

# Predicting New Plays in the Carboniferous: Milligans Formation, Bonaparte Basin

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The Milligans Formation has been correlated using a new sequence stratigraphic framework and depositional systems interpretation to predict palaeogeographic setting and facies quality. Two untested plays have been identified within the narrow Keep Inlet sub-basin; the C60 Sand structural play (A. largus c) and C80 Sand stratigraphic play (A. largus d). Evidence of in-situ oil generation within the Milligans Formation coupled with proven Tournaisian oil-source correlations and numerous oil and gas shows demonstrate an active Carboniferous petroleum system with remaining oil and wet gas potential.

The C60 reservoir was deposited in a deltaic to shallow marine setting during a brief, widespread lowstand. Sediment provenance is interpreted to have been from Proterozoic granites outcropping to the southeast. Fluvial systems flowed northwesterly, in a similar orientation to the present day Victoria and Fitzmaurice Rivers; crossing fault lows developed by footwall uplift associated with the Halls Creek Mobile Zone. An overpressured seal is provided by the overlying C60 flooding event predicted to be over 200 m thick.

By the late Visean the Keep Inlet sub-basin had infilled further, subsidence was waning and lowstand submarine slope fans are interpreted to have been deposited on the C80 sequence boundary outboard of a broad coastal plain. Fan geometry is supported by seismic character showing lobate features downdip of eroded channel belts up to 1.5 km in width. Overlying transgressive siltstones and deep marine marly facies associated with the C80 flooding surface are interpreted to have sealed the slope fans.

Geological risks identified include permeability at depths greater than 3500 m RTE, preservation of charge following significant uplift and erosion in the Triassic, and updip channel seal.