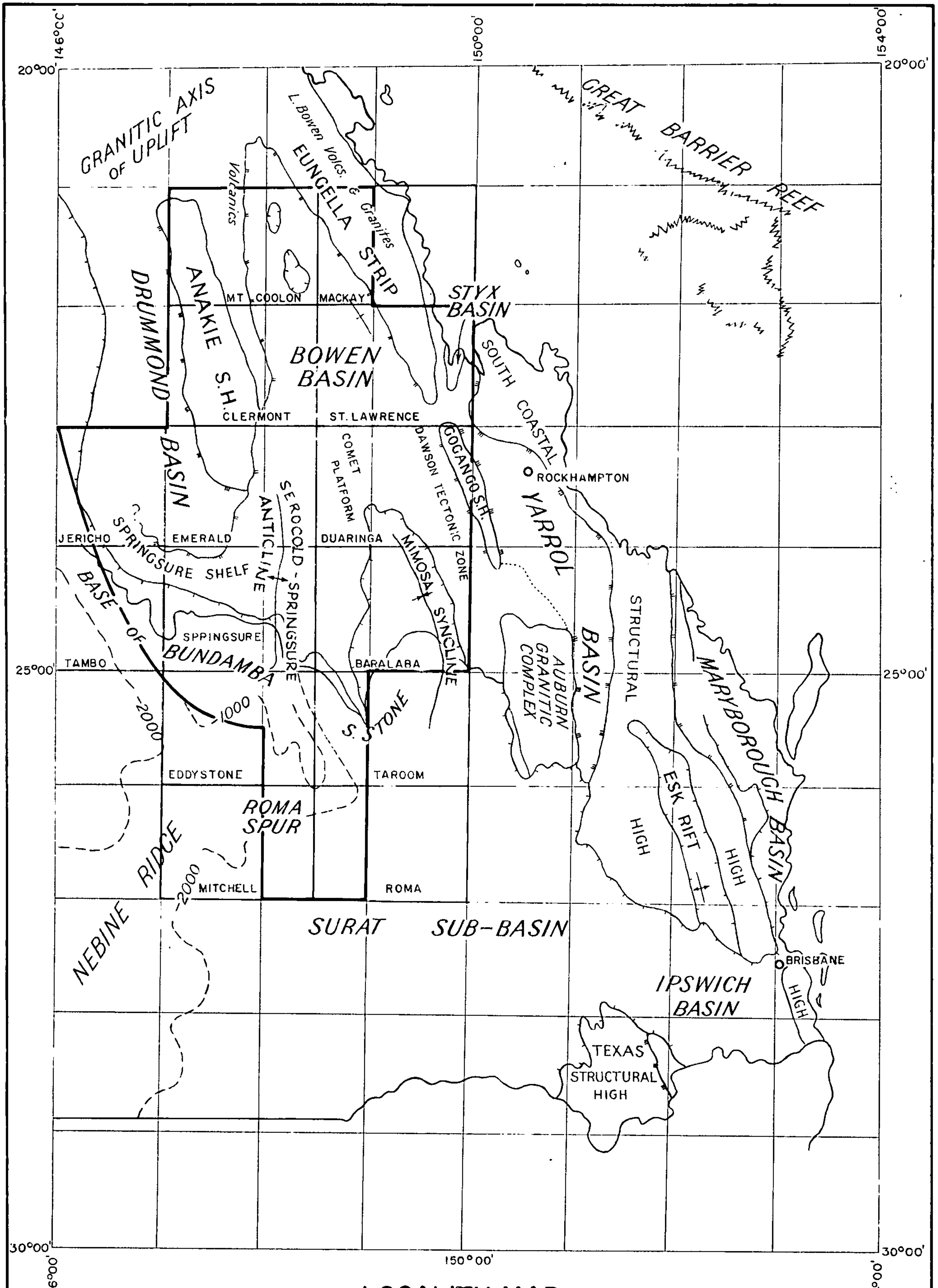
During the years 1961 to 1963 the Bureau of Mineral Resources made an aeromagnetic survey of the Bowen Basin with the object of determining the structure and thickness of potential oil-bearing sedimentary rocks. Part of the basin was also surveyed with an airborne scintillometer. The survey covered most of the area of outcropping Permian Bowen beds and extended into the Drummond and Yarrol Basins. It also included part of the area where Permian sediments are overlain by Mesozoic rocks to the south.

The recorded magnetic profiles have been reduced by a factor of approximately five and each alternate profile is displayed on a geological base map at a scale of 1:250,000. Estimated magnetic basement depth contours are displayed at a scale of 1:1,000,000.

Interpretation of the results was rendered difficult by interference between the effects of deep and superficial magnetic horizons. Also much of the area of prospective interest for oil was devoid of anomalies suitable for depth estimation. However, the results indicate that great thicknesses of prospective sediments are possible within the basin.

No radiometric anomalies of sufficient amplitude to warrant further investigation were recorded.

FIGURE 1 (to face page 1)

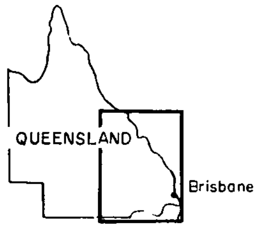


LOCALITY MAP
SHOWING
STRUCTURAL ELEMENTS OF SOUTH-EAST QUEENSLAND
AFTER D. HILL (HILL & DENMEAD, 1960)

SCALE IN MILES

80 0 80 160 240

LOCATION DIAGRAM



LEGEND

- Mesozoic Basins
- Permian Basins
- Devonian — Carboniferous Basins
- ...... Cambrian — Ordovician Shelf
- Anticlines, Synclines & other Structural Lines
- --- Basement Form Lines, relative to sea level
- Boundary of Airborne Survey 1961 — 63

Geophysical Branch, Bureau of Mineral Resources, Geology & Geophysics G55/B1-30

TO ACCOMPANY RECORD No. 1966/208

1. INTRODUCTION

The Bowen Basin is a large triangular-shaped synclinorium, which trends north-north-west across eastern Queensland (Figure 1). The apex of the triangle lies south of Townsville and the base is covered by Mesozoic sediments of the Great Artesian Basin south of latitude 25°S. It was the site of extensive sedimentary deposition during the Permian.

In this report the Bowen Basin is understood to include the areas of outcrops of Permian rocks bounded on the east by crystalline and metamorphic rocks of the Eungella Strip and the Gogango Structural High, and on the west by the Anakie Structural High. It also includes those areas where the Permian rocks are covered by Mesozoic sediments and Tertiary volcanics (Plate 2).

Interest in the Bowen Basin as an oil and gas prospect was aroused in 1900, when natural gas was discovered at Roma in a Government water bore. By 1932 twenty-five deep wells had been drilled near Roma in the search for oil or gas. Although oil shows were often encountered, only one well, A.A.O. Roma No. 1, produced a limited quantity of petroleum.

In 1934, following a programme of shallow stratigraphic drilling, a deep well was drilled by Oil Search Ltd at Warooby, seven miles east of Roma (Plate 16), which yielded 600,000 cubic feet per day of natural gas. Between 1936 and 1939 the Arcadia No. 3 well (Plate 15) was drilled by the same company in Permian rocks 90 miles north of Roma. It yielded 3,000,000 cubic feet of gas from three horizons, but no oil.

Systematic regional mapping of the southern Bowen Basin was commenced by Oil Search Ltd during the 1936-39 period. Shell Development (Queensland) Ltd commenced a geological and geophysical survey over a large area in 1940, and later several other companies became interested.

In 1960, geologists of the Institut Francais du Petrole reviewed (Trumpy, Guillemot, & Tissot, 1960) the Bowen Basin, among others, at the request of the Bureau of Mineral Resources (BMR). Their report on the oil prospects was not encouraging, but they considered that commercial accumulations of gas might exist in the Roma-Surat area. During the following year oil in commercial quantities was struck at Moonie, in the Surat Basin. Since then prospecting has intensified in the Roma-Surat area, Moonie has become a productive field, and several wells have struck oil and gas in the region around Roma.

Since 1960, parties from the Geological Branch of the BMR have been active in the Bowen Basin, with the object of completing geological mapping at a scale of 1:250,000. Provisional maps for several areas have been prepared by the BMR in association with the Geological Survey of Queensland, and others are in preparation. A map of the basin at a scale of 1:1,000,000 has been compiled from both government and private company data by B. Tissot of the Institut Francais du Petrole. It is reproduced, together with magnetic basement contours in Plate 2.

Since the regional gravity survey by Shell (Queensland) Development Ltd that was commenced in 1940, several private companies have carried out both regional and detailed gravity surveys in the Bowen Basin. The BMR commenced gravity and magnetic surveying in the Roma district in 1947 (Dooley, 1950), followed by semi-detailed work in the Comet-

Rolleston area in 1956 (Oldham, 1958). Several BMR regional traverses crossed parts of the basin in 1959-60. In 1963 a gravity survey of central Queensland using helicopters was done under contract to the BMR by Velocity Surveys Ltd and the northern part of the Bowen Basin was covered (Darby, 1966). In 1964, the southern part of the basin was covered by a survey, using helicopters, done by Wongela Geophysical Pty Ltd under contract to the BMR (Lonsdale, 1965). The results of these two surveys are shown in contour form in Plate 3.

Seismic surveying by private companies, in some cases subsidised by the Commonwealth, has been concentrated in the southern part of the basin. These surveys have aimed at solving local problems of subsurface structure and delineating areas of interest for stratigraphic testing. The BMR made a seismic survey across the centre of the basin in 1960, from the western margin near Anakie to the eastern margin near Duaringa (Robertson, 1961). This survey confirmed the presence of the Comet Platform (Figure 1) and showed that at least 10,000 ft of Permian sediments were present in troughs on either side.

Airborne magnetometer surveys on behalf of Exoil Pty Ltd., Magellan Petroleum Corporation, Union Oil Development Corporation, and Oil Structure Surveys Ltd have covered parts of the Bowen Basin and its margins. Some references to the results obtained are made later in this report.

The survey described in this Record covered almost all of the area of Permian outcrop in the Bowen Basin and was extended west to include part of the Drummond Basin (Figure 1). The exact boundaries were determined by the desire to provide continuous coverage between those areas flown for the private companies. Also some traverses were made from the coast south of Mackay to the offshore islands of the Styx Basin. The main aim of the survey was to record magnetic data that might provide information about the thickness of the Permian and Mesozoic sediments and delineate structures of interest in the search for oil. Also two scintillometers, one inboard and one towed 200 ft below the aircraft, were operated over the CLERMONT and EMERALD 1:250,000 map areas to detect the presence of radioactive minerals.

The survey area was covered by east-west traverses flown at two-mile intervals. Alternate magnetic profiles reduced to a scale of 1:250,000 are displayed in Plates 4 to 16, together with the geology where available. Trend lines indicating changes in level of gamma ray intensity also appear on these plates where applicable.

2. GEOLOGY

Structure

The Bowen Basin forms part of the Tasman Geosyncline, which in Queensland originated at the end of the Devonian and became stabilised late in the Permian. Downwarping of the basin probably began late in the Carboniferous, the oldest deposits being the terrestrial Lower Bowen Volcanics, which are now regarded as being of early Permian age. Major structural features are illustrated in Figure 1, and surface geology in Plate 2.

The basin is bounded in the west by the metamorphics of the Anakie Structural High, which could be any age from Proterozoic to Silurian. Some rocks are highly metamorphosed and fold axes are generally north, with granitic intrusions and serpentinites present in some places. Coralline limestones of Middle Devonian age are present in the eastern flank. It has been suggested that the Anakie Structural High rose during the early to Middle Devonian and might be continuous to the south-west as the Nebine Ridge in the Great Artesian Basin (Hill in Hill & Denmead, 1960, p 9).

On the eastern side the basin is bounded by crystalline and metamorphic basement rocks. In the south these form a structural 'high' known as the Auburn Granitic Complex, which is not mapped in detail. The constituent rocks are granites, gneisses, and schists of an age that could range from Precambrian to Permian. Further north the Bowen Basin is separated from the Yarrol Basin in the east by the Gogango Structural High, which consists of unfossiliferous slates and quartzites, and the age of which is not definitely known.

North of the Gogango Structural High, Lower Bowen volcanics and granites crop out in an elongated region known as the Eungella Strip, which forms the north-eastern boundary of the Bowen Basin sediments. The gap between these two structural 'highs' could have been a marine strait during part of the Permian, in which case the Bowen Basin and Yarrol Basin sediments would be continuous in the vicinity of latitude 23°S. Cainozoic cover makes geological mapping difficult in this area.

East of the southern end of the Eungella Strip the Styx Basin marks the axis of a downwarping movement which caused marine flooding during the Middle and Upper Devonian. After a period of uplift and stabilisation during the Permian, the Styx River Coal Measures were deposited during the Lower Cretaceous.

At the southern end of the survey area the Bowen Basin sediments are overlain by Mesozoic rocks of the Great Artesian Basin.

Recent geological mapping has revealed some complexity within the broad structure of the Bowen Basin. Hill (ibid, pp 10 & 19) suggests that both Permian and Triassic movements affected the Bowen Basin sediments. Folding was of Saxonian (fault-fold) style, the Triassic being the stronger. This latter movement was probably coincident with the uplift that brought about the cessation of sedimentation.

In the central section between latitudes 23°S and 24°30'S fold axes are generally north-west. This trend is apparent in the Dawson Tectonic Zone, in which intense folding has produced steep dips, overturned beds, and severe faulting. It is repeated in the Arcadia Anticline (Plate 15) to the south.

West of the Dawson Tectonic Zone a more northerly trend produced the Comet Platform, a feature in which Permian sediments exhibit shallow water characteristics. Two north-west trending fault zones, which have served as channels for Tertiary basalt intrusion, transect the structure (Derrington & Morgan, ibid, p 209). In the southern reaches of the basin, folding trends north to a little west of north. In this region the

Springsure-Serocold Anticline and the Mimosa Syncline extend for 100 miles.

The southernmost part of the survey area is bounded on the west by the Nebine Ridge, which extends north-east from the Eulo Shelf and separates the Eromanga and Surat Sub-basins of the Great Artesian Basin. A south-east trending extension of the Nebine Ridge, known as the Roma Spur, crosses the survey area in the vicinity of Roma.

The survey area also covers part of the Drummond Basin, of Devonian and Carboniferous age. It lies to the west of the Anakie Structural High, against which its sediments are either unconformable or faulted. The structures within this basin are broad simple folds trending generally north-north-west, except in the south-west, where north-easterly trends are known.

Stratigraphy (Bowen Basin)

Sedimentary deposition in the Bowen Basin occurred mainly in the Permian (see Plate 1). In the southern part, deposition continued into the Mesozoic, and Triassic rocks, which form a cover for the Permian, are continuous with those of the Great Artesian Basin. During the early studies of the two basins there was some doubt as to whether the Permian sediments extended south to any extent beneath the Mesozoic rocks, but recent drilling activities indicate their presence in the vicinity of Roma and further south into the Surat Sub-basin.

The history of the basin is generally one of alternating marine and continental deposition and varies from one region to another. The type area is around Collinsville in the north (Plate 2), but this sector is strongly faulted, and the Collinsville Coal Measures that crop out here are not found elsewhere. The greatest thickness of sediments is located to the south-west in the Springsure region.

Permian. Rocks of this system were divided lithologically into three members by Reid (1929), viz:

1. At the base, predominantly volcanic rocks.

2. In the centre, a sequence of predominantly marine and deltaic strata.

3. At the top, mainly continental sediments.

The lowest member, the Lower Bowen Volcanics, crops out extensively along the margins of the basin. In the northern part around Collinsville the sequence is 5400 ft thick. Reid distinguished three suites within the member; these he named in descending order, the Mount Devlin Volcanics, the Mount Devlin Coal Measures, and the Mount Toussaint Volcanics. It consists mainly of basalts, trachytic and rhyolitic flows and tuffs, and porphyritic andesites.

An unknown thickness of andesite and andesite tuffs, known as the Camboon Andesite, crops out in the Theodore-Cracow area (Plate 2). These are correlated with the Lower Bowen Volcanics. Andesite 234 ft thick was encountered in the S.(Q.)D. Morella No. 1 well (Plate 15) at

4634 ft, and the Arcadia No. 3 well (Plate 15) bottomed at 6036 ft in what is considered to be Lower Bowen andesite.

The central member is known as the Middle Bowen Beds. Tissot, on his geological map of the basin (Plate 2) has grouped rocks of similar age together for convenience, forming three units, A, B, and C, and these distinctions have been followed in compiling the stratigraphic table (Plate 1).

The Middle Bowen Beds are best displayed in the Springsure-Serocold Anticline, which extends from a point 25 miles north of Springsure to about the same distance south of Mount Serocold and has several culminations (Plate 13). At Reid's Dome, east of Mount Serocold, the lowest formation is the Cattle Creek Formation, consisting of dark coloured shales with sandstone and siltstone interbeds.

The shale is overlain by the Aldebaran Sandstone, a massive coarse-grained sandstone with lenses of glacial pebbles. This in turn is overlain by the Ingelara Formation, above which lies the Catherine Sandstone, which appears to have been deposited under freshwater conditions, apart from one or two fossiliferous limestone interbeds.

The top of the marine Permian is marked by the Mantuan Productus Bed, a highly fossiliferous limestone, marl, and sandstone formation. The overlying Lower Bandanna Formation marks the top of the Middle Bowen, and is replaced above by the freshwater Upper Bandanna Formation.

North of Reid's Dome in the Springsure area the oldest formation is the Orion Formation, 500 ft thick, and is the lowest member of the Middle Bowen sequence exposed on the anticline. It is unconformably overlain by the Stanleigh Formation, a grey to black indurated shale with sandstone and limestone interbeds.

The Staircase Sandstone, 950 to 1800 ft thick, overlies the shales and plunges beneath the Sirius Formation at Aldebaran Creek. The Sirius Formation of thickness 700 ft or more is regarded by Phillips (in Hill & Denmead, 1960) as the equivalent of the Cattle Creek Formation in Reid's Dome, and is similarly overlain by the Aldebaran Sandstone, the Ingelara Formation, and the Catherine Sandstone. The Catherine Sandstone is 300 to 1200 ft thick, mainly of freshwater origin, and is the youngest of the Permian rocks that crop out in the Springsure area.

West of the Springsure-Serocold Anticline the Springsure Shelf was the site for Permian deposition of a different kind. Sedimentation was almost entirely continental, and apart from the Mantuan Productus Bed none of the previously discussed strata is present. Deposition was apparently continued into the Triassic, and Permian sediments probably extend west to underlie the Mesozoic Formation of the Great Artesian Basin. The sequence consists of the Joe Joe Creek Formation, which is 2500 ft thick in places and could possibly be as old as Carboniferous. It is unconformably overlain by the Colinlea Formation, consisting of 4500 ft of massive quartz conglomerate and sandstone. Overlying the Colinlea Formation is the Mantuan Productus Bed.

East of the survey area the Middle Bowen Beds crop out in the Theodore-Cracow district (Plate 2), where they are known as the Back Creek Group. These sediments overlie the Camboon Andesite, previously referred to in the description of the Lower Bowen Volcanics, and are 5600 ft thick. They consist of fossiliferous limestone, mudstones, sandstones, and siltstones.

Further north in the Comet area (Plate 11), the Maria Formation flanks the Comet anticline, and may correlate with the Catherine Sandstone of the Springsure area. It is overlain by the Crocker Formation, consisting of quartz sandstone, siltstone, and shale. B. Tissot has assigned this formation to the upper sub-division (Unit C) of the Middle Bowen (Plate 2).

In the northern part of the Bowen Basin the Collinsville Coal Measures crop out in the region of Collinsville, where they are 700 ft thick. These beds are mainly arenaceous with several coal seams, and appear to overlie the Mount Devlin Volcanics unconformably. The coal measures are conformably overlain by 2000 ft of Middle Bowen marine sediments. At Homevale, further south (Plate 5), 8000 ft of marine Middle Bowen sediments are recorded. The correlation of the Homevale Beds with other outcrops is difficult because they lie between bands of rhyolite of unknown age.

The upper member of the system consists of mainly continental sediments with coal seams, and is known as the Upper Bowen Coal Measures. Upper Permian sedimentation continued into the Triassic, and Tissot has grouped the non-marine Upper Bowen sediments together as Upper Permian-Triassic.

Reid (1929) estimated the Upper Bowen Coal Measures to be 9600 ft thick in the northern part of the basin. They are conformable with the Middle Bowen Beds and are characteristically fine- to medium-grained tuffaceous sandstone, massive and jointed. These coal measures also crop out in the central western part of the basin near Cherwell Creek (Plate 6), where Rowe estimated the thickness as over 5000 ft (Hill & Denmead, 1960, p 195). Volcanic material in the form of basic lava flows and tuffs is present in these outcrops.

In the Theodore-Cracow area (Plate 2) the Upper Permian-Triassic is represented by the Theodore Group of sediments which overlie the Back Creek Group and are 13,000 ft thick. In the Comet area (Plate 11) the Taurus Formation, consisting of widely distributed siltstones, sandstones, and shales is regarded as being of Upper Permian age.

Mesozoic. Triassic freshwater sediments overlie the Permian sediments in parts of the Bowen Basin. Mesozoic rocks entirely cover the Permian in the southern part of the survey area, which lies within the Great Artesian Basin.

On the flanks of the Springsure-Serocold Anticline (Plate 13), the Lower Triassic Clematis Sandstone unconformably overlies Upper Permian sediments. Further east the Clematis Sandstone is overlain by the Moolayember Shale, where together they form the greatest thickness of Triassic rocks in the Bowen Basin. The Moolayember Formation is unconformably overlain to the south by the Bundamba Group of Upper Triassic to Jurassic continental sediments.

In the northern part of the Bowen Basin, Triassic residual sandstones form plateaux (Plate 4). The sandstones are of the order of 700 ft thick, and lie unconformably on the Upper Bowen Coal Measures.

The Cretaceous Styx River Coal Measures unconformably overlie "Palaeozoic basement rocks" in the Styx Basin (Figure 1 & Plate 7). These sediments attain a maximum thickness of 1270 ft in the Tooloombah Creek region (de Jersey in Hill & Denmead, 1960, p 330) and are bounded by a fault contact with Palaeozoic rocks on the eastern edge of the outcrop.

North of Roma (Plate 16) the Cretaceous Blythesdale Group consists of 1200 ft of sandstone and shales, which are of continental origin except for the upper 50 ft. It is overlain by the Roma and Tambo Formations, which are mainly calcareous clays interbedded with sandstones and impure limestones.

Tertiary. Tertiary rocks cover the Palaeozoic sediments in parts of the survey area. The Tertiary sediments are poor in fossils, but some attempt has been made to date them on their stratigraphic relationship to a phase of lateritisation that extended over Queensland, possibly in the Miocene. They are mainly sandstones, claystones, and conglomerates.

West of Duaringa the Duaringa Formation of shales, sandstones, and conglomerates is over 1000 ft thick (Cribb in Hill & Denmead, 1960 p 353). An argillaceous sequence of over 400 ft is recorded near Emerald, and apparently extends south beneath basalt cover. Tertiary laterite forms part of the Great Dividing Range to the west of the Drummond Basin, and encroaches on the survey area west of Jericho, where it overlies Permian sediments. Tertiary sediments also overlie Cretaceous rocks south of Roma, along the southern boundary of the survey area.

Igneous rocks. Granites are known in the Auburn Granitic Complex, which separates the Bowen and Yarrol Basins to the south (Figure 1). In the north these basins are separated by the granites and volcanics of the Eungella Strip, where the volcanics partly overlie, and are partly intruded by, the granites. Limited areas of granite outcrop occur in the northern part of the Bowen Basin, and domal structures are associated with granitic intrusion in the Annandale region (Plate 4) (Rowe in Hill & Denmead 1960, p 195).

Dykes and sills of feldspar porphyry have developed after faulting in the Collinsville Coal Measures. These range in thickness from one inch to 115 ft. The Upper Bowen Coal Measures have also been extensively intruded. Basic, then acid, plutonic rocks intruded sediments in the Dawson Tectonic Zone north of Baralaba (Figure 1), probably at the end of the Lower Triassic.

Extensive flows of Tertiary basalt cover large areas of Permian and Mesozoic sedimentation from north to south of the Bowen Basin along the 148th meridian, and smaller outcrops are scattered to the east of this line. These flows are known to be over 1000 ft thick in places.

Stratigraphy (Drummond Basin)

Sedimentation in the Drummond Basin commenced in the early Middle Devonian, (Figure 1 & Plates 9 & 10). The basal Dunstable Formation is at least 3500 ft thick, being mainly argillaceous at the base and volcanic (with sedimentary interbeds) towards the top. These beds are unconformably overlain by the Telemon Formation, which consists of approximately 4000 ft of presumably freshwater sediments, mainly conglomerates. These are regarded as possibly Upper Devonian age (Tweedale in Hill & Denmead, 1960, p 145).

Carboniferous sedimentation is represented by the Snake Range Group and the Ducabrook Formation, both terrestrial; together they attain a maximum thickness of almost 10,000 ft. The Snake Range Group of conglomerates and sandstones overlies the Telemon Formation with a slight angular unconformity. It is overlain by the Ducabrook Formation, which is of a facies similar to the Telemon Formation.

In the southern part of the basin the Joe Joe Creek Formation is conformable, at least in part, with the underlying Ducabrook Formation. There is some doubt as to whether it is of Carboniferous or Permian age.

3. MAGNETIC RESULTS

Owing to the multiplicity of magnetic horizons, the magnetic pattern in the Bowen Basin is very complex. In order to simplify the discussion of the results the survey area has been divided into zones signified by letters A, B, C, etc. It is not implied that the boundaries of the zones are necessarily geological boundaries.

The magnetic results appear in the Record as profiles superimposed on 1:250,000 geological maps (Plates 4 to 16). The 1:250,000 map areas will be discussed individually.

MOUNT COOLON and MACKAY WEST

This northernmost part of the area surveyed is divided into five zones, the boundaries of which generally follow the NNW structural trend (Zones A to D, Plates 4 & 5).

Zone A is relatively undisturbed, but exhibits a positive gradient to the west, of approximately 10 gammas per mile. In this zone the metamorphics of the Anakie Structural High either crop out or lie beneath a thin cover of Cainozoic alluvium. The low magnetic susceptibility of these metamorphic rocks is consistent with their sedimentary origin and low grade of dynamic metamorphism. The disturbed area around and to the north-west of the Rottenstone Range is an exception and indicates the presence of magnetic sources at or near the surface. These are associated with an intrusion of biotite-hornblende granodiorite, which crops out on the western survey boundary and, on the magnetic evidence, underlies the Suttor Formation of the Rottenstone Range.

Reliable depth estimates are not possible over the remainder of this zone, but the anomaly on Line 11 suggests a magnetic basement at about 12,000 ft below sea level, in the vicinity of Boundary Creek. The flank of a steep anomaly on the western end of Line 33 is probably associated with intruded faults along the boundary of the Drummond Group (Zone E) and the Anakie Structural High.

Zone B is marked by magnetic anomalies of short wave-length, which yield shallow depth estimates. These are often superimposed on broader anomalies associated with a much deeper magnetic horizon, but the degree of interference is such that depth estimation to the deeper horizon is not possible.

