

Bluesky/Ostracod Rock Properties- Peace River Tar Sands: “Not a Simple “Sand-Tank” Model”

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Exploitable bitumen reserves in the Peace River area of northwestern Alberta are found predominantly in Lower Cretaceous sandstones of the Ostracod Zone and Bluesky Formation which unconformably overlie Mississippian carbonates. Regionally, the Ostracod Zone consists mainly of brackish water mudstones. Locally however, thick sands accumulated in fluvial channels, which were sourced from the then emergent Red Earth Highlands to the north and northeast. These sands, reworked by wave and longshore currents comprise the lower portion of the reservoir at Peace River. With continued transgression of the Boreal Sea the overlying Bluesky Formation was deposited in a large wave dominated estuarine system.

Structure on the unconformity surface controlled facies distribution and reservoir thickness, which in the lows can exceed 35m. The reservoir sands are laterally continuous with no observable vertical permeability barriers. In localized areas of the reservoir a basal water zone, up to 12m thick is present. Post-depositional structural movement resulted in a variable oil-water contact.

The fluvial unit consists of subangular to subrounded, medium- to coarse-grained chert-rich sands, while the estuarine sands are composed of fine- to medium-grained quartz-rich sediments in which kaolinite can average 15% of the bulk rock fraction. Porosity values in the two facies average 28 to 30%, however effective permeability values to oil can be an order of magnitude less in the estuarine sands. It has been observed that the performance of different well designs can be affected by facies distribution within the reservoir.