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PEDIRKA BLOCK

ACREAGE ASSESSMENT

Western Team
SANTOS Ltd
(after Delhi SA3 Group)
April, 1988

CONTENTS

PAGE NO.

SUMMARY

1. GEOLOGY Never written (Santos, pers. comm.) (i)
2. FARMOUT ARRANGEMENTS (i)
3. FUTURE COMMITMENTS (i)
4. PROSPECT INVENTORY (i)
5. RECOMMENDTIONS (ii)
6. 5 YEAR PROGRAMME (ii)
7. RELINQUISHMENT PLAN (iii)

PROSPECTS AND LEADS TABLE (iv)

1.0 BASIC FACTORS 1

1.1 Regional Setting and Exploration Status 1
1.2 Physiography and Climate 2
1.3 Acreage and Terms 3

2.0 GEOLOGICAL CONSIDERATIONS 4

2.1 Exploration Data Base 4
2.2 Tectonic/Structural Framework 7

2.2.1 Regional 7
2.2.2 Pedirka Basin 9
2.2.3 Simpson Desert Basin 9
2.2.4 Eromanga Basin 10

2.3 Stratigraphy 11
2.4 Discoveries 14
2.5 Failure (Dryhole) Analysis 15
2.6 Hydrocarbon Potential 18

2.6.1 General 18
2.6.2 Source 18
2.6.3 Maturity 21
2.6.4 Seal 23
2.6.5 Reservoir 24
2.6.6 Diagenesis 27
2.6.7 Timing of Structuring, Migration and Diagenesis 29

2.7 Exploration Targets 30

2.7.1 General 30
2.7.2 Structural Targets 30
2.7.3 Stratigraphic Targets 31

2.8 Play Concepts

REFERENCES 35
APPENDICES Prospect Summaries 36

TABLES

TABLE 2 Seismic Data 4

TABLE 3 Well Data 5

FIGURES

Figure 1 - Location Map

Figure 2 - Stratigraphy - Central and Eastern Pedirka Sector

Figure 3 - Index Map - Seismic and Well Location Map

Figure 4 - Structural Elements Map

Figure 5 - C Time Structure

Figure 6 - "Upper" plus "Middle" Purni and Mt. Toondina Formation Isopach

Figure 7 - Peera Peera Formation Isopach

Figure 8 - Poolowanna Formation Isopach

Figure 9 - Birkhead Formation Zero Edge

Figure 10 - Birkhead Formation Depth Structure

Figure 11 - Birkhead Formation Isopach

Figure 12 - Birkhead Formation Net Shale Isopach

Figure 13 - Miandana 1 - Vitrinite Reflectance Profile

Figure 14 - Birkhead Formation - Vitrinite Reflectance

Figure 15 - Algebuckina Sandstone Isopach

Figure 16 - Cadna-owie Formation Isopach

Figure 17 - Poolowanna 1 Composite Log

Figure 18 - Poolowanna 2 Composite Log

Figure 19 - Purni Formation (Unit IV) - TOC

Figure 20 - Peera Peera Formation (Upper Unit) - TOC

Figure 21 - Poolowanna Formation (Lower Member, Unit III) - TOC

Figure 22 - Poolowanna 1 - Vitrinite Reflectance Profile

Figure 23 - Purni Formation (Unit IV) - Vitrinite Reflectance

Figure 24 - Peera Peera Formation (Upper Unit II) - Vitrinite Reflectance

Figure 25 - Poolowanna Formation (Lower Member, Unit III) - Vitrinite Reflectance

Figure 26 - Purni Formation (Unit II) - Porosity

Figure 27 - Peera Peera Formation (Middle Unit) - Porosity

FIGURES (Cont'd)

Figure 28 - Poolowanna Formation (Lower Member, Unit I) - Porosity

Figure 29 - Poolowanna Formation (Lower Member, Unit III) - Porosity

Figure 30 - Poolowanna Formation (Upper Member, Unit II) - Porosity

Figure 31 - Algebuckina Sandstone - Porosity

Figure 32 - Prospects Map

1.0 BASIC FACTORS

1.1 Regional Setting and Exploration Status

The Pedirka Block is situated in the central northern area of South Australia with its northern boundary defined by the Northern Territory - Queensland - South Australian border (Figure 1). The Block contains sediments of the Poolowanna Trough, Simpson Desert Basin, Pedirka Basin and Eromanga Basin which range in age from Permian to Recent (Figure 2).

The Pedirka Block is the largest within the current SANTOS-Delhi licence areas. It occupies an area of 49556 km^2 and is a frontier exploration Block with a total of 7944 km (0.16 km per km^2) of seismic and 12 wells. The most recent drilling was conducted in 1985 (5 wells) with 204 km of seismic recording in 1987.

The sedimentary section averages 2000 metres in thickness and exceeds 3000 metres in the Poolowanna Trough.

Potential hydrocarbon reservoirs are located within the Algebuckina Sandstone (including Hutton and Namur), Poolowanna Formation, Peera Peera Formation and Purni Formation. The Poolowanna, Purni, Peera Peera and Birkhead Formations contain potential hydrocarbon source rocks.

The Block is considered to have limited potential for gas due to thermal immaturity and liquid hydrocarbons are the primary objective.

1.0 BASIC FACTORS (Cont.)

1.2 Physiography and Climate

The Pedirka Block lies within the desert region of northern South Australia. It is flat-lying with topographic relief averaging 20-60 metres. Rainfall is low and erratic, averaging 150 - 250 mm per annum, falling principally during January to March. Temperatures range from 35°C+ in summer to 10°C in winter. The temperature also fluctuates on a diurnal basis by up to 20°C+.

The central area of the Block is dominated by NNW-SSE orientated broad, low amplitude, stablized sand dunes and interspersed shallow saline lagoons which are usually dry.

The eastern area of the Block is dominated by numerous ephemeral flood plains and channels associated with the Kallakoopah and Diamantina Rivers which flow southwest across the Block and empty into Lake Eyre.

The western area is generally gibber plain with minor dune development. Numerous ephemeral, poorly developed stream systems rising in the Peake and Denison Ranges are present in the south west. Permanent surface water is restricted to a few lagoons and waterholes in the eastern and southern areas of the Block.

There is minimal infrastructure consisting of the Birdsville Track in the east of the Block and minor tracks and gravel airstrips which service the local pastoral industry. Exploration companies, particularly SANTOS and Delhi have developed a limited network of tracks.

The Block can experience major periodic inundation from floodwaters of the Diamantina River. Perched dune lakes in the south east of the Block are filled by local rainfall.

1.0 BASIC FACTORS (Cont.)

1.3 Acreage and Terms

Location:	PELs 5 & 6 South Australia SW Eromanga Basin	
Area:	49556 km^2	
Interest Holders:	SANTOS Ltd	21.67% (operator)
	Delhi Petroleum Pty Ltd	35.14%
	Western Mining Corp	15.00%
	Bridge Oil Ltd	10.00%
	TCPL (assigned to SANTOS)	5.00%
	Adelaide Petroleum	4.53%
	SA Oil & Gas Corp	4.33%
	Vamgas Ltd	4.33%
Voting Rights:	Exploration Approvals	63%
	Exploration Vetoes	37.5%
	Change of Operator	63% and 2 partners

Terms: Pedirka Block is part of the Pedirka Sector which was originally acquired in 1956. The permit was renewed in 1976 and the first 25% Sector relinquishment took place in February, 1984. The second 25% relinquishment of the original permit area is due in Feburary 1989, and a third 25% in 1994. Final relinquishment is due in February 1999. No acreage has yet been relinquished in the Pedirka Block.

The work commitment from February 1984 to February 1989 is 1929 km seismic and six wells. Work done to date is 1633 km and 5 wells. Work planned for remaining term is 312 km and 1 well for a 5 year total of 1945 km seismic and 6 wells.

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2.0 GEOLOGICAL CONSIDERATIONS

2.1 Explortion Data Base

(i) Seismic

Table 1 lists the seismic overage in the Pedirka Block at 31 March 1988. A total of 7944 line km seismic has been shot, representing a coverage of only 0.16 km per km^2 (Figure 3).

TABLE 2

YEAR	SURVEY DATES	SURVEY NAME	KM	ACTUAL $	1986 $
1961	02/61 - 11/61	Innamincka Goyder-PED	100	12 500	65 297
1963	03/63 - 08/63	Pedirka-PED	162	24 300	123 718
1964	10/64 - 10/65	Poolowanna-PED	725	145 000	734 564
1974	04/74 - 06/74	Beal Hill-PED	290	305 000	1 009 709
1974	07/74 - 08/74	Lake Thomas - PED	437	480 000	1 589 042
1976	07/76 - 11/76	Pillan Hill-PED	893	1 348 400	3 390 078
1979	05/79 - 11/79	Peera Peera-PED	1570	1 834 760	3 351 418
1980	06/80 - 11/80	Koomarinna-PED	1051	1 716 782	2 863 851
1982	02/92 - 10/82	Christmas Creek-PED	1083	2 300 000	3 179 536
1984	07/84 - 11/84	Hogarth-PED	663	1 952 100	2 224 417
1985	04/85 - 07/85	Morphett-PED	766	2 614 000	2 810 050
1987	08/87 - 09/87	Mitchell-PED	204	520 300	520 300
Total			7944	13 253 142	21 861 980

Seismic exploration has concentrated within the northern half of the Block.

(ii) Drilling

A total of 12 wells have been drilled in the Pedirka Block (Table 2). The drilling was conducted in four phases - 1960's (2 wells), 1977 (2 wells), 1981-82 (3 wells) and 1985 (5 wells). All wells were plugged and abandoned with only Poolowanna 1 reporting a small oil flow and Walkandi 1 reporting oil shows (Figure 3).

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.1 Exploration Data Base (Cont.)

(ii) Drilling (Cont.)

TABLE 3

YEAR	WELL NAME	CLASS'N	RESULT	TD (m)	ACTUAL	1986 $
1963	Purni 1	NFW	P & A	1875	290 426	1 478 642
1966	Mokari 1	NFW	P & A	2386	452 516	2 156 773
1977	Poolowanna 1	NFW	P & A (small oil flow to surface)	3074	1 160 000	2 558 257
1977	Macumba 1	NFW	P & A	2616	823 000	1 815 039
1981	Walkandi 1	NFW	P & A (oil shows)	3125	1 804 664	2 744 258
1981	Erabena 1	NFW	P & A	2585	1 188 724	1 807 630
1981	Kuncherinna 1	NFW	P & A (minor shows)	2866	1 447 603	2 201 294
1985	Poolowanna 2	NFW	P & A	2916	1 540 000	1 655 500
1985	Oolarinna 1	NFW	P & A	2675	1 030 000	1 107 250
1985	Killumi 1	NFW	P & A	2312	1 540 000	1 655 500
1985	Glen Joyce 1	NFW	P & A	2289	974 500	1 047 587
1985	Miandana 1	NFW	P & A	2672	1 204 000	1 294 300
Total				31391	13 455 433	21 522 033

Newfield or Newpool Wildcats	(NFW, NPW)	12
Appraisal (including newpool tests)	(APP, ANP)	0
Total Exploration Wells		12

(iii) Other Work

The Pedirka Block has been covered in part by several gravity and aero-magnetic surveys conducted by various government instrumentalities and private companies.

The principal surveys in the Pedirka Block being:-

- Oodnadatta Aeromagnetic Survey carried out in 1961-62 by Aero-service Corp for Delhi Petroleum.
- Dalhousie Gravity Survey carried out in 1964 by Wongela Geophysical Corp for Total Exploration.
- Numerous BMR and SADME sponsored gravity and aero-magnetic surveys.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.1 Exploration Data Base (Cont.)

(iii) Other Work (Cont.)

Much of the basin mapping in the Pedirka Block is based upon the above surveys.

A geochemical survey was conducted by Recon Exploration (Australia) Pty. Ltd. in specific areas of the Pedirka Block during 1984. The survey involved both aerial detection of hydrocarbon microseepage above accumulations and ground validation by soil geochemical sampling. Anomalies indicative of hydrocarbons were detected over Glen Joyce, Killumi, Oolarinna and Poolowanna, however, drilling in 1985 failed to support these conclusions.

GENERAL PROJECTS SUMMARY

YEAR	PROJECT NAME	TYPE	ACTUAL $	1986 $
1981	NN-PED-81	GG	120 574	183 350
1982	NN-PED-82	GG	153 114	211 665
1983	NN-PED-83	GG	289 000	358 953
1984	NN-PED-84	GG	155 000	176 622
1985	NN-PED-85	GG	518 000	556 850
1985	NN-PED-IEP-85	GG	32 000	34 400
1986	NN-PED-86	GG	107 000	107 000
1961	61-GRAVITY, GEN-PED	0	207 200	1 082 369
1963	63-GRAVITY, GEN-PED	0	20 780	106 255
1964	64-GRAVITY, GEN-PED	0	17 760	89 971
1966	66-GRAVITY, GEN-PED	0	16 107	76 768
1974	74-G&G-OTHER-PED	0	23 556	77 982
1976	76-G&G-OTHER-PED	0	12 846	32 296
1977	77-G&G-OTHER-PED	0	113 239	249 736
1977	RIG POSITIONING	0	311 000	685 877
1979	79-G&G-OTHER-PED	0	72 550	132 521
1981	PEDIRKA ROADS ETC	0	2 278 189	3 464 323
1983	REPROCESS-PED-83	0	4 200	5 216
1984	PEDIRKA RECON	0	87 500	99 706
1985	PEDIRKA ROAD	0	2 103 000	2 260 725
Total			6 642 705	9 992 593

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.2 Tectonic Structural Framework

2.2.1 Regional

The Pedirka Block contains sediments of five Palaeozoic, Mesozoic and Cainozoic basins (Figure 4).

Warburton Basin (Cambrian?-Ordovician)
Pedirka Basin (Permo-Carboniferous)
Simpson Desert Basin (Triassic)
Eromanga Basin (Jurassic-Cretaceous)
Lake Eyre Basin (Tertiary-Quaternary)

Remnants of the Warburton Basin represent economic basement over much of the Pedirka Block, its sediments being mildly metamorphosed. There is some evidence that the Warburton Basin may provide the source rocks for the Poolowanna oil discoveries (see 2.6.2).

Downwarping during Carboniferous time produced the Pedirka Basin. Its depocentre lies northwest of the Pedirka Block towards McDills anticline or possibly in the Eringa Trough region. Tectonic activities during Permian time initiated trough and graben system structures in the basin.

During Early Triassic time, regional tilting to the east combined with subsidence initiated the Simpson Desert Basin (Walkandi Formation and Peera Peera Formation). The Mayhew-McDills Trend was uplifted at this time with much of the Permian section eroded. The Simpson Desert Basin depocentre is in the central portion of the Block around Walkandi 1 in the Poolowanna Trough. It is separated from the underlying Pedirka Basin by an unconformity spanning the late Early Permian and Later Permian. Fluviatile channel systems were active during deposition of the Peera Peera Formation which entered the basin via a general northwest-southwest trend.

During Early Jurassic time, the subsidence in the Pedirka Block continued, resulting a thick Eromanga Basin sequence. The Poolowanna Trough which was initiated during Triassic time, was reactivated and was extensively developed during the Early Jurassic. A relatively short break spanning late Triassic and earliest Jurassic times separates the Simpson Desert Basin from the overlying Eromanga Basin. Jurassic sediments exhibit several facies changes from west to east across the Block. Progressive filling of palaeolows and onlap and burial of low relief palaeo basement highs along the southern margins produced a generally broader basin of decreasing topographic relief. Subtle migration of the depocentre to the south east (Lake Eyre, Mulka Blocks) resulted in increased pelitic sedimentation in these areas. Sediments continued to onlap remaining basement highs. The Eromanga Basin depocentre again moved to the north during Mid to Late Jurassic times.

The Jurassic-Cretaceous boundary lies within the upper part of the Algebuckina Sandstone with the overlying Cadna-owie Formation being Neocomian in age. The Aptian to Cenomanian sequence above the Cadna-owie Formation, shows only minor lateral facies variations.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.2 Tectonic Structural Framework (Cont.)

2.2.1 Regional (Cont.)

Mesozoic and older units of the Simpson Desert region are typically overlain by up to 600 ft of Tertiary, Lake Eyre Basin strata, which in turn are capped by a veneer of Recent aeolian sandstones.

The dominant structural tends within the Block have been mapped by reconnaissance seismic surveys and generally trend north-northwest in the north, northeast and central areas (Poolowanna Fault). Elsewhere, in the north western part of the Block, trends are commonly aligned in a north-northeasterly direction (Purni and Border Faults). Anticlinal structures and associated faults have sinuous trends which range between north-northwest and north-north east. High angle reverse faulting is commonly present on the flanks of anticlinal structures, creating apparent horst Block features. In the southeast of the Block little data exists but there is some evidence from gravity and seismic of a near E-W trend.

Regional compression (E-W) during early-mid Tertiary time is considered to have set the current structural framework, however, several faults show evidence from gravity and seismic of a near E-W trend.

Re-interpretation of all seismic data in the Block was completed in 1987 and a regional C Time structure map prepared (Figure 5) in an attempt to incorporate new data and models. The Poolowanna region was remapped in 1988.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.2 Tectonic Structural Framework (Cont.)

2.2.2 Pedirka Basin

The Pedirka Basin is a Permian infrabasin beneath the Simpson Desert Basin.

It is contained mainly in the central north of South Australia and the southeastern Northern Territory (Figure 6).

The Pedirka Basin consists of two sedimentary formation; the Crown Point and Purni Formations, which are Early Permian in age.

The Pedirka Basin in the Pedirka Block is restricted to the western third of the Block and has onlapped against pre-Permian palaeohighs between Erabena 1 and Oolarinna 1 wells. The Purni Formation is eroded over the McDills-Mt. Hammersley trend west of the Block but a thick Crown Point section is still encountered in both Dalmatia and Mt. Hammersley.

The whole region was affected by the Alice Springs Orogeny which developed generally gentle structures in the pre-Permian strata and caused syndepositional movements during Permian time.

The Permian depositional phase which, following a prolonged period of erosion, was initiated by the formation of half-graben structures and hinged troughs during Late Carboniferous to Early Permian time. Synchronous with the structural event, centres of glaciation were established, resulting in the widespread deposition of tillites and other glacine sediments (Crown Point Formation). After retreat of the glaciers and further modification, siliciclastics with thick interbeds of coal seams (Purni Formation) were laid down. Within the Pedirka Basin, these deposits are only recorded up to middle of the Artinskian, whereas in the Cooper Basin, fluviatile to paludal deposition continued during the remainder of the Permian Period.

Following deposition of the Early Permian Pedirka Basin sediments, there was an important period of Late Permian structuring, as indicated by erosion of the sequence in structurally high positions, and by the large time break separating these deposits from overlying Mesozoic strata.

2.2.3 Simpson Desert Basin

The Simpson Desert Basin is a Triassic infrabasin beneath the Eromanga Basin (Figure 7). It covers the eastern and central portions of the Pedirka Block.

The basin consists of two sedimentary formations; The Walkandi and Peera Peera Formations, which are Early-Middle Triassic and Late Triassic in age.

The Walkandi Formation lies unconformably above the pre-Permian sediments (Figure 2) and is confined to the Central Poolowanna Trough. Its western extension onlapped the Oolarinna highs, and it is absent in Miandana 1, due to non-deposition.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.2 Tectonic Structural Framework (Cont.)

2.2.3 Simpson Desert Basin (Cont.)

The Peera Peera Formation conformably overlies the Walkandi Formation. It is bounded to the west against the Glen Joyce highs. The eastern extension of this formation reaches over the Birdsville Track Ridge into the Cooper Basin region and is laterally equivalent to the Upper Triassic Formation.

During Late Triassic time, reactivation along pre-existing trends, combined with eperiogenic uplift, produced the widespread unconformity present in the Pedirka Block. In the Poolowanna Trough, the top of the Peera Peera Formation appears to be a correlative unit across the area, indicating that erosion was due to regional emergence rather than local uplift and folding.

2.2.4 Eromanga Basin

The Eromanga Basin is a Jurassic-Cretaceous basin beneath the Lake Eyre Basin in the Pedirka Block.

The Eromanga Basin over most of the Block consists of three sedimentary formations; the Poolowanna Formation (Early Jurassic), Algebuckina Sandstone (Middle-Late Jurassic) and Cadna-owie Formation (Early Cretaceous).

The Poolowanna Formation is the basal Eromanga unit with the thickest section penetrated at Erabana 1 in the centre north of the Block (Figure 8).

The Birkhead Formation (Middle-Late Jurassic) of the Eromanga Basin has been observed in Miandana 1 and Kuncherinna 1, representing the western and northern edge of Birkhead sedimentation in the Block (Figure 5). The existence of this formation has been confirmed by palynology.

The Birkhead Formation is interpreted to be deepest and thickest in the southeastern portion of the Block (Figures 6 and 7). Poonarunna 1 immediately south in Lake Eyre Block intersected a thick Birkhead Formation with Vitrinite Reflectance values of 0.6 - 0.65% and TOC up to 15%. (Figure 8).

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.3 Stratigraphy

(a) General

The Pedirka Block contains sediments ranging in age from Permian to Recent in four superimposed basins and consequently the pre-Cretaceous stratigraphic sequence varies across it (Figures 2 and 4). Substantial periodic erosion of the sequence occurred in the Block in response to regional uplift and tilting during development of successive basin depocentres.

(b) Basement

Basement is believed to range in age from Proterozoic to Ordovician (Warburton Basin) and does not outcrop. It has been described in several wells as being predominantly dark brown-black, fissile siltstones and shales with fracture development often containing silica and calcite (Macumba 1, Poolowanna 1) and these are interpreted as being of Ordovician age. The western area of the Block may contain similar basement to that which crops out in the Peake and Denison Ranges. Although rocks included here may be considered as part of the sedimentary section elsewhere, they are regarded as basement because of their metamorphic nature.

(c) Permian

The Crown Point Formation is the basal sedimentary unit within the Pedirka Block, lying unconformably upon basement. It consists of shale, siltstone and minor sandstone and is intepreted as being equivalent to the Merrimelia Formation of the Cooper Basin. It is restricted to the north western area and is not considered a potential reservoir due to depth of burial and poorly developed sandstones.

The Purni Formation conformably overlies the Crown Point Formation. It consists of intercalated shale, siltstone, sandstone and coals and has both source and reservoir potential. Thermal maturity suggests that the formation lies within the "oil window" but the maceral type indicates the formation is capable of producing both liquid and gas. Porosity is low due to quartz over-growths and a kaolinitic matrix developed during diagenesis.

The Purni Formation is more extensive in occurrence than the Crown Point but is still restricted to the north western area of the Pedirka Block (Figure 6). The Purni Formation is currently most deeply buried toward the south-east and is most mature (VR = 0.93%) at Macumba 1.

(d) Triassic

The Walkandi Formation lies unconformably upon the Purni Formation in the north west, and basement rocks elsewhere in the Pedirka Block. It occurs over the central and eastern areas of the Block and consists of shales, siltstones and sandstones. The shales are grey green, brown or red and reflect shallow lacustrine to subaerial deposition. Organic content is low and the formation is regarded as having low prospectivity for hydrocarbons.

The Walkandi Formation is considered equivalent to the Nappamerri Formation of the Cooper Basin.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.3 Stratigraphy (Cont.)

(d) Triassic (Cont.)

The Peera Peera Formation conformably overlies the Walkandi Formation and occurs over the eastern and central areas of the Block (Figure 7).

It consists of interbedded shale, siltstone and sandstone and is divided into three units. The basal unit consists of grey shale and siltstone with minor thin sandstone and rare coal. The middle unit is sand and displays common fining upward cycles while the upper unit is characterised by black, silty, highly carbonaceous shale. Deposition is floodplain/meandering fluvial to lacustrine. Sandstones throughout the unit are typically fine to very fine grained with low observed porosity and permeability due to diagenesis.

The Peera Peera Formation has experienced diagenesis with general reservoir potential rated as poor to very poor. In the north central and north western portion of the Block, diagenesis is less severe (probably due to better primary porosity) but the reservoir has moderate potential at best.

Source rock potential is confined to the upper part of this unit and is rated as moderate to good.

(e) Jurassic

The Poolowanna Formation unconformably overlies the Triassic and Permian sequences. It is present thoughout the Pedirka Block being best developed in the Polowanna Trough (Figure 8). It consists of interbedded sandstone, siltstone, shale and coal deposited in a low energy meandering fluvial - floodplain environment. The Poolowanna Formation is a most prospective unit for liquid hydrocarbons, having excellent source and reservoir potential. However, it has experienced diagenesis with development of quartz overgrowths and kaolinitic matrix in the deeper parts of the basin.

The Algebuckina Sandstone (Figure 15) is areally extensive over the Block (Figure 12) and conformably overlies the Poolowanna Formation. It consists of a thick unit of fine to coarse grained sandstone of braided fluvial origin. The overlying Cadna-owie Formation provides an excellent seal for the Algebuckina.

The Birkhead Formation is developed in the south central and south eastern areas of the Block (Figure 9). Poorly developed Birkhead sediments, typically silty sandstones and shaly siltstones, are observed in Kuncherinna 1 and Miandana 1. The formation increases in thickness and pelitic content to the south and east and is a good potential source rock.

The presence of the Birkhead Formation subdivides the Algebuckina Sandstone into Namur Sandstone (Mooga Formation), Birkhead Formation and Hutton Sandstone (Figure 2).

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.3 Stratigraphy (Cont.)

(f) Cretaceous

The Cadna-owie Formation (Figure 16) conformably overlies the Algebuckina Sandstone and is a coarsening upward unit grading from interbedded mudstone and siltstone at the base to fine grained calcareous sandstone in the upper section. The lithology indicates marginal marine deposition and represents the onset of the Cretaceous marine transgression prior to deposition of the overlying deep marine Wallumbilla Formation. The formation has reservoir potential where beach and bar sands are developed.

A fine grained marine sequence comprising the Allaru Mudstone, Toolebuc Formation and Wallumbilla Formation lie conformably upon the Cadna-owie Formation. These units have excellent source potential. They are however probably immature for hydrocarbon generation.

The Mackunda Formation lies conformably upon the Allaru Mudstone and consists of interbedded calcareous sandstone and siltstone.

The uppermost Mesozoic unit is the Winton Formation, a conformable sequence of shales, siltstones, fine grained sandstones and lenticular coals.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.4 Discoveries

Poolowanna 1

Oil was discovered in the Early Jurassic Poolowanna Formation in 1977. DST 2 recovered over 610 m of oil in the pipe. A subsequent cased hole test (DST 5) flowed 6 barrels of oil to surface followed by a small water recovery during a four hour flow period. The oil is a dark brown, very waxy, possibly water washed crude with high melting point.

The sandstones are of low permeability and it is stated in the Poolowanna 1 well completion report that the Poolowanna Formation sandstones were subjected to some formation damage. Remapping of the Poolowanna structure incorporating more recent seismic data suggests that the well was located near an oil water contact.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.5 Failure (Dryhole) Analysis

Eleven of the twelve wells drilled in the Pedirka Block failed to intersect hydrocarbon accumulations and were plugged and abandoned (Figure 3).

A. Structure

Prior to the 1985 drilling programme, re-interpretation of all seismic data suggested many of the previous wells were not valid structural tests (Purni, Mokari, Poolowanna 1 etc). The 1985 programme was designed to evaluate the crest of the Poolowanna structure and four previously undrilled culminations with interpreted four-way dip closure. Seismic mapping suggested that up to 22 m and 18 m of closure remained to be tested at the C and JL horizons respectively above Poolowanna 1. The well in fact came in low to Poolowanna 1 and reported only trace hydrocarbons. The 1987 seismic programme was designed to again locate the Poolowanna crest. The remaining wells in the 1985 programme failed to intersect any hydrocarbons. The currently interpreted structural validity of the wells is detailed below.

INVALID STRUCTURAL TESTS

Purni 1	Outside closure at all objectives
Mokari 1	Outside closure at all objectives
Macumba 1	Outside closure at all objectives
Poolowanna 1	Within closure, not at crest
Poolowanna 2	Within closure, not at crest

VALID STRUCTURAL TESTS

		Comment
Walkandi 1	Within closure, near crest	deep Poolowanna test
Erabena 1	Within closure, near crest	deep Poolowanna test
Kuncherinna 1	Within closure, near crest	Poolowanna test/trace oil
*Glen Joyce 1	Within closure, near crest	deep Purni test (old data)
Miandana 1	Within closure, near crest	Poolowanna test (reprocessed)
*Oolarinna 1	Within closure, near crest	Poolowanna/Purni test (crestal faults)
Killumi 1	Within closure, near crest	Poolowanna test

* of the two valid Purni Formation tests Oolarinna had no independent fault closure and Glen Joyce 1 is based on old suspect data with little closure.

The only definitive test of the seismic remapping has been the Poolowanna structure. The failure of the geophysical prognosis in Poolowanna 2 necessitated re-evaluation of the seismic data much of which contained poor statics. Errors were due to unexpected velocity variations, correlation problems from unconformities in the sedimentary sequence and large well spacings.

Low permeabilities of target and formations were observed in several wells and may have influenced the lack of drilling success.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.5 Failure (Dryhole) Analysis (Cont.)

B. Reservoir Characteristics

Drilling in the Pedirka Block has shown that many sandstones have low permeability. This is attributed to diagenetic changes that have occurred as a result of either burial or chemical deposition of ground water solutes. The failure of crestal wells to intersect hydrocarbons in a region with adequate maturation indicates that migration into structures has not occurred and poor permeability may be a causative factor. Tight zones are readily apparent in the basal Algebuckina Sandstone and Poolowanna Formation with all reservoirs exhibiting some diagenetic alteration.

A trend towards better reservoir quality to the west of the block was predicted following Macumba 1 but Glen Joyce 1, Killumi 1 and Oolarinna 1 failed to intersect substantial reservoir sands. As a result diagenesis is seen as a widespread phenomenon that has had a marked impact on potential reservoirs.

The only well from which hydrocarbons have been recovered in the Pedirka Block is Poolowanna 1. A number of tests were conducted in the well in response to hydrocarbon shows but the majority had poor to negligible recoveries. This pattern was repeated in Poolowanna 2 where the greatest recovery was 1500 m SGCW in DST 1. Logs in Poolowanna 2 indicate tight sands throughout the Poolowanna and Peera Peera formations, with transit times in the order of 195-215 microsec/m. Sands also show extensive caving consistent with low permeabilities. (Figures 17 and 18).

