

## 3. JURASSIC PLOVER-PLOVER (.) PETROLEUM SYSTEM (Malita Graben, Sahul Platform)

The Jurassic Plover-Plover (.) petroleum system extends north from the Malita Graben across the Sahul Platform and Troubadour Terrace, with the northern limit defined politically by the boundary with Indonesia. The Sahul Platform is a large northeast trending basement high comprised of tilted fault blocks and horsts. The structure is overlain by less than 5 km of Late Permian to Cainozoic rocks.

The Malita Graben is a north-east oriented trough that contains a thick Mesozoic to recent section exceeding 10 km in thickness and is the main "source kitchen" for this petroleum system. The primary source for hydrocarbons is the oil and gas prone Plover Formation. This section is mature for gas generation within the graben and mature oil source pods are likely on the shallower northern graben flank. The Plover Formation entered the oil window in the mid-Cretaceous. Other potential hydrocarbon sources include the Late Jurassic Flamingo Group and the Early Cretaceous Echuca Shoals Group.

The primary reservoir is the Plover Formation. Other good quality reservoirs include the Flamingo Group and the Late Cretaceous sandstones of the Bathurst Island Group. The Bathurst Island Group also forms a regional seal with basal claystones and siltstones.

This system has excellent prospectivity for gas with four gas/condensate discoveries in the region: Chuditch, Evans Shoal, Sunrise and Troubadour. The Abadi field (5 tcf of gas) is also a member of this system but lies within Indonesian waters.

