

## **Permian Lacustrine Shale Exploration, Cooper Basin Australia**

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Beach Energy has commenced an exploration program to assess the shale gas potential of Permian lacustrine shales within the Cooper Basin, Australia. The program while designed to investigate the geochemistry, mineralogy, porosity, gas content and mechanical properties of the shales; the extensive data set obtained will also allow comparison of a lacustrine source system with lacustrine systems in China and the marine shale systems being commercially developed in the USA. Non-marine shale plays have not had any prominence in currently published studies.

A two well evaluation program will be undertaken starting July 2010. These wells will be extensively cored to allow detailed correlation between geochemistry, mineralogy and stratigraphy within the shales and correlation to wireline logs. The preliminary results of the first well will be presented. The geological environment for drilling is difficult with drill depths of 3000-3600m and high temperatures (170-200°C) expected over the target section.

The Cooper Basin is a Permian-Triassic sag basin underlying the more widespread Jurassic-Cretaceous Eromanga basin. Basement is primarily highly radioactive granites underlying the central part of the Nappamerri Trough with sediments and meta-sediments of the Cambrian Warburton Basin underlying the remainder of the basin. Heat-flow within the basin is variable and is controlled by basement type. The areas underlain by granites have high heat-flow with paleo-temperature gradients reaching 6°C/100m in the Nappamerri Trough, and lower gradients (3.3-3.7°C/100m) across the remainder of the basin. The high heat-flow within the Nappamerri Trough has provided sufficient maturity for the Permian lacustrine units to be considered shale gas targets.

The lacustrine Permian Murteree and Roseneath Shales are considered the primary objectives for shale gas; however the encased Epsilon Formation which consists of sandstones, shales and coals could provide a 'deep basin' type tight gas opportunity if gas filled across the area; as could the underlying Patchawarra Formation though this is considered higher risk. The well will be drilled outside of structural closure to investigate whether the Epsilon and Patchawarra sands are gas saturated off structure (gas saturated and over-pressured on structure).

The Murteree and Roseneath Shales each vary in thickness between 60-100m and appear to be continuous across the basin except where eroded around the trough margins. The two shales were considered by Boreham and Hill (1998) to be poor source rocks; however the identification of high resistivities and an anomaly across both units on sonic logs (Fig 2) in deep Nappamerri Trough wells suggested both units were over-pressured and likely to be of better source quality. TOC analysis showed carbon contents of between 2-8% and higher TOCs where thin coals were encountered. Rock-Eval analysis showed both units had Hydrogen and Oxygen Index values consistent with that published for the Barnett Shale (Kinley et al, 2008). Hydrogen Index values were lower than the Barnett due to the increased maturity (2-3%Ro) of the Nappamerri Trough samples.

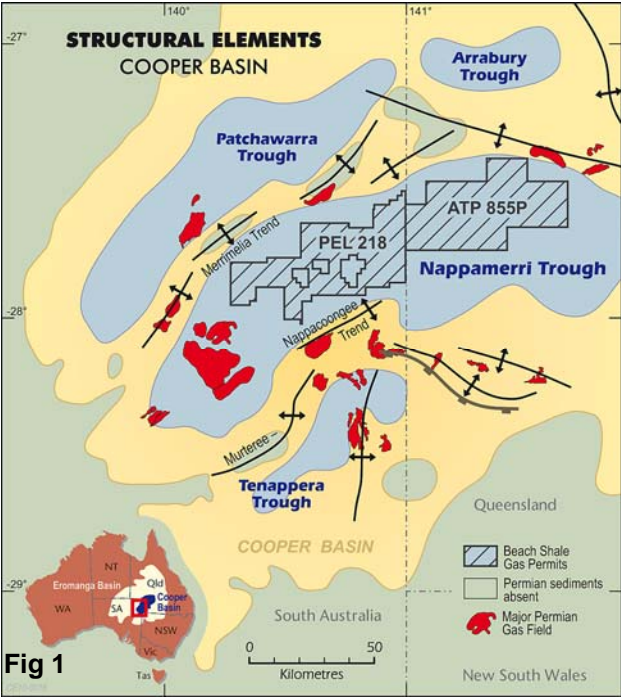


Fig 1 - Beach Energy Cooper Basin Shale Gas Permits

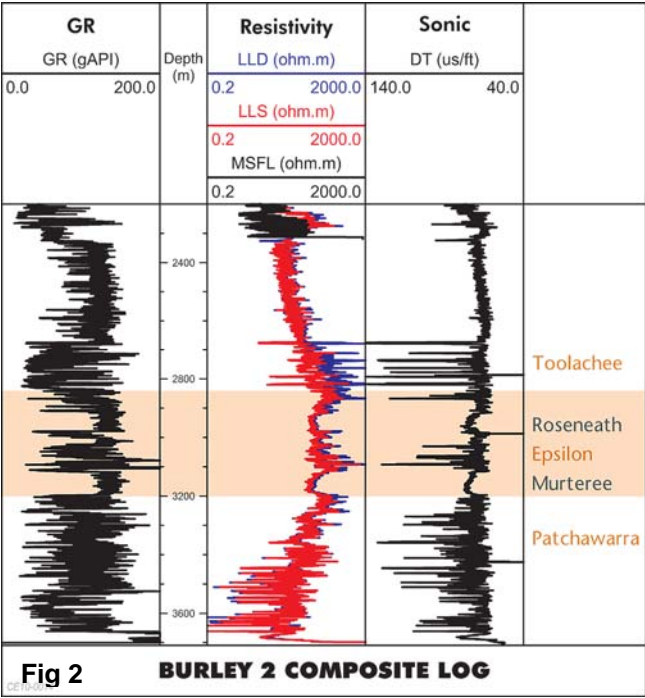


Fig 2 - Burley 2 well section showing Roseneath and Murteree Shale targets. Target depths are 2800-3000m. Note high resistivity and low sonic values in shales.

References

Boreham, C.J. and Hill, A.J., 1998: Source rock distribution and hydrocarbon geochemistry. In Petroleum Geology of South Australia Volume 4 Cooper Basin; Gravestock, D.I., Hibburt, J.E. and Drexel, J.F., eds, Chapter 8, 129-142. SA Dept Primary Industries and Resources Report Book 98/9.

Kinley, T.J., Cook, L.W., Breyer, J.A., Jarvie, D.M. and Busbey, A.B., 2008: Hydrocarbon potential of the Barnett Shale, west Texas and southeastern New Mexico. AAPG Bulletin, 92/8, 967-991.