DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

EXPLANATORY NOTES FOR THE POOLOWANNA 1:250 000 MAP SHEET

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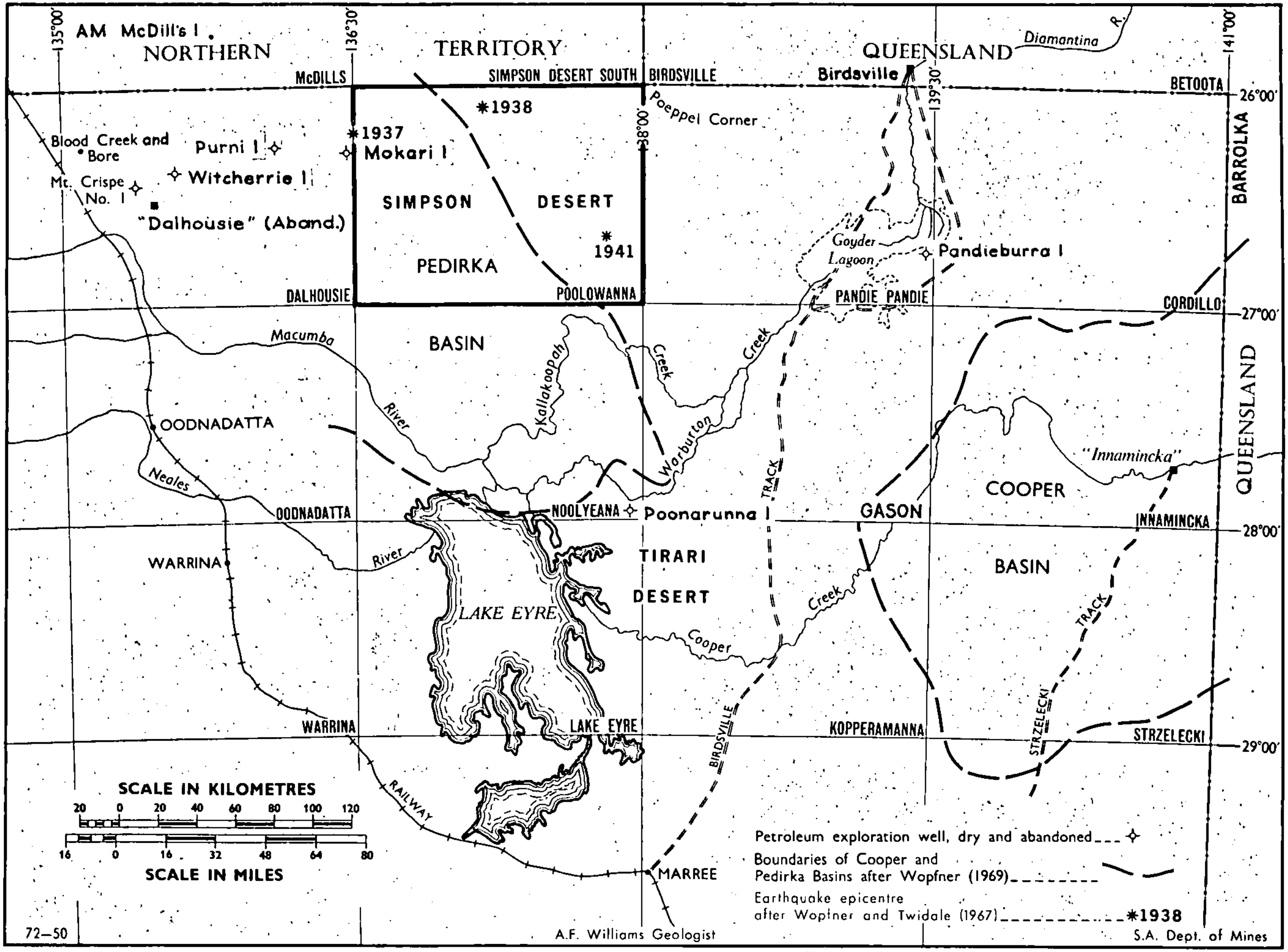

Fig. 1. Regional locality Map for Poolowanna 1:250000 Sheet Area

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ABSTRACT

The POOLOWANNA 1:250 000 sheet area is about 1 000 km north of Adelaide in the extreme north of the South Australian part of the Great Artesian Basin. The area mapped is covered by the Simpson Desert. The oldest exposed sediments are unnamed Pleistocene fluviatile sediments outcropping on the eastern side of the area. French Petroleum Company (Australia) Mokari 1 drilled a few km west on DALHOUSIE intersected Tertiary (159 m), Cretaceous (1 076 m), Jurassic (563 m), Permian (451 m) and (?)Ordovician (132 m) rocks. The only other sediments on POOLOWANNA are the Recent dune and salina deposits.

Aeromagnetic gravity and seismic surveys were carried out on the map area in the early sixties for the purpose of oil exploration but no drilling was undertaken. These surveys indicated approximate north-south structural trends similar to those in the Pedirka Basin to the west and south.

INTRODUCTION

The POOLOWANNA 1:250 000 map area (hereafter referred to as POOLOWANNA) lies in the most northerly portions of the state, between latitudes 26° and 27°S and longitudes 136°30' and 138°E. Its northern boundary is the South Australian - Northern Territory border. Adjacent map sheets are shown on Fig. 1.

The map area is completely uninhabited and would include some of the most desolate and inhospitable country in Australia. It is covered entirely by sand dunes and salinas. There are no pastoral leases on the area. Portion is now a national park. The nearest towns are Birdsville and Oodnadatta; both are 100 km from the map area. Easiest access is by way of a seismic track from Dalhousie Ruins to Poeppel Corner. This track is now used by tourists.

