Boyd, R.A., 1999, Groundwater Geochemistry in the Seminole Well Field, Cedar Rapids, Iowa: Journal of the American Water Resources Association, v. 35, no. 5, p. 1257-1268.

Abstract: The City of Cedar Rapids obtains its municipal water supply from four well fields in an alluvial aquifer along the Cedar River in east-central Iowa. Since 1992, the City and the U.S. Geological Survey have cooperatively studied the groundwater-flow system and water chemistry near the well fields. The geochemistry in the alluvial aquifer near the Seminole Well Field was assessed to identify potentially reactive minerals and possible chemical reactions that produce observed changes in water chemistry. Calcite, dolomite, ferrihydrite, quartz, rhodochrosite, and siderite were identified as potentially reactive minerals by calculating saturation indexes. Aluminosilicate minerals including albite, Ca-montmorillonite, gibbsite, illite, K-feldspar, and kaolinite were identified as potentially reactive minerals using hypothetical saturation indexes calculated with an assumed dissolved aluminum concentration of 1 microgram per liter. Balanced chemical equations derived from inverse-modeling techniques were used to assess chemical reactions as precipitation percolates to the water table. Calcite dissolution was predominate, but aluminosilicate weathering, cation exchange, and redox reactions also likely occurred. Microbial-catalyzed redox reactions altered the chemical composition of water infiltrating from the Cedar River into the alluvial aquifer by consuming dissolved oxygen, reducing nitrate, and increasing dissolved iron and manganese concentration. Nitrated reduction only occurred in relatively shallow (3 to 7 meters below land surface) groundwater near the Cedar River and did not occur in water infiltrating to deeper zones of the alluvial aquifer.