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Report

Illinois Department of Natural Resources

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DNR's Water Quantity related Authorities and Duties

The Illinois Department of Natural Resource (DNR) is the lead state agency governing water quantity planning and management decisions in Illinois. The DNR Office of Water Resources' (OWR) key water quantity management and planning powers cited under 20 ILCS 801/5-10 are (a) *To study and investigate ways and means by which the various water uses may be coordinated to the end that the water resources of the State be put to their maximum beneficial use . . .* (b) *To coordinate, determine and provide ways and means for the equitable reconciliation and adjustment of the various conflicting claims and rights to water users and uses.* (c) *To recommend legislation for the most feasible method or methods of conserving water resources and putting them to the maximum possible use . . .* The DNR has jurisdiction over all lakes and streams which the State has any rights or interests. Under the "Level of Lake Michigan Act" (615 ILCS 50) the DNR is designated as the agency to control and regulate the diversion of Lake Michigan water and is responsible for apportionment of water diverted from the Lake Michigan watershed. The OWR manages the Lake Michigan Allocation Program, which provides water supply to approximately one-half of the state's population. It also owns and manages the state's water supply storage in the three federal surface water reservoirs in Illinois, being Shelbyville, Rend, and Carlyle Lakes.

The Illinois State Water Survey (ISWS), DNR has been providing research and data since 1895 to help ensure safe drinking water and beneficial uses of our water resources in Illinois. The mission of the ISWS is *to characterize and evaluate the availability, quality, and use of the atmospheric, surface waters, and groundwater resources of the state and to make resulting data and information available to the public, decision makers, planners, and managers.* It has been a national and international leader in water-related research for over a century. In November of 2001, the ISWS prepared "A Plan for Scientific Assessment of Water Supplies in Illinois." This plan along with most of the recent water quantity planning and assessment documents pertinent to water quantity planning can be found on the ISWS internet site at <http://www.sws.uiuc.edu/docs/iwqpm/>.

The Illinois State Geological Survey (ISGS), DNR also has been instrumental in providing mapping, research and data collection on the state's groundwater resources since 1905. The mission of the ISGS is *to provide the citizens and institutions of Illinois with the earth science information needed for sound environmental and economic decision-making.* More specifically, the mission of its Hydrogeology Section is *to investigate and report on the hydrogeology of Illinois and to provide the people and institutions of Illinois with a scientific basis for the protection and beneficial use of its groundwater resources.*

Though the above offices serve as the DNR core for this agency's water quantity management duties and responsibilities, water resource issues have few bounds and spill over into all DNR offices and into other State Agencies as well. For example, the Natural History Survey and the Office of Realty and Environmental Protection provide data, analysis and research on sensitive and endangered species, and critical habitat, and the Waste Management and Research Center provides funds and performs research on topics such as sediment quality and its impact on water quality and arsenic in groundwater, all of which directly impact water resource decisions. ***Water is our most precious natural resource.***

State Water Plan Task Force (SWPTF) - The SWPTF was created in 1980 to guide policy decisions regarding the adequacy of programs to deal with an increasing number of water issues. In consideration of public and advisory group views, the SWPTF originally identified the following ten issues upon which to proceed:

1. Erosion and Sediment Control
2. Integration of Water Quality and Quantity Management
3. Water Conservation
4. Flood Damage Mitigation
5. Competition for Water
6. Aquatic and Riparian Habitat
7. Water-Based Recreation
8. Atmospheric Changes and Management
9. Drought Contingency Planning
10. Illinois Water Use Law

The SWPTF is an interagency group composed of management level representatives from state resource agencies, the University of Illinois, and the Governor's Office. The SWPTF is chaired by the director of the DNR Office of Water Resources. The following agencies are generally represented at the meetings:

Illinois Department of Agriculture (IDA)
Illinois Department of Commerce and Economic Opportunity (IDCEO)
Illinois Environmental Protection Agency (IEPA)
Illinois Department of Natural Resources
- Office of Mines and Minerals (OMM)
- Office of Resource Conservation (ORC)
- Office of Water Resources (OWR)
- State Geological Survey (ISGS)
- State Water Survey (ISWS)
Illinois Department of Public Health (IDPH)
University of Illinois - Water Resource Center (WRC)
U. S. Geological Survey - Illinois Water Science Center

The SWPTF meets quarterly and had its one hundred and twenty-third (123) meeting on December 7, 2004. Over the course of its existence, the SWPTF has published the State Water Plan (in 1984) and 28 reports from 19 special work groups.

Drought Response Task Force (DRTF) - The State's DRTF was first organized in 1983 under the recommendation of the SWPTF. The DRTF is co-chaired by the Director of the DNR Office of Water Resources and the Manager of the Public Water Supply Section of the IEPA. Other members include the IDA, IDCEO, Emergency Management Agency, ISWS, DNR Division of Fisheries, and the Office of the Governor. Each agency has technical expertise and capabilities in specific areas of drought management. It has been activated eight times, most recently during a period from August of 1999 through June of 2000.

