

County of McHenry: Division of Water Resources

# Update on Water Studies

Groundwater Protection Program

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## **Research Overview**

The availability and sustainability of an adequate and dependable quality water supply is essential for a society's public, environmental, and economic health. Groundwater is an especially important resource to McHenry County as underlying aquifers provide 100 percent of the County's water supply source, with no alternatives available. Additionally, McHenry County has been one of the fastest growing counties in the nation within the recent past.

There are two major groundwater concerns in McHenry County. First, is the primary impact of increased groundwater pumping on the existing water supply as groundwater shortages are predicted in the Southeast corner of McHenry County as soon as 2020. Second, is the potential for groundwater contamination grows proportionally with population increases and corresponding increases in business activity. It is important to note that if supply shortages are already forecasted, any unchecked impacts to our groundwater quality could seriously impact the viability of our resource to meet current or future potable water supply needs. Therefore, it is of significant importance to the County to ensure a safe, sustainable supply of potable fresh water for our current and future residents.

From 2000 to 2030, McHenry County's population is expected to grow by 225,000 with the number of households projected to increase by more than 66,000. That dependence is likely to continue to grow as the County's population swells from 304,000 in 2005 to an estimated 589,000 in 2050, a 94 percent increase (Dziegielewski and Chowdhury, 2008).

In the year 2000, water use in the county amounted to an annual average of 34.6 million gallons per day (mgd). Based in large part upon data provided by the Illinois State Water Survey (ISWS), Dziegielewski and Chowdhury (2008) estimated 2005 groundwater withdrawals in McHenry County, corrected to normal weather conditions, amounted to 39 million gallons per day (Mgd). By 2030, average annual water use is estimated to almost double to 67.5 mgd. Further, based upon a variety of assumptions, County-wide water demand could feasibly increase by 8 to 61 Mgd by 2050. In any given year, drought conditions could raise the demand even further.

Recent information, as stated above, as well as prior information from the Baxter and Woodman Groundwater Resources Management Plan, completed in 2006, all predict that water supply shortages are probable in McHenry County within the next 10-20 years. Therefore, McHenry County saw the need for proactive water supply planning and hired a Water Resources Manager in 2007. Since 2007, the Division of Water Resources has been coordinating the implementation of a comprehensive research program to quantify and clarify the groundwater resource concerns county-wide. Additionally, the Division of Water Resources has been working to develop a comprehensive Water Resources Action Plan to ensure the long-term sustainability of the County's drinking water supply.

## Summary of Projects:

### 1. Installation of an Observation Well Network and Level Troll Equipment

- **Funding Source:**
  - Planning Assistance to States (PAS)
    - Project Budget FY 2008: \$595,000
      - \$297,500 County / \$297,500 USACE (50/50 Cost Share)
    - Project Budget FY 2009: \$30,000
      - \$15,000 County / \$15,000 USACE (50/50 Cost Share)
- **Federal Partner:**
  - United States Army Corps of Engineers (USACE)
- **Project Scope:**
  - To observe and record the long-term changes in the aquifers across McHenry County through the installation of a dedicated observation well network and associated Level Troll Equipment for the real-time collection of aquifer water levels. Aquifers contain groundwater and groundwater is the sole source of drinking water for all of McHenry County.
- **Implementation Status:** Complete
  - 28 nested observation wells were installed per the original Scope of Work with United States Army Corps of Engineers
  - 12 additional observation wells were installed as a part of the County's 3-D Hydro-geological Mapping Project with the Illinois State Geological Survey.
    - Total of 40 wells with real time data loggers
      - 28 USACE Wells:
        - Wells per Townships: Alden (1), Marengo (1), Riley (1), Algonquin (2), Chemung (2), Grafton (2), Greenwood (2), Hebron (2), McHenry (2), Nunda (2), Seneca (2), Coral (3), Hartland (3), Richmond (3)
      - ISGS Wells:
        - Wells per township: Alden (1), Coral (1), Dorr (1), Dunham (1), Grafton (2), Greenwood (1), Hartland (1), Hebron (1), Marengo (1), McHenry (1), Nunda (1),

## 2. Three-Dimensional Hydro-geological Mapping

- **Funding Source:**
  - McHenry County Division of Water Resources
    - Project Budget: \$176,708
  
- **State Partner:**
  - Illinois State Geological Survey (ISGS)
  
- **Project Scope:**
  - The current 3-D mapping project in McHenry County, IL is aimed at providing technical information and support for the sustainable management and protection of groundwater resources for the County. In particular, this project will provide an evaluation of the distribution and character of sand and gravel aquifers in the County as well as insight on their potential for recharge and vulnerability to contamination. The 3-D hydro-geological map will also be used to construct a geological framework model for the numerical groundwater flow modeling that will be conducted by the Illinois State Water Survey (ISWS).
  
