

# Acreage release

## COOPER-EROMANGA BASINS SOUTH AUSTRALIA



EXPLORATION OPPORTUNITIES  
BLOCKS CO99A-H  
April 1999



PRIMARY INDUSTRIES  
AND RESOURCES SA



Government  
of South Australia



**PRIMARY INDUSTRIES  
AND RESOURCES SA**

**COOPER BASIN  
EXPLORATION OPPORTUNITY –  
SECOND ROUND  
BLOCKS CO99-A to H**

**Compiled by**

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Petroleum Group**

**MARCH 1999**

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**REPORT BOOK 99/00004**

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PRIMARY INDUSTRIES AND RESOURCES  
SOUTH AUSTRALIA

REPORT BOOK 99/00004 DME 99/0376

## COOPER BASIN EXPLORATION OPPORTUNITY. SECOND ROUND BLOCKS CO99-A to H.

Compiled by E.M. Alexander (PIRSA) with contributions from J.G.G. Morton \* - undiscovered potential, A.J. Hill \* and C. Boreham (AGSO) – source rocks, D.I. Gravestock \* – seals and traps, B. O’Neil – history, Alan Sansome \* and Dragan Ivic \* – data. PIRSA staff indicated by \*.

### Executive Summary

The South Australian part of the Cooper Basin has been under licence continuously since 1954, however on 27 February 1999 Petroleum Exploration Licences (PELs) 5 & 6 expired. The former PEL 5&6 area is being released in three bidding rounds over 1998–2000, with a planned total of 31 blocks on offer. The first round commenced in October 1998 when eleven blocks flanking the Cooper Basin (CO98-A to K) were released. Applications for those blocks closed on 11 March 1999 and a total of 41 bids were received from 15 consortia.

The current release of eight core Cooper Basin blocks (CO99-A to H) in the Patchawarra Trough (Fig. 1), adjacent to the producing oil and gas fields forms the second round acreage release. The total area on offer is approximately 6,000 km<sup>2</sup> or 1,472,500 acres (Table 1). A nine month evaluation period applies for all CO99 blocks and applications close at 4.00 pm on Thursday 25 November 1999.

**Table 1.** Second round acreage release blocks, and open file data summary Cooper Basin, 1999.

Block	Block area km <sup>2</sup>	acres	Year last drilled	No.Wells	2D Seismic km	3D Seismic km <sup>2</sup>
CO99-A	594	146,659	1998	5	1288	
CO99-B	617	152,342	1997	15	1490.3	27
CO99-C	651	160,889	1998	20	1318.4	4
CO99-D	767	189,536	1997	7	1690.9	40
CO99-E	1069	264,251	1998	37	2117	7
CO99-F	438	108,138	1998	27	1319.4	
CO99-G	1010	249,457	1998	52	3001.3	30
CO99-H	814	201,256	1995	62	2160.6	116

Applications may be made for any or all of the eight areas, CO99-A to H. Licences are offered on the basis of the most competitive work program. In the event that more than one area is offered to an applicant for licence, there is no obligation for the applicant to accept any or all of the offers. It should be noted that there are no criteria limiting the number of PELs which may be offered to one applicant (although in considering Competition Policy Principles it would require major work program benefits to offer more than two PELs to the one applicant in the second round of bidding). In addition, applications for this second release of acreage will in no way prejudice successful applications in future Cooper Basin acreage releases.

The third Cooper Basin acreage release is proposed to comprise twelve blocks (CO20-A to L) covering the remaining core acreage of the former PELs 5&6 and some flank acreage. The proposal for round 3 was announced on 8 April 1999, to assist planning of bidding strategies. The official release of the CO20 blocks is scheduled for 20 January 2000 and bids for these blocks will not be accepted until after that date. It is proposed that two closing dates for the CO20 release may apply – bids for flank blocks to close on 30 June 2000, bids for core Cooper Basin blocks to close on 29 September 2000 (Table 2). Your comments are sought on future Cooper Basin acreage releases.

Comments, enquiries and applications for Petroleum Exploration Licences may be addressed to:

Director, Petroleum Group

Level 7

101 Grenfell St  
Adelaide SA 5000  
AUSTRALIA

Telephone:IAC 61 8 8463 3204

Facsimile:IAC 61 8 8463 3229

Website:www.mines.sa.gov.au/petrol

Applications should be accompanied by a proposed five year work program, a map of the area applied for, the appropriate application fee (A\$ 2240 at the time of writing, but scheduled to increase on 1 July 1999) and details of the technical and financial resources of the applicant (an application form and summary guidelines are included in Appendix 3).

The envelope containing your application(s) must be marked ‘CONFIDENTIAL – PEL APPLICATION’.

Successful bids will be announced in January 2000.

**The closing date for CO99-A to H applications is 4.00 pm on Thursday 25 November 1999.**

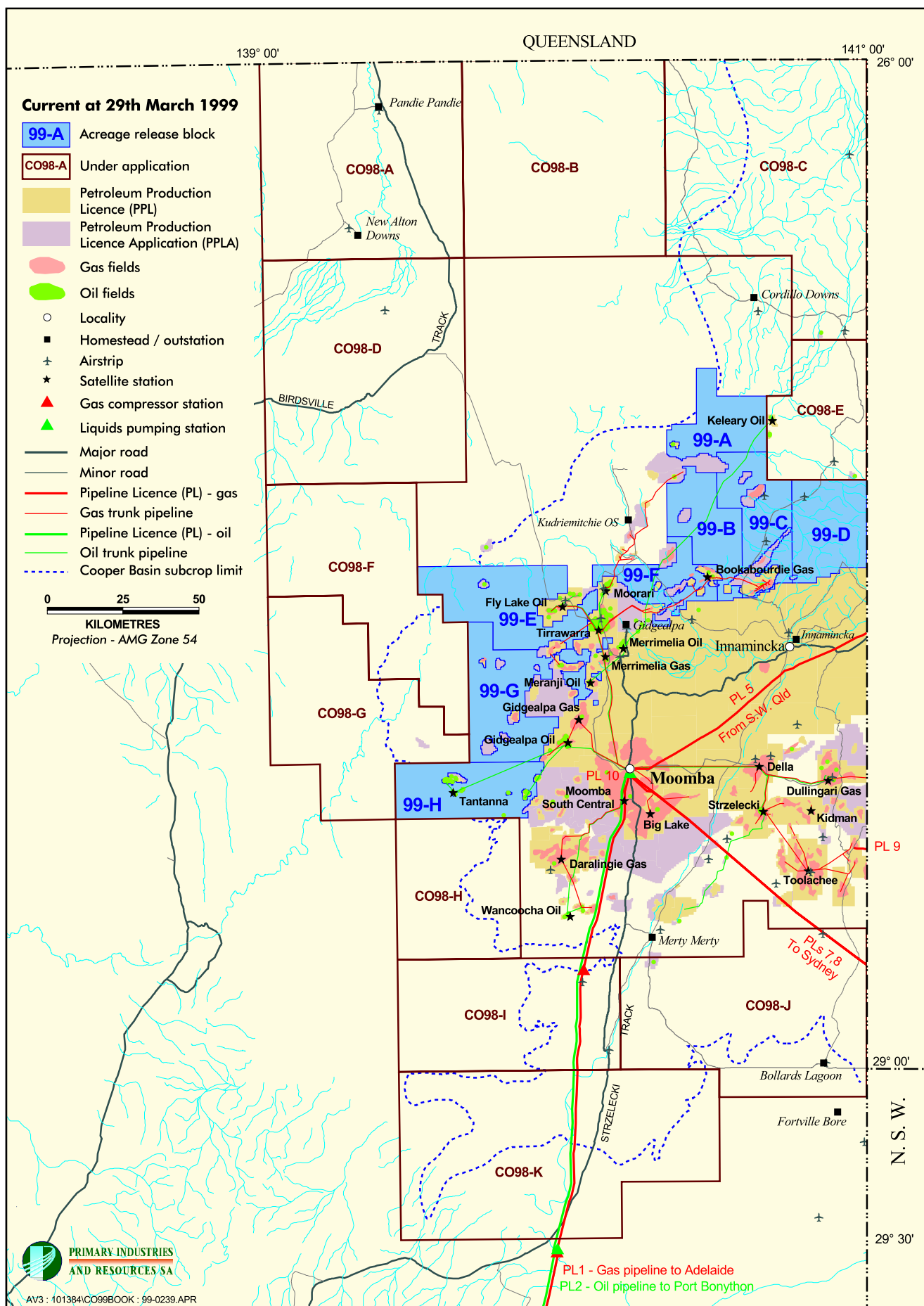


Fig. 1. Cooper Basin location map

## EXPLORATION HISTORY

The Cooper Basin is Australia's largest onshore oil and gas province (Fig. 1), located 800 km north of Adelaide in a remote, sparsely populated desert environment. The first petroleum exploration licence over the basin was issued in 1945 – OEL 1 issued to Zinc Corp. Ltd, covered the area from Lake Frome to the southern Cooper Basin. OELs 2 and 3, covering the now productive parts of the Cooper and Eromanga Basins, were issued in 1947 and transferred to Frome-Broken Hill Co. Pty Ltd. Petroleum exploration commenced in 1954 with the granting of OEL 7 to R. Bristowe on behalf of Santos. Santos then held a total of 860 000 km<sup>2</sup> in SA and Qld.

Initial exploration included reconnaissance gravity and magnetic surveys between Birdsville and Marree and structural/stratigraphic bores in the northern Cooper Basin undertaken by Geosurveys for Santos. In 1959 Delhi-Taylor Oil Corporation joined Santos as a partner and was exploration operator until 1987. Early exploration targeted Early Palaeozoic carbonates and clastics and in 1959 Innamincka 1, the first oil and gas exploration well was drilled. Additional reflection surveys over the ensuing years led to the discovery of gas in the Permian section in Gidgealpa 2 in 1963 and three years later the 'giant' Moomba gas field was discovered. One-third of SA's Cooper Basin gas reserves are in the Moomba and Big Lake fields.

The decision to generate the bulk of SA's electricity from natural gas ensured the economic viability of constructing and operating the Moomba–Adelaide pipeline, and gas was first supplied to Adelaide in 1969. PELs 5 and 6 were issued to Delhi and Santos in 1969 to replace OELs 20 and 21, and the first PPLs were granted. Further gas discoveries were made in 1970 at Packsaddle, Tirrawarra, Della, Merrimelia, Mudrangie and Strzelecki, some of which were made by farm in companies such as Crusader and Pursuit Oil NL.

In 1971 Santos was appointed operator of the gas production facilities and camp at Moomba by the joint venturers. Also during 1971 an agreement was signed by the Cooper Basin Producers to supply gas for the NSW market from 1976 to 2006 and construction of a pipeline linking Moomba and Sydney commenced. In 1975 the *Cooper Basin Ratification Act* (and Indenture) came into effect. Gas was first supplied to AGL in Sydney in 1976. Santos became the sole operator for development drilling, production and processing in 1979.

The first Cooper Basin oil was discovered in Tirrawarra 1 in 1970. The Tirrawarra field contains 80 per cent of known oil reserves in the SA region. Eromanga Basin oil was discovered in 1977 with an uneconomic flow from Poolowanna 1 (Poolowanna Trough) and the first economic oil flow was recorded from Strzelecki 3 in the following year. In order to market newly discovered oil and existing gas liquids, the Cooper Basin Liquids Project was initiated in 1980 and completed in stages from 1982 to 1984 at a cost of \$1.4 billion. The project involved the construction of a high vapour pressure liquids pipeline from Moomba to a processing plant and storage and loading facilities at Port Bonython, as well as field development, oil collection and crude stabilisation facilities at Moomba.

Export shipments of crude oil and condensate commenced in 1983 and LPG handling facilities were commissioned in July 1984. The establishment of these facilities enabled the Cooper Basin Producers to bring the wet gas reservoirs into production, which further enhanced production flexibility. In 1991 condensate production from Port Bonython was replaced by a full range naphtha, which has a greater market value.

Santos became exploration and production operator for PELs 5 and 6 in 1987. In 1991 a contract was signed for the sale of natural gas by the SW Queensland Producers to SA. The gas is delivered to the SA market via a 190 km pipeline constructed by the Producers to link the Queensland gas fields with the Moomba processing facility and the Moomba–Adelaide natural gas pipeline. An agreement was finalised between Santos on behalf of the Cooper Basin Producers and ICI in 1994 to supply ethane from Moomba to a petrochemical plant in Botany Bay. A pipeline was constructed and supply commenced in June 1996.

In 1995 the SA Government confirmed that no rights of renewal would be applied to PELs 5 and 6 on expiry, which occurred on 27 February 1999. The former exploration licence area has been divided into smaller blocks which are being progressively released for licence applications.

## COOPER BASIN ACREAGE RELEASE STRATEGY

Cooper Basin acreage is being released for work program bidding in three rounds over the period 1998 to 2000. Round one (CO98-A to K blocks) closed on 11 March 1999. A total of 41 bids from 15 consortia were received and all eleven blocks are now under application.

PIRSA has divided the remaining area of former PELs 5&6 into flank and core areas. Flank blocks lie beyond the margin of the Cooper Basin and because most have only regional seismic data and a few wells, a six month evaluation period applies. PELs granted for flank blocks have two renewals (i.e. three five year terms) because of the frontier nature of the acreage.

Core blocks are those close to production and have large volumes of seismic and well data available – a nine month evaluation period applies. PELs granted for core blocks will have one renewal (i.e. two five years terms).

CO99 blocks, current Petroleum Production Licences (PPL) and Petroleum Production Licence Applications (PPLA) are shown on Figure 1.

Areas constituting unsuccessful PPLAs made by the operators of former PELs 5&6 will not be included in the surrounding CO98, CO99 or CO20 block. Subject to resolution of PPLA issues, if such areas become available, they would be included in a separate bidding round, post September 2000.

The key dates for Cooper Basin acreage releases are listed in Table 2.

## GEOLOGICAL SUMMARY

### Eromanga Basin

The Eromanga Basin covers one million square kilometres of central-eastern Australia and contains the multi-aquifer system of the Great Artesian Basin. It

**Table 2.** Cooper Basin acreage releases, 1998 - 2000.

Round	No.of Blocks	Release dates	Closing dates	Notification of winning bids	PEL details
First CO98	11 flank	Th 15/10/98	Th 11/3/99	Fri 9/4/99	3x5 year terms
Second CO99	8 core	Th 8/4/99	Th 25/11/99	Jan 2000	2x5 year terms
Third CO20	6 flank	January 2000	June 2000	July 2000	3x5 year terms
(Provisional)	6 core		Sept 2000	Nov 2000	2x5 year terms

unconformably overlies the Cooper and Warburton Basins. Eromanga Basin stratigraphy can be divided into three sequences – lower non-marine, marine and upper non-marine (Fig. 2). Exploration is concentrated on the productive lower non-marine sequence.

The lowermost unit of the Eromanga Basin is the Poolowanna Formation, which consists of interbedded siltstone, sandstone and coal, deposited in high sinuosity fluvial and floodplain environments. Poolowanna Formation inter tongues with and is overlain by low sinuosity fluvial deposits of the Hutton and Algebuckina Sandstones. Basinward lateral equivalents of the Algebuckina Sandstone are Hutton Sandstone, Birkhead Formation, Adori Sandstone, Westbourne Formation, Namur Sandstone and Murta Formation. The Hutton, Adori and Namur Sandstones are similar in lithology and facies to

the Algebuckina but with an additional volcanoclastic component in minor amounts.

The Birkhead Formation consists of interbedded siltstone, coal and sandstone, Westbourne Formation consists of interbedded siltstone and sandstone of Late Jurassic age. Murta Formation and McKinlay Member overlie and intertongue with the Namur Sandstone and consist of thinly interbedded siltstone, shale, sandstone deposited in a large lake which extended throughout the Cooper Basin region. The McKinlay Member is a lacustrine shoreface facies.

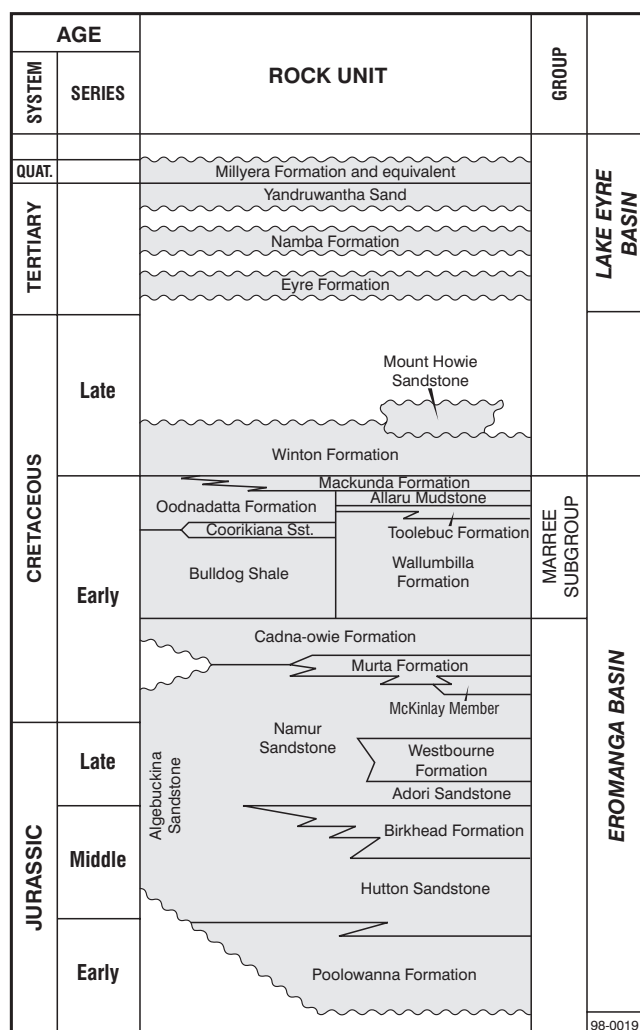
Cadna-owie Formation records the transition into open marine conditions during the Early Cretaceous and consists of interbedded sandstone, siltstone and claystone with minor carbonate. The fluvio-deltaic Wyandra Sandstone Member is developed at the top of the Cadna-owie Formation. The contact between sandstones of the upper Cadna-owie Formation (Wyandra Sandstone Member) and overlying marine shales of the Bulldog Shale or Wallumbilla Formation approximates a prominent seismic reflector – the C horizon – which is mappable across the entire Eromanga Basin (Fig. 3). Formations of the Early Cretaceous are of secondary interest to petroleum exploration in the area and are not discussed in detail. The marine succession is overlain by the rapidly deposited upper non-marine sequence (Winton Formation) which consists of coal, floodplain and low sinuosity channel deposits.

A period of erosion and deep weathering in the Late Cretaceous caused by a switch in drainage from the Cooper region to the Ceduna Depocentre on the rifted southern margin of the continent was followed by deposition of the non-marine Cainozoic Lake Eyre Basin. The modern landscape was formed during the Pliocene-Quaternary.

## Cooper Basin

The intracratonic Cooper Basin represents a Late Carboniferous to Triassic depositional episode. It lies unconformably over early Palaeozoic sediments of the Warburton Basin and is overlain disconformably by the Eromanga Basin (Fig. 4). Three major troughs (Patchawarra, Nappamerri and Tenappera) are separated by structural ridges (Gidgealpa-Merrimelia-Innaminka (GMI) and Murteree) associated with the reactivation of northwest-directed thrust faults in the underlying Warburton Basin. These troughs contain up to 2500 m of Permo-Carboniferous to Triassic sedimentary fill overlain by as much as 1300 m of Jurassic to Tertiary cover.

The Late Carboniferous to Early Permian formations of the Cooper Basin comprise, in ascending order, the Merrimelia Formation and Tirrawarra Sandstone – a glaciofluvial system deposited on glacially sculpted flat-lying to deformed Warburton Basin sediments, volcanics



**Fig. 2.** Eromanga Basin stratigraphy.



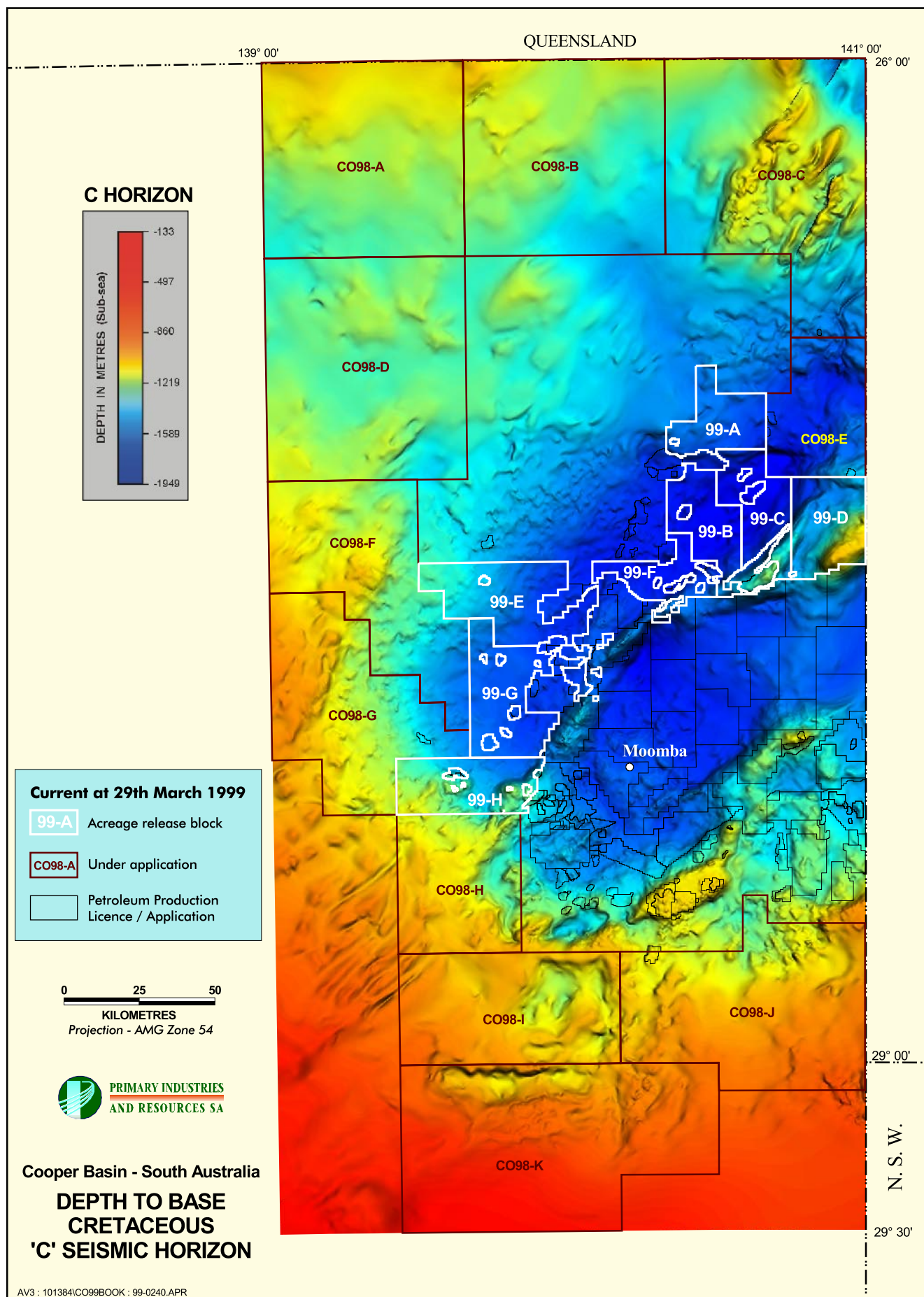


Fig. 3. Base Cretaceous, 'C' seismic horizon map



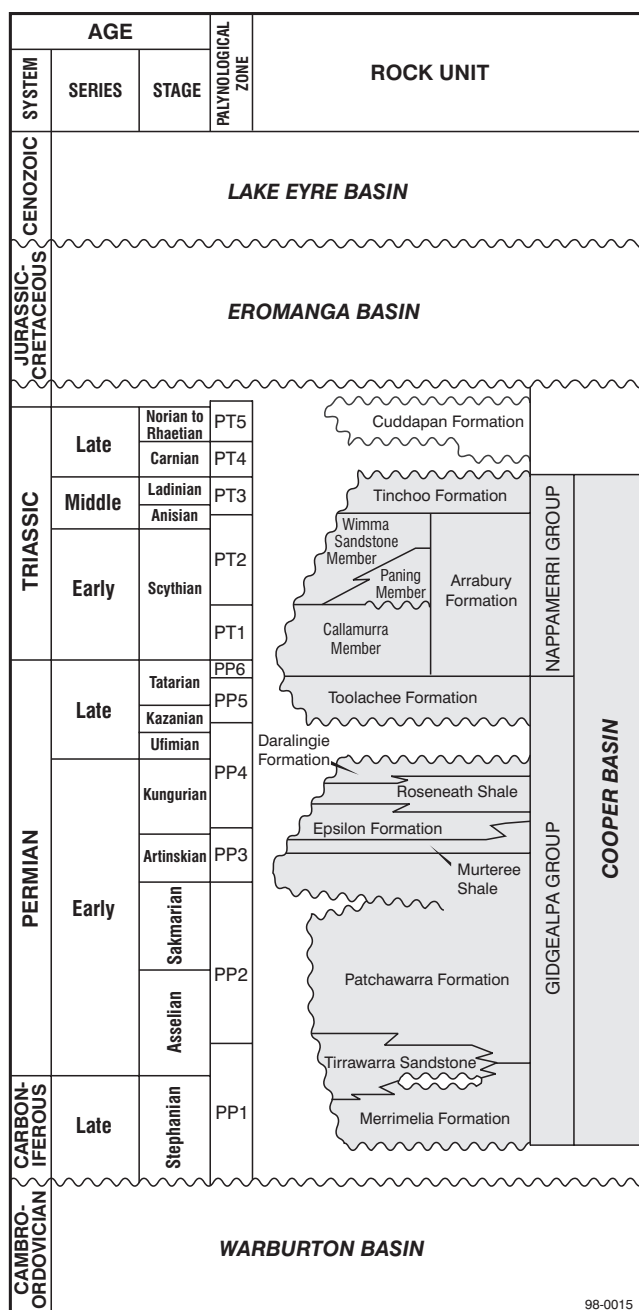


Fig. 4. Cooper Basin stratigraphy.

and intrusives. The Tirrawarra Sandstone represents low sinuosity fluvial to proglacial outwash deposits overlain by peat swamp, floodplain and high sinuosity fluvial facies of the Patchawarra Formation.

Two lacustrine siltstone units (Murteree and Roseneath Shales) with intervening fluvio-deltaic sediments (Epsilon and Daralingie Formations) were deposited during a phase of continued subsidence. Early Permian uplift led to erosion of the Daralingie Formation and underlying units from basement highs.

Floodplain, peat swamp and high sinuosity fluvial facies of the Late Permian Toolachee Formation were deposited on the Daralingie unconformity surface and are overlain conformably by Late Permian to Early Triassic Arrabury Formation. The uppermost coal, approximating the top Permian is mapped as the 'P' seismic horizon (Fig. 5). The

Arrabury Formation comprise floodplain and channel facies of the Callamurra, Paning and Wimma Sandstone Members, which are overlain by the Early Triassic Tinchoo Formation.

In the northern Patchawarra Trough, the Cooper Basin is locally overlain by the Middle to Late Triassic Cuddapan Formation. Deposition in the region was terminated at the end of the Early Triassic with slight but widespread deformation, regional tilt and erosion.

## Warburton Basin

The Cooper Basin is unconformably underlain by sediments and volcanics of the eastern Warburton Basin (Fig. 6). Warburton Basin sediments range from Cambrian to Ordovician; Devonian sediments have not been intersected in the Cooper Basin region of SA. The eastern Warburton Basin is essentially a fold belt deformed during the Late Devonian-Carboniferous Alice Springs Orogeny intruded by mid-Carboniferous granitoids and subsequently buried to depths ranging from 1300 m to almost 4000 m.

The eastern Warburton Basin contains a basal suite of acid-intermediate volcanics, tuff and agglomerate (Mooracoochie Volcanics), overlain by dolomitised shelfal limestone historically assigned to the basal Kalladeina Formation. A Middle to Late Cambrian carbonate shelf developed in the Coongie-Cuttapirie area, with a slope to the east. Several depositional sequences have been identified in the Kalladeina Formation typically with deep water shales overlain progressively by shallow water carbonate and clastic deposits. The Pando and Innamincka Formations continue this trend to shallow water depths as part of a deltaic complex with an extensive marine shelf sand. Black shale of the Dullingari Group with rare graptolites was deposited in the deep water Larapintine Sea which extended through the Warburton and Amadeus Basins to the Canning Basin.

Middle to Late Ordovician shale and siltstone constitute the last preserved deposits of the eastern Warburton Basin. Early-Middle Carboniferous granitic intrusives (Big Lake Suite) beneath the Nappamerri and Wooloo Troughs were responsible for localised silicification and contact metamorphism of Cambrian country rock. The unconformity at the top of the Warburton Basin is mapped as the 'Z' seismic horizon (Fig. 7). A weathered zone up to 150 m thick has altered Warburton Basin strata and the granites in particular, immediately beneath the Cooper Basin unconformity.

Structural style superimposed by compressional deformation during the Alice Springs Orogeny follows arcuate northeasterly trends imposed by northwest-directed thrust faults. Wrench fault zones have been mapped seismically in the Titan-Charo-Yanta area on the northwest flank of the Patchawarra Trough. Complex folding and faulting occur in some parts of the basin, but in many regions the Early Palaeozoic is almost flat lying.

## PETROLEUM GEOLOGY

### Reservoirs

#### Eromanga Basin

Principal reservoirs are good to excellent reservoir quality Hutton and Namur Sandstones (porosities up to 25%,

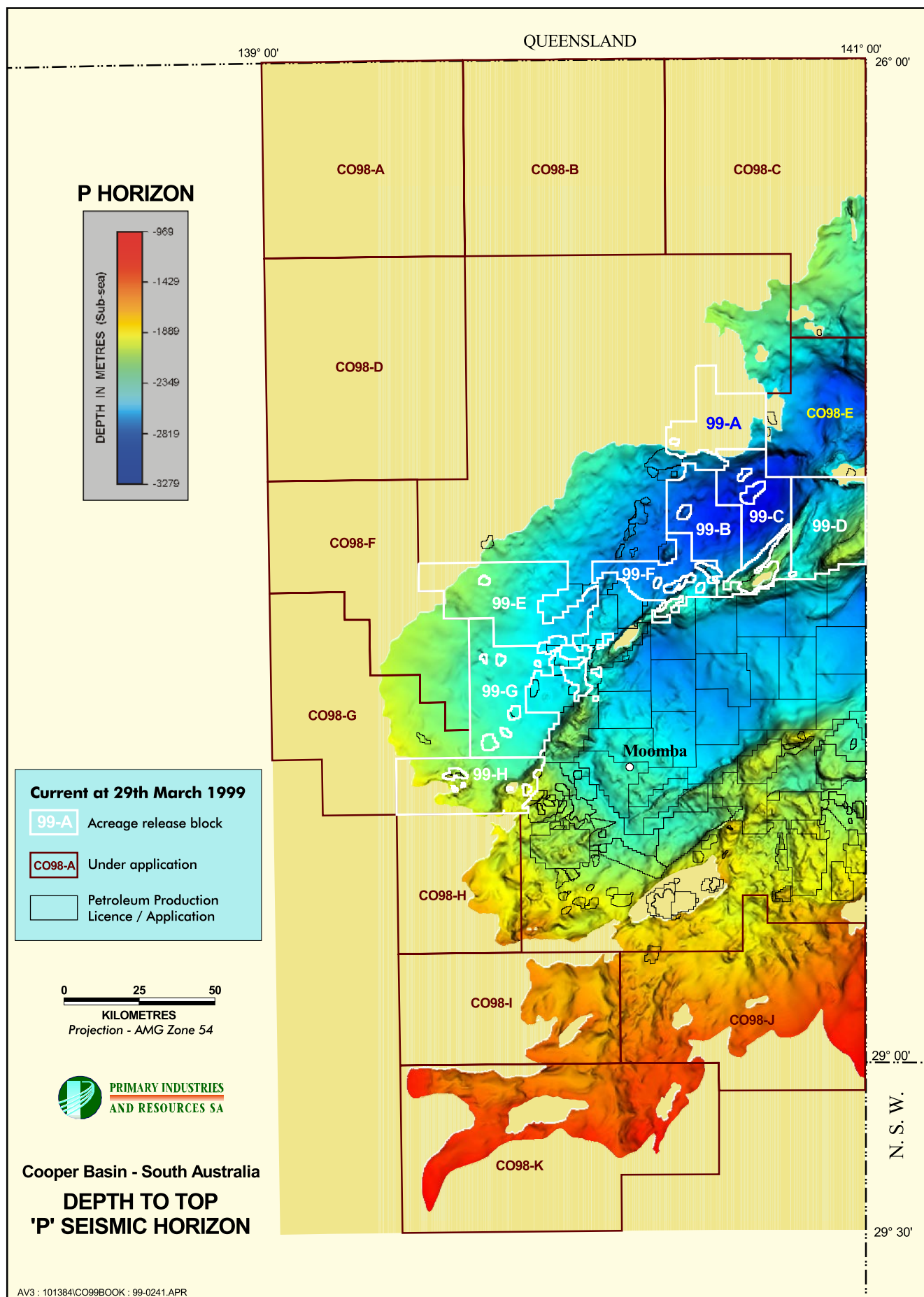


Fig. 5. Top Permian, 'P' seismic horizon

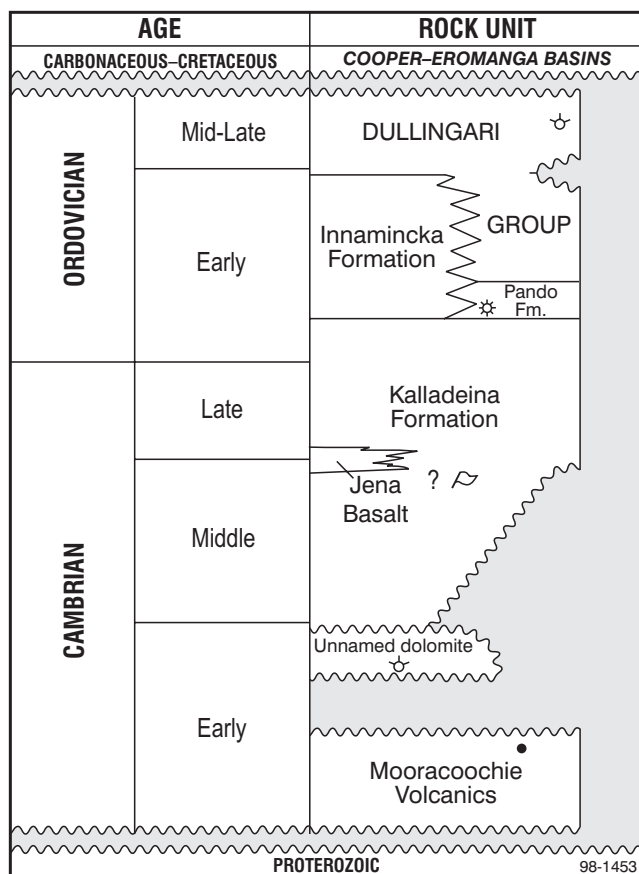


Fig.6. Warburton Basin stratigraphy.

permeability up to 2500 mD). Oil is also reservoir in fair to excellent quality sandstones in the Poolowanna and Birkhead Formations, McKinlay Member and Murta Formation. The Algebuckina Sandstone is a major artesian aquifer. The Cadna-owie Formation (Wyandra Sandstone Member) forms a significant oil reservoir in Queensland, however economic hydrocarbons have yet to be discovered in this unit within SA.

### Cooper Basin

Multi-zone high sinuosity fluvial sandstones form poor to good quality reservoirs. The main gas reservoirs occur primarily within the Patchawarra Formation (porosities up to 23.8%, average 10.5% and permeability up to 2500 mD) and Toolachee Formation (porosities up to 25.3%, average 12.4% and permeability up to 1995 mD). Shoreface and delta distributary sands of the Epsilon and Daralingie Formations are also important reservoirs. Oil is produced principally from low sinuosity fluvial sands within the Tirrawarra Sandstone (porosities up to 18.8%, average 11.1% and permeability up to 329 mD). Towards the margin of the Cooper Basin, oil is also produced from the Patchawarra Formation and from fluvial channel sands in the Merrimelia Formation in Malgoona field.

The Callamurra Member of the Arrabury Formation is conventionally regarded as a regional seal but nevertheless contains economic oil and gas reservoirs in some areas and is a leaky seal in others. Low sinuosity fluvial sandstones of the Paning and Wimma Sandstone Members form economic oil and gas reservoirs and high sinuosity fluvial sandstone of the Tinchoo Formation reservoir oil. As yet, there have been

no economic oil or gas fields discovered in the Cuddapan Formation in SA.

### Warburton Basin

Fractures in brittle siltstones (e.g. Dullingari Group in Lycosa 1) are capable of trapping commercial oil and gas. Fracture patterns and their relation to pre-Cooper and post-Cooper Basin structure are currently being studied by PIRSA and the NCPGG.

Pando Formation sandstone has surprisingly high porosity (~10%) in view of its low stratigraphic position. It is glauconitic and zircon-rich and consequently has a high gamma ray response. Moolalla 1 gas is reservoir in this formation which extends from Pando in the west to Moomba in the northeast.

Basal and middle Kalladeina Formation dolomites represent shelf limestones exposed to meteoric diagenesis during marine lowstands. Although minor gas shows have been recorded, porosity prediction has proved elusive, the dolomites and associated karst breccias proving tight when drilled.

Sturt 6 oil was produced from weathered tuff which forms an extensive unit beneath the southwest Cooper Basin. The tuff, together with underlying agglomerate and lava, comprises the Mooracoochie Volcanics. Both the oil and gas originated from Permian source rocks.

Oil and gas production from fields adjacent to CO99 blocks is summarised in Table 3.

### Source Rocks

Both Cooper and Eromanga Basin mature source rocks have actively contributed to oil accumulations in the region. Each oil accumulation needs to be considered on its merits with respect to the extent of 'mixing' from Permian and Mesozoic sources.

### Eromanga Basin

Oil originated either in the Eromanga or the Cooper Basin or a mixture of both. Although it is recognised that Birkhead and Murta Formation sources exist, there is still considerable debate as to their extent and relative contribution.

Potential source rocks of Jurassic and Early Cretaceous age contain Type II to Type III organic matter and have been shown to have maturities within the 'oil window' (onset of oil generation between vitrinite reflectance 0.65-0.7%). Significant suppression of Ro has been detected in some Eromanga Basin source rocks using the FAMM technique. Average TOC and pyrolysis yields are slightly lower for Eromanga source rocks compared to Permian source rocks. However, the Birkhead Formation (mid-Jurassic) contains the most hydrogen-rich organic matter and has an average TOC of 2.5% and S2 pyrolysis yield of 10.8 kg/tonne. The Poolowanna Formation shows fair to good source richness; the Westbourne Formation exhibits mainly fair source richness.

Hydrocarbon extracts of Jurassic potential source rocks are paraffinic and waxy and similar to those from Permian sediments. This lack of distinction probably reflects only minor changes in organic facies and/or maturation histories or alternatively, reflects oil staining/contamination of



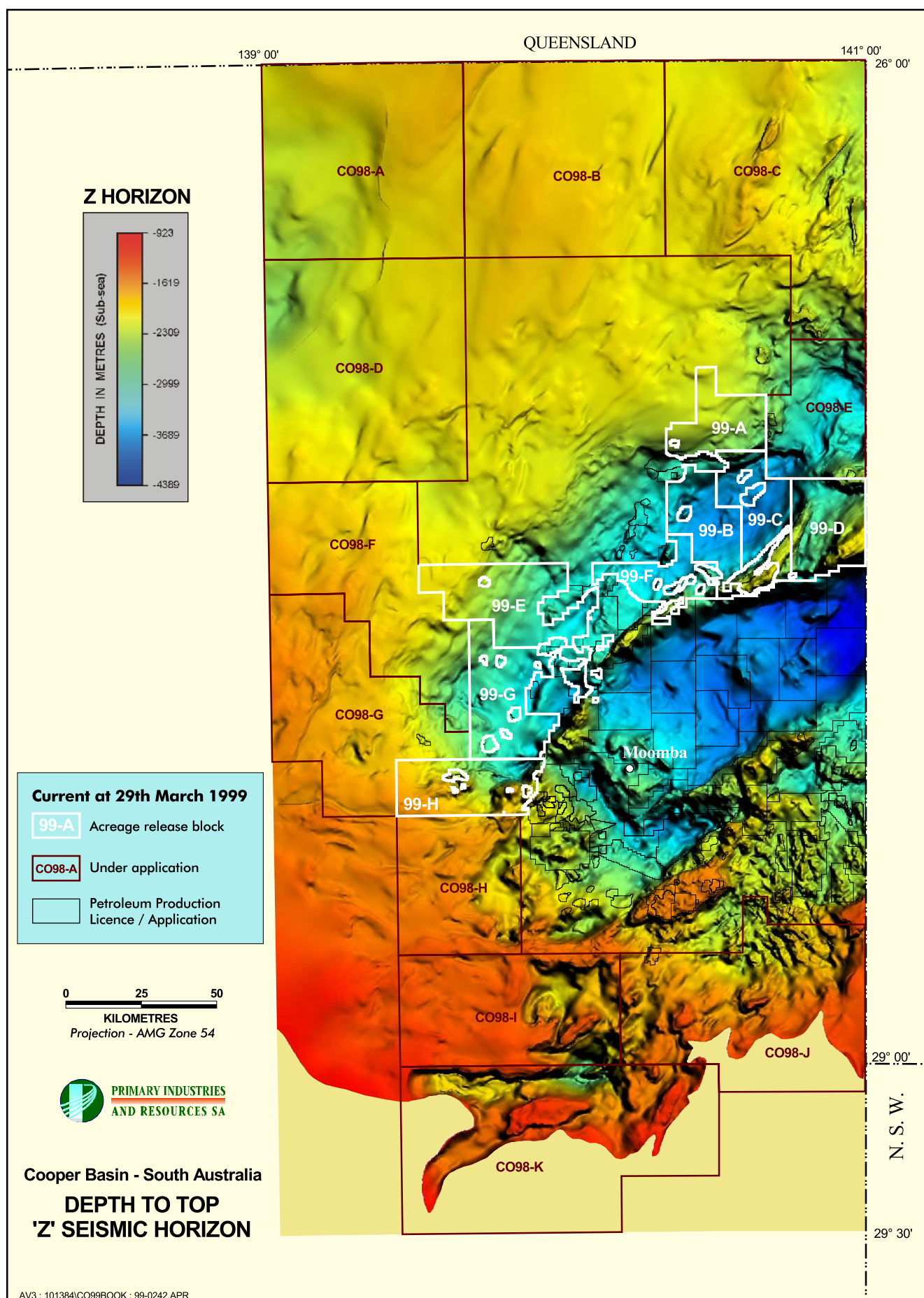


Fig. 7. Top Warburton Basin unconformity, 'Z' seismic horizon map

**Table 3.** Cumulative production to 30/6/98 for selected fields adjacent to CO99 Blocks.

Block	Field name	Gas pool	Gas (m <sup>3</sup> x10 <sup>6</sup> )	Oil pool	Oil (kL)
CO99-A	Tarragon			Hutton	3,136.8
				Tinchoo	661.4
CO99-B	Cuttapirrie	Epsilon	55.3	Poolowanna	2,647.7
	Bookabourdie	Nappamerri	8.8	Birkhead	18,516.4
		Tirrawarra	1,947.3	Hutton	5,131.0
	Merindal	Nappamerri	3.0		
CO99-C	Packsaddle	Nappamerri	133.8		
	Packsaddle/Pondrinie	Tool/Tirra/Merr	855.0		
CO99-D	Nil				
CO99-E	Fly Lake	Patchawarra	1,315.8	Patch/Tirra	75,877.7
	Fly Lake East	Patchawarra	183.1	Tirrawarra	18,437.3
	Fly Lake South	Patchawarra	25.2	Patch/Tirra	34,629.7
	Brolga	Patchawarra	177.1	Patch/Tirra	38,085.0
	Tirrawarra	Tool/Patch	4,467.8	Tirrawarra	3,805,455.8
	Rakoon	Patchawarra	5.4		
	Andree/Leleptian	Patchawarra	263.1		
	Varanus	Patchawarra	189.5		
CO99-F	Moorari	Nappamerri	30.4	Birkhead	13,720.4
		Patchawarra	5.3	Tirrawarra	506,285.8
		Toolachee	9.8		
	Bimbaya	Tirrawarra	485.2		
		Toolachee	12.3		
	Taylor South	Tirrawarra	166.6		
	Bookabourdie	Nappamerri	8.8	Birkhead	18,516.4
		Tirrawarra	1,947.3	Hutton	5,131.0
	Merupa	Tirrawarra	13.2		
		Toolachee	3.3		
CO99-G	Jack Lake	Patchawarra	40.7		
	Nephrite	Patchawarra	14.9		
	Nephrite South	Patchawarra	2.4		
	Cowralli	Patchawarra	75.6		
	Meranji	Epsilon	7.0	Namur	585,656.3
		Patchawarra	59.6		
		Tirrawarra	11.7		
		Toolachee	110.7		
		Patchawarra	11.0		
	Meranji South	Toolachee	0.0		
	Cooba	Patchawarra	57.6		
CO99-H	Taloola			Hutton	2,562.3
				Namur	191,759.4
				Poolowanna	2,440.2
	Tantanna			Hutton	451,199.7
				McKinlay	3,873.6
				Namur	478,892.7
				Poolowanna	153,777.4
	Malgoona			Merrimelia	45,898.5
				Birkhead	46,974.5
	Sturt			Patch/Warburton	11,220.9
	Sturt East			Poolowanna	356,233.4
				Birkhead	386,384.8
	Spencer North			Hutton	4,877.4
				Namur	2,752.8
Block	Field name	Gas pool	Gas (mm m <sup>3</sup> )	Oil pool	Oil (kL)
	Spencer South			Birkhead	109,861.6
				Hutton	3,072.6
	Spencer West			Birkhead	1,155.1
				Namur/McKinlay	27,776.6
	Muteroo			Birkhead	0.0
				Hutton	475,738.8
				Patchawarra	24.7
	Keena	Patchawarra	200.4		
		Toolachee	37.0		
		Epsilon	203.1		



Eromanga source rocks by migrating Permian hydrocarbons.

Oils in Cretaceous reservoirs are often geochemically distinct from those in Jurassic reservoirs. They are typically light (45° API gravity), non-waxy, low sulphur, paraffinic crudes although waxy oils do occur. In Dullingari field, Murta Formation oils are thought to be locally sourced from Early Cretaceous source rocks.

The marine Cretaceous sequence contains good potential source rocks, however it is considered immature for hydrocarbon generation. Clearly, more work needs to be done in order to distinguish local Eromanga Basin sourcing.

### Cooper Basin

Permian coal measures and shales are the principal hydrocarbon source rocks in the region and are dominated by Type III kerogens derived from higher plant assemblages. Oils and condensates are typically medium to light (30 to 60° API) and paraffinic, with low to high wax contents. Most Permian oils in Permian reservoirs contain significant dissolved gas and show no evidence of water washing. Gas composition is closely related to maturity/depth with drier gas occurring towards basin depocentres although there is strong geological control on hydrocarbon composition.

The Patchawarra Trough contains the bulk of the oil and wet gas reserves consistent with local source rocks being in the 'oil window' while the hot Nappamerri Trough (40–50° C/km), underlain in part by granite, is over mature and contains mainly dry gas.

Permian source rocks have average TOC and S2 pyrolysis yields of 3.9% and 6.9 kg/tonne, respectively (excluding coals). Locally, the Toolachee Formation is the richest source unit. The Patchawarra Formation is considered the other major source unit especially the lower shales and coals. The lacustrine Murteree and Roseneath Shales have little source potential.

Together, the petrographic and geochemical evidence support coals and associated DOM as the effective source rocks capable of generating gas and minor oil, albeit in low yields. At maturity levels between 0.7–0.95% Ro, initial generation from the richer facies has led to partial filling of reservoirs with wet gas and oil. There is a sharp onset of significant hydrocarbon accumulation when the source reaches a maturity of 0.95% Ro.

Thin, laterally discontinuous coals represent the best source rocks of the upper Nappamerri Group whilst shales tend to be organically lean. The lower Nappamerri Group is coal-poor, contains kerogen that tends to be oxidised and any source rocks are humic-rich and gas-prone.

### Warburton Basin

Source rock quality of samples principally from the Kalladeina Formation is poor to fair. With the exception of anomalously low maturity indices from Kalladeina 1, the succession below 3000 m is late-mature to post-mature for oil. Organic matter is mainly Type II kerogen derived from marine algal/bacterial precursors.

### Seals and Plays

Where the regional seal is thin or absent multiple oil and gas pools are stacked in coaxial Permian-Mesozoic

structures and may occur from as low as the Patchawarra Formation to as high as the Murta Formation. Locally, Permian oil has migrated into Warburton Basin reservoirs on the basin margin and gas has migrated into fractured Ordovician reservoirs fringing the Allunga Trough.

