

# **Integrated Geological and Engineering Characterization of an Upper Permian, Carbonate Reservoir, South Cowden Unit, Ector County, Texas — A Work in Progress: Abstract**

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## **ABSTRACT**

South Cowden Unit, located on the eastern margin of the Central Basin Platform, has produced 35 million barrels of oil since initial development in the late 1940's. The Unit, under waterflood since 1965, has been proposed for a CO<sub>2</sub> flood using horizontal injection wells. A team of geologists and engineers was formed to characterize the reservoir. The early and complete integration of geologic and engineering work has in a detailed reservoir description to be used in reservoir simulation.

Regional mapping and 3D seismic data indicate that sediments within the reservoir interval were draped over a paleohigh resulting in an unfaulted, anticlinal-like structure. A field-wide stratigraphic framework was developed using two to four-foot thick, gamma-ray log markers which correspond to low permeability, sandy dolomite layers recognized in core. These log correlations indicate fairly simple and uniform structure and stratigraphy. The gamma-ray markers delineate four zones within the 150 foot reservoir interval. Rocks composing these zones are extensively dolomitized and display a complex color mottling.

Color mottling which characterizes the reservoir interval is due to variable hydrocarbon staining and reflects a variation in porosity and permeability. This mottling is related most likely to bioturbation of carbonate sediments in a shallow, subtidal marine environment. Extensive and interconnected bioturbated areas have core analysis porosities averaging approximately 20% and permeabilities generally ranging from 2 to 350 md. The intervening, nonburrowed and unstained areas have porosities averaging 5% and permeabilities typically ranging from 0.01 to 2 md.

Variations in the quality and thickness of the mottled facies are major parameters controlling oil recovery. A belt of better reservoir-quality rock runs roughly parallel to structure and results in an area of higher cumulative oil production. Good waterflood response and uniform pressure distribution indicate continuity of the pay zones within this belt.

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1 Phillips Petroleum Company, Odessa, TX

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