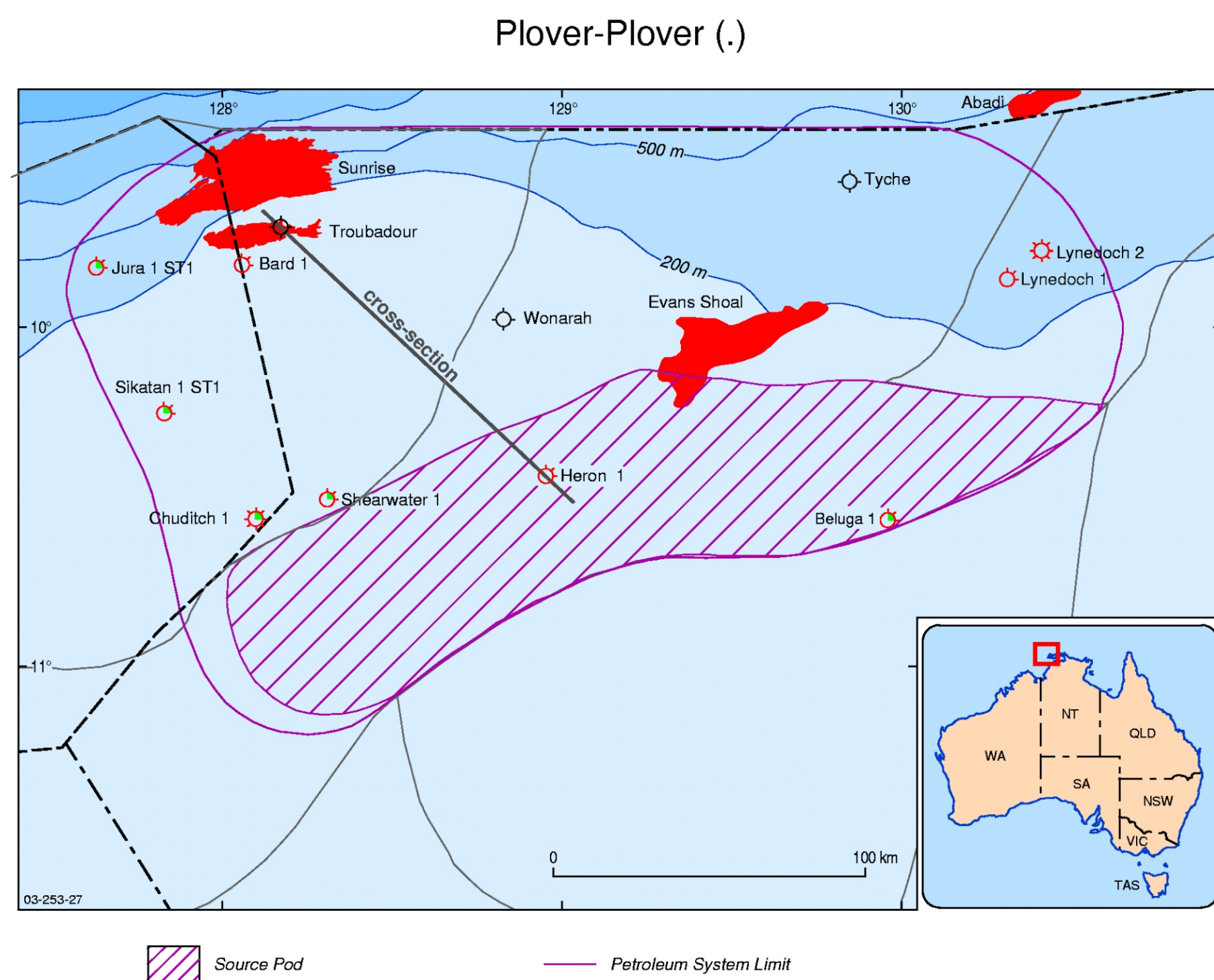


Figure 1: Spatial extent of the Jurassic Plover-Plover (.) petroleum system. This map displays hydrocarbon accumulations and shows thought to have been sourced from the Plover Formation. The source pod has been defined as the extent of the Malita Graben. The petroleum system limit is an envelope enclosing the discoveries attributed to the system and the Malita Graben. The cross-section refers to Figure 4.

