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CENTRAL SOUTH AUSTRALIA AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY,

SOUTH AUSTRALIA 1966

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SUMMARY

An airborne magnetic and radiometric survey of a region in central South Australia was flown during 1966 and it was found that three trends, oriented NW, NNW, and N, dominate the magnetic data throughout the survey area.

In the Copley 1:250,000 map area, north-trending magnetic anomalies are produced by near-vertical tabular bodies of basic composition, located at depths approximately 20,000 ft below sea level. These structures are restricted to the southern half of this area near the western and eastern boundaries.

Both systematic and random distributions of minor magnetic anomalies are also apparent in the Copley map area. These anomalies are related to faults, diapiric structures, and iron-rich sediments located at shallow depths.

The Norwest Fault lineament is seen to extend from the Copley map area diagonally across the Curdimurka map area. This structure divides the Curdimurka map area into a region of shallow magnetic basement in the east, where magnetic trends are oriented north-west, and a region of deep magnetic basement in the west with magnetic trends oriented north-north-west.

Intense magnetic anomalies recorded in the Billakalina map area are related to jaspilites.

Moderate amplitude anomalies with north-westerly trends recorded in an area of crystalline basement rock outcrop in the south-east of the Coober Pedy and the south-west of the Billakalina map area form a belt which extends through the Kingoonya map area into the Torrens map area. These anomalies have a form throughout indicative of shallow sources. The south-west boundary of the belt delineates the Gairdner (aeromagnetic) Lineament.

Intense radiometric anomalies were recorded in the Mount Painter district of the Copley map area. These anomalies are related to known uranium mineralisation.

1. INTRODUCTION

An airborne magnetic and radiometric survey was flown by the Bureau of Mineral Resources, Geology and Geophysics in the COPLEY, CURDIMURKA, and parts of the LAKE EYRE, COOBER PEDY, BILLAKALINA, TARCOOLA, and KINGOONYA 1:250,000 map areas of central South Australia during the period April to June 1966. This work was requested by the Department of Mines, South Australia, in 1965 and completes the aeromagnetic coverage of the eastern part of the State. The main purposes of the survey were to assist geological mapping, to detect structures associated with mineralisation, and to determine the regional sub-surface structure where possible. The boundary of the survey area is shown in Plate 1 together with the locations of previous geophysical surveys.

Three distinct geological provinces are contained within the area surveyed, as shown in Plate 2. COPLEY and south-east CURDIMURKA form the north-western area of outcrop of late Precambrian and Cambrian sediments of the Adelaide Geosyncline. LAKE EYRE, CURDIMURKA, BILLAKALINA and COOBER PEDY approximately form the southern margin of the Great Artesian Basin. TARCOOLA, and KINGOONYA, although having in places thin veneers of Mesozoic sediments, form the eastern boundary of the Precambrian Shield.

Previous geophysical work within the survey area includes ground radiometric surveys for uranium mineralisation in the Mount Painter district (Thyer, 1944 and 1945) and gravity surveys in COPLEY. The latter surveys were made about the Leigh Creek coal-field and areas further north where repetitions of the Triassic coal deposits were sought (Thyer, 1946 and 1948; Zelman, 1948; Williams, 1948; van Erkelens, 1949). Seismic surveys made by the South Australian Department of Mines to the south and east of COPLEY provide limited structural control to depths about 4000 ft below sea level (Kendall, 1965 and 1966). The aeromagnetic coverage to the west and south of the survey area shown in Plate 1 has been used to investigate iron ore occurrences in TARCOOLA (Whitten, 1958), and for geological mapping and metals search in CHILDARA-GAIRDNER (Quilty, 1962), ANDAMOOKA-TORRENS (Young, 1964), and PARACHILNA-ORROROO (Tipper and Finney, 1966). In contrast, the aeromagnetic work to the north has been directed towards oil search in the south-western part of the Great Artesian Basin (Delhi Australian Petroleum Ltd,1962; Milsom, 1965).

The chapter on geology consists of extracts taken directly from reports by geologists of the South Australian Department of Mines (Coats, 1966; Forbes, 1966; Whitten, 1966) written specifically for the BMR survey. This information and subsequent assistance given by the Department of Mines staff in the interpretation of the geophysical results are gratefully acknowledged.

2. GEOLOGY

COPLEY (Coates, 1966)

The area covered by COPLEY (Plate 7) represents part of the Adelaide Geosyncline (Sprigg, 1962), a mobile belt of thick sediments ranging in age from late Precambrian to Middle Cambrian.

The Adelaide Geosyncline is partly bounded by Older Precambrian crystalline terrains such as the Gawler Platform and Stuart Stable Shelf to the west and the Mount Painter Block in the north-east (Plate 2).

Essentially continuous slow subsidence, probably assisted by basement block faulting, resulted in the accumulation of an extremely thick pile of dominantly shallow water sediments. The major part of the sedimentary record within the geosyncline is represented by the Adelaide System, which attained an aggregate maximum thickness of about 85,000 ft. in COPLEY. The Adelaide System is conformably overlain by a Lower-Middle Cambrian sequence, which reached a maximum thickness of 25,000 ft. in the area.

Sedimentation was terminated during the Upper Cambrian-Lower Ordovician by a major orogeny which uplifted and folded the geosyncline. Late or post orogenic granites metamorphosed and metasomatised lower Adelaide System sequences, for example in the vicinity of the Mount Painter Block.

Subsequently the older rocks were partly mantled by thin, essentially continental deposits of Upper Triassic, Jurassic, Cretaceous, and Cainozoic age. Warping and block faulting movements, culminating in the late Tertiary and Quaternary, led to uplift of the Adelaide Geosyncline and preservation of infaulted and infolded basins of Mesozoic and Cainozoic sediments.

Stratigraphy. In marginal areas of the Adelaide Geosyncline the Cambrian and Adelaide System succession is unconformably underlain by Older Precambrian crystalline rocks. Within the Adelaide Geosyncline samples of the lower sequences provided by diapirs, which include blocks of crystalline basement, show that no major sedimentary sequence intervenes between the Adelaide System and the Older Precambrian complexes. Folded sediments of Upper Triassic age, preserved in small infolded basins in the west of the survey area, have been fully described by Parkin (1953). These rocks lie unconformably upon units of the Adelaide System and are in turn overlain with strong unconformity by Upper Jurassic-Lower Cretaceous sandstones. Appendix 1 shows detailed stratigraphic data, and the section in Plate 7 illustrates the fundamental relations that exist between these units.

Structure. The geological structure of the survey area is discussed in terms of folding, faulting, and diapirism.

Lower Palaeozoic fold structures in COPLEY form a well defined arcuate belt with a strong convexity towards the south. Thus fold axes in the west have a preferred north-westerly orientation, swinging to east-north-east to north-east in the east.

Two major fault structures occur in the area. These are the Norwest Fault in the west and the Paralana Fault system in the east. Post-Sturtian movements on the Norwest Fault were of the oblique-slip-strike type, the throw being of the order of 30,000 - 40,000 ft west of Copley and zero 10 miles to the south-east. Upthrust movements of the eastern block resulted in the development of an overfolded (to west), isoclinal syncline in Lower-Middle Cambrian sediments. The dip of the fault plane is of the order of 80 degrees to the east.

Crawford (1963) described the Paralana Fault as a system of west-dipping (50-70 degrees) upthrust faults having a cumulative throw of between 22,000 and 25,000 ft.

The two major faults of the survey area are discontinuously linked by essentially east-west faults of lesser throw. The relative movements of the minor structures appear to be also of the oblique-slip or dip-slip type with north block up.

A feature of the Adelaide Geosyncline is the presence of unusually large breccia bodies, localised essentially in or near cores of anticlines and fault channels. The genesis of the breccias was generally accepted as tectonic until Webb (1960) recognised the close lithologic affinities of breccia elements with rock types of the Willouran Series occurring elsewhere in stratigraphic sequence. Webb postulated an intrusive or diapiric origin for the breccia bodies. Willouran diapiric elements are now believed to be derived almost exclusively from carbonate beds of the Arkaroola sub-group, which are exposed in sequence in the Mount Painter region. Although probably thicker in the central part of the Adelaide Geosyncline the source beds invariably occur low in the sequence as suggested by rafts of crystalline basement, presumably plucked from the crystalline basement. Near Mount Painter a decollement relationship evident between the source beds and basement (in fact the basal Willouran quartzite) is assumed to be general for the major part of the geosyncline. The distribution of diapiric structures is obviously fundamentally controlled by the presence of these source beds.

Many diapiric structures include rafts of basic volcanics, suggesting persistence of the Wooltana Volcanics throughout the geosyncline. Stoped blocks of the intruded sequences also occur.

Diapir nomenclature is given by Coats (1964 & 1965).

Mineralisation. There is a close association between base metal occurrences and the Callanna Beds, both in diapiric and stratigraphic contexts. A concentration of mineral occurrences is also evident in some sedimentary sequences surrounding diapirs, for example at the Tindelpina Shale - lower glacial contact. Although mineralisation tended to favour certain stratigraphic horizons, the mineral occurrences are usually localised and occur in cross cutting veins. Most of the Cu, Au, Bi, As, Pb, Ag, Zn, and U mineralisation in the Mount Painter region is related by Blissett (1964) to the Younger Granite Suite. Nixon (1963) describes low-grade Ag, Pb, and Cu mineralisation which occurs in Lower Cambrian rocks in the Ediacara mineral field (Plate 7). At Mount Painter, secondary uranium mineralisation (torbernite) is associated chiefly with haematite and pyritic breccias. The breccia bodies occur mainly as irregular discrete masses, apparently occupying synclinal keels, but are also in localised fault channels. Extensive diamond drilling of the East Painter body suggests a basin or cone-shaped structure. Granite forms the chief breccia element but haematite shale fragments have also been noted. Age datings suggest a late Tertiary - Recent age for the secondary uranium. Dickinson et al (1954) postulated an intrusive origin for the breccias. Coats

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considers that the breccias are either the result of decollement of the Adelaide System or infillings by talus deposits. Pitchblende has been reported from Shamrock Mine (30°09'S, 139°22'E), Mount Shanahan uranium prospect (30°05'S, 139°23'E), and Nichols Nob (30°19'S, 138°43'E). Stratiform magnetite deposits occur west of Balcanoona H.S.

Coober Pedy - Lake Eyre region (Forbes, 1966)

The rocks of the region are mainly poorly outcropping Mesozoic shale , siltstone, and sandstone of the western Great Artesian Basin and eastern Officer Basin. Wopfner (1964) has named local parts of the Great Artesian Basin, respectively west and east of Mount Woods, the Lake Phillipson and Boorthanna troughs (Figure 1). From west to east, basement rocks are extensions of the Gawler Platform, the Stuart Stable Shelf, and the Adelaide Geosyncline. Plates 8 and 9 show the geology of COOBER PEDY, BILLAKALINA, and CURDIMURKA, and Plate 11 shows the geological structure of the Coober Pedy - Lake Eyre region.

Stratigraphy. Older Precambrian basement rocks are represented in COOBER PEDY where they occur as low scattered inliers of schist and gneiss. There are also granite and porphyry exposures. The Willouran Range in the south-east corner of the region (Plates 8 and 11) are composed largely of sedimentary rocks of the Adelaide System. Scattered outcrops of slate and quartzite in CURDIMURKA are also probably of this age.

Ludbrook (1961) has identified Permian rocks in the Lake Phillipson bore and other deep bores to the north and east. Of these, the Lake Phillipson bore provides the thickest Permian section, which extends from 166 to 314 ft and includes both marine and non-marine siltstones, shales, mudstones, and boulder clay.

?Jurassic sandstones, possibly equivalent to the Algebuckina and Mooga Sandstones, are known in bores and marginal to basement rocks. This unit is 66 ft thick in Lake Phillipson bore.

Grey claystone, siltstones, and shale of the Cretaceous are the most widespread rock types in the region; claystones and sandstones occur in bores in the Lake Eyre region where Mesozoic sediments may reach a thickness of the order of 4000 ft (see Figure 1).

Tertiary rocks include thin cappings of siliceous duricrust and thicker deposits (particularly near Lake Eyre) of dolomite (Etadunna Formation) clay and sandstone. Older Quaternary deposits include clays of lower-lying areas. There are wide areas of Recent alluvium, outwash, and sand ridges.

Structure. The most obvious feature of the geological structure of the region is the frequency of northwest to north-northwest lineaments. This lineation appears to have developed from at least as early as the lower Palaeozoic orogeny and to have been repeated during the Tertiary and possible later movements. Strong folding is largely confined to the basement rocks, whereas Permian and younger sedimentary rocks are flat-lying or gently dipping, except in certain small areas. Geological structure is indicated in Figure 1 (Wopfner, 1964) and Plate 11 (Forbes, 1961). The latter map has been subdivided into zones which are concerned largely with the attitude of post Carboniferous sedimentary rocks.

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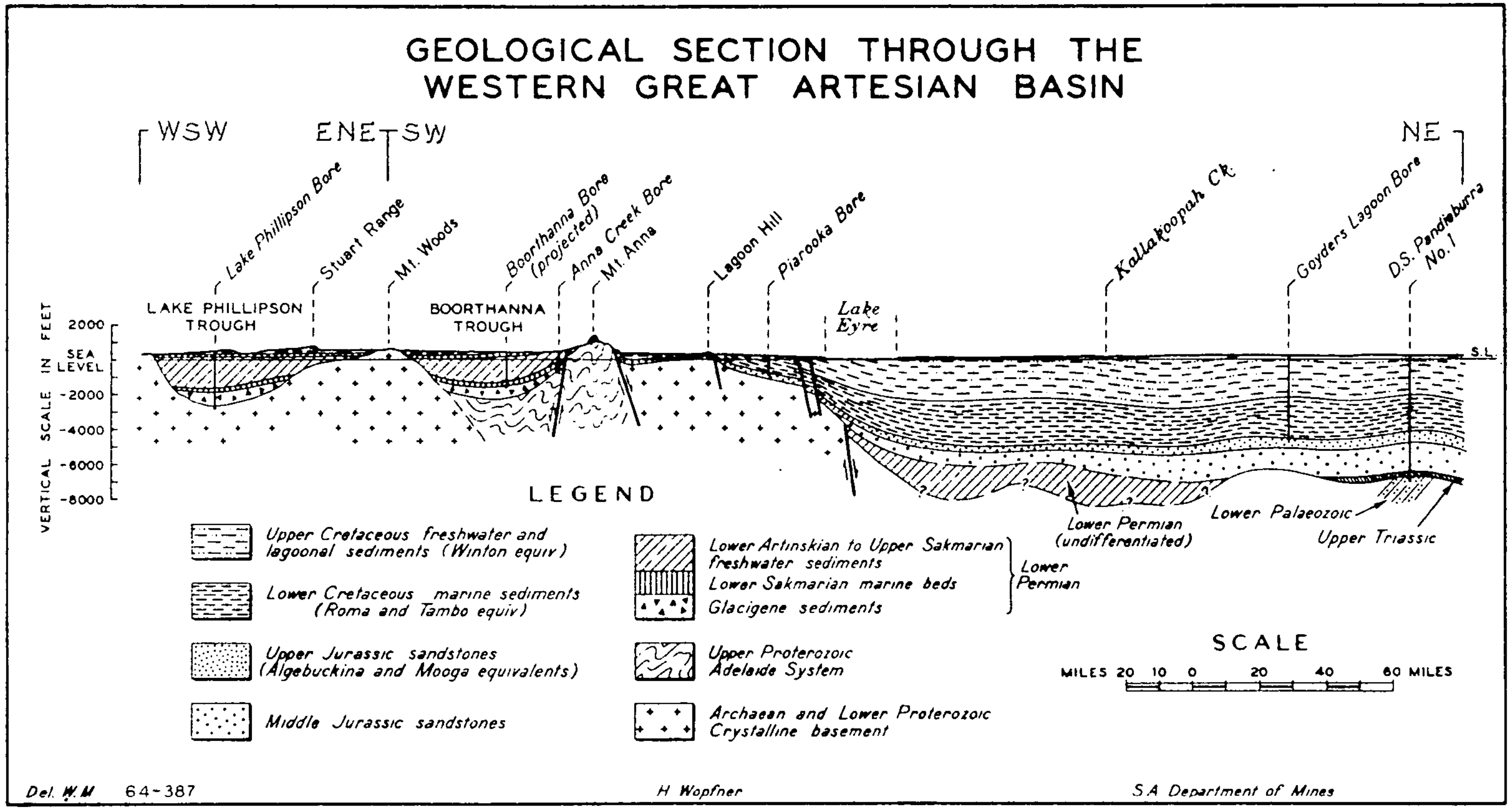
FIGURE 1

H. WOPFNER



East-west section through Western Great Artesian Basin between D.S. Pandieburra No. 1 and Lake Phillipson bore, showing Lake Phillipson and Boorthanna troughs and assumed Permian and Middle Jurassic sediments underneath the Lake Eyre Region.

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Dickinson and Sprigg (1953) have termed much of the area west and northwest of Lake Torrens the Stuart Stable Shelf, which is bounded to the east by the Torrens Lineament (Plate 2). There seems to be no evidence for the continuation of this lineament between Lake Torrens and the eastern edge of the Peake and Denison Ranges. The Gairdner Lineament (Plate 2) approximates the western edge of Zone II in Plate 11. The continuation of the Norwest Fault lineament is possibly represented by lineaments east of Lake William (Plate 11).

In the western and south-western part of COOBER PEDY i.e. Zone I of Plate 11, flat-lying ?Jurassic sandstones appear with scattered inliers of granite and Archaean metamorphic rocks. Many lineaments in the sandstone area are directed approximately to the north-northeast, at variance with the main north-northwest lineation. These north-northeast lineaments approximate the direction of the Pidinga Lineament of Dickinson and Sprigg (1953), which forms the north-western boundary of their Gawler nucleus.

