Paper No. 59-2

Presentation Time: 1:30 PM-5:30 PM

SEDIMENTOLOGICAL MODELS OF THE WATERLOO MORAINE FOR GROUNDWATER APPLICATIONS, SOUTHERN ONTARIO

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Source water protection legislation in Ontario will require significant improvement in the knowledge of aquifer units with respect to distribution, extent and internal heterogeneity. Moraines form significant recharge areas of many watersheds in southern Ontario; however, in over 100 years of mapping moraine distribution, few studies have investigated moraine composition. The Waterloo Moraine provides ~60 % of the municipal water supply of the Waterloo Region. The groundwater system of the moraine has been extensively modeled, yet it does not have a well-defined depositional model or understanding of the flow unit geometry.

The Waterloo Moraine covers a 400 km2 area of dissected hummocky terrain with a circular, spoke-like arrangement of stratified ridges. The moraine consists of up to 60 m of stratified sediment that overlies the regional Late Wisconsinan Catfish Creek Till. Borehole logs of the moraine indicate that the gross sediment composition is silty sand with lesser amounts of mud, diamicton and gravel.

Subsurface analysis indicates that gravel within the moraine is concentrated in a northwest-trending mound flanked by extensive sand deposits. Paleoflow measurements in gravel appears to parallel the northwest-trending structure. Sediment geometry and facies are arranged in two upward and laterally fining sequences that trend from gravel to mud.

Sediment facies and sediment architecture of shallow aggregate sections (< 25 m) suggest deposition from a few high-energy flow events. Deeper deposits are characterized by evidence of rapid sedimentation, bed aggradation, and fluidal and hyperconcentrated flows. Shallower deposits, however, contain a higher percentage of cut and fill structures suggesting lower rates of bed aggradation that are indicative of variable meltwater discharge to the moraine. The moraine was deposited in an ice-confined conduit with lateral subaqueous fan sedimentation. Evidence of an glacilacustrine setting is provided by horizons of mud and abundant fine-grained silty sand lateral to the main paleoflow.

2005 Salt Lake City Annual Meeting (October 16–19, 2005)
General Information for this Meeting

Session No. 59--Booth# 75
Innovations in Geological Mapping (Posters)
Salt Palace Convention Center: Hall C
1:30 PM-5:30 PM, Sunday, 16 October 2005

Geological Society of America *Abstracts with Programs*, Vol. 37, No. 7, p. 144