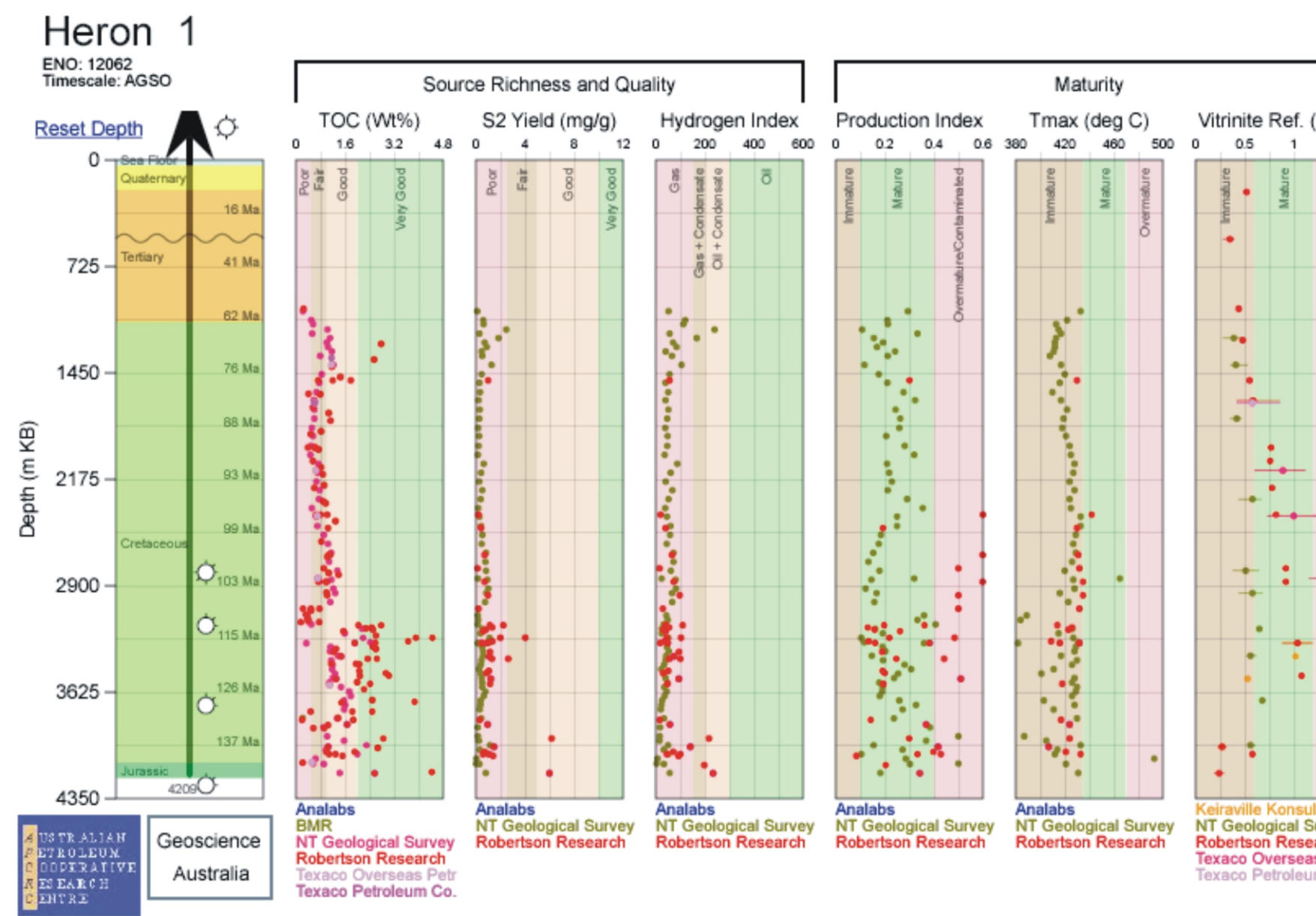


Figure 2: Source rock potential in Heron 1. Heron 1 is one of the few wells drilled within the Malita Graben source kitchen. Only the very top of the principal reservoir and source (Plover Formation) was intersected. The data points shown refers to the Cretaceous Bathurst Island Group (>1030 m) and Late Jurassic Flamingo Group (>3150 m). The sediments generally have fair to good potential for gas, with the lower Bathurst Island Group being good to very good (TOC >2%). The source rocks contain Type III kerogen (terrestrial) and are mature for hydrocarbon generation.

