Illinois Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief

MAJOR QUATERNARY AQUIFERS
KANE COUNTY, ILLINOIS

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2007

Illinois County Geologic Map
ICGM Kane-QA

Introduction

This map was produced as a part of *Kane County Water Resources Investigations: Final Report on Geologic Investigations* (Dey et al. 2007b) and is a refined version of two previous maps (Dey et al. 2004, 2005). The report and maps are part of a contract report for a project titled *Water-Resources Investigations for Kane County, Illinois* (Meyer et al. 2002). The Illinois State Geological Survey and Illinois State Water Survey (ISWS) have examined the groundwater resources of Kane County through three-dimensional geologic mapping and groundwater flow modeling. The goal of these investigations was to provide Kane County with tools to better manage their groundwater resources.

Major Quaternary Aquifers

In Illinois, major aquifers are defined as geologic units (sand and gravel or fractured and/or permeable bedrock) capable of yielding at least 70 gallons of water per minute (gpm) to wells completed in them (Miller et al. 1985). Quaternary aquifers in Kane County are thick sand and gravel deposits. This map depicts the location of large contiguous sand and gravel deposits that have the potential to meet the definition of a major aquifer. The thickness is an aggregate thickness of sand and gravel within the mapped aquifer and not necessarily the thickness of any one lithostratigraphic unit. The mapped aquifers are greater than 50 feet thick at some points within their distribution and are several square miles in areal extent. Boundaries are shown where the aquifer thickness is 20 feet or greater. Any properly constructed well that is sited where one of the identified aquifers has a saturated thickness of greater than 20 feet should have a high probability of producing greater than 70 gpm of water, assuming minimal influence from other pumping wells or aquifer boundaries.

Following the descriptions of Curry and Seaber (1990), Vaiden and Curry (1990) mapped four Quaternary aquifers that had the potential for development as public water supplies in Kane County. Working from these definitions and employing results from the current mapping effort, we have identified five major, named Quaternary aquifers and a group of unnamed major Quaternary aquifers. Estimates of the degree of saturation of aquifer materials are based on water level data collected by the ISWS during fall 2003 (Locke and Meyer 2005).

1. The St. Charles aquifer, named for the St. Charles Bedrock Valley, is located in the valley and its tributaries in eastern and southern Kane County. The St. Charles aquifer is composed of sand and gravel of the Ashmore Tongue of the Henry Formation and the Glasford Formation. These units are in hydraulic contact in a large portion of the mapped area of the aquifer. In the northern half of the county, away from the Fox River, the aquifer is commonly more than 50 feet below the land surface. Near the Fox River, the aquifer is commonly less than 20 feet below the land surface. The aquifer has some hydraulic connection to the Fox River in the vicinity of St. Charles where the aquifer could be considered to be under leaky confined conditions. Throughout the rest of the aquifer's extent it is under confined conditions.

2. The Hampshire aquifer is located west of Marengo Ridge (see Dey et al. 2007a) in northwestern Kane County and is named for the village of Hampshire. The Hampshire aquifer is composed of the Ashmore Tongue of the Henry Formation and sand and gravel of the Glasford Formation. Surficial sand and gravel of the Henry Formation are included in areas where the Tiskilwa Formation is absent north and west of Hampshire. These coarse-textured units are all in hydraulic contact northwest of Hampshire where the aquifer is unconfined. Where the Tiskilwa Formation is present (south and east of Hampshire), the aquifer is confined. The Ashmore Tongue and Glasford sand and gravel are in hydraulic contact in the area around Burlington. This aquifer is analogous to the previously mapped Bloomington aquifer (Curry and Seaber 1990).

3. The Virgil aquifer, named for the town of Virgil, is located in west-central Kane County. It is composed of the Ashmore Tongue of the Henry Formation and sand and gravel of the Glasford Formation. These coarse-textured units are in hydraulic contact near the center and eastern portion of the aquifer. The aquifer is overlain by greater than 20 feet of Tiskilwa diamicton and is 50 to 200 feet below the land surface. The aquifer is under confined conditions.

4. The Gilberts aquifer, named for the town of Gilberts, is located in north-central Kane County. It is composed of the Ashmore Tongue of the Henry Formation and sand and gravel of the Glasford Formation. The Gilberts aquifer is overlain by 50 to greater than 100 feet of Tiskilwa diamicton and is 125 to 250 feet below the land surface. The aquifer is under confined conditions.

The St Charles, Hampshire, Virgil, and Gilberts aquifers share most of the same lithostratigraphic units, but there is enough geographic separation between them to consider them separate aquifers.

5. The Carpentersville aquifer, named for the town of Carpentersville, is located in northeastern Kane County immediately below the ground surface and east of the Fox River. The Carpentersville aquifer is composed of the surficial sand and gravel of the Henry Formation, the Beverly Tongue of the Henry Formation, sand and gravel of the unnamed tongues of the Henry Formation underlying the Batestown and Yorkville Till members of the Lemont Formation, the Ashmore Tongue of the Henry Formation, and sands and gravels of the Glasford Formation. All of these coarse-textured units have some hydraulic connection in the mapped extent of the aquifer or to the east in Cook County. The upper sand and gravel units included in the aquifer may not be fully saturated; therefore, the mapped thickness of the aquifer may be overestimated. This aquifer is analogous to the previously mapped Valparaiso aquifer (Curry and Seaber 1990)

6. The unnamed aquifers are composed of surficial sand and gravel of the Henry Formation and/or sand and gravel of the unnamed tongues of the Henry Formation underlying the Batestown and Yorkville members of the Lemont Formation. Curry and Seaber (1990) had previously identified assemblages of these hydrostratigraphic units as the Kaneville aquifer (a member of the Elburn aquiformation). These units lack the continuity of a single aquifer, but locally may meet the definition of a major aquifer. Water level data for the units constituting these aquifers are sparse, making generalized assessment of their saturated thickness imprudent. In general, these aquifers are expected to be unconfined or leaky confined.

