

Kentucky Interagency Groundwater Monitoring Network: Annual Report, 2001–2002

Executive Summary

The Kentucky Interagency Groundwater Monitoring Network was established by the 1998 Kentucky General Assembly in recognition of the fact that groundwater is a vital resource in the Commonwealth and that systematic groundwater monitoring and characterization, as well as coordination between agencies that address groundwater issues, was needed.

The network is charged with collecting groundwater data, characterizing groundwater quality, distributing groundwater information, promoting interagency cooperation, and facilitating data sharing. These activities are to be carried out in coordination with an Interagency Technical Advisory Committee. The Kentucky Geological Survey is charged with annually reporting network activities to the Governor and the Legislative Research Commission within 90 days of the end of the State fiscal year.

From July 2001 through June 2002, groundwater was sampled and analyzed on both regional and local scales. The regional studies were designed to determine ambient (not affected by point-source discharges) groundwater quality and assess the effects of nonpoint-source pollution, whereas the local studies focused on specific problems or questions. Five major reports that will characterize groundwater quality are being prepared and will be made available to policy makers, landowners, researchers, and the general public. Groundwater information was communicated to the scientific and regulatory communities and to the public through presentations, publications, and postings on Web sites. Quarterly meetings of the Interagency Technical Advisory Committee provided an opportunity to coordinate groundwater-related efforts and share information. Exchange of groundwater data has proceeded through close cooperation between the agencies.

The Kentucky Interagency Groundwater Monitoring Network has been in existence for 4 years. During this time, significant progress has been made toward collecting and reporting groundwater quality and interagency cooperation. Important work remains, however. Among the larger issues to be addressed are: (1) developing new sample sites in areas where there are no existing wells or springs that can be sampled; (2) optimizing the sampling frequency to account for different groundwater flow systems throughout the state; (3) investigating whether there are pathogens such as bacteria in the groundwater flow system or in the water-delivery system of private households; (4) standardizing reporting information about sampling procedures, field measurements, and sample site descriptions; (5) developing a water-level monitoring network to track long-term climate effects on groundwater supplies; (6) standardizing laboratory reporting procedures; (7) facilitating electronic data sharing among agencies that work with results of groundwater measurements; and (8) providing public access to groundwater quality data via interactive Web sites.

The Kentucky Interagency Groundwater Monitoring Network will continue to address these issues. Real progress in these important areas is difficult under current staff and funding conditions, however. Most of the progress over the past 4 years has been the result of significant agency commitment of State executive budget funds, one-time grants to the Kentucky Division of Water Groundwater Branch and the Kentucky Geological Survey, and voluntary cooperation between agencies. Implementing a long-term groundwater monitoring plan requires sustained, recurring funding to maintain the long-term effort.

Introduction

Kentucky groundwater is used extensively for domestic, agricultural, commercial, and industrial purposes. This resource is also essential to the health of our rivers, lakes, and wetlands. Monitoring the quality of this critical resource and protecting it from contamination are important to the future of the Commonwealth and its citizens.

Information provided by the Groundwater Branch of the Kentucky Division of Water (DOW) indicates that more than 500,000 citizens in private households rely on groundwater from wells and springs for drinking, cooking, and washing. An additional 254 public water systems, serving more than 1.2 million people, rely on groundwater supplies. This dependence on groundwater resources will continue into the foreseeable future. Many public water-supply systems are considering switching from surface water to groundwater sources because the required treatment is less extensive and less expensive. Currently the cities of Hardinsburg and Louisville and the Greater Fleming Regional Water Supply are either considering switching to groundwater sources or are supplementing surface-water supplies with groundwater. Furthermore, many people who now rely on wells or springs for private domestic water supplies will remain dependent on groundwater because they cannot afford the cost of extending public water-supply systems to rural areas.

Significant quantities of groundwater are also used for commercial and industrial applications, crop irrigation, livestock watering, mining, and thermoelectric power generation. More than 225 million gallons are used each day by commercial and industrial operations, farmers and ranchers, mining operations, and thermoelectric power generators. Groundwater also sustains valuable ecosystems by providing base flow to streams, lakes, and wetlands. This is particularly important during droughts such as the one that occurred in 1999. In the absence of precipitation, groundwater base flow is the only source of water to maintain stream flow and lake levels, and to preserve riparian and wetland ecosystems.