### Eromanga Basin

Trapping mechanisms are dominantly structural (anticlines with four-way dip closure or drapes over pre-existing highs) with a stratigraphic component (e.g. Hutton–Birkhead transition, Poolowanna facies, McKinlay Member and Murta Formation). Eromanga structures in SA are rarely filled to spill with oil – net oil columns are relatively thin compared to the height under closure (due to poor sealing characteristics). Seals consist of intraformational siltstones and shales of the Poolowanna, Birkhead and Murta Formations – no economic hydrocarbons have been discovered in SA above the Murta Formation. Where these units are absent, potential seals include Bulldog Shale and Wallumbilla Formation.

### Cooper Basin

Anticlinal and faulted anticlinal traps have been relied on as proven exploration targets but potential remains high for discoveries in stratigraphic and sub-unconformity traps, especially where the Permian sediments are truncated by the overlying Eromanga Basin succession. Economic oil and gas are reservoirised in the Nappamerri Group, paradoxically regarded as a regional seal to the Cooper Basin. Intraformational shale and coal form local seals in the major reservoir units. Beneath the Daralingie Unconformity are two important early Permian regional seals - the Roseneath and Murteree Shales. The Roseneath Shale is the top seal of the Epsilon Formation and the Murteree Shale seals the Patchawarra Formation.

### Warburton Basin

Cooper Basin reservoirs, source rocks and seals have been juxtaposed against elevated ridges of Warburton Basin rock by faulting or by original deposition. These ridges are potential lateral seals but may also be reservoirs. Ridges are composed of sandstone, shale, carbonate and volcanic units, which are fresh to severely altered by weathering and diagenesis (but not metamorphism). Dips vary from horizontal to vertical, and units range from massive to

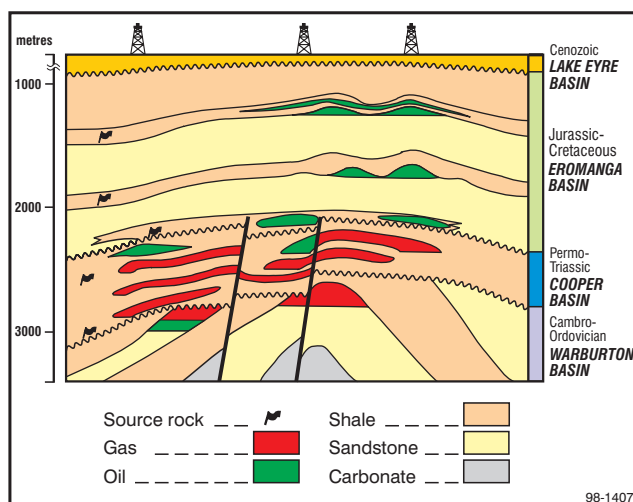


Fig. 8. Hydrocarbon plays schematic.

slightly to pervasively fractured, with weak to strong faulting and folding. Their competence as lateral seals is dependent upon a combination of lithologic and structural factors.

Potential traps in the Warburton Basin include large hanging wall anticlines associated with northeasterly trending thrust faults and upthrown fault blocks on wrench fault zones.

A thick impermeable weathered profile on the top Warburton unconformity surface forms a semi-regional seal and is distinguished on logs by its low uniform resistivity.

## UNDISCOVERED POTENTIAL

### Introduction

The Cooper Basin is a mature petroleum province, however potential remains high for discoveries in stratigraphic and sub-unconformity traps, which have received increasing interest in the past five years. Pinchout plays along the margins of the Cooper Basin have been tested with commercial success. 3D seismic will have a critical role to play in delineating more subtle traps in the future. Remaining SA Cooper–Eromanga Cooper Basin reserves (Santos) are shown below.

**Table 4.** SA Cooper Basin reserve summary, 1/1/98 (source Santos Ltd).

Energy minerals	Reserves
Sales gas	2488 PJ
Ethane	325 PJ
LPG	57.7 mmbbl
Condensate	34.5 mmbbl
Oil	34.7 mmbbl

Undiscovered reserves of hydrocarbons have also been estimated by PIRSA, the Bureau of Resource Sciences (BRS) and Stratigraphic Research International AS (APRAS) to predict the undiscovered potential of the Cooper and Eromanga Basins. Results are summarised below. For more detail, refer to *The Petroleum Geology of SA – Volume 4, Cooper Basin*

### Cooper Basin gas

The present discovered recoverable raw gas reserves (as at 1/1/98) of the basin are 229 billion cubic metres (8.2 TCF)

**Table 5.** Undiscovered recoverable Cooper Basin gas potential, billion cubic metres (tcf).

Method (gas)	Low estimate	Average estimate	High estimate
Basin analogue	108 (3.8)	192 (6.8)	277 (9.8)
APRAS (average)	39 (1.4)	181 (6.4)	546 (19.4)
Pareto	41 (1.5)	60 (2.1)	83 (3.0)
Basin plays	0 (0)	25 (0.9)	215 (7.7)
Lognormal	7 (0.3)	12 (0.4)	19 (0.7)

**Table 6.** Undiscovered recoverable Cooper Basin oil potential, million cubic metres (mmstb).

Method (oil)	Low estimate	Average estimate	High estimate
Basin analogue	14.8 (93.8)	20.2 (128.2)	25.6 (162.6)
Basin plays	0 (0)	13.7 (87)	41.5 (264)
Pareto	2.0 (12.9)	5.4 (34.3)	20.3 (127.6)
Lognormal	0.3 (2.0)	1.6 (10.0)	4.3 (27)
APRAS (average)	0 (0)	0 (0)	4.3 (27.2)

comprising 129 billion cubic metres (4.6 TCF) of produced gas and 101 billion cubic metres (3.6 TCF) of gas yet to be produced from known discoveries. The average recovery factor for gas fields is 64%. There have been 121 Cooper Basin gas fields discovered in SA to 1/1/98 from 298 new field wildcats.

### Cooper–Eromanga Basin oil

The present recoverable oil reserves (as at 1/1/98) of the basin are 6.9 million cubic metres (43.9 MMSTB) comprising 4.6 million cubic metres (29.1 MMSTB) of produced oil and 2.3 million cubic metres (14.8 MMSTB) of oil yet to be produced from known discoveries. The combined average primary and secondary recovery factor for oil fields is 21%. More than 80% of the oil reserves are contained in the Tirrawarra Field. There have been 25 Cooper oil fields discovered in SA up to 1/1/98 from 297 new field wildcats. In the overlying Eromanga Basin, there have been 33 oil fields discovered from 293 wildcats (to 1/1/93).

### Results

Potential (undiscovered) resources should not be compared to traditional Proved, Probable and Possible reserves in known discoveries. Undiscovered resources are calculated to give a quantitative indication of the potential of the basin, and require considerable exploration to establish their existence. The results of methods considered to be reasonably reliable are summarised in the tables below.

Some of the potential attributed to the Cooper Basin may have already been discovered in the Eromanga Basin. The current discovered recoverable oil reserves of the Eromanga Basin in the Cooper Basin region are 14.5 million cubic metres (92.5 mmstb).

## INFRASTRUCTURE AND MARKETS

### Production Facilities

A total of 5090 km of pipeline have been laid to gas markets in SA and NSW and to the liquids load out facility at Port Bonython. Key pipelines are listed in Table 7 and shown on Figure 1.

At 31 December 1998 in the SA Cooper Basin, 93 gas fields with a total of 378 gas wells, and 29 oil fields with a total of 123 oil wells were on line. A combined total of 154

PJ of sales gas were sold in 1997 to Epic Energy and AGL. The estimated average daily production in 1998 from the Cooper and Eromanga Basins was sales gas – 14.2 x 106m3 (0.5 bcf), crude oil and condensate – 3816 kL (21 400 bbl) and LPG – 986 t (11 500 bbl).

Gas emerges at the wellhead at pressures up to 25000 kPa and temperatures up to 120 °C. Gas from individual wells passes via field gathering systems (flowlines) to satellite stations which separate gas, free water and condensate. Evaporation ponds are used for water disposal. The essentially water-free gas and condensate pass to the Moomba treatment plant through trunklines. Crude oil is transported by either pipeline or truck to the Moomba plant. Currently, nine oil and eleven gas satellites are in operation in the Cooper and Eromanga Basins. Approximately 1010 km of trunklines and 1135 m of flowlines have been laid to date in the region.

At the Moomba plant free condensate and water are initially removed from the raw gas at the slug catchers. The gas then proceeds to the Benfield unit to ensure that no greater than 3% by volume of CO<sub>2</sub> remains in the sales gas stream. The gas is dehydrated at molecular sieves before it proceeds to the liquid recovery plant where 100% of the remaining condensate, 98% of the LPG (C3 and C4) and 75% of the ethane are removed, leaving sales gas for Adelaide and Sydney with a heating value <37.5 megajoules per cubic metre. The plant has been designed to process 25.4 x 10<sup>6</sup> m<sup>3</sup> (902 mmcf) of raw gas and 6000 kL (42 000 bbl) of condensate and crude oil per day. Condensate, LPG, crude and some ethane are transported as a ‘cocktail’ via a pipeline to Port Bonython where they are separated and marketed.

The feedstock delivered to Port Bonython is first sampled, filtered and metered to determine flow rates and composition. It is then pumped through a series of fractionating towers to separate ethane (which is used as fuel gas for the plant), propane, butane, light naphtha, intermediate naphtha, heavy naphtha, and reduced crude. Once cooled to ambient temperatures, the naphtha and reduced crude fractions are pumped to the blending section where they are mixed in precise ratios. The resulting two products, ‘naphtha’ and ‘crude oil’ are sent to storage tanks to await shipping.

One destination for Cooper–Eromanga crude oil and condensate is the refinery at Port Stanvac, which supplies petroleum products mainly for the SA market. The refinery commenced operations in 1963 and the adjacent lubricating oil refinery began operations in 1976. The refinery does not have sufficient capacity to produce all the State’s requirements for motor spirit, and some must be imported from interstate. The main refinery products from Port Stanvac are LPG, solvents, motor gasoline, jet fuel, kerosene, diesel, lube oil base stocks for Australian and overseas markets, fuel oil and bitumen.

Mini-refinery technology has proven itself viable in the Eromanga Basin at Eromanga in southwest Queensland, where the company, Inland Oil Refiners has been operating since 1985. The Eromanga mini refinery has a throughput capacity of 1500 barrels of crude per day and receives feedstock from a number of Eromanga Basin oil fields, including the Inland oilfield, discovered by the company in 1994. The principal product is diesel, which is trucked across western Queensland to regional centres for marketing. Other products include automotive distillate, jet fuel, high quality kerosenes and specialised products for Mount Isa Mines. Heavy residues are processed in Brisbane.

## Other facilities in the Cooper Basin

The northern part of SA is sparsely populated and relatively undeveloped due to its remoteness and harsh climate. The main primary industry in the region is cattle which are run on large pastoral leases. Eco-tourism is a growing industry in the region. The township of Innamincka is located 65 km from Moomba and offers a hotel, general store and light aircraft airstrip. The Birdsville and Strzelecki Tracks are unsealed, but provide access for heavy vehicle transport in the region.

Accommodation and support facilities are located at Moomba, a fly in-fly out camp operated by the Cooper Basin Joint Venture. Access to these facilities is by arrangement with Santos Ltd. The Moomba Camp can accommodate 450 people, with an additional 150 beds mothballed. A full range of support services is available at Moomba including logging, wireline, fracing, cementing, transport, fuel supply, aviation and emergency services. The sealed airstrip is 1720 m long and able to accept medium-sized jets.

**Table 7.** Cooper Basin pipeline licences, February 1999.

PL	Pipeline name	Operator	Product	Length (km)	Pipe diam. (mm)	MAOP Kpa	Construction Period
1	Moomba–Adelaide + 12 laterals	Epic Energy	Sales gas	1065 total	560 various	7300	1968–69 1969–90
2	Moomba – Port Bonython liquids line	Epic Energy (under contract to Santos)	Liquids	659	356	10380	1982
5	South–West Queensland	Santos	Sales gas	92	400	10000	1991–92
7	Moomba–Sydney Pipelines + loop line	East Australian	Sales gas	101 10	864 660	6200	1976 1984
8	Moomba–Sydney ethane line	East Australian Pipelines	Ethane	101	219	15300	1996
9	Stokes–Mettika	Santos	Raw gas	3.5	323.9	11400	1996
10	Moomba Interconnection Pipelines	Boral Energy Pipelines	Sales gas	0.087	250	9665	1998

Groundwater, extracted from the Great Artesian Basin aquifer system, is critical for petroleum operations in the region. There are two major aquifers, the lower occurs within the Algebuckina Sandstone and Cadna-owie Formation and provides hot (up to 100 °C) good quality (TDS 1000 mg/L) artesian water. The upper aquifer comprises the Winton and Mackunda Formations which produce poorer quality water.

## Oil and gas markets

A free market was introduced in 1988 for all oil and condensate produced in Australia. There is no restriction on imports or exports of crude oil or refined petroleum products. A similar regime has applied since 1991 for LPG. Markets for crude oil and condensate exist in SA and Australia and low sulphur light crude oils find a ready domestic and overseas market.

Ex-field natural gas prices in SA are freely negotiated between buyer and seller. Ex-Moomba plant natural gas prices from the Cooper Basin are currently in the order of A\$2.50 per gigajoule (Fig. 9). As a consequence of the gas reform process in Australia, regulatory policy impediments to the free trade in gas are being removed and the rights of access to gas transmission and reticulation pipelines have been provided, and direct negotiations between consumers and producers facilitated. The issue of a right of access to upstream facilities is also currently being reviewed.

Existing contracts with the South Australian and Queensland Cooper Basin Producers supply the State's needs in full until 2004, and partial needs to 2013 and those of New South Wales until 2006. Demand in NSW is forecast to exceed current contracted quantities after 2001. The Australian Gas Association (AGA) predict that gas will be the fastest growing energy source in Australia to 2030, with annual growth of 3% predicted. Natural gas currently supplies around 18 % of Australia's primary energy needs, and the AGA predict this will increase to 28 % by 2030. Their study of future Australian gas supplies and demand forecasts that gas reserves in southern and eastern Australia will be insufficient to supply market demand within a decade (Fig. 10).

## REGULATORY REGIME

### Review of Petroleum Act

Petroleum exploration and development are administered by the Petroleum Group, PIRSA under the *Petroleum Act 1940* (SA onshore); and the *Petroleum*

(*Submerged Lands*) *Act 1967* (Commonwealth, offshore) and 1982 (SA offshore).

During 1999 it is intended that new legislation will replace the existing Petroleum Act 1940. The main thrust of the proposed legislation is to provide a modern, pro-competitive, efficient and flexible basis for administration of petroleum exploration and development. The objective is to establish a business environment that maximises investment opportunities for the exploration industry in the State and facilitates development of discoveries. The main features of the Bill (which can now be accessed from the PIRSA website) are:

- establishment of a co-regulatory regime focusing on achievement of environmental, public safety and resource management objectives and reduced compliance costs.
- licence allocation and management mechanisms to facilitate competition for acreage and in gas supply.
- rights of third party access to licensed pipelines (where not covered by the national access regime), depleted reservoirs (for gas storage purposes) and pipeline easements.
- greater security of tenure for licences though improved registration procedures.
- consultation processes to establish environmental objectives.
- increased royalties from 2001 and a fee structure designed to encourage the adoption by industry of management systems to undertake their activities.

The Occupational Health and Safety (OH&S) provision of the Petroleum Regulations have been repealed and substituted by regulations under the OH&S Act.

## EXPLORATION ACCESS

### Access to land

PIRSA Petroleum Group acts as a 'one stop shop' for explorers in obtaining any necessary environmental approvals on the occasions when they are required from other Government Departments. Onshore and offshore tenement applications, approvals to conduct field operations etc. are first submitted to PIRSA, which arranges distribution to the other relevant Government agencies for comment and then issues the necessary approvals.

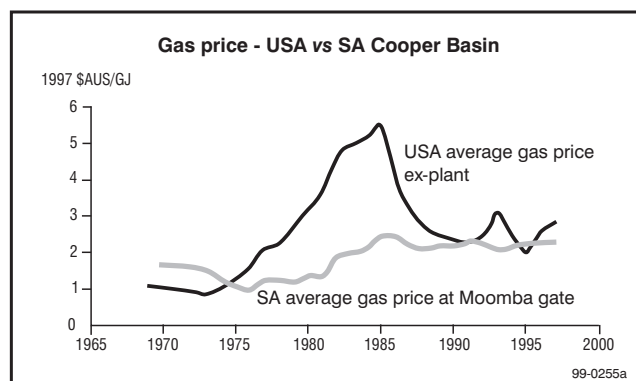


Fig.9. Comparison of Australian and US gas prices.

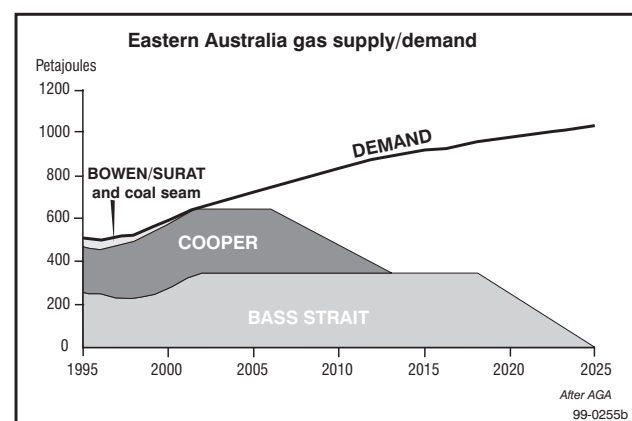


Fig. 10. Gas supply and demand, Eastern Australia (Australian Gas Association report).



Petroleum Group staff are available to assist licensees prepare the necessary paperwork.

PIRSA Petroleum Group is currently introducing an objective based co-regulatory approach to the regulation of the upstream petroleum industry. This marks a move away from prescriptive regulation and the pre-existing 'command and control' regime. There will still be inspection of field operations, including audits by PIRSA inspectors and authorised persons. The co-regulatory approach requires a change in both culture and method. Successful implementation of the new regime will reduce compliance costs and deliver better environmental outcomes.

## National Parks and Reserves

A number of National Parks and Reserves have been created to conserve the best examples of vegetation and landforms in the region (Fig. 11). There are three types of South Australian reserves including Conservation Parks, National Parks and Regional Reserves. The conditions of access vary from park to park, based upon the type of reserve classification, the activity proposed and its likely impact on the environment. Access for petroleum exploration and production is allowed in all parks in the Cooper Basin region and in all regional reserves in the state. Access issues into the Coongie Lakes Control Zone are currently under review.

## Innamincka and Strzelecki Regional Reserves

In 1986, the Government determined that it was necessary to consider the principle of multiple land use to reconcile any conflict between the aims of conservation, agricultural interests and exploration for, and development of, subsurface petroleum and mineral resources. A Regional Reserve classification was created under amendments in 1987 to the *National Parks and Wildlife Act 1972* specifically for the purpose of conservation while at the same time permitting the utilisation of the petroleum and other resources of the reserve. A good example of this is the Innamincka Regional Reserve which, with the full cooperation of the PPL operator and partners, now covers much of the productive area of the Cooper Basin.

Blocks CO99-A, B, C, D and F lie fully within the Innamincka Regional Reserve, Block CO99-E lies partly within the reserve. Part of Block CO99-H lies within the Strzelecki Regional Reserve (Fig. 11).

Mineral and petroleum exploration licence applications for areas within Regional Reserves are processed by PIRSA but are referred to the Minister for Environment, Heritage and Aboriginal Affairs (MEHAA) for comment. Exploration work programs are discussed with DEHAA (Department for Environment, Heritage and Aboriginal Affairs) as a matter of policy. In the case of production tenements, approval must be given by the MEHAA in Mining Production Tenements Regulation areas (Fig. 11) production licence applications must be referred to MTUPA (Minister for Transport, Urban Planning and Arts) for advice on environmental significance of operations.

In all other respects exploration and production is carried out under the provisions of the Petroleum Act and Regulations.

Parts of the Cooper Basin (Fig. 11) are listed as wetlands of international significance under the Ramsar Convention (the 1971 Convention on Wetlands of International Importance). The Coongie Lakes and part of the Coopers Creek system have also been included in the Register of the National Estate (Fig. 11).

## European Heritage

A number of sites of European heritage significance such as historic buildings and structures and geological monuments occur in the region. These are indicated on the Environmental Sensitivity Maps available from PIRSA. The majority of the sites are small and easily avoided by exploration activities.

## Aboriginal Heritage

In SA it is an offence to disturb or destroy Aboriginal sites, objects or remains. Standard procedures for determining the presence of Aboriginal heritage prior to the commencement of activities have been determined. These procedures involve consulting with the relevant Aboriginal organisation and maintaining a watch for sites, objects or remains during activities. Generally the sites are no larger than a few hundred square metres and are easily avoided. Since the

inception of the Aboriginal Heritage Act in 1988, there have been no conflicts between Aboriginal heritage sites and exploration or production activities in SA.

## Commonwealth Native Title Act 1993

The *Native Title Act 1993* was passed by Federal Parliament on 22 December 1993. This lengthy and complex Act provides statutory recognition and protection for the concept of native title as recognised by the High Court in the case of *Mabo v Queensland* in 1992. Native title means rights held by indigenous inhabitants of Australia at and since the time of European settlement – it differs from conventional titles. The nature of native title rights vary from group to group according to laws and customs, however there must be a sufficient and relevant connection to the land in question, continuous since European settlement in 1836 in SA. Native title may include the right to camp or travel across land, rights to hunt, fish, gather food and take materials (timber, bark, ochre etc.) from the land.

Applications by Aboriginal claimants are recorded in the Register of Native Title Claims. The National Native Title Tribunal (NNTT) makes determinations on applications under the Act. A National Native Title Register has been established, comprising a record of all approved determinations made by the NNTT, Federal Court, High Court, other Courts or Tribunals and recognised State/Territory arbitral bodies is maintained.

The Premier of SA declared in April 1994 that SA would enact State legislation to ensure that State laws were consistent with the Commonwealth's Racial Discrimination Act. Late in 1994, a package of four Native Title Bills was introduced into the SA House of Assembly and were all passed.

In 1995 a 'safety net' clause was introduced into the Petroleum Act which gives a current licensee first right to



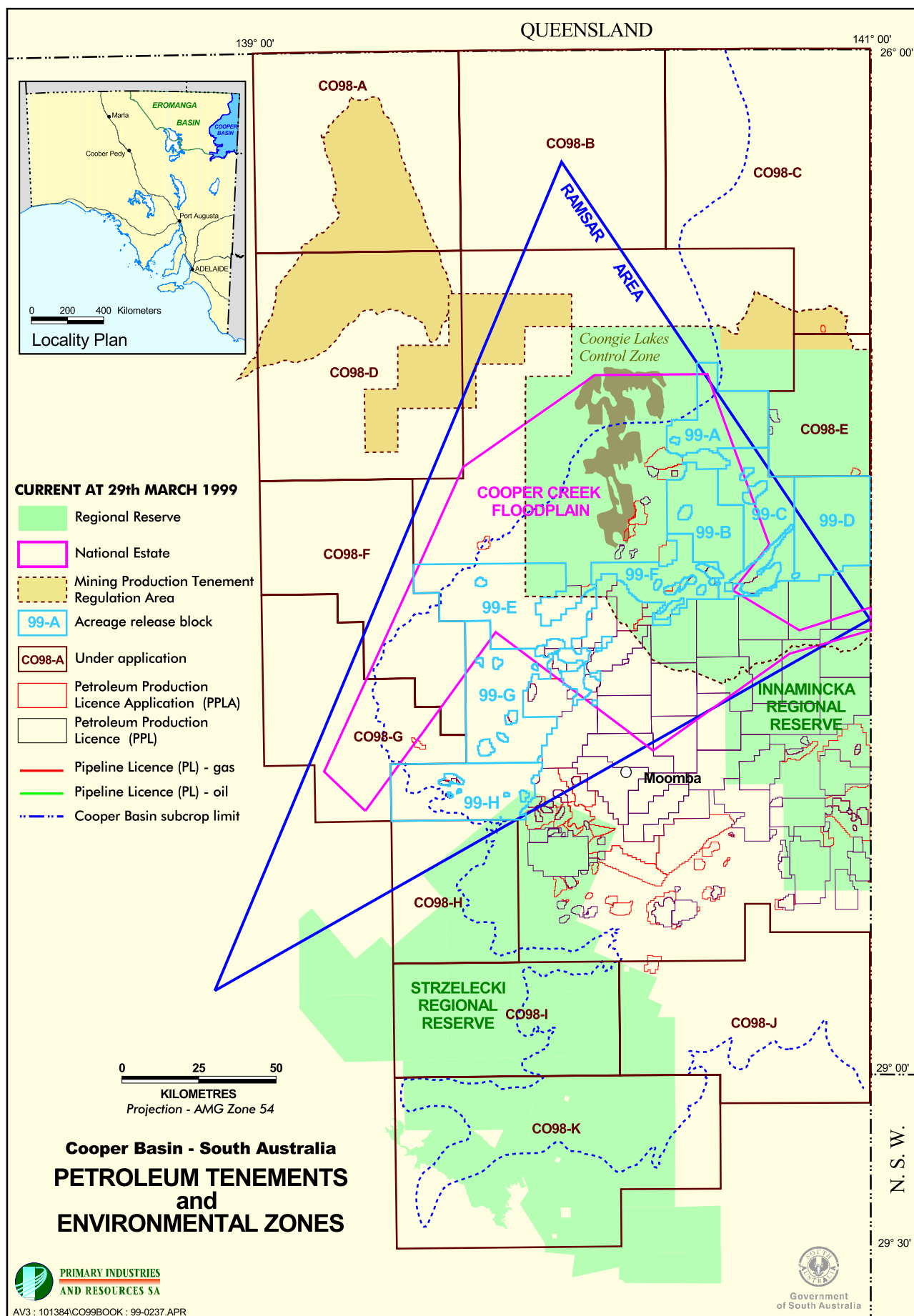


Fig. 11. Regional Reserves and environmental zones, Cooper Basin region

any area over which a licence may have been terminated due to no fault of the licensee.

The Native Title Amendment Act 1998 (Commonwealth) was passed by Parliament on 27 July 1998 and came into effect in September 1998. The Commonwealth Act allowed the States the right to put in place State alternatives to the Commonwealth right to negotiate for mineral and petroleum explorers. It also allows the States to validate 'acts' ie granting of licences that occurred between 1 January 1994 and 23 December 1996.

On 10 December 1998 the Attorney General introduced legislation into the SA Parliament, the Statutes Amendment (Native Title) Bill (No 2) 1998, to update the current State Native Title Act amendments and to introduce a right to negotiate into the Petroleum Act, such that it will be consistent with the Mining Act and Opal Mining Act. This regime is designed to be simpler and more flexible than that under the equivalent Commonwealth legislation. It will provide the opportunity for up-front negotiation of conjunctive agreements (i.e. covering both exploration and production) as well as umbrella authorisations (including a number of different licencees over a defined area of land). The right to negotiate under the Petroleum Act will enable the Government to grant exploration licences and the licensee will then have to negotiate in good faith with native title claimants to obtain native title agreement.

The proposed State Native title Legislation was the subject of further discussion and comment by interested groups before debate by Parliament later this year.

Licence holders are encouraged to develop a dialogue with regard to Aboriginal heritage and related matters with Aboriginal people having associations with their licence area. Current Native Title Applications in the Cooper Basin region are shown on Figure 12.

## Environmental regulation

### Petroleum Act 1940

Environmental issues pertinent to petroleum exploration are managed in SA primarily through proper operational planning in the initial stages. In order to ensure that activities are undertaken in a manner which avoids or minimises environmental impacts, several documents are required before approval to commence operations is given. First a Declaration of Environmental Factors (DEF) is required from the licensee. This is the licensee's assessment of the environmental impact of the proposed activity. A Code of Environmental Practice is also required by regulation. The code describes procedures that the proponent will adopt during the planning, field management and monitoring phases of the operation.

Santos Ltd and their joint venture partners, who are the major oil and gas producers within the Eromanga and Cooper Basin, have developed Codes of Environmental Practice for exploration and production. The codes provide guidance to licensees on environmental issues that need to be taken into consideration in planning and undertaking exploration activities. These codes are currently being revised in a move towards an outcomes based approach. However in the interim they provide a standard acceptable to the Government. A company may either adopt these Codes or use its own Codes of Environmental Practice subject to

approval by PIRSA. The Codes are required to be reviewed regularly (at least every 3 years) to ensure techniques are up-to-date.

PIRSA is able to assist licensees by providing examples of the documentation and advising on their scope. To date there have been no significant concerns raised with regard to requirements to minimise the environmental impacts of their operations.

### Petroleum Act 1999

The key requirements of the new Petroleum Act enacted sometime in the latter half of 1999 are:

a) All impacts on the environment, including the cultural and heritage and public safety aspects of the environment, of all activities pertaining to petroleum exploration and development must have a Declaration of Environmental Factors (DEF) prepared in accord with the requirements specified in the Regulations.

b) On the basis of the DEF and established criteria gazetted by the Minister, the Minister must classify the proposed activities as either low, medium or high impact activities.

c) On the basis of the information provided in the DEF and from stakeholder consultation, a statement of environmental objectives will be prepared and approved by the Minister for all regulated activities classified as low or medium impact. The statement documents the environmental objectives that must be achieved in carrying out the activities and the criteria to be used to determine whether the environmental objectives have been achieved. Compliance with the statement is a mandatory licence condition.

d) For low impact activities comprising the majority of wells, seismic surveys and development operations, the Minister approves the statement of environmental objectives for the proposed activity after consulting with the Minister for Environment, Heritage and Aboriginal Affairs.

e) For medium impact activities the Minister considers approval of the statement of environmental objectives through a public consultation process equivalent to the PER process under the SA Development Act 1993.

f) For high impact activities the Minister refers them to the Minister responsible for the administration of the Development Act 1993 (Minister for Transport, Urban Planning and Art) for an environmental impact assessment under Part 8 of that Act.

The new Act ensures transparency by making available on a public register all DEFs, statements of environmental objectives and classifications made on the level of environmental impact of all activities under this Act. Also, the classification on the level of environmental impact of proposed activities will be made by the Minister in consultation with the DEHAA; and Planning SA. The consultation arrangements with these agencies will be formalised in service or inter-Departmental agreements.

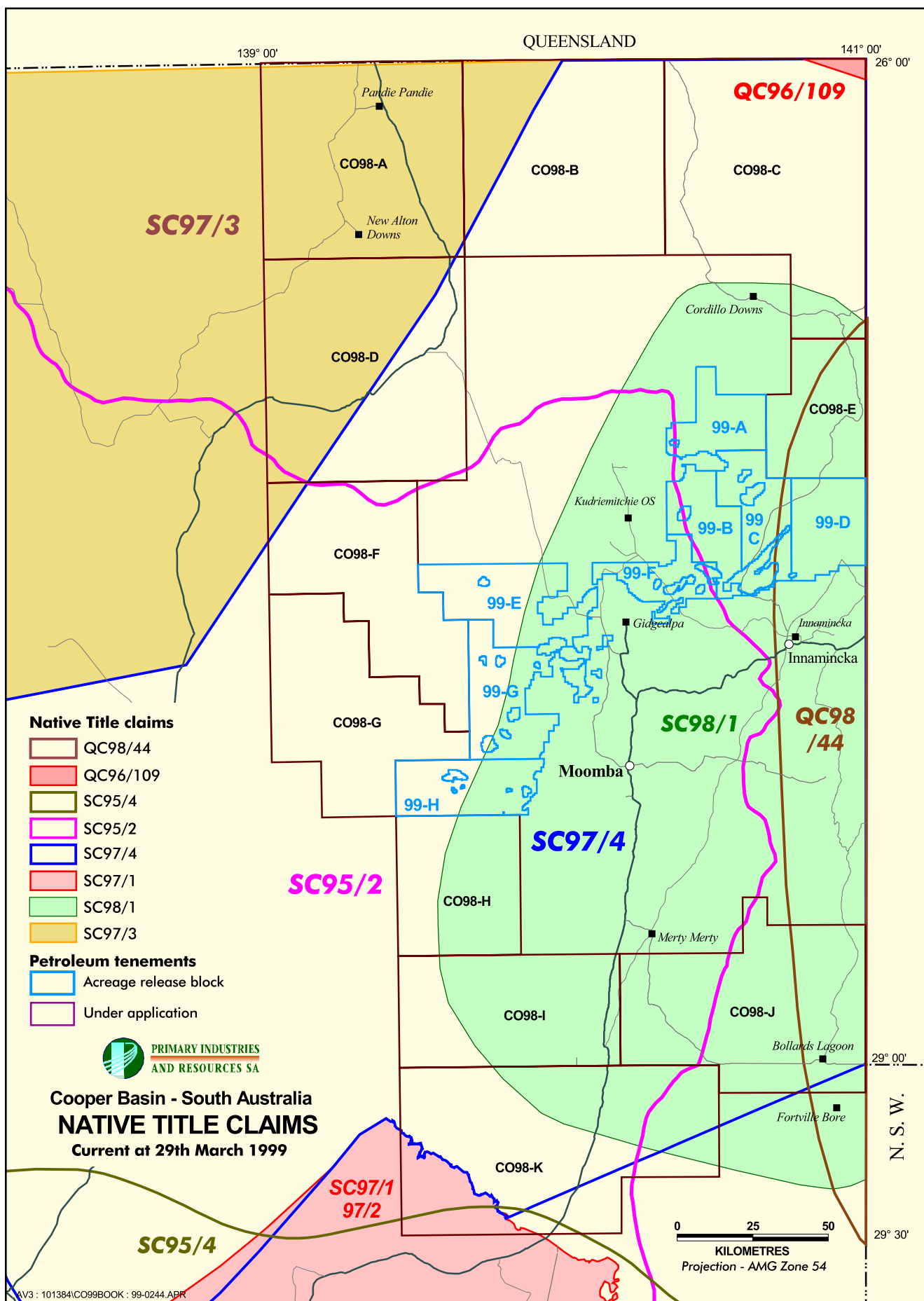


Fig. 12. Native Title Claims, Cooper Basin region



## **APPENDIX 1 – CO99 BLOCK MAPS, SEISMIC SURVEYS AND SELECTED WELL INFORMATION**

### **NOTES ON WELL & SEISMIC DATA TABLES:**

#### **TD**

Total depth (metres)

#### **TNMT**

Tenement, No. = tenement at well spud

#### **STATUS AT RIG RELEASE**

SC = single completion

Aban = abandoned

Susp = suspended

P&S = plugged and suspended

#### **WHEN OPEN**

When well completion report to be released to open file, 2 years for PEL wells (all wells and seismic drilled or recorded in former PELs 5&6 became open file on expiry), 5 years for PPL wells.

#### **SECURITY**

OF = open file

Conf = confidential

#### **PIRSA REF**

PIRSA reference number for each well completion report, to be used when ordering data.

#### **SEISMIC SURVEY INFORMATION**

Current at 18/3/1999.

Includes survey name, number of lines and line km within block.

For confidential seismic surveys 'when open' indicates date survey will be released to open file status (PEL seismic 2 years, all seismic recorded in former PELs 5 & 6 became open file on expiry, PPL seismic 5 years).

NOTE: All efforts are made to record best possible data and to correct errors or omissions made known to PIRSA. However, PIRSA takes no responsibility for the consequence of errors or omissions in these data CO99-A.



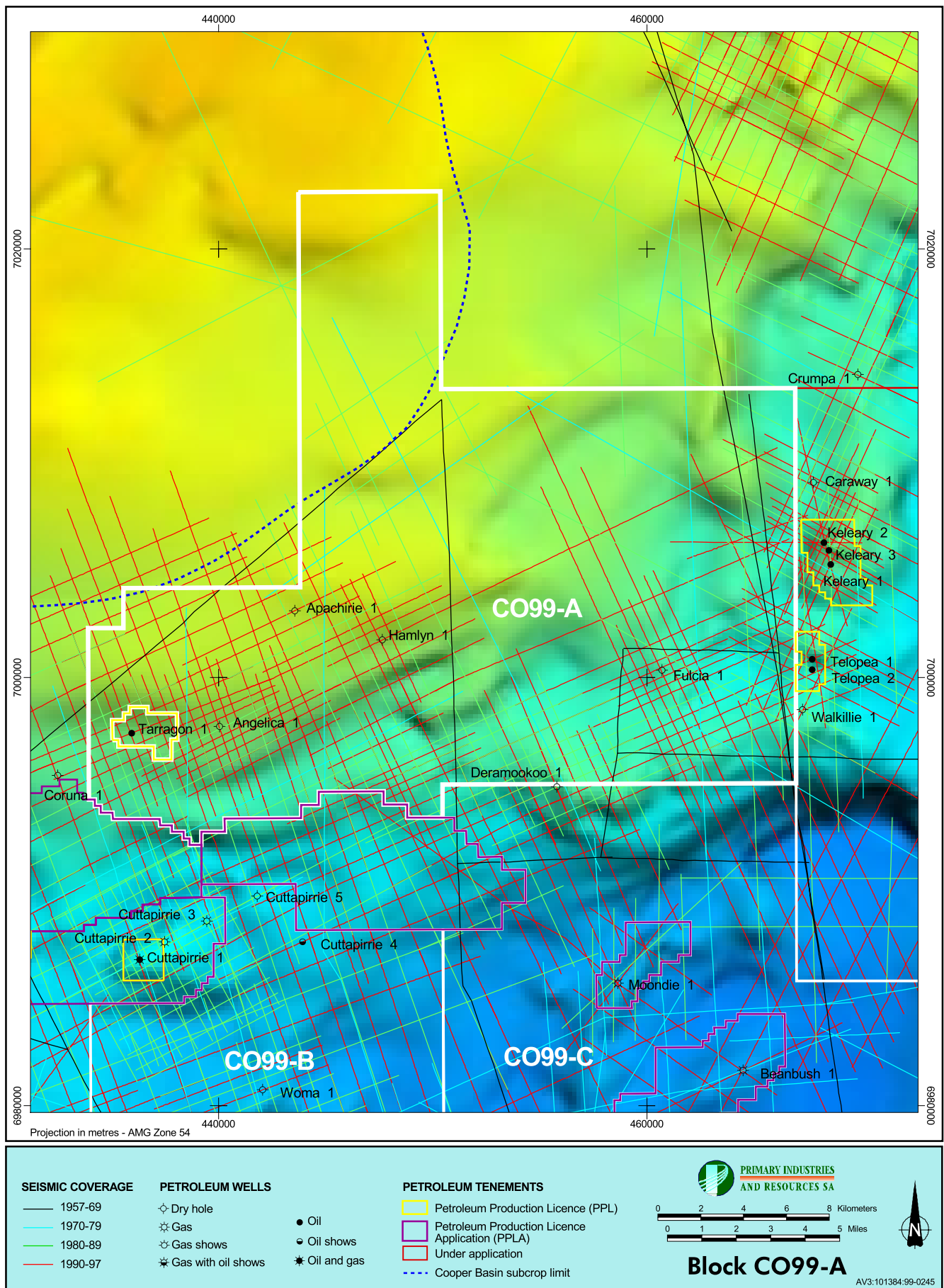


Fig. 13. Seismic line and well locations, base of Eromanga Basin image Block CO99-A

## CO99-A

Well data summary (including selected wells in adjacent PPLs and PPLAs).

Well	TD (m)	Tnmt	No.	Spud Date	Status Rig Release	Primary Objective	When Open	Security	PIRSA Ref
Angelica 1	2512	PEL	5&6	19/02/98	Aban	Birkhead/Hutton, Tinchoo oil	19/02/98	OF	7673
Apachirie 1	2376	PEL	5&6	25/05/95	Aban	Birkhead/Hutton, Poolowanna oil		OF	7515
Fulcia 1	2639	PEL	5&6	17/01/96	Aban	Tinchoo oil		OF	7530
Hamlyn 1	2451	PEL	5&6	3/05/97	Aban	Birkhead/Hutton, Poolowanna oil		OF	7617
Tarragon 1	2466	PEL	5&6	1/01/97	Susp	Birkhead/Hutton, Poolowanna oil		OF	7586

## 2D Confidential Surveys

**Summary:** 1 survey, 2 lines, 7.1 km

Survey	No. Lines	Total Line km	When Open
95 CP05	2	7.1	15/1/00

## 2D Open File Surveys

**Summary:** 24 surveys, 191 lines, 1288 km

Survey	No. Lines	Total Line km
58 ER02	1	18.7
63 CP01	4	40.3
65 CP01	2	35.0
70 CP08	3	40.0
73 CP01	1	0.4
78 CP01	5	79.0
80 CP02	16	122.7
81 CP04	15	74.0
82 CP02	3	10.5
82 CP42	1	8.2
83 CP31	9	41.9
84 CP12	3	28.9
87 CP11	4	30.2
88 CP01	4	10.2
89 CP01	3	32.5
91 CP11	15	66.1
92 CP01	1	3.5
94 CP01	10	33.0
94 CP10	3	4.3
94 CP21	20	240.7
95 CP01	39	226.2
96 CP01	6	18.4
97 CP01	19	101.5
98 CP01	4	21.9

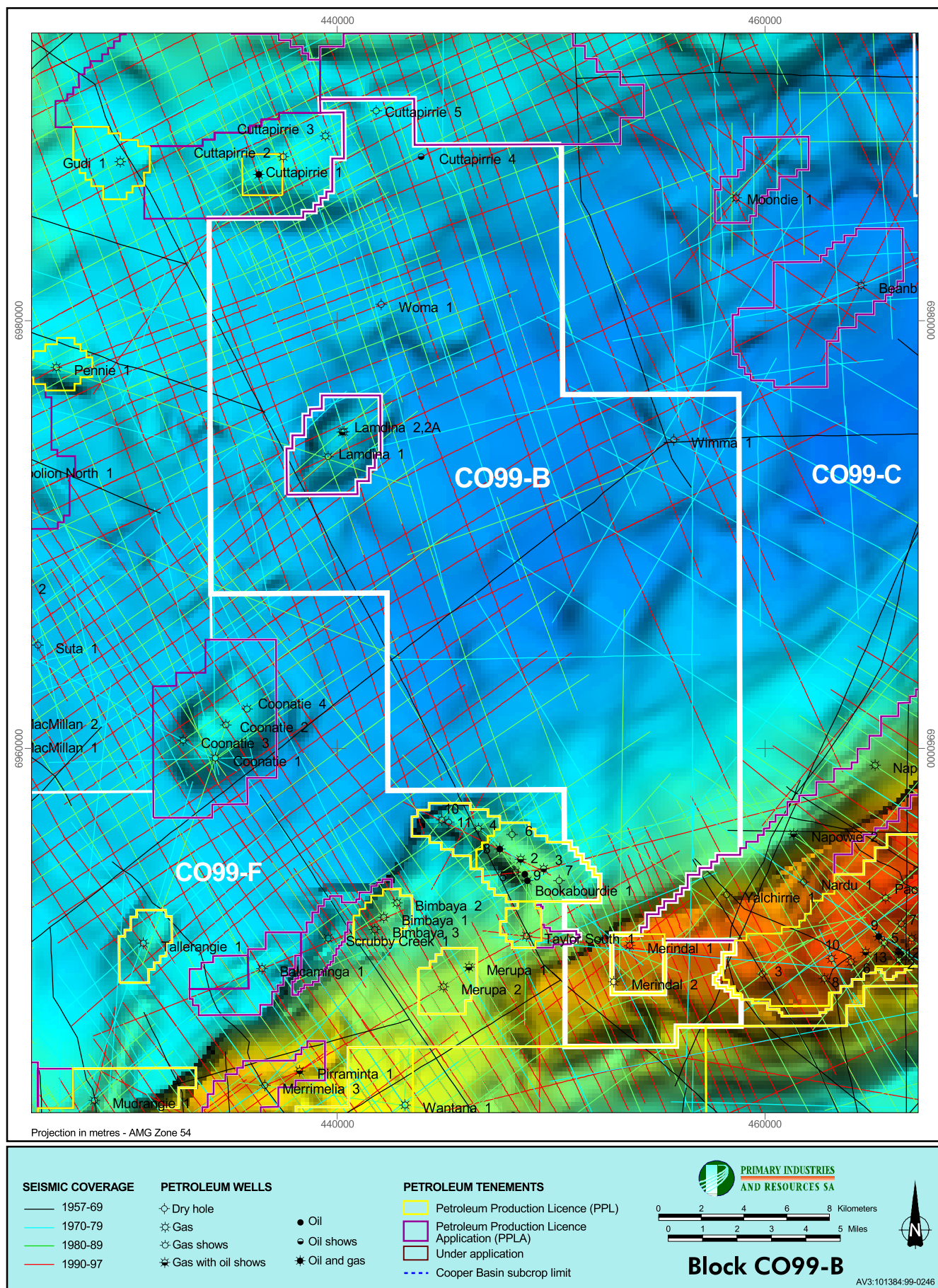


Fig. 14. Seismic line and well locations, base of Eromanga Basin image Block CO99-B

## CO99-B

Well data summary (including selected wells in adjacent PPLs and PPLAs).

Well	TD (m)	Tnmt	No.	Spud Date	Status Rig Release	Primary Objective	When Open	Security	PIRSA Ref
Cuttapirrie 1	3078	PPL	26	2/03/80	Susp	Cooper gas		OF	4050
Cuttapirrie 2	3025	PPL	26	14/08/95	Susp	Patchawarra gas	9/09/00	Conf	7521
Cuttapirrie 3	3069	PEL	5&6	26/06/96	Susp	Epsilon gas		OF	7549
Cuttapirrie 4	3040	PEL	5&6	20/07/97	Aban	Epsilon gas		OF	7629
Cuttapirrie 5	3066	PEL	5&6	20/09/97	Aban	Epsilon gas		OF	7641
Keleary 1	2634	PEL	5&6	26/09/91	Susp	Tinchoo oil		OF	7389
Keleary 2	2533	PEL	5&6	26/02/94	Susp	Tinchoo oil		OF	7480
Keleary 3	2578	PEL	5&6	3/4/95	Susp	Birk/Hutton, Poolowanna, Tinchoo oil		OF	7505
Lamdina 1	3326	PEL	5&6	19/09/85	Aban	Eromanga oil		OF	6506
Lamdina 2	2527	PEL	5&6	5/07/97	Aban	Toolachee & Epsilon		OF	7611
Lamdina 2A	3117	PEL	5&6	18/08/97	Susp	Toolachee Epsilon		OF	7638
Merindal 1	2323	PEL	5&6	6/01/97	Susp	Nappamerri Toolachee gas		OF	7194
Merindal 2	2462	PEL	5&6	12/08/97	Aban	Nappamerri Toolachee gas		OF	7634
Telopea 1	2747	PEL	5&6	25/09/94	Susp	Birkhead/Hutton oil, Poolowanna oil		OF	7501
Telopea 2	2728	PPL	76	16/12/95	Susp	Tinchoo oil	10/01/01	Conf	7531
Wimma 1	3706	PEL	5&6	2/07/81	Aban	Cooper gas		OF	4588
Woma 1	3164	PEL	5&6	24/08/96	Aban	Toolachee/Epsilon gas-condensate		OF	7561

## 2D Open File Surveys

**Summary:** 36 surveys, 231 lines, 1490.3 km

Survey	No. Lines	Total Line km
58 ER01	1	0.6
62 ER01	1	0.6
63 CP01	3	10.5
64 CP01	2	36.9
65 CP01	2	3.4
66 ER01	1	4.8
69 CP05	1	0.6
70 CP02	2	6.3
70 CP08	9	102.8
73 CP01	13	79.3
76 CP01	3	16.9
78 CP01	5	38.7
79 CP01	6	59.6
80 CP02	9	31.3
81 CP04	30	253.6
82 CP02	3	7.6
82 CP42	8	51.8
83 CP31	8	29.5
84 CP12	4	22.5
85 CP11	8	13.1
85 CP41	4	13.7
86 CP21	3	10.8
87 CP11	4	15.8
87 CP21	3	13.1
88 CP01	1	3.1
88 CP03	1	1.5
89 CP01	2	2.2
90 CP03	1	0.7
91 CP01	1	3.1
91 CP11	5	8.6
92 CP01	2	7.9
94 CP21	6	17.7
95 CP01	23	161.2

Survey	No. Lines	Total Line km
96 CP01	24	263.3
97 CP01	25	161.5
98 CP01	7	35.4

## CO99-B : 3D Surveys

Survey	Area (km <sup>2</sup> )	When Open
81 CP01	27	
97 CP02	11	5/5/02



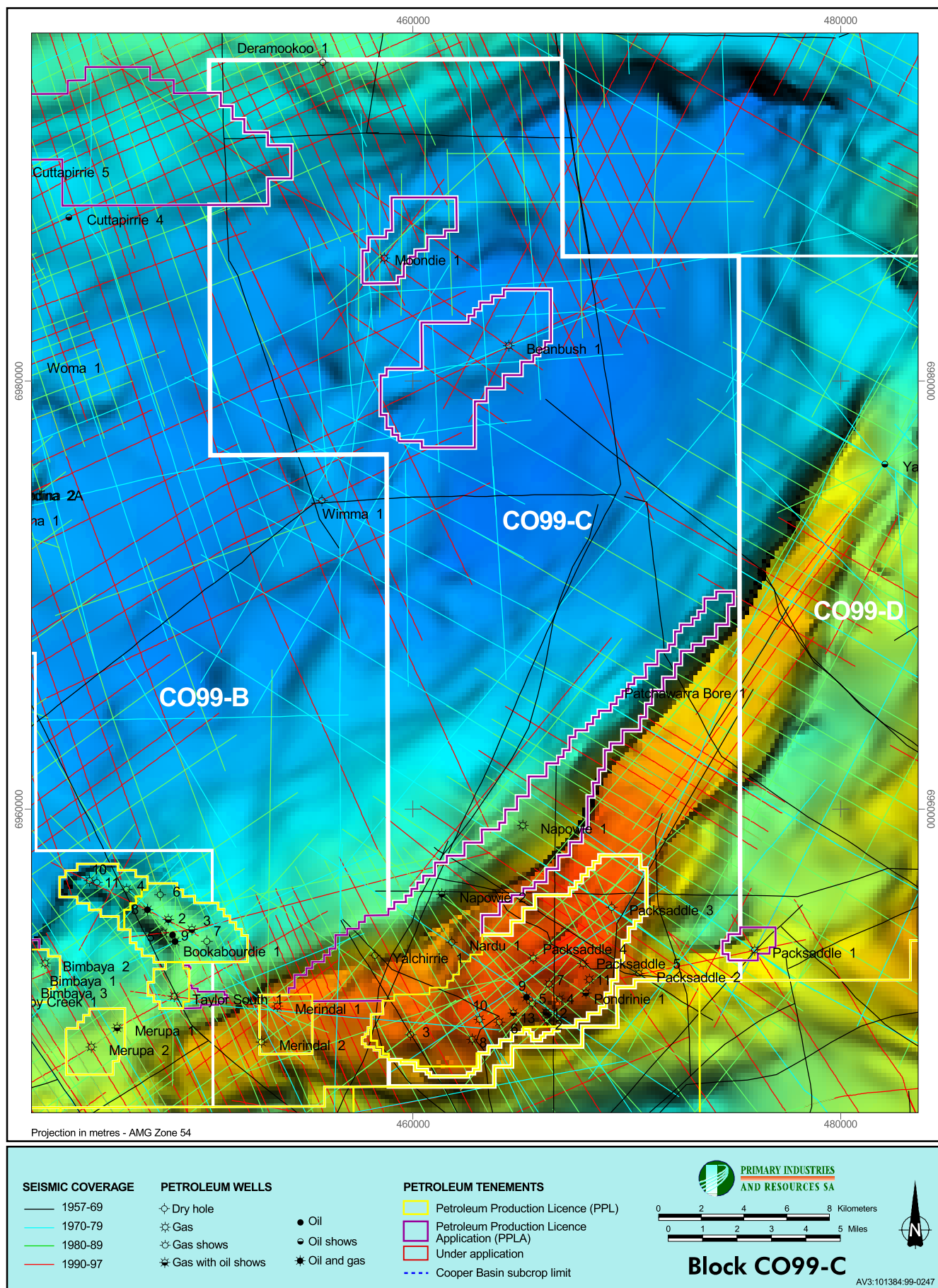


Fig. 15. Seismic line and well locations, base of Eromanga Basin image Block CO99-C

## C099-C

Well data summary (including selected wells in adjacent PPLs and PPLAs).

