Reservoir Architecture and Economic Implications of the Trail Member Fluvial Sandstones, Ericson Sandstone, Mesaverde Group*

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Abstract

The Trail Member of the Cretaceous Ericson Sandstone, exposed near Dry Canyon on the southeast flank of the Rock Springs Uplift, represents a low-accommodation fluvial system, with a high net-to-gross relative to both underlying and overlying strata. It is dominated by trough-cross stratified sandstone with frequent, but often discontinuous, mud and silt interlayers. Individual beds are laterally discontinuous and pinch out regularly, but both lateral and vertical amalgamation of sandy fluvial channel elements is common. Though this strata is overwhelmingly sand-rich in the study area, measured sections and photogrammetric modeling of this fluvial system show both spatial and temporal variations in the character and connectivity of these sands that have important implications in this and analogous systems in the subsurface. The studied outcrops are only 15 miles from the Trail Unit, which produces from this and other intervals of Cretaceous strata, and the high resolution variability seen in outcrops can better inform models of the subsurface in this and other fields.

Near the top of the Trail Member in the field area, sands are more laterally accreting and less vertically stacked, suggesting that accommodation was lowest at this time, leading to frequent avulsion and lateral migration of channels. In contrast, the majority of the stratigraphic section is composed of multi-story channel complexes sands that are vertically thick but generally less laterally extensive. Both of these configurations have very different reservoir implications, and ongoing work shows that these trends extend more regionally throughout the Rock Springs Uplift. In addition, within the exposed potential reservoir sands of the field area, key facies identified in outcrop show variability in both porosity and permeability. Through both large-scale observation of architectural elements and much finer-scale investigation of rock properties and facies relationships, it is shown that effective reservoir connectivity and drainage patterns can be much more complex than anticipated, even in a sandy high net-to-gross systems such as this.

References Cited


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ABSTRACT

The Trail Member of the Eocene Ericson Sandstone, exposed along the front of the Ranch Springs Uplift, comprises a major accommodation-related fluvial system, with some high-relief, parallelogram- to boat-shaped palaeo-rivers and small braided channels. The fluvial system shows both lateral and temporal variation in the character and connectivity of flowpaths that have significant implications for diagenesis and reservoir architecture. Near the basin edge, facies that are interpreted as channel-bounding bars are present, while channel-fill deposits are observed downstream. The fluvial system shows a transition from meandering to braided to fluvial environments over distance and time, which has significant implications for reservoir architecture and connectivity. Facies interpretation and stratigraphy are used to assess the reservoir architecture and potential economic implications of the Trail Member.

BACKGROUND

Facies 1: Meandering Sandstone
- Interpreted as a palaeo-channel
- Transition from braided to meandering environments

Facies 2: Braided Sandstone
- Interpreted as a palaeo-river
- Transition from meandering to braided environments

Facies 3: Interbedded Sandstone/Shale
- Interpreted as a palaeo-river
- Transition from braided to meandering environments

Facies 4: Laminated Mudstone
- Interpreted as a palaeo-basin
- Transition from meandering to braided environments

Facies 5: Dissolution/Disposal
- Interpreted as a palaeo-depression
- Transition from meandering to braided environments

NET TO GROSS STATISTICS

WET TO DRY STATISTICS

CONCLUSIONS

1. The upper stratigraphic section shows lateral accretion of channel bars, while the middle section shows higher accommodation settings with thicker, more laterally extensive channel systems.
2. Observations indicate a general westward flow, but some intermittency in flow direction.
3. The Trail Member of the Ericson Sandstone is characterized by multi-channel complexes, which show possible self-organized clustering patterns based on co-channel analysis.
4. However, important differences exist within differs sets, must be studied due to volumetric influence.
5. The Trail Member provides an excellent example of sedimentological variability and structural complexity that can significantly affect reservoir architecture and economic implications

SELECTED REFERENCES