The short wave-length anomalies indicate magnetic rocks at sea level and above. These are the Bulgonunna Volcanics which either crop out or are covered by a thin mantle of Suttor Formation sandstone and conglomerate. A high-amplitude anomaly trends north-north-west from Mount Coolon and marks the boundary of the volcanics and the Anakie Structural High. It supports the inference that a fault contact exists between these structural units, as indicated on section A-B of Plate 4. On the eastern boundary the anomaly gradients become less steep as the volcanics pass beneath the sedimentary rocks of Zone C. Magnetic basement contours arising from the volcanics are indicated by unbroken lines in Plate 2 to avoid confusion with those associated with a much deeper magnetic basement to the east.

In Zone C scattered short wave-length anomalies from superficial sources are imposed on broad anomalies arising from a basement of considerable depth. The former are caused by Tertiary basalt flows and dykes and Mesozoic dolerite sills and dykes. They are present on the flanks of all of the broad anomalies, and the smoothing process necessary to remove them considerably lowers the reliability of estimates of depth to the lower basement. This zone approximates to the western flank of the Bowen Basin; in the zone, Bowen sediments either crop out or are covered by younger sandstones and basalt flows. The magnetic basement contours (Plate 2) are based on the few suitable anomalies present, and are subject to the low reliability mentioned above. Interrogation marks on contours indicate that in the area between Lines 17 and 27 no control is available. For the same reason no contours are shown between the 32,000-ft line and the 24,000-ft line to the west; however, the contour pattern suggests that maximum depth in Zone C might not be much greater than 32,000 ft.

The identification of the magnetic basement is a matter for conjecture. The Bowen sediments, the underlying volcanics, and the Anakie Metamorphics are all too low in susceptibility to give rise to significant anomalies in depth, so the magnetic basement must be at least as low as the bottom of the Anakie Metamorphics. Malone, Corbett, and Jensen (1961) suggest a total thickness of 18,000 ft for the Upper and Middle Bowen beds, but the seismic evidence (Mines Administration Pty Ltd, 1963) places the bottom of these beds at approximately 8000 ft below sea level. The thickness of the Bulgonunna Volcanics is uncertain, and so also is the rate at which they lens out to the east; however, Veevers, Randal, Mollan, and Paten (1961) suggest a possible thickness of 16,000 ft at Mount Rankin (Plate 6). The thickness of the Anakie Metamorphics is unknown, but on the magnetic evidence appears to be at least 12,000 ft.

These figures suggest that the bottom of the Anakie Metamorphics is greater than 30,000 ft below sea level, which is of the same order as the depth to magnetic basement. The Anakie Metamorphics are almost certainly early Palaeozoic (Malone et al, 1961), and if, as Hill suggests (Hill & Denmead, 1960), Precambrian rocks form the floor of the Tasman Geosyncline, it is probable that magnetic basement in this area is Precambrian.

As the Middle Bowen Beds are the only likely source of oil, the underlying volcanics probably constitute prospective basement. An attempt to deduce the depth to prospective basement from the magnetic data involves assumptions about the thickness of these volcanics as well as the Anakie Metamorphics; consequently, the magnetic contours are of limited quantitative value. However, the general configuration of the western side of the Bowen synclinorium, as detailed on the Mount Coolon geological map, is reflected in the magnetic basement contours.

A large anomaly centred near Mount Orange in the south-west corner of MACKAY is associated with the outcropping Bundarra Granodiorite. A similar anomaly of lower amplitude on Line 19 in MOUNT COOLON is associated with the Gotthardt Granodiorite. Large sill-like masses of micrograpodiorite outcropping north-west of Exvale Homestead give rise to smaller and steeper anomalies indicative of more superficial magnetic sources.

Zone D lies mainly in MACKAY and is marked by short wave-length anomalies arising from surface basalt, some of which are superimposed on somewhat broader anomalies associated with outcrops of granite, adamellite, and gabbro. These latter are part of the Eungella Strip, which separates the Bowen sediments of Zone C from the outcrops of Lower Bowen Volcanics on the eastern margin of the survey area. They assume rectangular or triangular outlines, and lineations are indistinct. The north-north-west structural trend can be discerned in the anomalies arising from the Lower Bowen Volcanics, and steep anomalies that exhibit this are apparent in the Pioneer River area and further south. They are probably associated with basic intrusions along faults.

CLERMONT

The magnetic pattern in this area is dominated by short wave-length anomalies caused by extensive Tertiary basalt flows. The basalt outcrops form a band about 30 miles wide striking south-west across the centre of the sheet, and are mapped in detail in Plate 6.

The northern boundary of this band is in doubt where it is covered by Cainozoic alluvium, and has been sketched in on the magnetic evidence. It is not implied that the basalt is continuous over the area enclosed, or that isolated remnants do not lie outside it. The large anomaly east of Mount Violet possibly marks a volcanic neck.

On the western boundary, magnetic Zone E, of relatively undisturbed magnetic profiles, is approximately 15 miles wide in the south and narrows toward the north. Sediments of the Devonian-Carboniferous Drummond Basin crop out in this zone and overlie Anakie Metamorphics, which crop out to the east. Generally the flat profiles do not assist depth estimation, but a few estimates of 16,000 ft (Plate 2) south of Monteagle Homestead mark the westward continuation of a basement trough that dominates GALILEE (Exoil N.L., 1962).

A well defined anomaly along the eastern edge of this zone marks the contact between the Drummond sediments and the Anakie Structural High. It results from the outcrop of Silver Hills Volcanics. The sharp anomaly on the profile of Line 22 is probably associated with a basic intrusive rock at or near the surface.

Zone A marks the Anakie Structural High, which crosses the sheet from north to south. Its western side gives rise to the undisturbed magnetic field in the vicinity of Mount Vanguard; its eastern side is lost in the disturbed field caused by overlying Tertiary basalt. It is unfortunate that no anomaly suitable for a depth estimate is available in this region.

South-west of the town of Clermont the magnetic profiles indicate the edge of a magnetic 'high' that extends south into EMERALD. This is related to the Retreat Granite, which crops out along and to the north of Theresa Creek (Plate 10). Some of the superimposed short wave-length anomalies might result from upper Devonian Theresa Creek Volcanics, but they are probably associated with serpentinite, which is recorded in the area (Wilkinson in Hill & Denmead, 1960, p 144).

Zone B is represented in CLERMONT by a small area in the north. It marks the southern continuation from MOUNT COOLON of Devonian-Carboniferous volcanics. The short wave-length anomalies associated with the volcanics are apparent only in the north. Elsewhere they are masked by the magnetic effects of Tertiary basalt flows.

These volcanics unconformably overlie the Anakie Metamorphics to the west and pass unconformably below the Permian sediments of Zone C to the east. Between Winchester Downs Homestead and the Coast Highway the magnetic basement is estimated to be 3000 ft below sea level in an area of Middle Bowen Bed outcrop. This basement is almost certainly the volcanic sequence.

Middle and Upper Bowen sediments crop out in Zone C, which extends over the eastern third of the area, and give rise to undisturbed magnetic profiles in the north. South of Line 20, scattered remnants of Tertiary basalt cause anomalies, which modify the magnetic gradient from deeper sources, and the 24,000-ft depth contour shown in this region is of doubtful reliability.

Anomalies caused by the volcanics are not seen east of the 24,000-ft line, and estimates for this series of depth contours are based on the broad anomalies arising from a much lower basement. It is not possible to say whether the volcanic beds thin out to the east, as suggested by the seismic evidence (Mines Administration Pty Ltd, 1963). Even if they do not, their magnetic effect would not be apparent at any great depth. It seems likely that the deeper basement is the bottom of the underlying metamorphics, as was suggested for MOUNT COOLON. The contours indicate a deepening of magnetic basement to the east, which continues into ST LAWRENCE. Seismic evidence suggests that the Middle Bowen sediments deepen to the east (Mines Administration Pty Ltd, 1963) but much less steeply than the magnetic basement.

ST LAWRENCE and MACKAY EAST

ST LAWRENCE is divided into four zones C, D, F, and G (Plate 7). MACKAY EAST, which was covered by only four flight-lines at approximately 15-mile intervals (Plate 8) is discussed here because the two areas are geologically related.

Zone C of ST LAWRENCE covers the eastern side of the outcropping Middle Bowen sediments. The magnetic profiles are similar to those in east MOUNT COOLON, and, after smoothing, give an indication of a deep basement, as shown by the depth contours (Plate 2). Depths exceeding 32,000 ft below sea level are found in two depressions separated by a minor ridge trending slightly south of west. As in DUARINGA to the south, the Dawson Tectonic Zone (Figure 1) is not reflected in the magnetic results.

Shallower sources in this zone include the Bundarra Granodiorite, which causes the anomaly on Line 38, and Tertiary basalt, which is apparently wide-spread beneath the Cainozoic cover. The 1700-gamma anomaly on Line 62 could only be associated with an ultrabasic source, at an estimated depth of 1500 ft below sea level.

In Zone D the magnetic profiles indicate a superficial magnetic basement associated with the southern end of the Eungella Strip (Figure 1), which separates the Middle Bowen sediments of Zone C from the Permian and Cretaceous sediments of Zone F. The complex pattern of anomalies in this region arises from outcropping Lower Bowen Volcanics, granite, and remnants of Tertiary basalt. Faulting is common, but owing to the disturbed nature of the field, the association of individual faults with the magnetic pattern is difficult. This zone is clearly related to the Connors Range Gravity Platform (feature 22, Plate 3).

The smoother profiles of Zone F mark a narrow trough of sedimentary rocks, which apparently extends from latitude 21° to latitude 23°. In MACKAY it lies offshore between the coast and the neighbouring islands. Further south in ST LAWRENCE it underlies Broad Sound and extends onshore, where it is known as the Styx Basin. It terminates in the Boomer Range region in the north-east corner of DUARINGA (Plate 11).

This feature may be traced on the magnetic basement contours (Plate 2) where depths of over 4000 ft are indicated south-east of Mackay. It becomes shallower to the south of MACKAY where 2000 ft is indicated along a basement ridge that transects Broad Sound. Further south the basement falls away steeply towards the mouth of the Styx River, and depths of between

6000 and 8000 ft are indicated in the region of outcrops of the Cretaceous Styx River Coal Measures. The greatest depths occur south and east of Tooloombah Homestead where the 8000-ft contour closes along the Bruce Highway in a region of outcropping Permian sediments.

The trough corresponds to a sinuous gravity 'low' (features 27 & 28, Plate 3) that extends as far north as Proserpine. Steep gravity gradients in places suggest that it might be fault controlled (Darby, 1966), and this conclusion is supported by the magnetic data. Positions of possible fault zones are indicated in Plate 2.

Zone G exhibits a complex magnetic pattern in which sharp anomalies of amplitudes up to 2500 gammas are separated by areas in which anomalies of the order of 100 gammas predominate. Depth estimates on the high-amplitude anomalies indicate magnetic sources at or near sea level, whereas those of lower amplitude yield a scatter of values between sea level and 2000 ft. These anomalies of lower amplitude do not form a recognisable pattern and only two depth contours are shown, north of Marlborough.

This zone delineates the South Coast Structural High (Figure 1), a strip of low-grade metasediments and granites, with ultrabasic intrusions in the Marlborough area. It coincides with the Coastal Gravity Complex (Darby, 1966), and magnetic features can be related to gravity features.

The two steep magnetic anomalies centered on Lines 40 and 50, respectively, arise from ultrabasic rocks of the Marlborough-Princhester serpentine belt (Hill & Denmead, 1960, p 12) and coincide with a gravity 'high' north-east of feature 39 (Plate 3). Similarly, the magnetically disturbed area around Marlborough is associated with gravity feature 32, the Marlborough Gravity Ridge (Darby, 1966).

Some faults in this zone are indicated in Plate 7, and de Jersey (in Hill & Denmead, 1960, p 330) records a fault contact with Palaeozoic rocks in the eastern side of the Styx Coal Measures.

The South Coast Structural High has not been mapped in detail, however, and the magnetic results suggest other possible fault zones (Plate 2). It is not implied that faulting is continuous along the lines indicated, or is as simple in character as the presentation might suggest.

JERICHO and EMERALD

Zone E, which occupies the central part of this area, marks the southern part of the Drummond Basin (Plates 9 & 10). Apart from occasional sharp anomalies associated with surface basalt the magnetic profiles are relatively undisturbed in this zone. Magnetic basement appears to be at least 12,000 ft below sea level and deepens towards the north-east. Magnetic basement depths are of the same order as estimated geological basement depths for the Drummond Basin. Within the Drummond Beds the Silver Hills Volcanics is the only horizon that exhibits magnetic properties in outcrop, and then only to a degree that could not produce anomalies from the depths indicated. For these reasons a crystalline basement is favoured in this area, which might be related to the Retreat Granite, which crops out extensively along the Anakie Structural High to the east.

The eastern boundary of Zone E is marked by an abrupt change to short wave-length and occasionally large-amplitude anomalies of Zone A. A magnetic gradient on Line 46 near the eastern boundary of the zone yields a depth estimate of 15,000 ft. This suggests that the Drummond Beds are faulted against the Anakie Structural High, as indicated in the geological section (Plate 10).

An interesting feature is the absence of any magnetic evidence for the Pebbly Creek Anticline, which exposes Carboniferous strata as low as the Mount Hall Conglomerate for several miles north and south of Line 52. This suggests that magnetic basement is lower than geological basement in the trough that forms the eastern edge of the Drummond Basin. This contrasts with the situation to the west in JERICHO, and it is possible that underlying non-magnetic Anakie Metamorphics thicken considerable to the east. This interpretation is supported by the results of a gravity survey of the area, which indicate a gravity 'high' along the axis of the Pebbly Creek Anticline (feature 1, Plate 3) associated with "high standing basement metamorphics at depth" (Darby, 1966).

The sharp anomaly on Line 56 and the group of similar anomalies on Line 60 arise from surface bodies of higher magnetic susceptibility than the sediments. They also appear to be greater in amplitude than would be possible from remnants of Tertiary basalt flows, but could arise from plugs of Hoy Basalt, as does the anomaly on Line 64.

Zone A is marked by short wave-length magnetic anomalies of relatively large amplitude, which arise from various superficial sources. Tertiary basalt flows, either in continuous sheets or in scattered remnants, cover much of the area and give rise to the typical anomalies which modify the profiles associated with the underlying rocks. These are the Retreat Granite and the metamorphics of the Anakie Structural High.

Individual anomalies of high amplitude, sometimes negative in sign, are a feature of this zone. Many are doubtless associated with plugs of Hoy Basalt, which are numerous in the north-west. The 1500-gamma anomaly on Line 54 can only be associated with a near-surface body of high susceptibility, and serpentinite is suggested.

In Zone C Middle Bowen Beds either crop out or are thinly covered by Tertiary rocks. South of Zone E an elongated basement 'high' strikes slightly south of east and reaches a height of less than 2000 ft below sea level. North-west of this feature another basement ridge enters the survey area from the north at longitude 146°30' and reaches a height of less than 4000 ft below sea level. The results of a survey of the Drummond Basin (Exoil N.L., 1962), which covered the area immediately north, tend to support the existence of this latter ridge. Both these ridges are probably pre-Permian features.

The eastern part of Zone C in this area is mainly covered by Tertiary basalt, which yields characteristic short wave-length anomalies. Some depth estimates in this region were made after smoothing the magnetic profiles, but control is not adequate for contouring. These estimates indicate a basement of about 8000 ft below sea level in the vicinity of Emerald, which deepens to the east.

On the seismic evidence (Robertson, 1961) this horizon is the contact between the Bowen sediments and the underlying basement, which, it is suggested, might be Anakie Metamorphics. This is also the area of the Denison Gravity Low (feature 13, Plate 3) which delineates a Permian trough between the Anakie Structural High and the Comet Platform (Darby, 1966). If these estimates of magnetic basement depth are correct, an igneous, rather than a metamorphic, basement is the more likely for this trough, because the Anakie Metamorphics do not exhibit a sufficiently high susceptibility elsewhere.

DUARINGA

This area (Plate 11) falls mainly into Zone C, which exhibits the smoother profiles associated with Middle Bowen sedimentation. On the western side of the area a band of negative anomalies striking slightly west of north mark the Comet Platform, a structural unit upon which exposed Middle and Upper Permian sediments exhibit shallow water characteristics. These anomalies yield depth estimates around 3000 ft below sea level in the north and deepen to 6000 ft to the south (Plate 2).

Five anticlinal structures have been mapped on the Comet Platform; Cooroorah No. 1 , on the axis of the Cooroorah Anticline, bottomed in andesite at 3000 ft below sea level. This platform coincides with a gravity 'high', the Comet Gravity Platform (feature 14, Plate 3), which separates two gravity 'lows', the Denison Gravity Low (feature 13, Plate 3), and the Bluff Gravity Depression (feature 15, Plate 3). The gravity 'lows' are associated with Permian sedimentary troughs (Darby, 1966).

The negative anomalies are probably associated with the basic igneous rocks that constitute the andesite at the bottom of Cooroorah No. 1 well. These rocks are obviously older than Permian and are possibly associated with the Bulgonunna volcanism; however, their trend along the western edge of the Bowen Synclinorium tends to associate them with the initial Tasman orogenic phase in the Lower to Middle Devonian. Some weight is given to the above analysis by the seismic data, which show a refractor at approximately 3000 ft in the vicinity of Comet. Also, reflections from 14,000 ft indicate a marked discontinuity, above which lie folded strata, which Robertson (1961) suggests might be Anakie Metamorphics.

Tertiary basalt flows in the vicinity of Comet Downs cause the short wave-length anomalies seen in the south-west corner, and east of Lurline Homestead. These basalts have been channelled along NW-trending fault zones, which transect the Comet Anticline (Hill & Denmead, 1960).

The centre and west of Zone B in this area is characterised by smooth magnetic profiles indicating a slight regular gradient to the north-east. Generally the gradient is too low for satisfactory depth estimation, but trend lines on the eastern side give a picture of a deep basement deepening to the south and west. The 28,000-ft trend line in the central southern part of the area contrasts with the 6000-ft line 12 miles to the west, and emphasises the fact that more than one magnetic horizon is involved.

The north-western and south-east quadrants of this zone are marked 'deep' on the evidence of a few scattered estimates of low reliability. This deep region coincides with a gravity 'low' (feature 15), known as the Bluff Gravity Depression (Darby, 1966). Seismic results indicate 12,000 ft of sediments in this depression, but magnetic basement is much lower.

Some horizontal reflectors were recorded in the Dawson Tectonic Zone near Dingo, and 12 miles to the east at depths between 20,000 and 36,000 ft (Robertson, 1961). It seems certain that the magnetic basement sources lie within the sedimentary basement, and might correlate with the deep reflections referred to above. The intense folding in the Dawson Tectonic Zone is not apparent in the magnetic data, which suggests the absence of magnetic horizons in the Permian sediments, and that this folding did not affect the basement. Robertson estimates 20,000 ft of folded rocks in this tectonic zone, in which he tentatively includes the underlying metamorphics. If magnetic basement is as deep as this interpretation suggests, a considerable thickness of non-magnetic and probably horizontal rocks lie beneath the Permian sediments.

In Zone G, inliers of Lower Bowen Volcanics crop out through Middle Bowen sediments. These, together with Tertiary basalt remnants, cause the steeper anomalies that are superimposed on anomalies arising from the deeper basement. In the north-east corner a south-trending belt of steep near-surface anomalies enters the area from ST LAWRENCE, where it is associated with the granites and ultra-basic intrusions of the South Coast Structural High. In DUARINGA the larger anomalies in Zone G are probably caused by ultra-basic rocks, while the smaller anomalies are associated with the outcropping Rookwood Volcanics and Devonian-Carboniferous basic flows.

The southern part of Zone G is occupied by the Lower Palaeozoic rocks of the Gogango Range, which mark the eastern edge of the deeper part of the Bowen Basin in this vicinity.

Zone F, which marks a south-trending sedimentary trough, terminates in the north-eastern corner of DUARINGA in the Boomer Range region. In this area, Zone F represents the western end of the marine strait that might have linked the Bowen and the Yarrol Basins (Hill & Denmead, 1960, p 11).

TAMBO, AUGATHELLA, and SPRINGSURE

This area (Plates 12 & 13) falls entirely within Zone C. Only the eastern third of TAMBO and the north-east corner of AUGATHELLA were covered by this survey. The remainder of these 1:250,000 areas was surveyed by Aero Service Ltd for Magellan Petroleum Corporation (1963).

The magnetic pattern on the western side of the area surveyed by the BMR is complex, and two or possibly three magnetic horizons are recognised (Plate 12). The shallowest of these is given by three depth estimates, averaging 1500 ft below sea level, which indicate a lineation trending about S30°E as shown in Plate 2. This feature, sub-parallel to the dominant geological strike in the district, is thought to mark a zone of weakness along which basic igneous rocks have been intruded. It is not possible to say whether the intrusions reached the surface and any associated extended flows were later eroded away, or whether the intrusions existed only at depth. Even in this latter case it is probable that the three estimates denote a real geological horizon, presumably a strong competent layer of sediments.

Other depth estimates in the north-east of TAMBO are of about 11,000 ft below sea level. Magnetic basement rises to the south and west, attaining a minimum depth of about 5000 ft below sea level near the central western boundary of the survey area. This is in good agreement with the interpretation by Magellan Petroleum Corporation (1963). However, it is noticeable that, although sources are shallower near the western boundary of the survey area, anomaly amplitudes are smaller than those further east, and it seems unlikely that a single horizon has been contoured. The horizon contoured near the western boundary probably wedges out to the east, but may be related to the horizon suggested by the very shallow anomalies mentioned earlier. If this is so, the other horizon, which reaches a minimum depth of 7000 ft close to the postulated shallow lineation, can be assumed to deepen to the west. Any anomalies that it gives rise to there would be effectively concealed by those from shallower sources.

Depth control in the central part of the area is not very reliable. The most prominent feature is a narrow meridional band of magnetic anomalies running north from the exact centre of SPRINGSURE (Plate 13). This magnetic ridge coincides with the Nogoa Anticline, along the crest of which Middle Devonian sediments and Pre-Devonian schists and gneisses are exposed. There are no corresponding anomalies coincident with the rather similar Telemon Anticline to the west, but anomalies due to shallow sources occur just to the south, along a possible extension of the anticlinal axis. The schists and gneisses are likely to be the source of all these anomalies and to be magnetic basement throughout the Springsure Shelf region.

The fall in level of the magnetic basement in the central south of SPRINGSURE coincides approximately with the geological termination of the Springsure Shelf. However, there is no geological evidence to explain the sharp change in strike of this slope from west to north in the vicinity of 147°15'E, and it is probably due to a pre-Permian feature. In the extreme north-west of SPRINGSURE the basement rises and the basement slope again strikes approximately west.

The comparative simplicity of the Mesozoic and Permian geology of the central part of the area suggests that the basement 'deep' flanking the Springsure Shelf is also pre-Permian. The basement rises to the west of the 'deep' and the estimated depth of about 10,000 ft below sea level may be close to the true thickness of prospective sediments in much of SPRINGSURE off the Springsure Shelf.

The basement also rises south of the 'deep'. This rise may be related to the Nebine Ridge, which separates the Great Artesian Basin from the Surat Sub-basin. In this case the deep embayment extending eastwards may indicate that the two basins were connected at some stages of sedimentation in pre-Mesozoic times.

Tertiary basalt flows cover much of the land surface in the eastern part of the area. Sediments are interbedded with some igneous deposits and not all the flows give rise to magnetic anomalies. However, in most of the eastern part the magnetic field is too disturbed to allow depth estimates to be made on anomalies from sub-surface sources, and no basement contours can be drawn. Some depth estimates were made near the eastern boundary of the area, and basement contours are continued across this boundary from BARALABA. A shelf noted in the latter area at about 9500 ft below sea level occupies the south-east corner of SPRINGSURE, and depth control in this corner is quite good. There are indications of basement rising to the north, which provide sparse control for the continuation of the 6000-ft and 8000-ft contours from BARALABA. The contours are terminated at the main basalt outcrop.

West of the mapped basalt, in the southern part of the area, there are six or seven short wave-length anomalies, the majority of which coincide with small hills. These anomalies derive from surface or near-surface sources, which are tentatively considered to be unmapped basalt deposits. They have not been taken into account in drawing the basement contours.

BARALABA

This area (Plate 14) falls entirely within Zone C. Intense short wave-length anomalies that occur in parts of the area, notably in the south about longitude 149°30'E, are associated with surface deposits of Tertiary basalt. Magnetic basement throughout the area is at least 4500 ft below sea level (Plate 2).

In the eastern half of the area the magnetic profiles are smooth and almost featureless, suggesting a sedimentary sequence of considerable thickness. Depth estimates can be made in only a few places and are greater than 40,000 ft along the Mimosa Syncline. Similar depths were found in DUARINGA to the north, along the strike of the Bowen Syncline. It seems unlikely that these large estimates give the true thickness of Upper Palaeozoic sediments in the Bowen Basin, but they might indicate that the syncline was an active sedimentary trough at a much earlier date. In the east, in an area of outcropping Clematis Sandstone, magnetic basement rises to less than 14,000 ft below sea level. This rise coincides with the eastern wall of the Bowen Basin.

The magnetic pattern in the west of BARALABA is much more complex and there is more control for the basement contours. All profiles indicate a steep fall in basement level from less than 10,000 ft below sea level in the west to more than 18,000 ft below sea level. Estimated depths in the intermediate ranges are common, which suggests a genuine deepening of a single basement surface rather than the wedging out of a shallow magnetic horizon and the consequent exposure of a deeper one. In the north the basement slope strikes approximately S 15° E, but in the vicinity of latitude 24°30'S it swings sharply west, forming the north-west wall of a V-shaped basement embayment that extends almost to the western boundary of the area. From about 8 miles east of this western border the basement slope strikes approximately south-east to the southern boundary of the area.

The embayment is possibly reflected in the regional gravity pattern (Plate 3). However, a more noticeable correlation between the gravity and the magnetic results is the basement ridge and gravity 'high' (feature 14) that extend along the western boundary of DUARINGA to a termination east of Rolleston, on the north-west flank of the embayment. Even as far south as latitude 24°30', magnetic basement rises to within 7000 ft of sea level, and in the extreme north-west corner of the area it is only 4500 ft below sea level. A minor magnetic basement 'high' on the south-west flank of the embayment is also possibly indicated in the regional gravity contours.

West of the basement ridge there is a broad depression, averaging 9000 ft below sea level and extending into neighbouring SPRINGSURE. South-west of the ridge the depression opens out into a wide, apparently quite level, shelf area. The depression has a possible geological expression in the Triassic outliers mapped in the south-west of BARALABA. There is no geological indication of the V-shaped embayment, which is therefore considered to be an older feature, pre-dating Upper Palaeozoic sedimentation.

Two of the wells drilled in the southern part of the shelf area, A.P. Cometside No. 1 (24°39'S, 148°48'E) and A.F.O. Purbrook No. 1 (24°37'S, 148°48'E), passed into Upper Devonian sediments at 4000 and 4700 ft below sea level, respectively. The wells are close to a 9700-ft depth estimate. It therefore seems reasonable to expect magnetic basement to lie at least 5000 ft below prospective basement in much of BARALABA and also in parts of adjoining SPRINGSURE.