Well	TD (m)	Tnmt	No.	Spud Date	Status Rig Release	Primary Objective	When Open	Security	PIRSA Ref
Beanbush 1	3700	PEL	5&6	13/08/80	Susp	Cooper oil & gas		OF	4306
Deramookoo 1	2647	PEL	5&6	3/10/89	Aban	Tinchoo oil			7253
Moondie 1	3478	PEL	5&6	23/08/96	P&S	Toolachee/Epsilon gas-condensate		OF	7558
Napowie 1	3338	PEL	5&6	23/05/93	Susp	Tirrawarra Sst gas		OF	7459
Napowie 2	3053	PEL	5&6	3/05/98	Susp	Epsilon		OF	7685
Packsaddle 1	3169	PEL	5&6	24/03/70	Susp	Eromanga oil		OF	1437
Packsaddle 2	2713	PEL	5&6	2/01/78	Aban	Cooper gas			3513
Pondrinie 1	2435	PEL	5&6	6/10/83	Susp	Cooper oil & gas		OF	5489
Pondrinie 2	2526	PEL	5&6	22/05/84	Susp	Cooper gas		OF	5837
Pondrinie 3	2240	PEL	5&6	10/10/87	Aban	Cooper gas		OF	7078
Pondrinie 4	2320	PEL	5&6	16/01/89	Susp	Tool Tirrawarra gas, Napp oil & gas		OF	7212
Pondrinie 5	2398	PEL	5&6	1/09/89	Susp	Toolachee Tirrawarra gas		OF	7221
Pondrinie 6	2377	PEL	5&6	27/09/90	Susp	Tool, Tirrawarra, Merrimelia gas		OF	7315
Pondrinie 7	2219	PEL	5&6	20/10/90	Susp	Merrimelia gas		OF	7316
Pondrinie 8	2371	PEL	5&6	9/11/90	Susp	Toolachee, Merrimelia gas		OF	7325
Pondrinie 9	2286	PEL	5&6	31/01/91	Susp	Merrimelia gas, Napp oil		OF	7335
Pondrinie 10	2289	PEL	5&6	4/07/91	Susp	Tirrawarra & Merrimelia gas		OF	7379
Pondrinie 11	2395	PEL	5&6	17/10/96	Susp	Tirrawarra Sst gas		OF	7572
Pondrinie 12	2310	PEL	5&6	15/03/97	Susp	Tirrawarra Sst		OF	7605
Pondrinie 13	2371	PPL	90	18/02/98	Susp	Merrimelia gas		Conf	1/3/21
Yalchirrie 1	2592	PEL	5&6	27/08/91	Aban	Tirrawarra Sst gas		OF	8576

## 2D Open File Surveys

**Summary:** 36 surveys, 247 lines, 1318.4 km

Survey	No. Lines	Total Line km
58 ER01	3	28.3
58 ER02	1	1.2
62 ER01	2	21.7
63 CP01	4	54.7
64 CP01	3	24.1
65 CP01	5	18.7
66 ER01	1	9.6
69 CP05	3	5.0
70 CP01	2	1.0
70 CP08	2	13.2
73 CP01	18	149.8
76 CP01	7	11.9
78 CP01	11	81.9
79 CP01	7	60.3
80 CP02	19	113.8
81 CP04	19	80.8
82 CP02	5	4.2
82 CP05	12	20.9
82 CP42	5	25.6
83 CP02	3	18.9
83 CP31	8	12.7
85 CP41	6	21.7
87 CP11	2	3.4
87 CP21	6	50.4
88 CP01	2	4.8
88 CP03	4	19.5

Survey	No. Lines	Total Line km
89 CP01	4	8.4
90 CP01	1	5.3
91 CP01	3	2.2
91 CP11	4	14.2
92 CP01	9	42.8
94 CP21	9	21.8
95 CP01	19	133.1
96 CP01	23	140.3
97 CP01	12	73.4
98 CP01	3	18.5

## 3D Surveys

Survey	Area (km <sup>2</sup> )	When Open
95 CP02	4	
97 CP02	60	5/5/02

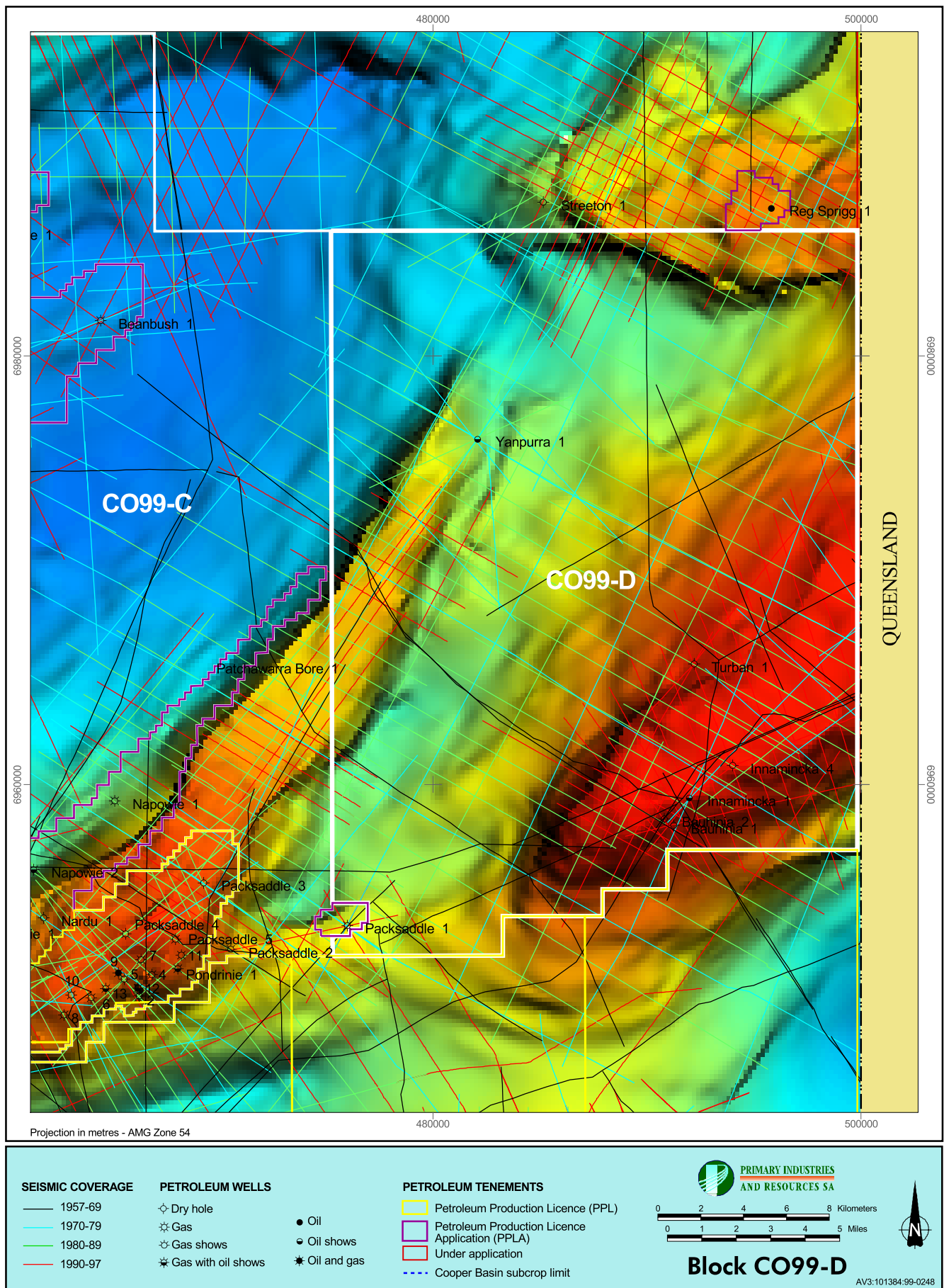


Fig. 16. Seismic line and well locations, base of Eromanga Basin image Block CO99-D

## CO99-D

Well data summary (including selected wells in adjacent PPLs and PPLAs).

Well	TD (m)	Tnmt	No.	Spud Date	Status Rig Release	Primary Objective	When Open	Security	PIRSA Ref
Bauhinia 1	2390	PEL	5&6	12/06/91	Aban	Tirrawarra Sst gas		OF	7372
Bauhinia 2	2212	PEL	5&6	4/12/97	Aban	Toolachee/Tirrawarra		OF	7646
Innamincka 1	3852	OEL	20	28/03/59	Aban	Stratigraphic test		OF	146
Innamincka 4	2129	PEL	5&6	5/12/83	Aban	Eromanga oil		OF	5555
Packsaddle 1	3169	PEL	5&6	24/03/70	Susp	Eromanga oil		OF	1437
Turban 1	2463	PEL	5&6	19/09/88	Aban	Tirrawarra oil		OF	7171
Yanpurra 1	2961	PEL	5&6	17/10/70	Aban	Cooper gas		OF	1564

## 2D Open File Surveys

**Summary:** 34 surveys, 193 lines, 1690.9 km

Survey	No. Lines	Total Line km
58 ER01	5	68.8
60 ER02	3	27.1
61 ER02	2	28.4
64 CP01	7	53.9
65 CP01	1	4.4
66 ER01	2	41.7
69 CP05	2	5.9
70 CP01	6	73.5
70 CP08	3	27.4
73 CP01	2	7.9
76 CP01	4	48.8
78 CP01	12	164.9
79 CP01	3	28.1
79 CPXX1	4	16.7
80 CP02	9	63.1
81 CP04	24	303.6
82 CP42	9	59.2
83 CP02	1	2.2
83 CP31	6	54.9
84 CP21	6	95.9
85 CP41	2	4.8
87 CP21	5	23.3
88 CP01	2	30.3
88 CP03	4	20.4
89 CP01	2	8.3
90 CP01	1	1.4
90 CP08	2	27.2
91 CP11	4	21.4
92 CP01	7	35.8
94 CP21	6	37.1
95 CP01	5	19.4
96 CP01	17	84.0
97 CP01	20	169.7
98 CP01	5	31.3

## 3D Surveys

Survey	Area (km <sup>2</sup> )
96 CP02	40



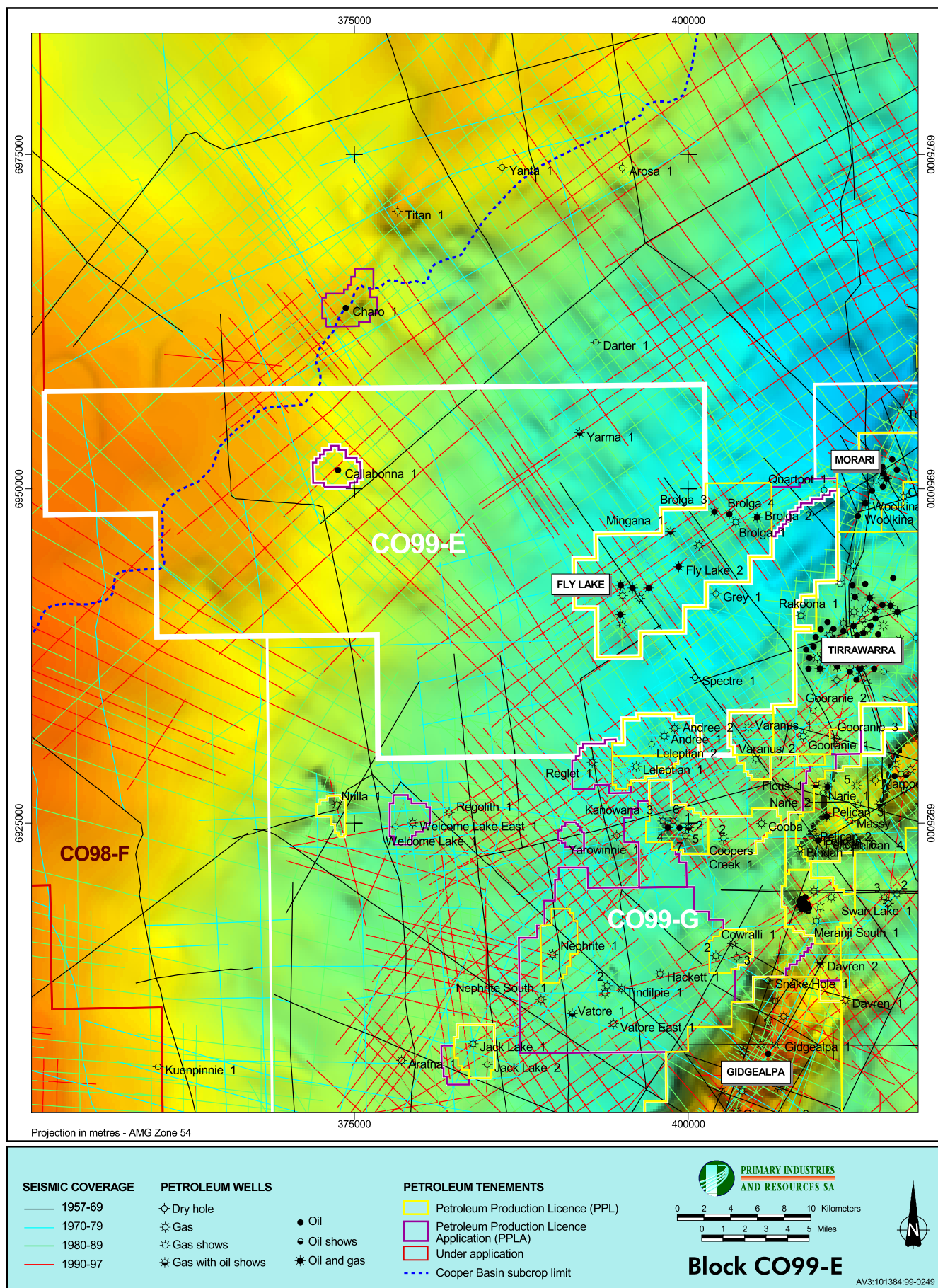


Fig. 17. Seismic line and well locations, base of Eromanga Basin image Block CO99-E

## CO99-E

Well data summary (including selected wells in adjacent PPLs and PPLAs).

Well	TD (m)	Tnmt	No.	Spud Date	Status Rig Release	Primary Objective	When Open	Security	PIRSA Ref
Andree 1	3178	PEL	5&6	26/08/82	Susp	Cooper oil & gas		OF	5050
Andree 2	3169	PEL	5&6	5/05/84	Susp	Cooper gas		OF	5787
Brolga 1	2967	PEL	5&6	19/04/72	Susp	Cooper oil/gas Eromanga oil		OF	2091
Brolga 2	2975	PPL	18	1/4/83	Susp	Cooper oil & gas		OF	5890
Brolga 3	2989	PPL	18	17/05/93	Susp	Patchawarra		OF	7458
Brolga 4	2957	PPL	18	29/06/94	Susp	Patchawarra gas	17/07/99	Conf	7494
Callabonna 1	2416	PEL	5&6	11/02/90	Susp	Hutton & Birkhead oil		OF	7274
Fly Lake 1	2949	PEL	5&6	2/09/71	Susp	Cooper oil & gas		OF	1993
Fly Lake 2	2949	PEL	5&6	16/12/71	Susp	Cooper oil		OF	2208
Fly Lake 3	2963	PEL	5&6	1/2/72	Aban	Cooper oil & gas		OF	2188
Fly Lake 4	2927	PPL	18	24/03/81	Susp	Cooper gas		OF	4591
Fly Lake 5	2934	PPL	18	17/10/81	Susp	Cooper oil & gas		OF	4860
Fly Lake 6	2923	PPL	18	4/06/82	Susp	Cooper oil & gas		OF	4905
Fly Lake 7	2936	PPL	18	24/04/84	Susp	Cooper oil & gas		OF	6475
Fly Lake 8	2954	PPL	18	24/10/92	Susp	Patchawarra gas, Tirrawarra oil		OF	7442
Fly Lake 9	2957	PPL	18	23/04/94	Susp	Patchawarra gas	16/05/99	Conf	7486
Gooranie 1	3161	PPL	20	4/07/85	Susp	Cooper gas		OF	6462
Gooranie 2	3089	PPL	20	2/03/86	Aban	Cooper gas		OF	7002
Grey 1	3119	PEL	5&6	15/02/91	Aban	Patchawarra gas		OF	7347
Mingana 1	3039	PPL	18	15/12/82	Aban	Cooper gas		OF	5056
Moorari 1	3023	PEL	5&6	1/01/71	Susp	Triassic Permian oil & gas		OF	1635
Moorari 2	3136	PEL	5&6	9/09/71	Aban	Cooper oil & gas		OF	1916
Moorari 3	2949	PPL	19	29/12/80	SC	Cooper oil & gas		OF	4439
Moorari 4	2954	PPL	19	30/11/81	Susp	Cooper gas		OF	4857
Moorari 5	2960	PPL	19	5/10/82	Susp	Cooper gas		OF	5355
Moorari 6	3029	PPL	19	19/01/83	Susp	Cooper & Eromanga oil		OF	5246
Moorari 7	3002	PPL	19	10/07/84	Susp	Cooper oil		OF	6563
Moorari 8	2943	PPL	19	25/11/90	Susp	Cooper oil		OF	7328
Moorari 9	3048	PPL	19	17/06/93	Aban	Tirrawarra oil		OF	7461
Moorari 10	2740	PPL	19	29/03/94	Susp	Birkhead oil, Nappamerri gas	19/04/99	Conf	7481
Quartpot 1	3036	PEL	5&6	11/10/88	Aban	Cooper oil & gas		OF	7179
Rakoonna 1	3225	PEL	5&6	8/11/82	Susp	Cooper gas		OF	5114
Spectre 1	3208	PEL	5&6	25/12/85	Aban	Cooper gas		OF	6565
Tirrawarra North 1	3117	PPL	20	11/02/84	Susp	Cooper oil		OF	5724
Tirrawarra West 1	3080	PPL	20	9/04/83	Susp	Cooper oil		OF	5330
Varanus 1	3140	PEL	5&6	24/06/88	Susp	Patchawarra gas		OF	7160
Varanus 2	3156	PEL	5&6	3/09/88	Susp	Cooper gas		OF	7174
Woolkina 1	3146	PPL	19	29/07/82	Susp	Eromanga oil Cooper oil/gas		OF	5055
Woolkina 2	3118	PPL	19	26/07/88	Susp	Cooper gas		OF	7162
Yarma 1	2873	PEL	5&6	12/01/98	Aban	Patchawarra gas		OF	7661

## 2D Open File Surveys

Summary: 43 surveys, 346 lines, 2117 km

Survey	No. Lines	Total Line km	Survey	No. Lines	Total Line km
62 ER01	1	3.8	66 ER01	1	2.2
63 CP01	5	34.7	67 CP01	1	6.2
64 CP01	1	8.0	69 CP04	6	60.6
65 CP01	7	52.3	70 CP03	7	46.0
			70 CP10	2	4.4

Survey	No. Lines	Total Line km
70 CP11	3	21.6
71 CP04	13	72.9
71 CP05	11	59.0
73 CP01	7	54.5
76 CP01	10	40.0
77 CP01	3	16.8
80 CP01	23	45.8
80 CP02	21	244.5
81 CP06	14	32.7
82 CP42	8	86.4
83 CP02	2	28.2
83 CP03	1	1.2
83 CP31	11	98.3
84 CP12	26	177.7
85 CP11	9	44.6
85 CP21	1	6.1
85 CP41	1	0.0
86 CP02	1	0.6
86 CP21	13	134.5
86 CP31	1	3.5
87 CP11	5	25.1
87 CP21	10	34.8
88 CP01	11	87.7
89 CP01	10	59.4
90 CP06	2	3.5
90 CP08	14	64.8
91 CP07	13	40.9
91 CP13	3	3.6
92 CP01	4	26.3
93 CP01	26	44.4
94 CP21	2	4.5
95 CP01	12	132.8
96 CP01	12	69.3
97 CP01	12	132.4

## CO99-E : 3D Surveys

Survey	Area (km <sup>2</sup> )	When Open
93 CP02	7	
94 CP02	5	31/12/99

## CO99-F

Well data summary (including selected wells in adjacent PPLs and PPLAs).

Well	TD (m)	Tnmt	No.	Spud Date	Status Rig Release	Primary Objective	When Open	Security	PIRSA Ref
Balcaminga 1	3251	PEL	5&6	9/03/87	Susp	Cooper gas		OF	6973
Bimbaya 1	2833	PEL	5&6	7/05/86	Susp	Cooper gas Eromanga oil		OF	7008
Bimbaya 2	2883	PEL	5&6	12/09/86	Susp	Cooper gas		OF	7019
Bimbaya 3	2905	PEL	5&6	23/12/87	Susp	Cooper gas		OF	7120
Bookabourdie 1	2960	PEL	5&6	25/10/84	Susp	Cooper gas		OF	6237
Bookabourdie 2	2952	PEL	5&6	3/03/85	Susp	Cooper gas		OF	6251
Bookabourdie 3	3024	PEL	5&6	1/06/85	Susp	Cooper gas		OF	6352
Bookabourdie 4	2939	PEL	5&6	16/11/85	Susp	Cooper gas		OF	6544
Bookabourdie 5	2356	PEL	5&6	22/11/85	Susp	Eromanga oil		OF	6550
Bookabourdie 6	3048	PPL	33	7/04/86	Aban	Cooper gas		OF	7009
Bookabourdie 7	3077	PPL	33	22/11/87	Aban	Cooper oil & gas		OF	7114
Bookabourdie 8	2877	PPL	33	22/02/88	Susp	Cooper gas		OF	7133
Bookabourdie 9	2899	PPL	33	25/03/88	Susp	Cooper gas		OF	7141
Bookabourdie 10	2976	PPL	42	15/11/88	Susp	Cooper gas		OF	7198
Bookabourdie 11	2995	PPL	42	22/11/92	Aban	Tirrawarra Sst gas		OF	7444
Cobbler 1	3021	PEL	5&6	9/11/98	Aban	Toolachee		OF	7708
Haloragis 1	2487	PEL	5&6	10/08/91	Aban	Tool, Tirrawarra gas, Napp oil/gas		OF	7387
Merrimelia 3	2737	PEL	5&6	13/02/65	Aban	Cooper oil		OF	508
Merupa 1	2863	PEL	5&6	10/10/86	Susp	Cooper gas Eromanga oil		OF	7027
Merupa 2	2871	PEL	5&6	29/06/88	Susp	Cooper gas		OF	7158
Minkie 1	2392	PPL	17	29/12/83	Aban	Eromanga oil		OF	5914
Pirraminta 1	2495	PEL	5&6	19/07/87	Susp	Cooper gas Eromanga oil		OF	7072
Scrubby Creek 1	3118	PEL	5&6	20/07/98	Susp	Tirrawarra		OF	7696
Tallerangie 1	3197	PEL	5&6	3/05/95	Susp	Callamurra, Cooper gas		OF	7512
Taylor South 1	2962	PEL	5&6	15/01/87	Susp	Cooper gas Eromanga oil		OF	7035
Thiele 1	2694	PEL	5&6	24/12/98	Aban	Tirrawarra		OF	7724
Toonman 1	3192	PEL	5&6	11/11/83	Aban	Cooper oil & gas		OF	5723

## 2D Open File Surveys

**Summary:** 40 surveys, 283 lines, 1319.4 km

Survey	No. Lines	Total Line km	Survey	No. Lines	Total Line km
62 ER01	1	3.7	82 CP42	18	67.7
63 CP01	1	0.8	83 CP02	7	26.5
64 CP01	12	81.5	83 CP31	1	1.8
65 CP01	3	13.7	84 CP12	6	18.3
66 ER01	5	14.3	85 CP11	21	140.9
70 CP02	8	46.9	85 CP41	10	33.2
70 CP03	2	7.6	86 CP21	11	30.9
70 CP08	9	45.4	87 CP11	6	25.0
70 CP11	1	3.7	87 CP21	4	10.8
71 CP05	2	7.3	88 CP01	1	0.2
73 CP01	2	2.2	90 CP03	2	4.0
76 CP01	5	24.5	90 CP08	8	28.8
78 CP01	6	54.2	91 CP11	8	49.2
79 CP01	4	32.6	91 CP12	4	3.3
80 CP01	1	0.3	92 CP01	1	0.3
80 CP02	7	23.1	93 CP01	8	23.8
81 CP04	15	89.5	94 CP21	23	99.6
81 CP06	6	16.8	95 CP01	1	2.8
82 CP02	1	0.3	96 CP01	26	172.2
			97 CP01	23	110.6
			98 CP01	3	1.2



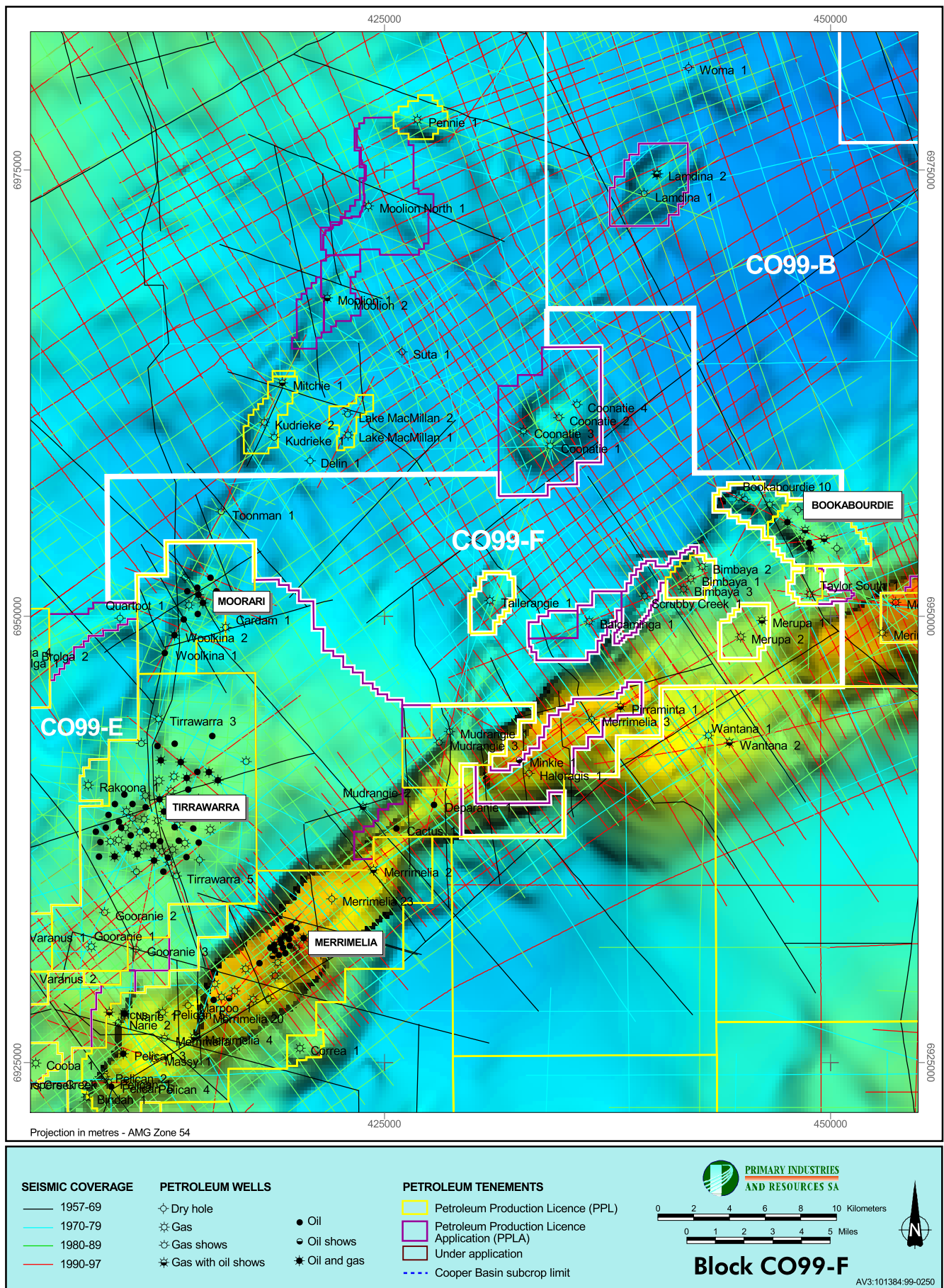


Fig. 18. Seismic line and well locations, base of Eromanga Basin image Block CO99-F

## CO99-G

Well data summary (including selected wells in adjacent PPLs and PPLAs).

Well	TD (m)	Tnmt	No.	Spud Date	Status Rig Release	Primary Objective	When Open	Security	PIRSA Ref
Aratna 1	3018	PEL	5&6	6/04/98	P&S	Patchawarra Fm gas – possible tight gas discovery		OF	7678
Bindah 1	2987	PEL	5&6	19/09/96	Susp	Patch/Tirr gas		OF	7570
Cooba 1	3170	PEL	5&6	28/02/91	Susp	Patchawarra gas		OF	7349
Coopers Creek 1	3206	PEL	5&6	5/06/71	Aban	Cooper oil & gas		OF	1732
Coopers Creek 2	3156	PEL	5&6	21/10/92	Susp	Patchawarra		OF	7441
Cowralli 1	3247	PEL	5&6	2/03/86	Susp	Eromanga oil		OF	7000
Cowralli 2	3261	PEL	5&6	10/08/87	Susp	Cooper gas		OF	7089
Cowralli 3	3305	PEL	5&6	4/04/89	Aban	Cooper gas		OF	7219
Davren 1	2993	PEL	5&6	9/08/97	Susp	Tool & Patch gas		OF	7630
Doublejay 1	3034	PEL	5&6	23/01/99	Aban	Patchawarra Fm gas		OF	7731
Hackett 1	3246	PEL	5&6	24/06/97	Susp	Patchawarra		OF	7618
Jack Lake 1	3144	PEL	5&6	19/02/82	Susp	Cooper gas		OF	4998
Jack Lake 2	3200	PEL	5&6	5/09/87	Aban	Cooper gas		OF	7092
Kanowana 1	3123	PEL	5&6	9/12/72	Susp	Cooper oil & gas		OF	2237
Kanowana 2	3135	PEL	5&6	26/01/85	Susp	Cooper gas		OF	6162
Kanowana 3	3152	PPL	28	20/02/88	Susp	Cooper oil & gas		OF	7128
Kanowana 4	3139	PPL	28	22/04/93	Susp	Patchawarra gas		OF	7457
Kanowana 5	3139	PPL	28	21/10/94	Susp	Patchawarra gas	17/11/99	Conf	7503
Kanowana 6	3107	PPL	28	23/02/97	Susp	Patchawarra gas	21/03/02	Conf	7600
Leleptian 1	3132	PEL	5&6	30/09/84	Susp	Cooper gas		OF	6094
Leleptian 2	3151	PEL	5&6	24/07/87	Aban	Cooper gas		OF	7082
Meranji 1	3073	PEL	5&6	12/06/85	Susp	Cooper gas		OF	6467
Meranji 2	3329	PEL	5&6	4/08/85	Susp	Cooper gas		OF	6413
Meranji 3	1782	PEL	5&6	18/10/85	Susp	Eromanga oil		OF	6493
Meranji 4	3068	PPL	35	4/04/86	Susp	Cooper gas		OF	7007
Meranji 5	1779	PPL	35	4/10/87	Susp	Eromanga oil		OF	7098
Meranji 6	1794	PPL	35	3/10/90	Susp	Namur oil		OF	7320
Meranji 7	3066	PPL	35	31/10/90	Susp	Toolachee gas, Patchawarra gas		OF	7322
Meranji 8	1914	PPL	35	9/11/90	Susp	Namur oil		OF	7326
Meranji 9	2073	PPL	35	3/12/90	Susp	Namur oil		OF	7329
Meranji 10	1779	PPL	35	14/12/90	Susp	Namur oil		OF	7333
Meranji 11	1790	PPL	35	4/08/91	Susp	Namur oil		OF	7388
Meranji 12	1798	PPL	35	21/08/91	Susp	Namur oil		OF	7392
Meranji 13	3031	PPL	35	23/09/92	Susp	Patchawarra gas		OF	7436
Meranji 14	1881	PPL	35	21/08/93	Aban	Namur oil		OF	7465
Meranji 14 DW1	2310	PPL	35	3/09/93	Susp	Namur oil		OF	7470
Meranji 15	2986	PPL	35	15/09/95	Susp	Patchawarra gas	8/10/00	Conf	7523
Meranji South 1	3030	PPL	35	3/12/96	Susp	Patchawarra gas	25/12/01	Conf	7587
Mica 1	3063	PEL	5&6	1/12/98	Susp	Patchawarra gas		OF	7221
Moongana 1	3079	PEL	5&6	18/10/98	Susp	Patchawarra gas		OF	7710
Nephrite 1	3185	PEL	5&6	26/12/96	Susp	Patchawarra gas		OF	7591
Nephrite South 1	3239	PEL	5&6	25/05/97	Susp	Patchawarra gas		OF	7625
Nulla 1	2799	PEL	5&6	12/09/85	Susp	Cooper oil/gas Eromanga oil		OF	6480
Pelican South 1	3086	PEL	5&6	29/09/98	Aban	Patchawarra gas		OF	7707
Reglet 1	3108	PEL	5&6	28/02/95	P&S	Patchawarra gas		OF	7506
Regolith 1	2956	PEL	5&6	17/11/88	Aban	Cooper gas		OF	7195
Tindilpie 1	3408	PEL	5&6	18/08/70	Aban	Cooper gas		OF	1552
Tindilpie 2	3367	PEL	5&6	30/08/84	Susp	Cooper gas Eromanga oil		OF	6056
Tindilpie 2 DW1	2935	PEL	5&6	7/02/97	Susp	Patchawarra gas		OF	7594
Varanus 1	3140	PEL	5&6	24/06/88	Susp	Patchawarra gas		OF	7160
Varanus 2	3156	PEL	5&6	3/09/88	Susp	Cooper gas		OF	7174
Vatore 1	3288	PEL	5&6	2/05/98	Susp	Patchawarra		OF	7682
Vatore East 1	3254	PEL	5&6	22/04/97	Susp	Patchawarra Fm gas		OF	7614
Welcome Lake 1	2926	PEL	5&6	10/05/81	Aban	Cooper oil/gas Eromanga oil		OF	4554
Welcome Lake E 2	2884	PEL	5&6	15/07/98	Susp	Patchawarra gas		OF	7702
Yarowinnie 1	3112	PEL	5&6	29/01/86	Aban	Cooper gas		OF	6650



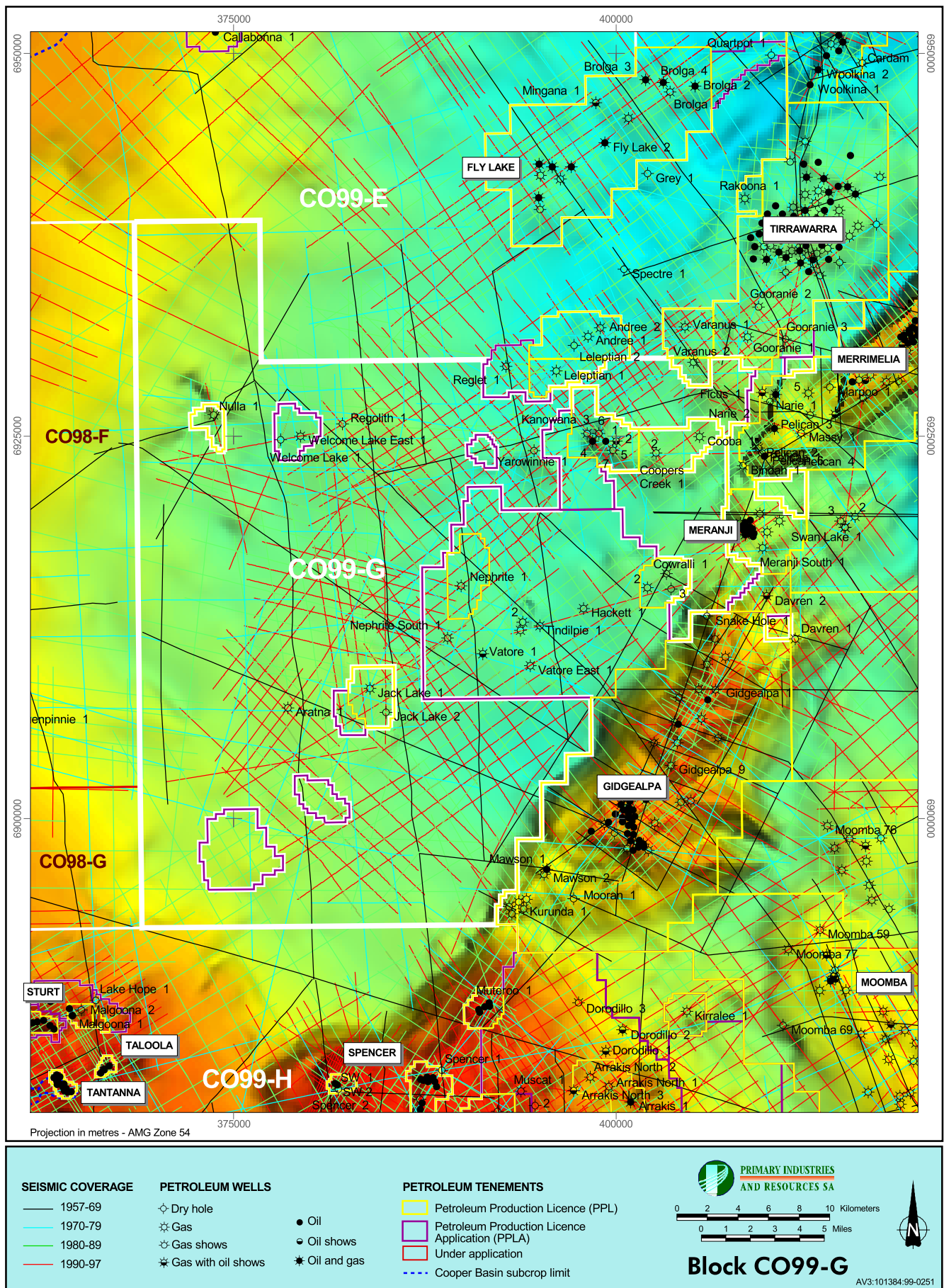


Fig. 19. Seismic line and well locations, base of Eromanga Basin image Block CO99-G

## 2D Confidential Surveys

**Summary:** 1 surveys, 3 lines, 4.6 km

Survey	No. Lines	Total Line km	When Open
95 CP06	3	4.6	1/7/00

## 2D Open File Surveys

**Summary:** 47 surveys, 483 lines, 3001.3 km

Survey	No. Lines	Total Line km
62 ER01	1	2.0
63 CP01	10	92.5
64 CP01	7	36.0
65 CP01	3	30.6
67 CP01	3	57.5
69 CP04	27	251.1
70 CP10	9	29.2
70 CP11	1	0.9
71 CP04	23	106.2
72 CP03	2	4.2
73 CP01	1	0.9
75 CP01	1	0.2
76 CP01	19	194.3
77 CP01	7	57.1
80 CP02	16	86.9
81 CP03	3	0.9
81 CP04	4	46.6
81 CP06	1	3.6
82 CP02	15	124.8
82 CP42	11	52.1
83 CP02	4	13.8
83 CP31	17	72.9
84 CP01	3	4.4
84 CP12	14	49.3
85 CP11	25	92.0
85 CP21	1	11.4
85 CP41	5	9.9
86 CP21	8	28.8
87 CP11	3	10.9
87 CP21	17	129.9
88 CP01	41	264.3
89 CP01	14	69.5
90 CP01	11	88.8
90 CP03	1	1.6
90 CP08	1	2.8
91 CP02	2	2.7
91 CP06	1	3.0
91 CP11	5	35.9
92 CP01	13	30.9
92 CP07	3	3.0
92 CP08	3	12.1
93 CP01	31	68.0
94 CP21	6	24.1
95 CP01	1	3.2
96 CP01	29	265.6
97 CP01	55	512.1
98 CP01	5	12.2

## 3D Surveys

Survey	Area (km <sup>2</sup> )
93 CP02	30



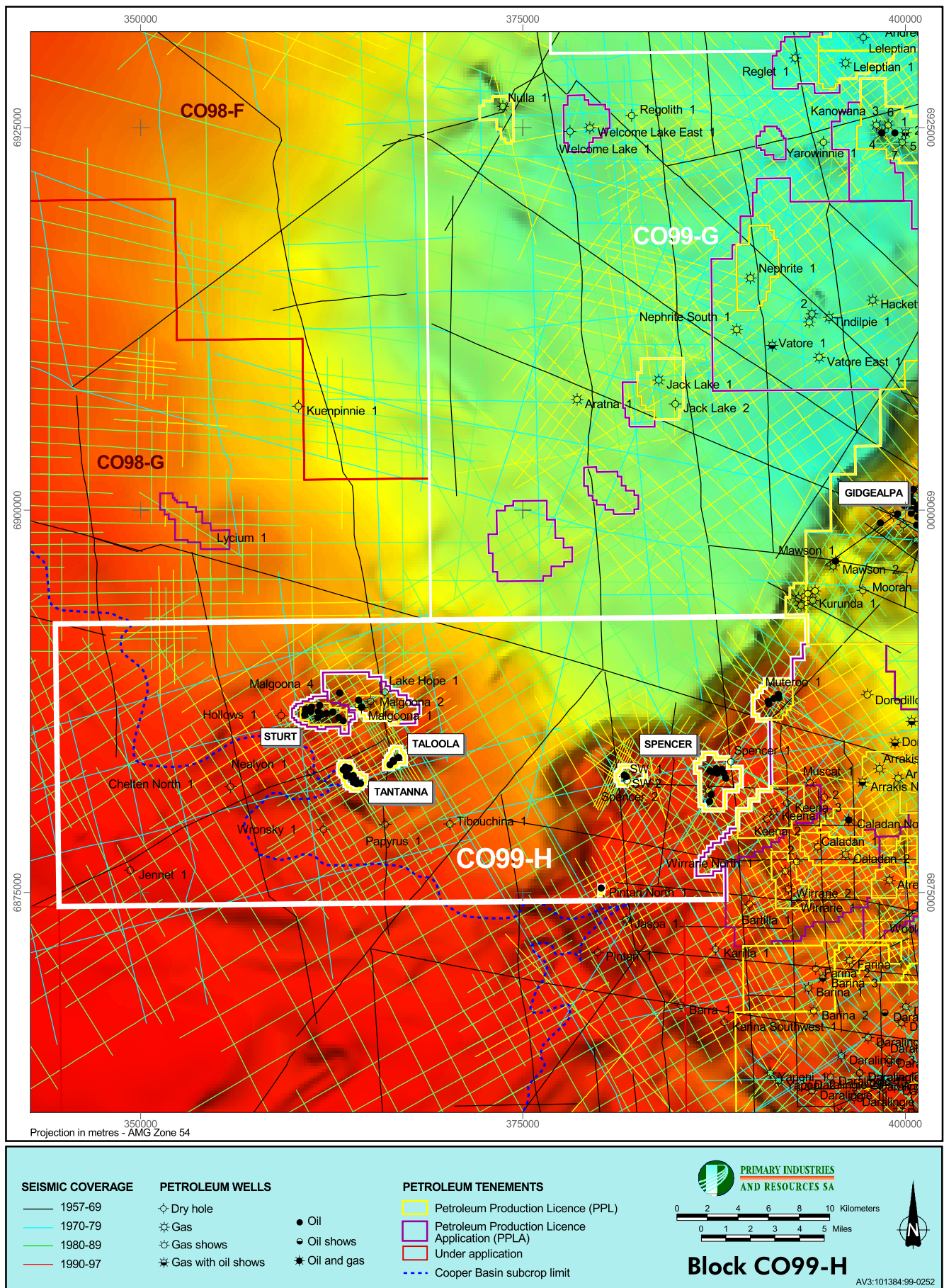


Fig. 20. Seismic line and well locations, base of Eromanga Basin image Block CO99-H

## CO99-H

Well data summary (including selected wells in adjacent PPLs and PPLAs).

