

SALTWATER CONTAMINATION DUE TO WELL CONSTRUCTION PROBLEMS—A CASE STUDY FROM VERNONBURG, GEORGIA

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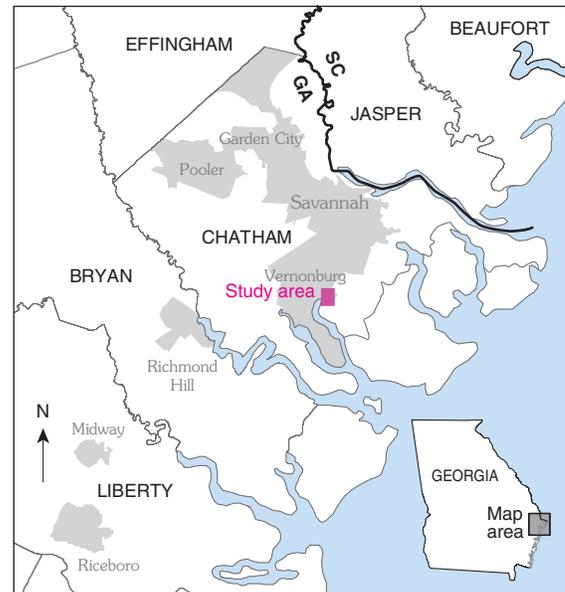
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Abstract. During January 2004, a Savannah-area well driller contacted the Georgia Department of Natural Resources, Environmental Protection Division (GaEPD) to report saltwater contamination of three domestic wells completed in the Upper Floridan aquifer in the Vernonburg, Georgia, area. Because the Upper Floridan aquifer is deeply buried in the area, it was unlikely that saltwater was encroaching laterally into the aquifer. Instead saltwater was more likely entering through an improperly constructed or failing well and leaking downward.

Vernonburg is located south of Savannah (Fig. 1) and is bordered by the Savannah city limit and the Vernon River. Vernonburg consists of about 65 households, 62 of which have wells completed in the Upper Floridan aquifer. The remaining three residences are connected to the Savannah public water system. Groundwater in the Vernonburg area is known to be salty at relatively shallow depths, within 50 feet below land surface in general and less than 10 feet deep adjacent to the river (Hall and Carter, 2004). Interviews with some well owners revealed that the saltwater contamination was first recognized during 2001.

GaEPD conducted a preliminary investigation to verify the reported saltwater contamination and identify wells with elevated specific conductance (an indicator of saltwater contamination). During February and March of 2003, an extensive well inventory was conducted, in cooperation with the U.S. Geological Survey (USGS), which included the measurement of water levels and collection of water samples for chloride analysis. Of the 51 wells inventoried, 11 had specific conductance levels exceeding 300 microsiemens per centimeter ($\mu\text{S}/\text{cm}$) (Fig. 2). Chloride concentrations in the wells with elevated specific conductance ranged from 227 to 4,173 milligrams per liter (mg/L) chloride. During the investigation, two possible sources for the saltwater were identified: an abandoned uncapped well located in the tidal zone along the Vernon River and a domestic well with ungrouted casing.

The abandoned well along the river was the most probable source of saltwater contamination; GaEPD personnel plugged the well during May 2004. Prior to plugging, the well was purged for 4 hours on May 17 and for 7 hours on May 18. The conductance of the purged water peaked at 7,480 $\mu\text{S}/\text{cm}$ and decreased to 3,000 $\mu\text{S}/\text{cm}$.



Base modified from U.S. Geological Survey
1:100,000-scale digital data

Figure 1. Location of study area.

The well was plugged by pumping neat cement through a 90-foot, 1-inch diameter tremmie pipe set into the well casing. The well was plugged in three stages using 18 bags (about 1 cubic yard) of cement. It was recommended to the city of Vernonburg that all abandoned wells be plugged and that the city continue to monitor the specific conductance in residential wells. The city has implemented the well-monitoring program on a biweekly schedule and has contracted a local well driller to plug the abandoned wells.

LITERATURE CITED

Hall, M.E., and B.R. Carter. 2004. Investigation of wells contaminated with saltwater, Vernonburg, Georgia: Memorandum to the record (Technical Files of the Georgia Geologic Survey), November 16, 2004, 6 pp. Available for public inspection at the Georgia Department of Natural Resources, Environmental Protection Division, Atlanta, Georgia.

