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#### ABSTRACT

Time Domain Electromagnetic (TEM) methods have long been used for hydrogeological / groundwater studies. Investigations into hydrostratigraphic units are common because of the ability to map aquifer properties based on grain-size, which is commonly related to electrical conductivity contrasts in the subsurface. However, surface conditions often limit access to some areas, such as densely forested regions, abundant infrastructure, or surface water bodies.

This investigation showcases the use of Geonics Ltd.'s G-TEM system applied in a mobile acquisition setup for waterborne TEM. The goals of the survey were to map the continuity / composition of a conductive glacial clay till unit, underlying a surficial water body. The G-TEM system allowed rapid, high-resolution acquisition across the lake for hydrostratigraphic mapping and evaluation of the clay till aquitard. The lake itself is fed by surface run-off and shallow groundwater, with an inconclusive level of influence from deeper groundwater that may feed into the lake from below the clay till.

Variations in the clay till may indicate zones of interests for possible hydrogeological pathways. Preliminary results showed variability in depth to both the top and base of the clay till. These variations may suggest a connection between structures in the deep underlying units and the glacially deposited till unit. Ground results from the GTEM compared favorably to previously acquired ground TEM surveys when the lake was frozen, as well as two boreholes used for ground-truthing. The results of this survey will be used to identify zones of interest based on variations in the clay till, which will help guide strategic drilling locations to verify the models and further evaluate hydrogeological processes into/out of the lake.