The next structural zone to the east is characterised by rocks with a slight south-westerly dip. This inference is based on the south-westerly extension of duricrust down the topographic slope in the Coober Pedy region.

Further east again is the inferred Zone III, which contains such diverse features as the higher parts of the Stuart Range, the Lake Cadibarrawirracanna basin and the Willouran Range. This is considered to be an area of mainly flat-lying rocks which have been unwarped slightly in places and from which a central area has been eroded to form a basin of Quaternary alluvium. ?Jurassic sandstones occur within and around Coorie Appa bore between two lineaments. These lineaments, which may represent faults, extend in a northerly direction for at least 10 miles. North of the bore is a small dome of ?Jurassic sandstone which also appears to be related to faulting, as are possibly two other small occurrences in the vicinity. Thus this area of possible Jurassic rocks may represent a minor dome transected by a system of north-northwest trending minor faults which are directly in line with southward prolongation of the Mount Margaret Range and which give rise to minor uplifted wedges of ?Jurassic sandstone.

To the north of Lake Eyre South, Cretaceous sediments reach their greatest thickness and have a generally greater angle of dip. The north-eastern part of CURDIMURKA contains minor folds in the Cretaceous, pitching towards the north. The Tertiary dolomite (?Etadunna Formation) would appear to be dipping gently toward Lake Eyre from the neighbourhood of Hermit Hill (Plate 8), assuming that the dolomites at these two localities are stratigraphically equivalent.

Economic geology. Gold has been obtained from basal ?Jurassic beds at the northern end of the Peake and Denison Ranges (Reyner, 1955). Opal occurs in Cretaceous rocks at Coober Pedy. In the Willouran Range there are minor occurrences of copper associated with the upper Precambrian Callanna Beds. Probably the most valuable mineral of the region is the water of the Great Artesian Basin in the ?Jurassic sandstone aquifer.

In the western part of the area the Mesozoic sequence is thin, hence possibilities of petroleum occurrence depend largely on the thickness of the underlying sedimentary rocks. Near Lake Eyre the thickness is more favourable for petroleum.

TARCOOLA and KINGOONYA (Whitten, 1966)

This region is covered mainly by sand underlain by poorly outcropping sediments of the Great Artesian Basin. There are scattered inliers of ?Middle Precambrian metasediments and granites and late Precambrian sediments. Narrow dykes of Gawler Range Volcanics intrude the late Precambrian sediments; larger outcrops are presumably extrusive. Plate 10 shows the known geology.

Stratigraphy. Precambrian outcrops are scattered and are usually of one rock type, which make correlation difficult.

The oldest known rocks are metasediments which are assumed to rest on an earlier basement. They consist of quartzites, slates, and jaspilites on the Tarcoola 1-mile sheet passing to gneisses, schists, and metajaspilites to the northwest. There is some evidence that the metamorphic grade also rises to the north and east into the survey area. Thus slightly metamorphosed jaspilites crop out in west KINGOONYA and south-central COOBER PEDY and meta-jaspilites at Mount Woods in BILLAKALINA. The latter rocks have also been intersected in drilling in central and western BILLAKALINA. These rocks are thus presumed to underlie all of KINGOONYA and are probably equivalent to the Middleback Group (South Australia) and possibly with the Hamersely Group (Western Australia).

Metamorphosed iron formations are contained in gneisses and metasediments. A coarse-grained homogeneous granite crops out near Warna Well on the Wilgena 1-mile sheet.

Unconformably overlying granite at Tarcoola and jaspilite at Wilgena Hill and the Wallabyng Range is the Tarcoola "Series". These beds pass upwards from conglomerates through quartzites and slates to dolomite.

Porphyry of the Gawler Range type intrudes both earlier Precambrian rocks on the Tarcoola sheet and granite on the Kingoonya sheet. Large outcrops of porphyry also occur on the Cardning, Ealbara, Tarcoola, and Kingoonya sheets and similar material may underlie basin sediments in the north and east of the area.

Sandy and shaly Precambrian units crop out in south-east KINGOONYA and are assumed to be the equivalent of inferred Marinoan age rocks which crop out in south-west ANDAMOOKA. These horizons possibly extend further west in KINGOONYA.

Lower Cambrian limestones and dolomites have been recognised during photointerpretation, and form suboutcrop on the Younghusband 1-mile sheet, where they probably rest with slight discordance on the Marinoan. They probably extend across the eastern portion of KINGOONYA and may even occur further west. Their thickness is unknown but presumed to be less than 1000 ft.

No upper Palaeozoic rocks are known in the area, but Permian sediments could occur locally such as in extensions of the Lake Phillipson Trough (BILLAKALINA).

Jurassic sandstone, possibly equivalent to the Algebuckina Sandstone, has been penetrated in bores and may approach 150 ft in thickness in north-central KINGOONYA thinning to the east, south, and west.

A thin veneer of clays, siltstones, and kaolinitic sandstones of unknown thicknesses probably represent Cretaceous rocks.

Structure. Structurally the area is part of the Gawler Platform, the eastern part merging into the Stuart Stable Shelf. Most of the area is overlapped by sediments of the Great Artesian Basin but on the west and south margins these are discontinuous.

The ?lower Middle Proterozoic rocks are steeply folded being draped over an upwarped area which trends north-easterly from the Malbooma 1-mile sheet (Plate 10) towards Mount Woods in east BILLAKALINA (Plate 9). Folding is assumed to be related to granitisation of the sediments and intrusion of mobilised portions of the sedimentary pile. The Tarcoola "Series" is unmetamorphosed and has moderate dips. All mapped minor intrusions strike north-south and dip steeply. The late Precambrian, Palaeozoic, and Mesozoic succession is presumed to be flat-lying or to show only broad shallow structures.

No major trends have been identified in mapping or in photo-interpretation.

Mineralisation. The jaspilite and metajaspilite of the ?Middle Proterozoic referred to above have been the subject of intense investigation by the South Australian Department of Mines.

The Tarcoola "Series" at Tarcoola, has been intruded by transverse quartz veins containing gold which is precipitated where a vein crosses graphitic slate. Acidic dykes crossing the same rocks and the granite on which they rest, contain galena, chalcopyrite, etc. Copper mineralisation has also been reported elsewhere in the district.

At Glenloth, immediately to the south-west of the Kingoonya 1-mile sheet, gold occurs in porphyry dykes which intrude granite and sediments.

Tin occurs at Earea Dam on the border of the Wilgena and Kingoonya 1-mile sheets.

3. MAGNETIC RESULTS AND INTERPRETATION

The magnetic data are displayed in Plates 3 to 10. Plates 3 to 6 show all profiles of total magnetic intensity reduced to an east-west scale of 1:250,000, and related to a series of east-west lines which approximate the flight paths. North-south scales of 1:62,500 or 1:125,000 were used to improve data presentation.

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For the reduction of the original profiles by pantography, the aircraft's ground speed is considered constant along any one traverse in each 1:250,000 map area. Departures from this constant speed introduce a positional error in the presentation of the magnetic data, which shows itself as a herring-bone pattern in the magnetic trends. This effect is particularly noticeable in COPLEY owing to the extreme topographic relief of the Flinders Ranges. The probable error in data positioning in this area is $\pm$ 1 mile, whereas in the remainder of the survey area it is $\pm \frac{1}{2}$ mile.

A selection of magnetic profiles are shown in Plates 7 to 10, together with geological mapping supplied by the Department of Mines, South Australia.

COPLEY

The magnetic data in Plates 3 and 7 indicate that the sources of the magnetic anomalies are located at two distinct horizons. The deeper horizon is observed in the southern half of the area near the western and eastern boundaries, whereas the shallower horizon is more widespread and includes all sources which are located at or near surface level.

The deep magnetic basement is characterised by anomalies which range in amplitude from 500 to 1500 gammas, and which have simple form and very pronounced northerly elongation. Analysis of typical magnetic anomalies by curve fitting methods (Gay, 1963) demonstrate that the sources may be interpreted as steeply-dipping thin sheets with widths less than their depth of burial. Figure 2 illustrates the degree of fit obtained between a standard curve and part of the magnetic anomaly profile recorded on flight line 114. Interference from an adjacent source to the west of the anomaly prevents a complete fit being obtained and, furthermore, produces some broadening of the anomaly. This broadening introduces an error in the depth calculation, which is estimated to be 10% too great, i.e. the calculated depth of 24,000 ft should be corrected to 21,500 ft with reference to sea level. This estimate compares favourably with that of 20,400 ft as shown in Plate 7, this latter figure being obtained as indicated in Appendix 2.

These thin sheet sources possible delineate hinge lines in the Archaean basement of the Adelaide Geosyncline. Susceptibility calculations indicate that the magnetic source rocks have a basic to ultrabasic composition. The value 3.5×10^{-2} obtained for the anomaly on flight line 114 is in fact similar to that for olivine basalt. It is therefore postulated that the magnetic sources are fissures from which the basal volcanics of the Callana Beds were extruded.

All depth estimates obtained from the deep horizon are included in Plate 7. With the exception of depth determinations on lines 128, 129, and 130 at longitudes $138^{\circ}26'$ no other data are available to establish the form of the Archaean basement in COPLEY in the vicinity of the Flinders Ranges.

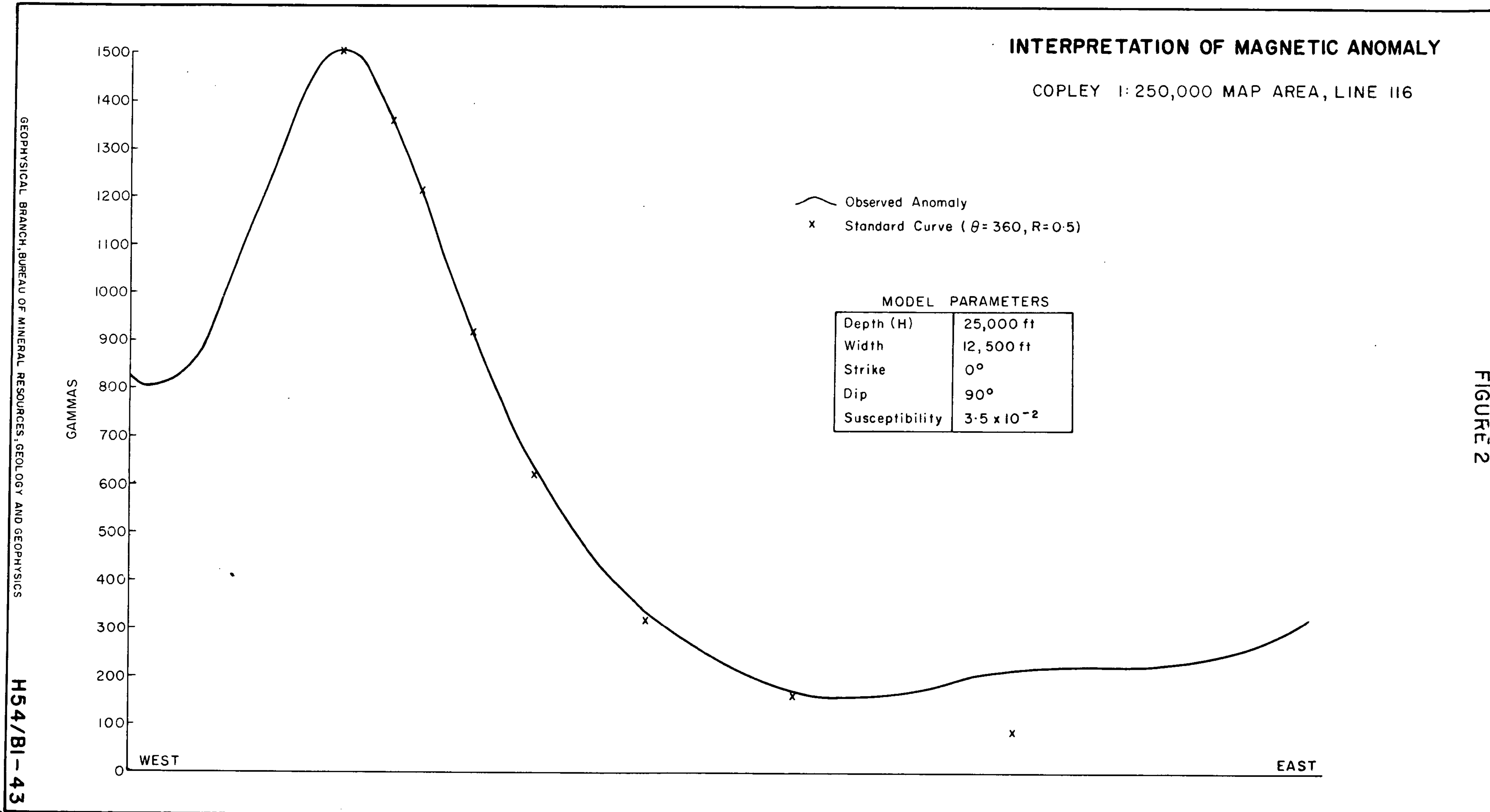

FIGURE 2

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The magnetic anomalies produced by shallow sources have various geological associations. Plate 7 shows that elongation of these anomalies is more common in the southern half of the area than the north. This effect is probably a function of the parallelism that exists between flight lines and surface geological strike, which increases into the northern part of COPLEY.

The basement exposure about Mount Painter produces the most magnetically anomalous zone in the area. In general the largest anomalies are located at the western extremity of this basement block and these are mainly associated with the Wooltana Volcanics. By comparison, moderate amplitude anomalies are associated with similar volcanic rocks to the south of Mount Painter and may therefore indicate a decrease in the basic composition of these rocks.

Sediments of the Wilpena Group produce magnetic anomalies with amplitudes of 250 gammas in the synclinal structure to the south-west of Mount Painter. The trends resolved from these anomalies illustrate the stratified nature of the magnetic source rocks, which are the iron-rich lower and middle sequences of this group. This magnetic character is not associated with rocks of the Wilpena Group elsewhere in COPLEY. It is possible that a combination of suitable facies and metamorphism results in the localisation of these anomalies south-west of Mount Painter.

Negative magnetic anomalies were recorded on flight lines 90 to 92 and 96 to 98 (Plate 3) between longitudes 138°45' and 139°00'. Although the resolution and location of these anomalies is impaired by the low angle of intersection of flight lines with geological strike, they have been correlated with the Tindelpina Shale Member of the Umberatana Group. Anomalies with a similar magnetic character were better resolved in ORROROO, where they serve as excellent markers for geological mapping (Tipper & Finney, 1965).

Important shallow magnetic anomalies recorded in the south and east of COPLEY have pronounced elongation in the direction of geological strike. Many of these features are closely related to faults or fault zones. The most significant of these anomalies have amplitudes of less than 10 gammas. Two outstanding examples are the anomalies associated with the Ediacara Fault in the south-west of COPLEY, and the fault zone in the south-east of COPLEY. In both cases the shallow magnetic anomalies closely parallel the deep-seated anomalies previously discussed.

The shallow and deep-seated anomalies are nearly coincident with the Ediacara Fault, which suggests that the structure within the Archean basement has exercised some local control on surface geology. Furthermore the superposition of the two anomaly trends supports the interpretation of the deeper anomaly being due to a steeply-dipping thin sheet type source. In the south-east fault zone the surface magnetic anomaly is offset by approximately 15,000 ft to the east of the deeper anomaly. The form of the shallow anomaly is interpreted as caused by an easterly dipping thin sheet source normally polarised. It is not considered justifiable therefore to suggest a common plane between these two anomaly sources.

For such a fault plane to exist, either its dip must vary or the surface magnetic anomaly must result from both induced and remanent magnetistation, the latter opposing and overriding the former.

Magnetic anomalies which have amplitudes between 5 and 250 gammas and which show little continuity between adjacent flight lines form fairly well defined zones distributed throughout the centre of COPLEY. Most of these zones can be related to diapiric structures in which the magnetic source rocks include basement rafts, volcanics, and to a minor extent basaltic plugs. Plate 7 shows the location of these zones together with the extent of known diapiric structures. It is noticeable that few of these structures are without some associated magnetic disturbance; however, no structure has its shape fully defined by the magnetic data.

The magnetic data suggest that the Lyndhurst Diapir extends beneath the alluvium cover to the north-west for some considerable distance. It is also possible that iron-rich sediments of the Wilpena Group could account for this magnetic disturbance. Some gravity work done by the Department of Mines supports the former hypothesis and obviously, if an extension of the diapir were of economic significance, more detailed geophysical surveys would be required to clarify the matter.

Anomalous zones to the west of Mount Painter in an area of Wilpena Group outcrop may have as their sources iron-rich sediments or diapiric structures. Attention is directed to the similarity in anomalies recorded on flight lines 84 and 90 at longitudes $139^{\circ}10'$ and $138^{\circ}45'$ respectively. The latter anomaly is produced by a basalt plug, which would favour the interpretation that diapiric sources are responsible for the magnetic disturbance under consideration.

Coober Pedy - Lake Eyre Region

The magnetic profiles shown in Plates 4 and 5 indicate a number of magnetic basement units which are all assumed to be of Precambrian age. These units are included in Plate 11 and briefly discussed hereunder. Where possible, correlations are made with established geology.

Unit 1 (south-central COOBER PEDY). In this locality magnetic anomalies generally have amplitudes less than 100 gammas and do not appear to have any continuity across adjacent flight lines. A few larger anomalies with amplitudes exceeding 500 gammas also occur and show simple form and some elongation in the direction N310°. This magnetic basement unit is correlated with neighbouring outcrops and borehole samples of granites and gneisses which constitute the crystalline basement of the Gawler Platform. Basement depth determinations shown in Plate 9 indicate the crystalline basement to be uniformly near the surface.

