



**SEAL EVALUATION OF A FLUVIAL-LACUSTRINE RIFT TO
POST-RIFT SUCCESSION, THE EARLY CRETACEOUS
EUMERALLA FORMATION, OTWAY BASIN, AUSTRALIA**

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ABSTRACT

The Early Cretaceous Eumeralla Formation is regarded as an ineffective regional top seal in the Otway Basin, largely due to sand interbeds providing preferential hydrocarbon migration pathways. A deeper water lacustrine facies consisting of interbedded siltstones and claystones and massive claystones is developed at the base of the Eumeralla Formation in some wells. This interval (Unit VI) was deposited within a transgressive to early highstand systems tract and has better sealing properties than the other overlying Eumeralla Formation intervals.

Theoretical gas column heights that the various Eumeralla Formation facies can support were calculated from mercury injection capillary pressure (MICP) analysis. Results range from 4 meters to 812 meters, and indicate that the fine-grained, lower Eumeralla Formation intervals have a higher seal capacity than the sand rich upper Eumeralla facies. However, the floodplain-dominated sediments commonly developed within the lower Eumeralla Formation are coal-rich and therefore associated with a high risk of brittle failure. Shallow lacustrine sediments have higher seal integrity, but are lithologically variable with extensive secondary porosity developed from dissolution of feldspar. The deeper lacustrine Unit VI provides the best Eumeralla seal for potential Katnook Sandstone and Windermere Sandstone Member reservoirs. Unfortunately, Unit VI is the only Eumeralla facies that is not developed entirely throughout the South Australian Otway Basin.

The gamma ray log is generally unable to identify Eumeralla sandstone interbeds due to the sand's high volcanoclastic content. An integration of log data with seismic data, palynology, conventional core, and sidewall core and cuttings descriptions has enabled the seal geometry of the Eumeralla Formation to be determined. The deeper lacustrine Unit VI is locally developed in the St Clair Trough and on the flank of the Merino High. It is absent in the central Penola Trough and the Robe Trough, but could potentially be developed within the undrilled southern Penola Trough and in the Tantanoola Trough. Unit VI occurs preferentially in basins formed on the hanging wall of half grabens during late rift to early sag.

The risk of top seal fracturing is considered high in the Robe Trough, and the Eumeralla Formation is very sandy in the central Penola Trough. Good seals are likely to be developed in the southern, predominantly offshore Otway Basin where Eumeralla sediments are generally deeper, and therefore more affected by mechanical compaction and diagenesis.

STATEMENT OF AUTHENTICITY

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University library, being available for loan and photocopying.

Lotte Svendsen

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