Well	TD (m)	Tnmt	No.	Spud Date	Status Rig Release	Primary Objective	When Open	Security	PIRSA Ref
Chelten North 1	1756	PEL	5&6	30/09/89	Aban	Namur oil		OF	7251
Hollows 1	2043	PEL	5&6	24/04/94	Aban	Poolowanna, Birkhead oil		OF	7487
Jennet 1	1687	PEL	5&6	16/10/86	SC	Eromanga oil		OF	7028
Keena 1	2012	PEL	5&6	13/06/87	Susp	Eromanga oil		OF	7074
Keena 2	2009	PEL	5&6	28/08/89	Susp	Patchawarra gas		OF	7239
Keena 3	2041	PEL	5&6	29/01/90	Aban	Patchawarra gas		OF	7273
Lake Hope 1	2500	PEL	5&6	17/08/71	Aban	Cooper gas		OF	1758
Malgoona 1	2164	PEL	5&6	27/07/90	Aban	Merrimelia, Patchawarra oil		OF	7301
Malgoona 1 DW1	2332	PEL	5&6	10/08/90	Susp	Merrimelia, Patchawarra oil		OF	7305
Malgoona 2	2335	PEL	5&6	14/09/90	Aban	Merrimelia oil		OF	7309
Malgoona 3	2271	PEL	5&6	12/07/91	Susp	Merrimelia Fm (74-3 Sand)		OF	7382
Malgoona 4	2270	PEL	5&6	10/09/91	Susp	Merrimelia oil		OF	7395
Muteroo 1	2011	PEL	5&6	6/04/85	Susp	Cooper gas Eromanga oil		OF	6291
Muteroo 2	1884	PEL	5&6	13/06/85	Susp	Eromanga oil		OF	6285
Muteroo 3	1768	PEL	5&6	7/09/85	Susp	Eromanga oil		OF	6468
Muteroo 4	2015	PPL	32	3/10/88	Susp	Hutton oil		OF	7169
Muteroo 5	2020	PPL	32	15/02/89	Susp	Eromanga oil		OF	7215
Nealyon 1	1932	PEL	5&6	5/10/86	Aban	Eromanga oil		OF	7026
Papyrus 1	2137	PEL	5&6	7/07/89	Aban	Poolowanna & Patchawarra oil		OF	7235
Spencer 1	2056	PEL	5&6	16/12/65	Aban	Cooper oil & gas		OF	558
Spencer 2	1960	PEL	5&6	4/12/81	Aban	Eromanga oil		OF	4680
Spencer 3	1924	PEL	5&6	9/01/86	Susp	Eromanga oil		OF	6558
Spencer 4	1895	PEL	5&6	15/03/86	Susp	Eromanga oil		OF	7003
Spencer 5	1893	PPL	37	28/06/87	Susp	Eromanga oil		OF	7077
Spencer 6	1899	PPL	37	5/09/87	Susp	Eromanga oil		OF	7093
Spencer 7	1907	PPL	37	12/05/88	Susp	Eromanga oil		OF	7142
Spencer 8	1921	PPL	37	28/10/89	Susp	Birkhead oil		OF	7259
Spencer 9	1811	PPL	37	9/11/89	Susp	Birkhead oil		OF	7261
Spencer 10	1899	PPL	37	21/11/89	Aban	Birkhead oil		OF	7263
Spencer 11	1723	PPL	37	29/08/91	Susp	Birkhead oil		OF	7394
Spencer 12	1723	PPL	37	7/11/91	Susp	Birkhead		OF	7401
Spencer West 2	1785	PPL	53	18/11/93	Susp	Namur oil		OF	7473
Sturt 1	1974	PEL	5&6	29/06/88	Susp	Namur oil		OF	7159
Sturt 2	1927	PEL	5&6	1/10/88	Susp	Birkhead oil		OF	7177
Sturt 3	1915	PEL	5&6	31/10/88	Susp	Birkhead oil		OF	7192
Sturt 4	1969	PPL	47	21/05/89	Susp	Poolowanna oil		OF	7230
Sturt 5	1921	PPL	47	6/12/89	Susp	Birkhead oil		OF	7266
Sturt 6	1945	PPL	47	8/07/90	Susp	Poolowanna oil		OF	7299
Sturt 7	2018	PPL	47	25/08/90	Susp	Patchawarra		OF	7303
Sturt 8	2027	PPL	47	13/09/90	Susp	Poolowanna oil		OF	7312
Sturt East 1	1905	PEL	5&6	15/10/88	Susp	Birkhead & Hutton oil		OF	7183
Sturt East 2	1899	PEL	5	12/12/88	Susp	Poolowanna oil		OF	7197
Sturt East 3	1942	PPL	47	20/04/89	Susp	Poolowanna oil		OF	7225
Sturt East 4	1906	PPL	47	12/09/89	Susp	Poolowanna oil		OF	7231
Taloola 1	1924	PEL	5&6	19/05/88	Susp	Namur oil		OF	7147
Taloola 2	1899	PEL	5&6	12/06/88	Susp	Namur oil		OF	7154
Taloola 3	1937	PEL	5&6	19/08/88	Aban	Namur Poolowanna oil		OF	7168
Taloola 4	1929	PPL	45	18/05/91	Susp	Namur oil		OF	7367
Tantanna 1	1848	PEL	5&6	17/07/88	Susp	Namur oil		OF	7163
Tantanna 2	1857	PEL	5&6	1/08/88	Susp	Namur Hutton Poolowanna oil		OF	7166
Tantanna 3	1861	PEL	5&6	3/09/88	Susp	Namur Hutton & Poolowanna oil		OF	7172
Tantanna 4	1863	PEL	5&6	17/09/88	Susp	Namur Hutton Poolowanna oil		OF	7175
Tantanna 5	1860	PEL	5&6	15/11/88	Susp	Hutton Namur Poolowanna oil		OF	7190
Tantanna 6	1875	PPL	46	28/06/90	Susp	Namur, Hutton, Poolowanna		OF	7293
Tantanna 7	1866	PPL	46	2/09/90	Susp	Namur, Hutton and Poolowanna oil		OF	7308
Tantanna 8	1883	PPL	46	13/10/90	Susp	Namur, Birk/Hutton, Poolowanna oil		OF	7321
Tantanna 9	1875	PPL	46	24/12/90	Susp	Namur, Hutton oil		OF	7336
Tantanna 10	1858	PPL	46	8/05/91	Susp	Hutton, Poolowanna oil		OF	7364
Tantanna 11	1875	PPL	46	31/05/91	Susp	Hutton oil		OF	7370
Tantanna 12	1890	PPL	46	10/06/91	Susp	Hutton oil		OF	7373
Tantanna 13	1853	PPL	46	19/02/95	Susp	Hutton oil	2/03/00	Conf	7508
Tibouchina 1	2192	PEL	5&6	15/12/89	Aban	Patchawarra oil		OF	7268
Wronsky 1	1968	PEL	5&6	5/03/89	Aban	Hutton & Poolowanna oil		OF	7218

## 2D Open File Surveys

**Summary:** 30 surveys, 306 lines, 2160.6 km

Survey	No. Lines	Total Line km
63 CP01	3	45.9
64 CP01	7	85.5
65 CP01	2	38.4
66 ER01	1	8.8
67 CP01	1	3.0
68 CP01	1	7.2
69 CP04	4	16.7
70 CP09	9	137.9
76 CP01	6	78.9
77 CP01	1	4.0
78 CP01	4	37.4
80 CP02	5	33.6
82 CP02	6	17.9
84 CP32	13	148.5
85 CP11	45	338.9
85 CP21	5	36.9
86 CP21	1	0.2
86 CP31	16	40.6
87 CP11	17	123.1
88 CP01	47	369.7
89 CP01	40	182.4
90 CP01	26	139.7
90 CP05	2	8.2
90 CP08	8	35.6
91 CP03	4	14.7
91 CP08	2	8.3
91 CP11	10	71.8
94 CP21	6	17.3
95 CP01	10	98.3
96 CP01	4	11.2

## 3D Surveys

Survey	Area (km <sup>2</sup> )
92 CP12	116

## APPENDIX 2 – DATA AND ORDER FORMS

Extensive databases of petroleum information are held by PIRSA Petroleum Group and are readily available and accessible in digital and hard copy format. All basic technical data obtained by a licensee in an exploration licence are required to be submitted to PIRSA as part of licence commitments. These data are held confidential for two years after acquisition for PELs and for five years for PPLs, after which data are placed on open file. Basic data comprises well completion reports, well logs, core and fluid analyses, seismic acquisition and processing reports, seismic record sections, field and processed tapes and production data.

PIRSA provides a ‘one stop shop’ for industry and is ready and able to provide data and expert advice quickly to the explorer. A digital database (PEPS-SA®) contains details of all wells drilled, seismic surveys, production statistics etc. Comprehensive digital datasets and maps of key seismic horizons in the Cooper, Eromanga and Otway Basin are also available.

### PIRSA COOPER BASIN PRODUCTS

#### PEPS-SA® (Attribute database)

PEPS-SA (Petroleum Exploration and Production System—SA) is a comprehensive relational database containing a wide range of technical data relevant to the petroleum industry. PEPS-SA is available for purchase. The key data element is the petroleum well and each well has thousands of attributes. There are eight key modules comprising 99 data sets (Table 8).

Data are supplied with a PEPS-SA menu-driven windows system. For clients without Paradox, a copy of Paradox Runtime and software to query and export the data are provided.

#### PEPS-SA® (spatial database)

Bundled with the attribute data are Mapinfo spatial datasets. Viewing this data in a mapping package allows the geoscientist to spatially view datasets, to turn on and off various layers of interest, zoom in and out etc, to allow the generation of custom built base maps which can be printed.

There are more than 60 separate layers, ranging from general topographic data such as state boundaries, coastline, national parks and restricted areas, road, railways and various tenements, through to geotechnical layers such as basin outlines, well locations, seismic lines, seismic horizons, tectonic provinces, and many more.

The PEPS-SA attribute and spatial databases are bundled together as one package on CD-ROM which costs \$3000. Twice yearly updates of PEPS-SA cost an additional \$300 per year.

#### Core Photos

The department has recently scanned all petroleum core photographs, and the thumbnail images are included in the data package if you receive the CD-ROM version. Full size images are also available and are approximately 1500 pixels by 1000 pixels by 256 colours. The total set contains over 1900 images occupying 1.4 Gigabytes.

The Core Photo CD-Rom set (3 disks) costs \$250, and includes viewing software which links the photo to the attribute data. A special discount of 50% is available for Tertiary academic institutions.

#### Selected publications

Publications providing information on petroleum in SA and in the Cooper Basin include:

- *Petroleum Exploration and Development in South Australia 1999 edition* — comprehensive summary of the State’s petroleum industry, published every two years (free).

**Table 8.** PEPS-SA® modules and contents.

<b>Engineering</b>	Well abandonments; casing details; formation tests (open & closed); liquid evaluation tests; perforations; treatments; well tests.
<b>Geology</b>	Core analyses; cores (including core photograph thumbnails); cuttings; available formation tops; hydrocarbon bulk composition; palynology; Rock-Eval; aromatic and saturated hydrocarbon analyses; source rock extracts; thin sections; vitrinite reflectance.
<b>Geophysics</b>	Available seismic exabyte tapes (including raw field data and processed data); seismic lines; seismic sections; seismic survey reports; seismic survey summaries; surveys and lines; synthetic seismograms, seismic survey marks; seismic analog tapes.
<b>Log data</b>	Index to log paper prints; index of digital logs; log codes; log headers and bottom hole temperatures.
<b>Miscellany</b>	Petroleum Act; Petroleum Regulations. Statistics – exploration expenditure; consumer price index; crude oil prices; gas pricing, gas sales; liquid sales; petroleum royalties; raw gas production; seismic surveys; wells drilled annually.
<b>Production</b>	CO <sub>2</sub> ; crude oil; crude oil production summary; crude oil test data; crude unit oil; enhanced oil recovery gas injection volumes; gas field reservoir data; Katnook gas production; oil field reservoir data; raw gas deliverability; raw gas production summary; raw gas production completion summary; raw gas production.  Production graphs – production history (gas, oil); decline curves (gas, oil); completions (gas, oil); water ratio (gas); water ratio history (gas); average gas rates (gas); gas rate history (gas); completion days (gas, oil); oil cut decline (oil); oil cut history (oil); average oil rates (oil); oil rate history (oil); monthly production versus cumulative (gas, oil).
<b>Tenements</b>	PELs; PPLs; PLs and pipeline details.
<b>Wells</b>	Basic well data (latitude, longitude, TD, KB, status, classification etc.), well completion reports (PIRSA reference, cost).



- *Petroleum Services Directory South Australia* — published annually (free).
- *Holders of Petroleum Tenements. Sheet P1* — includes maps of, and interests in PELs, PPLs and PLs, produced quarterly (free).
- The *Petroleum Geology of South Australia* series. Volume 4 provides a comprehensive review of the petroleum geology of the Cooper Basin, published in 1998. The book costs \$195 plus \$25 p&p; a pdf file on CD-ROM costs \$100. Volume 2 covers the Eromanga Basin and the book costs \$50 plus \$25 p&p.
- *Cooper Basin Exploration Opportunity. Blocks CO98-A to K.* — acreage release brochure published in 1998 (free).

## Well Logs (Petlog)

This digital open hole well log database includes field and edit tapes, and higher resolution data including dipmeter, FMS (Formation Micro scanner), array sonic and VSP (Vertical Seismic Profile). These data are now available in a variety of formats and media including CD-ROM.

Digital data are available as:

- basic validated data as originally supplied, EDIT or FIELD processing, and
- fully verified and merged data, or data digitised from analogue source.

The cost of basic log data is derived from the cost of transfer – e.g. a special CD-Rom containing 100 selected Cooper Basin well logs costs \$100. Free quotes are provided for specialised orders and fully verified, merged or digitised data orders.

## Seismic Shotpoint Database

This is a comprehensive digital data set of shotpoint locations and associated attribute data from ~611 surveys carried out in the State and adjacent waters to latitude 40°S since 1955, totalling over 200 000 km. These data are maintained in ArcInfo where complex GIS analysis and modelling can be performed with other digital data sets. The index to these data and summary information are also available in PEPS.

Digital data are available for purchase in various formats on exabyte tape or diskette. Hard copy maps can be prepared for any area at any scale. As an example, the Cooper Basin Seismic Shotpoint database costs \$75 for approximately 80 000 km of seismic lines.

## Stack seismic data

Archive processed data in SEGY format are available for approximately 5000 seismic lines over the Cooper and Eromanga Basin area. In most cases 3 versions of data are available:

- Filtered Final
- Filtered Migration
- Raw Final for each line.

The stack seismic totals approximately 13 000 data files on 15 Exabyte Tapes. All data has had SP/CDP relationships embedded in the EBCIDIC header, and supporting attribute

data relating to the line and data files. A data index is also provided in spreadsheet form for each tape.

Stacked Cooper Basin seismic sections (SEG Y, approx 13 000 files) costs \$22 400.

## Seismic Mapping

A program commenced in 1989 to consolidate open file basic and interpreted data into coherent data sets. The aim was to prepare regional interpretations of basin structure in prospective basins. This program is nearing completion for the major onshore and large areas of the offshore basins, including the Otway, Eromanga, Cooper, Simpson and Pedirka Basins.

The SA Cooper Basin seismic mapping data package contains 54 digital datasets and costs \$23 900 for all datafiles.

## Cooper Basin Folio

This folio is the culmination of an extensive seismic and geological mapping and interpretation of the Cooper Basin and the overlying Eromanga Basin in SA:

- Volume 1 contains 39 maps including key seismic depth structure maps, formation isopachs and structural elements, infrastructure, licences, fields, wells and seismic line locations.
- Volume 2 contains 30 maps of geological datasets including lithofacies and maturity maps of key source intervals (depths to oil and gas windows).

All data are also available in digital format and are supplemented by individual technical reports available from PIRSA. Each volume of the folio in digital format (pdf) costs \$999, including postage and packing (if both volumes are purchased together a special price of \$1499 applies). In addition, gridded and contoured digital datasets of Volume 1 and Volume 2 maps (i.e. fully manipulative data) are available for \$23 900 and \$5000 respectively.

Hard copies cost \$1999 for each volume (if purchased together, a special price of \$2999 applies). Individual hard copy maps can be purchased from \$100 each and discounts are available if map sets are purchased.

## NGMA COOPER/EROMANGA PRODUCTS

### Regional seismic horizon maps

Regional time and depth datasets covering key Cooper Basin seismic horizons in SA and Queensland, and key Eromanga Basin horizons in SA, Queensland, NSW and the NT have been prepared as part of the National Geoscience Mapping Accord (NGMA) Project involving the above States and AGSO.

Digital grid files and digital contour files cost \$1800 each; individual hard copy colour fill contour maps cost \$200 each and sun shaded images cost \$600 each. A 50% discount applies to companies who have already purchased the SA Cooper and Eromanga Basin datasets.

### Cooper Basin Geohistory

An interactive CD-Rom Cooper-Eromanga Geohistory Report, which uses a display version of WinBury and Web Browser software to dynamically display model plots has been developed. It includes individual well model plots of geohistory, maturity, source rock generation and maps of

selected horizons which can be animated through time. In addition, cross sections showing palaeotemperature, maturity and source rock expulsion can be displayed and animated. The interactive Geohistory CD-Rom costs \$3000.

### **Organic geochemistry database**

A comprehensive organic geochemistry database (Oracle v7) has been developed during the NGMA Project. It includes company and government generated Rock Eval, TOC and Vitrinite Reflectance data for the Cooper and Eromanga Basins. The Oracle database (PC or Unix) costs \$9000, an ASCII file of data costs \$3000, available from AGSO.

### **Petroleum Tenements**

A free SA petroleum tenement brochure, including a listing of tenement, holder(s) and interests, expiry date and area, is released quarterly. In addition, up-to-date digital tenement data are available for free download from the PIRSA website.

All tenements granted, surrendered or cancelled are published in the SA Government Gazette issued weekly from the State Information Centre, 25 Grenfell St, Adelaide. These notices are also widely publicised in the business, investment and resources sectors of the local and international press, as well as by circulation to listed exploration companies, stockbrokers, etc.

## **OTHER PIRSA SERVICES**

### **Core Library**

Well samples obtained from company and departmental petroleum, stratigraphic and mineral exploration are stored at the PIRSA Core Library. Over 3 million metres of core and cuttings from 24 000 SA drillholes are currently stored. The Core Library is located at 23 Conyngham St, Glenside, approximately 3 km SE of the Adelaide CBD.

Viewing facilities are world class – the core layout area is fully enclosed with special lighting. All open file samples are available for inspection, in most cases sampling is permitted. 48 hours notice for a layout is required – there is no charge for viewing and sampling.

### **Aeromagnetic Database**

A digital database of aeromagnetic survey boundaries has been compiled and gives the location of all airborne surveys over SA and adjacent waters. Aeromagnetic survey digital data and hard copy maps are also available for purchase from PIRSA.

### **Digital Geological Maps Of SA**

#### **SA\_DISPLAY**

An integrated set of State-wide geological, geophysical, geochemical and groundwater databases brought together in GIS where they can be digitally overlain and interrogated. Available in ArcView and MapInfo formats.

#### **SA\_GEOLOGY**

A library of digital geological maps that provides detailed, up to date GIS coverages of the State's geology. Available in ASCII, ArcInfo, DXF, ArcView and MapInfo formats.

## **Miscellaneous Hardcopy Data**

PIRSA holds the largest collection of SA geoscientific literature, mining and exploration data, dating from the 1850s. Open file data comprises company exploration reports (including well completion and seismic reports), PIRSA report books, geophysical data including seismic sections, government publications, geoscientific maps, plans, publications and more.

The PIRSA Document Storage Centre is responsible for storing and copying all unpublished material. Copies may be ordered on paper, microfiche and transparency. The DSC strives to complete orders within two days.

### **Web Site**

To be kept up to date on what is happening in SA, why not visit our web site at:

<http://www.mines.sa.gov.au/petrol>

## **PETROLEUM DATA CONTACTS**

### **PEPS-SA® (attribute and spatial), core photos, well logs:**

Alan Sansome (Petroleum Data Manager)

Ph: 08 8463 3221 \*

[asansome@msgate.mesa.sa.gov.au](mailto:asansome@msgate.mesa.sa.gov.au)

### **Seismic data:**

Dave Cockshell

Ph: 08 8463 3233 \*

[dcockshell@msgate.mesa.sa.gov.au](mailto:dcockshell@msgate.mesa.sa.gov.au)

### **NGMA datasets**

Tony Hill

Ph: 08 8463 3214 \*

[ahill@msgate.mesa.sa.gov.au](mailto:ahill@msgate.mesa.sa.gov.au)

### **Petroleum Tenements**

Mario Collela

Ph: 08 8463 3209 \*

[mcollela@msgate.mesa.sa.gov.au](mailto:mcollela@msgate.mesa.sa.gov.au)

### **Core Library**

Brian Logan

Ph: 08 8379 9574

Fax 08 8338 1925

[blogan@msgate.mesa.sa.gov.au](mailto:blogan@msgate.mesa.sa.gov.au)

### **Digital Geological Maps Of SA**

Stephen Bell

Ph: 08 8463 3288

Fax 08 8463 3268

[sbell@msgate.mesa.sa.gov.au](mailto:sbell@msgate.mesa.sa.gov.au)

### **Aeromagnetic Database**

Dominic Calandro

Ph: 08 8463 3051

Fax 08 8463 3040

[dcalandro@msgate.mesa.sa.gov.au](mailto:dcalandro@msgate.mesa.sa.gov.au)

**Ordering copies of miscellaneous hardcopy data**

Peter Dunne

Ph: 08 8463 3003

Fax 08 8204 1880

pdunne@msgate.mesa.sa.gov.au

\* Fax 08 8463 3229

**DATA ORDER FORMS**

Two order forms for Cooper Basin data products and free PIRSA publications follow. Completed forms can be mailed to:

Petroleum Group

PIRSA

GPO Box 1671

ADELAIDE SA 5001

Or faxed to:

National (08) 8463 3229

International +(618) 8463 3229

NOTE: All prices herein are \$Australian.

## SELECTED COOPER BASIN DATA PACKAGES



**PRIMARY INDUSTRIES  
AND RESOURCES SA**

Product	Digital Data	Number Required	Hardcopy Data	Number Required
PIRSA Seismic Mapping (Cooper Basin) (total of 54 digital datasets)	\$23 900		—	
Cooper Basin Folio 1 (seismic) gridded & contoured datasets included in PIRSA Seismic Mapping product	* \$999		\$1 999	
Cooper Basin Folio 2 (geology)	* \$999		\$1 999	
Cooper Basin Folio 2 gridded and contoured datasets	\$5 000		—	
Cooper Basin Folios 1 & 2 (special offer)	* \$1 499		\$2 999	
Petroleum Geology of SA Volume 4 – Cooper Basin	—		\$195 p&p \$25	
Cd-rom version Petroleum Geology of SA Volume 4 – Cooper Basin (pdf file)	\$100		—	
Lineament associations in the Cooper Basin, basement controls on hydrocarbon distribution	—		\$75	
PEPS and MAPINFO Database (entire State)	\$3 000		—	
Selected Cooper Digital Well Logs CD-ROM	\$100		—	
Seismic Shotpoint Database – Cooper Basin only	\$75		\$100	
Stacked Seismic Sections (SEGY) - (approx 14000 files for Cooper Basin 2D seismic)	\$22 400		—	

\* = pdf file only, restricted data manipulation only (e.g. re-sizing)

I accept the following conditions of sale:

1. All data must be kept exclusively for the use of the purchaser/purchasing company and must not be transmitted, traded or sold to any third-party without the permission in writing of the CE, Primary Industries and Resources SA.
2. All efforts are made to record best possible data and to correct errors or omissions made known to PIRSA. However, PIRSA takes no responsibility for the consequence of errors or omissions in these data.

Customer signature: . . . . .

Total cost of order: \$Aust . . . . .

☐ I enclose a cheque ☐ Please invoice

Please charge my: ☐ Bankcard ☐ Mastercard ☐ Visacard

Cardholder's name: . . . . .

Expiry date: . . . . .

Cardholder's signature: . . . . .

Date: . . . . .

Name: . . . . .

Company: . . . . .

Address: . . . . .

. . . . .

Phone: . . . . .

Fax: . . . . .

Email: . . . . .



**ORDER FORM  
FREE  
PETROLEUM PUBLICATIONS AND  
COOPER BASIN REPORTS**



**PRIMARY INDUSTRIES  
AND RESOURCES SA**

Name: . . . . .  
 Company: . . . . .  
 Address: . . . . .  
 . . . . .  
 . . . . .  
 Phone: . . . . .  
 Fax: . . . . .  
 Email: . . . . .

Please mail me a copy of the following free publications and add me to the PIRSA Petroleum free mailing list:

Petroleum Exploration and Development in SA	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Quarterly SA petroleum tenement update	<input type="checkbox"/> YES	<input type="checkbox"/> NO
MESA Journal	<input type="checkbox"/> YES	<input type="checkbox"/> NO
SA petroleum industry services directory	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Cooper Basin acreage release brochures	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Cooper Basin gas economics report	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Cooper Basin undiscovered potential report	<input type="checkbox"/> YES	<input type="checkbox"/> NO
A guide to Cooper basement log picks	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Cooper99 Symposium Abstracts	<input type="checkbox"/> YES	<input type="checkbox"/> NO

## APPENDIX 3 – LICENCE APPLICATION FORM AND PROCEDURES

### Application

Although there is no form set by regulation, an application for a Petroleum Exploration Licence (PEL) may be lodged in accordance with the attached pro forma, and should be accompanied by two copies of a plan of the application area and accompanied by the prescribed fee (which is currently A\$ 2240 for each licence applied for).

An application can be made by one or more individuals or one or more companies or a combination of both. When a foreign company makes an application, the foreign company must be registered under the provisions of the Australian Corporations Law. Information on registration requirements can be supplied on request.

### Technical Qualifications/Experience

The applicant must submit with the application a summary of the technical qualifications of the applicant (or consultants/agents of the applicant) to satisfy requirements that the applicant is capable of satisfying compliance with the Petroleum Act and the terms and conditions of the licence.

### Financial Position

Evidence of the financial position of the applicant is to be supplied to demonstrate ability to fulfil the proposed work program and in particular, any 'guaranteed' portion of the program (see below). Such evidence can be in the form of the latest annual report or a verifiable statement from an independent accountant, auditor or financial institution. If financial resources are not available for the full five year program, the applicant will have to provide evidence that there are financial resources available for at least the guaranteed years, or if no guaranteed program, the first licence year program.

### Work Program

The applicant must submit with the application a statement of exploratory operations the applicant proposes to carry out in each year of the first five year term of each licence, including an estimate of exploration expenditure (in A\$) to be incurred in each year of the licence. Note that the program must be on a dry hole basis, and that appraisal drilling will not be counted towards the first five year work program bid.

#### *Guaranteed Program*

Applicants must state clearly if the program is guaranteed or not and also state which years will be guaranteed. The Petroleum Act provides that as a minimum the first year of the program is guaranteed. A guaranteed program is a firm commitment by the applicant regardless of circumstances ('force majeure' excepting). Failure to fulfil the work program for any year of the guaranteed program will, if a genuine 'force majeure' case is not proved, result in cancellation of the licence. Furthermore it may jeopardise future applications for petroleum exploration licences.

#### *Non-Guaranteed Program*

For those years of the program not guaranteed, once that licence year has been entered the licensee is obliged to carry out the work program stipulated. Variation of non-

guaranteed work programs are possible, however this would only generally be done where extraordinary cause exists, especially for a licence issued for which there were competing bids. In that case, variations below the next highest bids received at the time of award would not be approved, and may require partial relinquishment of the licence area.

### Award Criteria

The basic objective in awarding a Petroleum Exploration Licence is to select the work program most likely to achieve the fullest assessment of the petroleum potential within the licence over the initial 5 year licence term recognising the essential role of wells in the discovery of petroleum. Work program bids will be assessed taking account of the criteria listed below. The criteria for assessment of work programs, not necessarily in order of priority are:

- The number of exploration wells (dry hole basis) to be drilled, their timing and the anticipated exploration targets (i.e. Mesozoic, Permian, or Pre-Permian objectives).
- The amount and nature of seismic surveying to be carried out and its timing.
- The number of years that the applicant is willing to guarantee the work program.
- Other data acquisition and seismic reprocessing to be carried out.
- The extent that the wells proposed to be drilled are supported by adequate seismic or other geophysical techniques.
- The adequacy of financial resources and technical expertise available to the applicant.

In addition to the above criteria, where work program bids are similar, the benefits of the introduction of new explorers into the area (including intention with regard to establishing an office in SA) may be taken into account. It should be noted that there are no criteria limiting the number of PELs which may be offered to one applicant providing the applicant has adequate financial resources to complete all programs (although in considering Competition Policy Principles it would require major work program benefits to offer more than two PELs to the one applicant in the second round of bidding). There will be no consideration taken of the success of applicants in the various bidding rounds in selecting successful applicants. In the case of 'cascading bids' (i.e. multiple bids for an area by one applicant or joint venture) only the highest of the bids will be considered.

## PEL APPLICATION CHECKLIST

The following information must be included in the licence application:

1. Complete the attached PRO FORMA and include two copies of a plan of the application area.
2. PRO FORMA application must be signed by individual applicants and if the application is made by a consortium including a company(s) the application must be made under the company(s) seal.
3. If applicant is a foreign company, the company must be registered as a foreign company under the provisions of the Australian Corporations Law.
4. A summary of the technical qualifications of the applicant (or consultants/agents of the applicant).
5. Evidence of the financial position of the applicant to demonstrate ability to fulfil the proposed work program (i.e. the latest annual report or a verifiable statement from an independent accountant/auditor/financial institution).
6. A statement of exploratory operations the applicant proposes to carry out in each year of the five year term of the licence, including an estimate of exploration expenditure to be incurred in each year of the licence in A\$.
7. The prescribed fee for each licence applied for, made payable to Primary Industries and Resources South Australia. At writing the application fee was A\$2240, however all fees are scheduled to increase on 1 July each year. **It is recommended that you check the current fee with PIRSA prior to sending in your application.**
8. Please ensure the envelope(s) containing your application(s) are marked 'CONFIDENTIAL – PEL APPLICATION'.

**APPLICATION FOR  
PETROLEUM EXPLORATION LICENCE  
PETROLEUM ACT, 1940 (SECTION 7)**



**PRIMARY INDUSTRIES  
AND RESOURCES SA**

To the Chief Executive, Department of Primary Industries and Resources South Australia

I/We, . . . . .  
 . . . . .  
 . . . . .

hereby make application for the grant of a petroleum exploration licence in respect of the area described hereunder [please tick block(s) you are applying for]:

DESCRIPTION OF AREA			
Block	Tick here	Approximate area	
		km <sup>2</sup>	Acres (million)
CO99-A	<input type="checkbox"/>	594	146 659
CO99-B	<input type="checkbox"/>	617	152 342
CO99-C	<input type="checkbox"/>	651	160 889
CO99-D	<input type="checkbox"/>	767	189 536
CO99-E	<input type="checkbox"/>	1069	264 251
CO99-F	<input type="checkbox"/>	438	108 138

Please indicate Block(s) under application. Note each Block is offered as a separate licence and the application fee, while currently A\$ 2240 per licence, is subject to annual adjustment (the next proposed fee adjustment is 1 July 1999). Details in support of the application and the application fee of \$..... are attached (see Checklist).

. . . . .  
 . . . . .

Signature of applicants(s). Where application is made by a consortium including a company(s), the application must be made under the company(s) seal.

Dated this ..... day of ..... 1999

**CLOSING DATE 4.00 PM ON THURSDAY 25 NOVEMBER 1999**

**SEND APPLICATIONS MARKED 'CONFIDENTIAL – CONTAINS PEL APPLICATION' TO:**

Director, Petroleum Group  
 Primary Industries and Resources SA  
 Level 7  
 101 Grenfell St  
 Adelaide SA 5000  
 AUSTRALIA.  
 Phone: IAC 61 8 8463 3204  
 Facsimile: IAC 61 8 8463 3229



# SOUTH AUSTRALIA



Government  
of South Australia

# PETROLEUM

## OVERVIEW

**Earth Resources  
Information Sheet P4**



**PRIMARY INDUSTRIES  
AND RESOURCES SA**

# Overview

South Australia has a long history of petroleum exploration, extending back to 1866 when the first well was dug in the search for oil. The first commercial discovery of hydrocarbons in the State was Permian gas in the Cooper Basin in 1963, which has been piped to Adelaide for sale since 1969. Sydney has been supplied from this source since 1976. Gas was also discovered in the onshore Otway Basin of southeastern South Australia in 1987, and a pipeline servicing local markets was constructed in 1989.

Cooper Basin oil was discovered in the Tirrawarra Field in 1970, and Eromanga Basin oil in 1978 in the Strzelecki Field. In order to market oil and gas liquids, the Cooper Basin Liquids Project was initiated in 1980 and completed in 1984. This involved constructing a liquids pipeline from Moomba to a processing plant and storage and loading facilities at Port Bonython, 630 km to the southwest.

Apart from the Cooper and Otway Basins, the State has been only lightly explored for petroleum. Large areas of Neoproterozoic to Mesozoic sedimentary basins offer significant oil and gas potential.

Petroleum provides the majority of the State's primary energy needs; approximately half of its electricity is generated by gas. Two-thirds of all the gas and most of the liquid petroleum are supplied from the South Australian portion of the Cooper and Eromanga Basins.

The estimated average daily production in 1998 from the Cooper and Eromanga Basins was:

- sales gas  $14.2 \times 10^6 \text{ m}^3$  (0.5 bcf)
- crude oil and condensate 3816 kL (21 400 bbl)
- LPG 986 t (11 500 bbl).

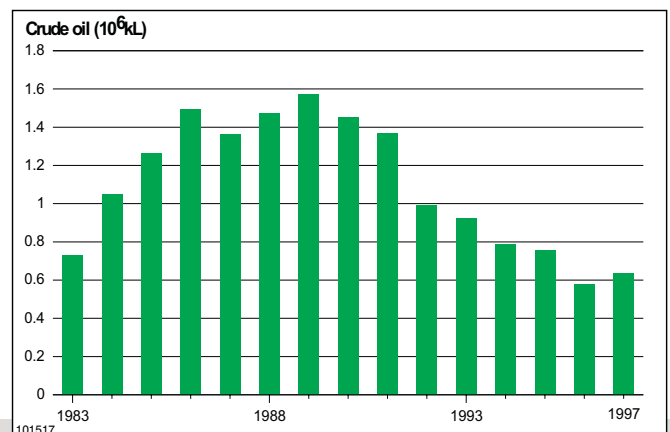
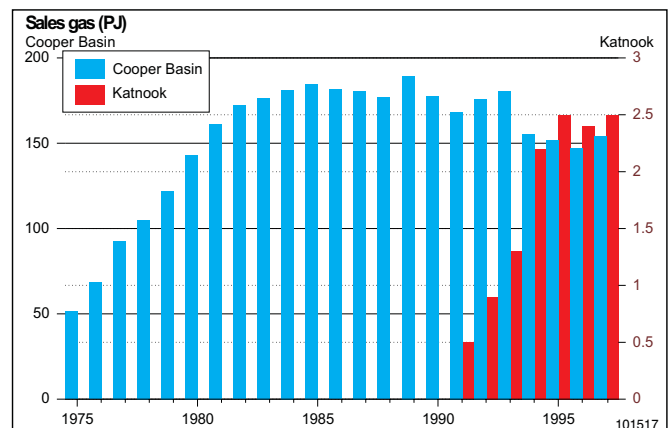
A small amount of gas (~2.5 PJ, 2.37 bcf) and carbon dioxide (27 112 t, 0.5 bcf) are produced annually from the Otway Basin.

## Petroleum geology

South Australia is situated between the ancient Archaean shield of Western Australia and the mobile orogenic belts of the Eastern States. As a result of this tectonic setting, the geological record in South Australia has preserved a unique history of sedimentation from the middle Precambrian to Ordovician, and from the Early Devonian to Tertiary.

Prospective sedimentary basins of South Australia may be subdivided into three groups based on their relative stratigraphic position:

- Basins of Mesozoic age which either overlie older intracratonic basins or are developed on the southern continental margin of Australia. Onshore, these include the Eromanga and Simpson Basins, and the Berri Basin (Renmark Trough area). Offshore are the Duntroon, Bight and Otway Basins, the last two of which extend onshore.
- Permo-Carboniferous to Early Triassic basins which overlie early Palaeozoic basins include the Cooper, Pedirka and Arkaringa Basins in northern South Australia, and the Troubridge, Nadda and Denman Basins to the south.
- Early Palaeozoic basins of Cambrian to Devonian age include the Warburton, Arrowie, Stansbury and



Officer Basins. These are underlain by extensive Neoproterozoic sediments which, where unmetamorphosed, may also be prospective for hydrocarbons.

The Cooper and Eromanga Basins, which span northeastern South Australia and southwestern Queensland, comprise Australia's largest onshore petroleum province. Permian and younger sedimentary basins beyond the main producing region contain similar non-marine sequences in intracratonic settings.

Continental margin basins on and offshore have very thick Cretaceous fill and include the Otway Basin, a proven gas province.

In several instances, mature source rocks for petroleum have been identified in lacustrine and marginal marine settings associated with reservoir sands. These occur not only in Permian and Cretaceous rocks but also in basins with thick Neoproterozoic to Ordovician clastics and carbonates with additional source potential in marine settings.

Exploration is ongoing in the producing region of the Cooper and Eromanga Basins and vigorous exploration effort is underway in the Otway Basin. Prospective basins elsewhere are underexplored and in some instances are frontier territory for modern exploration techniques.





## Infrastructure and markets

A total of 5090 km of pipeline have been laid to gas markets in South Australia and New South Wales, and to the liquids load out facility at Port Bonython. The Moomba plant processes raw gas into sales gas and has been designed to process  $25.4 \times 10^6 \text{ m}^3$  (902 mmcf) of raw gas and 6000 kL (42 000 bbl) of condensate and crude oil per day. Condensate, LPG, crude and some ethane are transported as a 'cocktail' via a pipeline to the Port Bonython liquids plant where they are separated and naphtha and crude oil are produced for export.

Another destination for Cooper-Eromanga crude oil and condensate is the refinery at Port Stanvac, south of Adelaide, which supplies petroleum products mainly for the South Australian market. The main products from here are LPG, solvents, motor gasoline, jet fuel, kerosene, diesel, lube oil base stocks, fuel oil and bitumen.

Ex-field natural gas prices in South Australia are freely negotiated between buyer and seller. Ex-Moomba plant natural gas prices from the Cooper Basin are currently in the order of A\$2.50 per gigajoule. As a consequence of the gas reform process in Australia, legislative and regulatory policy impediments to the free trade in gas are being removed, the rights of access to gas transmission and reticulation pipelines have been provided, and direct negotiations between consumers and producers facilitated. The desirability of a right of access to upstream facilities is currently being reviewed.

A free market exists for all oil and condensate produced in Australia. There is no restriction on imports or exports of crude oil or refined petroleum products. A similar regime applies for LPG. Markets for crude oil and condensate exist in South Australia and Australia, and low sulphur light crude oils find a ready domestic and overseas market.

Existing contracts with the South Australian and Queensland Cooper Basin Producers supply the State's needs in full until 2004, partial needs to 2013, and those of New South Wales until 2006. Demand in New South Wales is forecast to exceed current contracted quantities after 2001. The Australian Gas Association study of future Australian gas supplies and demand forecasts that gas reserves in southern and eastern Australia will be insufficient to supply market demand.



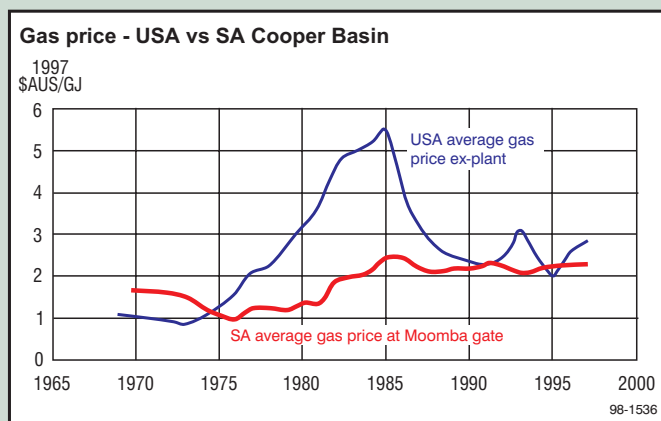


## Regulatory regime

Petroleum exploration and development are administered by the Petroleum Group, Primary Industry and Resources SA (PIRSA) under the *Petroleum Act 1940* (South Australia onshore), and the *Petroleum (Submerged Lands) Act 1967* (Commonwealth, offshore) and 1982 (South Australia offshore).

During 1999 it is intended that new legislation will replace the existing Petroleum Act 1940. The main thrust of the proposed legislation is to provide a modern, pro-competitive, efficient and flexible basis for administration of petroleum exploration and development. The objective is to establish a business environment that maximises investment opportunities for the exploration industry in the State and facilitates development of discoveries. The main features of the Bill are:

- establishment of a co-regulatory regime focusing on achievement of environmental, public safety and resource management objectives and reduced compliance costs
- licence allocation and management mechanisms to facilitate competition for acreage and in gas supply



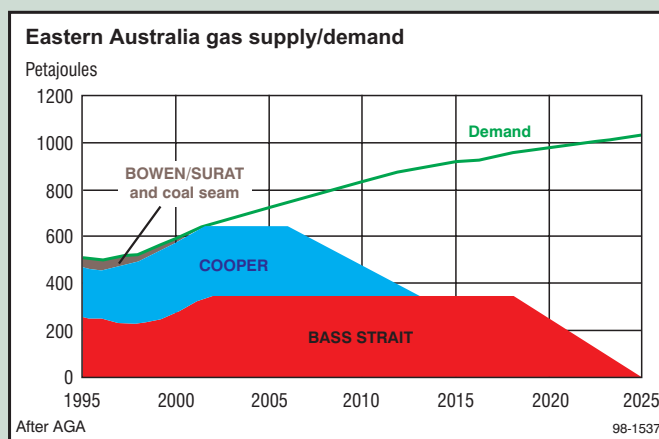
- rights of third-party access to licensed pipelines (where not covered by the national access regime), depleted reservoirs (for gas storage purposes) and pipeline easements
- greater security of tenure for licences through improved registration procedures
- consultation processes to establish environmental objectives and for significant proposed activities
- increased royalties from 2001 and a fee structure designed to encourage the adoption by industry of management systems to undertake their activities.



## Access to land

PIRSA Petroleum Group acts as a 'one stop shop' for explorers in obtaining any necessary environmental approvals on the occasions when they are required from other Government Departments. Onshore and offshore tenement applications, approvals to conduct field operations etc. are first submitted to PIRSA, which arranges distribution to the other relevant Government agencies for comment and then issues the necessary approvals. Petroleum Group staff are available to assist licensees prepare the necessary paperwork.

In 1986, the Government determined that it was necessary to consider the principle of multiple land use to reconcile any conflict between the aims of conservation, agricultural interests and exploration for, and development of, subsurface petroleum and mineral resources. A Regional Reserve classification was created under amendments in 1987 to the *National Parks and Wildlife Act 1972* specifically for the purpose of conservation while at the same time permitting the utilisation of the petroleum and other resources of the reserve. A good example of this is the Innamincka Regional Reserve which, with the full cooperation of the operator and partners, now covers much of the productive area of the Cooper Basin.





PIRSA Petroleum Group is currently introducing an objective-based co-regulatory approach to the regulation of the upstream petroleum industry. This marks a move away from prescriptive regulation and the pre-existing 'command and control' regime. There will still be inspection of field operations, including audits by PIRSA inspectors and authorised persons. The co-regulatory approach requires a change in both culture and method. Successful implementation of the new regime will reduce compliance costs and deliver better environmental outcomes.

Following passage of the *Commonwealth Native Title Act 1993*, effective from 1 January 1994, petroleum exploration and production licences continue to be issued over land over which Native title rights have been extinguished on the advice of the Crown Solicitor. In 1995, a 'safety net' clause was introduced into the South Australian Petroleum Act under which a licensee may seek an agreement with the Minister for a first right to any licence which may be terminated due to no fault of the licensee.

In December 1998, legislation was tabled in State Parliament to introduce a Native title right to negotiate regime into the Petroleum Act. This regime is designed to be simple and more flexible than that under the equivalent Commonwealth legislation. It will provide the opportunity for upfront negotiation of conjunctive agreements (i.e. covering both exploration and production) as well as umbrella authorisations (including a number of different licencees over a defined area of land).

Licence holders are encouraged to develop a dialogue with regard to Aboriginal heritage and related matters with Aboriginal people having associations with their licence area.

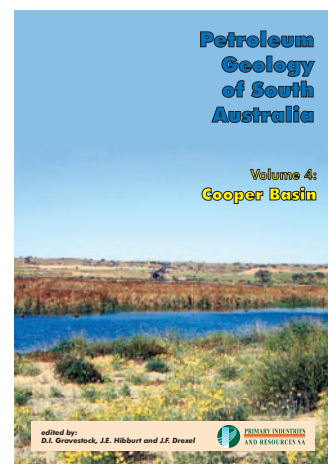
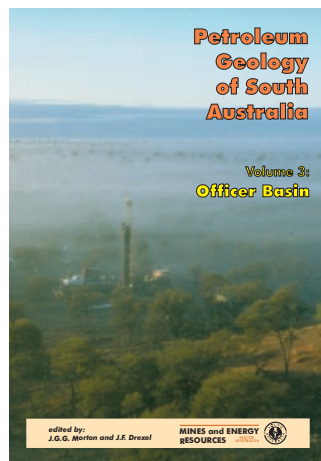
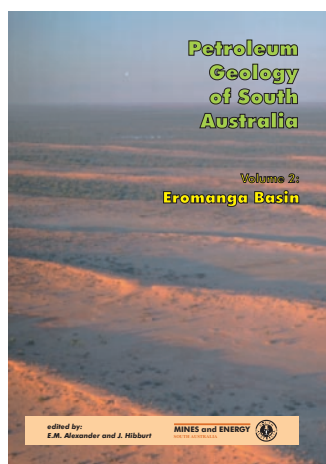
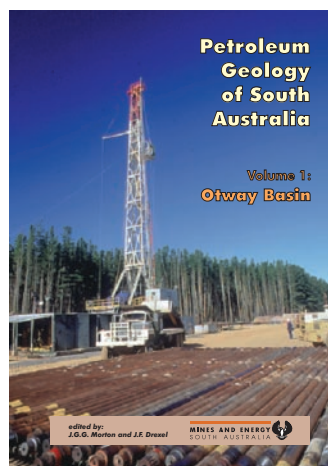
## Access to data

Extensive databases of petroleum information are held by PIRSA Petroleum Group and are readily available and accessible to the public and private sector in digital and hardcopy format. All basic technical data obtained by a licensee in an exploration licence are placed on open file two years after acquisition onshore, and two years after data were furnished for offshore. For production licences, basic data are released five years after acquisition onshore, and one year after offshore data are furnished.

PIRSA provides a 'one stop shop' for the industry and is ready and able to quickly provide data and expert advice to the explorer. A digital attribute and spatial database is available (Petroleum Exploration and Production System – South Australia, PEPS-SA<sup>®</sup> or PEPS<sup>®</sup>) which contains details of all wells drilled, seismic surveys, production statistics etc. In addition, extensive digital data sets and maps of key seismic horizons in the Cooper–Eromanga and Otway Basins are now available.

Publications summarising information on petroleum in South Australia include:

- *Petroleum Exploration and Development in South Australia* — a comprehensive summary of the State's petroleum industry, published every two years.
- *Petroleum Services Directory South Australia* — published annually.
- Acreage release brochures — produced as required for South Australian acreage releases.
- *Earth Resources Information Sheet P1: Holders of Petroleum Tenements* — produced quarterly.
- The *Petroleum Geology of South Australia* Series. Each of these volumes provides a comprehensive review of the petroleum geology of one of the State's producing and prospective basins. Vol. 1, Otway Basin (1995); Vol. 2, Eromanga Basin (1996); Vol. 3, Officer Basin (1997); and Vol. 4 Cooper Basin (1998) are available now. The Bight–Duntroon Basin volume is scheduled for release in 1999, and Cambrian basins (Warburton, Arrowie and Stansbury) in 2000.



## Petroleum Geology of SA Series

## MORE ABOUT SOUTH AUSTRALIA

South Australia combines competitive cost, skill and infrastructure advantages with an exceptional quality of life. It is strategically located at the convergence of the nation's road, rail and air transport linkages. The State is an ideal location for national and international investment and business ventures. Its major strengths are:

- strategic location on the Asia-Pacific rim
- well developed modern industry
- competitive business costs
- advanced research and development base
- highly skilled and productive workforce
- successful collaboration between industry, government and universities
- high quality of living.

Area	984 377 km <sup>2</sup> (385 000 square miles)
Capital city	Adelaide (population 1.08 million)
State population	1.5 million
Main language	English
State founded	1836

### Climate

January–February (summer) mean max.	29°C (84°F)
July (winter) mean max.	15°C (59°F)
Adelaide average annual rainfall	585 mm (23 inches)

### Major exports —

#### selected commodities 1996–97

	(\$ million)
Cereals and cereal preparations	745
Motor vehicles, parts, accessories	656
Metals and metal products	542
Wine	398
Machinery	379
Wool and sheepskin	261
Meat and meat preparations	182

### Total exports per year \$5 billion

### Major markets —

#### percentage of total exports

Asia	41
Europe	13
New Zealand	8
United States	14
Rest of world	24

### Time zones

London — 9.5 hours behind Adelaide  
Houston — 15.5 hours behind

## Doing business in South Australia

South Australia offers exceptional value and advantages to businesses setting up operations in the State. In 1998, the State Government commissioned a major competitive study which assessed South Australia and Adelaide with comparable locations in the United States, Asia and United Kingdom. Some of the results are listed below:

### Business climate

- lower taxes and charges
- industrial harmony
- government assistance to potential investors
- fast-tracking of projects.

### Management and labour costs

- highly educated, multi-lingual and skilled workforce
- competitive labour and management costs
- low on-costs
- enterprise agreements in place
- cost competitive on professional service providers, e.g. legal, insurance.

### Construction advantages

- well located
- inexpensive flat land (highly cost-competitive within Australia)
- easy access to all transport links
- average three months planning and building approval time
- building completion costs are amongst the most competitive of all the advanced industrial countries.

### Factory and office rental

- some of the lowest commercial rents in Australia
- further regional advantages.

### Lower energy costs

- competitive electricity and gas prices.

