

# Cooper Basin

## CO2013-A and B

South Australia  
Acreage Release



Government  
of South Australia

Department for Manufacturing,  
Innovation, Trade,  
Resources and Energy

Energy Resources Division



Bids close  
**MAY 29**  
2014

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

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# South Australia COOPER BASIN

## Acreage Release Block CO2013-A & B

BIDS CLOSE 4.00 pm Australian Central Standard Time, Thursday 29th May 2014

### THE OFFER

Two new petroleum exploration licences (PELs) in the Cooper and Eromanga basins are being offered by the South Australian Government on the basis of competitive work program bidding (Fig. 1).

- ▶ **Block CO2013-A** comprises one area totalling 627 sq km relinquished from PEL 93 in the southern Cooper Basin. One well (Tawriffic East 1) has been drilled and 876 line kilometres of 2D seismic data acquired (Fig. 2).
- ▶ **Block CO2013-B** comprises one area totalling 3443 sq km in the southern Cooper Basin. No wells have been drilled within the block which contains 315 line kilometres of 2D seismic data (Fig. 3).

Should any additional acreage be relinquished within Zone 1 (the Cooper Basin competitive tender region, Fig. 1) before 1 May 2014 (i.e. four weeks prior to close of bidding), new blocks may be added to the CO2013 release. There is also an opportunity for industry to nominate currently vacant areas in Zone 1 for inclusion in the release by contacting Energy Resources Division before 1 May 2014. Any new CO2013 blocks will be advertised on the DMITRE website and promptly published in the South Australian Government Gazette.

### PRODUCTS AND DATA

A comprehensive summary of the Cooper and Eromanga basins is available in The Petroleum Geology of South Australia volumes 2 ([Eromanga Basin](#)) and 4 ([Cooper Basin](#)). These volumes include chapters on structural and tectonic history, litho- and biostratigraphy, source rocks and maturity, reservoirs, seals, trap development,

discovered reserves, field reviews, undiscovered potential, and exploration history. The publications can be downloaded via the DMITRE Petroleum website, and are also available for free on the Petroleum and Geothermal in South Australia USB. To request a copy of the USB, please email [dmitre.petroleum@sa.gov.au](mailto:dmitre.petroleum@sa.gov.au)

Previous exploration data and reports are readily available from DMITRE in digital format on portable hard drives, including:

- ▶ [well completion reports](#) (also downloadable from the DMITRE Petroleum website via SARIG)
- ▶ [GIS datasets including wells, seismic, tenements, pipelines](#)
- ▶ seismic survey shot point location data
- ▶ [seismic survey reports and archive stack data \(SEGY format\)](#)
- ▶ digital well logs (DLIS/LIS format)
- ▶ velocity survey check shot information
- ▶ structure maps and datasets
- ▶ [PEPS-SA database with production, well, seismic and engineering data](#) (also downloadable from the DMITRE Petroleum website)
- ▶ company prospectivity reports (also downloadable from the DMITRE Petroleum website via SARIG)

Selected datasets (hyperlinked in green) for the CO2013 Acreage Release areas are available on this DVD.

For more information, select 'Products and Data' on the DMITRE Petroleum website home page ([www.petroleum.dmitre.sa.gov.au](http://www.petroleum.dmitre.sa.gov.au)).

# Cooper and Eromanga Basins, South Australia PETROLEUM LICENCES

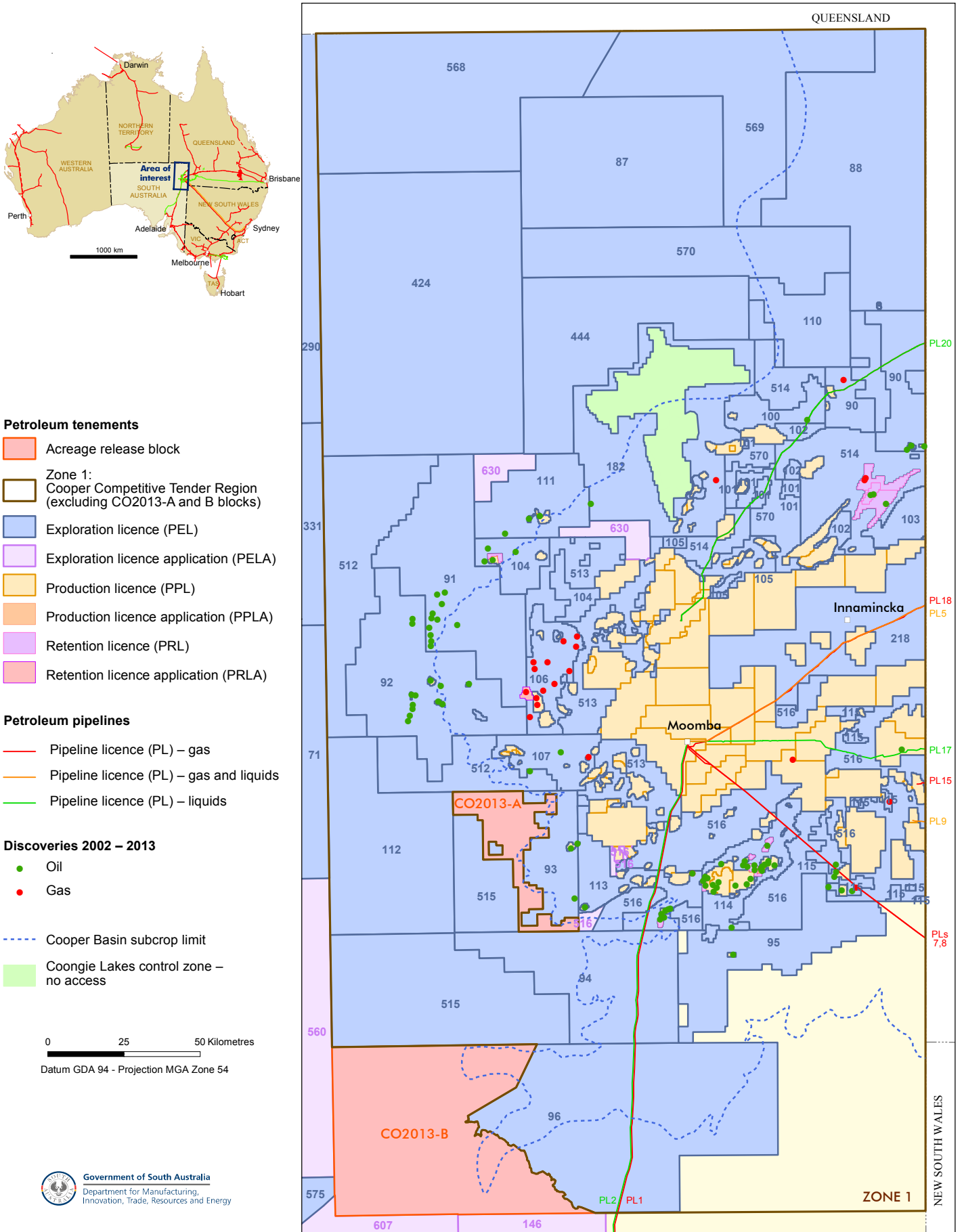
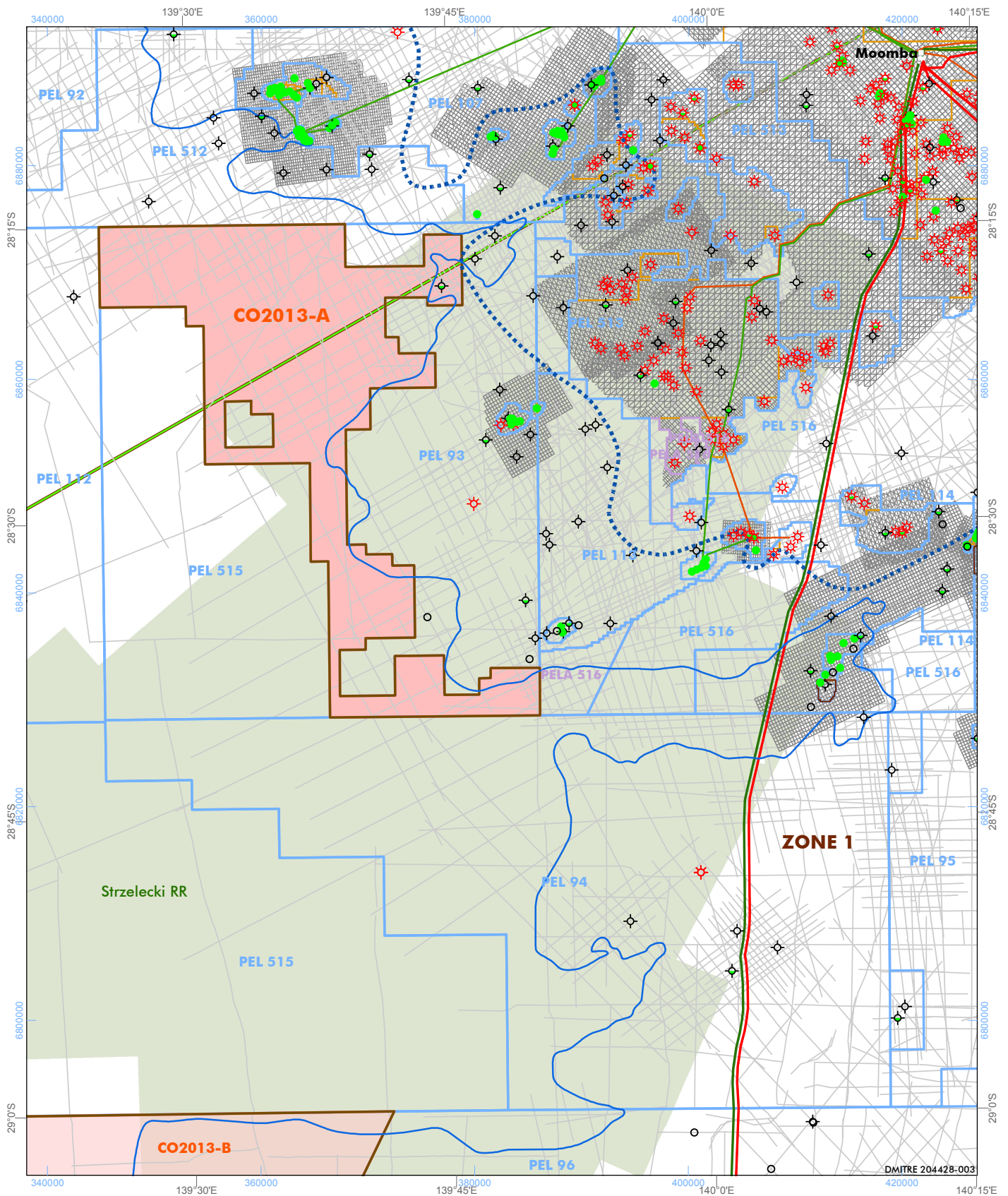