C. Seal Characteristics

The Cadna-owie Formation is a potential seal for the Algebuckina Sandstone. Its thickness ranges from 130 ft in the western portion of the Pedirka Block increasing towards the south and east (Figure 16). The prograding characteristics of the Cadna-owie Formation produce a reliable seal for the underlying sequences.

The intraformational shale units within the Poolowanna Formation provide seals for sandstones within the lower Poolowanna Formation. Their development increases towards the central Poolowanna Trough. (Figure 8).

Erabena 1, Killumi 1, Macumba 1, Poolowanna 1 and Poolowanna 2 are independent of faulting at their crests. However the lowest closing contours of these wells are at fault intersections and the seal has possibly been breached. The rest of the wells are independent of faulting. The Peera Peera Formation has good intraformational seals.

Seal in the Purni Formation is intraformational and varies from 60 ft to 200 ft. The main problem is its rapid facies changes; from crevasse splay sediments around Macumba 1, Killumi 1 and Oolarinna 1 to fluviatile channel systems in the centre of the Pedirka Block at Glen Joyce 1. This facies changes to flood basin and lacustrine sediments at Purni 1 well.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.5 Failure (Dryhole) Analysis (Cont.)

D. Source Characteristics

The main source rock for the Algebuckina Sandstone and Poolowanna Formation is the Poolowanna Formation which is oil prone; hydrocarbon yields are fair to very good (1-20% TOC) with high amounts of cutinite, and sporinite. In Poolowanna 1, the Poolowanna Formation contains up to 75% of oil prone cuticle, miospore and fine saproplic detritus. Maturity varies from 0.8 to 0.9 Ro max. in the central Poolowanna Trough, decreasing towards the edges of the Eromanga Basin and becoming marginally mature around Glen Joyce 1 and Mokari 1 and possibly immature for oil generation at Purni 1.

The upper Peera Peera Formation is an important source rock. This formation is commonly rich in organic matter, largely cutinite, with TOC of up to 5%. The main oil generation phase for this maceral is in the range Ro max = 0.8-0.9%. Reflectance data for Poolowanna 2 record values exceeding 0.9% in this formation, placing the Peera Peera Formation well within the oil window, and strong oil cuts were visible in some coals.

In the southern portion of the Block the Birkhead may become an important source rock. Miandana 1 shows a vitrinite reflectance value of 0.7% Rv (max) (Figure 13) while Poonarunna 1 immediately south in the Lake Eyre Block has vitrinite reflectance values of 0.6-0.65%. Rv (max) and TOC values in excess of 15% indicting very good source richness for petroleum hydrocarbons. At Poonarunna 1 exinite (mostly lamaginite) comprises 35 - 85% of the DOM.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential

2.6.1 General

The Pedirka Block contains 12 wells and regional seismic (20-40 km grid) covers more than 70% of the block. Semi-detailed and detail seismic and most wells are concentrated in the north central and northwestern areas of the block in the Poolowanna Trough and Permian Pedirka Basin, the perceived areas of best hydrocarbon potential.

The principal potential reservoirs are the Jurassic Algebuckina Sandstone (including Hutton and Namur) and Poolowanna Formation, Triassic Peera Peera Formation and Permian Purni Formation. The Cadna-owie Formation may have reservoir potential if beach and bar sands and developed.

The potential reservoir formations also contain potential source rocks with the Poolowanna Formation and the Birkhead Formation in the southeast showing the best characteristics.

2.6.2 Source

Vitrinite reflectance data indicates that the Permian, Triassic and mid-lower Jurassic sections lie within the "oil window" and are capable of generating oil, particularly in the Poolowanna Trough. The Birkhead Poolowanna, Peera Peera and Purni Formations are potential source.

Purni Formation

The Purni Formation is the principal Permian source rock and was intersected by five exploration wells in the Pedirka Block, three of which were not valid tests. The upper section (Faridi, 1986) of the Purni Formation is considered to have better source potential in terms of suitable lithology (shale + coal) and source facies. The source volume of this unit is generally adequate throughout the Pedirka Basin.

Data indicate moderate-excellent hydrocarbon generative potential with maceral and TOC analyses suggesting the formation is both oil and gas prone with fair-excellent potential hydrocarbon yields (Figure 19).

Peera Peera Formation

The Peera Peera Formation contains the principal Triassic source rocks (Simpson Desert Basin) in the Pedirka Block. The upper section of the formation (Faridi, 1986) is considered to contain the best source potential.

Analyses indicate hydrocarbon yields are poor to fair (<16 mg per gm) with TOC ranging from 1.1% (Miandana 1) to 6% in Poolowanna 1 (Figure 20). Source rocks are well developed throughout most of the basin (100 ft) with best development in the Macumba and Poolowanna areas. The source rocks contain equal proportions of vitrinite and exinite macerals indicating the formation is capable of generating both oil (predominant) and gas. However, the lower value of hydrocarbon yields significantly downgrades generative potential.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.2 Source (Cont.)

Peera Peera Formation (Cont.)

A light non-waxy "oil" (42° API gravity, -1° pour point) was extracted from drilling mud which accompanied a minor gas flow (GTS at RTSTM) from the Peera Peera Formation (DST 3) in Poolowanna 1. Analyses indicate the oil (condensate) is unaltered and generated insitu (Peera Peera Formation in Poolowanna 1, 0.94% Rv(max)).

Poolowanna Formation

The Poolowanna Formation (Jurassic) contains the principal source rocks in the Pedirka Block with the mid-lower Poolowanna section containing the best potential source rocks (Faridi, 1986). The formation is areally extensive over the block (Figure 8) but is best developed in the Poolowanna Trough where it attains a maximum shale thickness of 150 ft (Poolowanna area).

Exinite constitutes the main oil-prone maceral component of the Poolowanna Formation, with vitrinite and inertinite subordinate. In Poolowanna 1, organic matter within the interval 7757 ft to 8440 ft, contains up to 75% exinite. The dominant exinite type in the coals is cutinite, whereas sporinite is dominant in the DOM. Sporinite and cutinite have their main oil generation in the range Ro max = 0.7-0.9%. TOC contents increase from Kuncherinna 1 (1.3%) to the central Poolowanna Trough; 5% in Poolowanna 1 and 6% in Walkandi 1. These values decrease towards the western edge of the Poolowanna Trough (around the Macumba and Mokari structures) and increase significantly towards the northern depocentre around the Erabena and Colson structures (Figure 21).

Hydrocarbon and potential yields in the Poolowanna Formation are generally rated "fair to very good". The hydrocarbon yield varies from 11.5 mg/gm (Erabena 1) to 52 mg/gm (Poolowanna 1) with potential yields from 5.0 kg/tonne (Miandana 1) to 12 kg/tonne (Glen Joyce).

In Poolowanna 1, DST 2 recovered over 2000 ft of oil which subsequently flowed oil to surface at the rate of 96 barrels per day (DST 5). The oil (37°) API gravity, 41°C pour point) is classified as a water-washed, paraffinic-naphthenic crude. The lower API and higher pour point reflects depletion in hydrocarbons with lower molecular weights, possibly due to flushing by artesian waters.

No alteration was evident in DST 2 (Peera Peera Formation) where the oil/condensate recovery was consistent with the lower permeability and porosity of the reservoir.

The inital thermal maturity in Poolowanna 1 was measured by applying methylphenanthrene index (MPI) measurements to calculate source maturity of VR = 0.87% for DST 2 (Poolowanna Formation). The calculated value approximates the present day thermal maturity of the formation in Poolowanna 1 (0.84% Ro max) indicating insitu oil generation. (Figure 22).

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.2 Source (Cont.)

Poolowanna Formation (Cont.)

The Poolowanna Formation in Purni 1 is immature (<0.5% Ro max) but further the east around Mokari 1, reaches 0.62% Ro max (mature for oil generation). The thermal maturity increases towards the distal Poolowanna Trough, where is reaches 0.84% Ro max (intensive oil generation zone) in Poolowanna 1.

Birkhead Formation

The Birkhead Formation contains potentially significant source rocks within the Pedirka Block. The formations is best developed in the south eastern portion of the Block where it attains a total shale thickness in excess of 150 ft. The formation is more areally extensive than previously considered (results of 1986 evaluation of Mulka and Lake Eyre Blocks). Analyses indicate the Birkhead Formation contains source rocks (oil prone) of moderate to excellent generative potential.

Only two wells (Miandana 1, Kuncherinna 1) have intersected a shaly Birkhead facies in the Pedirka Block and were both located near the limit of the recognisable Birkhead Formation.

Poonarunna 1, immediately south of the Pedirka Block in Lake Eyre Block intersected an organically rich early mature Birkhead Formation. The Amdel source rock evaluation report describes the source richness for petroleum hydrocarbons as good to very good with TOC ranging from 2.05 to 15.2% from four core samples. Optical microscopy of the dispersed organic matter reveals that it is exceptionally rich in exinite (35 - 85% of DOM). Exinite enriched terrestrial DOM is described as a characteristic feature of the Birkhead Formation where it displays high oil source potential on the flanks of the Nappameri Trough. The facies is atypical however as lamalginite is the dominant exinite maceral reflecting the isolation of the Poonarunna 1 paludal environment from the Nappamerri Trough region.

The rank threshold of oil generation from lamalginite rich organic material is given as VR = 0.7% with the Poonarunna 1 maturity of 0.6 - 0.65% (at 5000 - 5335 ft depth). Immediately north in the Pedirka Block the Birkhead Formation is predicted to be a similar lamalginite rich paludal facies but is estimated to be up to 1000' deeper. If this is in fact true then the Birkhead Formation would be more likely to be mature for oil generation. The Birkhead Formation is at a depth of 6538' at Miandana 1 with a VR = 0.7% although TOC in the Birkhead samples is only 0.33 to 0.86%.

Warburton Basin Sequence

A report entilted "Carbon Isotopic Composition of oils in Poolowanna 1" by J. Hunt (Delhi Petroleum 5.11.87) has suggested that the C13/C12 ratio of the Poolowanna oil for DST 2 is significantly less than a range of 37 samples taken elsewhere from Cooper and Eromanga oils. In fact the value falls in the range generally associated with pre-Permian oils.

Little evidence is available about the source potential of the Warburton Basin. The possibility of pre-Permian source rocks must remain open.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.3 Maturity

General

The Pedirka Block contains Permian and Triassic sediments with significantly lower geothermal maturities (1.0% Rv max or less) than those encountered in the Cooper Basin indicating very low geothermal gradients during Permo-Triassic deposition. The Jurassic-Recent sequence also exhibits lower geothermal maturity compared to Eromanga sediments overlying the Cooper Basin but is comparable to Eromanga sediments lying unconformably on basement.

Vitrinite reflectance profiles (Figure 22) demonstrate a uniform reflectance curve lacking anomalies indicating that sediments are in geothermal equilibrium and the current geothermal gradient is the highest yet experienced and post dates the early-mid Tertiary structuring. It is unknown whether the elevated geothermal gradient was initiated by the Tertiary Period structuring.

Potential hydrocarbon generation and migration are therefore relatively recent phenomena.

Purni Formation

The Purni Formation is considered to be within the early-peak phase of oil generation (i.e 0.5 - 1.0% Ro(max)). The most mature areas are in the Colson 1, Macumba 1 areas (Figure 23).

Vitrinite reflectance data suggest that in the Pedirka Basin only the eastern portion (east of Glen Joyce 1) is mature for peak oil generation (greater than 0.7% Ro (max)) and the Purni Formation is immature for gas generation. The area north of the Pedirka Block north of Colson 1 is also anticipated to be mature. TOC values east of Glen Joyce 1 are interpreted to decrease rapidly to the zero edge. Oil cuts have been observed during source rock and petrological studies (e.g. Oolarinna 1).

Peera Peera Formation

The Peera Peera Formation (Figure 24) is considered mature for liquid hydrocarbon generation (0.5 - 0.9% Ro (max)). The areal extent of the formation which maturities are within the peak oil generation phase (0.75-0.90% Ro (max)) is considerably more extensive than the Purni Formation. The most mature areas are around Macumba 1 and Poolowanna 1.

Poolowanna Formation

Regional well data indicate over 50% of the block contains Poolowanna Formation sediments which lie within the early-peak phase of oil generation (0.5 - 0.9% Ro (max)) with the most mature areas in a central N-S trending corridor (Figure 25).

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.3 Maturity (Cont.)

Birkhead Formation

Maturity of the Birkhead Formation source rocks is unknown. However extrapolation from adjacent blocks suggests the most mature potential source rocks are currently at their early-peak phase of oil generation (0.6-0.9% Ro (max)). The area of greatest maturity is the potentially deepest Birkhead Section south and east from Miandana 1. (Figure 14).

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential

2.6.4 Seal

General

Potential seals of good-excellent quality confine almost all potential reservoirs in the Pedirka Block. Formational and intraformational seals induced by lithological variation and diagenesis are present. The abundance of diagenetic seals (particularly in the Algebuckina Sandstone and Poolowanna Formation) has probably downgraded the ability of hydrocarbons to reach many potential reservoirs.

The impact of faulting or fault re-activation (early-mid Tertiary) on seal quality is unknown.

Purni Formation

The Purni Formation contains good-excellent intraformational seals. The overlying Walkandi Formation constitutes a good-excellent formation seal.

Peera Peera Formation

The Peera Peera Formation contains good-excellent intraformational seals. The overlying Poolowanna Formation represents a good-excellent formation seal. The Poolowanna Formation seal quality declines as the unit thins to the west away from the Poolowanna Trough.

Poolowanna Formation

The Poolowanna Formation contains numerous intraformational seals which are best developed in the Poolowanna Trough. Seal quality is generally excellent. No formation seal is present for the Poolowanna Formation.

Birkhead Formation

The Birkhead Formation is a potential seal where sufficiently well developed.

Algebuckina Sandstone

The Cadna-owie Formation constitutes the seal for the Algebuckina Sandstone. Well and seismic data indicate the formation is an excellent potential seal. The Algebuckina Sandstone contains numerous intraformational, diagenesis produced seals of variable quality.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.5 Reservoir

General

The principal potential reservoirs in the Pedirka Block are contained within the Purni Formation, Peera Peera Formation, Poolowanna Formation and the Algebuckina Sandstone. All have intraformational reservoir potential for both intraformational and exformational source rocks.

The Purni, Peera Peera and Poolowanna Formations contain two distinct type of reservoir.

Channel Belt Sandstones - principal reservoirs which are well developed and areally extensive being deposited under a high energy environment.

Overbank and Flood Basin Sandstones - subordinate reservoirs which are generally poorly developed, discontinuous and difficult to map and were deposited under a low energy fluvial regime.

The reservoir parameters of these formations are controlled by both reservoir type and post depositional alteration.

The Algebuckina Sandstone is a high energy braided fluvial deposit with the reservoir parameters predominantly controlled by post depositional alteration. The development of Birkhead Formation in the southeastern areas of the block subdivides the Algebuckina Sandstone into the Namur and Hutton Sandstones. Reservoir parameters of these units improve to the south and east.

Purni Formation

The Purni Formation contains potential reservoirs in the middle (principal) and upper (subordinate) sections of the formation. The principal potential reservoirs (middle unit) of the formation attain a maximum sand thickness of approximately 150 ft in the Mokari area and an average thickness of 100 ft. The reservoir is widespread over the Pedirka Basin with observed porosities ranging from 6%-12% (Figure 26).

The upper section of the formation contains numerous subordinate low energy sandstones which exhibit poor-fair porosity. Potential reservoir quality is variable and difficult to predict although data indicate reservoir quality improves toward the west (Glen Joyce 1, 11%; Mokari 1, 12%).

Peera Peera Formation

In the Peera Peera Formation the principal reservoir sandstones are contained within the middle section of the formation with subordinate reservoirs in the basal section.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.5 Reservoir (Cont.)

Peera Peera Formation

The middle section of the formation contains sandstones which are areally extensive over much of the Simpson Desert Basin reaching a maximum sandstone thickness of 120 ft in the Kuncherinna area. Reservoir porosity is generally poor in the central areas of the basin with observed porosities averaging less than 10% (Walkandi 4% to Oolarinna 13%) and improve toward the basin margin (Figure 27).

Potential reservoirs are poorly developed in the basal section of the Peera Peera Formation and are primarily restricted to the deeper areas of the basin coincident with maximum burial and diagenetic alteration. Potential reservoirs are discontinuous and generally poorly developed due to their low energy depositional environment. However parameters are anticipated to improve in the middle unit sandstone located toward the margins of the basin, particularly the north west (average 12%) and the east (near Kuncherinna 1).

Poolowanna Formation

The Poolowanna Formation contains potential reservoir sandstones throughout the sequence, however, the best development of channel belt sandstones are observed in the basal section, a mid-Poolowanna unit (principal reservoir) and a unit in the upper Poolowanna Formation. These units contain well developed areally extensive sandstone reservoirs whilst other potential reservoirs are generally poorly developed and/or discontinuous and lenticular.

The basal Poolowanna section (Figure 28) contains well developed sandstones (35 ft - 160 ft net sand) throughout the Poolowanna Trough. Flank and trough areas of the basin exhibit superior porosity (average 10%+) whilst the deeper basin areas, despite increased sandstone development, exhibit poor porosity (<10%).

The mid-Poolowanna Formation unit respresents the best potential reservoir being areally extensive, well developed (30 -100 ft+) and generally having superior porosity (Figure 29). The reservoir potential of the unit was confirmed by the oil recovery in Poolowanna 1 and oil shows in Walkandi 1, Poolowanna 2 and Kuncherinna 1. The unit exhibits increasing porosity toward the flanks and margin of the Poolowanna Trough as evidenced by Mokari 1 (ϕ = 13%) with a similar increase anticipated on the eastern margin. Porosity is also observed to be variable within the trough with Poolowanna 1 and 2 (2 km apart) exhibiting porosities of 11% and 7% respectively.

The upper Poolowanna unit (Figure 30) contains potential reservoir sandstones which exhibit substantial thinning from the central Poolowanna Trough (265 ft, Erabena) to an average of 40 ft on the periphery of the trough. Porosity improves from an average of 6-9% in the central trough to 12% on the margin areas.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.5 Reservoir (Cont.)

Algebuckina Formation

The Algebuckina Sandstone is an excellent potential reservoir and present throughout the Pedirka Block. The sequence represents braided fluvial sedimentation under high energy fluvial regimes. Porosity data (core analyses and wireline data) indicate significant porosity variations from less than 10% to 22%+ across the block (Figure 31). The regional trend is for prosity to increase away from the deep central area of the block toward block boundaries.

In the southeastern quadrant of the block the Birkhead Formation is developed (Miandana 1, Kuncherinna 1) and the Algebuckina Sandstone is accordingly subdivided into the Namur Sandstone (Mooga Formation), Birkhead Formation and Hutton Sandstone. The reservoir quality of the Namur and Hutton Sandstone is considered to be fair to excellent improving dramatically near the southern block boundary (regional well data).

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.6 Diagenetic Effects (Cont.)

Diagenetic alteration of the potential reservoirs and migration pathways is the principal control on the prospectivity of the Pedirka Block, particularly the Jurassic section. All potential reservoirs, Purni, Peera Peera and Poolowanna formations and the Algebuckina Sandstone have experienced significant diagenetic destruction of porosity and permeability, particularly the Jurassic Poolowanna Formation and Algebuckina Sandstone.

Diagenetic alteration in the Purni Formation (Permian) and Peera Peera Formation (Triassic) consists principally of quartz and kaolinitic overgrowths with the most significant loss of reservoir quality confined to the Pedirka Basin and Simpson Desert Basin depocentres.

The Purni and Peera Peera reservoirs are considered to exhibit typical diagenetic alteration given their age, tectonic and thermal history. The formations demonstrate several comparable features with Permian and Triassic sediments of the Cooper Basin (particularly the Nappamerri Trough).

The Poolowanna Formation and Algebuckina Sandstone reservoirs exhibit significantly elevated diagenetic effects when compared to Jurassic sediments in adjacent blocks. The diagenetic alteration is areally and locally variable being pervasive in some areas and sporadic in other areas.

An explanation of the severity of diagenesis requires an origin independent of normal thermal/burial diagenesis.

The Poolowanna Formation and Algebuckina Sandstone because of their importance have been extensively studied (di Toro, Amdel, Fander, etc). The generalized results of these studies are:-

Algebuckina
- Framework grains are predominantly quartz, with very occasional microcline and detrital garnet.
- All quartz grains are stressed, sometimes quite severely.
- The main cement is quartz, in optical continuity with the framework grains (i.e. also stressed).
- The quartz cement was sporadically replaced, after deformation, by calcite (confirmed by stain tests) and by ankerite-siderite. Minor recrystallized clays (illite and sericite) and chlorite occur sporadically.

Poolowanna
- original sediments (reservoir) were relatively clean, predominantly fine-medium grained, mature sandstone.
- all quartz grains are stressed.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.6 Diagenetic Effects (Cont.)

Poolowanna

- Quartz overgrowths in optical continuity with the framework grains (ie also stressed) are the most important diagenetic mineral with minor calcite and siderite also variably present.
- overgrowths are better developed in fine-medium grained, well sorted sandstones.
- leaching and dissolution of shale clasts, feldspar and other lithics is observed (after creating secondary porosity?)
- authigenic clays, predominantly kaolinitic, fill most remaining primary and secondary pore space.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.6 Hydrocarbon Potential (Cont.)

2.6.7 Timing of Structuring, Migration and Diagenesis

An understanding of the inter-relationship and sequential timing of structuring, hydrocarbon generation, migration and reservoir diageneis is fundamental to assessing the hydrocarbon potential of the Pedirka Block. The model developed below is drawn from available data within the block and regional assessment.

Hydrocarbon generation and migration - are "recent" phenomena (mid Tertiary - Recent) and post date even the most recent structuring in the block (early-mid Tertiary).

Structuring - in early-mid Tertiary time created and enchanced observed Jurassic structures in the block and post dates the destruction of primary porosity (via quartz overgrowths) of the Jurassic and Permo-Triassic sandstones.

Structuring - during the early-mid Tertiary time, via compression, faulting and stress-fracturing developed much of the secondary porosity observed (particularly in Jurassic sediments), thereby providing access for secondary leaching and further chemical diagenesis.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.7 Exploration Targets

2.7.1 General

The Pedirka Block contains a variety of delineated and indicated structural and stratigraphic targets. Potential plays occur within the Permian, Triassic and Jurassic section.

Play types include
- four-way dip closed structures (Permian, Triassic, Jurassic)
- fault/dip closed structures (Permian, Triassic, Jurassic)
- fault closure (Permian, Triassic, Jurassic)
- onlap and pinchout traps (Permian, Trassic, Jurassic)
- facies controlled traps (Permian, Triassic, basal Jurassic)
- diagenetic traps

2.7.2 Structural Targets

2.7.2.1 Prospects

A total of sixteen prospects are currently delineated in the block (Figure 32/Table 1). The structures are concentrated in the central and north-western areas reflecting the increased seismic density in these areas. All structures are four-way dip closed culminations at the C horizon, however some structures particularly those on structural trends may have a fault component at lower horizons.

The prospects are currently defined on C horizon (Cadna-owie Formation) mapping and are generally small-large in size (700-8100 acres MLCC) with low-moderate vertical closure (20-40 ms).

Many prospects, particularly in the Poolowanna Trough area, are separate subsidiary culminations (Pedine, Pendulla, Penunga etc) of a very large structure or structural trend and therefore tend to have low vertical relief.

2.7.2.2 Weak Leads

The Pedirka Block contains in excess of 100 indicated and inferred leads. All leads are currently based upon C horizon mapping and vary in size from less than 500 acres to over 5000 acres of indicated closure.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.7 Exploration Targets

2.7.2 Stratigraphic Targets

Numerous potential stratigraphic traps are present in the Purni, Peera Peera and Poolowanna Formations and the Algebuckina Sandstone. Principal potential objectives are:

Purni/Peera Peera
- pinchout and onlap plays on the respective basin margins
- fault controlled traps often with a dip component
- unconformity barrier

Poolowanna
- fault controlled traps often with a dip component
- diagenetically induced permeability barriers
- facies controlled traps (i.e. channel belt sandstones)

Algebuckina
- diagenetically induced permeability barriers
- Birkhead onlap on palaoehighs.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.8 Play Concepts

Principal plays in the Pedirka Block are structural and stratigraphic traps containing Jurassic sandstone reservoirs. Algebuckina Sandstone (Namur and Hutton Sandstones) and Poolowanna Formation reservoirs within four-way dip closed structures and stratigraphic traps formed by pinchout and permeability barriers are the most highly rated.

The Purni Formation (Permian) and Peera Peera Formation (Triassic) are secondary targets worthy of investigation particularly when associated with Jurassic traps. The formations contain similar play types to the Jurassic.

Selection of exploration targets must be predicated upon the timing of the structuring, hydrocarbon generation and migration and diagenesis. Structures, reservoirs, source and seal have been demonstrated to be present and more than adequate to reservoir hydrocarbons.

Jurassic

Diagenesis is the fundamental control on target prospectivity in the Poolowanna sequence. Hydrocarbon generation and migration in all potential source rocks post-date Tertiary period structuring and destruction of primary sandstone porosity and permeability. However, diagenesis is highly variable (vertically and laterally) and there is currently no method of accurately mapping potential primary conduits connecting source and reservoir or even for predicting which structures have suitable reservoir parameters.

Adequate source rock quantity and quality is the fundamental control for the Hutton and Namur targets.

Permo-Triassic

Whilst some elevated diagenesis has been observed, juxtaposition of source and reservoir is the primary control on prospectivity. Permian (Purni Formation) and Triassic (Peera Peera Formation) source rocks reached peak generative maturity after Tertiary structuring although some hydrocarbons may have been generated during Mesozoic time. Post depositional alteration in the sandstones is consistent with normal diagenesis in sediment of this age and depth of burial except at some localities in the Poolowanna Trough which experienced elevated diagenesis.

The Pedirka Block can be divided into two geolocial domains based upon diagenetic alteration.

A. North central and north western areas of the block (particularly the Poolowanna Trough region, (Figure 4) where diagenesis has significantly downgraded reservoirs and migration pathways. Accordingly potential targets should be selected so as to minimize distance between source and reservoir and maximize the number of potential reservoirs and migration conduits.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.8 Play Concepts (Cont.)

Most highly rated targets

- have coincident reservoir and source
- have access to the thickest, most mature source rock pile
- are located on major structural trends (to maximize all available migration fairways).
- are associated with faulting and flexuring (potential for fault induced hydrocarbon conduits).
- contain as many target formations as possible.

Structures on the Poolowanna Trend are most highly rated on the above criteria. Poolowanna 1 highlights the prospectivity of these structures. Structures associated with the East Border Fault are also highly rated.

Structures in the northwestern area of the block have access to less mature and thinner section of source rocks and are only moderately prospective despite the intensity of faulting and flexure.

B. All other areas of the block - where diagenesis is generally a subordinate influence on prospectivity.

Accordingly potential targets with access to areally extensive, mature source rocks are prospective if structurally definable migration pathways are present.

Most highly rated targets

- lie on structural trends with access (via migration pathways) to the largest volume of mature source rocks (ie thick source rock pile and areally extensive source rocks).
- are within structures located at "bottom of trend" to "mid trend" because whilst migration fairways are present oil generation and migration is a "recent" phenomenon.

Limited data precludes delineation of all structural trends present however the extension of the Warrandinna-Lake Promise Trend (northward), the Poolowanna-Perina Trend southward, trends in the Miandana area and possible trends associated with the Birdsville Track Ridge are highly rated.

2.0 GEOLOGICAL CONSIDERATIONS (Cont.)

2.8 Play Concepts (Cont.)

Exploration in the Pedirka Block must recognise that

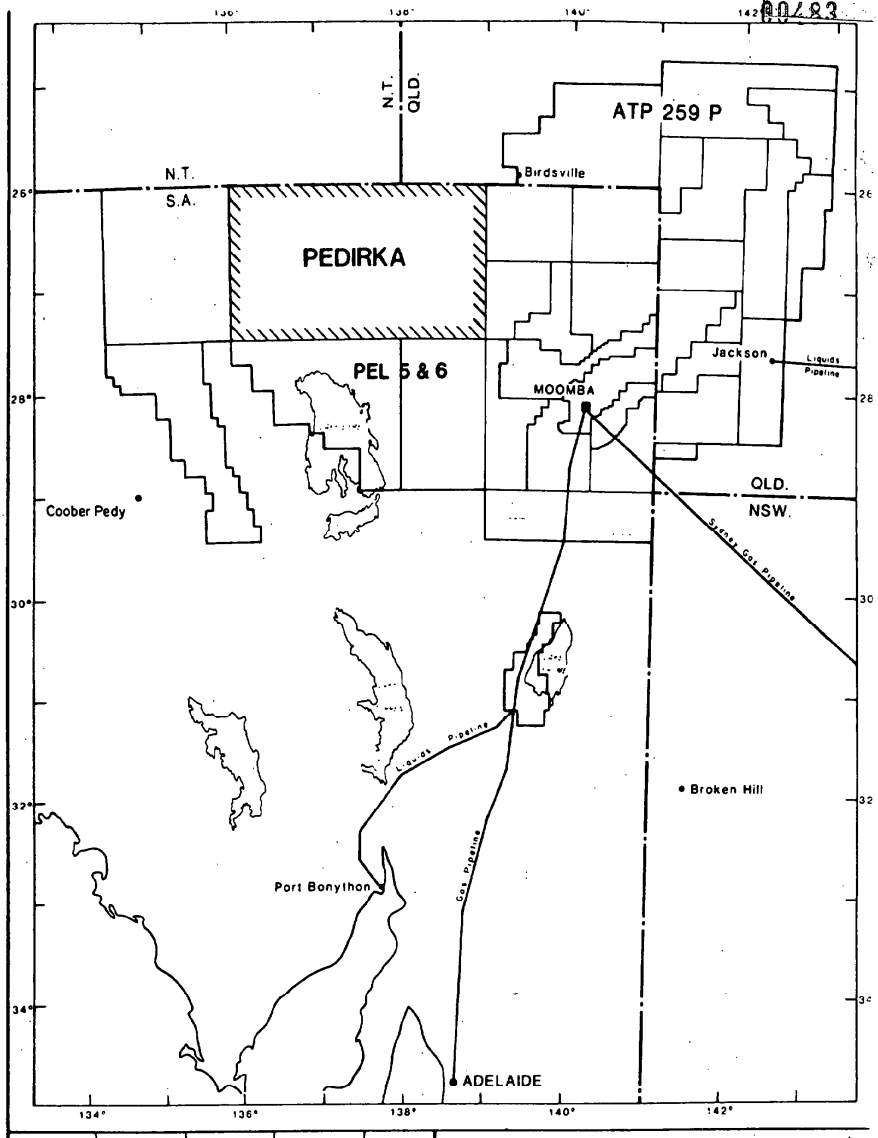
- no consistent model currently explains the mechanism which produced the observed diagenetic effects.
- diagenetic effects cannot currently be mapped or predicted.
- current data densities in the block are inadequate to solve the observed anomalies.

