Loudon Develops New Ground-Water Sources

A ground-water investigation conducted by Bradfield Environmental Services, Inc. for the Loudon Utilities Board in Loudon, Tennessee succeeded in locating wells capable of producing in excess of three million gallons of water per day. While Loudon obtains about eight million gallons of water per day from the Tennessee River, new ground-water sources needed to augment existing supplies can be developed and treated at a fraction of the cost of expanding their surface water plant.

. . . new ground-water sources needed to augment existing supplies can be developed and treated at a fraction of the cost of expanding their surface water plant.

Developing large-producing wells in areas underlain by rock formations requires a detailed study to identify those areas most likely to produce ground water. The geology of the study area is mapped at the 1:24,000 scale on topographic maps. Areas underlain by limestone formations are more likely to produce water than are areas underlain by shale formations. Most water movement in areas underlain by rock formations is along faults and bedding-plane openings between different geologic formations. The discharge of streams in the study area is then measured at 15 to 20 sites to identify those reaches of streams that are gaining water from the ground water system and those reaches of streams that are losing surface water to the ground water system.

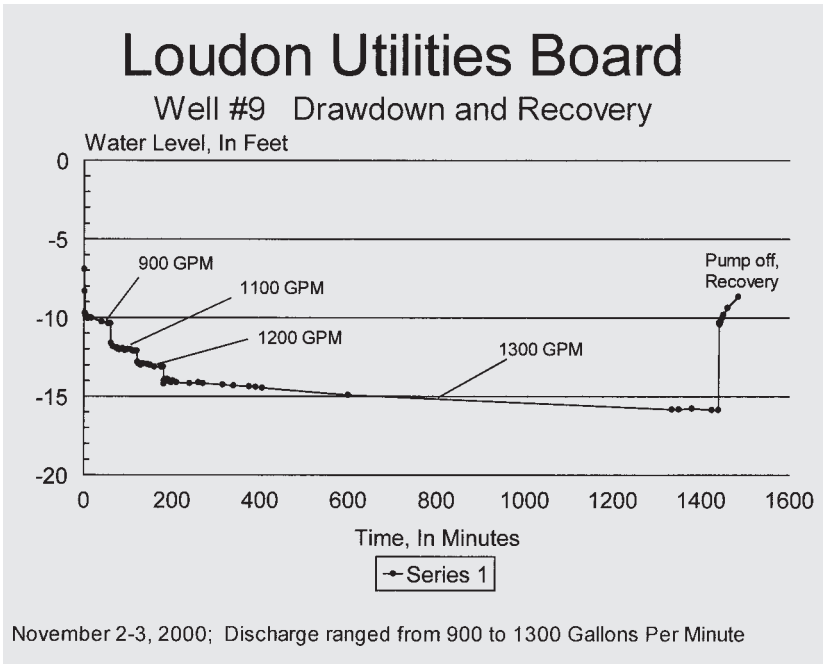
Once specific areas likely to produce ground water are identified, a number of test wells are drilled. The number of wells required will depend on the size of the area considered and on local geologic and hydrologic conditions. Because of the difficulties in locating fractures in rock formations, it is critical that enough wells are drilled to fully explore an area for ground water.

A total of 10 wells were drilled during the investigation for the Loudon Utilities Board, of which three produced substantial quantities of ground water. Productive wells were located near the contact between the Chepultepec dolomite and the Copper Ridge dolomite. Roberson Spring, which once was the only water source for the city of Loudon, is also located near this geologic contact. Other wells were dry holes or encountered openings filled with mud.

Those wells that appeared to produce large volumes of water as the wells were drilled were selected for aquifer tests. Productive wells were pumped for a minimum of 24 hours to establish the sustainable yield of each well and the amount of draw down in water levels associated with pumping over an extended period of time. The most productive well for Loudon was pumped at rates ranging from 900 to 1300 gallons per minute (Figure 1).

Near the end of the pumping phase of the aquifer test, samples

John Davis, Loudon Utilities Environmental Engineer, worked with Bradfield Environmental Services, Inc. to drill a total of ten wells, of which three produced substantial quantities of ground water.



November 2-3, 2000; Discharge ranged from 900 to 1300 Gallons Per Minute

for water quality parameters required by the Tennessee Division of Water Supply for the approval of new water sources were collected. Bacteriological data indicated the well is under the influence of surface conditions. Additional monitoring is scheduled to determine the extent of influence that Sweetwater Creek, a major stream in the area, has on the ground-water system tapped by the well.

One to three million gallons of ground water per day can be found in many areas of middle and eastern Tennessee. Ground water is by far the most economical source of water for public water systems. Those public water systems experiencing water quality problems, revenue problems, difficulties meeting regulatory requirements (especially new turbidity and disinfection by-product standards), or facing the cost of upgrading an existing surface-water plant should consider a ground-water investigation.

Surface-water systems should consider drilling wells near their surface water sources to avoid building and maintaining expensive intake structures and to realize the benefits of "riverbank filtration." Bank filtrate is river water that has passed through the riverbanks and proceeded to the ground-water table where it is then pumped to a treatment facility.

Underground passage reduces the concentration of turbidity and contaminants in surface water, including disinfection by-product precursors. Because the temperature of ground water is fairly constant, bank filtration compensates for seasonal temperature peaks, which further improves treated water quality. Refer to the December 2000 issue of the American Water Works Association Journal (Volume 92, Number 12, p.60) for an excellent overview of riverbank filtration.

Bradfield Environmental Services, Inc. has developed wells capable of producing one to three million gallons of water per day for the cities of Erwin, Elizabethton, Decatur, Athens, and Loudon, TN. These public water systems have realized significant savings in construction and treatment costs that will more than offset the cost of developing their ground-water resources. The solution to your water system's problem could be under the very ground you're walking on. TPW