- **Implementation Status: In Progress**
  - The four year project began in July 2008 and will conclude in December 2011.
  - All geological borings and geophysical analysis are complete
    - 17 locations were drilled in the county (8 first year, 9 second year):
    - 11 drilling locations and 9 wells were funded by the county
    - 6 additional drilling locations and 5 additional wells funded by NE IL Water Supply project
  - Geophysical Logging and Analysis:
    - Approximately 20 miles of seismic and approximately 13 miles of electrical resistivity surveys
    - Downhole gamma logs and electrical resistivity logs completed in 27 wells (14 USACE, 13 ISGS) and downhole seismic profiles in 8 wells
  - ISGS currently entering all data into a 3-D model and will begin working with staff to develop application specific maps

### 3. Groundwater Studies for Water Supply Planning in McHenry County, Illinois

- **Funding Source:**
  - McHenry County Division of Water Resources
    - Project Budget: \$218,793
  
- **State Partner:**
  - Illinois State Water Survey (ISWS)
  
- **Project Scope**
  - The link between sound groundwater management and sustainable economic growth has prompted the County to seek the appropriate scientific and technical assistance from the Illinois State Water Survey (ISWS) to create a groundwater flow model for the County utilizing the digital 3-D geological map being developed by the Illinois State Geological Survey (ISGS). It will also utilize and interpret information gathered from the County's Observation Well Network. This model will provide a tool to examine impacts from current and future groundwater development, determine groundwater flow directions and groundwater interaction between aquifers, provide insight on the location and relative sensitivity of groundwater recharge areas, and develop a web based tool called *uWATER* for viewing and analyzing Groundwater Flow Model outputs.
  
- **Implementation Status: In Progress**
  - The three year project began in February 2010.
    - Currently, the ISWS is developing a free, publicly accessible and user friendly online tool called *uWATER* for displaying relevant water resources information for the purpose of Groundwater Flow Modeling. Data sets compiled to date include: streamflow, rainfall, evapotranspiration, groundwater withdrawals. Advance Identification (ADID) wetlands, and McHenry County Natural Areas Inventory (MCNAI) sites.
    - ISWS has begun analyzing preliminary data supplied by the ISGS, Northeastern Illinois Regional Water Supply Planning Group, the United States Geological Survey (USGS), and the County's Observation Well Network installed by the United States Army Corps of Engineers (USACE).
  - ISWS is assisting the United States Geological Survey (USGS) in the development of a database for collecting and processing groundwater levels, precipitation information, and stream gauges from the County-wide real-time network.

#### 4. Water Supply Planning in McHenry County, Illinois

- **Funding Source:**
  - Groundwater Resources Program of the U.S. Geological Survey, U.S. Department of the Interior
    - Project Budget: \$280,000
- **Federal Partner:**
  - United States Geological Survey
- **Project Scope**
  - The current water supply planning project in McHenry County, IL is aimed at providing technical information and support for the sustainable management and protection of groundwater resources for the County. In particular, this project will equip all 40 observation wells with telemetry equipment for the real-time transmission of aquifer water level data to the United States Geological Survey National Water Information System Web Interface and will then be processed and displayed on a publicly accessible website tailored to meet McHenry County's unique needs and similar to <http://waterdata.usgs.gov/nwis/gw>.
  - A second component of this project is to install two stream gauges in the Western half of McHenry County in the Kishwaukee River Watershed. Currently, this watershed does not have any continuous stream gauges in McHenry County. The Stream Gauges will assist the County with its long-term goal of maintaining a safe and sustainable water supply for the county by recording the interactions of groundwater and surface water. Additionally, these stream gauges will meet the needs of the Natural Hazards Mitigation Planning efforts of the County by assisting with the prediction of flood events, assisting with revision base flood elevations, assisting with the protection of critical facilities, and, long-term, can help to reduce repetitive flood loss claims.
- **Implementation Status: In Progress**
  - USGS is currently developing a web based database to collect and process all information from McHenry County's observation wells, stream gauges, and precipitation gauges.
  - All Telemetry equipment has been ordered and is scheduled for installation beginning in mid-late June.
  - McHenry County is currently working to secure locations along Franklinville Creek and the Kishwaukee River for installation of Stream Gauges. The County is also working with local municipalities to secure a long-term financial commitment to support the operation and maintenance of these gauges (Total O&M cost is ~\$12,500 per year, County is looking for 2 or more partners for a total of \$6,500 cost share assistance per year). Pending approval and a financial partner, these stream gauges will be installed between August and October 2010.

## 5. Water Quality Analysis on Aquifers Utilizing the Observation Well Network in McHenry County, IL

- **Funding Sources:**
  - Planning Assistance to States (PAS)
    - 2010 Project Budget: \$70,000
      - \$35,000 County / \$35,000 USACE (50/50 Cost Share)
  - Groundwater Resources Program of the U.S. Geological Survey, U.S. Department of the Interior
    - Project Budget: Approximately \$20,000 of the \$280,000 mentioned in Project 4.
- **Federal Partners:**
  - Joint project with the United State Geological Survey (USGS) and the United States Army Corps of Engineers (USACE)
- **Project Scope:**
  - McHenry County has a network of 40 observation wells located in shallow sand and gravel aquifers from 25 – 400 feet in depth. These aquifers are utilized as a potable water supply for private, community and municipal wells. The purpose of this project is to evaluate these aquifers, utilizing the observation well network, and to record a portion of the baseline water quality information to assist the County in identifying changes in the short-term and long-term viability of the drinking water supply. This baseline monitoring data can also be used to respond to current and future deteriorations in water quality by equipping the County with information on what area(s) is impacted, what contaminant(s) is present, and what impact(s) it may have on human health. It is the County's belief that being proactive will help to ensure the future health and safety and economic viability of the county. Groundwater aquifers are the sole source of drinking water for all of McHenry County.
- **Implementation Status: In Progress**
  - Currently working with the USGS and the USACE to develop a scope of work and an associated contract.
  - Parameters for analysis have been coordinated with other agencies to ensure quality information is collected and to ensure comparability to other data sets. Coordinating agencies include:
    - Illinois Environmental Protection Agency – Bureau of Groundwater's annual analysis,
    - United States Geological Survey's annual NAWQA sampling efforts,
    - Illinois State Water Survey for our Groundwater Study in Project #3 from above.
  - Pending approval, the USGS will begin sampling in late July and conclude in late August.