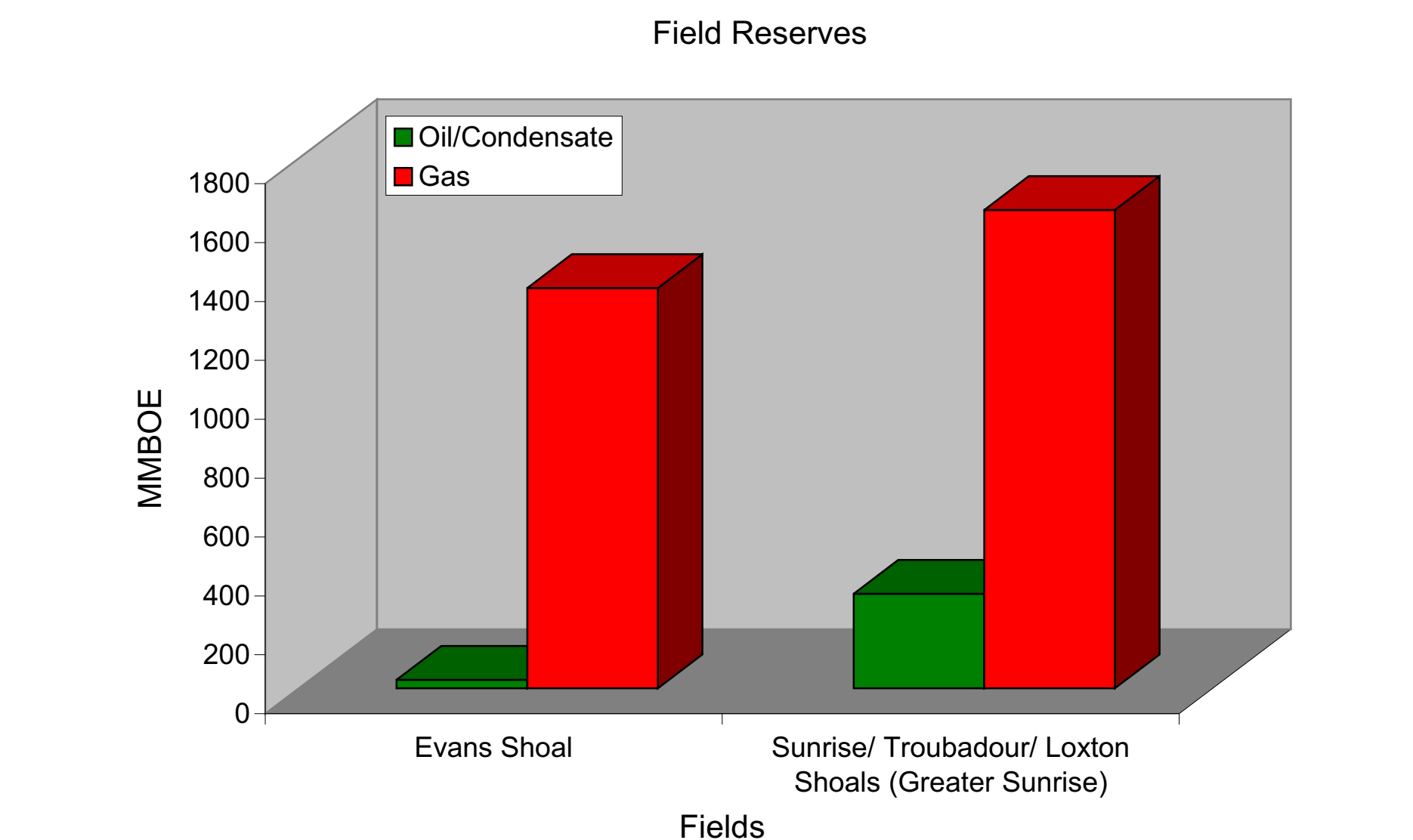
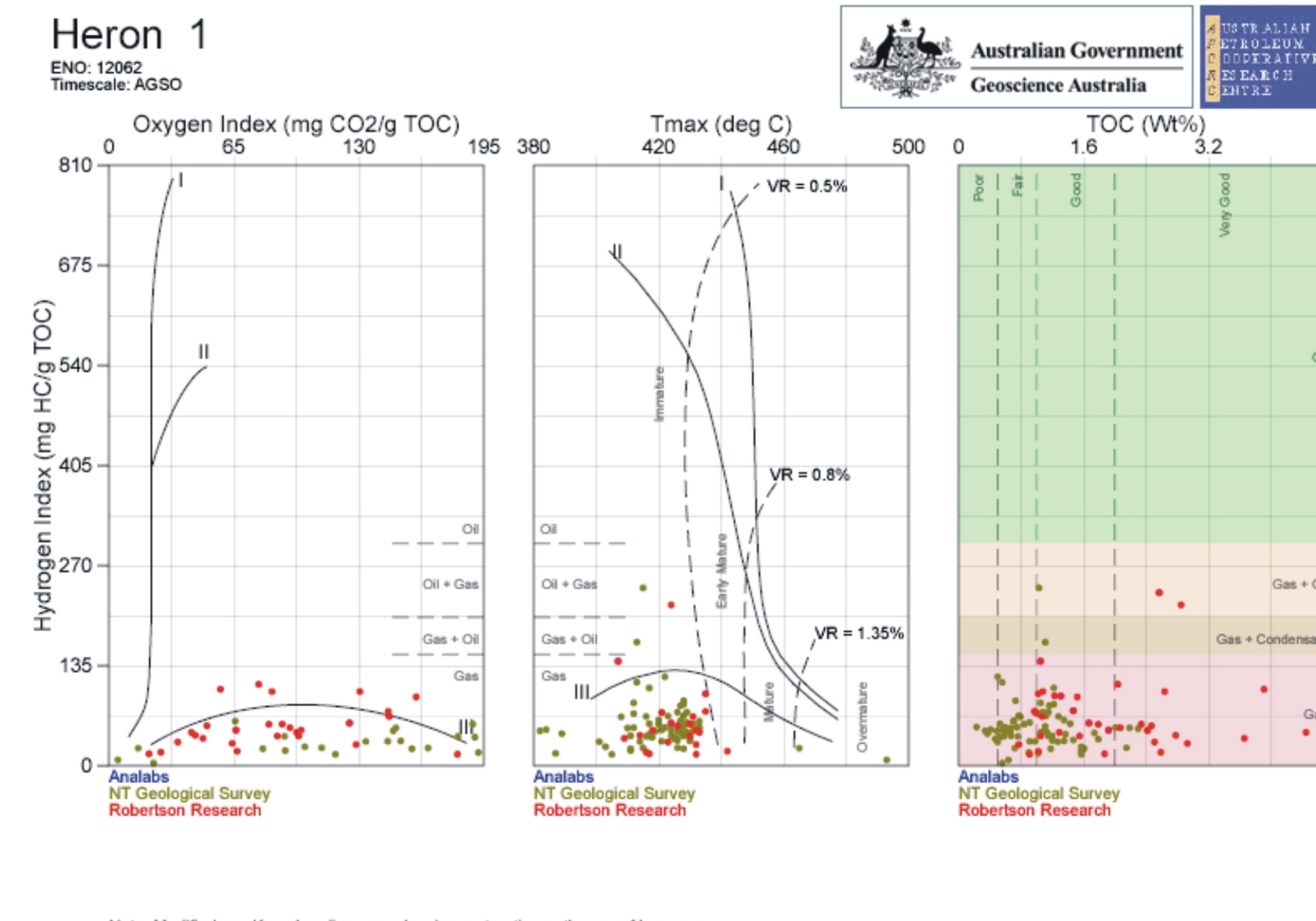


Figure 3: Field reserves for the Plover-Plover Petroleum System (.). All reserve numbers are sourced from Northern Territory Government Department of Business, Industry and Resource Development. Reserves/resources are estimated by the Department and exploration companies.

