The Geology of the Permian Coal Sequence (Purni Formation) in the Pedirka Basin

STRATIGRAPHY AND GEOLOGICAL HISTORY

A discussion of the regional geology of the Simpson Desert area, including the coal bearing Permian Purni Formation, occurs in Attachment 1 (Part B). The stratigraphy of the Simpson Desert area has many similarities with Cooper-Eromanga basins to the south and tectonic elements are outlined in Figure 1. Figure 2 outlines the stratigraphy of the Simpson Desert area.

PERMIAN SEDIMENTATION (PEDIRKA BASIN)

The Pedirka Basin and its associated depocentres, the Eringa and Madigan troughs and the northwestern Poolowanna Trough, date back to the Alice Springs Orogeny (Late Devonian–Early Carboniferous). The Permo–Carboniferous record is dominated by widespread glaciation and basal diamictites (Crown Point Formation), which were previously thought to be disconformably overlain by intracratonic sediments of the Early Permian Purni Formation (Youngs 1975). However, this interpretation recognises regional development of glacial outwash sandstones at the base of the Purni Formation (ie lower Patchawarra Formation equivalent), which are believed to be equivalent to the Tirrawarra Sandstone of the Cooper Basin.

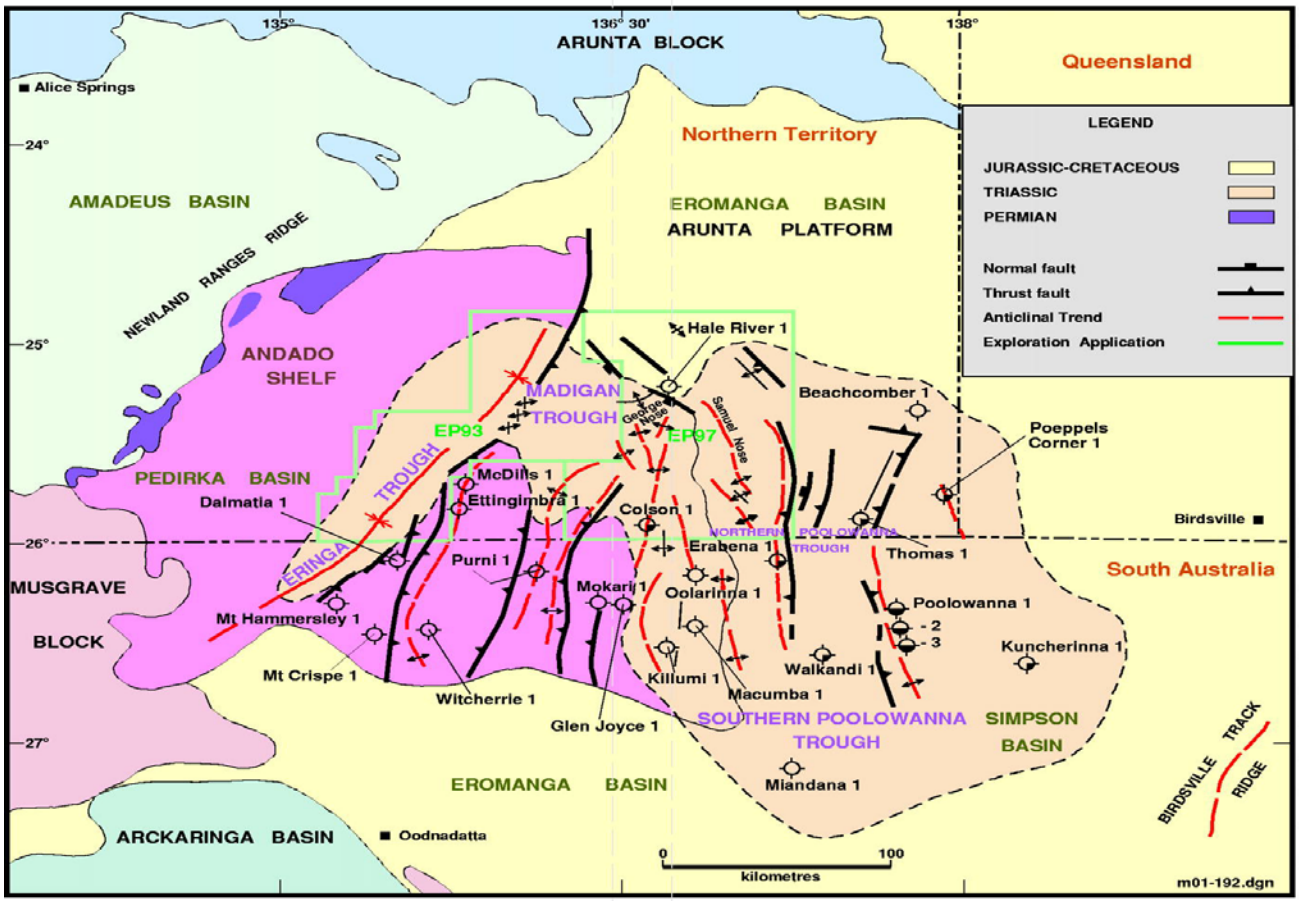

Fig.3 Tectonic Elements Simpson Desert Area- note all tenements are shown on pp1,2.

Thus the equivalent of the highly productive lower Patchawarra/Tirrawarra Sandstone petroleum system of the Cooper Basin can be shown to be widespread in the Pedirka Basin. An important reference section occurs in Mount Hammersly-1 in South Australia, which includes the Purni Formation (286 m), the Tirrawarra Sandstone (197 m) and the Crown Point Formation (504 m).

Permo- Carboniferous Crown Point Formation

The basal Permian unit, the Crown Point Formation, is a dominantly glacial succession, comprising extensive diamictite, glacial-fluvial outwash, ripple laminated sandstone and siltstone, together with thick shale and varved successions. Coarse sandstone, conglomerate and diamictite are common around palaeo-highs, whereas basinal areas focused shale and varve sedimentation. The succession is thickest in the Eringa Trough and 701 m of clean sandstone and siltstone was encountered in Mount Hammersley-1; these are believed to represent glacio-lacustrine deposits.

Early Permian Purni Formation / Tirrawarra Sandstone equivalent

