Hydrology - Water Resources Report 7

Aquifer Storage and Recovery, Myrtle Beach, South Carolina

Phase II: A Hydrogeologic, Geochemical, and Economic Investigation

By
Joffre E. Castro
1995

ABSTRACT

Stringent national water quality regulations have forced Horry County, S.C., water utilities and municipalities to upgrade their water treatment facilities. In this county, during the last seven years, surface water has replace ground water as the major source of drinking water, reversing a 100-year practice. Although quality and quantity of the drinking water have improved, water costs have risen. Large investment in peak treatment capacity that is rarely utilized has also contributed to higher water rates.

To develop new water management alternatives that could curtail rising water costs in the region, and aquifer storage and recovery (ASR) project was undertaken. A prototype ASR system was tested in Myrtle Beach to study its hydrologic, geochemical, and economic applicability. Ten injection tests were made between February 1991 and October 1992. The first nine injection tests were a series of short-term tests designed to evaluate the hydrologic changes in the aquifer resulting from the injection of treated surface water. The other test was a long-term test set up to investigate the geochemical system and water quality changes of the recovered water. During this last test, approximately 8 million gallons of treated surface water were injected into an aquifer of poor water quality. After several months of storage, the water was successfully recovered through the same well.

The geochemical modeling of the system revealed that mostly it was mixing and, to a lesser degree, chemical reactions that governed the quality of the recovered water. The most important geochemical processes modeled were pyrite oxidation, calcite dissolution, and calcium-sodium exchange. Near the well bore, chemical reactions prevailed and developed under aerobic conditions. Farther away from the well, mixing was the prevalent process and chemical reaction, which developed under anaerobic conditions, was a subordinate process.

This study demonstrated that the ASR concept is applicable in unconsolidated sediments of the South Carolina Coastal Plain. Moreover, it showed that ASR operational systems could inexpensively augment daily flows in a distribution system and thereby provide for long-term and emergency demands. It additionally suggested that the total unit cost of an ASR system is no more than half that for expansion of a treatment plant of similar capacity.

Copies of this report are available in the SCDNR's Columbia office.