



# WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

## U.S. GEOLOGICAL SURVEY GROUND-WATER STUDIES IN ILLINOIS

### GROUND-WATER ISSUES

Ground water is an important source of supply in Illinois. The largest amount of ground-water withdrawal is in the northern one-third of the State where both shallow and deep aquifers supply water of favorable quality and quantity. Ground-water withdrawals account for almost one-fourth of the total water withdrawn for public water supplies. Approximately 88 percent of the public water-supply systems in Illinois use ground water to supply potable water to more than 5 million people in 1,200 communities. The major issues related to ground water in Illinois are:

- Water quality, owing to contamination from point and nonpoint sources,
- Availability, owing to declining water-levels in northeastern Illinois and to the susceptibility to drought of limited supplies in rural and southern areas of Illinois, and
- Rising ground-water levels in the American Bottoms near East St. Louis.

### U.S. GEOLOGICAL SURVEY PROGRAMS

The U.S. Geological Survey (USGS), established in 1879, is the principal source of scientific and technical expertise in the earth sciences within the Federal government. USGS activities include research and services in the fields of hydrology, geology, and cartography. The mission of the Water Resources Division of the USGS is to develop and disseminate scientific information on the Nation's water resources. The activities of the Water Resources Division in Illinois are conducted by scientists, technicians, and support staff in offices in Urbana, De Kalb, and Mt. Vernon.

Hydrologic data stations are maintained at selected locations throughout Illinois to record stream discharge and stage, ground-water levels, and the quality of surface and ground water. Water-resources data are stored in the USGS National Water Data Storage and Retrieval System data base. These data are used by water planners, State agencies, and others involved in decisions that affect Illinois' water resources.

From 1984 to 1987, the USGS, in cooperation with the Illinois Environmental Protection Agency, sampled a network of 2,080 public water-supply wells throughout Illinois to assess ground-water quality. The USGS also maintains a network of three wells to monitor fluctuations of water levels. These data are used to determine baseline conditions and changes in the resource; however, the data need to be integrated with other observations and ground-water investigations to be most relevant and useful.

The USGS has conducted more than 80 hydrologic investigations in Illinois. During fiscal year 1987, the USGS had cooperative agreements with 14 Federal, State, and local agencies involving 21 hydrologic investigations in Illinois;

9 investigations involved studies of ground-water quality and quantity. These investigations also may provide needed information on statewide, regional, and national hydrologic problems. Three examples of ground-water studies by the USGS that address specific ground-water issues in Illinois are discussed in the following sections.

### Low-level Radioactive Waste near Sheffield and Argonne National Laboratory

In 1975, the USGS began a national program to determine hydrogeologic factors that control the migration of radionuclides from low-level radioactive-waste disposal sites. The program called for using existing burial sites as field laboratories. Two of the sites are in Illinois: a commercial repository near Sheffield in northwestern Illinois and a U.S. Department of Energy (DOE) facility near Argonne National Laboratory in northeastern Illinois (both Illinois sites are now closed). At both sites, low-level radioactive waste was buried in trenches excavated in unconsolidated glacial deposits. Research began at the Sheffield site in 1976. The USGS drilled 115 test wells and dug a 120-meter tunnel beneath four waste trenches. Data were collected at the site to provide information on climate, erosion, infiltration of



precipitation, gas transport, ground-water flow in the unsaturated and saturated zones, and radionuclide movement within the hydrologic system. These data were used to evaluate trench-cap erosion, infiltration of water and migration of radionuclides through the trenches, and transport of radionuclides by gases and ground water. Research at the Argonne National Laboratory also began in 1976. The site was used during and shortly after World War II to dispose of low-level radioactive waste generated by the world's first nuclear reactors (the Manhattan Project). The USGS drilled more than 50 test wells and conducted numerous hydraulic and tracer tests at the site. The data have been analyzed to determine how the geology at the site affects the migration of tritium, and to explain the occurrence of tritium in a well near the radioactive-waste burial site. Currently, research is being conducted to understand the movement of radionuclides in fractured rock, a topic with widespread applicability in the selection of sites for disposal of radioactive and hazardous wastes. Results of USGS research at low-level radioactive-waste disposal sites are being used to develop hydrogeologic guidelines that can be used by the DOE and appropriate State agencies to establish technical criteria for selecting, evaluating, licensing, and operating new waste-burial sites.

#### **Industrial-Waste Contamination near Byron**

As the principal source of scientific and technical expertise in the earth sciences within the Federal government, the USGS is cooperating with the U.S. Environmental Protection Agency (EPA), Region V, in studies at four hazardous-waste sites in Illinois. These sites are being investigated as part of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. At a site near Byron, water in a fractured bedrock aquifer is contaminated with cyanide, heavy metals, and volatile organic compounds from industrial wastes deposited at the site. Several domestic water supplies near the Rock River have been contaminated, and a fish kill occurred in a stream near the waste site. The USGS has compiled available data and conducted tests to obtain additional data. The geology and hydrology were described, and geophysical logging was conducted as part of the hydrogeologic investigation at the site. The EPA will use the results of the study by the USGS to plan remedial action alternatives for the site.