### Petroleum System Characteristics

- Source:** Plover Formation
- Reservoir:** Plover Formation
- Seal:** Bathurst Island Group, intraformational
- Source Quality:** Gas prone with minor liquids
- Source Type:** Marine mudstones and coal with terrestrial input
- System Age:** Jurassic
- Expulsion:** Mid-Cretaceous (oil) through to Tertiary (dry gas)
- Traps:** Horst blocks, tilted fault blocks, faulted anticlines, Stratigraphic
- Risk:** Gas flushing of oil accumulations, CO<sub>2</sub>
- Key References:** Acreage Release 2002

Barrett, A.G., Hinde A.L., & Kennard, J.M., 2004. Undiscovered resource assessment methodologies and application to the Bonaparte Basin. In: Ellis G.K., Baillie P.W. and Munson T.J. (Eds) Timor Sea Petroleum Geoscience. Proceedings of the Timor Sea Symposium, Darwin, Northern Territory, 19-20 June 2003. Northern Territory Geological Survey, Special Publication 1.

Longley, I.M., Bradshaw, M.T., & Hebergerger J., 2000. Australian petroleum provinces of the 21st century. PESA Journal 28, 21-42.

Miyazaki, S., 1997. Australia's southeastern Bonaparte Basin has plenty of potential. Oil & Gas Journal, 95 (16), 78- 81.  
Siegge R.J., Ainsworth R.B., Johnson D.A., Koninx J.P.M., Spaargaren B. & Stephenson P.M., 2000. Awakening of a sleeping giant: Sunrise-Troubadour gas-condensate field. APPEA Journal 40(1), 417-435.