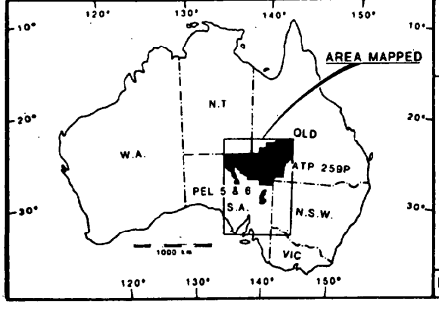
REFERENCES

FARIDI, H. Block Review, Basin Analysis and Hydrocarbon prospectivity of the Pedirka Block (1986). Delhi Petroleum (unpublished).

APPENDIX 1 PROSPECT SUMMARIES

Poolowanna 3
Pediban
Pendleton
Miamiana





SANTOS LIMITED

S.A. EXPLORATION

P.E.L. 5 & 6 AND A.T.P. 259 P

PEDIRKA BLOCK

LOCATION

100 0 100 200

KILOMETRES

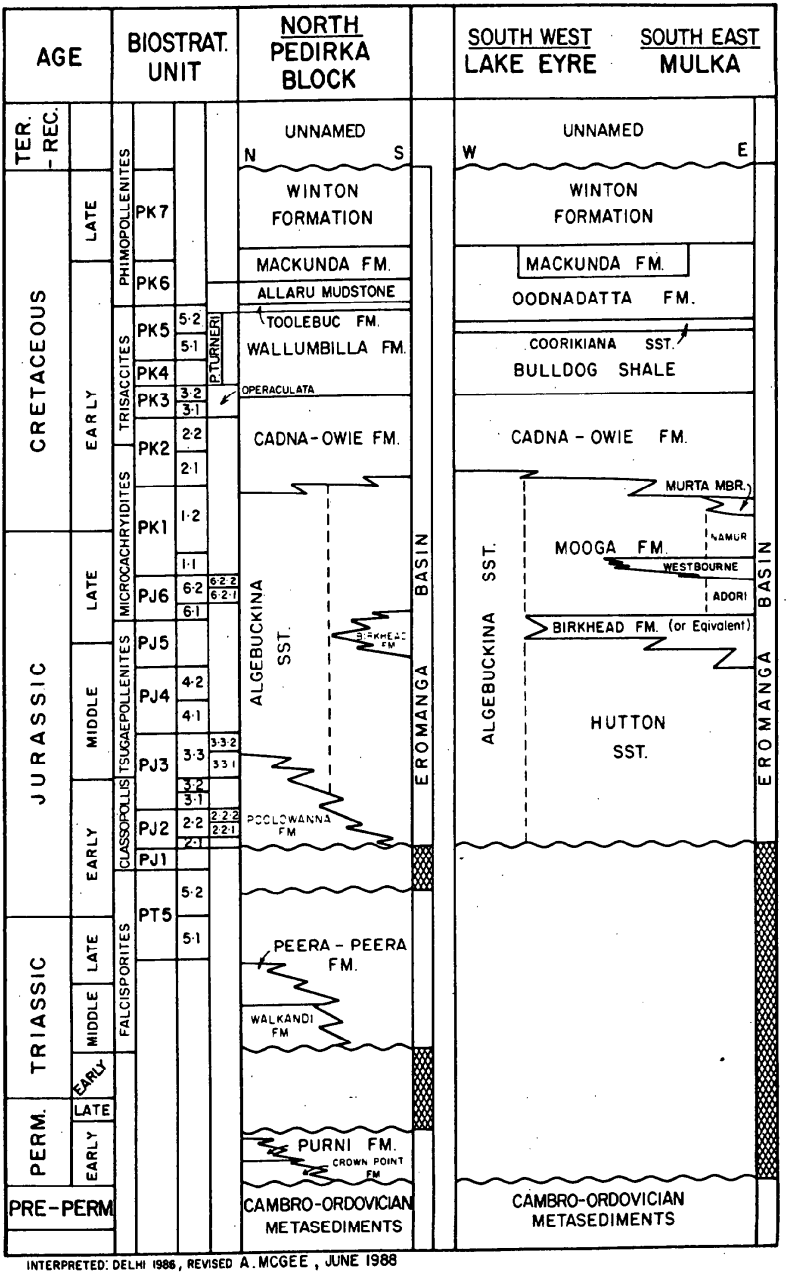
Date JUNE 1988	Drafted RM	Author P.S.	Fig. 1

PEDRLK 01

SANTOS LIMITED

86484

STRATIGRAPHY-
CENTRAL AND EASTERN PEDIRKA SECTOR



INTERPRETED: DELHI 1986, REVISED A. MCGEE, JUNE 1988

PEDSEC 011

00486

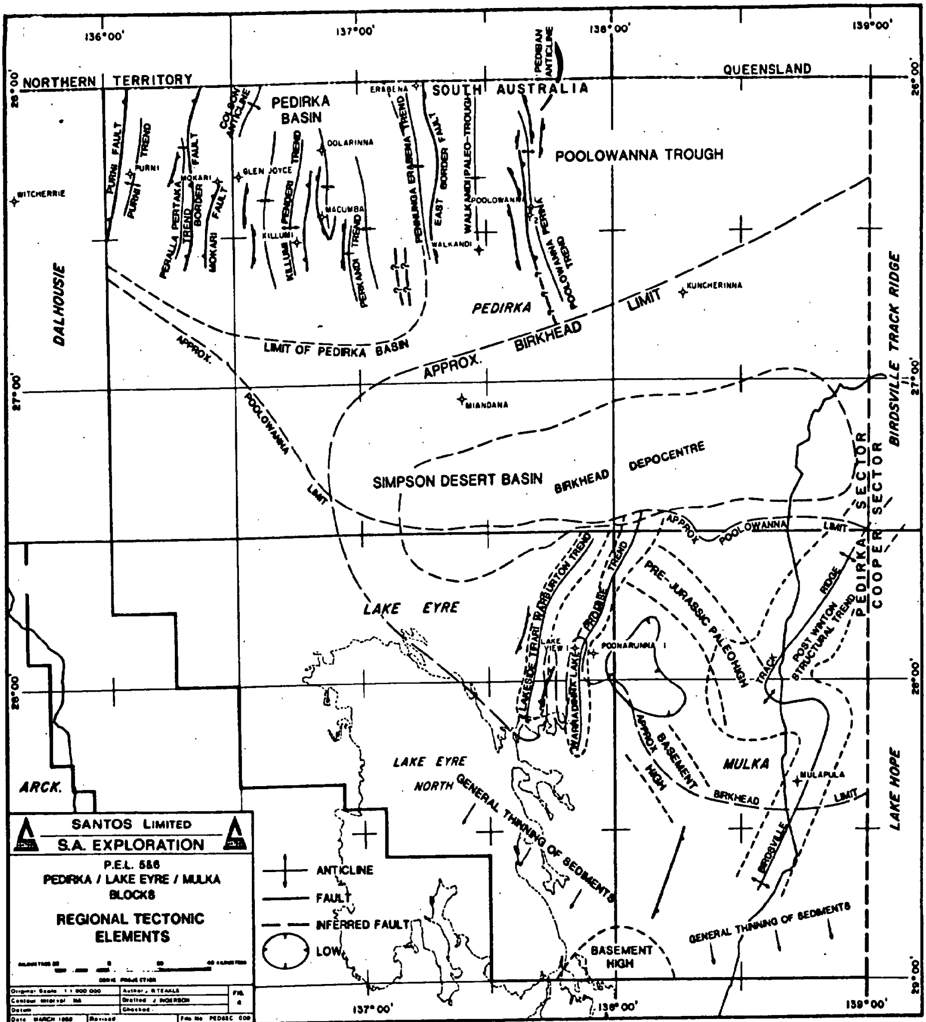

SANTOS LIMITED
S.A. EXPLORATION
P.E.L. 5&6
PEDIRKA / LAKE EYRE / MULKA BLOCKS
REGIONAL TECTONIC ELEMENTS
ANTICLINE
FAULT
INFERRED FAULT
LOW
136°00'
137°00'
138°00'
139°00'
26°00'
27°00'
28°00'
29°00'
NORTHERN TERRITORY
QUEENSLAND
SOUTH AUSTRALIA
PEDIRKA BASIN
POOLOWANNA TROUGH
PEDIRKA
LIMIT OF PEDIRKA BASIN
APPROX. BIRKHEAD LIMIT
APPROX. POOLOWANNA LIMIT
SIMPSON DESERT BASIN
BIRKHEAD DEPOCENTRE
DALHOUSIE
BIRDSVILLE TRACK RIDGE
PEDIRKA SECTOR
COOPER SECTOR
LAKE EYRE
LAKE EYRE NORTH
GENERAL THINNING OF SEDIMENTS
PRE-JURASSIC PALEOHIGH
POST WINTON STRUCTURAL TREND
APPROX BASEMENT HIGH
MULKA
BIRKHEAD LIMIT
BASEMENT HIGH
LAKE HOPE
ARCK.
WITCHERRIE
PURNI
PURNI FAULT
PURNI TREND
PERALLA PERTAKA TREND
BORDER FAULT
MOKARI
MOKARI FAULT
COLSON ANTICLINE
GLEN JOYCE
KILLUMI
KILLUMI PENDERI TREND
DOLARINNA
MACUMBA
PERKANDI TREND
ERABENA
PENNINGA ERABENA TREND
EAST BORDER FAULT
WALKANDI PALEO-TROUGH
WALKANDI
POOLOWANNA
POOLOWANNA TREND
PEDIRIAN ANTICLINE
KUNCHERINNA
MIANDANA
LAKESIDE TRARI WARBURTON TREND
LAKE VIEW
POONARUNNA
LAKE PRIMROSE TREND
MULAPULA
BIRDSVILLE TRACK RIDGE

Fig.4

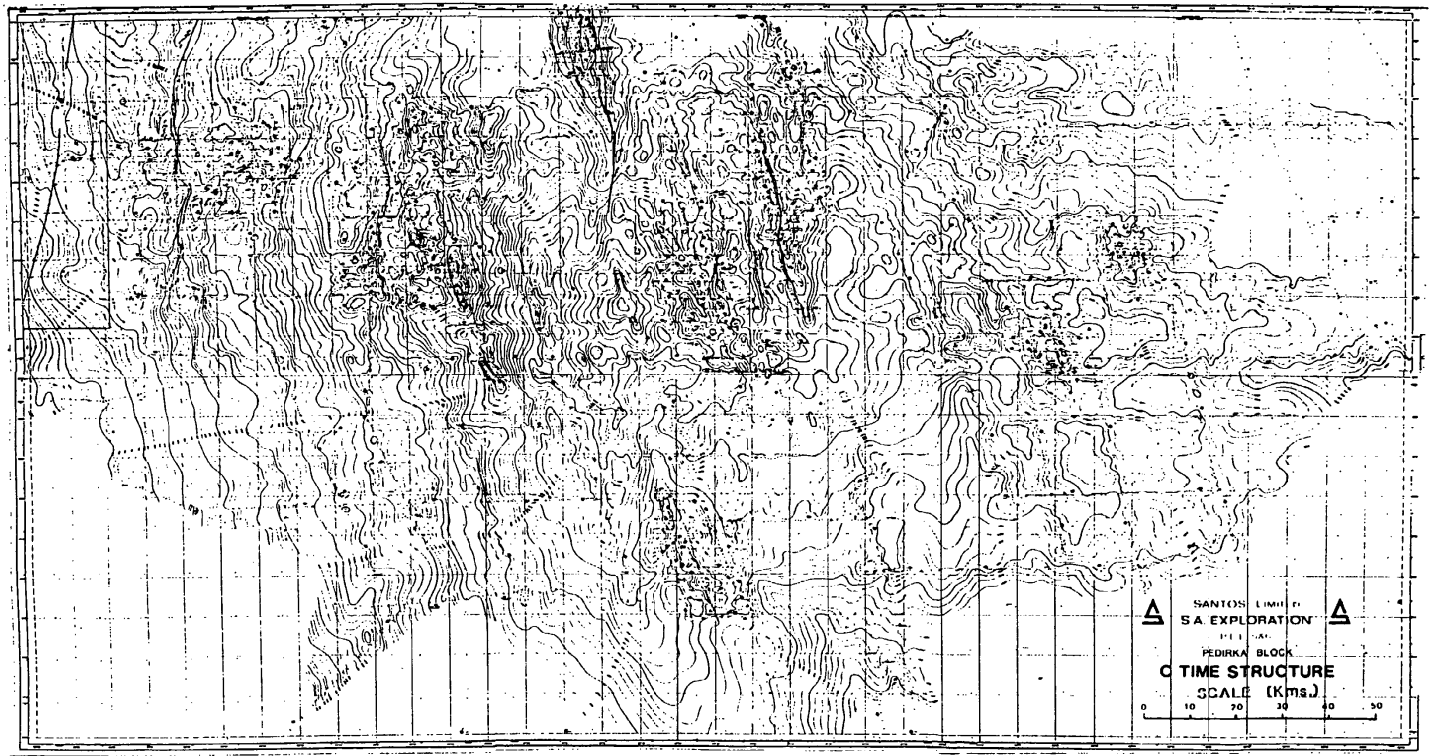
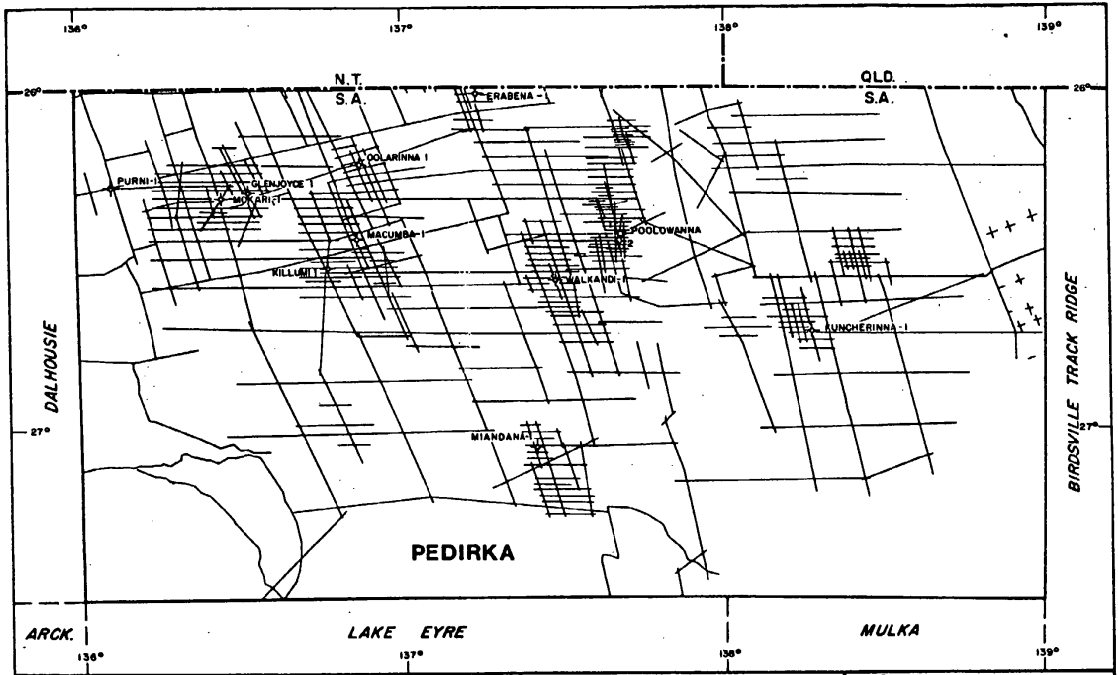

SANTOS LIMITED
S.A. EXPLORATION
PEDIRKA BLOCK
C TIME STRUCTURE
SCALE (KMS.)
0 10 20 30 40 50

Fig. 5



LEGEND

SEISMIC COVERAGE
——— UP TO 1988

- WELL, SITE OR DRILLING
- DRY WELL
- OIL SHOW
- GAS SHOW
- L WELL
- AS WELL

SANTOS LIMITED
PEDIRKA BLOCK
INDEX MAP

1:1000 000
km 10 0 10 20 30 40 km

DRAFTED. J.G.
INTERP. SA-3
DATE OCT. 1986

Fig 3

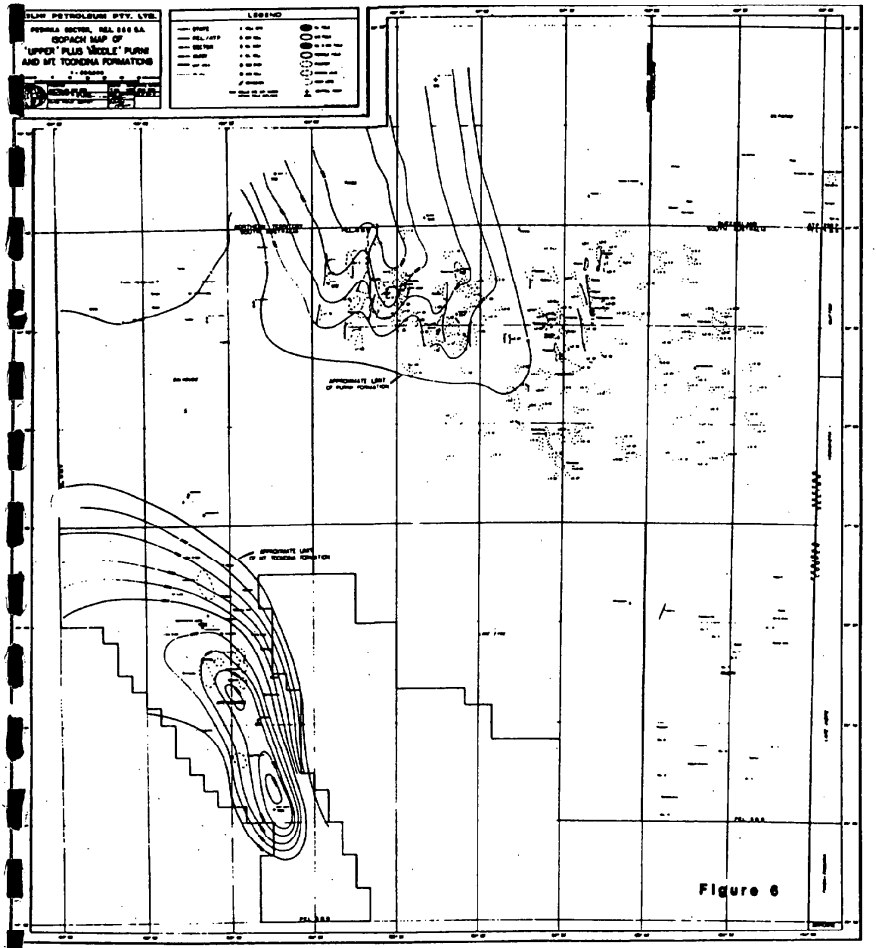
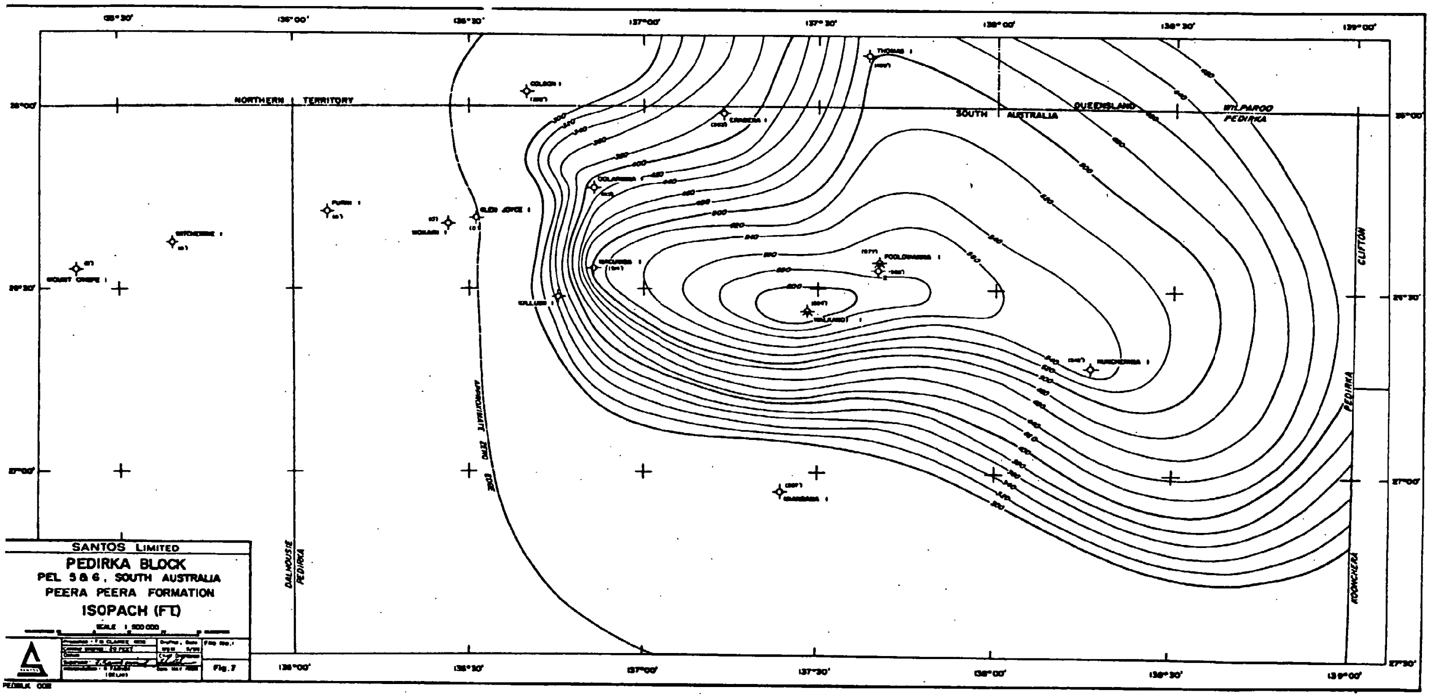

ISOPACH MAP OF
'UPPER' PLUS 'MIDDLE' PURNI
AND MT TOONDINA FORMATIONS
LEGEND
APPROXIMATE LIMIT
OF PURNI FORMATION
APPROXIMATE LIMIT
OF MT TOONDINA FORMATION

Figure 6

00489


SANTOS LIMITED
PEDIRKA BLOCK
PEL 5 & 6, SOUTH AUSTRALIA
PEERA PEERA FORMATION
ISOPACH (FT)
Fig. 7
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
WILPAROO
PEDIRKA
CLIFTON
KOONCHERA
DALHOUSIE
APPROXIMATE ZERO EDGE
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'

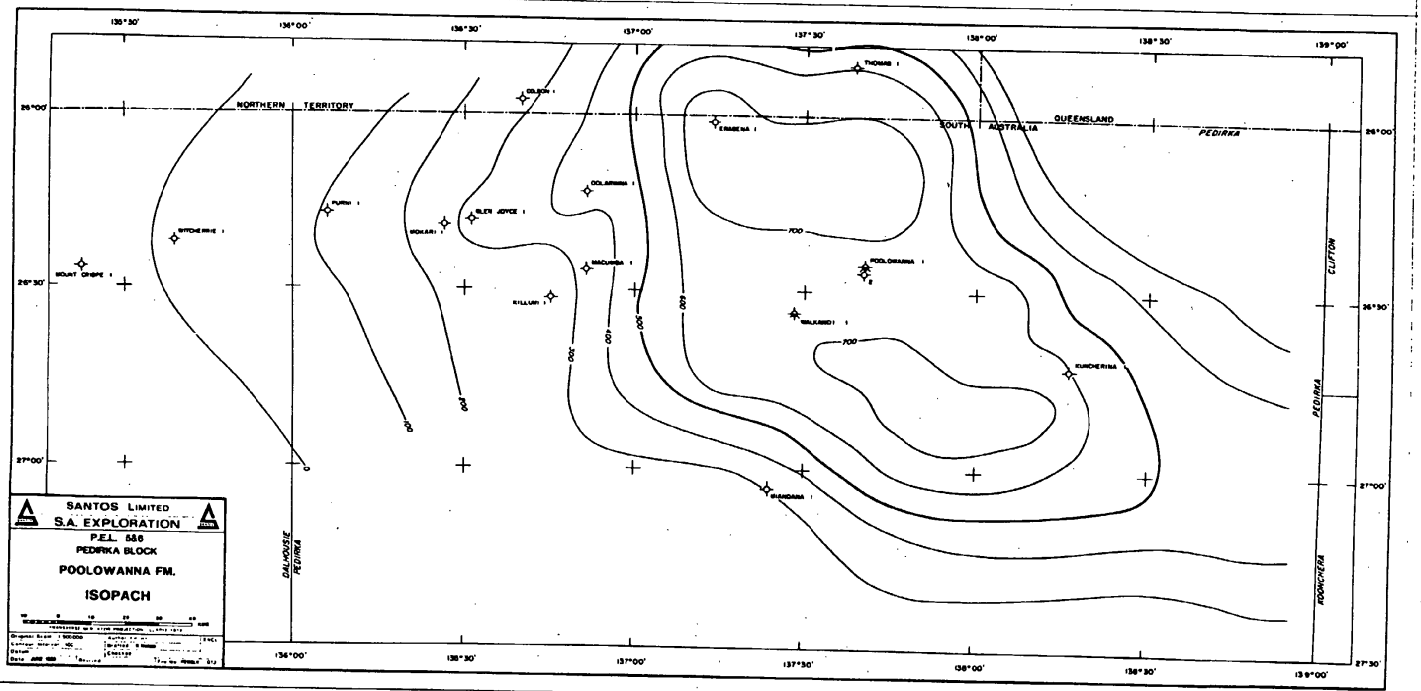
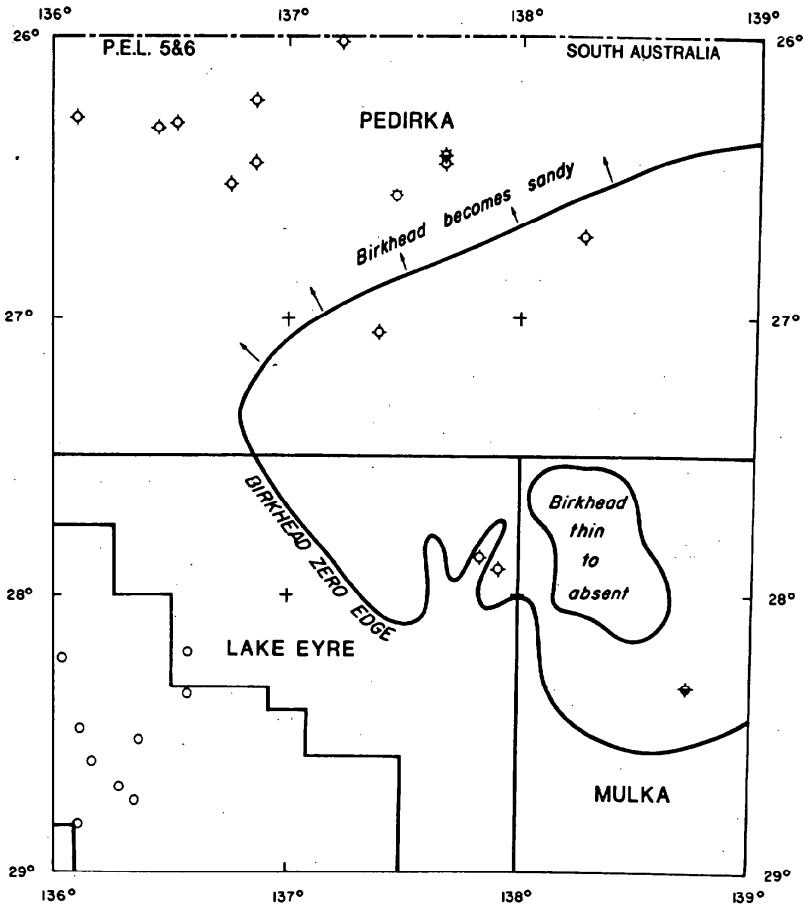

SANTOS LIMITED
S.A. EXPLORATION
P.E.L. 556
PEDIRKA BLOCK
POOLOWANNA FM.
ISOPACH
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
PEDIRKA
CLIFTON
DALHOUSIE
ROMACHERA
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'
THOMAS 1
GILES 1
EMBERA 1
GOLARINNA 1
SYCHERRIE 1
PURNI 1
MOLARI 1
GLEN JOYCE 1
MOUNT CRISPE 1
MACUMBA 1
KILLURI 1
POOLOWANNA 1
BALKANDI 1
KUNCHERINA 1
BIANDANA 1
700
600
500
400
300
200
100

