

Oil and Natural Gas Potential of the pre-Cretaceous Section in the New Mexico Part of the Raton Basin

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The Raton Basin, which straddles the Colorado-New Mexico border, is an asymmetric north-south elongated Laramide (Late Cretaceous - Early Tertiary) compressional basin that extends into Colfax County, New Mexico from Las Animas County, Colorado. On the New Mexico side of the basin, coal bed methane has been produced since 1999 from approximately 600 wells in the shallow Vermejo and Raton Formations (Upper Cretaceous to Lower Tertiary). The Pierre and Niobrara Shales (Upper Cretaceous) have produced gas from four wells in the New Mexico part of the basin, three of which are part of an active play.

The pre-Cretaceous section in the New Mexico side of the basin has been sparsely penetrated by exploratory wells and thus far has not been productive. The Morrison Formation (Jurassic) is present at depths of 900 ft on the shallow eastern flank of the basin to 6200 ft along the basin axis. It is comprised of 300 to 430 ft of fluvial sandstones and nonmarine shales and has a facies belt of dark-gray to black organic-rich shales with mixed oil- and gas-prone kerogens. The Morrison is within the oil window on the shallow basin flanks and within the gas window in the deeper, central parts of the basin. Gas and oil shows have been reported from exploratory wells. The Morrison contains both reservoirs and source rocks.

Triassic nonmarine sandstones and the shallow-marine Glorieta Sandstone (Permian) are characterized by CO₂-water systems instead of hydrocarbon-water systems. Reservoirs are not stratigraphically associated with petroleum source rocks. The CO₂ may have been sourced by the magmas that form the Tertiary volcanic rocks that intruded the deeper parts of the basin. The top of the Triassic is present at a projected depth of 6700 ft along the basin axis and rises to 1300 ft along the shallow eastern flank of the basin. The top of the Glorieta is approximately 300 ft below the top of the Triassic.

Sandstones in Pennsylvanian to Lower Permian strata are targets for hydrocarbon gas exploration. These strata have not been penetrated by exploratory wells in the deepest parts of the basin where they are present at projected depths between 7500 ft and the top of Precambrian basement at 10,500 ft. Thickness data from wells drilled on the shallow flanks of the basin suggest that a Pennsylvanian-age basin may be present underneath the Raton Basin and is a possible southern extension of the Late Paleozoic Central Colorado Basin. Pennsylvanian and Lower Permian clastic sedimentary rocks may be as thick as 3000 ft along the axis of the Pennsylvanian basin. The Pennsylvanian and Lower Permian sections contain lateral facies belts defined by the presence of organic-rich dark-gray to black shales. These source facies are within the thermogenic gas window in the deeper, axial parts of the basin.