

Play Analysis in the Pedirka Basin- Poolowanna Trough region

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Play Analysis in the Pedirka Basin- Poolowanna Trough region

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5. Exploration History, Hydrocarbon Shows and Well Data
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7. Summary of 4 plays reviewed in the region



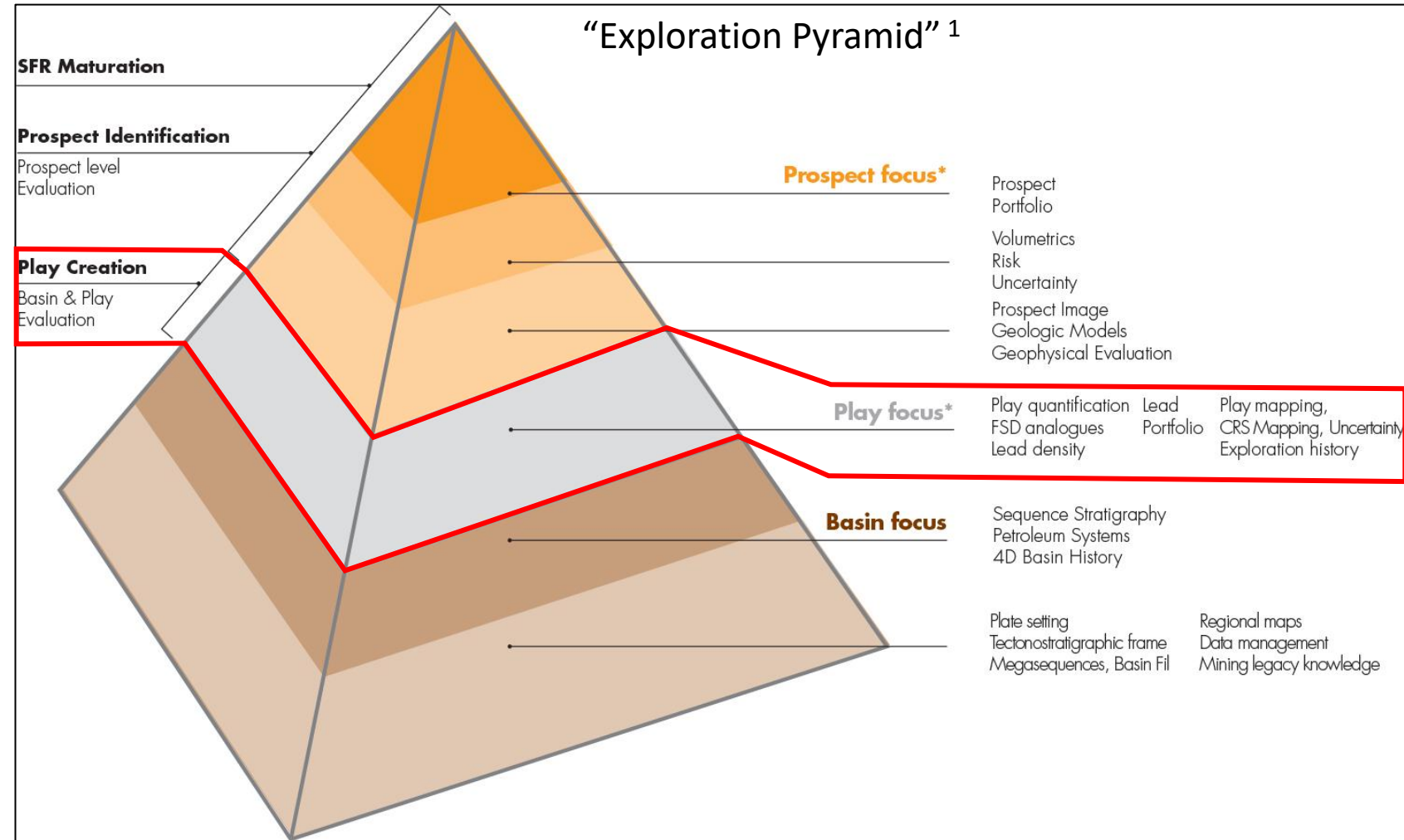
Pedirka Basin-Poolowanna Trough

Play-Based Exploration Overview 1



- Play-Based Exploration
 - Understanding of petroleum system in basin leads to identification, mapping and quantification of plays within basin
 - Maps:
 - Play elements
 - Summary play maps
 - Common risk segments
 - Identification of sweet spots

- Analysis of plays using this process is **not static**
 - Iterative feedback required following new information



¹ Royal Dutch Shell, 2014: [Play Based Exploration, A Guide for AAPG's Imperial Barrel Award Participation](#)

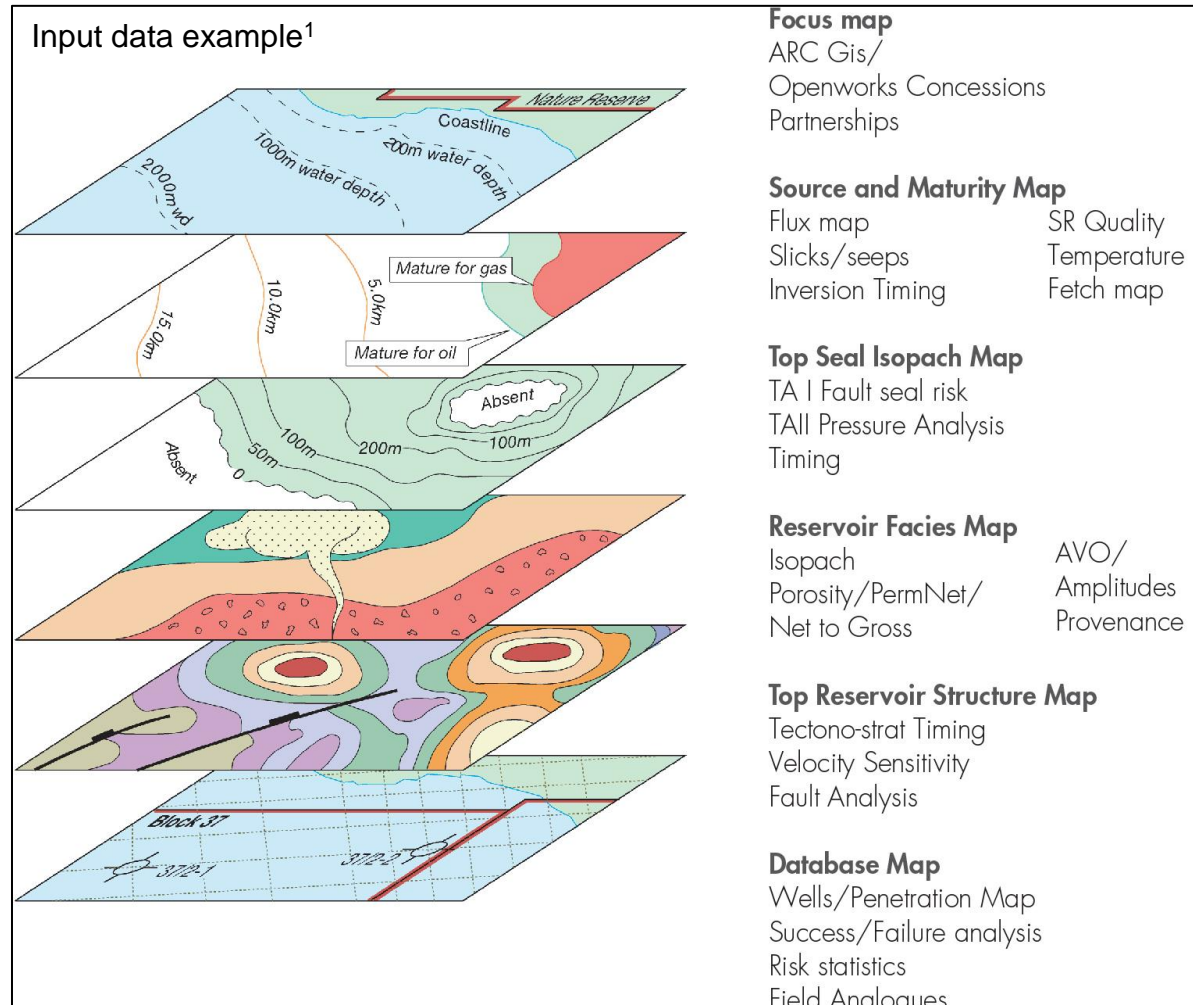
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Play-Based Exploration Overview 2



Geological boundaries required for all elements of Petroleum System:

- Extent and type of Reservoir interval
- Hydrocarbon Charge:
 - Extent of likely Source Rock
 - Maturity of Source Rock
 - Limits of potential migration from Source Rock
- Entrapment:
 - Extent of Sealing interval
 - Structural elements