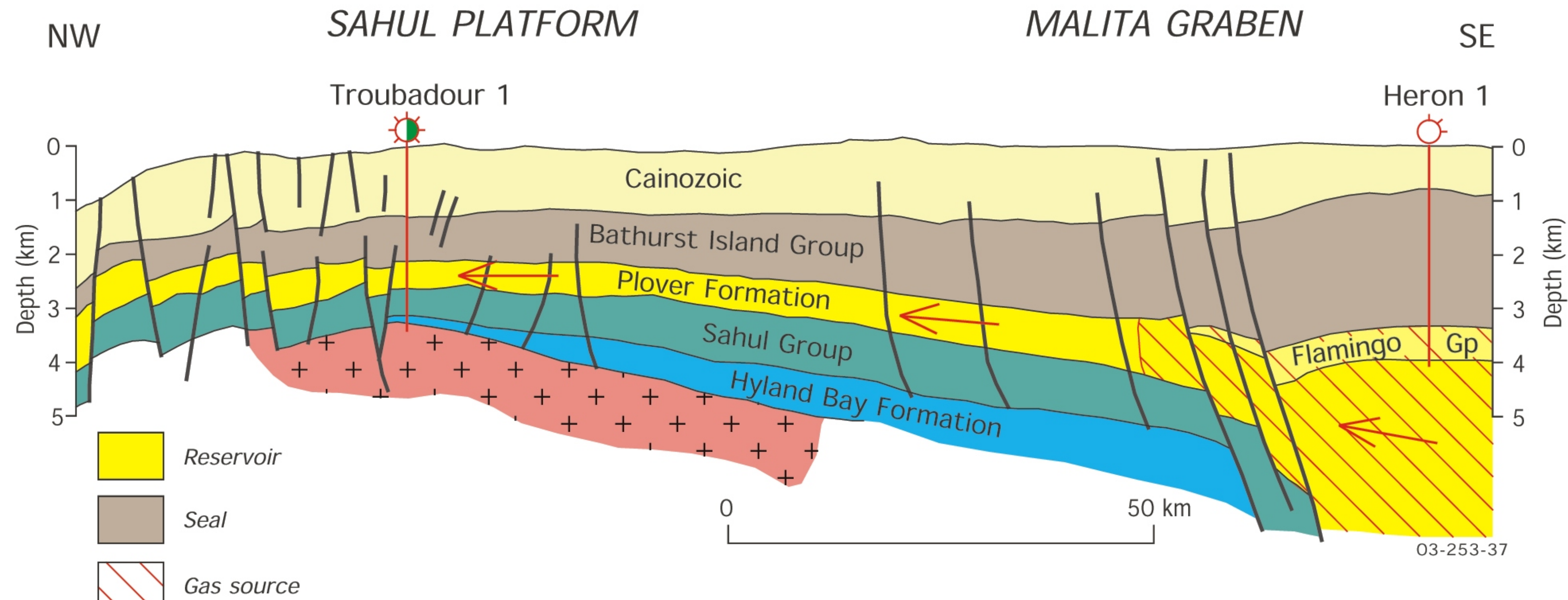


Figure 4: Cross-section, Troubadour 1 to Heron 1. Gas is generated and expelled from the Malita Graben. Migration occurs up structural highs (such as the Sahul Platform) with trapping in horsts, tilted fault blocks and faulted anticlines. The Plover Formation acts as both a source and reservoir with the Bathurst Island Group acting as a regional seal.

