Report Book

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DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
REGIONAL SURVEYS DIVISION

1:250 000 GEOLOGICAL SERIES -- EXPLANATORY NOTES

PANDIE PANDIE

SOUTH AUSTRALIA

SHEET SG/54-9 INTERNATIONAL INDEX

by

A. F. WILLIAMS

Rept.Bk.No.73/43
G.S. No. 5050
DM. No. 944/71

14th February, 1973

CONTENTS

FIGURES

TABLES

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EXPLANATORY NOTES FOR THE PANDIE PANDIE 1:250 000 SHEET

ABSTRACT

The Pandie Pandie 1:250 000 map area lies in the most northerly portion of the Great Artesian Basin in South Australia. The western half of the area is covered by the longitudinal dunes of the Simpson Desert while the remainder is covered by Goyder Lagoon - a large flood plain which is part of the Diamantina - Warburton River system, and the northern extremity of the Gason Dome, a gentle anticlinal upwarp in a Mesozoic and Cainozoic rock sequence. Pleistocene clays are the oldest outcropping rocks in the mapped area, but an oil well - Delhi Santos Pandieburra No. 1 (1963) penetrated Tertiary, Mesozoic (including 1 238 m of Cretaceous, 731 m of Jurassic and 61 m of Upper Triassic) and Ordovician (86 m) rocks. No hydrocarbons were detected and the hole was completed as a water bore. Structures in the area trend mainly north-south which is consistent with adjacent areas of the Great Artesian Basin.

INTRODUCTION

The Pandie Pandie map area (hereafter referred to as PANDIE PANDIE) lies in the extreme north of the state between latitudes 26° and 27° south and longitudes 138° and 139°30' east. Its northern boundary is the South Australian - Queensland border. Adjoining sheets are CORDILLO (mapped by the Petroleum Exploration Division - now in drafting stages), GASON (in preparation) to the south, POOLOWANNA (in preparation) to the west and BIRDSVILLE (Olgers, 1964) to the north. The country is used to raise cattle and horses, the only stations being New Alton Downs and Pandie Pandie. There are no towns on PANDIE PANDIE - the nearest being Birdsville about 13 km to the

north across the border. George Farwell's "Land of Mirage" gives an interesting account of the history of the area.

The average rainfall for this area is about 130 mm but this is very irregular. The water supply is either from artesian bores (Delhi Santos Pandieburra No. 1) or permanent water holes along the Diamantina River.

Average temperatures range from 20°C in winter to 35°C in summer.

Vehicle access in the area is good only in the south-east corner of PANDIE PANDIE. Elsewhere, the network of channels of Goyder Lagoon or the long high sandhills makes travelling extremely slow and difficult. The Birdsville Track and other tracks may be impassable for months in times of flood.

Mapping was carried out by Mr. Alex Mond from the Bureau of Mineral Resources in October, 1970, as part of a joint programme of the Bureau and the South Australian Department of Mines for the mapping of PANDIE PANDIE and an adjoining sheet, GASON. Air photographs (RC9) at a nominal scale of 1:85 000 (provided by the South Australian Department of Lands) gave complete coverage of the area. Map compilation was carried out by Mond, the author and the Cartographic Section, South Australian Department of Mines. Shallow stratigraphic drilling was carried out in conjunction with the regional geological mapping using the Fox Mobile B40L drilling rig operated by the Bureau of Mineral Resources. Three holes (16.8, 70.1, 70.1 m deep respectively) were drilled to obtain lithological and wireline logging information because of lack of exposure and bore details on the map area. Cuttings were taken at 1.5 m intervals while drilling with air and at 3 m intervals while drilling with mud or water as a circulating fluid. A summary of the drilling is given by Mond (1972)

PREVIOUS WORK

Earliest explorers on PANDIE PANDIE included Sturt (1849), Lewis (1875), Winnecke (1884) and Lindsay (1899). Sturt passed through Goyder Lagoon on his way to find the "inland sea" supposed to exist in the centre of Australia.

He gave very unfavourable accounts of the area. Lewis traverses the shores of Lake Eyre and the Warburton River, Winnecke travelled from the Kallakoopah-Warburton junction to what is now Poeppel Corner and thence on into Queensland. Lindsay led an expedition across the Simpson Desert to Poeppel Corner, returning along the same path to Dalhousie Station. Brown (1884) visited the Pandie Pandie sheet area in 1883, briefly commenting on the geology. The first to actually cross the Desert was E.A. Colson (1936) who, together with a black boy and 5 camels went from Blood's Creek to Birdsville and back in the winter of 1936. All explorers reported endless ridges of high sand hills and flat monotonous gibber plains (e.g. Sturt's Stony Desert).

The first scientific study of the Simpson Desert was by Madigan and colleagues who crossed it in 1939. Their reports (Madigan 1945, 1946; Crocker, 1946; Carrol, 1944) covered the geology and physiography of the desert (their actual crossing was about 150 km north of the border but they passed through Pandie Pandie homestead on their way back to Marree).

