

Geometry and distribution of the low permeability sandstones of the Upper Colorado Group; Western Canada's largest gas reservoir

*Karsten Schjødt Nielsen and Claudia J. Schröder-Adams, Dept. of Earth Sciences, Carleton University, Ottawa,
Dale A. Leckie, Geological Survey of Canada*

Sandstones from the Upper Colorado Group are a major target in shallow-gas exploration in southeastern Alberta and southwestern Saskatchewan. The Medicine Hat Formation, the main reservoir in this interval, consists of at least three sandstones and is considered to be the largest gas reservoir in Western Canada.

The Medicine Hat Gas Field east and north-east of the Sweetgrass Arch is well-known for its biogenic gas production. This study describes the geometry and distribution of the sandstones in this area, and also the potential of other sandstones, which might act as reservoirs on the western and northern part of the Sweetgrass Arch.

The Medicine Hat Formation, in the Medicine Hat Gas Field, is characterised by three sandstone intervals which are separated by silty shale. They are named in ascending order D, C, and A sandstone. The distribution of the Medicine Hat Formation is limited to the flanks of the Sweetgrass Arch and not on its crest. This indicates that the Sweetgrass Arch was a paleohigh, which influenced sediment distribution patterns.

In the centre of the Medicine Hat Gas Field all sandstones are prominent, pinching out over a short distance eastwards towards Saskatchewan. To the north, only the stratigraphically highest sandstone (A) can be recognised, whereas towards the north-west, the C sandstone is well developed. The crest of the Sweetgrass Arch, dipping to the north-east, is characterised by a distinct lack of sandstone development. On the southwestern flank of the Sweetgrass Arch sandstone development exists with one coarsening-upward cycle. Detailed stratigraphic correlation shows the relationship between the three distinct sandstones of the gas field and these in more distal regions.

In the Medicine Hat Gas Field the uppermost of the A and C sandstones is heavily bioturbated, which has contributed to reservoir quality. The bioturbation decreases with greater distance to the gas field area indicating a paleoenvironmental change to deeper water.

The Medicine Hat Formation is overlain by the First White Speckled Shale, which is the sealing rock for the gas reservoirs. Sandstones within this shale, with possible gas potential, indicate continued influence of the arch on sedimentation in southeastern Alberta and southwestern Saskatchewan.