

Project Summary

Title: An Analysis of Arsenic Replacement Wells to Determine Validity of Current Department of Natural Resources Guidance

Investigators: Kelley O'Connor, WDNR, Northeast Region, Green Bay
Marcy McGrath, WDNR, Northeast Region, Green Bay
Keld Lauridsen, WDNR, Northeast Region, Green Bay

Project ID: 156

Period of Contract: August 2000 – June 2002

Background/Need: The occurrence of arsenic in groundwater in parts of Northeast Wisconsin was first identified in 1987 during a routine feasibility study for a proposed landfill location in the town of Vinland, Winnebago County, and has been an ongoing problem since that discovery. Drinking water wells near the proposed landfill site were sampled for background parameters to develop baseline data on groundwater quality in the area. When many of the samples were found to have higher arsenic levels than would be expected for background parameters, an investigation ensued and it was determined that the arsenic in this area is naturally occurring. Since that time, several studies have been undertaken to determine the extent of the problem. Some of these studies have focused on providing solutions to property owners who rely on private wells for drinking water and well drillers who need to be able to advise their customers on the best well drilling techniques to prevent or dramatically reduce the amount of arsenic in potable wells. Based on these studies, the Wisconsin Department of Natural Resources (WDNR) delineated an Arsenic Advisory Area (AAA) and provided recommendations for drilling wells in this area. To determine if the WDNR's recommendations were having the intended result of eliminating or dramatically reducing the amount of arsenic in potable wells, it was necessary to conduct arsenic sampling of wells in the AAA that were constructed according to these recommendations and compare these results to other wells in this area that were not constructed with any precautionary measures. This study attempted to test the validity of the WDNR's recommendations, and ultimately to advise the WDNR if the guidance should become mandatory or if modifications to the guidance are warranted.

Objectives: There were four objectives to this study:

1. Determine if the current well construction guidance is eliminating or reducing naturally occurring arsenic in potable wells.
2. Observe the effect of seasonal changes on arsenic levels.
3. Examine if the degree of arsenic contamination increases over time.
4. Discover which physical factors are potentially contributing to the "failure" of reconstructed or replacement wells.

Methods: Letters were sent to select potable well owners located in the area of interest asking them to participate in this study. A total of 64 wells were included. Drinking water samples were collected from selected wells during five separate

sampling events over a period of 18 months, from November 2000 to April 2001. Samples were laboratory analyzed for arsenic, and some sampling events included analysis for iron, conductivity and pH.

Results/Discussion: While the issue is complex and there are many variables, in general, the sampling results did not provide strong evidence for the WDNR to continue their current guidance of recommending that drillers case wells a minimum of 80 feet into the St. Peter Sandstone (StP).

Recommendations: Our recommendation is that well drillers go beyond the “80 feet” guidance and follow the WDNR’s most recent (2004) recommendation to drill wells that avoid drawing water from the StP. In addition, we recommend that sampling be performed on a regular basis and that local units of government educate their residents in the Arsenic Advisory Area of the health effects of arsenic and provide a sustainable methodology for sampling (e.g., initiate annual or semi-annual Town Based Sampling events).

Related Publications: Weissbach, A, Heinen, E., and Lauridsen, K. A study of well construction guidance for arsenic contamination in Northeast Wisconsin. WDNR, December, 1998.

Key Words: Arsenic, Groundwater, Potable Wells, St. Peter Sandstone, Northeast Wisconsin

Funding: Wisconsin Department of Natural Resources

Final Report: A final report containing more detailed information on this project is available for loan at the Water Resources Institute Library, University of Wisconsin - Madison, 1975 Willow Drive, Madison, Wisconsin 53706 (608) 262-3069.