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TECHNICAL SERVICES SECTION

NOTES ON THE KINGOONYA 1:250 000 PRELIMINARY GEOLOGICAL MAP

B.G. FORBES

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South Australia ——

DEPARTMENT OF MINES - SOUTH AUSTRALIA

BIBLIOGRAPHY INDEX

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6 1 Tarcoola Beds 2147

Tent Hill Formation 2104

Andamooka Limestone 2271

Permian 1012

Cretaceous 1009

Cambrian 1017

Precambrian 1004

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DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
REGIONAL GEOLOGY DIVISION

NOTES ON THE KINGOONYA 1:250 000 PRELIMINARY GEOLOGICAL MAP

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G.S. No. 5836
DM. No. 395/72

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DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept.Bk.No. 77/7
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NOTES ON THE KINGOONYA 1:250 000 PRELIMINARY GEOLOGICAL MAP

ABSTRACT

The KINGOONYA map area covers parts of the southwestern Great Artesian Basin (Cretaceous), Stuart Shelf (Cambrian and Upper Precambrian) and Gawler Craton (Proterozoic to Archaean). Rock units of interest include the Gawler Range Volcanics, Proterozoic iron formations and Tarcoola Beds. These are unconformably overlain in the east by the upper Precambrian Tent Hill Formation and Cambrian Andamooka Limestone. Large areas in the north are covered by Cretaceous shales bleached in a late Mesozoic or Cainozoic soil profile. Subsurface Permian shales occur in the northeast.

INTRODUCTION

These notes were originally prepared in manuscript form in connection with the Skylark 1081 remote sensing project (Thomson et al., 1972). They are reproduced here with only slight modification because of increased interest in the Stuart Shelf as a copper prospect.

The accompanying KINGOONYA preliminary map sheet is the first edition of 1972, based upon a field traverse of only two weeks duration by S.J. Daly and B.G. Forbes and a short office study of black and white air photos by B.G. Forbes. Much further field work, preferably aided by coloured air photos, will be required in order to bring the map up to a satisfactory standard for publication.

The area lies between latitudes 30° and 31° and longitudes 135° and $136^{\circ}30'$ and contains in its south-west corner the township of Kingoonya on the Trans-Australian Railway. The Stuart Highway runs northward and eastward from Kingoonya. The only other settlements in the area are the homesteads of sheep stations. Except for the south-west corner, permission is required from the Weapons Research Establishment to enter the area. Climate

is semi-arid to arid.

The more important publications relevant to the geology of the area are listed under previous reports. Unpublished reports by Hanlon, Miles and Twist refer only to early reconnaissances for Clarence River Basin Oil Exploration Co. N.L.

As indicated on the Royal Australian Survey Corps (1967) KINGOONYA topographic map (SH53-11), elevation is about 150 m. Relief is low and lower-lying ground is indicated by claypans which extend across the southern part of the area and up the eastern side. The highest ground, with north-east-facing scarps, appears to be south and north-west of Mount Paisley which itself is the highest hill (243 m approx.). Vegetation is sparse in many parts and is typified by blue bush (Kochia spp.), salt bush (Atriplex spp.), mulga and myall (both Acacia spp.).

The area is in the Great Artesian Basin, near its south-west margin, and is underlain at shallow depth by Lower Cretaceous shales and sandstones of approximately horizontal attitude. The Cretaceous rocks are largely covered by a variety of younger superficial materials including soils of various ages, colluvium, alluvium and wind-blown sand. In the south-west the Artesian Basin rocks give way to a basement of strongly folded Proterozoic rocks of the Gawler Craton. East and south-east of the Artesian Basin are flat-lying Cambrian limestone and upper Proterozoic sandstone of the eastern Gawler Craton or Stuart Shelf. (Thomson, 1970; Thomson et al., 1976).

STRATIGRAPHY

Stratigraphy is summarized in Table 1; colours are those appearing in hand specimen or outcrop.

Cleve Metamorphics

An outcrop of folded and steeply-dipping red banded jaspilite occurs 1.6 km southeast of Wallabyng Range, just east of the Stuart Highway (pers. comm., B.P. Thomson).