Background

Since June of 2000, the DNR and the Illinois EPA have worked together toward formulation of a means and strategy to better identify, plan for and address the numerous and diverse water quantity issues in the State. In June of 2000, a Water Resources Advisory Committee (WRAC) was established to prepare a strategy to address water management in Illinois. The WRAC comprised 27 individuals representing a cross section of water users and water suppliers, which was co-chaired by the DNR and the EPA. In January of 2001, the WRAC developed 12 consensus principles (which were highlighted in the following described report by the ICCG Subcommittee on Integrated Water Planning and Management). The Governor's Executive Order #5 (2002) directed the Interagency Coordinating Committee on Groundwater (ICCG) to designate a subcommittee, chaired by the Department of Natural Resources, to develop an integrated groundwater and surface water resources agenda and assessment report also to be considered by the ICCG and the Groundwater Advisory Council (GAC) for establishing a water-quantity planning procedure for the State. In December of 2002, the DNR-chaired Subcommittee on Integrated Water Planning and Management provided the ICCG and GAC with a comprehensive groundwater and surface water assessment report with recommendations. This report included a draft strategic plan for water quantity planning and management, and a prioritized agenda and timetable for producing specific required scientific assessments. The report also included detailed information on key water resource concerns, critical water issues, needed water management powers, and the availability of water management tools and technologies. The report highlighted ongoing water quantity assessment activities being conducted at the Illinois Scientific Surveys and provided detailed information with respect to various state agencies, committees and groups which have involvement with or possess authorities relating to water quantity issues. In January 2003, the ICCG concurred with the following six recommendations as cited in the Subcommittee Report:

1. The ICCG should develop a detailed Statewide Strategic Plan for Water Quantity Planning and Management over the next 12 months (a suggested outline is provided in Appendix IV of the Report).
2. The plan should receive broad public review and input.
3. The plan should have an initial focus on securing and making easily accessible the scientific data that will be needed to designate Priority Water Quantity Planning Areas, areas that can be identified as being at risk for water shortages based on existing data or as new data become available.
4. As Priority Water Quantity Planning Areas are identified, the state should nurture the development of voluntary, cooperative regional water management consortia in those areas by providing technical and financial assistance for planning and management efforts.
5. The legislature should address an immediate need to grant the Governor expanded emergency powers to deal with major region-wide droughts or water-related disasters. Under the Emergency Services and Disaster Agency Act of 1988, the Governor has broad emergency powers for 30 days to suspend statutes, regulations and even take real estate. A study of this law suggested that these emergency powers were not sufficiently focused to respond to a drought emergency. The Subcommittee believes seeking appropriate authority is the strategy most likely to avoid both prescriptive regulatory water allocation frameworks and future water quantity crises.
6. The state should consider voids in current law like instream flow and well interference by initially developing guidelines identifying best management practices (BMPs) for voluntary adoption. Experience with voluntary implementation of such BMPs will clarify whether it is necessary to adopt them statutorily.

IWQPM - Framework

The IWQPM Committee meets quarterly at DNR headquarters. The committee makeup thus far has been staff from the DNR Office of Water Resources, the State Water Survey and the State Geological Survey; all participants have job duties related to water quantity planning and management. The ex officio IWQPM Committee meetings serve as a means to develop an integrated groundwater and surface water resources agenda as stated in the background section above, in establishing a water-quantity planning procedure for the State. The meetings are informal, though the normal procedures for the meetings have been to address the following:

- Report on accomplishments directly related to targeted work areas
- Report on attended meetings or other related activities
- Report of any external comments or input received
- Discussion on next steps/tasks, new or changing focus, new issues
- Discussion of legislative bills and budgeting issues
- Notice of upcoming water quantity related meetings
- Considerations (agenda items) for next IWQPM meeting

The following individuals currently comprise the IWQPM Committee:

Gary R. Clark, P.E., Director, Office of Water Resources, **and**
Dr. Derek Winstanley, Chief, Illinois State Water Survey, **servicing as co-chairmen**, coordinate the meetings, set agendas, review goals and task assignments, and all final reports. They also are responsible for reporting and coordination with the SWPTF, the ICCG, and for reporting to other agencies, regional groups, organizations and the Governor's Office.

Mike Demissie, Director, ISWS Center for Watershed Science

Beverly Herzog, Director, ISGS Environmental Geoscience Center

Don Keefer, Section Head, ISGS Hydrogeology Unit

Vern Knapp, Senior Hydrologist, ISWS Center for Watershed Science

Frank Pisani, P.E., Office of Water Resources, Division of Program Development

Allen Wehrmann, P.E., Director, ISWS Center for Groundwater Science

Other DNR staff have attended meetings to report on a specific activity or area relating to the needs and tasks of the IWQPM. The meetings are open to anyone who desires to inform the Committee on a subject matter relating to the role of the IWQPM. Those interested in attending may contact Frank Pisani at (217) 557-8243 (e-mail: FPISANI@dnrmail.state.il.us).

The IWQPM reports to the ICCG and GAC annually, summarizing accomplishments, work in progress, and future goals. The SWPTF is regularly apprised on work accomplishments and reports relating to the goals and objectives set for the IWQPM. Presentations and progress reports on water quantity planning and management issues are routinely provided, followed by the opportunity for discussion and comment. Outreach and information transfer are also provided at conferences and meetings. The IWQPM will continue to disseminate information and reports on the ISWS web page. A link to the IWQPM page (<http://www.sws.uiuc.edu/docs/iwqpm/>) is accessible from the ISWS Water Supply homepage (<http://www.sws.uiuc.edu/docs/wsfaq/>). A "hot button" is included to provide a forum for public comments and questions.

2004 Water Quantity Planning & Management Reports

The following reports were prepared in 2004 and can be accessed from the ISWS - IWQPM link:

Countywide Projections of Community Water Supply Needs in the Midwest - Prepared by the Department of Geography, Southern Illinois University at Carbondale for the Midwest Technology Center (MTAC) at the ISWS. This analysis of county-level, public-supply water use in six Midwestern states provides useful insights into the relationship between water use and those factors that are most likely to predict or explain water use. It also provides a perspective on the challenges that face water system managers and regional officials in planning to meet future water system infrastructure needs in the region. This summary reviews the water-use projections and related findings of the study, and makes several recommendations for actions that may improve water use forecasting and infrastructure planning for drinking water systems (<http://mtac.sws.uiuc.edu/mtacdocs/finalreports/FinalReportMidwestCWSProjections.pdf>).