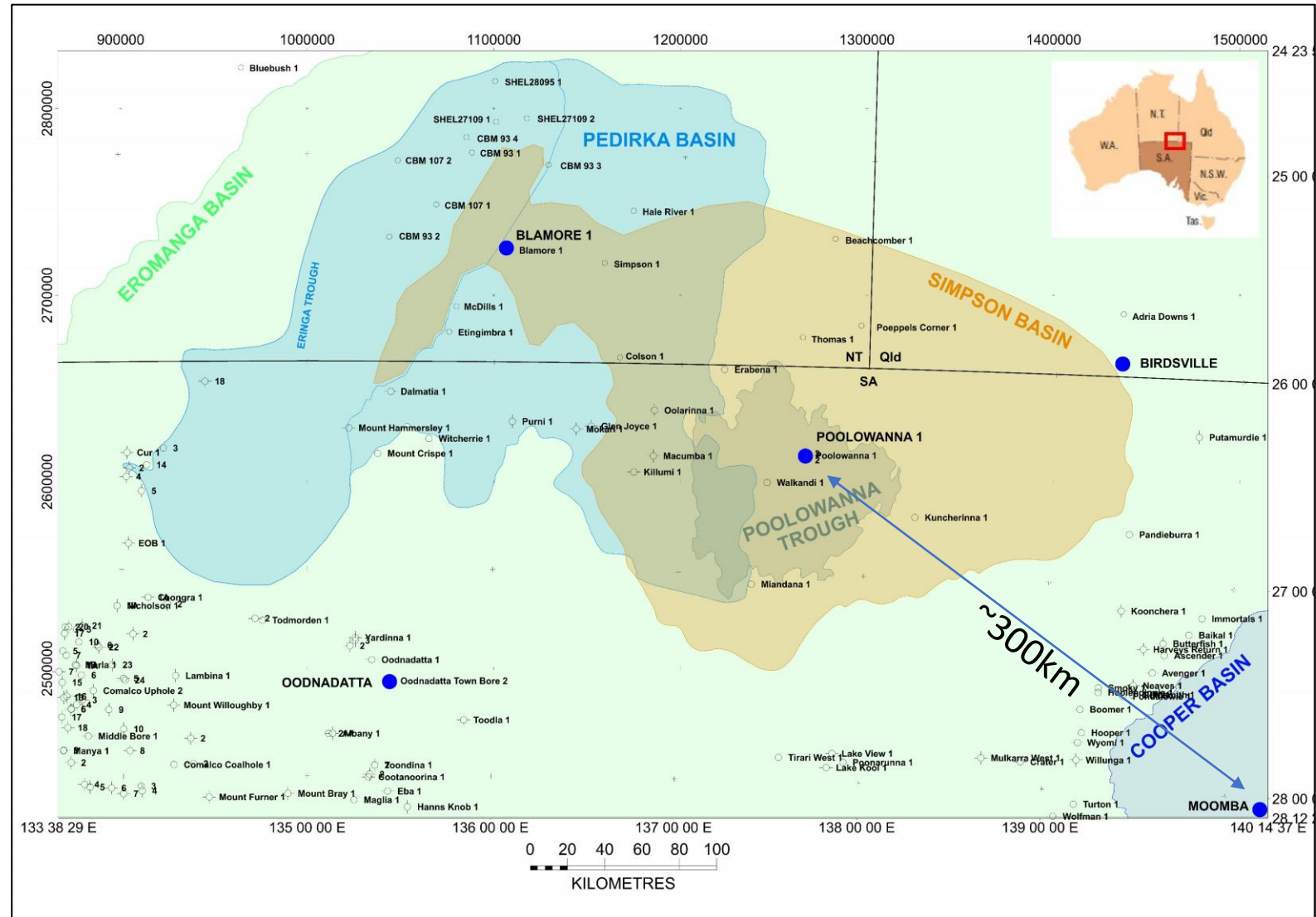


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Pedirka Basin-Poolowanna Trough

Location of Study Area

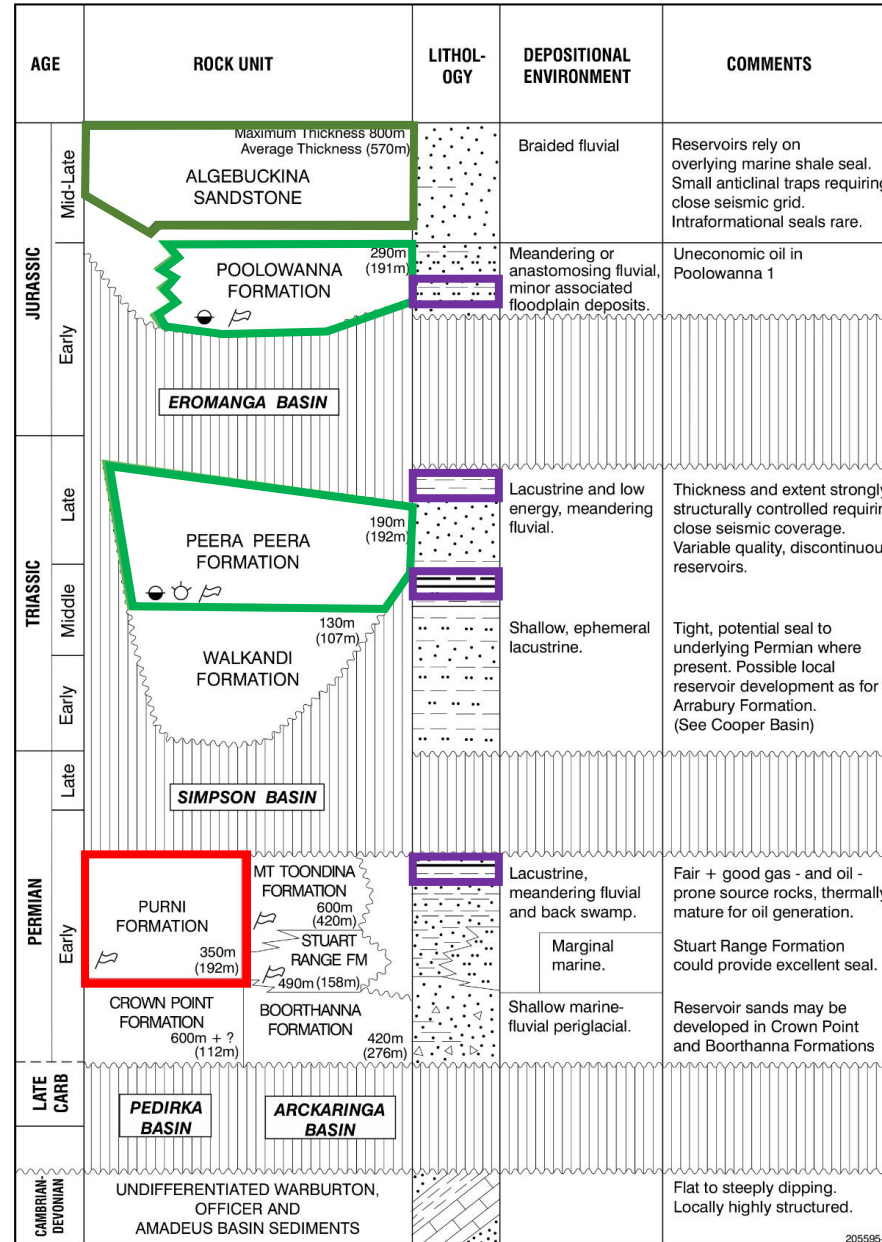
- Remote and harsh environment in central Australia:
 - Simpson Desert
- Several basins prospective for hydrocarbons
 - Jurassic-Cretaceous Eromanga
 - Triassic Simpson
 - Permian Pedirka
- Collaboration Between DEM-ERD, Geoscience Australia and NT Geological Survey as part of Australia's Future Energy Resources (AFER) project





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Pedirka Basin-Poolowanna Trough

