Evaluation of urban public supply well vulnerability from leaking sewers using geochemistry, microbiology, and geomechanics

Christopher Gellasch, Assistant Professor, Uniformed Services University

Approximately one third of the U.S. population uses public supply wells (PSWs) as their drinking water source and recently a greater focus has been placed on assessing the risk of contaminants entering these wells. A variety of field methods can be used to better understand the primary mechanisms that control the transport of wastewater contaminants from leaking sewers into bedrock multi-aquifer systems and to develop effective methods for assessing the vulnerability of PSWs in such settings.

In a siliciclastic aquifer near a public supply well, fractures may have an important role in the transport of sewer-derived wastewater contaminants. Reverse water-level fluctuations (RWFs), a phenomenon in which water levels rise briefly in response to pumping, may influence contaminant transport. Data from pressure transducers located at varying depths and distances from a PSW suggest that the RWFs propagate rapidly through fractures to influence wells hundreds of meters from the pumping well. The pattern of RWF propagation can be used to better define fracture connectivity in an aquifer system.

Time sequenced sampling for geochemical wastewater indicators and human enteric viruses is a useful tool for characterizing transport within an aquifer system. There is an apparent connection between recharge events and increased flow in sanitary sewers and, based on limited data, these increased wastewater flows appear linked with virus detection in groundwater at short times after these events. In order to accurately assess the vulnerability of PSWs to near surface contaminants it is important to characterize fracture flow and the impact of PSW pumping.

Lt. Col. Christopher Gellasch is a career Army officer currently serving as an assistant professor and the Environmental Sciences Graduate Program Director at the Uniformed Services University of the Health Sciences in Bethesda, MD. He received his Ph.D. in Geology from the University of Wisconsin-Madison. His research combines aspects of hydrogeology and environmental engineering to determine the most likely pathways for near-surface contaminants to migrate through the subsurface and impact public supply wells.

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