County Level Forecasts of Water Use in Illinois: 2005-2025 - Also prepared by the Department of Geography, Southern Illinois University at Carbondale with funding from the Illinois Board of Higher Education through the ISWS. The purpose of this research was to prepare estimates of future water use in Illinois counties based upon the best available data and forecasting methods. The principal outcome of this research is a set of water demand forecasts for seven water use sectors in Illinois: thermoelectric, public supply, self-supplied commercial and industrial, irrigation, self-supplied domestic, mining, and livestock. Total water use is projected to increase in 89 of 102 counties; public water supply use is projected to increase by more than 1.0 mgd in 21 counties. Total water use is projected to increase by 4.4 billion gallons per day, which is equivalent to twice the amount of water diverted from Lake Michigan to Illinois. The report also states that use forecasting can be greatly improved through improvements in the frequency and quality of water use data collection, perhaps through coordination of data collection responsibilities at the ISWS and IEPA.

(<http://info.geography.siu.edu/projects/CountyLevelForecasts/FinalProductPDFs/ISWS%20IL%20Water%20Use%20Projections.pdf>).

An Analysis of Groundwater Use to Aquifer Potential Yield in Illinois - ISWS has conducted a comparison of Year 2000 groundwater withdrawals against estimated aquifer potential yields. The comparison is presented as a ratio of groundwater use (withdrawals) to groundwater yield on a township basis. GIS was used to determine township use-to-yield ratios for three aquifer types (sand-and-gravel, shallow bedrock, and deep bedrock). A high use-to-yield ratio (e.g., >0.9) suggests an area where groundwater availability problems exist or could be impending and should be considered as a means for calling attention to areas to prioritize for water resources planning and management (<http://www.sws.uiuc.edu/pubdoc/CR/ISWSCR2004-11.pdf>).

Water Supply: Identification of Priority Aquifers for Illinois, 2004

Water Supply: Identification of Priority Watersheds for Illinois, 2004

Two draft reports prepared by the ISWS Centers for Groundwater Science and Watershed Science, identify priority aquifer systems and watersheds as most in need of study. Aquifer systems recommended include: 1) the deep bedrock aquifer system of northeastern Illinois, 2) the sand and gravel and shallow bedrock aquifers of northeastern Illinois, 3) the Mahomet aquifer of east-central Illinois, and, 4) the American Bottoms of southwestern Illinois (MetroEast area). Watersheds recommended include the Fox, Kaskaskia, Sangamon, Kankakee and Kishwaukee Rivers as priority watersheds most in need of study. The two reports are being combined for on-line publication as an ISWS Miscellaneous Report in 2005 and will appear on the IWQPM page.

The following reports were published by the ISGS in 2004 and can be ordered through their webpage at <http://www.isgs.uiuc.edu>, then clicking on “Publications and Product Sales” under the “Quick Links”.

Groundwater Geology of DeKalb County, Illinois, with Emphasis on the Troy Bedrock Valley
By R.C. Vaiden, E.C. Smith, and T.H. Larson. 2004. Circular 563. 39 pages. \$13.00
CD-ROM

This report presents findings of a study of the geology and shallow groundwater resources of DeKalb County, concentrating on the aquifers of the buried Troy Bedrock Valley, which have potential for future groundwater development. The study describes the shallow bedrock formations and presents updated maps showing their thicknesses and extent. Cross sections depict the complexity of the materials overlying the bedrock and filling the Troy Bedrock Valley. Descriptions of the three informal units comprising the sediments in the buried bedrock valley give a better understanding of the aquifers in the county.

Illinois Groundwater: A Vital Geologic Resource by Myrna M. Killey and David R. Larson. 2004. Geoscience Education Series 17. 61 pages. \$5.25

Learn more about an essential Illinois resource we often take for granted and sometimes misunderstand. Using easy-to-read text and understandable diagrams, the authors explain what groundwater is, how groundwater is influenced by its geologic framework, what kinds of materials make up aquifers, and how water moves underground. The text also discusses how water supplies are located and retrieved, well types, well maintenance, groundwater quality, and other issues. Understanding how critical groundwater is to Illinois is the first step in managing and protecting this valuable resource.

Land-Use Decisions and Geology: Getting Past “Out of Sight, Out of Mind by Myrna M. Killey and Richard C. Berg. 2004. 68 pp. \$6.00.

The impacts of the state’s large population and its industrial and agricultural bases have presented many kinds of environmental challenges. This book shows how understanding a location’s geologic framework and contamination potential can help society make safer, more cost-effective decisions about land use. Although the focus is on groundwater protection, it is related to groundwater quantity.

Lake Michigan Update

The Corps of Engineers Water Year 2000 Annual Report on Illinois' Diversion from Lake Michigan shows that the diversion in Water Years 2000 and 2001 was 616 cfs and 502 cfs less than the Supreme Court Decree limit respectively. The report concludes that the measurement and computation of the diversion are in full accord with the Supreme Court Decree standard of "best current engineering practice and scientific knowledge." They also acknowledge that they expect Illinois to fully repay its water debt within the next several years. Eliminating Illinois' water debt is significant primarily because it increases the likelihood that we will be able to meet the water demands of the growing northeastern Illinois area into the future within the constraints of the existing Decree. Being in full compliance with the Decree also reduces the potential for conflicts with our neighboring Great Lakes states. Source: IDNR/OWR Lake Michigan Allocation Newsletter Winter 2005.

A summary of water use by all permittees for the 2003 Water Year shows that total domestic consumption of Lake Michigan water was 1031 million gallons per day and represents about 50% of Illinois' total allowable diversion under the Supreme Court Decree. Water diverted directly into the Chicago Sanitary and Ship Canal system and stormwater runoff from the diverted Lake Michigan watershed account for the remainder of Illinois' allowable diversion. Source: 2003 Annual Water Use Audit Reports.