### Resource discovery in the next 10-15 years

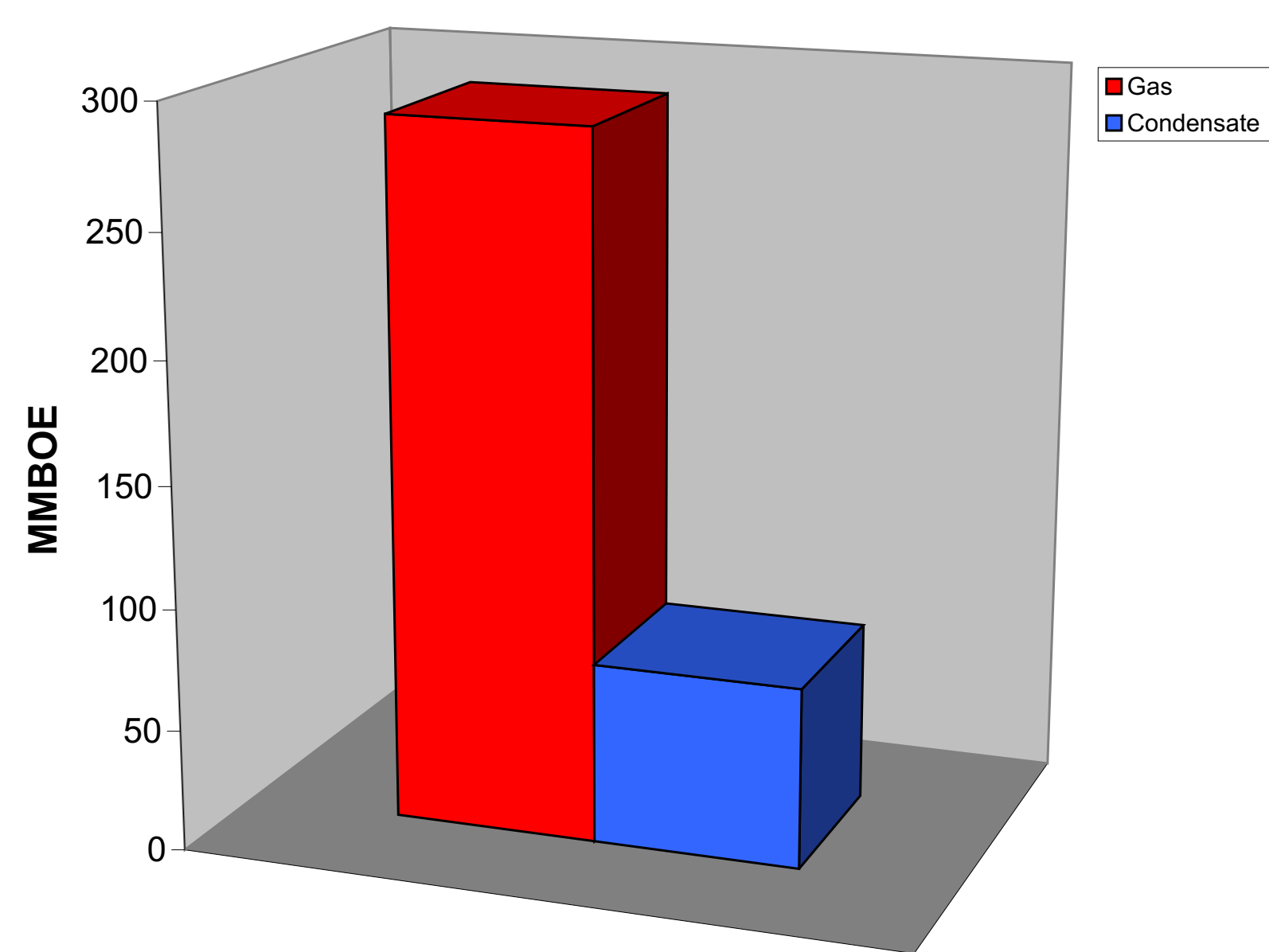


Figure 5: Geoscience Australia (Austplay) estimates of the recoverable hydrocarbons to be discovered in the next 10-15 years in the Jurassic Plover-Plover (.) petroleum system. Based on the work of Barrett et al. (2004).

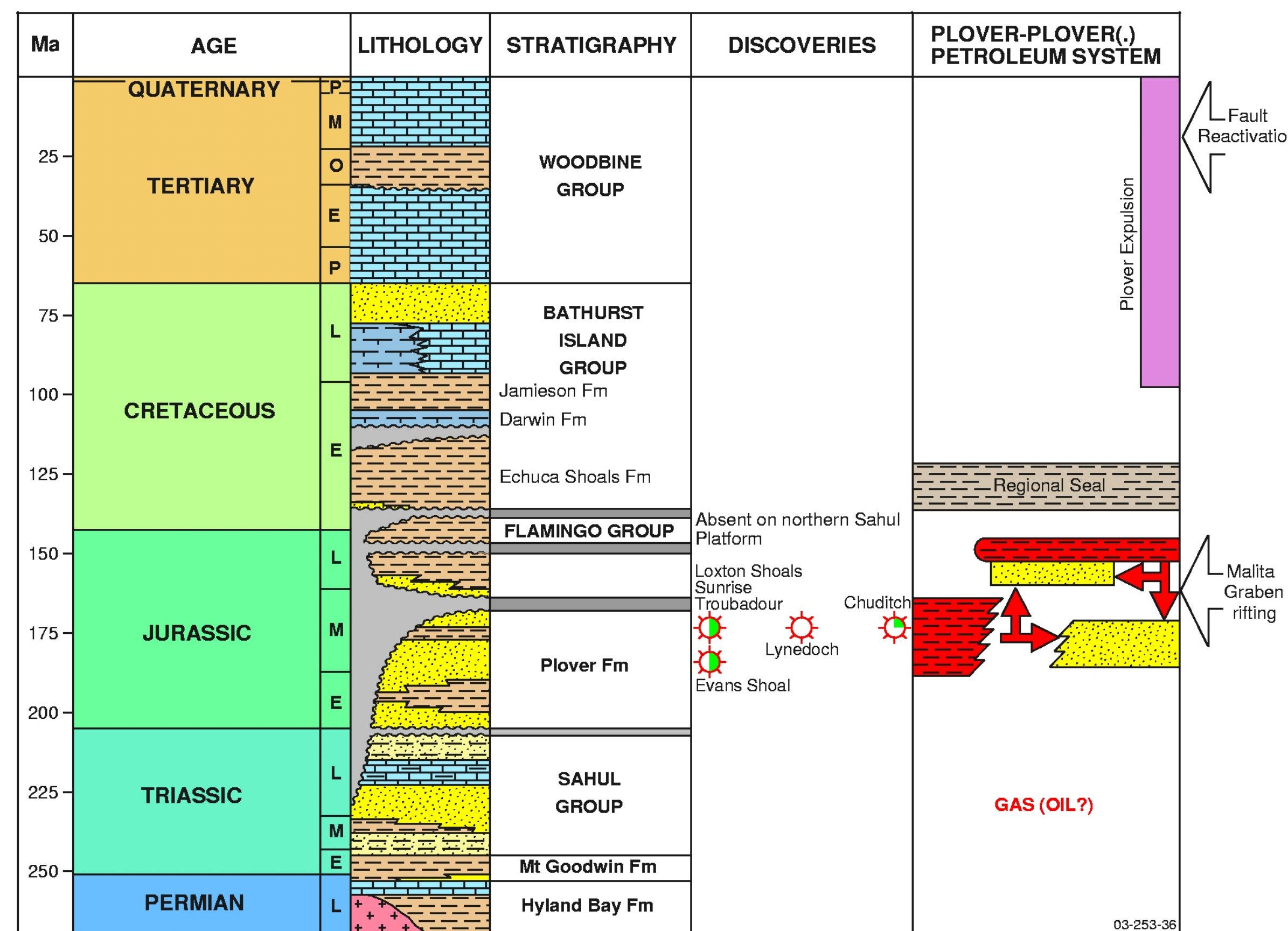


Figure 6: Schematic diagram of the Plover-Plover (.) petroleum system.