### For more information on petroleum in South Australia contact:

Petroleum Group  
Primary Industries and Resources SA  
Level 7, 101 Grenfell St  
ADELAIDE  
SOUTH AUSTRALIA

GPO Box 1671  
ADELAIDE SOUTH AUSTRALIA 5001

Ph: +61 8 8463 3204  
Fax: +61 8 8463 3229

Email: [petrdata@msgate.mesa.sa.gov.au](mailto:petrdata@msgate.mesa.sa.gov.au)

Website: [www.mines.sa.gov.au/petrol](http://www.mines.sa.gov.au/petrol)

## PETROLEUM



Government  
of South Australia

**Earth Resources  
Information Sheet P5**



**PRIMARY INDUSTRIES  
AND RESOURCES SA**

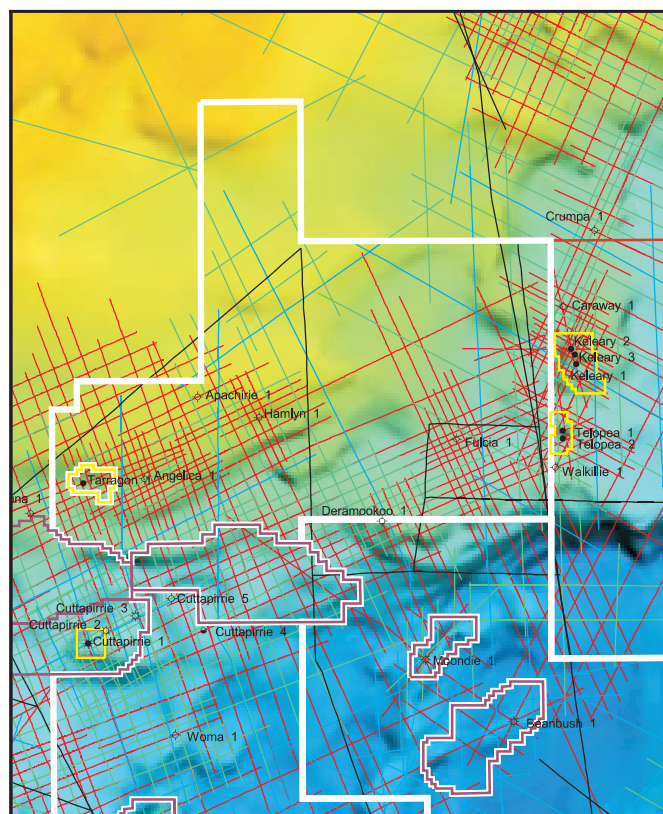


# Data

South Australia has a long history of petroleum exploration, extending back to 1866, when the first well was dug in the search for oil. The discovery of Permian gas in the Cooper Basin in 1963 was the first commercial discovery of hydrocarbons in the State. By 1969 gas was being piped to Adelaide for sale, and during 1971 an agreement was signed by the Cooper Basin Producers to supply gas for the New South Wales market and a pipeline was constructed linking Moomba and Sydney. Gas was also discovered in the onshore Otway Basin in 1987 and in 1989 a pipeline servicing local markets was constructed.

The first oil was discovered in the Cooper Basin in 1970, Eromanga Basin oil was discovered in 1978. In order to market newly discovered oil and existing gas liquids, the Cooper Basin Liquids Project was initiated in 1980 and involved the construction of a liquids pipeline from Moomba to a processing plant at Port Bonython.

Apart from the Cooper and Otway Basins, the onshore part of the State and offshore basins are only lightly explored for petroleum. Large areas of SA's Neoproterozoic to Mesozoic sedimentary basins offer significant oil and gas potential.



## Petroleum data

Extensive databases of petroleum information are held by PIRSA, and are readily available and accessible to the public and private sector in digital and hardcopy format. All basic technical data obtained by a licensee in an exploration licence are required to be submitted to PIRSA as part of licence commitments. These data are held confidential for two years after acquisition for PEL (Petroleum Exploration Licences) and for five years for PPL (Petroleum Production Licences), after which data are placed on open file. For offshore EPP (Exploration Permit for Petroleum), data are held confidential for two years after furnished, and for offshore Production Licences for Petroleum (PLPs) one year after. Basic data comprises well completion reports, well logs, core and fluid analyses, seismic acquisition and processing reports, seismic record sections, survey data, field and processed tapes and production data.

The Department provides a 'one stop shop' for industry and is ready and able to quickly provide data and expert advice to the explorer. A digital database is also available (PEPS-SA<sup>®</sup>) which contains details of all wells drilled, seismic surveys, production statistics etc. In addition, extensive digital data sets and maps of key seismic horizons in the Cooper, Eromanga and Otway Basins are now available.

## Publications

Publications summarising information on petroleum in South Australia include:

- *Petroleum Exploration and Development in South Australia* — a comprehensive summary of the State's petroleum industry, published every two years.
- *Petroleum Services Directory South Australia* — published annually.





- Acreage release brochures — produced as required for South Australian acreage releases.
- *Earth Resources Information Sheet P1: Holders of Petroleum Tenements* — produced quarterly.
- The *Petroleum Geology of South Australia* series. Each of these volumes provides a comprehensive review of the petroleum geology of one of the State's producing and prospective basins. Vol. 1, Otway Basin (1995); Vol. 2, Eromanga Basin (1996); Vol. 3, Officer Basin (1997); and Vol. 4 Cooper Basin (1998) are available now. The Bight–Duntroon Basin volume is scheduled for release in 1999, and Cambrian basins (Warburton, Arrowie and Stansbury) in 2000.

### PEPS-SA® (attribute database)

PEPS-SA (Petroleum Exploration and Production System — South Australia) is a pc-based comprehensive relational database containing a wide range of technical data relevant to the petroleum industry. PEPS-SA is being continually developed and is available for purchase. The key data element is the petroleum well, of which there are ~1600 in South Australia. For each well there may be thousands of attributes. There are eight key modules comprising 99 data sets:

**Engineering** Well abandonments, casing details, formation tests (open and closed), liquid evaluation tests, perforations, treatments, well tests.

**Geology** Core analyses, cores (including core photograph thumbnails), cuttings, formation tops, hydrocarbon bulk composition, palynology, Rock-Eval, aromatic and saturated hydrocarbon analyses, source rock extracts, thin sections, vitrinite reflectance.

**Geophysics** Available seismic exabyte tapes (including raw field data and processed data), seismic lines, seismic sections, seismic survey reports, seismic survey summaries, surveys and lines, synthetic seismograms, seismic survey marks, seismic analog tapes.

**Log data** Index to log paper prints, index of digital logs, log codes, log headers and bottom hole temperatures.

**Miscellany** Petroleum Act, Petroleum Regulations. Statistics on exploration expenditure, consumer price index, crude oil prices, gas pricing, gas sales, liquid sales, petroleum royalties, raw gas production, seismic surveys, wells drilled annually.

**Production** Crude oil production, crude oil test data, oil field reservoir data, enhanced oil recovery gas injection volumes, raw gas production, raw gas deliverability, gas field reservoir data.

**Production graphs** Production history (gas, oil), decline curves (gas, oil), completions (gas, oil), water ratio (gas), water ratio history (gas), average gas rates (gas), gas rate history (gas), completion days (gas, oil), oil cut decline (oil), oil cut history (oil), average oil rates (oil), oil rate history (oil), monthly production versus cumulative (gas, oil).

**Tenements** PEL, PPL, PL and pipeline details.

**Wells** Basic well data (latitude, longitude, TD, KB, status, classification etc.), well completion reports (reference, cost).

Data are supplied with a PEPS-SA menu-driven windows system. For clients without Paradox, a copy of Paradox Runtime and software to query and export the data are provided.

### PEPS-SA® (Spatial database)

Bundled with the attribute data are MapInfo spatial data sets. Viewing these data in a mapping package allows the geoscientist to spatially view data sets, to turn on and off various layers of interest, and zoom in and out etc., to allow the generation of custom-built base maps which can be printed.

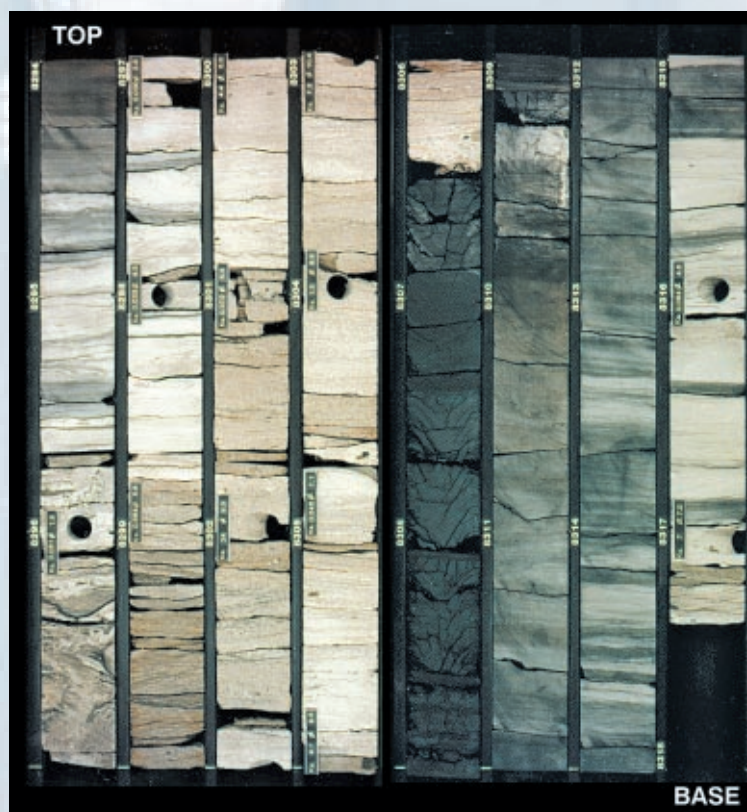
There are more than 60 separate layers, ranging from general topographic data such as State boundaries, coastline, national parks and restricted areas, road, railways and various tenements, through to geotechnical layers such as basin outlines, well locations, seismic lines, seismic horizons, tectonic provinces, and many more.

The PEPS-SA attribute and spatial databases are bundled together as one package on CD-ROM, priced at \$3000. Twice-yearly updates of PEPS-SA cost an additional \$300/year.

### Core photos

PIRSA has recently scanned all petroleum core photographs and the thumbnail images are included with the CD-ROM data package. Full-size images at ~1500 x 1000 pixels by 256 colours are also available. The total set contains over 1900 images (1.4 Gigabytes).

The Core Photo CD-ROM set (three disks) is priced at \$250, and includes viewing software which links the photo to the attribute data. A special discount of 50% is available for Tertiary academic institutions.



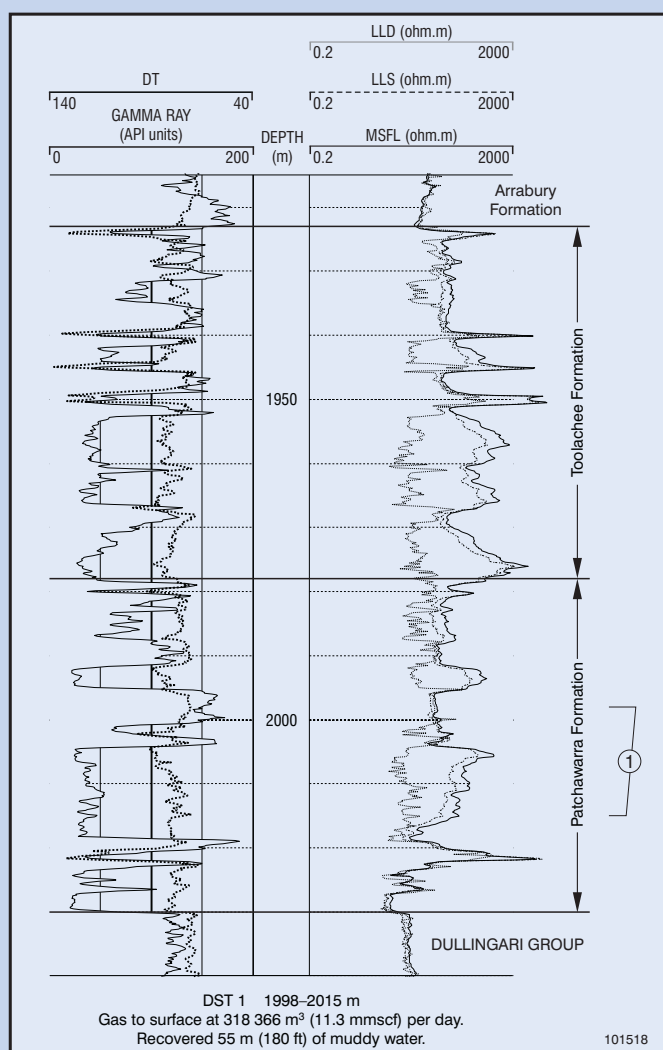
## Well logs (Petlog)

This digital open-hole well log database includes field and edit tapes, and higher resolution data including dipmeter, FMS (Formation Microscanner), array sonic and VSP (Vertical Seismic Profile). These data are now available in a variety of formats and media including CD-ROM.

Digital data are available as:

- basic validated data as originally supplied, EDIT or FIELD processing
- fully verified and merged data, or data digitised from an analogue source.

The cost of basic log data is derived from the cost of transfer, for example a special CD-ROM containing 100 selected Cooper Basin well logs costs \$100. Free quotes are provided for specialised orders and fully verified, merged or digitised data orders.



## Seismic Shotpoint Database

This comprehensive digital data set of shotpoint locations and associated attribute data from ~610 surveys carried out in the State and adjacent waters to latitude 40°S since 1955 totals over 200 000 km. These data are maintained in ArcInfo where complex GIS analysis and modelling can be performed with other digital data sets. The index to these data and summary information are also available in PEPS.

Digital data are available for purchase in various formats on Exabyte tape or diskette. Hardcopy maps can be

prepared for any area at any scale. As an example, the Cooper Basin Seismic Shotpoint Database costs \$75 for ~80 000 km of seismic lines.

## Seismic field data

As a service to the oil industry, field tapes for all recently recorded (1974+) digitally recorded onshore seismic surveys have been transcribed to a de-multiplexed SEG Y format and are now available on Exabyte Tape. All associated field support data necessary for reprocessing the field tapes are also available.

The price per line in \$10.

## Hardcopy seismic sections

The entire collection of 29 300 hardcopy seismic sections held by PIRSA are now fully indexed and catalogued with key attribute data such as date of processing, form of processing, scale and length. Access to this catalogue is available through PEP-SA and now facilitates a fast turnaround on data orders. Copying costs are \$5 per metre for paper.

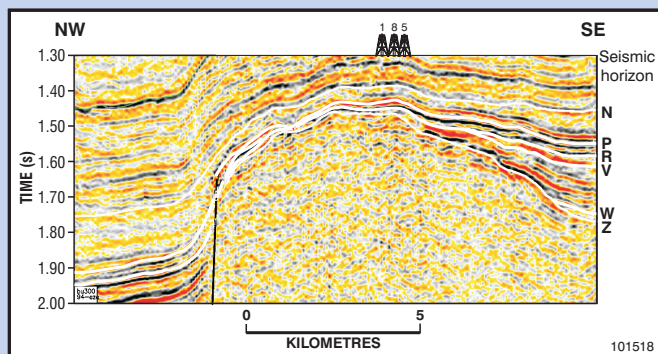
More recently, these processed sections are being submitted in a CGM digital format by exploration companies and are available on Exabyte tape at \$10 per file.

## Digital processed seismic data

Archive processed data in SEG Y format are available for ~5000 seismic lines over the Cooper and Eromanga Basin area. In most cases, three versions of data are available: filtered final, filtered migration and raw final for each line.

The stack seismic totals ~13 000 data files on 15 Exabyte tapes. All data have had SP/CDP relationships embedded in the EBCIDIC header, and supporting attribute data relating to the line and data files. A data index is also provided in spreadsheet form for each tape.

Stacked Cooper Basin seismic sections (SEG Y) costs \$24 000. Extensive data from other areas in the State are also available.



## Seismic mapping

A program commenced in 1989 to consolidate open file basic and interpreted data into coherent data sets. The aim was to prepare regional structural interpretations in prospective basins. This program is nearing completion for the major onshore and large areas of the offshore basins, including the Otway, Eromanga, Cooper, Simpson and Pedirka.

The South Australian Cooper Basin seismic mapping data package contains 54 digital data sets, and costs \$23 900 for all data files.



## Cooper Basin Folio

This folio is the culmination of an extensive seismic and geological mapping and interpretation of the Cooper Basin and the overlying Eromanga Basin in South Australia.

- Volume 1 of the Cooper Basin Folio contains 39 maps including key seismic depth structure maps, formation isopachs and structural elements as well as infrastructure, licences, fields, wells and seismic line locations.
- Volume 2 contains 30 maps of geological data sets including lithofacies maps and maturity maps of key source intervals (depths to oil and gas windows).

All data are also available in digital format and are supplemented by individual technical reports available from PIRSA. Each volume of the folio in PDF format costs \$999, including postage and packing (if both volumes are purchased together a special price of \$1499 applies). In addition, gridded and contoured digital data sets of Volume 2 maps (fully manipulative data) are available for \$5000.

Hardcopies cost \$1999 for each volume (a special price of \$2999 applies if purchased together). Individual hardcopy maps can be purchased from \$100 each, and discounts are available if map sets are purchased.

## NGMA Cooper–Eromanga products

### Regional seismic horizon maps

Regional time and depth data sets covering the key Cooper Basin seismic horizons in South Australia and Queensland, and key Eromanga Basin horizons in South Australia, Queensland, New South Wales and the Northern Territory have been prepared as part of the National Geoscience Mapping Accord (NGMA) Project involving the above States and AGSO.

Digital grid files and digital contour files cost \$1800 each; individual hardcopy colourfill contour maps cost \$200 each and sun-shaded images cost \$600 each. A 50% discount applies to companies who have already purchased the South Australian Cooper and Eromanga Basin data sets.

### Cooper Basin geohistory

An interactive CD-ROM Cooper–Eromanga Geohistory Report, which uses a display version of Winbury and Web Browser software to dynamically display model plots, has been developed. It includes individual well model plots of geohistory, maturity, source rock generation and maps of selected horizons which can be animated through time. In addition, cross-sections showing palaeotemperature, maturity and source rock expulsion can be displayed and animated. The interactive Geohistory CD-ROM costs \$3000.

### Organic geochemistry database

A comprehensive organic geochemistry database (Oracle version 7) has been developed during the NGMA Project. It includes company and government-generated Rock Eval, TOC and Vitrinite Reflectance data for the Cooper and Eromanga Basins. The Oracle database (PC or Unix) costs \$9000; an ASCII file of data costs \$3000.

## Petroleum tenements

A free petroleum tenement brochure, including a listing of tenement, holder(s) and interests, expiry date and area, is released quarterly. In addition, up-to-date digital tenement data are available for free download from the PIRSA website.

All tenements granted, surrendered or cancelled are published in the South Australian Government Gazette issued weekly from the State Information Centre, 25 Grenfell Street, Adelaide. These notices are also widely publicised in the business, investment and resources sectors of the local and international press, as well as by circulation to listed exploration companies, stockbrokers, etc.

## Other data services

### Core library

Well samples obtained from company and Departmental petroleum, stratigraphic and mineral exploration are stored at the PIRSA Core Library. Over 3 million metres of core and cuttings from 24 000 South Australian drillholes are currently stored.

Viewing facilities are world class — the core layout area is fully enclosed with special lighting. All open file samples are available for inspection and in most cases sampling is permitted. Forty-eight hours notice for a layout is required but there is no charge for viewing and sampling.

The Core Library is located at 23 Conyngham Street, Glenside.

### Aeromagnetic Database

A digital database of aeromagnetic survey boundaries provides the location of all surveys over South Australia and adjacent waters. Aeromagnetic survey digital data and hardcopy maps are also available for purchase from PIRSA.

### Digital geological maps of South Australia

#### SA\_DISPLAY

SA\_DISPLAY is an integrated set of State-wide geological, geophysical, geochemical and groundwater databases brought together in GIS where they can be digitally overlain and interrogated. It is available in ArcView and MapInfo formats.

#### SA\_GEOLOGY

SA\_GEOLOGY is a library of digital geological maps that provides detailed, up to date GIS coverages of the State's geology. It is available in ASCII, ArcInfo, DXF, ArcView and MapInfo formats.

### Miscellaneous hardcopy data

PIRSA holds the largest collection of South Australian geoscientific literature, and mining and exploration data, dating from the 1850s. The data comprise open file company exploration reports (including well completion and seismic reports), PIRSA open file report books, geophysical data including seismic sections, government publications, geoscientific maps, plans and more.

The PIRSA Document Storage Centre is responsible for storing and copying all unpublished material. Copies may be ordered in paper, microfiche and transparency media. The centre strives to complete orders within two days.

## The future

The South Australian Government fully recognises that its mineral and petroleum resources have the potential to make a significant contribution to the State's growth. The Government intends to work closely with industry and community groups to ensure that this potential is fully realised. Investment in the Targeted Exploration Initiative South Australia (TEISA) is a clear example of this commitment. The total allocation in the first year of TEISA (1998–99) is \$3.19 million for mineral and petroleum projects.

A major petroleum data project, funded by TEISA, to scan and provide on-line access to reports and other hardcopy data, will be completed in 2002. Well completion, seismic and other technical reports, seismic survey data and the petroleum licence register will all be scanned and made progressively available on CD-ROM. Petroleum projects for the first year of TEISA are provided in Table 1.

**Table 1** Petroleum projects for the first year of TEISA.

Project	First year cost	Description
Petroleum data archiving	\$400 000	Report scanning and on-line data access pilot
Cooper Basin	\$250 000	Source, migration, Warburton Basin reservoirs, seals, undiscovered resources, marketing
NCPGG* Chair	\$100 000	Professorship in petrophysics focusing on bypassed pay (especially Cooper Basin) plus South East Asian opportunities
Cambrian basins	\$90 000	Officer Basin mapping, Stansbury Basin reservoirs, Arrowie Basin gravity survey, biostratigraphy
Adelaide Plains gas storage	\$60 000	Seismic survey
Otway Basin	\$40 000	Stratigraphy, prospect inventory

\* National Centre for Petroleum Geology and Geophysics, University of Adelaide.

## Web site

To be kept up to date with what is happening in South Australia, visit our web site at <http://www.mines.sa.gov.au/petrol>

*Note: All prices listed in this brochure are in \$Australian.*

## PETROLEUM DATA CONTACTS

### PIRSA Petroleum Group

Street address:

Level 7, 101 Grenfell ST  
ADELAIDE  
SOUTH AUSTRALIA

Postal address:

GPO Box 1671  
ADELAIDE 5001  
SOUTH AUSTRALIA

General petroleum contact numbers:

ph: +61 8 8463 3204

fax: +61 8 8463 3229



### PEPS-SA® (attribute and spatial), core photos, well logs

Alan Sansome (Petroleum Data Manager)

ph: (08) 8463 3221

e-mail: [asansome@msgate.mesa.sa.gov.au](mailto:asansome@msgate.mesa.sa.gov.au)

### Seismic data

Dave Cockshell

ph: (08) 8463 3233

e-mail: [dcockshell@msgate.mesa.sa.gov.au](mailto:dcockshell@msgate.mesa.sa.gov.au)

### NGMA data sets

Tony Hill

ph: (08) 8463 3214

e-mail: [ahill@msgate.mesa.sa.gov.au](mailto:ahill@msgate.mesa.sa.gov.au)

### Petroleum tenements

Mario Collela

ph: (08) 8463 3209

e-mail: [mcollela@msgate.mesa.sa.gov.au](mailto:mcollela@msgate.mesa.sa.gov.au)

### Core Library

Brian Logan

ph: (08) 8379 9574, fax: (08) 8338 1925

e-mail: [blogan@msgate.mesa.sa.gov.au](mailto:blogan@msgate.mesa.sa.gov.au)

### Digital Geological Maps of South Australia

Stephen Bell

ph: (08) 8463 3288, fax: (08) 8463 3268

e-mail: [sbell@msgate.mesa.sa.gov.au](mailto:sbell@msgate.mesa.sa.gov.au)

### Aeromagnetic Database

Domenic Calandro

ph: (08) 8463 3051, fax: (08) 8463 3040

e-mail: [dcalandro@msgate.mesa.sa.gov.au](mailto:dcalandro@msgate.mesa.sa.gov.au)

### Ordering copies of miscellaneous hardcopy data

Peter Dunne

ph: (08) 8463 3003, fax: (08) 8204 1880

e-mail: [pdunne@msgate.mesa.sa.gov.au](mailto:pdunne@msgate.mesa.sa.gov.au)



# Earth Resources Information Sheet

P1

## HOLDERS OF PETROLEUM TENEMENTS

Current as at 1 July 1999

### EXPLORATION TENEMENTS

#### ONSHORE: PETROLEUM EXPLORATION LICENCE (PEL)

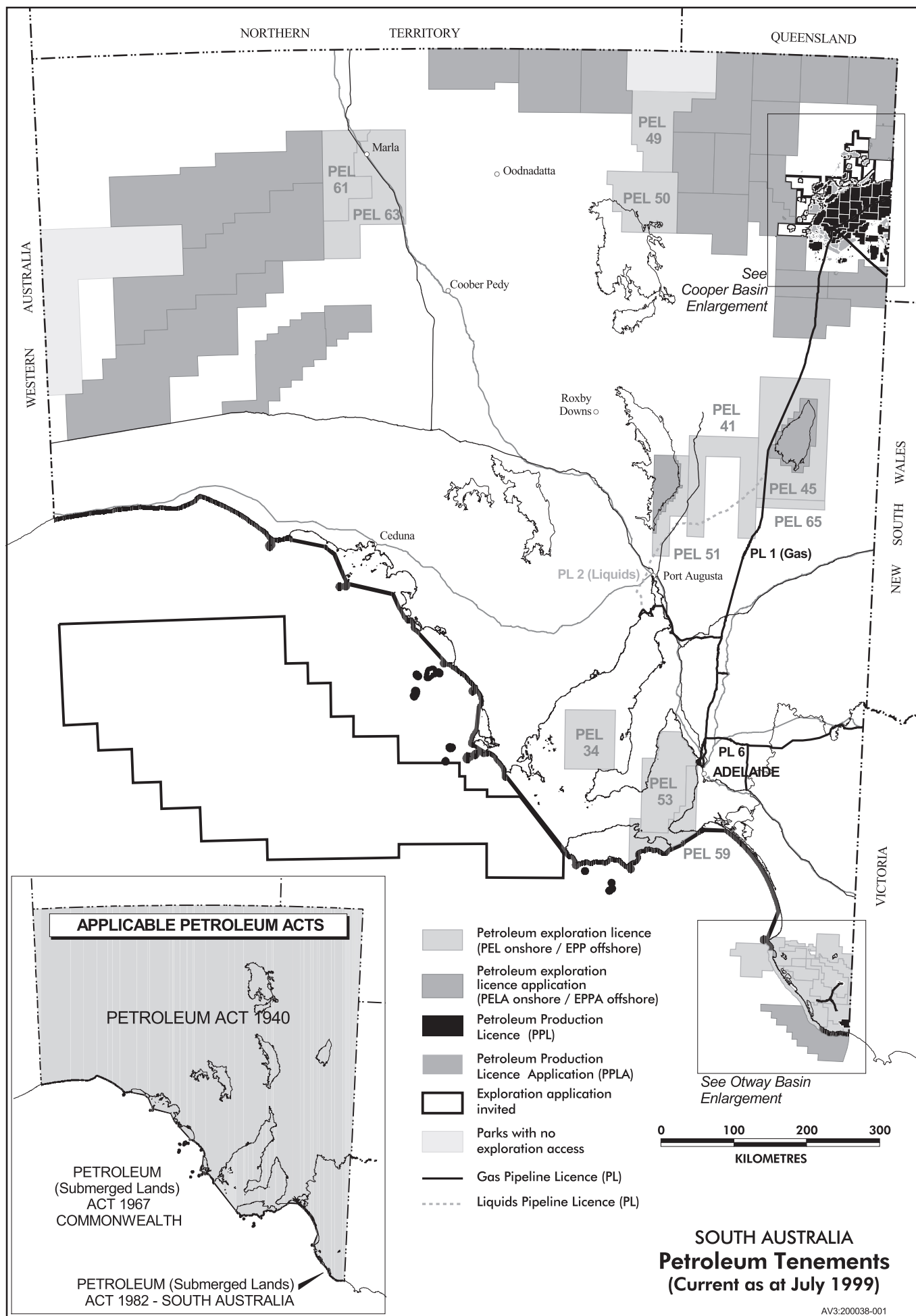
		Interest %	Expiry date	Area (km <sup>2</sup> )	Minimum area to be relinquished upon renewal (km <sup>2</sup> )
27	Oil Company of Australia Ltd	66.667	30/07/99	1080	848
	Basin Oil NL	27.778			
	Cultus Petroleum (Australia) NL	5.555			
32	Sagasco Southeast Inc.	35.7143	18/02/2000	1 116.23	576.25
	Omega Oil NL	24.2857			
	Boral Energy Resources Ltd	20			
	Basin Oil NL	15			
	Cultus Petroleum (Australia) NL	5			
34	Nerdlihc Co. Inc.	100	27/06/2000	5 597	Final Renewal
+39	Basin Oil NL	91.25	9/11/99	672	231.75
	Cultus Petroleum (Australia) NL	8.75			
41	Frontier Exploration Ltd	100	18/02/2000	7 911	3 957.25
45	Beach Petroleum NL	30	28/08/99	11 785	2 946.25
	Claremont Petroleum NL	30			
	Oakman Pty Ltd	20			
	J.F. Allender	20			
*49	Felstea Pty Ltd	100	30/06/96	6 873	2 303.25
*50	Felstea Pty Ltd	100	30/06/96	7 285	2 428.50
51	Beach Petroleum NL	30	28/08/99	2 667	666.75
	Claremont Petroleum NL	30			
	Oakman Pty Ltd	20			
	J.F. Allender	20			
*53	Wagner (Australia) Ltd	35	3/12/95	7 198	2 534
	Brown (Australia) Ltd	35			
	Forcenergy International Inc.	25			
	BET Australia, LLC	5			
57	Lakes Oil NL	70	17/11/2001	772	262
	Victoria Petroleum NL	10			
	Cultus Petroleum (Australia) NL	10			
	Mirboo Ridge Pty Ltd	10			
*59	Wagner (Australia) Ltd	35	30/03/98	4 129	1 032.25
	Brown (Australia) Ltd	35			
	Forcenergy International Inc.	25			
	BET Australia, LLC	5			
+60	Oil Company of Australia Ltd	62.5	10/08/99	1 069	267.25
	Cultus Petroleum (Australia) NL	25			
	Todd Petroleum Australia Ltd	12.5			



		<b>Interest %</b>	<b>Expiry date</b>	<b>Area (km<sup>2</sup>)</b>	<b>Minimum area to be relinquished upon renewal (km<sup>2</sup>)</b>
61	Hemley Exploration Pty Ltd	100	22/05/2001	6 258	1 564.5
62	Lakes Oil NL	50	2/11/2000	1 407	505.75
	Sun Resources NL	50			
63	Hemley Exploration Pty Ltd	100	22/05/2001	10 930	2 732.5
65	Matthew Reilly	100	26/10/2000	1 227	306.75
66	Boral Energy Resources Ltd	70	17/06/2001	1 234	308.5
	Beach Petroleum NL	30			
72	Boral Energy Resources Ltd	100	25/03/2002	686	171.5
74	Strike Oil NL	100	14/10/2002	213	53.25
75	Strike Oil NL	100	22/12/2002	937	234.25
76	Richfield Resources Pty Ltd	50	22/12/2002	276	69
	Lamina Ltd	50			
85	Eoil Pty Ltd	100	19/4/2004	151	37.75
Total				81 322.23	

*\*Application for renewal pending*

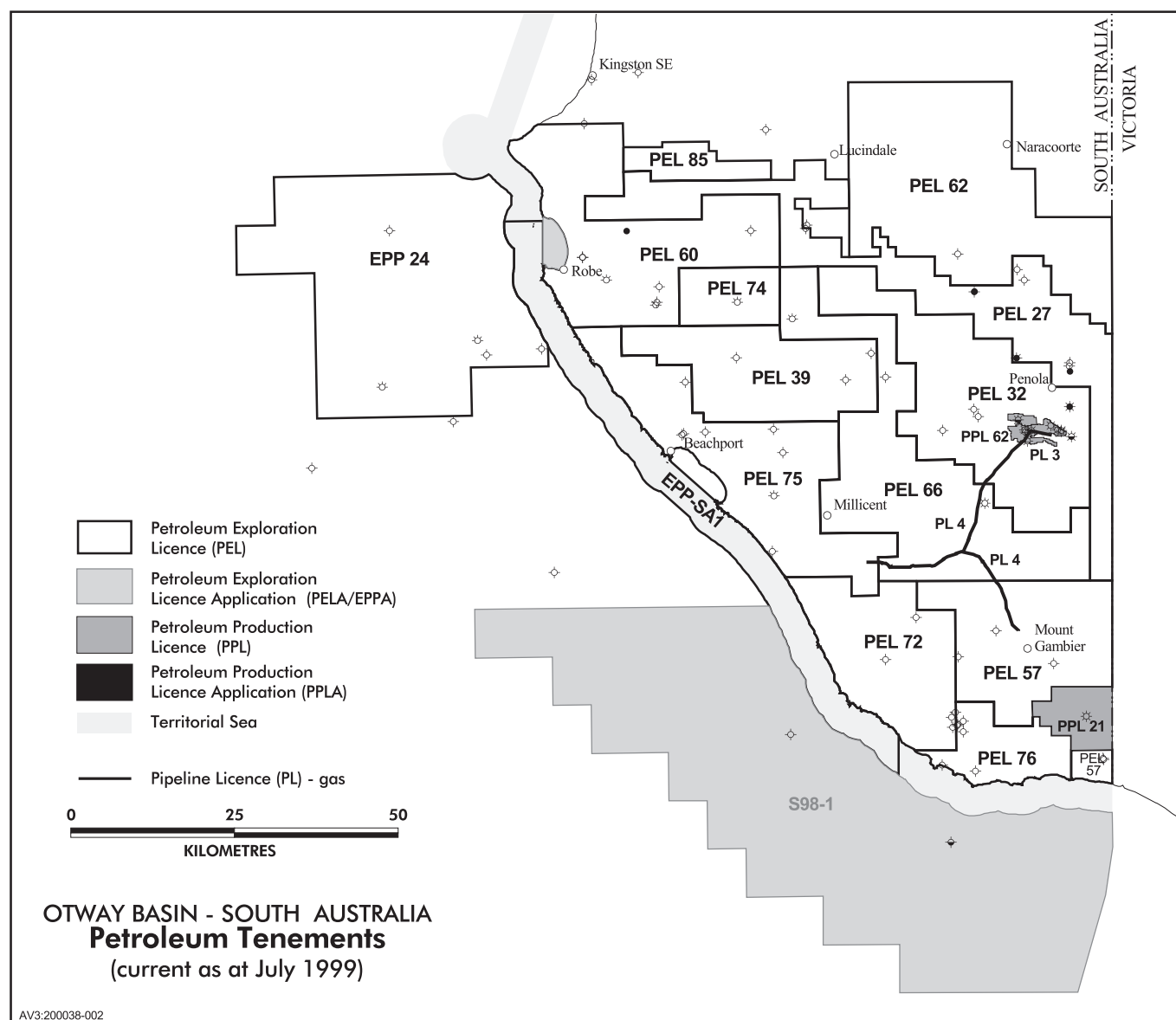
*+Application for surrender being processed*



## OFFSHORE: EXPLORATION PERMITS FOR PETROLEUM (EPP)

		Interest %	Expiry date	Number of graticular blocks
24	*Boral Energy Resources Ltd	51.43	29/07/2001	31
	Cultus Petroleum NL	17.57		
	Otway Resources Pty Ltd	8.33		
	Pan Pacific Petroleum NL	5		
	Basin Oil NL	5		
	Victoria Diamond Exploration Pty Ltd	6.67		
	Durum (Australia) Pty Ltd	6		
<i>EPP (Pursuant to the SA Petroleum (Submerged Lands) Act 1982)</i>				
SA-1	*Cultus Petroleum (Australia) NL	55	14/11/2000	27
	Oil Company of Australia Ltd	20		
	Cultus Timor Sea Ltd	15		
	Basin Oil NL	10		
Total				58

\*Operator





# PRODUCTION TENEMENTS

## ONSHORE: PETROLEUM PRODUCTION LICENCE (PPL)

		Interest %	Expiry date	Area (km <sup>2</sup> )	Name of area
6	*Santos Ltd	40.70	31/12/2005	257.4	Gidgealpa Field
	Vamgas Pty Ltd	8.51			
	Alliance Petroleum Australia Pty Ltd	3.97			
	Reef Oil Pty Ltd	1.97			
	Santos Petroleum Pty Ltd	0.40			
	Bridge Oil Developments Pty Ltd	3.99			
	Santos (BOL) Pty Ltd	0.21			
	Boral Energy Resources Ltd	13.19			
	Delhi Petroleum Pty Ltd	20.21			
	Basin Oil NL	2.10			
	Gulf (Aust) Resources NL	4.75			
7	"	"	31/12/2005	254.2	Moomba North Field
8	"	"	31/12/2005	254.0	Moomba West Field
9	"	"	31/12/2005	133.0	Moomba South Field
10	"	"	31/12/2005	226.4	Daralingie Field
11	"	"	31/12/2005	160.1	Big Lake Field
12	"	"	31/12/2005	157.3	Burke-Dullingari Fields
13	"	"	31/12/2005	56.07	Brumby Field
14	"	"	31/12/2005	233.05	Toolachee Field
15	"	"	31/12/2005	154.3	Della Field
16	"	"	31/12/2005	126.9	Big Lake and Namur Fields
17	"	"	31/12/2005	140.83	Merrimelia Field
18	"	"	31/12/2005	109.4	Fly Lake-Brolga Fields
19	"	"	31/12/2005	36.5	Moorari Field
20	"	"	31/12/2005	129.72	Tirrawarra Field
21	*Air Liquide Australia Ltd	100	30/04/2000	144.96	Caroline Field
22	*Santos Ltd	40.70	31/12/2006	233.82	Strzelecki Field
	Vamgas Pty Ltd	8.51			
	Alliance Petroleum Australia Pty Ltd	3.97			
	Reef Oil Pty Ltd	1.97			
	Santos Petroleum Pty Ltd	0.40			
	Bridge Oil Developments Pty Ltd	3.99			
	Santos (BOL) Pty Ltd	0.21			
	Boral Energy Resources Ltd	13.19			
	Delhi Petroleum Pty Ltd	20.21			
	Basin Oil NL	2.10			
	Gulf (Aust) Resources NL	4.75			
23	"	"	31/12/2006	79.9	Munkarie Field
24	"	"	31/12/2006	167.69	Kidman Field
25	"	"	31/12/2006	19.6	Narcoonowie Field
26	Vamgas Pty Ltd	43.75	10/06/2007	3.6	Cuttapirrie Field
	*Santos Ltd	25.6022			
	Delhi Petroleum Pty Ltd	17.143			
	Boral Energy Resources Ltd	10.536			
	Gulf (Aust) Resources NL	2.9688			
27	*Santos Ltd	40.70	31/12/2006	23.4	Mudrangie Field
	Vamgas Pty Ltd	8.51			
	Alliance Petroleum Australia Pty Ltd	3.97			
	Reef Oil Pty Ltd	1.97			
	Santos Petroleum Pty Ltd	0.40			
	Bridge Oil Developments Pty Ltd	3.99			
	Santos (BOL) Pty Ltd	0.21			
	Boral Energy Resources Ltd	13.19			
	Delhi Petroleum Pty Ltd	20.21			
	Basin Oil NL	2.10			
	Gulf (Aust) Resources NL	4.75			

		<b>Interest %</b>	<b>Expiry date</b>	<b>Area (km<sup>2</sup>)</b>	<b>Name of area</b>
28	"	"	6/05/2007	15.7	Kanowana Field
29	"	"	31/12/2008	2.99	Rakoona Field
30	"	"	31/12/2006	48.6	Limestone Creek- Biala Fields
31	"	"	6/05/2007	5.7	Wancoocha Field
32	"	"	6/05/2007	5.65	Muteroo Field
33	"	"	31/12/2006	15.4	Bookabourdie Field
34	"	"	31/12/2006	9.46	McKinlay Field
35	"	"	31/12/2006	21.3	Meranji Field
36	"	"	31/12/2006	46.93	Ulandi/Alwyn/Jena Fields
37	"	"	6/10/2007	7.64	Spencer Field
38	"	"	6/10/2007	10.21	Dirkala Field
39	"	"	31/12/2006	1.50	Nungeroo Field
40	"	"	31/12/2007	10.59	Lepena Field
41	"	"	31/12/2011	20.34	Mundi/Kapinka Fields
42	"	"	31/12/2008	7.26	Bookabourdie (Extension) Field
43	"	"	31/12/2008	3.29	Taylor South Field
44	"	"	31/12/2008	5.23	Bimbaya Field
45	"	"	29/03/2010	1.30	Taloola Field
46	"	"	20/12/2009	1.99	Tantanna Field
47	"	"	20/12/2009	3.50	Sturt and Sturt East Fields
48	"	"	31/12/2010	2.12	Kurunda Field
49	"	"	31/12/2010	8.09	Leleptian Field
50	"	"	31/12/2009	17.26	Andree Field
51	"	"	31/12/2011	6.88	Kirralee Field
52	"	"	31/12/2009	1.59	Gooranie South Field
53	"	"	4/12/2010	1.78	Spencer West Field
54	"	"	15/06/2010	0.10	Pintari North Field
55	"	"	31/12/2011	9.71	Varanus Field
56	"	"	31/12/2013	3.74	Varanus South Field
57	"	"	16/07/2011	10.47	Thurakinna Field
58	*Santos Ltd	40.70	31/12/2010	14.88	Mettika Field
	Vamgas Pty Ltd	8.51			
	Alliance Petroleum Australia Pty Ltd	3.97			
	Reef Oil Pty Ltd	1.97			
	Santos Petroleum Pty Ltd	0.40			
	Bridge Oil Developments Pty Ltd	3.99			
	Santos (BOL) Pty Ltd	0.21			
	Boral Energy Resources Ltd	13.19			
	Delhi Petroleum Pty Ltd	20.21			
	Basin Oil NL	2.10			
	Gulf (Aust) Resources NL	4.75			
59	"		16/07/2011	10.46	Garanjanie Field
60	"		25/05/2014	6.54	Wirrarie North Field
61	"		17/10/2011	11.86	Arrakis-Murta Fields
62	Sagasco Southeast Inc.	35.7143	26/11/2011	28.75	Katnook, Ladbroke and Haselgrove Gas Fields
	Omega Oil NL	24.2857			
	*Boral Energy Resources Ltd	20			
	Cultus Petroleum (Australia) NL	15			
	Basin Oil NL	5			

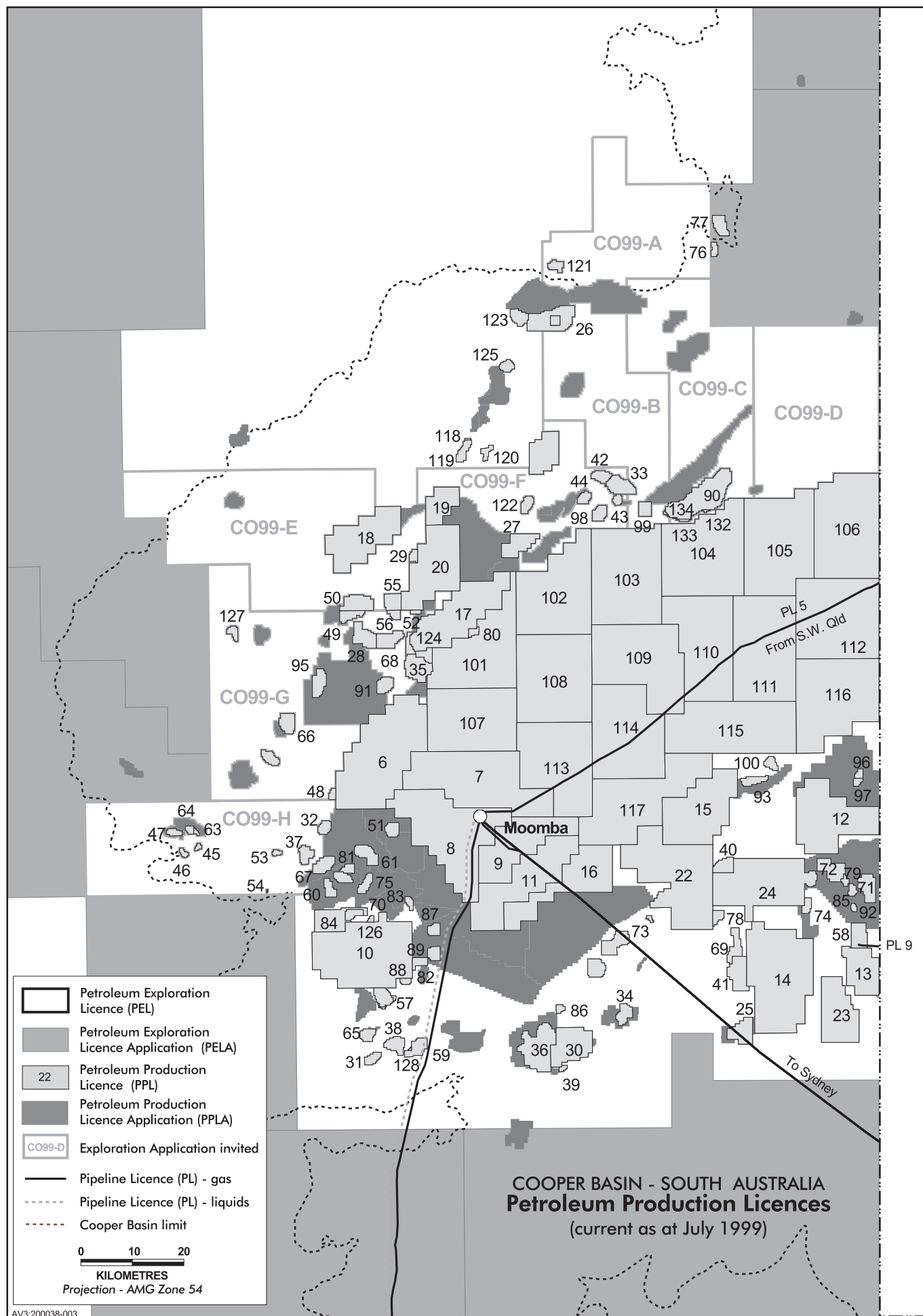
		<b>Interest %</b>	<b>Expiry date</b>	<b>Area (km<sup>2</sup>)</b>	<b>Name of area</b>
63	*Santos Ltd Vamgas Pty Ltd Alliance Petroleum Australia Pty Ltd Reef Oil Pty Ltd Santos Petroleum Pty Ltd Bridge Oil Developments Pty Ltd Santos (BOL) Pty Ltd Boral Energy Resources Ltd Delhi Petroleum Pty Ltd Basin Oil NL Gulf (Aust) Resources NL	40.70 8.51 3.97 1.97 0.40 3.99 0.21 13.19 20.21 2.10 4.75	23/05/2012	1.28	Malgoona (E) Field
64	"		23/05/2012	1.92	Malgoona (W) Field
65	"		17/07/2012	6.36	Kujani Field
66	"		24/11/2012	10.60	Jack Lake Field
67	"		17/07/2012	10.91	Keena Field
68	"		31/12/2011	14.09	Cooba Field
69	"		31/12/2011	11.64	Tarwonga Field
70	"		25/05/2014	5.70	Farina Field
71	"		31/12/2013	15.68	Kerna Field
72	"		31/12/2013	17.45	Dilchee/Pira Fields
73	"		31/12/2015	1.05	Mudlalee Field
74	"		31/12/2015	4.66	Allambi Field
75	"		26/10/2016	6.46	Caladan Field
76	Vamgas Pty Ltd *Santos Ltd Delhi Petroleum Pty Ltd Boral Energy Resources Ltd Gulf (Aust) Resources NL	43.75 25.6022 17.1430 10.5360 2.9688	26/10/2016	3.39	Telopea Field
77	"	"	26/10/2016	9.66	Keleary Field
78	*Santos Ltd Vamgas Pty Ltd Alliance Petroleum Australia Pty Ltd Reef Oil Pty Ltd Santos Petroleum Pty Ltd Bridge Oil Developments Pty Ltd Santos (BOL) Pty Ltd Boral Energy Resources Ltd Delhi Petroleum Pty Ltd Basin Oil NL Gulf (Aust) Resources NL	40.70 8.51 3.97 1.97 0.40 3.99 0.21 13.19 20.21 2.10 4.75	31/12/2016	5.55	Baratta Field
79	"		31/12/2016	2.35	Gahnna Field
80	"		31/12/2016	3.36	Correa Field
81	"		31/10/2017	4.39	Caladan Northeast Field
82	"		31/12/2016	5.72	Waukatanna Field
83	"		31/12/2016	3.2	Pogona Field
84	"	"	6/06/2018	28.30	Barina Field
85	"	"	31/12/2017	3.41	Alisma Field
86	"	"	31/12/2017	2.34	Carmina Field
87	"	"	31/12/2017	5.35	Boobook Field
88	"	"	31/12/2017	2.49	Lycosa Field
89	"	"	31/12/2017	6.14	Bobs Well Field
90	"	"	31/12/2017	60.81	Packsaddle/ Pondrinnie Field
91	"	"	31/12/2017	9.44	Cowralli Field
92	"	"	31/12/2017	1.77	Plantago Field
93	"	"	31/12/2017	7.4	Wilpinnie Field
94	"	"	08/01/2019	6.84	Atreides Field
95	"	"	21/05/2019	12.01	Nephrite Field
96	"	"	31/12/2017	2.65	Beckler Field



