

The Devonian Three Forks Formation: Manitoba's Newest Oil Play

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Abstract

The Devonian Three Forks Formation covers the extreme southwest corner of Manitoba from Twp 1-23 and Rge 13-29W1. This formation has been the subject of much exploration and success in Manitoba in recent years. The Three Forks is currently producing at Sinclair Field, Daly Field, Kirkella Field, and north of Pierson Field. The largest of these is the Sinclair Field, and it has greatly expanded in size and production since its discovery in 2004. Proven and probable reserves at Sinclair are estimated at 3.8 million m³.

The Devonian Three Forks Formation is a cyclical transgressive-regressive sequence of shaley, silty dolarenite, interbedded with shale and brecciated in many places. Deposition of the Three Forks was influenced by several weathering events due to transgressive and regressive cycles and basin tectonics. It is subdivided into four units. The best reservoirs are Units 2 and 4. Unit 2 is an interbedded siltstone and shale, massive shale and occasionally brecciated, and is productive as a secondary reservoir at the Sinclair Field and Daly Field. Unit 4, the uppermost unit represented in Manitoba, is an interbedded siltstone and silty shale with thick subunits of highly distorted and brecciated siltstone beds. Unit 4 is the primary and most productive reservoir at Sinclair Field. Units 2 and 4 are productive at the unconformity surface as a subcrop-type play.

Thinning of the Three Forks Formation and truncation of the best reservoir units towards the east suggest the eastern expansion of the Sinclair Field may be limited. Mapping of these units towards the south along Range 29W1 indicates that Unit 4 is preserved up to the Manitoba-North Dakota international border, thereby extending the reservoir potential to the south. A recent successful Three Forks completion north of Pierson Field provides hope for future exploration efforts south of Sinclair Field. North of Sinclair Field, the Three Forks has proven productive up to Kirkella Field.

The sub-Paleozoic extension of the Precambrian Superior Boundary Zone (SBZ) runs north-south in the study area. The Birdtail-Waskada Axis (BWA) runs roughly through the middle of the southern extent of the SBZ. Isopach, structural and geophysical evidence suggest the presence of faults running parallel to the SBZ eastern and western margins; these faults were active at the end of the Devonian. Movements along these faults caused the preservation of the primary reservoir (Unit 4) of the Three Forks Formation east and west of the SBZ margins, while secondary reservoir unit (Unit 2) was exposed as a plateau on the BWA. The preservation of Unit 4 in some wells east of the BWA margin, along the SBZ margin opens up the possibility that, under the right trapping conditions, there may be another Sinclair-type play yet to be discovered east of Range 24W1.

This paper was presented at the 15th Williston Basin Petroleum Conference and Prospect Expo in Regina, Saskatchewan, April 29-May 1, 2007.