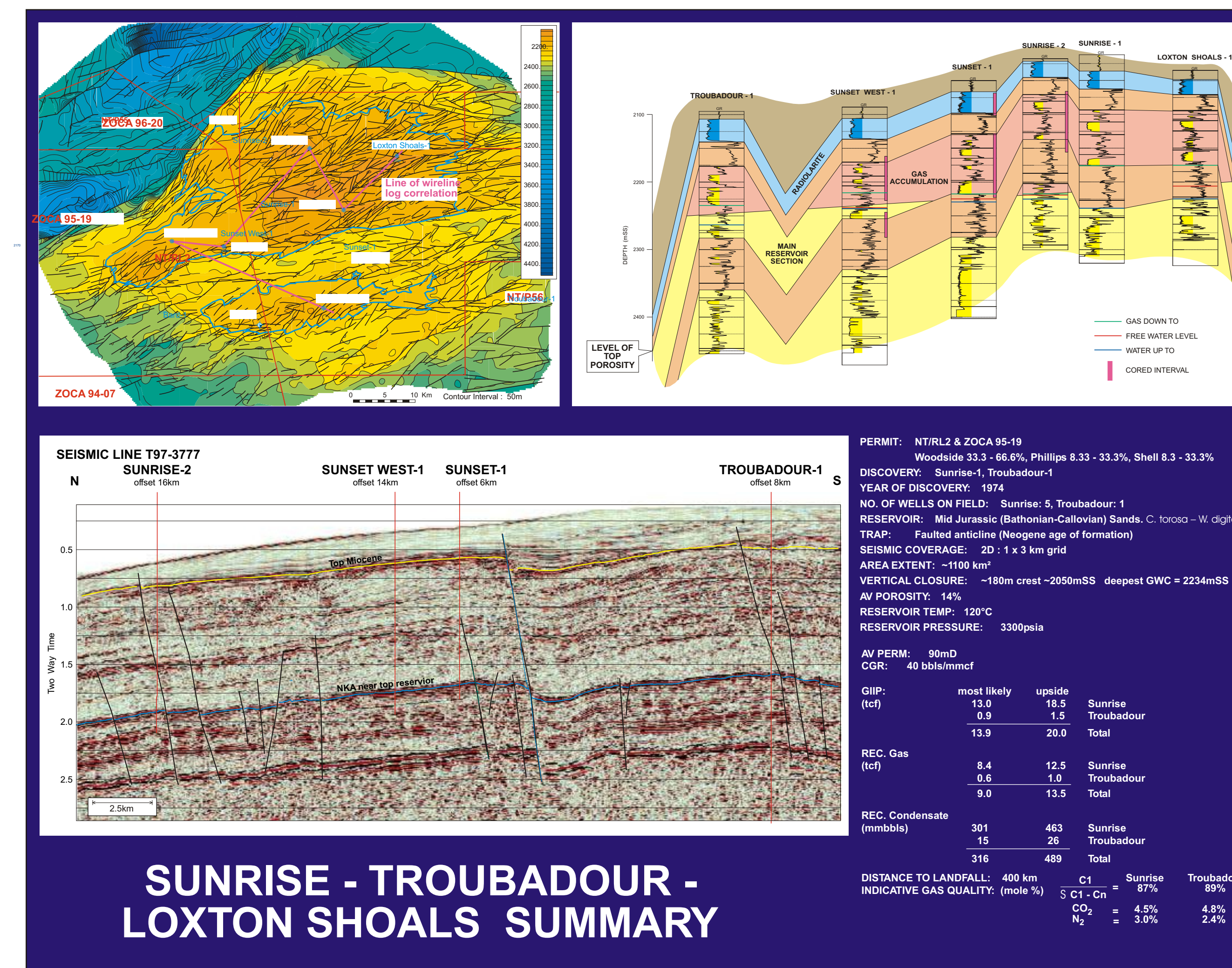


Figure 7: Summary of the Sunrise - Troubadour - Loxton Shoals gas and condensate accumulation.