

2009 Portland GSA Annual Meeting (18-21 October 2009)

Paper No. 75-12

Presentation Time: 10:55 AM-11:10 AM

THE USE OF ISOTOPIC TRACERS IN UNDERSTANDING THE HYDROGEOLOGY OF THE OAK RIDGES MORAINES, SOUTHERN ONTARIO, CANADA

[HENKEMANS, Emily](#), Earth Science, University of Waterloo, Waterloo, ON N2L 3G1, Canada, emily.henkemans@gmail.com, FRAPE, Shaun K., Earth & Environmental Sciences, University of Waterloo, 200 University Avenue West, Waterloo, ON N2L 3G1, Canada, METEER, Laura, Water Resources, Environmental Services, York Region, 17250 Yonge St, Newmarket, ON L3Y6Z1, Canada, and GERBER, Richard, Oak Ridges Moraine Hydrogeology Program, 70 Canuck Avenue, Building 100, Downsview, ON M3K 2C5, Canada

The Oak Ridges Moraine is located north of Toronto in Southern Ontario, Canada and runs 160 km west from the Niagara Escarpment to Rice Lake. Flow system understanding in the area is complicated by tunnel channels eroded through the Newmarket Till and Thorncliffe Aquifer as well as by a system of north-south trending bedrock valleys eroded as part of the Laurentian River system, once the main drainage course for the Great Lakes basin. The study focuses on York Region where a number of communities are reliant either wholly or in part on groundwater resources from regional aquifers. As such, understanding the regional flow system is a priority to ensure safe and consistent drinking water supplies.

As a source water protection initiative York Region began a detailed isotopic study of groundwater in the aquifers of the Oak Ridges Moraine complex in 2008. Samples were taken from shallow, intermediate and deep aquifers along three north-south running transects in York Region in 2008 and 2009. Further samples were furnished by the Toronto Region Conservation Authority. Data from isotope tracer tests extending back to the early 1990s (Gerber et al, 2009) provides historic data as well as a more regional context for the study. Samples were analyzed for inorganic chemical parameters, ^{18}O , ^2H and ^3H . A small subset of samples were age dated using ^{14}C with some samples shown to be greater than a thousand years old.

Younger, post-glacial recharge water has flushed much of the older water from the system. Some of this isotopically depleted water, recharged during colder climatic conditions, remains in the vicinity of bedrock valleys to the north of the drainage divide and beneath the drainage divide where overburden is thickest. Chemical and isotopic results confirm that tunnel channels provide windows through an otherwise regionally extensive aquitard separating the shallow and intermediate aquifers. Tunnel channels, where a downward gradient exists, provide recharge to the deeper aquifers but also present a potential conduit for contaminants and thus should be considered in source water protection planning.

Gerber, R., Holysh, S., Doughty, M., Frape, S., Henkemans, E., and Kemp, W., 2009. Flow system dynamics: isotopic tracer studies, south-central Ontario. Proceedings of Joint CGS-IAH/CNC Annual Conference, Halifax, September 2009.

[2009 Portland GSA Annual Meeting \(18-21 October 2009\)](#)

[General Information for this Meeting](#)

Session No. 75

[Buried Valley Aquifers: From Bedrock to Sediment Hosted Tunnel Valleys](#)

Oregon Convention Center: B113

8:00 AM-12:00 PM, Monday, 19 October 2009

Geological Society of America *Abstracts with Programs*, Vol. 41, No. 7, p. 215

© Copyright 2009 The Geological Society of America (GSA), all rights reserved. Permission is hereby granted to the author(s) of this abstract to reproduce and distribute it freely, for noncommercial purposes. Permission is hereby granted to any individual scientist to download a single copy of this electronic file and reproduce up to 20 paper copies for noncommercial purposes advancing science and education, including classroom use, providing all reproductions include the complete content shown here, including the author information. All other forms of reproduction and/or transmittal are prohibited without written permission from GSA Copyright Permissions.