Sub-vertical hard white quartzite beds at Mount Eba (hill) south of Lake Labyrinth are accompanied by a thin, dark ironstone bed and are tentatively grouped with the Cleve Metamorphics. The Beds strike partly in a northeast direction and cross-bedding suggests an original southerly transport of sediment. Apart from the ironstone, however, these beds resemble part of the Corunna Conglomerate or Tarcoola Beds.

Granitic Rocks

Geochronological evidence (A.W. Webb, 1977, unpublished Amdel report) suggests these rocks may be about 2 400 million years old. They intrude metamorphic rocks of amphibolite to granulite grade including quartz-feldspar and quartz-feldspar-garnet gneisses with augite and hornblende-augite granulites (Daly, 1975, unpublished). Foliation is mainly northwest trending.

?Corunna Conglomerate or Tarcoola Beds

Steeply-dipping white, pale grey and brownish quartzite and conglomerate (pebbles of iron formation, quartzite and quartz) form the Wallabyng Range and isolated hills south-east and west of there. West-northwest of Wallabyng Range is a sericitic sandstone containing pebbles stretched in the dip direction of the schistosity; it contains boulders up to 50 cm in diameter. Schistosity strikes 060^{o} and dips 85^{o}NW.

Gawler Range Volcanics

A laminated pinkish, flaggy volcanic rock with chalcedonic layers and geodes is well exposed at the north-west end of Lake Harris; the lamination is sub-vertical. Nearby are more massive reddish colvanics. The rock commonly features pink feldspar and rounded quartz crystals in a fine-grained matrix.

There are other minor outcrops of the volcanics, including one on the Stuart Highway east of Kingoonya and also southwest of Mt. Eba (see Blissett, 1975).

Tent Hill Formation

Best exposures of this formation occur in low lake-side cliffs such as those at the north end of Lake Hanson and Lake Parakylia in the south-east of the map area. The rocks are mainly sandstones, pale greyish, brownish or white, flaggy to medium-bedded, laminated and cross-bedded and medium to fine-grained. At Lake Parakylia the cliffs are about 19 m high and cross-bedding indicates original sediment transport toward the east to south-southwest. Greenish, reddish and grey fine-grained micaceous flaggy sandstones are known from wells north-west of Lake Parakylia.

The Tent Hill Formation has been described by Johns (1968) in the adjacent ANDAMOOKA area and is the equivalent of the ABC Range Quartzite and the Brachina Formation of the Wilpena Group in the Adelaide Geosyncline.

Andamooka Limestone

This Lower Cambrian formation, named by Johns (1968, p. 31), is generally poorly exposed and covered partly with calcrete and other superficial deposits. During reconnaissance, best outcrops were seen near Arcoona Hill and Shultz's Tank. The rock is a pale grey or pale brownish hard limestone which is sometimes laminated and sometimes composed of edgewise breccia.

About 25 km south-southeast of "Parakylia" Dampier Mining (open file Envelope 2698) proved 38 m of Andamooka Limestone. A summary of the hole (P4) is as follows:

?Quaternary	0-21 m depth
Andamooka Limestone	21-59 m
?Yarloo Shale	59-84 m
Shale, sandstone, dolomite	84-99 m

Permian Sediments

Shales, siltstone and sandstone containing plant material of Early Permian age occur from near surface to about 116 m depth southwest of "Millers Creek" (Dampier Mining, Envelope 2320). These are not shown on the accompanying map.

Mesozoic and Cainozoic sediments and associated Paleosols

Cadna-owie Formation

Clayey, feldspathic, calcitic or ferruginous quartz sandstones, frequently coarse and pebbly, form the marginal deposits of the Great Artesian Basin. They are exposed mainly in the southern, eastern and northeastern parts of the map area. Water bore records suggest thicknesses possibly up to about 30 m. Ferruginized sandstones are very dark in colour.

Bulldog Shale

Cretaceous Shales outcrop mainly in the north-western quadrant of the map area and have generally been altered to a white colour through deep chemical weathering (the "Stuart Pedoderm" of Jessup and Norris, 1971) of Late Cretaceous or Tertiary age. The rocks include white or pale yellowish, reddish, grey and mauve shale, claystone, siltstone and lithic sandstone, mainly medium-bedded to massive or occasionally flaggy. Some beds carry vermicular casts. Total thickness in bore holes may possibly reach about 60 m in the northwest..