Stratigraphy and Plays Reviewed



 Oil shows in NT sector
Potential for oil in SA sector

 Oil and gas recovered in SA sector

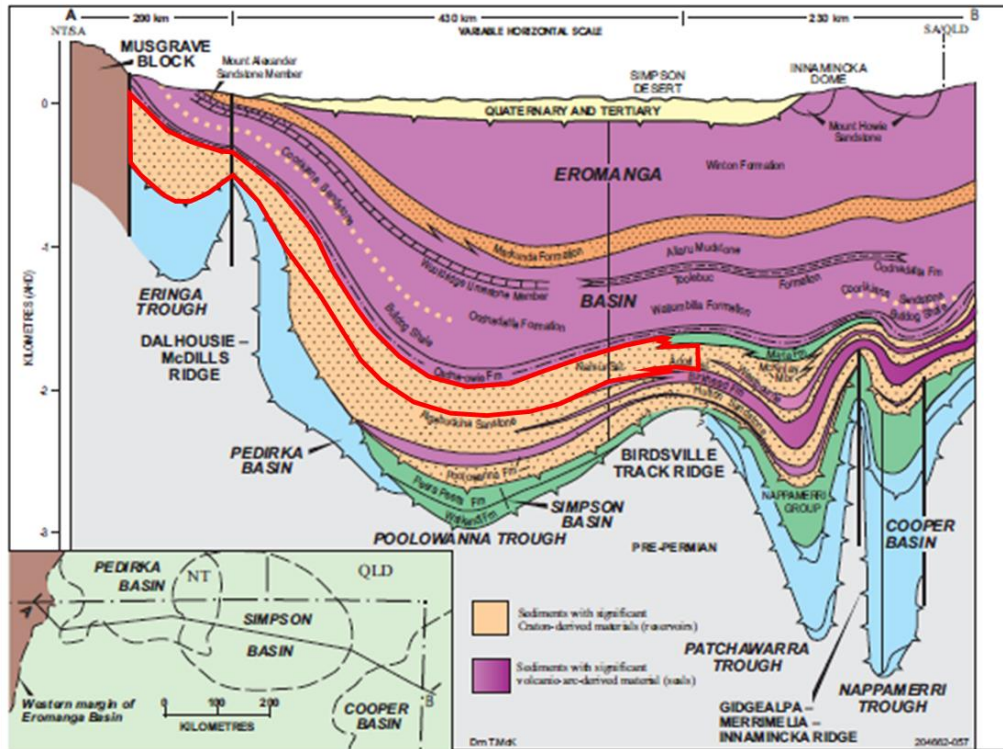
 Potential for gas in SA & NT sectors

 Potential source rocks



Pedirka Basin-Poolowanna Trough

Structure and Petroleum System Events



Schematic cross-section of the Eromanga, Pedirka and Simpson Basins

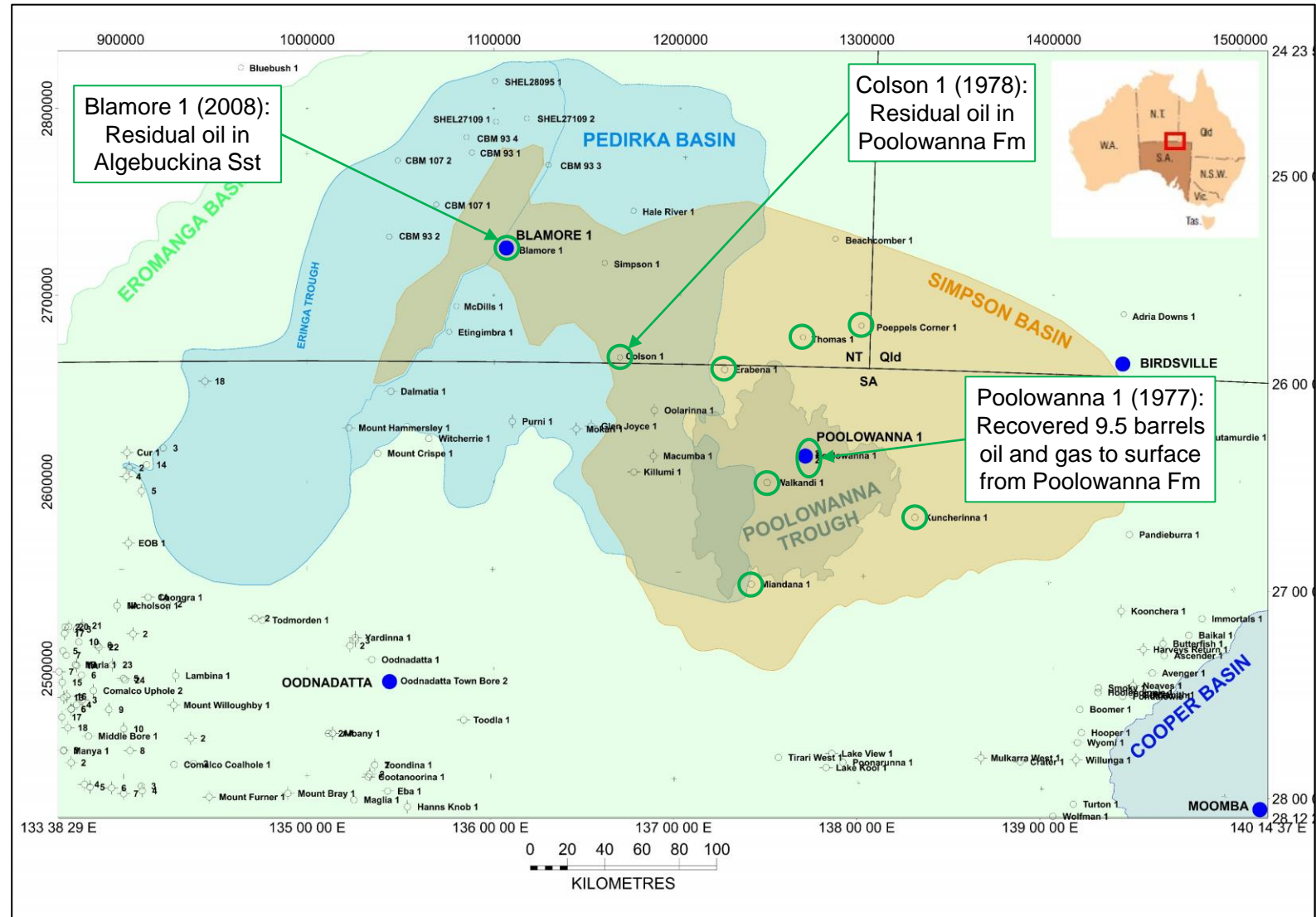
200														100					(Ma)
PERMIAN		TRIASSIC			JURASSIC			CRETACEOUS				TERTIARY					Geological time scale		
E	L	E-M	L	E	M	L	E	L	PALEO	EOCENE	OLIGO	MIOCENE	PLIOCENE						
PEDIRKA		SIMPSON			EROMANGA				LAKE EYRE					Basins					
Crown Point Fm	Purni Fm	Walkandi Fm	Peera Peera Formation	Poolowanna Fm	Algebuckina Formation	Cadnawowie Fm	Building Shale	Oodnadatta Fm	Winton Fm	Eyre Fm	Namba Fm				Stratigraphy				
														Source rock					
														Reservoir rock					
														Seal rock					
Structural trap development and fault reactivation					Compaction and drape over early structures					Trap development and fault reactivation		Compaction	Fault reactivation	Compaction	Fault reactivation	Compaction	Trap formation		
Initial generation in deepest parts of basin							Early mature in deepest parts of basin		Major generation					Generation, migration and entrapment					
Subsidence	Uplift	Subsidence in Poolowanna Trough		Uplift	Subsidence			Compression	Subsidence	Reactivation	Subsidence	Reactivation	Subsidence	Tectonics					
														↑	Main critical moment				



Pedirka Basin-Poolowanna Trough

Exploration History and Hydrocarbon Shows

- 1950s: Exploration commenced
 - Licences first acquired by Santos
- 1957: First petroleum well - Oodnadatta 1
- 1963: Cooper Basin gas discovered
- 1976: First commercial hydrocarbon in Eromanga Basin - gas from Namur 1
- 1977: Oil discovered in Poolowanna Trough - uneconomic oil flows from Jurassic and Triassic in Poolowanna 1
- Several wells with oil and gas shows in study area



Pedirka Basin-Poolowanna Trough

Algebuckina Sandstone

Play Elements: Reservoir and Seal

• Reservoir:

- White, fine to coarse-grained quartzose sandstone with granule and pebble layers and shale intraclasts common in coarser beds. Minor lenses of siltstone and shale are locally developed.

• Seal:

- Cadna-owie/Murta Formations
- Pale grey siltstone/thinly interbedded dark grey siltstone, shale

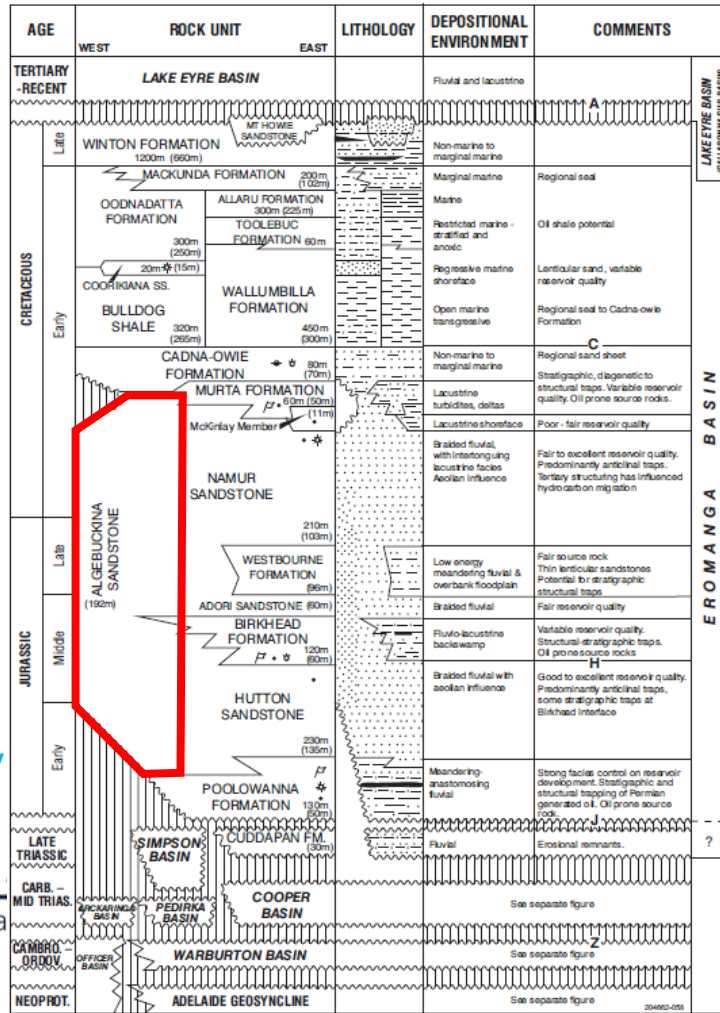


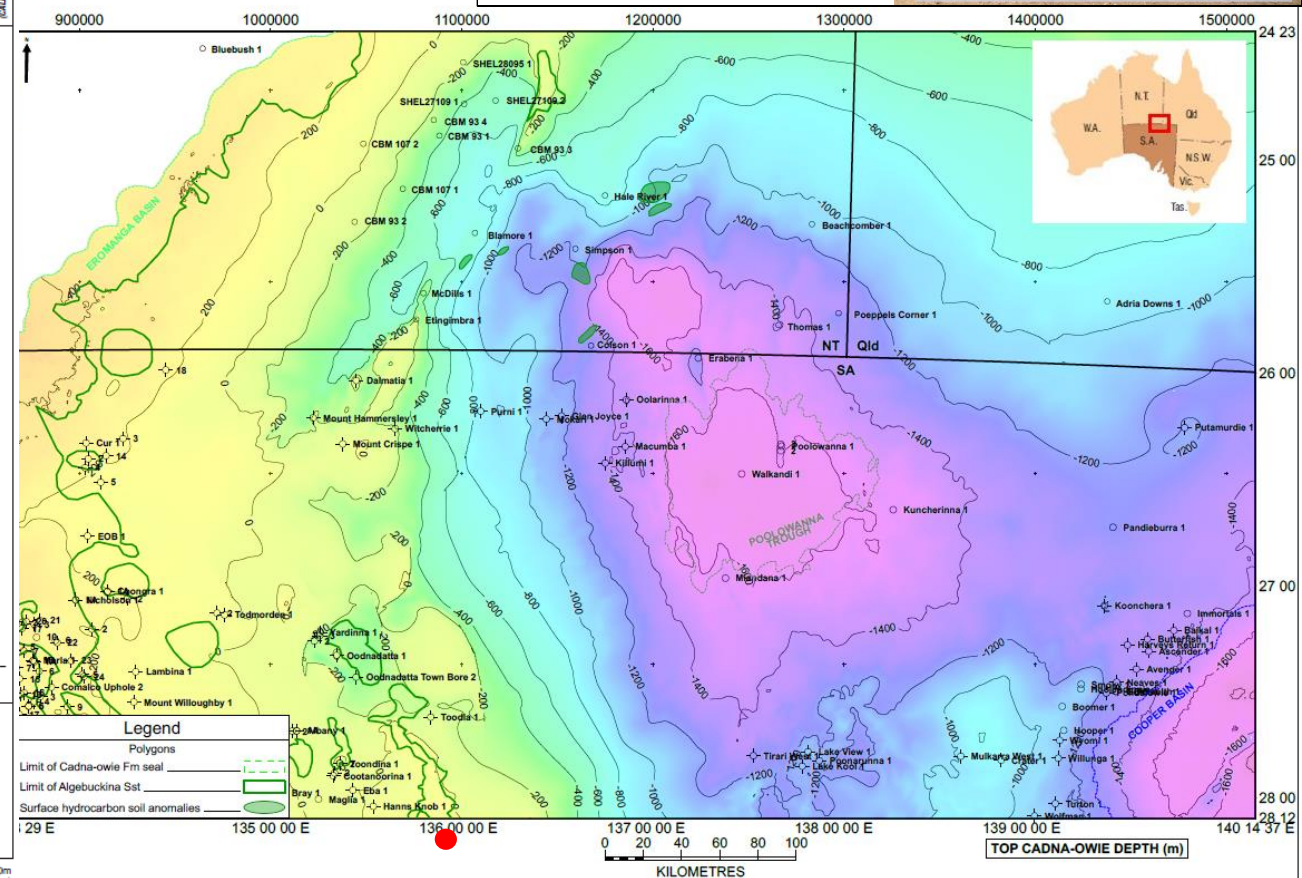
Figure 3 Geological summary of the Eromanga Basin (Cooper region).