The Purni Formation conformably overlies the Crown Point Formation, being a depositional continuum following the termination of glaciation in Sakmarian time. Youngs (1975) subdivided the Purni Formation at Mokari-1 and Purni-1 into three members with a total maximum thickness of 350 m in Mokari-1 and 286 m in Mount Hammersley-1. The lowest member comprises thinly interbedded sandstone and siltstone, with minor carbonaceous shale and conglomerate. This facies resulted from a predominantly low-energy, meandering-fluvial depositional system. The middle member, which is believed to be both a stratigraphic and depositional facies correlative of the Tirrawarra Sandstone in the Cooper Basin, comprises thick (200 m in Mount Hammersley-1) glacial outwash sandstone, displaying both fining-upward and coarsening-upward GR log motifs. The sandstone is medium-grained to conglomeratic, massive to cross-bedded and kaolinitic, with occasional carbonaceous interbeds (Questa 1990). The upper member consists of paludal/floodplain deposits, comprising very fine- to fine-grained carbonaceous sandstone and interbedded siltstone, shale and coal. This succession is probably thicker than the lower two units combined in the Eringa Trough.

The Early Permian Purni Formation Coal Sequence

The early Permian coal seams being targeted in the EL application areas are confined to the Purni Formation and within the relevant area only two wells have intersected the basinal section whereas earlier drilling was located on palaeohighs. The coals are believed to be mainly sub-bituminous with potential to generate both oil and gas. Two exploration wells drilled in 2008 , ie Blamore-1 and CBM93001, intersected thick Purni Formation sequences with respective thicknesses of 564 m and 499 m. The Blamore -1 section included 132 m of net coal in seams greater than 2 m thick; the thickest seam was 16 m thick. The CBM 93-001 Well intersected 138 m of net coal in seams greater than 2 m thick. Details of analytical data relevant to the two coal sections occur in Appendix 11 of the main report. A third well drilled by Central, Simpson-1, intersected 135 m of Purni Formation containing 7 m of net coal in seams greater than 2 m thick. Certified consultants estimate the “Exploration Target Potential” within Central’s permits at 1.1-1.4 trillion tonnes of coal less then 1000 m below the surface (Al Maynard & Associates, 2009).

There is a possibility that the coal sequence could be subjected to open cut mining. However, it is envisaged a more likely use for the coal will be for the generation of hydrocarbon liquids. The various options for coal exploitation are described in Appendices 8, 9 and 10 of the main report.

Figure 2. Stratigraphy of the Pedirka, Simpson and Eromanga Basins