

## **Structural and Stratigraphic Influences on Reservoir Compartmentalization in Low Accommodation Settings: Basal Quartz “A” Sandstones, Alderson Lower Mannville “D4D” Pool**

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### **ABSTRACT**

The Alderson Lower Mannville “D4D” (Kininvie) Pool represents a Basal Quartz reservoir that is compartmentalized through a combination of stratigraphic and structural influences. Structurally, it appears that paleovalley geometry and orientation, fluid migration pathways, subsequent porosity enhancement and reservoir anisotropy are predominately fault controlled. In addition, reservoir quality and porosity also appears to be in part, stratigraphically influenced. Upward migrating fluids through the Mississippian, dissolved clays and minor framework grains in the overlying strata, creating reservoir porosity. This dissolution occurred preferentially in the Basal Quartz sandstone over the lower quality underlying Detrital Beds. Engineering data including initial pressures and production histories supports these geological and geophysical interpretations.

### ***Structural Influences***

There are several lines of evidence in the Kininvie Pool that support the influence of structure on reservoir compartmentalization. Seismic imaging illustrates that Basal Quartz valley incisions appear to be influenced by pre-existing fault patterns in the Mississippian. Periodic reactivation of these faults likely created conduits that facilitated the migration of organic acids, hydrocarbons (early tertiary), and other Laramide “orogenic fluids” across the sub-Cretaceous unconformity. Porosity enhancement and reservoir anisotropy appear to be a consequence of these early fluid migration events. Detailed fluid analyses show Mississippian aged water and oil present in the Basal Quartz, thus supporting the migration of fluids through faults from the Mississippian into the overlying strata.

### ***Stratigraphy***

The reservoir consists of a series of stacked and braided medium to coarse-grained meandering Basal Quartz fluvial deposits that are highly variable in reservoir quality. These sandstones, along with the underlying Detrital Beds, were accumulated in a confined paleovalley system that was incised into Mississippian aged strata. Development drilling has further defined the reservoir as “A” Valley and Terrace geometry, which represents a compound incised valley system. This geometry has proven to be the most complex of all the Basal Quartz rock types. The Kininvie paleovalley system is bounded to the west/south-west by paleotopographic highs in the subcropping karsted Mississippian Pekisko Formation.

***Reservoir Quality***

The Basal Quartz in the Kininvie Pool consists dominantly of quartz and chert framework grains with subordinate amounts of ductile clay-rich sedimentary rock fragments. Reservoir quality is highly variable within the Basal Quartz, with dissolution processes from upward migrating fluids, having the greatest positive effect on quality. Core analysis data indicates that permeabilities most commonly range from 50md to 1d with porosities between 20 and 24%; however, permeabilities and porosities have been documented as high as 7.2d and 30%, respectively.