Maximum Thickness: 450m
Average Thickness: (55m)



Type Section (Wopfner et al., 1970)

Figure 5.31 Algebuckina Sandstone type section, 0.8 km SW of the unused Algebuckina siding on the Central Australian Railway line. The sandstone rests unconformably on Proterozoic rocks. (Photo T011515)



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Pedirka Basin-Poolowanna Trough

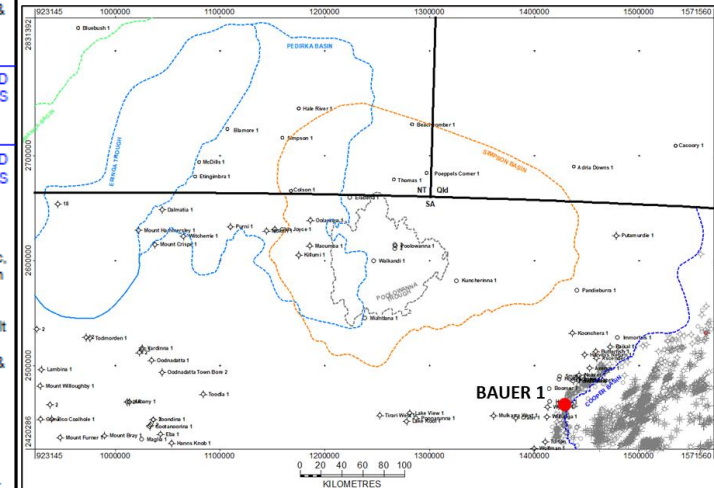
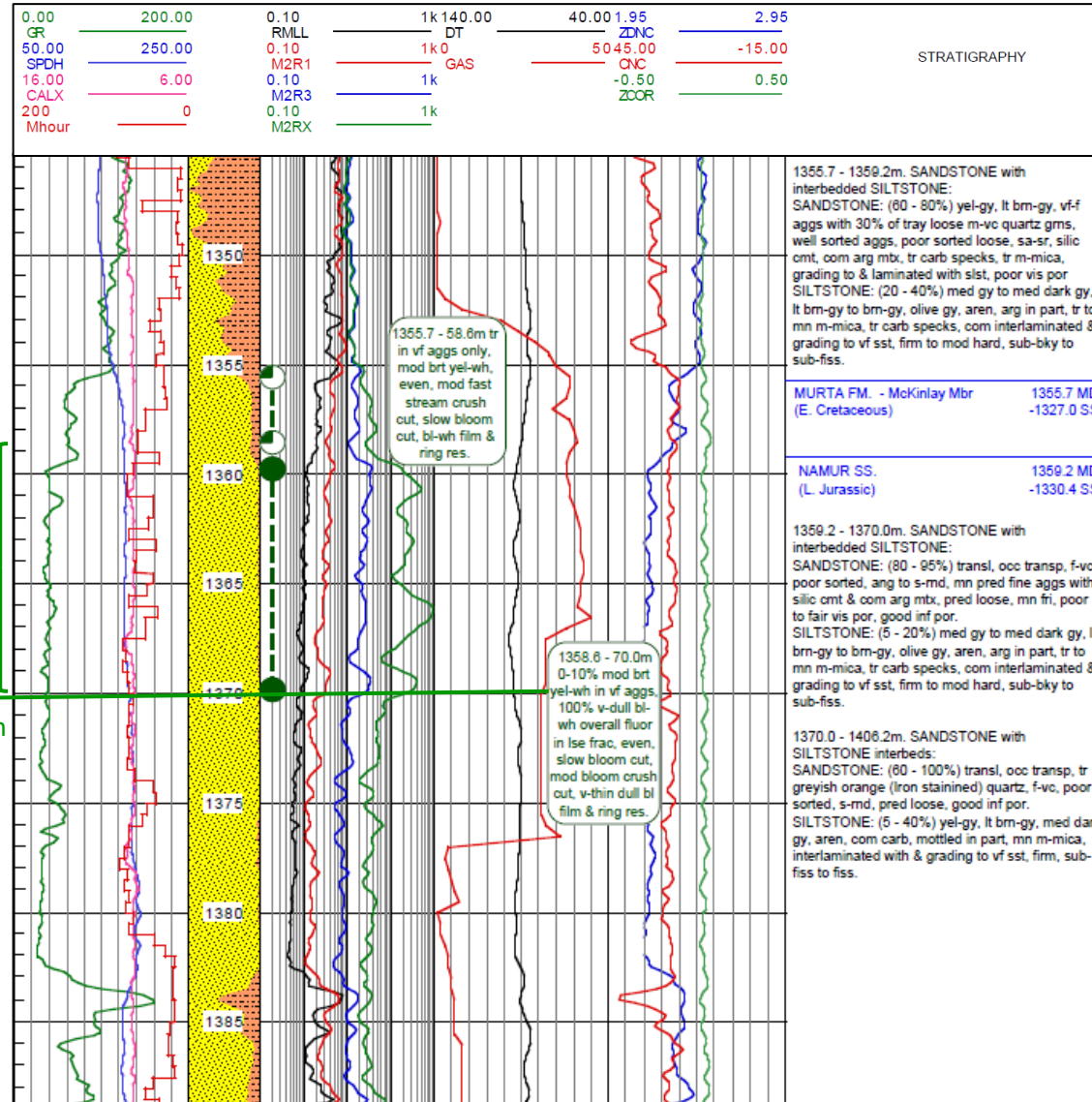
Algebuckina Analogue Well: Bauer 1

(Beach, 2011):

- Cooper Basin area of the Eromanga Basin
- Has produced 1.280 million barrels of oil from the Namur Sst

11.4m column,
10.67m NP,
av ϕ 27.5%,
av Sw 37.3%

OWC 1370m
(-1344.3m)



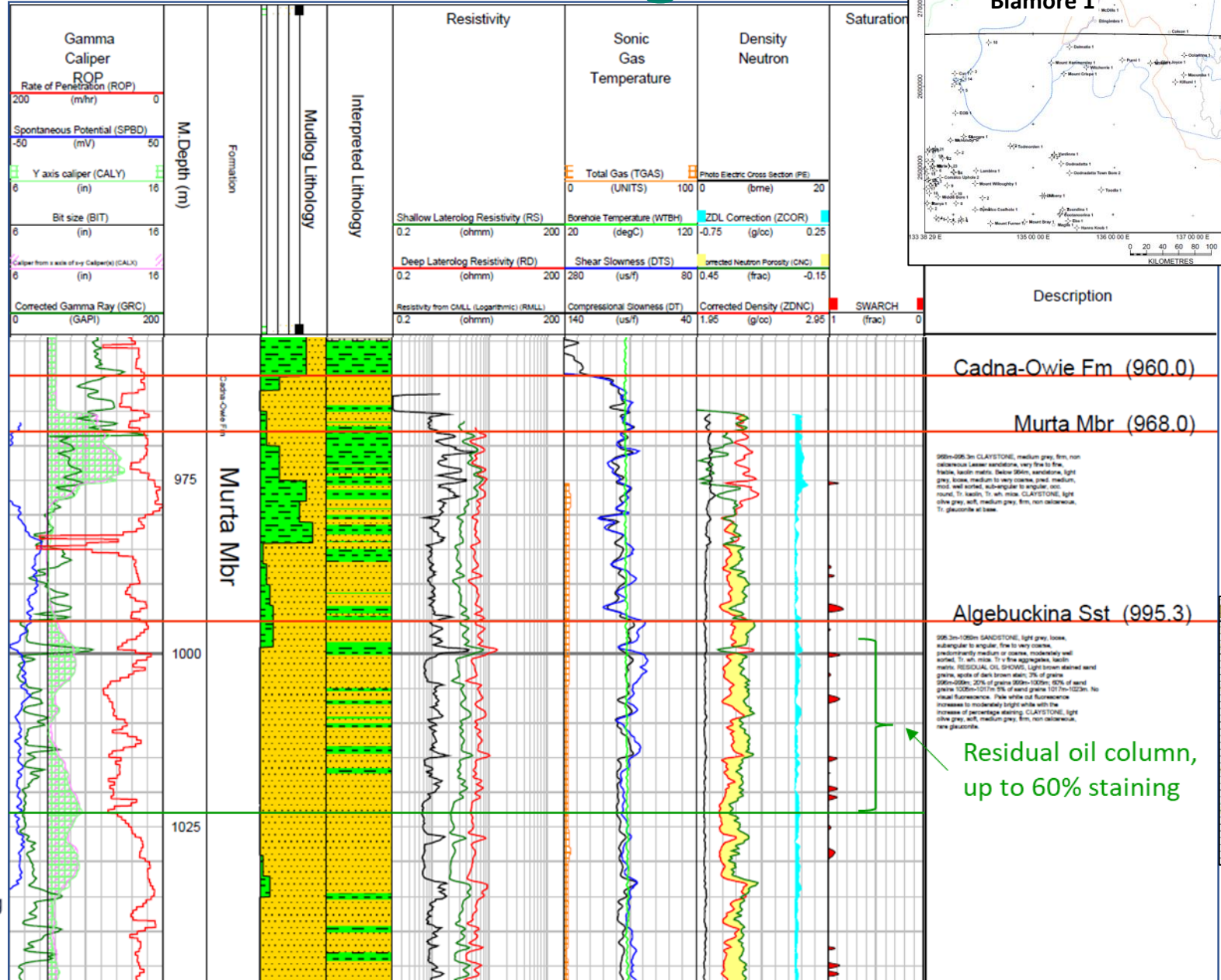
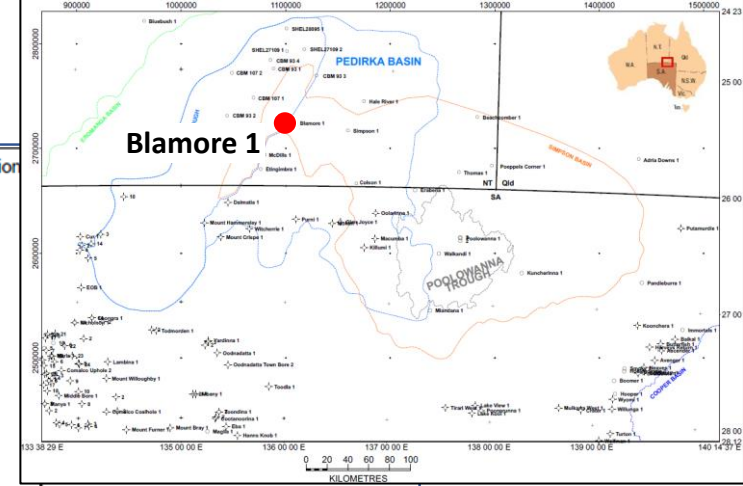
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Pedirka Basin-Poolowanna Trough

Algebuckina Type Well in region: Blamore 1

(Central Petroleum, 2008):

- "a positive indication of prior oil entrapment was seen with the intersection of a 15m plus residual oil column from 998m – 1023m (up to 60% staining) at the top of the Algebuckina Sandstone." (Well Completion Report)

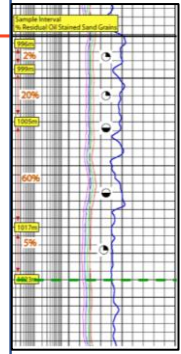


Cadna-Owie Fm (960.0)