The average rainfall on POOLOWANNA is less than 130 mm and average maximum temperatures range from 20° in winter to 35°C in summer (Charlotte Waters, Marree records - Commonwealth Bureau of Meteorology, Adelaide). However, summer maxima may reach 55°C.

Southeast POOLOWANNA was visited by G. Krieg in June, 1971 during a helicopter mapping survey of the Lake Eyre, Simpson Desert and Dalhousie areas when most outcrops of Pleistocene rocks on the map area were examined. RC 9 photography at a scale of 1:84 600 was available for mapping purposes from the South Australian Department of Lands.

PREVIOUS WORK

Part of the map area was first explored by Lindsay (1889) in 1885 who travelled from Dalhousie Station to what is now Poeppel Corner and back. Winnecke (1884) had previously journeyed through GASON and PANDIE PANDIE to Poeppel Corner and then on into Queensland. The first actual crossing of the desert was by Colson (1936) who, in 1936, traversed along the South Australian - Northern Territory border from Blood's Creek to Birdsville, returning slightly south of that route. He noted only "endless sand ridges and occasional salt lakes". Madigan, after making aerial flights across the desert in 1929, crossed it to the north of POOLOWANNA with a scientific team in 1939. He named it the Simpson Desert (see Madigan, 1930b to 1946; Crocker, 1946a; Carrol, 1944).

With the advent of oil exploration in the Great Artesian Basin in the late fifties and early sixties, Santos took up O.E.L. 20 and 21 (now P.E.L. 5 and 6) which included POOLOWANNA, and later formed a partnership with Delhi International Oil Corporation. Gravity and aeromagnetic surveys were carried out in the initial stages of exploration prior to the signing of a farmout agreement with the French Petroleum Company (Australia) (hereafter referred to as FPC(A), now Total Exploration Australia P.L.). FPC(A) included the NW areas of the sheet in their Poolowanna Seismic Survey (Drayton, 1967) and ceased work in the area in 1966 after drilling four dry wells to the west. At this time, mapping was carried out throughout the western Great Artesian Basin by company geologists (Santos, FPC(A)). Dr. H. Wopfner (formerly S.A.D.M., now Professor of Applied Geology, University of Köln, West Germany) had examined Pleistocene outcrops south of Poeppel Corner during one of the seismic surveys. Structural contour plans of seismic reflections ("Z", "P" & "C" horizons - see later), depth to magnetic basement contours and plans showing Bouguer gravity anomalies have been prepared by the Petroleum Exploration Division of the S.A.D.M.

Much has been written on the geology of the Great Artesian Basin which is relevent to POOLOWANNA (e.g. Krieg, 1960; Ludbrook, 1966; Sprigg, 1958-63; Wopfner, 1960-1973; Twidale, 1972a,b and others). One of us (B.C.Y.) made a study of the sediments of the Pedirka Basin.

Adjacent map sheets currently in preparation are DALHOUSIE, PANDIE PANDIE and NOOLYEANA. Explanatory notes are available for the latter two (Williams, 1973a,c). Simpson Desert South in the Northern Territory is also in preparation (pers. comm., 1971, A. Mond, Bureau of Mineral Resources). Subdivision of the subsurface on POOLOWANNA is based on the surface stratigraphy described on OODNADATTA (Freytag, *et al*., 1967). Photo-interpreted maps have been prepared by FPC(A) in 1963 and by Gregory (S.A.D.M.)in 1970 .

PHYSIOGRAPHY

POOLOWANNA is occupied entirely by sand dunes and playas of the Simpson Desert. The dunes trend NNW and are asymmetric, generally being steeper on the E side. This however depends on the causal wind direction. The top few metres are usually mobile but the lower portions are fixed by vegetation. They are usually not more than 20 m in height although larger dunes are found to the E. Dune frequency varies from 5 to 6 per km W of the map area to 3 to 5 per km on central and eastern POOLOWANNA. Surface elevations across the desert show a gentle lowering of the dune base towards the centre. There is no external drainage on POOLOWANNA. Rainfall may find its way into salinas in the interdunal corridors via very small gutters and creeks. The salinas usually have a halite or gypsum crust and are moist below this, making them treacherous to vehicles.

Vegetation in the desert includes sand hill canegrass (*Zygochloa paradoxa*), spinifex (*Triodia sp.*), salt bush (*Atriplex sp.*), mulga (*Acacia aneura*), and needle wood (*Hakea leucoptera*).
(Note - all botanical names were provided by the State Herbarium, Botanic Gardens).

TABLE 1 - Stratigraphy (Surface and Subsurface)

AGE			MAP UNIT	MAP SYMBOL	LITHOLOGY	THICKNESS (METRES)	REMARKS
CAINOZOIC	QUATERNARY	Recent	lake sediments	Qrl	Fine, orange to brown sands and clays with halite and gypsum crusts.	0 - 1.5?	In salinas.
		Pleistocene to Recent	aeolian sand	Qrs	Orange brown, fine to medium grained quartz sand of sub-parallel dunes and clayey sand of interdunal flats. Plant remains and carbonate infilled root cavities near base.	10 - 30	Dunes usually asymmetric - steeper on E side. Trend NNW. Simpson Sand of Firman (1970). Basal section with carbonate and plant remains may be older i.e. Pleistocene.
		Plio-Pleistocene	unnamed fluvial sediments	Qps	Multicoloured, crossbedded channel sands and clays with occasional vertebrate remains. May be heavily gypsified.	2 - 5	Probably includes Katipiri Sand and Tirari Formation (Stirton et al., 1961). Traces of old meanders visible in interdunal flats.
					In subsurface only - information derived from Mokari 1 and Pandieburra 1		
	TERTIARY	Lower-Upper	unnamed	T	Sandstones, sandy limestones and clays overlying red and yellow poorly consolidated sandstone, very coarse to conglomeratic at the base with some thin streaks of grey clay.	150?	Lower sandstones may be equivalent to Eyre Formation on INNAMINCKA (Wopfner et al., 1973). This includes Macumba Sandstone on OODNADATTA and Murnpeowie Formation on MARREE.
MESOZOIC	CRETACEOUS	Albian - Cenomanian	Winton Formation	Kw	Grey, silty, carbonaceous claystone with fine to medium grained sandstone lenses and layers. Thin coal seams near base.	455	Fluviatile and paludal deposit. Gradational change from Oodnadatta Formation where environment changed from marine to non-marine.

