

## RED RIVER "B" ZONE — SOUTHWEST WILLISTON BASIN: HORIZONTAL DRILLING AWAKENS A SLEEPING GIANT

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### ABSTRACT

#### Summary

This paper outlines the exploration and development history of the Ordovician Red River "B" zone reservoir leading to the discovery of the giant Cedar Hills Field, Bowman County, North Dakota. Production from vertical wells completed in this thin, oil-saturated dolomite yielded marginal economics at best. Detailed geologic evaluation of the reservoir and drilling program revisions led to the successful economic exploitation of the "B" zone through horizontal drilling. This application culminated in the discovery and development of the Cedar Hills Field, a single reservoir covering more than 320 km<sup>2</sup> (125 square miles) with over 150 MMBO of recoverable reserves.

#### Introduction

The "B" zone dolomite is porous over a large area in the southwest Williston Basin, averages 3.05 m (10 feet) thick, has high porosity but typically low permeability. This oil-saturated, 2,743 m (9,000 ft) deep reservoir was sub-economic, a fact which had frustrated explorationists for many years. Burlington Resources first exploited the "B" zone in the mid-1980s, drilling vertical wells along the east flank of the Cedar Creek Anticline in Montana. Continued development was halted because of marginal production rates and dropping oil prices.

#### Horizontal Drilling Application

In 1989, horizontal drilling was implemented along the

flank of the Cedar Creek Anticline in an attempt to economically develop the known "B" zone reserves. Although higher production rates were achieved in an initial five-well program, they did not offset the higher costs of horizontal drilling and continuing low oil prices. However, in 1993, a second horizontal program yielded solid economic returns. Geologic and engineering re-evaluation of the initial program led to a better defined stratigraphic target and improved drilling technology that yielded lower costs, longer laterals and higher production rates.

Burlington Resources, in 1994, expanded the play to the southeast into Bowman County, North Dakota, where three wells indicated a large area with high oil saturation in the "B" zone. A horizontal "B" zone wildcat was completed in October 1994 flowing 250 BOPD, and produced 75 MBO in its first year. Following the discovery, more than 200 horizontal wells have been drilled in the play; their combined daily production exceeds 16,000 BO.

### CONCLUSION

The critical step leading to the current drilling activity was recognizing that the Red River "B" zone held significant oil in place over a large area, but was uneconomic to develop by conventional methods. Improved horizontal drilling technology, interdisciplinary team work and perseverance were the key ingredients to unlocking the potential of a giant oil field in the midst of a mature producing area.