Murta Mbr (968.0)

Algebuckina Sst (995.3)

Residual oil column, up to 60% staining

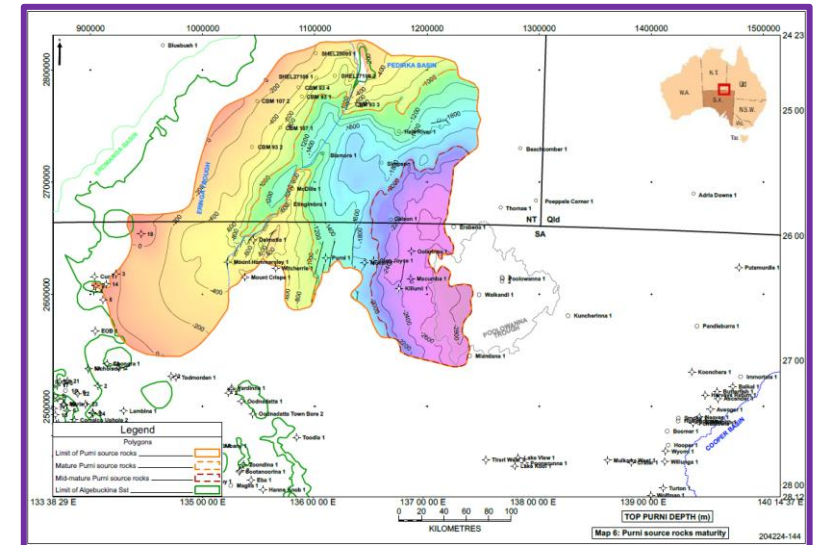
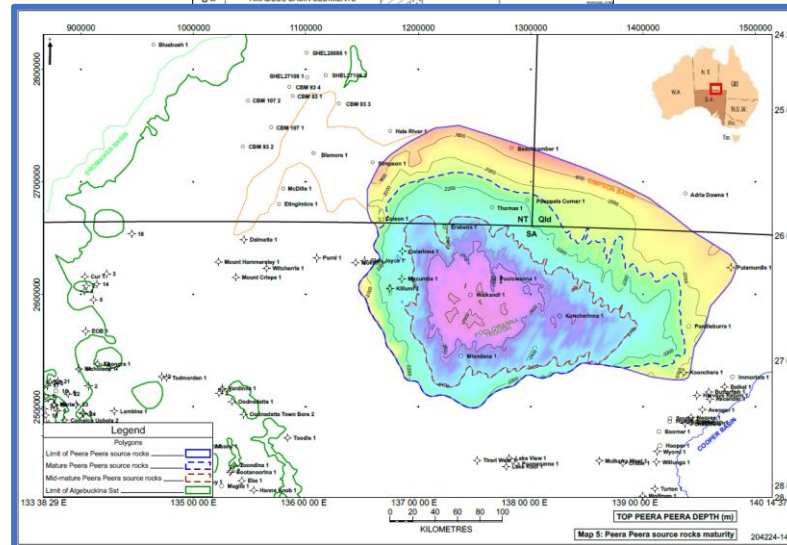
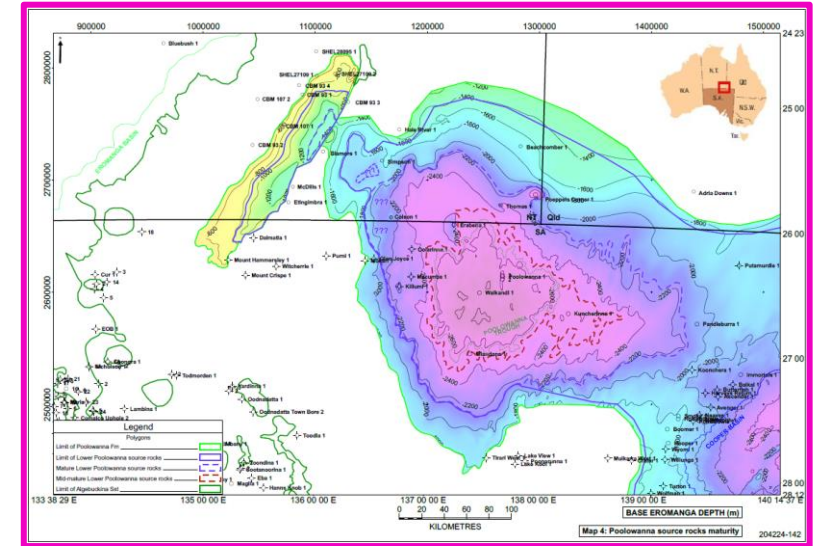


Pedirka Basin-Poolowanna Trough

Play Element: Source Rock Maturity

- Potential source rocks in Poolowanna Trough region:
 - Basal Jurassic lower Poolowanna Formation
 - Triassic Peera Peera Formation
 - Permian Purni Formation
- Maturity for hydrocarbon generation dependent upon:
 - Type of organic matter present
 - Depth of burial

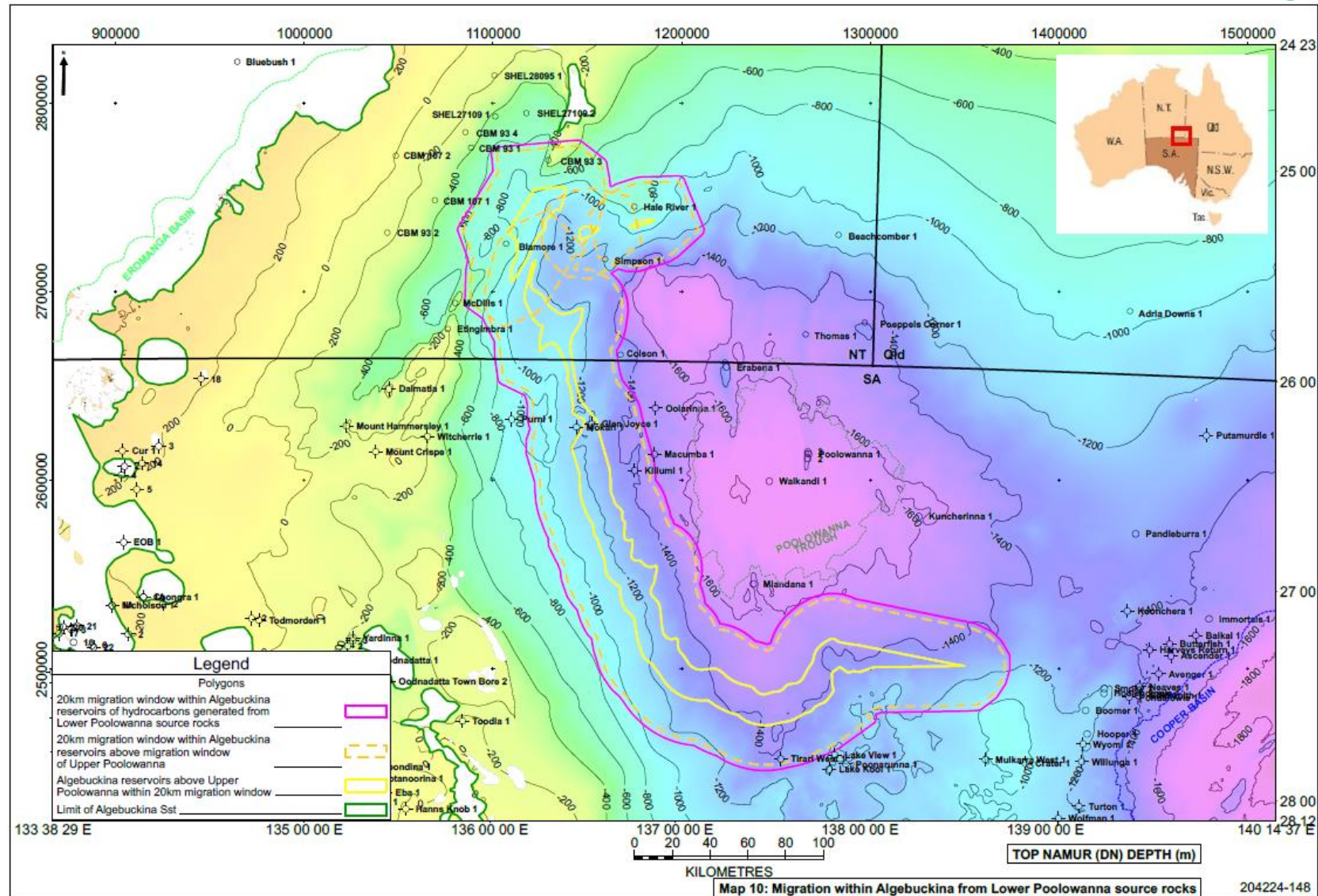
AGE	ROCK UNIT	LITHOLOGY	DEPOSITIONAL ENVIRONMENT	COMMENTS
JURASSIC	ALGEBUCKINA SANDSTONE	Maximum Thickness 800m Average Thickness 370m	Brackish fluvial	Reservoirs rely on overlying marine shale seal. Small additional traps requiring close seismic grid. Intraformational seals rare.
	POOLOWANNA FORMATION	200m (195m)	Marginal or anastomosing fluvial, minor associated floodplain deposits.	Unconformic oil in Poolowanna 1
	EROMANGA BASIN			
TRIASSIC	PEERA PEERA FORMATION	190m (180m)	Lacustrine and low energy meandering fluvial.	Thickness and extent strongly structurally controlled requiring close seismic coverage. Variable quality, discontinuous reservoirs.
	WALKMANNI FORMATION	130m (107m)	Shallow, ephemeral lacustrine.	Tight, potential seal to underlying Permian where present. Possible local reservoir development as for Anabury Formation. (See Cooper Basin)
	SIMPSON BASIN			
PERMIAN	PURNI FORMATION	300m (192m)	Lacustrine, fluvial and back swamp.	Fair + good gas + oil + prone source rocks, thermally mature for oil generation.
	STUART RANGE Fm	100m (105m)	Marginal marine.	Stuart Range Formation could provide excellent seal.
	BOORHANNAN FORMATION	420m (270m)	Shallow marine-fluvial periglacial.	Reservoir sands may be developed in Crown Point and Boorhannan Formations
LATE CARBONIFEROUS	PEDIRKA BASIN			
UNDIFFERENTIATED WARRIBITON, AMADUUS BASIN SEDIMENTS				Fair to deepish dipping. Locally highly structured.