In the north of BARALABA the magnetic basement slope approximately coincides with the geological axis of the Bowen Syncline. Although the syncline is somewhat assymetric and dips are generally steeper on the eastern side, the maximum depths recorded on this slope must lie close to the true axis. Subtracting the 5000-ft difference noted above, it therefore seems unlikely that the Permo-Triassic sedimentary sequence extends to more than 9500 ft in the north of the area, or to more than 12,000 ft in the south.

EDDYSTONE and TAROOM

The magnetic profiles for this area, which lies in Zone C, are shown in Plate 15. The northern part exhibits the pattern of short wave-length anomalies seen in SPRINGSURE and BARALABA. They trend in a north-westerly direction in the north, and due north in the region south of latitude 25°45'S. As before, they are associated with superficial Tertiary basalt outcrops, not all of which appear on the geological map.

Broader anomalies with north-north-westerly trends indicate a much deeper magnetic horizon. Many of these are unsuitable for depth estimation because of interference from surface sources, and in some cases because of their low amplitude. However, smoothing of the profiles was attempted in some cases and the resulting contours indicate a deeper basement, generally of 12,000 ft below sea level. This basement rises towards the eastern survey boundary, where it reaches a level of 4000 ft and coincides with a gravity 'high' (Plate 3).

A central basement 'deep' is marked by a 20,000-ft contour, and is based on a few satisfactory anomalies which exhibit the familiar north-north-westerly trend. It is not possible to determine whether these anomalies arise from the same horizon that yields the shallower estimates on either side, as the contours might suggest. The basement 'deep' lies in a region of low gravity values, which become lower to the south-west.

A.A.O. Westgrove No. 3 well, which lies near the centre of this deep region, bottomed in 'basement rocks' at 10,994 ft below sea level. This is approximately 8000 ft above the estimated magnetic basement. South of this well, A.A.O. Kildare No. 2, A.A.O. Glentulloch No. 1, and A.A.O. Killoran No. 1 wells present a picture of prospective basement (Devonian) rising steadily to the south. No information is available for contouring the magnetic basement in this southern region because the magnetic field is devoid of suitable anomalies, but the smooth profiles suggest that it is deep. On the eastern side of the survey area O.S.L. Arcadia No. 3 also reached a prospective basement about 3000 ft above estimated magnetic basement . These results indicate that magnetic basement lies deep below the bottom of the Permian sediments; therefore the basement contours are unlikely to assist in mapping the prospective basement in this area.

ROMA and MITCHELL

In this area (Plate 16), which also exhibits the smoother profiles characteristic of Zone C, the Permian Bowen sediments are entirely covered by Mesozoic and Tertiary rocks.

North of latitude 26°40'S the magnetic field is exceptionally undisturbed, and except for the anomaly near the eastern boundary of the survey area, on Line 116, it yields no information about deep basement. This anomaly yields a depth estimate of 3000 ft below sea level. It lies midway between S.M.N.L. Mooga No. 1 well, which reached metamorphic rocks at 3567 ft, and A.A.O. Pleasant Hills No. 1, which entered granite at 3485 ft. As neither of these horizons produces magnetic anomalies elsewhere in the area, this anomaly is probably caused by a fault contact. This interpretation is supported by the report on the Moree-Miles aeromagnetic survey (Kahanoff, 1962), which indicates an adjoining fault across the common survey boundary.

Short wave-length anomalies associated with remnants of Tertiary basalt have a northerly trend in the north-east corner of MITCHELL. Similar anomalies of lower amplitude are scattered as far south as 26°30'. Two such anomalies were recorded in ROMA: on Line 116 near Bungil Creek, and 10 miles to the east on Line 120.

Anomalies of sufficient amplitude for depth estimation occur along and south of latitude 26°40'S; they exhibit a northerly trend. The magnetic basement contours indicate depths between 10,000 and 12,000 ft in a region south of Roma (Plate 2). Wells in this region (e.g. A.A.O. Bungil No. 1) bottomed in the Devonian Timbury Hills Formation at approximately 3000 ft below sea level; consequently they do not provide information about the magnetic basement geology, except to show that it is at least 7000 ft below the top of the Devonian sediments. Magnetic basement appears to deepen to the west, as do the overlying sediments. A.A.O. Arbroath No. 1, 21 miles west of Bungil No. 1 entered the Timbury Hills Formation at 7119 ft below sea level.

In the south-west corner of the survey area, a group of well defined anomalies indicate a region of magnetic basement between 3000 ft and 5000 ft below sea level. This basement might be a different horizon from the deeper one to the north but it is not possible to be certain about this point, or to indicate exactly where the boundary between them lies. A.A.O. Bony Creek No. 1 and A.A.O. Durran No. 1 wells both entered the Timbury Hills Formation at just over 3000 ft below sea level, which is much closer to magnetic basement than the region to the north. A.A.O. Brucedale No. 1 well bottomed in Triassic sandstone at 4261 ft below sea level at a point where magnetic basement is estimated to be at a depth of 3000 ft or more below sea level. Here, basement is associated with Jurassic volcanics encountered at 3311 ft. These volcanics might also be the cause of the basement 'high' to the north-west, enclosed by a 4000-ft contour.

Generally the shallow basement contours in the south-east corner agree well with the adjoining contours based on the interprepretation of the Moree-Miles aeromagnetic survey (Kahanoff, 1962). The flat profiles in the south-west corner suggest a deep basement, but the data are not suitable for depth estimation. South of the survey boundary, Kahanoff's interpretation suggests depths in excess of 10,000 ft adjoining this region.

4. RADIOMETRIC RESULTS

No radiometric anomalies of sufficient amplitude to warrant further investigation were detected in either CLERMONT or EMERALD, which were the only areas surveyed. However, the radiometric data were analysed to determine changes in the general level of radioactive intensity, and the results are reproduced in Plate 6 and 10. The radioactive 'highs' tend to be associated with exposures of Middle Bowen sediments and with some granite outcrops. In the former case they are caused by marine shales, which often exhibit a relatively high radioactivity for sedimentary rocks.

5. CONCLUSIONS

The most favourable potential oil-bearing rocks in the area surveyed are the Permian Middle Bowen Beds. It is therefore unfortunate that for the reasons previously discussed the survey has not in general yielded information about the thickness of these beds. Where deep drilling has provided this information, the magnetic basement contours are of some value in extrapolating to surrounding regions, as was done in BARALABA. However, deep drilling has been concentrated in the south, where the interpretation of magnetic data is hampered by a lack of anomalies arising from deep sources. In the central and northern parts of the Bowen Basin there is a similar interpretation problem along the axis of the synclinorium. Depth contours along the flanks might prove useful if the relation between magnetic basement and prospective basement is established by drilling.

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* Unpublished report on a Commonwealth-subsidised operation.

APPENDIX A

Summary of drilling information

Well	Latitude	Longitude	Elevation (ft)	Total Depth (ft)	Bottom	Refer Plate No.
O.S.L. Arcadia No. 3	25°17'	148°45'	1310	6036	Basement	15
A.A.O. Westgrove No. 3	25°34'	148°26'	1719	12663	?Basement	15
O.S.L. Hutton Creek No. 2	25°42'	148°42'	1509	4688	Permian	15
A.A.O. Kildare No. 2	25°43'	148°23'	1613	7667	Permian	15
A.A.O. Glentulloch No.1	25°47'	148°23'	1507	4083	Devonian	15
A.A.O. Killoran No. 1	25°54'	148°19'	1697	2350	Devonian	15
A.F.O. Bandanna No. 1	25°07'	148°17'	1420	4041	Permian	15
A.P. Cometside No. 1	24°39'	148°48'	824	5561	Devonian	14
A.F.O. Purbrook No. 1	24°37'	148°48'	783	4949	Devonian	14
A.A.O. Brucedale No. 1	26°55'	148°57'	964	5225	Triassic	16
A.A.O. Rosewood No. 1	26°04'	148°42'	1400	2075	Granite	16
S.M.N.L. Mooga No. 1	26°15'	148°58'	1298	3567	Metamorphics	16
A.A.O. Pleasant Hills No. 1	26°25'	149°00'	1248	3485	Granite	16
A.A.O. Lorne No.1	26°42'	148°26'	1098	4253	Permian	16
A.A.O. Arbroath No. 1	26°41'	148°28'	1156	8367	Devonian	16
A.A.O. Bong Creek No. 1	26°45'	148°58'	1023	4583	Devonian	16
A.A.O. Apple Grove No. 1	26°41'	148°51'	927	4144	Devonian	16
A.A.O.Bungil No.1	26°40'	148°50'	952	4107	Devonian	16
A.A.O.Durran No.1	26°42'	148°44'	934	4315	Devonian	16
A.A.O. Roma No.1	26°35'	148°52'	1123	3616	Metamorphics	16
S.(Q.)D. Morella No. 1	25°01'	148°29'	950	4634		15
O.S.L. Warooby No. 1	26°34'	148°55'	1045			16
A.F.O. Cooroorah No. 1	23°07'	148°43'	595	3523	Andesite	11

APPENDIX B

Operational details

Survey specifications

Altitude : 1500 to 2000 ft above sea level where possible, otherwise 700 ft above ground level

Line system : East-west at 2-mile intervals

Tie system : North-south at 15-mile intervals

Navigation : By ground recognition on aerial photographs

Magnetometer sensitivity : 50 gammas/inch

Scintillometer sensitivity : 50 counts/cm

Equipment

Magnetometer : BMR fluxgate MFS-4 or MFS-5

Vertical camera : Aeropath continuous strip

Air position indicator : BMR (modified from S. Smith & Sons)

Radio altimeter : S.T.C. type STR 30B

Magnetic storm detector : BMR fluxgate MFD-2 or MFD-3

Method of interpretation

The basis of the interpretation was the half-maximum-slope method of depth determination (Peters, 1949). The horizontal distance between the points of half-maximum-slope was divided by 1.6 to give the depth to the top of the source. Reference to the preliminary magnetic intensity contours has made it possible in some cases to allow for the oblique intersection of contours and flight lines. In other cases anomaly trends were estimated from comparison of adjacent profiles.

Personnel

Personnel engaged in the survey were :

BMR : A. G. Spence, G. A. Young, R. Wells, J. M. Milsom, B. A. Dockery, J. Moo, F. E. M. Lilley, A. Drage, P. B. Turner, P. Lynne, J. Smith, C. J. Braybrook, D. A. Mort, D. Park, O. Scherl, N. Price, C. Groves, P. Kersulis, E. Kram-Steins.

TAA : G. Close, P. Korsman, D. Baker.

PLATE 1

BOWEN BASIN STRATIGRAPHIC TABLE (PERMIAN)

Compiled from: Hill and Denmead,(1960)
and B.Tissot.

AGE		NORTHERN AREA		SOUTHERN AREA					CENTRAL WESTERN
		COLLINSVILLE	HOMEVALE	REIDS DOME	SPRINGSURE CULMINATION	SPRINGSURE SHELF	THEODORE / CRACOW	COMET	
UPPER PERMIAN-TRIASSIC		Upper Bowen Coal Measures 9600 ft		Rewan Formation 300 - 2300 ft 〰〰〰 Upper Bandanna Formation 300-400 ft		Cheshire Formation 1300 ft	Theodore Group 13,000 ft	Taurus Formation 2500 ft	Upper Bowen Coal Coal Measures >5000 ft
MIDDLE BOWEN BEDS	UNIT C	Marine sediments 2000 ft Big Strophalosia zone Collinsville Coal Measures 700 ft		Lower Bandanna Formation 200-1100 ft - - - - - - - - - - - Mantuan Productus Bed ≪ 100 ft	Top of Marine Palaeozoic	Mantuan Productus Bed (50 ft)	Back Creek Group 5600 ft	Crocker Formation 180 ft	Post Clarkei Formation (including Passage Beds) ≪ 400 ft Clarkei Sandstone 10-30 ft Pre-Clarkei Formation 50+ ft
	UNIT B		Ingelara horizon	Catherine Sandstone Ingelara Formation Alderbaran Sandstone	Catherine Sandstone 300-1200 ft Ingelara Formation Alderbaran Sandstone 1500-3000 ft	Colinlea Formation 〰〰〰 Joe Joe Creek Formation (possibly Carboniferous)		Maria Formation 175 ft	
	UNIT A		Homevale Beds > 8000 ft	Cattle Creek Formation 400 ft	Sirius Formation 500-700 ft Staircase Sandstone 950-1800 ft Stanleigh Formation 2000 ft 〰〰〰 Orion Formation <500 ft				
LOWER BOWEN VOLCANICS		Mt.Devlin Volcanics 2000 ft Mt.Devlin Coal Measures 400 ft Mt. Toussaint Volcanics 3000 ft	Andesite				Caraboon Andesite Cracow Volcanics?		

LEGEND

〰 Unconformity

} Undifferentiated

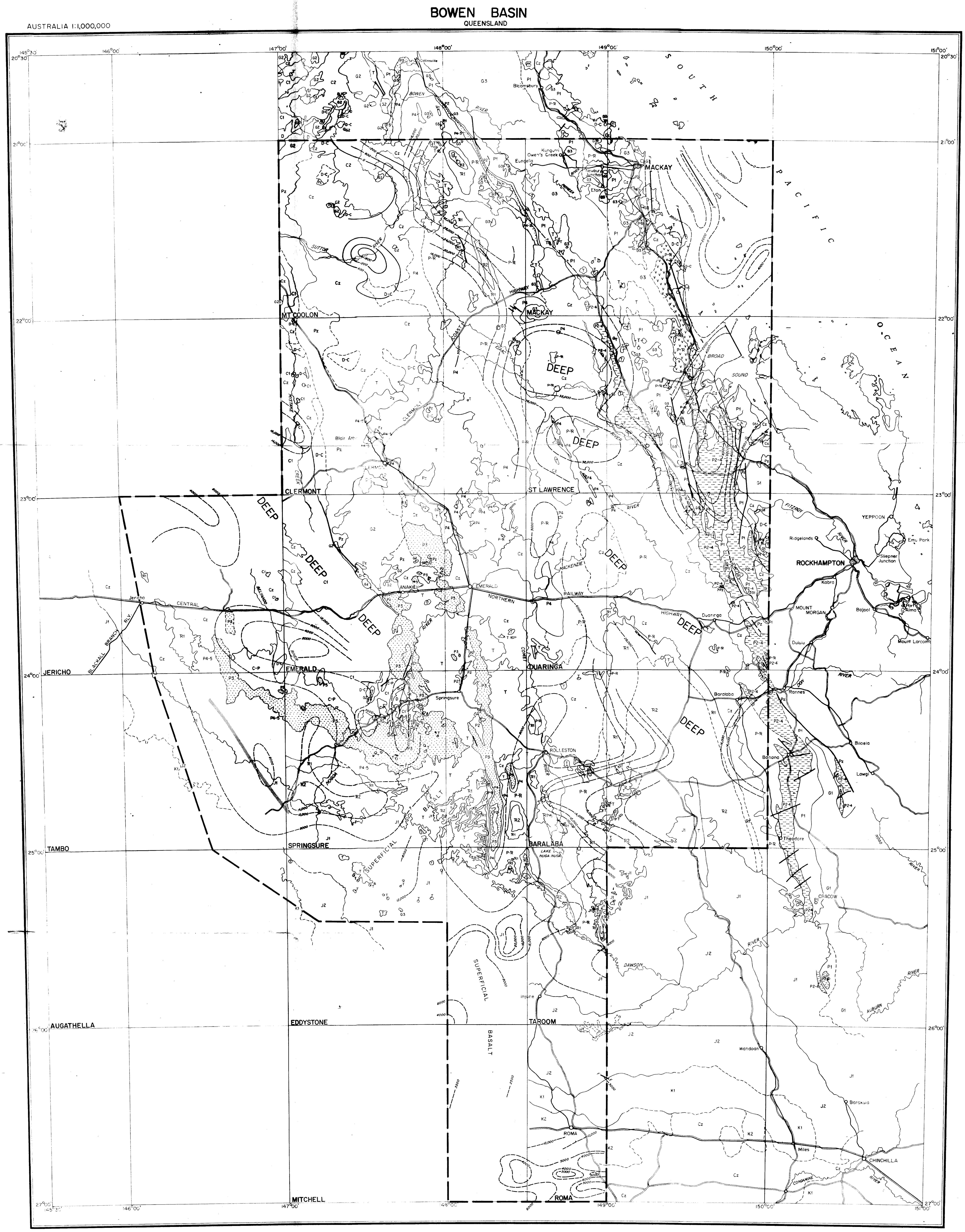
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. F55/B1-30

TO ACCOMPANY RECORD 1966/208

PLATE 2

AUSTRALIA 1:1,000,000

BOWEN BASIN
QUEENSLAND



(Based on F55/B0-34)

GEOLOGICAL LEGEND

Rock units of approximately similar age are grouped for convenience. The units grouped do not represent stratigraphic successions nor are they necessarily time equivalents. Some of the rock unit names are synonyms.

CAINOZOIC	Cz	Undifferentiated.
TERTIARY	T	Basalt and other volcanics.
CRETACEOUS	K2	Roma Fn., Tambo Fn. Styx Coal Measures.
JURASSIC to LOWER CRETACEOUS	K1	Blythesdale Group.
JURASSIC	J2	Walloon Coal Measures.
	J1	Marburg Sandstone. Bundamba Group.
TRIASSIC	R2	Moolayember Formation. Teviot Formation.
	R1	Clematis Sandstone. Carborough Sandstone.
MESOZOIC or PERMIAN	P-R	Carmila Volcanics (mainly Permian). Unnamed volcanics (south-east of Duaringa).
UPPER PERMIAN - TRIASSIC	P-R	Rewan Formation. Upper Bowen Coal Measures. Taurus Formation. Upper Bandanna Formation. Theodore Group. Kianga Formation. Calen Beds.
PERMIAN	P4-5	Middle Bowen Beds, (probably Unit "C") with some Upper Bowen Beds (P-R) included. Colinlea Formation (top part). Cheshire Formation ? Blair Athol Coal Measures.
	P4	Middle Bowen Beds, Unit C. "Passage Beds" (north of Clermont). Crocker Formation. Maria Formation. Lower Bandanna Formation. Mantuan Productus Bed. Big Strophalosia Zone. Dry Creek Shale.
	P3	Middle Bowen Beds, Unit B. Collinsville Coal Measures. Colinlea Formation, main part (may also be equivalent to lower rock units). Catherine Sandstone. Ingelara Formation Aldebaran Sandstone.
	P2	Middle Bowen Beds, Unit A. Cattle Creek Formation Staircase Sandstone, Sirius Shale. Orion Formation Stanleigh Formatiom Dilly Beds.
	P2-4	Middle Bowen Beds, Units A, B, and C undifferentiated. Apis Creek Formation. Back Creek Group. Prospect Creek Series. Cockatoo Creek Formation. Yatton Limestone.
	P1	Lower Bowen Volcanics. Camboon Andesite. Cracow Volcanics (?). Rockwood Volcanics. Dinner Creek Beds (may be in part Carboniferous).
CARBONIFEROUS to PERMIAN	C-P	Joe Joe Creek Formation.
CARBONIFEROUS	C2	Bulgonunna Volcanics.
LOWER to MIDDLE CARBONIFEROUS	C1	Ducabrook Formation. Raymond Sandstone. Mt. Hall Conglomerate. Undifferenticted sediments (north east of Duaringa).
DEVONIAN - CARBONIFEROUS	D-C	Campwyn Beds. Telemon Formation. Silver Hills Volcanics Theresa Creek Volcanics. Mt. Wyatt Beds. Undifferentiated volcanics.
DEVONIAN	D	Dunstable Formation. Douglas Creek Limestone. Ukalunda Beds. Undifferentiated sediments.
SILURIAN - DEVONIAN	S-D	Undifferentiated sediments north-east and south-east of Duaringa.
PALAEOZOIC	Pz	Rannes Beds. Anakie Metamorphics (may include some Ukalunda Beds). Undifferentiated metamorphics in Marlborough area.
	IGNEOUS INTRUSIVES	
POST-PERMIAN	G3	Urannah Complex (includes some pre-Permian intrusives). Gotthardt Granodiorite. Mt. Barker Granodiorite. Bundara Granodiorite. Undifferentiated intrusives. Serpentine (Chesterton Range).
PRE-PERMIAN	G2	Retreat Granite. Undifferentiated intrusives.
AGE UNKNOWN	G1	Auburn Complex. Undifferentiated intrusives.

~	Geological boundary	═	Road
-·-·-	Probable geological boundary	—	Railway Line
—	Fault		
- - -	Probable Fault		

This map has been compiled by B. TISSOT (Institut Français du Pétrole) from the following existing data:

Provisional geological maps at 1:250,000 scale (unpublished) prepared by the Bureau of Mineral Resources, Geology and Geophysics, in association with the Geological Survey of Queensland: Bowen, Proserpine, Mount Coolon, Mackay, Clermont, Saint Lawrence, Emerald, Duaringa.

Photogeological maps at 1:250,000 scale (unpublished) prepared by the Institut Français du Pétrole (Mission in Australia) in association with the Bureau of Mineral Resources, Geology and Geophysics: Saint Lawrence, Duaringa, Springsure, Eddystone North, Jericho.

Geological map of Queensland at a scale of 40 miles to 1 inch, prepared by the Geological Survey and the University of Queensland, 1953.

Springsure 4 mile geological sheet, G/55-3 with explanatory notes by D. HILL 1957

Geological maps in "General report on investigations and operations carried out by the company in the search for oil in Queensland" by Shell (Queensland) Development Ltd, 1951. (unpublished)

Reconnaisance geological survey at 1:250,000 scale by J.E. MACK, Jun. (Union Oil Development Corporation), published by the Bureau of Mineral Resources, Geology and Geophysics, 1962.

Geological map of the Bowen Basin, compiled by G.W. TWEEDALE (Geological Survey of Queensland) and R.F. ISBELL (Commonwealth Scientific and Industrial Research organisation) in "The Geology of Queensland" by D. HILL & A.K. DENMEAD et al., 1960.

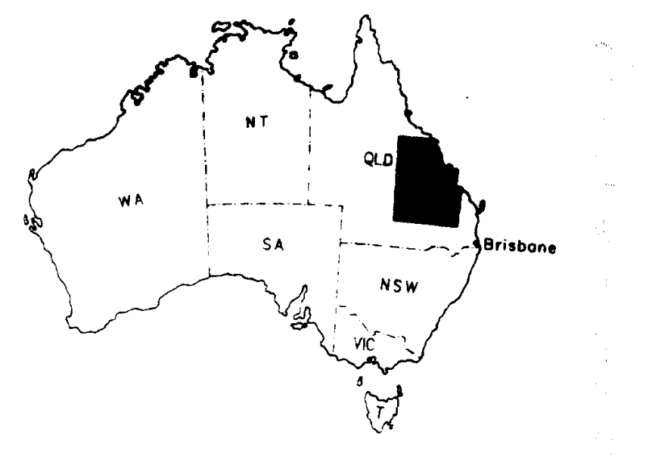
Geological sketch map of the Cockatoo Creek area by A.C.M. LAING of Mines Administration Pty Ltd (ibid)

Drawn by G.J. Verburg
December, 1962.

GEOPHYSICAL LEGEND

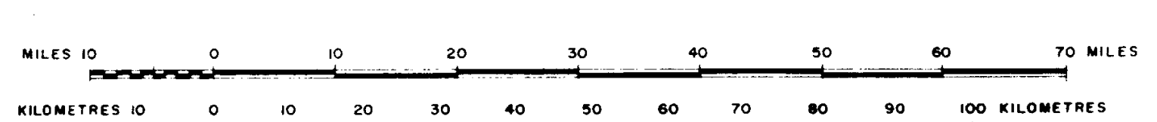
▬ ▬	Survey boundary
—18,000—	Magnetic basement contour
—2000—	Magnetic basement contour (intermediate horizon)
F——F	Possible fault
//////	Lineation

LOCATION DIAGRAM

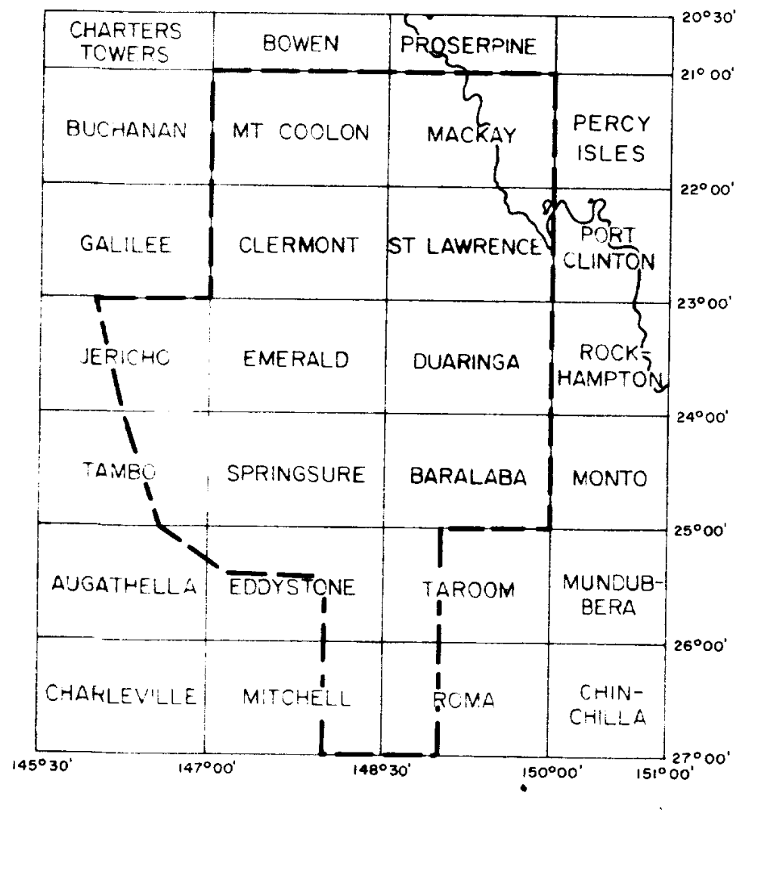


AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY, 1961-63

MAGNETIC BASEMENT DEPTH CONTOURS



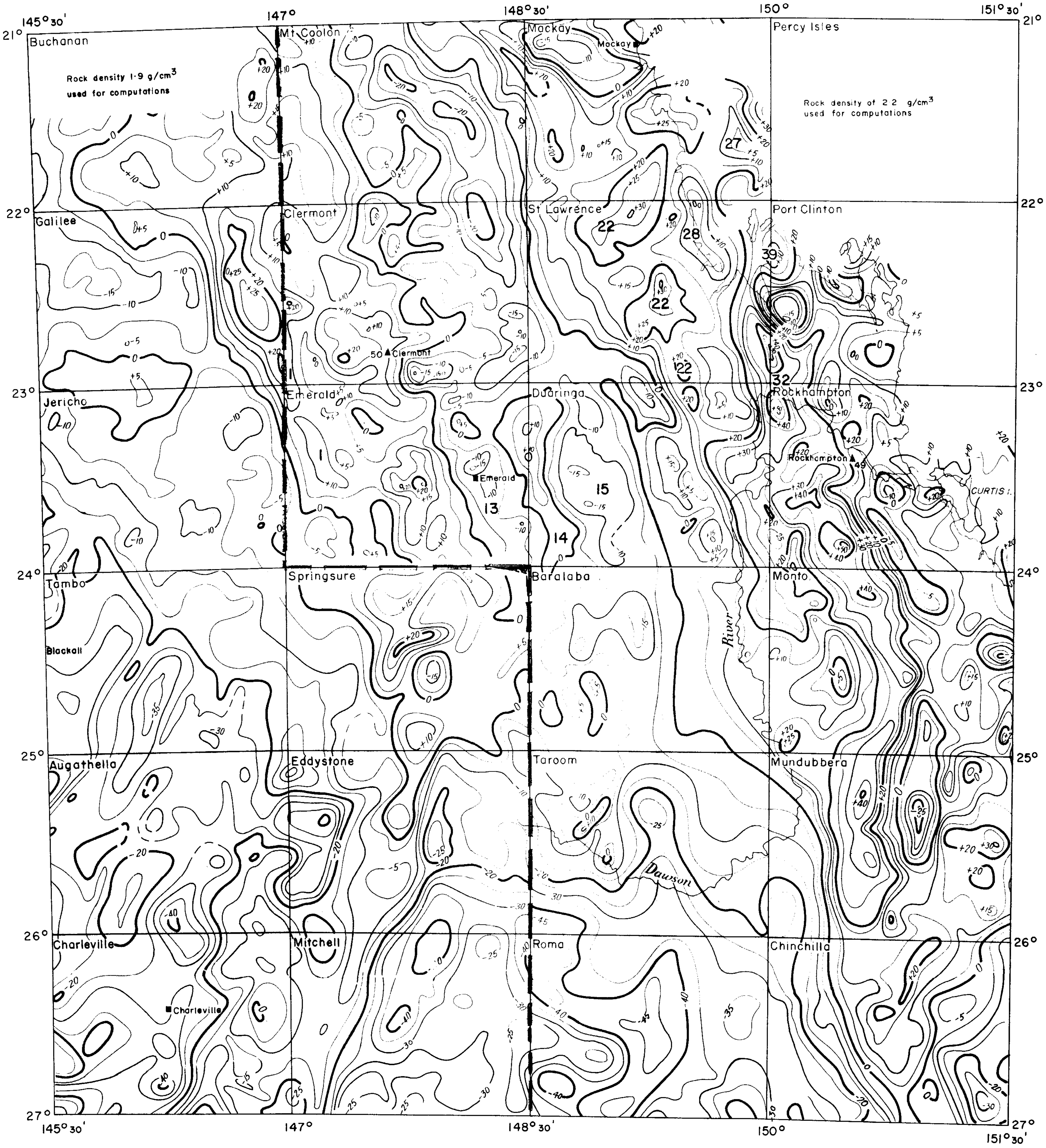
INDEX TO 1:250,000 SHEETS



Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. F55/BI-29

TO ACCOMPANY RECORD NO. 1966/208

PLATE 3



BOWEN BASIN, QUEENSLAND

BOUGUER ANOMALIES

SCALE

0 50 100 MILES

0 50 100 KILOMETRES

LEGEND

0 / -10	Bouguer anomalies (milligals)
▬ ▬	Rock density boundary
39	Gravity feature number (after Darby, 1966)
▲ 49	B.M.R. gravity pendulum station

Based on Preliminary Bouguer Anomaly Map of Australia, G20-33, September 1965 edition, Bureau of Mineral Resources, Geology and Geophysics.