Other literature relevant to PANDIE PANDIE includes that by Sprigg (1958a, 1958b, 1961, 1963) who discussed the geology of the Great Artesian Basin with reference to its petroleum potential. The geomorphological history of the area is discussed by Wopfner and Twidale (1967). Wopfner (1960-1973) has described other aspects of the geology of the Great Artesian Basin which apply to the sheet area. Geophysical work commenced in the late fifties and early sixties (by both private companies and by the seismic section of the South Australian Department of Mines) and this led to the drilling of Delhi Santos Pandieburra No. 1 (hereafter Pandieburra 1) in 1963. At the time of writing of these notes, aeromagnetic and gravity contour maps covering each 1:250 000 sheet area in South Australia were being prepared by the Petroleum Exploration Division, S.A. Department of Mines (B. Milton, pers. comm., 1971). Structural contour maps of seismic reflectors in the subsurface of PANDIE PANDIE are available ("Z

horizon, Hall, 1968; "P" horizon, Krieg, 1967; "C" horizon, Freytag and Brownhill, 1963; revised 1964 by Freytag, in 1966, 1968 by Townsend and in 1972 by Stadter).

Gregory (1970) photointerpreted PANDIE PANDIE and Grant (1970) of the CSIRO carried out a terrain study for the Highways Department on the four sheets between Marree and Birdsville - namely MARREE, KOPPERAMANNA, GASON and PANDIE PANDIE.

PHYSIOGRAPHY

PANDIE PANDIE may be split into three broad physiographic zones, the gibber plains, the floodplains and the desert.

The south east corner of PANDIE PANDIE consists of a very flat, low lying gibber plain (probably less than 30 m above sea level), the most northerly part of the Gason Dome. Surface relief is negligible except for a few small seif dunes. Streams are ephemeral and either run off the northern end of the Gason Dome into Goyder Lagoon or into swamps and claypans on the Dome itself. Vegetation consists of sandhill canegrass (Zgyochloa paradoxa (R. Br.) S.T. Blake), saltbush (Atriplex sp.), mulga (Acacia aneura FvM. ex Benth) and coolabahs (Eucalyptus microtheca FvM.) in the creeks.

South of Birdsville, the Diamantina flows out into a large floodplain, Goyder Lagoon, a very flat area characterized by an intricate pattern of braided channels and meanders. It then flows out of the Lagoon into the more confined Warburton River System. Goyder Lagoon is usually partially inundated every year but only after exceptional rains in central and western Queensland will it become a true lagoon and then floodwaters enter the Warburton and flow on to Lake Eyre (Bonython, 1963). Such was the case in March-July, 1971. Vegetation in this area includes coolabahs, small acacia, lignum (Meuhlenbeckia cunninghamii (Meis.) FvM), sandhill canegrass and saltbush.

The majority of PANDIE PANDIE is covered by the north northwesterly trending sand dunes of the Simpson Desert. These rarely exceed 30 metres in height and are usually steeper on the eastern side. They cover an extensive ancient floodplain. Traces of old infilled channels can be seen in the interdunal corridors far from the present day river courses. On the western side of PANDIE PANDIE playas occur in the interdunal spaces. These are moist saline areas which rarely contain any surface water. Vegetation comprises canegrass and saltbush which occurs both on the lower slopes of the dunes (the upper portions are mobile) and in the interdunal flats together with gidgee (Acacia cambagei R.T. Baker), needlebush (Hakea leucoptera R. Br.) and small mulga (Acacia aneura FvM. ex Benth).

After heavy rains, the whole country supports a rich flora of grasses and small bushes including nardoo (Marsilea drummondii A. Br.), spear grass (Stipa sp), mitchell grass (Astrebla pectinata (Lindl) FvM ex Benth), buckbush (Salsola kali L.) and hopbush (Rumex vesicarius L.).

STRATIGRAPHY

PANDIE PANDIE is completely covered by Quaternary deposits. The oldest of these are the Pleistocene fluviatile deposits which outcrop around the edges of salt lakes on the western side of the map area. However, Pandieburra 1 (see Table IV) intersected rocks of Tertiary (100 m), Cretaceous (1 258 m), Jurassic (731 m), Upper Triassic (61 m) and Ordovician (86 m) age. Delhi Santos Putamurdie No. 1 (hereafter Putamurdie 1) drilled 70 km northeast of Pandieburra 1 on CORDILLO, intersected a similar sequence. A summary of the stratigraphy appears on Tables I and II. Table III shows nomenclature and correlation of part of the Mesozoic in the subsurface below and adjacent to PANDIE PANDIE. This is discussed later in the text.

TABLE IV

Formation tops and thicknesses Pandieburra No. 1 - K.B. 35.66 m (see nomenclature and correlation chart - Table III).