2004 DNR Attended Meetings related to Water Quantity Planning & Management

State Water Plan Task Force (SWPTF) Meetings - water quantity related presentations/discussions:

*Feb. 18, 2004 “Characterization of Worst Case Droughts” by Derek Winstanley
“Groundwater Use to Aquifer Yield” by Al Wehrmann
“Water Reuse/ Conservation Workshop” discussion*

*May 25, 2004 “American Bottoms” by Bob Olson
“Priority Watersheds and Aquifers” by Al Wehrmann & Vern Knapp
“National Perspectives on GW availability” by Bev Herzog
“Senate Bill 2142 - permits for high capacity wells” discussion*

*August 31, 2004 “USGS National Water Use Report” by Bob Holmes
“Illinois Streamflow Assessment Model (ILSAM)” by Vern Knapp
“Priority Watersheds and Aquifers” feedback & discussion
“Critical Water Supply/ need for Emergency Powers” discussion*

*Dec. 7, 2004 “Southern Lake Michigan Regional WS Consortium” report by Al Wehrmann
“Integrated Water Supply & Demand Management” by Ximing Cai*

Integrated Water Quantity Planning and Management (IWQPM)

Meetings were held during the mornings prior to the above cited SWPTF meetings

Mahomet Aquifer Consortium meetings, Champaign, held: *January 20, April 13, July 20 (Easton Field trip), September 14, and November 16, 2004*

Northeastern Illinois Planning Commission (NIPC) & Tri-State Consortium (Illinois, Wisconsin, Michigan) meetings, Chicago, held on: *January 21, June 1, and November 3, 2004*

National Ground Water Association Conference on Pharmaceuticals and Endocrine Disrupting Chemicals in Ground Water, held in Minneapolis on *April 14-15, 2004*

Illinois Groundwater Association, held in Utica on *April 22, 2004* and Batavia on *November 17, 2004*

National Ground Water Association on Ground Water and Environmental Law, held in Chicago on *May 5-6, 2004*

Interagency Coordinating Committee on Groundwater (ICCG), Groundwater Advisory Council (GAC), Springfield, meeting held on: *July 27, 2004*

Southern Lake Michigan Regional Water Supply Planning Consortium Technical Subcommittee meeting, Matteson, held *August 12, 2004*

Illinois Municipal League annual meeting, Chicago, held *September 16-18, 2004*

Illinois Water 2004 Conference, Urbana, held *October 13-14, 2004*

Midwest Groundwater Conference, held in Bloomington, IN on *October 27-29, 2004*

National Ground Water Association Annual Meeting and Exposition, held in Las Vegas on *December 12-15, 2004*

The following project list was prepared by the State Scientific Surveys and identifies projects recently completed or currently underway that are related to effective water quantity assessment and management.

Summary of

Water Supply Planning and Management Projects for the Illinois State Water Survey *related to implementation of the* DNR Integrated Water Quantity Planning and Management Program

ISWS Statewide Planning and Management

Water supply web site - The State Water Survey (ISWS) maintains a web site for water supply information at <http://www.sws.uiuc.edu/docs/wsfaq/>. The web site is intended to be the primary support site in the state for water supply information and includes a “hot button” to receive public input and comments specific to water planning issues.

Climate studies - Studies of climate variability and change have been a core research area for many decades. Three specific research thrusts are: 1) the frequency and intensity of extreme precipitation events which have exhibited considerable temporal variability will be compared to natural variations 2) past and projected fluctuations in Lake Michigan levels and the associated economic impacts and legal problems 3) the threat to future water supplies due to potential natural and human-induced climate changes.

Planning for a worst-case drought - We can better prepare for the next major drought by studying the occurrence of historical droughts over the longest available climatological and hydrologic records and quantifying the precipitation deficits that can be expected in the future. These data can be translated into reduced water availability in lakes, reservoirs, rivers, and shallow aquifers, and to increased water demand. ISWS is preparing the drought scenarios with which water supply managers can evaluate the capacity of their water systems and, if necessary, identify alternative water supplies (if problems exist) with appropriate levels of risk and cost.

Drought planning for small public water systems in the Midwest - Many Western states have experienced widespread and severe economic and environmental impacts of “worst-case” droughts in recent years, and have recognized from these experiences the importance of improved water-supply planning and management, including drought preparedness. However, it is probable that many system managers in the MTAC region have not evaluated their capability to meet water demand during major droughts, nor have in place adequate plans to deal with such emergencies. The goal of this project is to review the status of drought planning, methodologies suitable for drought planning, and adequacy of databases and analytical tools needed for drought planning by small public water systems in the MTAC region.

Planning, developing and maintaining a groundwater supply: a brochure for small communities in the Midwest - For decades, the ISWS has provided expertise to Illinois communities seeking to secure dependable water supplies. This history of experience provides a number of practical guidelines for communities to follow to understand, maintain, and expand their groundwater supplies. This is particularly true for small communities that generally do not have the ability to retain full-time staff devoted to maintaining or expanding current water sources or finding new water sources. In 1981 and 1983, ISWS groundwater scientists organized groundwater workshops to teach engineering consultants, water operators, and drillers about the groundwater resources of the state, techniques for well and aquifer test analysis, well and well field design, and groundwater development planning. With partial funding from MTAC, the workshop notes are being expanded into a useful booklet for small communities across the Midwest (using Illinois principally for examples). Such a booklet can provide needed background information on the steps to take to secure a new groundwater supply and will provide a basic understanding of groundwater concepts so that community leaders can communicate intelligently with their constituency and the people they hire to undertake the task of supply development. The primary client is assumed to be small municipalities in the Midwest although development of industrial and irrigation supplies and even larger municipal supplies will be similar. Topics will include preliminary planning (projecting water demand), groundwater exploration, well/aquifer testing, and well maintenance.