AGE	MAP UNIT	MAP SYMBOL	LITHOLOGY	THICKNESS (METRES)	REMARKS
MESOZOIC, CRETACEOUS, Albian	Oodnadatta Formation	Klo	Grey silty carbonaceous shale, thin lenses of sandstone and siltstone, rarely glauconitic. Dark grey calcareous shale near base - Wooldridge Limestone Member? - fossiliferous on eastern side.	388	Thickness approximate. Basal Coorikiana Sandstone Member difficult to recognise on logs because it is probably a shaly facies similar in lithology to upper part of the Bulldog Shale and the lower part of the Oodnadatta Formation.
MESOZOIC, CRETACEOUS	Bulldog Shale	Klb	Dark grey, silty, fossiliferous shale with argillaceous siltstone lenses - some glauconite and pyrite.	185	
MESOZOIC, CRETACEOUS, Neocomian	Cadna-owie Formation	Klc	Shale with intercalations of fine grained, calcareous glauconitic sandstone in western areas - much sandier to east.		
MESOZOIC, JURASSIC, Lower -Upper	Algebuckina Sandstone	J	Undifferentiated; poorly consolidated, medium to coarse grained quartz sandstone with some interbedded micaceous shale and rare coal seams towards the base. More shaly to the east.	563	Terrestrial fresh water sequence. Good aquifer in this part of basin - not utilized.
PALAEOZOIC, PERMIAN, Lower	Purni Formation and Crown Point Formation	P	Undifferentiated: coals, shales, siltstones and sandstones in upper section (Purni Formation) conglomerates, sandstones and shales in lower section (Crown Point Formation).	451	Target zone as possible reservoir of hydrocarbons.
PALAEOZOIC, ORDOVICIAN, Lower	unnamed	O	Grey green shales with stringers of fine grained sandstone.	132	

STRATIGRAPHY

The oldest outcropping sediments on POOLOWANNA are the Pleistocene fluviatile deposits exposed on the edges of playas on the E side of the map area. The rest of the area is covered by sand dunes. There is no subsurface geological information on the map sheet itself. However, data are available from several oil wells drilled in surrounding portions of the western Great Artesian Basin. These wells are Delhi-Santos Pandieburra 1 (1963) on PANDIE PANDIE, Amerada McDills 1 (1965) on McDILLS, FPC(A) Witcherrie 1 (Magnier 1964a), Purni 1 (Magnier, 1964b), Mt. Crispe 1 (Jacque, 1966a) and Mokari 1 (Jacque, 1966b) on DALHOUSIE, and Poonarunna 1 (Magnier and Cooper, 1964) on NOOLYEANNA (all locations shown on Fig. 1). All wells penetrated Cainozoic and Mesozoic sediments. Mokari 1 is only about 6 km west of POOLOWANNA.

TABLE 2

FORMATION TOPS AND THICKNESSES, MOKARI 1. KB 68.0 m
(Stratigraphy in well completion report modified from nomenclature of Whitehouse, 1955).

FORMATION	TOP (METRES)	THICKNESS (METRES)
Recent to Tertiary	0	164
Winton Formation	164	455
Oodnadatta Formation	619	388 (approx.)
Wooldridge Limestone Member	969	33
Bulldog Shale	1007 (approx.)	185 (approx.)
Cadna-owie Formation	1192	48
Algebuckina Sandstone	1240	563
Permian	1803	451
?Ordovician	2254	132
TOTAL DEPTH	2386	2386

The Pre-Permian rocks encountered in oil exploration wells near to the margins of POOLOWANNA are all of uncertain age and have been tentatively dated by radioactive methods and lithological comparisons. Purni 1 and Mokari 1 both bottomed in dense, grey, steeply dipping shales which together with shales under the Cooper Basin may represent a lateral facies change of the Ordovician Stairway Sandstone in the Amadeus Basin (Youngs, 1973). Poonarunna 1 also finished drilling in a similar lithology and is tentatively correlated as Ordovician.

Devonian strata have not been positively identified in wells close to POOLOWANNA but a seismic reflector, believed to originate from the top of Devonian sediments, has been mapped in the north western corner of the area (Fig. 4). The sediments are most likely to be the Mereenie Sandstone, a medium-coarse grained, cross-bedded terrestrial sand, and/or the Polly Conglomerate which, to the north is a polymict, terrestrial conglomerate of the Finke Group (Wells *et al.*, 1970; Youngs, 1973).

The Lower Permian rocks are the only positively identified Palaeozoic strata in the region and it is believed that the Permian Pedirka Basin extends east from Mokari 1 under the Simpson Desert (Youngs, 1973). The sediments comprise the underlying terrestrial glacial and peri-glacial Crown Point Formation which consists of diamictites, sands and clays and the disconformably overlying Purni Formation. The Purni Formation is composed of alternating sandstones and shales which, at the top of the sequence, contain an increasing amount of coals and carbonaceous shales. This lithology is similar to that of many hydrocarbon-bearing formations in the Gidgealpa Group of the Cooper Basin.