GEOPHYSICAL BRANCH, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS **F55/B1-31**

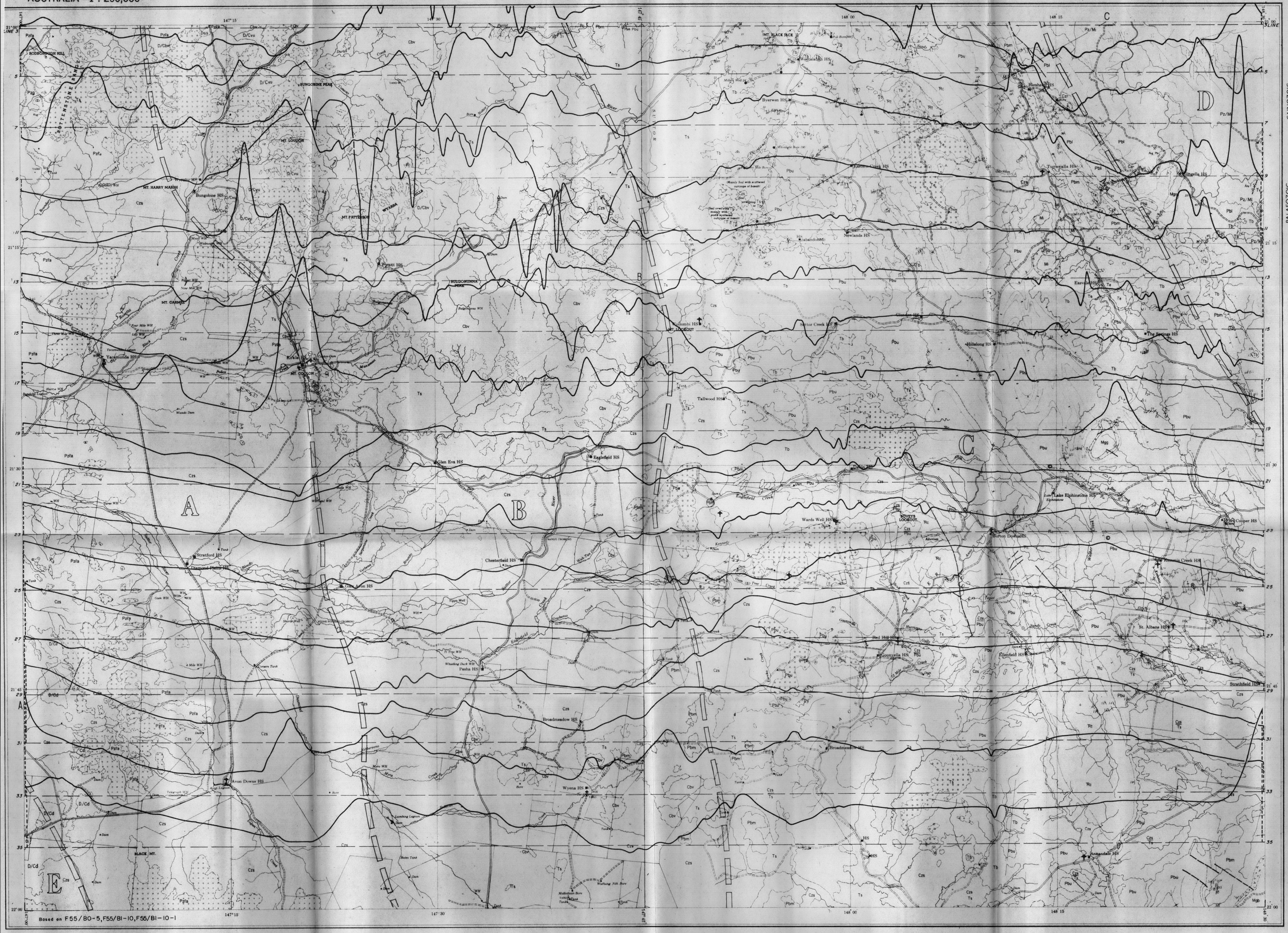
TO ACCOMPANY RECORD No. 1966/208

MT. COLON

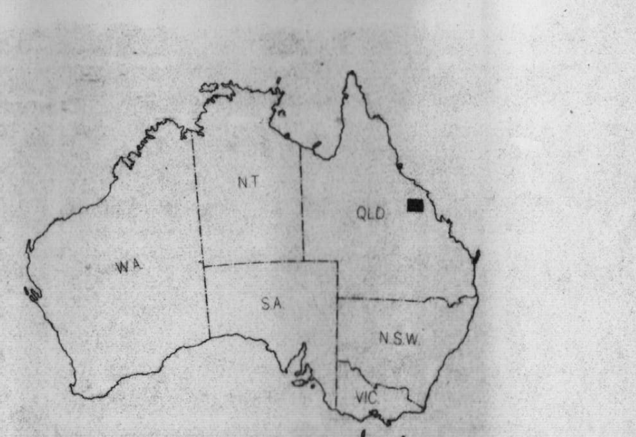
QUEENSLAND

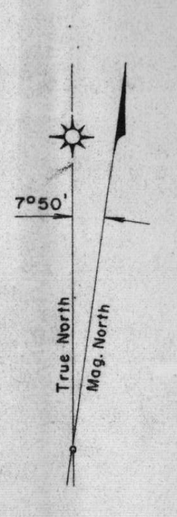
AUSTRALIA 1 : 250,000

PLATE 4



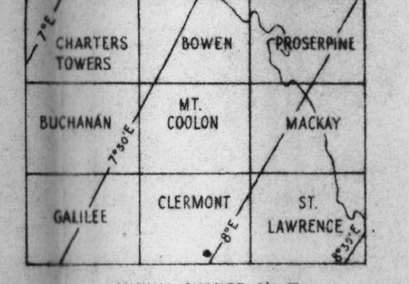
Geological and Planimetric Mapping from 1:250,000 Scale Geological Series Sheet SF55-7, Preliminary Edition, 1962, Bureau of Mineral Resources, Geology and Geophysics. Transverse Mercator Projection.





INDEX TO ADJOINING SHEETS

Showing magnetic declination



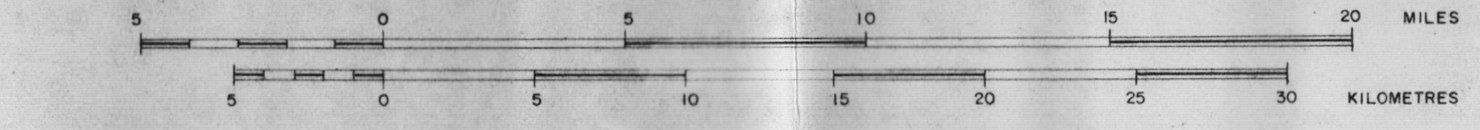
CHARTERS TOWERS	BOWEN	PROSERPINE
BUCHANAN	MT. COOLON	MACKAY
GALILEE	CLERMONT	ST. LAWRENCE

ANNUAL CHANGE 2' 30"E

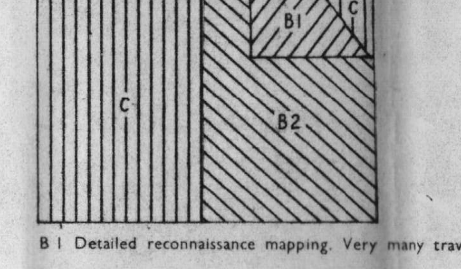
AIRBORNE SURVEY, BOWEN BASIN, QLD, 1962

TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY

SCALE



GEOLOGICAL RELIABILITY DIAGRAM

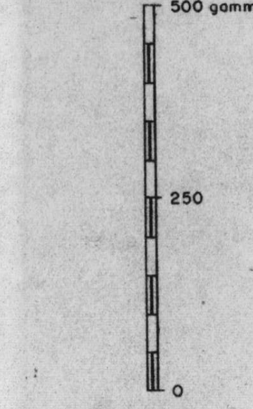


B 1 Detailed reconnaissance mapping. Very many traverses

B 2 Reconnaissance mapping. Numerous traverses

C Sketchy. Some traverses and air-photo interpretation

APPROX. PROFILE SCALE



EXPLANATORY NOTES

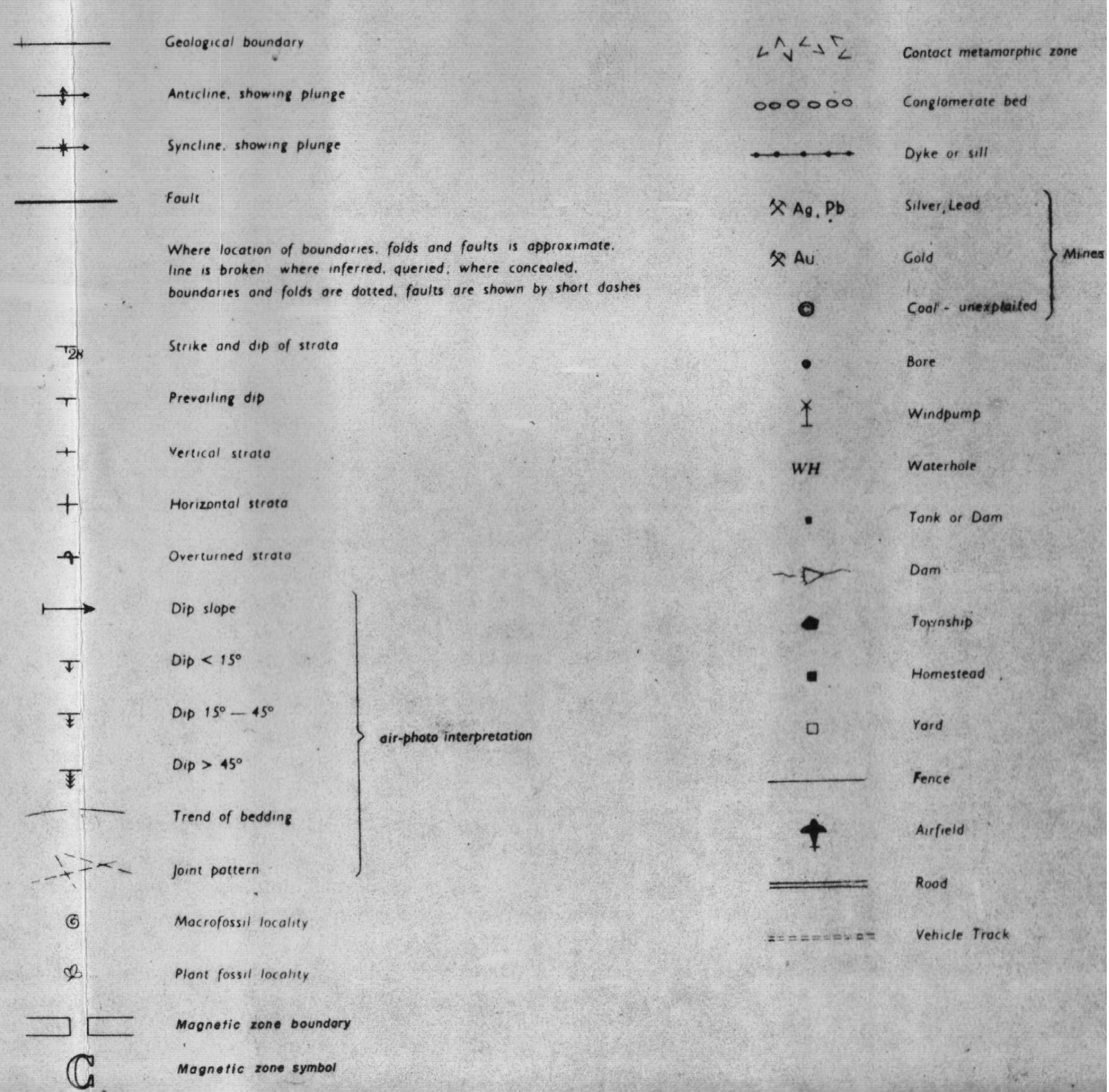
THE SURVEY WAS MADE WITH A DC. 3 AIRCRAFT AT AN ALTITUDE OF 2000 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 8 GAMMAS PER MILE IN A DIRECTION S9°W. PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH AN ACCURACY OF ± 1/4 MILE BY CONTROL AT LONGITUDES 147° 22' 30" AND 148° 7' 30".

Reference

CAINOZOIC			Czs	Soil, sand, alluvium, laterite, lateritic soils and gravels
			Czr	River channel and flood-plain deposits
			○○○○	Laterite on underlying formation
	Tertiary	**Suttor Formation**	Ts	Cross-bedded quartz sandstone, lenses of fine and pebble conglomerate, sandy claystone; silicified claystone, river channel conglomerate
			Tb	Basalt flows and rare plugs; few trachyte flows, plugs and dykes
		Exevale Formation	Te	Friable quartz sandstone with scattered pebbles and some thin conglomerate bands, silicified quartz sandstone, white friable siltstone
PALAEOZOIC OR MESOZOIC			Pz/Mi	Alkali granite, adamellite, aplite, gabbro
MESOZOIC			Mi	A possibly differentiated series of intrusives including leucocratic anorthite gabbro, leuco-diorite, quartz hornblende diorite, porphyritic micro-granodiorite, granodiorite, alkali granite, dolerite and porphyritic plagioclase dolerite sills and dykes
		Gotthardt Granodiorite	Mgg	Biotite hornblende granodiorite
		Bundarra Granodiorite	Mgb	Leuco granodiorite
		Mt. Barker Granodiorite	Mgm	Biotite-hornblende granodiorite
	Triassic	**Teviot Formation**	Rt	Micaceous lithic sandstone, calcareous in places, and micaceous siltstone
		Carborough Sandstone	Rc	Cross-bedded quartz sandstone, feldspathic in places, some fine and pebble conglomerate
PALAEOZOIC	Permian	**Upper Bowen Coal Measures**	Pbu	Cross bedded, well sorted lithic sandstone, siltstone, carbonaceous shale, some coal seams, pebble and cobble conglomerate beds, dolomitic and calcareous greywacke
		Middle Bowen Beds	Pbm	Brown-grey quartz greywacke, grey blue greywacke grading into micaceous siltstone, blue grey and brown siltstone, quartz sandstone, calcareous quartz greywacke. Locally metamorphosed to knotted schist, slate, graphitic schist, hornfels. Current-bedded quartz sandstone, conglomerate, siltstone
		Collinsville Coal Measures	Pc	**Quartz sandstone,** pebble conglomerate, siltstone
		Lower Bowen Volcanics	Pbl	Andesite flows, sills, tuffs, crystal and lithic tuffs, agglomerate, black siltstone, coarse tuff grading into volcanic ash
			Pbli	Sills and laccoliths of diorite, micro-gabbro and dolerite
	Carboniferous		Ci	Granite, diorite, hornblende gabbro, acid to intermediate stocks and bosses
		Bulgonunna Volcanics	Cbv	Flow-banded, porphyritic rhyolite, quartz-feldspar porphyry, acid tuff and agglomerate, tuffaceous greywacke, siltstone. Intrusive acid to intermediate stocks and bosses, some intrusive rocks, probably equivalents of the extrusives
			Pzg	Biotite-hornblende granodiorite
	Devonian-Carboniferous	**Drummond Group**	D/Cd	Feldspathic quartz sandstone, buff siltstone and claystone, rhyolite flows, rhyolitic agglomerate, quartz greywacke, siltstone
		Undifferentiated Volcanics	D/Cvu	Tuff, siliceous tuff, porphyritic lavas, conglomerate, tuffaceous sandstone
	Devonian		Dus	**Tuffaceous lithic sandstone, sandstone, conglomerate, siltstone**
	Pre- Upper Devonian	**Anakie Metamorphics**	Pzla	Mica schist, phyllite, schistose and lineated siltstone, closely jointed quartz greywacke, sheared feldspathic sandstone, silicified quartz sandstone and fine conglomerate, brecciated and quartz veined in places. Includes rocks of Middle Devonian age in north-west of area



SECTION

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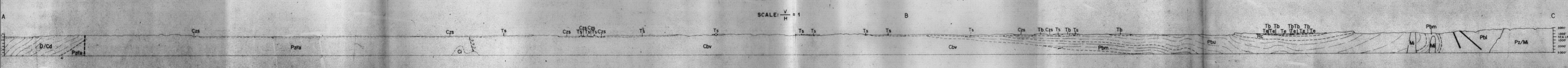


Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. F55/BI-10-2

TO ACCOMPANY RECORD No. 1966/208

AIRBORNE SURVEY, BOWEN BASIN, 1962

PLATE 5

TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY
MACKAY WEST
QUEENSLAND

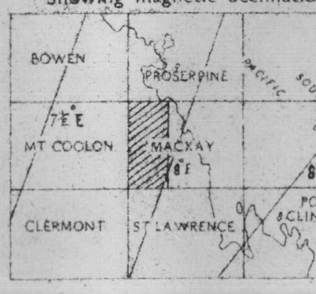
Scale
1 : 250.000

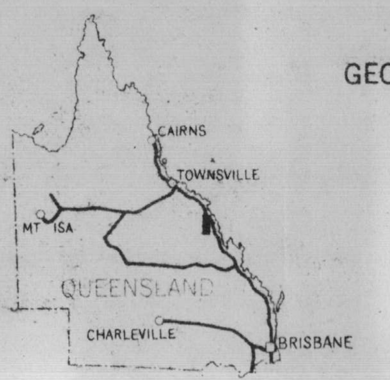
5 0 5 10 15 MILES

5 0 5 10 15 20 25 30 KILOMETRES

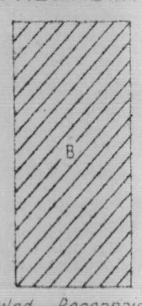
Geology after Geological Branch, Bureau of Mineral Resources,
Geology and Geophysics, 1962
by : A.R. Jensen, C.M. Gregory, V.R. Forbes.
drawn by : G. Matveev.

INDEX TO ADJOINING SHEETS
Showing magnetic declination





GEOLOGICAL RELIABILITY DIAGRAM



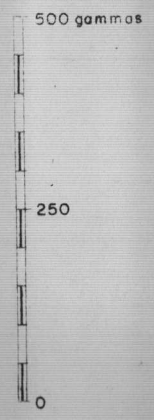
B- Detailed Reconnaisance
– Numerous Traverses

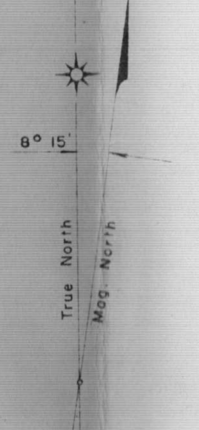
Reference

CAINOZOIC			Czs	Soil, sand, alluvium, flood plain deposits.
	Tertiary		Ts	Coarse semi-friable sandstone, partially lateritized.
			Tv	Rhyolite, trachyte, andesite, rhyolitic agglomerate and breccia, minor basalt.
			Tb	Mainly basalt flows, some porphyritic rhyolite.
MESOZOIC		Bundarra Granodiorite	Mgb	Leuco-granodiorite.
			Md	Leuco-microdiorite.
		Eungella-Broken River Igneous Complex	Pz/Mi	Diorite-granodiorite-granite mass with abundant acid, intermediate and basic dykes.
PALAEOZOIC	Permian	Upper Bowen Coal Measures	Pbu	Cross bedded, well sorted, lithic sandstone, calcareous lithic sandstone, siltstone, carbonaceous shale; some coal; conglomerate bands.
		Middle Bowen Beds	Pbm	Quartz sandstone, blue micaceous fossiliferous siltstone, calcareous lithic quartz sandstone.
		Lower Bowen Volcanics	Pbl	Andesitic flows, agglomerates and tuffs; minor rhyolite and dacite; shale, siltstone and sandstone.

⊐ ⊏	Magnetic zone boundary
D	Magnetic zone symbol
- - - -	Geological boundary, position approximate
—?—?—	Inferred fault
28	Strike and dip of strata
	Prevailing dip
—+—	Vertical strata
+	Horizontal strata
	Overturned strata
⟼	Dip slope
	Trend of bedding
	Macrofossil locality
	Plant fossil locality
Ag	Silver
Au	Gold
Cy	Clay
Cu	Copper
Ol	Torbanite
Pb	Lead
Zn	Zinc
⚒	Mine, glory hole, or large open cut
	Windmill
■ Nebo	Township
■ H.S.	Homestead
✈	Airfield
═══	Formed road
====	Vehicle track
	Joints
—•—•—	Igneous dyke
^∠^∧>∨	Metamorphic aureole

APPROX. PROFILE SCALE





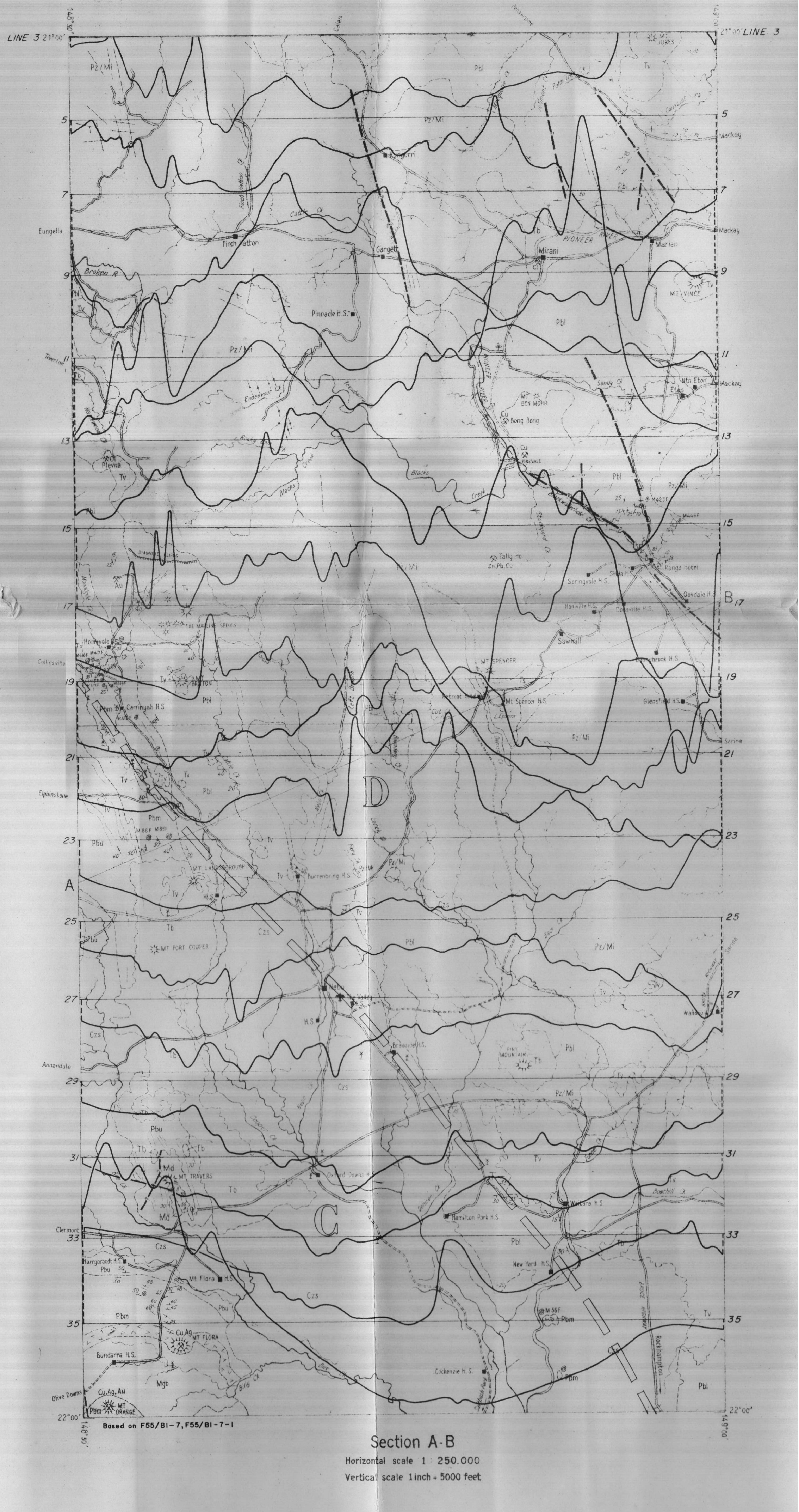
EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC.3 AIRCRAFT AT AN ALTITUDE OF 2000 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 7 GAMMAS PER MILE IN A DIRECTION S 6° W.