Illinois Water Inventory Program (IWIP) - Documentation of annual water withdrawals (water use) for all of Illinois began in 1978 under a cooperative agreement with the U.S. Geological Survey (USGS). Fiscal support by the USGS ended in 1991, but the IWIP continues under the general oversight of the ISWS Center for Groundwater Science. Surface water and groundwater withdrawal data are collected annually by voluntary submission of a form tailored to each (known) major water user in the state. For more information, see <http://www.sws.uiuc.edu/gws/gwinfo.asp>.

Adequacy of surface water supply systems - An update of the 1989 study “Adequacy of Illinois Surface Water Supply Systems to Meet Future Demands,” is addressing water supply issues in central and southern Illinois. The development of (Illinois Streamflow Assessment Model) ILSAM

models (<http://gismaps.sws.uiuc.edu/ilsam/>) provides the framework needed for updating the basic hydrologic information. An extension of these models for determining reservoir yield is envisioned. Each public water supply system will be contacted to obtain information on current facilities, water use, service areas, and plans for dealing with water supply shortages, if any.

Instream flow assessment - Defining instream flow needs for aquatic ecosystems, navigation, and recreation is crucial to determining the availability of surface water resources during drought conditions. Although instream demands must often be defined by biologists, determination of protected flow levels must also be based on hydrologic considerations, such as how much water is available, how often, and at what times of the year. Additional considerations, particularly in the collar counties in northeastern Illinois, is the joint maintenance of the water supply and instream uses of streams under the influence of wastewater discharges that accompany urban/suburban development. The ISWS is in a unique position to conduct such studies to analyze the hydrologic aspects of protected flow.

Arsenic in Illinois groundwater - The USEPA lowered the arsenic maximum contaminant level for arsenic in drinking water from 50 µg/L to 10 µg/L to be effective by 2006. The IEPA estimates that approximately 50 utilities that use groundwater may be out of compliance without additional treatment. Thousands of private wells likely exceed this health-based standard. To address this issue, the ISWS provides free arsenic analysis of water samples and is continuing research on the occurrence and distribution of arsenic in community, non-community, and private wells in Illinois and potential arsenic removal treatment alternatives. Recently completed reports include *Arsenic Geochemistry and Distribution in the Mahomet Aquifer, Illinois*

(http://www.wmrc.uiuc.edu/main_sections/info_services/library_docs/RR/RR-107.pdf), *Arsenic in Illinois Groundwater: Implications for Non-Community Public Water Supplies*

(http://mtac.sws.uiuc.edu/mtacdocs/finalreports/IDPH_Final_Report.pdf), *Arsenic Removal in Water Treatment Facilities: Survey of Geochemical Factors and Pilot Plant Experiments*

(<http://mtac.sws.uiuc.edu/mtacdocs/finalreports/ArsenicTreatmentMTACFinalReport.pdf>). A final report entitled, *Development of Low-Cost Treatment Options for Arsenic Removal in Water Treatment Facilities*, will be published in 2005. A summary of arsenic-related information can be found on the Center for Groundwater Science page at: (<http://www.sws.uiuc.edu/gws/arsenic/>).

Aquifer testing for water supplies in Illinois - One of the most unique services provided by the ISWS is conducting aquifer tests for communities and large facilities to provide estimates of well and aquifer yield. Testing typically consists of pumping a well at a constant rate over a pumping period of 3 to 24 hours and measuring the groundwater level decline in the pumped well and nearby observation wells, if available. (<http://www.sws.uiuc.edu/gws/gwinfo.asp>).

Water well record keeping - A long-term effort at the ISWS involves archival of construction reports for all water wells drilled in Illinois. Data on the construction reports includes well location, owner, driller, depth of well, well yield, water level when the well was drilled, and geologic formations penetrated. While historical water well data are known to be incomplete, the ISWS possesses records for over 300,000 water wells drilled in Illinois since the turn of the 20th Century. Data archival now includes a digital scan of the original water well construction report. The ISWS receives numerous calls from the public on a daily basis for copies of records or for interpretation of information contained on these records (<http://www.sws.uiuc.edu/data/gwdb/>).

Groundwater level observation network - The ISWS maintains various networks of observation wells for groundwater-level monitoring (<http://www.sws.uiuc.edu/gws/gwinfo.asp>). One statewide network of about 20 wells is used to evaluate long-term trends in the water table, data which can provide a link between climate conditions and shallow groundwater levels, part of the Water & Atmospheric Resources Monitoring (WARM) Program (<http://www.sws.uiuc.edu/warm/>). These data and views of water level hydrographs will be available on-line in 2005. Other networks are used to provide periodic glimpses of aquifer conditions as a result of groundwater development, for

example, water levels in approximately 400 wells completed in the deep bedrock aquifer are measured en-mass every five years - results of the last measurement of deep wells in 2000, *A Comparison of Potentiometric Surfaces for the Cambrian-Ordovician Aquifers of Northeastern Illinois, 1995 and 2000* can be found at:

<http://www.sws.uiuc.edu/pubdoc/DCS/ISWSDCS2002-02.pdf>.

Increasing access to groundwater data - A cooperative effort between the ISWS and the IEPA is enhancing access to three important ISWS-maintained statewide databases on groundwater quality, aquifer hydraulic properties, and water use in Illinois. An ISWS Internet Map Server (IMS) site has been developed to improve internal accessibility to the databases. Water use and groundwater quality are now available on the ISWS IMS (and IEPA SWAP?) sites. Aquifer hydraulic properties will be on the sites in 2005. Improved data access allows users to map specified data, view the map, print information, and download specified data for further analysis.