Figure 1 Petroleum licences



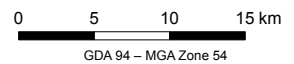
- Petroleum tenements**
- Acreage release block
  - Zone 1: Cooper Competitive Tender Region (excluding CO2013-A and B blocks)
  - Exploration licence (PEL)
  - Exploration licence application (PELA)
  - Production licence (PPL)
  - Retention licence (PRL)

- Petroleum wells**
- Dry hole
  - Dry hole with oil shows
  - Gas shows
  - Gas well
  - Gas well with oil shows
  - Oil and gas well
  - Oil well
  - Proposed or currently drilling

- Seismic coverage**
- 2 dimension
  - 3 dimension

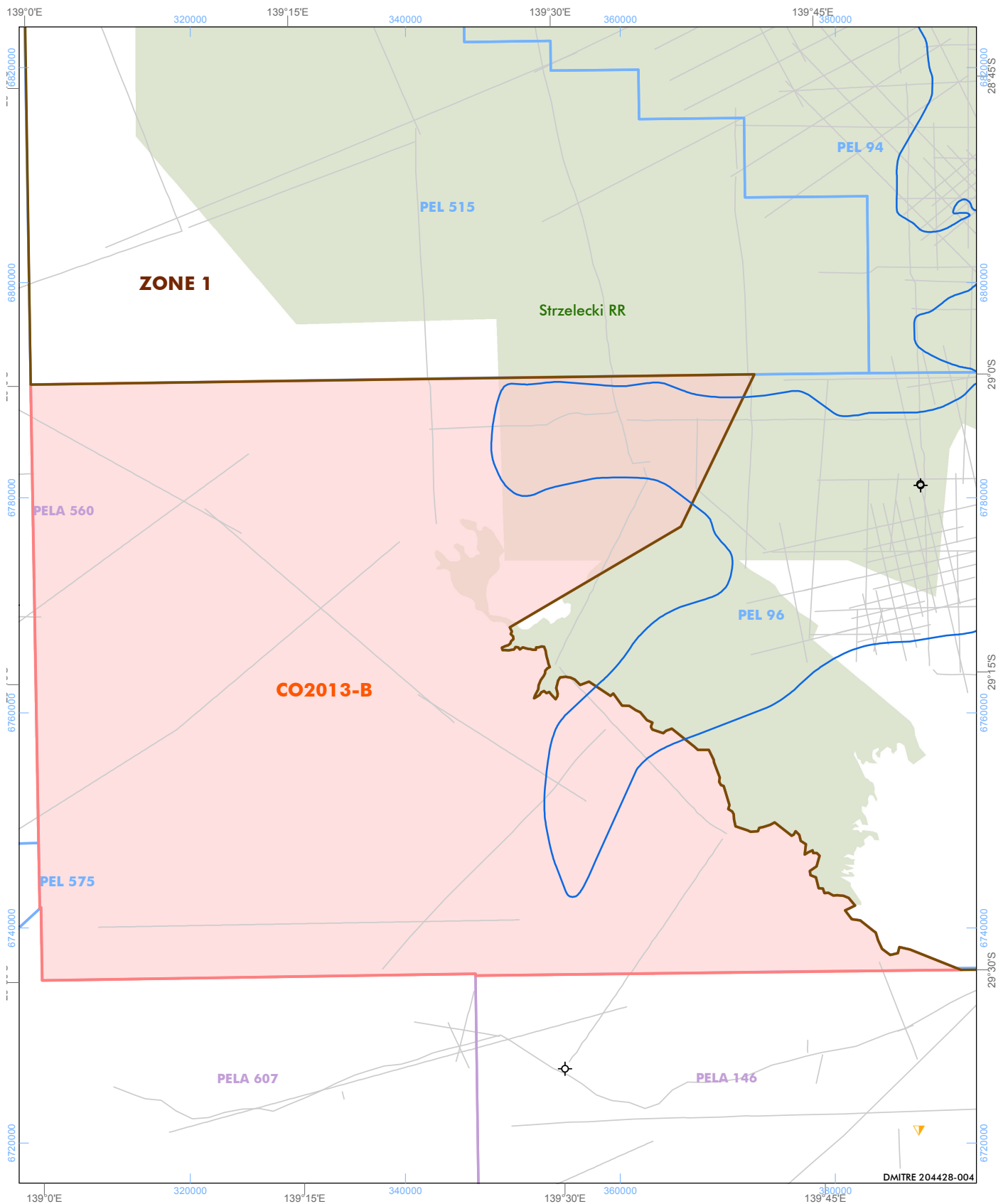
- Petroleum pipelines**
- Gas
  - Gas and liquids
  - Liquids
  - Liquid trunkline
  - Gas trunkline
  - Cooper Basin Permian edge
  - Top Nappamerri subcrop edge

- Parks with petroleum exploration access
- Ramsar site



Cooper and Eromanga basins,  
South Australia  
**ACREAGE RELEASE  
CO2013-A**

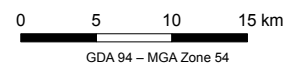
**Figure 2** CO2013-A acreage release  
Cooper Basin CO2013-A & B



- Petroleum tenements**
- Acreage release block
  - Zone 1: Cooper Competitive Tender Region (excluding CO2013-A and B blocks)
  - Exploration licence (PEL)
  - Exploration licence application (PELA)

- Petroleum wells**
- Dry hole
  - Geothermal
  - Proposed or currently drilling

- Seismic coverage**
- 2 dimension
  - Parks with petroleum exploration access
  - Cooper Basin Permian edge



Cooper and Eromanga basins,  
South Australia

## ACREAGE RELEASE CO2013-B

Figure 3 CO2013-B acreage release

Cooper Basin CO2013-A & B

## INTRODUCTION

The Cooper Basin is a Permo-Carboniferous to Triassic intracratonic basin located 800 km north of Adelaide, extending into southwest Queensland (Gravestock et al., 1996). It is overlain by the prospective Jurassic to Cretaceous intracratonic Eromanga Basin which extends of much of central-eastern Australia (Cotton et al., 2006). The Cooper and Eromanga basins collectively contain up to 3700 m of predominantly fluvial, glaciofluvial, lacustrine and deltaic sediment with some Cretaceous marine sediments (Figure 4). Targets are 1200–3700 m deep. The Cooper and Eromanga basins lie unconformably over early Palaeozoic marine sediments of the Warburton Basin and Mid-Carboniferous Big Lake Suite granite, which is currently being evaluated as a

source of geothermal energy (e.g. Wyborn, et al., 2004; Wyborn, 2008).

