

Cooper Basin

CO2012-A

South Australia Acreage Release

Bids close **APRIL**

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Government of South Australia
Department for Manufacturing,
Innovation, Trade, Resources and Energy

www.petroleum.dmitre.sa.gov.au

Energy Resources Division
August 2012

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South Australia COOPER BASIN

Acreage Release Block CO2012-A

BIDS CLOSE 4.00 pm Australian Central Standard Time, Thursday 4th April 2013

THE OFFER

A new petroleum exploration licence (PEL) in the Cooper and Eromanga Basins is being offered by the South Australian Government on the basis of work program bidding (Fig. 1). Block CO2012-A comprises two areas totalling 391.8 sq km relinquished from PEL 111 on the western margin of the Patchawarra Trough. One well (Darter 1) has been drilled and 581 line kilometres of 2D seismic data have been acquired within the block (Fig. 2).

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* DVD.

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 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)

SARIG (South Australia Resources Information Geoserver) can be accessed by selecting SARIG on the DMITRE Petroleum website <www.petroleum.dmitre.sa.gov.au>. SARIG provides an interactive map window to view, query and download data. The map window is useful for viewing wells, seismic lines, tenements, land access etc over the various Cooper Basin depth, time and isopach images.

More information on products and data can be accessed by selecting 'Products and Data' on the DMITRE Petroleum website home page.

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., 1998). 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 (Fig. 3). 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