Fig. 8



SANTOS LIMITED

S.A. EXPLORATION

P.E.L. 5&6

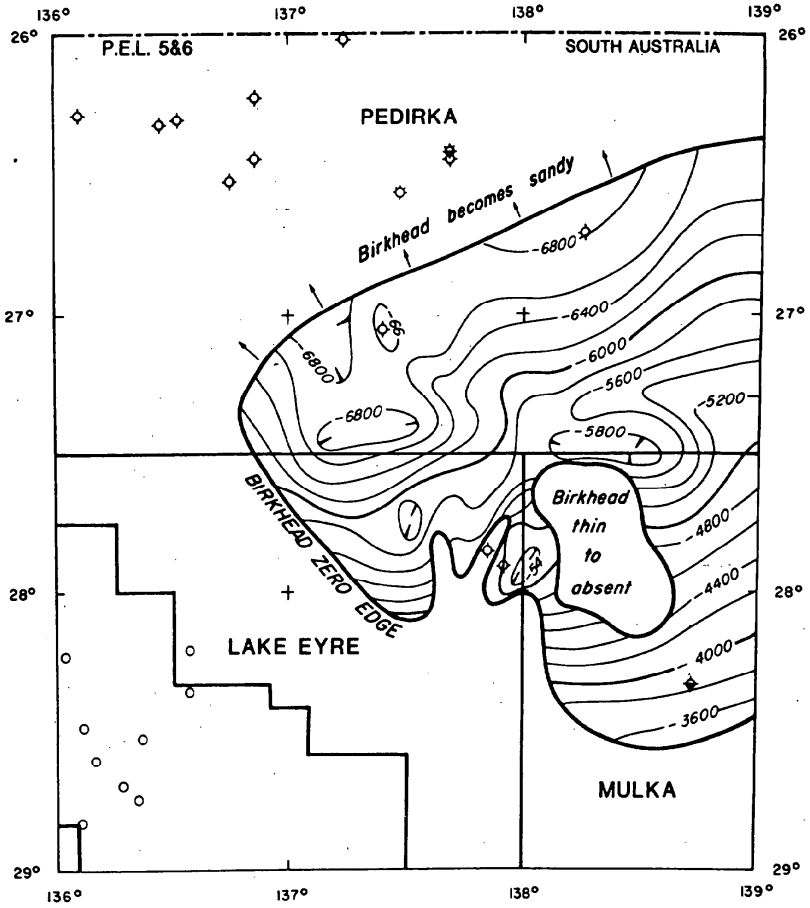
BIRKHEAD FORMATION

ZERO EDGE

1: 2000000

20 0 20 40 60 80 100

Fig. 9
PEDSEC 004



SANTOS LIMITED

S.A. EXPLORATION

P.E.L. 5&6

BIRKHEAD FORMATION

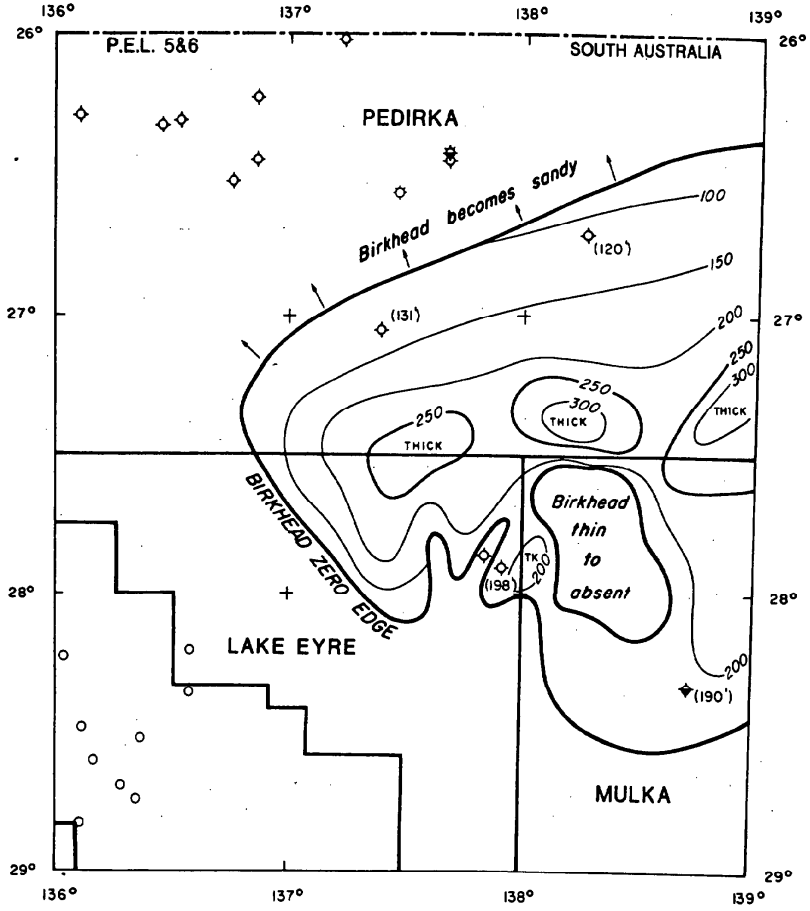
DEPTH STRUCTURE

1: 2000000

20 0 20 40 60 80 100

Fig. 10

PEDSEC 005



SANTOS LIMITED

S.A. EXPLORATION

P.E.L. 5&6

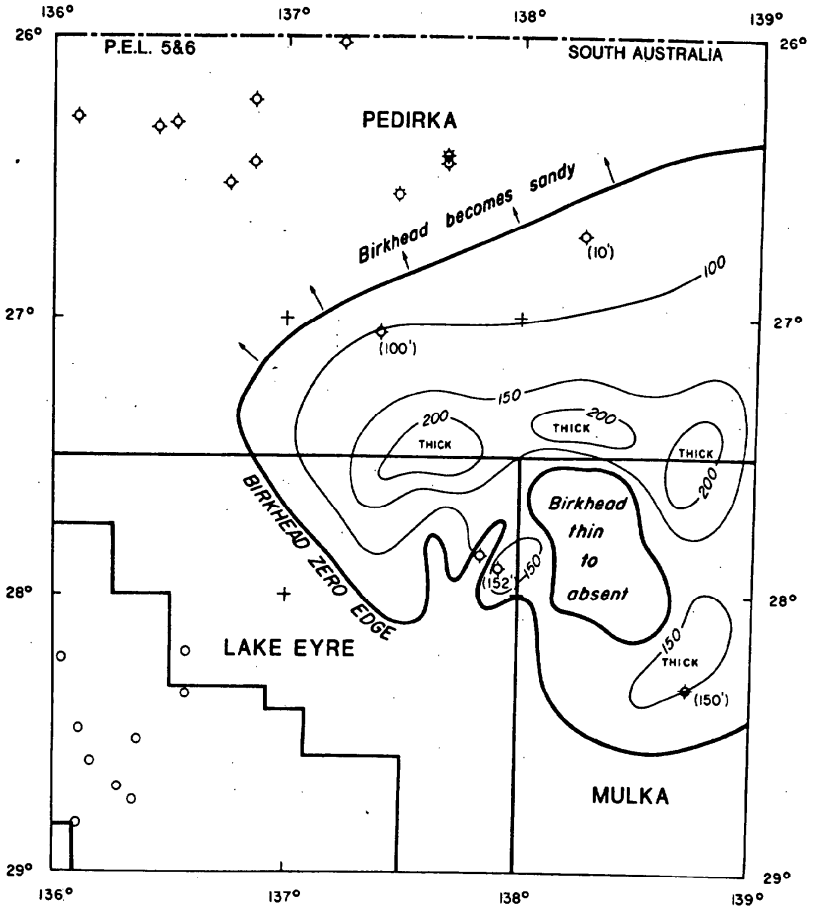
BIRKHEAD FORMATION

ISOPACH

1: 2000000

20 0 20 40 60 80 100

Fig. 11
PEDSEC 007



SANTOS LIMITED

S.A. EXPLORATION

P.E.L. 5&6

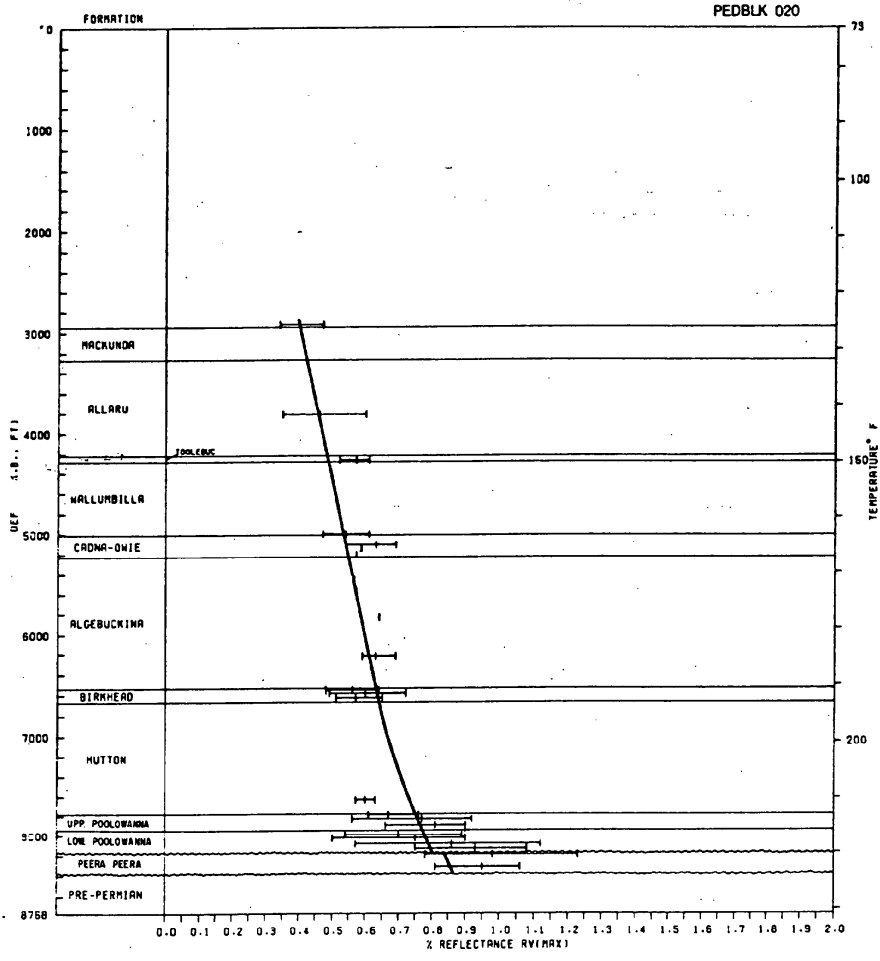
BIRKHEAD FORMATION

NET SHALE ISOPACH

1: 2000000

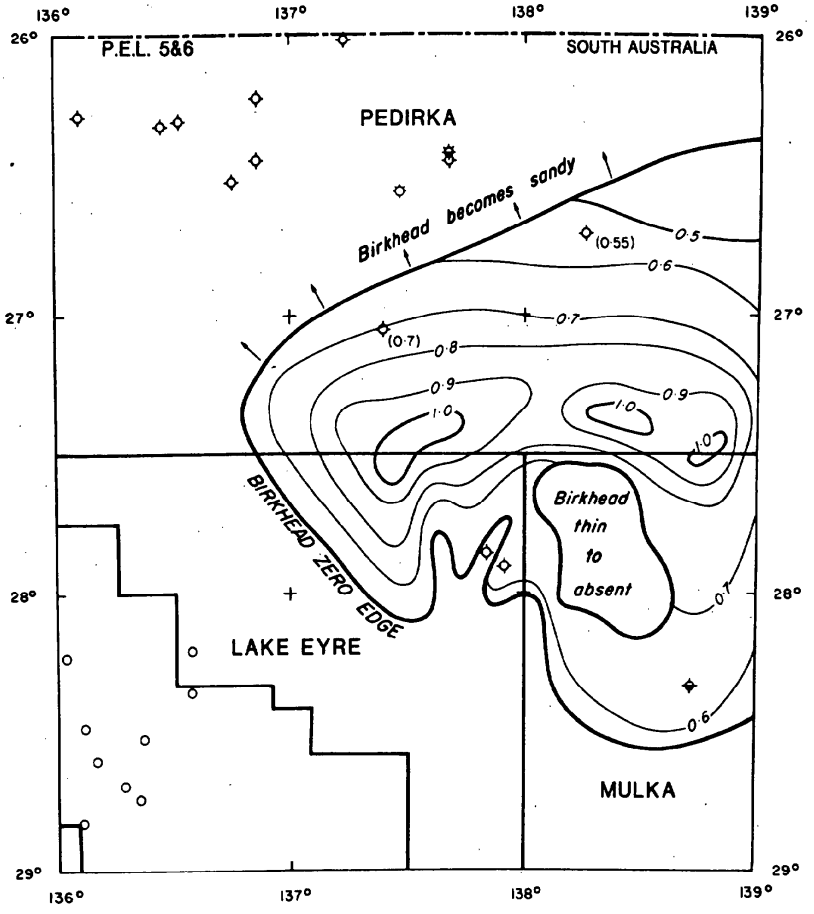
20 0 20 40 60 80 100

Fig. 12
PEDSEC 008



MIANDANA 1 : VITRINITE REFLECTANCE PROFILE

Fig. 13



SANTOS LIMITED

S.A. EXPLORATION

P.E.L. 5&6

BIRKHEAD FORMATION

VITRINITE REFLECTANCE
(% Reflectance Rv (max))

1: 2000000

20 0 20 40 60 80 100

Fig. 14
PEDSEC 006

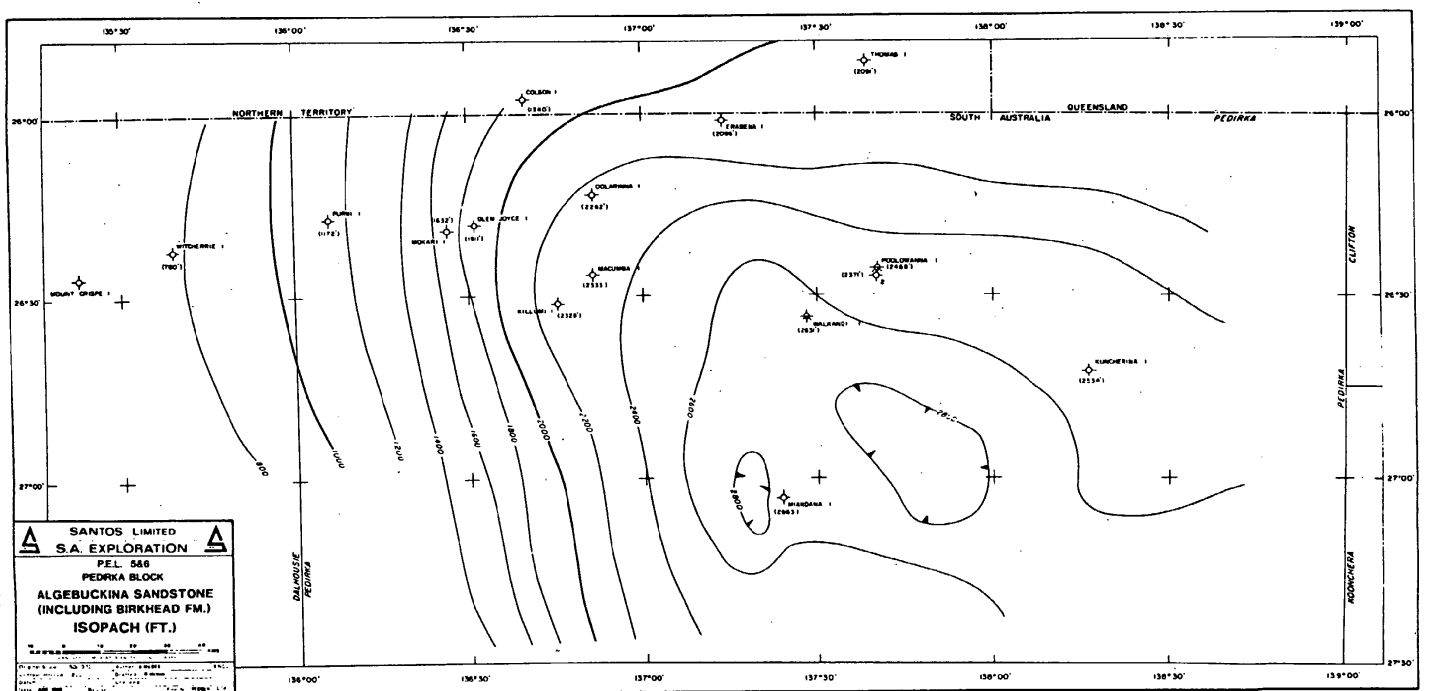
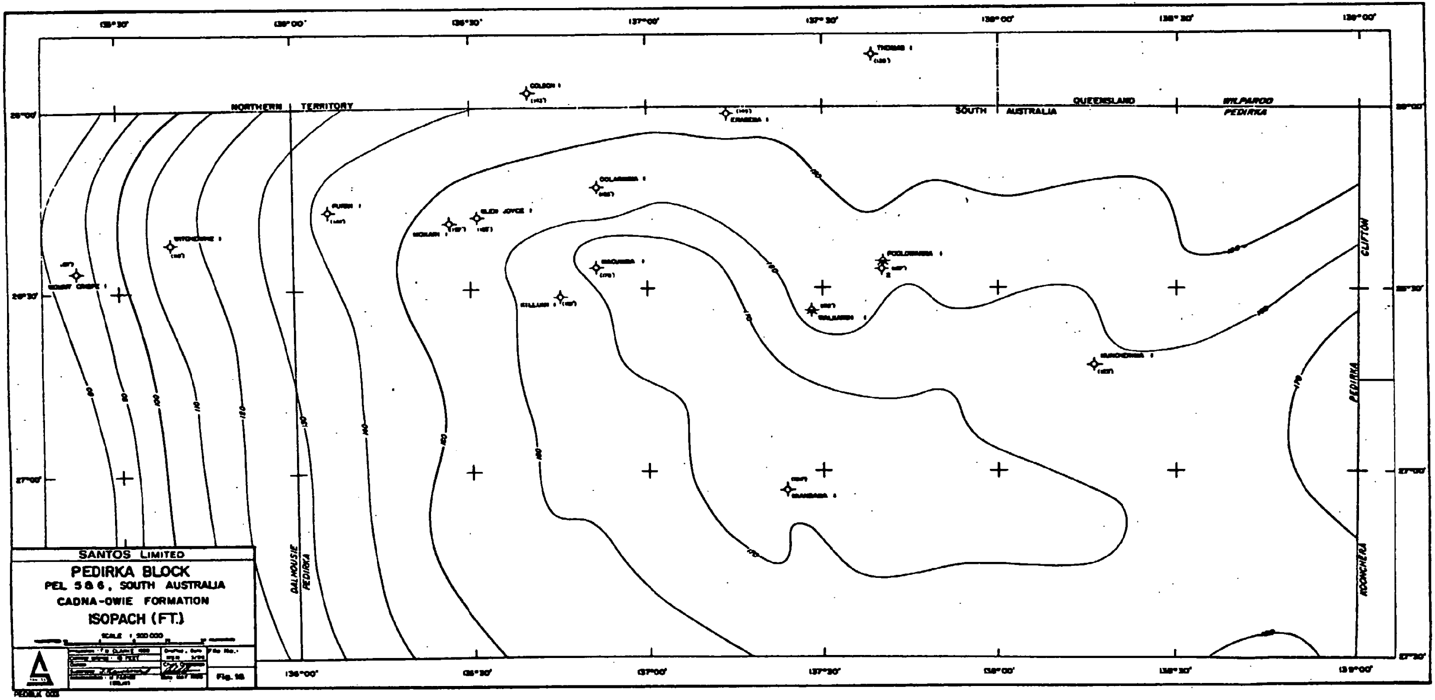

SANTOS LIMITED
S.A. EXPLORATION
P.E.L. 586
PEDIRKA BLOCK
ALGEBUCKINA SANDSTONE
(INCLUDING BIRKHEAD FM.)
ISOPACH (FT.)
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
PEDIRKA
DALHOUSIE
PEDIRKA
CLIFTON
PEDIRKA
KOONCHERA
135°30'
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'
THOMAS 1
COLSON 1
ERADENA 1
DOLARINNA 1
PURNI 1
MOKARI 1
GLEN JOYCE 1
MACUMBA 1
KILLANI 1
MOUNT CRISPE 1
WITCHERRIE 1
PEDDLEWANNA 1
BALRANGI 1
KUNCHERINA 1
MIANDANNA 1
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400

Fig. 15

00498


NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
WILPAROO
PEDIRKA
DALHOUSIE
PEDIRKA
CLIFTON
PEDIRKA
KOONCHERA
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'
THOMAS 1
COLSON 1
ERABENA 1
COLAMINNA 1
PURNI 1
GLEN JOYCE 1
WITCHERRIE 1
POOLOWANNA 1
KILLUMI 1
WALKANDI 1
SANTOS LIMITED
PEDIRKA BLOCK
PEL 5 & 6, SOUTH AUSTRALIA
CADNA-OWIE FORMATION
ISOPACH (FT.)
SCALE 1:500 000
Fig. 18
PEDIRKA 003

PLASTIC INSERT

Paloma 1
Composite Log.

Figure 17.

PLASTIC INSERT

Pool number 2

Composite log.

Figure 18.

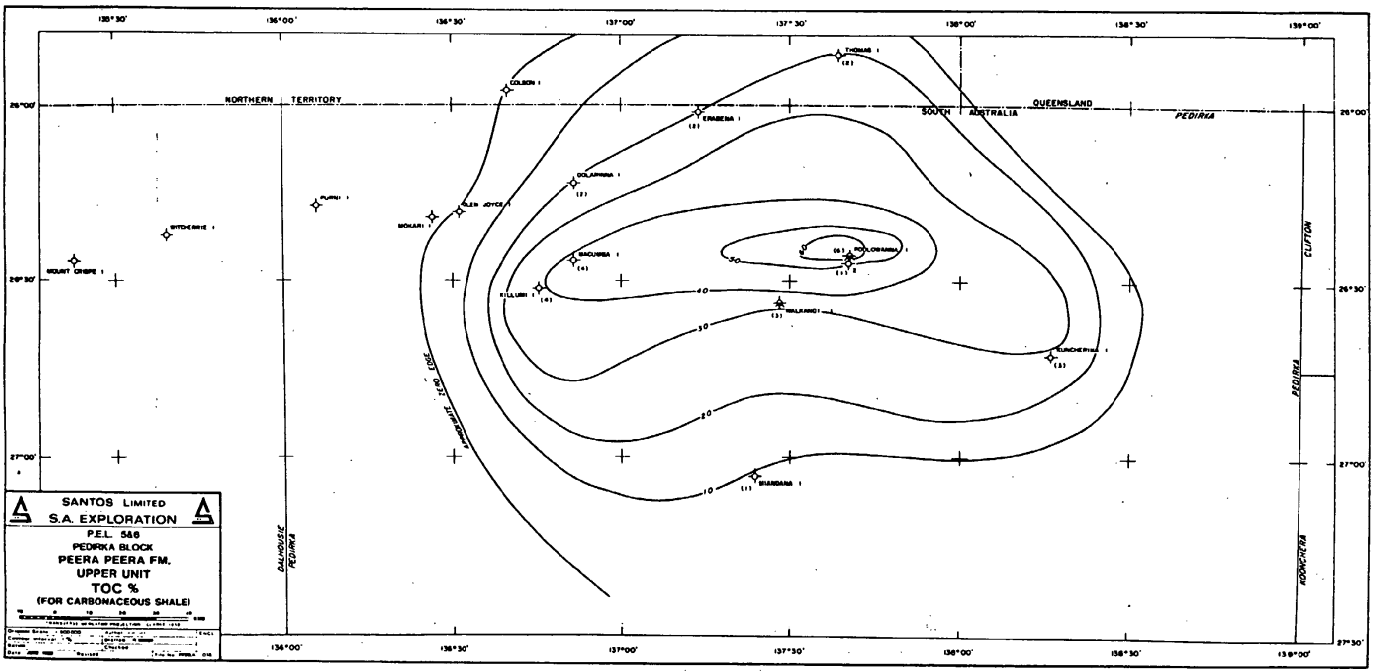
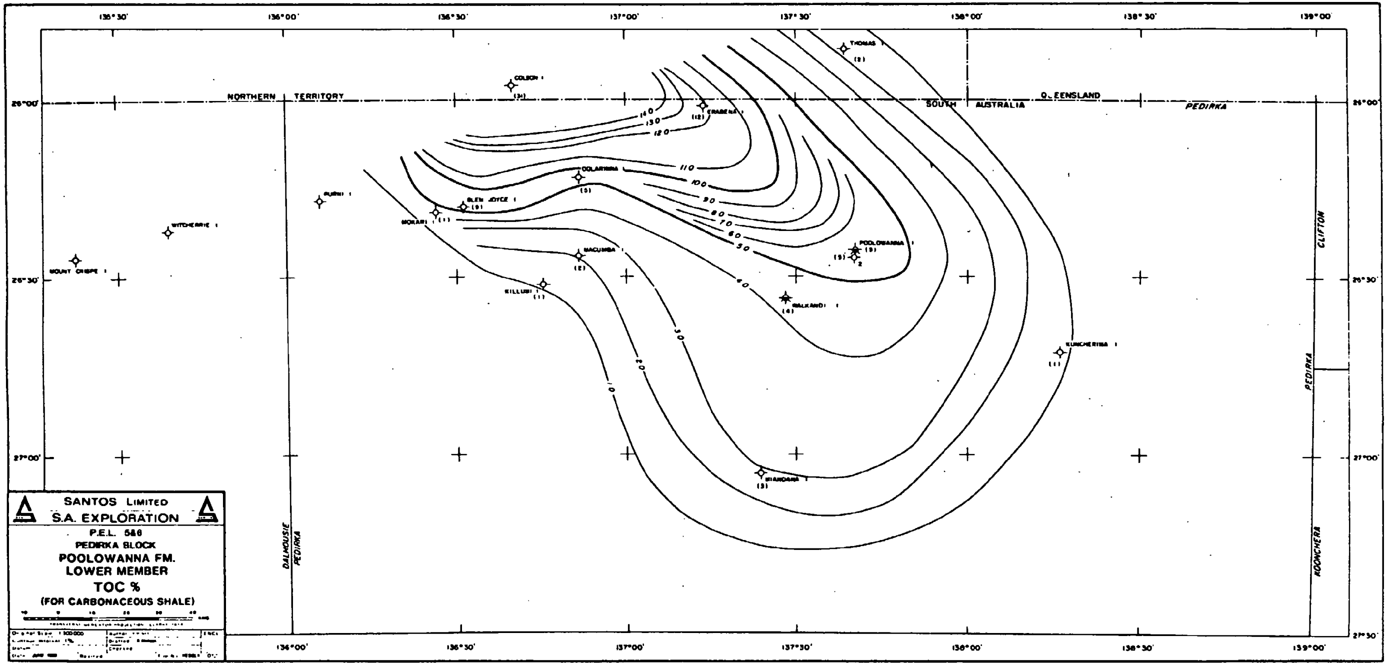

135°30'
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
25°00'
26°30'
27°00'
27°30'
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
PEDIRKA
CLIFTON
KOONCHERA
DALHOUSIE
THOMAS 1
COLSON 1
ERAMERA 1
DULKANINNA 1
GLEN JOYCE 1
MOKARI 1
FURNI 1
WITCHERRIE 1
MOUNT CRISPE 1
MACUMBA 1
KILLUBI 1
WALKARINDI 1
POOLOWANNA 1
SUNCHERIBA 1
SHANDANA 1
50
40
30
20
10
SANTOS LIMITED
S.A. EXPLORATION
PEL. 546
PEDIRKA BLOCK
PEERA PEERA FM.
UPPER UNIT
TOC %
(FOR CARBONACEOUS SHALE)

Fig. 20

00502



SANTOS LIMITED
S.A. EXPLORATION
P.E.L. 5&6
PEDIRKA BLOCK
POOLOWANNA FM.
LOWER MEMBER
TOC %
(FOR CARBONACEOUS SHALE)
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
PEDIRKA
CLIFTON
KOONCHERA
DALHOUSIE
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'

Fig. 21

SANTOS LIMITED

POOLOWANNA 1

VITRINITE REFLECTANCE PROFILE

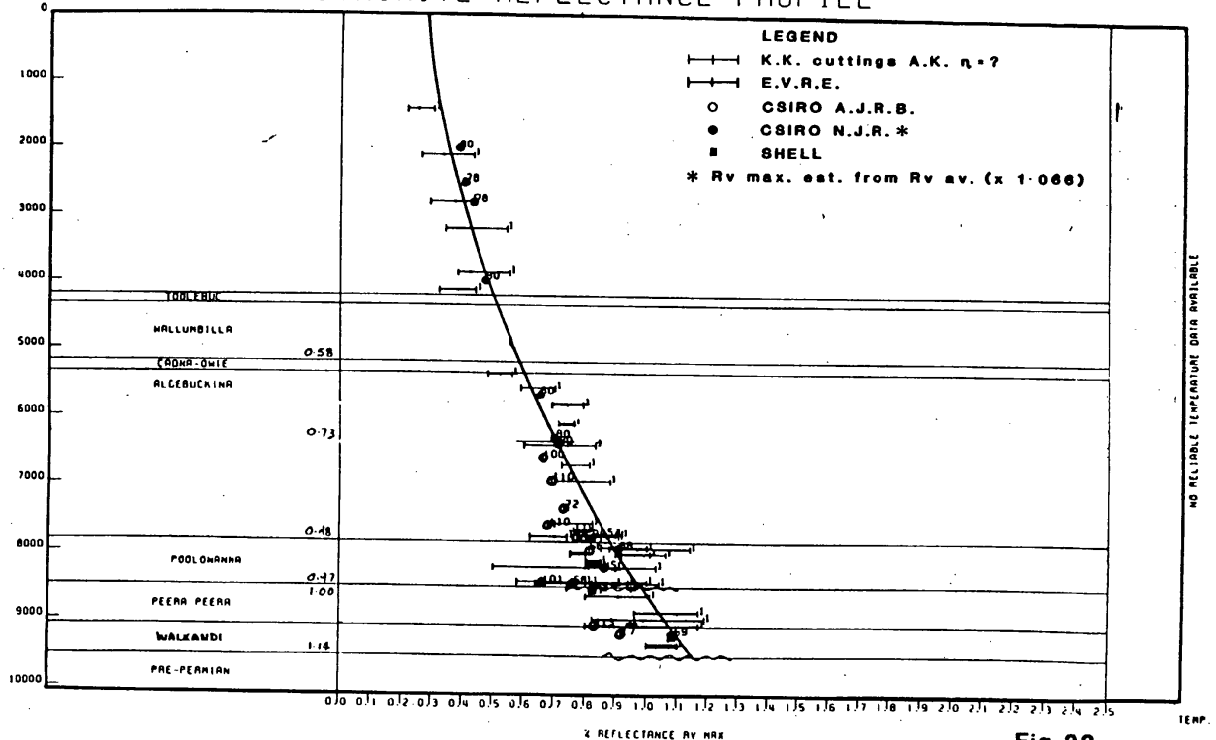


Fig. 22

TOTAL DEPTH 10086'
TEMP. GRADIENT 0 00 at 100'