The Cooper Basin and overlying Eromanga Basin is Australia's largest and most mature onshore hydrocarbon province, supplying major south-eastern Australian gas markets since 1969 and producing oil since 1982. The Cooper Basin Liquids Project (1980–84) was initiated to market the oil and existing gas liquids. A liquids pipeline links Moomba to a processing plant and storage and export loading facilities at Port Bonython.

Over 2,000 exploration and development wells have been drilled and over 76,690 km<sup>2</sup> 2D and 14,048 km<sup>2</sup> 3D seismic recorded to end June 2013. Estimated total cumulative product sales to end June 2013 are: 5.12 tcf of sales gas, 77.7 mmbbl of condensate, 164.5 mmbbl of oil and 79.2 mmbbl of LPG. Annual petroleum production and the value of sales since 1970 are shown in Figure 5. Oil production was declining until 2002 when new discoveries caused a resurgence of drilling activity and exploration success, while gas sales peaked in 1989 and have been declining since 1998.

Exploration drilling has produced a steady stream of discoveries since the discovery of gas in 1963 as indicated by the world class exploration success rates (Figure. 6). While drilling hiatuses correlate with oil price crashes, the steep increases in the oil discovery success rate are linked to improved seismic acquisition and processing, more 3D seismic acquisition, testing new play types (e.g. the

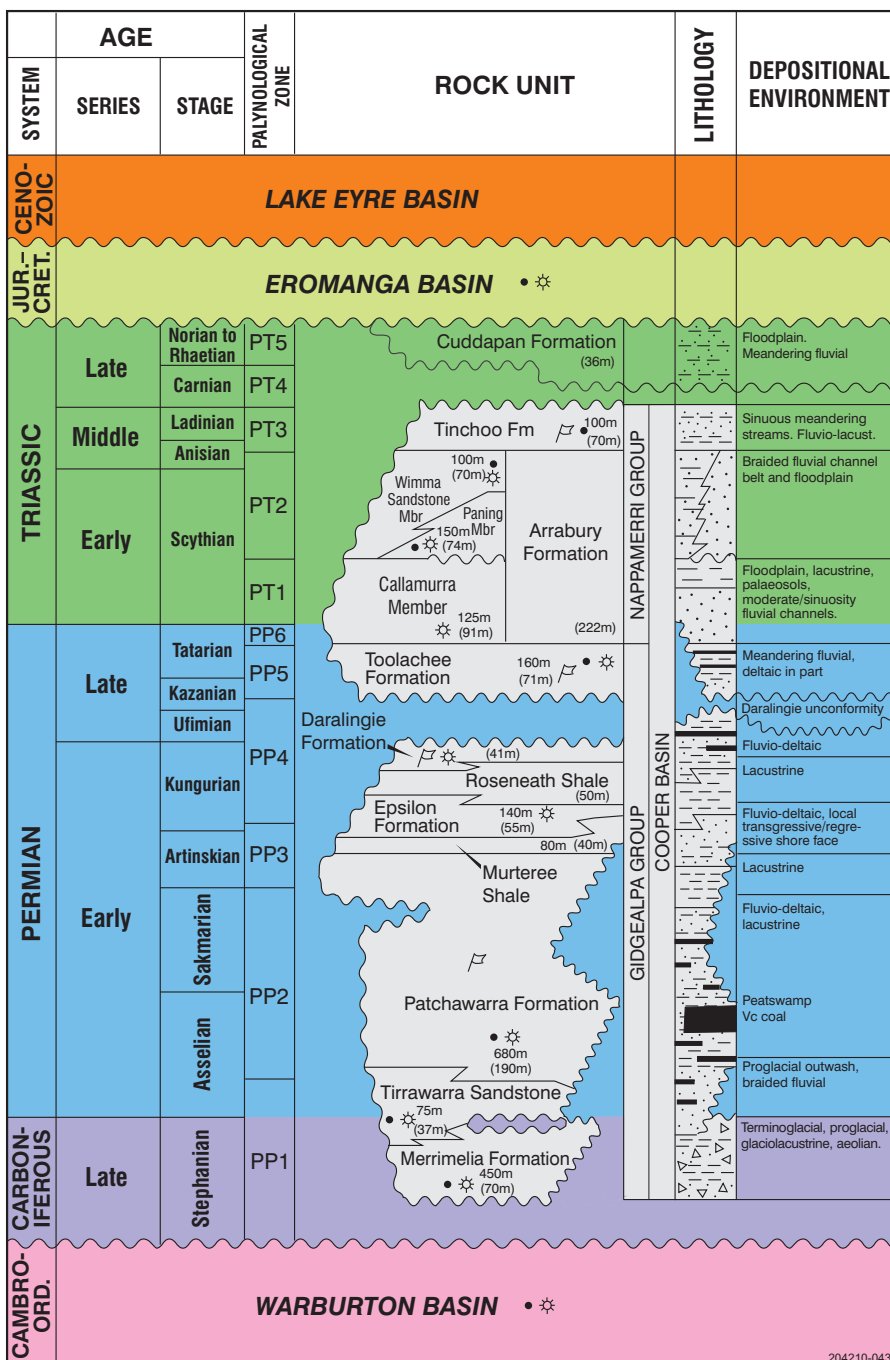


Figure 4 Cooper-Eromanga Basin stratigraphy

## PETROLEUM GEOLOGY

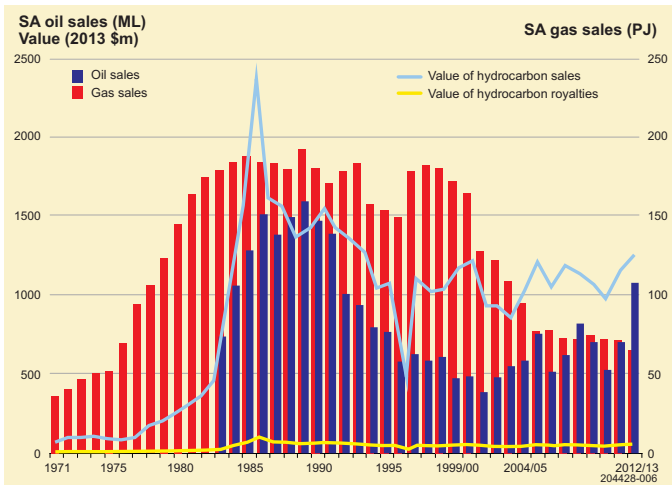
The Cooper Basin unconformably overlies flat lying to compressively deformed Cambro-Ordovician Warburton Basin strata and Carboniferous granitic intrusives. The unconformity is mapped as the Z seismic horizon (Figure 7). The intracratonic Cooper Basin represents a Late Carboniferous to Triassic depositional episode terminated at the end of the Middle Triassic with regional uplift and erosion. Three major troughs (Patchawarra, Nappamerri and Tenappera) are separated by ridges (Gidgealpa–Merrimelia–Innamincka (GMI) and Murteree) associated with the reactivation of NW-directed thrust faults in the underlying Warburton Basin (Figure 7). These troughs contain up to 2,500 m of Permo-Carboniferous to Triassic sedimentary fill overlain by as much as 1,300 m of Jurassic to Tertiary strata.