Cooper and Eromanga Basins, South Australia

PETROLEUM LICENCES

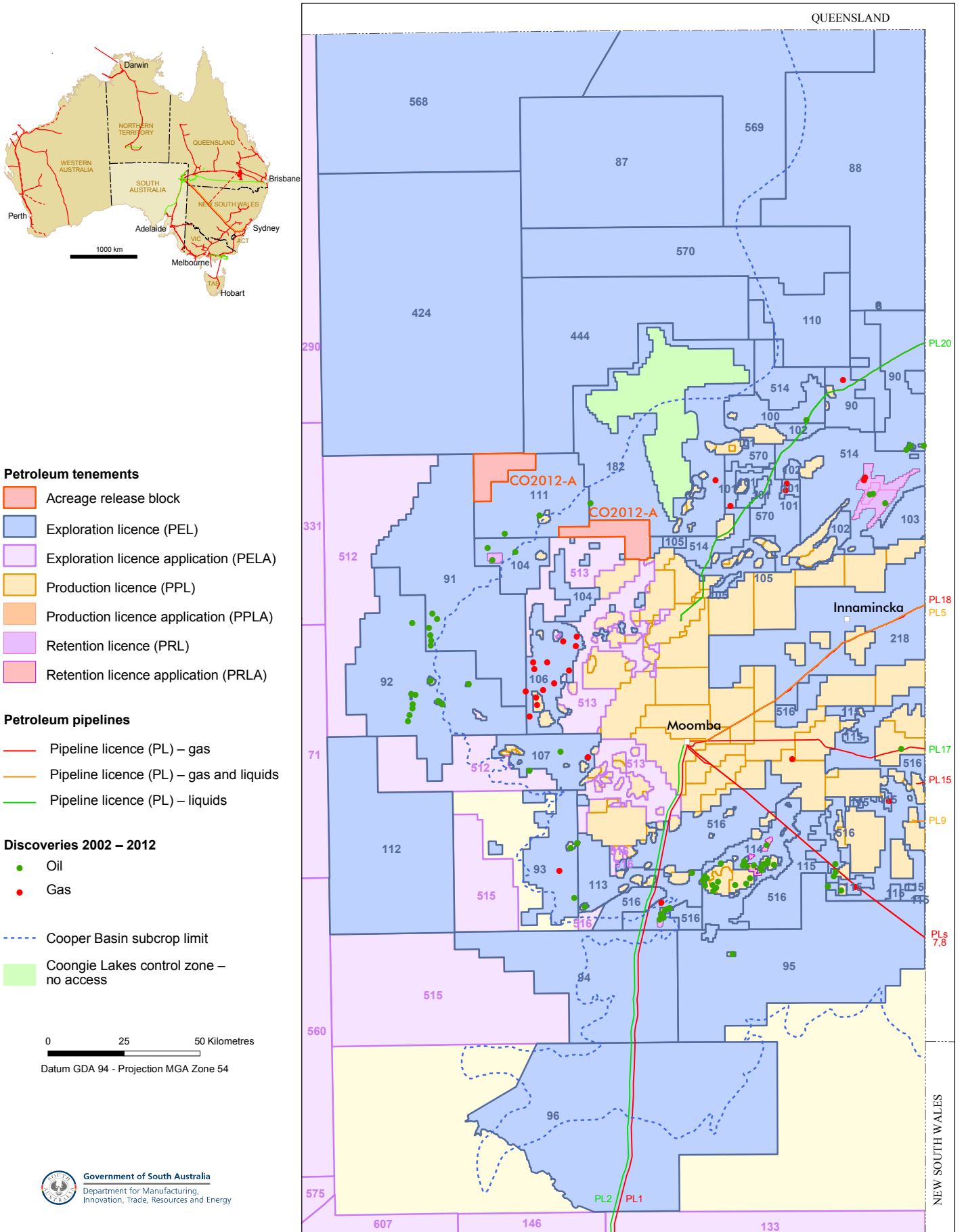


Figure 1 Petroleum licences

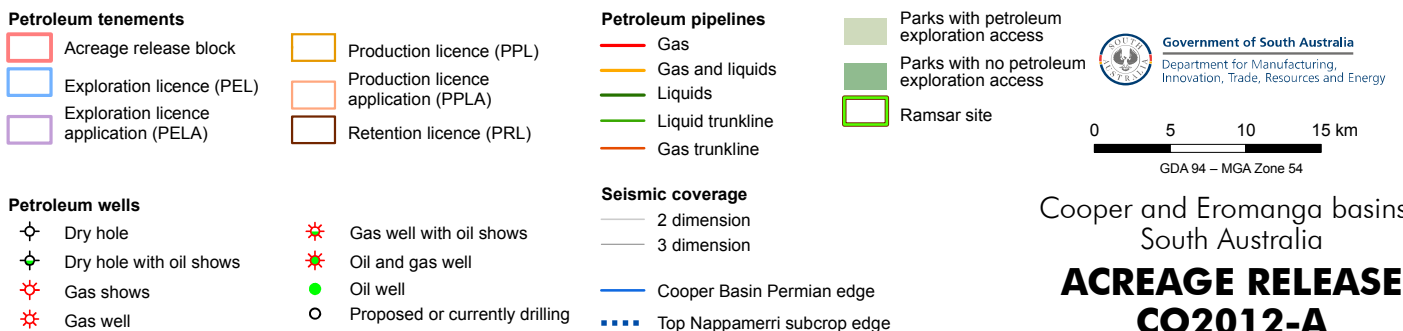
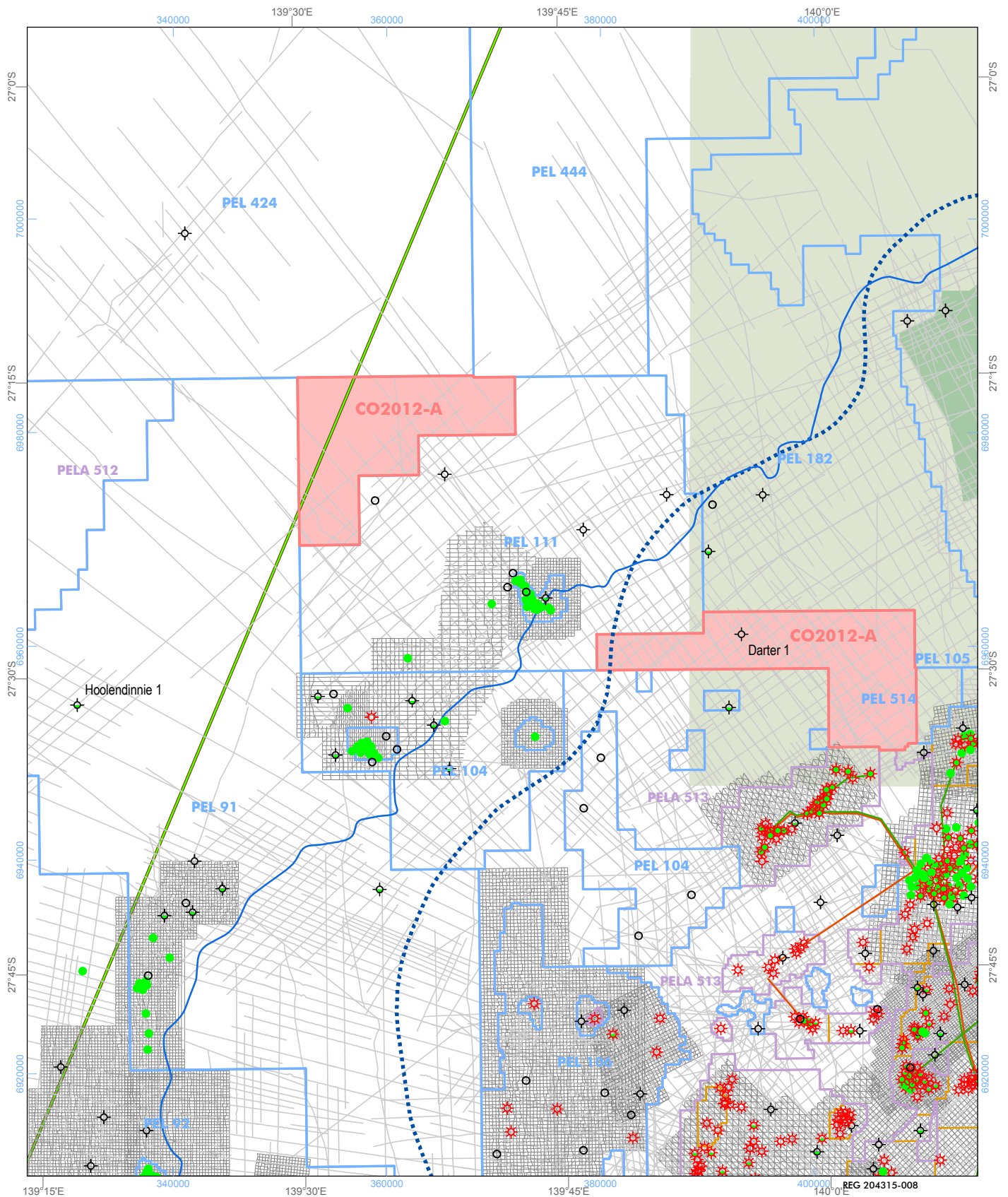


Figure 2 CO2012 acreage release

Cooper Basin CO2012-A

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 2000 exploration and development wells have been drilled and over 75 829 km² 2D and 8882 km² 3D seismic recorded. Estimated total cumulative product sales to end June 2012 are: 5.05 tcf of sales gas, 77 mmboe of condensate, 158.0 mmbbl of oil and 78.2 mmboe of LPG. Annual petroleum production and the value of sales since 1970 are shown in Figure 4. 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 (Fig. 5). 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 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.