FORMATION	TOP (METRES)	THICKNESS (METRES)
Recent to Tertiary	0	100.6
Winton Formation	100.6	592.9
Oodnadatta Formation	693.5	388.5
Wooldridge Limestone Member	1055.2	6.7
Bulldog Shale	1082 (approx.)	217 (approx.)
Cadna-owie Formation	1272.3	59.7
Algebuckina Sandstone	1331.9	207.3
Birkhead Formation	1539.2	92.0
Hutton Sandstone	1031.2	432.2
Unnamed Upper Triassic	2063.5	60.9
Ordovician	2124.4	86.3
Total Depth		2210.7

The three shallow stratigraphic holes, (BMR Pandie Pandie 1, 2 and 3 - Mond, 1972) drilled by the Bureau, penetrated clayey soils with minor gypsum in the upper metre or so, then fine to medium grained, white, quartz sandstones which were silicified in part (usually at the upper levels) and bottomed in mottled grey and yellow, well weathered mudstone and kaolinitic sandstone. The lowest unit is weathered Winton Formation. The middle unit is a Tertiary fluviatile sandstone which is probably a finer grained facies equivalent of the Eyre Formation on the INNAMINCKA 1:250 000 sheet (Wopfner et al., 1973). The uppermost unit, the clayey gypsiferous soil, may be a remnant of the gypsite profile, a Pleistocene weathering profile characterized by a massive gypsum crust, an intermediate mottled zone and a basal ferruginous zone (Wopfner and Twidale, 1967).

The exposed stratigraphy on PANDIE PANDIE consists of unnamed fluviatile sediments in the southwest corner, a Pleistocene to Recent soil unit (mantled by silcrete gibbers), and Recent sand spread, creek and lake alluvium. Late Tertiary to Pleistocene fluviatile deposits are present beneath the dunes of the Simpson Desert because traces of old infilled channels and meanders can be seen in the inter-dunal flats in the southwest part of PANDIE PANDIE. There are few outcrops of these sediments on the map area but they are amply exposed on surrounding sheets such as POOLOWANNA, NOOLYEANA and GASON.

The dunes on PANDIE PANDIE are composed of fine to medium grained quartz sand which varies in colour from white in the vicinity of Goyder Lagoon to orange-brown away from these areas. The dunes are longitudinal, trending roughly north-northwesterly. Their heights may reach 30 m. Dune frequency decreases from about 5 per kilometre on the west side to 2 to 3 per kilometre on the east side of the sheet. The origin of the dunes is disputed. Wopfner and Twidale (1967) believe them to have been derived from alluvium deposited in the vicinity of Lake Eyre in Late Pleistocene to Recent times. They consider "the alluvium was deposited by various rivers on flood plains, flood outs and playas and subsequently picked up by the wind and carried in suspension and by saltation to the north of the source areas". However King (1960) considers "that a channelling action, accompanied by shepherding of loose sand has been the principal element repsonsible for the evolution of the corrugated desert landscape". Folk (1971a, b) also attributes a similar mechanism for dune formation although his observations are confined to a small area on the extreme western margin of the desert. Others to have discussed the dunes of the Simpson Desert include Carrol (1944), Crocker (1946b) and Madigan (1930-46).

Nomenclature and correlation of part of the Mesozoic on PANDIE PANDIE and surrounding areas

During the course of regional mapping and hydrocarbon exploration in the southwestern portion of the Great Artesian Basin, a number of stratigraphic nomenclatures have been applied to the Cretaceous and Jurassic geology. Discussion

of the correlation of these various nomenclatures is considered beyond the scope of these notes and the reader is referred to previous writers for any such comments (see Whitehouse, 1954; Day, 1964; Exon, 1966; Vine et al., 1967; Nugent, 1969; Wopfner - in Parkin, 1969; Exon and Vine, 1970 ; Wopfner et al., 1970).

Different nomenclatures have been used by the Bureau of Mineral Resources in western Queensland, the oil companies in the Cooper Basin (see locality map) and the South Australian Department of Mines in northern South Australia. Some of these are shown in table III together with a modified subdivision of part of the Mesozoic in Pandieburra 1. The table is based on Fig. 65 by Wopfner (in Parkin, 1969).

The most recent nomenclature used by the Bureau of Mineral Resources in Queensland is that shown on BARROLKA (Senior, 1970). That on the BIRDSVILLE has been amended since more subsurface information is known now than at the time of publication of the explanatory notes (Olgers, 1964). The nomenclature on BEDOURIE (Reynolds, 1968) and BETOOTA (Jauncey, 1965) is similar to BIRDSVILLE.

Subdivision used for Pandieburra 1 is in part derived from the Queensland terminology as used by Nugent (1969) in the Cooper Basin. There is one alteration however, the term Mooga Formation is discarded and the term Algebuckina Sandstone used in preference due to confusion over the misuse of the former term (see Wopfner in Parkin, 1969). The rest, except for the term Winton Formation, is derived from the Oodnadatta area (Freytag, 1966; Wopfner et al., 1970) where these formations have been mapped on the surface. All are traceable in the subsurface using geophysical logs. However, it is not known whether the so called "Fish-scale zone" in Pandieburra 1 is equivalent to the Wooldridge Limestone.

STRUCTURE

The subsurface structure on PANDIE PANDIE consists of relatively flat lying Mesozoic and Cainozoic sediments overlying older folded rocks. These older folded rocks, probably Palaeozoic in age, form a ridge which separates the Pedirka and Cooper Basins (for boundaries see fig. 1) both of which contain Permian sediments. Bouguer gravity contours (S.A. Dept. Mines, Dwg. 71-684A; also fig. 2) show a gravity high over the ridge. This feature is part of a gravity high named the Noolyeana Gravity Swell by Wongela (1964) which they consider to be probably due to density contrasts between basement rock and higher density rocks intruded into it.