### Cooper Basin

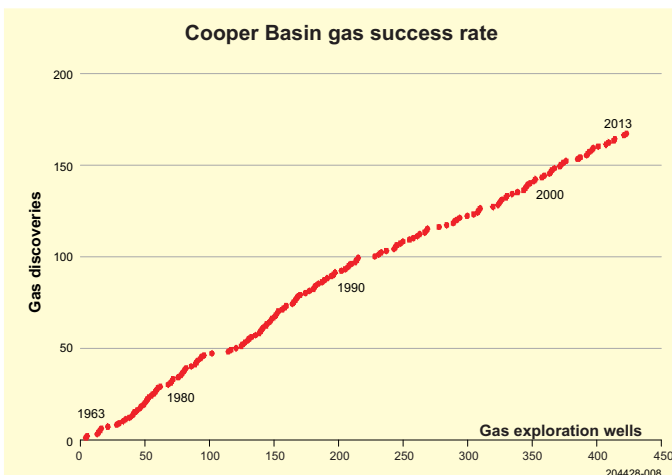
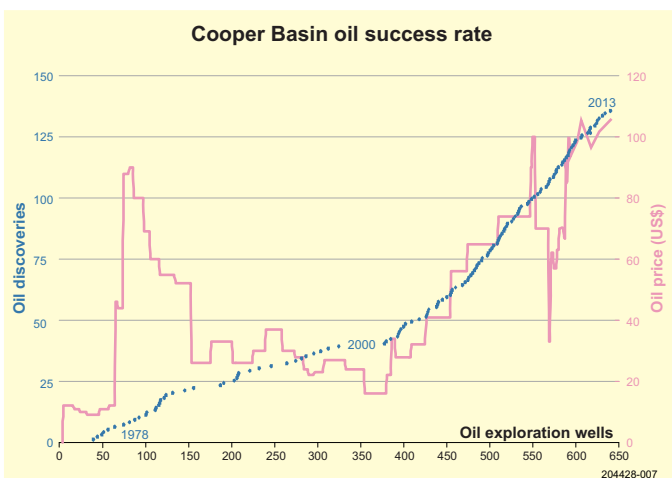
The Late Carboniferous to Late Permian succession consists of basal glaciofluvial clastics and proglacial outwash deposits, overlain by thick coal measures (peat swamp), floodplain, lacustrine and high sinuosity fluvial facies. Uplift and erosion at the end of the Early Permian resulted in a depositional break and Late Permian to Early Triassic fluvial and floodplain facies were deposited on the unconformity surface. Deposition in the region was terminated at the end of the Early Triassic with slight but widespread deformation, regional tilt and erosion. The top of the Permian succession is mapped as the P Seismic Horizon.

### Eromanga Basin

The Jurassic–Cretaceous Eromanga Basin can be divided into three sedimentary packages — a lower non-marine package, a marine package, and an upper non-marine package. Exploration is concentrated on the productive lower non-marine sediments, which consist of basal high-sinuosity fluvial and floodplain deposits (Poolowanna Formation), overlain by extensive and thick low-sinuosity fluvial sandstones. Two floodplain and lacustrine units (Birkhead and Westbourne formations) occur within this sand package, which is overlain by extensive lacustrine and shoreface facies (Murta Formation), deposited in a large lake which extended throughout the Cooper Basin



**Figure 5** Annual Cooper Basin petroleum production and the value of sales since 1971



**Figure 6** Cooper Basin oil and gas discoveries

Jackson discovery in 1981 and the Strzelecki-3 oil discovery in 1978) and also to new companies entering the basin and reinvigorating exploration. In contrast, the gas discovery success rate curve is smoother because the commodity price has not been as variable as the oil price, and long term contracts dominate the market.



Cooper and Eromanga Basins, South Australia

**TOP BASEMENT DEPTH IMAGE with STRUCTURAL ELEMENTS**

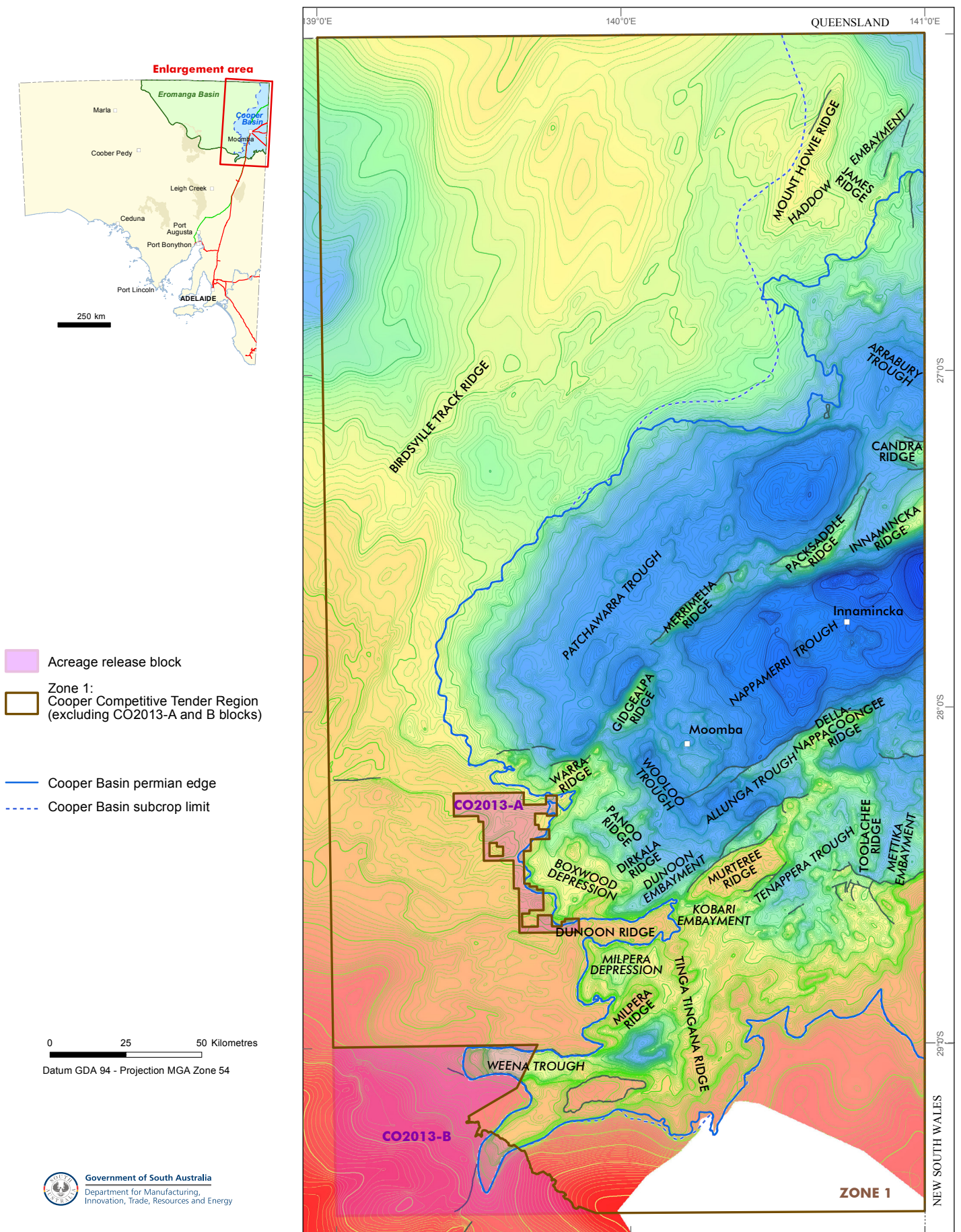


Figure 7 Top basement depth structure map with structural elements

region. This lower non-marine package is overlain by Early Cretaceous marine shales that form a regional seal, and Late Cretaceous non-marine deposits. The top Cadna-owie Formation (Early Cretaceous) is mapped as the C Seismic Horizon.

## Lake Eyre

Tertiary to Recent fluvial to lacustrine deposits of the Lake Eyre Basin unconformably cover the Eromanga Basin. The unconformity at the top of the Eromanga Basin is often difficult to distinguish in wells and seismic.

## SOURCE ROCKS

### Cooper Basin

Numerous producing oil and gas fields and significant gas and oil shows in wells in the Cooper Basin area indicate that sufficient mature source rocks are present and have generated hydrocarbons. Permian coal measures and shales have high Total Organic Carbon (TOC) content and represent the main hydrocarbon source for Cooper Basin oil and gas accumulations.

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.

Coal and carbonaceous shale of the Patchawarra Formation represent the principal source rocks of the Cooper Basin, both in source richness and quality, and overall thickness (Boreham and Hill, 1998). Rock-Eval data indicates that Patchawarra Formation source rocks contain a mix of both Type II and Type III kerogen (Figure 8). Toolachee Formation coal and carbonaceous shale represent the second most important source rock unit of the Cooper Basin in terms of richness, quality and thickness. Rock-Eval data indicates that Toolachee Formation source rocks also contain a mix of both Type II and Type III kerogen (Figure 9). The total gas generative potential of the Cooper Basin source rocks has been estimated to be between 4,027 tcf (minimum estimate) to 8,055 tcf (maximum estimate) (Morton, 1998).

