

A geophysical, petrological, and reservoir potential study of the Glass Sand marker unit and associated sandstones in the Upper Horton Bluff Formation, Horton Group, Windsor Basin, Nova Scotia, Canada

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A geological evaluation of sandstones in the upper Horton Bluff Formation (uHBF) was undertaken to determine the reservoir potential with emphasis on the Glass Sand marker unit (GS_{mu}). Multiple wells have been drilled in the Windsor Basin, Nova Scotia, targeting quartz arenite sandstones in the uHBF, yet there has been no production to date. This project was initiated to identify whether these sandstones have the ability to conventionally store and transmit hydrocarbon in economic quantities.

Wireline logs of the uHBF from 6 wells show multiple clean sand units that have API readings between 35 and 45. Based on an interpretation of gamma ray returns, these units typically coarsen upwards and may represent marine parasequences. A basin-wide mature quartz arenite bed conforming to strip log and outcrop descriptions by earlier workers, is identifiable in only two of these cores, which indicates that the facies consistent with the GS_{mu} is not a basin-wide phenomenon. Strip logs describe multiple occurrences of well indurated, texturally mature quartz arenite commonly interbedded with black carbonaceous shales; petroliferous odours and signs of degassing were common and noted in well reports. The quartz arenite beds within the uHBF are characterized by hummocky cross-stratification and ichnofacies consistent with a shallow marine setting and represent the uppermost portion of a marine parasequence. Thin section analysis and liquid porosity and permeability testing were performed on both core and outcrop samples within this sequence at a variety of locations and have yielded porosities averaging 11% with permeability readings <1 mD. Thin section analyses indicate that these sands are compositionally and texturally mature and that burial diagenesis is common. Preservation of mica and feldspar minerals in core samples was evident and also contributes to diminished porosity and permeability at depth.

The Glass Sand marker unit does not appear to be a reliable basin-wide marker unit and we recommend that this designation be discontinued. As well, the mature sands within uHBF do not appear to have conventional reservoir potential, although their proximity to thick and brittle carbonaceous shales facilitate development by unconventional processes.