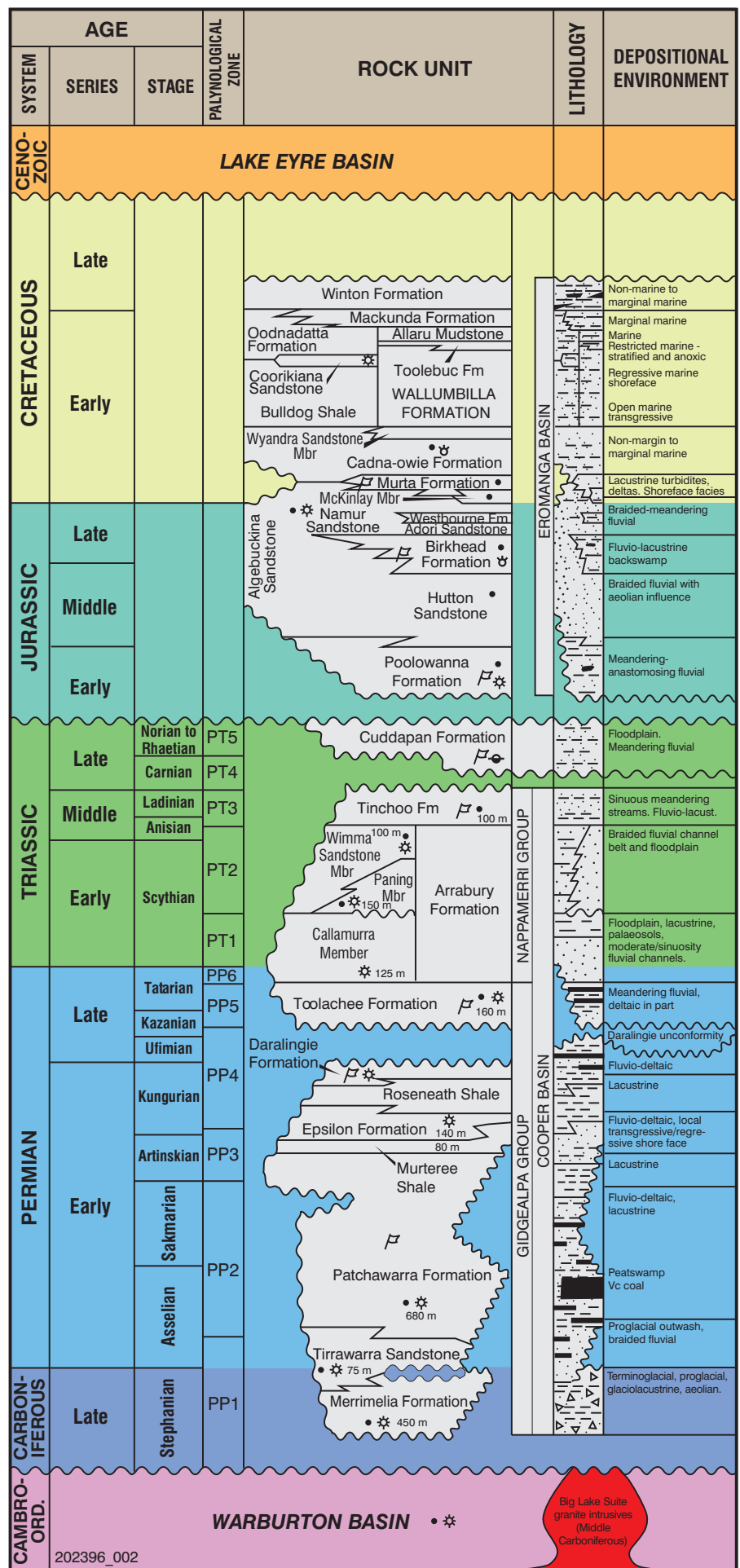


Figure 3 Cooper–Eromanga Basin stratigraphy

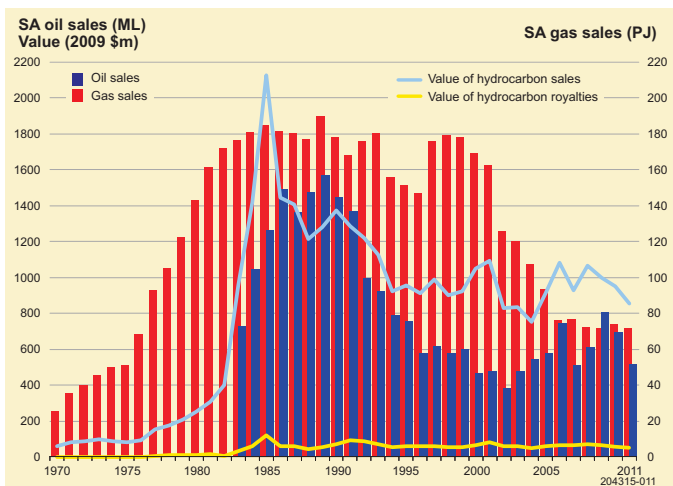


Figure 4 Annual Cooper Basin petroleum production and the value of sales since 1970

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 (Fig. 6). 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–Innaminka (GMI) and Murteree) associated with the reactivation of NW-directed thrust faults in the underlying Warburton Basin (Fig. 6). 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 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.

