

Cavalier Grand Rapids A SAGD Project at Hoole: Core Case Study

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Summary

Cavalier's Hoole project is located in the western portion of Alberta's Athabasca Oil Sands, in the Municipal District of Opportunity No. 17. Approximately 10 km northeast of the town of Wabasca, the bitumen-bearing Cretaceous Grand Rapids reservoir is encountered at a depth of approximately 250m below ground surface in the Hoole Project Area. A sub-unit of the Mannville Group, the Grand Rapids formation is a sequence of prograding shoreface sands and shales underlain by Devonian carbonates and Cretaceous siliciclastic formations, and overlain by Cretaceous shales and Quaternary sediments. Key players nearby include Laricina's Germain and Cenovus' Pelican Lake projects. Steam-assisted gravity drainage (SAGD) has been determined as the optimal recovery method for the ~20m of net pay over Cavalier's Hoole project area.

Cavalier has divided the Grand Rapids formation into three sub-units, Grand Rapids A, B and C members. The target sequence for Cavalier's development is the Grand Rapids A member, a prograding regressive shoreface sand regionally deposited in a broad coastline environment during relative sea level fall. The Grand Rapids A sand is a well sorted, unconsolidated feldspathic litharenite with angular to sub-rounded grains, indicative of immature provenance. Occasional variability in the Grand Rapids sands occurs in three main forms: cemented zones, bioturbated zones and conglomerates. Cemented zones, or concretions occur sporadically within the Grand Rapids A sand but are not laterally extensive and originate in early deposition due to an influx of freshwater-induced nucleation around fragments of organic matter. The high energy, wave-dominated coastal environment of Grand Rapids A sand deposition is evidenced by the low diversity trace fossil assemblage consisting primarily of *cruziana* and *skolithos* ichnofacies. Conglomerate beds may be remnants of storm deposits.

A comparison for the Grand Rapids reservoir is the bituminous McMurray formation, which sits stratigraphically below the Grand Rapids in the Mannville Group. The McMurray formation has comparable porosity, permeability and bitumen saturations to the Grand Rapids A and considerable production exists from McMurray SAGD projects. The Grand Rapids reservoir differs from the McMurray in that its broad, areal extent signifies predictable and extensive distribution of porosity and net pay. While the Grand Rapids A sands are extensive shoreface deposits, the McMurray represents a complex depositional environment where reservoir sands can exist as isolated pools created by random distribution of stacked fluvial channel sands. This characteristic makes the Grand Rapids reservoir comparatively efficient for large scale development.