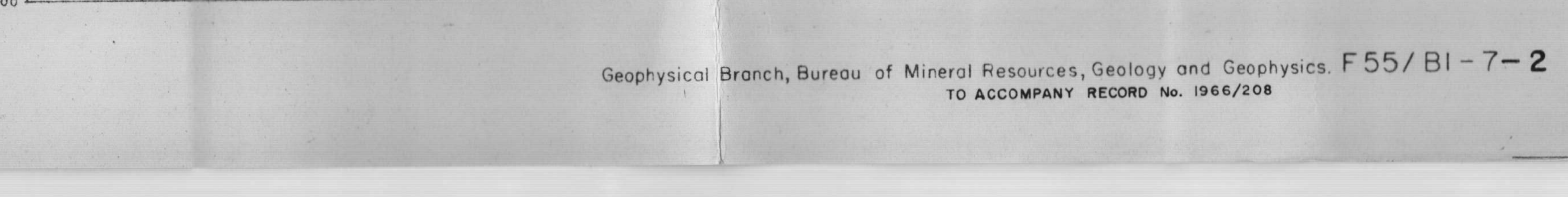
THE PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH A PROBABLE ERROR OF ± ¼ MILE BY CONTROL AT LONGITUDES 148° 30' AND 149° 00'.



Based on F55/BI-7, F55/BI-7-1

Section A-B
Horizontal scale 1 : 250.000
Vertical scale 1 inch = 5000 feet



Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. F55/BI-7-2
TO ACCOMPANY RECORD No. 1966/208

CLERMONT

QUEENSLAND

AUSTRALIA 1:250 000

BASED ON F55/B0-12, F55/B1-16, F55/B1-16-1, F55/B1-2-2

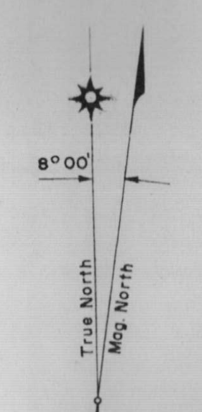
Geological and Planimetric Mapping from 1:250,000 scale Geological Series Sheet SF55-11, subject to amendment, Bureau of Mineral Resources, Geology and Geophysics. Transverse Mercator Projection

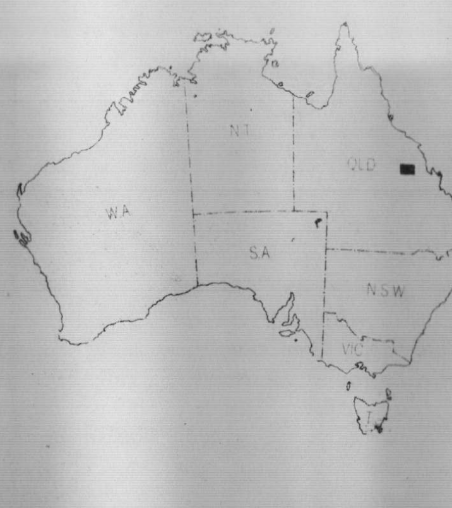
INDEX TO ADJOINING SHEETS

Showing Magnetic Declination

BUCHANAN	MT. COOLON	MACKAY
GALILEE	CLERMONT	ST. LAWRENCE
JERICHO	EMERALD	DUARINGA

ANNUAL CHANGE 2'45" E.





AIRBORNE SURVEY, BOWEN BASIN, QLD, 1961

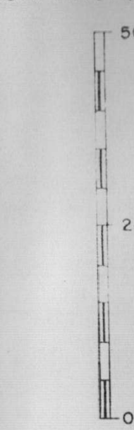
TOTAL MAGNETIC INTENSITY PROFILES, RADIOMETRIC RESULTS AND GEOLOGY

SCALE

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETRES

APPROX. PROFILE SCALE

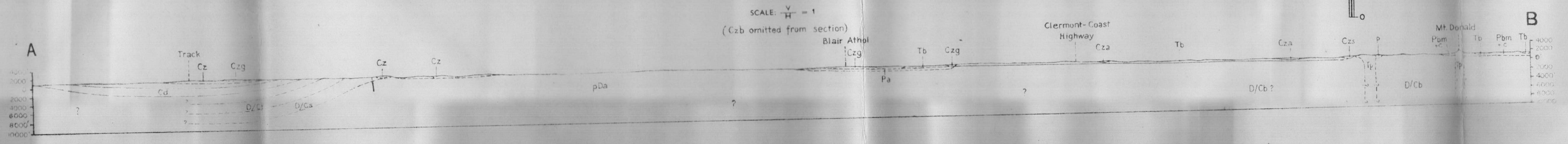


Sections

A B

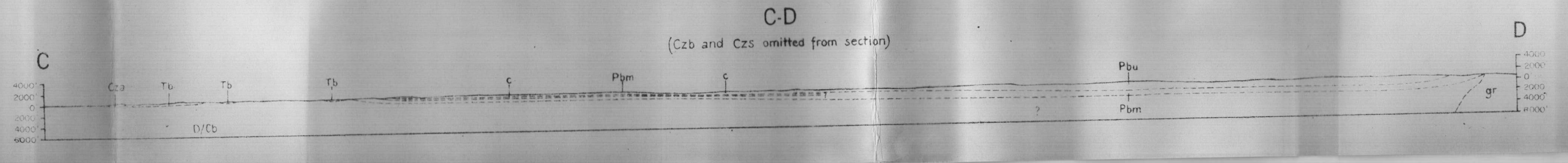
SCALE: $\frac{V}{H} = 1$

(Czb omitted from section)



C-D

(Czb and Czs omitted from section)



EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC. 3 AIRCRAFT AT AN ALTITUDE OF 500 FEET ABOVE GROUND LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 8 GAMMAS PER MILE IN A DIRECTION S 10° W. PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH A PROBABLE ERROR OF ± ¼ MILE BY CONTROL AT LONGITUDES 147° 00', 147° 45' AND 148° 30'.

Probable boundary of Tertiary Basalt

Magnetic zone boundary

Magnetic zone symbol

Intensity Change A

Intensity Change B

Intensity Change C

These symbols indicate a change in the level of radioactive intensity along a flight line. The short hachured lines point to the lower average intensity. The magnitude of the change is graded as A, B, or C, depending whether it is 1½, 1, or ½ times the background level on the low side of the change.

Reference

CAINOZOIC	Undifferentiated Cainozoic		Cz	Undifferentiated soil and alluvium
			Cza	Alluvium
			Czb	Heavy-textured dark soil
			Czg	Gravel
			Czs	Sand, sandy soil
			Czm	Magnesian limestone
	Tertiary ?		° ° ° °	Laterite
		Peak Range Volcanics	Tp	Rhyolite, trachyte
		Suttor Formation	Ts	Quartz sandstone, siltstone, conglomerate
			Tb	Basalt
MESOZOIC OR TERTIARY	Undifferentiated post-Triassic		sy	Syenite
			gr	Granite
MESOZOIC	Triassic ?	**Carborough Sandstone**	₹c	Quartz sandstone, quartz greywacke
PALAEOZOIC	Undifferentiated Permian		P	Fine quartz conglomerate, sandstone, shale
	Permian	**Blair Athol Coal Measures**	Pa	Sandstone, shale, coal
		Upper Bowen Coal Measures	Pbu	Lithic sandstone, greywacke, siltstone, mudstone, coal
		Middle Bowen Beds	Pbm	Quartz sandstone, quartz greywacke, siltstone, minor coal
			c	Sandy coquinite (Clarkei-bed)
	Upper(?) Palaeozoic		Pzum	Monzonite porphyry, granodiorite
	Carboniferous	**Ducabrook Formation**	Cd	Quartz sandstone, greywacke, siltstone
	Devonian-Carboniferous	**Telemon Formation**	D/Ct	Tuffaceous sandstone, siltstone
		Silver Hills Volcanics	D/Cs	Flow-banded rhyolite and trachyte, agglomerate, tuff
		Volcanics (Mt. Rankin area)	D/Cb	Intermediate to acid volcanics, greywacke, siltstone
	Undifferentiated Palaeozoic		Pzs	Chocolate pebbly sandstone, shale
	Middle and Upper Devonian	**Theresa Creek Volcanics**	Dt	Intermediate to acid volcanics, minor tuff
	Middle Devonian		Ds	Micaceous siltstone
		Douglas Creek Limestone	Dd	Coralline and stromatoporoid limestone
PALAEOZOIC OR PRECAMBRIAN	pre-Devonian	**Anakie Metamorphics**	pDa	Schist, slate, fine sandstone

Geological boundary

Geological boundary, inferred

Fault, position accurate, showing dip

Fault, position approximate

Fault, inferred

Strike and dip of strata

Prevailing dip

Horizontal strata

Very shallow dip

Dip slope

Dip < 15°

Dip 15° — 45°

Trend of bedding

Trend of bedding beneath overburden

Joints

Lineaments

air-photo interpretation

Marine fossil locality

Plant fossil locality

Reference number to specimen locality

Dyke (do - dolerite, m - monzonite, b - olivine basalt, tr - trachyte)

Ridges of rhyolite

Volcanic vent plug, olivine basalt or olivine gabbro

Platy-flow layering, inclined

Platy-flow layering, vertical

Mine or workings, disused

Bore

Well

Spring

Windpump

Waterhole

Tank or dam

Dam

Homestead

Airfield

Road

Vehicle Track

Railway line and siding

Trigonometrical station

Spot height in feet, instrument levelled

Spot height in feet, barometric traverse

datum m

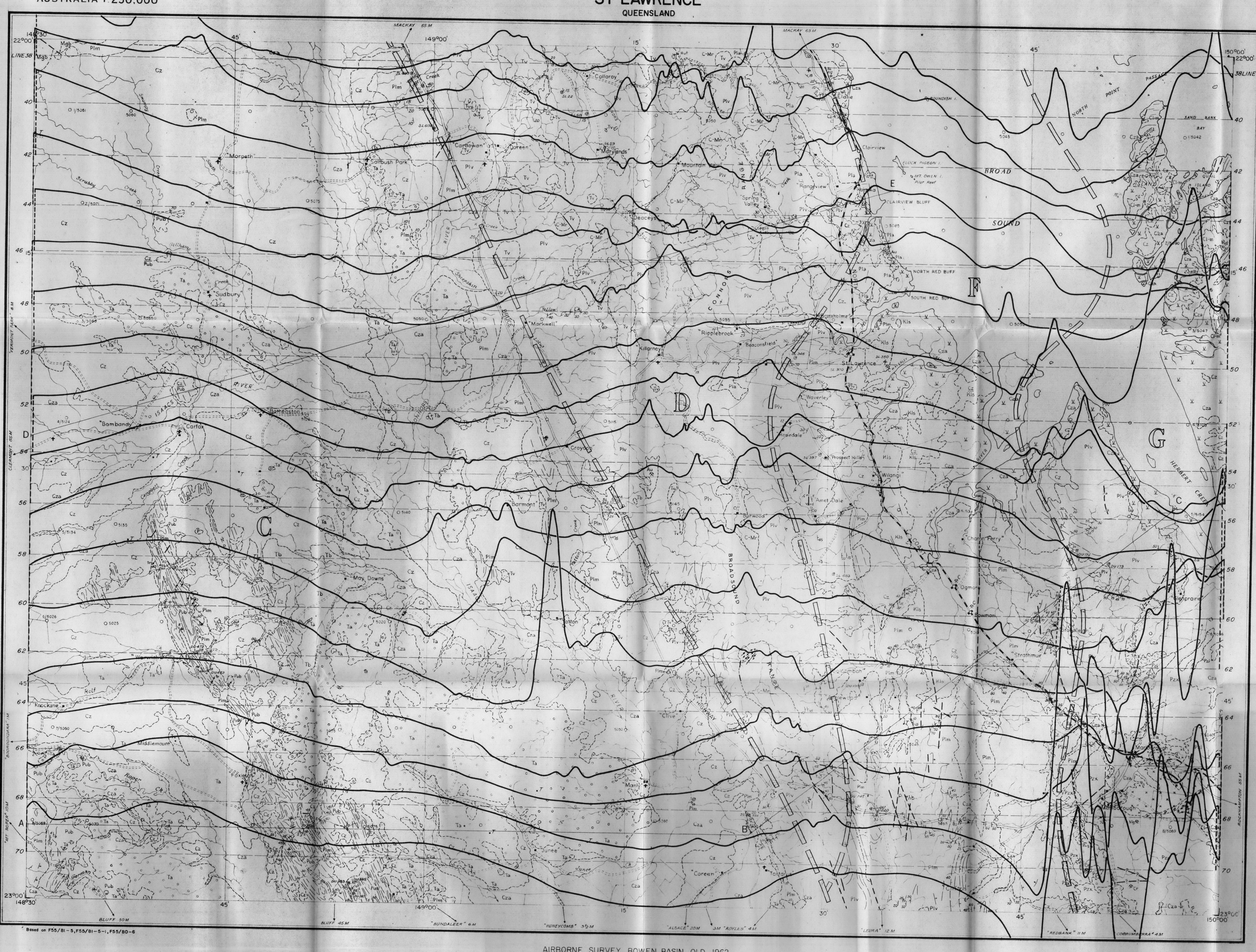
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics F55/

TO ACCOMPANY RECORD No. 1966/208

AUSTRALIA 1:250,000

ST LAWRENCE
QUEENSLAND

PLATE 7



Based on F55/B1-5, F55/B1-5-1, F55/B0-6

Reference

CAINOZOIC	UNDIFFERENTIATED		Cz	Soil, sand, gravel, alluvium, reworked laterite
			Cza	Alluvium
			° °	Laterite, and reworked laterite
	TERTIARY		Ta	Sandstone, siltstone, claystone, diatomite, conglomerate, some volcanics
			Tb	Basalt
			Tv	Rhyolitic, dacitic, and andesitic lavas and pyroclastics
MESOZOIC	LOWER CRETACEOUS	Bundarra Granodiorite	Mgb	Leuco-granodiorite
		Styx Coal Measures	Kls	Sandstone, conglomerate, siltstone, carbonaceous shale, coal
	CARBONIFEROUS TO MESOZOIC	Urannah Complex	C-Mr	Granite, adamellite, diorite and gabbro, with andesite dykes
			+ +	Granite
PALAEOZOIC	PERMIAN	Upper Bowen Coal Measures	Pub	Lithic and calc-lithic sandstone, quartz sandstone, siltstone, carbonaceous shale, coal, siliceous siltstone with plant remains, limestone
		Undifferentiated Upper Bowen Coal Measures and Middle Bowen Beds	P	
		Middle Bowen Beds	Plm	Quartz and quartz-lithic sandstone, micaceous siltstone, limestone, sheared siltstone, dark-grey to buff phyllite
		Carmila Beds	Pla	Acid crystal tuff, some acid lava, conglomerate, lithic sandstone, siltstone, carbonaceous shale, coal
		Lower Bowen Beds	Plv	Andesitic to dacitic pyroclastics and lavas; some rhyolitic and basaltic volcanics. Some fossiliferous limestone, tuffaceous sandstone, siltstone, conglomerate
		Rookwood Volcanics	Plr	Basalt, mainly pillow lavas; some agglomerate, tuffaceous sandstone, siltstone
	LOWER-MIDDLE CARBONIFEROUS		Cl-m	Oolitic limestone, calcareous siltstone, sandstone, siltstone, conglomerate
	UNDIFFERENTIATED		× ×	Granite, granodiorite
			⁄ ⁄	Diorite
			✶ ✶	Gabbro
			Pzx	Ultrabasic complex, mainly serpentinite
			Pzl	Quartz mica schist, phyllite

—— – –	Geological boundary
—— ——	Fault
	Where location of boundaries, folds and faults is approximate, line is broken; where inferred, queried; where concealed, boundaries and folds are dotted, faults are shown by short dashes
⊤75	Strike and dip of strata
+	Vertical strata
+	Horizontal strata
⊥	Dip < 15° } air-photo interpretation
))	Trend lines } air-photo interpretation
✕	Joint pattern } air-photo interpretation
▲70	Strike and dip of foliation
✦	Vertical foliation
⊛	Macrofossil locality
✤	Plant fossil locality
▭	Fossil wood locality
SL 199	Text reference to fossil locality
—•—•—	Dyke or vein: g-gabbro, tr-trachyte
⚒C	Mine
Au	Gold
C	Coal
Gr	Chromium
Mg	Magnesite
⩘	Dam
▪T	Earth tank
⊻	Mangrove
═══	Road
======	Vehicle track
—◘—	Railway with siding
⁓	Fence
▪"Yatton"	Homestead
✈	Landing ground
○ 8/5089	Air-photo centre point
⊐ ⊏	Magnetic zone boundary
𝔹	Magnetic zone symbol

Geological and planimetric mapping from 1:250,000 scale
Geological Sheet SF55-12, preliminary edition 1963,
Bureau of Mineral Resources, Geology and Geophysics.
Transverse Mercator Projection

INDEX TO ADJOINING SHEETS.

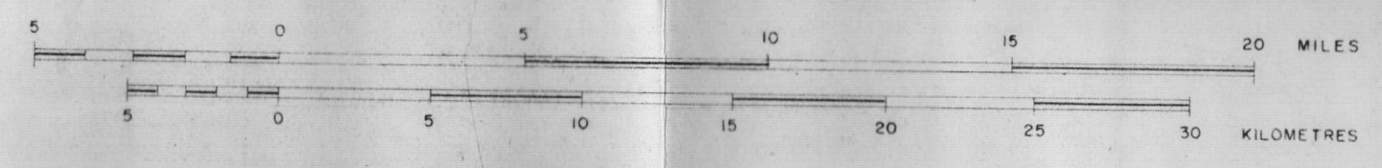
MT COOLON	MACKAY	PERCY ISLES
CLERMONT	ST LAWRENCE	PORT CLINTON
EMERALD	DUARINGA	ROCKHAMPTON

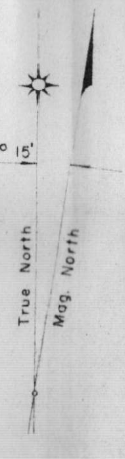
LOCATION DIAGRAM

AIRBORNE SURVEY, BOWEN BASIN, QLD, 1962

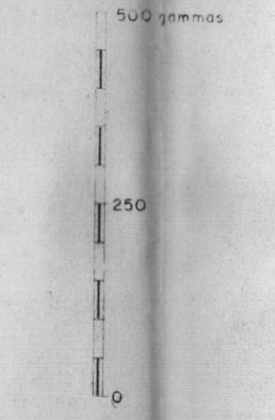
TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY

SCALE





APPROX. PROFILE SCALE



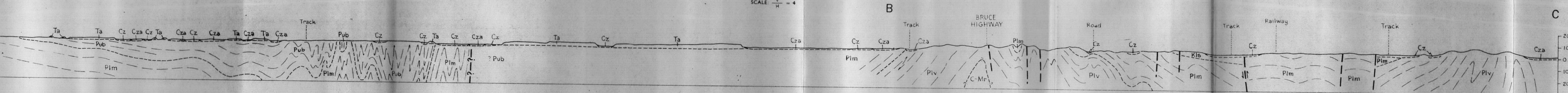
EXPLANATORY NOTES

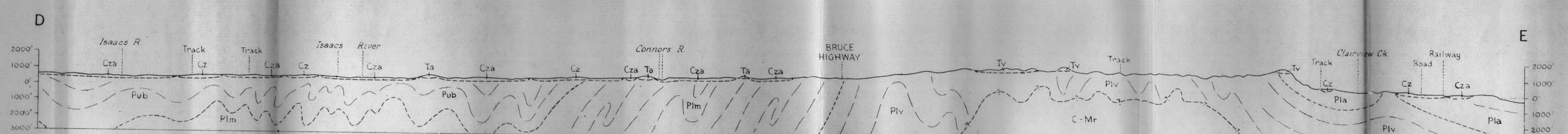
THE SURVEY WAS MADE WITH A DC3 AIRCRAFT AT AN ALTITUDE OF 2000 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 8 GAMMAS PER MILE IN A DIRECTION S 7°W. PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH AN ACCURACY OF ±¼ MILE BY CONTROL AT LONGITUDES 148° 52' 30" AND 149° 52' 30".

Sections
Folding diagrammatic
SCALE: V/H = 4





To overprint Base Map F55/B0-6

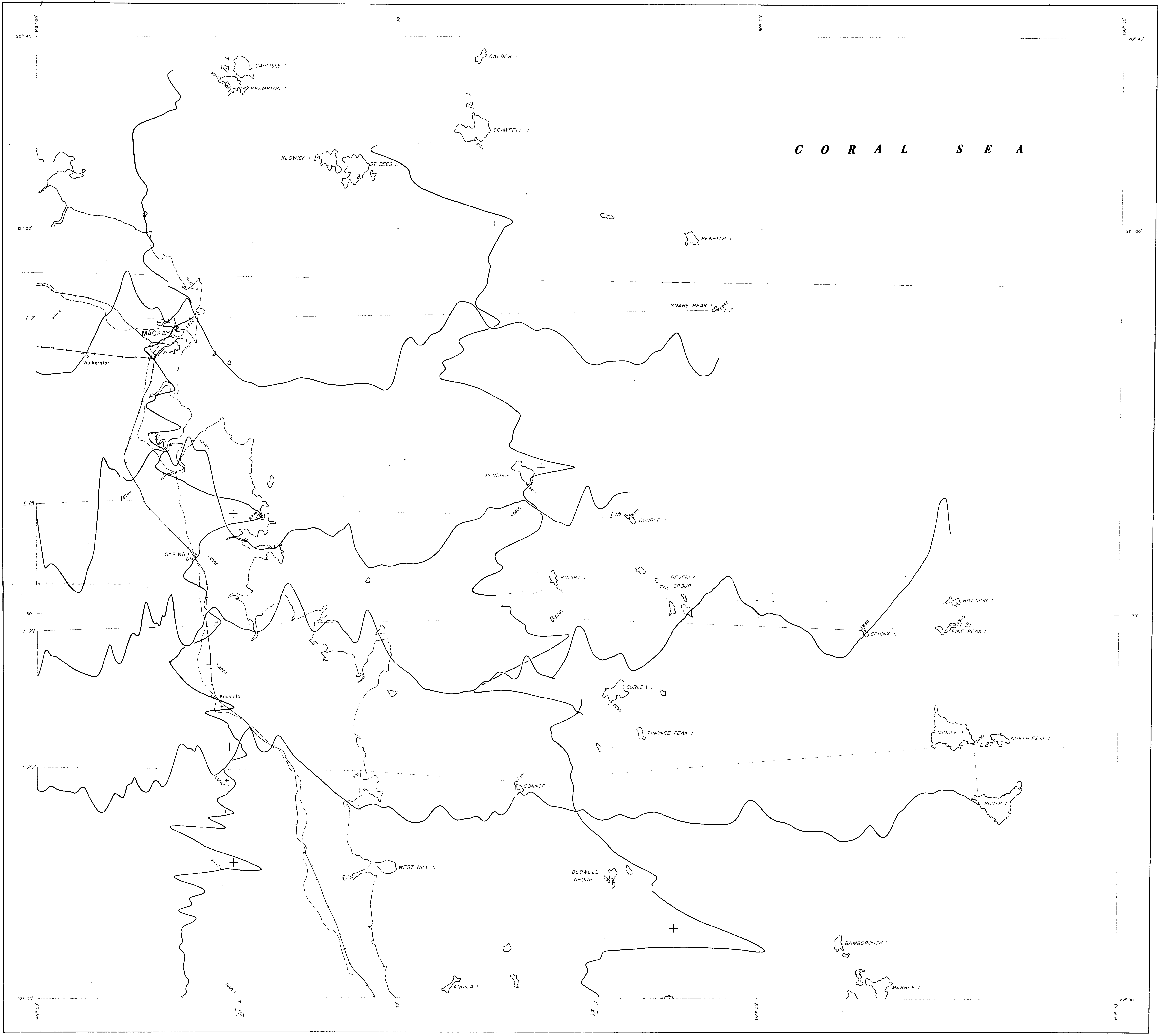
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics **F55/B1-5-2**
TO ACCOMPANY RECORD No. 1966/208

AUSTRALIA 1:250,000

MACKAY EAST

QUEENSLAND

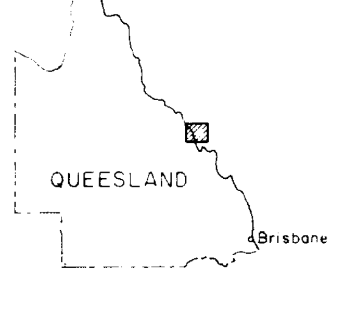
PLATE 8

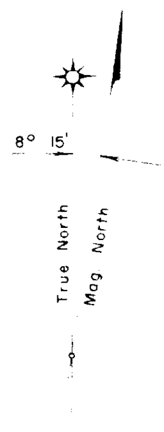


INDEX TO ADJOINING SHEETS

BOWEN	PROSERPINE	
MT COOLON	MACKAY	PERCY ISLES
CLERMONT	ST LAWRENCE	PORT CLINTON

LOCATION DIAGRAM

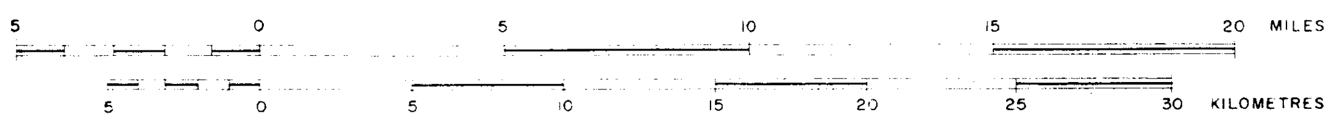




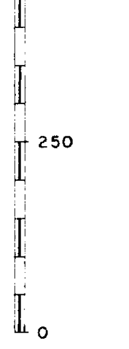
TOTAL MAGNETIC INTENSITY PROFILES

AIRBORNE SURVEY, BOWEN BASIN, Q'LD 1962

SCALE



APPROX. PROFILE SCALE



EXPLANATORY NOTES

THE TRAVERSES WERE FLOWN BY A DC.3 AIRCRAFT AT AN ALTITUDE OF 2000 FEET ABOVE SEA LEVEL.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER AND HAVE BEEN CORRECTED FOR A REGIONAL GRADIENT IN TOTAL INTENSITY OF 8 GAMMAS PER MILE IN A DIRECTION S5°W.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN CONTROLLED AT THE POINTS SHOWN. THE ERROR IN POSITIONING THE FLIGHT LINES IS NOT EXPECTED TO EXCEED 1/2 MILE.

