

Diagenetic history of the Bashkirian Grand Anse Formation, Maringouin Peninsula, southeast New Brunswick, Canada

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The lower Pennsylvanian Grande Anse Formation is exposed in the western part of the Cumberland Basin, including the Maringouin Peninsula of southeast New Brunswick. Based on the sedimentological analysis of coastal outcrops, several sandstone-mudstone depositional cycles have been recognized. Predominantly clean, pinkishgrey and reddish-brown, medium- to coarse-grained sandstone and conglomerate, chiefly quartz-rich arenite, were deposited as fluvial sedimentary rocks. Fine-grained facies include reddish-brown and minor bluish-grey siltstone, mudstone, and very fine- grained to fine-grained sandstone, deposited on associated floodplains.

Petrographic investigations indicate the Bashkirian strata have undergone minor clay infiltration and various diagenetic alterations. These include: (1) cementation by iron oxide which imparted the red colour to the sandstone and mudstone; (2) replacement of feldspar and muscovite by kaolinite in sandstone; interpreted to the influx of meteoric waters and alteration of unstable detrital grains under conditions of slight acidity (pH ~ 5). The formation of kaolinite is associated with the creation of intragranular porosity, and thus porosity enhancement; and (3) diagenetic quartz that occurs mainly as syntaxial overgrowths which partly to completely cover detrital quartz grains and fill either partially and/or wholly the adjacent intergranular pores. The distribution of quartz cement within depositional facies is controlled by the spatial and temporal extent of grain-coating clays, carbonate, and iron oxide cement. Cementation by quartz overgrowths has resulted in reduced porosity during late eodiagenesis. Several samples also indicate unusual replacement of carbonate by silica and multiple intergrowths of the two. Timing of these phases is uncertain and may have occurred during early burial diagenesis of lacustrine or palustrine sediments or silicification of paleosols, or during later telogenetic uplift. However, the replacements and intergrowths of carbonate and silica in the fluvial sediments suggest more alkaline conditions with fluctuating pH of ~ 9.