Unit 2 (south-east COOBER PEDY and south-west BILLAKALINA). Two types of magnetic anomalies were recorded in this area. The first type includes most of the anomalies which are somewhat compound in form and which generally have amplitudes less than 100 gammas. Their ourstanding characteristic is a pronounced elongation in the direction N310°, which parallels a mapped lineament in the south-west of BILLAKALINA (Plate9). These anomalies are similar to others previously recorded in the eastern and western parts of GAIRDNER and TORRENS (Young, 1964), which were interpreted as produced by near-surface vertical tabular sources bearing some structural relationship to the Gairdner Lineament (shown in Plate 2).

The second type of magnetic anomaly has very limited extent and high amplitude. Few of these anomalies occur; however, they do appear to lie along an axis which trends N50° and which is parallel to the Pidinga Lineament (Thomson, 1966).

The former group of anomalies are correlated with the region of Precambrian shelf sedimentation at the north-eastern extremity of the Gawler Platform and are probably caused by dykes or mineralisation along fault planes within the crystalline basement. The more intense anomalies are probably caused by metajaspilites, which are known to occur in the regions about Tarcoola and Mount Woods.

Unit 3 (central BILLAKALINA). Very intense magnetic anomalies with amplitudes ranging up to 15,000 gammas characterise this basement unit. These anomalies show little continuity across more than two flight lines but nevertheless do have an orientation N300°. Similar magnetic anomalies were previously recorded in the Oodnadatta aeromagnetic survey (Delhi, 1962). The sources of the anomalies are metajaspilites, which as yet are not thought to be of economic importance.

Unit 4 (south-east BILLAKALINA and south-west CURDIMURKA). The magnetic anomalies defining this basement unit have very low amplitudes that rarely exceed 25 gammas. In addition these anomalies do not show any specific trends although the flight line spacing and anomaly resolution could contribute to this effect. It is difficult to make depth determinations in this region; however, the general appearance of the magnetic profiles shown in Plate 9 is consistent with a fairly shallow magnetic basement approximately 3000 ft below sea level, in the western region of Unit 4. The profiles in both regions of Unit 4 (Plates 8 and 9) suggest that the basement is composed of acidic rocks such as granite gneiss or metasediments; however, there is no geological control to confirm this interpretation.

Unit 5 (south-west CURDIMURKA). This basement unit includes magnetic anomalies with amplitudes up to 1500 gammas which are elongated in the direction N350° (Plate 8). Similar anomalies were recorded in the west of ANDAMOOKA along a meridional zone (Young, 1964). The basic rocks of Archean age exposed about Peake Hill (Dunlop & Parkin, 1958) coupled with the lineaments oriented N165° to the south of Mount Margaret (Plate 11) suggest that similar basic rocks are the probable source of these anomalies in CURDIMURKA and ANDAMOOKA.

Unit 6 (south-central CURDIMURKA). Magnetic anomalies with amplitudes between 500 to 1000 gammas and with considerable breadth are included in this basement unit. These anomalies are in general poorly resolved owing to mutual interference, and are typical of a deep-seated basic crystalline basement. A few trends have been

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resolved from the general magnetic disturbance (Plate 8) which are oriented N340°. The lineaments mapped between this basement unit and basic rock exposures in the Peake Hill region indicate that similar magnetic rocks of Archean age constitute the crystalline basement in both areas.

The basic rocks do not appear to transgress the axis of the Norwest Fault in the south of CURDIMURKA although they may do so in the north.

Unit 7 (east CURDIMURKA). To the east of the Norwest Fault magnetic anomalies have a form typical of steeply-dipping thin sheet sources located at shallow depths. Anomalies range in amplitude from 50 to 300 gammas and show pronounced elongation in the direction N320°. It is postulated that this magnetic basement unit represents dykes or mineralisation along fault planes. Furthermore, the magnetic source rocks are contained within the Adelaide System producing a horizon which delineates the base of the post Palaeozoic sediments. No magnetic expression is observed of the underlying Archean rocks in this region.

Table 1 shows probable relations that exist between current interpretation of magnetic basement units and the basement zones resolved by Aero Service Ltd in the Oodnadatta survey (Delhi, 1962). The possible relations between magnetic basement units and structural zones recognised by Forbes (1966) from surface geology are also included in this table.

TABLE 1

Basement unit	Basement zone (Delhi)	Structural zone (Forbes)
1	A	I
2	A	II
3	C	III
4	A	III
5	B	V
6	C	V
7	A	VI

Sub-surface structure. The magnetic interpretation shown in Plates 8 and 9 indicates that the most significant structural trends are oriented approximately N310° and N340°. A similar conclusion was obtained by Forbes (1966) from a study of surface geology.

The offset of magnetic trends in east-central CURDIMURKA indicates the presence of a transcurrent fault which strikes N100° (Plate 8). There is little geological evidence to support the existence of this fault; however, the southern shoreline of Lake Eyre is approximately coincident with this inferred fault, and some lineaments in west CURDIMURKA are oriented in a similar direction. The continuity of this inferred fault across the Norwest Fault is difficult to determine from the magnetic profiles. It is probable that this will be more clearly resolved when magnetic contours become available.

The continuity of the Norwest Fault diagonally across CURDIMURKA from COPLEY is clearly resolved by the magnetic basement contours and anomaly trends shown in Plate 8. In addition, magnetic anomalies with amplitudes less than 15 gammas were recorded on some flight lines at their intersection with the strike of the fault. It is not possible to establish the throw of this fault as different magnetic basement units are indicated on either side. The magnetic basement contours shown in Plate 8 do however provide an upper limit for this throw. Furthermore, it is probable that a lower limit could be set at 5000 ft, as such a thickness of non-magnetic rocks overlying the shallower basement unit would attenuate the magnetic anomalies to the extent that they would become unresolvable.

The magnetic data indicate that in the north-west corner of CURDIMURKA the Norwest Fault is either truncated or swings round to a more westerly strike.

Magnetic basement contours shown in Plates 8 and 9 illustrate that no major development of sediments were observed with the probable exception of Adelaide System rocks west of the Norwest Fault. A minor trough is seen to extend in a direction N130° from the Lake Phillipson bore, the maximum sedimentary thickness developed in the survey area being 3000 ft (Plate 9).

The thinning of the sedimentary section southwards from LAKE EYRE through the eastern part of CURDIMURKA is in agreement with the postulated structural contour plan of the Lower Cretaceous transition beds in this locality (Freytag, 1965).

In general the magnetic basement contours show good agreement with the results previously obtained from the Oodnadatta aeromagnetic survey (Delhi, 1962). A different contour form is interpreted from the current survey results in the east of BILLAKALINA although basement depths are nearly identical.

The agreement between the magnetic basement contours in CURDIMURKA and ANDAMOOKA (Young, 1964) appear reasonable in form only. The difference in absolute depth is partially explained by the lower depth scaling factor used in the latter survey (1.3 x H); however, it is probable that too much weight was given to the isolated depth estimate in the north-east of ANDAMOOKA.

With the completion of aeromagnetic coverage of this part of the Great Artesian Basin and the Pirie - Torrens Basin it is essential that reinterpretation of all magnetic data should take place when all magnetic contour maps become available.

KINGOONYA and TARCOOLA

The magnetic data presented in Plates 6 and 10 reveal the very pronounced N310^{o} elongation of anomalies with amplitudes up to 200 gammas. These anomalies form a zone occupying most of KINGOONYA. Similar trends were previously recorded in TORRENS (Young, 1964) and obviously bear a structural relationship to the Gairdner Lineament, as this lineament approximates the south-west limit of this zone of anomalies. Continuity of these trends into the south-east and south-west corners of COOBER PEDY and BILLAKALINA (Plates 5 and 9) near known metamorphosed jaspilites and metajaspilites suggest possible sources for these anomalies. The form of these anomalies indicates their sources to be very shallow, near-vertical, thin sheets, indicative of mineralisation along fault planes.

Thompson (1966) states that the Gairdner (aeromagnetic) Lineament probably marks the limit of Precambrian shelf sediments. It would now appear from the magnetic data that the zone of anomalies trending N310^{o} delineates the region of Precambrian shelf sediments, and the division between the Stuart Stable Shelf and the Adelaide Geosyncline is presumably located at the north-east boundary of the zone.

The magnetic data recorded in TARCOOLA are markedly different from those of KINGOONYA as shown by Plate 6. Many anomalies in the former area have amplitudes in excess of 2000 gammas and rarely show any significant elongation. These data considered in conjunction with the magnetic contours of the remainder of TARCOOLA (South Australian Dept of Mines, 1965) and the magnetic profiles in BILLAKALINA (Plate 9) indicate that a zone of high amplitude magnetic anomalies extends from Deception Hill in TARCOOLA (Plate 10), N45^{o} to Beatrim Downs in BILLAKALINA. This zone is approximately coincident with a region of steeply folded ?lower Middle Proterozoic rocks (Whitten, 1966).

The anomalies previously recorded in the Tarcoola 1-mile sheet were inspected during an assessment of iron ore deposits (Whitten, 1958). In general these anomalies were found to overlie granite although a few were associated with haematite quartzites. Whitten concluded that the known iron ore deposits were too small, too low grade, and too isolated to warrant further attention. As the magnetic anomalies shown in the profiles in Plate 6 are smaller than many of those considered by Whitten it is probable that his conclusions are applicable to all of KINGOONYA and the eastern part of TARCOOLA.

The form of the magnetic anomalies recorded in the north-east corner of KINGOONYA indicates a minor deepening of the magnetic sources.

4. RADIOMETRIC RESULTS AND INTERPRETATION

Radiometric data were recorded by two scintillometers in COPLEY, COOBER PEDY, BILLAKALINA, TARCOOLA, and KINGOONYA. Owing to the loss of the towed bird installation, the outboard data are incomplete for COPLEY.

The inboard scintillometer recorded the general level of radioactivity to aid geological mapping. The purpose of the outboard scintillometer was to detect localised sources of radioactivity.

Inboard scintillometer

Contour presentations of the radiometric data are shown in Plates 12, 13, and 14 together with known geology. Some smoothing of the contours has been necessary to reduce distortions produced by a combination of factors. The more important of these factors involve data positioning inaccuracies, departure of aircraft altitude from 500 ft above ground level, and instrumental variations.

The most intense gamma radiation was recorded in COPLEY about Mount Painter. Plate 12 shows that most radiometric 'highs' in this locality are coincident with granitic rocks, which supports the association of uranium mineralisation with the Younger Granite Suite (Blissett, 1964).

The Wooltana Volcanics to the north-west and south of Mount Painter show little associated radioactivity, which would suggest their composition ranges from intermediate to basic.

Rocks of the Wilpena Group generally have higher associated radioactivity than any other sediments of the Adelaide System. This is particularly noticeable in the south of COPLEY. This result is comparable to that obtained in PARACHILNA and ORROROO, where rocks of the Wilpena and Umberatana Groups were found to be the most radioactive sediments (Tipper & Finney, 1966).

Topography has an appreciable effect upon the radiometric contours, the 'low' along the Norwest Fault is almost certainly due to an increase in aircraft altitude above ground in an area of rugged terrain.

In east TARCOOLA radiometric 'highs' are coincident with exposures of granites and porphyries (Plate 14). Salt lakes such as Lake Hanson, Lake Ross, and Lake Younghusband are seen to account for many radiometric 'highs' in KINGOONYA. Further north in BILLAKALINA similar features appear to be associated with the drainage system which includes Millers Creek (Plate 13). Apart from these generalised correlations little else is obvious from the radiometric contours.

It is interesting to speculate upon the significance of the radiometric low area near the common corners of COOBER PEDY, BILLAKALINA, TARCOOLA, and KINGOONYA (Plates 13 and 14). The higher radiometric response recorded to the south-west and east of this locality suggests the presence of shallow acidic rocks bordering the radiometric 'low'. The 'low' itself would then be interpreted as a possible deepening of the acidic rocks beneath the sedimentary and alluvium section. This interpretation is somewhat similar to that obtained from the magnetic data further north where a trough was resolved which extended to the south-east from Lake Phillipson. This similarity is in form only, as the axis of the radiometric feature is well offset to the west of the magnetic feature.

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Outboard scintillometer

The 60 restricted source anomalies detected are listed in Appendix 3 and shown in Plates 12, 13, and 14. The criteria used for anomaly selection and classification has been described in previous records (Young & Tipper, 1966; Tipper & Finney, 1966).

No definite conclusions can be drawn regarding the sources of the anomalies. Further investigation would require ground geophysical surveys followed by geological inspection and sampling. Only the anomalies in categories A and B need be considered for such investigations.

The extreme topographic relief about Mount Painter virtually precludes the possibility of interpreting the radiometric data for the location of restricted source anomalies. The occurrence of uranium mineralisation in this area is obvious from the records of both the inboard and outboard scintillometers; however, it is doubtful whether any new knowledge has been obtained about the distribution of radiometric sources. Anomalies 6, 8, 9, and 11 have no greater significance than the many broader features observed which invariably had much greater intensities.

In the western part of the survey area a number of the restricted source anomalies occur on or near salt lakes or granite outcrops and may therefore be of little interest (Plates 13 & 14). Examples of these are anomalies 32, 42, 51, 55, 56, 57, and 58 near salt lakes and 46, 47, and 48 near granite outcrops.

5. CONCLUSIONS AND RECOMMENDATIONS

The interpreted Precambrian subsurface structure constitutes the most significant result of the survey. When contour maps of total magnetic intensity become available for both this survey area and all adjacent areas it would be appropriate to review the interpretation included in this Record. This current interpretation reveals the importance of lineaments, or zones of lineaments, which extend over large distances. These appear to bear a fundamental relation to the margin of the Gawler Platform.

It appears probable that a reinterpretation of magnetic data over this geological province would clearly resolve major tectonic units such as the Gawler Platform and the Adelaide Geosyncline, and in addition yield valuable information regarding their structural relationship. Such reinterpretation should initially be directed towards the investigation of the composition of crystalline basement rocks by recognition of the different magnetic basement units. It is important to obtain accurate geological control for these units by the use of data in areas of good basement exposure.

The disposition and distribution of these units should also be investigated. Attention has already been drawn to the systematic distribution of the lineaments which trend approximately 355° (Whitten, pers. comm.). It is probable that statistical analyses of the magnetic data would yield structural information.

The area of intense magnetic disturbance in west-central BILLAKALINA has now been fully defined. It should be possible to complete the investigation of the economic significance of these magnetic anomalies which are caused by metajaspilites.

Many of the magnetic anomalies in COPLEY, produced by shallow sources, have such small amplitudes that they will not be apparent in a contour presentation of the magnetic data. In the areas where the magnetic data are of prime importance for detailed geological mapping, it would be of advantage to produce the magnetic profiles at a scale of 1:62,500 using the finalised flight-line control plot for data positioning.

In general the radiometric data do not appear to reveal any new important information. Although a fair contour presentation of gamma radiation was obtained in the Mount Painter area, the extreme topographic relief of this region makes it unsuitable for airborne radiometric survey by fixed wing aircraft. If further airborne geophysical work were considered desirable in the locality, equipment should be helicopter-borne.

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APPENDIX 1

STRATIGRAPHY OF THE COPLEY 1:250,000 MAP AREA

AGE	GEOLOGICAL	UNIT	LITHOLOGY	COMMENTS
CAINOZOIC	Undifferentiated Jurassic & Quaternary	J-Q	Sandstones, piedmonte gravels, silcrete (or duricrust), sands, clays, conglomerates	
MESOZOIC	Upper Triassic	R	Carbonaceous shales, ferruginous coal seams, minor sandstone	Leigh Creek coal measures
PALAEOZOIC	Middle Cambrian Series	Lake Frome Group Єf	Red siltstones and sandstones (4000 ft)	
		Ardona Creek Limestone III Wirrealpa Limestone	Massive dolomite, flaggy limestones (300 ft)	Disseminated lead mineralisation
	Lower Cambrian Series	Billy Creek Formation	Red siltstones and sandstones (1400 ft)	
		Hawker Group Єh	Argillaceous sandstones, dolomites, massive and shaly limestones, shales (1400 ft - 20,000 ft)	Ag-Pb-Cu mineralisation at Ediacara
UPPER PROTEROZOIC (ADELAIDE SYSTEM)	Marinoan Series	Wilpena Group Ꝑw	Sandstone-quartzite (Pound Quartzite 500-900 ft) haematite red and green siltstones and shales, limestones, calcareous shales, sandstone quartzite (Wilpena Group 13,000-17,000 ft)	Lower to Middle sequences are iron rich
	Sturtian Series	Umberatana Group	Upper glacial sequence : Boulder tillite, tillitic siltstones, feldspathic sandstone Interglacial sequence : Laminated shales and siltstones minor carbonates, carbonaceous shales (Tindelpina Shale) Lower glacial sequence (0-20,000 ft) : Boulder tillites, tillitic siltstones, minor quartzites	Tindelpina pyritic, locally contains pyrrhotitic, copper and vanadium.
	Torrensian Series	Burra Group Ꝑb	Siltstones, greywacke, dolomites, magnetites. Well bedded quartzites (Copley Qte, dolomitic shales, arkose, phyllites, quartzite. (Burra Group 14,000 ft, Copley Qte 500-5500 ft)	Magnesite deposits Heavy mineral lamination
	Willouran Series	Callanna Beds Ꝑc	Upper Callanna Beds (9000 ft): siltstones, minor carbonates, sandstones and carbonaceous shales Lower Callanna Beds (5500 ft) : Basic lavas and tuffs, minor red shales and sandstones. Marbles, actinolitic marbles, minor metasediments, siltstones, well bedded quartzite, conglomerate	Wooltana Volcanics. These rocks contain anomalous magnetite and haematite. Diapiric source beds host rocks for Cu, U.
OLDER PRECAMBRIAN	Age Uncertain	Mount Painter Complex Ꝑє	Metasedimentary Sequence : well bedded quartzites, and argillaceous quartzites, minor arenaceous schists, mica schists, migmatites.	Heavy mineral laminations. Host rocks for Uranium mineralisation. Amphibolite rich in magnetite.
			Mica schists, arenaceous schists, minor sedimentary amphibolites, skarns, quartzites.	
			Granitic Rocks (undifferentiated) : Ropakivi granite, granite porphyry, microgranite, granodiorite, foliated quartz, feldspar porphyry, gneissic granite (Older Granite Suite - Carpentarian)	Intruded Mount Painter Complex as laccoliths and sills.
			Other Granitic Rocks (undifferentiated) : Granodiorites, sodic granites, pegmatites aplites, (Younger Granite Suite/Lower Palaeozoic) Basic Rocks Diorites Amphibolites	Intruded Lower-Middle Adelaide System and Mount Painter Complex: Associated Cu, Au, Bi, As, Pb, Ag, Zn, U mineralisation. Intruded diapiric cores, associated Cu and Fe mineralisation. Intruded Mt. Painter Complex in sills and dykes.

