

## HELICOPTER TIME-DOMAIN EM RESULTS OVER THE WAHPETON AQUIFER, FARGO, NORTH DAKOTA

Jean M. Legault<sup>1</sup>, Geoffrey Plastow<sup>1</sup>, Jared D. Abraham<sup>2</sup>, Theodore H. Asch<sup>2</sup>, David Hisz<sup>3</sup> and H. Scott Parkin<sup>3</sup>

1 - Geotech Ltd., Aurora, ON

2 - Aqua Geo Frameworks LLC, Mitchell, NB

3 - North Dakota State Water Commission, Bismarck, ND

jean@geotech.ca, geoffrey.plastow@geotech.ca, jabraham@aquageoframeworks.com,  
tasch@aquageoframeworks.com, dhisz@nd.gov, sparkin@nd.gov

*EEGS Annual Meeting  
Nashville, Tennessee USA  
March 25-29, 2018*

### Simple Abstract

Buried valley aquifers, consisting of permeable sand and gravel deposits in glacial and bedrock valleys, are important sources of groundwater supply in many regions of the United States and Canada. These aquifers have been difficult to define because they are often partially eroded, have complex lithology, and are hidden by other shallow sand and gravel aquifers within thick glacial overburden.

Investigations of the Spiritwood glacial aquifer near Jamestown, North Dakota, in October, 2016, by the North Dakota State Water Commission (NDWC) showed that airborne time domain electromagnetic (TDEM) surveys could be used in aquifer mapping and characterization. Using a VTEM helicopter TDEM system, the resistivity contrasts between the relatively resistive Quaternary glacio-lacustrine sand-gravels that are relatively permeable and low resistivity clay-tills that are relatively impermeable, allowed them to be mapped above the much less resistive Cretaceous Pierre Formation Shale basement rocks. These results were presented at SAGEEP in 2017.

Following the survey success on the Spiritwood JT survey, the NDWC commissioned another VTEM survey over the nearby Wahpeton survey block in Fall, 2017. The Wahpeton survey consisted of nearly 2000 line-km of coverage along a roughly 10-20 km wide by 100 km long north-south corridor, lying just west of the Red River and the Minnesota State border, and roughly extending from the city of Fargo to the north, to Wahpeton in the south.

The VTEM data collected over the Wahpeton Aquifer System have been inverted with a layered-earth algorithm to produce resistivity-depth models. These models resolve the location and depths to the top and bottom of the aquifers, providing more detailed pictures of the aquifer geometry. Advanced processing and inversion complemented with integration of existing data (i.e. well data, hydrogeological data) allowed a superior image of the aquifers in 3 dimensions providing the State with an enhanced framework for groundwater management.