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## **Reservoir Architecture of the Triassic Khartam Carbonate Sequence, Khuff Outcrop Analogue in Al-Qassim, central Saudi Arabia**

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The Permo-Triassic Khuff carbonates were deposited during a major marine transgression on the Arabian Plate at the terminal Paleozoic to form a huge, East-facing, arid ramp. The up to 194-meter Khuff Formation outcrop in Al-Qassim region, central Saudi Arabia overlies Permo-Carboniferous siliciclastics and is overlain by Sudair Triassic fine-siliciclastics. The Khuff outcrop is mainly composed of carbonates mixed with shale/mud, evaporates and some sandstone, and is divided into four members (in stratigraphical order): Huqayl, Midhnab, Dhahsan and Khartam.

The Triassic Khartam sequence boundary coincides with the Permo-Triassic Boundary that overlies a reddish Paleosol. The studied interval is the Transgressive System Tract (TST) of this sequence with an initial flooding of restricted facies with shallow subtidal microbial heads overlain by the cliff forming upper Khartam carbonates of high-energy cross-bedded ooid channels and sheets, and low-to-medium energy bedded peloidal pellet packstone/wackestone. This later TST package exhibits lateral variability controlled by the depositional setting of good reservoir quality (dominated by moldic porosity) grainstone bars, channels, and sheets within adjacent non-reservoir muddy carbonates.

The 26-meter Khartam Member is time equivalent to the Triassic Khuff B & A carbonate gas reservoirs in Ghawar subsurface. The outcrops exhibit reservoir character similar to that observed in the subsurface and tied to similar rock fabric signatures. These outcrops offer outstanding exposures in two-and-three-dimensions enabling the mapping of these reservoir bodies in detail with their rock fabric and spatial extent, as well as, the stacking patterns. Correlating these outcrops with the subsurface helps develop better predictive models of the Khuff gas reservoirs.

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