		<b>Interest %</b>	<b>Expiry date</b>	<b>Area (km<sup>2</sup>)</b>	<b>Name of area</b>
97	"	"	31/12/2017	2.48	Beckler South Field
98	"	"	31/12/2017	7.28	Merupa Field
99	"	"	31/12/2017	6.84	Merindal Field
100	"	"	31/12/2017	5.21	Nappacoongee Field
101–117	"	"	2/11/2018	4 141.3	Nappamerri Trough
118	*Santos Ltd Delhi Petroleum Pty Ltd Boral Energy Resources Ltd Vamgas Pty Ltd Gulf (Aust) Resources NL	25.6022 17.1430 10.5360 43.75 2.9688	26/05/2019	0.36	Kudrieke North Field
119	*Santos Ltd Vamgas Pty Ltd Alliance Petroleum Australia Pty Ltd Reef Oil Pty Ltd Santos Petroleum Pty Ltd Bridge Oil Developments Pty Ltd Santos (BOL) Pty Ltd Boral Energy Resources Ltd Delhi Petroleum Pty Ltd Basin Oil NL Gulf (Aust) Resources NL	40.70 8.51 3.97 1.97 0.40 3.99 0.21 13.19 20.21 2.10 4.75	31/12/2017	7.14	KudriekeField
120	"	"	31/12/2017	3.95	Lake MacMillan Field
121	*Santos Ltd Delhi Petroleum Pty Ltd Boral Energy Resources Ltd Vamgas Pty Ltd Gulf (Aust) Resources NL	25.6022 17.1430 10.5360 43.75 2.9688	26/05/2019	5.08	Tarragon Field
122	"	"	23/09/2019	6.29	Tallerangie Field
123	"	"	23/09/2019	5.38	Pennie Field
124	*Santos Ltd Vamgas Pty Ltd Alliance Petroleum Australia Pty Ltd Reef Oil Pty Ltd Santos Petroleum Pty Ltd Bridge Oil Developments Pty Ltd Santos (BOL) Pty Ltd Boral Energy Resources Ltd Delhi Petroleum Pty Ltd Basin Oil NL Gulf (Aust) Resources NL	40.70 8.51 3.97 1.97 0.40 3.99 0.21 13.19 20.21 2.10 4.75	31/12/2018	4.96	Bindah Field
125	*Santos Ltd Delhi Petroleum Pty Ltd Boral Energy Resources Ltd Vamgas Pty Ltd Gulf (Aust) Resources NL	25.6022 17.1430 10.5360 43.75 2.9688	11/02/2020	8.76	Gudi Field
126	*Santos Ltd Vamgas Pty Ltd Alliance Petroleum Australia Pty Ltd Reef Oil Pty Ltd Santos Petroleum Pty Ltd Bridge Oil Developments Pty Ltd Santos (BOL) Pty Ltd Boral Energy Resources Ltd Delhi Petroleum Pty Ltd Basin Oil NL Gulf (Aust) Resources NL	40.70 8.51 3.97 1.97 0.40 3.99 0.21 13.19 20.21 2.10 4.75	21/02/2020	1.20	Daralingie North Field
127	"		21/02/2020	4.24	Nulla Field
128	"		21/02/2020	0.29	Garanjanie West Field
129	"		20/04/2020	0.64	Thurakinna (South) Field
130	"		20/04/2020	0.61	Thurakinna (East) Field
131	*Santos Ltd Delhi Petroleum Pty Ltd Boral Energy Resources Ltd Vamgas Pty Ltd Gulf (Aust) Resources NL	25.6022 17.1430 10.5360 43.75 2.9688	20/04/2020	39.85	Coonatie Field

		<b>Interest %</b>	<b>Expiry date</b>	<b>Area (km<sup>2</sup>)</b>	<b>Name of area</b>
132	*Santos Ltd Vamgas Pty Ltd Alliance Petroleum Australia Pty Ltd Reef Oil Pty Ltd Santos Petroleum Pty Ltd Bridge Oil Developments Pty Ltd Santos (BOL) Pty Ltd Boral Energy Resources Ltd Delhi Petroleum Pty Ltd Basin Oil NL Gulf (Aust) Resources NL	40.70 8.51 3.97 1.97 0.40 3.99 0.21 13.19 20.21 2.10 4.75	31/12/2019	0.58	Pondrinnie/Packsaddle South Field
133	"		31/12/2019	1.31	Pondrinnie/Packsaddle Southwest Field
134	"		31/12/2019	0.49	Pondrinnie/Packsaddle West Field
135	"		31/12/2019	11.10	Goyder Gas Field
136	*Santos Ltd Delhi Petroleum Pty Ltd Boral Energy Resources Ltd Vamgas Pty Ltd Gulf (Aust) Resources NL	25.6022 17.1430 10.5360 43.75 2.9688	17/06/2020	32.65	Cuttapirrie Main Field
137	*Santos Ltd Vamgas Pty Ltd Alliance Petroleum Australia Pty Ltd Reef Oil Pty Ltd Santos Petroleum Pty Ltd Bridge Oil Developments Pty Ltd Santos (BOL) Pty Ltd Boral Energy Resources Ltd Delhi Petroleum Pty Ltd Basin Oil NL Gulf (Aust) Resources NL	40.70 8.51 3.97 1.97 0.40 3.99 0.21 13.19 20.21 2.10 4.75	25/05/2020	7.0	Moonanga Field
139	"		31/12/2019	15.73	Milluna Field
168	*Boral Energy Resources Ltd SAGASCO South East Inc. Omega Oil NL	20.0 55.7143 24.2857	25/06/2020	8.81	Redman Field
Total				8 104.85	

**\*Operator**



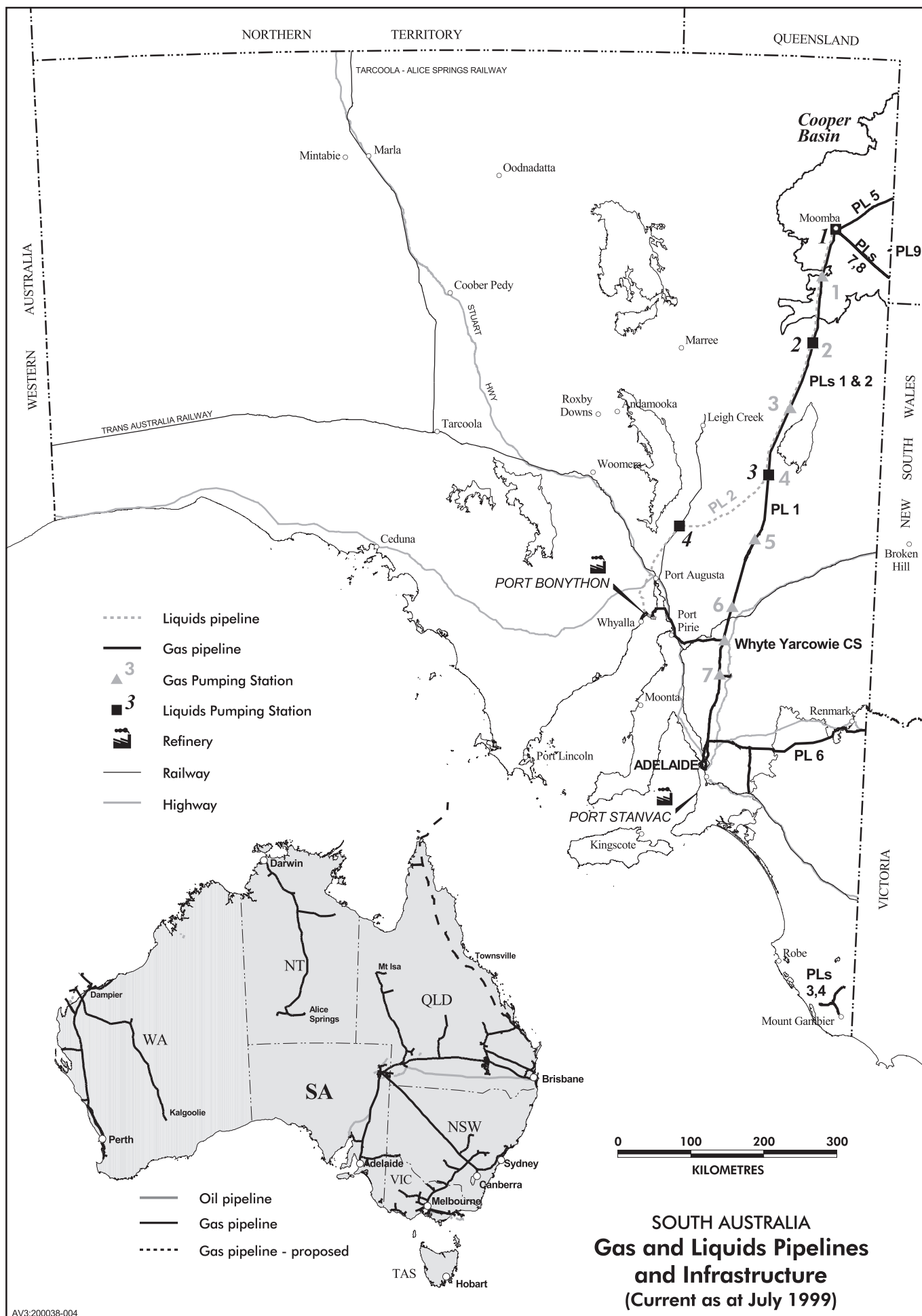
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## PIPELINE LICENCE (PL)

		Interest %	Commis- sioning date	Expiry date	Length (km)	Diameter (mm)	Maximum allowable operating pressure (kPa)
1	Epic Energy SA Pty Ltd	100	Nov 69	29/06/2016	1 067.31	559	7 322
2	Santos Ltd	37.7294	Jan 83	25/11/2002	659	355.6	10 340
	Delhi Petroleum Pty Ltd	17.0342					
	Boral Energy Resources Ltd	13.1493					
	Bridge Oil Development Pty Ltd	8.8143					
	Vamgas Pty Ltd	7.5459					
	Reef Oil Pty Ltd	4.6391					
	Basin Oil NL	4.6391					
	Gulf (Aust.) Resources NL	3.9303					
	Alliance Petroleum Aust. Pty Ltd	1.5509					
	Santos Petroleum Pty Ltd	0.5036					
	Santos (BOL) Pty Ltd	0.4639					
3	Epic Energy SA Pty Ltd	100	Mar 91	29/06/2016	4.5	60.3	10 000
4	Epic Energy SA Pty Ltd	100	Feb 91	29/06/2016	67	168	10 000
5	Santos Ltd	32.6300	Oct 93	21/04/2013	92	400	14 500
	Delhi Petroleum Pty Ltd	23.2000					
	Santos Petroleum Pty Ltd	18.7200					
	Boral Energy Resources Ltd	16.5000					
	Vamgas Pty Ltd	7.5125					
	Gulf Australian Hydrocarbons Ltd	1.2000					
	Oil Company of Australia NL	0.2375					
6	Ayers Net Ltd	100	Oct 94	26/01/2015	231	114	10 000
7	East-Aust Pipeline Ltd	100	1976	29/06/2015	111	864	6 200
8	Gorodok Pty Ltd	100	July 96	09/07/2017	101	219	15 300
9	Santos Ltd	32.63	April 96	16/02/2018	3.483	323.9	11 400
	Delhi Petroleum Pty Ltd	23.2					
	Santos Petroleum Pty Ltd	18.72					
	Boral Energy Resources Ltd	16.5					
	Vamgas Pty Ltd	7.5125					
	Gulf Australian Hydrocarbons Ltd	1.2					
	Oil Company of Australia Ltd	0.2375					
10	Boral Energy Pipelines Pty Ltd	100	25/04/99	29/10/2019	0.087	250	7 290
11	Envestra Ltd	100		30/04/2020	42.3	114	9 928
Total length					2 378.68 km		



<b>Pipeline Licence number</b>	<b>Pipeline name</b>	<b>Pipeline type</b>	<b>Pipeline operator</b>	<b>Pipeline owner</b>
1	Moomba–Adelaide	Natural gas	EPIC Energy	EPIC Energy SA Pty Ltd
2	Moomba–Port Bonython	Hydrocarbon liquids	EPIC Energy	Santos Ltd
3	Katnook–SAFRIES	Natural gas	EPIC Energy	EPIC Energy SA Pty Ltd
4	Katnook–Mt Gambier/Snuggery	Natural gas	EPIC Energy	EPIC Energy SA Pty Ltd
5	Queensland–Moomba	Natural gas/liquids	Santos Ltd	Santos Ltd
6	Riverland	Natural gas	EPIC Energy	Ayers Net Ltd
7	Moomba–Sydney	Natural gas	East Aust Pipeline	East-Aust Pipeline Ltd
8	Moomba–Sydney	Ethane	ICI Aust Engineering P/L	Gorodok Pty Ltd (ICI Aust.)
9	SWQ–Mettika	Natural gas/liquids	Santos Ltd	SWQ JV
10	Moomba Interconnection	Natural gas	Epic Energy	Boral Energy Pipelines Pty Ltd
11	Berri–Mildura	Natural gas	TBA	Envestra Ltd



AV3:200038-004

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[www.pir.sa.gov.au](http://www.pir.sa.gov.au)



**Government  
of South Australia**

*Gas satellite, Dullingari Field, Cooper Basin*





*Tirrawarra oil field satellite, Cooper Basin*

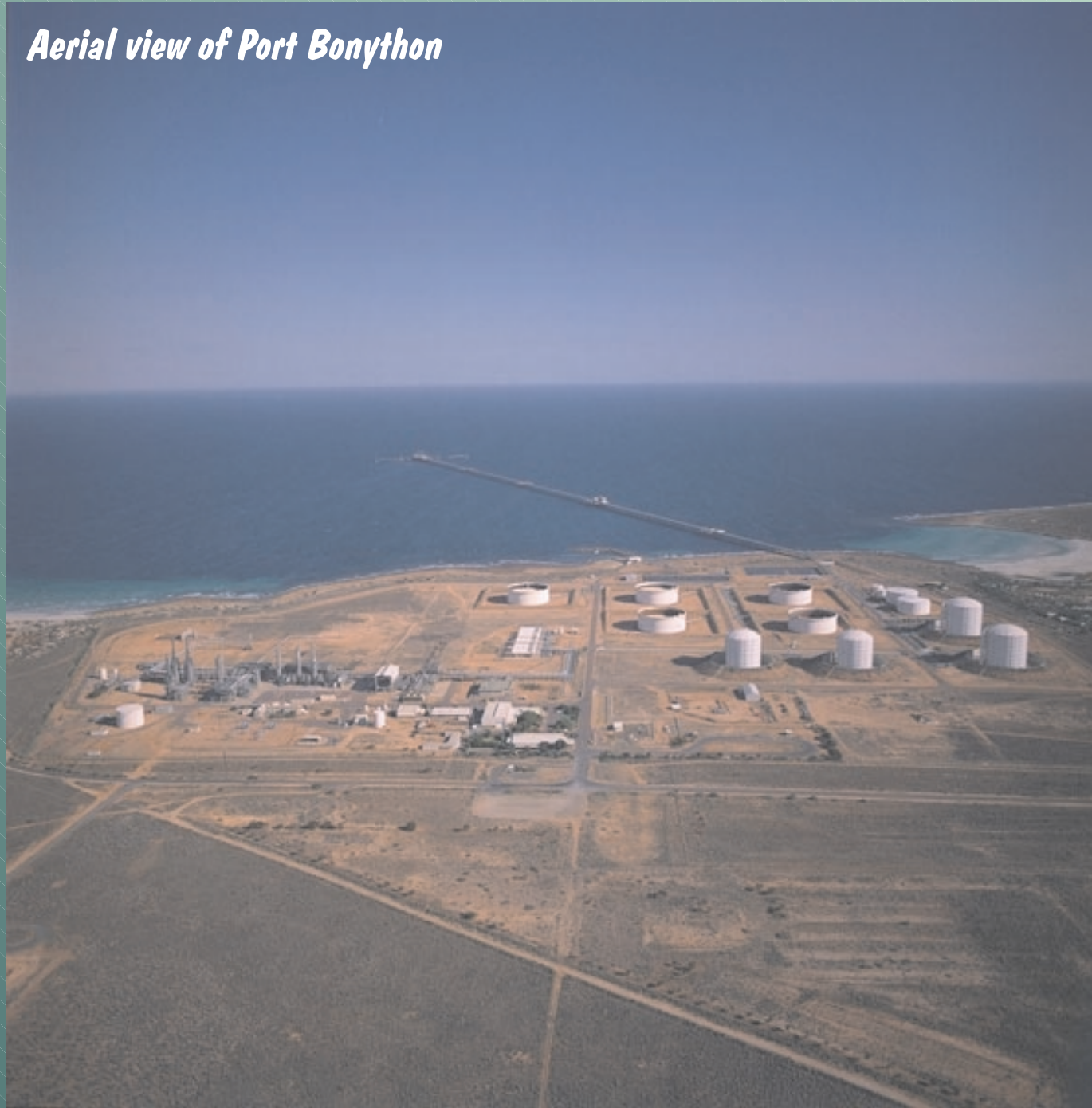


*Tirrawarra oil field satellite, Cooper Basin*

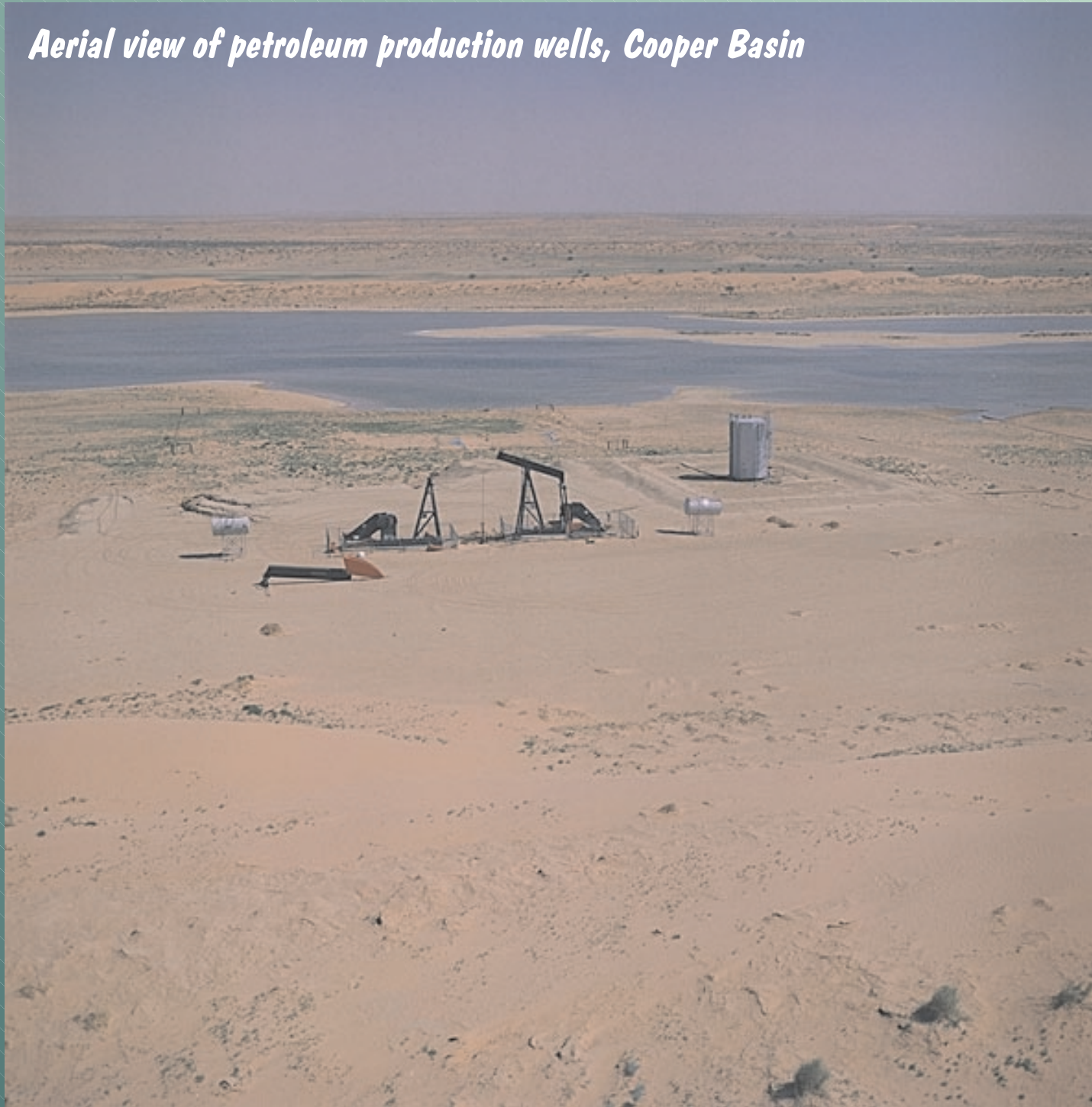




*Aerial view of Port Bonython*



*Aerial view of petroleum production wells, Cooper Basin*





*Aerial view of Tirrawarra production facility, Cooper Basin*





*Aerial view of Moomba processing plant, Cooper Basin*



*Aerial view of Moomba processing plant, Cooper Basin*



*Aerial view of petroleum exploration well, Cooper Basin*





*Moomba processing plant*



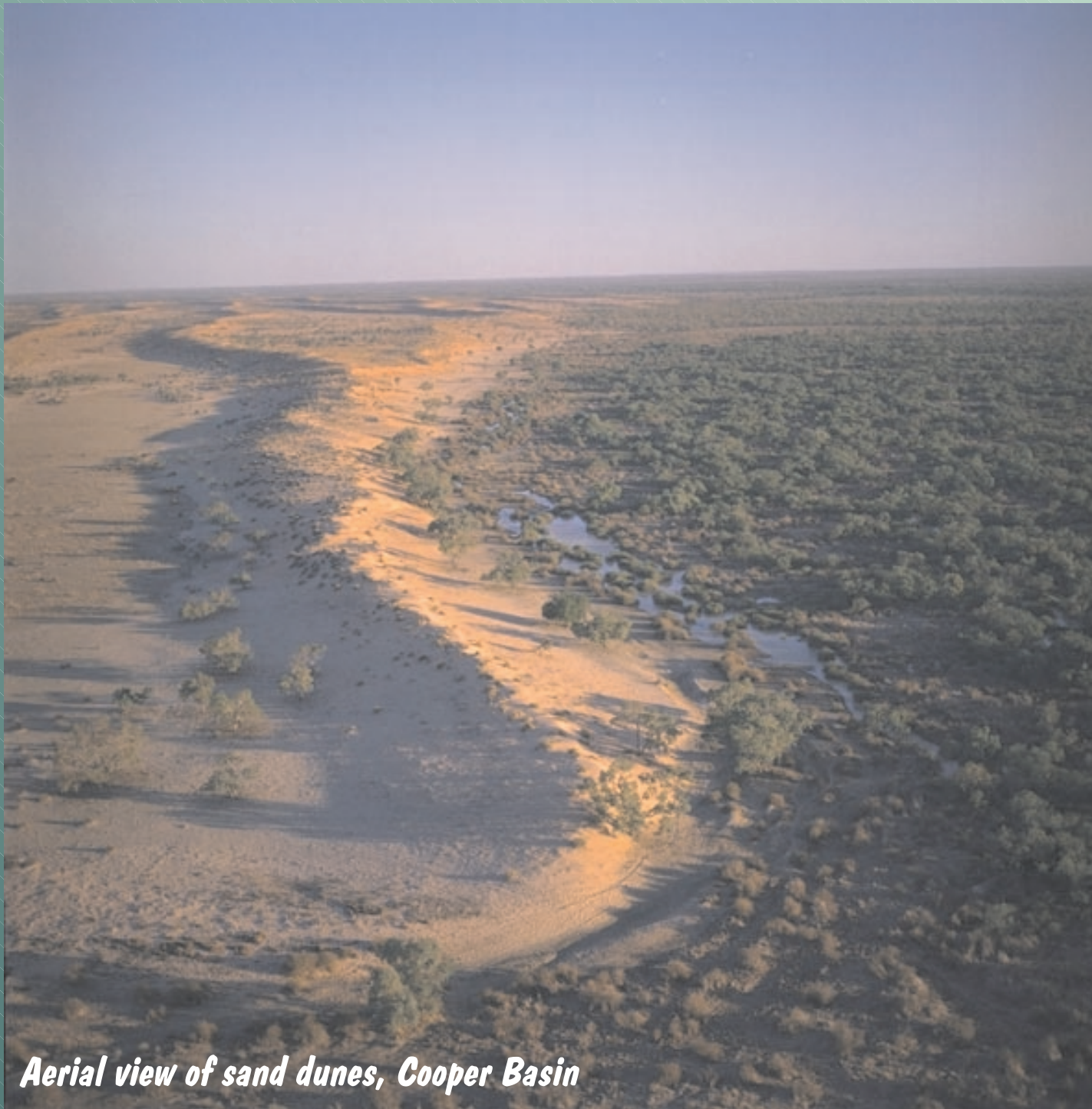


*Aerial view of pipeline route, Cooper Basin*



*Aerial view of geophysical survey trucks in the Cooper Basin*





*Aerial view of sand dunes, Cooper Basin*





*Gas processing plant at Moomba, Cooper Basin*



*Digging the trench for the ethane pipeline PL8 Moomba to Sydney*

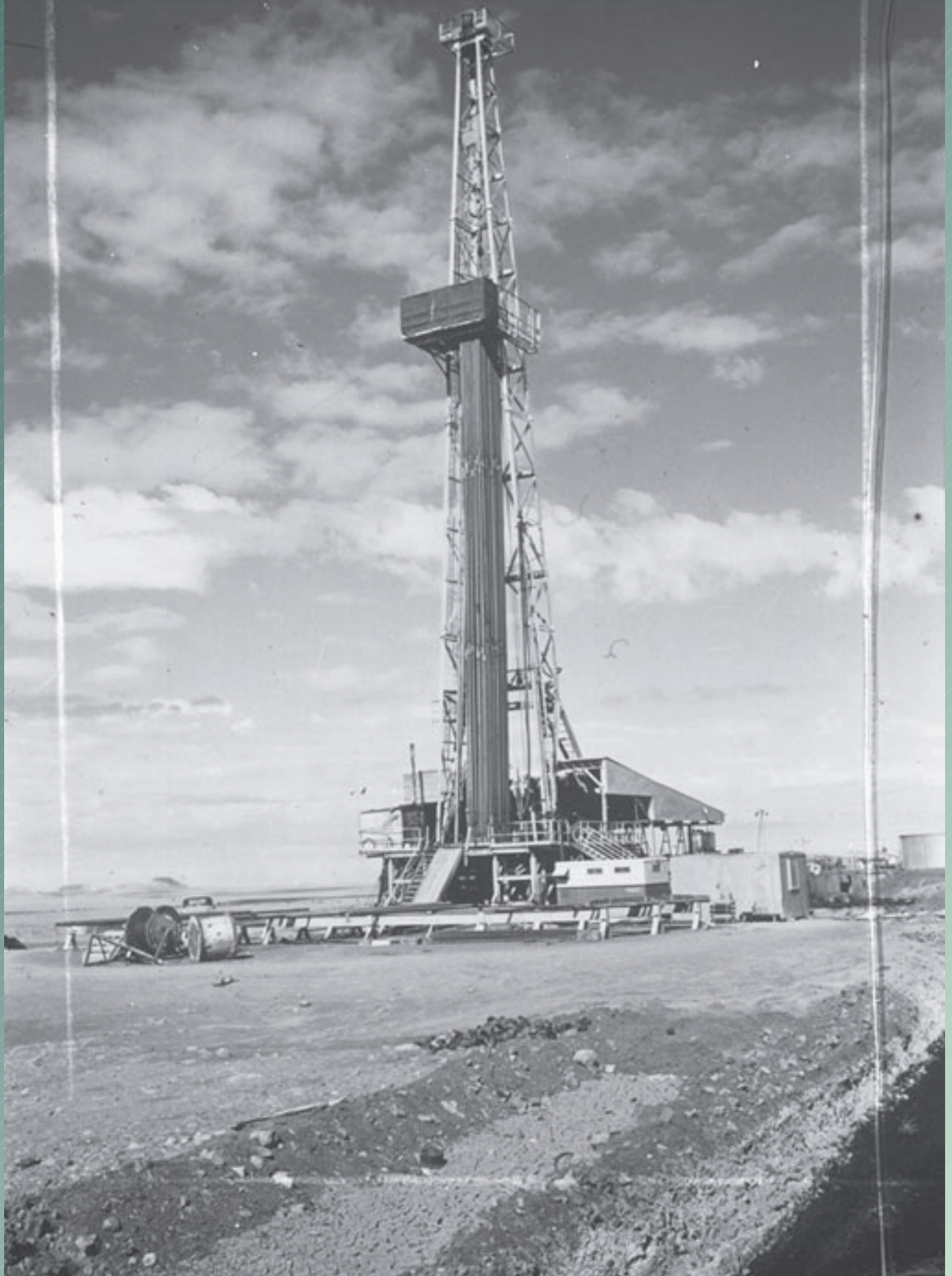


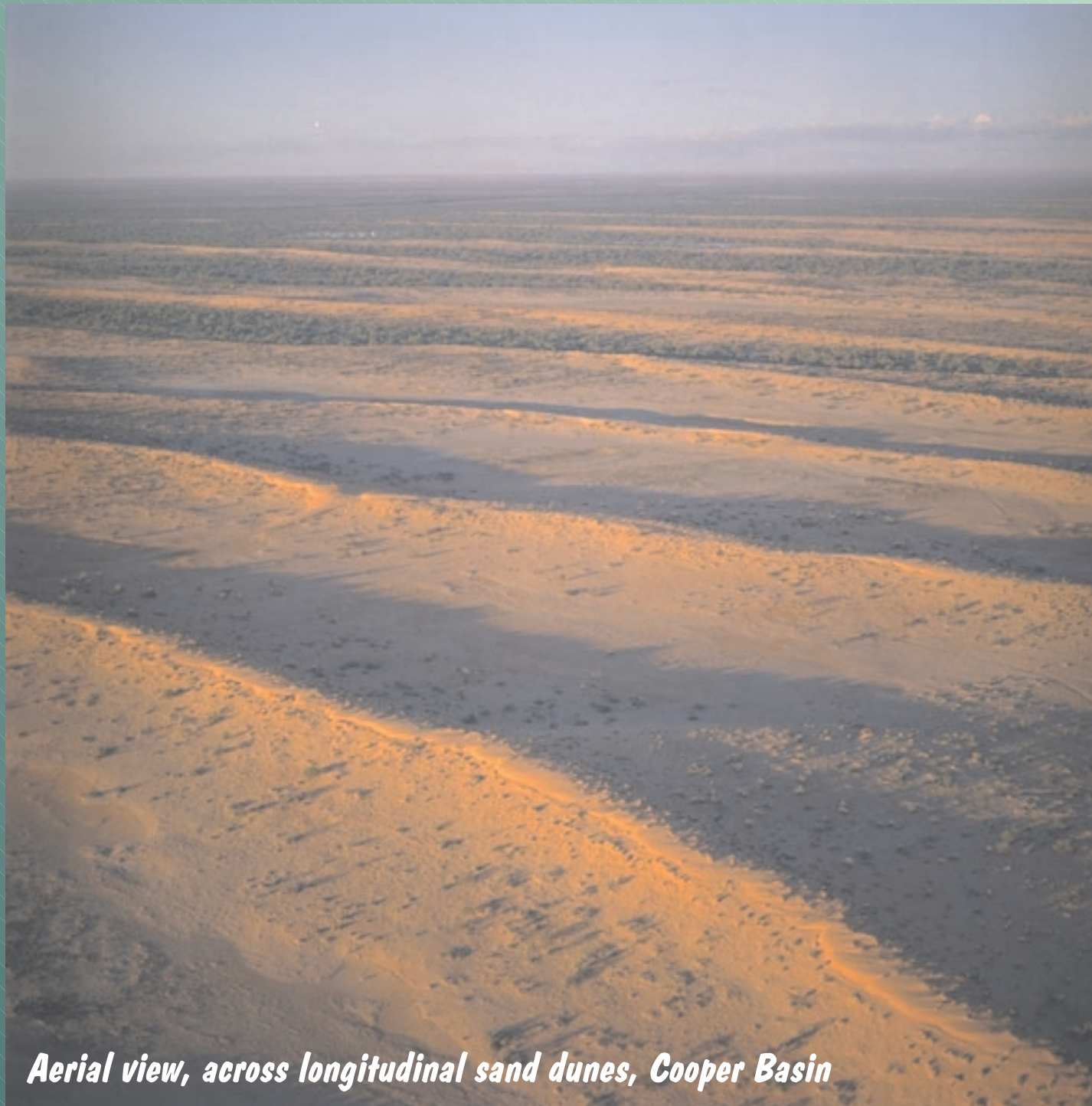
*Aerial view, Cooper Basin*





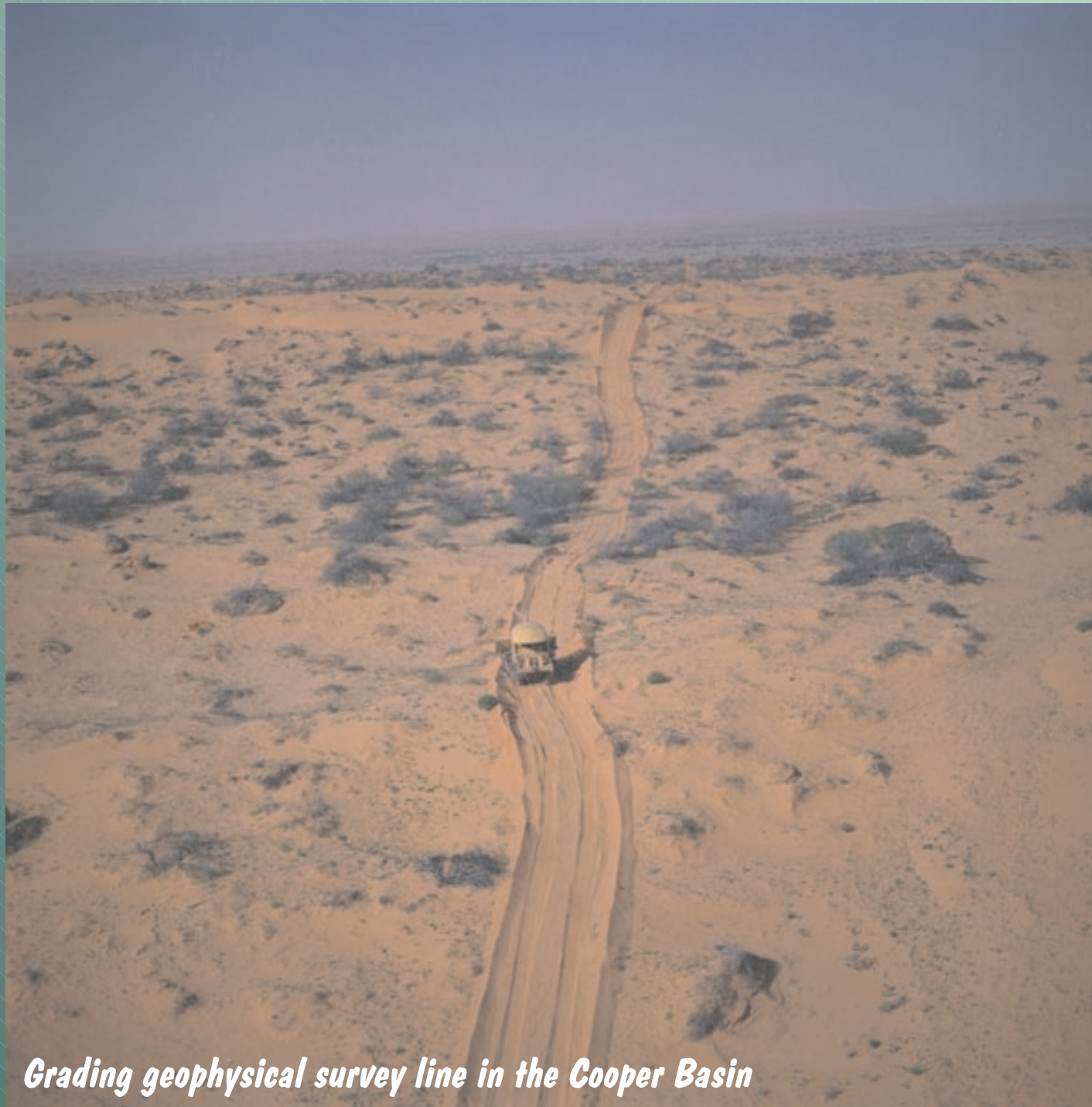
***First petroleum exploration well in the Cooper Basin, Innamincka No. 1***





*Aerial view, across longitudinal sand dunes, Cooper Basin*





*Grading geophysical survey line in the Cooper Basin*



# **PETROLEUM SERVICES DIRECTORY SOUTH AUSTRALIA 1999**



**PRIMARY INDUSTRIES  
AND RESOURCES SA**



Gas and liquids pipelines in Australia.

**PETROLEUM  
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Government  
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**PRIMARY INDUSTRIES  
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**Cover photo** — Geco Prakla Vibroseis crew in the Strzelecki Desert west of Moomba, May 1996.  
(Courtesy of Ian Oswald-Jacobs; photo 43769)

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## INTRODUCTION

I am delighted to introduce this 1999 edition of the *Petroleum services directory South Australia*. Major new petroleum exploration opportunities will be made available this year. The expiry in February of PELs 5 and 6 in the Cooper Basin has provided a rare opportunity for petroleum explorers to acquire highly prospective acreage in Australia's largest onshore petroleum-producing basin. A further incentive to attract new explorers to the State has been the removal of impediments to free trade in gas and the ability of producers to negotiate directly with gas consumers.

The directory is designed to provide information on South Australian based petroleum exploration and development consultants and service companies with an emphasis on upstream services. International companies which have established regional operations in South Australia are included. It provides a broad cross-section, but is by no means an exhaustive list.

Exploration and production companies are not included. However, companies holding tenements in South Australia are listed in PIRSA Earth Resources Information Sheets P1 and P2.



Dennis Mutton  
**Chief Executive**  
**Primary Industries and Resources**  
**South Australia**





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*see* Stratigraphic Research  
International AS

Stratco (SA) Pty Ltd 60

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Pty Ltd 62

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WGS

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Woodward-Clyde

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Zeiss, Carl Pty Ltd 65–66



# CAPABILITY REFERENCE

	Airborne surv. data process.	Computers — analytical laboratory	Economic and property evaluation	Drilling contractors	Engineering consultants	Environmental consultants	Geochemistry, organic	Geological consulting	Geophysical consulting	Industry association	Legal	Native title, research	Palm oil	Petrology	Petroleum engineering	Pipeline design and design	Project management	Research, scientific	Seismic acquisition	Seismic data processing	Software	Suppliers	Surveying	Training	Transport and logistics	Well logging	Well log data services	Wellsite supervision	Other*
Ace Chemical Co.																						•							•
Affinity Contracting & Search			•																										•
AGC Woodward-Clyde						•	•											•											•
Aish Drafting Supplies			•																			•							
Amdel — Petroleum Services		•						•																					
Applied Structural Geol. Anal.									•	•																			
Archimedes Consulting										•																			
Armstrong Photographics																													•
Australian Mineral Foundation					•																								•
Australian Petroleum Services Co.																						•							
Baker Oil Tools (Australia)																						•					•		
Bardrill Corporation																									•				•
Benchmark Positioning Services																						•							
Bested & Associates																							•						
Bevan & Co.					•		•										•	•											
Bowyer									•																				•
Burdon and Associates					•		•																						
Burns										•																			
Century Drilling			•																										
Challenger Geological Services																						•			•				•
Dames & Moore Group					•		•	•		•							•	•	•						•				•
Donovan & Associates													•																•
Dynamic Satellite Surveys																							•						

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## COMPANY SUMMARIES

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### ACE CHEMICAL CO.

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#### **Ace Chemical Co.**

Robert Twelftree

119A Mooringe Avenue, Camden Park  
SA 5065

Phone (08) 8376 0844

Fax (08) 8295 8563

Ace Chemical Co. is a supplier of industrial and laboratory chemicals used in drilling and other services applicable to oil and gas exploration. Ace can formulate to customer specifications as required.

#### **Affinity Contracting & Search**



Cheryl Smith (State Manager South Australia and Western Australia)

193–199 Franklin St, Adelaide SA 5000

Phone (08) 8304 1740

Fax (08) 8304 1711

Email [casmith@affinity.aag.com.au](mailto:casmith@affinity.aag.com.au)

Affinity Contracting & Search is the recruitment arm of a well established and leading information technology company, servicing major corporate and government clients within all sectors (many within the resources industry). Affinity offers quality contractors and permanent staff in all areas of information technology. The company has developed a specialist group of

geo-computing staff that are qualified as geophysicists, geologists and environmentalists with computing qualifications for data management, software development and maintenance, systems administration etc. Affinity is national and has a database of qualified candidates from across Australia.

#### **Woodward-Clyde**



#### **AGC Woodward-Clyde Pty Ltd**

Paul Howe

25 North Terrace, Hackney SA 5069

Phone (08) 8366 0080

Fax (08) 8366 0081

Email [info@wcc.com](mailto:info@wcc.com)

Web site [www.wcc.com](http://www.wcc.com)

AGC Woodward-Clyde, part of the international Woodward-Clyde Group Inc., has been operating in Australia (formerly as Australian Groundwater Consultants) for 30 years. The company specialises in environmental management, waste management, water management, civil and geotechnical engineering and information technology services. Consultancies for the petroleum industry include oil spill contingency plans, spill response training, environmental sensitivity analyses, environmental impact assessments and pipeline routing and geotechnical investigations.

## **Aish Drafting Supplies Pty Ltd**

Michael Aish

134 Glen Osmond Road, Parkside  
SA 5063

Phone (08) 8373 2282

Fax (08) 8373 2998

Email [aish@camtech.com.au](mailto:aish@camtech.com.au)

Aish Drafting is a supplier of Hewlett Packard, Canon, Epson, Océ and Lexmark large and small format printers, scanners, digitisers, laser, palm tops and plain paper copiers plus full range of cartridges, toners, disks, papers, films and general office supplies. Day and night modem service via the Internet for plotting and plan printing. Multiplan racking and vertical filing available for all sizes of seismic section drawings.

## **Amdel Ltd — Petroleum Services**



Brian Watson (Manager)

35–37 Stirling Street, Thebarton  
PO Box 338, Torrensville Plaza SA 5031

Phone (08) 8416 5240

Fax (08) 8234 2933

Email [brianwatson@amdel.com.au](mailto:brianwatson@amdel.com.au)

Amdel — Petroleum Services specialises in chemistry, geochemistry and core analysis. A wide range of analytical services are offered including: core analysis; compositions of high pressure gases and liquids; on-site gas and water

analyses; crude oil assays; physical testing of petroleum liquids; source-rock analyses; petroleum geochemistry.

## **Applied Structural Geological Analysis**

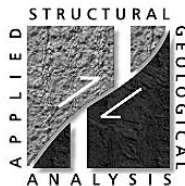
Colin Winsor  
(Principal Consultant)

28 Wildwood Drive, Salisbury Park  
SA 5109

Phone/fax (08) 8281 8136

Email [colin.winsor@newwave.net.au](mailto:colin.winsor@newwave.net.au)

Web site [www.newwave.net.au/~colin.winsor](http://www.newwave.net.au/~colin.winsor)



## **Background**

Colin Winsor has 20 years of applied structural geology experience, involving investigations in South Australia, Queensland, Western Australia, Victoria and New Zealand. He has carried out: analysis of fracture patterns at all scales e.g. determination of joint control by sedimentary anisotropy; structural and seismic investigation of the Eromanga and Cooper Basins; and studied deformation overprints in carbonates and clastics at all scales.

## **Services offered**

Offshore and onshore sedimentary basins:

- regional and localised structural analysis
- seismic data interpretation (cross-sections and horizon data)
- compilation of interpreted cross-sections
- microfabric analysis to determine structural overprints in terms of

porosity and permeability (recognition of fluid pathways and history of dilation and dissolution)

- Landsat lineament analysis and determination of stress fields
- analysis and prediction of fracture directions based on regional and local structural assessment
- analysis of compressional and extensional structures in terms of fold trends, interlimb angle and wavelength, stress field and fracture directions

## Experience

Drillhole and lithological experience Bowmans coal deposit, St Vincent Basin, South Australia. Regional analysis of structures (folds and faults) and interpretation of seismic sections and horizon data for portions of the Eromanga and Cooper Basins, South Australia and Queensland. Regional, mesoscopic and microscopic (microfabric) investigation of dissolution and dilation overprints in carbonates and clastics of the Irregularly Formation, Bangemall Basin, Western Australia. Structural analysis of deformation history and fracture pattern analysis in underlying basement regions in Australia and New Zealand, e.g. Delamerian fold belt, Mount Isa Block, Otago Schist and central Victoria.

## Archimedes Consulting Pty Ltd

Irena Kivior (Director)  
24 Stirling Street, Thebarton  
PO Box 423, Glenside SA 5065



Phone (08) 8234 0511  
0417 809 788 (mobile)  
Fax (08) 8234 2637  
Email [ikivior@archimedes-consulting.com.au](mailto:ikivior@archimedes-consulting.com.au)  
Web site [www.archimedes-consulting.com.au](http://www.archimedes-consulting.com.au)

## Background

Irena Kivior established Archimedes Consulting in 1997 after completing PhD and post-doctoral studies at the University of Adelaide. Prior to commencing her PhD, she worked in ore exploration and at ETSA in coal exploration and mining.

## Services

Archimedes specialises in advanced processing, analysis and interpretation of high-resolution aeromagnetic and gravity data. The company applies new techniques to the interpretation of aeromagnetic data over sedimentary basins to assist companies in petroleum exploration. The principal methods used are: energy spectral analysis (on grid data); and automatic curve matching (on profile data). Using these methods the thickness of the sedimentary section and the major structural elements of the underlying basement such as highs and troughs can be defined, even when the basement is only weakly magnetic. It is also possible to detect magnetic horizons such as unconformities, fault and joint patterns within the sedimentary section, and volcanics and intrusives.

## Experience

Archimedes has undertaken a number of projects in Australia and overseas. These include the Otway, Officer,



McArthur–Beetaloo, Papuan, and Cooper–Eromanga–Warburton Basins, North West Shelf and Tallaringa Trough.

### Recent clients

Petroleum industry and government geological surveys.

### Armstrong Photographics

Jon Armstrong  
11 Clifton Street,  
Maylands SA 5069

Phone (08) 8332 9467  
018 500 240 mobile  
Email armphot@enternet.com.au

Armstrong Photographics offers a wide range of visual support in environmental imaging and general cadastral photography/videography.



### Australian Mineral Foundation

Geoff Hudson  
(Director)  
63 Conyngham Street, Glenside SA 5065  
Phone (08) 8379 0444  
Fax (08) 8379 4634  
Email amf@amf.com.au  
Web site www.amf.com.au/amf



Established and funded by Australia's mineral and petroleum industries, the

Australian Mineral Foundation (AMF) is a premier provider of information, education and applied training services. For over 25 years AMF has promoted the introduction and transfer of new technology and quality management in Australia and internationally through the identification, recovery and coordination of mineral and petroleum information.

### Australian Petroleum Services Co.



Geoff Atkinson (Managing Director)  
201 Regency Road, Croydon Park  
SA 5008  
Phone (08) 8346 3777  
Fax (08) 8346 1399  
Email apSCO@camtech.net.au

Australian Petroleum Services (APSCO) is an oil field supply store offering a 'one stop shop' for the petroleum exploration and production industries. APSCO is experienced in the supply of speciality items and stocks a large range of pipe fittings, valves, tools, safety equipment and work clothes. Agencies or representations include Checkpoint Pumps, FMC Fluid Control Division, Hydril, Jet-Lube, Zero Halliburton, Clif Mock, Cavins Oil Well Tools, Bowen, KF Industries, Walls Clothing and Redwing Shoes.

## **Baker Oil Tools (Australia)**

Ewan McDonald  
(Operations Manager)

23 Pambula Street, Regency Park SA 5010

Phone (08) 8243 2966

Fax (08) 8345 4778

Baker Oil Tools (Australia), a division of Baker Hughes Australia Pty Ltd, offers a large range of oil field products and services including:

- open hole drillstem testing
- permanent packers
- retrievable packers
- flow control equipment
- inflatable equipment
- fishing services
- safety systems
- thru-tubing services
- thru-tubing fishing
- thru-tubing inflatable equipment
- liner hanger equipment
- remedial and stimulation products

## **Bardrill Corporation Ltd**

David Brooker (General Manager)

133 Rundle Street, Kent Town SA 5067

Phone (08) 8362 8971 work

(08) 8269 4847 home

0419 811 071 mobile

Fax (08) 8362 1019



## **Background**

Bardrill Corporation was formed in 1984 primarily to service Santos's earthmoving, transport and water well drilling requirements.

## **Services offered**

- all civil earthmoving works e.g. road construction and maintenance, rig, camp sites, evaporation ponds etc.
- water well drilling, water supply including pumping (air lift) pipe line and hauling
- general transport and labour

Equipment includes dozers, graders, scrapers, multi-tyred rollers, sheep-foot rollers, front-end loaders, backhoe, water tankers, tippers, tilt-tray truck with winch, rubbish skips, air compressors, lay flat hose, water pumps, water well drilling rig, mobile support camps, and four-wheel drives.

## **Experience**

Management and the majority of operators have up to 35 years experience working in the Cooper and Eromanga Basins.