Recognizing the importance of groundwater, the 1998 Kentucky General Assembly directed the Kentucky Geological Survey (KGS) to establish a long-term, interagency groundwater monitoring network to characterize the quality, quantity, and distribution of groundwater in Kentucky (KRS 151.620 and 151.625). The major goals of the Groundwater Monitoring Network are to collect groundwater data, characterize groundwater quality, distribute groundwater information, improve coordination between agencies that collect groundwater data, and facilitate sharing of groundwater data (Interagency Technical Advisory Committee, 1996).

The 1998 General Assembly also established an Interagency Technical Advisory Committee on Groundwater (ITAC) to assist KGS in the development, coordination, and implementation of a groundwater monitoring network (KRS 151.629). ITAC consists of representatives of the following agencies:

- ◆ Kentucky Department for Environmental Protection
- ◆ Kentucky Department for Natural Resources
- ◆ Kentucky Department for Surface Mining Reclamation and Enforcement
- ◆ Kentucky Department of Mines and Minerals
- ◆ Kentucky Division of Conservation
- ◆ Kentucky Division of Environmental Health and Community Safety
- ◆ Kentucky Division of Forestry
- ◆ Kentucky Division of Pesticide Regulation
- ◆ Kentucky Division of Waste Management
- ◆ Kentucky Division of Water
- ◆ University of Kentucky, Kentucky Geological Survey
- ◆ University of Kentucky, College of Agriculture
- ◆ University of Kentucky, Kentucky Water Resources Research Institute
- ◆ U.S. Geological Survey

The 1998 legislation directed KGS to provide an annual summary of groundwater monitoring activities to the Governor and the Legislative Research Commission. This is the fourth annual report of the Kentucky Interagency Groundwater Monitoring Network. Previous reports can be viewed at www.uky.edu/kgs/water/gnet/gnet.htm.

2001–2002 Activities and Accomplishments

Brief summaries of work performed by the ITAC agencies during the 2001–2002 fiscal year are given below. The activities are organized to show how each of the major goals of the network have been addressed. Additional information regarding these projects can be obtained by contacting the responsible agency.

Groundwater Data Collection

Collecting and analyzing water from wells and springs provides the basic data needed to determine the current quality of the groundwater resource and to detect changes in quality over time. Two general types of groundwater data collection programs were conducted during the reporting period. Statewide and expanded groundwater monitoring programs are designed to show ambient groundwater quality (the chemical composition of groundwater that is not affected by point-source con-

tamination) and to determine whether nonpoint-source pollutants such as pesticides and volatile organic chemicals have entered the groundwater system. In contrast, site-specific studies are designed to evaluate groundwater conditions in locations where the effects of particular land uses are being investigated or where water supplies are being evaluated.

Statewide ambient groundwater quality monitoring

DOW collected approximately 400 groundwater samples at approximately 120 wells and springs that compose DOW's regular ambient groundwater monitoring program, including additional assessment monitoring to support watershed management efforts. Each site was sampled quarterly, and pH, temperature, conductivity, major and minor solutes, metals, nutrients, pesticides, and synthetic and volatile organic chemicals were analyzed. Analytical results were entered into the DOW database and will be copied to the KGS data repository.

Expanded groundwater monitoring for nonpoint-source pollution assessment in the Tradewater and Green River Basins (basin management unit 4)

DOW selected and sampled 30 new sites in the Tradewater and Green River watersheds in cooperation with the Kentucky Watershed Management Framework (Kentucky Division of Water, 1997). The wells and springs were sampled quarterly. Samples were analyzed for temperature, pH, conductivity, major and minor solutes, metals, nutrients, pesticides, and synthetic and volatile organic chemicals. Analytical results were added to the DOW database and will be copied to the KGS data repository. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Expanded groundwater monitoring for nonpoint-source pollution assessment in watersheds of the Upper Cumberland, Lower Cumberland, and Tennessee Rivers, and the Jackson Purchase Region (basin management unit 4)

KGS selected 33 new wells and springs in basin management unit 3 and sampled them quarterly for four seasons. Samples were analyzed for bulk water properties, major and minor solutes, metals, nutrients, pesticides, and synthetic and volatile organic chemicals. Analytical results were added to the DOW database and will be copied to the KGS data repository. This work was

funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Assessment of nonpoint-source pollution impacts on groundwater in the headwaters of the North Fork of the Kentucky River

DOW conducted a study of the effects of nonpoint-source pollution on local groundwater resources in an area served predominantly by private wells and springs, and in which adequate domestic waste disposal is available. Surveys located groundwater users willing to participate in the study. Wells were inspected to determine construction or maintenance deficiencies. A total of 87 wells and springs serving approximately 350 people were evaluated. Field screening and lab analyses were conducted for nonpoint-source contaminants associated with on-site waste disposal and mining, including pathogens, nutrients, metals, and pH. At least one sample from each field sampling event was analyzed by laboratory methods to compare laboratory analytical results with the results produced by field screening. A folder containing well and septic tank maintenance materials along with information on nonpoint-source contaminants was provided to each participant. A final report for the study is being prepared.

