



POST-LATE EOCENE DEVELOPMENT OF THE  
BASS BASIN, SOUTHEASTERN AUSTRALIA

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## ABSTRACT

The Bass Basin is located in southeastern Australia and contains sediments of Early Cretaceous to Recent age. The aim of this thesis was to investigate the post-Late Eocene development of the basin with particular emphasis on its Late Tertiary structural evolution and possible implication for hydrocarbon exploration.

The post-Late Eocene sediments of the Bass Basin are characteristic of a marine transgressive sequence. The initial marine incursion is represented by the restricted marine, soft shales of the Late Eocene Demon's Bluff Formation. Conformably overlying the Demon's Bluff Formation are the Oligocene to Recent Torquay Group sediments. The lower Torquay Group consists mostly of silts and muds which grade upwards into marls followed by the deposition of bioclastic limestones, as conditions within the basin became more open marine from the Miocene onwards. Sandier facies for the Demon's Bluff Formation and Torquay Group occur around the basin margin and in the southern extent of the basin. Three episodes of volcanism are recognised from seismic and well data. The main phase of volcanism occurred in the Late Oligocene, with less extensive activity occurring in the Mid and Late Miocene.

Structural development of the post-Late Eocene is complex. However, interpretation of approximately 6000 kilometres of seismic data, followed by structure contour mapping of key horizons and fault trend analysis, enables two structural province types to be recognised. First, in the northwestern and southeastern portions of the basin, extensional tectonic features are dominant. Here, normal faults have developed over the edge of basement

blocks due to continued movement of these blocks in the Late Tertiary. Secondly, in the central portion of the basin, wrench tectonics are dominant and influenced structural development. In this region of the basin, pre-Late Eocene depocentres have been inverted to show Late Tertiary structural growth, as evidenced at the Cormorant-1 well location.

The interpretation of these data suggests that the overall tectonic setting for the Bass Basin in the Late Tertiary is best explained by the anti-clockwise rotation of Tasmania with respect to Australia, resulting in the Bass Basin experiencing left-lateral shear superimposed on the overall pattern of thermal sag. Igneous activity appears to have been associated with the more intense periods of tectonism, and volcanic centres are concentrated in areas where wrench tectonics are dominant.

The Cormorant-1 and Yolla-1 wells, located in the central wrench dominated portion of the basin and on structures that show Late Tertiary structural growth, had significant oil recoveries from immature sands of the upper Eastern View Coal Measures sediments. This would suggest that in these areas, vertical migration of oil in the Late Tertiary from mature source beds at depth up faults and into shallower sands has been more significant than previously recognised. As a result of this study, it is recommended that future hydrocarbon exploration should test structures that show Late Tertiary growth and that are located in areas where wrench tectonics are dominant.

This thesis contains no material which has been accepted for an award of any other degree or diploma in any University nor, to the best of my knowledge and belief, does it contain any material previously published or written by another person, except where due reference is made in the text.

The author consents to the thesis being made available for photocopying and loan if accepted for the award of the degree.

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