Silcrete

This is a widespread silicified zone related to an old land surface possibly of early Tertiary age. It is generally represented in the present landscape by a hard, flinty, bouldery capping of pale grey, pale brownish or yellowish colour and has been named "Naryilco silcrete" by Jessup and Norris (1971). Plant stem impressions have been preserved in some silcrete and rounded quartzite boulders, possibly a Tertiary deposit, are often found incorporated in silcrete. Maximum observed thickness is about 2 m.

In the northern and northwestern part of the map area ferricrete is associated with silcrete and appears to represent a later period of ferruginization. Papers by Barnes and Pitt (1976) are relevant to silcrete and other Cainozoic materials.

?Etadunna Formation

Good exposures of white dolomite rock and grey and greenish claystone may be seen overlying ferruginized and silicified Cadna-owie Formation near Moodlampnie Hill and west of Devils Playground. Maximum observed thicknesses are: dolomite 5 m; claystone, 13 m. The white dolomite rock forms a prominent plateau. This may represent the central part of an ancient lake, the strand-lines of which may be the old north-trending dune system of the ANDAMOOKA region (Johns, 1968).

?Pleistocene sandy claystone

This rock was seen only at Woolnomulla Bluff where it reaches a thickness of about 6 m. It is capped by a gypsum crust, possibly of the gypsite surface (Wopfner and Twidale, 1967). Mr. J.M.Lindsay (S.A. Geological Survey: personal communication, 1972) has not found any organic remains in a specimen of the sandy claystone but suggests the lithology to be more characteristic of the Quaternary than the Mesozoic or Palaeozoic.

Pleistocene to Recent superficial materials

The oldest of these observed during the reconnaissance is a widespread reddish, hard sandy clay or sandstone, sometimes with a fragmental or conglomeratic texture, and is possibly the "Illeroo Pedoderm" of Jessup and Norris (1971) or Wiluna Hardpan of Bettenay and Churchwood (1974).

It is frequently exposed in road-metal pits and contains soft, platy calcrete in its upper part. It is post-ferricrete in age but its relationships with the ?Etadunna Formation and ?Pleistocene sandy claystone are not known. A rubbly, reddish sandstone is known in the NOORINA/TALLARINGA region in western South Australia: this also is overlain by calcrete and overlies a mottled clay.

East-trending sand ridges composed of reddish quartz sand are widespread. In the southeast of the map area interdunal calcrete is present on the higher parts as well as lower parts of the valleys.

Gravels, composed mainly of silcrete and ironstone (partly magnetic) fragments are also widespread. Darker, less disturbed gravel sheets (Qpt) are taken to represent an older land surface, possibly the gypsite surface in a non-gypseous form (Wopfner and Twidale, 1967). East of Lake Hanson the Arcoona Plateau is represented as Qrt and the ground surface is composed of a ?lag gravel of slabs of the Arcoona Quartzite Member of the Tent Hill Formation with silcrete boulders and rounded quartzitic boulders derived from the Cadna-owie Formation. Materials probably associated with Qrt and Qpt are the Callabonna Clay (Firman, 1970) and Mumbalo Pedoderm and Pimba Formation (Jessup and Norris, 1971).

STRUCTURE

Axial surfaces of folds in the rocks of the crystalline basement appear to be sub-vertical and in part trending northeasterly. There has been little fold movement since deposition of the Tent Hill Formation. The flat-lying Tent Hill Formation and Andamooka Limestone represent the western part of the known Stuart Shelf, which is underlain by crystalline rocks of the Gawler Craton.

A map of magnetic intensity shows lineaments probably representing north-westerly trending dykes. Some high magnetic values near the northwest corner, near Lake Labyrinth and near Mount Paisley are coincident with higher gravity values and may represent basic rocks. A full geophysical interpretation is yet to be made; one aim of this should be to delineate possible graben structures in the basement (see Young & Gerdes, 1966).

Lineaments shown on the map are more densely distributed among or near pre-Mesozoic rocks, as may be expected. The most common trends are northeasterly or northwesterly and at least some of these are fault lines

of Cretaceous or younger age. Scarps near Moondiepitchnie Hill (southeast of Mount Vivian and west of Wingilpin Bluff) are probably of fault-line origin.