Oils and condensates are typically medium to light (30–60° API) and paraffinic, with low to high wax contents. Most Permian oils in

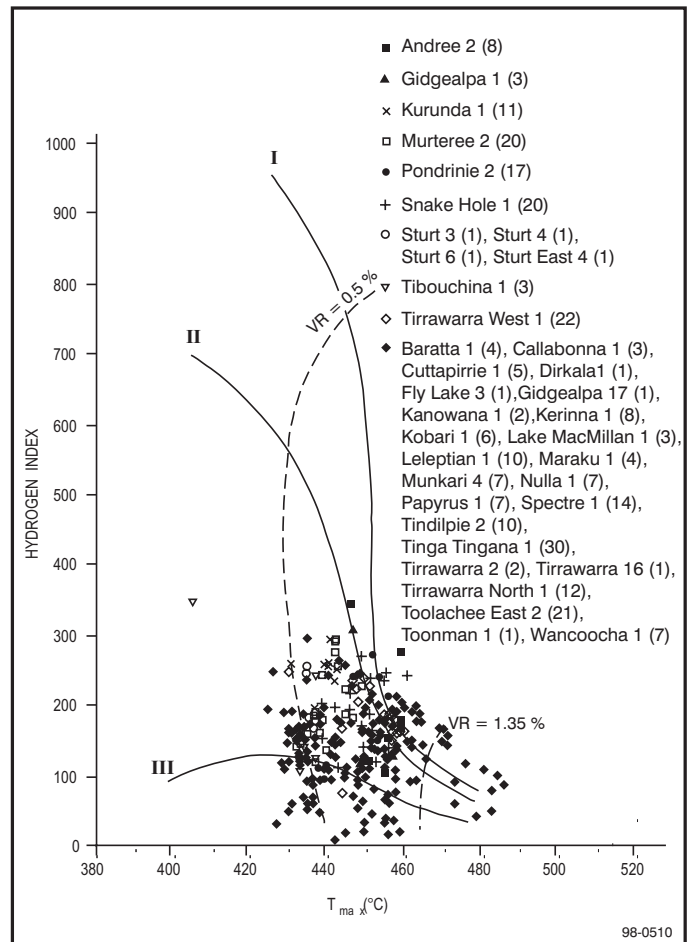


Figure 8 HI vs Tmax plot, Patchawarra Formation

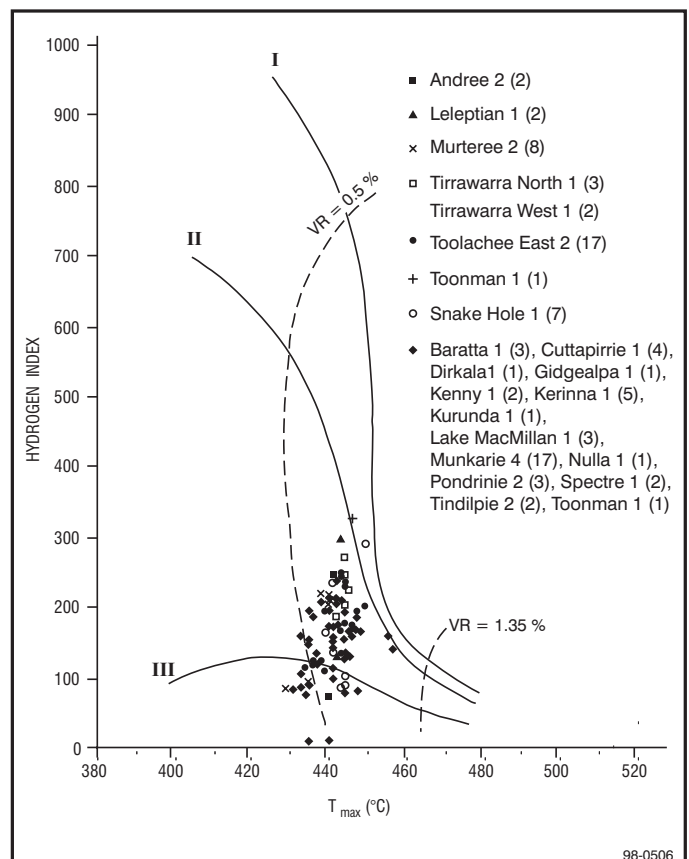


Figure 9 HI vs Tmax plot, Toolachee Formation

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.

## Eromanga Basin

In the Eromanga Basin, the Poolowanna and Birkhead formations contain organic-rich shales that are oil-prone (Type II/III kerogen) and maturity ranges from 0.5-0.7% Ro. The Murta Formation is interpreted to have potential to generate light paraffinic crude oils, even at maturity levels as low as 0.50–0.55% Ro. It generally contains Type II/III kerogen, however the best Murta source facies contain telalginite and indicators of bacterial precursors occur.

The marine sediment package and upper non-marine sediment package are immature for hydrocarbon generation over much of the basin (< 0.45% Ro).

Both Permian and Mesozoic source rocks have contributed to oil accumulations in the Eromanga Basin. Each Eromanga oil accumulation needs to be considered in terms of its access to potential source kitchens to assess the likelihood of Permian and/or Mesozoic sources (McKirby et al., 2005).

## RESERVOIRS AND SEALS

Multi-zone high-sinuosity fluvial sandstones form poor to good quality reservoirs in the Cooper Basin succession. The main gas reservoirs occur primarily within the Patchawarra Formation (porosities up to 23.8%, average 10.5%; permeability up to 2500 mD) and Toolachee Formation (porosities up to 25.3%, average 12.4%; 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%; permeability up to 329 mD). Towards the margin of the Cooper Basin, oil is also produced from the Patchawarra Formation and from Merrimelia Formation fluvial channel sands in the 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 Wimmera Sandstone members form economic oil and gas reservoirs, and high-sinuosity fluvial sandstone of the Tinchoo Formation reservoirs oil. As yet, there have been no economic oil or gas fields discovered in the Cuddapan Formation in South Australia.

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. A younger regional seal is provided by the Triassic Arrabury Formation.

The principal Eromanga Basin reservoirs are good to excellent reservoir quality Hutton and Namur braided fluvial sandstones (porosities up to 25%, permeability up to 2500 mD). Oil is also reservoirized in fair to excellent quality sandstones in the Poolowanna and Birkhead formations, McKinlay Member and Murta Formation. The Wyandra Sandstone Member of the Cadna-owie Formation forms a significant oil reservoir in Queensland; however, the only significant accumulation in SA occurs in the Aldinga Oil Field. Seals consist of intra-formational diagenetic sandstones, siltstones and shales of the Poolowanna, Birkhead and Murta formations in the Cooper region.

## TRAPS

### Warburton Basin

The Warburton Basin remains under-explored, yet has all the required ingredients of a valid hydrocarbon system: oil and gas shows and flows, reservoir, seal, traps and access to proven mature source rocks via down dip migration pathways from the Eromanga and Cooper basins (Sun and Gravestock, 2001). Hallmann et al. (2006) present evidence for small amounts of migrated Warburton Basin oil in Permian reservoirs. 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. Overlying

Merrimelia Formation glaciolacustrine shale would form an effective seal.

## 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 reservoired in the Nappamerri Group, paradoxically regarded as a regional seal to the Cooper Basin.

Structural growth during the Permian and Jurassic and differential compaction played an important role in trap formation and fill, as well as strongly affecting reservoir properties. Anticlinal, fault, sub-unconformity truncation, structure–stratigraphic (e.g. channel fairway facies draped on structural nose) and stratigraphic pinchout traps are also proven plays.

## Eromanga Basin

Trapping mechanisms within the Eromanga Basin are dominantly structural (anticlines with four-way dip closure or drapes over pre-existing highs) with a stratigraphic component (e.g. Poolowanna Formation, Hutton–Birkhead transition, intra-Birkhead channel sands, McKinlay Member and Murta Formation). Seals consist of intraformational siltstones within the Poolowanna, Birkhead and Murta Formations. The Birkhead-Hutton petroleum system is the most productive in the Eromanga Basin.

Stacked oil pay in the McKinlay/Namur, Hutton and Birkhead occurs around the Cooper Basin region. The Eromanga Basin also contains rare gas accumulations, where Permian gas has migrated upwards along faults and been trapped higher in the section (e.g. Namur Gas Field).

## EXPLORATION POTENTIAL

The number of oil discoveries in the South Australian part of the Cooper Basin reached 135 at the end of August 2013 (Figure 6). Extensive areas on the flanks of the Cooper Basin and in the broader Eromanga Basin remain under-explored.

In the core Cooper province, oil and gas exploration has typically focused on four-way dip-closed anticlines. 3D seismic is an extremely useful tool for prospect delineation in the Eromanga Basin where vertical closures can be small, falling within the range of possible errors introduced by statics and lateral velocity variations. There is currently a 56% success rate for oil exploration wells drilled on 3D seismic in the Eromanga Basin. Stratigraphic plays are a proven play concept in Cooper Basin (e.g. the Brownlow Gas Field, Patchawarra Trough), and recent Eromanga Basin discoveries on the western flank of the Cooper Basin have a stratigraphic component.