MESOZOIC

Nomenclature for the Mesozoic on POOLOWANNA is similar to that used on OODNADATTA (Freytag *et al.*, 1967). It is discussed briefly together with correlation between surrounding areas at the end of this section.

Jurassic

Disconformably overlying the Permian in Mokari 1 are 563 m of medium to coarse grained quartz sandstones with minor interbedded fissile shales. Occasional coal seams are present near the base. The sequence has been left undifferentiated in the section where the name Algebuckina Sandstone (Sprigg, 1958a) has been ascribed to it (see later). The sequence becomes more shaly eastwards.

Cretaceous

The base of the Cretaceous in Mokari 1 is marked by a thin (48 m) sequence of shale and fine grained calcareous sandstone.

Above the Cadna-owie Formation in Mokari 1 are two dark grey shale sequences separated by a marly unit (Jacque, 1966b). These two sequences in the well completion report have been correlated with the Roma and Tambo Series of Whitehead (1955) and the marly unit is equated with the Wooldridge Limestone Member of the Oodnadatta Formation (Freytag, 1966).

Conformably overlying the Oodnadatta Formation is the Winton Formation which is characterized by coal beds and feldspathic sandstones implying a change in environment from marine to non-marine.

CAINOZOIC

Tertiary

Mokari 1 intersected about 150 m of Tertiary sediments. The lower 65 m of the sequence is composed of coarse grained quartz sandstones and conglomerates with some clays near the top and are equated with the Lower Tertiary Eyre Formation (Wopfner et al., in press) which is exposed on surrounding sheets. Similar quartz sandstones overlie the Winton Formation in Pandieburra 1 and Poonarunna 1.

Above this sequence are sands, clays and sandy limestones of probable Upper Tertiary age. The upper portions of this sequence are probably of Quaternary age. No surface equivalents of these are exposed on POOLOWANNA.

Quaternary

The oldest exposed sediments are the unnamed ?Pleistocene gypsiferous channel sands and clays which outcrop (outcrops exaggerated on map) around the edges of the deflated salinas on the E side of POOLOWANNA. Surface expression of some of these deposits is shown as traces of the old meanders and channels in the interdunal corridors. These deposits may include the Katipiri Sands and Tirari Formation (Stirton et al., 1961). However equivalents to these are probably buried beneath younger sediments on NOOLYEANA, LAKE EYRE and KOPPERAMANNA (seen by A.F.W.). The gypsum is probably related to Wopfner and Twidale's (1967) "gypsite" profile, a weathering profile which developed in outcropping sediments during Middle to Late Pleistocene times throughout the western portion of the Great Artesian Basin.

Overlying most of POOLOWANNA are the longitudinal NNW trending dunes of the Simpson Desert. On eastern POOLOWANNA, the dunes are separated by elongate salinas containing fine aeolian sand and clay and covered by a thin crust of halite and gypsum. Elsewhere, interdunal corridors contain clayey sand and occasional fragments of limestone which appear to be infilled root cavities, weathered out of the lower portions of the dune. This calcareous material is thought to be part of an ancestral dune system (Wopfner & Twidale, 1967).

There are conflicting opinions as to the age of the dunes. Crocker (1964a) and Heath and Wopfner (1963) consider them to have formed during the arid period which closely followed the end of the Pleistocene about 8-10 000 years ago. Folk (1971a,b) believes that they have developed under the presently existing wind regime.

The most feasible origin of the dunes of the Simpson Desert is that proposed by Wopfner and Twidale (op. cit.) - see also Twidale (1972b). They consider them to have been derived from alluvium deposited by various rivers in the vicinity of Lake Eyre which was then "picked up by the wind and carried by suspension and saltation to the north of the source areas. Other origins are suggested by King (1960) and Folk (op. cit.). Carrol (1944) and Madigan (1930-

		McDILLS 1:250000 SHEET AREA — NORTHERN TERRITORY	OODNADATTA 1:250000 SHEET AREA	POOLOWANNA 1:250000 SHEET AREA	PANDIE PANDIE 1:250000 SHEET AREA	BARROLKA 1:250000 SHEET AREA— QUEENSLAND
		Stewart 1968	Freytag, *et al.*, 1967	These notes	Williams 1973	Senior 1970
CRETACEOUS	Cenomanian	Eroded	NEALES RIVER GROUP: Winton Formation	Winton Formation	Winton Formation	ROLLING DOWNS GROUP: Winton Formation
						Mackunda Formation
			Mount Alexander S'st. Mem.	Oodnadatta	Oodnadatta	Allaru Mudstone
			Oodnadatta			
			Wooldridge L'st. Mem.	Wooldridge L'st. Mem.	Wooldridge L'st. Mem.	Toolebuc Limestone
			Formation	Formation	Formation	Wallumbilla Formation
		Rumbalara Shale	Coorikiana S'st. Mem.			
			Bulldog Shale	Bulldog Shale	Bulldog Shale	
	Neocomian		Cadna-owie Formation	Cadna-owie Formation	Cadna-owie Formation	"Hooray Sandstone"
JURASSIC	Upper	De Souza Sandstone	Algebuckina Sandstone	Algebuckina Sandstone	Algebuckina Sandstone	
					Westbourne Formation	INJUNE CREEK GROUP: Westbourne Formation
					Adori Sandstone	Adori Sandstone
	Lower	No deposition	No deposition	Undifferentiated	Birkhead Formation	Birkhead Formation
					Hutton Sandstone	Hutton Sandstone

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S.A. Department of Mines

1 : 8"

Table III. Nomenclature and correlation of part of the Mesozoic on the Poolowanna map sheet and surrounding areas (taken from published maps and explanatory notes)

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1946) have also commented on aspects of Simpson Desert dunes.