Identification and determining priority of karst groundwater basins in Kentucky for targeting resources for nonpoint-source pollution prevention and abatement

DOW completed eight consecutive quarters of monitoring at 12 karst springs in the Mississippian Plateau. Samples were analyzed for bulk water properties, major and minor solutes, metals, nutrients, pesticides, and synthetic and volatile organic chemicals. Analytical results were added to the DOW database and will be copied to the KGS data repository. Working with the Natural Resources Conservation Service and county extension agents, DOW will use the water-quality data provided from this project and other groundwater quality data in the Mississippian Plateau, and karst hydrologic mapping and land-use data from this area, to rank karst basins for future nonpoint-source funding and best management practice (BMP) implementation. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Little River Clean Water Action Plan: Karst watershed boundary delineations

DOW is using dye traces to verify or modify delineated hydrologic unit code (HUC) watersheds within and adjacent to the Little River Basin in southwestern Kentucky. Unit base flow assessment for karst springs is a secondary method being used in this study. The new data have identified the widest confirmed perennial groundwater distributary in Kentucky, a local three-spring perennial distributary that also functions as a seasonal overflow for a larger karst sub-basin, and a complex two-level aquifer. Two flow routes pass beneath HUC boundaries, documenting the fact that HUC watershed delineations do not always accurately represent groundwater divides. Three springs in the study area yield only 50 to 60 percent of expected spring flow, suggesting there is an unobserved underflow to the receiving streams.

Evaluation of high-yield well potential in the Eastern Kentucky Coal Field

KGS is using geologic and remote-sensing technologies to identify sites in the Eastern Kentucky Coal Field that could yield more than 30 gallons of groundwater per minute. Intersecting linear features caused by faults or fractures are identified from aerial photographs, satellite images, low-altitude radar images, and topographic maps, and inclined drilling is used to locate well sites. This work was funded by the Kentucky Infrastructure Authority.

Assessing water supplies from abandoned underground coal mines in eastern Kentucky

KGS is exploring abandoned underground coal mines in eastern Kentucky as potential municipal water supplies. Detailed analyses of sites in Letcher, Perry, Clay, and Harlan Counties have found storage volumes for mines that range from 260 to 480 million gallons and recharge rates that range from 120,000 to 700,000 gallons per day. This work was funded by the Kentucky Infrastructure Authority, the Kentucky River Authority, and the Kentucky Geological Survey.

Nitrate and pesticide impacts on bedrock aquifers in the Western Kentucky Coal Field

KGS, the UK Department of Agronomy, and the UK Department of Biosystems and Agricultural Engineering are evaluating the movement and fate of pesticides and nitrate at an agricultural site in Henderson County in the Western Kentucky Coal Field. Twenty-eight moni-

toring wells and four domestic wells are being sampled to determine whether present agricultural practices have had an impact on local groundwater quality.

Protection of groundwater supplies from nitrate contamination in the Jackson Purchase Region

KGS is investigating nitrate sources and occurrences of high nitrate concentrations in wells in the Jackson Purchase Region by sampling wells, analyzing groundwater, conducting land-use and well-construction surveys, and applying tracer tests to determine well integrity. This work is funded by Kentucky Senate Bill SB-271, administered through the University of Kentucky College of Agriculture.

Monitoring impacts of the Animal Research Center on surface-water and groundwater quality

KGS and the UK Department of Biosystems and Agricultural Engineering are monitoring streams, springs and wells at the UK Animal Research Center to determine if farm practices are affecting water quality. This work is funded by Kentucky Senate Bill SB-271, administered through the University of Kentucky College of Agriculture.

