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Distribution of Potash-Rich Members of the Prairie Evaporite Formation in Saskatchewan

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A geophysical-log study of about 1500 non-confidential wells has resulted in refinement of the stratigraphic framework of the potash-rich members. These revised stratigraphic correlations may have a bearing on the potential for further potash-mine development within Saskatchewan. Isopach and salt-back thickness maps of the potash-rich members of the Prairie Evaporite Formation are now available on the Saskatchewan Ministry of Energy and Resources website (Open Files 2009-24 to 2009-29).

The four potash-rich members previously recognized within the upper part of the Middle Devonian Prairie Evaporite Formation in Saskatchewan are, in ascending stratigraphic order, the Esterhazy, the White Bear, the Belle Plaine and the Patience Lake.

The top of the Esterhazy Member is easily identified in most wells at the top of the lowermost sequence of potash-rich layers, but the base can be placed only arbitrarily in wells where the lower portion of this member contains small amounts of potash. The thickness of the member ranges from zero to a maximum of 26 m in well 121/04-16-018-23W2. The thickness of this member exceeds 6 m primarily between Townships 10 and 33, Range 2W3 to the Manitoba boundary.

The White Bear Member, which is separated from the underlying Esterhazy Member by halite beds, is composed of beds of low-grade sylvinite and halite with clay seams. Its thickness ranges from zero to a maximum of 9.6 m in southeastern Saskatchewan, where it is most fully developed. The distribution of the White Bear Member is, in general, inconsistent.

The Belle Plaine Member ranges in thickness from zero to a maximum of 23 m in the area surrounding well 101/06-12-038-04W3. The upper boundary is picked at the top of a consistent clay bed that immediately overlies the uppermost potash-rich bed, and the lower boundary is picked at the base of the lowermost potash-rich bed. This member has a thickness greater than 6 m predominantly in the area between Townships 12 and 42, Range 30W1 to Range 2W3.

The Patience Lake Member is the uppermost potash member of the Prairie Evaporite Formation. It attains a maximum thickness of 27 m at well 101/01-12-035-26W2. The topmost layer of this member is made up of halite with clay bands beneath which are potash-rich beds. This member has a thickness of greater than 6 m predominantly between Townships 10 and 45, Range 8W2 to Range 24W3.

West-east structural cross-sections illustrate a general westward deepening of potash members and westward backstepping from the lowermost Esterhazy Member to the uppermost Patience Lake Member. North-south structural cross-sections show an overall southward deepening and thinning of potash members.

Apart from the White Bear Member, the potash-rich members appear to show relatively continuous distribution. They have, however, been observed to disappear locally over a distance of a few hundred metres without any change in total thickness of the Prairie Evaporite Formation. Elsewhere, the entire potash-rich upper part of the Prairie Evaporite Formation is absent, resulting in a significant reduction in the thickness of the formation. Identification of these anomalies is crucial to potash exploration.

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