Pedirka Basin-Poolowanna Trough Play Element: Hydrocarbon Charge

Rule of thumb:

Up to 20km from mature source rocks is a reasonable migration distance within porous reservoirs



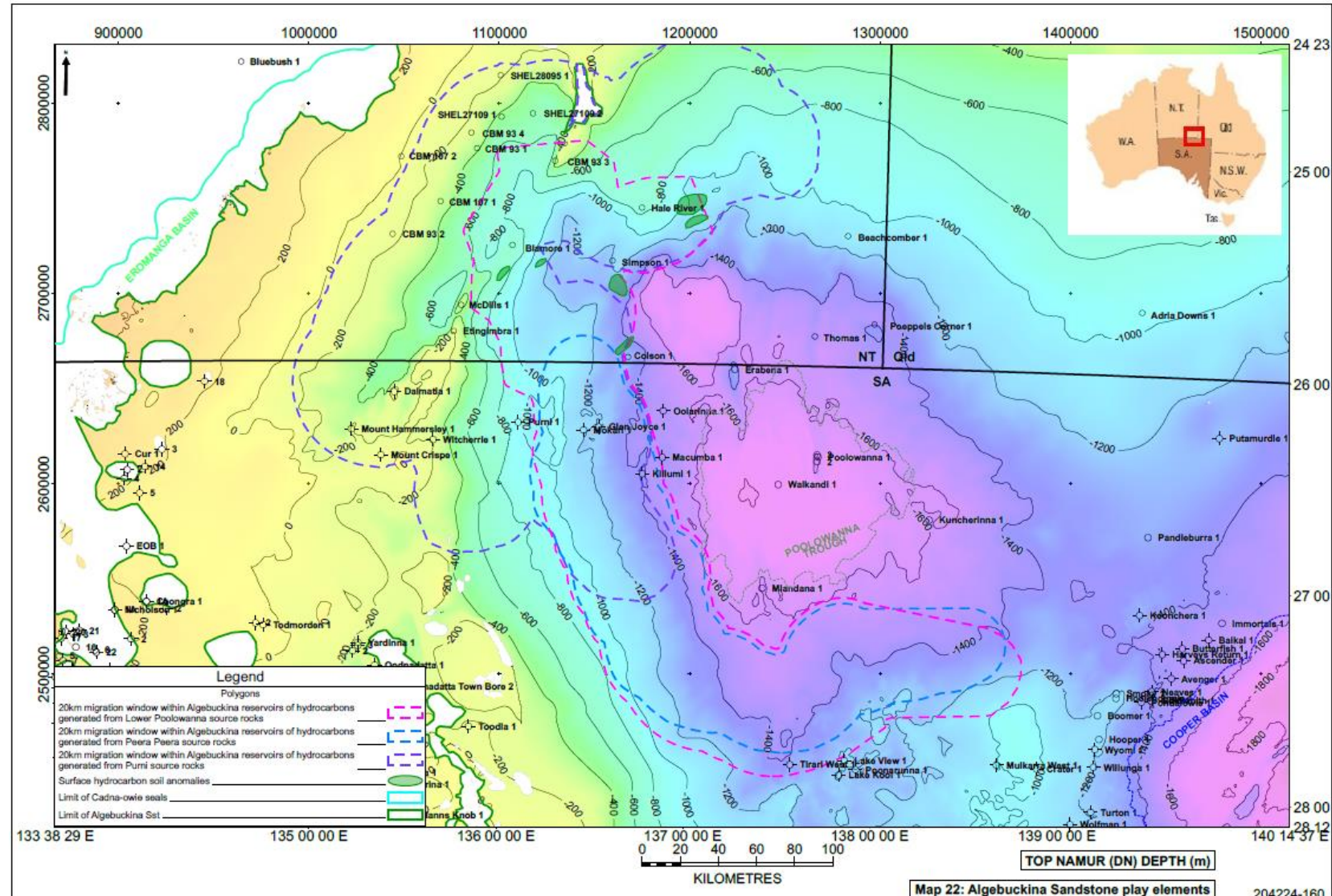
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Pedirka Basin-Poolowanna Trough

Play Elements: Algebuckina Sandstone

- Outlines for Algebuckina Sst play:

- Reservoir extent
- Extent of seal above reservoir
- Extents of potential hydrocarbon migration from mature source rocks 20km within reservoir:
 - Lower Poolowanna
 - Peera Peera Formation
 - Purni Formation



Pedirka Basin-Poolowanna Trough

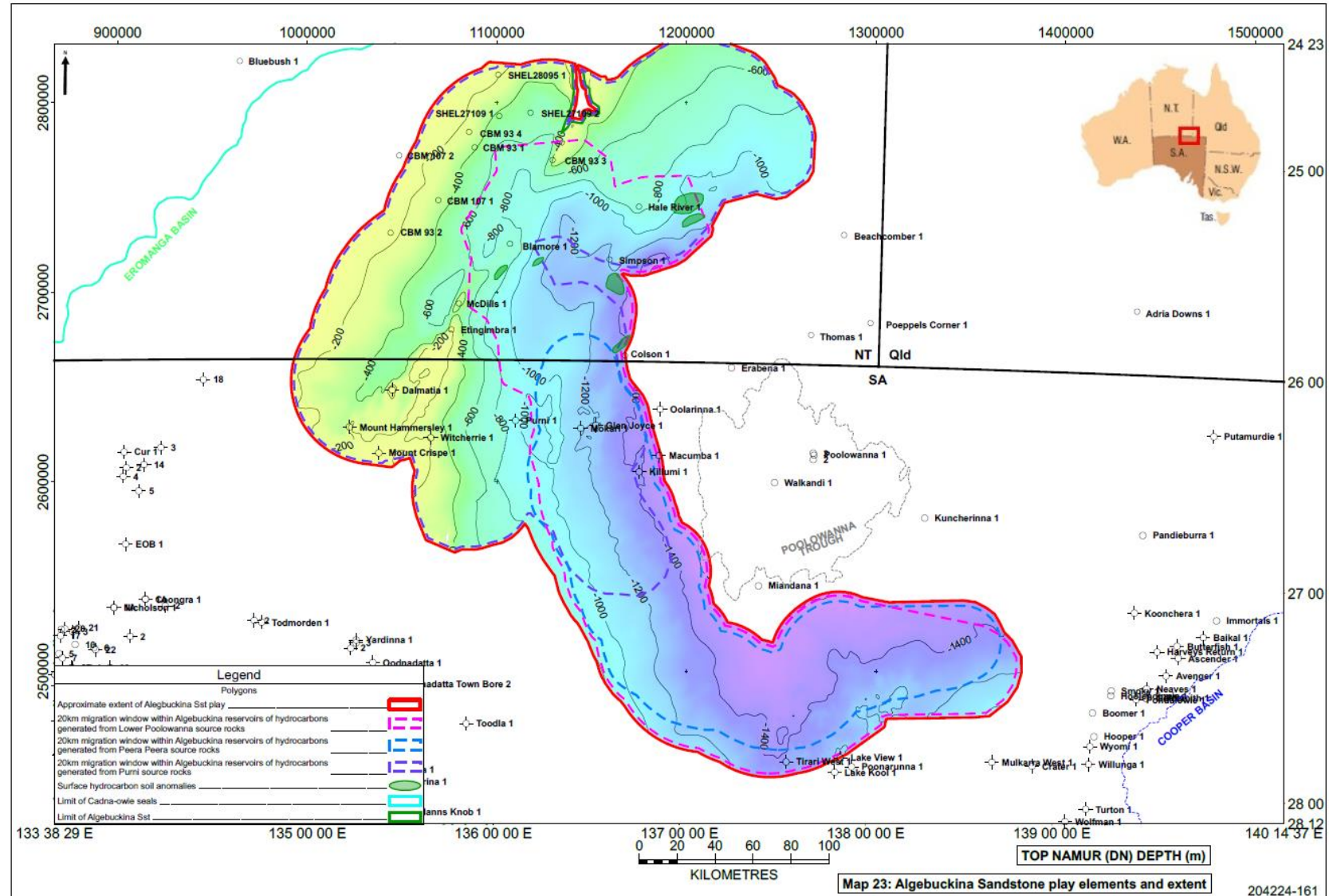
Play Extent: Algebuckina Sandstone

- Outlines for Algebuckina Sst play:

- Reservoir extent
- Extent of seal above reservoir
- Extents of potential hydrocarbon migration from mature source rocks 20km within reservoir:
 - Lower Poolowanna
 - Peera Peera Formation
 - Purni Formation
- Algebuckina Sst play extent

NB: In theory - no chance of play being found outside of approximate extent of the play

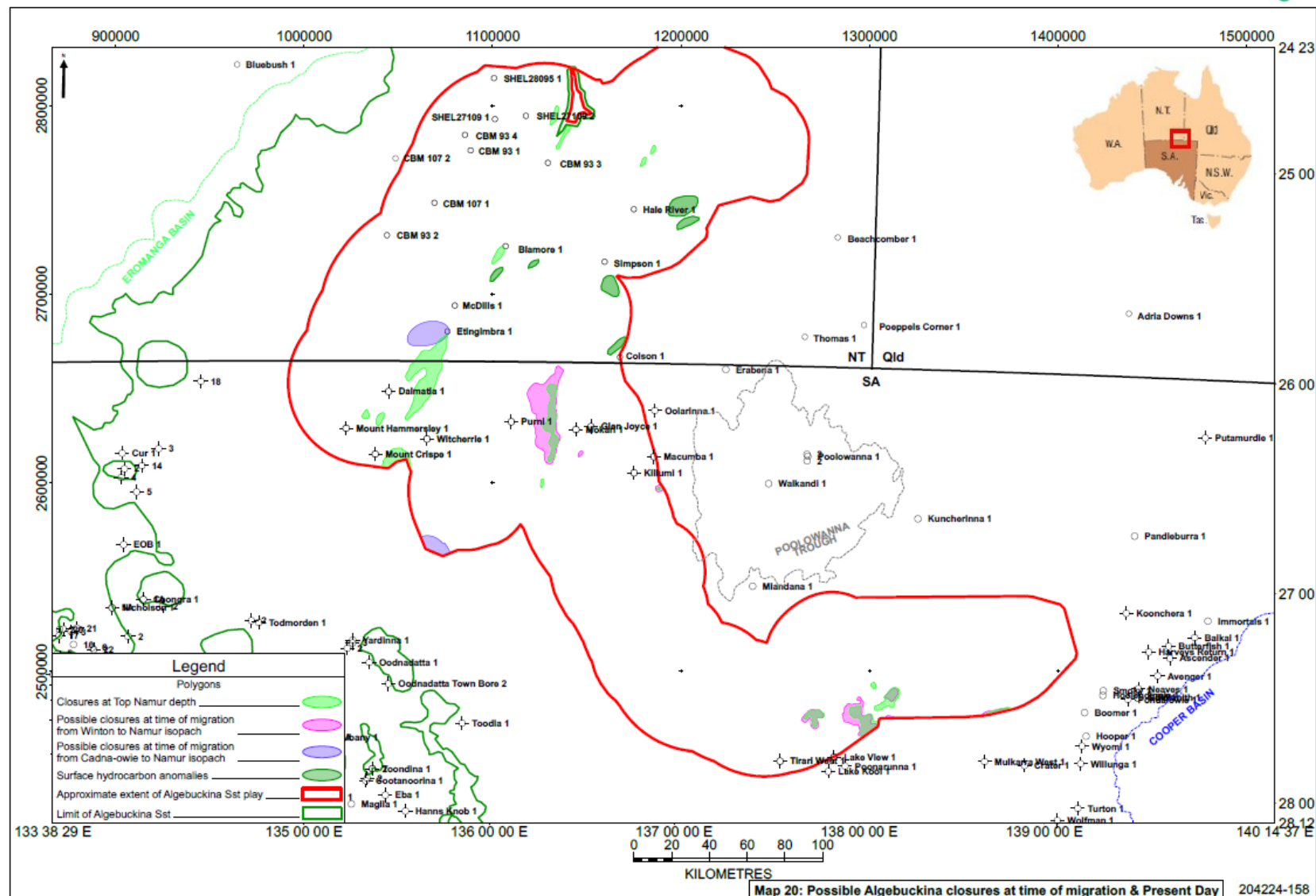
- Extents only as good as data available