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APPENDIX 2

METHOD OF DEPTH DETERMINATION

Depth determinations were made by combined application of the half-maximum-slope method (Peters, 1949) and the straight-slope method (Vacquier et al, 1951) using the original charts for computations. The mean determination obtained from the two methods was accepted as the depth to the magnetic source, providing the deviation of this mean from either determination did not exceed 15%.

The horizontal distance between points of half-maximum-slope vary from 1.2 times the depth for a thin sheet to 2.0 times the depth for the edge of a semi-infinite block. In most cases a factor of 1.6 was used. This is applicable to a body whose width is equal to about twice its depth. The straight-slope method of interpretation involves the measurement of the horizontal extent of the steepest part of the anomaly curve. In order to use this parameter to obtain the depth to the magnetic source it is necessary to multiply the straight-slope length by a factor within the range of 1.0 to 1.8. A factor of 1.5 was used for all determinations.

In general, comparisons between adjacent profiles enable an adjustment to be made for depth determinations influenced by oblique intersections of magnetic contours with flightlines. Depth estimates remain uncorrected if the anomaly cannot be traced across neighbouring profiles, or if the field is too disturbed for a pattern to be seen. As the correction is simple multiplication by the sine of the angle of intersection, uncorrected depths, which are common in regions of shallow or extremely deep basement, are maximum estimates.

Systematic errors are introduced by the application of standard factors for depth determinations in areas where they are inappropriate. Anomaly interpretation by curve fitting methods (Gay, 1963) produced more reliable depth estimates providing the anomalies have simple forms. This method of depth determination was used wherever possible to establish control depths and further to provide anomaly analysis for local adjustment of half-slope factors.

APPENDIX 3

OUTBOARD RADIOMETRIC ANOMALIES

Anomaly No.	Line No.	Fiducial No.	Half peak width (secs)	Amplitude (x S.D.)	Anomaly classification	1:250,000 map area
1	71	0148	3.5	4	B	Copley
2	74	0647	3.0	4	C	Copley
3	75	0808	3.0	5	B	Copley
4	77	1103	3.0	4	C	Copley
5	78	1360	3.5	5	B	Copley
6	78	1254	3.5	8	A	Copley
7	81	1840	3.0	4	B	Copley
8	82	1951	4.0	4	C	Copley
9	84	2304	4.0	6	A	Copley
10	87	0032	3.5	5	C	Copley
11	87	0165	3.0	5	A	Copley
12	92	0323	4.0	6	C	Copley
13	134	0512	3.0	8	C	Copley
14	136	0931	3.0	8	A	Copley
15	137	0595	3.0	12	C	Copley
16	22	0067	3.0	4	C	Billakalina
17	28	1953	3.0	6	B	Coober Pedy
18	29	1795	3.0	4	B	Billakalina
19	29	1658	3.0	12	A	Billakalina
20	31	1169	4.0	5	C	Billakalina
21	31	1091	3.0	6	C	Billakalina
22	32	0723	3.0	8	C	Billakalina
23	32	0852	3.0	5	A	Billakalina
24	34	0465	3.0	3	C	Billakalina
25	40	0226	3.0	4	C	Kingoonya
26	40	0104	3.0	4	B	Kingoonya
27	42	1479	4.0	5	B	Kingoonya
28	42	1453	3.0	4	C	Kingoonya
29	42	1397	3.5	8	B	Kingoonya
30	43	1049	3.5	5	C	Tarcoola
31	43	1237	4.0	4	B	Kingoonya
32	43	1262	4.0	6	C	Kingoonya
33	44	0766	3.5	4	B	Kingoonya
34	45	0622	3.5	7	C	Kingoonya
35	49	0615	3.0	4	C	Kingoonya
36	50	0083	3.0	6	B	Kingoonya
37	51	0261	4.0	8	A	Tarcoola
38	52	0400	3.5	6	B	Tarcoola
39	52	0475	4.0	5	A	Kingoonya
40	52	0537	3.0	3	B	Kingoonya
41	52	0598	3.5	5	B	Kingoonya
42	52	0630	4.0	8	A	Kingoonya
43	53	0666	3.5	5	B	Kingoonya
44	53	0792	3.0	4	C	Kingoonya
45	54	1259	3.5	4	B	Kingoonya

Anomaly No.	Line No.	Fiducial No.	Half peak width (secs)	Amplitude (x S.D.)	Anomaly classification	1:250,000 map area
46	55	1542	3.5	12	C	Tarcoola
47	56	1653	4.0	9	A	Tarcoola
48	56	1660	4.0	4	C	Tarcoola
49	56	1723	3.5	6	A	Kingoonya
50	57	1982	4.0	4	B	Kingoonya
51	59	0187	3.5	4	B	Kingoonya
52	60	0564	3.5	7	B	Kingoonya
53	62	0863	4.0	7	B	Kingoonya
54	64	1134	3.0	5	C	Kingoonya
55	65	1375	3.5	7	C	Kingoonya
56	65	1371	3.5	8	C	Kingoonya
57	68	1872	3.5	6	A	Kingoonya
58	69	0048	3.0	4	C	Kingoonya
59	70	0233	3.0	4	C	Kingoonya
60	70	0309	3.0	3	B	Kingoonya

APPENDIX 4

OPERATIONAL DETAILS

Staff

Party leader	G. A. Young	
Geophysicist	R. A. Gerdes	
Senior Radio Technicians	P. B. Turner	
	P. Ryan	
Drafting Assistant	P. Kersulis	
Geophysical Assistants	K. A. Mort	
	D. Park	
	C. I. Parkinson	
Pilots	Capt. G. Litchfield	
	First Officer D. Spiers.	
Aircraft maintenance engineers		T.A.A.
	B. Hall	
	W. Briggs	

Equipment

Aircraft	D.C. 3 VH-MIN
Magnetometers	MFS-5 saturable core fluxgate, tail boom installation coupled to "Speedomax" and digital recorders. MFD-3 saturable core fluxgate ground installation for storm warning, coupled to Esterline-Angus recorder.
Scintillographs	Twin crystal MEL scintillation detector heads inboard and single phosphor detector head outboard (the latter suspended from a cable 200 ft below aircraft). Outputs coupled to DeVar recorder.
Radio altimeter	Pilot control
Air position indicator	Track recorded by DeVar recorder
Camera	BMR 35-mm strip

Survey Specifications

Line spacing	COPLEY : 1 mile) Elsewhere: 2 miles) see Figure 3
Line orientation	East
Tie system	Single lines spaced 15 miles apart (see Fig. 3)
Altitude	CURDIMURKA 1500 ft a.s.l.
	Elsewhere 500 ft a.g.l.
Navigation control	Aerial photographs
Record sensitivity	
MFS-5	50 gammas/inch
MFD-3	20 gammas/inch
Inboard scintillograph	50 c/s/inch
Outboard scintillograph	50 c/s/inch
Scintillometer time constants	
Inboard scintillograph	10 seconds
Outboard scintillograph	1 second

Survey Base — Leigh Creek

Survey timetable

Party arrived Leigh Creek	12th April
Survey flying commenced	13th April
Survey flying completed	4th June
Party departed Leigh Creek	7th to 10th June

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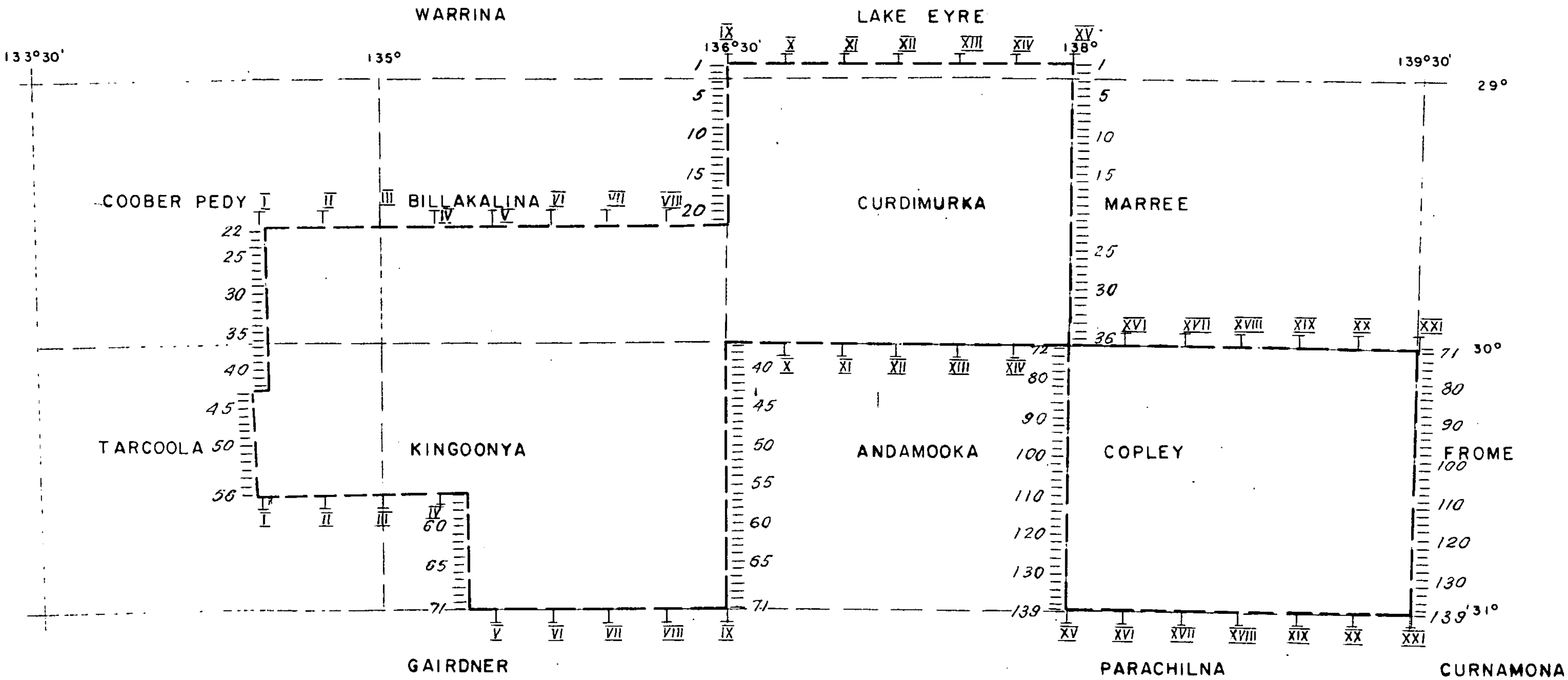
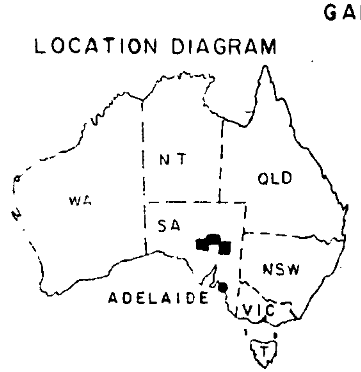
TO FACE PAGE 30 (last page)





AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

FLIGHT-LINE AND TIE-LINE SYSTEM

Scale

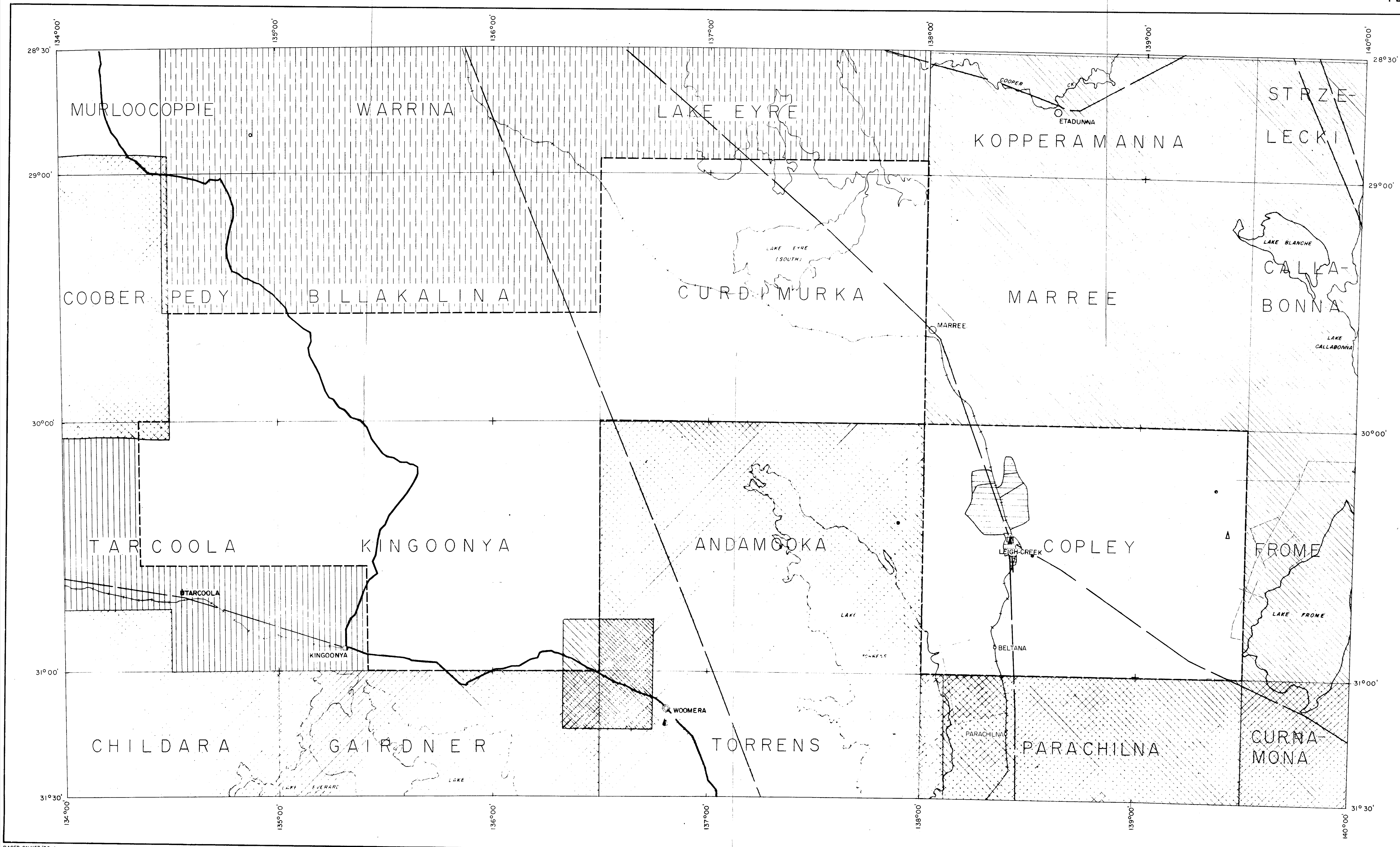
MILES 40 20 0 40 80 120 160 MILES

FIGURE 3

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics H53/B1-42

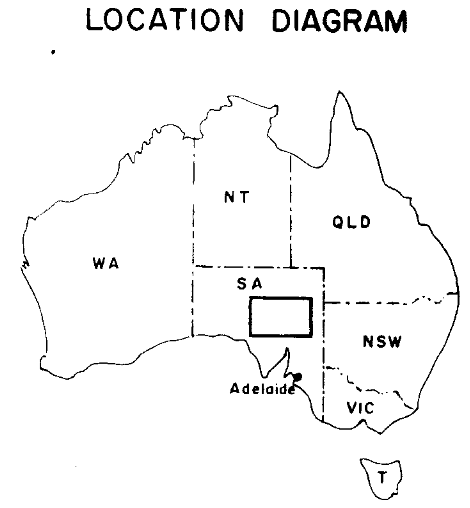
32

PLATE I



BASED ON H53/80-1
BASED ON H54/80-1

LOCATION DIAGRAM



AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

LOCALITY MAP

10 0 10 20 30 40 50 60 70 80 MILES

10 0 10 20 30 40 50 60 70 80 90 100 110 120 KILOMETRES

BOUNDARY OF B.M.R. 1966 AIRBORNE SURVEY

PREVIOUS GEOPHYSICAL SURVEYS

SURVEYS BY B.M.R.

