
Petroleum Geology of the McGregor Range, Otero County, New Mexico

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ABSTRACT

The McGregor Bombing and Artillery Range is a U.S. Army training and testing facility that occupies approximately 1,100 mi² in central and southwestern Otero County, New Mexico. It encompasses several tectonic elements including the Otero platform, the Hueco Mountains, the Tularosa Basin, and the Sacramento Mountains. Only nine exploratory wells have been drilled within the Range. The last exploratory well was drilled in 1954. No oil and gas production has been established within the McGregor Range, but gas was discovered during 1997 by the Harvey E. Yates No. 1Y Bennett Ranch well, which was drilled 5 miles east of the Range. This well marks the first commercially viable gas discovery in an otherwise unproductive frontier region.

Petroleum source rocks are Devonian shales, Mississippian shales and limestones, and Pennsylvanian shales and limestones. Source rocks are generally thermally mature in the southern part of the range and are immature to marginally mature in the northern part of the Range. Thermal maturity increases in proximity to Tertiary-age intrusive complexes and also probably increases within Pennsylvanian grabens. Source rocks are also mature within the Tularosa Basin in the northwesternmost part of the McGregor Range. Kerogens are dominantly oil-prone types in the Devonian, the Mississippian, and the Pennsylvanian.

Reservoir rocks are present within the Ordovician, Silurian, Mississippian, and Pennsylvanian sections. Ordovician and Silurian reservoirs are widespread dolostones with well-developed vugular porosity. The Mississippian section may contain some carbonate reefal reservoirs. The Pennsylvanian section contains shallow-water shelf carbonates in the Sacramento Mountains in the northern part of the McGregor Range. Elsewhere, Pennsylvanian strata are dominantly basinal deposits and potential reservoirs include carbonate debris flows; shallow water reefal deposits may be present on intrabasinal uplifts. Intrusive Tertiary-age igneous sills may also be reservoirs where they have intruded Mississippian or Pennsylvanian source rocks.

A significant exploratory problem in the area is that extensive tectonism has pervasively fractured the brittle carbonate rocks that dominate the lower Paleozoic and Pennsylvanian sections. Many of the reservoirs have yielded fresh water on drill-stem tests. Traps that may have the best possibility of preservation are in areas where tectonic activity was minimal, or where significant volumes of less-brittle shales were deposited in the Pennsylvanian section.