#### **Ground-Water-Quality Monitoring, Statewide**

As part of Illinois' Public Act 83-1268, the Illinois Environmental Protection Agency (IEPA) was assigned to establish a statewide ground-water-monitoring network. A cooperative program between the USGS and the IEPA, Division of Public Water Supplies, was developed, and sampling of the State's public water-supply wells began in 1984. The monitoring program was initially operated as a pilot study from 1984 to 1985, during which time about 100 wells in the major aquifers in Illinois were sampled quarterly for nutrients, cations and anions, and metals. In 1985, the program was expanded to include the sampling of all public water-supply wells and the first statewide sampling for volatile organic compounds. From 1985 to 1987, more than 2,000 public water-supply wells were sampled; 330 wells also were sampled for more than 30 pesticides, herbicides, and polychlorinated biphenols. The IEPA will use the USGS data collected from public water-supply wells to develop ground-water-quality standards to be authorized by the Illinois Pollution Control Board.

#### **GROUND-WATER MANAGEMENT**

The principal State agencies responsible for ground-water programs in Illinois are the Department of Energy and Natural

Resources, which includes the State Geological and State Water Surveys; the Environmental Protection Agency; the Department of Public Health; the Department of Transportation, Division of Water Resources; and the Pollution Control Board. The Department of Energy and Natural Resources is responsible for maintaining geologic and ground-water quality and quantity records. The Environmental Protection Agency regulates pollution control and public water-supply systems. The Department of Public Health operates laboratories for the analysis of voluntarily submitted water samples from private water-supply wells in the State and maintains these records in their files. The Division of Water Resources is involved in water-quantity issues in Illinois, and the Pollution Control Board has the authority to issue regulations to restore, maintain, and enhance the purity of the waters of the State. During fiscal year 1987, the Illinois Environmental Protection Agency and the U.S. Environmental Protection Agency entered into interagency or cooperative cost-sharing agreements with the USGS to conduct ground-water investigations in Illinois.

#### **SELECTED REFERENCES**

- Garrelts, M.G., 1988, Water resources activities in Illinois, 1987: U.S. Geological Survey Open-File Report 87-698, 116 p.
- Healy, R.W., deVries, M.P., and Striegl, R.G., 1986, Concepts and data-collection techniques used in a study of the unsaturated zone at a low-level radioactive-waste disposal site near Sheffield, Illinois: U.S. Geological Survey Water-Resources Investigations Report 85-4228, 37 p.
- Illinois Pollution Control Board, 1986, A plan for protecting Illinois groundwater: Report of the Board, R86-8, August 26, 1986, 81 p.
- Kay, R.T., Ryan, B.J., Mears, E.J., and Yeskis, D.J., 1987, Hydrogeology of the Byron/Johnson Salvage Yard Superfund Site near Byron, Illinois: Proceedings, Water Resources Symposium, October 1987, Illinois Section American Society of Civil Engineers, p. 1-11.
- Kirk, J.R., Hlinka, K.J., Sasman, R.T., and Sanderson, E.W., 1987, Water withdrawals in Illinois, 1984: State of Illinois, Department of Energy and Natural Resources, Circular 163, 43 p.
- Nicholas, J.R., and Healy, R.W., 1988, Tritium migration from a low-level radioactive-waste disposal site near Chicago, Illinois: U.S. Geological Survey Water-Supply Paper 2333, 46 p.
- U.S. Geological Survey, 1984, National water summary, 1983—Hydrologic events and issues: U.S. Geological Survey Water-Supply Paper 2250, 243 p.
- \_\_\_\_\_, 1985, National water summary 1984—Hydrologic events, selected water-quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, 467 p.
- Voelker, D.C., 1986, Observation-well network in Illinois, 1984: U.S. Geological Survey Open-File Report 86-416(W), 108 p.
- \_\_\_\_\_, 1988, Illinois ground-water quality: U.S. Geological Survey Open-File Report 87-0723, 9 p.

Information on technical reports and data related to ground water in Illinois can be obtained from:

District Chief  
U.S. Geological Survey  
Water Resources Division  
102 East Main Street, 4th Floor  
Urbana, Illinois 61801

Director  
Water Resources Center  
University of Illinois  
208 N. Romine Street  
Urbana, Illinois 61801

D.C. Voelker, J.R. Nicholas,  
and K.L. Norton, 1988  
Open-File Report 88-143