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TABLE 1: STRATIGRAPHY OF THE KINGOONYA 1:250 000 MAP AREA

Age	Rock Unit (Map Symbol)	Lithology	Notes
Cainozoic			
Quaternary			
Pleistocene to Recent	(Qrl)	Pale reddish clay, sand, gravel.	Claypans, swamps, lakes, e.g. Lake Wingilpin. Partly of aeolian origin.
	(Qra)	Gravel, sand, clay; pale reddish, very pale brown.	Stream-channel alluvium.
	(Qrt)	Brownish silcrete-fragment and ferruginous gravel, sand, silt, reddish clay.	Colluvium or slope detritus, often with striped gilgai pattern. Often underlain by calcrete, "Illeroo Pedoderm".
	(Qpt)	Dark reddish brown silcrete-fragment and ferruginous gravel.	Remnant sheets of an older (usually darker) gravel. Eroded to give Qrt.
	(Qrn)	Reddish sandy soil.	Soils lacking coarse gravel, not classified with Qrs.
	(Qrs)	Reddish quartz sands; minor calcrete, silcrete, "Illeroo Pedoderm".	Generally with longitudinal aeolian sand ridges indicating transport toward ESE, e.g. southern Wingilpin sheet.
	(Qpy)	Pale brownish and greenish sandy claystone.	Capped by white gypsum at Woolnomulla Bluff. Possibly equivalent to Avondale Clay (Pleistocene).
Tertiary			
?Oligocene or ?Miocene	(Tmd)	White dolomite rock and sometimes underlying white dolomitic clay and greenish and greyish claystone.	?Etadunna Formation: Millers Creek Dolomite Member and Billa Kalina Clay Member (Jessup and Norris). North of Moodlampnie Hill. ?Lacustrine origin.

?Eocene to Miocene	(Tsi)	Pale grey, yellowish, brownish silcrete (chalcedony); minor reddish-black ferricrete, ferruginised ?silcrete.	Broken remnants of a silicified layer related to an old ground surface; "Naryilco Silcrete".
Mesozoic Cretaceous ?Aptian	?Bulldog Shale (Klb)	White altered flaggy to medium-bedded shale, claystone, siltstone, lithic sandstone.	Originally grey marine shale altered to white kaolinitic rock by deep chemical weathering ("Stuart Pedoderm").
?Neocomian	?Cadna-owie Formation (Klc)	Brownish clayey (pale) or ferruginised (dark) sandstone; pebbly to bouldery sandstone.	Continental to marginal marine beds altered in "Stuart Pedoderm" or younger soil processes.
Palaeozoic Permian		Shale, siltstone, sandstone	Southwest of "Millers Creek", subsurface.
Cambrian	Andamooka Limestone (Є)	Pale brownish and grey limestone.	Partly laminated; some edgewise breccia. Frequently calcreted and forming pale areas between sand dunes SW of "Parakylia".
Proterozoic Adelaidean	Tent Hill Formation (Pw)	Pale brown to grey sandstone, siltstone.	Flaggy and cross-bedded. Some reddish, brownish and greenish sandstone and siltstone. SE part of area, in scarps around clay pans.
Carpentarian	Gawler Range Volcanics (pЄv)	Reddish quartz-feldspar porphyry or fine-grained acid volcanics.	Steeply layered rock, NW margin of Lake Harris. Small exposures in SW part of area.
	?Corunna Conglomerate ?Tarcoola Beds (pЄc)	White or brownish quartzite, conglomerate and diamictite.	Inselbergs of steeply folded sedimentary rocks in SW part of area.
Older Precambrian (Proterozoic-?Archaean)	?Cleve Metamorphics (pЄ)	White quartzite and dark ironstone of Mount Eba; dark iron formations.	SW part of area. Iron formations possibly equivalent to Mt.Christie. Metajaspilite and Wilgena Hill Jaspilite.
	(pЄg)	Granitic rocks.	Margin of map area NW of Lake Harris.