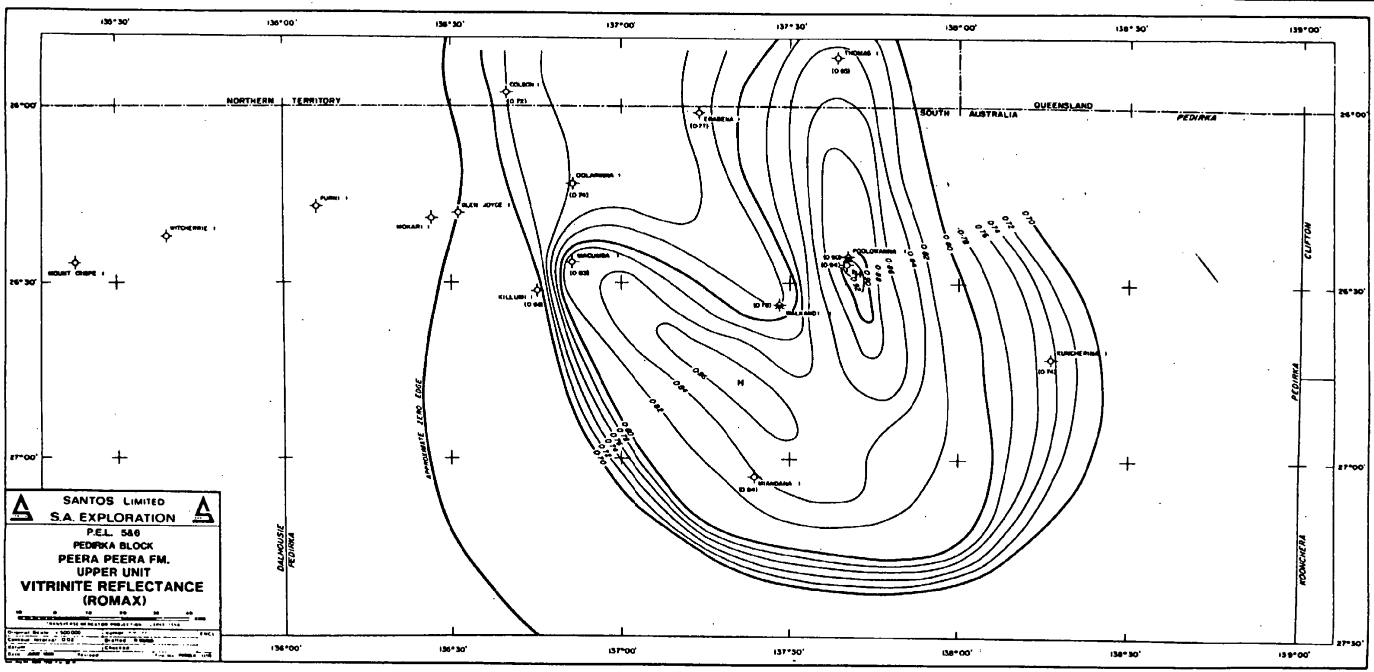

SANTOS LIMITED
S.A. EXPLORATION
P.E.L. 5&6
PEDIRKA BLOCK
PEERA PEERA FM.
UPPER UNIT
VITRINITE REFLECTANCE
(ROMAX)
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
PEDIRKA
CLIFTON
KOONCHERA
DALHOUSIE
APPROXIMATE ZERO EDGE
THOMAS 1
COLSON 1
OOLARINNA 1
PURNI 1
WITCHERRIE 1
MOKARI 1
GLEN JOYCE 1
MACUMBA 1
KILLUMI 1
POOLOWANNA 1
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'

Fig. 24

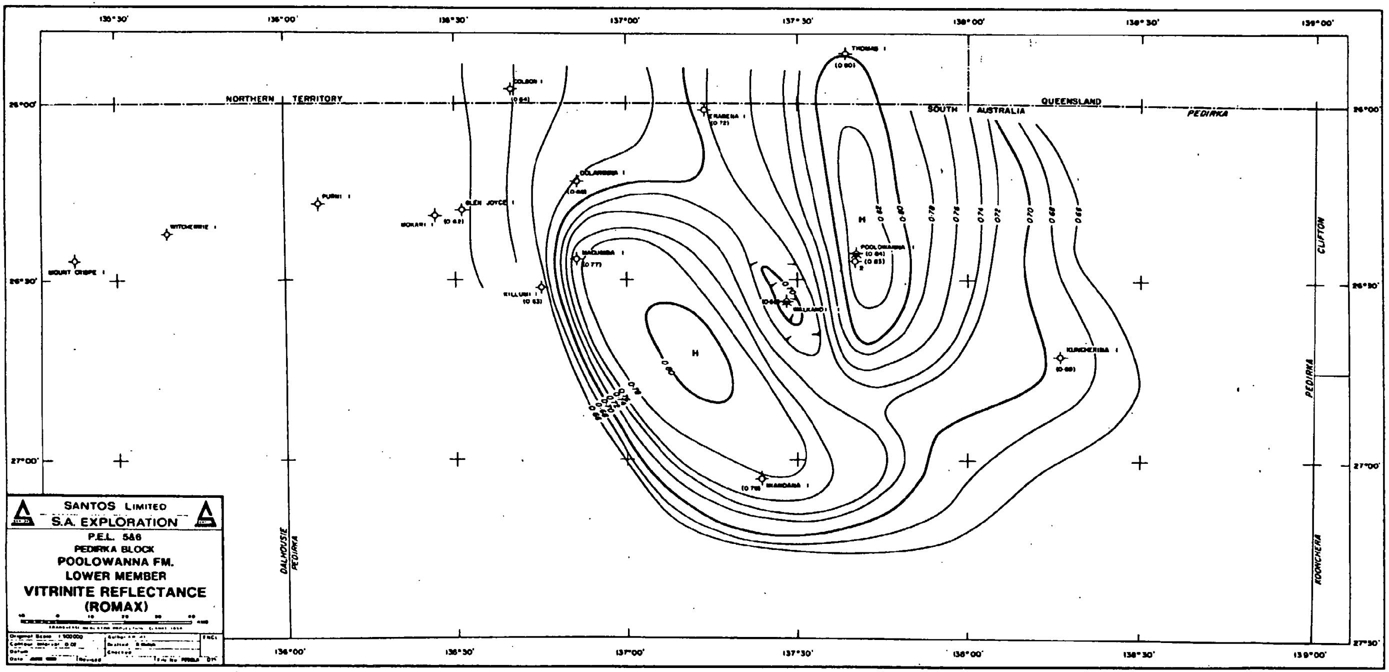

SANTOS LIMITED
S.A. EXPLORATION
P.E.L. 5&6
PEDIRKA BLOCK
POOLOWANNA FM.
LOWER MEMBER
VITRINITE REFLECTANCE
(ROMAX)
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
PEDIRKA
CLIFTON
KOONCHERA
DALHOUSIE
COLSON 1
(0.64)
ERABENA 1
(0.72)
THOMAS 1
(0.80)
DOLARINNA 1
PURNI 1
GLEN JOYCE 1
MOKARI 1
(0.62)
WITCHEBRIE 1
MOUNT CRISPE 1
MACUMBA 1
(0.77)
KILLUMI 1
(0.63)
POOLOWANNA 1
(0.84)
2
(0.85)
KUNCHERIBA 1
(0.69)
H
0.80
0.78
0.76
0.74
0.72
0.70
0.68
0.66
135°30'
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'

Fig. 25

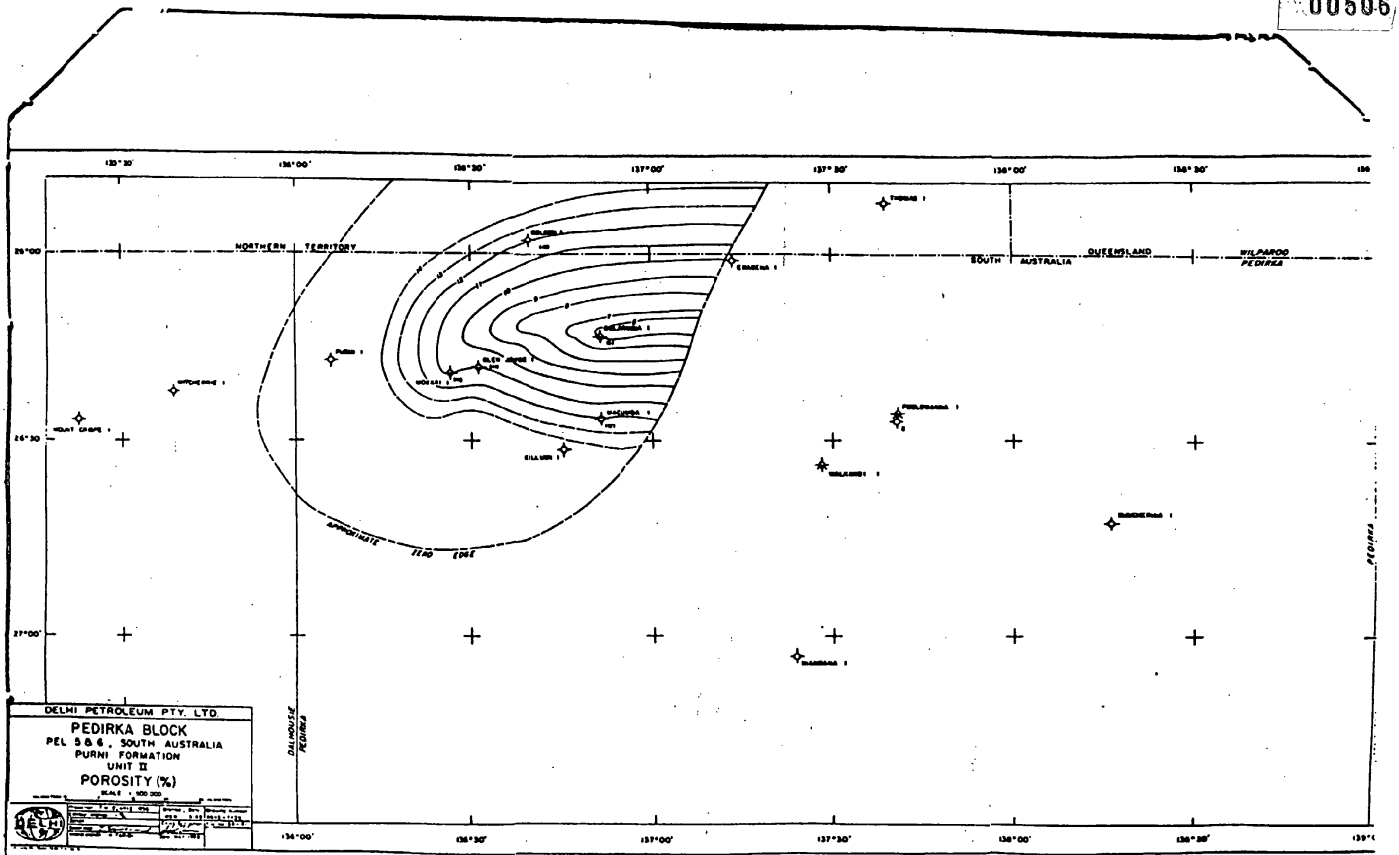
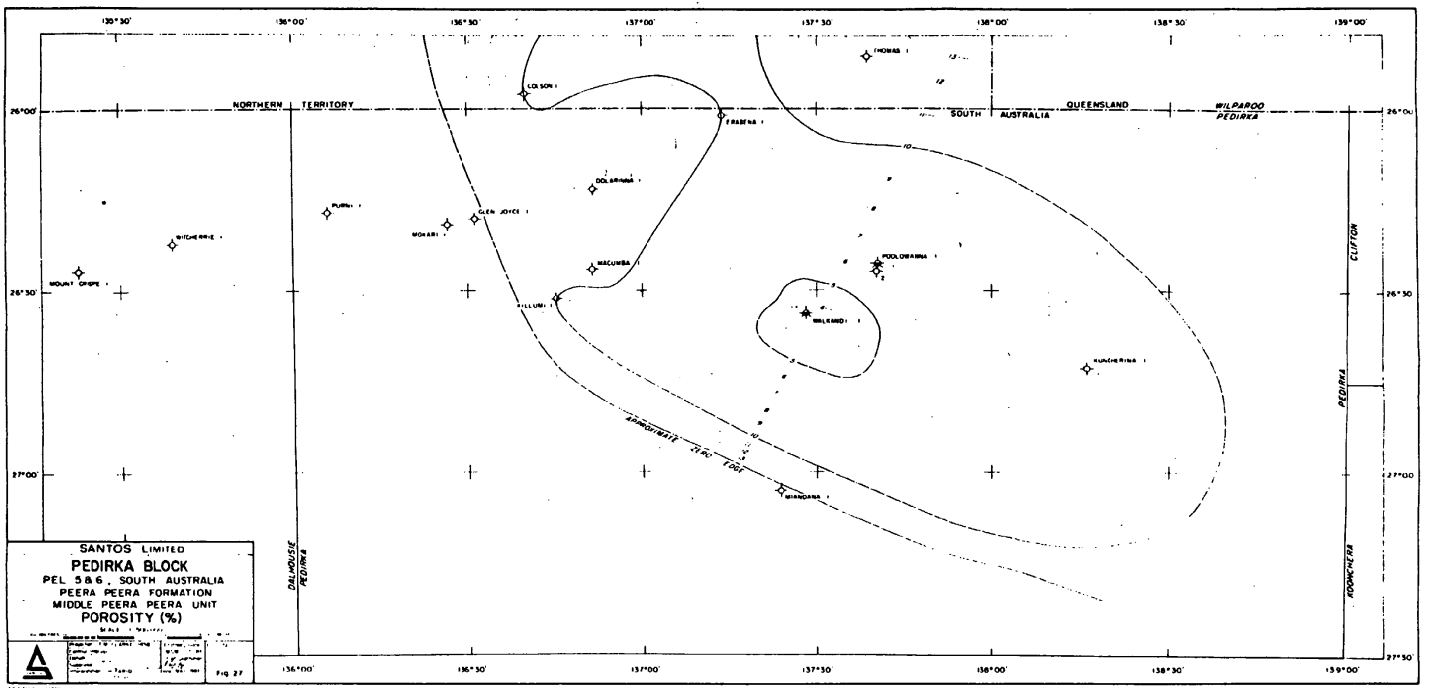

NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
WILPAROO
PEDIRKA
APPROXIMATE ZERO EDGE
DALHOUSIE
PEDIRKA
DELHI PETROLEUM PTY. LTD.
PEDIRKA BLOCK
PEL 5 & 6, SOUTH AUSTRALIA
PURNI FORMATION
UNIT II
POROSITY (%)

Figure 26


135°30'
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
WILPAROO
PEDIRKA
THOMAS 1
COLSON 1
TRABENA 1
DOLERINNA 1
PURNI 1
GLEN JOYCE 1
MOKARI 1
WITCHERRIE 1
MOUNT CHOPE 1
MACUMBA 1
PODLOWARINA 1
WILLURU 1
WILKINDI 1
KUNCHERINA 1
APPROXIMATE 2500 FAULT
MIRANDINA 1
DALHOUSIE
PEDIRKA
CLIFTON
PEDIRKA
ROOMCHERA
10
SANTOS LIMITED
PEDIRKA BLOCK
PEL 5 & 6, SOUTH AUSTRALIA
PEERA PEERA FORMATION
MIDDLE PEERA PEERA UNIT
POROSITY (%)
FIG 27

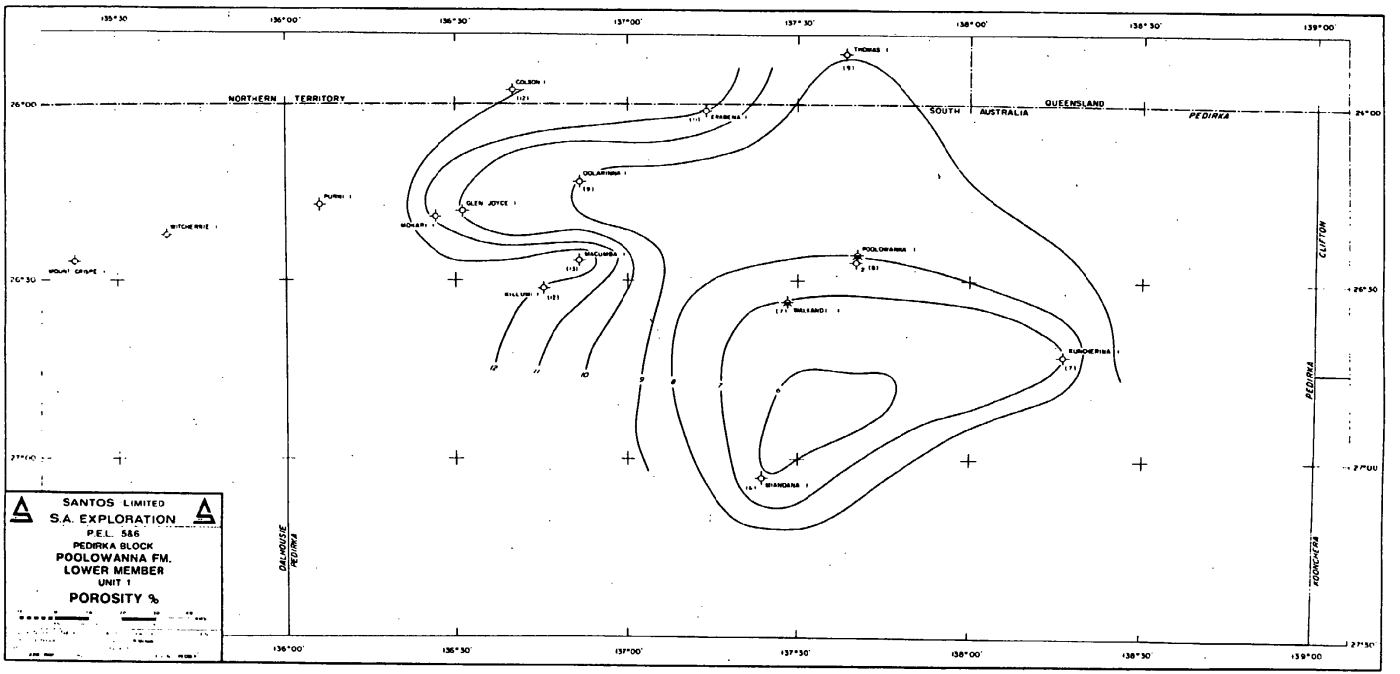
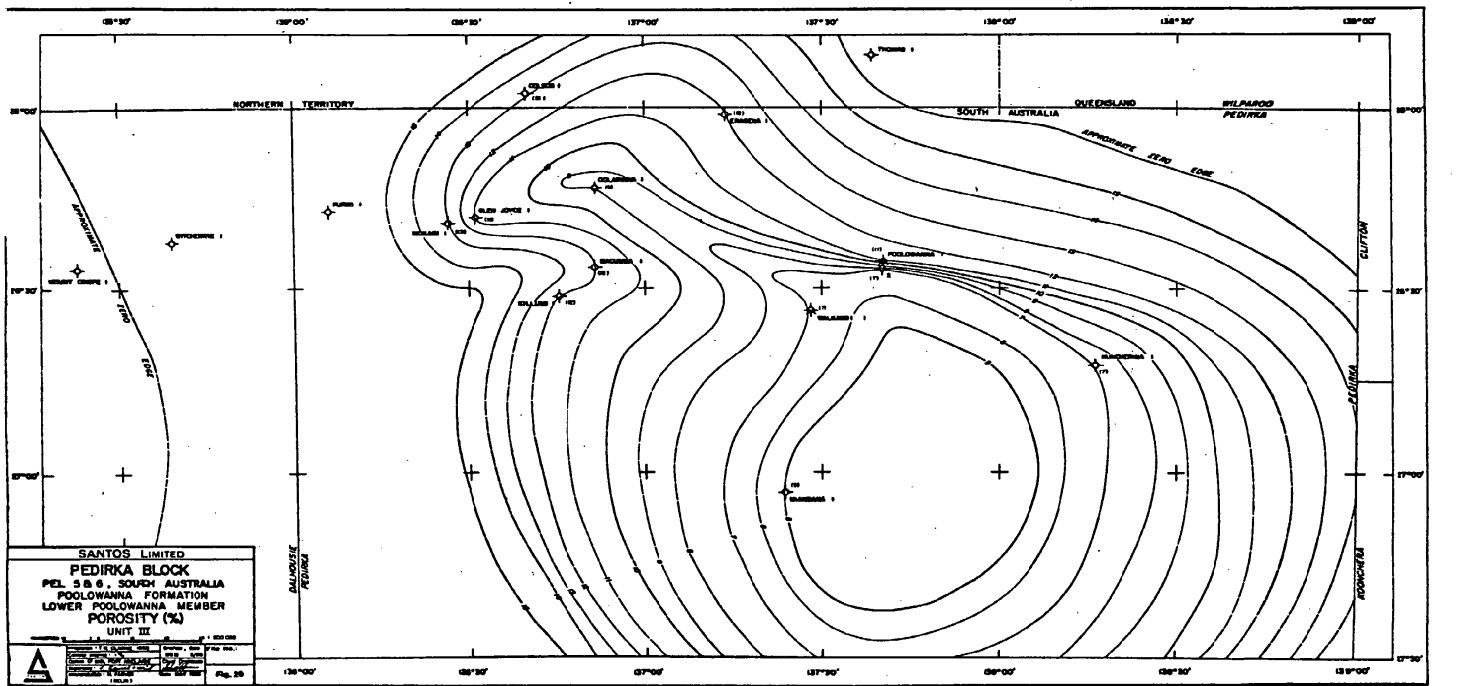
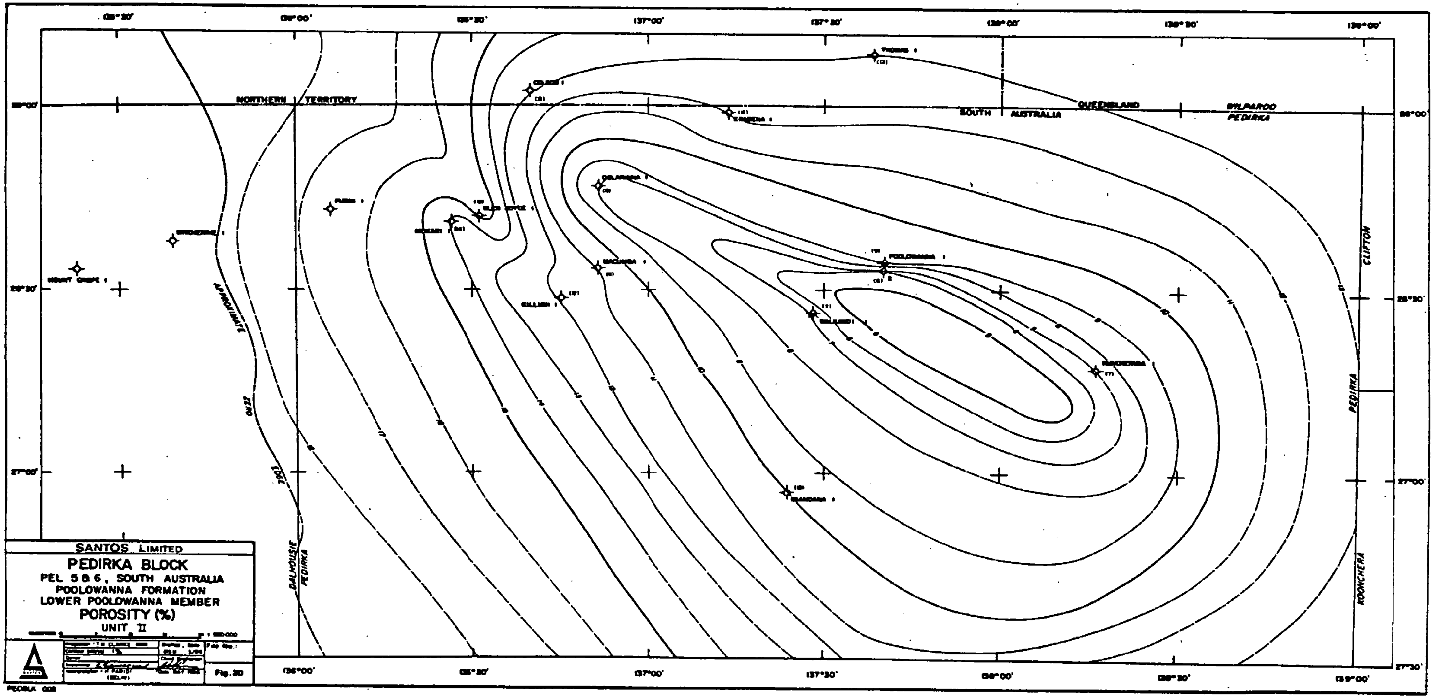

135°30
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30
27°00
27°30
NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
PEDIRKA
CLIFTON
DALHOUSIE
COLSON 1
(12)
THOMAS 1
(18)
ERSKINE 1
(11)
DOLARITINA 1
(19)
PURNI 1
GLEN JOYCE 1
MOHARI 1
WITCHERRIE 1
MOUNT CRISPE 1
MACUMBA 1
(13)
WILLURU 1
(12)
POOLOWANNA 1
(21)
BALLAMBY 1
(17)
KUNCHERINA 1
(7)
BRANDANA 1
(8)
SANTOS LIMITED
S.A. EXPLORATION
P.E.L. 586
PEDIRKA BLOCK
POOLOWANNA FM.
LOWER MEMBER
UNIT 1
POROSITY %

Fig. 28

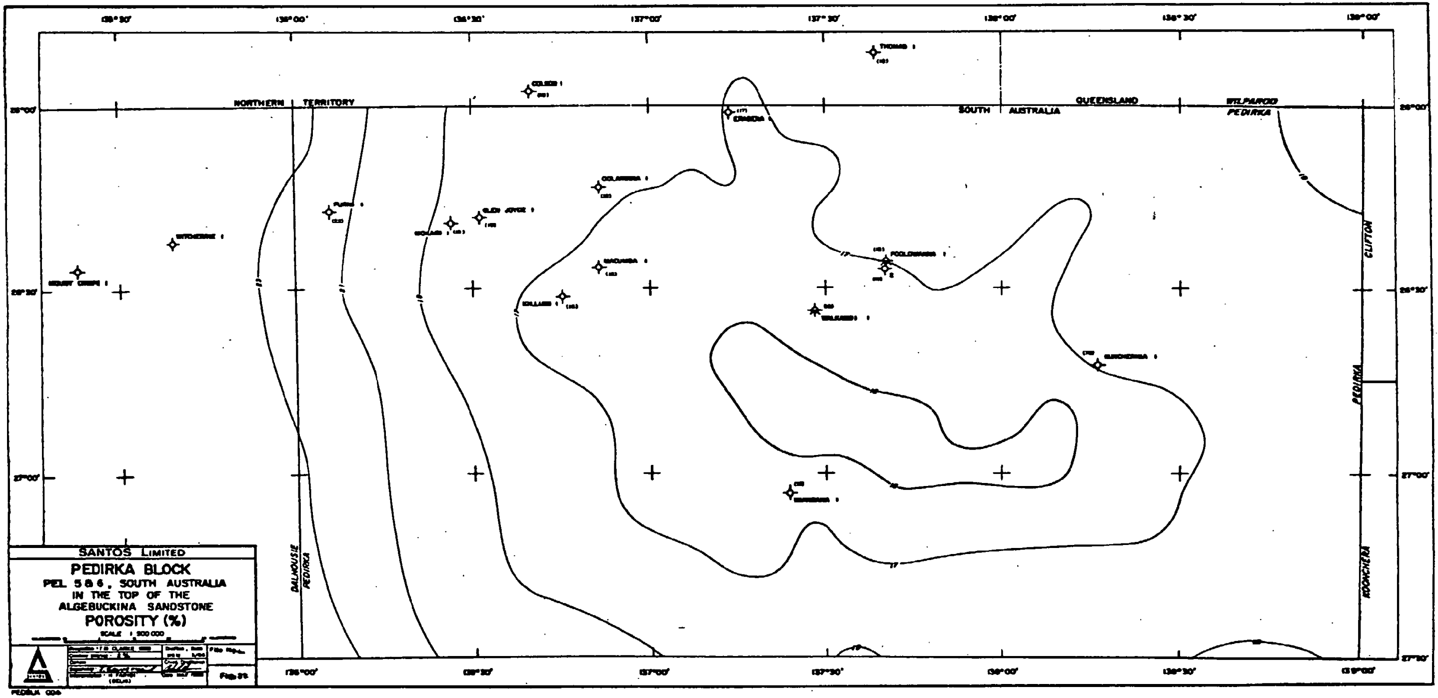

NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
WILPAROO PEDIRKA
APPROXIMATE ZERO EDGE
CLIFTON
DALHOUSIE PEDIRKA
APPROXIMATE ZERO EDGE
SANTOS LIMITED
PEDIRKA BLOCK
PEL 5 & 6, SOUTH AUSTRALIA
POOLOWANNA FORMATION
LOWER POOLOWANNA MEMBER
POROSITY (%)
UNIT III
Fig. 20

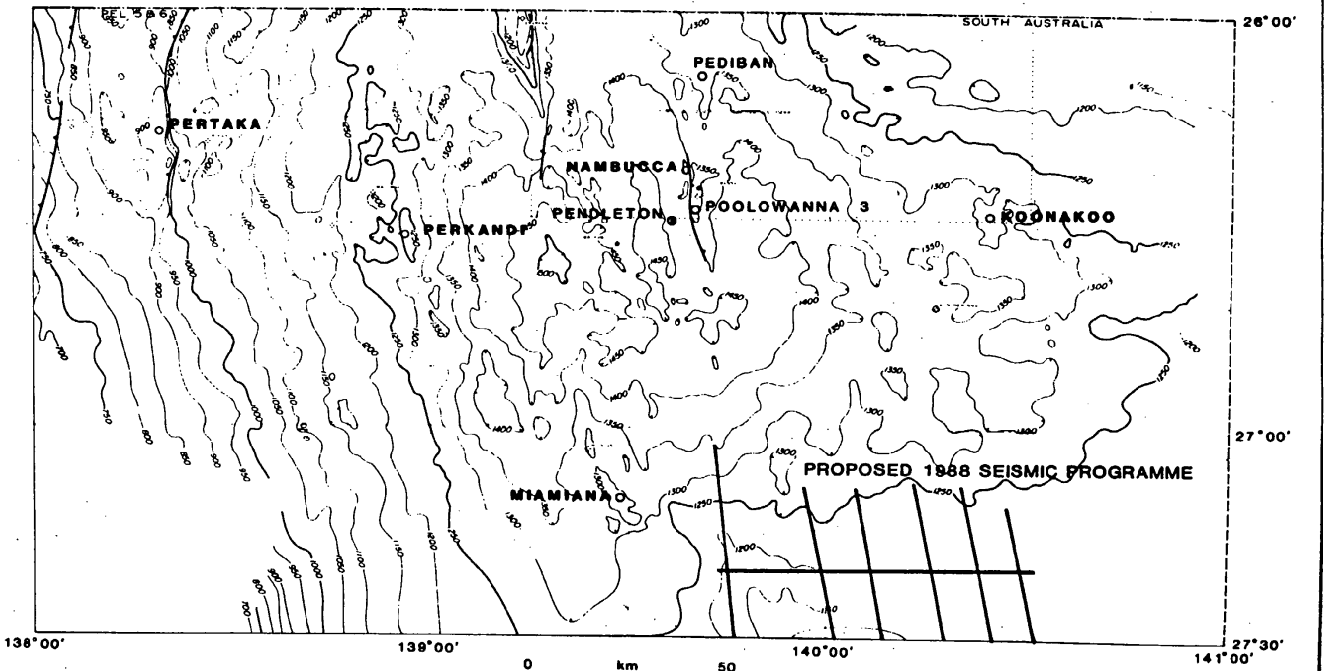
00510



NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
PEDIRKA
DALHOUSIE
CLIFTON
ROONCHERA
137°00'
137°30'
26°30'
27°00'
27°30'
POOLOWANNA
SANTOS LIMITED
PEDIRKA BLOCK
PEL 5 & 6, SOUTH AUSTRALIA
POOLOWANNA FORMATION
LOWER POOLOWANNA MEMBER
POROSITY (%)
UNIT II
Fig. 30

00511


NORTHERN TERRITORY
SOUTH AUSTRALIA
QUEENSLAND
WILPAROO
PEDIRKA
CLIFTON
KOONCHERA
DALHOUSIE
THOMAS 1
COLSON 1
ERABENA 1
OOLARINNA 1
GLEN JOYCE 1
MACUMBA 1
POOLOWANNA 1
2
WALKANDI 1
KOONCHERRA 1
136°00'
136°30'
137°00'
137°30'
138°00'
138°30'
139°00'
26°00'
26°30'
27°00'
27°30'
SANTOS LIMITED
PEDIRKA BLOCK
PEL 5 & 6, SOUTH AUSTRALIA
IN THE TOP OF THE
ALGEBUCKINA SANDSTONE
POROSITY (%)
SCALE 1:500 000



PEDIRKA BLOCK
"C" TIME STRUCTURE

KEY PROSPECTS & LEADS

Fig. 32

WILDCAT WELLS

SUMM SHEET

00513

Date : 29/07/88

Prospect	:	**POOLOWANNA 3**		
Status	:	PROSPECT		
Licence	:	PEL'S 5 AND 6	Block : PEDIRKA	
Trap type	:	ANTICLINE	Latitude	: 26 27
Ref. Seismic Line	:	85-WPC	S.P. : 640-740	Longitude : 137 40
Proposed T.D.	:	9500		G.L. : 82
Dist. to Facility (km)	:	300 (oil),	(gas)	

Geological Summary : POOLOWANNA 3 WILL EVALUATE THE CREST (POOLOWANNA & PEERA PEERA) OF THE POOLOWANNA STRUCTURE. POOLOWANNA 1 RECOVERED OIL FROM THE JURASSIC AND TRIASSIC SECTIONS. STATIC AND VELOCITY PROBLEMS RESULTED IN POOLOWANNA 2 BEING OFF THE CREST AND LOWER THAN POOLOWANNA 1.