Depth to magnetic basement contours (fig. 2 - after Laherrere and Drayton, 1965) show a magnetic low on central PANDIE PANDIE. Demaison (1970) interprets this as being due to presence of a Lower Palaeozoic trough. This is supported by presence of folded Ordovician rocks which were intersected in Pandieburra 1 and Putamurdie 1. This figure also shows several possible faults on the map area, all with a north-northwest to north-northeast trend which is consistent with trends elsewhere in the vicinity of the map area (fig. 2).

Geophysical work throughout the Great Artesian Basin has enabled compilation of structural contour maps of certain seismic reflectors. These include the "Z" horizon (Hall, 1968), the "P" horizon (Krieg, 1967) and the "C" horizon (Stadter, 1972). The "Z" horizon is largely the pre-Permian angular unconformity. On PANDIE PANDIE however, it is doubtful whether any Permian exists and this horizon probably represents the unconformity between the folded Lower Palaeozoic and flat lying Triassic and Jurassic sediments (Hall op. cit). The "Z" horizon shows the Mesozoic sequence thickening to the west.

The "P" horizon which approximates the top of the Permian (Krieg, 1967) in the Cooper and Pedirka Basins is equivalent to the "Z" horizon on the map area. The "P" and "Z" horizon contours have been recently updated by the Petroleum Exploration Division (Thornton and Ramakrishna personal communication, S.A.D.M., 1972).

Of interest on PANDIE PANDIE are thin Upper Triassic sediments intersected in Pandieburra 1. Wopfner (in Parkin, 1969) considers these and similar sediments in Putamurdie 1 to have widespread subsurface distribution in a structural low area in the vicinity of Goyder Lagoon.

The "C" horizon in the Great Artesian Basin represents a reflection coming from within the Cadna-owie Formation (Townsend, 1968; Stadter, 1972). It can be approximated to the base of the Cretaceous. Contours of the "C" horizon (see tectonic sketch) show the Cretaceous sediments to be part of the east limb of a large basinal structure with its axis probably running northwards through central POOLOWANNA. Thicknesses increase westwards.

The northern flank of the Gason Dome, a gentle anticlinal structure in the Mesozoic sediments, extends slightly on to the map area. A number of folds occur in the vicinity of Pandieburra 1 which was drilled on a closed structure at the intersection of two major anticlinal axes.

Surface expression of the Dome on PANDIE PANDIE is displayed by the gentle dip of Cainozoic sediments under the younger Pleistocene and Recent sediments of the Simpson Desert. Surface elevations show a slight lowering westwards.

GEOLOGICAL HISTORY

(mainly after Wopfner, 1969, 1970 and Wopfner and Twidale, 1967)

Deposition, burial, diagenesis and uplift of Lower Palaeozoic rocks are the earliest geological events recorded on PANDIE PANDIE. The area was probably a structural high in Lower Permian times. Glaciation, syndepositional epeirogenic uplifts and faulting took place with development of Permian grabens and the Cooper and Pedirka Basin (Nappamerrie Formation - Martin, 1967), to the southeast and west of the map area. Negative movements in Upper Triassic times resulted in some deposition in the structurally low area around Goyder Lagoon.

During the Jurassic, deposition took place under terrestrial fresh water conditions which continued until Cretaceous times when a marine transgression influenced events in the Great Artesian Basin. Stable basin conditions then followed

and finally a gradual regression resulted in non-marine deposition (Winton Formation) in late Albian and Cenomanian times (Wopfner, in Parkin, 1969; Harris, 1971). After burial and diagenesis, gentle folding and uplift exposed the upper portions of the Winton Formation to weathering and erosion. Sedimentation became restricted to occasional fluviatile deposits such as the Mount Howie Sandstone (Wopfner, 1963) which is exposed on GASON and later early Tertiary channel and flood plain deposits. Weathering took place during these times involving silicification, ferruginization and kaolinization of these exposed sediments.

Continued broad folding of the Mesozoic and Tertiary rocks gave rise to structural highs and lows in this part of the basin. Fluviatile deposition continued from Late Tertiary to Pleistocene times in the lows.

During the Pleistocene the climate became arid with the subsequent development of a gypsiferous soil profile. This period of aridity has continued to the present with the formation of red soils, development of an extensive dune system and deflation which formed the playas.

ECONOMIC GEOLOGY

Hydrogeology

PANDIE PANDIE has an intermittent and unreliable rainfall and the cattle stations in the area must rely on permanent water holes and artesian bores for their source of water. According to local report the Diamantina usually flows into Goyder Lagoon once a year and replenishes the various water holes including Andrewilla waterhole near New Alton Downs Station.

There is one artesian bore on PANDIE PANDIE, Pandieburra 1 (total depth 2 210 m). The casing has been fractured at 1 393 m in the Upper Jurassic Sandstone aquifer (Algebuckina Sandstone, Hooray Sandstone equivalents). The rate of flow is about 2.05 million litres per day of good quality water with a salinity of 530 ppm. Temperature of the water at the bore head is about 95°C. Lower to Upper Cretaceous shales and siltstones form the aquiclude over the porous beds. Intake to the aquifers occurs in eastern Queensland and New South Wales. Dissolved salt in the artesian water is mainly carbonate as compared with waters west of Lake Eyre which are sulphate bearing. The carbonate is thought to have been derived

from limestones, dolomites and basalts on the eastern margins of the Great Artesian Basin (Ker, 1963).

