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2007 Ground Water Summit

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Ground Water Sources and Pathways to a Public-Supply Well in a Glacial Aquifer System, Woodbury, Connecticut

Craig J. Brown, PhD and J. Jeffrey Starn, U.S. Geological Survey

A glacial aquifer system was studied to identify factors that affect the ground-water quality in the contributing area to a community-supply well (CSW) in Woodbury, Connecticut. The distribution of pH, major and minor elements, stable isotopic values, recharge temperatures, dissolved organic carbon, and volatile organic compounds were used to identify recharge source areas, aquifer source material, anthropogenic sources, chemical processes, and ground-water pathways from recharge areas to receptors. Ground water in glacial stratified deposits contributes most of the water to the CSW and is young (< 6 yrs), mostly oxic, and provides most of the ground water to the community supply well (CSW). Ground water in fractured bedrock beneath the valley bottom contributes old (>50 yrs), reduced water of higher pH and ionic strength that comprises up to 11 percent of samples taken near the bottom of the glacial aquifer. Dissolved arsenic and uranium concentrations generally are near the reporting level, but a few wells screened in glacial deposits that are likely derived from underlying organic-rich Mesozoic shales, contain arsenic concentrations up to 7 µg/L. Septic-tank drainfields, road salting, chemical spills, stormwater drains, and lawn fertilizers, also provided contaminant sources to the CSW. Comparison of chloride concentrations and Cl/Br ratios indicates that most samples result from mixing of ground water and road salt or sewage. Leachate from septic-tank drainfields results in locally reduced conditions with nitrate concentrations up to 19 mg/L. Locally high concentrations of gasoline oxygenates (MTBE) and chlorinated solvents (PCE, TCE, and 1,1,1 TCA), and low concentrations of disinfection byproducts were detected in several wells including the CSW. Concentrations of TCE in raw water sampled from the CSW frequently exceeded the MCL of 5 µg/L.

Craig J. Brown, PhD, U.S. Geological Survey Craig Brown is a hydrologist with the U.S. Geological Survey. His research interests include aquifer geochemistry and processes associated with the mobilization and transport of trace elements in aquifer systems. He is currently working on studies of transport of anthropogenic and natural contaminants to public supply wells for the National Water-Quality Assessment Program, and the geochemical implications of Aquifer Storage and Recovery.

J. Jeffrey Starn, U.S. Geological Survey Jeff Starn has been a hydrologist with the Federal government for over twenty years. He has worked overseas with the Peace Corps, with the USEPA in Region IV, and with the USGS in the Kentucky and Connecticut Water Science Centers. His current interests include probabilistic ground-water modeling and using combined

watershed and ground-water models to help better understand hydrologic processes in glacial/crystalline rock aquifer systems.

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