**Detailed Characterization of a Complete, New Woodford Shale Section in the Ardmore Basin of Oklahoma: The Case for a New Type Section?**

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Abstract

To date very few outcrops in the Ardmore Basin and Arbuckles area of Oklahoma preserve a complete stratigraphic section of the Woodford Shale. In this study, we present the results of an unpublished and recently discovered Woodford outcrop in southern Oklahoma. Characterization techniques such as XRF, XRD, SEM, TOC, and petrography, tied with subsurface well-log responses provide significant contributions towards a better understanding of the shale heterogeneities at different scales. The exposed section comprises the entire Woodford Shale (320 ft), and partially its under- and overlying units, the Hunton Group and Sycamore Limestone respectively. The lower contact is sharp and characterized by the presence of a Pre-Woodford coarse sandstone (Misener Sandstone?) interbedded with non-organic greenish and brown shales. The upper contact with the Sycamore Limestone is transitionally represented by interbeddings of chert, and black and greenish mudstones.

Twelve lithofacies were recognized, and distributed into 3 major compositional domains (siliceous, argillaceous and calcareous) and honoring sedimentological features such as texture, structure, mineral assemblages and bioturbation. Vertical stacking of these lithofacies, tied with hand-held Gamma Ray profiles and chemostratigraphic proxies reveal a cyclical pattern interpreted as fourth-order transgressive (TST) and regressive (HST) cycles superimposed onto a major third-order stratigraphic sequence. Also, a Maximum Flooding Surface (MFS) was recognized near the transition between the middle and upper members of the Woodford Shale. Reservoir quality of this section was assessed via mineralogical composition, organic richness, porosity and the vertical arrangement of lithofacies; where potential target zones are interpreted to be composed of high-frequency interbeddings of organic-rich beds (acting as source) and brittle beds (acting as more fracturable or fractured rocks). According to this model, and relating our high frequency sequence stratigraphic framework, the best horizontal drilling zones are interpreted within the HST right above the MFS. Finally, but not least with this work, we propose this outcrop as a renovated type locality for the Woodford shale in Oklahoma, since this preserves the entire Woodford thickness and its boundaries very well exposed, we think this could be an exceptional opportunity for operators to calibrate subsurface correlations and stratigraphic models of this, and other resource shales.