ARSENIC IN BEDROCK WELLS IN CONNECTICUT

by

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ABSTRACT

Samples collected from private bedrock wells in two areas in Connecticut were analyzed to evaluate the relative importance of bedrock type and redox chemistry on the occurrence and mobility of arsenic in bedrock. Samples were collected from wells along transects in two areas where (1) bedrock is known to contain arsenic-bearing minerals, or (2) arsenic concentrations have been high in water from bedrock wells. Samples also were collected from wells in adjacent bedrock types that were not expected to have a high arsenic content. Each transect included 20 wells. Total and dissolved arsenic, redox-sensitive constituents (dissolved oxygen, iron, and sulfide), and major dissolved ions in the water from specific bedrock types were analyzed to help determine the sources and pathways of arsenic in bedrock wells.

Dissolved arsenic concentrations were below the detection limit (< 0.18 μg/L) in 16 of the 20 wells in the towns of Colchester and East Hampton. Arsenic concentrations showed little or no difference in samples from wells in the Hebron gneiss and the Brimfield schist, but concentrations of dissolved iron and manganese were higher in the Brimfield schist. In northeastern Connecticut, where arsenic concentrations in bedrock wells have historically been high, seven wells had dissolved arsenic concentrations higher than 0.18 μg/L. Six of these wells were in the Hebron gneiss near South Woodstock. Samples from three of these wells had dissolved arsenic concentrations that exceeded the new USEPA arsenic standard (10 μg/L)—24 μg/L, 23 μg/L, and 14 μg/L, and total arsenic concentrations as high as 39 μg/L. Unexpectedly, arsenic concentrations were highest in wells that had oxic water and low concentrations of dissolved iron. Water from five of the wells in Woodstock with the highest arsenic concentrations had pH levels > 7.7; this suggests that arsenic occurrences could be related to the desorption of arsenate at high pH. The higher pH in wells in the Hebron gneiss in Woodstock compared to that in the Hebron gneiss in the Colchester-East Hampton area probably results from higher concentrations of calcite in the Woodstock rock. The composition of the Hebron gneiss ranges from an interbedded quartz-biotite-plagioclase schist and calc-silicate gneiss in the Colchester area to a well-layered feldspathic biotite-quartz schist in the South Woodstock area; previous studies of the Hebron gneiss do not indicate the local presence of arsenic-bearing minerals, but whole-rock chemistry data are lacking. Small pegmatite intrusions and vein-filled fractures are common throughout the Hebron gneiss and may be a source of arsenic-bearing minerals. Further study will be necessary to determine whether the high frequency of arsenic occurrences is from arsenic within the Hebron gneiss, from overlying glacial deposits, or from anthropogenic contamination, such as the application of pesticides that contain arsenic.

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