Subartesian water was obtained in a few wells and bores in the vicinity of Old Alton Downs Station. Aquifers here were presumably Pleistocene fluviatile sands. Most have been abandoned due to their excess salinity and unreliability.

Petroleum

Pandieburra 1 is the only oil well drilled on PANDIE PANDIE. It was abandoned at 2 210 m in Ordovician orthoquartzites and cased off as an artesian bore. Faint traces of fluorescence were observed in the Upper Triassic sediments but these were of no economic importance.

A.F. WILLIAMS
GEOLOGIST

AFW:FdeA
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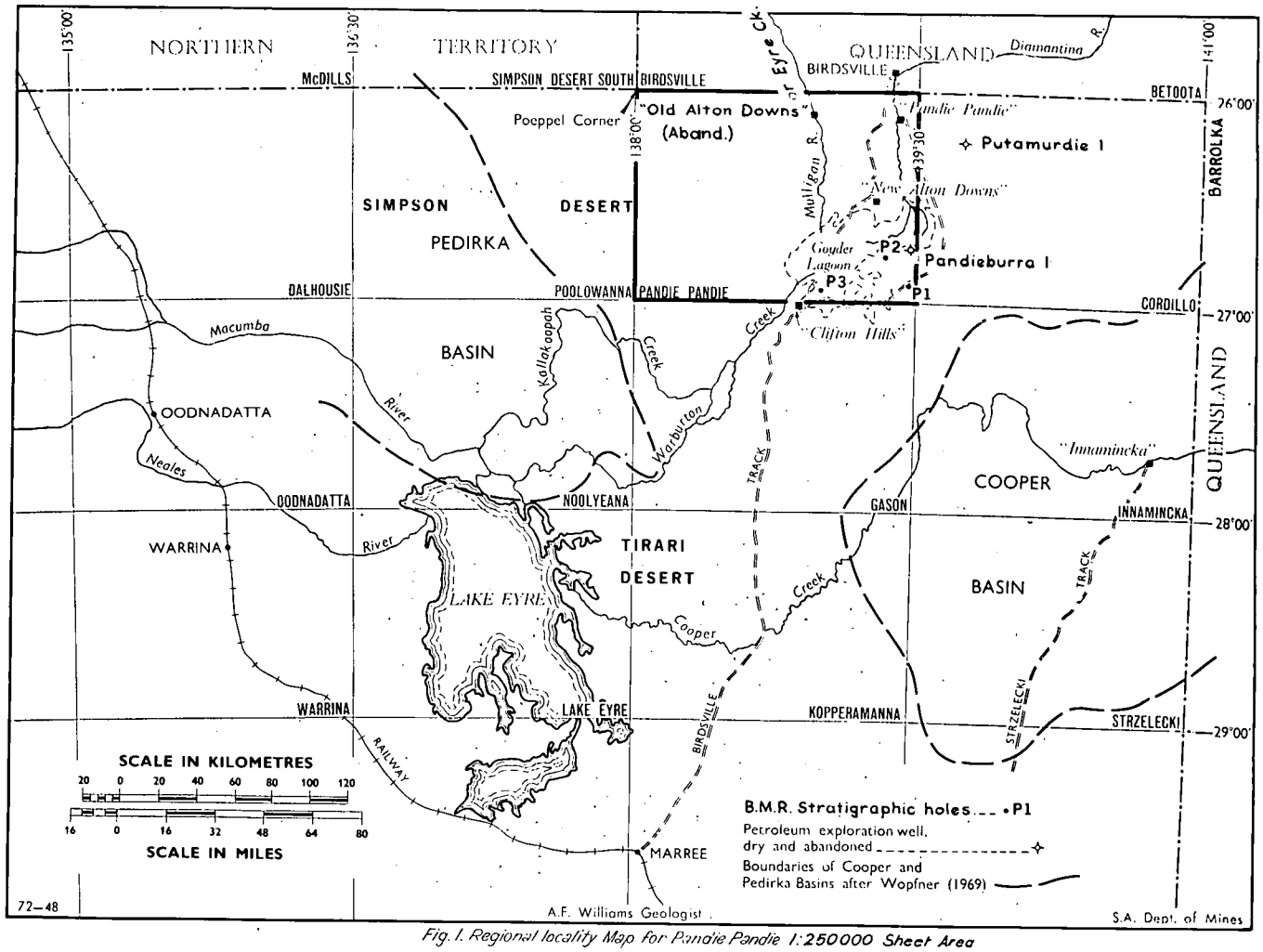
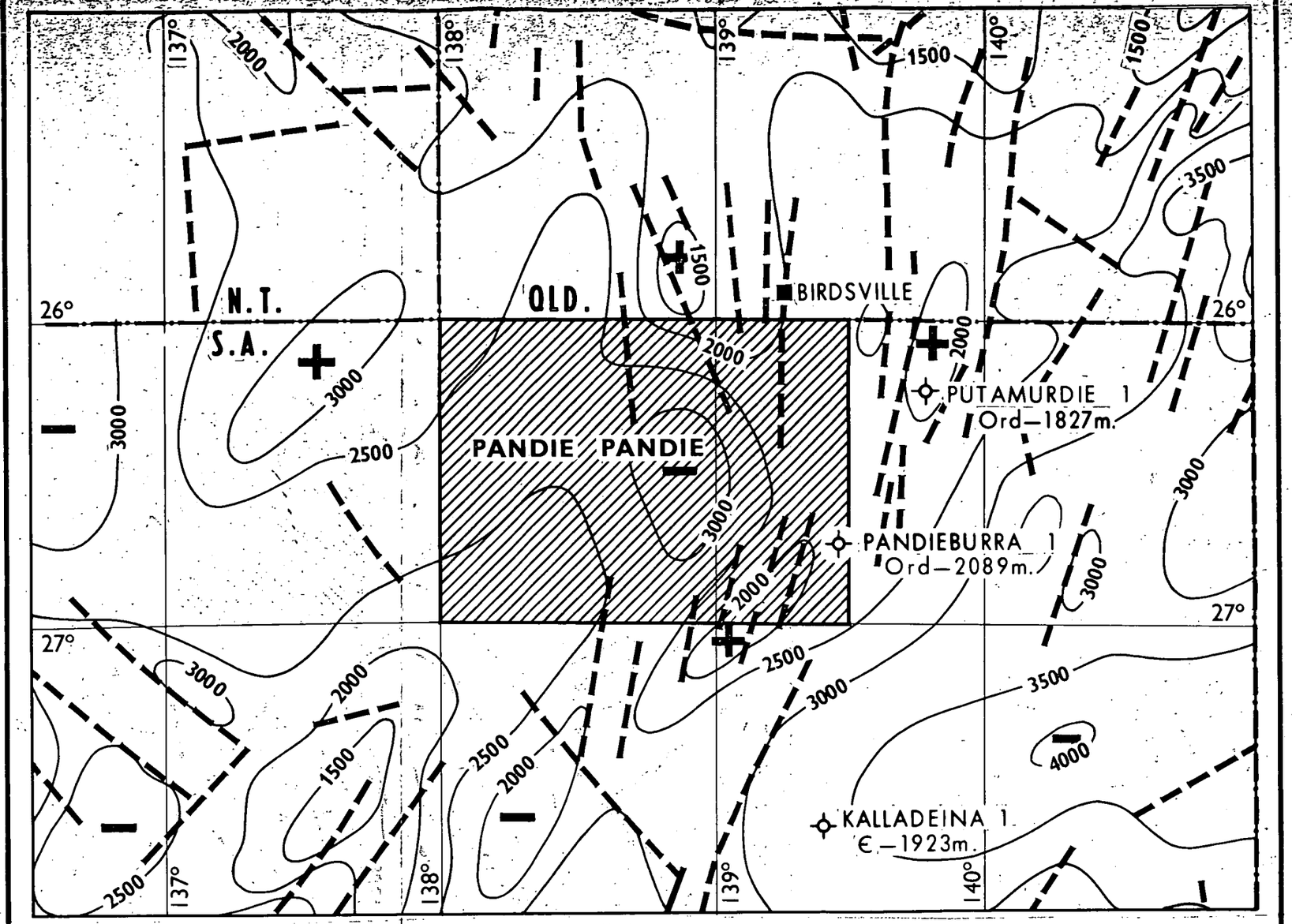
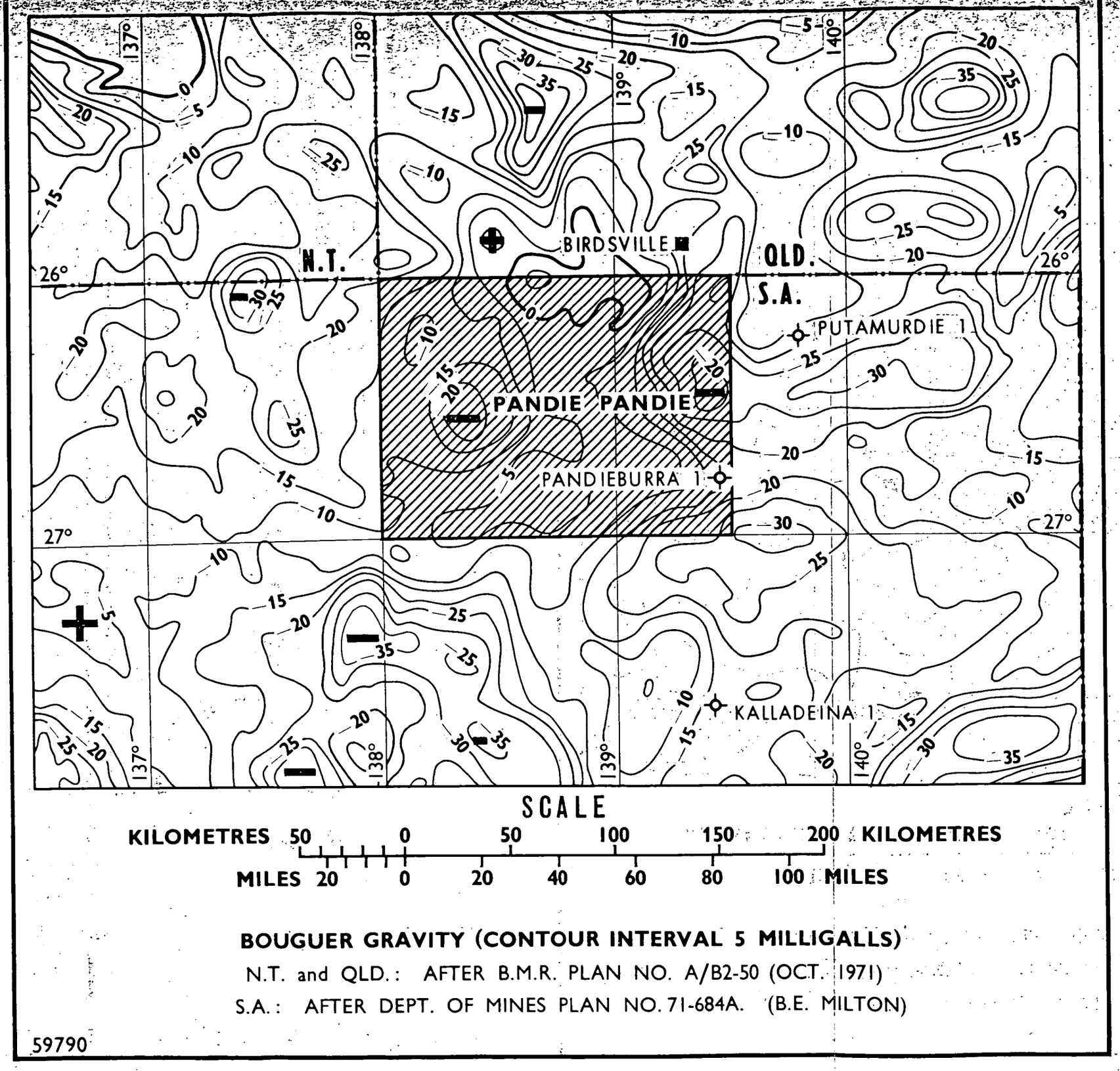