Significant unconventional gas potential remains in the Cooper Basin, in the form of shale gas, tight gas and coal seam gas. At this early stage the Cooper Basin JV (operated by Santos) and Beach Energy already have contingent unconventional gas resources totalling more than 5 Tcf in the South Australian Cooper Basin, equivalent to the total sales gas production from the South Australian Cooper Basin to date. The US Energy Information Administration has estimated that the entire Cooper Basin (South Australia and Queensland) has a risked recoverable shale gas resource of 85 trillion cubic feet. The US EIA report 'World Shale Gas Resources: An initial assessment of 14 regions outside the United States' can be downloaded via the following link: <http://www.eia.gov/analysis/studies/worldshalegas/pdf/fullreport.pdf>

The region is also being explored for geothermal energy (e.g. Wyborn et al., 2004).

## Block CO2013-A

Block CO2013-A captures the western margin of the Boxwood Depression in the Cooper Basin, bound to the north-east by the Warra Ridge and to the south-east by the Dunoon Ridge and also captures the Eromanga Basin west of the Permian sub-crop edge (Figure 7).

*Multiple stacked plays (Cadna-owie, Murta, McKinlay, Birkhead, Hutton, Poolowanna)–Eromanga Basin*

The Worrior and Padulla oil fields lie within PEL 93 and 113 respectively, to the east and southeast of Block CO2013-A. These oil pools are basinward of the Permian sub-crop edge

but beyond the Nappamerri Group pinchout. Cumulative oil production from the Worrior and Padulla fields to the end of March 2013 is  $5.88 \times 10^5 \text{ m}^3$  and  $57.98 \times 10^3 \text{ m}^3$  respectively.

The Tantanna oil field lies on the Permian pinchout to the north of CO2013-A within PPL 46. Multiple oil pools were tested in the Tantanna 1 discovery well with flows of 1900 BOPD, 3175 BOPD and 2265 BOPD respectively from the Poolowanna Formation, Hutton and Namur sandstones. Cumulative oil production from the Tantanna field to the end of March 2013 is  $1.253 \times 10^6 \text{ m}^3$ . These results clearly demonstrate the superior nature of the Permian pinchout play.

### *Conventional four-way dip closures - Cooper Basin*

Worrior 1 tested a thin 7m interval (DST 4: 1713 – 1720m) within sands of the Patchawarra Formation that flowed at 7.3 mmcf/d and 60 BOPD within an unfaulted four way dip closure trapped by 19m of Murteree Shale. This test demonstrated that a reduced Patchawarra Formation sequence is being charged from a more vertically extensive Patchawarra sequence basinward of the Worrior Field but still capable of being trapped by a reduced Murteree Shale seal.

### *Warburton Basin Oil Play*

Worrior 3 well tested orthoquartzites of the Pando Formation (DST 3: 1734-1791m) recovering 6 bbls of oil. On the strength of this recovery, the Pando Formation was identified as a secondary target in Worrior 4 and subsequently tested. DSTs 1 and 3 targeted poor to good fluorescence in open fractures but both tests were misruns. The Pando Formation was consequently perforated but failed to produce hydrocarbons on production. However, the recovery of hydrocarbons in Worrior 3 and subsequent shows in Worrior 4 clearly demonstrate that an active petroleum system is in place with Warburton Basin sediments being charged by mature downdip Permian source rocks.

## **Block CO2013-B**

Block CO2013-B lies predominantly within the confines of the Warburton and overlying Eromanga basins, capturing the western extremity of the Weena Trough of the Cooper Basin (Figure 7). No wells have been drilled within the acreage release block with the nearest wells (Weena 1 and Forge 1) located 21 km to the east in PEL 96.

### *Multiple stacked plays (Cadna-owie, Murta, McKinlay, Birkhead, Hutton)– Eromanga Basin*

Potential exists for multiple stacked oil pools resulting from long range migration out of the basin beyond the Permian sub-crop edge.

### *Patchawarra Formation Deep Coal Seam Gas play*

Individual coal seams up to 13m thick were intersected in the Patchawarra Formation over the interval 1313-1326m in Forge 1 within the Weena Trough. Whilst thinning of the Patchawarra Formation can be expected on the western margins of the Weena Trough, there is still potential for a Deep CSG play.

### *Merrimelia Formation shale play – Cooper Basin*

Shales in the Merrimelia Formation may be a shale oil target if sufficient organic richness, thickness and lateral extent can be demonstrated.

### *Unconventional gas plays - Warburton Basin*

Fractured basement plays charged from Permian source rocks have been proven on the western margin of the Eromanga Basin (e.g. Lycosa 1, Charo 1 and Worrior 4) and remain a viable play within Block CO2013-B. Hydrocarbons may be trapped by altered basement (Boucher, 2001) or Jurassic seals.

## **INFRASTRUCTURE AND TRANSPORT**

A total of 5,590 km of pipeline has been laid to gas markets in South Australia, New South Wales and Victoria and to the liquids load out facility at Port Bonython. 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 which was 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. Twenty oil and 13 gas satellites are currently in operation.

Since January 2009, the Queensland to South Australia/New South Wales (QSN) Link Pipeline between Ballera (Qld) and Moomba has transported sales gas sourced from coal seam methane reserves in south-eastern Queensland directly into the Moomba to Adelaide Pipeline. A connection directly into the Moomba to Sydney Pipeline is also possible.

The new entrant Cooper Basin explorers have secured access to Moomba facilities operated by Santos Ltd. Oil is trucked from a number of oil field fields to Moomba. New pipelines are also planned/under construction to connect western margin oilfields to the existing pipeline network or directly to Moomba.

Condensate, LPG, crude and some ethane are transported as a cocktail from Moomba via a pipeline to Port Bonython where they are separated and exported. At least one party has attained an agreement for third-party gas to be processed at Moomba (Smegsy 1, operated by Great Artesian Oil and Gas in 2005).

The township of Innamincka, located 65 km NE of Moomba, lies 113 km northeast of Block CO2013-A and 175 km north-northeast of Block CO2013-A (Figure 1). It offers a hotel, general store, and light-aircraft airstrip, and is accessible by good quality roads. The causeway at Innamincka provides the major crossing point for the Cooper Creek, which in times of flood is impassable by vehicle.

Accommodation and support facilities are located at the Moomba Production Facility, operated by the Cooper Basin Joint Venture, and not open to the general public. Access is by arrangement with the operator. The full range of support services are located at the Moomba camp including wireline logging, fracture stimulation, cementing, transport, fuel supply, aviation (including helicopter) and emergency services. There is a sealed airstrip at the Moomba Production Facility.

## LAND ACCESS

### National parks and reserves

Parts of the Cooper Creek system are listed as wetlands of international significance under the Ramsar Convention (1971). The northern portion of Block CO2013-A falls within the Ramsar area (Figure 10). South Australia's obligations are to manage the wetlands wisely to maintain their ecological character; this does not necessarily restrict exploration access.

The southern portion of Block CO2013-A and the northeastern portion of Block CO2013-B lie within the Strzelecki Regional Reserve, in the core of Australia's arid region (Figure 10). Regional Reserve is a reserve classification under the National Parks and Wildlife Act 1972 that specifically accommodates multiple land use. A PEL application incorporating any portion of the Strzelecki Regional Reserve will be referred to the Minister for Sustainability, Environment and Conservation and the views of such Minister are required to be taken into account when granting the PEL. In the case of Petroleum Production Licences within the Strzelecki Regional Reserve, approval must be obtained from the Minister for Sustainability, Environment and Conservation. Failing such Minister's approval, the issue is referred to the Governor for decision.

### Environmental regulation

One of the key environmental requirements of the Petroleum and Geothermal Energy Act 2000 is the need for all regulated activities to be covered by an approved Statement of Environmental Objectives (SEO), whether in a Regional Reserve or on pastoral leases. The purpose of the SEO is to address all risks associated with activities and to address issues and concerns raised by stakeholders detailed in a supporting document - an Environmental Impact Report (EIR). The SEO is prepared on the basis of the EIR through stakeholder consultation. The SEO also provides an effective mechanism for establishing 'one-window-to-government' for the industry by engaging the other agencies in the SEO consultation process.

