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PS Integrating Outcrop and Subsurface Data for Reservoir Prediction in Fluvial Tight-Gas Sands, Upper & Middle Williams Fork Fm, Grand Hogback, CO*

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Abstract

The Williams Fork Formation of western Colorado is a significant tight-gas sand reservoir composed of coals, mudstones, and fluvial sandstones. Sandbodies can be isolated or amalgamated and show a variety of geometries and lithofacies content. Poor understanding of reservoir continuity and quality is commonplace as a result, forcing operators to decrease well spacing; thus, increasing well costs and associated risks. This study aims to better characterize these fluvial reservoirs through the integration of outcrop geometries, quantitative channel-fill measurements, outcrop gamma ray curves, subsurface geophysical well logs, and petrographic descriptions. Four distinct sandbody types have been defined along the Grand Hogback based on outcrop geometries and reservoir potential: (1) Type I – Single-story channels, (2) Type II – Laterally amalgamated channels, (3) Type III – Multi-story channels, and (4) Type IV – Crevasse channels & splays. Type I sandbodies are most common (approx. 60%); however, Type III likely contribute the greatest reservoir potential due to higher sand volumes and overall thickness. Geometric relationships (axis thickness vs. apparent width) are seen between discrete sandbody types, as well as lithofacies content due to stratigraphic architecture. Outcrop gamma ray curves have been measured in tandem with stratigraphic sections, lithofacies samples, and photo panoramas to show what geophysical well logs actually represent within each fluvial succession. These curves are equivalent to spectral gamma ray well logs (total GR, K, U, Th), and give clear evidence of lithofacies content (sands vs. muds) and changes (fining- vs. coarsening-upwards) in respective sandbody types. This data integration gives insight to reservoir prediction from 100- to sub-meter scales based on fluvial-style, internal characteristics, and stratigraphic position within the Williams Fork Formation.

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