Quality of Ground Water in the Upper Arkansas River Basin from Buena Vista to Salida, Colorado, 2000 – 2003

This document summarizes the quality of ground water in the Upper Arkansas River Basin from Buena Vista to Salida, as presented in U.S. Geological Survey Scientific Investigations Report 2005-5179, "Hydrogeology and Quality of Ground Water in the Upper Arkansas River Basin from Buena Vista to Salida, Colorado, 2000 – 2003," by Kenneth R. Watts. The report is available at http://pubs.usgs.gov/sir/2005/5179/. The reader is also referred to U.S. Geological Survey Water-Resources Investigations Report 82-4114, "Water-Resources Appraisal of the Upper Arkansas River Basin from Leadville to Pueblo, Colorado," by Crouch and others (1984), which is available at http://pubs.er.usgs.gov/pubs/wri/wri824114.

Summary

Ground-water samples were collected in the Upper Arkansas River Basin between Buena Vista and Salida during September and October 2001 from 39 water-supply wells (32 in the alluvial-outwash aquifer and 7 in the basin-fill aquifer) to characterize the general physical properties and chemical characteristics of ground water in the study area. The data can be accessed from the World Wide Web at the following Web sites: http://waterdata.usgs.gov/nwis/qw/ or http://co.water.usgs.gov/.

Ground water in the upper several hundred feet of the alluvial-outwash and basin-fill aquifers generally is calcium-bicarbonate water type with less than 250 mg/L (milligrams per liter) of dissolved solids. Dissolved-solids concentrations in the alluvial-outwash aquifer ranged from 58 to 282 mg/L and were less than the nonenforceable secondary maximum contaminant level for dissolved solids of 500 mg/L. In general, concentrations of dissolved solids tended to increase from recharge to discharge areas because ground water is in contact and can react with minerals in the aquifer as it flows down-gradient. Because ground-water flow in the alluvial-outwash aquifer is relatively rapid, residence times in the aquifer are short and changes in concentrations and chemical composition of the ground water are relatively small. Concentrations of dissolved solids in water sampled from 7 wells completed from the basin-fill aquifer ranged from 104 to 517 mg/L.

Nitrite plus nitrate concentrations in water from both aquifers ranged from 0.05 to 6.3 mg/L, and all sample concentrations were below the Colorado Department of Public Health and Environments drinking-water standard of 10 mg/L. However, concentrations of nitrite plus nitrate, as nitrogen, in 3 of 32 samples from the alluvial-outwash aquifer were greater than the background level of 1-2 mg/L, indicating localized potential anthropogenic sources from the surface, such as septic systems or agricultural sources. As the population of Chaffee County increases, further study of nitrate in ground water may be needed to evaluate potential increases in nitrate loads from septic systems.

The small concentrations of dissolved nitrate, orthophosphate, and phosphorus measured from samples collected from the basin-fill aquifer did not indicate contamination from surface sources (agricultural or sanitary waste); however, only seven samples were collected from the basin-fill aquifer, and additional sampling would be needed to confirm these preliminary results.

Comparison of Water Quality between the Alluvial-Outwash and Basin-Fill Aquifers

In general, water from the alluvial-outwash aquifer contained less dissolved solids than water from the basin-fill aquifer. Median concentrations of dissolved solids in samples from the alluvial-outwash and basin-fill aquifers were about 108 and 224 mg/L, respectively. Samples from the alluvial-outwash and basin- fill aquifers, with a few notable exceptions, had similar proportions of the major cations and anions. Water from both aquifers is typically a calcium-bicarbonate water type. Because the samples collected for this study from the basin-fill aquifer were from relatively shallow wells, no inferences can be made with these data on the quality of water from deeper in the basin-fill aquifer. The electrical-resistivity sections measured in a previous study indicated a downward decrease in electrical resistivity of the subsurface in the study area, which can be interpreted as indicating upward decrease in clay content or dissolved-solids concentration in ground water, or both, in the upper 500 to 1,000 ft of the basin-fill deposits. The shapes of the resistivity profiles (Crouch and others, 1984, fig. 2) support the preliminary cross-sectional models of ground-water flow with downward flow of recharge with low dissolved-solids content (low specific conductance) on the western (upgradient) side of basin and upward flow of water with relatively high dissolved-solids content (high specific conductance) on the eastern (downgradient) side of the basin (Crouch and others, 1984, fig. 21).

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