## **Recent clients**

Santos, Hunt Energy.

## **Benchmark Positioning Services**

Rob Ferguson (Manager, South Australia and Northern Territory)

92 Carrington Street, Adelaide

GPO Box 6260, Adelaide SA 5001

Phone (08) 8223 7338

Fax (08) 8223 7345

Email [benchpos@dov.net.au](mailto:benchpos@dov.net.au)

Benchmark Positioning Services is an agent for Trimble GPS satellite navigation equipment and OmniSTAR DGPS receivers. Navigation GPS sub-metre mapping to RTK dual frequency survey grade receivers. Sales, hire and software support are available.

### **John C Bested Associates Pty Ltd**

John Bested

362 Magill Road, Kensington Park  
SA 5068

Phone (08) 8332 7111

Fax (08) 8364 1829

Email [bessurv@camtech.net.au](mailto:bessurv@camtech.net.au)

Bested & Associates is a surveying company specialising in GPS, geodetic control surveys, topographic surveys including terrain modelling, easement surveys, road and transmission line surveys, baseline set out and gridding, borehole location, volume calculations, construction and engineering surveys.

### **Bevan & Co Pty Ltd**

David Bevan (Principal)  
Level 6, 74 Pirie Street,  
Adelaide

GPO Box 1726, Adelaide SA 5001

Phone 0411 862 748 mobile

Fax (08) 8232 1219



### **Background**

Bevan & Co. offers commercial and related analytical services to companies operating in the energy sector.

### **Services offered**

The services offered to petroleum explorers include:

- evaluation of exploration and production economics, including risk assessment
- conceptual engineering of petroleum production facilities, including gathering systems, processing facilities and transmission pipelines
- support for negotiations with potential joint venture parties, operators of existing petroleum production assets, potential customers and government agencies

### **Experience**

David Bevan has 22 years experience in the Australian oil and gas industry, mainly relating to the Cooper Basin. He has formal qualifications in chemical engineering and experience in process engineering, pipeline design and commercial analysis, especially supporting negotiations.

### **Recent clients**

Boral Energy, Epic Energy, Kinhill Engineers, Santos, Terra Gas Trader.

### **David Bowyer**

David Bowyer

66 Narinna Avenue, Cumberland Park  
SA 5041

Phone/fax (08) 8293 1091

## Background

David Bowyer graduated with a BSc (Hons) in Geology from the University of Adelaide in 1983. He has 15 years experience in the Cooper and Eromanga Basins. David worked for Santos for 13 years and more recently has been employed by Strike Oil. David is a member of the AAPG and the International Association of Hydrogeologists.

## Services offered

- geological data acquisition
- interpretation of water analyses
- recognition of representative formation waters
- selection of suitable water resistivities for log analysis
- identification of sources of water influx in production wells
- drill stem test interpretation\*
- hydrodynamics studies\*
- bypassed pay identification\*

\*Services offered in association with Hugh W. Reid & Associates Ltd.

## Experience

David's work has included: compilation, review and mapping of geological and geochemical data for the Cooper and Eromanga Basins; maintenance of computer-based geological data for oil and gas fields and regional studies; and consulting on formation waters.

## Geoff Burdon and Associates

Geoff Burdon (Principal)

13 Oakridge Road, Aberfoyle Park  
SA 5159

Phone (08) 8270 5660

0417 822 567 mobile

Fax (08) 8358 6088

## Background

Geoff Burdon is an independent consultant with over 26 years experience in the domestic and international petroleum industry and has held senior positions in the major Australian companies, Santos and Western Mining. Geoff is a founding member and Director of PETRA Group petroleum consultants.

## Services offered

- analytical reservoir engineering solutions
- reserve assessments
- production profiles
- well test design and analysis
- PVT and core analysis
- formation evaluation
- field performance analysis
- resource development plans
- reserves management
- simulation modelling
- property valuations
- technical audits
- multi-discipline tasks through selected associates (economic evaluations, project development, geosciences, petroleum engineering, drilling, hydrocarbon processing)



## Experience

Experience covers most Australian petroleum provinces (particularly Cooper, Eromanga, Surat and Carnarvon Basins) and parts of Indonesia, Papua New Guinea and Thailand. After serving with Santos for 13 years and Western Mining for three years, Geoff became an independent consultant in 1987. Major projects that the company has participated in are Cooper Basin gas field development, offshore Carnarvon Basin oil field development and onshore Carnarvon gas field development. Technical evaluation of company assets has included Sagasco, Bridge Oil, Ampolex, Sino United States Petroleum, Australian Hydrocarbons and Wapet. Project acquisitions have included Kakap (Indonesia), Harriet and Thevenard Island (Carnarvon Basin), Woodada and Dongara (North Perth Basin), Salawati and Sabuka TACs (Irian Jaya) and MIM Holdings and Inland (South-West Queensland).

## Recent clients

Carnarvon Petroleum, Discovery Petroleum, Premier Oil Australia, Hemley Exploration, Grant Samuel and Associates, Esso Australia, Cue Energy, Beach Petroleum.

## Danny Burns

8 Joan Avenue, Glengowrie SA 5044

Phone (08) 8376 6210  
15 856 196 mobile  
Fax (08) 8376 6204  
Email dburns@eisa.net.au

## Background

Danny Burns graduated in 1983 with a First Class Honours Degree in Geophysics from the Flinders University of South Australia. Since then he has been involved in seismic acquisition, processing, interpretation and mapping for Australian and international oil companies. He has also spent time with Schlumberger as their Australian exploration software support manager.

## Services offered

- basin analysis and evaluation
- seismic planning, interpretation and mapping, from regional to field development
- can provide own workstation

## Experience

Danny has extensive experience in prospect generation and evaluation using both 2D and 3D seismic data. In Australia he has worked in the Cooper, Eromanga and Carnarvon Basins, and the Timor Sea including the ZOCA. He has also worked in the East Korea Bay, offshore North Korea. Whilst working for Schlumberger–GeoQuest Danny ran training classes in workstation exploration techniques and software use to geologists and geophysicists. He is familiar with GeoQuest software, Paradigm's SeisX Interpretation System and Petrosys mapping, and has also used Landmark's SeisWorks and SMT's Kingdom Suite.

## Recent clients

Beach Petroleum, Gas Strategies.

## Century Drilling Ltd

Mike Newport (General Manager, Oil and Gas)

172 Fullarton Road,  
Dulwich SA 5065

Phone (08) 8333 0336  
0414 567 216 mobile

Fax (08) 8333 0442

Email [mnewport@centurydrilling.com.au](mailto:mnewport@centurydrilling.com.au)

Web site [www.centurydrilling.com.au](http://www.centurydrilling.com.au)



Energy (Thailand), Unocal Geothermal of Indonesia.

## Challenger Geological Services Pty Ltd



Stephen Batty (Manager)

13A Weaver Street, Edwardstown  
PO Box 101, Melrose Park SA 5039  
Phone/fax (08) 8277 6777

### Background

Century Drilling was formed in 1985 and listed on the Australian Stock Exchange. In May 1997, Century Drilling was acquired by the Downer Group, a major construction contracting group. Downer's Contracts Services Division includes resource mining, oil-gas-geothermal-mineral drilling, and roads and government services.

### Services offered

Century Drilling is an oil, gas, geothermal and mineral onshore contractor. Century specialises in providing contract drilling and workover services to the petroleum and geothermal industries.

### Experience

Century Drilling has extensive experience in contract drilling operations in remote locations and in modifying drilling equipment to meet special needs and/or unusual circumstances of clients.

### Recent clients

Santos, Oil Company of Australia, Empire Oil Company (Western Australia), Australian Gasfields, Oil Search, Cairn

### Background

Challenger Geological Services has been servicing the petroleum and mining exploration industries successfully since 1980.

### Services offered

- core and rock sample photography (white light and fluorescence), lapping and grinding, re-packaging etc.
- storage — core, drill cuttings, samples, field equipment, vehicles etc.
- logistical support, sample transport, field activity coordination
- assistance with supply of field personnel, small electrical equipment, field supplies, major consumables, core trays, sample bags etc.

### Recent clients

Santos, Boral, BHP, MIM, plus many small to medium sized mineral and petroleum explorers.

## Dames & Moore Group

Martin Andrew

11–13 Bentham Street,  
Adelaide SA 5000

Phone (08) 8212 6955

Fax (08) 8212 6061

Email [aacmadel@ozemail.com.au](mailto:aacmadel@ozemail.com.au) or  
[adl@dames.com](mailto:adl@dames.com)

Web site [www.dames.com](http://www.dames.com)



### Background

The Dames & Moore Group comprises a global network of companies with 170 offices in 29 countries and a total of 7500 staff. This unique geographic reach allows the companies to offer a broad scope of quality services to clients throughout the world. In Australia the Dames & Moore Group of companies, consists of AACM, Dames & Moore, Dames & Moore – NRM, DMQ, Fortech, Hardcastle & Richards, and Radian International.

### Services offered

- Corporate (providing strategic advice – sharing risk) including: risk and hazard evaluation; community strategies; environmental management systems; greenhouse strategies; training material, workshops; corporate reporting; policies, procedures, codes; due diligence; natural resource management and conservation planning; program evaluation; environmental reporting; and economic analysis and planning.
- Site (providing tailor-made solutions) including: waste management; auditing; community relations; permitting; baseline; community

development; site selection infrastructure; trouble shooting; monitoring; closure; site rehabilitation; pastoral property management; natural resource management and conservation planning; program/project evaluation; and environmental reporting

### Experience

From Australian offices Dames & Moore Group companies work together to offer a fully integrated suite of services for mining and energy industry projects of all complexities. Experience has demonstrated that answers to today's complex environmental issues rarely rest with one discipline. The company's technical diversity provides a broad understanding of minerals and energy industry priorities and prevailing regulatory concerns, allowing the group to develop cost-effective environmental engineering solutions by combining the expertise of appropriate technical specialists in science, engineering, economics, community relations, planning and evaluation.

### Recent clients (petroleum)

BHP Petroleum, Woodside Petroleum, Esso, Boral, WMC, BP, Santos, Phillips Petroleum.

## Donovan and Associates

Peter Donovan (Managing Partner)

PO Box 436, Blackwood SA 5051

Phone/fax (08) 8270 1770

Email [donovan@peg.apc.org](mailto:donovan@peg.apc.org)



## Background

Donovan and Associates was established in 1980. The firm specialises in historical research and writing and providing advice on cultural heritage. It has consulted to clients Australia-wide and has undertaken many projects in country South Australia and the Northern Territory.

## Services offered

- historical and archival research
- corporate histories
- native title research
- cultural heritage advice
- book and report publication

## Experience

The firm has undertaken extensive historical research in outback South Australia and the Northern Territory. This has included heritage surveys of the Mound Springs area, the Flinders Ranges, South Australia's railway heritage and an overview of mining in Australia for the Australian Council of National Trusts. Commissioned histories have included books on the South Australian Pastoral Board, a history of the Strzelecki Track, a two volume history of the Northern Territory and a history of Roche Bros. The firm is currently involved in native title research for the Attorney-General's Department.

## Recent clients

Roche Bros, Hymix Australia, Asset Services, Transport SA, ACTEW Corporation, South Australian Attorney-General's Department, South Australian Pastoral Management Branch.

## Dynamic Satellite Surveys Pty Ltd

Bill Hedditch

71 Ferguson Avenue, Myrtle Bank  
SA 5064

Phone (08) 8338 2855

Fax (08) 8379 5809

Email [adelaide@dss.com.au](mailto:adelaide@dss.com.au)

Dynamic Satellite Surveys is a GPS survey specialist. GPS operations include static, kinematic, differential DGPS and real time RTK utilising single and dual frequency receivers. Survey control for mines, photogrammetry, lease boundaries, well set out and completion reports and pipeline route and centre line surveys. Complete surveys for 2D and 3D seismic with in-house quality control. Borehole and gravity surveys and GPS mounted machine control for line clearance.

## EconSearch Pty Ltd

Julian Morison (Director)

PO Box 1148, Stirling SA 5152

Phone (08) 8357 9560 work

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0419 869 633 mobile

Fax (08) 8373 2442

Email [econsrch@camtech.net.au](mailto:econsrch@camtech.net.au)



EconSearch offers the following services to the petroleum and mineral industries: economic impact assessment of mine developments (construction and operating); flow-on impacts (multiplier effects) on local, regional and State



economies in terms of employment, value added, business turnover and household income; and cost-benefit analysis and other standard analytical techniques used in the assessment of investment proposals in the mining industry incorporating non-market (e.g. environmental) benefits and costs.

**Ecos  
Consulting  
(Aust.) Pty  
Ltd**



Mark Watson (Director)

Suite 6, 3 Gordon Street, Glenelg SA 5045

Phone (08) 8376 3200

0412 217 776 mobile

Fax (08) 8376 3211

Email [mcwatson@ecos.com.au](mailto:mcwatson@ecos.com.au)

Web site [www.ecos.co.au](http://www.ecos.co.au)

**Background**

Ecos Consulting (Aust.) offers resource and environmental management consultancy services to the petroleum, pipeline and mining industries and Government throughout Australia.

Principal consultants have held engineering, operations and environmental positions in industry or natural resource management positions in government agencies. This experience provides Ecos with a unique ability to fully integrate the client's resource and environmental management objectives with overall business and project needs. The company has offices in Adelaide, Melbourne, Brisbane and Perth.

**Services offered**

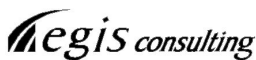
- project management of environmental impact assessments
- coordination of government approvals processes
- community and stakeholder consultation programs
- site and route selection
- landholder negotiations, land acquisition and compensation
- in-house environmental support to environmental coordinators and officers on specific projects or during overloads
- environmental auditing
- environmental monitoring programs
- environmental education and training programs
- environmental risk assessment
- environmental management systems, codes of practice, environmental improvement/management plans, procedures and guidelines
- environmental compliance manuals
- specialist environmental studies

**Experience**

The management and staff of Ecos have provided consultancy services to some of Australia's largest industry and infrastructure projects over the last four years including: Eastern Gas Pipeline (Sale to Sydney), Minerva Gas Field Development (Port Campbell), Gorgon LNG Project (North West Shelf), South-West Queensland Gas Pipeline, Point Lillias Chemicals Storage and Port, East Coast Armaments Complex (Geelong), Queensland Ammonium

Nitrate Plant, North West Shelf Expansion Project, and Underground Gas Storage Project (Port Campbell).

**Egis  
Consulting  
Australia Pty Ltd**



Paul Linton (State Manager,  
Environmental)

102 Greenhill Road, Unley SA 5061

Phone (08) 8291 2222

Fax (08) 8373 1287

Web site [www.cmpsf.com.au](http://www.cmpsf.com.au)

**Background**

Egis Consulting Australia, formerly CMPS & F, has provided quality consulting engineering services for over 60 years in Australia in the areas of environmental, infrastructure, mining and manufacturing, oil and gas, and building engineering. The Environmental Group in South Australia has worked with the petroleum industry for over 10 years providing dedicated assistance in the areas of site management incorporating the issues associated with site acquisition, divestment and development.

**Services offered**

- Contaminated site investigations, human health and ecological risk assessments and, where necessary, the design, installation and management of on-site remediation systems. These services are supported in South Australia by a strong groundwater numerical modelling and fate and transport capability, combined with GIS data.

- Accredited contaminated land and industrial facilities auditing, site-specific environmental management systems, consequence analyses and spill contingency planning. Egis can facilitate liaison with regulatory authorities to assist clients in compliance with relevant regulatory requirements.
- Design and installation of major oil and gas transfer pipelines and associated infrastructure. Egis offers these services to all petroleum industry sectors from refinery to retail site as well as to petroleum storage and handling facilities at all industrial and commercial facilities.

**Epic Energy Pty  
Ltd**



**epicenergy**

Ian MacGillivray  
(General Manager,  
Eastern Australian Operations)

25 Conyngham Street, Glenside

PO Box 53, Glenside SA 5065

Phone (08) 8372 2500  
0419 825 465 mobile

Fax (08) 8379 0151

Email [ian\\_macgillivray@epic.com.au](mailto:ian_macgillivray@epic.com.au)

Web site [www.epicenergy.com.au](http://www.epicenergy.com.au)

**Background**

In addition to Epic Energy's significant local expertise, major strategic shareholders, United States gas giants El Paso Energy and Consolidated Natural Gas (CNG), provide resources and expertise to the company's Australian operations. Both El Paso and CNG have been delivering innovative and

cost-effective services for more than 60 years.

### Services offered

Offshore and onshore:

- gas gathering and processing facilities
- gas transmission
- operation and maintenance of gas processing and pipeline systems
- complete pipeline operations and management services

### Experience

In Western Australia, Epic Energy owns, operates and maintains the primary gas trunkline, the Dampier to Bunbury gas pipeline and associated laterals, the Pilbara Energy Pipeline and the Burrup Peninsular Pipeline (a total of 1773 km, and diameters of 450–600 mm, commissioned in 1984).

In Queensland, Epic Energy owns and operates the South West Queensland, Ballera to Wallumbilla gas pipeline (755 km, 406 mm diameter, commissioned in 1997).

In South Australia, Epic Energy owns, operates and maintains the primary gas trunkline, the Moomba to Adelaide Pipeline System and laterals to Whyalla, Port Pirie and Angaston (781 km, 550 mm diameter, commissioned in 1969). It also owns and operates the Katnook Pipeline System which transports natural gas to Mount Gambier, Snuggery and Safries (71 km, 150 mm diameter system, commissioned in 1991).

Epic Energy operates and maintains: the Moomba to Port Bonython Liquids Pipeline which transports crude oil, condensate and liquid petroleum gas on behalf of the Cooper Basin Oil and Gas

Producers (659 km, 350 mm diameter, commissioned in 1982). Epic Energy also operates and maintains the Riverland Pipeline System from Angaston to Berri and Murray Bridge (232 km, 100 mm diameter, commissioned in 1995) on behalf of Boral Energy.

### Recent clients

Santos, Terra Gas Trader, Boral Energy, PG&E, Alinta Gas, ETSA Corporation.

### Expertest Pty Ltd



David G. Hawkes (Managing Director)

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Web site [www.expertest.com.au](http://www.expertest.com.au)

### Background

Expertest has been providing quality wellsite services to onshore oil and gas producers for over 20 years. Expertest is now a member of the Gearhart Australia group of companies.

### Services offered

- production well testing and wireline services
- electric line and memory tool logging services
- Kinley Caliper and power tool services
- closed chamber drillstem tests
- plunger lift installations
- EVI oil tool completion design and equipment supply
- wireline and production testing schools

## **Fatchen Environmental Pty Ltd**

Tim Fatchen (Director)

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### **Background**

Fatchen Environmental is an ecological consultancy with special expertise in land management, environmental planning, ecological survey and monitoring, and arid and tropical environments. Activities include impact assessment, land rehabilitation and landcare planning. Continuous consulting services have been provided since 1981 throughout Australia.

### **Services offered**

- environmental impact assessment at all levels from minor reviews and declarations to major environmental impact statement production
- environmental monitoring — ecological, landscape integrity, air pollution effects
- land rehabilitation — post-mining, post-exploration drilling and related
- ecological and biological surveys
- environmental program and project management including sourcing, directing and managing appropriate project teams
- other associated technical services

### **Experience**

Fatchen Environmental has an extremely wide industry and government exposure, whether as specialist or as a lead consultant, extending well beyond the petroleum industry.

Experience within the petroleum industry includes: ecological survey, management and rehabilitation assessments for oil and gas fields ranging from the Canning Basin to high rainfall southern Australia; environmental assessments of major pipeline routes; production of statutory environmental declarations for oil and gas exploration drilling programs; and research investigations into outcomes of seismic surveys. Recent projects include evaluation of completion criteria for oil and gas exploration in the Cooper Basin and environmental impact statement production involving development of intensive wellfield operations.

Projects outside the petroleum industry include airport development, uranium mining, copper smelting, road and rail construction, port development, pastoral management, national park planning, World Heritage issues, waste rehabilitation and surface and groundwater management.

### **Recent clients**

PIRSA (evaluation of completion criteria for oil and gas exploration, Cooper Basin, South Australia), Heathgate Resources (environmental impact statement production including development of intensive wellfield operations).

## **Finlaysons** *Finlaysons*

Jon Gregerson

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Finlaysons is a legal firm providing a full range of services to the petroleum industry, whether at the exploration, appraisal, development or production stage. The firm has special expertise in acting for foreign clients investing in the Australian petroleum industry and in acquisitions/capital raising.

### **Fugro-Photec**

Ken Jeffery

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Fugro-Photec is a survey specialist providing on- and offshore services. Onshore — GPS surveys; photogrammetry and digital mapping GIS services; open-pit surveys, 3D modelling; volume calculations; digital terrain modelling; geodetic control surveys; exploration baseline and gridding; borehole location; aerial photography; underground mining surveys; construction and engineering surveys. Offshore — seafloor mapping, bathymetric and geophysical surveys; soil sampling and analysis; shallow seismic; data acquisition and reporting; location of underwater objects; rig positioning.

### **Fyfe Surveyors Pty Ltd**

Geoffrey Allen

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Fyfe Surveyors has the resources to offer specialist surveying, mechanical design, and related services to the petroleum industry. Fyfe has extensive experience in remote location operations and has established a network of associations with consultants in supplementary disciplines that include environmentalists, archaeologists and anthropologists. Services offered include: route selection and documentation for pipelines, roads etc.; co-ordination of consultants to gain project approvals; alignment survey and design; hazard identification for risk assessment in accordance with the requirements of AS 2885; mechanical and civil design; pipeline construction packages; pipeline licence and easement surveys; gas/oil field planning and infrastructure siting; well location pegging, documentation and registration; geodetic, GPS surveys and processing; mapping and land information systems; and computing applications for client specific projects.

### **Gaia Geological Services**



Colin Gatehouse

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## Background

Colin Gatehouse graduated from the University of Tasmania BSc (Hons) in 1961 and obtained a MSc in Earth and Space Sciences from the State University of New York at Stonybrook in 1969. Expertise in Cambrian palaeontology, carbonate petrology and basin analysis; special training in non-marine sandstone reservoirs.

## Services offered

- all aspects of wellsite geology in petroleum in remote areas
- wellsite work in sedimentary basins including program planning and execution
- preparation of well completion reports
- log digitising
- Wellcad display of summary and detailed logs
- interpretation of borehole televIEWER logs
- detailed correlations of marine and non-marine sedimentary environments from drillholes
- construction of structure contour maps
- gas reserve estimates in multiple-sand reservoirs
- good relationships with Maralinga Tjarutja people over some 23 years place Colin Gatehouse in a unique position to smooth the way for access to Maralinga Tjarutja land

## Experience

Thirty-six years experience in Cambrian sedimentary basins of Australia, carbonate petrology, stratigraphy and sedimentology, also Cambrian palaeontology of Antarctica

and northern Australia. Recent focus has been the sedimentology and stratigraphy of the Officer Basin and of the Kanmantoo Trough.

## Recent clients

Heathgate Resources, Pima Mining, Cheetham Salt, Goldstream Mining.

## Gearhart United Pty Ltd



Alistair Murray (Sales Manager)

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Web site [www.gearhart.com.au](http://www.gearhart.com.au)

Gearhart United is based in South Australia and is a member of the Gearhart Australia group of companies. The company offers engineering, manufacturing and inspection services to the oil and gas industry and industry in general. Full machine shop services are located in both Adelaide and Moomba. Gearhart United is licensed to cut a range of premium threads by Nippon Steel, NKK, Grant Prideco and Kawasaki FOX and is qualified to API Specifications 5CT, 6A and 7. Redback Roller Reamers and Wallaby Stabilisers are manufactured and supplied. Comprehensive on-site inspection services are offered in accordance with API or DS1 requirements.

## GeoMechanics International Inc.



David Castillo

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Web site [www.geomi.com](http://www.geomi.com)

### Background

GeoMechanics International (GMI) is a United States-based company offering a wide range of geomechanical, petrophysical and well bore imaging services to the oil and gas, geothermal, environmental and geotechnical industries. GMI's core group of scientists have established a world-leading research program in borehole geophysics at Stanford University; the technologies are the result of more than 20 years of research in wells and boreholes drilled in a wide range of settings around the world.

### Services offered

GMI offers consulting services, propriety software (SFIB<sup>TM</sup>, IMAGER<sup>TM</sup>, MOHRFRAC<sup>TM</sup>, WAVE4<sup>TM</sup>) and training to help geologists and engineers define the:

- in situ stress state
- distribution, orientation and properties of natural fracture systems
- petrophysical properties of rock formations

All software can be developed or augmented to meet the specific needs of individual clients.

GMI uses knowledge of the stress field and natural fractures/faults to address a suite of exploration related issues such as:

- identification of the critically-stressed fractures that support fracture permeability in fractured reservoirs
- design of a directional drilling program that intersects the maximum number of these hydraulically conductive fractures
- assessment of fault-trap integrity where detailed knowledge of the stress field and seismically-derived faults are used to identify those faults most likely to support a hydrocarbon column without fault leakage

GMI's petrophysical analysis technologies provide the capability to display, process, and interpret acoustic waveform data, enabling quality control of waveform analysis of cased-well and open-hole data in problematic intervals.

### Experience

David Castillo is head of GMI's office in Australia, and is joined by a strong group of scientists and analysts in Palo Alto, California and Czech Republic. This team includes Drs Colleen Barton, Daniel Moos, Pavel Peska, and Mark Zoback. David completed his PhD at Stanford University in 1993 and since 1985 has worked for Amoco Production Co. International, United States Geological Survey, Lawrence Livermore National Laboratory and the University of Adelaide. He has broad experience with in situ stress measurements in the Ocean Drilling Program, San Joaquin Valley production fields in California and more recently in exploration and production wells in the

Timor Sea and North West Shelf, offshore Australia.

### Recent clients

Woodside Energy, Shell Development Company Australia, BHP Petroleum, British Petroleum, Occidental Inc., Pemex, Mobil, Texaco, Exxon, Harding and Lawson.

### Geoscience Associates Australia Pty Ltd

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Geoscience Associates Australia is a service contractor of slim-hole well logging for the oil, gas, coal and mineral industries; PC-based digital acquisition systems and software; well log digitising; also designer, manufacturer, instrument sales and service; API calibrated; customised logging units.

### Geoservices Overseas SA



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### Background

Geoservices Overseas has been contributing to the development of the oil and gas industry since 1958, and now enjoys an international reputation as a prominent service company in the upstream sector. The company offers mudlogging, directional drilling, and production and integrated services.

### Geoweste Pty Ltd

Griff Weste (Principal Geologist)

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### Background

Geoweste was incorporated in 1987 to specialise in three aspects of petroleum exploration: evaluation of the 'older' Devonian to Proterozoic sedimentary basins from basin analysis through to well supervision; operations and wellsite geological services for offshore and remote onshore locations; liaison with Aboriginal landholders.

### Services offered

- basin evaluation
- identification of potential source rocks, reservoirs, and suitable long-term seals
- maturation modelling, trap timing and migration
- evaluation of carbonate and evaporite plays



- operations geology
  - planning of exploration and drilling programs
  - Mines Department liaison
  - operations geologist and wellsite geologist services
  - well completion report compilation
- Aboriginal liaison
  - initial negotiation of exploration agreements with Aboriginal organisations and individuals
  - general liaison during exploration
  - organisation and implementation of area and site clearance surveys for seismic and drilling operations

### Experience

Griff Weste has 18 years experience evaluating the hydrocarbon potential of 'older' basins, including the Officer, Stansbury, Arrowie, Adelaide Geosyncline, Warburton, Amadeus, Canning and McArthur. He has extensive experience as operations geologist and wellsite geologist in these basins and in the offshore Bonaparte, Browse and Dampier Basins and in South-East Asia. Exploration agreements have been successfully negotiated with Aboriginal organisations in South Australia, Northern Territory and Western Australia.

### Recent clients

Wagner and Brown, Canyon, Shell Development, Woodside, BHP Petroleum, First Sourcenergy, Bow Valley, Asamera.

## GPA Engineering Pty Ltd

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### Background

GPA Engineering is a multi-discipline engineering design company experienced in oil and gas facilities. It was established in 1987 and offers 30 engineering and drafting personnel who have recent and substantial experience in Australia and New Zealand. Personnel previously filled key technical and management positions in operating companies in developing major oil and gas accumulations in the Cooper and Eromanga Basins in Australia and in South-East Asia.

### Services offered

- process, mechanical, piping, tankage, metering, instrumentation and electrical engineering; planning and scheduling; inspection; cost estimating and cost control (GPA has significant experience in overall project management and contract management for oil and gas facilities)
- design and specification of oil and gas surface production facilities from wellhead to custody transfer metering
- design and specification of data acquisition and telemetry systems
- programmable logic control specifications, operator interface and configuration design
- hazard and operability reviews



- knowledge of specialist supply companies

## Experience

Personnel have experience in remote areas of Queensland, South Australia, Northern Territory and Western Australia and a total of 12 years experience in South-East Asia. Projects include: Beharra Springs gas plant, Western Australia (project management of original facility including membrane CO<sub>2</sub> removal plant and facility expansion); Palm Valley gas plant, Northern Territory (design, project management and commissioning of wellhead, compression and telemetry facilities); Katnook gas plant, South Australia (design, project management and commissioning of complete gas system from wellhead to metering including gas processing facility); Kaimiro–McKee, New Zealand (plant debottlenecking, compression, flare, separation facilities and an on-line control system upgrade); Moomba, South Australia and South-West Queensland oil and gas production and processing facilities (variety of projects including gas filtration, compression, control systems, PLC management).

## Recent clients

Magellan Petroleum, Boral Energy Resources, Santos, Epic Energy, ETSA, MIM Petroleum, Parker and Parsley, Boral Energy Asset Management, Command Petroleum (India), Petrocorp Exploration (New Zealand), Petroz, Envestra, Optima Energy.

## Halliburton Australia Pty Ltd



Mark Parsons (Operations Manager, Australia, Papua New Guinea, New Zealand)

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Halliburton Australia, part of the Halliburton Company, offers a diversified range of energy products and services including zonal isolation, stimulation chemicals and services, wireline logging and perforating, completion and production products, coiled tubing services, nitrogen services, sand control products and services, production and exploration well testing services, workover services, completion products and services, Sperry-Sun drilling services, Baroid drilling fluids and Security DBS drill bits.

## Hassell Pty Ltd



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## Background

Hassell is one of the largest and most successful multi-disciplinary design

consultancies in Australia and the Asia-Pacific region. Design skills include architecture, interior design, health planning, landscape architecture and urban and regional planning.

### Services offered

Services with relevance to the petroleum industry include feasibility studies, master planning, facility planning, site planning, community consultation, architectural design, documentation, project management plans, environmental and land assessment, financial feasibilities and cost-benefit analysis, and land rehabilitation and reuse.

### Experience

Hassell has the ability and experience necessary to service small critically sensitive projects as well as large and complex projects. Projects are diverse and have included commercial ventures such as Melbourne Central valued at US\$800 million and the planning and development of new towns and facilities for remote areas.

### Recent clients

Pipelines Authority, Santos, Department of Environment and Natural Resources, MFP Development Corporation, Department of Transport, Mobil Oil Australia.

### Richard Hillis

Richard Hillis (Senior Lecturer)

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### Background

Richard Hillis graduated BSc (Hons) from the University of London in 1985, and obtained a PhD from the University of Edinburgh in 1989. After periods at Flinders University, Adelaide, and the British Geological Survey, Edinburgh, he joined the University of Adelaide in 1992. He is a member of AAPG, AGU, ASEG, EAGE, FESSA, GSA, GSL, PESA and SEG.

### Services offered

- In situ crustal stresses— determining the in situ stress field from well log and drilling data. The in situ stress environment impacts on a number of issues critical to hydrocarbon exploration and development, namely, nature of recent tectonism, orientation of open natural fractures, hydraulic integrity of reservoir seals, fluid flow in reservoirs, orientation and nature of hydraulically-induced fractures and wellbore stability, especially of deviated and horizontal wells. See Hillis and Williams (1993, APEA Journal, 33:373-385) and Hillis et al. (1995, APEA Journal, 35:494-506).
- Burial-history of eroded basins — quantification of erosion/maximum burial-depth. Many sedimentary basins have been eroded from maximum burial-depth, often in association with basin inversion. It is imperative to constrain the magnitude

of erosion and incorporate its effects into source rock maturity modelling, reservoir porosity modelling, velocity analyses for depth-conversion, sedimentary rock decompaction procedures and analysis of basin structure and migration pathways at the time of maximum burial depth. See Hillis (1995, AAPG Bulletin, 79:130–152).

### **Experience**

Richard Hillis has consulted on in situ stress and burial-history projects in the Otway, Amadeus, Cooper and Eromanga Basins, Timor Sea, Southern North Sea Basin (offshore United Kingdom), Celtic Sea Basins (offshore United Kingdom – Ireland), Western Approaches Trough (offshore United Kingdom – France), Taranaki Basin (New Zealand) and offshore Brunei.

### **Recent clients**

Shell United Kingdom, Arco United Kingdom, Chevron United Kingdom, Hydrocarbon Management International, Oil Company of Australia, Magellan, Santos, Phillips Oil Company Australia, Enterprise Oil, Petrocorp New Zealand, Fletcher Challenge Petroleum Borneo.

### **Horwarth (SA) Pty Ltd**

Austin Taylor (Director)  
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Horwarth is among the largest international firms of Chartered Accountants, with offices in most countries. Administrative accounting taxation (Australian and international) services are offered to companies wishing to establish an office and operating infrastructure in South Australia or Australia.

### **IMTC Australia Pty Ltd**

International Multidiversified Trading Company

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Web site [www.freeyellow.com/members/imtc](http://www.freeyellow.com/members/imtc)

IMTC Australia offers: worldwide drilling fluids engineering, training and/or operational–administrational management which is independent of product lines; proven cost control and specialisation in post well audits from twenty years of experience; project pre-planning including supervision and financial reconciliation to safeguard clients interest.

### **Independent Drilling Fluid Services Pty Ltd**



Andre Skujins (Managing Director)  
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SA 5000



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### **Background**

Independent Drilling Fluid Services is a supplier of drilling fluid engineering services, drilling fluid products and related services. Since its inception in 1987, the company has built on the philosophy of providing individual and personalised service based upon the client's requirements.

### **Services offered**

- formulation of mud programs
- rig site engineering and monitoring
- problem solving
- training programs
- information technology
- entire range of drilling fluid additives available including environmentally responsible products

### **Experience**

Independent Drilling Fluid Services employs fully qualified mud engineers and chemists. Expertise in all exploration areas of Australia.

### **John Iredale**

John Iredale  
100 Swaine Avenue, Toorak Gardens  
SA 5065  
Phone/fax (08) 8332 3955

### **Background**

John Iredale graduated in 1979 with a First Class Honours Degree in Geophysics from

the University of Adelaide. Since then he has been involved all aspects of geophysics in the Cooper and Eromanga Basins while employed by Delhi, Santos and South Australian Oil and Gas Corporation.

### **Services offered**

- well-shoot supervision and interpretation
- seismic interpretation and mapping
- loading of seismic data to Geoquest workstation

### **Experience**

Seismic interpretation and mapping in petroleum exploration, development and appraisal. Systems of preference are Geoquest and Petrosys, but some experience with Landmark and Sattlegger.

### **Recent clients**

MESA, Santos.

### **Brent Jensen-Schmidt & Associates**

Brent Jensen-Schmidt  
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### **Background**

Brent Jensen-Schmidt graduated in 1979, with a BSc in Geophysics, from the University of British Columbia, Canada. Since then he has been involved in seismic interpretation and mapping with both major and minor exploration companies in both North America and Australia.

Associates include highly experienced geophysicists, geologists and reservoir engineers, all consultants in their own right. The company has strong connections in all States and in Asia.

### Services offered

- Seismic interpretation and mapping in play generation, basin analysis, field development and appraisal. Systems of preference are the Petrosys mapping system and Geoquest interactive workstation, but also familiar with Landmark, Sierra, Sycor and ECS.
- Expertise and information relating to bidding for exploration licences resulting from the 1999 release of the Cooper Basin acreage through the associated company New Age Oil Holdings Pty Ltd.

### Experience

Recent projects include very detailed regional mapping and analysis of the Cooper and Eromanga Basins (from the western Eringa Trough to the Queensland border) and of the offshore Otway Basin in South Australia.

Area of specialty is the Cooper and Eromanga Basins. Other Australian areas worked include Otway, Pedirka, Simpson, Duntroon and Officer Basins, Eringa Trough and North West Shelf. Overseas areas include Georges Bank (United States) and Scotian Shelf, Jean d'Arc, Avalon and Sverdrup Basins (Canada).

### Recent clients

PIRSA, Northern Territory Department of Mines and Energy, Norcen, Hunt Energy and Minerals, Canyon, Aboriginal Legal Rights Movement.

## Johnson Winter & Slattery

Peter Slattery

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Johnson Winter & Slattery is a firm of barristers and solicitors specialising in upstream petroleum industry issues (transactional nature or dispute related) including: joint venture agreements; farmin arrangements; acquisitions; project development agreements; land access and title arrangements; production sales and offtake arrangements; pipeline and access haulage arrangements; related regulatory issues.

## Kinhill Pty Ltd



John Prowse (Manager)

Mining, Processing and Industrial)

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### Background

Kinhill is an Australian based ISO9001 accredited multi-disciplinary engineering and project-construction management company with an established network of over 30 offices throughout Australia, Asia and the Pacific and over 1500 staff (200 in South Australia). In 1997, Kinhill was acquired by the international engineering and construction company, Brown & Root, whose parent is Halliburton Company, a

major United States company. Halliburton incorporates a number of other significant process-related business units including Dresser Industries, MW Kellogg and Granherne. As a part of Halliburton Company, Kinhill offers clients the best of both worlds with its traditional local resources and expertise together with the global technical capability and financial resources of one of the world's largest oil and gas services companies.

### Services offered

Kinhill offers a wide range of services in the oil and gas industry as well as chemical, mining, mineral processing, effluent treatment, power generation, water resources and marine works. These services include initial planning, process selection, feasibility studies, environmental assessments, front end engineering design (FEED) development, cost estimates and cost control, detailed design and specification, procurement and contract administration, construction management, commissioning, project management and plant maintenance and operation. Kinhill has delivered entire projects on an engineering procurement and construction management (EPCM) basis and EPC (design and construction (D&C)) basis.

### Experience

Kinhill has extensive experience in the services offered. FEED packages include: a petrochemical ethane treatment facility at Moomba; Olympic Dam Expansion Project; South-West Queensland Gas Project Moomba plant modifications; Refinery C4 and gasoline treatment units at Geelong, Victoria and an Ethylene Debottlenecking Project in Victoria; Bentu

PSC Gas Project in Indonesia; and a petroleum products terminal at Hastings, Victoria. EPCM and EPC (D&C) contracts include: an ethane treatment plant at Moomba (EPC); a lead refinery modernisation in South Australia (EPCM); Hides Gas Field Development, Papua New Guinea (EPCM); Moomba to Adelaide gas pipeline and the Bolivar DAFF waste water treatment plant (EPCM).

### Recent clients

Santos, Epic Energy, Energy Equity, Optima Energy, SA Water, WMC, Pasminco.

### Leica Geosystems Pty Ltd



Trevor Ley

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Web site [www.leica.com](http://www.leica.com)

Leica Geosystems offers sales service and hire for GPS, total stations, reflectorless measuring systems, digital levels, surveying software solutions and precision industrial measuring systems.

### LETService Pty Ltd



David Linn (Marketing Director)

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LETService was established in 1988 and offers training services to the petroleum industry in Australia and South-East Asia. Course presenters are sourced worldwide and particularly focus on development of technical skills at professional level from exploration to marketing.

## **Lloyd Helicopter Group**



Ian McBeath (Sales and Marketing Director)

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Lloyd Helicopter Group operates a fleet of 34 helicopters from fixed bases throughout Australia and South-East Asia. The aircraft support a wide range of operations including offshore oil and gas exploration and production, search and rescue, emergency services, underslung load lifting, media, onshore surveys and general charter.

## **McDonald & Co.**

Mike McDonald

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McDonald & Co. is a law firm with over 10 years experience in the provision of commercial legal services. Experience includes both upstream and downstream work and onshore and offshore petroleum operations. Field of work includes gas and liquids sales contracts, petroleum project documentation, government liaison/negotiations, litigation and dispute resolution, joint venture and tenement matters, acquisitions and disposals, Aboriginal and native title matters and advice on and management of regulatory matters.

## **Raymond John McKinnon**

John McKinnon

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John McKinnon, a licensed cray fisherman in the Port MacDonnell area for the past 39 years, has an extensive knowledge of the coastline and surrounding areas and a good rapport with local fishermen. Over the last 18 years John has been contracted by exploration companies and government bodies to clear craypots prior to seismic surveys. Although mainly based in South Australia, John has also worked along the Victorian coastline between Cape Otway and Port Campbell. A BHP Petroleum contract included grab sampling from the ocean floor to assist with geo-mechanical analysis for anchor points on offshore drilling rigs. John provides resources to undertake these surveys including the



*Perfect Lady*, a 17.3 x 5.5 x 1.8 m fibreglass boat equipped with lifting equipment, winches, radar, GPS, and two-way radio. Recent clients include the Australian Geological Survey Organisation, Boral, Ultramar, Cultus, BHP Petroleum and Chevron.

### Maloney Field Services



Barry Maloney (Managing Director)

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Maloney Field Services, a land access consultancy, facilitates mineral and petroleum exploration programs through to the construction and development of major cross-country pipelines. Consultants are trained valuers and land economists with extensive knowledge and experience in addressing all legal, environmental, cultural and political requirements necessary to pave the way and to provide access for the development of major infrastructure projects.

Assignments include: Ballera to Mount Isa gas pipeline; Minerva onshore gas pipeline development, Port Campbell; Berri to Mildura gas pipeline; Fenton Creek – Mylor gas field development, Paaratte; and Geraldton to Windimurra natural gas pipeline.

### Maptek Pty Ltd



Steve Sullivan (Regional Sales Manager)

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Maptek is a leading developer of software for the resources industry. VULCAN is a 3D, interactive software package covering all areas of the industry, from hard rock mining to the oil and gas sector. VULCAN software can be used for geological modelling, exploration, hydrocarbon resource calculations, seismic modelling and environmental impact statements. Bureau work and consulting services carried out in-house or on-site.

### Mathews Consulting Services Pty Ltd

Geoff Mathews

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### Background

Geoff Mathews is a chemical engineer with almost 30 years experience in the energy sector, and has been an independent consultant for three years. Geoff worked for Mobil Oil Australia for 11 years gaining operational and planning experience; Delhi Petroleum for five years on planning and joint venture management; and Santos for 10 years on

planning, financial modelling and acquisitions.

### Services offered

The company primarily offers economic evaluation services for all types of projects plus commercial and corporate acquisitions. A balanced blend of technical and operational expertise, planning and financial modelling skills and project and corporate experience supports these services.

The company specialises in developing comprehensive computer models based around discounted cash flow analysis. The extensive experience and background of the principal ensures that an appropriate balance between the relevant technical, economic and financial factors is achieved.

### Experience

Oil and gas experience covers all areas of Australia plus Malaysia, Indonesia, Papua New Guinea, United States and United Kingdom. Electricity experience includes deregulated markets in Victoria, New South Wales, Queensland and South Australia.

### Recent clients

WMC, Australian Energy Advisors, Santos, Mobil Refining (Aust.), PetroVal Australasia, Boral Energy.

### M-I Australia Pty Ltd



Dave Bennett (Senior Operations Engineer)

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M-I Australia is a leading supplier of drilling fluids products/systems, services and equipment to the worldwide petroleum industry. The company is owned by Smith International Inc. (60%) and Schlumberger (40%).

### Microbits



Max Mentiplay (Managing Director)

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Microbits is a South Australian assembler and supplier of desktop computers and file servers to industry, corporate and government markets. Microbits offers the latest in information technology including teams specialising in networking and other communication methods, e-Commerce and Year 2000 remediation.

### Minter Ellison

Ewan Vickery (Partner)

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Ewan Vickery and Neville Martin are Partners in Minter Ellison, a full service law firm, and part of the international Minter Ellison Legal Group. The firm is experienced in all aspects of business establishment, local and foreign transactions, capital raising, corporate reconstructions, mergers and acquisitions, joint ventures, offshore and onshore titles management advice, taxation and revenue, environment law, trade practices, native title and indigenous issues, public affairs issues and property law and transactions.

## Morgan Palaeo Associates

Roger Morgan  
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## Background

Roger Morgan has 28 years of experience comprising postgraduate studies (Adelaide University, 1970–74), Geological Survey of New South Wales (1974–79), BNOC/Britoil (United Kingdom, 1979–83) and current palynological consultancy. Nigel Hooker has 18 years of experience comprising postgraduate studies (Sheffield University, United Kingdom, 1980–81), Britoil/BP Exploration (United Kingdom, 1981–91) and current palynological consultancy.

## Services offered

Palynological analyses from office-based locations include:

- age
- biozone
- environment
- maturation
- multi-well correlation and review studies, including sequence stratigraphic analysis and palaeogeographic reconstruction

Rig site-based services include:

- stratigraphic monitoring
- prediction (coring and TD points, and anticipation of overpressured zones)

## Experience

Competent in the late Palaeozoic, Mesozoic and Cainozoic of Australia, Papua New Guinea, and the North Sea.

Extensive recent multi-well correlation projects in the Otway Basin (Late Cretaceous–Tertiary), Duntroon Basin (Cretaceous–Tertiary), Carnarvon Basin (Triassic), North West Shelf and Timor Sea (Jurassic–Cretaceous) and Papuan Basin (Jurassic–Tertiary).

## Recent clients

Ampolex, Apache Energy, BHP, Boral, BP Petroleum, Cultus, Esso Australia/Papua New Guinea, GFE Resources, MIM Petroleum, Mobil, Phillips Petroleum, Victorian Department of Minerals and Energy, Wapet, Woodside.

## **National Centre for Petroleum Geology and Geophysics**



John Kaldi (Director)

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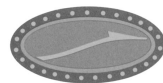
Email [msutton@ncpgg.adelaide.edu.au](mailto:msutton@ncpgg.adelaide.edu.au)

Web site [www.ncpgg.adelaide.edu.au/ncpgg.html](http://www.ncpgg.adelaide.edu.au/ncpgg.html)

The National Centre for Petroleum Geology and Geophysics (NCPGG) is a cooperative venture between the Universities of Adelaide and South Australia and is a joint venture partner in the Australian Petroleum Cooperative Research Centre. The core activities of the NCPGG are: training students for industry and research; conducting research on behalf of government bodies and members of the Australian petroleum industry; and providing training and research on a worldwide basis but with an emphasis on South-East Asia.

Areas of expertise centre around the derivation of rock properties and their application to: basin analysis; stratigraphic and structural modelling; seismic stratigraphy; reservoir characterisation; petrophysics and log analysis; diagenesis; structural analysis in complex terrains; and integration of data to derive an exploration model.

## **National Jet Systems Pty Ltd**



Hugh Davin (Executive  
Director, Marketing)

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National Jet Systems has the expertise and operational experience for all aviation requirements. The company can provide everything from the aircraft and their crews, to the management of the entire operation including airfields. National Jet Systems has a proud track record with major mining and resource companies in Australia and overseas.

## **Oil Drilling & Exploration Ltd**



Neil Dean (Operations  
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Oil Drilling and Exploration (ODE) was incorporated in New South Wales in 1954,



to offer contract drilling and workover services for gas, oil, geothermal energy and coal seam methane in Australia and overseas. It also offers related services such as the provision of drilling crews and equipment for other rig operators both on and offshore. The company has over 45 years experience in supplying drilling and workover services in many parts of the world. It currently owns 23 onshore drilling rigs, five onshore workover units and has a 50% interest in one offshore platform workover unit. Of these rigs, 12 are in Australia and 16 are overseas. ODE operates a subsidiary company, Oilfield Supply Pty Ltd, with offices throughout Australia and in Houston, United States. This company ensures ODE immediate access to all spares and equipment required for the efficient operation of its rigs worldwide.

### **OmniSTAR Pty Ltd**

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Web site [www.omnistar.com.au](http://www.omnistar.com.au)

Omnistar is the world's principal provider of Differential GPS (DGPS) signals. Using DGPS signals the accuracy of most GPS receivers can be increased from  $\pm 100$  m to  $< 10$  m, (some receivers can achieve sub-metre accuracy). This

accuracy is achievable, without post-processing base station data (real time positioning), anywhere in Australia.

### **Bernard O'Neil**

Bernard O'Neil

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### **Background**

Bernard O'Neil is a freelance editor and historian. He has 19 years experience as a historian–researcher and 16 years of editorial and production experience. He is a Visiting Research Fellow, History, Adelaide University (1989–).

### **Services offered**

- land titles/leases research
- native title claims research
- recording oral history
- identifying sites
- proofreading, editing, indexing
- publication production liaison
- archival advice

### **Experience**

Publications include the *PESA Journal* (production editor, 1986–95), *The Cooper and Eromanga Basins, Australia* (editor, 1989), annual reports, the history of MESA (*In search of mineral wealth*, 1982; *Above and below*, 1995) and chapters on 'Minerals and energy' (*The Bannon decade*, 1992), 'South Australia's mining history' (*Australia's mining heritage*, 1995) and 'Exploration and development' (*Petroleum geology of South Australia*

series: *Vol. 2: Eromanga Basin*, 1996; *Vol. 3: Officer Basin*, 1997, *Vol. 4: Cooper Basin*, 1998).