Mapping karst groundwater basins in the Inner Bluegrass Region

KGS is using dye traces to delineate groundwater basins in the karst terrane of the Inner Bluegrass Region. Results are presented in workshops that inform landowners, emergency management officers, county and municipal officials, and the public about the vulnerability of karst aquifers to both point-source and nonpoint-source pollution. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Inventory of karst springs in Fayette County

KGS is converting hard-copy reports of springs in Fayette County to geographic information system data and producing maps of spring locations to make the information more readily available. Results can be used to anticipate and avoid problems that could result from future development of karst terrane. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Water quality survey of Kentucky Army National Guard training facilities

KGS is assessing the quality of water resources at the Wendell H. Ford, Artemus, and Eastern Kentucky Army National Guard training sites. Results provide a baseline water-quality assessment and can be used by the Army to protect water resources at these sites. This work is funded by the Kentucky Army National Guard.

Hydrogeologic investigations at the Paducah Gaseous Diffusion Plant

KGS is helping the Kentucky Cabinet for Health Services plan and evaluate remedial activities by reviewing contractors' reports and investigating the hydrologic and geochemical environment that has been affected by releases of technetium and TCE from the plant. This work is funded through a memorandum of understanding between KGS and the Kentucky Department for Public Health, administered by the Kentucky Water Resources Research Institute.

USGS groundwater-quality monitoring

Groundwater-quality data were collected by the USGS at the following locations:

- ◆ Ohio River alluvial aquifer, Jefferson County – 26 wells (13 shallow and deep well pairs) sampled biannually for major and minor inorganic constituents and volatile organic chemicals.
- ◆ Ohio River alluvial aquifer, Hardin County – 11 wells were sampled monthly for chlorides and field water-quality parameters.
- ◆ Maxey Flats Low-Level Radioactive Materials Depository, Fleming and Rowan Counties – 14 wells were sampled annually for tritium; five wells were sampled semiannually for tritium and other radionuclides; and four wells were sampled quarterly for tritium and field water-quality parameters.
- ◆ Distler Brickyard Superfund Site, Hardin County – 11 wells were sampled intermittently for volatile organic chemicals, selected inorganic chemicals, and miscellaneous biogeochemical indicators.
- ◆ In cooperation with the Kentucky Division of Pesticide Regulation, eight karst springs in the Green River drainage basin were sampled semiweekly from May through September 2001 for pesticides and nutrients.

USGS groundwater-level monitoring

USGS collected real-time continuous groundwater-level data collection at observation wells near Paducah (McCracken County), in Graves County, and near West Point (Hardin County).

USGS monitored groundwater levels and temperatures in the Downtown Louisville alluvial aquifer network, Jefferson County. Eleven wells were measured quarterly and two wells were equipped with continuous recording equipment for both water-level and temperature data. Hydrographs of data collected from this network are available on the USGS Web site at www.ky.water.usgs.gov.

USGS measured water levels in 19 wells in the Northeast Louisville alluvial aquifer network and equipped five wells with continuous recording equipment for both water-level and temperature data.

USGS monitored 25 wells in the Ohio River alluvial aquifer, Hardin County. Water levels were measured monthly in 25 wells, and three wells were equipped with continuous recording equipment.

USGS measured water levels quarterly in 13 wells, and equipped 18 wells with continuous water level recording equipment at the Maxey Flats Low-Level Radioactive Materials Depository in Fleming and Rowan Counties.

Groundwater-Quality Characterization

Five reports on groundwater quality are being prepared. Each report is a summary of regional groundwater investigations and an evaluation of ambient groundwater quality. These reports will provide information by which the overall health of the groundwater resource can be evaluated and the various beneficial uses of groundwater in particular locations can be determined.

Groundwater monitoring for nonpoint-source pollution assessment in the Kentucky River Basin (basin management unit 1)

DOW is summarizing the results of expanded groundwater monitoring activities in the Kentucky River watershed. Expected completion date is spring 2003. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Groundwater assessment and spring basin delineations within the Salt and Licking River Basins (basin management unit 2)

DOW is summarizing the results of expanded groundwater monitoring activities in the Salt and Licking River watersheds. Expected completion date is fall 2002. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Groundwater monitoring for nonpoint-source pollution assessment in the Upper Cumberland, Lower Cumberland, and Tennessee River Basins, and the Jackson Purchase Region (basin management unit 3)

KGS is summarizing the results of expanded groundwater monitoring activities in the Upper Cumberland, Lower Cumberland, and Tennessee River Basins, and the Jackson Purchase Region. Expected completion date is winter 2002. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Evaluation of existing groundwater quality data from wells and springs in the Upper Cumberland, Lower Cumberland, Green, Tradewater, and Tennessee River Basins, and the Jackson Purchase Region (basin management units 3 and 4)

