

The Influence of Antecedent Passive Margin Structure and Stratigraphy on Subsequent Foreland Basin Depositional Systems, Peace River Area, North-West Alberta.

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ABSTRACT

Most stratigraphic and paleogeographic studies of foreland-basin deposits focus on tectonically generated subsidence and uplift trends that are *synchronous* with sedimentation. However, this study demonstrates that in some cases it is of greater importance to understand the structural and stratigraphic elements of the antecedent passive margin, in order to explain/predict the field-scale reservoir complexities of the foreland-basin deposits.

A number of pre-foreland-basin features appear to have influenced reservoir location in the Lower Cretaceous Peace River Oil Sands. These include: erosional relief on the sub-Cretaceous unconformity, collapse of karst in the underlying Mississippian units, reactivated Late Paleozoic normal faults, and the presence of a Paleozoic carbonate-platform edge laying several hundred metres below the Cretaceous foreland basin strata. The absolute and relative contributions of each of these factors varied spatially and temporally during deposition of the Gething and Bluesky formations. With the addition of new data sets provided by recent drilling and 2D seismic acquisition, the nature and timing of these controls can be reconciled with the resultant paleogeography and stratigraphy of the deposit.

Pre-existing topography on the unconformity was initially the dominant paleogeographic control. However, during reservoir time, a complex interplay developed between the spatially coincident Leduc platform edge, karsted Mississippian Debolt Fm. strata, and a NW-SE trending basement-related structural boundary, west of which strata dip to the southwest, and east of which strata are sub-horizontal to slightly northeast-dipping. Along this structural break, a series of grabens and half-grabens developed as a result of the combination of basement-involved normal faulting and the collapse of Debolt Fm. karst structures. The associated positive accommodation space controlled the position and ultimate preservation of the sandy, tide-dominated channel deposits that are the reservoir units.