An SEO does not have to be prepared for every activity proposal if the licensee can demonstrate that their proposed activity is covered by an existing approved SEO, such as the current

# Cooper and Eromanga Basins, South Australia REGIONAL RESERVES and ENVIRONMENTAL ZONES

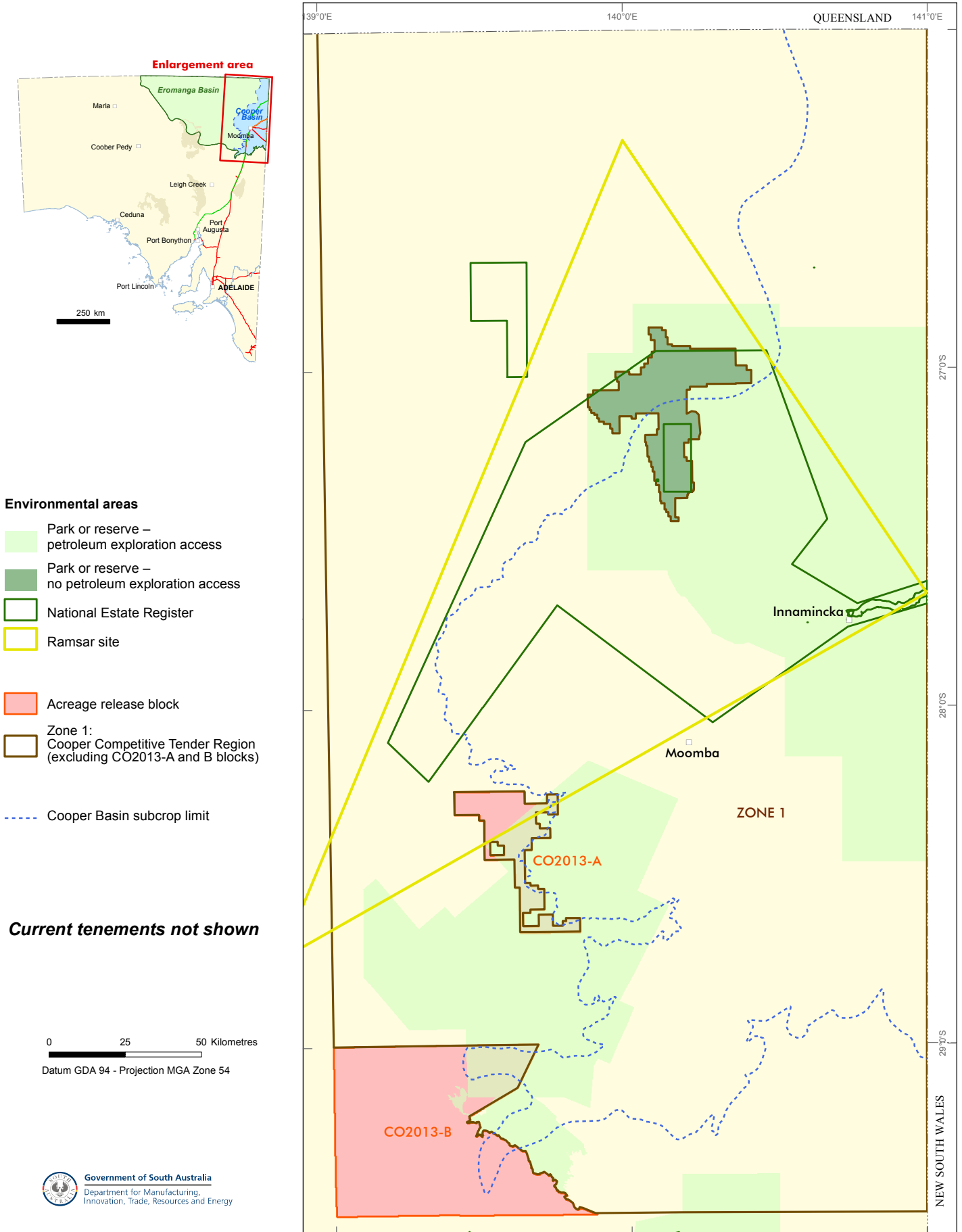
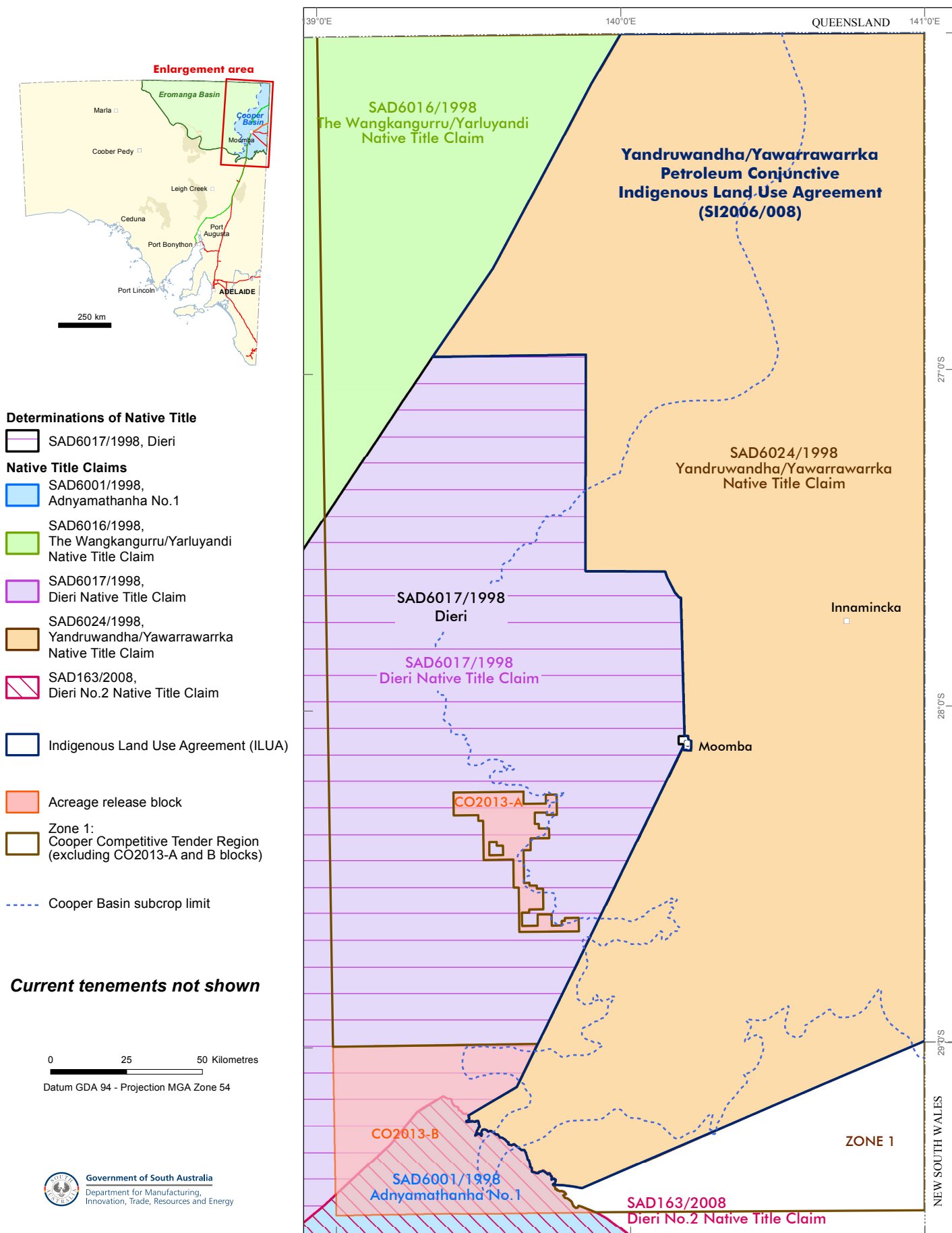


Figure 10 Regional reserves and environmental zones

# Cooper and Eromanga Basins, South Australia

## INDIGENOUS LAND USE AGREEMENT and NATIVE TITLE CLAIMANTS



REG 204428-011

Figure 11 Indigenous land use agreement and registered native title claimants



regional Cooper Basin SEOs for drilling and seismic activities (downloadable from the DMITRE Petroleum website).

### **Heritage and land access**

A PEL cannot be granted in the Cooper Basin unless an appropriate land access agreement is in place with the recognised native title parties (Figure 11), the State Government and the explorer. Indigenous Land Use Agreements (ILUAs) are an alternative to the right-to-negotiate (RTN) process pursuant to the Commonwealth Native Title Act 1993 and now cover most of the Cooper Basin. All South Australian land access agreements cover the full cycle of petroleum activities including exploration, development and production.

Conjunctive ILUAs are being used to expedite land access with lower transaction costs than RTN proceedings. The negotiations for an ILUA for the South Australian Cooper Basin region (already covered with RTN land access agreements) commenced in 2006 and in February 2007 the Yandruwandha/Yawarrawarrka peoples entered into the first petroleum ILUA. This agreement was the first conjunctive petroleum ILUA in a producing basin in Australia. Negotiations for additional ILUAs have progressed with the two relevant native title parties over the remainder of the Cooper Basin with the Wangkangurru/Yarluyandi peoples petroleum ILUA achieving formal registration in March 2012. The State Government intends to propose enhancements to the existing Yandruwandha/Yawarrawarrka ILUA to match any significant enhancements agreed with the other two relevant native title parties in the Cooper Basin region. Establishing essentially common terms for all three ILUAs will be fair, efficient, and foster sustainable development for the whole of the Cooper Basin and most of the Eromanga Basin in South Australia.

