

Hydrocarbon Pools of the Southeastern Great Slave Plain, Northwest Territories

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ABSTRACT

The southeastern Great Slave Plain of the Northwest Territories lies south and southwest of Great Slave Lake. Since the 1950's several Middle Devonian carbonate gas discoveries have been made in this region. Geological mapping, beginning in the late 19th century, had already recognized the presence of a barrier reef complex (Presqu'île Barrier) and intensive exploratory drilling activity closely followed the discovery of significant oil reserves in Middle Devonian reefs of central Alberta.

In 2002, one of the discoveries was brought into production in the Cameron Hills, which straddle the NWT / Alberta border. Geological and geophysical data from a number of recently drilled wells in this field remains confidential pending settlement of land claims and resumption of land sales. The other discoveries in the southeastern Great Slave Plain have not yet been developed.

Volumetric reserve estimates for discoveries with economic potential were derived using non-confidential data contained in well files, drill cuttings, core and other sources. Pool sizes are largely based upon previous seismic interpretations done by the original operating companies. Where data is inadequate for defining pool size, reserve estimates assume a normal gas pool spacing size (259 hectares).

The presence of reefal facies is a controlling factor for the presence of reservoir rock in this region, but degree and style of dolomitization are also crucial for porosity development. A factor common to these discoveries is block faulting rooted in the Precambrian and extending into Upper Devonian formations. Dolomitization and porosity development appear to have been influenced by proximity to the sides of the fault blocks.

The initial Cameron Hills discovery at Paramount HB Cameron Hills M31-6010-11700 was made in 1979 and is located just east of the current producing field very close to the Alberta border. Data for this field is confidential, but it likely shares many pool characteristics with the M31 discovery. Both the Slave Point and Keg River formations are potentially productive. The Slave Point gas reservoir at M31 is developed near the top of the formation in a fossiliferous limestone with an average porosity of 7.5%. Estimated reserves for the Slave Point are 53 106m³ (roughly 1.9 Bcf) within a standard spacing unit. The Keg River reservoir at M31 is developed in sucrosic dolomite with porosity of up to

15%. Keg River estimated reserves are 46 106m³ (roughly 3.0 Bcf) for a standard spacing unit. Oil was also recovered from drill stem tests at M31, but no reserve estimate was made.

Gas was discovered in 1969 at Shell HB Grumbler G63-6020-11545 on the west shore of Buffalo Lake, approximately 75 kilometres south of the town of Hay River. The well encountered a large volume of slightly sour gas from the Slave Point Formation while tripping for a bit change. Reservoir rock consists of shaly and fossiliferous wackestones and packstones with porosity (average 11%) enhanced by fine fracturing. Reserves are estimated at 54 106m³ (roughly 1.9 Bcf) for a standard spacing unit.

Roughly 1 Mmcf/d was tested from the Slave Point Formation at Pan American Shell Kakisa F35-6100-11715, which was drilled in 1964 near the eastern shore of Kakisa Lake, approximately 90 kilometres west of Hay River. The pay zone at F35 averages 9% porosity near the top of the Slave Point, which consists of a highly fossiliferous packstone here. No reserve estimate was made for this location due to insufficient data.

The Rabbit Lake gas discovery, drilled in 1955, was the first gas discovery made in the NWT. Rabbit Lake is approximately 100 kilometres southwest of the community of Fort Providence. Two wells (Briggs Rabbit Lake No. 1 O16-6100-11845 and Briggs Rabbit Lake No. 3 B07-6100-11845) tested gas from the Sulphur Point Formation in a northeast trending horst structure, which was initially mapped as an anticline. The Sulphur Point Formation is a porous (average porosity 10%), fragmental and crystalline limestone consisting of packstones and grainstones. Surface mapping combined with data from a series of test holes enabled structural closure to be measured and a pool area of 3771 hectares to be determined. Reserves are estimated to be 496 106m³ (18.0 Bcf).

In 1973 gas was discovered at Pacific Amoco Tathlina N18-6020-11800 in the Slave Point Formation. This well is located south of Tathlina Lake, approximately 50 kilometres northwest of the Cameron Hills field. The reservoir rock consists of dolomitic light brownish grey wackestones to packstones with traces of leached pinpoint vuggy porosity (average 10%). Pool reserves are estimated at 131 106m³ (4.6 Bcf) within a standard spacing unit.