Pedirka Basin-Poolowanna Trough

Algebuckina Sandstone Structural Closures

- Present Day closures at Top Namur/Algebuckina
- Structural closures within Algebuckina play area at potential time of migration
 - SA: Top Winton to Top Namur/Algebuckina isopach
 - NT: Top Cadna-owie to Top Namur/Algebuckina isopach
- Closures defined by 2D seismic data BUT seismic coverage is relatively poor compared with Cooper Basin

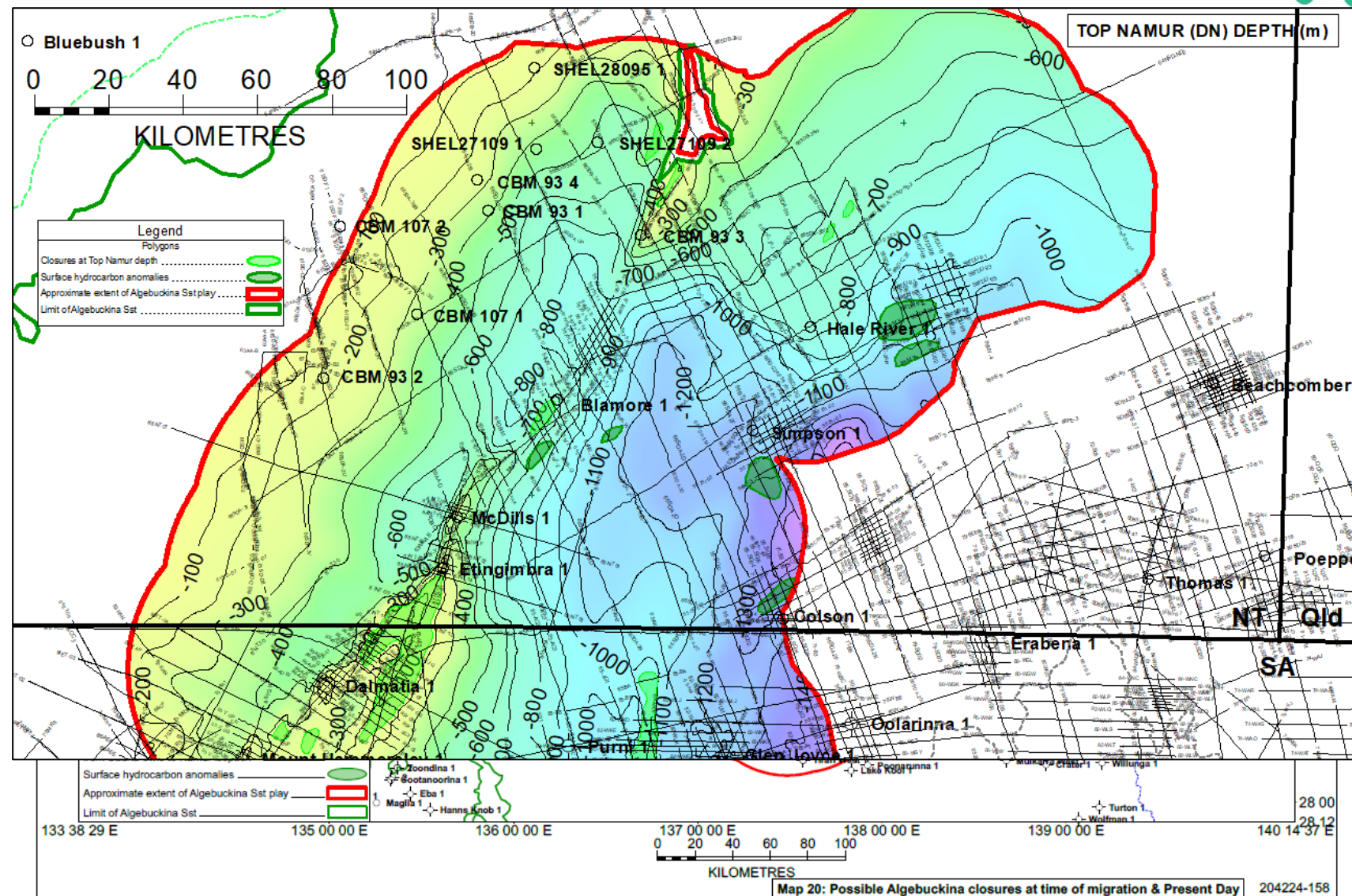


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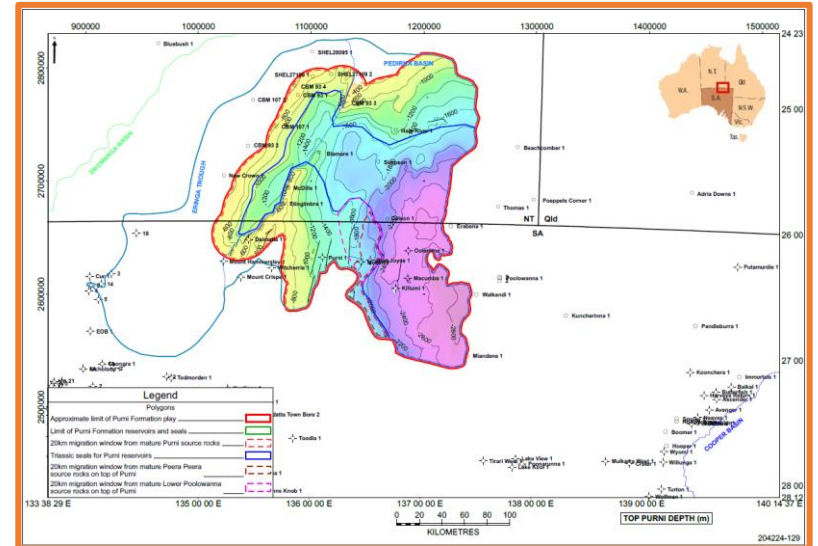
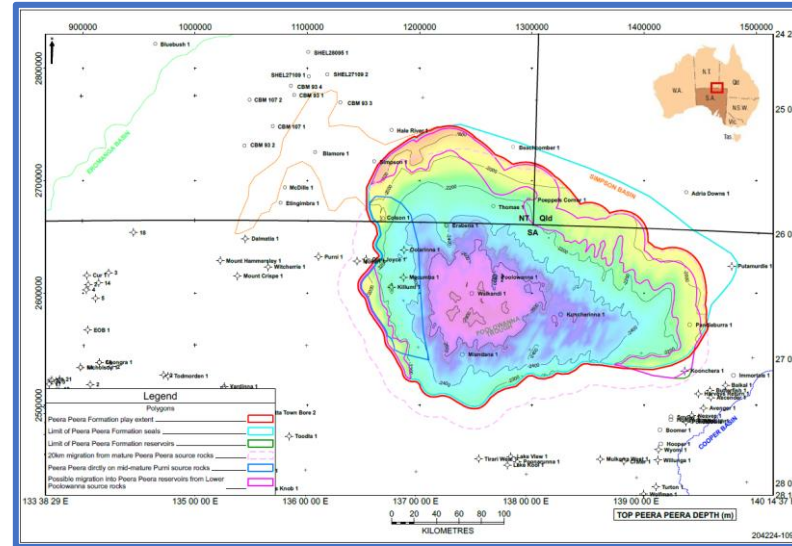
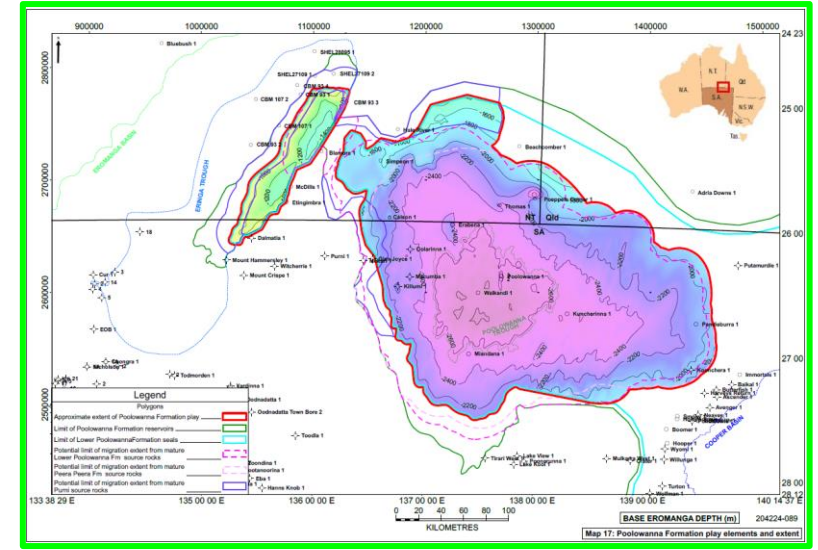
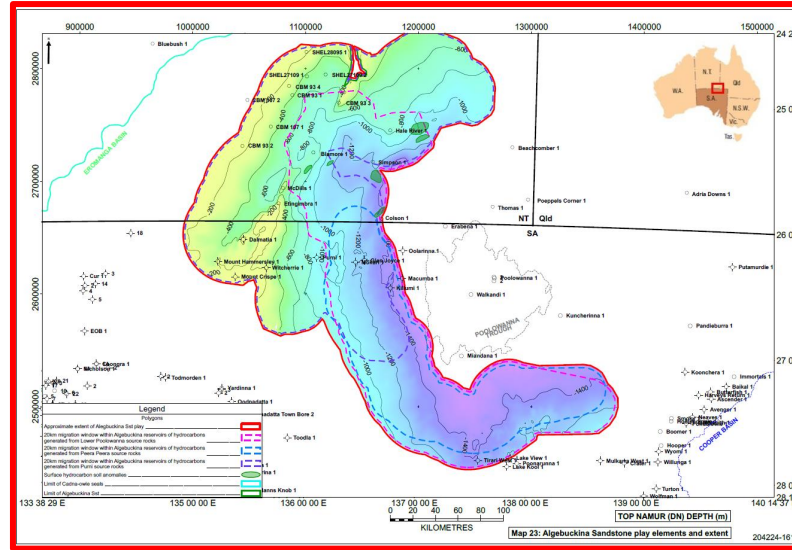