Nomenclature and correlation of part of the Mesozoic POOLOWANNA and surrounding areas.

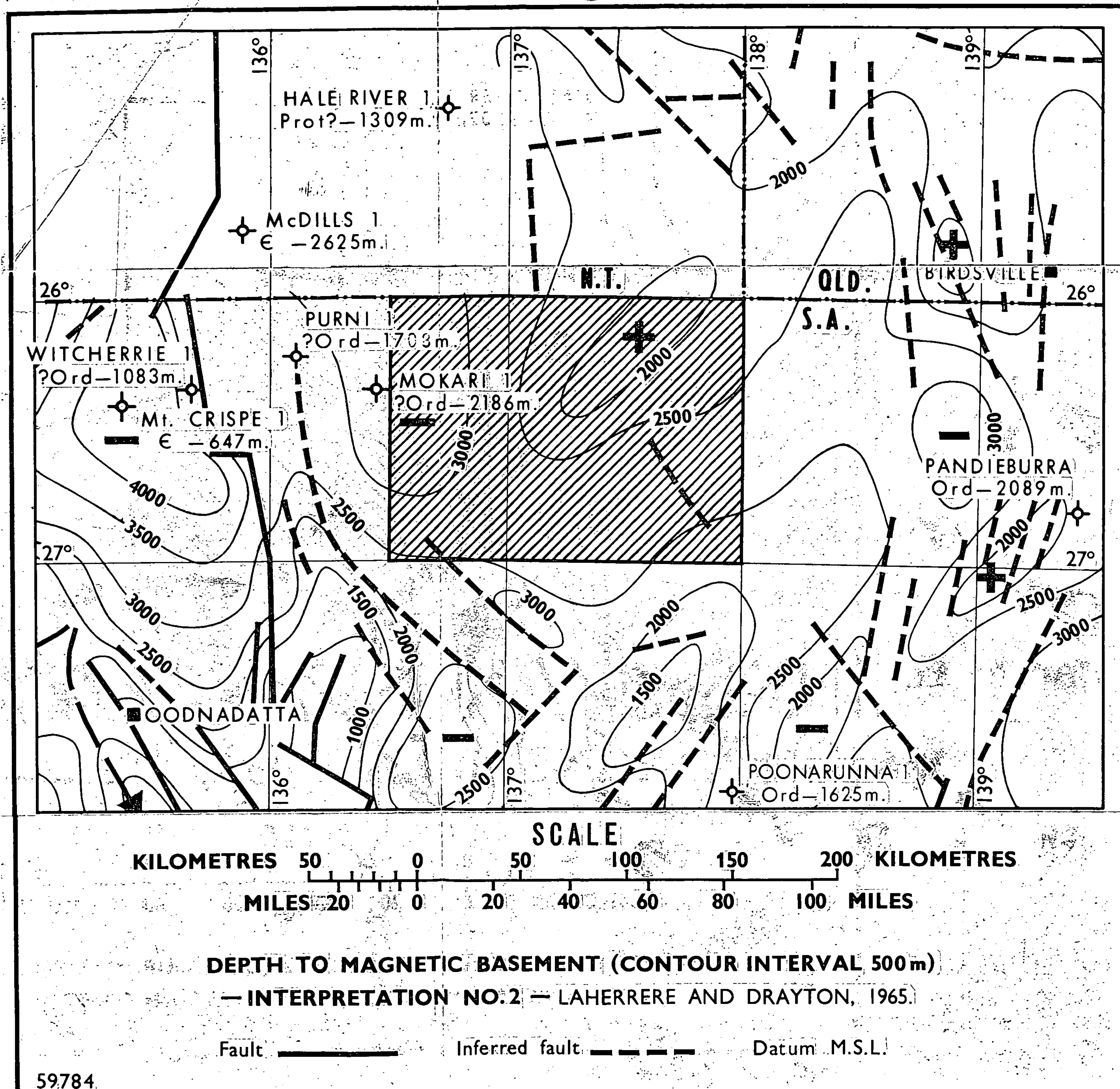
Table 3 gives some of the nomenclature used for parts of the subsurface Mesozoic beneath areas surrounding POOLOWANNA. Discussion of the correlation of these nomenclatures is beyond the purpose of these notes, interested readers are referred to Whitehouse (1955), Day (1964), Exon (1966), Vine *et al.* (1967), Nugent (1969), Wopfner in Parkin (1969), Exon and Vine (1970) and Wopfner *et al.*, (1970) who have dealt with this subject in some detail.

Nomenclatures shown in the table includes that used by the Bureau of Mineral Resources on McDILLS (Stewart, 1968) and BARROLKA (Senior, 1970) (see Fig. 1). Senior (*op. cit.*) gives the current nomenclature used by the Bureau in the central portions of the Great Artesian Basin. That for PANDIE PANDIE has been added to compare the Jurassic sequence on the two adjoining sheet areas.