Fig. 1. Regional locality Map for Pandie Pandie 1:250000 Sheet Area



MAP OF PANDIE PANDIE AND SURROUNDING AREAS SHOWING DEPTH TO MAGNETIC BASEMENT FIG 2

J.R. 5



MAP OF PANDIE PANDIE AND SURROUNDING AREAS SHOWING PRELIMINARY BOUGUER ANOMALY CONTOURS FIG 3

TABLE I - Surface Stratigraphy

AGE	ROCK UNIT	MAP SYMBOL	THICKNESS (METRES)	LITHOLOGY	REMARKS
CAINOZOIC / QUATERNARY / Recent	Lake)))alluvium)	Qrl	0.1 - 5+	Fine, orange to brown, clayey sands and grey, silty clays containing salt and gypsum in playas and claypans.	
	Creek)	Qra		Grey, sandy clays and clayey sands of main creek (Goyder Lagoon - Diamantina River) - clays, gravels and sands of the lesser creeks and brown sandy and silty clays of the flood plains and swamps. Thin veneers of aeolian sand.	May include Tingana clay.
Pleistocene to Recent	Aeolian sand	Qrs	2 - 30	Sand of the Simpson Desert; orange brown, fine to medium grained quartz sand of subparallel seif dunes and sand spreads. Sand clayey towards base with organic remains and carbonate infilled root cavities. Clayey sand of inter-dunal flats.	White to light yellow in the vicinity of Goyder Lagoon and Eyre Creek (Wopfner and Twidale, 1967). Some older material possibly Pleistocene, included in this unit. May be equivalent to Simpson Sand (Firman, 1970).
	Gibber alluvium	Qrt	1+	Pale brown to red brown sandy clay containing gypsum reworked from older deposits and mantled by a layer of gibbers usually of silcrete provenance.	May include Callabonna Clay (Firman, 1970).
TERTIARY / Plio-Pleistocene	Unnamed fluvial deposits	Qps	5+	Channel sands and clays with vertebrate remains - gypsified at top. Not visited on map area.	Well exposed on GASON and other sheet areas. Possibly equivalent in part to Katipiri Sand and Tirari Formation. Old channel meanders exposed in inter-dunal corridors.