KGS and DOW are summarizing existing groundwater-quality data for samples taken from sites in the Upper Cumberland, Lower Cumberland, Green, Tradewater, and Tennessee River Basins, and the Jackson Purchase Region. The KGS Groundwater Data Repository is the source of the analytical records. Expected completion date is winter 2002. This work was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Evaluation of existing groundwater quality data from wells and springs in watersheds of the Kentucky, Salt, Licking, Big Sandy, and Little Sandy Rivers, and Tygarts Creek (basin management units 1, 2, and 5)

KGS and DOW are summarizing existing groundwater-quality data for samples taken from sites in the Kentucky, Salt, Licking, Big Sandy, and Little Sandy River, and Tygarts Creek watersheds. The KGS Groundwater Data Repository is the source of the analytical records. Expected completion date is summer 2003. This work

was funded by a one-time grant from the U.S. Environmental Protection Agency, administered by the DOW Nonpoint Source Section.

Distribution of Groundwater Information

One of the most important functions of the Groundwater Monitoring Network is to convert analytical data derived from groundwater analyses to understandable information that can be used by the public. During the past fiscal year, groundwater information was distributed via oral and poster presentations at meetings and conferences, published reports, and Web sites.

Presentations

- Andrews, R.E., Wunsch, D.R., and Dinger, J.S., 2002, Evaluation of the use of fracture-flow solutions to analyze aquifer test data collected from wells in the Eastern Kentucky Coal Field: Fractured-Rock Aquifers 2002, National Ground Water Association, Denver, Colo., March 13–15, 2002.
- Crain, A.S., 2002, Pesticides and nutrients in springs: Green River Basin, Kentucky, May–September 2001: Kentucky Water Resources Annual Symposium, Lexington Ky., February 20, 2002.
- Dinger, J.S., Andrews, R.E., Wunsch, D.R., and Dunno, G.A., 2002, Remote sensing and field techniques to locate fracture zones for high-yield water wells in the Appalachian Plateau, Kentucky: Fractured-Rock Aquifers 2002, National Ground Water Association, Denver, Colo., March 13–15, 2002.
- Fisher, R.S., 2002, Arsenic in Kentucky groundwater: Geological Society of America North-Central and Southeastern Section annual meeting, Lexington, Ky., April 5, 2002.
- Fisher, R.S., 2002, Groundwater quality in Kentucky: Activities of the Kentucky Interagency Groundwater Monitoring Network: Poster presentation at the KGS annual symposium, Lexington, Ky., April 26, 2002.
- Fisher, R.S., 2002, Monitoring groundwater quality in Kentucky: The Kentucky Interagency Groundwater Monitoring Network: University of Kentucky Department of Geological Sciences seminar, November 29, 2001.
- Fisher, R.S., and Goodmann, P.T., 2002, Characterizing groundwater quality in Kentucky: From site selection to published information: Poster presentation at the National Water Quality Monitoring Council conference, Madison, Wisc., May 21, 2002.
- Pena-Yewtukhiw, E.M., Grove, J.H., Beck, E.G., and Dinger, J.S., 2001, Site-specific approach to define the ni-

trate point-source contaminating a domestic well: Soil Science Society of America Annual Meeting, Charlotte, N.C., November 10, 2001.

- Taylor, C.J., 2002, Physical hydrogeologic and geochemical framework of a transitional karst aquifer in south-central Louisville, Kentucky: Kentucky Water Resources Research Institute annual symposium, Lexington, Ky., February 20, 2002.
- Taylor, C.J., 2002, Physical hydrogeologic and geochemical framework of the Silurian-Devonian carbonate aquifer in south-central Louisville, Kentucky: Geological Society of America North-Central and Southeastern Section annual meeting, Lexington, Ky., April 3-5, 2002.
- Unthank, M.D., 2002, Summary of ground-water-quality in the Ohio River alluvial aquifer, Louisville, Kentucky: Water Sub-Committee of the Louisville Chamber of Commerce, Louisville, Ky., May 21, 2002.