The RTN, ILUA and legislation-specific processes will continue to be developed with a desire to enable the expeditious grant of new PELs in ways that remain fair to traditional owners and sustainable in relation to exploration and production investment. The native title deeds for all South Australian petroleum exploration licenses subject to the right-to-negotiate or ILUA process pursuant to the Commonwealth Native

Title Act 1993 are available for public scrutiny from the DMITRE website.

It may be necessary to access adjoining accessible areas to conduct regulated activities relative to the PEL, via an Associated Activities Licence (AAL). The right-to-negotiate or ILUA process will include negotiation for facilitation of appropriate access to such adjacent accessible areas reasonably necessary to conduct such regulated activities, and will also include negotiation for facilitation of access relative to the grant of any ensuing licence for future production and necessary infrastructure development.

For further details of the right-to-negotiate or ILUA process contact Joe Zabrowarny, General Manager, Licensing and Legislation, email <joe.zabrowarny@sa.gov.au>, phone (08) 8463 3203.

A number of sites of European heritage significance such as historical buildings, structures and geological monuments may also occur in the area. The majority of sites are small and easily avoided by exploration activities.

### **Geothermal Exploration Licences**

A number of Geothermal Exploration Licences (GELs) coincide with petroleum exploration and production licences in the Cooper Basin region (Figure 12). The GEL licensee must be notified of activities in PELs, and may object to the activity and claim compensation if their activities or resources are affected. Likewise the GEL holder must notify the PEL holder of their activities, and the PEL holder may also object and claim compensation.

### **Associated Activities Licences**

Associated Activities Licences (AALs) are now available under the Petroleum and Geothermal Energy Act 2000. These licences allow explorers to undertake activities (e.g. seismic surveys) or establish facilities in proximity to petroleum exploration, retention and production licences. AALs are typically used to enable the recording of full-fold seismic within a PEL by recording tails of seismic lines outside the licence area.

## **CLIMATE AND LAND USE**

Australia's seasons are opposite to those of the northern hemisphere – the hottest months are January-February and the coldest month

# Cooper and Eromanga Basins, South Australia GEOTHERMAL LICENCES

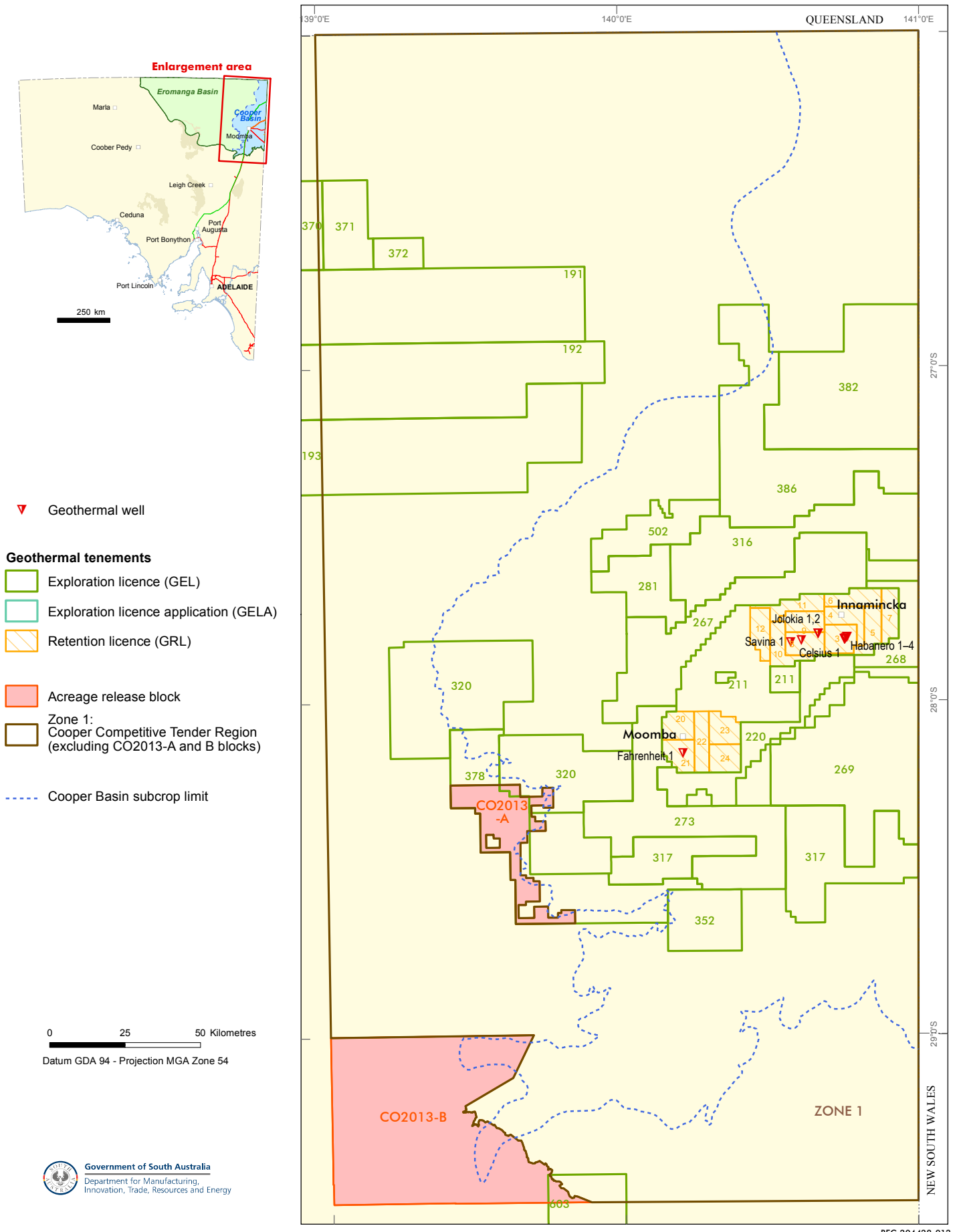


Figure 12 Geothermal licences

is July. At Moomba temperatures can range as high as 48 °C (118 °F) in summer, while overnight temperatures can drop to 2 °C (36 °F) in winter. The Cooper Basin is located in the core of Australia's arid region. The average annual rainfall in far northern South Australia is 176 mm (7 in), with the heaviest rainfall during December–February.

The northern part of South Australia is sparsely populated and relatively undeveloped due to its remoteness and harsh climate. The main industries are petroleum exploration and development, followed by large pastoral leases producing cattle and tourism.

## APPLICATION AND AWARD PROCESS

Winning bidders will be selected on the basis of the total five-year work program bid. The work program must be completed within the overall area of the PEL. It must include a statement of exploration operations the applicant proposes to carry out in the first five-year licence term. It is expected that at least one petroleum exploration well would be included in the program.

For application and award procedures, go to:

- ▶ [Applications and Awards Procedures](#).
- ▶ [Applications for Petroleum Exploration Licence \(pro forma template\)](#).

Bids will be assessed using the philosophies expressed in 'Selecting the winning bid'. For a review of how this process has been applied see '[Shaping the Cooper Basin 21st century renaissance](#)'. The specific scoring scheme is detailed in '[CO2013 Bid Assessment Policy](#)'.

In general, it is important to note that the timing of well drilling and seismic or other data acquisition will be taken into account.

Key assessment criteria include:

- ▶ The number and timing of exploration wells to be drilled in the PEL.
- ▶ The number of years the applicant is prepared to guarantee the program.
- ▶ The extent to which proposed wells are supported by existing or new programmed seismic data.
- ▶ The amount and nature of seismic surveying (i.e. 2D versus 3D) to be carried out and its timing.

- ▶ Other data acquisition (e.g. gravity, aeromagnetic or geochemical surveys).
- ▶ Seismic reprocessing to be carried out.

In addition to the above criteria, where bids are similar, the benefits of the introduction of new explorers into the area may be taken into account. In the case of cascading bids (i.e. multiple or hybrid bids by one applicant or joint venture), only the highest bid will be considered.

The closing date for CO2013-A and B applications is 4.00pm, Thursday 29<sup>th</sup> May 2014.

The envelope containing your application must be marked '**Confidential — contains PEL application**'

The Minister is expected to announce the winning bidder, together with details of work programs, by late June 2014.

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## CONTACT INFORMATION

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