

Reservoir Characterization of Divide County, North Dakota

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ABSTRACT

This study focuses on the first bench of the Three Forks Formation of the Bakken Petroleum System along the northern fringes of the Williston Basin, in Divide County, North Dakota. The aim of the study is to delineate the productive play fairway and its reservoir characteristics as found through wireline log analysis (structure, isopach, and petrophysical), utilization of prior geochemical analysis and publically available core analysis. Production results have similar volumes in the over-pressured basin center making the understanding of primary drivers essential. Regional structural mapping, petrophysical analysis and geochemical analysis aid in the delineation of three target areas. Regional mapping of all publically available subsurface data within the study area in concert with regional strike and dip traverses of cross-sectional displays exhibits a group of structural trends with corresponding porosity trends in the 8.4% to 11.1% range. Reactivation of basement faults from the subduction of the Kula and Farallon plates during the Mesozoic and Cenozoic are the best explanation for their formation. Log and geochemical analysis show that the lower Bakken Shale Formation is not mature enough to contribute the bulk of hydrocarbon; therefore, the majority of hydrocarbons present migrated into the system from the basin center. The structure feature located in Divide County exhibits 283.8 MMBO of net reservoir barrels as calculated through cross-sectional areas. Two inferred migration pathways in the form of structural trends bound and developed porosity trends, which supply the study area with 179.2 MMBO of migrated light hydrocarbons. All data included in the full-scale analysis of this capstone is public in origin. The limitations of that data source restrict the ability to pinpoint definitively the exact geologic mechanisms that drive improved performance within the study area; however, numerous key trends and characteristics support this hypothesis. Additional data beyond the public realm is necessary to understand the burial and tectonic history of the area, structural limitation, causation of porosity and lower Bakken Shale hydrocarbon contribution. Specifically, 2D/3D seismic data would be required to achieve a greater understanding of this analysis.