ISWS Regional Studies

Southern Lake Michigan Water Supply Consortium - The ISWS is working closely with the Northeastern Illinois Planning Commission (NIPC), representatives from local, state and federal agencies, professional organizations, universities, and the business community to establish an organizational structure, process and detailed plan for water supply planning around southern Lake Michigan. Components of planning include education, outreach, scientific studies, and funding. With support from the Joyce Foundation, a water supply conference, entitled *Straddling the Divide: Water Supply Planning in the Lake Michigan Region*, will be held in February 2005. The conference proceedings are available at:

<http://www.nipc.org/environment/slmrWSC/conferences/program.htm>

Chicago area rain gage network - The Cook County Precipitation Network is a 25-site raingage array operated year-round since 1989 by the ISWS for the COE. The network is located in the Lake Michigan and Des Plaines River watersheds of Cook County and is laid out in a grid with a spacing of approximately 10 km between gages. The primary purpose of the network is to produce consistent, accurate data for Lake Michigan diversion accounting. The volume of water diverted from Lake Michigan into the state of Illinois is monitored to ensure that the diversion does not exceed a long-term average as imposed by a 1967 U.S. Supreme Court Order, as updated in 1980.

Water use planning and management for the Fox River - Two current ISWS projects that will play a crucial role in water use planning and management for the Fox River are the water quality evaluation of the Fox River being conducted for the Fox River Study Group, and the water resource evaluation study for Kane County. The ILSAM for the Fox River will serve as a basis for the interactive surface water accounting model for Kane County. The customized model will include enhanced post processing of generated flow data and advanced modeling options that will allow users to assess hydrologic impacts of various future scenarios of water use development. Water quality constraints will be incorporated into the surface water accounting and availability model. These studies will need to be expanded for developing a water supply management plan for the entire Fox River region.

Assessment of water resources availability for Kane County - The ISWS and ISGS are conducting studies to provide technical support for management and protection of water resources in Kane County. The objectives are to help preserve groundwater availability, protect quality, provide a basis for formulating policy and management strategies, and also provide baseline data and a framework for future studies. This past year, the ISWS created potentiometric surface maps depicting groundwater elevations in various shallow aquifers in Kane County. An assessment of shallow groundwater quality, based on water samples collected from 75 shallow aquifer wells and a review of recent historical data in the ISWS water quality database, was also completed. These data

will provide baseline information for identification of potential future changes in groundwater levels and quality from increased withdrawals, land-use changes, or climate change. Preliminary reports on potentiometric surface mapping and groundwater quality will be available in April 2005. (<http://www.sws.uiuc.edu/gws/neilproj.asp>).

Groundwater modeling in northeastern Illinois - Groundwater modeling activities for northeastern Illinois continue to advance. Activities completed include creation of an interstate geological framework, an interstate database of historical water withdrawals by aquifer, and an aquifer hydraulic database for a regional three-dimensional computer model from the aquifers' deepest layers of pre-Cambrian bedrock to the land surface. Models will be used to estimate recharge rates, leakage between aquifers, aquifer responses to increased aquifer development, and assess aquifer yields; assess surface water/groundwater interactions; evaluate alternative management scenarios; and establish a framework for future modeling studies. Current modeling efforts are principally focused on a regional model of the deep bedrock aquifer system and a high-resolution model of shallow aquifers in Kane County. The shallow aquifer model is based on 3-D geologic maps for Kane County and townships immediately surrounding the County. Both models are in calibration phases; predictive modeling from the regional model is expected before the end of 2005.

Mahomet aquifer and the Mahomet Aquifer Consortium - The Mahomet Aquifer Consortium is a grass-roots, not-for-profit organization whose goal is to manage the Mahomet Aquifer which is the major groundwater resource for east-central Illinois. Withdrawals in 1995 for municipal use are estimated at over 30 mgd. Withdrawals for irrigation, principally in Mason and Tazewell Counties (the Havana Lowlands area), put usage well over 100 mgd. Long-term observations of groundwater levels at Champaign show a decline in artesian head of nearly 50 feet since 1950, as a result of increasing water demand in the Champaign-Urbana area. Projections suggest that by 2020 population in the Mahomet aquifer region may increase by 100,000 people. ISWS and ISGS scientists serve as technical advisers to the Consortium. In 2004, ISWS scientists measured water levels in over 50 wells in Champaign and Vermilion Counties to better define the potentiometric surface within and north of the Champaign-Urbana cone of depression. These data will be useful for making improvements to and calibrating the ISWS' digital flow model of the aquifer. The intent of modeling is to examine the effects of increased development and to provide insight on development alternatives (<http://www.sws.uiuc.edu/gws/mahomet.asp>).

Modeling aquifer heterogeneity: NCSA Fellowship - Fractured dolomite aquifers are one of a series of bedrock aquifers that are part of the drinking- water supply for the greater Chicago area. Groundwater flow and contaminant transport in fractured rock systems are notoriously difficult to characterize because the features conducting flow do not necessarily fill the available volume that porous media (e.g., sand-and-gravel) typically do. With support from the National Center for Supercomputing Applications and Sandia Laboratories, research is continuing on the characterization of these aquifers through the advanced analysis of simulated hydraulic and tracer tests. The goal is to determine the relationship between the flow dimension inferred from hydraulic tests, stochastic models of heterogenous transmissivity, and the behavior of tracer tests and thus identify plausible models of aquifer heterogeneity.

