

Fifty Shades Darker: Integrating Sedimentology, Sequence Stratigraphy, Chemostratigraphy and Geophysics to Identify Sweet Spots the Liquids-Rich Duvernay Shale Play, Kaybob Alberta

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Abstract

The Frasnian Duvernay Formation of Alberta Canada is a proven source rock that is becoming one of the hottest liquids-rich shale plays in North America. In the Kaybob region, the play is rapidly moving from an early exploration phase that began in late 2010, towards multi-well pad development. With this progression companies are actively high grading their acreage.

Conventional sedimentology, sequence stratigraphic and chemostratigraphic work flows provide the framework for developing a predictive model for deciphering rock quality to reservoir quality relationships vertically and laterally. Relative amounts of TOC, biogenic silica, clay, and carbonate control reservoir quality in the Duvernay. Twelve lithofacies have been classified into three end-member rock types that display decreasing reservoir quality from highly siliceous organic rich mudstones, argillaceous mudstones down to non-reservoir carbonates. The deposition and distribution of these lithofacies and their associated system tracts are controlled by the basin bathymetry and morphology. The highest reservoir quality rocks are associated with the transgressive systems tracts to early highstands, where enhanced preservation of organic material has led to the development of dominantly intrakerogen porosity within the highly siliceous mudstones. During highstands, reservoir potential is diluted due to carbonate shedding from the platform and the contemporaneous Leduc reefs and through the increased influx of axial derived detrital clay. Similarly channelized (?) lowstand deposits diminish reservoir quality as a result of the influx of detrital carbonate.