Bedrock Topography and Drift Thickness Mapping of the Zama Lake Area, NTS 84L: Implications for Shallow Gas

John G. Pawlowicz*, Adrian S. Hickin, Mark M. Fenton and Roger C. Paulen
Alberta Geological Survey, Alberta Energy and Utilities Board
4th Floor, 4999 – 98 Avenue, Edmonton, AB T6B 2X3
John.Pawlowicz@gov.ab.ca

ABSTRACT

Shallow gas is present in Quaternary sediments in the Zama Lake area and is currently being produced from depths as shallow as 50 m in the Sousa gas field. As part of a multi-year multidisciplinary collaborative program between the Alberta Geological Survey, Geological Survey of Canada and the British Columbia Ministry of Energy and Mines, Quaternary stratigraphic studies are being conducted in the Zama Lake area (NTS 84L). One of the project objectives is to model the bedrock topography and drift thickness, providing crucial information on the Quaternary stratigraphy, sediment characteristics, and glacial history. The work will have direct implications for Quaternary-hosted shallow gas in northwestern Alberta and other areas with similar geology.

The present day landscape in northern Alberta is largely a result of the multiple glacial advances and retreats during the Quaternary. The bedrock is almost entirely covered by drift, which in part masks both the broad uplands and the deep preglacial valley systems. Over 100 m of drift is present throughout much of the Zama Lake region, with local areas attaining thicknesses greater than 300 m. Our work has identified several topographic depressions in the bedrock surface that are interpreted to represent these deeply buried valleys of glacial or pre-glacial origin. Many contain fluvial sediments near their base overlain by tills and/or glaciolacustrine clay units separated by glaciofluvial sediment. The basal sediments commonly are sands and gravel of either preglacial or glacial age. The tills and glaciolacustrine deposits are characteristically denser and fine-grained, and act as impermeable beds within the Quaternary package. Fluvial and glaciofluvial sequences, at the base and within the drift, potentially form gas reservoirs and/or aquifers. In places the valleys have intersected gas-bearing zones in the bedrock such as the Bluesky Formation and it is speculated that the hydrocarbons have migrated from the bedrock through the permeable fluvial and glaciofluvial sediments and become trapped by the impermeable units. Alternatively, gas migration from the bedrock into Quaternary sediments may have occurred through conduits formed from fractures in the bedrock associated with known or inferred faults.