

Upper Cretaceous Belle Fourche Sandstone, Southeastern Alberta

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Abstract

The sandstone in the Belle Fourche Formation (BFF) in southeastern Alberta is called Second White Specks Sandstone in industry, and it is also called Belle Fourche Sandstone (BFS) because it lies within the BFF. Although the BFS is an important unconventional gas producer, its forming mechanism has not been clearly known.

Based on examination of about 20 cores and 500 well logs, the BFF is tentatively subdivided into six allomembers whose boundaries are major flooding surfaces. These allomembers show coarsening-upward facies successions from shale at the base to sandstone at the top. The BFS in the sixth allomember at the top of the BFF is the main gas-producing reservoir with a thickness of 2-3 m. It consists of several small fining-upward units with lower hummocky-stratified and low-angle cross-stratified fine sandstone and upper mudstone. The topmost unit is intensely bioturbated. The sedimentary characteristics suggest that the BFS was mainly deposited in wave-dominated inner-shelf to lower-shoreface environment. However, well data show that the BFS fines westward into shale in southwestern Alberta, and outcrops in the Rocky Mountain Foothills show the BFF consists of very fine sandstone and shale.

This study proposes that the uplifting of the Sweetgrass Arch as a peripheral forebulge of the Western Canadian Foreland Basin in the Cenomanian is a dominant control on sand concentration in southeastern Alberta. Sands were probably taken by geostrophic storm flow from basin margin hundreds of kilometer away in west and deposited in the inner-shelf to lower shoreface environment on the Sweetgrass Arch.