- AEROMAGNETIC SURVEY
- AERO SCINTO SURVEY
- GRAVITY SURVEY
- ENGINEERING SURVEY
- GROUND URANIUM SURVEY
- GROUND METALL. SURVEY
- PRIMARY GRAVITY STATION
- SECONDARY GRAVITY STATION
- AIRSTRIP GRAV. READING

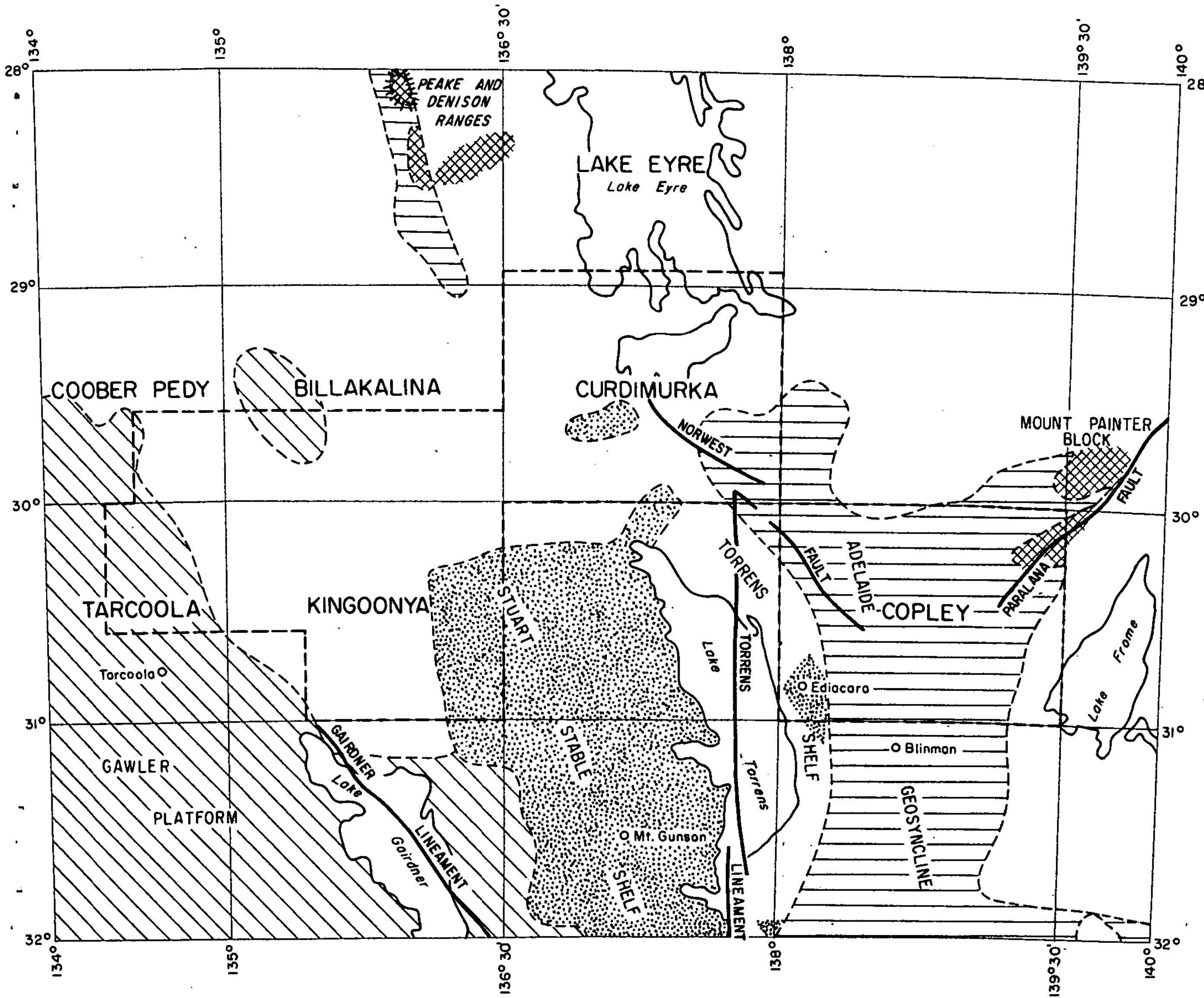
OTHER GEOPHYSICAL SURVEYS

- AEROMAGNETIC SURVEY, SOUTH AUSTRALIA
- AEROMAGNETIC SURVEY, PRIVATE COMPANY
- SEISMIC TRAVERSE SOUTH AUSTRALIA

To accompany Record No. 1966/224

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. H53/BI-4

PLATE 2



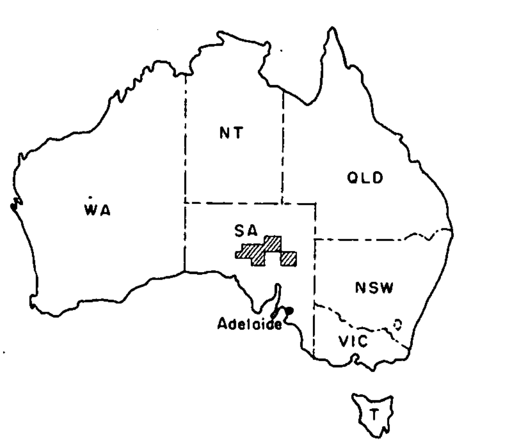
AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

PRECAMBRIAN – CAMBRIAN TECTONIC UNITS

50 0 50 100 150 MILES

50 0 50 100 150 200 250 KILOMETRES

LOCATION DIAGRAM



LEGEND

POST CAMBRIAN SEDIMENTS OF YOUNGER BASINS MESOZOIC – CAINOZOIC

UPPER PROTEROZOIC – CAMBRIAN FOLDED SEDIMENTS OF THE ADELAIDE GEOSYNCLINE

UPPER PROTEROZOIC – CAMBRIAN THIN FLAT LYING OR GENTLY FOLDED SHELF SEDIMENTS

PROTEROZOIC – ARCHAEAN ? MOBILE CRYSTALLINE BASEMENT OF ADELAIDE GEOSYNCLINE

PROTEROZOIC – ARCHAEAN CRYSTALLINE BASEMENT OF PLATFORMS

SURVEY AREA BOUNDARY

To accompany Record No. 1966/224

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics H53/BI-43

COPLEY
SOUTH AUSTRALIA

PLATE 3

LOCATION DIAGRAM

INDEX TO ADJOINING SHEETS

CURDIMURKA	MARREE	CALLABONNA
ANDAMOOKA	COPLEY	FROME
TORRENS	PARACHILNA	CURNAMONA

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

TOTAL MAGNETIC INTENSITY PROFILES

EAST–WEST SCALE

4 0 4 8 12 16 20 MILES

5 0 5 10 15 20 25 30 KILOMETRES

NORTH–SOUTH SCALE

1 0 1 2 3 4 5 MILES

1 0 1 2 3 4 5 6 7 KILOMETRES

APPROX PROFILE SCALE

500 gammas

250

0

EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC3 AIRCRAFT AT AN ALTITUDE OF 500 FEET ABOVE GROUND LEVEL ALONG LINES SPACED ONE MILE APART. THE FLIGHT-LINES ARE IDEALISED, AND SERVE AS BASELINES TO THE PROFILES. THEY APPROXIMATE THE ACTUAL FLIGHT PATH WITH A PROBABLE ERROR OF ± 1 MILE.

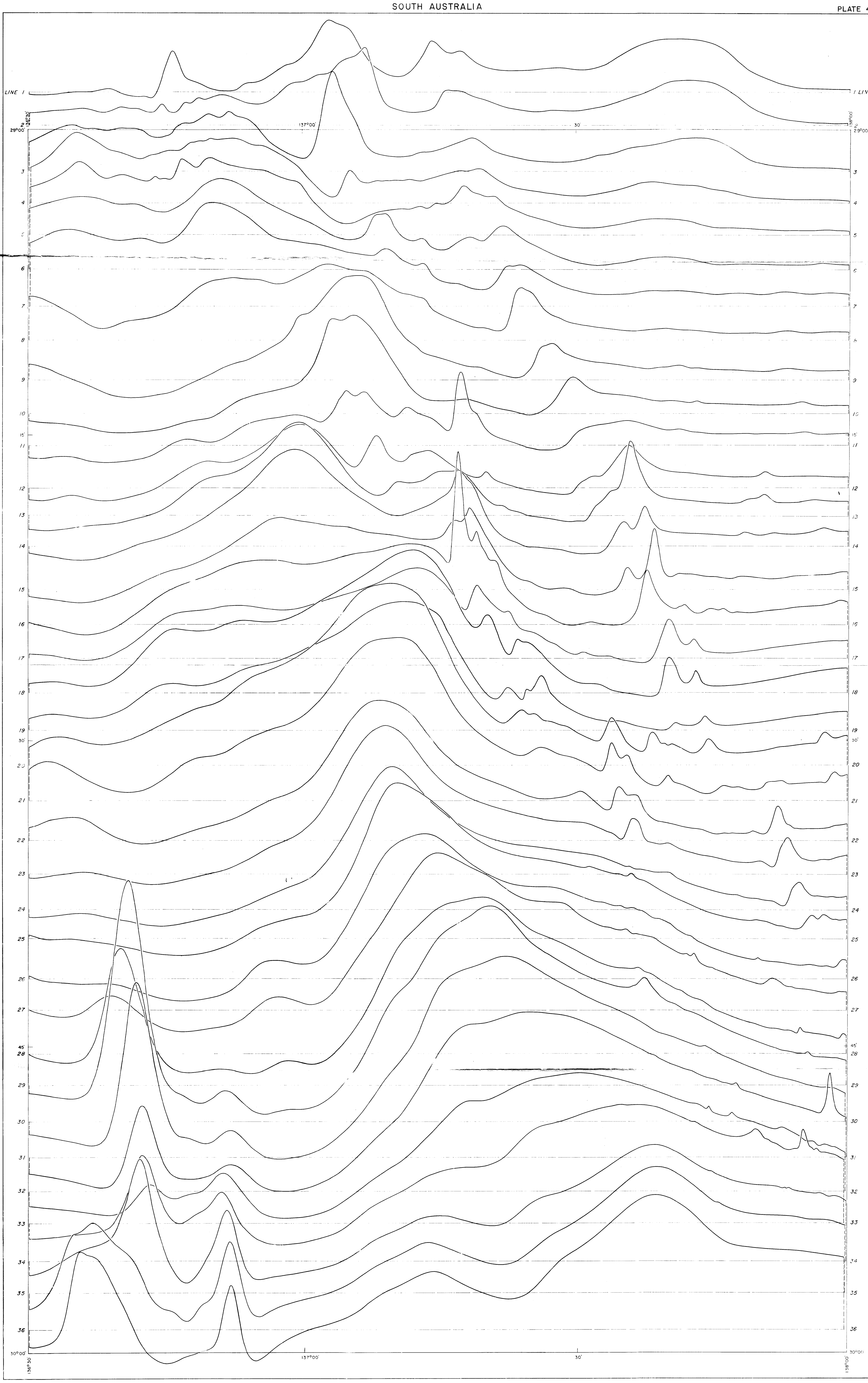
THE PROFILES HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL MAGNETIC INTENSITY. THIS COMPONENT AMOUNTS TO 8·9 GAMMAS PER MILE.

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics H54/B1-44

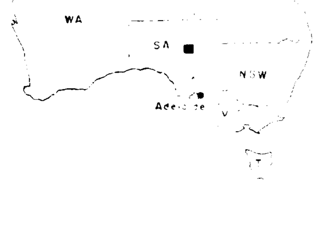
To accompany Record No. 1966/224

CURDIMURKA
SOUTH AUSTRALIA

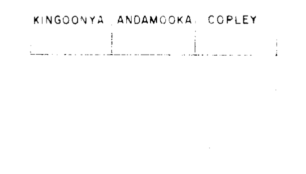
PLATE 4



LOCATION DIAGRAM

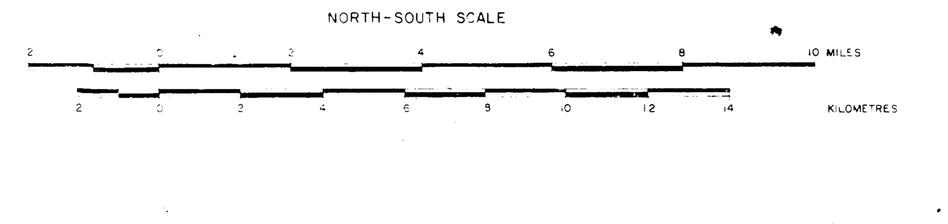


INDEX TO ADJOINING SHEETS

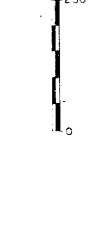


AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

TOTAL MAGNETIC INTENSITY PROFILES



APPROX. PROFILE SCALE



EXPLANATORY NOTES

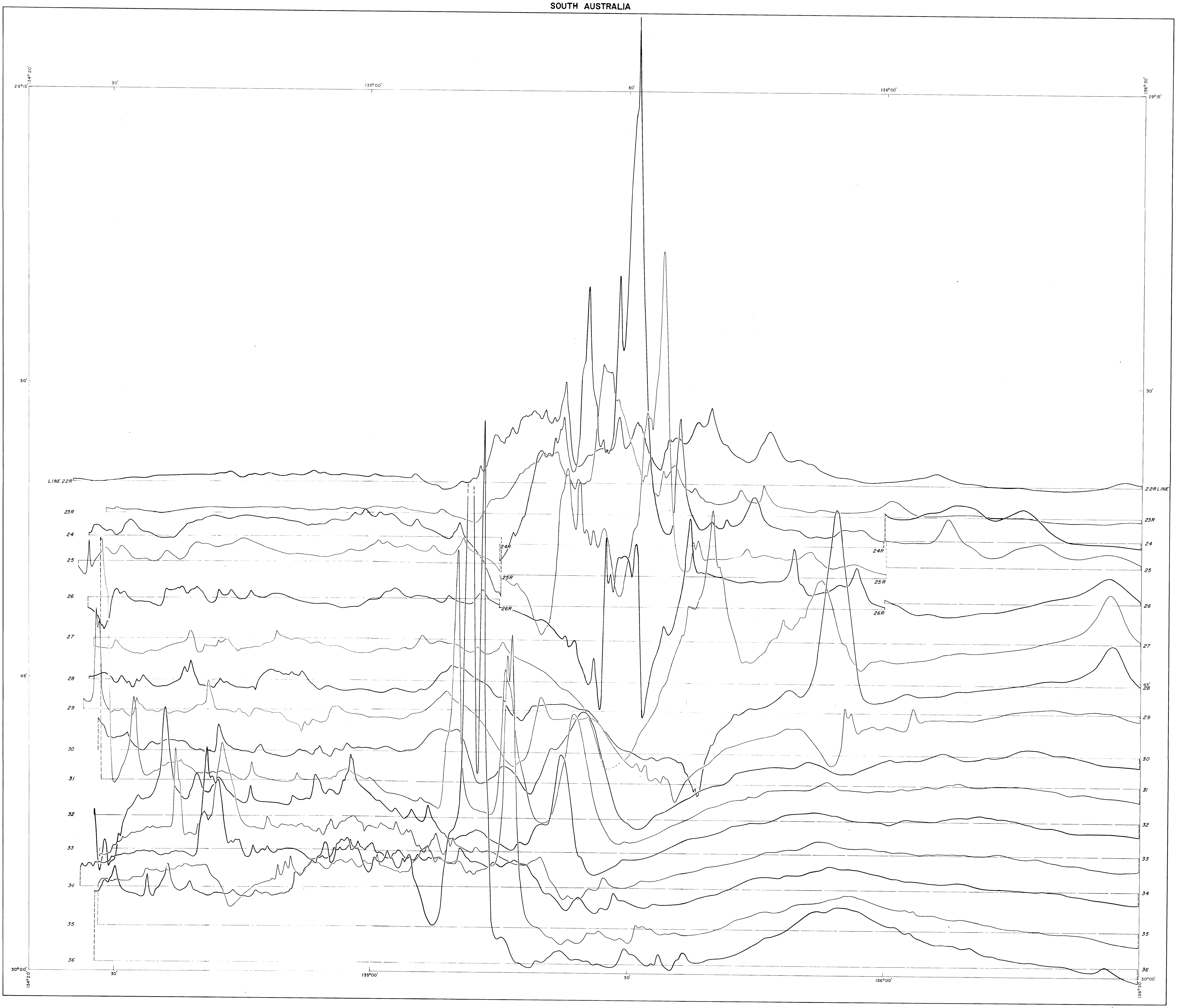
THE SURVEY WAS MADE WITH A DC.3 AIRCRAFT AT AN ALTITUDE OF 1500 FEET ABOVE SEA LEVEL ALONG LINES SPACED TWO MILES APART. THE FLIGHT-LINES ARE IDEALISED, AND SERVE AS BASELINES TO THE PROFILES. THEY APPROXIMATE THE ACTUAL FLIGHT PATH WITH A PROBABLE ERROR OF ± ½ MILE.

THE PROFILES HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL MAGNETIC INTENSITY. THIS COMPONENT AMOUNTS TO 91 GAMMAS PER MILE.