Water levels, precipitation, and recharge in the Imperial Valley - Mason & Tazewell Counties The ISWS has operated a network of rain gauges in Mason and Tazewell Counties since August 1992 and also established a network of groundwater observation wells in the Mason-Tazewell area in 1994 that is monitored by the Imperial Valley Water Authority. The purpose of these networks is to collect long-term data to determine the impact of groundwater withdrawals in dry periods and during the growing season, and the rate at which the aquifer recharges. Precipitation is recorded continuously at 20 rain gauges. Groundwater levels are measured each month at 13 observation

wells. The database from these networks consists of eleven years of precipitation data and nine years of groundwater observations. Six new observation wells were added in 2003 at an irrigation field site near Easton to observe the interaction of precipitation, groundwater levels, stream discharge, and irrigation. A field trip to the site was conducted for the Mahomet Aquifer Consortium in July 2004. The most recent publication of data for 2002-03 can be seen at: <http://www.sws.uiuc.edu/pubdoc/CR/ISWSCR2004-01.pdf>

Groundwater conditions of the principal aquifers of Lee, Whiteside, Bureau, and Henry Counties, Illinois - This report on the aquifers often associated with the Green and Rock River Lowlands was published in 2004. The region encompasses more than 900 square miles in northwestern Illinois, including Rock Falls, Princeton, Amboy, and Annawan. Groundwater provides about 45 mgd for summer irrigation and about 3.5 mgd year-round for the area's 45,000 residents. The study entailed drilling 41 observation wells at 27 sites and the collection of over 1800 groundwater level measurements between 1991 and 1995. The data show that the two aquifer systems, a shallow water-table aquifer (the Tampico aquifer) and a deeper artesian aquifer (the Sankoty aquifer), are hydraulically independent, that heavy use of the Sankoty for irrigation does not influence water levels in the overlying Tampico aquifer, and that water levels in the Sankoty historically recover fully over the nonirrigation season. These data also show that groundwater movement in both aquifers is largely down the valley between the Rock and Green Rivers eventually discharging to the Mississippi River, but that a significant portion of the flow in the deeper Sankoty is diverted down the ancient Mississippi valley to the modern Illinois River. Annual estimated recharge to the Tampico aquifer was 7 inches but only 1 inch to the Sankoty aquifer. The final report can be found at: <http://www.sws.uiuc.edu/pubdoc/DCS/ISWSDCS2004-01.pdf>

ISWS Statewide Education and Outreach

“Water Choices” - an educational tool - Water Choices is an educational computer program developed as an aid in teaching concepts of water resources. It presents the student with a hypothetical stream – wetland – aquifer system and calculates the impacts of management decisions on a wetland, streamflow, and groundwater levels. Water Choices is distributed with scenarios that illustrate specific water resources concepts, including Moderate Development, Predevelopment, Climate Change, and Competitive Usage scenarios. Water Choices was developed under a grant from the Illinois State Board of Higher Education.

Summary of

Water Supply Planning and Management Projects for the Illinois State Geological Survey *related to implementation of the* DNR Integrated Water Quantity Planning and Management Program

ISGS Statewide Planning and Management

Cross references of well logs among state agencies - Well logs are the basis for groundwater investigations. To facilitate cross-referencing between water well databases at the ISGS, Illinois ISWS, Illinois Department of Public Health (IDPH), and Illinois Environmental Protection Agency (IEPA), the ISGS entered API well identification numbers for more than 6,000 community water-supply wells to the IDPH, IEPA, and ISWS databases. During this project, valuable locational data also were added to the ISGS database. This effort was completed in 2004.

National Resources Geospatial Data Clearinghouse - The Illinois Natural Resources Geospatial Data Clearinghouse (Illinois Clearinghouse) provides Internet access for no-cost, geographically-referenced digital data and imagery for Illinois. The on-line data holdings can be used to support a variety of GIS and remote sensing applications. The Illinois Clearinghouse, <http://www.isgs.uiuc.edu/nsdihome/>, is a multi-agency effort to make metadata and digital geospatial data about Illinois natural resources available on the Internet. ISGS established and maintains the Illinois Clearinghouse, which has been on-line since July 1997. The primary goal of this effort is to foster a climate for the cooperative development of a statewide clearinghouse network in Illinois by promoting the advantages of the National Spatial Data Infrastructure (NSDI), a worldwide effort that promotes and supports digital data access and distribution. Available data sets (with documentation) include: Digital Raster Graphics (DRG) files, Digital Orthophoto Quarter-quads (DOQ) files, geology, major bedrock aquifers, sand and gravel aquifers, Aquifer Sensitivity to Contamination by Nitrate Leaching, Aquifer Sensitivity to Contamination by Pesticide Leaching, land use, political boundaries, and more. The Illinois Clearinghouse continues to attract considerable attention and download rates increase every month. During the first six months of 2003, the Illinois Clearinghouse recorded about 1,350,000 hits from 54,500 individual users. During the same period, about 60,500 DOQ files were downloaded from the Clearinghouse, a rate of more than 300 per day. The Illinois Clearinghouse can be accessed at <http://www.isgs.uiuc.edu/nsdihome/ISGSindex.html>.

ArcIMS Application to Access ISGS Well Data - A simple interactive map, accessed through the ISGS home page (<http://www.isgs.uiuc.edu/>) allows easy access to ISGS's database on water wells and other related borings. Visitors to the site can use the map to zoom in to a location and see what records are available. By clicking on the individual well spots, information about the location and ownership of the well, and its total depth can be viewed in tabular form. Clicking on the specific well identifier in the table brings up the driller's description of the character of the geological materials penetrated by the well (if recorded). The location and ownership information ("header" data) for about 286,000 wells drilled for water, engineering tests, and stratigraphic control are available through the new on-line query system. About 204,000 of these wells have geological information recorded in the database; for those not yet entered into the database, paper records are available. Alternatively, on another page, you can query the data base by section, township and range to get a listing of all wells in a section. Geological and other data on about 190,000 oil and gas production and exploration wells can be accessed through a separate system. Much work remains to make both digital databases complete.