### Recent clients

MESA, Carnegie Minerals, Donovan & Associates (per Attorney-General's Department), Sagasco Resources (1992–93), PIRSA.

## Organic Geochemistry in Basin Analysis Group



David McKirdy (Director)

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### Background

The Organic Geochemistry in Basin Analysis Group (OGBA) is based in the Department of Geology and Geophysics, University of Adelaide and incorporates the postgraduate training and research activities of its Organic Geochemistry Laboratory under the direction of Associate Professor David McKirdy, one of Australia's most experienced organic geochemists.

The group conducts research in all areas of applied organic geochemistry including source rock and petroleum geochemistry, palaeoenvironmental and thermal history studies, and the origin and fate of oil in the marine environment. The group also has

an established track record in all aspects of coal geology and resource evaluation through its links with G&S Resources. OGBA maintains a high level of analytical expertise in organic petrology, gas chromatography (GC), gas chromatography – mass spectrometry (GC–MS) and stable isotope analysis.

### Services offered

Analytical services include:

- vitrinite reflectance and maceral analyses
- extraction and chromatographic separation of hydrocarbon fractions from sediments and crude oils
- biomarker analyses of crude oils and petroleum source rocks
- carbon isotopic analysis of kerogens and hydrocarbon fractions
- through long-standing arrangements with other laboratories OGBA can offer additional analytical services such as Rock-Eval pyrolysis, pyrolysis-GC, compound specific isotope ratio mass spectrometry, and palynology

Contract services include:

- retrieval, collation and interpretation of organic geochemical data
- establishment of geochemical and geological databases
- oil–oil and oil–source correlations
- recognition of petroleum systems
- reconstruction of migration pathways and reservoir charge histories
- coalfield evaluation
- geophysical log interpretation
- lithostratigraphic correlation
- 3D geological modelling

## Experience

David McKirdy and Bernd Michaelsen have accumulated over 37 years of experience in the petroleum exploration industry, mostly within Australia. Gavin Springbett has worked for over 20 years in the coal industry throughout Australia and Asia.

## Recent clients

AusAid, BHP Petroleum, Boral Energy Resources, BP, Burton Coal, Calcutta Electric Supply Company, Canyon (Australia), Optima Energy, PIRSA, Santos.

## Oxford Geological Consultants Pty Ltd



Steve Robinson

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## Background

Oxford Geological Consultants comprises a group of experienced petroleum geologists (average 18 years each) with proven abilities and varied experience in the oil and gas industry, specialising in modern wellsite geological supervision and evaluation and operations geology. Formed in 1989 with several individual consultants, the group functions as a pool of geological experience for contract on any short or long-term project. Personnel are based in South Australia, Queensland and Western Australia.

## Services offered

- comprehensive wellsite service
- wellsite quality control of service company personnel and performance
- operations geology
- reservoir and field analysis
- prospect generation
- basin analysis

## Experience

Wellsite experience includes wireline log acquisition, quicklook log interpretation, highly deviated and horizontal wells, overpressured regimes, clastic and carbonate sequences, monitoring inflate/conventional drillstem tests and cutting conventional and low-invasion fibreglass/metal sleeved cores.

Work has been undertaken in the following Australian basins or areas: Amadeus, Arafura, Bonaparte, Browse, Canning, Carnarvon Basin, Cooper–Eromanga, Gallilee, Gippsland, Otway, North West Shelf, Surat and Timor.

Overseas experience includes Brazil, Burma (Myanmar), Colombia, Gulf of Mexico, Indonesia, New Zealand, North America, North Sea, Papua New Guinea, Peru, Philippines, Trinidad and Vietnam.

## Recent clients

Amoco (Myanmar), Apache Energy, BHP Petroleum, British Gas E & P (Indonesia), Conoco (Papua New Guinea), Delhi Petroleum, Discovery, Esso Australia, Energy Equity, First Sourcenergy, Kufec Australia, Inland Oil Resources, Magellan Petroleum, MIM Exploration, Oil Company of Australia, Parker & Parsley, Roma Petroleum, Santa Fe Energy

Resources (Indonesia), Santos, Sagasco, Ultramar Australia/Lasmo, Unocal (Indonesia), Woodside, Yukong (Yangon, Myanmar).

## **Paradigm Pty Ltd**

Vic Musolino (Director)

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### **Background**

Paradigm is a project management consultancy with an emphasis on partnering for project success. Paradigm's aim is to provide high quality, cost-effective and professional project management services, tools and techniques by working closely with organisations undertaking development of their own infrastructure assets and investments in new business ventures.

The practice is based in Adelaide and its professional team is structured to allow complete independence and flexibility in resourcing an appropriate mix of specialist skills. Paradigm's approach is to ensure clients and the nominated projects under their care are resourced with high calibre professionals in their respective disciplines, working in a project team environment.

### **Services offered**

- contract documentation – superintendents–administration
- cost planning

- design documentation and control
- due diligence processes – monitoring and reporting
- issues management
- planning – time scheduling
- project facilitation – coaching–mentoring
- project management training and workshop development
- project management training materials – tools–techniques
- quality audit reporting and monitoring
- quality systems
- reporting and monitoring
- risk identification – mitigation–monitoring
- Strategic–tactical – operational resource planning

### **Experience**

Paradigm's principal consultants have been involved in the successful project management of infrastructure development work for over 25 years. Since 1991, Paradigm has successfully completed and secured repeat project management commissions with leading local, interstate and international companies through its demonstrated ability to add value and augment the client organisation's existing resources.

### **Recent clients**

Petroleum industry — Santos (South Australia, Queensland, Northern Territory and offshore business units).



## **Petroleum Engineering Services (Aust.) Pty Ltd**

Bill Waterhouse (Principal)

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### **Background**

Petroleum Engineering Services (Aust.) was established in 1982. Bill Waterhouse is a petroleum engineer with over 30 years experience in Australia and overseas. Founding member of PETRA Group conjunct services petroleum consultancy.

### **Services offered**

- completions, workover and well intervention (conventional rig, snubbing unit, coiled tubing and wireline) designs, programming and supervision, and equipment and services specification and selection
- well test and drillstem test (conventional and closed chamber) design, programming and analysis
- production engineering advice and conceptual facilities design
- production monitoring, reporting and accounting
- project and field development capital and operating cost estimates
- well cost estimation, tracking and reporting spreadsheet systems

### **Experience**

Recent work has included: budgeting and development of well cost estimation, tracking and reporting systems (Cooper and Eromanga Basins); technical audit of subsea well completion design (East Spar gas field, Carnarvon Basin); design,

equipment sourcing, detailed programming and supervision of single and dual well completions, well tests and well interventions (Inland oil field, Eromanga Basin); extended production test/early production system feasibility study, deviated internal gravel pack and horizontal screen completions design, detailed programming and equipment selection for shallow unconsolidated oil reservoir (Wandoo Field, offshore Carnarvon Basin); well intervention cost estimates for development wells (Wandoo Field and Lufeng heavy oil field, offshore China); shallow unconsolidated gas reservoir well completion designs, well test and well intervention planning (Tubridgi Field, onshore Carnarvon Basin); petroleum field development cost databases, field development costing and economic studies (onshore and offshore Australia); and review of completion design, service and workover philosophy for extended reach, gas-condensate wells (NRA Platform, North West Shelf).

### **Recent clients**

Santos, East Spar Alliance, IOR Exploration, Ampolex, Boral Resources – Devex – Doral Resources, Western Mining, Woodside Offshore Petroleum.

## **Petroleum Exploration Society of Australia Ltd (SA Branch)**



PESA-SA Secretary

GPO Box 2571, Adelaide SA 5001

Web site [www.pesa.com.au/states/sa.html](http://www.pesa.com.au/states/sa.html)

The purpose of the Petroleum Exploration Society of Australia (PESA) is to promote professional and technical aspects of the petroleum industry throughout Australia by providing a medium for the gathering of individuals interested in oil and gas exploration and the petroleum industry, to present views and discuss technical and professional matters relating to the petroleum industry on a national basis; to foster and provide continuing research among its members; and to maintain a high standard of professional conduct on the part of its members.

Activities of the South Australian Branch include regular luncheon meetings at which a talk on an aspect of the petroleum industry is given, technical courses and various social events.

## **Petroleum Support Services**

Chris Annear

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## **Background**

Petroleum Support Services is based in the South-East of South Australia, offering services to exploration companies for both seismic operations and wellsite preparations. The company was established following the 1987 Katnook gas discovery to serve the needs of the various exploration companies operating in the area.

## **Services offered**

- permit person or land manager including title searching, landowner liaison, and Aboriginal consultation for seismic surveys and wellsite locations
- environmental impact statements and declaration of environmental factor reports for seismic and wellsite operations as well as post operational environmental audit reports for both
- scouting of areas/locations in the planning stages for seismic or wellsites
- temporary fencing and line clearing services

## **Experience**

Seismic experience in the South-East has included being permit person and assisting in line supervision during recording for: 3D survey through the vineyards and surrounding land and swamp areas of the Coonawarra wine region; operations through native forests, pine forests and blue gum plantations; surveys through conservation parks utilising a hydro-axe machine; surveys through environmentally sensitive coastal dune and wetland areas; survey across the hyper-saline Lake Eliza; and surveys through farming operations including barramundi, alpaca, ostrich, deer, emu, chicken, horse, cattle, sheep, turf, potatoes, small seeds, cereal and oilseed. Chris has also operated as permit person for two seismic surveys in Victoria and one around the outskirts of Sydney.

Over the last six years Chris has been involved in 23 exploration wells involving landowner and Aboriginal consultation, wellsite pad construction and clean-up and

the long-term monitoring of rehabilitation of the wellsites.

### Recent clients

Oil Company of Australia, Boral Energy Resources, Lakes Oil.

### Petrosys Pty Ltd

Volker Hirsinger (Director)

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### Background

Petrosys was started in 1984 to provide software and computing systems for the petroleum exploration and production industry. Their systems are now developed in Adelaide and supported from Petrosys offices in Houston and Scotland, with a user base of over 100 sites in more than 23 countries.

### Services offered

Petrosys offers a family of technical software, with particular emphasis on the requirements of the petroleum exploration and production environment. Specific functions of the systems include mapping, data management, analysis of interpreted seismic, and digitising. Software includes options for digitising and for import and export to a wide range of seismic workstations, third party graphics systems and graphics formats.

- Petrosys mapping is a project oriented high quality mapping system that includes seismic time to depth

conversion, gridding, contouring, and volumetrics.

- dbMap is a petrotechnical data management and mapping system which includes detailed relational data management of well, seismic, culture, lease, and asset data.

### Experience

Petrosys staff experience with geoscientific software dates back to the early 1970s, and includes extensive work with interactive graphics, cartography, GIS, relational databases, gridding and contouring, graphical user interfaces and communications. A staff of 18 predominantly professional people at the head office provides software development and support, and is backed up by support and marketing staff at overseas offices.

### Recent clients

AEC, Australian Geological Survey Organisation, Beach, BHP Petroleum, Boral, Conoco, Victorian Department of Natural Resources and Environment, First Source, Gulf, Marathon, PGS, Phillips, PIRSA, Santos, Shell Australia, Wapet, Woodside.

### PetroVal Australasia Pty Ltd

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### Background

PetroVal was incorporated to provide comprehensive geophysical, geological,

engineering and commercial analyses and thereafter leading specifically to valuations and corporate technical advice to the upstream oil and gas industry.

### Services offered

- oil and gas reservoir engineering
- petrophysics and volumetrics
- exploration analysis
- commercial modelling
- risk and decision analysis
- valuations and expert's reports

### Experience

Key consultants have 25–40 years experience in petroleum geology, geophysics, petrophysics, reservoir engineering and commercial analysis. Geographic experience is concentrated on Australia, South-East Asia and Asia. Projects have been diverse, but with a more recent emphasis on the assessment of exploration strategies, reserve estimates, oil field rehabilitation projects, feasibility studies, valuations and expert's reports.

### Recent clients

The Directors of the company have provided consulting services to over 50 industry companies and government organisations.

## Phillips-Gerrard Petrology Consultants



PGPC

Sally Phillips

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### Background

Phillips-Gerrard Petrology Consultants (PGPC) is a South Australian based petrology consultancy which was established in 1994. The consultancy offers comprehensive petrology and sedimentology services to industry and government organisations. Sally Phillips (BA Hons, BSc, Dip Ed, PhD) has over 10 years experience in the petroleum industry and worked in both university and service industry environments before establishing PGPC.

### Services offered

- Petrology — interpretation of diagenetic alteration, depositional environments, sediment provenance, factors controlling reservoir quality, mineralogical reasons for petrophysical problems and formation damage. Techniques utilised for petrology–mineralogy include:
  - description of thin sections (clastics and carbonates)
  - photomicrographs
  - X-ray diffraction (bulk and clay)
  - X-ray fluorescence
  - scanning electron microscopy
  - electron microprobe analyses
  - cathodoluminescence microscopy
  - stable isotope analyses
  - fluid inclusion microthermometry
- Sedimentology — integration of petrological, sedimentological and petrophysical data for regional studies. Palaeogeography, facies, isopach and



porosity maps, cross plots, basic log interpretation and literature reviews undertaken.

All reports are available in full digital format and/or hard copy.

## Experience

Confidential regional studies and data for well completion reports have been undertaken in the following Australian basins and areas: Cooper–Eromanga, Warburton, Surat–Bowen, Otway, Bonaparte, Browse, Petrel Sub-basin, Vulcan Sub-basin, ZOCA, Perth, Canning, Carnarvon, McArthur, Wiso, Arafura and Gippsland. Other countries where petrological studies have been performed include Russia, New Zealand, Papua New Guinea, China, Vietnam, Indonesia and Madagascar.

## Recent clients

Woodside, Mobil, Santos, Boral Energy Resources, Cultus.

## Piper Alderman

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Piper Alderman is a national law firm providing strategic advice, documentation and dispute resolution services to the petroleum industry including all legal aspects of joint venture agreements,

farmins and farmouts, mining titles, operational contracts, royalties, financing, native title, land access, Aboriginal heritage, environment, water resources, land management, construction, tenement and property issues.

## Pitt Research Pty Ltd



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## Background

Airborne geophysical data is a cost-effective alternative or pre-cursor to expensive petroleum seismic and drilling programs. Pitt Research is an independent geophysical data processing company specialising in airborne surveys. The company was formed in 1980 and has an established reputation for quality aeromagnetic and radiometric work.

## Services offered

- airborne geophysical survey data processing
- image processing and high-quality mapping
- GIS data packages
- data analysis and interpretation.
- petroleum interpretation services including:

- pseudo-depth slicing from aeromagnetics
- depth-to-basement mapping
- modelling of magnetic anomalies
- detection of hydrocarbon alteration zones from radiometrics
- complete basin studies can be arranged in conjunction with a network of specialist interpreters

### Experience

Pitt Research has a long history of experience in processing, analysis and presentation of airborne geophysical data. The company has introduced a number of important innovations to the industry including micro-levelling and statistical noise reduction for radiometric surveys. The company employs three geophysicists and a computer scientist.

### Recent clients

Hemley Exploration, New South Wales  
Department of Mineral Resources,  
Archimedes Consulting, Lakes Oil.

## POTENTIAL ENERGY

### Potential Energy Pty Ltd

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### Background

Potential Energy Pty Ltd (PEP) has substantial expertise in the Australian energy industry, particularly in the

Australian natural gas industry. PEP's two directors and co-founders, Fraser Ainsworth and Scott Hutchinson, initially gained much of their gas industry experience as Sagasco Holdings, which owned both upstream (oil and gas exploration and production) and downstream (gas distribution) assets.

### Services offered

PEP offers consulting services covering a wide range of the commercial and market aspects of the energy industry including:

- Australian natural gas markets generally, i.e. upstream (exploration and production, transmission, pipelines) and downstream (distribution, marketing)
- financial analysis and evaluation of projects
- marketing, contractual and joint venture arrangements
- gas industry reform (including access code), *Trade Practices Act 1974* (Cwlth), Australian Competition and Consumer Commission and other regulatory or government policy aspects of the industry
- acquisition evaluation, due diligence and financing
- strategic assessment of energy market developments and gas supply alternatives
- business strategy development, with particular emphasis on energy related issues

### Experience

Recent projects have included: a review of South Australian and Queensland gas markets, gas reserves, supply alternatives

and open access implications for a potential investor in gas industry infrastructure; assessment of gas market developments and recommendation of gas supply strategies for a major South Australian gas user; assessment and recommendation of energy supply alternatives and strategies for a remote location energy user; review of implications of open access for gas pipelines and review of exposures from pending Australian Competition and Consumer Commission authorisations and other regulatory changes for a major gas user; analysis of Australian natural gas markets (history, structure, outlook etc.) for an overseas new entrant; advice on commercial arrangements in the gas industry and gas market outlook for an independent valuation of a Cooper Basin Producer; forecast of energy requirements (electricity and gas) and consideration of supply of natural gas for electricity generation for a major remote-location consumer on behalf of an energy supply authority; preparation of submissions on proposed regulatory changes, e.g. to IPART (New South Wales) on proposed AGL access undertaking, South Australian Government's review of the *Cooper Basin (Ratification) Act 1975*, and National Competition Council and Gas Reform Implementation Group on draft National Third Party Access Code.

### **PPK Environment and Infrastructure Pty Ltd**

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PPK Environment and Infrastructure is a national company employing over 400 professional engineers, planners and scientists with experience in over 40 countries in the Asia-Pacific region. Services to the petroleum industry include project concept development, engineering feasibility studies, environmental impact studies, environmental health and safety services, environmental remediation and a full-range of engineering design and project management services.

### **Preview Geoservices Pty Ltd**

David Tucker (Principal)

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### **Background**

Preview Geoservices was established in 1986. The consultancy offers comprehensive exploration geophysics services to industry and government. David Tucker (PhD) has 33 years experience in the petroleum and mineral industries and has worked directly for exploration companies, for government and as a principal in exploration

companies. Consultants' experience range from three to 10 years in exploration. The company has participated as a joint venture partner.

### **Services offered**

Magnetic and gravity surveys — advice on use of techniques, airborne magnetic and gravity survey design, specifications and tenders, supervision, quality control and verification of data. Magnetic susceptibility and density measurements on drillhole material.

Magnetic and gravity interpretation — specialised interpretation map production, modelling of anomaly sources, depth to basement estimation, structural skeleton, correlation with seismic and other geological data to link with basin architecture.

Gamma spectrometer surveys — from design to delivery; specialised interpretation products.

Electrical geophysics — advice on use of techniques, survey design, specification and tenders, supervision, quality control and verification; interpretation; time and frequency domain electromagnetics (EM), induced polarisation (IP), surface and downhole. Data broking.

Geophysics visualisation — use of commercial visualisation software to merge geophysical potential field and electrical models with geology, drilling and seismic for development of drilling targets.

### **Experience**

Projects have been carried out in the following Australian basins: Amadeus, Arrowie, Bass, Browse, Canning, Carpentaria, Cooper, Eromanga, Georgina,

McArthur, Murray, Ngalia, Otway and Stansbury, as well as overseas. Extensive experience has been gained in mineral provinces in Australia and Africa. The company has been a key participant in the South Australian Exploration Initiative and other huge airborne geophysical surveys.

### **Recent clients**

Petroleum exploration studies — Boral, Canyon (Australia), Coffey MPW (Philippines), Geological Survey of Queensland, PIRSA, New South Wales Department of Mineral Resources, Oil Company of Australia, World Geoscience Corporation.

### **Protech Australasia Pty Ltd**



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Protech Australasia assists companies to succeed through utilising information technology as a tool to improve business efficiency and effectiveness. Protech achieve this through the provision of high quality products, and customer focused services.



## Questa Australia Pty Ltd



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### Background

Steve Ingham, who manages Questa Australia, is a Chartered Professional Engineer in Australia and a Registered Professional Engineer in Texas. He has 40 years experience in the industry.

### Services offered

Questa offers a full range of reservoir and petroleum engineering services to the petroleum industry including:

- engineering
  - operational
  - artificial lift
  - secondary recovery
  - enhanced recovery
  - simulation
- operational
  - drilling
  - production
  - completions
  - workovers
  - stimulation
- economics
  - resource valuations
  - field
  - risk

- management
  - development planning
  - feasibility
  - expert witness/arbitration
  - prospectus/Part B
  - project management
  - course presentation

### Experience

Through the years, Questa professionals have consulted to government energy groups (federal and State), major and independent oil companies, national oil companies, banks and financial institutions, manufacturers and the individual investor, both on technical and management levels.

### Recent clients

Air Liquide Australia, ARC Energy, PetroVal Australasia, Premier Oil.

## Recon Exploration (Australia) Pty Ltd



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### Background

Recon Exploration was established in the United States and has been providing airborne and land-based integrated exploration services to the Australian petroleum industry since 1980. New petroleum reservoirs may be detected by measuring hydrocarbon 'microseepage' and related alterations. These leading-edge, multi-disciplinary

exploration technologies provide explorationists with cost-effective techniques for evaluating both stratigraphic and structural environments.

### Services offered

Exploration techniques include:

- geomorphology
- airborne and near-surface hydrocarbon detection
- aerial and surface gamma-ray spectrometry
- high-sensitivity aeromagnetic surveys
- magnetic susceptibility measurements of soils and drill cuttings

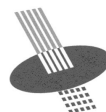
These combined methods can substantially increase the probability of wildcat success and minimise finding costs. Recon's survey systems are portable and can be deployed readily to evaluate the more remote frontier areas.

Recon utilises its own, as well as other, advanced spectrometers deployed by helicopter and fixed wing aircraft to map areas of anomalous hydrocarbon gas seepage as well as surface alterations and other conditions resulting from hydrocarbon microseepage. Ground-based sampling programs usually follow the aerial phase of exploration. Simultaneous soil hydrocarbon gas, magnetic susceptibility and surface gamma-ray measurement validate previously detected aerial leads and provide additional confirmation of prospects. Statistical processing methods are employed along with special computer analysis of Recon's extensive database for determination of background and anomaly characteristics.

### Experience

Australian basins in which Recon has experience and data include the Surat, Arckaringa, Eromanga, Amadeus, Cooper, Perth, Canning, Carnarvon, Murray, Officer, Sydney, Otway, Pedirka and McArthur. Staff include senior explorationists with experience in the integration of customised combinations of exploration techniques that lead to reduced costs, while improving wildcat success.

### Scan Conversion Services



Bernie Mitchell (Production Manager)

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Fax (08) 8227 0899

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Web site [www.scanservices.com.au](http://www.scanservices.com.au)

Scan Conversion Services undertakes: scanning of all document types; conversion of maps to digital formats; large format colour copying; CD-ROM writing; large file Internet services.

### Schlumberger Oilfield Australia Pty Ltd



Jeff Meisenholder (Oilfield Services PEGS Manager, Australasia)

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Web site [www.slb.com](http://www.slb.com)

Schlumberger Oilfield Services is the leading supplier of services and technology to the international petroleum industry. The company offers virtually every type of exploration, production and completion service needed in the petroleum industry including: rigs; real-time drilling; fluids engineering and pumping; seismic data acquisition, processing and interpretation; data services and software; and wireline well evaluation, testing and production.

## Secon Pty Ltd

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## Background

Secon is a South Australian multi-discipline engineering design company. It was established in January 1996 by the merger of three local, well established engineering consultancies. Secon includes 12 engineering and drafting personnel.

## Services

- in-house electrical, mechanical and instrumentation design, documentation, estimating, planning and scheduling
- total project management utilising in-house resources and other specialist sub-consultants if required
- remote area power generation and infrastructure
- oil production using various pumping systems including variable speed submersible pumps, jet pumps and water re-injection systems
- hazardous area delineation based on Australian and international standards

## Experience

Personnel have experience in the Middle-East, Indonesia, Philippines, New Zealand and remote areas of South Australia and Queensland.

## Recent clients

Santos, Foxboro, GPA Engineering, WMC.

## Seismic Supply Kaltex

Peter Graham-Sutton (Manager)  
15 Myuna Street, Regency Park  
SA 5010

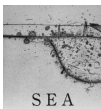
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0417 811 463 mobile

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Seismic Supply Kaltex is a supplier of drilling, mining and exploration equipment, GPS and differential systems, and geologists and surveyors equipment.

## Social and Ecological Assessment Pty Ltd



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### Background

Social and Ecological Assessment (SEA) is an environmental consultancy formed in 1981. It services a diverse range of private and public sector clients throughout Australia and overseas and specialises in the petroleum industry.

### Services offered

- environmental impact assessment
- environmental management
- environmental impact statements
- specialist ecological services
- project management
- excellent document preparation and presentation skills

Both onshore and offshore projects are undertaken.

### Experience

SEA has been undertaking environmental consulting projects for 18 years. Work includes preparation of complex environmental impact statements, particularly for the petroleum industry, and management of long-term environmental monitoring and pollution mitigation projects. The company is currently revising Santos' codes of environmental practice and environmental procedures for

the management of various field operations.

### Recent clients

Santos, Boral Energy, BHP Petroleum, ETSA, Environmental Protection Authority, BHP Long Products Division.

## Society of Petroleum Engineers (SA Section)



Thomas G. Paspaliaris (Chairman of SPE (SA Section))

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The Society of Petroleum Engineers (SPE), Inc. is an international technical/professional, non-profit organisation dedicated to the advancement of technology associated with the recovery of energy resources from well bores. The SPE collects and disseminates new technical information and technology on the exploration, drilling and production of oil and natural gas through extensive conferences and meetings, publications and section programs.

The South Australian Section was established in 1982, and holds regular



technical meeting/luncheons and social events, and offers scholarships to South Australian students studying petroleum engineering at the University of New South Wales. It also sponsors the South Australian Secondary School Mathematics Competition.

### **Sokkia Pty Ltd**

**SOKKIA**

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Sokkia offers supply, service and hire of surveying equipment including total stations, GPS solutions, software products, electronic theodolites, automatic levels and construction lasers. The company is fully committed to a quality system conforming to Australian standards.

### **South Australian Chamber of Mines and Energy**

Bob Goreing (Chief  
Executive Officer)

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The South Australian Chamber of Mines and Energy was established in 1979 to protect the interests of and promote the minerals and petroleum industry in South Australia; includes over 60 members from both the corporate and service sector. The Chamber represents the industry in a variety of forums to raise awareness and increase understanding for a range of audiences. It performs a traditional lobby role and responds to issues which impact on the industry.

### **Southern Cross Science Pty Ltd**

John Weigand  
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Fax (08) 8277 3311  
Email southx@disc-masters.com.au

Southern Cross Science offers laboratory and environmental instrumentation and supplies including balances, centrifuges, environmental analysis instruments/data loggers, high quality injection moulded plastic consumables, quality glassware and high purity chemicals. Also suppliers of safety equipment and signs including portable outdoor flammable storage units, internal flammable storage units, fume cupboards and laminar flow cabinets. Southern Cross has a new agency, Paton Scientific Pty Ltd, specialising in heavy duty shaking equipment, ie. platforms, water baths, incubators and stainless steel fabrication.

## Specialist Computer Supplies



Melanie Singleton

21 Kensington Road, Norwood SA 5067

Phone (08) 8332 8874  
1800 882 330 free call

Fax (08) 8332 8278

Specialist Computer Supplies is a quality endorsed national distributor of a wide range of computer consumables and peripherals. Products include a complete range of media, imaging supplies and peripherals from all major manufacturers to satisfy the special requirements of the mining industry.

## Stratco (SA) Pty Ltd

Chris Wright

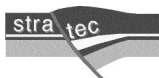
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Stratco (SA) is a sheetmetal manufacturer specialising in core storage systems, colorbond and zincalume roofing, walling, rainwater goods and fencing, sheetmetal and stainless steel fabrication. The company is based in Adelaide with manufacturing facilities in all States.

## Stratec Pty Ltd



Thomas Flöttmann

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Web site [www.stratec.net](http://www.stratec.net)

## Background

Stratec aims to integrate structural and sedimentological–stratigraphic data to provide a multi-disciplinary basin analysis service to assist in the identification and evaluation of petroleum and mineral plays.

Stratec's co-founders are Thomas Flöttmann (BSc Hons, PhD) and Peter Haines (BSc Hons, PhD). Thomas has been a Research Associate at the University of Adelaide since 1990 working on the evolution of Palaeozoic basins, foreland fold-thrust belts and accretion tectonics in southeastern Australia and Antarctica. Peter is currently lecturer at the University of Tasmania.

## Services offered

Structural evaluation of extensional basins or fold and thrust belts through balanced and restored cross-sections based on seismic and surface data. This technique can reveal many critical aspects of the tectonic and stratigraphic history of basins despite subsequent deformation.

## Experience

Structural analysis of deformed basins: Cooper Basin, Hamersley Province, Lawn Hill Platform, Adelaide Geosyncline, Stansbury Basin and Amadeus Basin); specialist short courses on the tectonics of fold-thrust belts and cross-section balancing; mapping in sedimentary basins (most notably McArthur, Georgina, Arafura and Amadeus Basins and the

Adelaide Geosyncline including Arrowie and Stansbury Basins and Kanmantoo Trough); overseas experience in Namibia, South Africa.

### **Recent clients**

Santos, Wagner & Brown, CRA (Century Zinc, Pacific Oil and Gas), Hamersley Iron; collaborative projects with PIRSA and the Northern Territory Geological Survey.

## **Stratigraphic Research International AS**

Cedric Griffiths

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Email gbertram@sriuk.demon.co.uk

### **Background**

Stratigraphic Research International (SRI) was started in Trondheim, Norway in 1993 by a geoscience database specialist and two ex-BP stratigraphers. The company's professionals include George Bertram, Cedric Griffiths and Derek Lacey. SRI's aim is to develop and supply new technology for stratigraphic prediction and the manipulation of inter-related geological data.

### **Services offered**

Exploration consultancy offering:

- play recognition and mapping and acreage review
- sequence stratigraphy
- geoscience computing
- stratigraphic forward modelling and quantitative stratigraphy

- business focused courses and workshops in the above

Products include SAGE organic-geochemical database system, StrataBugs biostratigraphic database system, 3D-Chronostrat tool, 3D stratigraphic analysis tool, SEDSIM 3D forward stratigraphic modelling and SEDPAK 2D forward stratigraphic modelling.

### **Experience**

Recent projects include: sequence stratigraphic analysis (Faeroes Basin, United Kingdom), block evaluation (Kakap, Indonesia), 3D stratigraphic interpretation workshop, Perth Basin study (Western Australia), United Kingdom and Irish licensing round acreage screening, Vienna Basin sequence stratigraphy and Matzen Field study, Tertiary sequence stratigraphy (Denmark, Norway), acreage evaluation (Pakistan, Bangladesh, Australia), Miano Field study (Pakistan), prospect mapping (Vietnam, Albania), 2.5D gravity-magnetic modelling in relation to seismic geometry (Vøring Plateau), 2D and 3D modelling of aggradation angle for lithofacies in a shoreface environments, review of state-of-the-art in forward stratigraphy modelling, numerical modelling of shoreface sands (Rannoch Formation, North Sea), quantitative thermal conductivity studies from shallow drillholes (offshore Norway), undiscovered resources (Cooper Basin, South Australia), installation of SAGE organic geochemical database (SAGA Petroleum, Elf, Norsk Hydro).

## Recent clients

BP, Deminex, Discovery, Elf, MESA, Mobil, Norsk Hydro, Novus, National Centre for Petroleum Geology and Geophysics, OMV, Premier, Saga, Statoil.

## Strength Mining & Exploration Supplies Pty Ltd

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Web site [www.strength.com.au](http://www.strength.com.au)



Strength Mining & Exploration Supplies manufactures Strength core trays and racking systems, Geochem sample envelopes, Strength aluminium clipboards, Markrite waterproof survey books and pads, Strength diamond saw blades and core saws, Beltline 1800 hipchains. Supplier of compasses, GPS units etc. and all consumables to the surveying, exploration and mining industry.

## SYDAC Pty Ltd



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SYDAC delivers innovative engineering solutions in control, automation and operational analysis systems, including resource planning interfaces. SYDAC incorporates physical and knowledge based models into SCADA and operational analysis and control systems to automate and optimise operator and plant performance. SYDAC's use of iterative design and virtual prototyping methodologies reduces commissioning time and project risk, whilst delivering operator training systems.



**ONKAPARINGA INSTITUTE  
OF TAFE**

## TAFE, Onkaparinga Institute

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institutes/onkaparinga/lims/  
geoindex](http://www.tafe.sa.edu.au/institutes/onkaparinga/lims/geoindex)

Onkaparinga Institute is the third largest institute of TAFE within South Australia and combines with seven other institutes to form TAFE SA, a public provider of quality training. Education and training in geosciences is offered at the O'Halloran Hill campus. Existing courses are Certificate III in Geoscience Field Practices and Diploma of Geoscience. Short courses can be arranged and



customised for small groups in occupational health safety and welfare, GPS, first aid, four-wheel driving, and computing (Microsoft products, Arcview, ER Mapper, Autocad).

### **TNT, Domestic & International Express**



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Web site [www.tntew.com](http://www.tntew.com)

TNT offers national and international door to door express transport for urgent documents and parcels, international mailing services, general international air and sea freight services, custom clearance services. The company currently operates in over 200 countries and carries around 2 million consignments a week.

### **Todd Alexander Surveyors Pty Ltd**

**TODD  
ALEXANDER  
SURVEYORS**

Ian Evans

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Todd Alexander Surveyors has over 25 years experience in petroleum exploration and development work. The company is proficient in: surveys of well locations, pipelines, roads, transmission lines, easements, topography including terrain modelling, evaporation areas, airstrips, stockpiles for volume determination and set out of civil and structural works; selection of infrastructure sites; and GIS and database management.

### **University of Adelaide, Department of Geology and Geophysics**



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The University of Adelaide is an Australian leader in learning and teaching, education for the professions, research and research training. The Department of Geology and Geophysics offers undergraduate and postgraduate courses, research and consultancy.

**University of South  
Australia,  
Department of  
Applied Geology**



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The University of South Australia is a national leader in collaborative industry research and has been recognised nationally for the quality of its teaching and community service. The School of Engineering was formed in July 1996 by amalgamating existing schools responsible for civil, electrical, manufacturing, mechanical and minerals engineering, and applied geology. Undergraduate and postgraduate courses, research and consultancy, and analytical services are offered.

The main analytical equipment, offered in conjunction with ACS Laboratories and the National Centre for Petroleum Geology and Geophysics, is a mercury injection porosimeter up to 40 000 psia. It measures pore-throat size distribution, breakthrough pressures, imbibition and drainage efficiency for general pore size and shape characterisation and effective porosities, and grain density. Other equipment includes a steady state probe permeameter.

**Visage Audio  
Visual  
Presentation Services**



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0412 371 417 mobile  
Email [visage@picknowl.com.au](mailto:visage@picknowl.com.au)

Visage is an audiovisual presentation company. Services offered include technical production management of functions (conferences, sales or in-house presentations, annual general meetings etc.), audiovisual hire equipment and personnel, and advice and assistance with preparation of audiovisual and multi-media presentations. Visage was the technical director for PIRSA's Cooper 99 Symposium.

**Western  
Geophysical  
Australia**



Western Geophysical

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Western Geophysical Australia is a division of Baker Hughes Australia Pty Ltd. The company offers 2D and 3D land and marine seismic data processing services to the petroleum exploration

industry. Western Geophysical has its main data processing centre in Perth and a smaller centre located in Melbourne. Marine seismic acquisition is operated from an office in Singapore.

## Wiltshire Geological Services



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### Background

Wiltshire Geological Services (WGS) was established in 1969, and is now in its 30th year of continuous operation. Since 1984 the company has focussed on capture, quality control scrutiny, preservation and redistribution of digital well log data.

WGS now have effectively complete data sets of basic petrophysical evaluation logs for all open file wells in nearly all Australian sedimentary basins, for most New Zealand wells and some Papua New Guinea wells.

WGS's prime interest is in the timely delivery to clients of quality assured data that is geologically meaningful, and is formatted to allow ready import into client applications. The company has no financial ties to any exploration company, and can thus offer a fully independent service.

### Services offered

WGS is primarily a data service company. Data includes digital logs, and digital text

summaries (condensed extracts of well completion report and other text data). Where data have been previously processed and are stored in-house, rapid response delivery of geologically validated data is offered — worldwide delivery within one day generally (using electronic transfer). Clients thus reduce technical acquisition and opportunity costs.

WGS offers in-house digitising services on a confidential basis, and can offer other data management services. The company is currently working on software to assist in basinwide prospectivity evaluation studies using WGS data, and hope to begin offering these services within 1999. WGS also plans to offer software modules to allow clients to more readily manage their log data.

### Recent clients

Most companies active in the exploration industry in Australia are or have been clients.

## Carl Zeiss Pty Ltd



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[www.zeiss.de](http://www.zeiss.de)

Carl Zeiss provides laboratory microscopes for transmitted and reflected

light, polarisation and NOMARSKI DIC. Photomicrography and image archiving and analysis software are available from the newly created subsidiary Carl Zeiss Vision GMBH.



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- IMTC Australia 34
- Organic Geochemistry in Basin  
Analysis Group 44–45
- Phillips-Gerrard Petrology Consultants  
50–51
- University of South Australia,  
Department of Applied Geology 64

## **Audiovisual services**

- Visage Audio Visual Presentation  
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## **Computers — supply/support**

- Affinity Contracting & Search 12
- Aish Drafting Supplies 13
- Expertest 25
- Independent Drilling Fluid Services  
34–35
- Microbits 40
- Protech Australasia 54
- Specialist Computer Supplies 60

SYDAC 62

*see also* software

## **Data management**

- Petrosys 49
- Wiltshire Geological Services 65

## **Digitising**

- Gaia Geological Services 27–28
- Geoscience Associates Australia 30
- Petrosys 49
- Wiltshire Geological Services 65

## **Drilling contractors**

- Century Drilling 20
- Expertest 25
- Gearhart United 28
- Geoservices Overseas SA 30
- Halliburton Australia 32
- Oil Drilling & Exploration Ltd 42–43
- Schlumberger Oilfield Australia  
56–57

## **Economic and property evaluation**

- Bevan & Co. 17
- Burdon and Associates 18–19
- Dames & Moore Group 21
- EconSearch 22–23
- Hassell 32–33
- Mathews Consulting Services 39–40
- Petroleum Engineering Services 47
- PetroVal Australasia 49–50
- Potential Energy 52–53
- Questa Australia 55

## **Education**

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National Centre for Petroleum Geology  
and Geophysics 42  
TAFE, Onkaparinga Institute 62–63  
University of Adelaide, Department of  
Geology and Geophysics 63  
University of South Australia,  
Department of Applied Geology 64  
*see also training*

### **Engineering consulting**

AGC Woodward-Clyde 12  
Bevan & Co. 17  
Burdon and Associates 18–19  
Dames & Moore Group 21  
Egis Consulting Australia 24  
Epic Energy 24–25  
Expertest 25  
GeoMechanics International 29–30  
GPA Engineering 31–32  
Hillis 33–34  
IMTC Australia 34  
Independent Drilling Fluid Services  
34–35  
Kinhill 36–37  
Petroleum Engineering Services 47  
PetroVal Australasia 49–50  
PPK Environment and Infrastructure  
53  
Questa Australia 55  
Schlumberger Oilfield Australia  
56–57  
Secon 57  
SYDAC 62

### **Environmental consulting**

AGC Woodward-Clyde 12  
Dames & Moore Group 21

Ecos Consulting 23–24  
Egis Consulting Australia 24  
Expertest 25  
Fatchen Environmental 26  
Gaia Geological Services 27–28  
Geoweste 30–31  
Hassell 32–33  
Kinhill 36–37  
Paradigm 46  
PPK Environment and Infrastructure  
53  
Social and Ecological Assessment 58

### **Environmental imaging**

Armstrong Photographics 15

### **Geochemistry, hydrocarbon detection**

Recon Exploration (Australia) 55–56

### **Geochemistry, organic**

Amdel — Petroleum Services 13  
Organic Geochemistry in Basin  
Analysis Group 44–45

### **Geochemistry, water**

Bowyer 17–18  
Dames & Moore Group 21

### **Geological consulting**

Applied Structural Geological Analysis  
13–14  
Bowyer 17–18  
Dames & Moore Group 21  
Gaia Geological Services 27–28  
GeoMechanics International 29–30  
Geoweste 30–31  
Hillis 33–34  
Morgan Palaeo Associates 41

Organic Geochemistry in Basin  
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Oxford Geological Consultants 45–46  
PetroVal Australasia 49–50  
Phillips-Gerrard Petrology Consultants  
50–51  
Recon Exploration (Australia) 55–56  
Stratec 60–61  
Stratigraphic Research International  
61–62

### **Geophysical consulting**

Applied Structural Geological Analysis  
13–14  
Archimedes Consulting 14–15  
Burns 19  
GeoMechanics International 29–30  
Hillis 33–34  
Iredale 35  
Jensen-Schmidt & Associates 35–36  
PetroVal Australasia 49–50  
Pitt Research 51–52  
Preview Geoservices 53–54  
Stratec 60–61  
Stratigraphic Research International  
61–62

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Donovan & Associates 21–22  
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### **Industry association**

Petroleum Exploration Society of  
Australia Ltd (SA Branch) 47–48  
Society of Petroleum Engineers (SA  
Section) 58–59  
South Australian Chamber of Mines  
and Energy 59

### **Information services**

Australian Mineral Foundation 15

### **Land access consulting**

Maloney Field Services 39  
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### **Legal**

Finlaysons 26–27  
Johnson Winter & Slattery 36  
McDonald & Co. 38  
Minter Ellison 40–41  
Piper Alderman 51

### **Logistics**

*see* transport–logistics

### **Native title, legal issues**

*see* legal

### **Native title, research**

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O’Neil 43–44

### **Palynology**

Morgan Palaeo Associates 41

### **Petrology**

Phillips-Gerrard Petrology Consultants  
50–51

### **Petrophysics**

Geomechanics International 29–30  
PetroVal Australasia 49–50  
Schlumberger Oilfield Australia  
56–57  
*see also* analysis

### **Photography**

Armstrong Photographics 15  
Challenger Geological Services 20

## **Pipeline development and design**

Bevan & Co. 17  
Dames & Moore Group 21  
Egis Consulting Australia 24  
Epic Energy 24–25  
GPA Engineering 31–32

## **Pipeline route design**

AGC Woodward-Clyde 12  
Dames & Moore Group 21

## **Presentation services**

Visage Audio Visual Presentation  
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## **Professional association**

*see* industry association

## **Project management**

AGC Woodward-Clyde 12  
Bevan & Co. 17  
Dames & Moore Group 21  
Ecos Consulting 23–24  
Epic Energy 24–25  
GPA Engineering 31–32  
Hassell 32–33  
IMTC Australia 34  
Kinhill 36–37  
Paradigm 46  
PetroVal Australasia 49–50  
PPK Environment and Infrastructure  
53  
Questa Australia 55  
Schlumberger Oilfield Australia  
56–57  
Secon 57  
Social and Ecological Assessment 58  
SYDAC 62

## **Recruitment**

Affinity Contracting & Search 12

## **Research, scientific**

Dames & Moore Group 21  
Expertest 25  
Hillis 33–34  
National Centre for Petroleum Geology  
and Geophysics 42  
Organic Geochemistry in Basin  
Analysis Group 44–45  
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University of Adelaide, Department of  
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University of South Australia,  
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Expertest 25  
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## **Seismic data processing**

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56–57  
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## **Service contractor**

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## **Software**

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GeoMechanics International 29–30  
Geoscience Associates Australia 30  
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Mathews Consulting Services 39–40  
Paradigm 46  
Petrosys 49  
Schlumberger Oilfield Australia  
56–57  
Stratigraphic Research International  
61–62  
SYDAC 62  
Wiltshire Geological Services 65

## **Suppliers**

Ace Chemical Co. 12  
Aish Drafting Supplies 13  
Australian Petroleum Services Co. 15  
Baker Oil Tools (Australia) 16  
Benchmark Positioning Services  
16–17  
Challenger Geological Services 20  
Expertest 25  
Geoscience Associates Australia 30  
Halliburton Australia 32  
Independent Drilling Fluid Services  
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Leica Geosystems 37  
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Supplies 62  
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## **Surveying**

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Dynamic Satellite Surveys 22  
Fugro–Photec 27  
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Todd Alexander Surveyors 63

## **Training**

Australian Mineral Foundation 15  
Dames & Moore Group 21  
Expertest 25  
GeoMechanics International 29–30  
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Independent Drilling Fluid Services  
34–35  
LETService 37–38  
National Centre for Petroleum Geology  
and Geophysics 42  
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Petroleum Exploration Society of  
Australia Ltd (SA Branch) 47–48  
Questa Australia 55  
Society of Petroleum Engineers (SA  
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Challenger Geological Services 20  
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TNT, Domestic & International  
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### **Well logging**

Expertest 25  
Halliburton Australia 32

### **Well log data sets**

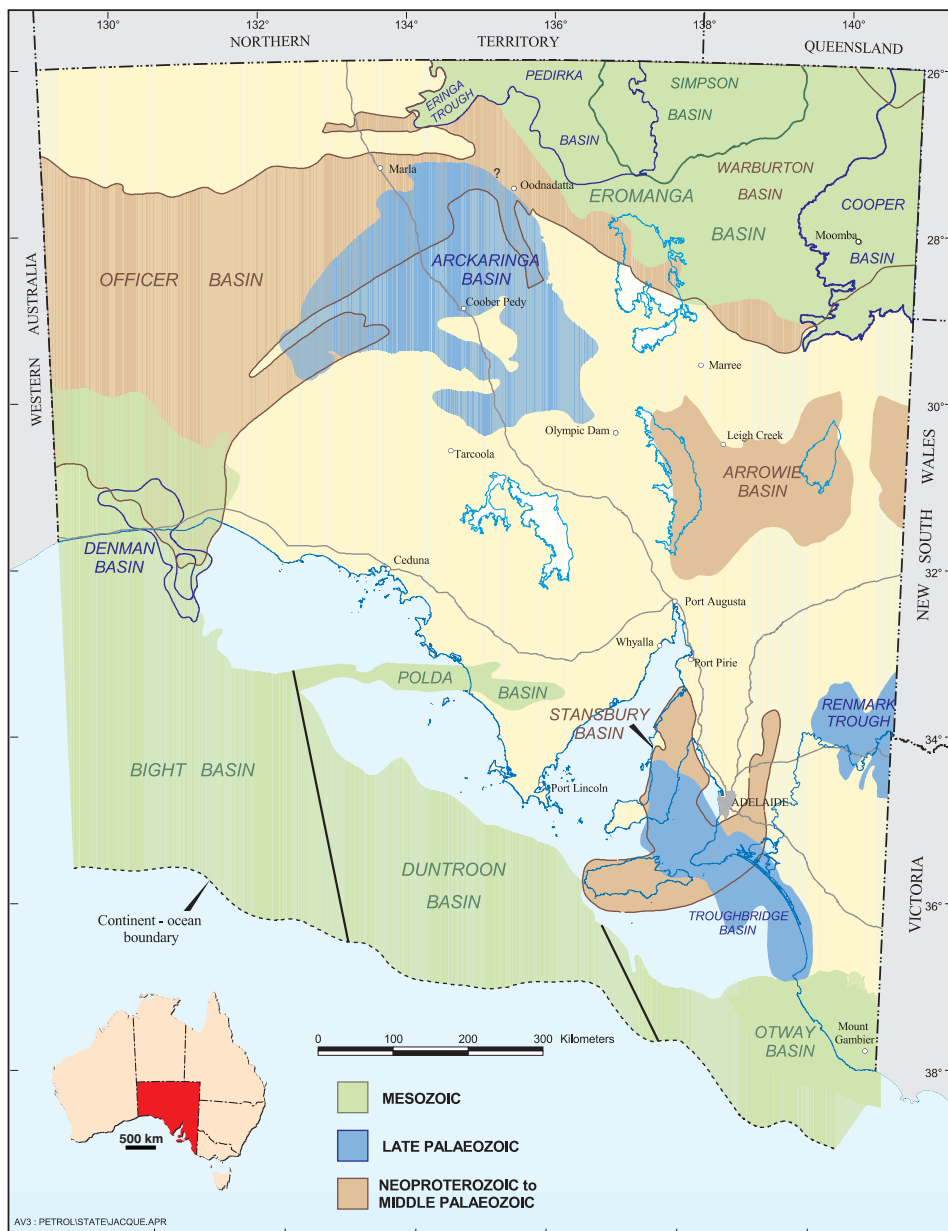
Wiltshire Geological Services 65

### **Wellsite services**

Baker Oil Tools (Australia) 16  
Expertest 25  
Gearhart United 28  
GeoMechanics International 29–30  
Geoscience Associates Australia 30  
Geoservices Overseas SA 30  
Halliburton Australia 32  
IMTC Australia 34  
Independent Drilling Fluid Services  
34–35  
M-I Australia 40  
Schlumberger Oilfield Australia  
56–57

### **Wellsite supervision**

Expertest 25  
Gaia Geological Services 27–28  
Geoweste 30–31  
IMTC Australia 34  
Oxford Geological Consultants 45–46



*Pre-Tertiary sedimentary basins in South Australia.*



**Government  
of South Australia**