Publications

- Andrews, R.E., Wunsch, D.R., and Dinger, J.S., 2002, Evaluation of the use of fracture-flow solutions to analyze aquifer test data collected from wells in the Eastern Kentucky Coal Field: Proceedings of Fractured-Rock Aquifers 2002, National Ground Water Association, p. 119-123.
- Blanset, J., and Goodmann, P.T., 2002, Arsenic in Kentucky's groundwater and public water supplies [abs.]: Geological Society of America, Abstracts with Programs, v. 34, no. 2, p. A-108.
- Crain, A.S., 2001, Pesticides and nutrients in karst springs in the Green River Basin, Kentucky, May-September 2001: U.S. Geological Survey Fact Sheet 133-01.
- Dinger, J.S., Andrews, R.E., Wunsch, D.R., and Dunno, G.A., 2002, Remote sensing and field techniques to locate fracture zones for high-yield water wells in the Appalachian Plateau, Kentucky: Proceedings of Fractured-Rock Aquifers 2002, National Ground Water Association, p. 195-199.
- Fisher, R.S., 2002, Arsenic in Kentucky groundwater [abs.]: Geological Society of America, Abstracts with Programs, v. 34, no. 2, p. A-107.
- Fisher, R.S., 2002, Groundwater quality in Kentucky: Arsenic: Kentucky Geological Survey, ser. 12, Information Circular 5, 4 p.
- Fisher, R.S., and Goodmann, P.T., 2002, Characterizing groundwater quality in Kentucky: From site selection to published information: Proceedings, National Water Quality Monitoring Council Conference, Madison, Wisconsin, 9 p.
- Fogle, A.W., Taraba, J.L., and Dinger, J.S., 2002, Effect of stream diurnal variations on mass loads in a small

agricultural karst watershed: American Society of Agricultural Engineers, Total Maximum Daily Load Conference, Fort Worth, Tex., 6 p.

- Goodmann, P.T., and Webb, J., 2002, The greater occurrence of agricultural herbicides in karst aquifers in Kentucky [abs.]: Geological Society of America, Abstracts with Programs, v. 34, no. 2, p. A-44.
- Harmon, D., and Goodmann, P.T., 2002, Kentucky's on-site wastewater disposal dilemma [abs.]: Geological Society of America, Abstracts with Programs v. 34, no. 2, p. A-108.
- Pena-Yewtukhiw, E.M., Grove, J.H., Beck, E.G., Dinger, J.S., and Counts, R.C., 2001, The site specific approach and environmental quality: Distribution of nitrate in deep soil layers and assessment of the area for remediation in a nitrate contaminated farmstead in western Kentucky, USA [abs.]: Third European Conference on Precision Agriculture, Montpellier, France, p. 56.
- Pena-Yewtukhiw, E.M., Grove, J.H., Beck, E.G., and Dinger, J.S., 2001, Site-specific approach to define the nitrate point-source contaminating a domestic well [abs.]: Soil Science Society of America Annual Meeting, Agronomy Abstracts, p. 93.
- Taylor, C.J., and Alley, W.M., 2001, Ground-water-level monitoring and the importance of long-term water-level data: U.S. Geological Survey Circular 1217, 68 p.
- Taylor, C.J., and Hostettler, F.D., 2002, Hydrogeologic framework and geochemistry of ground water and petroleum in the Silurian-Devonian carbonate aquifer, south-central Louisville, Kentucky: U.S. Geological Survey Water-Resources Investigations Report 02-4123.

KGS maintains and annually updates a Web site for the Kentucky Interagency Groundwater Monitoring Network (www.uky.edu/kgs/water/gnet/gnet.htm). This site contains maps and data summaries of nitrate and fluoride concentrations, maps of pH and hardness, a location map showing wells and springs that have been analyzed for various water-quality parameters, and previous annual reports of the network. The site also has links to the Web sites of the ITAC agencies and organizations. KGS also has compiled information about hydrology, geology, topography, water supply, and water quality from maps, reports, and data collected from 1940 to 2000 and posted them for public access at www.uky.edu/KGS/water/library/webintro.html.

DOW is currently scanning water-well records and converting the information from paper copies to digital files so searches can be made more rapidly. Copies of the scanned records will be sent to the KGS Groundwater Data Repository.