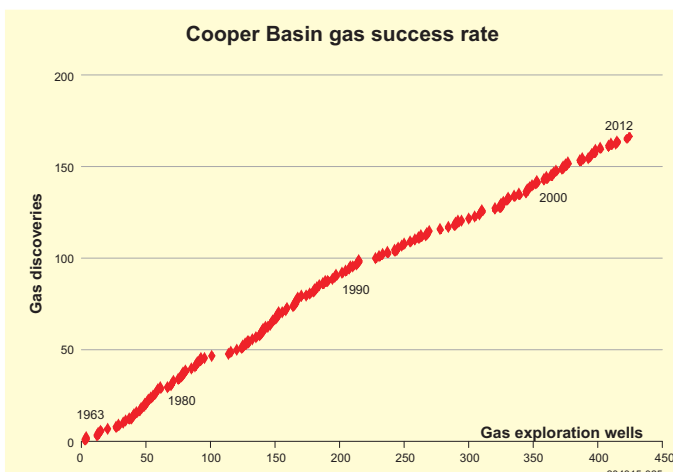
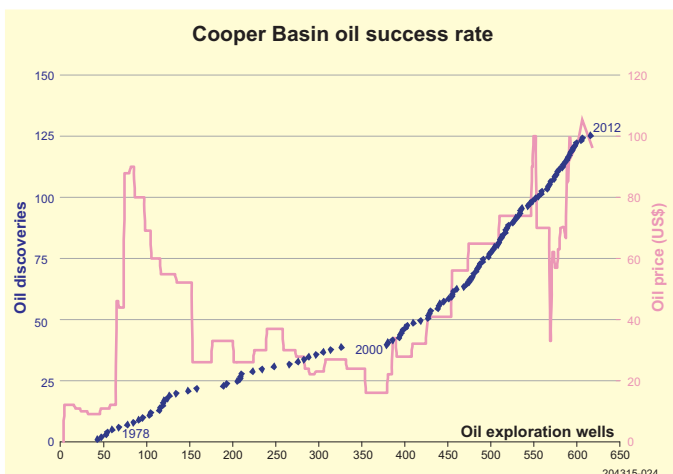


Figure 5 Cooper Basin oil and gas discoveries

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 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

Cooper and Eromanga Basins, South Australia

TOP BASEMENT DEPTH IMAGE with STRUCTURAL ELEMENTS

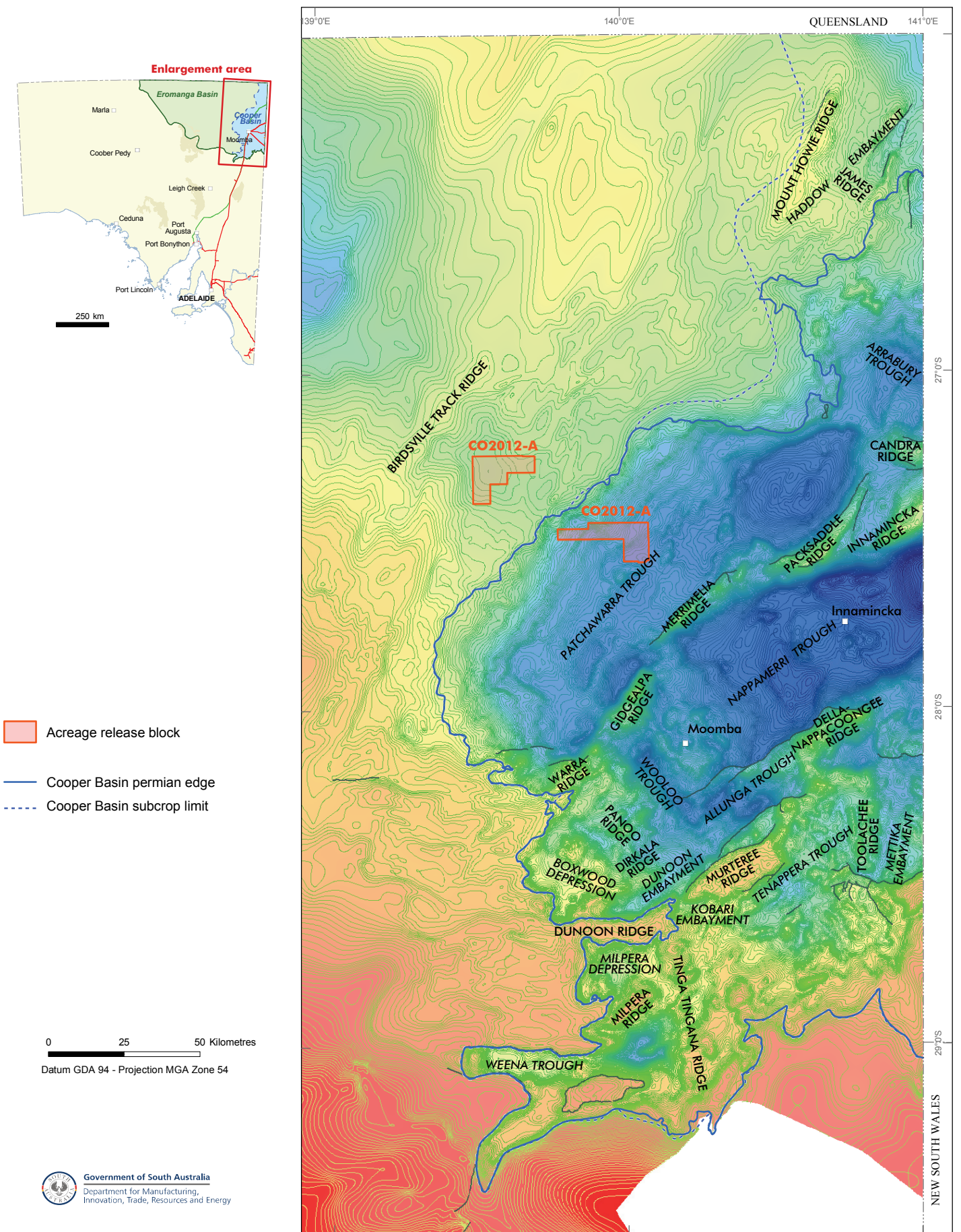


Figure 6 Top basement depth structure map with structural elements

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 (Fig. 7). 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 (Fig. 8). The total gas generative potential of the Cooper Basin source rocks has been estimated to be between 4027 tcf (minimum estimate) to 8055 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 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

