Moving beyond ‘salt thickness’: a detailed assessment of lithological heterogeneity within salt-bearing evaporite successions in the Elk Point Group of Alberta

Characterizing Heterogeneities in Elk Point Group Evaporite Successions

• The regional distribution of salt potential within the Elk Point Group, both at the reservoir and contact level, is characterized by a significant spatial variability. Detailed mapping of evaporite thickness, contacts, and quality is essential for accurate assessment of reservoir quality and potential for cavern development.

• Salt thickness alone, while an important parameter, is not sufficient to fully define the heterogeneity of the evaporite succession. Other factors such as contact morphology, quality, and variations in evaporite composition must be considered.

• The Prairie Evaporite displays the greatest variation in average salt bed thickness and non-salt interbeds (graphs above), in contrast to the more uniform beds in the Waterton, Shell Lake, and Whitkow Members. This variation is likely influenced by differences in depositional environments and diagenetic processes.

• The Waterton, Shell Lake, and Whitkow Members show less variation in average thickness and non-salt interbeds compared to the Prairie Evaporite. These differences are likely related to variations in depositional environments and diagenetic histories.

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• Many factors beyond general ‘salt thickness’ need to be considered for cavern placement in the subsurface of Alberta. Bedded evaporite basins exhibit a wide range of salt bed thicknesses, and the variation in thickness and interbedding can significantly impact cavern development.

• The Prairie Evaporite spans the range of salt potential, from low to high, and exhibits a wide range of salt bed thicknesses and non-salt interbeds. This variability must be considered when evaluating the suitability of the Prairie Evaporite for cavern development.

• The Waterton, Shell Lake, and Whitkow Members show a more uniform distribution of salt potential and salt bed thicknesses, with less variation compared to the Prairie Evaporite. These differences can be attributed to variations in depositional environments and diagenetic processes.

A 5% net salt cut-off is applied for cavern development. In the Prairie Evaporite, the average thickness of salt beds is 2 m, with some areas exhibiting greater thickness. The Waterton, Shell Lake, and Whitkow Members show a more uniform distribution of salt potential, with average thicknesses of 1–2 m. The Prairie Evaporite displays the greatest variation in average salt bed thickness and non-salt interbeds, with some areas having thicknesses of up to 4 m.