		RESERVOIR PARAMETERS											POTENTIAL RESERVES						
Formation	Reservoir	Subsea Depth ft	Struct Area LCC Acres	Max Rel ft	Pot Pool Area Acres	% Area Fill	Gross Hyd Col ft	Ave NEP ft	Por %	Sh %	BO/ BG Oil	BO/ BG Gas	Pot OIP MMSTB	Pot GIP BCF	Rec Fac %	Pot Rec Oil MMSTB	Pot Sales Gas BCF	Pot LPG (C3C4) MMSTB	Pot Cond (C5) MMSTB
POOLOWANNA		7800	2950		850	29	40	19	12	60	0.91		8.30		25	2.07			
PEERA PEERA		8400	3200	120	850	27	40	14	10	60	0.91		5.04		25	1.26			
TOTAL													13.34			3.33			

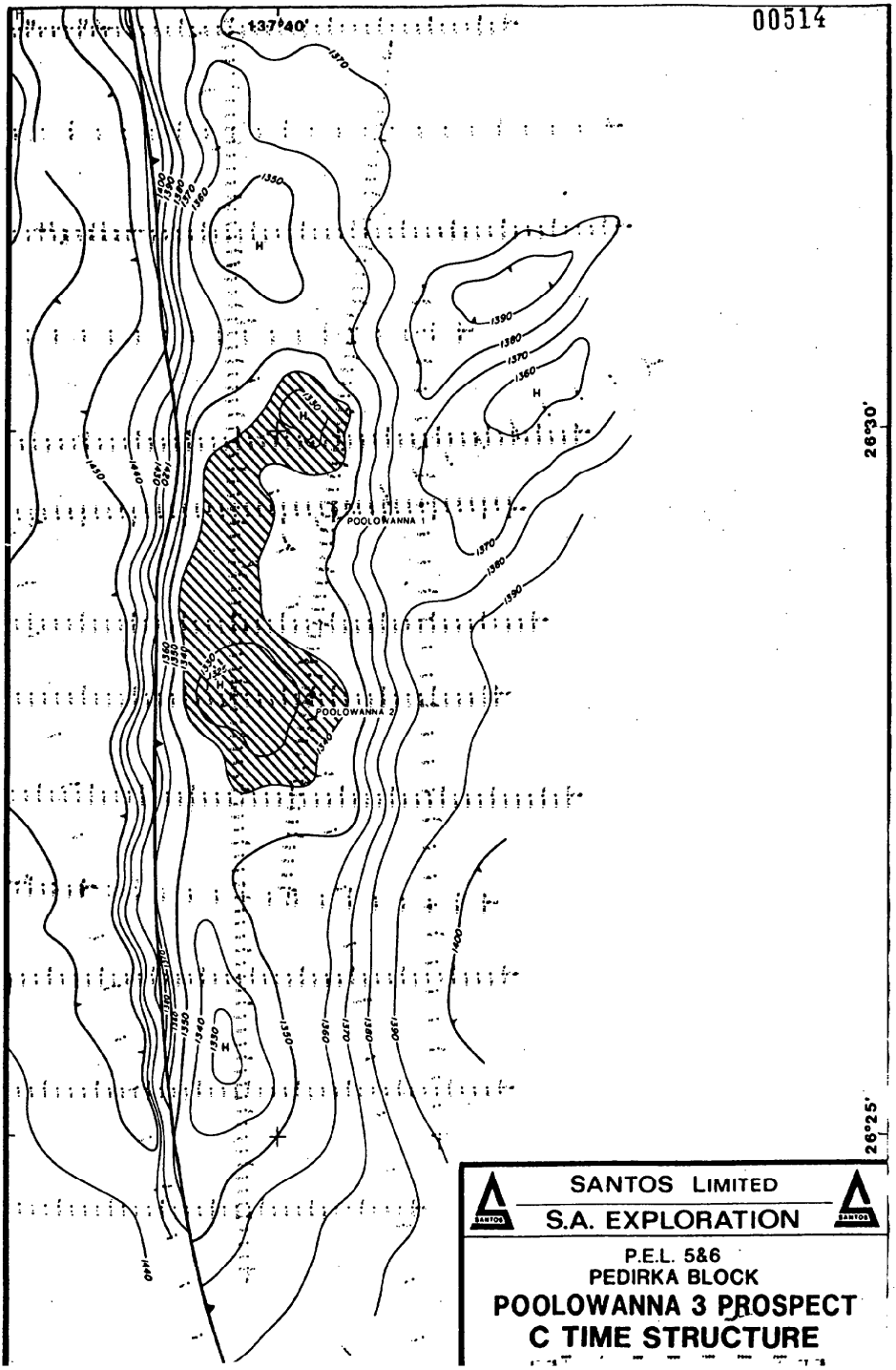
Reference Field or Well : POOLOWANNA 2

Risk :

Dry Hole Cost ($mm) : 1.944

Case and Suspend Cost ($mm) :

00514



SANTOS LIMITED

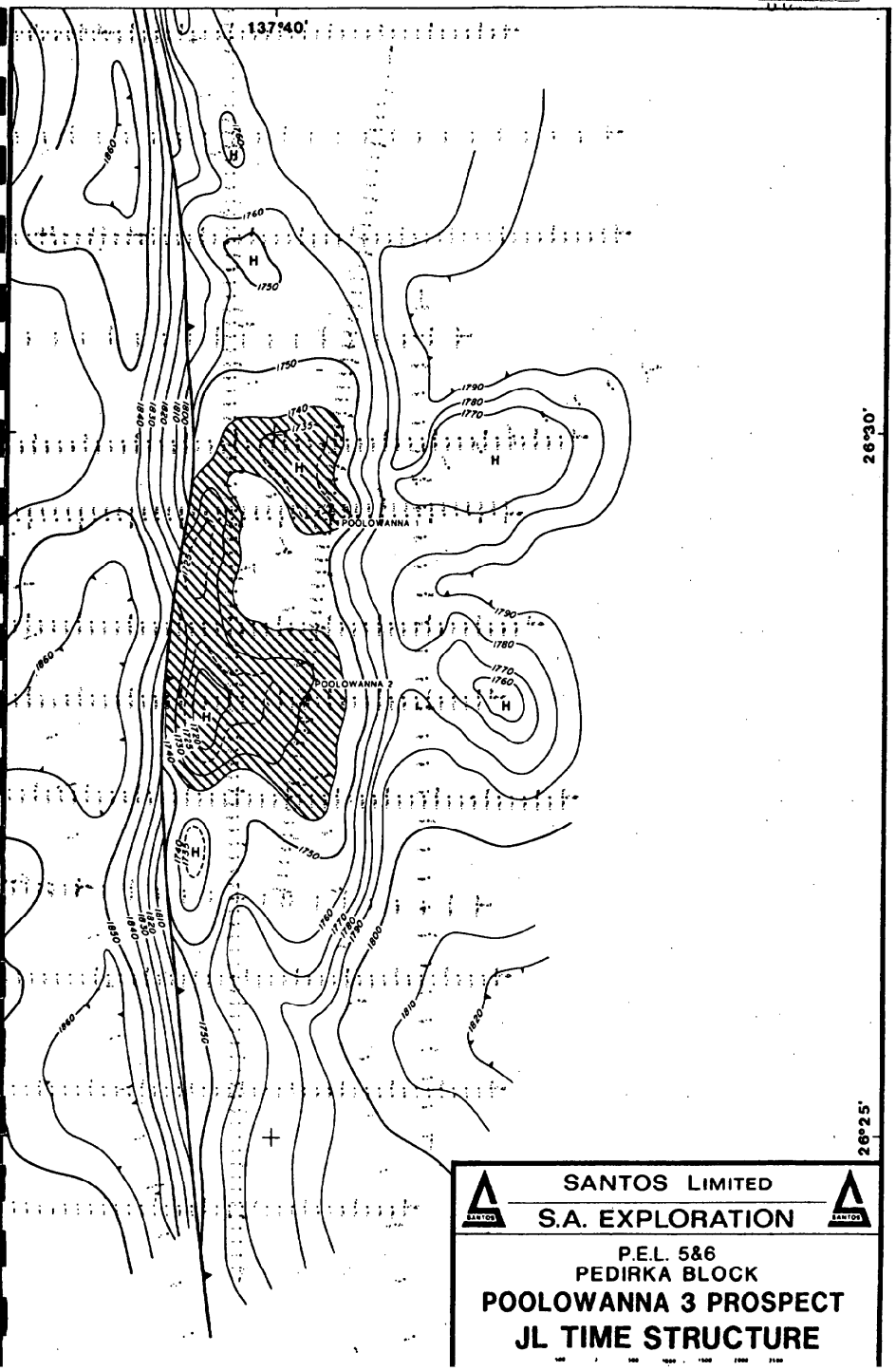
S.A. EXPLORATION

P.E.L. 5&6

PEDIRKA BLOCK

POOLOWANNA 3 PROSPECT

C TIME STRUCTURE



SANTOS LIMITED

S.A. EXPLORATION

P.E.L. 5&6

PEDIRKA BLOCK

POOLOWANNA 3 PROSPECT

JL TIME STRUCTURE

SANTOS LIMITED

S.A. EXPLORATION

POOLOWANNA-3 PROSPECT

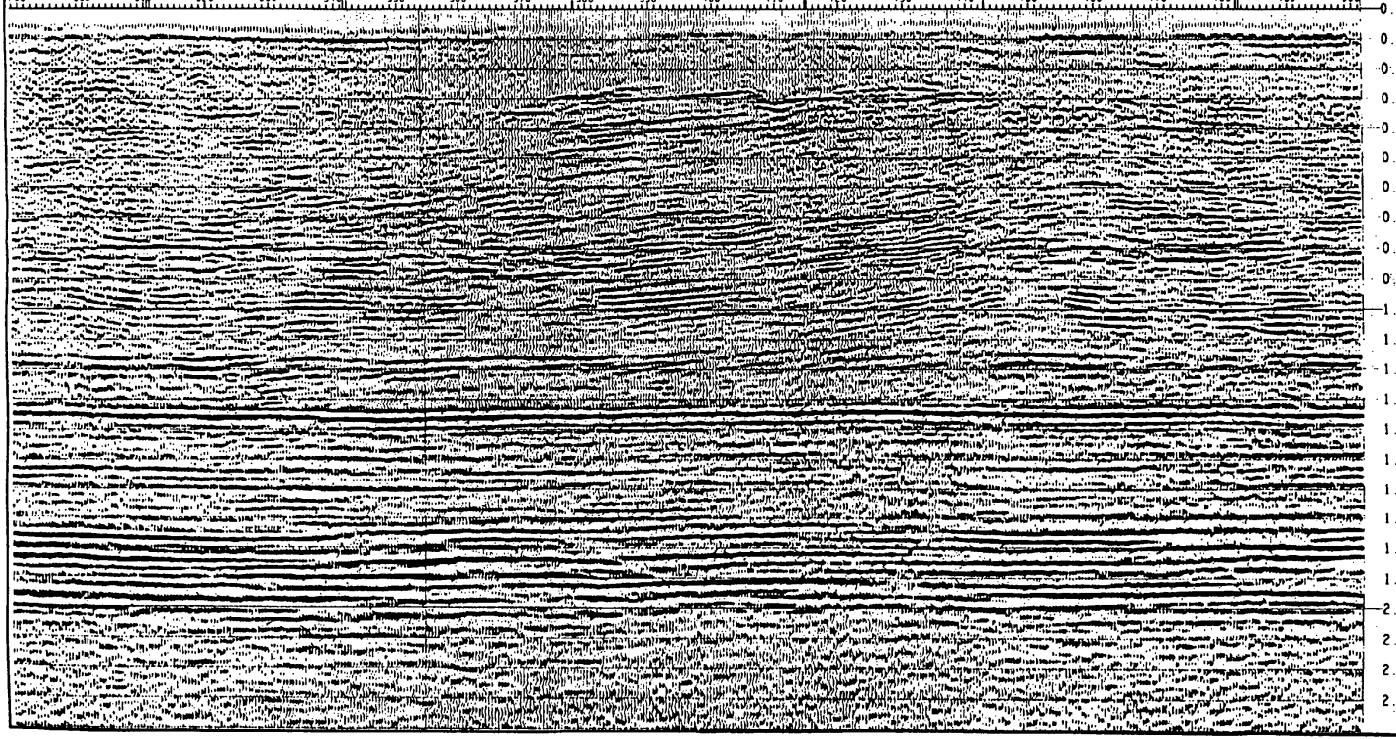
PEDIRKA BLOCK

87-WQZ

FINAL QC STACK (133.2B)

S

N



WILDCAT WELLS

SUMMA SHEET

00517

Date : 29/07/88

Prospect : PEDIBAN
Status : PROSPECT
Licence : PEL'S 5 AND 6 Block : PEDIRKA
Trap type : ANTICLINE Latitude : 26 08
Ref. Seismic Line : 87-WRD S.P. : 230-320 Longitude : 137 42
Proposed T.D. : 9500 G.L. : 50
Dist. to Facility (km) : 300 (oil), (gas)

Geological Summary : PEDIBAN IS A 4-WAY DIP CLOSED STRUCTURE LYING ON A MAJOR STRUCTURAL TREND IN THE POOLOWANNA TROUGH NORTH OF POOLOWANNA. THE PROSPECT EXHIBITS SUBDUED CLOSURE AT THE C.

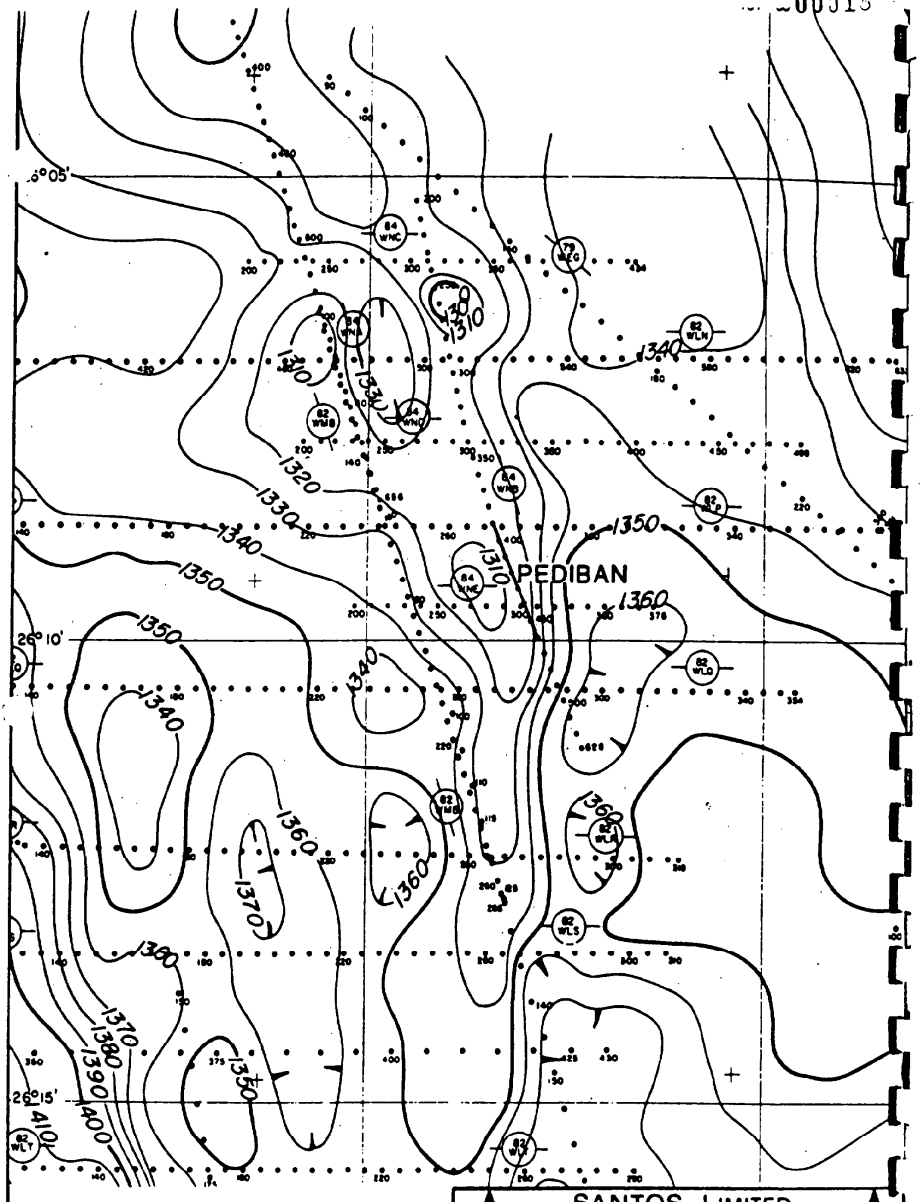
		RESERVOIR PARAMETERS											POTENTIAL RESERVES						
Formation	Reservoir	Subsea Depth ft	Struct Area LCC Acres	Max Rel ft	Pot Pool Area Acres	% Area Fill	Gross Hyd Col ft	Ave NEP ft	Por %	Sh %	BO/ BG Oil	BO/ BG Gas	Pot OIP MMSTB	Pot GIP BCF	Rec Fac %	Pot Rec Oil MMSTB	Pot Sales Gas BCF	Pot LPG (C3C4) MMSTB	Pot Cond (C5) MMSTB
POOLOWANNA		7800	1600	60	300	19	40	17	13	60	0.91		2.78		25	0.69			
PEERA PEERA		8500	500	40	500	100	40	14	10	60	0.91		2.97		25	0.74			
TOTAL													5.75			1.43			

Reference Field or Well : POOLOWANNA 2

Risk :

Dry Hole Cost ($mm) :

Case and Suspend Cost ($mm) :



SANTOS LIMITED

S.A. EXPLORATION

PEDIRKA BLK.

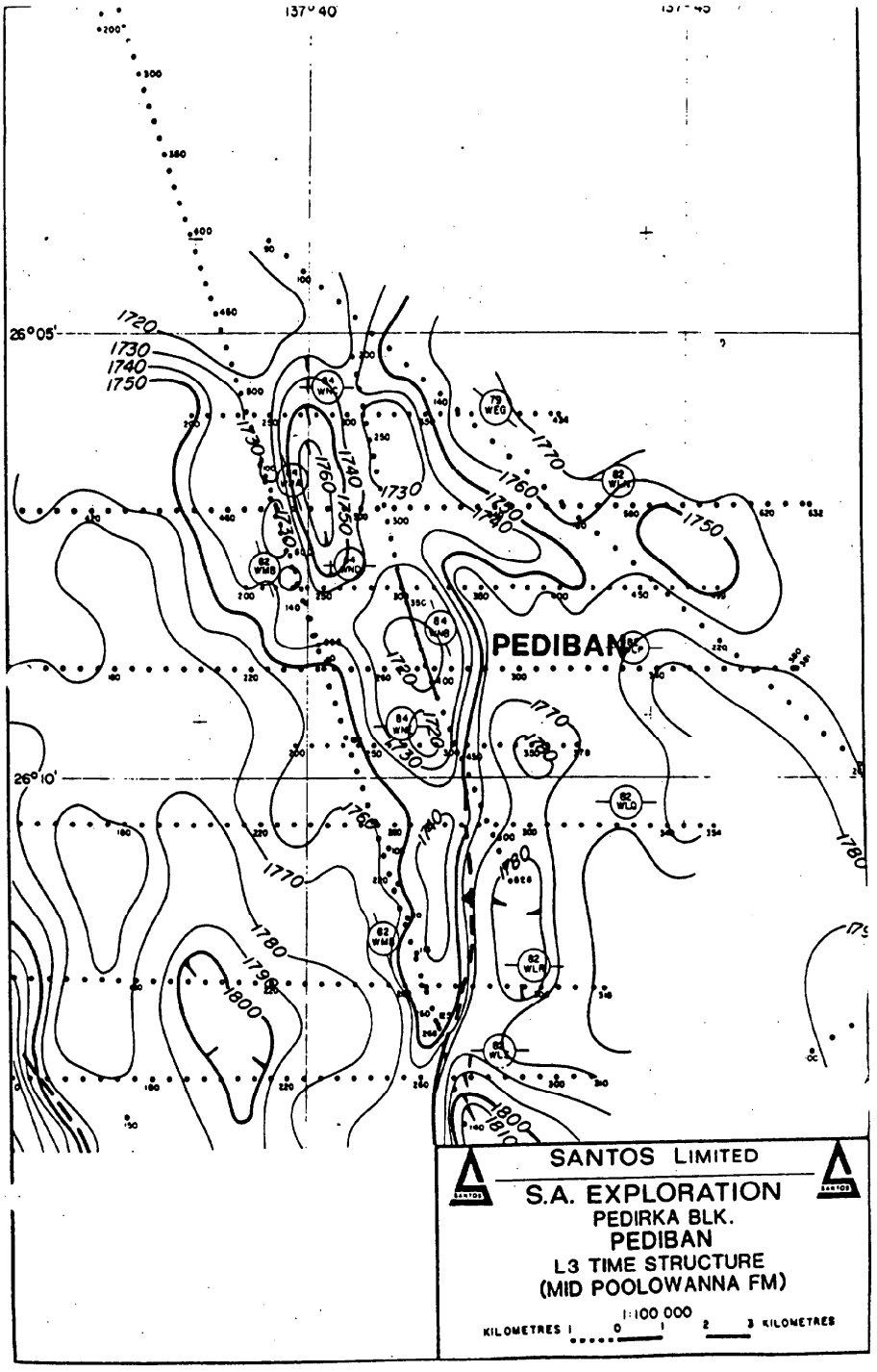
PEDIBAN

C TIME STRUCTURE

1:100 000

KILOMETRES 1 0 1 2 3 KILOMETRES

00519


137°40'
26°05'
26°10'
1720
1730
1740
1750
1760
1770
1780
1790
1800
1810
PEDIBAN
84 WNC
79 WEG
82 WLM
82 WMB
84 WMB
84 WNC
82 WLC
82 WMB
82 WLR
82 WLL
SANTOS LIMITED
S.A. EXPLORATION
PEDIRKA BLK.
PEDIBAN
L3 TIME STRUCTURE
(MID POOLOWANNA FM)
1:100 000
KILOMETRES 1 0 1 2 3 KILOMETRES

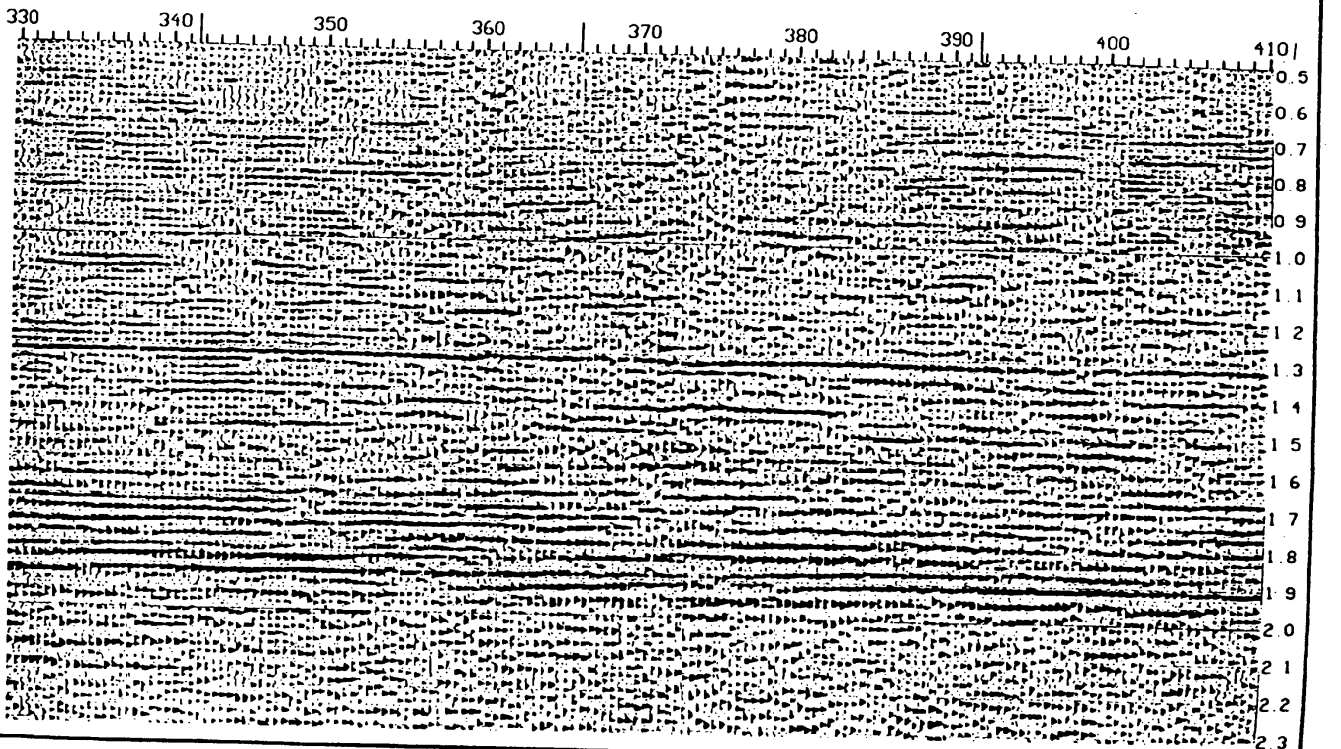
00520

PEDIBAN PROSPECT

SANTOS LIMITED

PEDIRKA BLOCK

LINE 84-WNB



WILDCAT WELLS

SUMP SHEET

Date : 29/07/88

Prospect : PENDLETON
Status : PROSPECT
Licence : PEL'S 5 AND 6 Block : PEDIRKA
Trap type : ANTICLINE
Ref. Seismic Line : 85-WPF S.P. : 340-460
Proposed T.D. : 9500
Dist. to Facility (km) : 300 (oil), (gas)

Latitude : 26 29
Longitude : 137 36
G.L. :

Geological Summary : PENDLETON IS AN ELONGATE STRUCTURE IN THE CENTRAL POOLOWANNA TROUGH. THE STRUCTURE LIES ON THE DOWNTHROWN (WEST) SIDE OF A MAJOR FAULT SYSTEM DEFINING THE POOLOWANNA-PERINNA TREND. THE STRUCTURE EXHIBITS 4-WAY DIP CLOSURE WITH ROLLOVER INTO THE FAULT APPROX. 25 MS OF CLOSURE AT C.

