Investigation into potential controls on uranium concentration in new production wells intercepting a Triassic sandstone aquifer, Bridgetown, Nova Scotia

D. Finlayson-Bourque and G. W. Kennedy
Nova Scotia Department of Natural Resources, 1701 Hollis Street, PO Box 698, Halifax, Nova Scotia B3J 2T9, Canada
<kennedgw@gov.ns.ca>

The Town of Bridgetown overlies one of Nova Scotia's most productive sedimentary bedrock aquifers. As an alternative to the expensive upgrades required to the existing surface water system, the town investigated the potential for a new groundwater supply from this aquifer. A groundwater exploration program was initiated in 2006 and involved the installation of three open-hole test wells and a series of pumping tests and inorganic chemistry analyses. Total uranium was found to be elevated (maximum of 15 µg/L) but below the Canadian Drinking Water Quality interim maximum acceptable concentration of 20 µg/L, and appeared to be stable based on the results of a 30 day pumping test. The town decided to pursue a groundwater supply option and converted two of the test wells into partially screened larger diameter production wells in 2007. The new production wells showed higher concentrations of uranium during pump testing, with a maximum observed concentration of 27 ug/L.

To investigate the mechanism for the increase in uranium in the production wells compared to the test wells a series of investigations followed, including additional pumping tests, depth-discrete sampling, a packer test, and aqueous leachate testing of rock cuttings from the remaining test well. The results of these investigations suggest a redox control on uranium concentration. Greater drawdowns occur where well screens are present, leading to the development of more oxidized conditions which favour the mobilization of uranium. The findings have guided wellfield remedial actions, including the conversion of the remaining test well to a fully screened production well to minimize drawdown. Given that Triassic sedimentary aquifers in the Annapolis Valley are widely used as a groundwater source and have been associated with the potential for elevated uranium, an improved understanding of the controls influencing the mobility of uranium in groundwater could help other water users in the area to address similar concerns.

Atlantic Geology, 2010, Volume 46, Number 1