Interagency Coordination

Cooperation among agencies and research organizations that collect, analyze, and use groundwater data is essential to reduce monitoring costs, improve program efficiency, and promote data sharing. The Kentucky Interagency Groundwater Monitoring Network provides a forum for organizations that participate in the Interagency Technical Advisory Committee to meet quarterly and discuss groundwater issues. In addition, KGS researchers serve on the following committees and work groups:

- ◆ Certified Water Well Drillers' Advisory Committee
- ◆ Cumberland River Basin and Four Rivers Region Team
- ◆ Kentucky River Basin Team
- ◆ Onsite Sewage Disposal Advisory Committee
- ◆ Watershed Steering Committee

Groundwater Data Sharing

Sharing groundwater data is an essential function of the Interagency Groundwater Monitoring Network. Data transfers between agencies provide each group access to a larger database than each agency could develop independently, thereby improving evaluations of groundwater quality and suitability for various uses, threats to groundwater quality, and the effects of mining, logging, agricultural practices, urbanization, waste disposal, and oil and gas production. Sharing data also reduces the overall expense and increases the efficiency of monitoring efforts.

Data has been transferred electronically between the DOW groundwater database and the KGS groundwater data repository, and between the KGS analytical laboratory and DOW numerous times. There has also been a high level of collaboration and data sharing between KGS and DOW during the reporting period as the agencies are jointly reporting on groundwater quality throughout the state. During the past fiscal year, DOW scanned paper copies of water well records for the DOW groundwater database; DOW also copied the scanned images to compact disks and sent the disks to KGS, where they will be added to the Groundwater Data Repository. DOW is working with the Department for Environmental Protection EMPOWER team to migrate their data to a relational database to improve performance.

Future Activities

Preparing and distributing reports that summarize the results of groundwater investigations in terms that are readily understood by the public will remain a very important function of the Kentucky Interagency Groundwater Monitoring Network. Reports summarizing expanded groundwater monitoring activities in basin management units 1 (Kentucky River watershed), 2 (Salt and Licking River watersheds), and 3 (watersheds of the Upper and Lower Cumberland Rivers, Tennessee River, and the Jackson Purchase Region), and summaries of groundwater quality data in basin management units 3 and 4 (watersheds of the Upper and Lower Cumberland, Tennessee, Green and Tradewater Rivers, and the Jackson Purchase Region) will be completed and distributed within the next year. Expanded groundwater monitoring in watersheds of the Big Sandy River, Little Sandy River, and Tygarts Creek (basin management unit 5) will begin in the fall of 2002. Quarterly sampling of the approximately 100 wells and springs that make up DOW's ambient groundwater monitoring network will continue.

In addition to continuing these existing projects, the following activities are needed and will be initiated as funding becomes available:

- ◆ Evaluating the optimal sample collection frequency for wells and springs in different flow systems so that the efficiency of monitoring programs can be increased
- ◆ Developing a network to record water levels in strategically located wells
- ◆ Developing a common set of data elements for recording information about sample sites, sample collection procedures, and field-measured water-quality parameters
- ◆ Transferring groundwater-level and groundwater-quality data from paper files to the electronic database
- ◆ Expanding the number of sampled wells and springs to improve coverage of the state
- ◆ Using groundwater-quality data to help delineate groundwater basins and wellhead protection areas
- ◆ Delineating areas where different groundwater flow systems prevail; it is essential to distinguish between shallow, intermediate, and deep flow systems and between the laminar flow conditions that occur in porous media and the turbulent flow that can occur in karst systems so that nonpoint-source best management practices and groundwater vulnerability can be better assessed

Summary

The Kentucky Interagency Groundwater Monitoring Network was very active during the reporting period. Programs to collect statewide ambient groundwater quality, as well as to investigate specific problems of karst hydrology and aquifer sensitivity, potential nonpoint-source contamination of groundwater supplies, and the effects of agricultural practices on groundwater resources were completed or are in progress. Five summary reports on ambient groundwater quality are being written and will be completed within the next 12 months.

Most of the activities conducted during the reporting period were largely investigations of identified or suspected groundwater-quality problems and were possible only because the agencies involved were able to obtain funding from outside sources. As noted in the

2000–2001 annual report, the availability of these funds is decreasing. A stable source of recurring funding is essential if groundwater issues are to be addressed on a proactive basis that will best serve the needs of citizens, resource managers, and environmental regulators.

References Cited

- Interagency Technical Advisory Committee on Groundwater, 1996, Framework for the Kentucky Groundwater Monitoring Network: A report of the Interagency Technical Advisory Committee: University of Kentucky, Kentucky Water Resources Research Institute, 29 p.
- Kentucky Division of Water, 1997, Kentucky Watershed Management Framework: Kentucky Division of Water, 14 Reilly Rd., Frankfort, KY 40601