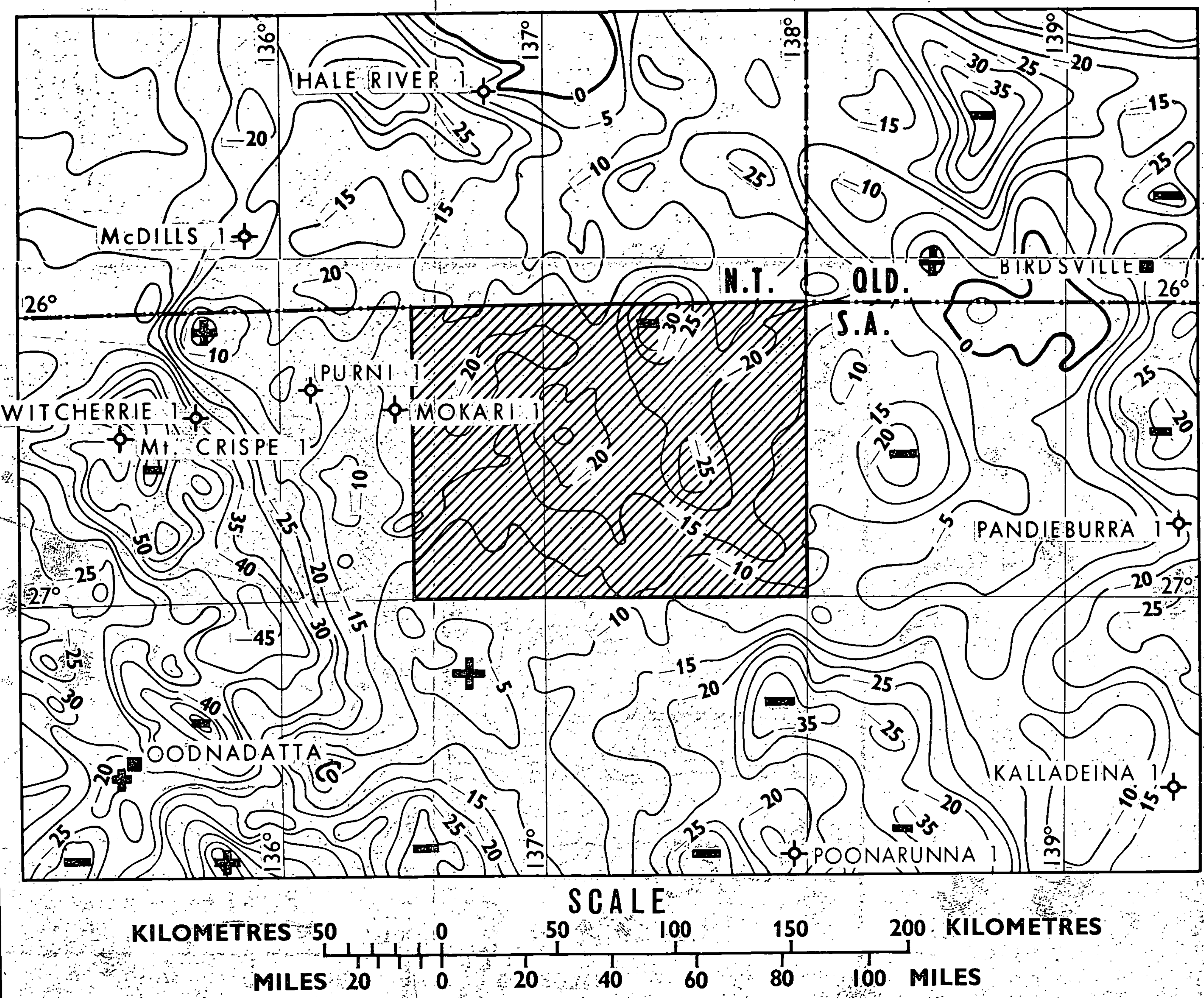
The subdivision used in Mokari 1 by FPC(A) (Jacque, 1966b) has been discarded and replaced by that used on OODNADATTA (Freytag *et al.*, 1967) which has also been adopted for POOLOWANNA. The Jurassic sequence has not been subdivided as on PANDIE PANDIE due to facies changes. This interval becomes increasingly sandy westward such that the Westbourne and Birkhead Formations are no longer recognisable on the geophysical logs of Mokari 1 (Nugent, 1969). Cretaceous nomenclature is the same as that used on PANDIE PANDIE but differs from that used on OODNADATTA in that the basal Coorikiana Sandstone Member of the Oodnadatta Formation (Freytag, 1966) is not distinguishable in Mokari 1. This may also be a result of facies changes.

STRUCTURE

The subsurface structure of POOLOWANNA is known entirely from geophysical surveys, a summary of which is presented below.



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



BOUGUER GRAVITY (CONTOUR INTERVAL 5 MILLIGALLS)

N.T. and QLD.: AFTER B.M.R. PLAN NO. A/B2-50 (OCT., 1971)

S.A.: AFTER DEPT. OF MINES PLAN NO. 71-684A. (B.E. MILTON)