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. F55/B1-6

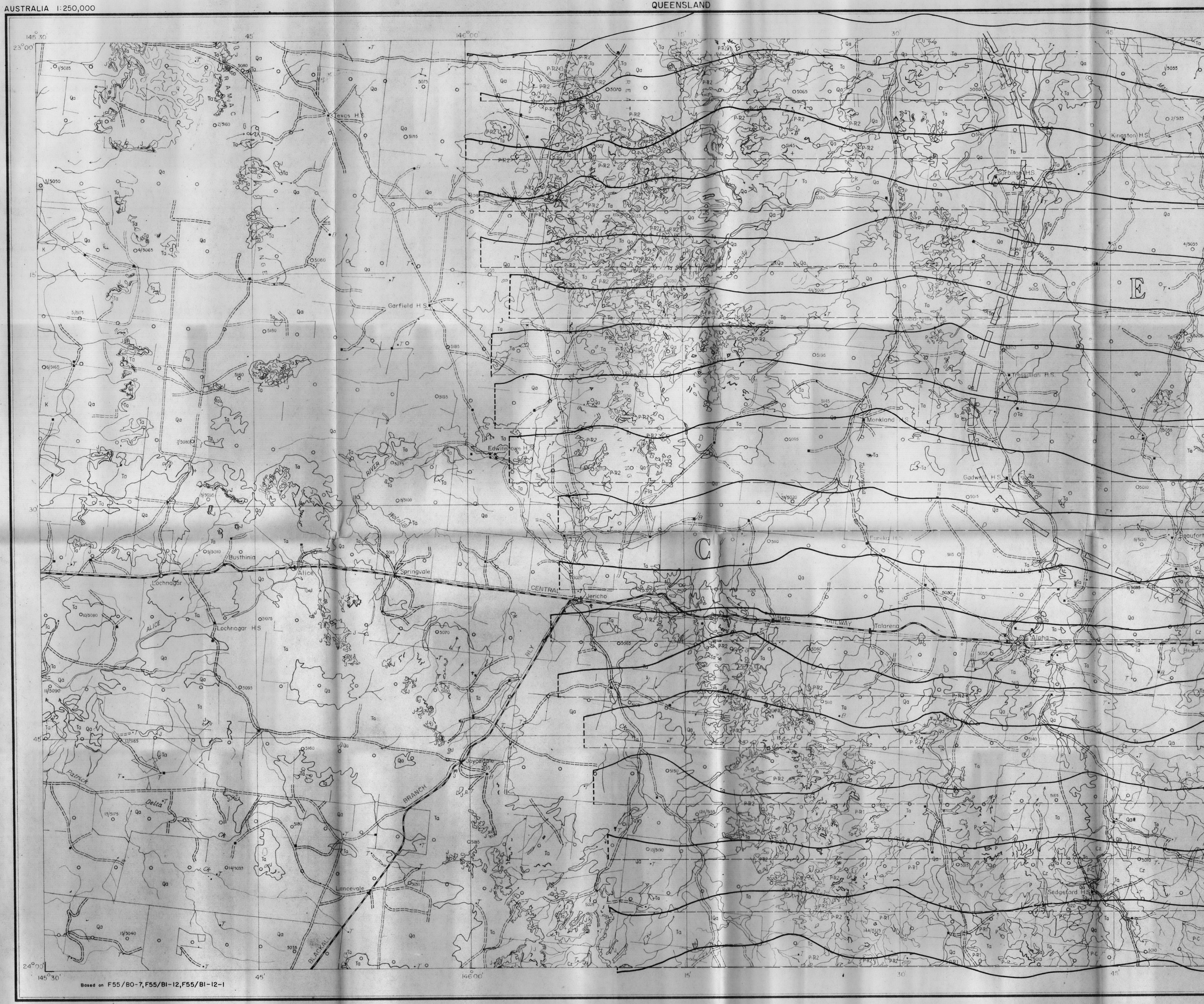
TO ACCOMPANY RECORD 1966/208

PLATE 9

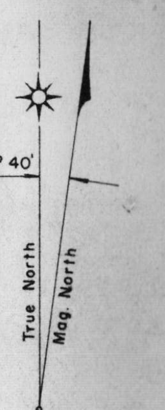
AUSTRALIA 1:250,000

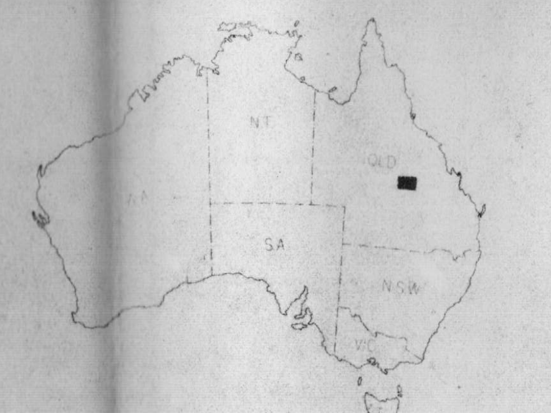
JERICHO

QUEENSLAND



Geological and Planimetric Mapping from 1:250,000
Scale Photogeological Sheet SF55-14, Bureau of
Mineral Resources, Geology and Geophysics.
Transverse Mercator Projection.

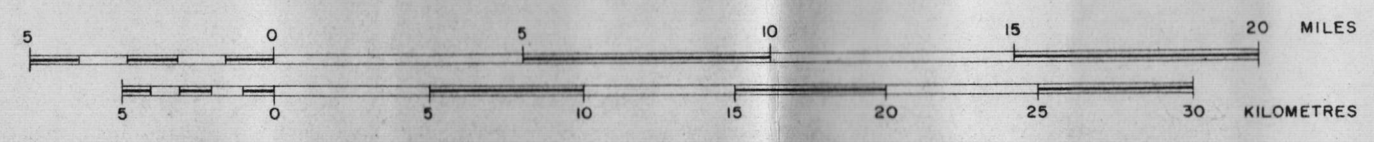




AIRBORNE SURVEY, BOWEN BASIN, QLD, 1962

TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY

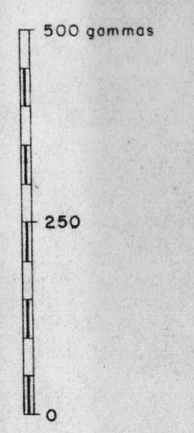
SCALE



INDEX TO ADJOINING SHEETS

MUTTABURRA	GALILEE	CLERMONT
LONGREACH	JERICHO	EMERALD
BLACKALL	TAMBO	SPRINGSURE

APPROX. PROFILE SCALE



EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC. 3 AIRCRAFT AT AN ALTITUDE OF 2000 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 9 GAMMAS PER MILE IN A DIRECTION S10°W. PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH AN ACCURACY OF ± 1/4 MILE BY CONTROL AT LONGITUDES 146° 15' AND 146° 45'.

REFERENCE

Photogeological Character		Possible Geological Interpretation		
	Qb	Recent alluvium	QUATERNARY	CAINOZOIC
	Qa	Alluvium and soil		
Grey tone, coarse texture	Cz	Cover		
	Ta	Clastics and laterite	TERTIARY	
	Tb	Basalt		
	Unconformity			
White tone, weathered appearance	K		CRETACEOUS	MESOZOIC
Dark tone, patchy outcrops, forming low scarps in the south	J	Bundamba Group and younger	JURASSIC	
Dark tone, low relief	P-R2		PERMO-TRIASSIC	
White tone, weathered appearance, no bedding	P-R1			PALAEOZOIC
Dark tone, smooth texture; progressively losing scarp-forming habit northwards	P	Colinlea Formation	PERMIAN	
	Unconformity			
Medium-dark tone, alternating hard and soft beds	P-C	Outcrop Mantled Joe Joe Ck Formation		
Medium-dark tone, alternating hard and soft beds	C3	Ducabrook Formation	CARBONIFEROUS	
Well bedded alternative light and dark tone	C2	Undifferentiated Carboniferous		

MT. BEAUFORT ANTICLINE
(from J.J. Veevers et al., 1962)

Dark toned, scarp forming	Cb	Mount Hall Conglomerate and top of Telemon Formation	DEVONIAN — CARBONIFEROUS
Grey tone, forms low scarp	Dtb	Telemon Formation	
White tone, coarse texure, low relief	Dta		
Forms high mass, hard appearance	V	Volcanics	

▭ ▭ Magnetic zone boundary

ℂ Magnetic zone symbol

- Geological boundary
- Probable geological boundary
- Edge of bed
- Edge of bed expressed as scarp
- Trend
- Joints
- Anticlinal axis
- Synclinal axis
- Fault
- Probable fault
- Laterite (L) Terrace (T) Scree (S)
- Topographic scarp
- Direction of dip of surface

<u>Estimated dips</u>

- + Horizontal
- Very low
- Low
- Medium
- Steep
- Vertical

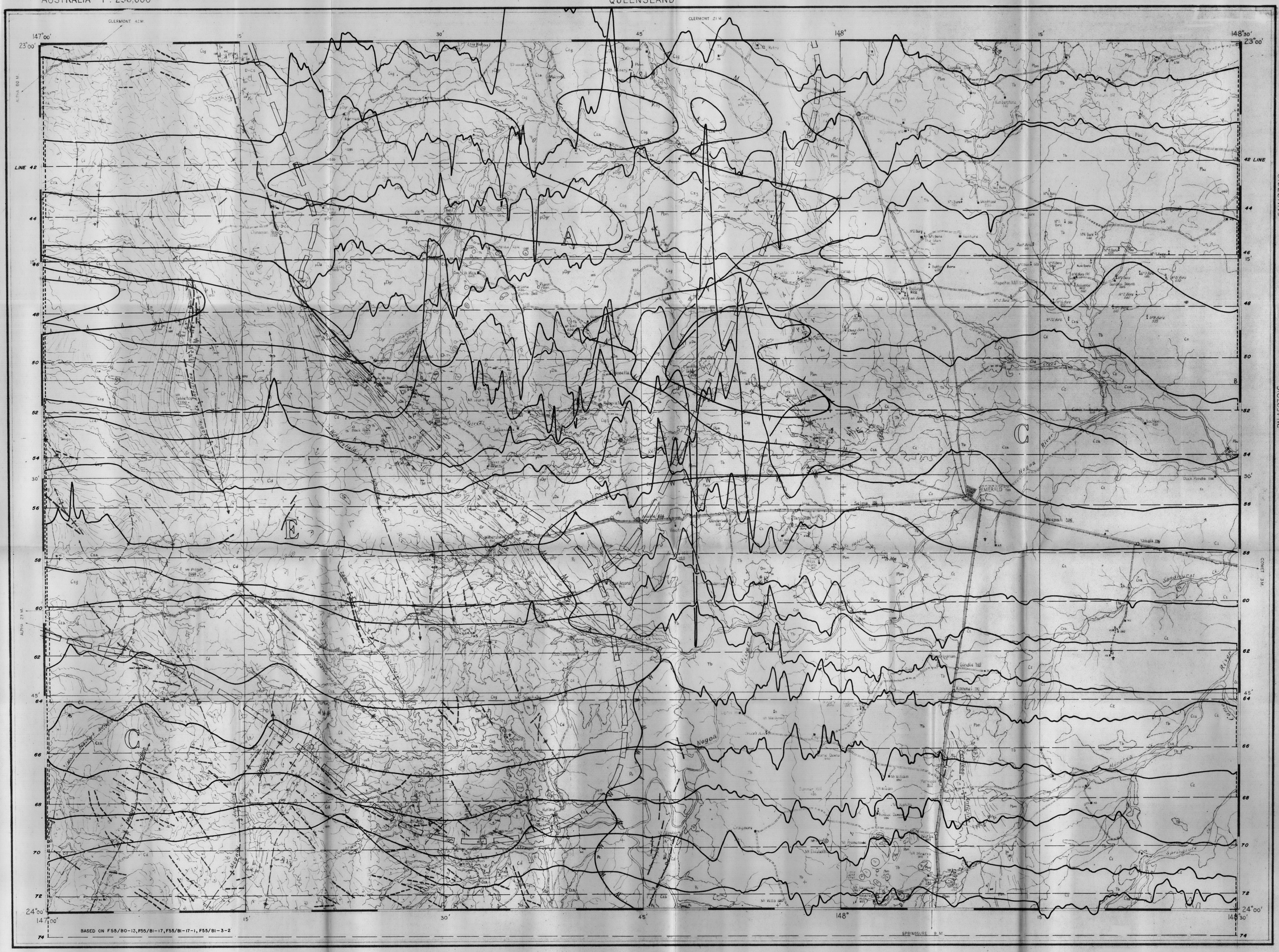
- Road
- Vehicular track
- Railway line
- Telephone line
- Fence
- State boundary
- Mine
- ■ Homestead
- Yard
- Windpump
- Airport or Airfield, Landing ground
- •B Bore
- •T Tank
- •W Well
- •S Spring
- WH Waterhole
- •D Dam
- ○ Photo-centre points
- Photo-centre points-adjoining sheet

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. F55/B1-12-2
TO ACCOMPANY RECORD No. 1966/208

AUSTRALIA 1 : 250,000

EMERALD
QUEENSLAND

PLATE 10



Reference

CAINOZOIC	UNDIFFERENTIATED		Cza	Alluvium
			Czg	Gravel
			Cz	Soil, sand, clay and gravel
	TERTIARY		Tr	Alkaline trachyte and rhyolite, plugs, domes and dykes
		Undifferentiated	Tb	Flows of olivine basalt, interbedded in places with trachytic pyroclastics and sediments
		Hoy Basalt	Th	Plugs of olivine basalt with inclusions
PALAEOZOIC		Undifferentiated	Pzg	Granite
	PERMIAN	Upper Bowen Coal Measures	Pbu	Sandstone, shale and coal
		Middle Bowen Beds	Pbm	Pebbly sandstone, sandstone and shale
		Colinlea Formation	Pc	Pebbly sandstone
	CARBONIFEROUS	Ducabrook Formation	Cd	Sandstone, shale and minor tuff
		Raymond Sandstone	Cr	Sandstone, shale and minor tuff
		Mount Hall Conglomerate	Ch	Quartz pebble conglomerate
	CARBONIFEROUS - DEVONIAN	Telemon Formation	D-Ct	Sandstone and siltstone, tuffaceous in part, tuff and conglomerate
		Silver Hills Volcanics	D-Cs	Rhyolite, trachyte and andesite flows and agglomerate
	MIDDLE DEVONIAN	Undifferentiated	Dm	Coralline limestone and volcanics
	PRE-DEVONIAN	Retreat Granite	pDgr	Granite, granodiorite and adamellite
		Anakie Metamorphics	pDa	Schist and slate

Geological boundary
Fault
Anticline
Syncline
Monocline
Where location of boundaries faults and fold axes is approximate, line is broken; where inferred, queried; where concealed, folds are dotted
Strike and dip of strata
Horizontal strata

Dip < 15°	Air-photo interpretation
Dip 15°-45°	
Dip > 45°	
Horizontal strata	
Dip slope	
Trend of bedding	

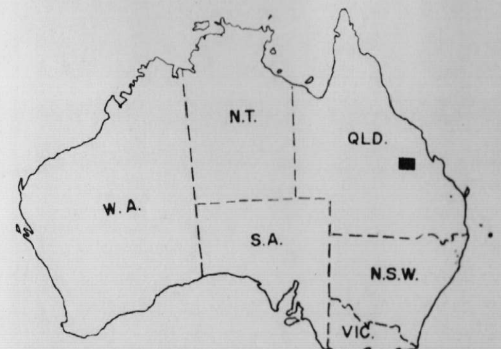
Dyke
Macrofossil locality
Microfossil locality
Plant fossil locality
Bore with wind pump
Trigonometrical station

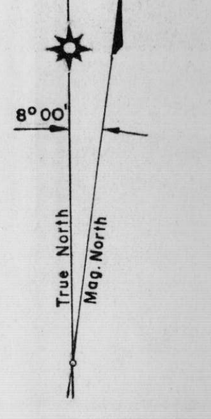
·596 Height in feet, instrument levelled	datum : mean sea level
·875 Height in feet, barometric	

Road
Vehicle track
Railway line with siding
HS Homestead
Landing ground
Town
Old river channel
Dam
Magnetic zone boundary
Magnetic zone symbol

Intensity Change A	**These symbols indicate a change in the level of radioactive intensity along a flight line. The short hachured lines point to the lower average intensity. The magnitude of the change is graded as A, B, or C, depending whether it is 1½, 1, or ½ times the background level on the low side of the change.**
Intensity Change B	
Intensity Change C	

Geological and Planimetric Mapping from 1:250,000 scale Geological Series sheet SF55-15, Preliminary Edition, 1962, Bureau of Mineral Resources, Geology and Geophysics. Transverse Mercator Projection.





INDEX TO ADJOINING SHEETS

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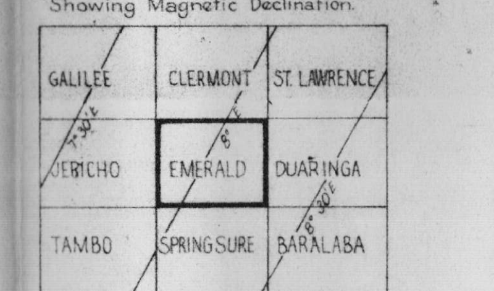
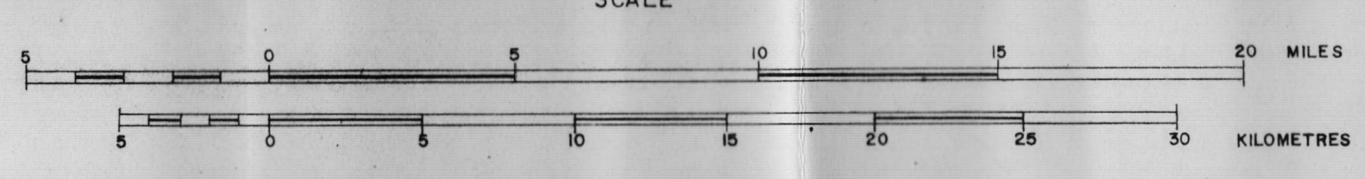


ANNUAL VARIATION 2'30"E

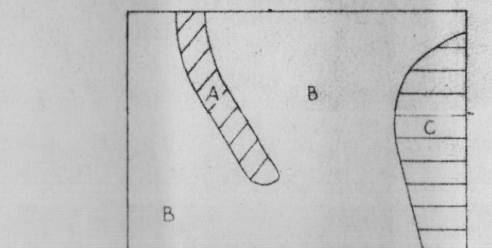
AIRBORNE SURVEY, BOWEN BASIN, QLD. 1961

TOTAL MAGNETIC INTENSITY PROFILES, RADIOMETRIC RESULTS AND GEOLOGY

SCALE

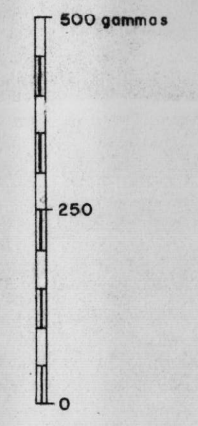


GEOLOGICAL RELIABILITY DIAGRAM



A. Detailed reconnaissance, numerous traverses.
B. Numerous traverses and air-photo interpretation.
C. Air-photo interpretation, few traverses.

APPROX. PROFILE SCALE



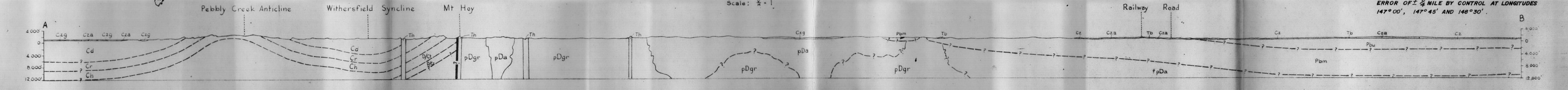
EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC. 3 AIRCRAFT AT AN ALTITUDE OF 500 FEET ABOVE GROUND LEVEL WEST OF LONGITUDE 148° 07', AND AT 1500 FEET ABOVE SEA LEVEL EAST OF THIS LONGITUDE, ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 9 GAMMAS PER MILE IN A DIRECTION S. 9° W. PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH A PROBABLE ERROR OF ± ¼ MILE BY CONTROL AT LONGITUDES 147° 00', 147° 45' AND 148° 30'.

Section A - B
Scale: V/H = 1

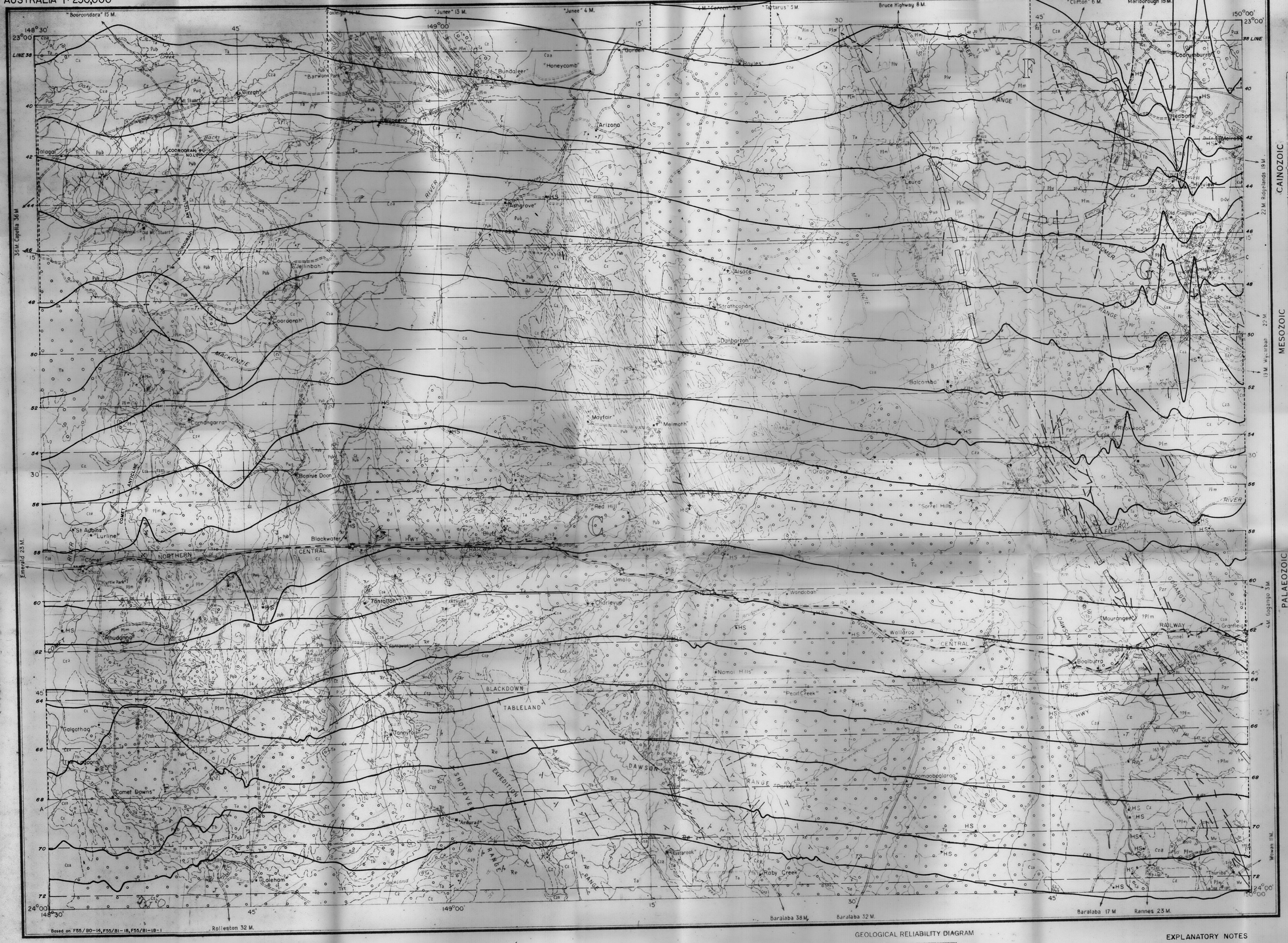


Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. F55/B1-17-2
TO ACCOMPANY RECORD No. 1966/208

AUSTRALIA 1:250,000

DUARINGA

QUEENSLAND



Reference

CAINOZOIC — UNDIFFERENTIATED		Cz	Soil, sand, gravel, alluvium, reworked laterite
		Cza	Alluvium
		○ ○ ○	Laterite and reworked laterite
		Czp	Piedmont deposits
CAINOZOIC — TERTIARY		Ta	Sandstone, siltstone, claystone, diatomite, conglomerate; some volcanics
		Td	Sandstone breccia
		Tb	Basalt
		Tv	Rhyolitic and trachytic flows and intrusions
MESOZOIC — UNDIFFERENTIATED		Mv	Andesitic to dacitic agglomerate, tuff and flows; some tuffaceous conglomerate and sandstone
MESOZOIC — LOWER CRETACEOUS		Kl	Sandstone, conglomerate, siltstone, shale
MESOZOIC — TRIASSIC	Clematis Sandstone	Re	Quartz sandstone; siltstone interbeds
	Rewan Formation	Rr	Red and buff mudstone, siltstone and sandstone; grey-green lithic sandstone
PALAEOZOIC		+ + +	Granite, granodiorite
			Diorite, intermediate intrusives
PALAEOZOIC — PERMIAN	Upper Bowen Coal Measures	Pub	Lithic sandstone, calcareous in places, quartz sandstone, limestone, siltstone carbonaceous shale, coal; siliceous siltstone with abundand plant fossils Quartz sandstone lenses
	Burngrove Member	Pug	Calcareous lithic sandstone, carbonaceous siltstone, grey-green siltstone
	Middle Bowen Beds	Plm	Quartz sandstone, quartz lithic sandstone, siltstone, limestone, conglomerate, sheared siltstone, phyllite, greywacke, tuffaceous sandstone
	Lower Bowen Volcanics	Plv	Andesitic flows and pyroclastics; some rhyolitic and basaltic volcanics
	Rookwood Volcanics	Plr	Spilitic, pillow lavas, and agglomerate; some tuffaceous sandstone and siltstone
	Dinner Creek Beds	Pld	Conglomerate, sandstone, siltstone, tuffaceous sandstone; some basic to intermediate volcanics
PALAEOZOIC — MIDDLE CARBONIFEROUS		Cm	Calcareous siltstone and sandstone with some richly fossiliferous horizons, conglomerate, mudstone
PALAEOZOIC — LOWER TO MIDDLE CARBONIFEROUS		Cl-m	Limestone, mudstone, siltstone, sandstone, conglomerate
PALAEOZOIC — LOWER CARBONIFEROUS		Cl	Oolitic limestone, siltstone, mudstone, sandstone, chert
PALAEOZOIC — DEVONIAN TO CARBONIFEROUS		D-Cv	Intermediate to basic flows and pyroclastics; chert
PALAEOZOIC — SILURIAN TO DEVONIAN		S-D	Fossiliferous limestone and marble, phyllite, tuffaceous sandstone, agglomerate
PALAEOZOIC — UNDIFFERENTIATED		Pzr	Quartz sandstone, quartz lithic sandstone, siltstone, micaceous siltstone, mudstone, sheared siltstone, phyllite, greywacke, tuff, agglomerate
		Pzx	Ultrabasic igneous complex, mainly serpentinite

Geological boundary

Anticlinal axis, showing plunge

Synclinal axis, showing plunge

Monoclinal axis

Axis of overfolded beds

10° Plunge of minor fold

Fault

Where location of boudaries, folds and faults is approximate, line is broken; where inferred, queried; where concealed boundaries and folds are dotted, faults are shown by short dashes

20 Strike and dip of strata

Vertical strata

Horizontal strata

78 Strike and dip of overturned strata

Dip < 15°
Dip > 45°
Bedding trend line
Joints
} Air-photo interpretation

84 Strike and dip of foliation

Macrofossil locality.