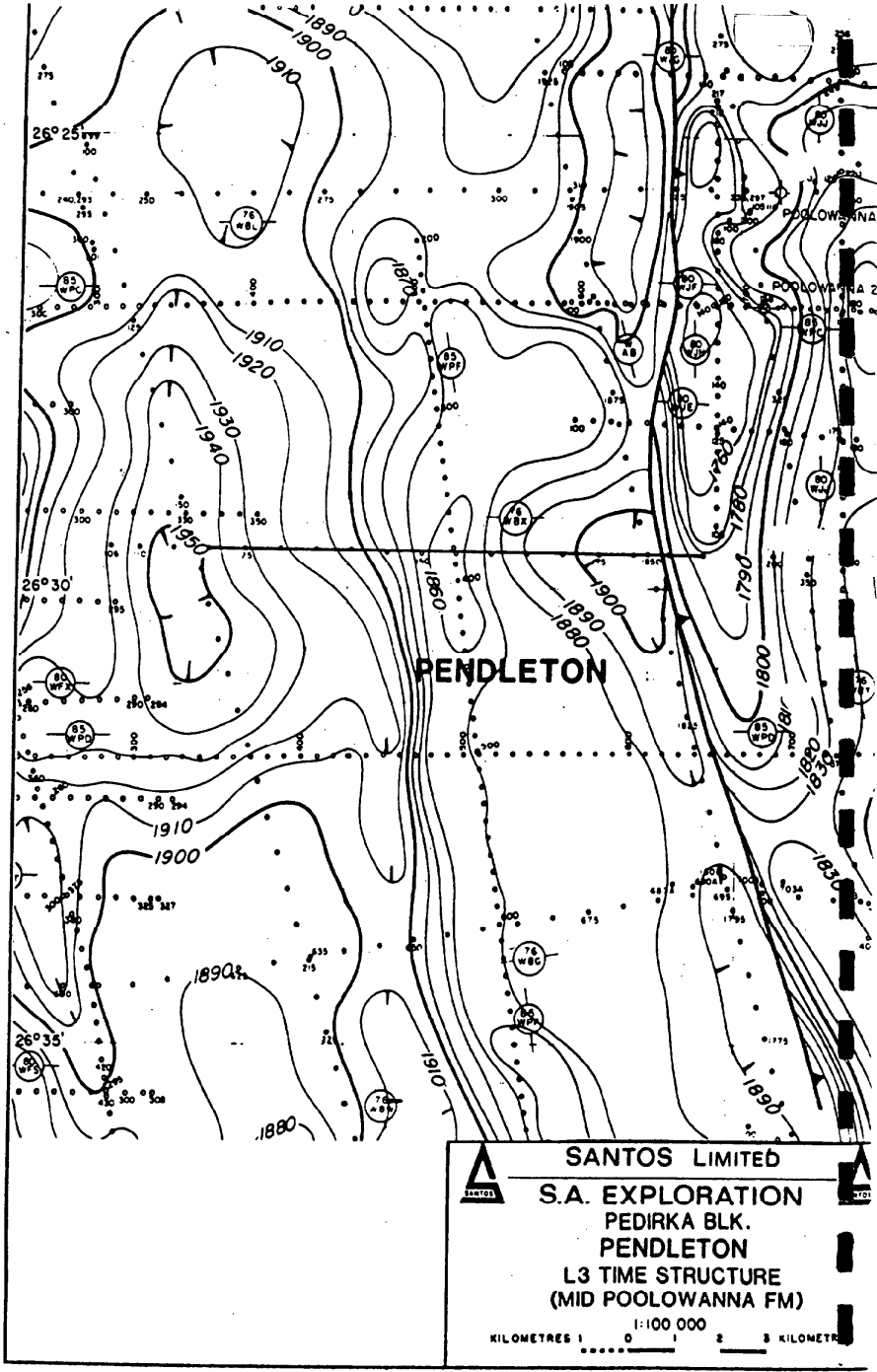
		RESERVOIR PARAMETERS											POTENTIAL RESERVES							
Formation	Reservoir	Subsea Depth ft	Struct Area LCC Acres	Max Rel ft	Pot Pool Area Acres	% Area Fill	Gross Hyd Col ft	Ave NEP ft	Por %	Sh %	BO/ BG Oil	Gas	Pot OIP MMSTB	Pot GIP BCF	Rec Fac %	Pot Rec Oil MMSTB	Pot Sales Gas BCF	Pot LPG (C3C4) MMSTB	Pot Cond (C5) MMSTB
POOLOWANNA		7800	7510	80	1350	18	40	16	12	60	0.91		10.70		25	2.68			
TOTAL													10.70			2.68			

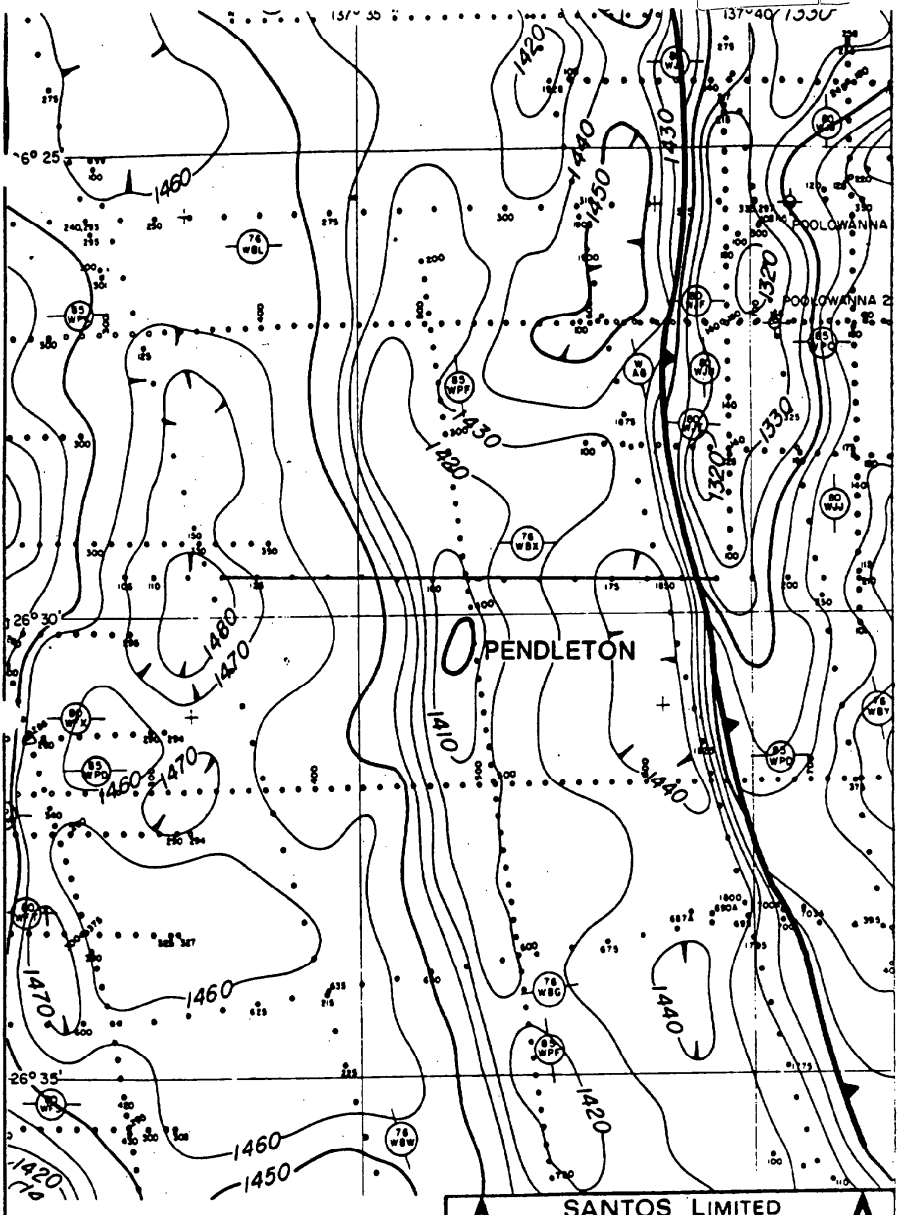
Reference Field or Well : POOLOWANNA 2

Risk :

Dry Hole Cost ($mm) :

Case and Suspend Cost ($mm) :


1890
1900
1910
26° 25'
1910
1920
1930
1940
1950
26° 30'
1890
1880
1900
1790
1780
1800
1820
1830
1850
PENDLETON
1910
1900
1890
26° 35'
1880
1910
1890
POOLOWANNA
SANTOS LIMITED
S.A. EXPLORATION
PEDIRKA BLK.
PENDLETON
L3 TIME STRUCTURE
(MID POOLOWANNA FM)
1:100 000
KILOMETRES 1 0 1 2 3 KILOMETR



SANTOS LIMITED

S.A. EXPLORATION

PEDIRKA BLK.

PENDLETON

C TIME STRUCTURE

1:100 000

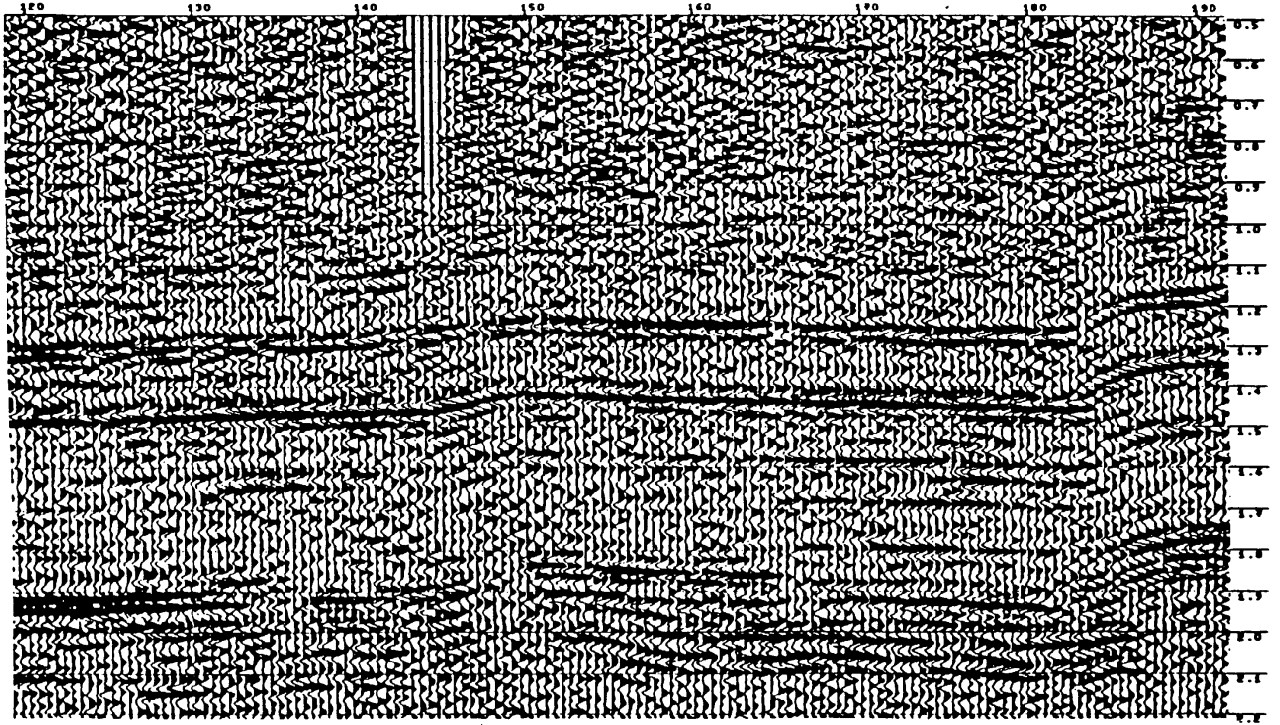
KILOMETRES 1 0 1 2 3 KILOMETRES

PENDLETC . PROSPECT

SANTOS LIMITED
PEDIRKA BLOCK

LIN. 76-WBX

00524



WILDCAT WELLS

SUMMA SHEET

Date : 29/07/88

Prospect : MIAMIANA
Status : PROSPECT
Licence : PEL'S 5 AND 6 Block : PEDIRKA
Trap type : ANTICLINE
Ref. Seismic Line : 80-WHN S.P. : 350-500
Proposed T.D. :
Dist. to Facility (km) : 300 (oil), (gas)

Latitude : 27 10
Longitude : 137 27
G.L. : 75

Geological Summary : MIAMIANA IS A LARGE 4-WAY DIP STRUCTURE SITUATED ON THE MIANDANA-MIAMIANA STRUCTURAL TREND, AND LIES APPROX 10 KMS SOUTHEAST OF MIANDANA 1 IN THE CENTAL SOUTHERN SECTOR OF THE BLOCK. THE STRUCTURE EXHIBITS APPROX. 30 MS OF CLOSURE AT C.

		RESERVOIR PARAMETERS											POTENTIAL RESERVES						
Formation	Reservoir	Subsea Depth ft	Struct Area LCC Acres	Max Rel ft	Pot Pool Area Acres	% Area Fill	Gross Hyd Col ft	Ave NEP ft	Por %	Sh %	BO/ BG Oil	BO/ BG Gas	Pot OIP MMSTB	Pot GIP BCF	Rec Fac %	Pot Rec Oil MMSTB	Pot Sales Gas BCF	Pot LPG (C3C4) MMSTB	Pot Cond (C5) MMSTB
HUTTON		6500	14650	40	1400	10	40	21	16	60	0.91		20.00		33	6.60			
TOTAL													20.00			6.60			

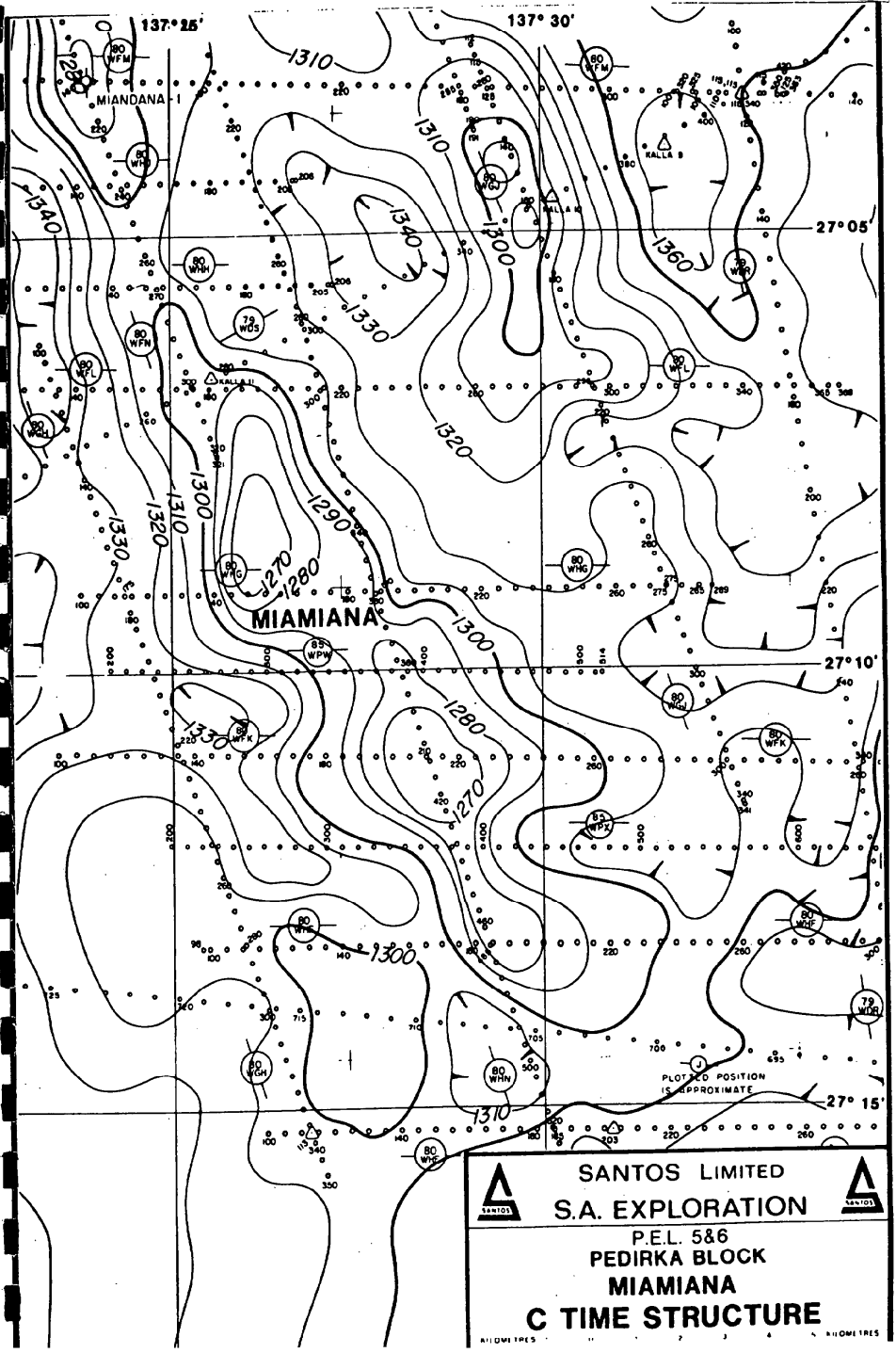
Reference Field or Well : MIANDANA

Risk :

Dry Hole Cost ($mm) :

Case and Suspend Cost ($mm) :

00526

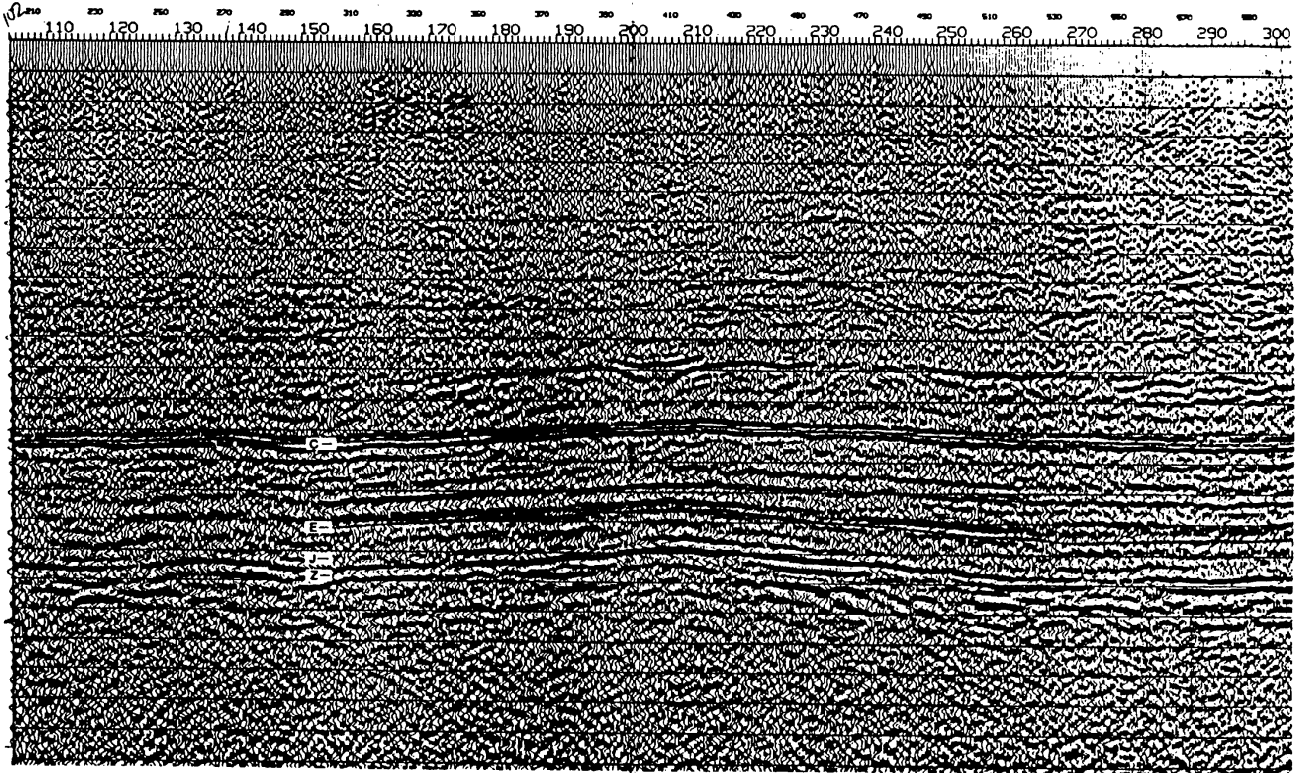

137° 25'
137° 30'
27° 05'
27° 10'
27° 15'
MIAMIANA-1
MIAMIANA
KALLA B
KALLA M
KALLA H
PLOTTED POSITION IS APPROXIMATE
SANTOS LIMITED
S.A. EXPLORATION
P.E.L. 5&6
PEDIRKA BLOCK
MIAMIANA
C TIME STRUCTURE
KILOMETRES

SANTOS LIMITED
S.A. EX. _ORATION

00527

LINE 80-WFK

W — MIAMIANA — E



00528

SANTOS LIMITED

S.A. EXPLORATION

MIAMIANA

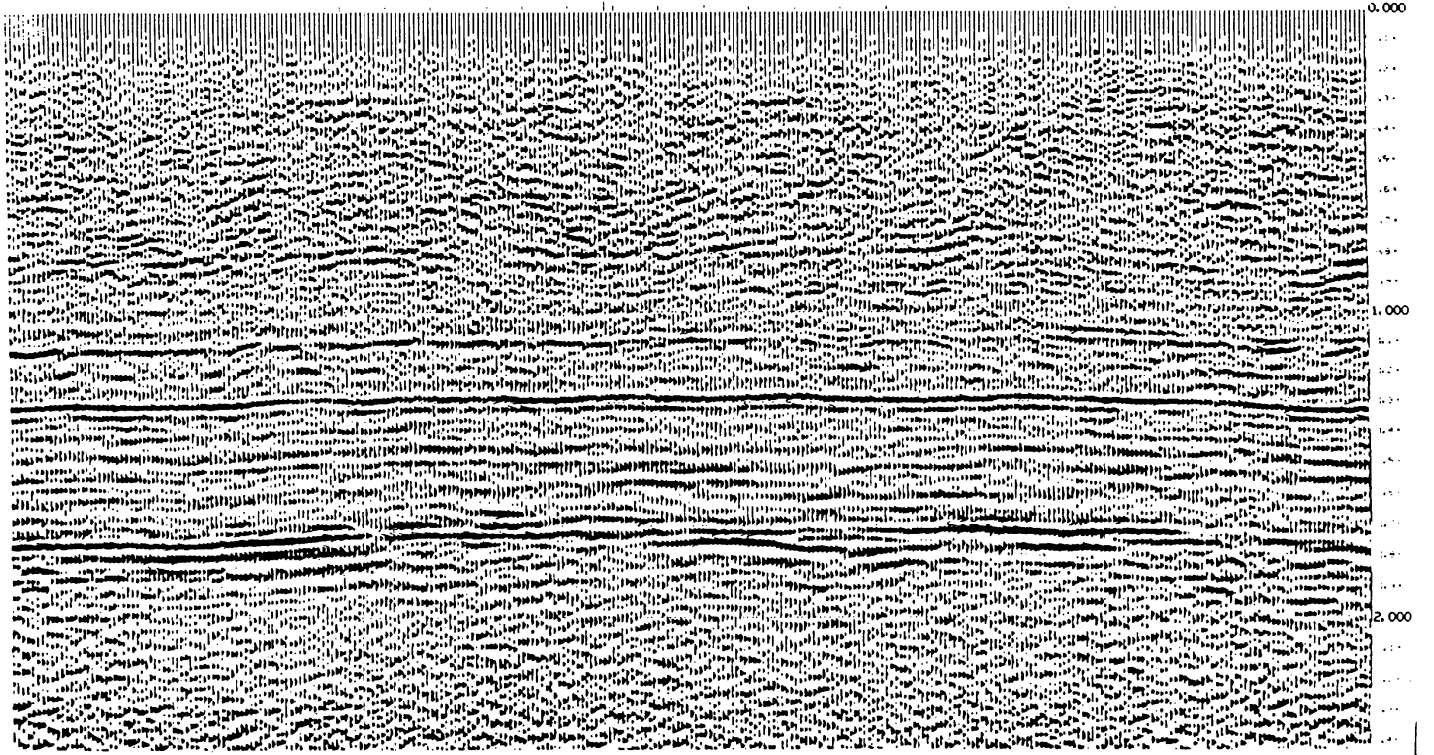
PEDIRKA BLOCK

80-WHN

FINAL TIME SECTION

NW SE

350 360 370 380 390 400 410 420 430 440 450 460 470 480 490



WILDCAT WELLS

SUMMA SHEET

0059

Date : 29/07/88

Prospect : MACUMBA UPDIP
Status : STRONG LEAD
Licence : PEL'S 5 AND 6 Block : PEDIRKA
Trap type : ANTICLINE Latitude : 26 27
Ref. Seismic Line : 84-WMM S.P. : 2000 Longitude : 136 52
Proposed T.D. : 8500 G.L. : 1,840
Dist. to Facility (km) : 380 (oil), (gas)

Geological Summary : MACUMBA IS A DOME-SHAPED ANTICLINAL STRUCTURE LYING ON THE MACUMBA-PERKANDI -PATANGA TREND. MACUMBA UPDIP WILL EVALUATE THE CREST OF THE STRUCTURE, WHICH EXHIBITS APPROX 50 MS OF CLOSURE AT C. THE PURNI FORMATION ONLAPS THE CREST AND IS PROGNOSED AS ABSENT.

		RESERVOIR PARAMETERS											POTENTIAL RESERVES							
Formation	Reservoir	Subsea Depth ft	Struct Area LCC Acres	Max Rel ft	Pot Pool Area Acres	% Area Fill	Gross Hyd Col ft	Ave NEP ft	Por %	Sh %	BO/ BG Oil	BO/ BG Gas	Pot OIP MMSTB	Pot GIP BCF	Rec Fac %	Pot Rec Oil MMSTB	Pot Sales Gas BCF	Pot LPG (C3C4) MMSTB	Pot Cond (C5) MMSTB
POOLOWANNA		7000	23400	200	970	4	40	15	13	60	0.91		7.95		25	1.99			
TOTAL													7.95			1.99			

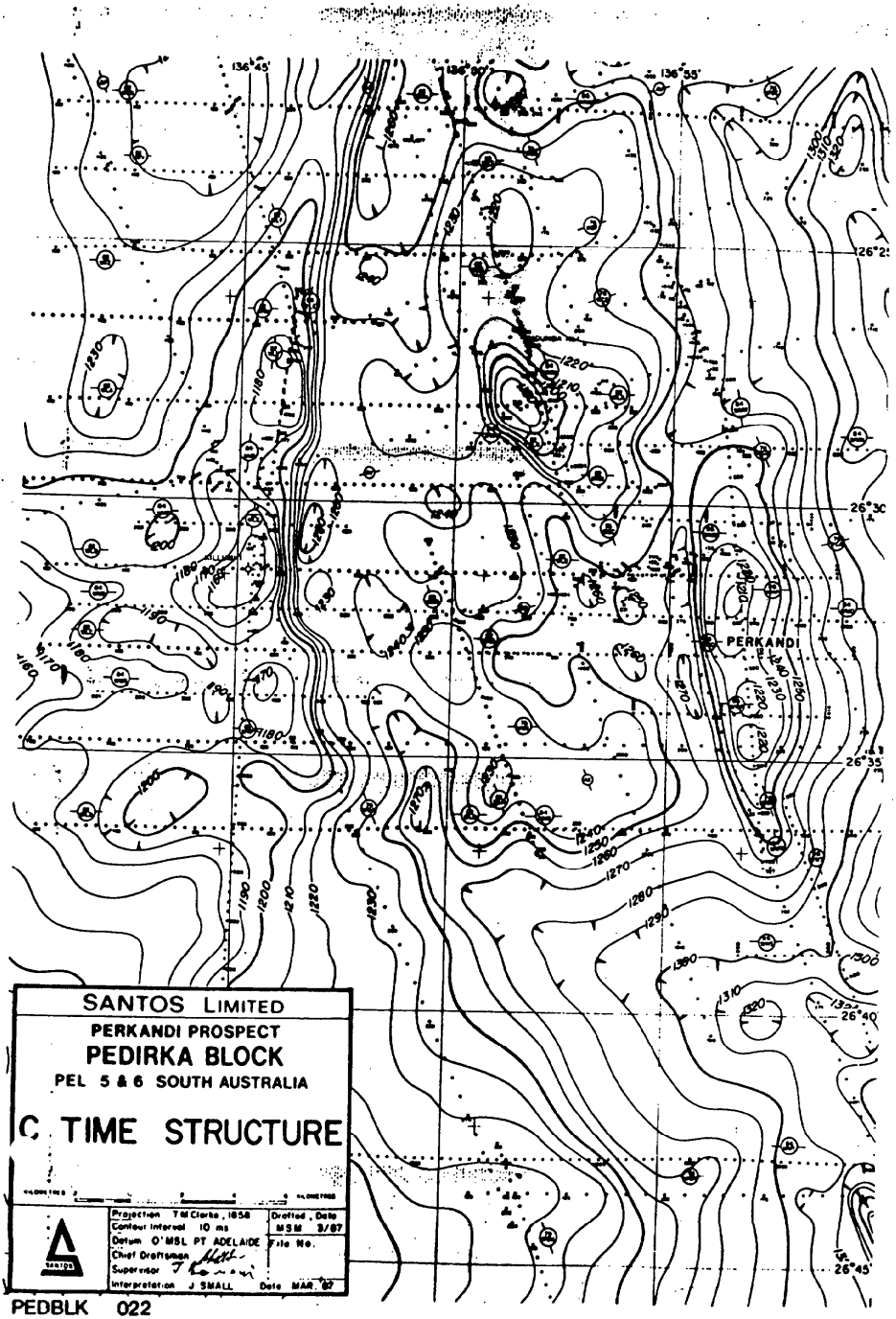
Reference Field or Well : MACUMBA 1

Risk :

Dry Hole Cost ($mm) :

Case and Suspend Cost ($mm) :

00530



SANTOS LIMITED

PERKANDI PROSPECT

PEDIRKA BLOCK

PEL 5 & 6 SOUTH AUSTRALIA

C TIME STRUCTURE

KILOMETRES 2 0 2 4 6 KILOMETRES

Projection	TM Clarke, 1858	Drafted, Date
Contour Interval	10 ms	MSM 3/87
Datum	O'MSL PT ADELAIDE	File No.
Chief Draftsman		
Supervisor		
Interpretation	J SMALL	Date MAR '87

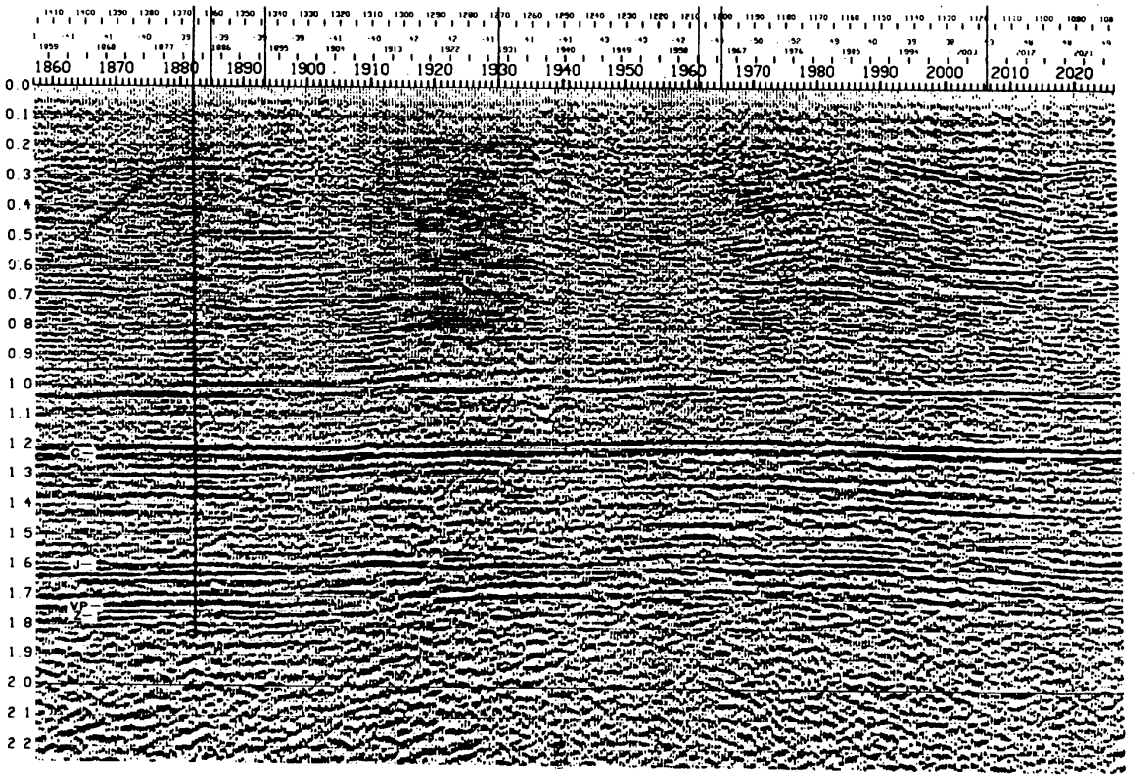
PEDBLK 022

SANTOS LIMITED
S.A. EX. _ORATION

00531

LINE d4-WMM

N MACUMBA 1 MACUMBA UPDIP S



WILDCAT WELLS

SUMMARY SHEET

Date : 29/07/88

Prospect : PERKANDI
Status : PROSPECT
Licence : PEL'S 5 AND 6 Block : PEDIRKA
Trap type : ANTICLINE
Ref. Seismic Line : 85-WHP S.P. : 430-450
Proposed T.D. : 8500
Dist. to Facility (km) : 380 (oil), (gas)

Latitude : 26 34
Longitude : 136 56
G.L. : 164

Geological Summary : PERKANDI IS A 4-WAY DIP CLOSURE LYING ON THE MACUMBA-PERKANDI-PATANGA STRUCTURAL TREND APPROX 12 KM SOUTH-EAST OF MACUMBA 1. THE STRUCTURE EXHIBITS APPROX. 45 MS OF CLOSURE AT C.