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics H53/B1-35

To accompany Record No. 1966/224

COOBER PEDY–BILLAKALINA
SOUTH AUSTRALIA



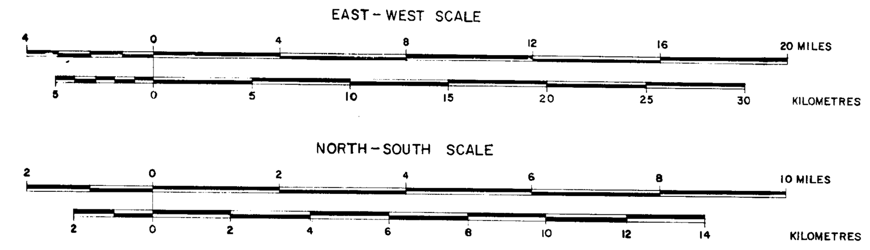
LOCATION DIAGRAM

INDEX TO ADJOINING SHEETS

MURLOO–COPPIE	WARRINA	LAKE EYRE
COOBER PEDY	BILLAKALINA	CURDIMURKA
TARCOOLA	KINGOONYA	ANDAMOOKA

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

TOTAL MAGNETIC INTENSITY PROFILES



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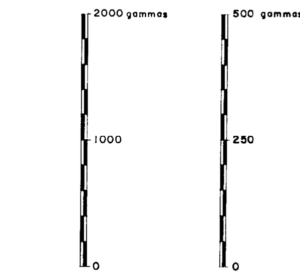


EXPLANATORY NOTES

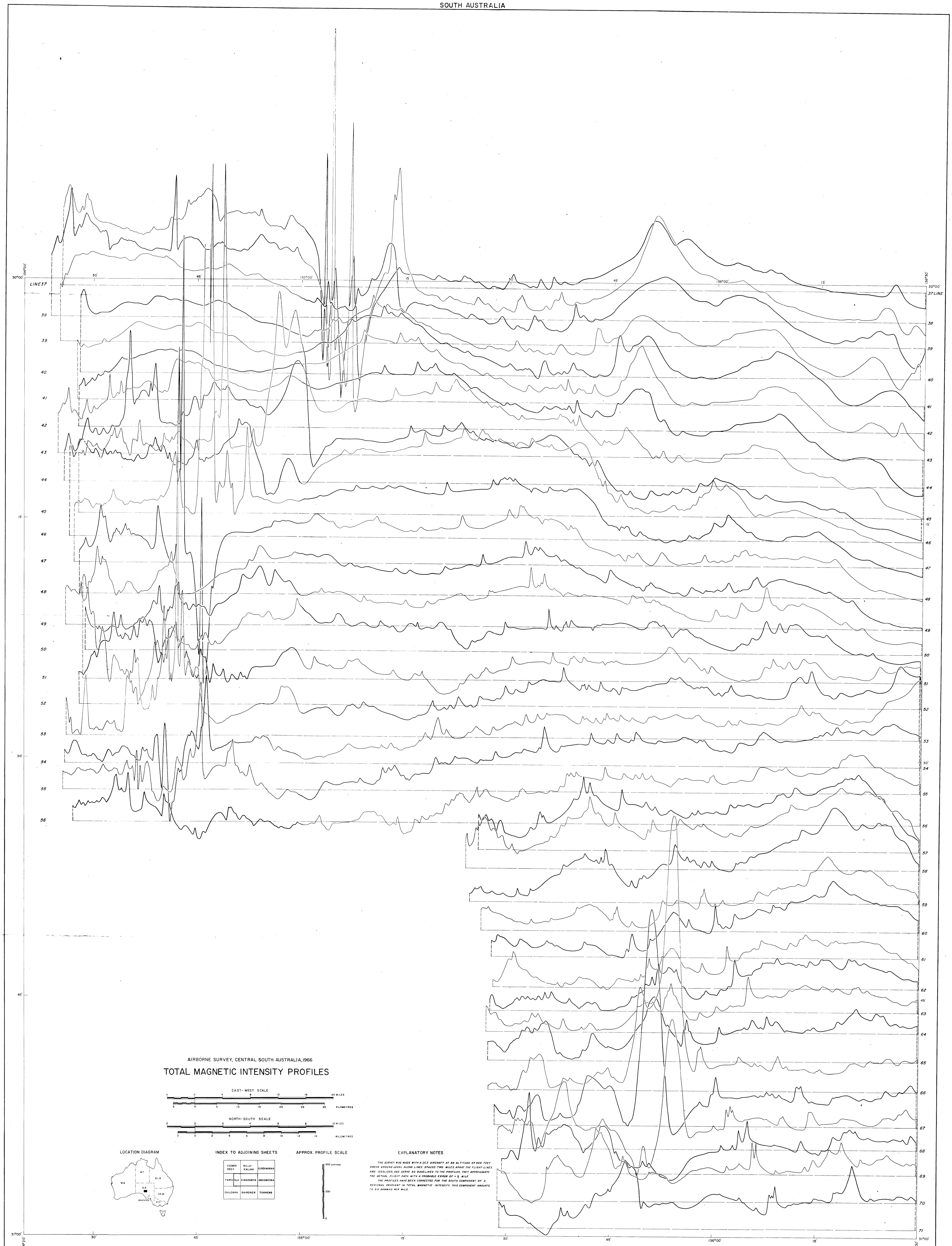
THE SURVEY WAS MADE WITH A DC3 AIRCRAFT AT AN ALTITUDE OF 500 FEET ABOVE GROUND LEVEL ALONG LINES SPACED TWO MILES APART. THE FLIGHT-LINES ARE IDEALISED, AND SERVE AS BASELINES TO THE PROFILES. THEY APPROXIMATE THE ACTUAL FLIGHT PATH WITH A PROBABLE ERROR OF ± ½ MILE.

THE PROFILES HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL MAGNETIC INTENSITY. THIS COMPONENT AMOUNTS TO 9·0 GAMMAS PER MILE.

To accompany Record No. 1966/224

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics H53/B1-45

TARCOOLA-KINGOONYA
SOUTH AUSTRALIA



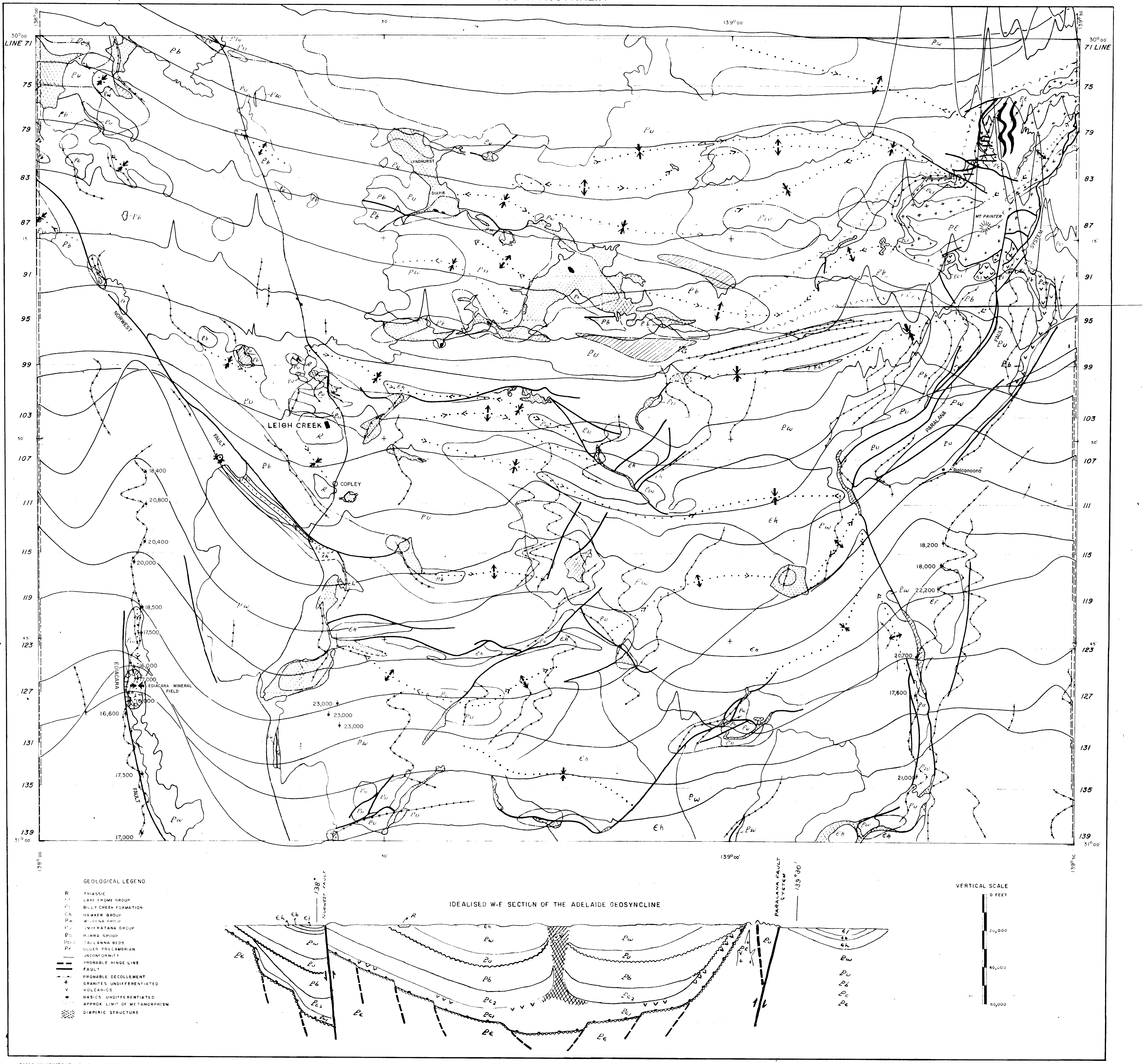
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. H53/B1-46

To accompany Record No. 1966/224

AUSTRALIA 1:250,000

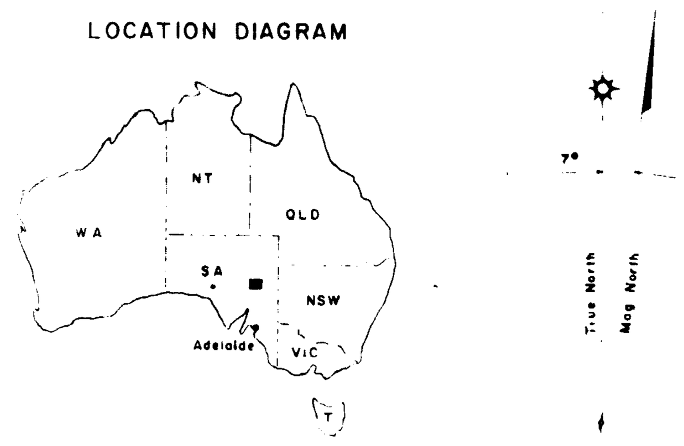
COPLEY
SOUTH AUSTRALIA

PLATE 7



BASED ON H54/B0-13 BASED ON H54/BI-38 BASED ON H54/BI-39

LOCATION DIAGRAM



INDEX TO ADJOINING SHEETS

CURDIMURKA	MARREE	CALLABONNA
ANDAMOOKA	COPLEY	FROME
TORRENS	PARACHILNA	CURNAMONA

GEOLOGICAL AND PLANIMETRIC MAPPING, REF. No 66-206/6 COMPILED AND DRAWN BY DEPARTMENT OF MINES, SOUTH AUSTRALIA

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

TOTAL MAGNETIC INTENSITY PROFILES
MAGNETIC INTERPRETATION
AND
GEOLOGY

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETRES

APPROX. PROFILE SCALE

500 gammas
250
0

GEOPHYSICAL LEGEND

- MAGNETIC TREND-SHALLOW SOURCE
- MAGNETIC TREND-DEEP SOURCE
- ZONE OF SMALL MAGNETIC ANOMALIES
- ZONE OF NEGATIVE MAGNETIC ANOMALIES
- 2000 BASEMENT DEPTH ESTIMATE CORRECTED FOR MAGNETIC STRIKE, DEPTH IN FEET BELOW SEA LEVEL.

EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC.3 AIRCRAFT AT AN ALTITUDE OF 500 FEET ABOVE GROUND LEVEL ALONG LINES SPACED ONE MILE APART. THE FLIGHT-LINES ARE IDEALISED, AND SERVE AS BASELINES TO THE PROFILES. THEY APPROXIMATE THE ACTUAL FLIGHT PATH WITH A PROBABLE ERROR OF ± 1 MILE.

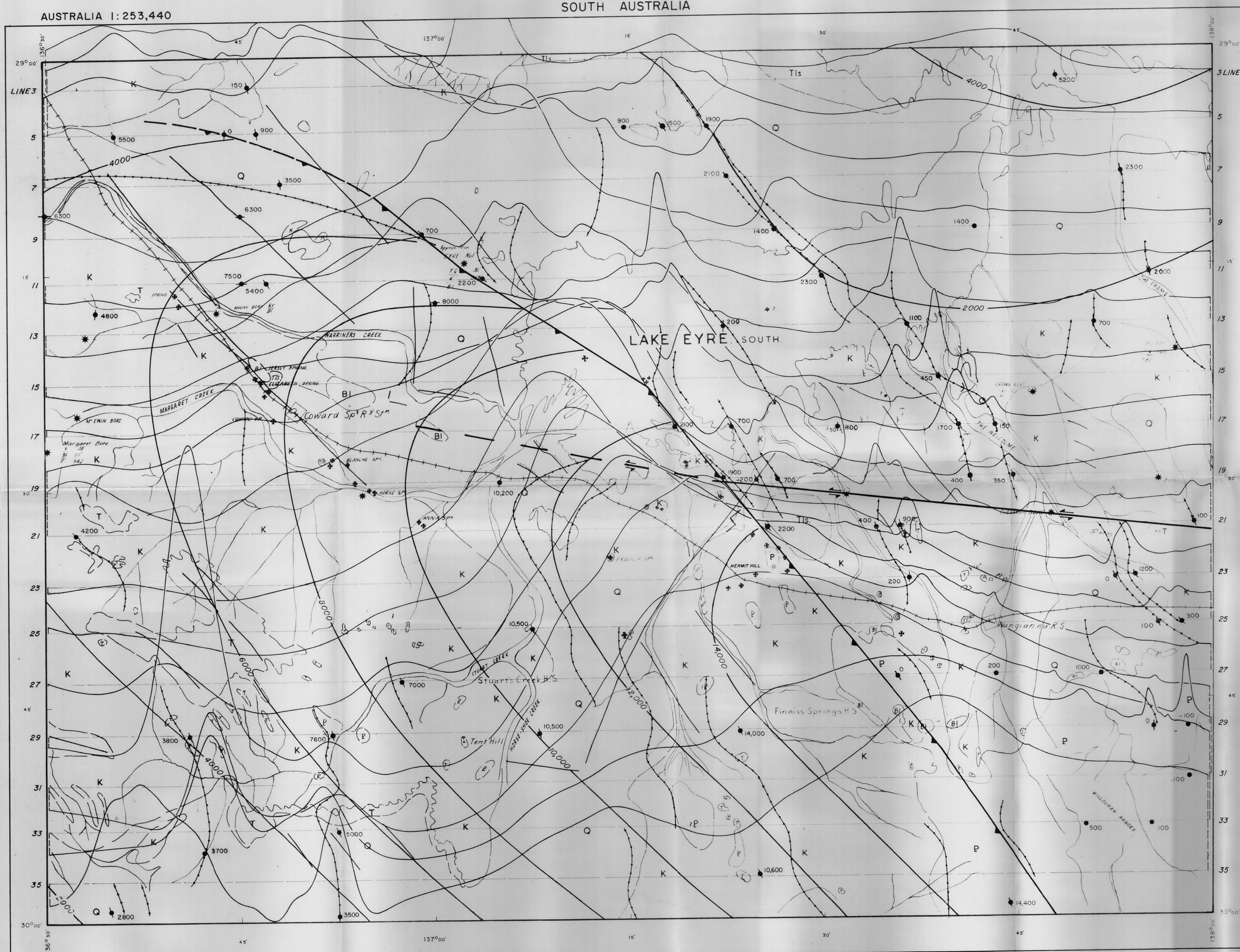
PROFILES RECORDED AT INTERVALS OF 4 MILES ARE SHOWN ON THE MAP.

THE PROFILES HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL MAGNETIC INTENSITY. THIS COMPONENT AMOUNTS TO 8.9 GAMMAS PER MILE.

Geophysical Branch, Bureau of Mineral Resources Geology and Geophysics H54/BI-41
To accompany Record No. 1966/224

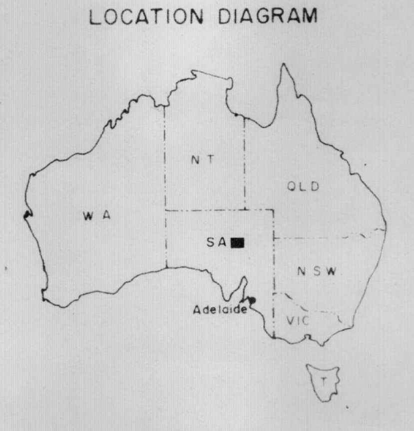
CURDIMURKA
SOUTH AUSTRALIA

AUSTRALIA 1:253,440



BASED ON H53/80-14
BASED ON H53/81-53
BASED ON H53/81-54

LOCATION DIAGRAM



INDEX TO ADJOINING SHEETS

WARRINA	LAKE EYRE	KOPPERAMANNA
BILLAKALINA	CURDIMURKA	MARREE
KINGOONYA	ANDAMOOKA	COPLEY

GEOLOGICAL AND PLANIMETRIC MAPPING, REF. No 61-742, COMPILED AND DRAWN BY DEPARTMENT OF MINES, SOUTH AUSTRALIA

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

TOTAL MAGNETIC INTENSITY PROFILES
MAGNETIC INTERPRETATION
AND
GEOLOGY

MILES 4 0 4 8 12 16 20 MILES

KILOMETRES 5 0 5 10 15 20 25 30 KILOMETRES

APPROX. PROFILE SCALE

500 250 0

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 FLIGHT-LINES ARE IDEALISED, AND SERVE AS BASELINES TO THE PROFILES. THEY APPROXIMATE THE ACTUAL FLIGHT PATH WITH A PROBABLE ERROR OF ± ½ MILE.

PROFILES RECORDED AT INTERVALS OF 4 MILES ARE SHOWN ON THE MAP.

THE PROFILES HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL MAGNETIC INTENSITY. THIS COMPONENT AMOUNTS TO 9·1 GAMMAS PER MILE.