AGE	ROCK UNIT	MAP SYMBOL	THICKNESS (METRES)	LITHOLOGY	REMARKS
MESOZOIC JURASSIC Upper	Algebuckina Sandstone equivalent	Jua	70+	Light coloured, medium to coarse, poorly sorted, angular to subrounded, clear quartz sandstone and minor shale.	The Jurassic sequence set out here is derived from Nugent (1969) with the one alteration; Algebuckina Sandstone is used in preference to Mooga Sandstone, a term which has been loosely used (Wopfner in Parkin, 1969) Further west of Pandieburra 1, Nugent (op cit) does not recognize the Westbourne and Birkhead Formations presumably because of facies changes and for simplicity on the map legend, the Jurassic sequence is left undifferentiated. Table III shows correlations and nomenclatures relevant to the map area.
	Westbourne Formation equivalent	"	30+	Medium grey, micaceous, carbonaceous, pyritic siltstones and fissile shale.	
	Adori Sandstone equivalent	"	104+	Similar to Algebuckina. Clean, angular to sub-angular, porous quartz sandstones and minor shales.	
Lower Middle	Birkhead Formation	"	92+	Interbedded, light grey to brown, fine to medium grained, subangular, poorly sorted, quartz sandstone and dark grey to brown, silty micaceous and very carbonaceous shale.	
	Hutton Sandstone equivalent	"	432+	Light coloured, fine to very coarse, subangular to sub-rounded, quartz sandstone in upper portion with sandstone and interbedded dark grey, carbonaceous shale and thin coal beds in lower portion.	
TRIASSIC Upper	Unnamed	TR	61	Fine grained, grey to white, angular to subrounded, hard, quartz sandstone with silica and kaolin cement and rare irregular partings of dark grey shale.	Also found in Putamurdie 1 on CORDILLO.
PALAEOZOIC ORDOVICIAN	Unnamed	O	86+	Dark grey, fine to medium grained orthoquartzite.	Economic basement in Pandieburra 1.

TABLE II - Subsurface Stratigraphy

(Pre-Winton units were intersected in Pandieburra 1 only)

AGE	ROCK UNIT	MAP SYMBOL	THICKNESS (METRES)	LITHOLOGY	REMARKS
CAINOZOIC TERTIARY Paleocene to Eocene	Eyre Formation	Tee	10 - 50+	Partially silicified, white, fine to medium grained, quartz sandstone and grey claystone with chalcedonic and opaline cement.	Recorded from BMR stratigraphic holes and Pandieburra 1.
Cenomanian	Winton Formation	Kw	593	Interbedded, feldspathic, fine to coarse, angular (or sub-angular), poorly sorted, carbonaceous and cross-bedded sandstone and lignitic shale. Chemically altered at the top.	" "
MESOZOIC CRETACEOUS	Oodnadatta Formation	Klo	388	Grey, fissile, fossiliferous shales minor bands of grey to brown, micro-crystalline limestones and thin feldspathic sandstones near the top. Fish scale zone near base.	Coorikiana Sandstone Member (Freytag, 1966) of the Oodnadatta Formation which marks the base of the Formation is not recognizable on the geophysical logs of Pandieburra 1. It is probably a shaly facies. See Table III. Fish scale zone may be equivalent to Wooldridge Limestone of Oodnadatta Formation and Toolebuc Limestone in Queensland.
Neocomian	Bulldog Shale	Klb	217	Grey micaceous shale, minor interbeds of grey, green, fine to medium grained angular to subangular sandstone. Pelecypod fragments throughout.	
	Cadna-owie Formation	Klc	60	White to light grey, medium to coarse grained, subrounded quartz sandstone and dark grey shale.	Aquifer - though not as important as the Jurassic

			OODNADATTA 1:250000 SHEET AREA SOUTH AUSTRALIA	COOPER BASIN SOUTH AUSTRALIA, QUEENSLAND	PANDIEBURRA 1 SOUTH AUSTRALIA	BIRDSVILLE 1:250000 SHEET AREA QUEENSLAND	BARROLKA 1:250000 SHEET AREA QUEENSLAND
			Wopfner et. al., 1970 (J-K) and Freytag, 1966 (K)	Nugent 1969 (J) and Delhi Santos Well Reports (K)	As used in these notes	Olgers 1964	Senior 1970
CRETACEOUS	Cenomanian	GROUP	Winton Formation	Winton Formation	Winton Formation	Winton Formation	Winton Formation
						Mackunda Formation	Mackunda Formation
		RIVER	Mount Alexander Sandstone M. / Oodnadatta Formation	Tambo Formation	Oodnadatta Formation	Wilgunya Formation	Allaru Mudstone
			Wooldridge Limestone M		Wooldridge Limestone M ?	Toolebuc Member	Toolebuc Limestone
			Coorikiana Sandstone M				
	Neocomian	NEALES	Bulldog Shale	Roma Formation	Bulldog Shale		Wallumbilla Formation
			Mount Anna Sandstone Member / Cadna-owie Formation	Transition Beds	Cadna-owie Formation	Longsight Sandstone	Hooray Sandstone
JURASSIC	Upper		Algebuckina Sandstone	Mooga Formation	Algebuckina Sandstone	? ?	
				Westbourne Formation	Westbourne Formation	No information	Westbourne Formation
				Adori Sandstone	Adori Sandstone		Adori Sandstone
	Middle		No deposition	Birkhead Formation	Birkhead Formation		Birkhead Formation
	Lower			Hutton Sandstone	Hutton Sandstone		Hutton Sandstone

ROLLING DOWNS GROUP (Barrolka: Winton Formation, Mackunda Formation, Allaru Mudstone, Toolebuc Limestone, Wallumbilla Formation)

INJUNE CREEK GROUP (Barrolka: Westbourne Formation, Adori Sandstone, Birkhead Formation)

Table 3 Jurassic and Cretaceous Nomenclature and Correlation, PANDIE PANDIE and surrounding areas