Technique development for improved mapping - Techniques to improve data collection and map display were developed. High-resolution seismic reflection appears to be well suited for defining sand and gravel aquifers within the Quaternary sediments. Recent advances in data collection allow more efficient data collection. These advances are summarized at http://www.isgs.uiuc.edu/geologicm/g_m19.htm, with a more detailed report available at http://www.isgs.uiuc.edu/servs/pubs/pdf-pubs/ibhe_report.pdf. ISGS is also evaluating different approaches for including uncertainty in geologic maps.

Effects of agriculture on groundwater - The ISGS and ISWS have continued studying the environmental effects of agriculture including pesticides in shallow groundwater, swine manure pits, and nitrogen in the shallow groundwater of an agricultural watershed. A report on the Statewide Pesticide Monitoring Network is currently in final review and should be published within a year.

ISGS Regional Studies

Mapping of groundwater resources - ISGS scientists have been involved with mapping groundwater resources and studying the fate and transport of contaminants in shallow groundwater. *Groundwater Geology Dekalb County*, described above, was published in 2004. Additional efforts are underway to map the groundwater resources in McHenry and Lake Counties.

(http://www.isgs.uiuc.edu/geologicm/g_m9.htm), and the MetroEast area (http://www.isgs.uiuc.edu/geologicm/g_m13.htm). A new joint study of the groundwater resources of Kendall County is expected to begin in 2005 with the ISWS. Three formalized and eighteen preliminary geologic maps (mainly surficial geology, bedrock geology and drift thickness) were published in 2004. These maps are the basis for detailed aquifer mapping. Additionally, the ISGS has an active program to help municipalities find groundwater through surface geophysical explorations techniques. In 2004, the Clark-Edgar Rural Water District, the city of Paris, and the Village of Gifford were among the municipalities contracting for this service; all located the water they needed.

Southern Lake Michigan Water Supply Consortium - ISGS is a member of the technical committee to the Consortium. See above under ISWS studies.

Assessment of water resources availability for Kane County - ISGS shares responsibility with ISWS for this project. The ISGS completed the preliminary geologic mapping in 2004 and published “*Kane County water resources investigations: interim report on geologic investigations*” by William S. Dey, B. Brandon Curry, John C. Sieving, Alec M. Davis, and Curt C. Abert, 75 p. ISGS Open file series 2004-9. This publication is available on CD-ROM for \$13.00 or on-line at http://www.isgs.uiuc.edu/servs/pubs/new-pdfs/ofs/2004/ofs2004_09.pdf. Several of the large-scale maps are available separately.

Mahomet aquifer and the Mahomet Aquifer Consortium - The ISGS, ISWS, USGS/Urbana, and IDNR/Office of Water Resources continued to serve as technical advisors for the Mahomet Aquifer Consortium (<http://www.mahometaquiferconsortium.org/>), which has sought funding and support to study the aquifer underlying east-central Illinois. See write-up under ISWS studies.

Groundwater Resources and Peaker Power Plants in Illinois - The ISGS is assessing the demand for water by peaker plants with respect to the occurrence of water resources and the demands from domestic, municipal, commercial, industrial, and agricultural uses. The report should be completed in 2005.

ISGS Statewide Education and Outreach

Education series publication on groundwater - Two publications, “*Groundwater: A Vital Geologic Resource*” and “*Land-Use Decisions and Geology: Getting Past “Out of Sight, Out of Mind”*” were developed as part of the ISGS educational series to provide the citizens of Illinois with a better understanding of their state’s groundwater resources and the need to protect them. These publications are described above; ordering information can be found at: http://www.isgs.uiuc.edu/isgshome/new_pubs/new-pubs.htm.

Target Areas for 2005

The IWQPM will continue to target the following areas for water quantity planning and management in 2005:

1. Work toward development of a Regional and Multi-state pilot plan for northeastern Illinois, working with NIPC and the Tri-State Water Consortium.
2. Work toward development of a pilot or model aquifer management plan, working with local and regional authorities. For example, preliminary discussions with the Mahomet Aquifer Consortium Executive Board have shown them to be receptive to creation of a Management Committee to initiate discussions of what aquifer management means to the Consortium and the various forms such management might take.
3. Work toward development of a pilot management plan for the Fox River, working with the existing Fox River Study Group coalition, which includes the Fox River Ecosystem Partnership, NIPC et al.
4. Work at updating the “Mitigative Measures for At-Risk Public Surface Water Supply Systems in Illinois” report done by Singh and McConkey in 1990. A Standard Research Agreement between the DNR Office of Water Resources (as sponsor) and the University of Illinois was executed late this year for the ISWS to begin this effort. The proposed study is expected to have a three-year duration, depending on available funding levels.
5. Provide input and comment on proposed water quantity related legislation.
6. Continue planning strategies and data collection for addressing the worst-case drought.
7. Draft reports on Priority Water Quantity Planning Areas have been prepared and can be accessed from the ISWS web site. We have received some comments on these reports, for example, a consideration to add the Kishwaukee River to the watershed priority list. We intend to finalize these reports this year in consideration of the comments we have received. We will promote the development of voluntary, cooperative regional water management consortia in these priority areas by providing technical and financial assistance for planning and management efforts.
8. The Subcommittee recommended that the state should consider voids in current law like instream flow and well interference by initially developing guidelines identifying best management practices (BMPs) for voluntary adoption. It stated that experience with voluntary implementation of such BMPs will clarify whether it is necessary to adopt them statutorily. We hope to develop draft BMP reports for review and comment by the end of the year.
9. Expand county-wide studies of groundwater potential to more counties in high priority areas. Kane County has been a good model for these studies. The ISGS and the ISWS are currently in negotiations with Kendall County for a similar study. Also, the ISGS plans to start assimilating the detailed geologic quadrangle maps its been doing in Lake County into countywide maps which emphasize aquifer occurrence, starting in 2005.