

REGIONAL STRATIGRAPHIC ANALYSIS OF THE GIDGEALPA GROUP
- SOUTHERN COOPER BASIN, AUSTRALIA

BY



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SUMMARY

A regional stratigraphic analysis, using mainly quantitative data derived from wireline logs, has led to the reconstruction of the palaeogeography and depositional history of the Permian Gidgealpa Group within the Southern Cooper Basin. The Southern Cooper Basin is an infrabasin, containing up to 1 600 m of Gidgealpa Group sediments, which covers an area of 60 000 km² near the centre of Australia. It contains major reserves of gas and minor amounts of oil in fluvial to marginal marine sandstone reservoirs within coal measures.

Lithofacies analysis of a sequential set of palynologically defined time-rock units through the Gidgealpa Group, has clarified depositional trends, identified regions of optimum channel locations, located positions of shorelines, and shown directions of marine transgressions and regressions. Detailed core study, investigation of the cyclic nature of sedimentation, and linear regression analysis have helped to elucidate depositional environments.

Gidgealpa Group deposits were laid down from rivers, lakes, coal swamps, and large inland "seas". By and large, the geomorphic relief has diminished with time. As a result, the earliest fluvial deposition was from braided streams, whereas subsequent periods experienced mainly meandering rivers in a floodplain environment. Braided streams deposited Tirrawarra Sandstone on a possibly glacially scoured land surface.

As topographic gradients declined, rivers began to meander, and sandstone, shale and coal deposits of the Patchawarra Formation enroached over Tirrawarra Sandstone.

Northwards flowing rivers entered the basin at its southern extremity. In the southern part of the basin, valleys were gradually filled by sediments. Few major rivers reached the northern part of the basin, which received mainly over-bank deposits.

During uppermost Patchawarra Formation deposition, the Cooper Basin was invaded from the east by an inland "sea", which then deposited the Murteree Shale. As this "sea" retreated, shoreline sediments of the Epsilon Formation built out towards the east. However, a second transgressive pulse inundated the land once more, and the Roseneath Shale was deposited. Finally, deltas of the Daralingie Beds prograded eastwards, in the wake of the retreating sea.

A long period of uplift and erosion followed, during which time the present structural grain was imposed on the basin. However, by the time deposition commenced once more, the land surface was flat, except for a few hills rising above the plain. Meandering rivers entered the basin in the west, and deposited sandstone, shale and coal of the Toolachee Formation as they flowed eastwards. Gidgealpa Group deposition ended when the climate, perhaps, became unsuitable for the Toolachee Formation coal measures.

On a continental scale, Cooper Basin palaeogeography is related to that of the Permian basins to the east, all of which ultimately had access to the open sea somewhere in the vicinity of the present day coastline.

The Cooper Basin holds considerable scope for future petroleum discoveries in anticlines, and fault traps. In addition, stratigraphic traps hold great potential, especially valley traps resulting from onlap, as well as shoreline and channel sandstones enclosed in shales.

STATEMENT

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

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