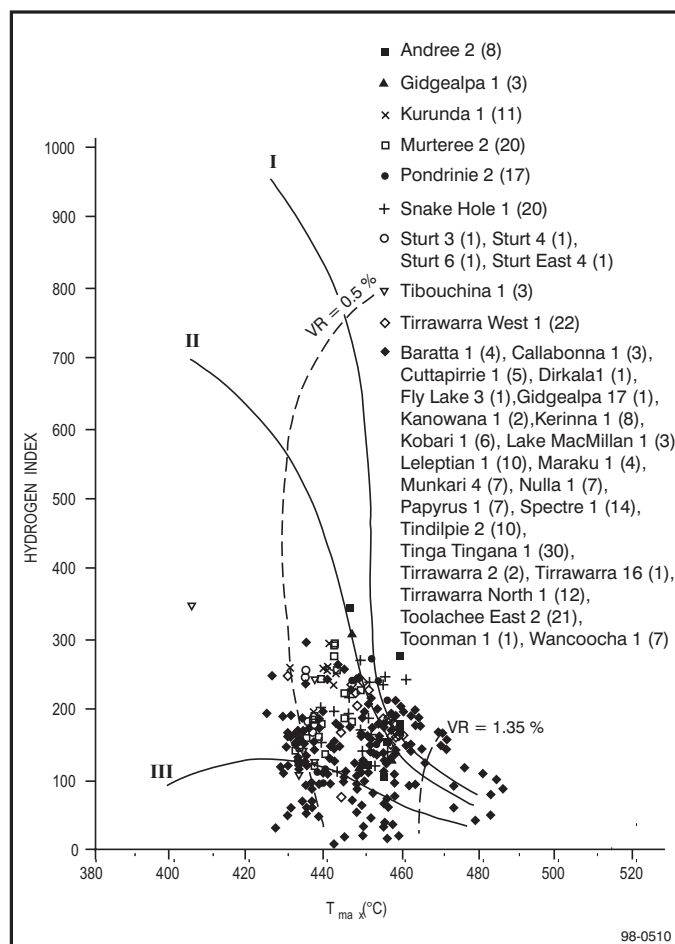


Figure 7 HI vs Tmax plot, Patchawarra Formation

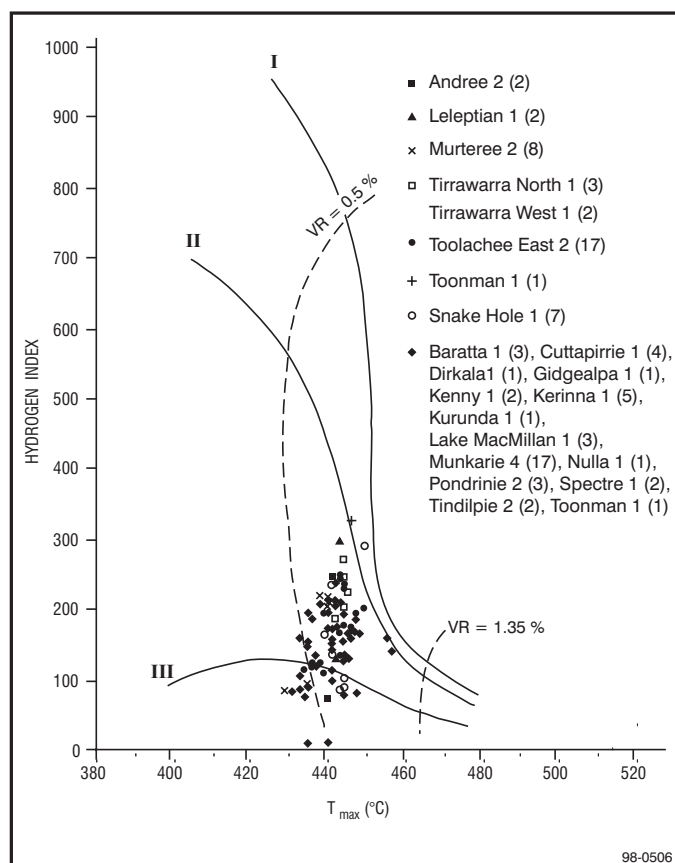


Figure 8 HI vs Tmax plot, Toolachee Formation

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 (McKirdy 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 reservoirized 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 125 at the end of June 2012 (Fig. 5). 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. 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 from <www.eia.gov/analysis/studies/worldshalegas>.

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

Block CO2012-A

Block CO2012-A captures part of the north-western margin of the Patchawarra Trough in the Cooper Basin, and the Eromanga Basin west of the Permian sub-crop edge.

Birkhead Channel Play — Eromanga Basin

The Snatcher and Charo oil fields and the Warhawk 1 and recent Mustang 1 oil discoveries lie within the area of PEL 111, immediately adjacent to Block CO2012-A. These oil pools occur in Birkhead Formation channel sands on or immediately west of the Permian sub-crop edge.

Charo 1 (PPL 177), drilled in 1984 was the first intra-Birkhead oil discovery in the area. However, the intra-Birkhead channel play was not further pursued in the area until 2007 with the drilling of Charo 2 in PPL 177, and later Warhawk 1 (PEL 111) in 2008 and Snatcher 1 (PEL 111) in 2009. All these wells were sited on 2D seismic. 3D seismic surveys (Charo – 2008 and Mollichuta – 2009) have since been acquired to better image the Birkhead Formation channel systems and better define structural closures.