Plant fossil locality

163 Fossil wood

t Dyke, t-trachyte

Mine C-coal

A.F.O. Cooroorah No 1 Dry hole

T Tank

Dam

Road

Vehicle track

Railway with siding

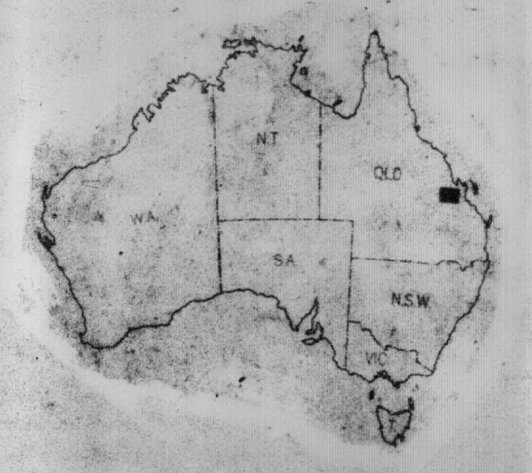
"Balcomba"
HS
} Homestead

Airstrip

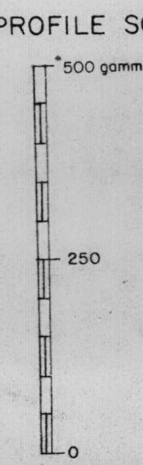
Magnetic zone boundary

𝔹 Magnetic zone symbol

Geological and planimetric mapping from 1:250,000 scale Geological Sheet SF 55-16, Bureau of Mineral Resources, Geology and Geophysics
Transverse Mercator Projection



APPROX. PROFILE SCALE



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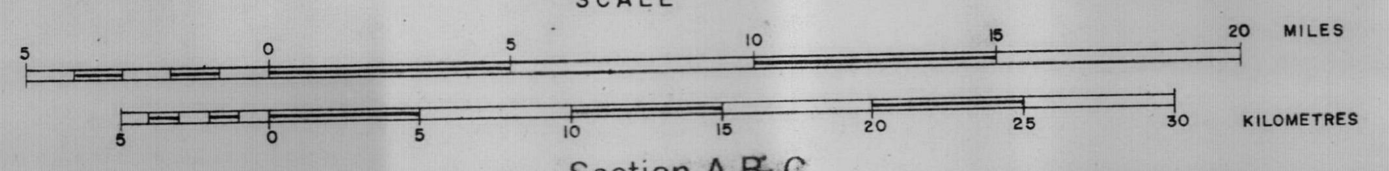
GALILEE SF 55-10	CLERMONT SF 55-11	ST LAWRENCE SF 55-12	PORT CLINTON SF 56-9	
JERICHO SF 55-14	EMERALD SF 55-15	DUARINGA SF 55-16	ROCKHAMPTON SF 56-13	HERON ISLAND SF 56-14
TAMBO SG 55-2	SPRINGSURE SG 55-3	BARALABA SG 55-4	MONTO SG 56-1	BUNDABERG SG 56-2
AUGATHELLA SG 55-6	EDDYSTONE SG 55-7	TAROOM SG 55-8	MUNDUBBERA SG 56-5	MARYBOROUGH SG 56-6

Annual change 3'E

AIRBORNE SURVEY, BOWEN BASIN, QLD, 1961

TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY

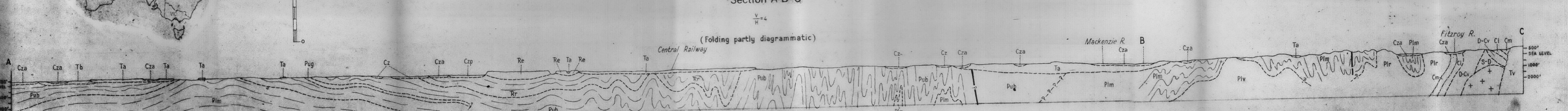
SCALE



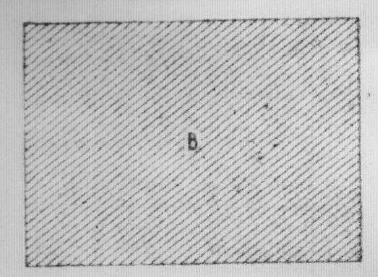
Section A-B-C

$\frac{V}{H}=4$

(Folding partly diagrammatic)



GEOLOGICAL RELIABILITY DIAGRAM



B. Detailed reconnaissance-numerous traverses, air-photo interpretation

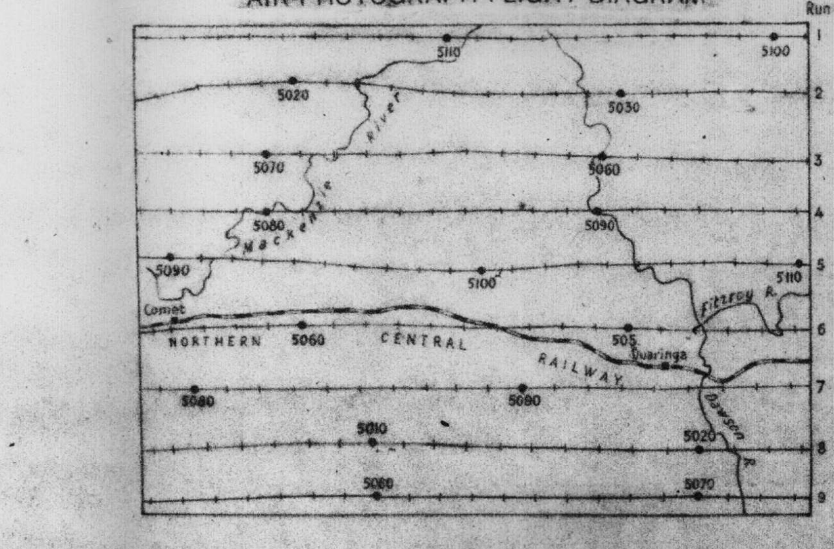
EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC. 3 AIRCRAFT AT AN ALTITUDE OF 1500 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 9 GAMMAS PER MILE IN A DIRECTION S6°W. PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH A PROBABLE ERROR OF ± ¼ MILE BY CONTROL AT LONGITUDES 148° 30', 149° 15' AND 150° 00'.

AIR-PHOTOGRAPH FLIGHT DIAGRAM



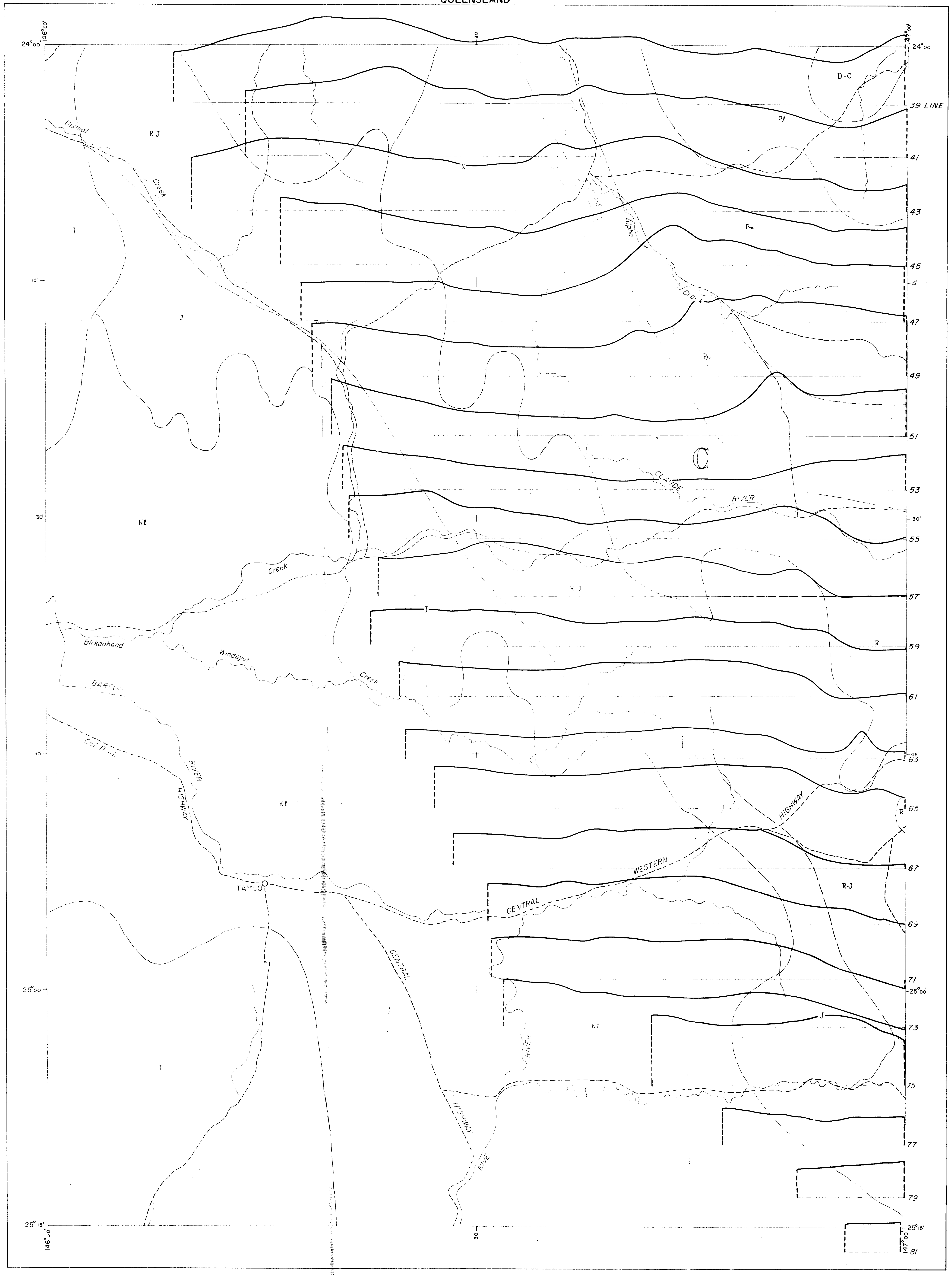
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics.
TO ACCOMPANY RECORD No. 1966/208

F55/B1-18-2

PLATE 12

AUSTRALIA 1:250,000

TAMBO–AUGATHELLA
QUEENSLAND



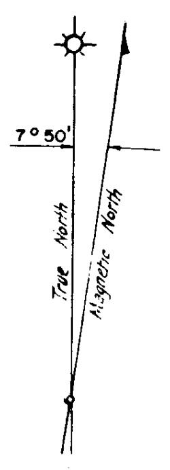
Legend

TERTIARY	T	
CRETACEOUS	Kℓ	Roma formation (marine) and Blythesdale sandstone
JURASSIC	J	Walloon coal measures
TRIASSIC OR JURASSIC	R-J	Marburg sandstone (fω) and Bundamba group (fω)
TRIASSIC	R	Moolayember shales (fω) and Clematis sandstone
PERMO CARBONIFEROUS	Pu	Upper Bowen coal measures
	Pm	Colinlea formation (fω)
	Pℓ	Joe Joe formation (glacial)
CARBONIFEROUS DEVONIAN	D-C	Drummond group (fω)

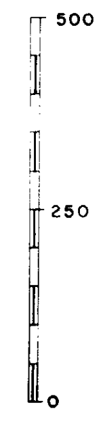
Geological boundary
Anticlinal crest
Synclinal trough
Fault

River or creek
Railway
Road or track
○ Named place
C Magnetic zone symbol

Geology after Geological Map of Queensland, 1953 edition



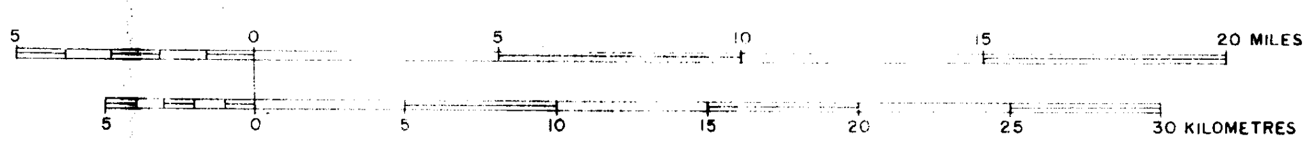
APPROX. PROFILE SCALE



AIRBORNE SURVEY, BOWEN BASIN, QLD, 1962

TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY

SCALE



INDEX TO ADJOINING SHEETS

LONGREACH	JERICHO	EMERALD
BLACKALL	TAMBO	SPRINGSURE
ADAVALE	AUGATHELLA	EDDYSTONE

LOCATION DIAGRAM

EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC.3 AIRCRAFT AT AN ALTITUDE OF 2000 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 11 GAMMAS PER MILE IN A DIRECTION S 9° W.

THE PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

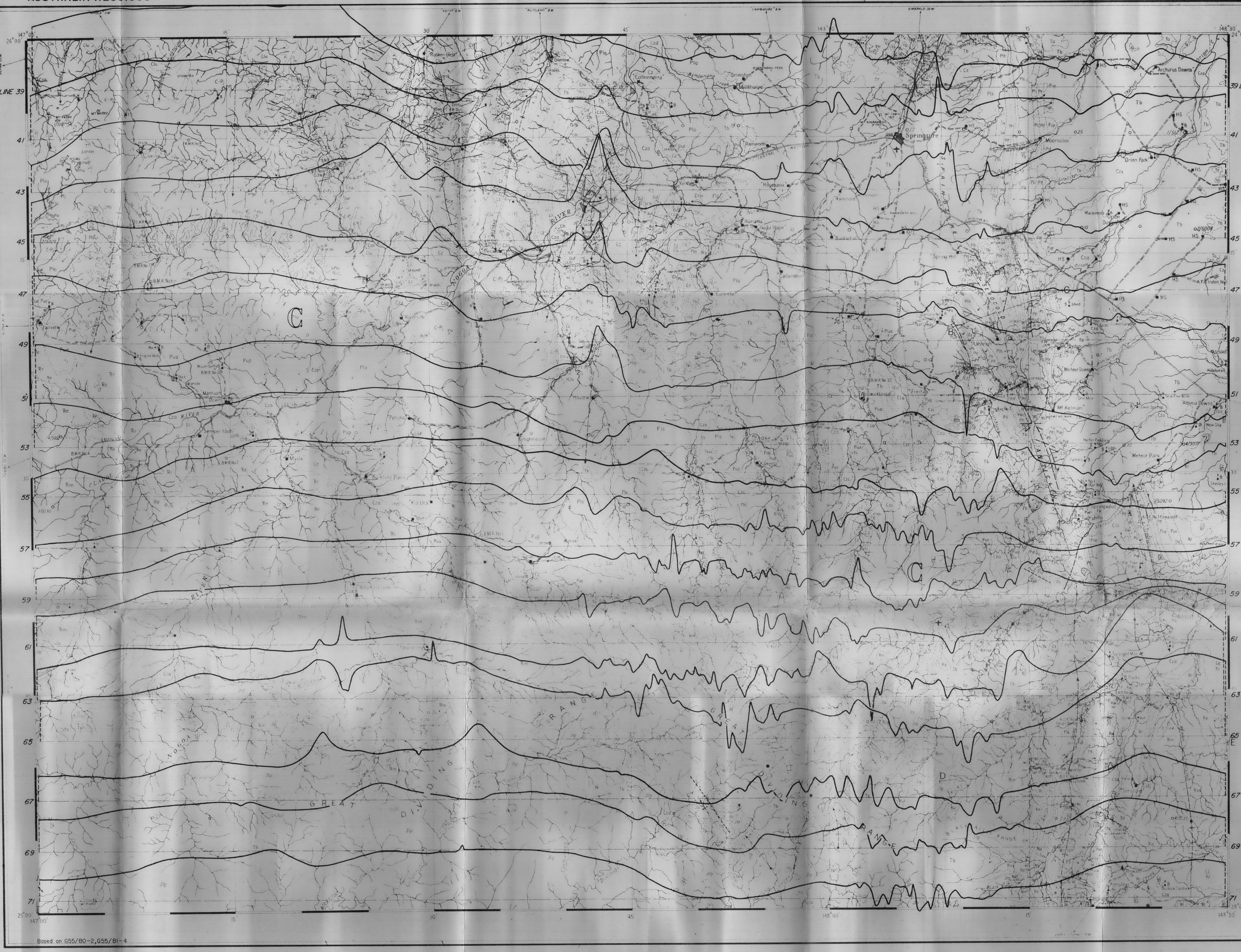
THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH A PROBABLE ERROR OF ± 1/4 MILE BY CONTROL AT LONGITUDE 146° 30'

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics G55/B1-2
TO ACCOMPANY RECORD 1966/208

PLATE 13

SPRINGSURE
QUEENSLAND

AUSTRALIA 1:250,000


Based on G55/BO-2, G55/BI-4

Reference

- Geological boundary
- Anticline, showing plunge
- Syncline, showing plunge
- Fault (D - downthrown side)

Where location of boundaries, folds and faults is approximate, line is broken; where inferred, queried; where concealed, boundaries and folds are dotted, faults are shown by short dashes

- 20 Strike and dip of strata
- Unmeasured dip
- Vertical strata
- Horizontal strata
- Generalised strike and dip of undulating strata
- Strike and dip of foliation
- Dip <15° } air-photo interpretation
- Dip 15°-45° } air-photo interpretation
- Dip >45° } air-photo interpretation
- Horizontal strata } air-photo interpretation
- Dip slope <15° } air-photo interpretation
- Bedding trend lines } air-photo interpretation
- ● Volcanic vent or plug } air-photo interpretation
- Dyke: r - rhyolite, b - basalt
- •M Mantuan *Productus* Bed outcrop
- Macrofossil locality
- e Macrofossils in erratics
- Plant fossil locality
- Fossil wood locality
- Fossil locality, general (algae, fish scales, megaspores)
- SP460, Z5 Fossil locality numbers
- •C Coal
- Dry oil well (abandoned)
- Abandoned well with show of gas
- Abandoned well with show of oil and gas
- ○ B.M.R. No5 Shallow stratigraphic drill hole
- Measured type-section
- Measured section

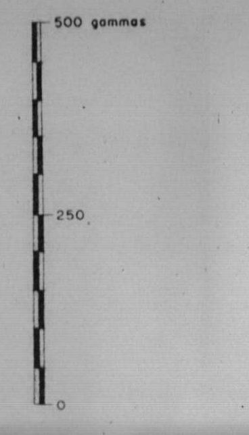
Where dashed, section transferred along strike

- S26 Section reference number
- B Bore with windpump
- W Well with windpump
- T Tank
- Swamp
- Road
- Vehicle track
- Railway with station
- ■ "Euneeke" } Homestead
- ■ HS } Homestead
- Landing ground
- □ yd Stockyards
- ·920 Height in feet, barometric } datum mean sea level
- ·1066 Height in feet, instrument levelled } datum mean sea level
- ○ 4/5052 Air photo centre point - run/number
- ℂ Magnetic zone symbol

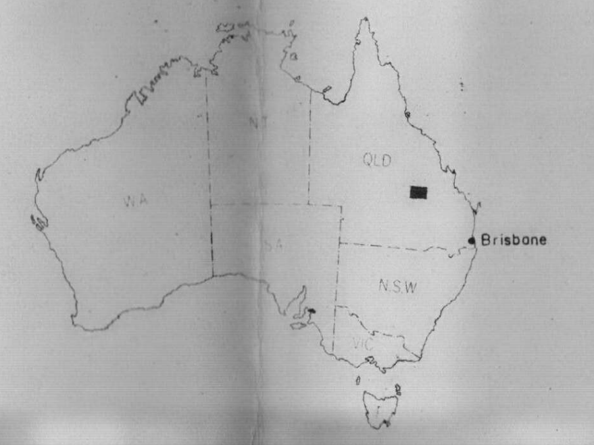
Reference

CAINOZOIC			Cz	Soil, gravel, 'billy', scree, alluvium
			Cza	Alluvium
			Czc	Collapsed basalt sheets
	TERTIARY		⁘	Laterite
			Ta	Conglomerate, sandstone
		Minerva Hills Volcanics	Tr	Plugs, domes and dykes of alkaline quartz trachyte and rhyolite
			Tb	Basalt
MESOZOIC	LOWER JURASSIC	Precipice Sandstone	Jlp	Quartz sandstone
	TRIASSIC	Moolayember Formation	Rm	Micaceous siltstone, lithic sandstone, shale, minor coal
		Clematis Sandstone	Re	Quartz conglomerate and sandstone, micaceous siltstone
		Rewan Formation	Rr	Red and green silty mudstone, green lithic quartz sandstone
PALAEOZOIC			gr	Granite
	UPPER PERMIAN	Bandanna Formation	Pua	Sandstone, siltstone, shale, tuffaceous clay, cherty fossil plant beds, coal
		Peawaddy Formation	Pup	Lithic quartz sandstone, carbonaceous siltstone, lenticular coquinite (Mantuan *Productus* Bed)
	LOWER PERMIAN	Catherine Sandstone	Plf	Feldspathic quartz sandstone
		Ingelara Formation	Pli	Conglomeratic siltstone, shale and sandstone; calcareous nodules
		Aldebaran Sandstone	Pll	Quartz conglomerate and sandstone, minor siltstone and coal
		Colinlea Sandstone	Plo	Quartz conglomerate and sandstone, minor siltstone
		Sirius Formation	Pls	Carbonaceous siltstone, sandstone, shale
		Staircase Sandstone	Plt	Quartz conglomerate and sandstone, siltstone, minor shale
		Stanleigh Formation	Plh	Lithic quartz sandstone, siltstone, dark shale, minor limestone
		Cattle Creek Formation	Plk	Conglomeratic silty sandstone, siltstone, coquinitic limestone
		Orion Formation	Plg	Lithic quartz sandstone, carbonaceous shale with rootlets, fossil plant beds. Equivalent to 'undivided freshwater beds' of A.O.E. Reid's Dome Nos. 1 and 2
			Plj	Micaceous siltstone with abundant plant fossils, sandstone
	CARBONIFEROUS PERMIAN	Joe Joe Formation	C-Pj	Lithic conglomerate, quartz-lithic sandstone, siltstone, minor shale
	LOWER CARBONIFEROUS	Ducabrook Formation	Clu	Lithic sandstone, siltstone, shale, tuff, minor algal limestone
		Raymond Sandstone	Clr	Flaggy quartz sandstone, minor siltstone
		Mount Hall Conglomerate	Clh	Quartz conglomerate and sandstone
	UPPER DEVONIAN	Telemon Formation	Dut	Lithic quartz conglomerate and sandstone, multicoloured tuffaceous siltstone and shale, algal limestone
	MIDDLE DEVONIAN	Dunstable Formation	Dmn	Andesitic, basaltic, trachytic, and rhyolitic volcanics, lithic quartz conglomerate, sandstone, cherty siltstone, lenses of coralline limestone
	PRE-DEVONIAN		pD	Gneiss, phyllite, and sheared diorite

APPROX. PROFILE SCALE



Geological and planimetric mapping from 1:250,000 scale Geological sheet SG 55-3, preliminary second edition 1964. Bureau of Mineral Resources, Geology and Geophysics
Transverse Mercator Projection



INDEX TO ADJOINING SHEETS
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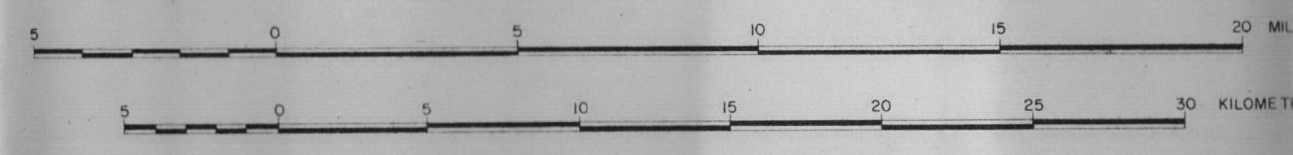
LONGREACH SF 55-13	JERICHO SF 55-14	EMERALD SF 55-15	DUARINGA SF 55-16	ROCKHAMPTON SF 56-13
BLACKALL SG 55-1	TAMBO SG 55-2	SPRINGSURE SG 55-3	BARALABA SG 55-4	MONTO SG 56-1
ADAVALE SG 55-5	AUGATHELLA SG 55-6	EDDYSTONE SG 55-7	TAROOM SG 55-8	MUNDUBBERA SG 56-5
QUILPIE SG 55-9	CHARLEVILLE SG 55-10	MITCHELL SG 55-11	ROMA SG 55-12	CHINCHILLA SG 56-9

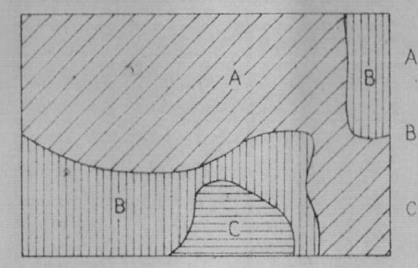
ANNUAL CHANGE 3' E.

AIRBORNE SURVEY, BOWEN BASIN, QLD 1962

TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY



GEOLOGICAL RELIABILITY DIAGRAM



- A Detailed reconnaissance - numerous traverses
- B Reconnaissance - several traverses
- C Air-photo interpretation

EXPLANATORY NOTES

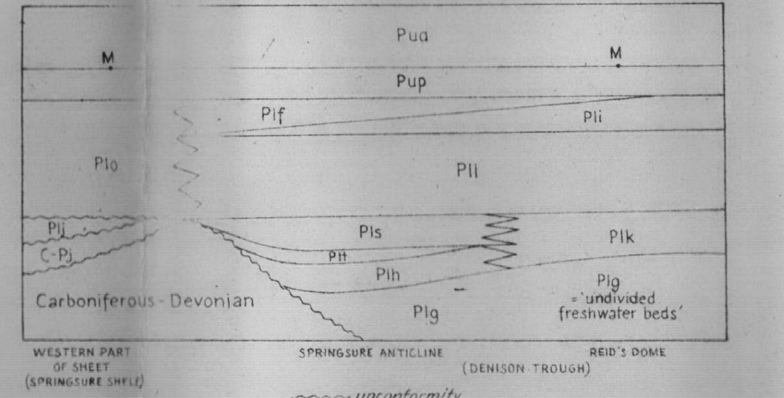
THE SURVEY WAS MADE WITH A DC3 AIRCRAFT AT AN ALTITUDE OF 2000 FEET ABOVE GROUND LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 11 GAMMAS PER MILE IN A DIRECTION S 9°W.

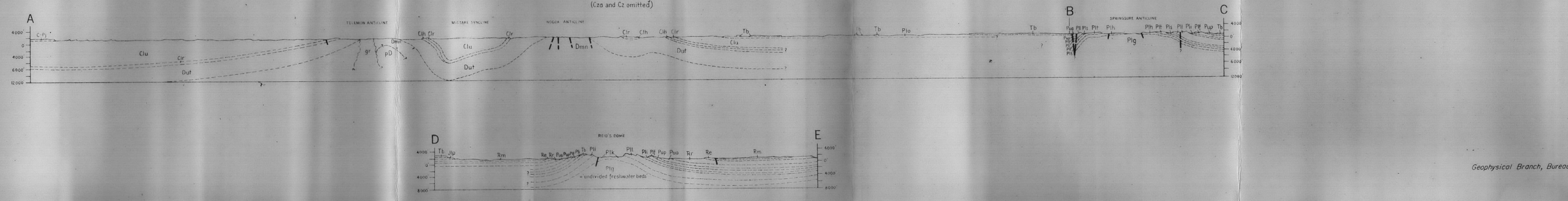
THE PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT-LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH A PROBABLE ERROR OF ± 1/4 MILE BY CONTROL AT LONGITUDES 147° 22'30" AND 148° 7'30".