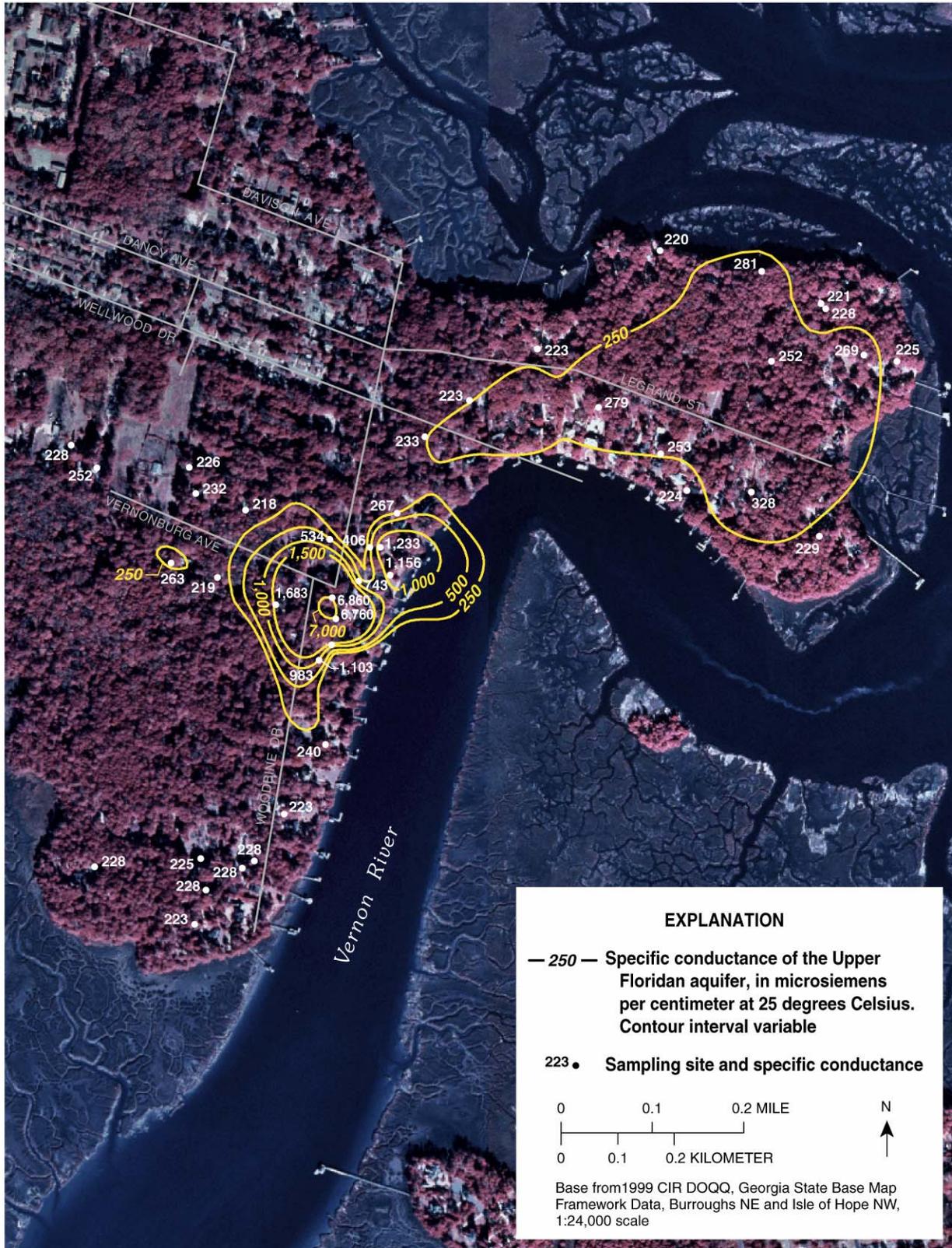


Figure 2. Specific conductance of water in the Upper Floridan aquifer, February 24–March 4, 2004, and location of selected wells used for water-level measurements and water-quality sampling in the Vernonburg area, Georgia. [CIR DOQQ, color-infrared digital orthophoto quarter-quad; NE, northeast; NW, northwest]