

## **Keys to Niobrara and Codell Production, East Pony/Redtail area, Denver Basin, Colorado**

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### **ABSTRACT**

The Niobrara Formation and Codell Sandstone are important producers in the East Pony and Redtail areas of the Denver Basin. These formations are currently being developed with horizontal drilling and multi-stage hydraulic fracturing. Many geological and technological factors influence production in this area. Principal source beds are the Sharon Springs member of the Pierre Shale, Niobrara marls, Carlile Formation shales, and Greenhorn Formation organic-rich marl/shale intervals. Source bed maturity is an important control on production. Elevated maturity values as compared to surrounding areas appears to be related to continuation of the Wattenberg Field geothermal anomaly. Maturity is recognized by source rock and petrophysical analyses. Other important keys to production include matrix and fracture porosity and permeability, reservoir facies, mechanical stratigraphy, and drilling and completion technologies. The Niobrara is approximately 300 ft thick and consists of Smoky Hill and Fort Hays members. Vertical depths to the Niobrara are approximately 5600 to 5950 ft for the area. The Smoky Hill is approximately 280 ft thick and can be divided into five chalks units (in descending order: A, B1, B2, C, and D). Porosities as measured on density logs for the chalk interval ranges from 12 to 16%. The most important source rocks in the Smoky Hill member are found in the A marl, and C marl units. TOC contents range from 3-5.5 wt. %. The C marl unit has anomalously high resistivity as compared to other areas in the Denver Basin. The Codell is 7-10 ft thick in the area. It is also targeted with horizontal drilling. The overlying Fort Hays member of the Niobrara and Codell are thought to be a common- source-of-supply. Oil-in-place for the area is estimated to be 40-70 MMBOE per section. Operators are planning for 16 wells per drilling and spacing units (640 to 9660-acre). Recoverable oil per well at a 10% recovery factor is 370 MBOE. Initial production has been up to 860 BOEPD for B chalk completions.