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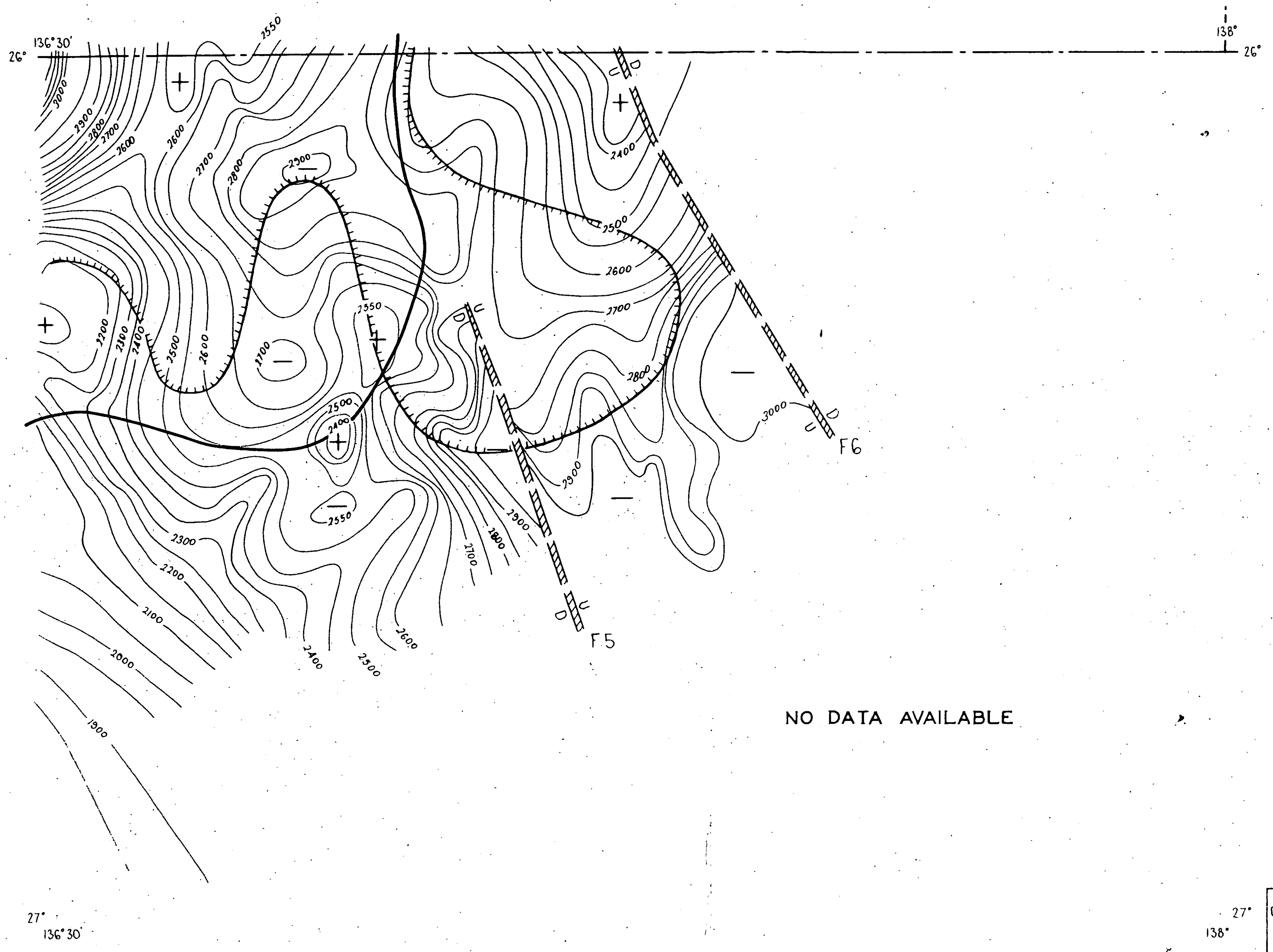
MAP OF POOLOWANNA AND SURROUNDING AREAS SHOWING PRELIMINARY BOUGUER ANOMALY CONTOURS FIG. 3

(a) Aeromagnetic and Gravity Results

POOLOWANNA lies in the western portion of the Mesozoic Great Artesian Basin and the western half of the area overlies part of the Permian Pedirka Basin (Fig. 1).

The interpretation of depths to magnetic basement by Compagnie Generale de Geophysique (C.G.G.) (Fig. 2) shows a NE trending basement ridge at 2 000 m in the NE portion of POOLOWANNA. This is flanked to the S and W by a region of deeper basement (3 000 m). The greatest depths to the basement on POOLOWANNA occur in the NW beneath the Permian Pedirka Basin and there is a gradual rise away from the Palaeozoic basin toward Poeppel Corner.

Fig. 3 shows an area of gentle gravity gradients on POOLOWANNA and this conforms with the pattern for the Great Artesian Basin to the E. Bouguer gravity values decrease towards the NE and a minimum of 30 milligals is reached along the central northern border of the area. The aeromagnetic and gravity results do not indicate the likely existence of any extensive deep Palaeozoic sedimentary basins similar to those further W and SW which are part of the Warburton Basin (Wopfner, 1972). However, small pockets of Palaeozoic rocks could be preserved as a result of downfaulting to the E of fault F6 (Fig. 4, "Z" horizon), the presence of which is also indicated on the aeromagnetic and gravity plans (Figs. 2 and 3). The negative gravity anomaly along the Northern Territory border indicates an area of low density rocks and may be caused by a remnant of Permian or older strata. The one elongate area of relatively shallow basement in the NE could be composed of a series of shallower areas separated by deeper pockets infilled with Upper Palaeozoic (Devonian and Permian) sediments. Both the -30 and -25 milligal anomalies on the E half of POOLOWANNA (Fig. 3) lie on the downthrown side of the fault F6 (Fig. 4) interpreted from the three geophysical methods. It is possible that these strata could be Upper Palaeozoic in age as such sediments are relatively unconsolidated, undeformed and therefore of low density.



Approximate limit of Devonian Finke Group reflector (from Drayton, 1967).

Approximate limit of Permian Reflector (from Drayton, 1967)

Contour Interval 50 metres
Depths below sea level
After FPC(A), 1965

SCALE IN KILOMETRES

10 0 10 20 30 40 50 60

FIG. 4.