GEOLOGICAL LEGEND

Q	Quaternary alluvium, sandridges
Tls	?Pliocene dolomite, limestone
T	Tertiary duricrust
K	Cretaceous shales, with minor limestone, sandstone
Bl	?Blythesdale Group sandstone
P	Adelaide System slates, quartzites.
	?Dip of bedding.
	Lineament
	?Old strand line
	Spring
	Macrofossil locality.
	Plant fossil locality
	Bore Hole

GEOPHYSICAL LEGEND

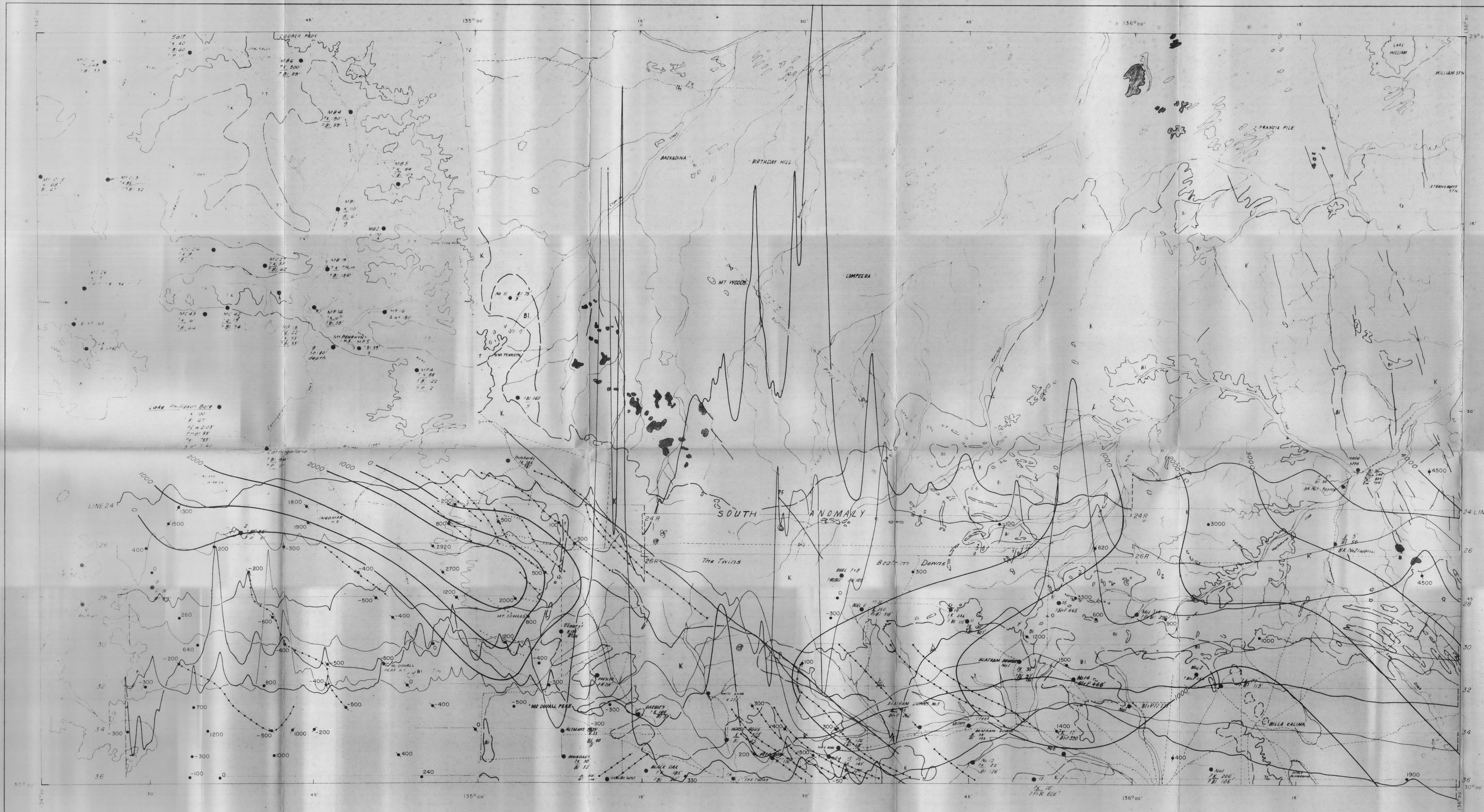
	MAGNETIC TREND
	FAULT VERTICAL MOVEMENT (BARB POINTS TO DOWNTHROW)
	FAULT TRANSCURRENT MOVEMENT
7000	BASEMENT DEPTH CONTOUR
• 2000	BASEMENT DEPTH ESTIMATE CORRECTED FOR MAGNETIC STRIKE. DEPTH IN FEET BELOW SEA LEVEL
• 2000	BASEMENT DEPTH ESTIMATE UNCORRECTED FOR MAGNETIC STRIKE. DEPTH IN FEET BELOW SEA LEVEL
-200	DEPTH IN FEET ABOVE SEA LEVEL

To accompany Record No. 1966/224

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics H53/B1-55

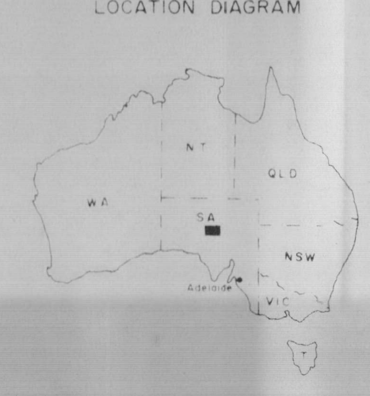
AUSTRALIA 1:253,440

COOBER PEDY–BILLAKALINA
SOUTH AUSTRALIA



BASED ON H53/BI-48

LOCATION DIAGRAM



True North
Mag North
5°45'

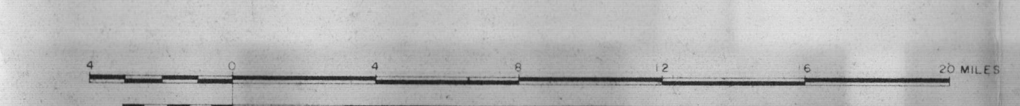
INDEX TO ADJOINING SHEETS

MURLOO-COPPIE	WARRINA	LAKE EYRE
COOBER PEDY	BILLAKALINA	CURDIMURKA
TARCOOLA	KINGOONYA	ANDAMOOKA

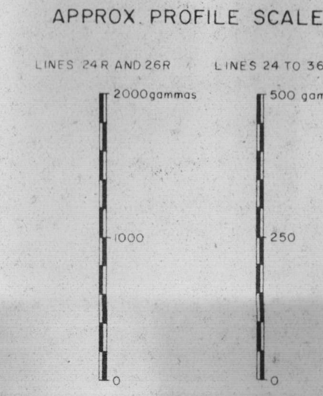
GEOLOGICAL AND PLANIMETRIC MAPPING, REF. Nos. 61-737 AND 61-741, COMPILED AND DRAWN BY DEPT OF MINES, SOUTH AUSTRALIA

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

TOTAL MAGNETIC INTENSITY PROFILES
MAGNETIC INTERPRETATION
AND
GEOLOGY



APPROX. PROFILE SCALES



GEOPHYSICAL LEGEND

- MAGNETIC TREND
- 2000 BASEMENT DEPTH CONTOUR
- 2000 BASEMENT DEPTH ESTIMATE CORRECTED FOR MAGNETIC STRIKE. DEPTH IN FEET BELOW SEA LEVEL.
- 2000 BASEMENT DEPTH ESTIMATE UNCORRECTED FOR MAGNETIC STRIKE. DEPTH IN FEET BELOW SEA LEVEL
- −200 DEPTH IN FEET ABOVE SEA LEVEL

EXPLANATORY NOTES

THE SURVEY WAS MADE WITH A DC3 AIRCRAFT AT AN ALTITUDE OF 500 FEET ABOVE GROUND LEVEL ALONG LINES SPACED TWO MILES APART. THE FLIGHT-LINES ARE IDEALISED, AND SERVE AS BASELINES TO THE PROFILES. THEY APPROXIMATE THE ACTUAL FLIGHT PATH WITH A PROBABLE ERROR OF ± ½ MILE.

PROFILES RECORDED AT INTERVALS OF 4 MILES ARE SHOWN ON THE MAP

THE PROFILES HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL MAGNETIC INTENSITY. THIS COMPONENT AMOUNTS TO 9·0 GAMMAS PER MILE.

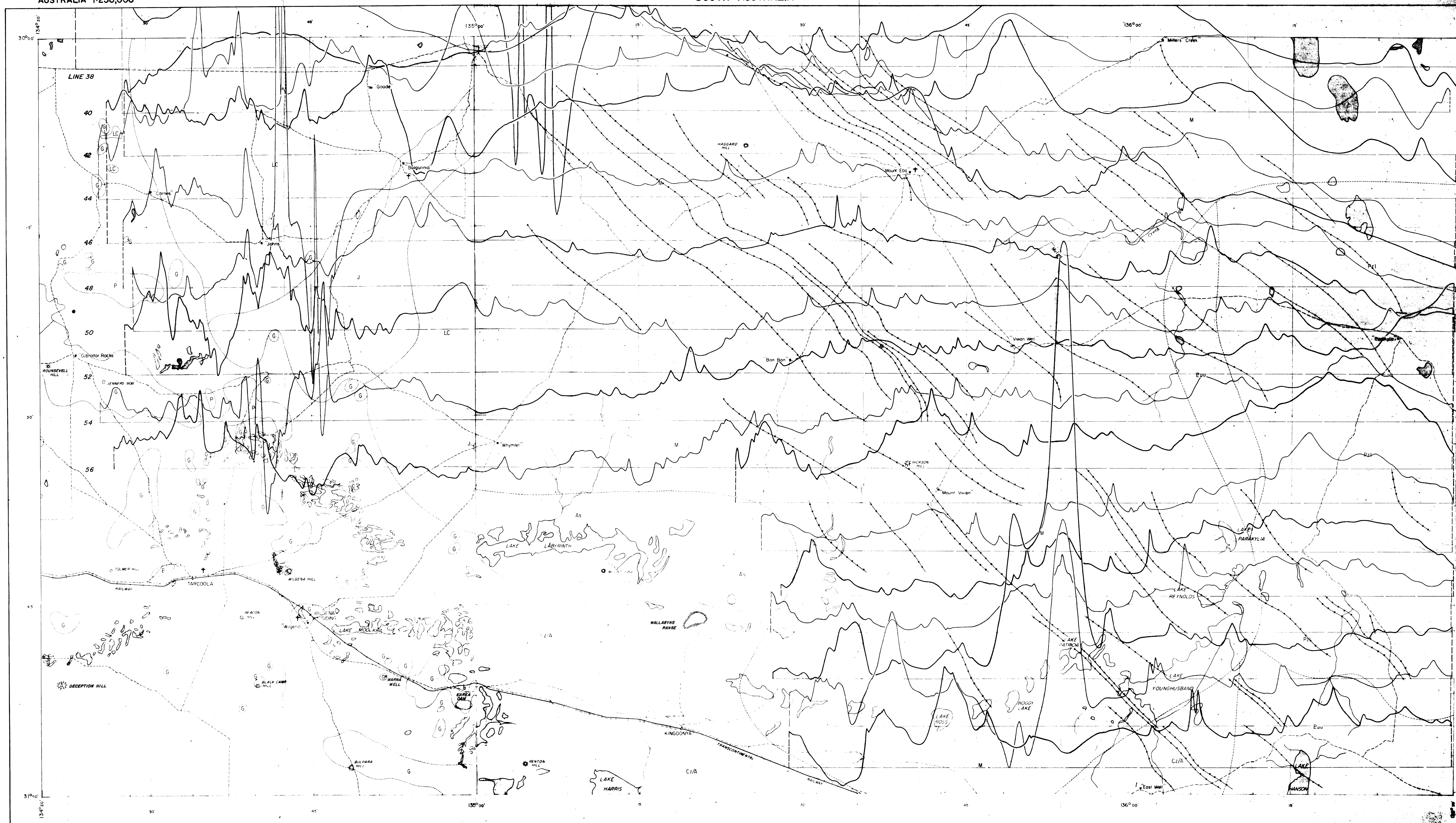
GEOLOGICAL LEGEND

Q	Quaternary alluvium, sandridges
Tls	?Pliocene fresh-water limestone
T	Tertiary duricrust
K	Cretaceous shales
Bl	?Blythesdale Group ("Jurassic") sandstone
P	Permian beds
Pfw	Permian "fresh-water" beds
Pma	Permian "marine" beds
Pgl	Permian "glacial" beds
g	Granite
gn	Gneiss
sch	Schist
A	Archaean
	Precambrian
	Lineament
F	Fault

PLATE NO. 1

AUSTRALIA 1:250,000

TARCOOLA - KINGOONYA
SOUTH AUSTRALIA



BASED ON H53/B1 – 50
BASED ON H53/B1 – 49
BASED ON H53/B0 – 10
BASED ON H53/B0 – 11

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

TOTAL MAGNETIC INTENSITY PROFILES
MAGNETIC INTERPRETATION
AND
GEOLOGY

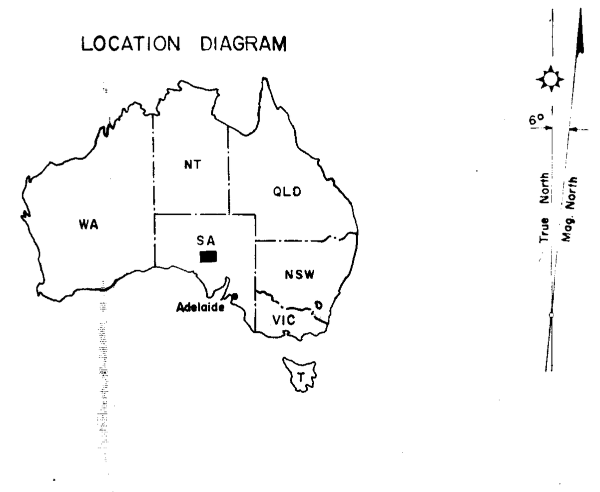
GEOLOGICAL LEGEND

TARCOOLA		KINGOONYA	
LC	MESOZOIC LOWER CRETACEOUS	M	MESOZOIC
J	JURASSIC (?)	Pzl	LOWER PALAEOZOIC
Ᵽ	PROTEROZOIC	Ᵽuu	UPPER UPPER PROTEROZOIC
A	ARCHAEAN	Cz/A	UNDIFFERENTIATED ARCHAEAN
	IRONSTONE	As	ARCHAEAN
G	GRANITE, GNEISS ETC	....	Geological boundary
P	PORPHYRY		
....	Geological boundary		

PLANIMETRIC MAPPING AFTER 1:250,000 SCALE MAP OF TARCOOLA SH 53-10, EDITION I BY ROYAL AUSTRALIAN SURVEY CORPS.
TRANSVERSE MERCATOR PROJECTION.
GEOLOGY AFTER 1:253,440 SCALE GEOLOGICAL AND ACCESS PLAN OF TARCOOLA REF. NO. 59-129 BY SOUTH AUSTRALIAN DEPARTMENT OF MINES.

PLANIMETRIC MAPPING AFTER 1:253,440 SCALE MAP OF KINGOONYA BY ROYAL AUSTRALIAN SURVEY CORPS, 1946.
TRANSVERSE MERCATOR PROJECTION.
GEOLOGY AFTER TECTONIC MAP OF AUSTRALIA

LOCATION DIAGRAM



INDEX TO ADJOINING SHEETS

COOBER PEDY	BILLAKALINA	CURDIMURKA
TARCOOLA	KINGOONYA	ANDAMOOKA
CHILDARA	GAIRDNER	TORRENS

INDEX TO 1 MILE MAPS

MUCKANIPPIE	BULGUNNIA	KALABYNG	EBA	PEEPINBIE
CARNDING	EALBARA	BONBON	WINGILPIN	PARAKYLIA
MALBOOMA	TARCOOLA	LABYRINTH	VIVIAN	BEBOOWIE
KYCHERING	WILGENA	KINGOONYA	ROSS	YOUNGHUSBAND

—TARCOOLA— —KINGOONYA—

134°00' 135°00' 136°00' 30°00' 31°00'

5 0 5 10 15 20 MILES
5 0 5 10 15 20 25 30 KILOMETRES

APPROX. PROFILE SCALE

500 gammas
250
0

TOPOGRAPHICAL LEGEND

Road or track
Railway with siding
Railway station
Homestead
Aerodrome or landing ground

GEOPHYSICAL LEGEND

Magnetic trend

EXPLANATORY NOTES

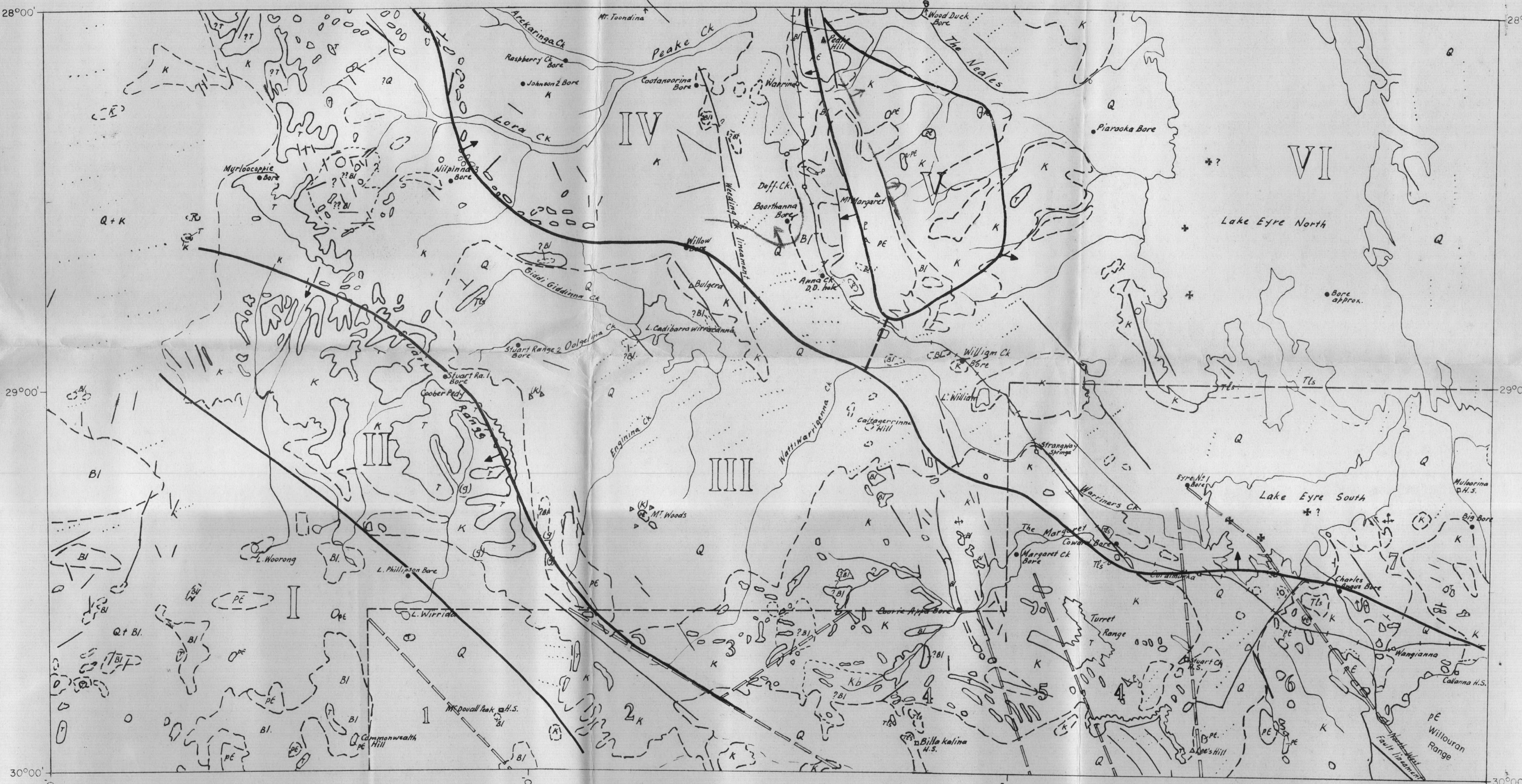
THE SURVEY WAS MADE WITH A DC.3 AIRCRAFT AT AN ALTITUDE OF 500 FEET ABOVE GROUND LEVEL ALONG LINES SPACED TWO MILES APART. THE FLIGHT-LINES ARE IDEALISED AND SERVE AS BASELINES TO THE PROFILES. THEY APPROXIMATE THE ACTUAL FLIGHT PATH WITH A PROBABLE ERROR OF ± ½ MILE.

