



SEDIMENTOLOGY AND STRATIGRAPHY OF THE LATE NEOPROTEROZOIC BONNEY SANDSTONE

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ABSTRACT

This study represents the first good detailed sedimentological and sequence stratigraphic analysis of the Bonney Sandstone exposed at the Arkaroola Syncline in the Northern part of Flinders Ranges, South Australia. The Bonney Sandstone is located between two prominent Late Neoproterozoic Formations, the underlying Wonoka Formation and overlying Rawnsley Quartzite. These rocks have become significant in recent years due to their importance in hydrocarbon exploration in salt withdrawal basins. However there are few published studies on the Bonney Sandstone.

Ten lithofacies were identified which formed the five facies associations. These facies associations include Offshore deposits (FA 5), Offshore transition deposits (FA 4), Shoreface/Foreshore deposits (FA 3), Mixed Wave-Tidal delta deposits (FA 2) and Channel Deposits (FA 1). These facies association represent three major depositional environments, shallow marine, mixed wave-tidal delta and fluvial deposit.

Sequence stratigraphically, there are shows two significant intervals. The lower transgressive interval which is made up of siltstone deposits with interbedded massive sandstones. Low stand system tract deposit which marked the boundary between the Wonoka Formation and the Bonney Sandstone. The middle to upper section essentially represents a highstand system tract with normal regression. The normal regressive interval was characterised by prograding delta and aggrading channel sandstone deposit. Cyclicity pattern within the Bonney Sandstone are made up of third and fourth order cycles.

Eastern paleocurrent directions suggest palaeo flow towards the Arkaroola Syncline. Petrographic interpretation shows basement source rocks with deposition in a low topographic area with little or no exposure of sediments. Adverse effects of prevailing climatic conditions significantly affected sediment deposition as observed within the grain size, mineralogical composition and reservoir potential of the Bonney Sandstone. Reservoir quality of the Bonney Sandstone is essentially low due very poor porosity and permeability.

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