

PS Codell Sandstone, Northern DJ Basin, Wyoming and Colorado: Reservoir Characteristics in a Tight Oil Play*

Kevin H. Smith¹, Richard J. Bottjer¹, Robert H. Sterling¹, Henry C. Nowak², and Thomas A. Berkman³

Search and Discovery Article #10761 (2015)**

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Abstract

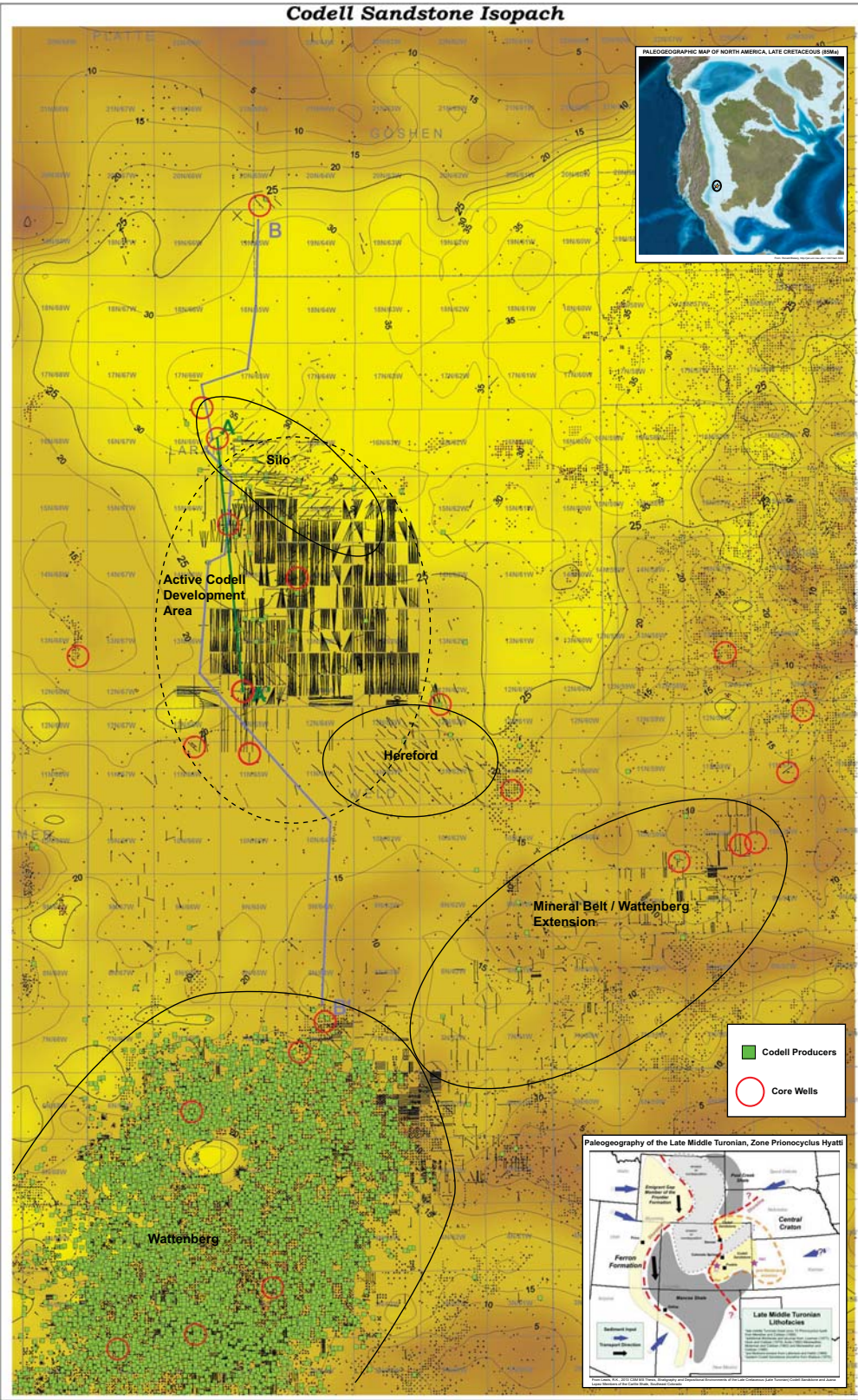
The Codell Sandstone has been producing gas and oil in the Colorado/Wyoming DJ Basin since 1979. Due to relatively good porosity but low permeability Codell production has historically been restricted to the Wattenberg Field where thermal maturity of the Codell is in the gas window. Recent advances in horizontal drilling and multi-stage fracture stimulations have extended the play outside of Wattenberg Field into the northern DJ Basin. Stabilized production rates up to 1300 BOPD are associated with recently completed horizontal Codell wells. This new play area in Laramie County, Wyoming and northern Weld County, Colorado is thermally in the oil window with gas-oil ratios less than 2000 scf/bbl.

The Codell Sandstone was deposited on the eastern side of the Western Interior Seaway by storm events during Late Cretaceous time. The Codell is a very fine- to fine-grained sand and produces oil from two main facies: bioturbated sandstone and laminated sandstone. The laminated facies is parallel to sub-horizontally bedded with some hummocky cross-stratification; it has 8 to 15 percent porosity and 0.01 to 0.10 millidarcies permeability. The bioturbated sandstone has 8 to 13 percent porosity and .008 to 0.05 millidarcies permeability. The Codell is a low-resistivity pay zone that produces oil with low water- cuts from zones with less than 10 ohm-m resistivity. Clay content 15-25% with abundant microporosity in feldspars as imaged with epifluorescent microscopy account for high- bound water content and explains low formation resistivity. The Codell thins from north to south due to erosional truncation beneath an angular unconformity at the base of the Fort Hayes Limestone Member of the Niobrara Formation. Gross thickness ranges from 18 to 33 feet.