PETROLEUM GEOLOGY SECTION	DEPARTMENT OF MINES – SOUTH AUSTRALIA	Scale: As shown
Compiled: B Youngs	POOLOWANNA 1:250 000	Date: 14 Feb 1972
Drn: R.H.	DEPTH TO Z HORIZON & LIMITS OF UPPER PALAEOZOIC REFLECTORS	Drg. No. 72-214 BC

(b) Seismic Results

The "Z" horizon in the Pedirka Basin was defined as the first marker with a horizontal velocity greater than 5 000 m/s (Laherrere and Drayton, 1965) and in this region it is the deepest seismic horizon to have been recorded. Over much of the Pedirka Basin it represents a Palaeozoic horizon beneath the Devonian. Elsewhere in the South Australian portion of the Great Artesian Basin the term "Z" horizon has been used in a different sense, i.e. the unconformity at the base of the Permian sediments (Hall, 1968). It is now defined as the pre-Permian unconformity and will only coincide with the C.G.G. horizon in areas where Devonian sediments are absent. This is the case on nearly all of POOLOWANNA (Fig. 4). The plan shows two NW trending faults in a highly folded area which increase in depth from 1 900 m in the SW to cover 3 000 m at fault F6 and in the NW.

The Devonian "F" reflector (Drayton, 1967) was identified in the NW of the area and marks the eastern end of a Devonian sedimentary basin which extended into the Pedirka from the Amadeus Basin (Wells et al., 1970) (Fig. 3). This corresponds to Hall's "Z" horizon.

Three "P" horizons have been mapped in the Pedirka Basin by FPC(A) and these were believed to represent Lower Permian sandstone (P), the top of the Upper Purni coal beds (P1) and Lower Jurassic sediments (P2) (FPC(A), 1963). The "P" horizon was not mapped on POOLOWANNA but the possible pinchout of the coal bearing Permian was located from the "P1" horizon; the pinchout according to FPC(A) is shown in Fig. 4.

Structural trends of the "P1" and "P2" are similar to those of the "C" horizon (the top of the Cadna-owie Formation) and show a general N-S alignment of the contours with small basins and ridges throughout (Youngs, 1972). At all levels there is a gradual deepening southward towards the central parts of the Great Artesian Basin in South Australia and this is further evidenced at the surface by a gradual lowering of topographic elevation.

GEOLOGICAL HISTORY

Proterozoic sediments representing a possible continuation of the Adelaide Geosyncline to the Amadeus Basin were deformed by a number of Precambrian earth movements and subjected to long periods of erosion during the late Proterozoic and early Palaeozoic. The Poolowanna area was a relatively stable platform during the Lower Palaeozoic and may have received either little or no Cambrian sediments. Ordovician strata were deposited in a marine environment, deformed by the late Ordovician Rodingan earth movement and greatly eroded during the Silurian period. The Devonian Mereenie Sandstone and Finke Group areas of terrestrial deposition may have extended over the region or at least into the NW. Devonian deposition took place under hot arid conditions and was brought to an end by the Alice Springs (Kanimblan) Orogeny.

In late Carboniferous and early Permian times glaciers developed in the newly formed mountainous areas. The tillitic Crown Point Formation was deposited on a variety of Proterozoic and Palaeozoic surfaces in a continental glacial and peri-glacial environment. A short period of erosion, during which the climate became warmer, followed this and the Purni Formation sediments were deposited under terrestrial freshwater conditions.

Probably no deposition occurred during the Triassic when epeirogenic movements initiating the downwarp of the Great Artesian Basin commenced. Jurassic terrestrial sands and shales (Algebuckina Sandstone) were deposited in the gradually sinking basin and were overlain by marine Cretaceous sandstones, shales and siltstones (Cadna-owie Formation, Bulldog Shale and Oodnadatta Formation) which accumulated as the sea transgressed from the NE. The regression of this sea during the middle Cretaceous (Albian) is marked by the presence of the terrestrial Winton Formation. Tectonic movements in late Cretaceous and early Tertiary times resulted in uplift, weathering, and erosion of the Winton Formation.

Further fluviatile sediments (Eyre Formation - Wopfner et al., in press) were deposited in early Tertiary times and these, together with the Cretaceous sediments, underwent weathering including silicification (silcrete) near the surface (Wopfner and Twidale, 1967). Terrestrial sedimentation continued in late Tertiary times with deposition of sands, clays, and sandy limestones (in Mokari 1). Towards the end of the Tertiary and during the Pleistocene, fluviatile sediments were deposited in the structurally low area now occupied by the Simpson Desert. A change to an arid climate followed with the subsequent development of a gypsiferous weathering profile during middle to late Pleistocene times (Wopfner and Twidale, 1967) and later the extensive dune system of the desert. Tectonism, as evidenced by recent earthquakes (Bolt, 1958; Youngs and Wopfner, 1972) and features such as Recent mound springs and N - S groove structures on Lake Eyre, led to deflation of the salinas, in particular Lake Eyre, the main source of material for the dunes of the Simpson Desert (Wopfner and Twidale, 1967).

ECONOMIC GEOLOGY

Hydrogeology

Although water supplies of up to 2 000 cubic metres per day are available at depth (1 200 m+) in Mesozoic artesian aquifers (Algebuckina Sandstone and Cadna-owie Formation), the country is unsuitable for pastoral use because of lack of feed. Mokari 1 aquifers were cased off for this reason. The only surface water on POOLOWANNA occurs in interdunal flats after rain and may not last much longer than a few weeks before evaporating.

Petroleum

Geophysical exploration for petroleum was carried out over POOLOWANNA in the early 1960's but results were unsuccessful. Early potential targets were Lower Palaeozoic sediments but then emphasis was shifted to the Permian after gas was discovered in the Cooper Basin, SE of POOLOWANNA. The Permian sediments were mapped and later drilled but although good porosities were indicated, the geological history suggests that conditions suitable for the entrapment of hydrocarbons may not have existed (Drayton, 1967).

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