The nearby Callabonna (1990), Growler (2006), Wirraway (2007) and Tigercat (2008) oil pools also occur in intra-Birkhead Formation channel sands on or near the Permian sub-crop edge. Similarly the discovery wells were sited on 2D seismic and 3D seismic surveys have since been acquired. Reservoir quality has been variable as a result of lateral facies changes in the fluvial system. The Growler Field is an example of this lateral variability. Growlers 3, 4 and 5 intersected good sands and this is reflected in the improved oil flow rates compared with Growlers 1 and 2.

Significantly, gas peaks, hydrocarbon fluorescence and an oil recovery from the basal Birkhead Formation in Hoolendinnie 1 suggest that oil has migrated at least 20 km from the Permian sub-crop edge, if it is Permian sourced (Fig. 2). Alternatively Michaelsen and McKirdy (1996) have argued that the Charo and Callabonna oils have a Jurassic source affinity on the basis of specific biomarker ratios. If the Eromanga Basin oils are sourced from intraformational source rocks then oil prospectivity is independent of the Permian subcrop edge.

Conventional four-way dip closures — Cooper Basin

The Brolga, Fly Lake, Moorari and Woolkina oil and gas fields are trapped in four way dip closures near the south eastern edge of Block CO2012-A. The Fly Lake-Brolga trend contains liquid rich gas in Patchawarra Formation sands, and volatile oil in the basal Patchawarra Formation and Tirrawarra Sandstone. The Moorari-Woolkina trend has oil in the Tirrawarra Sandstone, and liquid rich gas accumulations in the Patchawarra and Toolachee formations and the Nappamerri Group.

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.

Numerous oil shows have been recorded within sands and shales of the Merrimelia Formation in the vicinity of the southern portion of Block CO2012-A, and over a wide area of the central and south-western Patchawarra Trough. In Yarma 1 shows vary from 10–40% fluorescence (9089–9093 feet, 2770.3–2771.5 m).

Sedimentological analysis of cored sections within the Merrimelia Formation reveals a complex glacial environment with over 20 facies identified including glaciolacustrine, deltaic, fluvial and aeolian facies (Chaney, 1998). Facies changes can be abrupt and provide juxtaposition of source and reservoir sequences with potential for stratigraphic traps.

Of these facies, a persistent shale ranging in thickness from 15 to 30 feet at the top of the

Merrimelia Formation in the Tirrawarra – Brolga – Woolkina region has returned encouraging Rock Eval results from recent sampling by DMITRE. Two Merrimelia Formation core samples over the interval 9742 to 9743 ft (2969.4 to 2969.7 m) in Tirrawarra 17 returned TOC values of 6.26 and 9.88% (excellent generative potential) and S2 Pyrolysis Yields of 11.50 and 16.15 mg HC/g (very good generative potential). Corresponding Hydrogen Index (HI) values were 163 and 185 mg HC/g TOC which places this shale in the gas-prone kerogen range, close to the mixed oil/gas threshold of 200 mg HC/g TOC. Given these results, organic rich shales in the Merrimelia Formation may be a potential source of Tirrawarra Sandstone oil accumulations in a number of fields including Tirrawarra, Fly Lake and Moorari.

Palynological analysis, commissioned by DMITRE, of the Merrimelia shale in Tirrawarra 17 (sample depth 9742'2"/2969.4m) returned an APP1.2 age with an abundance of freshwater algae, suggesting a lacustrine depositional environment. Future work will concentrate on mapping the lateral and vertical extent of this facies.

A mean maximum Vitrinite Reflectance value of 1.04% over the same interval confirms a late oil to wet gas maturity. This suggests potential for a shale oil/liquid rich gas play in the upper Merrimelia Formation, especially in slightly shallower portions of the Patchawarra Trough both on the western Cooper margin and also against the GMI Ridge.

INFRASTRUCTURE AND TRANSPORT

A total of 5240 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 x 10⁶ m³ (902 mmcf) of raw gas and 6000 kL (42 000 bbl) of condensate and crude oil per day. Nine oil and 11 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 lies southeast of Block CO2012 (Fig. 1), 65 km NE of Moomba. 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). Most of Block CO2012-A falls within the Ramsar area (Fig. 9). South Australia's obligations are to manage the wetlands wisely to maintain their ecological character; this does not necessarily restrict exploration access.

Part of the eastern portion of Block CO2012-A lies within the Innamincka Regional Reserve, in the core of Australia's arid region (Fig. 9). 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 Innamincka 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 Innamincka 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 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 Registered Native Title Claimants (Fig. 10), 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 and Eromanga Basins, South Australia REGIONAL RESERVES and ENVIRONMENTAL ZONES