PROFILES RECORDED AT INTERVALS OF 4 MILES ARE SHOWN ON THE MAP

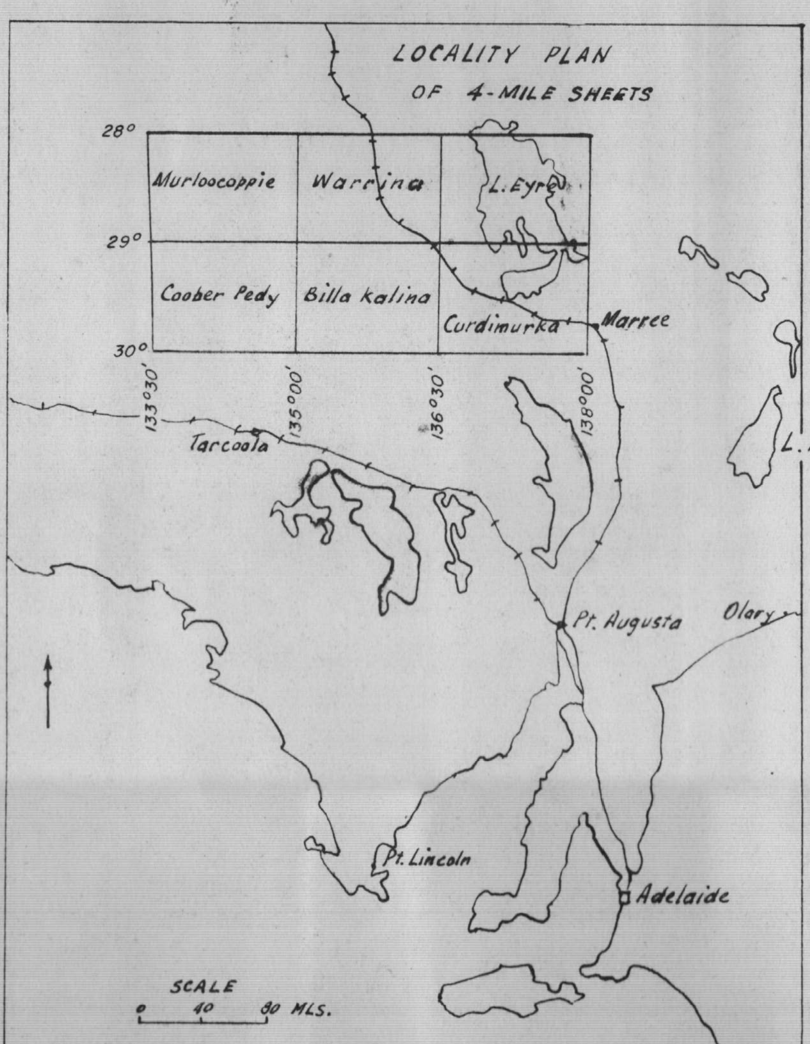
THE PROFILES HAVE BEEN CORRECTED FOR THE SOUTH COMPONENT OF A REGIONAL GRADIENT IN TOTAL MAGNETIC INTENSITY. THIS COMPONENT AMOUNTS TO 9·0 GAMMAS PER MILE.

To accompany Record No. 1966/224

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics **H53/B1-58**



Geological and planimetric mapping, ref. No. 61–794, compiled and drawn by Department of Mines, South Australia.



Based on airphoto interpretation by R.P. Coats and B.G. Forbes and previous reports

SCALE

16 8 0 16 32 48 64

MILES

COOBER PEDY–LAKE EYRE REGION
GEOLOGICAL STRUCTURE AND MAGNETIC BASEMENT UNITS

GEOLOGICAL LEGEND

Quaternary Alluvium, sand ridges	Q
Pliocene freshwater limestone, dolomite	Tls
Tertiary duricrust	T
Cretaceous shales	K
?Blythesdale Group ("Jurassic") sandstones	Bl
Permian	P
Precambrian basement	pЄ
Structural zone and boundary, showing regional dip	II
Lineament	
Dip of bedding	
Spring	

GEOPHYSICAL LEGEND

Magnetic basement unit	1
Airborne survey boundary	

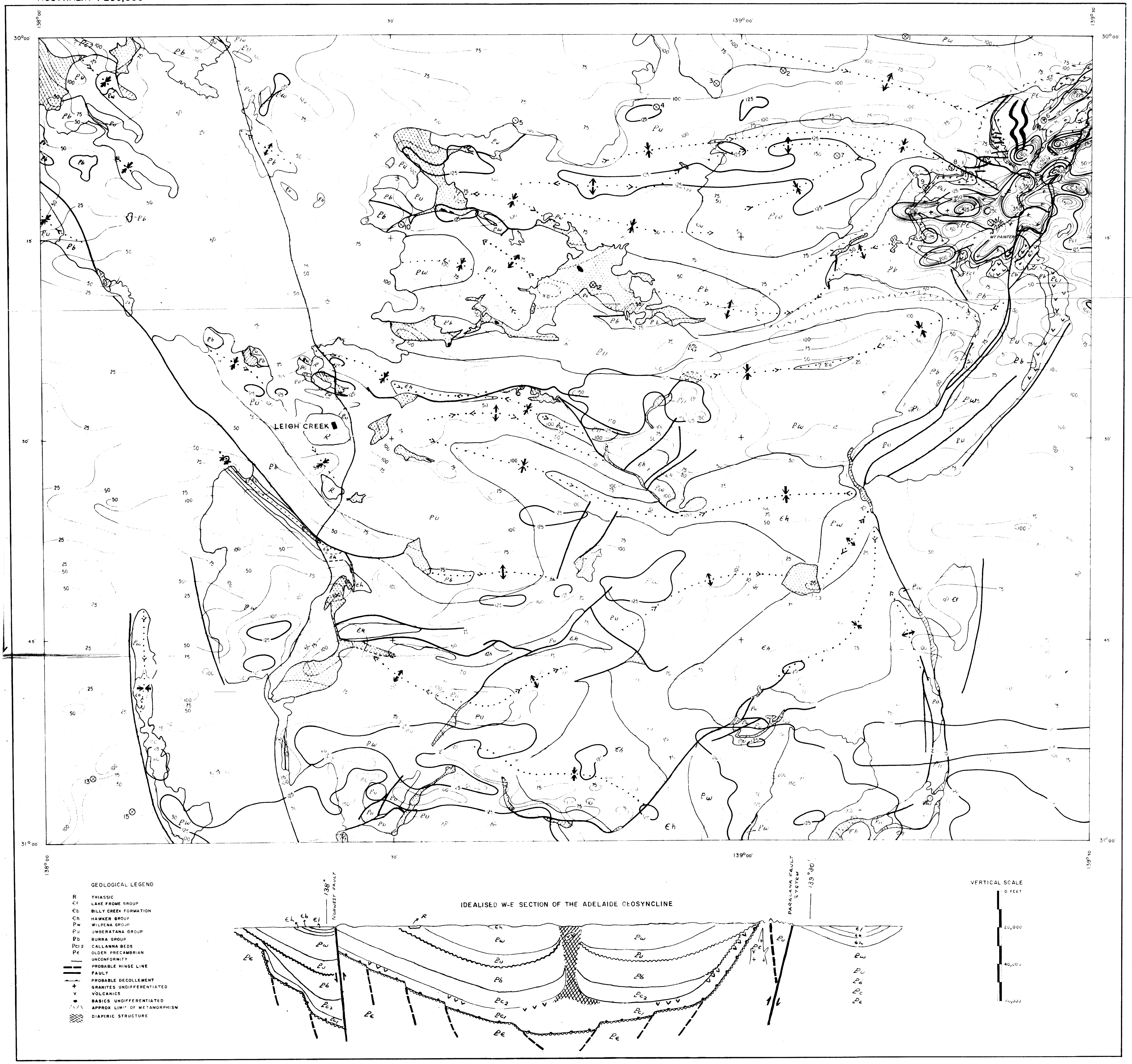
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics H53/B1-61

To accompany Record No. 1966/224

AUSTRALIA 1:250,000

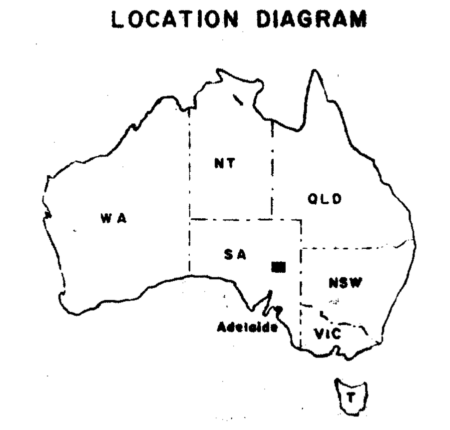
COPLEY
SOUTH AUSTRALIA

PLATE 12



BASED ON H54/B0-13
BASED ON H54/B1-40

LOCATION DIAGRAM



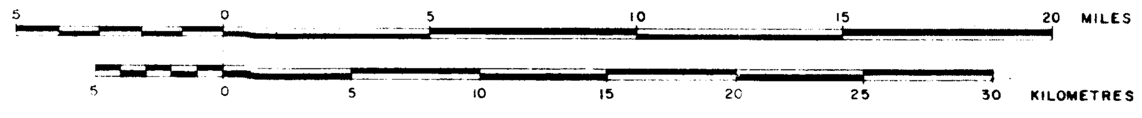
INDEX TO ADJOINING SHEETS

CURDIMURKA	MARREE	CALLABONNA
ANDAMOOKA	COPLEY	FROME
TORRENS	PARACHILNA	CURNAMONA

GEOLOGICAL AND PLANIMETRIC MAPPING, REF. No 66-206/6 COMPILED AND DRAWN BY DEPARTMENT OF MINES, SOUTH AUSTRALIA

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

RADIOMETRIC RESULTS AND GEOLOGY



GEOPHYSICAL LEGEND

RADIOMETRIC CONTOURS, COUNTS PER SECOND

10 ⊙ RADIOMETRIC ANOMALY RESTRICTED SOURCE (ANOMALIES ARE NUMBERED FOR REFERENCE ONLY)

Geophysical Branch, Bureau of Mineral Resources Geology and Geophysics

H54/B1-42

To accompany Record No. 1966/224

COOBER PEDY–BILLAKALINA
SOUTH AUSTRALIA

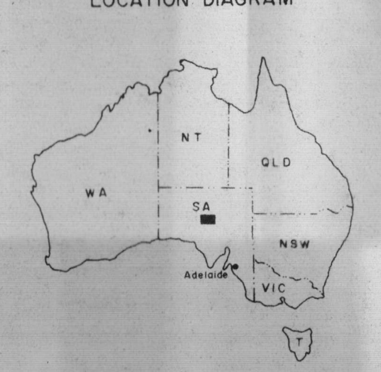
AUSTRALIA 1:253,440

GEOLOGICAL LEGEND

Q	Quaternary alluvium, sandridges
T ls	?Pliocene fresh-water limestone
T	Tertiary duricrust
K	Cretaceous shales
Bl	?Blythesdale Group ("Jurassic") sandstone
P	Permian beds
Pfw	Permian "fresh-water" beds
Pma	Permian "marine" beds
Pgl	Permian "glacial" beds
g	Granite
gn	Gneiss
sch	Schist
A	Archaean
	Precambrian
	Lineament
F	Fault

BASED ON H 53/BI – 51
BASED ON H 53/BO – 12
BASED ON H 53/BO – 13

LOCATION DIAGRAM



True North
Mag. North
5°45'

INDEX TO ADJOINING SHEETS

MURLOO-COPPIE	WARRINA	LAKE EYRE
COOBER PEDY	BILLAKALINA	CURDIMURKA
TARCOOLA	KINGOONYA	ANDAMOOKA

GEOLOGICAL AND PLANIMETRIC MAPPING, REF. Nos 61-737 AND 61-741, COMPILED AND DRAWN BY DEPT OF MINES, SOUTH AUSTRALIA.

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

RADIOMETRIC RESULTS
AND
GEOLOGY

20 MILES
KILOMETRES

GEOPHYSICAL LEGEND

100 / 125 / 150 — Radiometric contours, counts per second.

23 ⊗ — Radiometric anomaly, restricted source.
(Anomalies are numbered for reference only)

To accompany Record No. 1966/234

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics H53/BI—57

TARCOOLA - KINGOONYA
SOUTH AUSTRALIA

AUSTRALIA 1:250,000

BASED ON H53/B0-10
BASED ON H53/B0-11
BASED ON H53/B1-52

GEOLOGICAL LEGEND

TARCOOLA

- LC MESOZOIC LOWER CRETACEOUS
- J JURASSIC (?)
- Ꝑ PROTEROZOIC
- A ARCHAEAN
- IRONSTONE
- G GRANITE, GNEISS ETC.
- P PORPHYRY
- Geological boundary

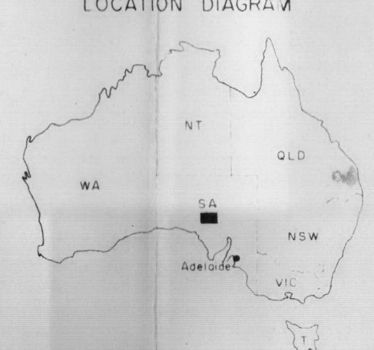
KINGOONYA

- M MESOZOIC
- Pzl LOWER PALAEOZOIC
- Ꝑuu UPPER UPPER PROTEROZOIC
- Cz/A UNDIFFERENTIATED ARCHAEAN
- As ARCHAEAN
- Geological boundary

PLANIMETRIC MAPPING AFTER 1:250,000 SCALE MAP OF TARCOOLA SH 53-10, EDITION I BY ROYAL AUSTRALIAN SURVEY CORPS.
TRANSVERSE MERCATOR PROJECTION.
GEOLOGY AFTER 1:253,440 SCALE GEOLOGICAL AND ACCESS PLAN OF TARCOOLA REF. NO. 59-129 BY SOUTH AUSTRALIAN DEPARTMENT OF MINES.

PLANIMETRIC MAPPING AFTER 1:253,440 SCALE MAP OF KINGOONYA BY ROYAL AUSTRALIAN SURVEY CORPS, 1948.
TRANSVERSE MERCATOR PROJECTION.
GEOLOGY AFTER TECTONIC MAP OF AUSTRALIA.

LOCATION DIAGRAM



True North
Mag North
6°

INDEX TO ADJOINING SHEETS

COOBER PEDY	BILLAKALINA	CURDIMURKA
TARCOOLA	KINGOONYA	ANDAMOOKA
CHILDARA	GAIRDNER	TORRENS

AIRBORNE SURVEY, CENTRAL SOUTH AUSTRALIA, 1966

RADIOMETRIC RESULTS AND GEOLOGY

5 0 5 10 15 20 MILES
5 0 5 10 15 20 25 30 KILOMETRES

TOPOGRAPHICAL LEGEND

- Road or track
- Railway with siding
- Railway station
- Homestead
- Aerodrome or landing ground

GEOPHYSICAL LEGEND

- 100 / 125 / 150 RADIOMETRIC CONTOURS, COUNTS PER SECOND
- 10 ⊗ RADIOMETRIC ANOMALY RESTRICTED SOURCE (ANOMALIES ARE NUMBERED FOR REFERENCE ONLY)