Two Codell cores from Laramie County, WY, provide examples of the two depositional facies. The Noble Berry UN #13-09 core recovered 28.5 feet of Codell Sandstone, including 27 feet of bioturbated facies and 1.5 feet of laminated facies. The Cirque Laguna #8-8-2CH core recovered 20 feet of Codell Sandstone, including 13 feet of bioturbated facies and 7 feet of laminated facies. Core oil saturations and fluorescence under UV light indicate that the Codell Sandstone is oil saturated in both cores. Nearby horizontal wells drilled and completed in the Codell Sandstone indicate that oil can be recovered economically, extending Codell production more than 50 miles north of Wattenberg Field.

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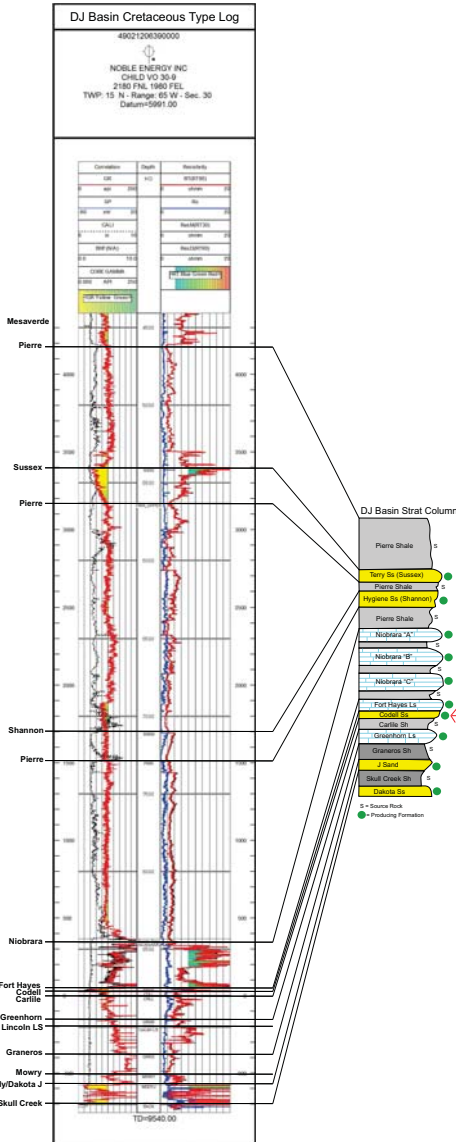
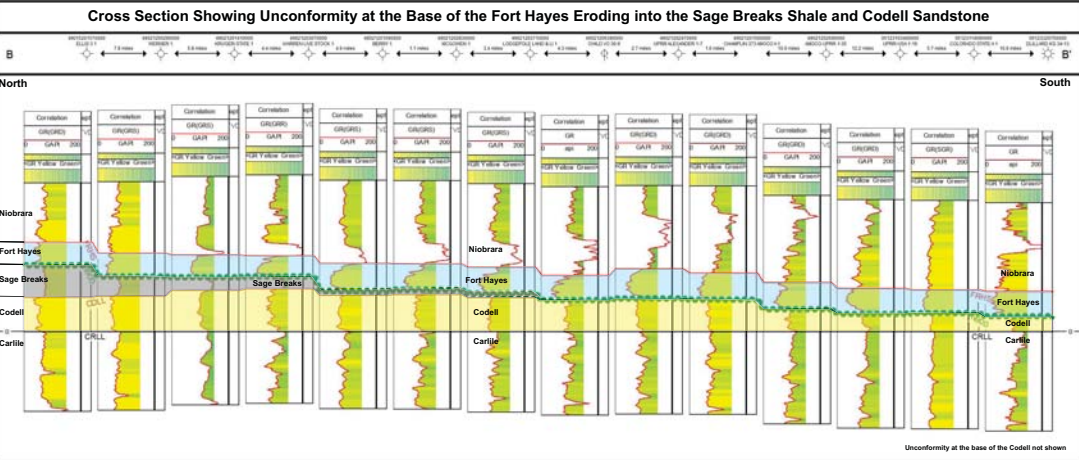
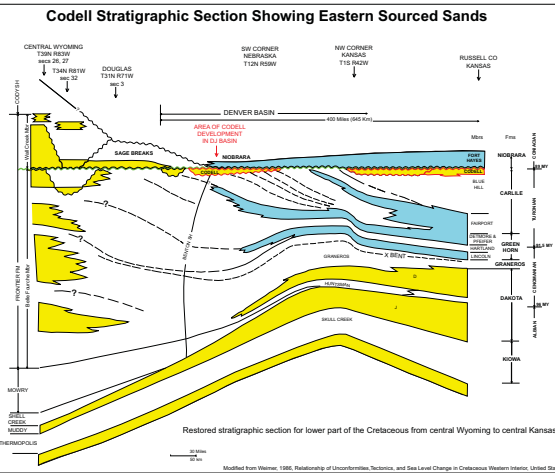
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LAGUNA 8-8-2CH CORE PHOTOS

Depth 8831' - 8861.5