DIAGRAMMATIC RELATIONSHIP OF PERMIAN AND CARBONIFEROUS-PERMIAN ROCK UNITS



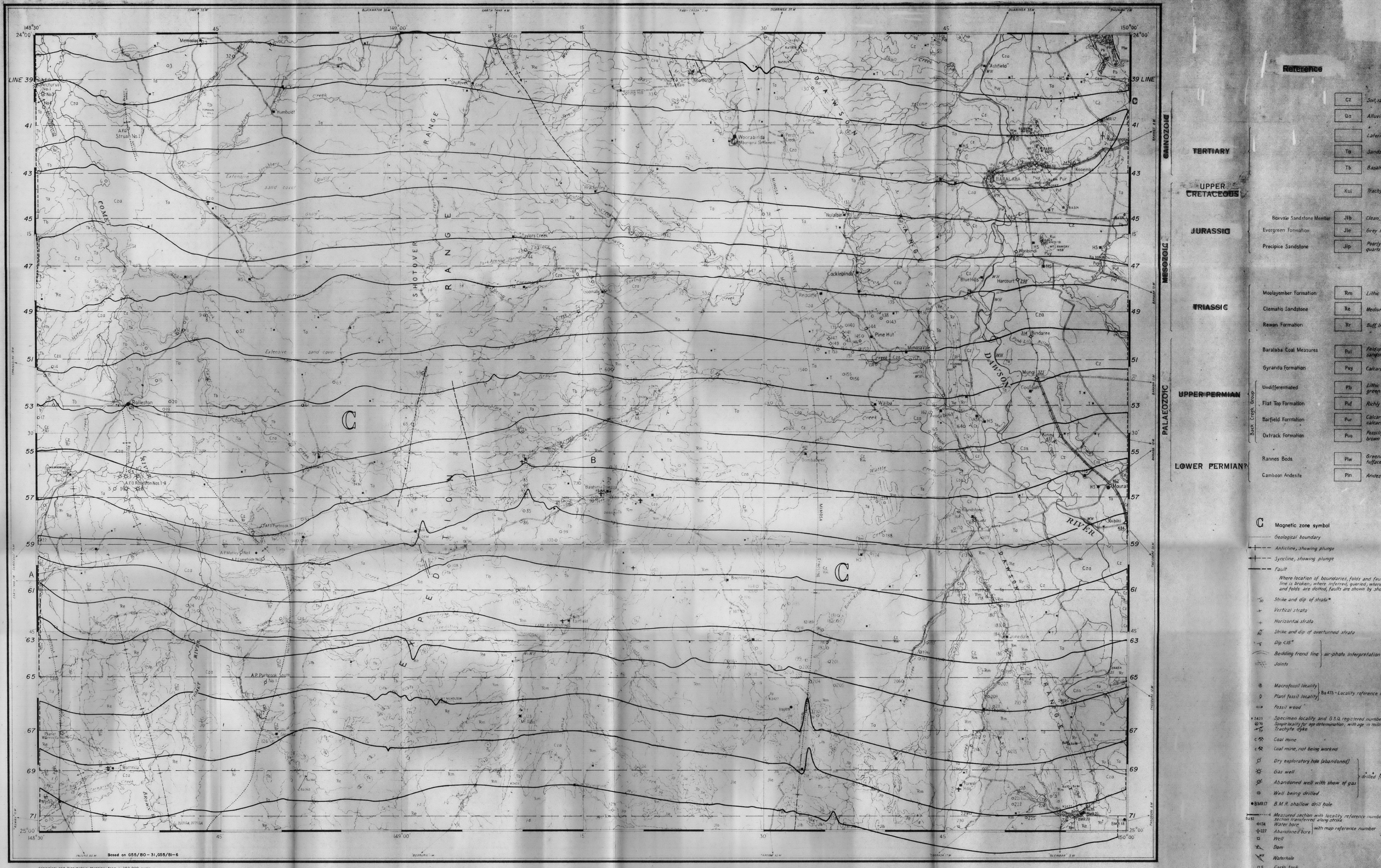
Sections
Scale V/H = 1
(Cza and Cz omitted)



Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics G55/BI-4-1
TO ACCOMPANY RECORD No. 1966/208

AUSTRALIA 1:250,000

BARALABA
QUEENSLAND



Based on G55/B0-31, G55/B1-6

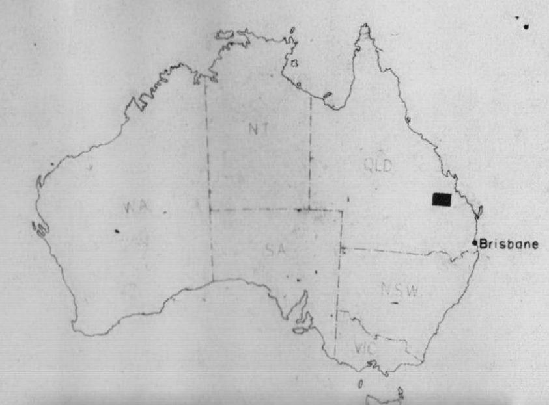
Geological and Planimetric Mapping from 1:250,000 scale.
Geological Series Sheet SG55-4, First Edition, 1965
Bureau of Mineral Resources, Geology and Geophysics.
Transverse Mercator Projection.

Reference

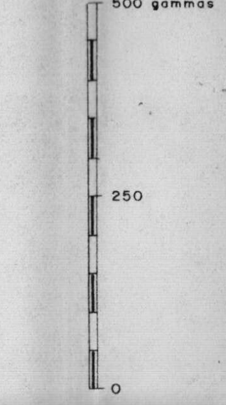
CAINOZOIC			Cz	Soil, sand, gravel, alluvium
			Qa	Alluvium
	TERTIARY			Laterite
			Ta	Sandstone, siltstone, claystone, conglomerate
			Tb	Basalt
MESOZOIC	UPPER CRETACEOUS		Kui	Trachyte
	JURASSIC	Boxvale Sandstone Member	Jlb	Clean, fine-medium grained quartz sandstone; fossil wood
		Evergreen Formation	Jle	Grey shale, white, fine grained, micaceous sandstone. Abundant plant fragments
		Precipice Sandstone	Jlp	Poorly sorted, strongly cross-bedded quartz sandstone; some conglomerate
	TRIASSIC	Moolayember Formation	Rm	Lithic sandstone, grey shale, conglomerate. Plant fossils
		Clematis Sandstone	Re	Medium grained, cross-bedded quartz sandstone, micaceous siltstone
		Rewan Formation	Rr	Buff, lithic sandstone and siltstone, red siltstone and shale
PALAEOZOIC	UPPER PERMIAN	Baralaba Coal Measures	Pul	Feldspathic sandstone, coal, lithic feldspathic sandstone, siltstone, shale. Plant fossils
		Gyranda Formation	Puy	Calcareous lithic sandstone, siltstone, shale. Plant fragments
		Back Creek Group: Undifferentiated	Pb	Lithic sandstone, grey and olive green shale, green quartz lithic sandstone
		Back Creek Group: Flat Top Formation	Puf	Richly fossiliferous calcilutite. Some coquinite
		Back Creek Group: Barfield Formation	Pur	Calcareous silty mudstone with calcareous nodules. Limestone lenses
		Back Creek Group: Oxtrack Formation	Puo	Fossiliferous limestone and grey and light brown calcareous siltstone
	LOWER PERMIAN?	Rannes Beds	Plw	Greenish shale, siltstone, fine grained tuffaceous sandstone, slate
		Camboon Andesite	Pln	Andesite, basalt, crystal tuff, tuff, agglomerate

C	Magnetic zone symbol
	Geological boundary
	Anticline, showing plunge
	Syncline, showing plunge
	Fault
	Where location of boundaries, folds and faults is approximate, line is broken; where inferred, queried; where concealed, boundaries and folds are dotted, faults are shown by short dashes
30	Strike and dip of strata*
+	Vertical strata
+	Horizontal strata
80	Strike and dip of overturned strata
	Dip <15° (air-photo interpretation)
	Bedding trend line (air-photo interpretation)
	Joints (air-photo interpretation)
	Macrofossil locality (Ba 473 - Locality reference number)
	Plant fossil locality (Ba 473 - Locality reference number)
	Fossil wood
× 2423	Specimen locality and G.S.Q. registered number
70	Sample locality for age determination; with age in millions of years
Tr	Trachyte dyke
c	Coal mine
c	Coal mine, not being worked
	Dry exploratory hole (abandoned) (drilled for oil or gas)
	Gas well (drilled for oil or gas)
	Abandoned well with show of gas (drilled for oil or gas)
	Well being drilled (drilled for oil or gas)
● BMR17	B.M.R. shallow drill hole
Ba 82	Measured section with locality reference number. Where dashed, section transferred along strike
○174	Water bore (with map reference number)
227	Abandoned bore (with map reference number)
□	Well
	Dam
WH	Waterhole
□ E	Earth tank
	Road
	Vehicle track
	Railway with siding
	Quarry, road material
■ "Avoca"	Homestead
■ HS	Homestead
	Landing ground
.640'	Height in feet, instrument levelled. Datum: Mean sea level
●	Bore

LOCATION DIAGRAM

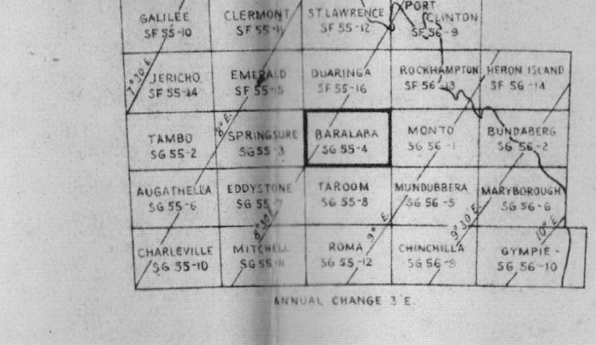


APPROX. PROFILE SCALE



INDEX TO ADJOINING SHEETS

Showing Magnetic Declination



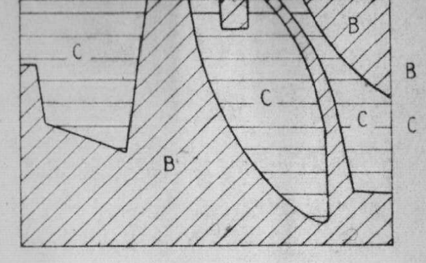
AIRBORNE SURVEY, BOWEN BASIN, QLD 1962

TOTAL MAGNETIC INTENSITY PROFILES AND GEOLOGY

MILES 5 0 5 10 15 20 MILES

KILOMETRES 5 0 5 10 15 20 25 30 KILOMETRES

GEOLOGICAL RELIABILITY DIAGRAM



B Detailed reconnaissance, numerous traverses, air-photo interpretation

C Air-photo interpretation

EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC3 AIRCRAFT AT AN ALTITUDE OF 2000 FEET ABOVE GROUND LEVEL ALONG LINES SPACED TWO MILES APART.

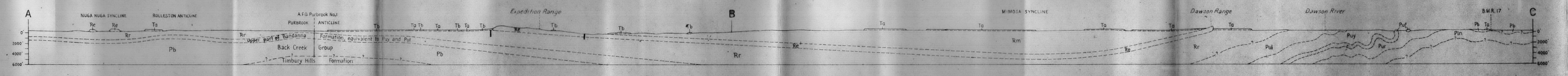
THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 10 GAMMAS PER MILE IN A DIRECTION 57°W.

PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

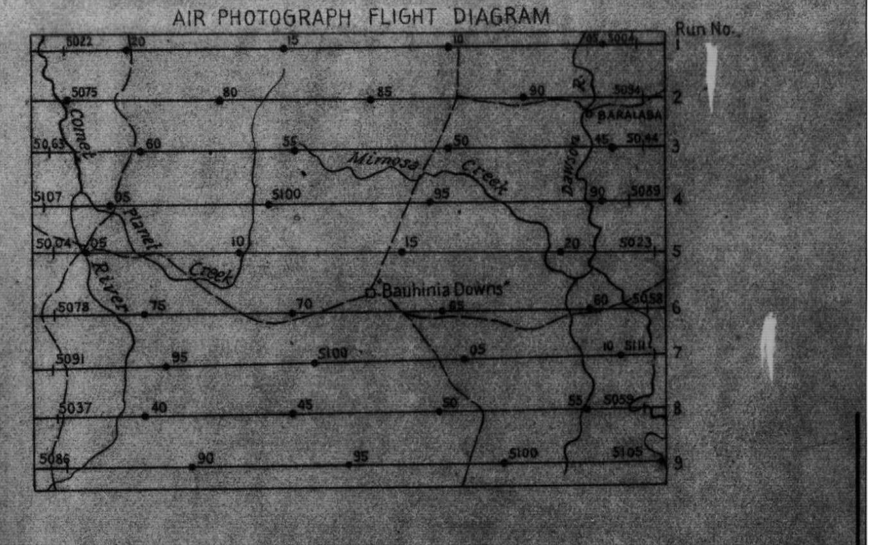
THE FLIGHT-LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH A PROBABLE ERROR OF ± 1/4 MILE BY CONTROL AT LONGITUDES 148° 52' 30" AND 149° 37' 30".

Section

Folding partly diagrammatic
(Cz and Cza omitted from section)
Scale: $\frac{V}{H} = 2$



AIR PHOTOGRAPH FLIGHT DIAGRAM

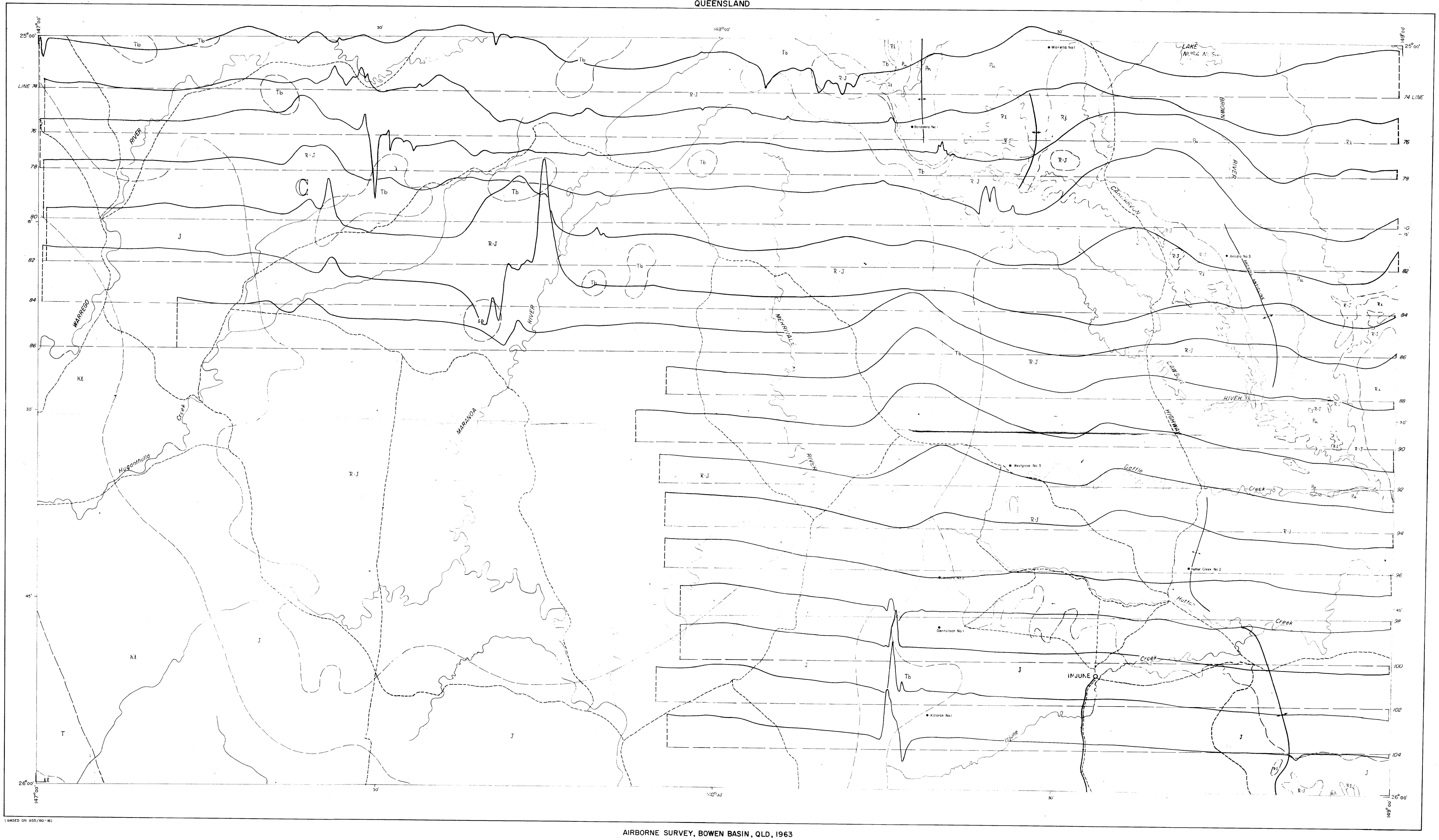


Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. G55/B1-6-1
TO ACCOMPANY RECORD No. 1966/208

AUSTRALIA 1:250,000

EDDYSTONE-TAROOM
QUEENSLAND

PLATE 15



(BASED ON G55/80-16)

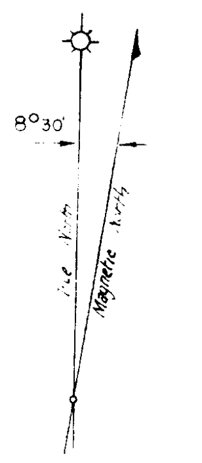
Legend

TERTIARY	T	
	Tb	Volcanics, mainly basalt
CRETACEOUS	Kl	Roma (marine) and Blythesdale formations
JURASSIC	J	Walloon coal measures
TRIASSIC OR JURASSIC	R·J	Marburg sandstone and Bundamba group (fw)
TRIASSIC	R	Moolayember shale (fw) and Clematis sandstone
PERMO CARBONIFEROUS	Pu	Upper Bowen group
	Pm	Middle Bowen group
IGNEOUS ROCK	sp	Serpentine

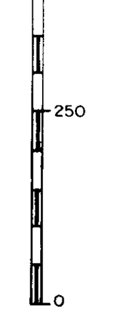
- Geological boundary
- Anticlinal crest
- Synclinal trough
- Fault

- River or creek
- Railway
- Road or track
- ○ Named place
- ● Bore
- C Zone symbol

Geology after Geological Map of Queensland, 1953 edition and Assoc. Petrol. Geol., Vol 31, N°8 (August 1947), Reeves, Plate 1



APPROX PROFILE SCALE



INDEX TO ADJOINING SHEETS

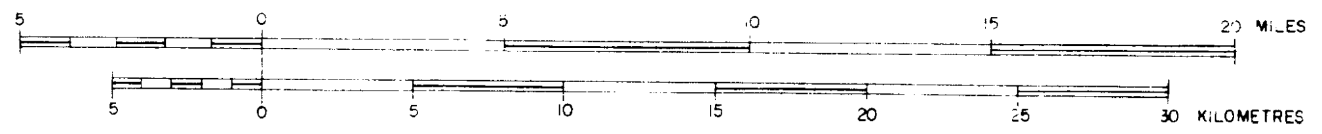
TAMBO	SPRINGSURE	BARALABA
AUGATHELLA	EDDYSTONE	TAROOM
CHARLEVILLE	MITCHELL	ROMA

LOCATION DIAGRAM

AIRBORNE SURVEY, BOWEN BASIN, QLD, 1963

TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY

SCALE



EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A D.C.3. AIRCRAFT AT AN ALTITUDE OF 2,500 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART.

THE TOTAL MAGNETIC INTENSITY PROFILES WERE RECORDED BY A RECTILINEAR RECORDER, AND HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL INTENSITY OF 11 GAMMAS PER MILE IN A DIRECTION S8°W.

PROFILES RECORDED AT INTERVALS OF FOUR MILES ARE SHOWN ON THE MAP.

THE FLIGHT LINES, WHICH ALSO SERVE AS BASELINES TO THE PROFILES, HAVE BEEN POSITIONED ON THE MAP WITH A PROBABLE ERROR OF ± 1/4 MILE BY CONTROL AT LONGITUDES 147°30', 148°15' AND 148°45'.

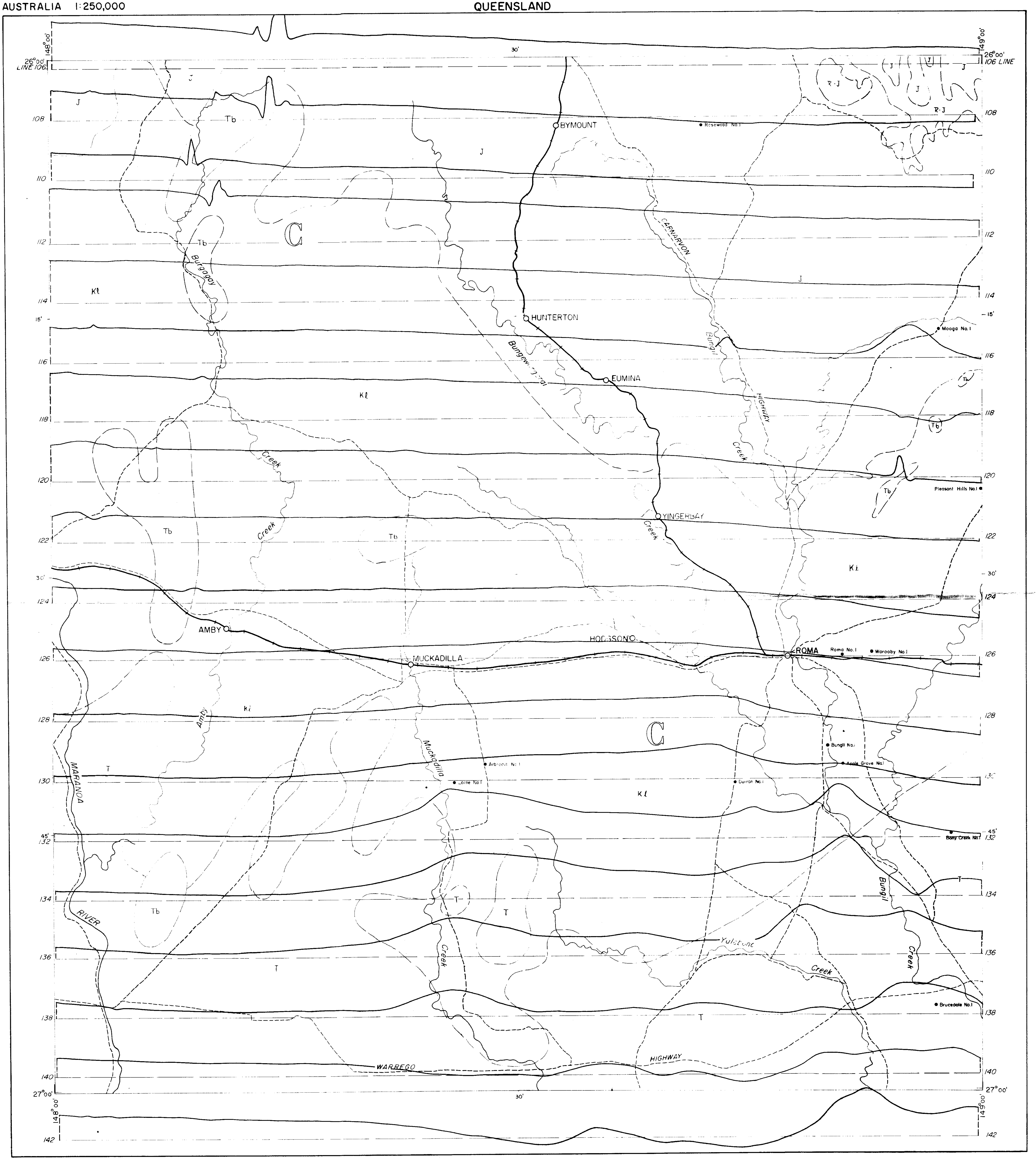
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics G55/B1-17-1

TO ACCOMPANY RECORD No 1966/208

AUSTRALIA 1:250,000

MITCHELL—ROMA
QUEENSLAND

PLATE 16



(BASED ON G55/B0-17)

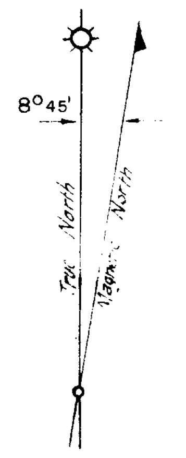
Legend

TERTIARY	T	
	Tb	Volcanics mainly basalt
CRETACEOUS	Kl	Roma formation (marine) and Blythesdale sandstones
JURASSIC	J	Walloon coal measures
TRIASSIC OR JURASSIC	R-J	Hutton sandstone

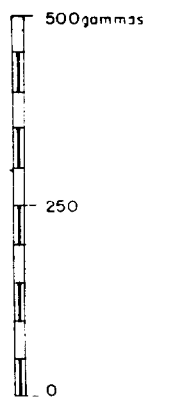
Geological boundary
Anticlinal crest
Synclinal trough
Fault

River or creek
Railway
Road or track
○ Named place
● Bore
C Zone symbol

Geology after Geological Map of Queensland 1953 edition and Assoc. Petrol Geol. Vol 31, N°8 (Aug 1947), Reeves, Pl 1



APPROX. PROFILE SCALE



EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A D.C 3 AIRCRAFT AT AN ALTITUDE OF 2,500 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART.

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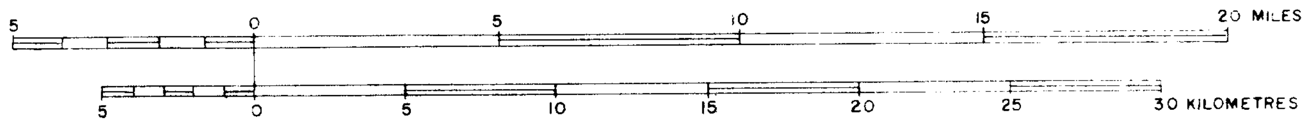
AIRBORNE SURVEY, BOWEN BASIN, QLD, 1963

TOTAL MAGNETIC INTENSITY PROFILES
AND
GEOLOGY

SCALE



INDEX TO ADJOINING SHEETS

AUGATHELLA	EDDYSTONE	TAROOM
CHARLEVILLE	MITCHELL	ROMA
WYANDRA	HOMEBOIN	SURAT

LOCATION DIAGRAM

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics

G55/B1-19-1

TO ACCOMPANY RECORD No 1966/208

To overprint base map G55/B0-17