Pedirka Basin-Poolowanna Trough

Plays Reviewed

Approximate extents of plays:

- Algebuckina Sandstone
- Poolowanna Formation
- Peera Peera Formation
- Purni Formation



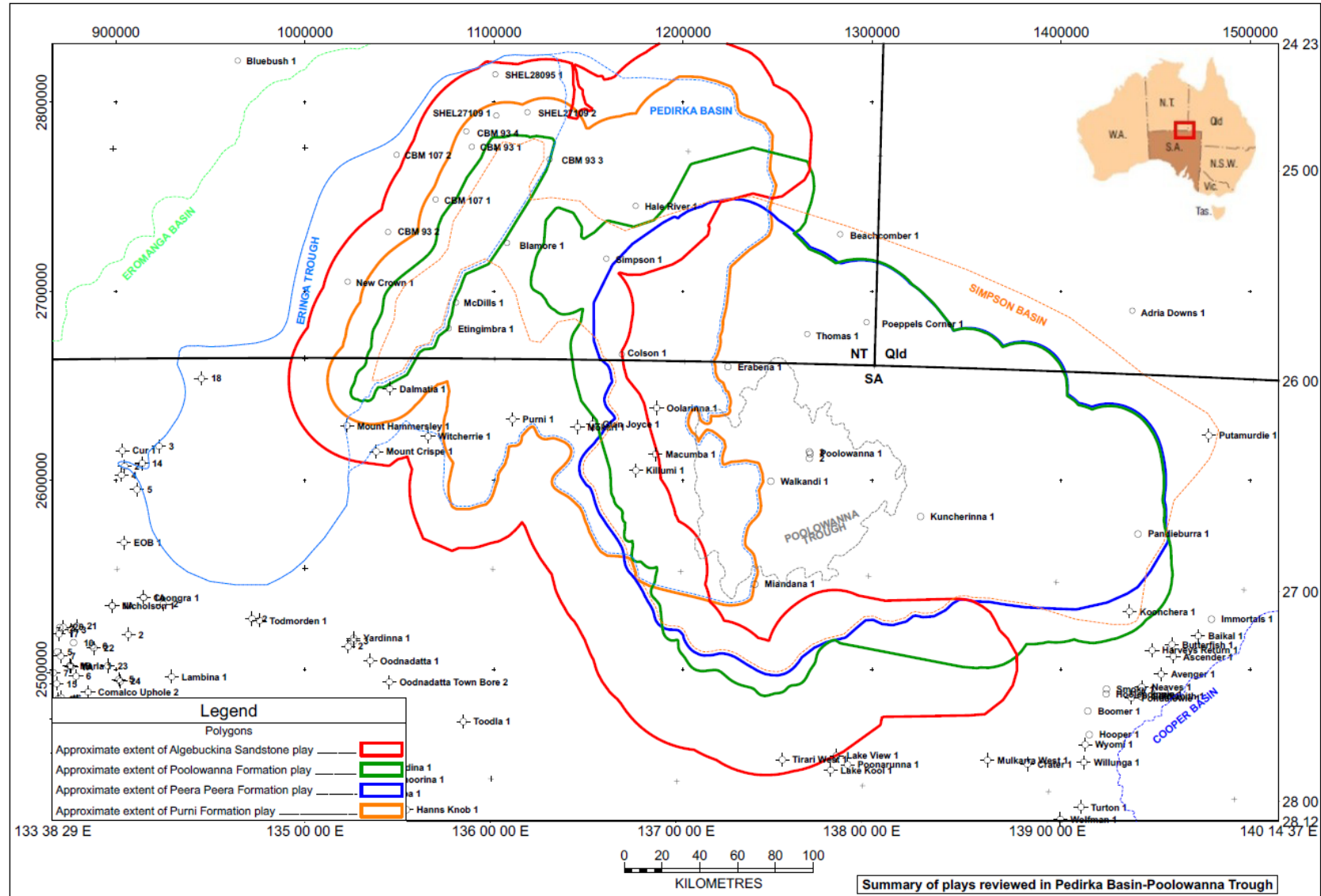
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Pedirka Basin-Poolowanna Trough

Summary of Plays Reviewed

Approximate extents of plays:

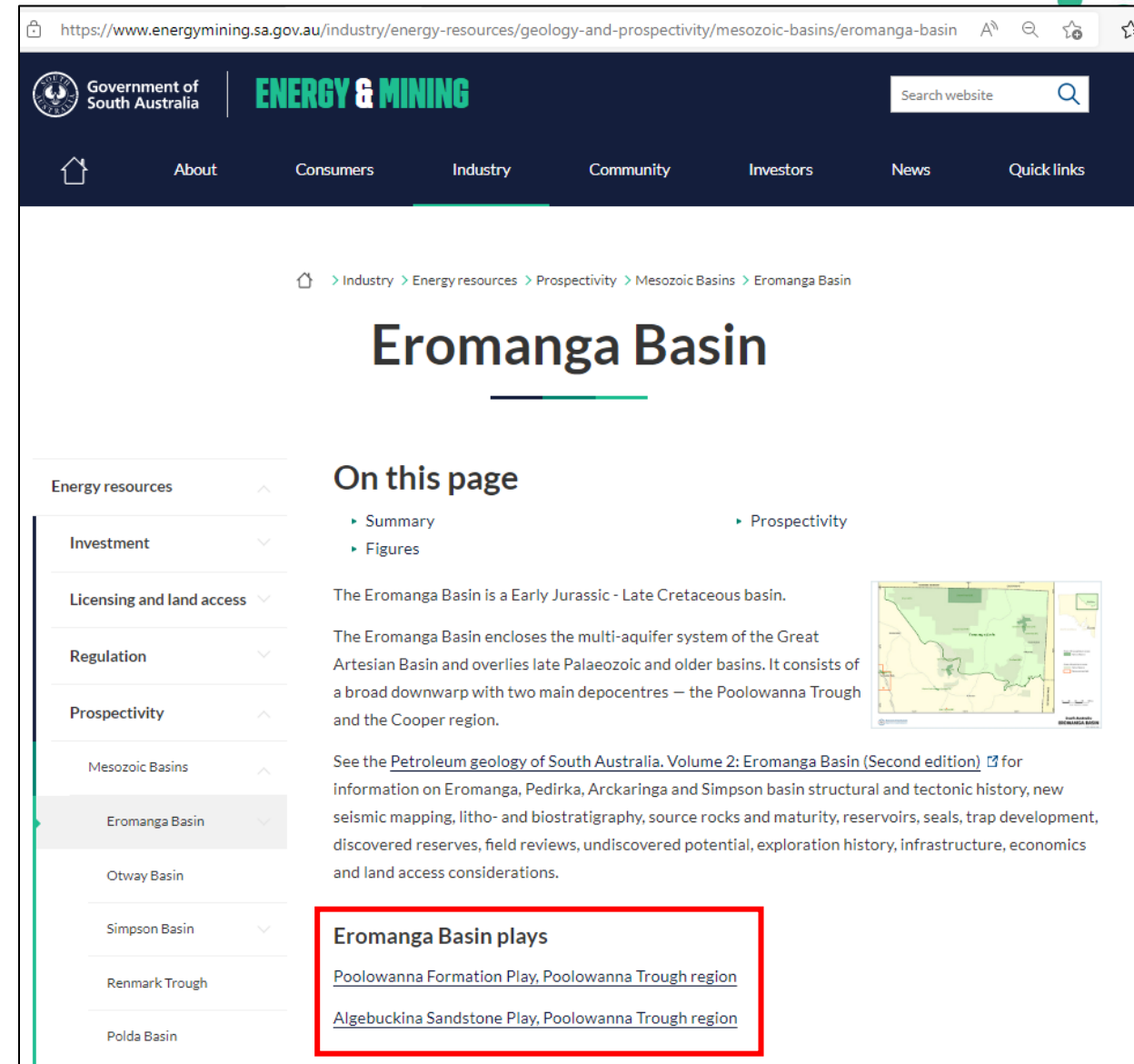
- Algebuckina Sandstone
- Poolowanna Formation
- Peera Peera Formation
- Purni Formation



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Pedirka Basin-Poolowanna Trough Play Analysis Data Available

- All 4 plays reviewed in study documented on the DEM Energy Resources website under individual Basins:
 - <https://www.energymining.sa.gov.au/industry/energy-resources/geology-and-prospectivity>
- Shapefiles, GeoTiffs and layered PDFs of the results included in **Basin in a Box Pedirka Basin** on SARIG (<https://map.sarig.sa.gov.au>)



<https://www.energymining.sa.gov.au/industry/energy-resources/geology-and-prospectivity/mesozoic-basins/eromanga-basin>

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Eromanga Basin

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Eromanga Basin

Otway Basin

Simpson Basin

Renmark Trough

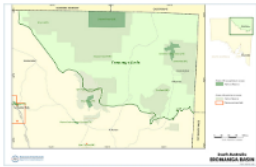
Polda Basin

On this page

- Summary
- Figures
- Prospectivity

The Eromanga Basin is a Early Jurassic - Late Cretaceous basin.

The Eromanga Basin encloses the multi-aquifer system of the Great Artesian Basin and overlies late Palaeozoic and older basins. It consists of a broad downwarp with two main depocentres – the Poolowanna Trough and the Cooper region.



See the [Petroleum geology of South Australia, Volume 2: Eromanga Basin \(Second edition\)](#) for information on Eromanga, Pedirka, Arckaringa and Simpson basin structural and tectonic history, new seismic mapping, litho- and biostratigraphy, source rocks and maturity, reservoirs, seals, trap development, discovered reserves, field reviews, undiscovered potential, exploration history, infrastructure, economics and land access considerations.

Eromanga Basin plays

- [Poolowanna Formation Play, Poolowanna Trough region](#)
- [Algebuckina Sandstone Play, Poolowanna Trough region](#)



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