

The Role of Fluid- and Sediment-Gravity Flow Processes During Deposition of the Carrot Creek Conglomerates (Cardium Formation, Upper Cretaceous), West-Central Alberta

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Most previous works on conglomerates in the Cyn-Pem/Carrot Creek area have focused on understanding the stratigraphic context of these colloquially termed conglomerate “bars”. Lacking, however, is a detailed understanding of the depositional mechanisms that controlled the spatial distribution of conglomerate facies, which in turn control reservoir quality and related production characteristics within and between different pools. As a result a number of important questions still remain.

Many of these issues can be resolved by differentiating fluvial from delta-front conglomerates, and also appreciating the sedimentological importance of the steep depositional gradient ($\sim 20\text{-}25^\circ$) on the delta front. Fluvial and delta-front conglomerates commonly consist of interstratified matrix-rich and matrix-poor conglomerate. In fluvial conglomerates, this bipartite structure (couplet) is most likely related to the spatial variability of gravel and sand deposition on the leeside of gravel-bed bar forms. Reservoir quality in these conglomerates, however, has been significantly reduced by an infiltrated sand matrix. Marine conglomerates, on the other hand, were deposited on a steep delta-front (Gilbert-like delta) by sediment-gravity processes. Planar-based, ungraded, matrix-supported layers overlain abruptly by well-sorted fine pebble conglomerate represent, respectively, en masse deposition from hyperconcentrated sediment-gravity-flow dispersions and grain-by-grain gravity-driven transport. Most dispersions were arrested on the delta slope, but others flowed to the base of the slope and deposited their sediment in a granular jump. Sand-sized sediment deposited at the mouths of distributary channels was winnowed and mobilized by waves and transported alongshore and away from the delta front, and thus preserved the high-reservoir quality that characterizes the delta-front conglomerates.