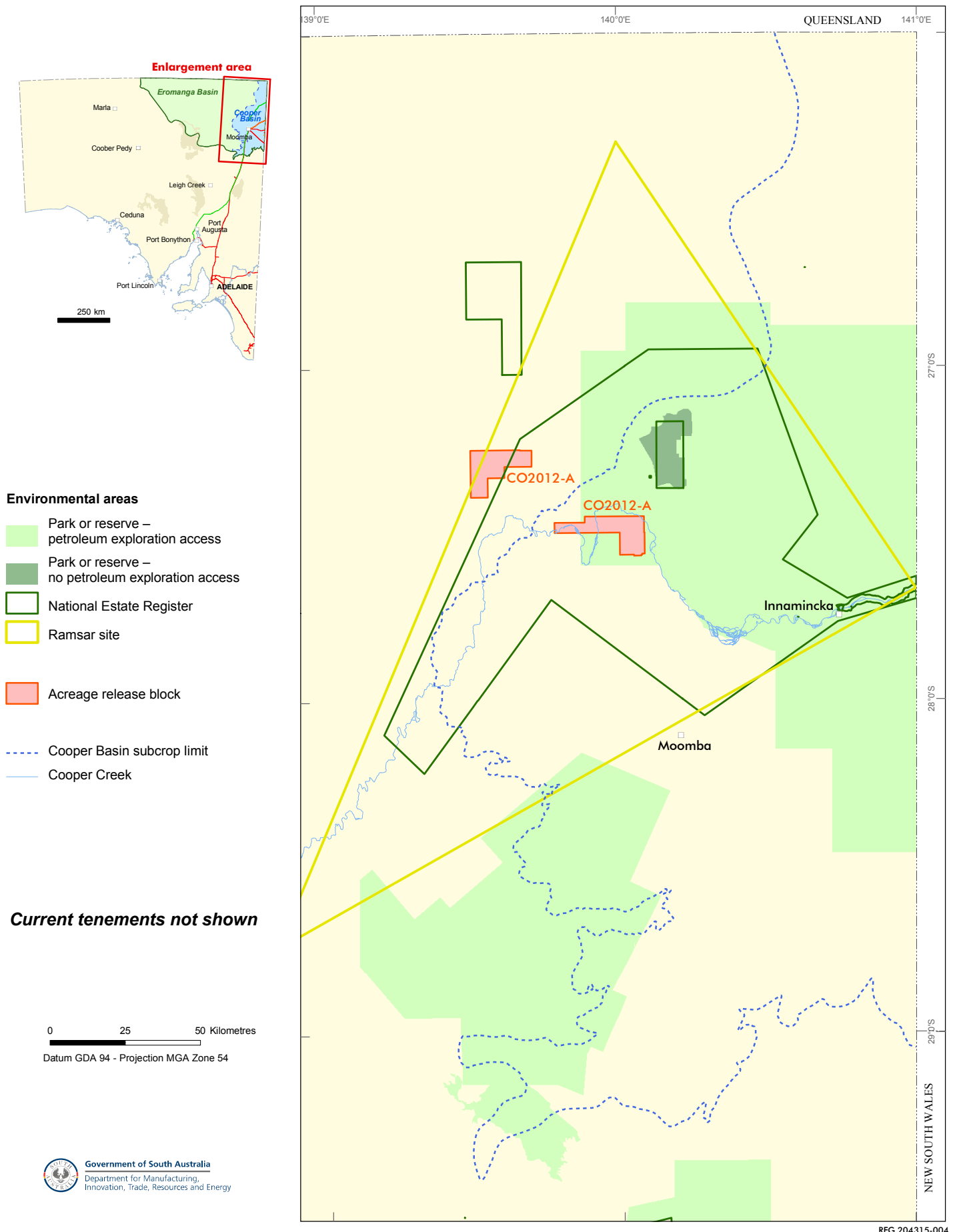


Figure 9 Regional reserves and environmental zones

Cooper and Eromanga Basins, South Australia

INDIGENOUS LAND USE AGREEMENT and NATIVE TITLE CLAIMANTS

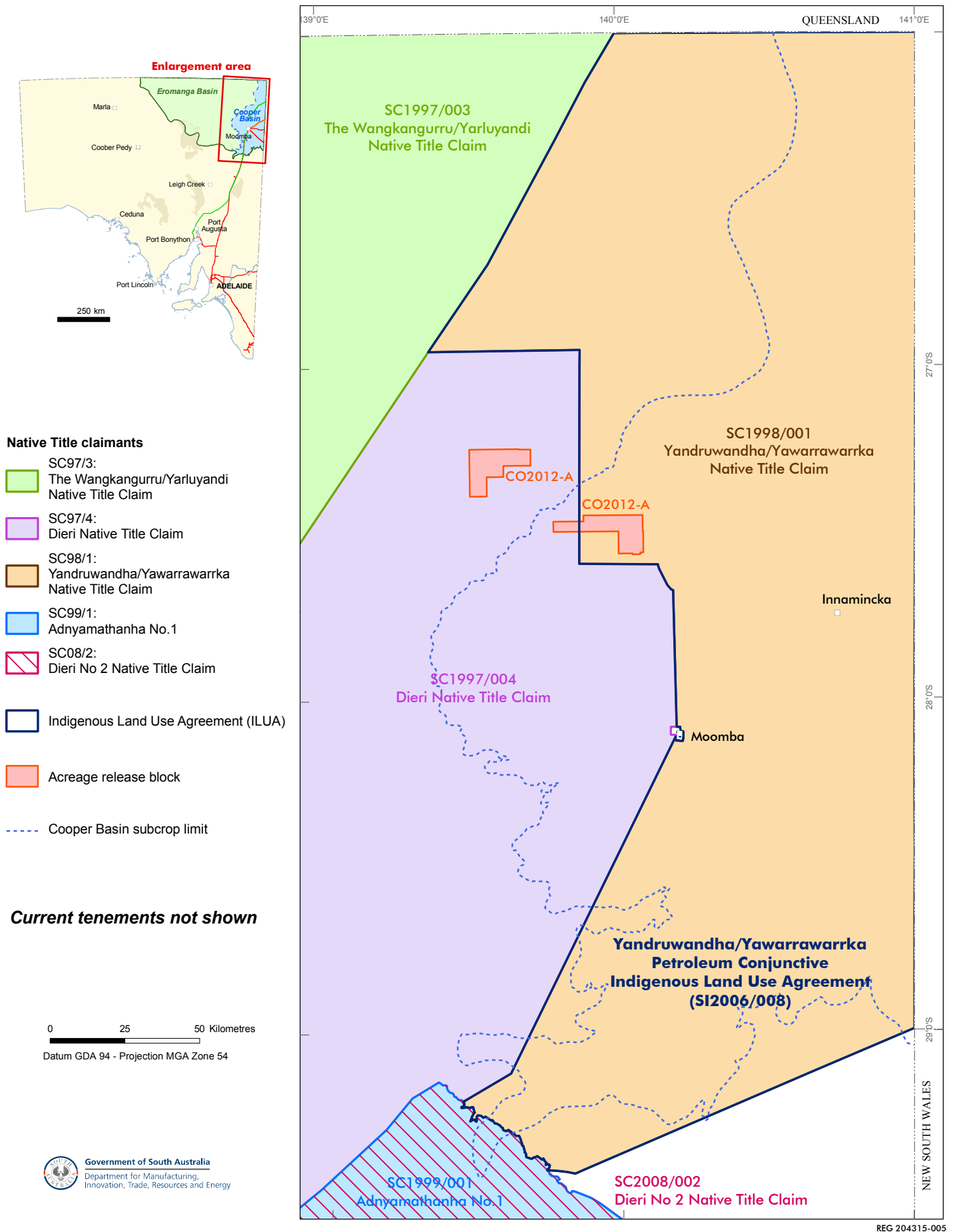


Figure 10 Indigenous land use agreement and registered native title claimants

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 claim groups 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 groups with registered claims 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, Resource Royalties and Licensing, 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 (Fig. 11). 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 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.

Cooper and Eromanga Basins, South Australia GEOTHERMAL LICENCES

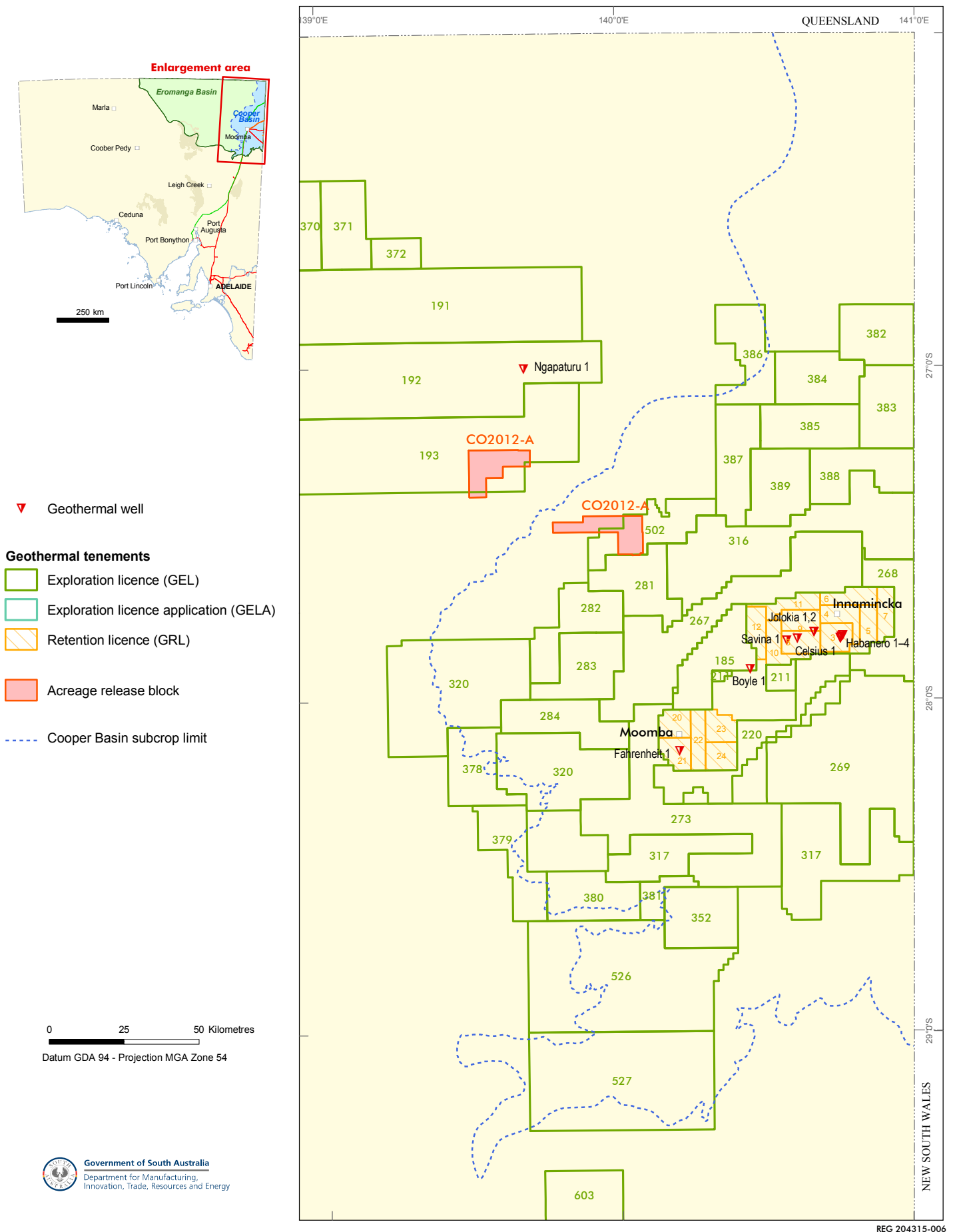


Figure 11 Geothermal licences

BIDDING 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.

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 'CO2012 Bid Assessment Policy' included on this DVD.

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 CO2012-A applications is 4.00 pm, Thursday 4th April 2013.

The Minister is expected to announce the winning bidder, together with details of work programs, by late May 2013.

CONTACT INFORMATION

Comments, inquiries and applications for exploration licences may be addressed to:

Executive Director, Energy Resources Division
Department for Manufacturing, Innovation,
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Web www.petroleum.dmitre.sa.gov.au

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

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