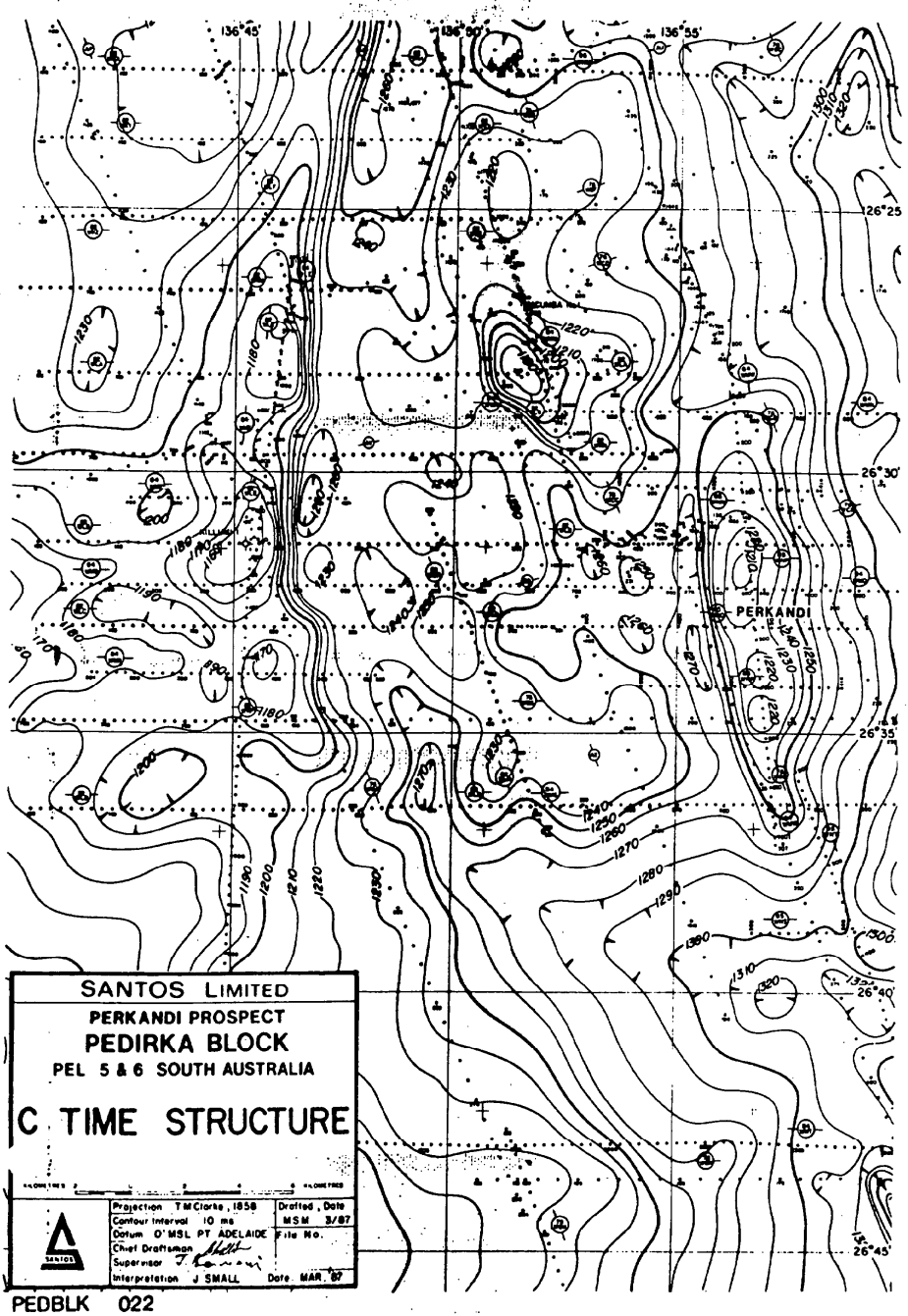
		RESERVOIR PARAMETERS											POTENTIAL RESERVES						
Formation	Reservoir	Subsea Depth ft	Struct Area LCC Acres	Max Rel ft	Pot Pool Area Acres	% Area Fill	Gross Hyd Col ft	Ave NEP ft	Por %	Sh %	BO/ BG Oil	BO/ BG Gas	Pot OIP MMSTB	Pot GIP BCF	Rec Fac %	Pot Rec Oil MMSTB	Pot Sales Gas BCF	Pot LPG (C3C4) MMSTB	Pot Cond (C5) MMSTB
POOLOWANNA		7000	11350	180	1550	14	40	15	13	60	0.91		12.70		25	3.18			
TOTAL													12.70			3.18			

Reference Field or Well : MACUMBA 1

Risk :

Dry Hole Cost ($mm) :

Case and Suspend Cost ($mm) :



SANTOS LIMITED

PERKANDI PROSPECT

PEDIRKA BLOCK

PEL 5 & 6 SOUTH AUSTRALIA

C TIME STRUCTURE

Projection T.M.Clarke, 1858	Drafted, Date
Contour Interval 10 ms	M.S.M. 3/87
Datum 0' MSL PT ADELAIDE	File No.
Chief Draftsman	
Supervisor	
Interpretation J. SMALL	Date MAR. '87

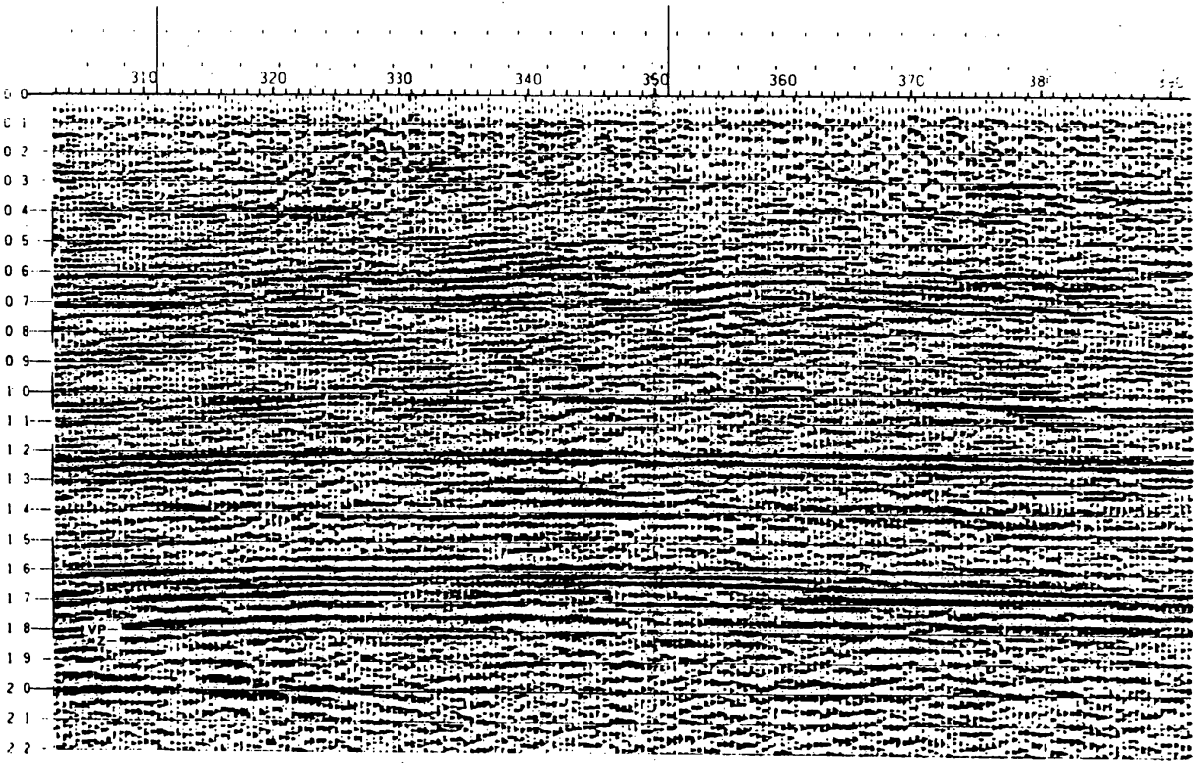
PEDBLK 022

SANTOS LIMITED
S.A. EXPLORATION

LINE85-WNP

00534

W PERKANDI E



WILDCAT WELLS

SUMMARY SHEET

00535

Date : 29/07/88

Prospect : PERALLA
Status : STRONG LEAD
Licence : PEL'S 5 AND 6 Block : PEDIRKA
Trap type : ANTICLINE
Ref. Seismic Line : 82-WEQ S.P. : 100-260
Proposed T.D. : 7500
Dist. to Facility (km) : 480 (oil), (gas)

Latitude : 26 20
Longitude : 136 20
G.L. : 246

Geological Summary : PERALLA IS A 4-WAY DIP CLOSURE LYING ON THE PERALLA-PERTAKA TREND APPROX. 15 KMS SOUTHWEST OF MOKARI 1. THE STRUCTURE IS ASSOCIATED WITH A MAJOR FAULT SYSTEM AND LIES ON THE WESTERN UPTHROWN SIDE. THE STRUCTURE EXHIBITS APPROX. 40 MS OF CLOSURE AT C.

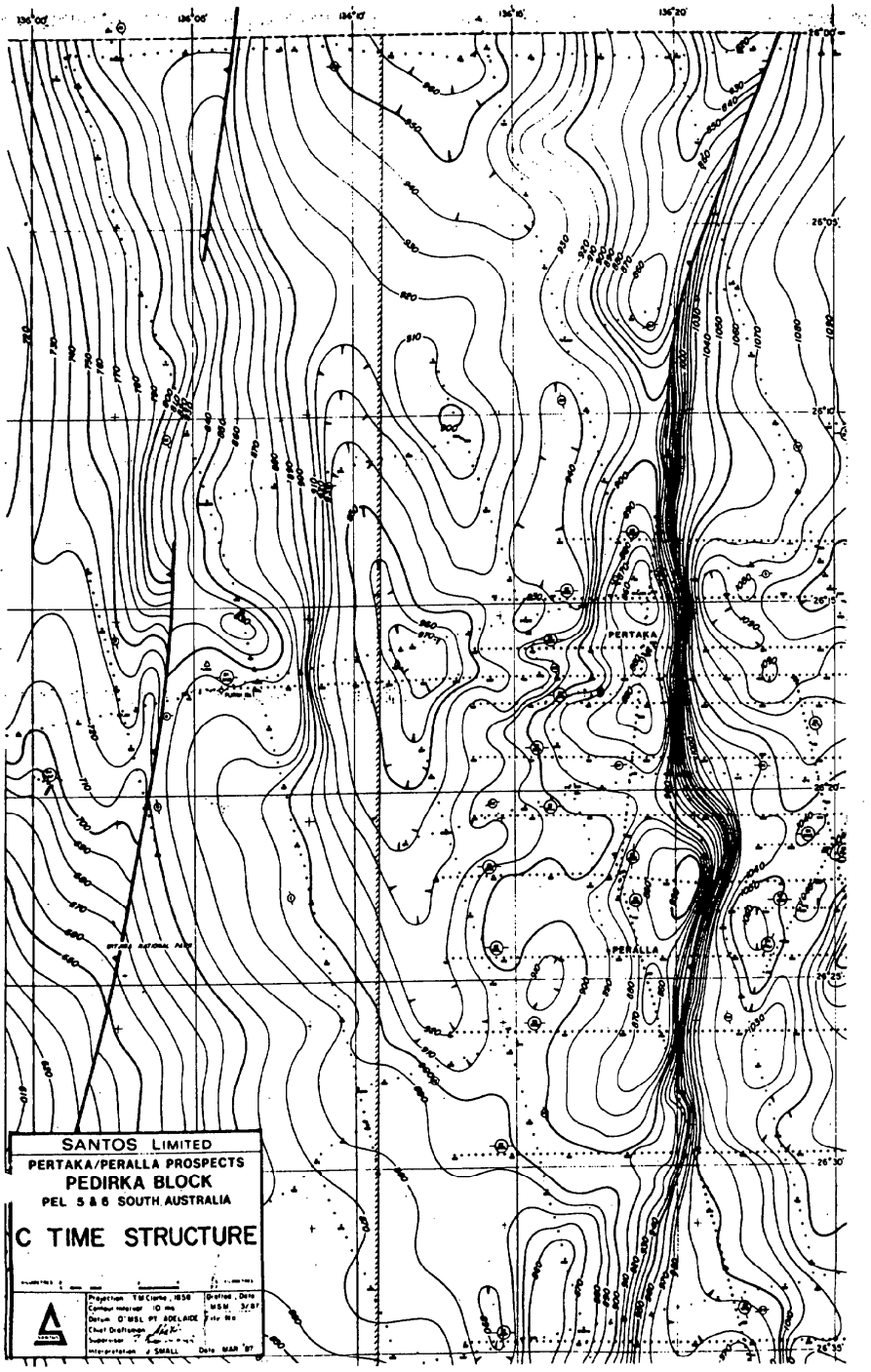
Formation	Reservoir	RESERVOIR PARAMETERS											POTENTIAL RESERVES						
		Subsea Depth ft	Struct Area LCC Acres	Max Rel ft	Pot Pool Area Acres	% Area Fill	Gross Hyd Col ft	Ave NEP ft	Por %	Sh %	BO/ BG Oil	BO/ BG Gas	Pot OIP MMSTB	Pot GIP BCF	Rec Fac %	Pot Rec Oil MMSTB	Pot Sales Gas BCF	Pot LPG (C3C4) MMSTB	Pot Cond (C5) MMSTB
PURNI		3500	13900	160	750	5	40	12	14	60	0.91		5.52		25	1.38			
TOTAL													5.52			1.38			

Reference Field or Well : MOKARI 1

Risk :

Dry Hole Cost ($mm) :

Case and Suspend Cost ($mm) :



SANTOS LIMITED

PERTAKA/PERALLA PROSPECTS

PEDIRKA BLOCK

PEL 5 & 6 SOUTH AUSTRALIA

C TIME STRUCTURE

Projection TM Clarke, 1858	Drafted, Date
Contour Interval 10 ms	MSW 3/97
Datum 0' MSL PT. ADELAIDE	File No
Chief Draftsman	
Supervisor	
Interpretation J. SMALL	Date MAR '97

WILDCAT WELLS

SUMMARY SHEET

00537

Date : 29/07/88

Prospect : NAMBUCCA
Status : STRONG LEAD
Licence : PEL'S 5 AND 6 Block : PEDIRKA
Trap type : ANTICLINE
Ref. Seismic Line : 87-WQX S.P. : 260-330
Proposed T.D. : 6000
Dist. to Facility (km) : 300 (oil), (gas)

Latitude : 26 22
Longitude : 237 37
G.L. : 147

Geological Summary : NAMBUCCA IS A 4-WAY DIP CLOSURE IN THE CENTRAL POOLOWANNA TROUGH. THE STRUCTURE LIES ON THE DOWNTHROWN (WEST) SIDE OF A MAJOR FAULT SYSTEM DEFINING THE POOLOWANNA-PERINNA TREND. THE STUCTURE EXHIBITS APPROX 30 MS OF CLOSURE AT THE C HORIZON.

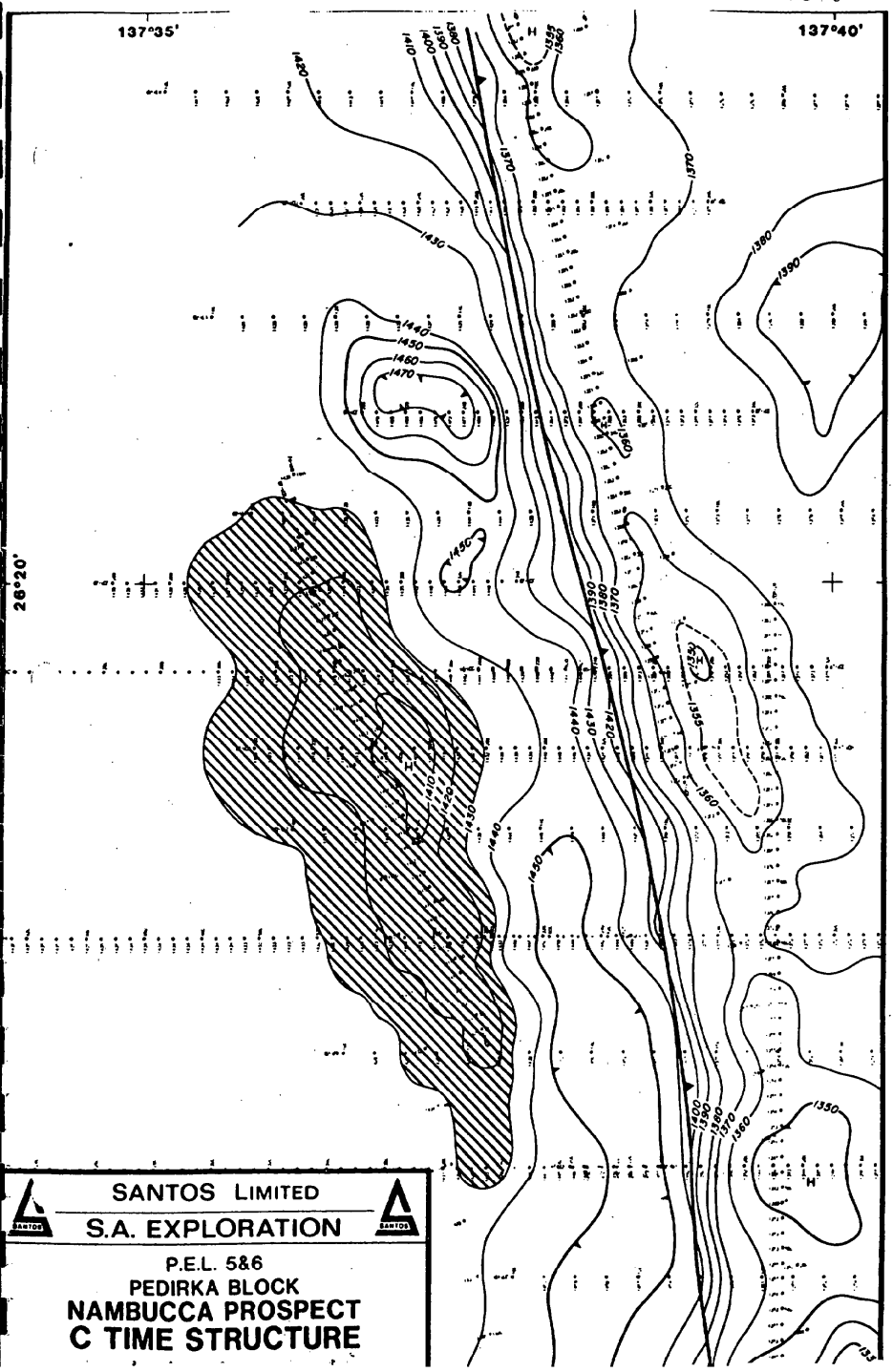
		RESERVOIR PARAMETERS											POTENTIAL RESERVES							
Formation	Reservoir	Subsea Depth ft	Struct Area LCC Acres	Max Rel ft	Pot Pool Area Acres	% Area Fill	Gross Hyd Col ft	Ave NEP ft	Por %	Sh %	BO/ BG Oil	BO/ BG Gas	Pot OIP MMSTB	Pot GIP BCF	Rec Fac %	Pot Rec Oil MMSTB	Pot Sales Gas BCF	Pot LPG (C3C4) MMSTB	Pot Cond (C5) MMSTB
POOLOWANNA		5500	3160	160	115	4	40	16	12	60	0.91		0.91		25	0.23			
TOTAL													0.91			0.23			

Reference Field or Well : POOLOWANNA 1

Risk :

Dry Hole Cost ($mm) :

Case and Suspend Cost ($mm) :



SANTOS LIMITED

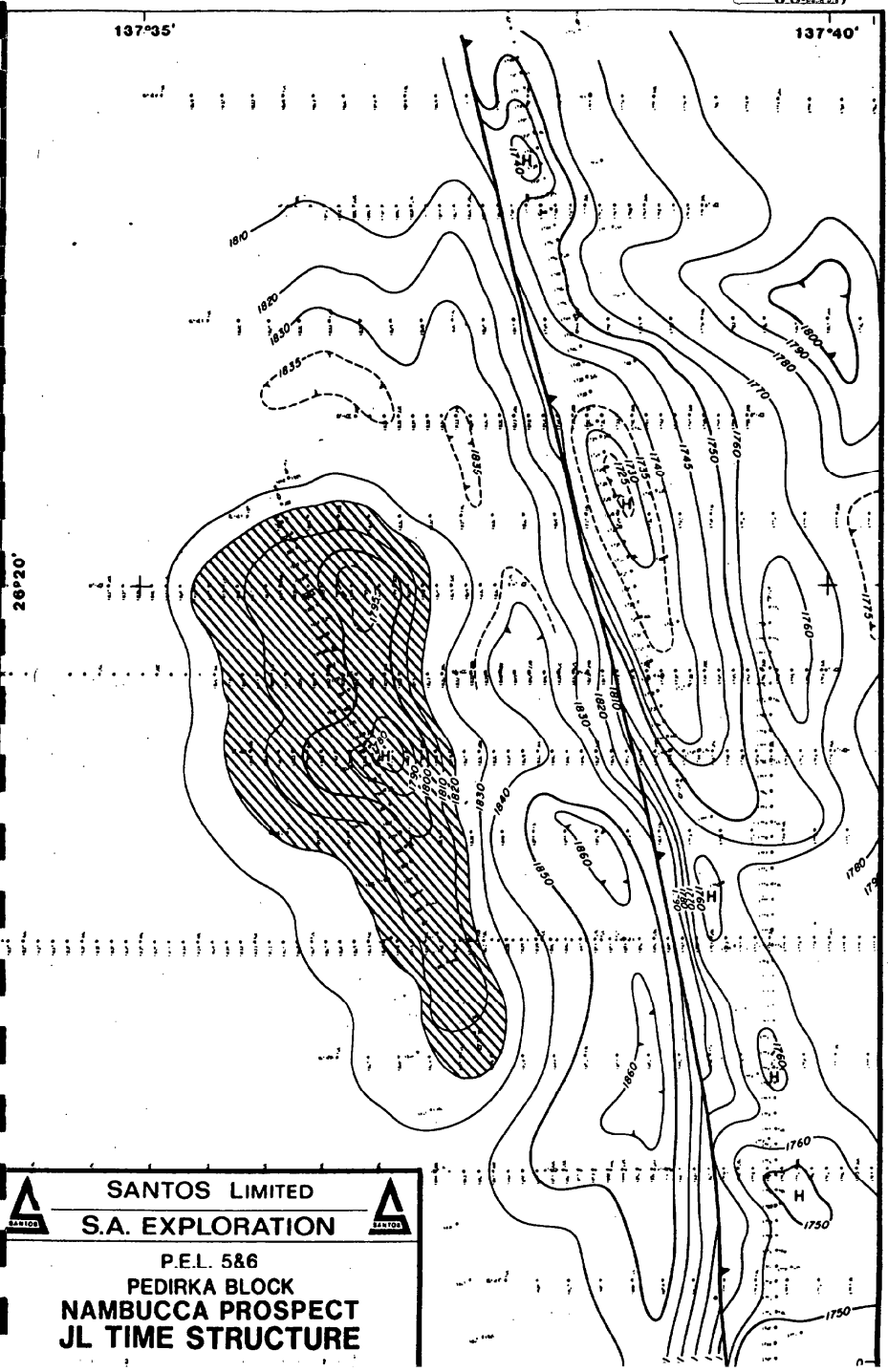
S.A. EXPLORATION

P.E.L. 5&6

PEDIRKA BLOCK

NAMBUCCA PROSPECT

C TIME STRUCTURE



SANTOS LIMITED

S.A. EXPLORATION

P.E.L. 5&6

PEDIRKA BLOCK

NAMBUCCA PROSPECT

JL TIME STRUCTURE

00540

SANTOS LIMITED

S.A. EXPLORATION

NAM. UCCA PROSPECT

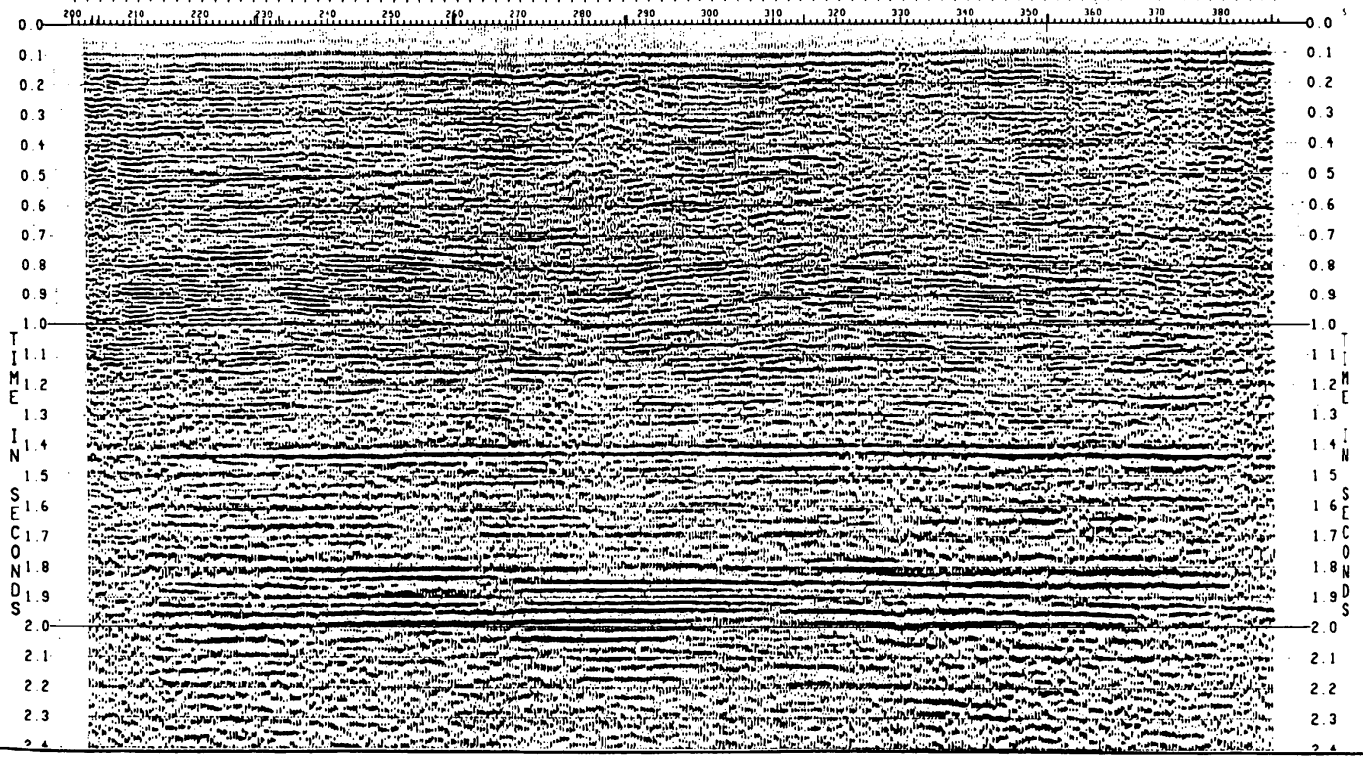
PEDIRKA BLOCK

87-WQX

FINAL QC STACK (133.2B)

NNW

SSE



00541

SANTOS LIMITED

S.A. EXPLORATION

NAM. UCCA PROSPECT

PEDIRKA BLOCK

87-WQH

FINAL QC STACK (133.2B)

W

E