

# Structural and Stratigraphic Controls on Hydrocarbon Accumulations in the Cretaceous Viking Formation, West-central Saskatchewan, Canada

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## Abstract

The distribution of hydrocarbons in the Cretaceous Lower Colorado Group Viking Formation in Saskatchewan, Canada is controlled by both structural trapping and stratigraphic pinch-out of the reservoir facies. The structural surface of the Viking top mimics the underlying sub-Cretaceous erosional surface, draping over its erosional highs, in particular, the erosional structural surface of the Mississippian Madison Group and its subcrop edge. The Viking mimics the sub-Cretaceous as a result of compaction of the underlying marine mudstones of the Cretaceous Mannville Group and Joli Fou Formation. Detailed understanding of Viking Formation reservoirs in Saskatchewan, Canada is absent from current research and this study has produced high resolution contour maps that are used to explain the nature of hydrocarbon trapping that has yet to be achieved. The lack of detailed mapping was addressed by incorporating every available stratigraphic data point within the study area, which included over 15000 Viking Formation tops used to generate isopach and structure contour maps. Oil and natural gas production rates and 'oil cut' values were also calculated and contoured, to illustrate the spatial distribution of the Viking Formation's oil and gas production and to identify production 'sweet spots', areas where the highest oil cuts and gas production exist. A combination of all the maps (structure, isopach, production, cross-section) was then used to illustrate the controls influencing the distribution of the hydrocarbons. This study determined Viking oil plays

are controlled both by the structural features created by the sub-Cretaceous erosional surface, where the hydrocarbons are trapped in structural roll-overs (anticlines) and by reservoir facies pinch-outs. And, oil is generally found either differentially trapped up-dip from natural gas pools within a series of successive traps along the Viking's hydrocarbon migration pathway, or within structural lows below trapped natural gas.