



## **Geological Property Modelling in Support of the Safe Closure of the Medicine Hat – Alderson Gas Field in Southeastern Alberta, Canada.**

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### **ABSTRACT**

Concurrent production of natural gas (termed 'commingling') from the Medicine Hat Member of the Upper Cretaceous Niobrara Formation and the Alderson Member of the Upper Cretaceous Lea Park Formation in single boreholes throughout southeastern Alberta has been occurring since 1973. Many existing gas wells are nearing the end of their commercial life. The question being asked by the Alberta Energy Regulator is, "Will residual natural gas in the gas zones escape through the natural petroleum trap up-dip to aquifer-bearing units if the gas zones are left commingled after the fields are permanently closed?" In answering this question, it was found that many conceptual models existed showing different, but plausible, understandings of: 1) the interconnection of reservoirs within the gas field; 2) the strength of seals isolating gas-bearing from water-bearing zones; 3) the connection between the gas-bearing and water-bearing portions of the Medicine Hat/Alderson/Milk River system; and 4) the controls on regional groundwater flow. Resolving these conceptual model differences required a deeper understanding of the properties of the geological units than had ever been done previously. Geophysical logs from more than 5 000 wells were used to determine rock properties of the Medicine Hat and Alderson members, and of the Milk River Formation. Subsequent 3D geostatistical modelling of these properties reveal the internal structure of these geological units and provide insights to the: 1) gas distribution, 2) reservoir and seal properties; 3) higher permeability pathways within and between units, and 4) diversity of well completion strategies amongst operators. The results will be subsequently used in multiphase flow models to better understand gas migration and groundwater flow as natural gas production and groundwater use evolve over time. Ultimately the results of the geological and hydrogeological modelling approaches are to inform a safe closure strategy for the Medicine Hat-Alderson gas field.