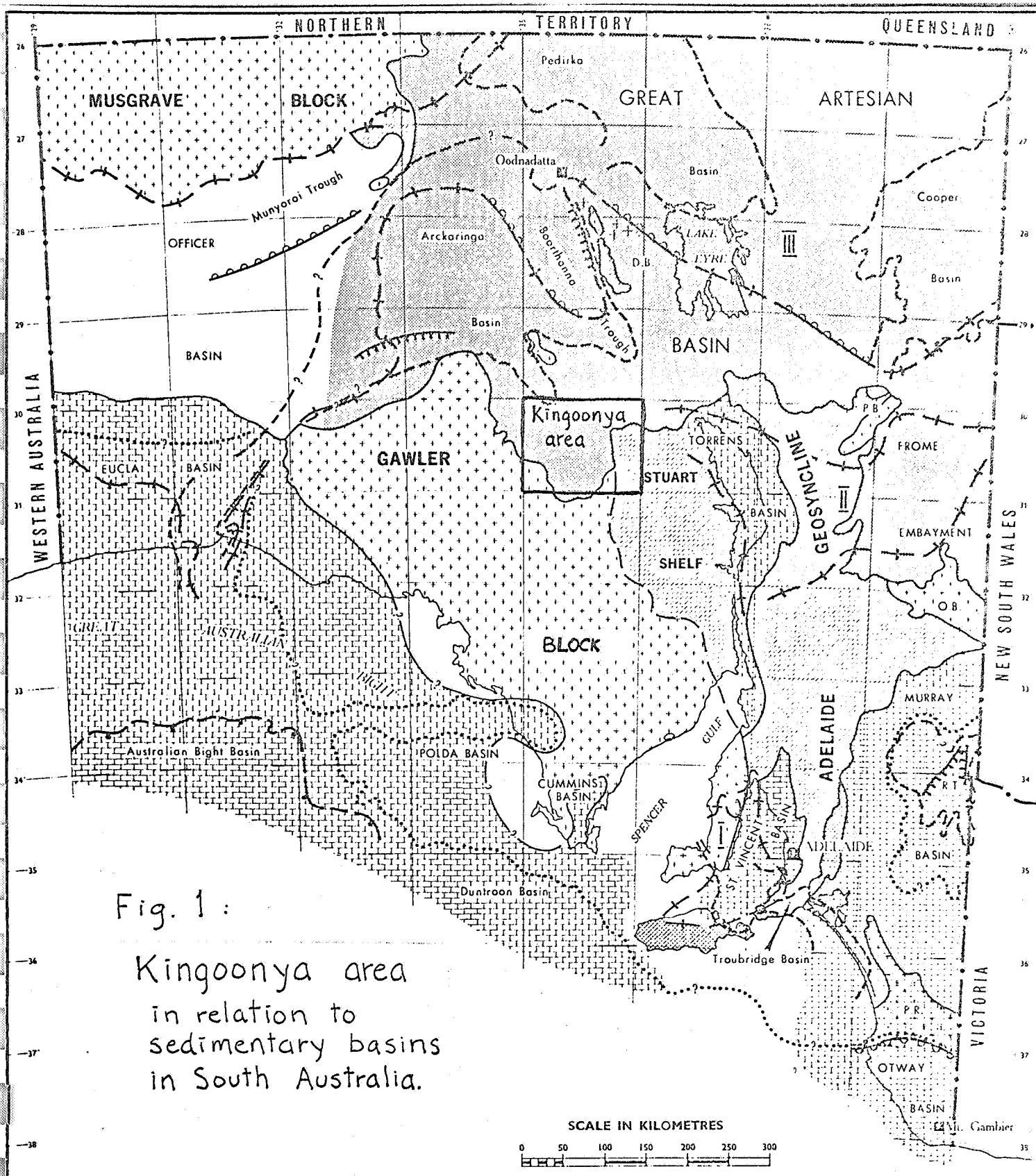

Fig. 1:

Kingoonya area in relation to sedimentary basins in South Australia.

LEGEND

- Tertiory basins (mainly peri-continental)
- Mesozoic cover of Great Artesian Basin (thin Tertiary cover excluded)
- Subsurface boundary of Mesozoic 'infra-basins'
- Approx. northern limit of thick (?)Mesozoic deposits Aust. Bight Basin
- Outline of Permo-Carboniferous basins
- Renmark Trough — R.T.
- Outline of Cambro-Devonian basins (Surface and subsurface)
- Stansbury Basin — I
- Arrowie Basin — II
- Warburton Basin — III
- Kanmantoo-Group (metamorphosed Cambro-Ordovician)
- Adeloideon Sediments (Precambrian)
- Crystalline basement (approx. age as shown)
- Padthaway Ridge (Ol) — P.R.
- Denison Block (P) — D.B.
- Painter Block (P) — P.B.
- Olory Block (P) — O.B.
- Hinge-zone
- Fault

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