Methodology

This map was constructed by compiling appropriate individual isopach (thickness) maps for each of the major sand and gravel units in the county where the units have some hydraulic continuity. Hydraulic continuity was determined by generating maps where intervening fine-textured units were absent. The map depicts only those regions where the thickness of aquifers is greater than 20 feet. For example, the St. Charles aquifer was delineated by combining isopach maps of the sand and gravel of the Ashmore Tongue of the Henry Formation and the upper and lower coarse-textured layers of the Glasford Formation (see Abert et al. 2007). The sand and gravel isopach maps were compared with isopach maps of the upper and middle fine-textured layers of the Glasford Formation (see Abert et al. 2007) to identify areas where these intervening fine-textured layers were absent. The absence of these layers in portions of the mapped areas confirmed hydraulic continuity between the coarse-textured units. The combined sand and gravel thicknesses were superimposed on the bedrock topography map. The St. Charles aquifer is identified as the thick sands in the vicinity of the St. Charles Bedrock Valley and its tributary bedrock valleys.

The Hampshire aquifer was delineated by combining isopachs of the Ashmore Tongue of the Henry Formation and sand and gravel of the upper and lower coarse-textured layers of Glasford Formation in the region west of Marengo Ridge (Dey et al. 2007a). The isopach of the surficial sand and gravel of the Henry Formation was added where the Tiskilwa Formation is absent.

The Gilberts and Virgil aquifers were delineated by combining isopach maps of the sand and gravel of the Ashmore Tongue of the Henry Formation and sand and gravel deposits of the Glasford Formation.

The Carpentersville aquifer was delineated using isopachs for all of the coarse-textured Quaternary units.

The unnamed aquifers were delineated by combining isopachs of surficial sand and gravel of the Henry Formation and/or sand and gravel of the unnamed tongues of the Henry Formation underlying the Batestown and Yorkville members of the Lemont Formation.

Application

The map shows areas where there is a high probability of obtaining greater than 70 gpm from a properly constructed well finished in one of the mapped aquifers. Areas where the aquifers are close to or greater than 100 feet thick are recommended as locations to begin searching for shallow high-capacity wells. This map is intended to be used for county-scale planning and as a guide to exploration for developing shallow groundwater resources. This map should not be used as a substitute for site-specific work.

References

Abert, C.C., W.S. Dey, A.M. Davis, and B.B. Curry, 2007, Three-dimensional geologic model, Kane County, Illinois: Illinois County Geologic Map, ICGM Kane-3D.

Curry, B.B., and P.R. Seaber, 1990, Hydrogeology of shallow groundwater resources, Kane County, Illinois: Illinois State Geological Survey, Contract/Grant Report 1990-1, 37 p.

Dey, W.S., A.M. Davis, B.B. Curry, and C.C. Abert, 2007a, Geologic cross sections, Kane County, Illinois: Illinois State Geological Survey, Illinois County Geologic Map, ICGM Kane-CS, 1:100,000.

Dey, W.S., A.M. Davis, B.B. Curry, D.A. Keefer, and C.C. Abert, 2007b, Kane County water resources investigations: Final report on geologic investigations: Illinois State Geological Survey, Contract Report (in press).

Dey, W.S., A.M. Davis, B.B. Curry, and J.C. Sieving, 2004, Preliminary map of major Quaternary aquifers, Kane County, Illinois: Illinois Preliminary Geologic Map, IPGM Kane-QA, 1:100,000.

Dey, W.S., A.M. Davis, B.B. Curry, and J.C. Sieving, 2005, Interim map of major Quaternary aquifers, Kane County, Illinois: Illinois Preliminary Geologic Map, IPGM Kane-QA, 1:100,000.

Locke, R.A., and S.C. Meyer, 2005, Kane County water resources investigations: Interim report on shallow aquifer potentiometric surface mapping: Illinois State Water Survey, Contract Report 2005-04, 89 p.

Meyer, S.C., D.D. Walker, S.M. McConkey, W.S. Dey, B.B. Curry, C.C. Abert, and E. Mehnert, 2002, Water-resources investigations for Kane County, Illinois: Illinois State Water Survey and Illinois State Geological Survey, A proposal to Kane County Development Department, 55 p.

Miller, J.R., R.C. Berg, T.M. Johnson, and H.A. Wehrmann, 1985, Siting a low-level radioactive waste disposal facility in Illinois; Statewide criteria description of maps compilation data base and intended use: Illinois State Geological Survey, Report to Illinois Department of Nuclear Safety, 27 p.

Vaiden, R.C., and B.B. Curry, 1990, Aquifers with potential for development of public water supplies, Prairie Aquigroup, Kane County: Illinois State Geological Survey, Open File Series 1990-2a, 1:62,500.

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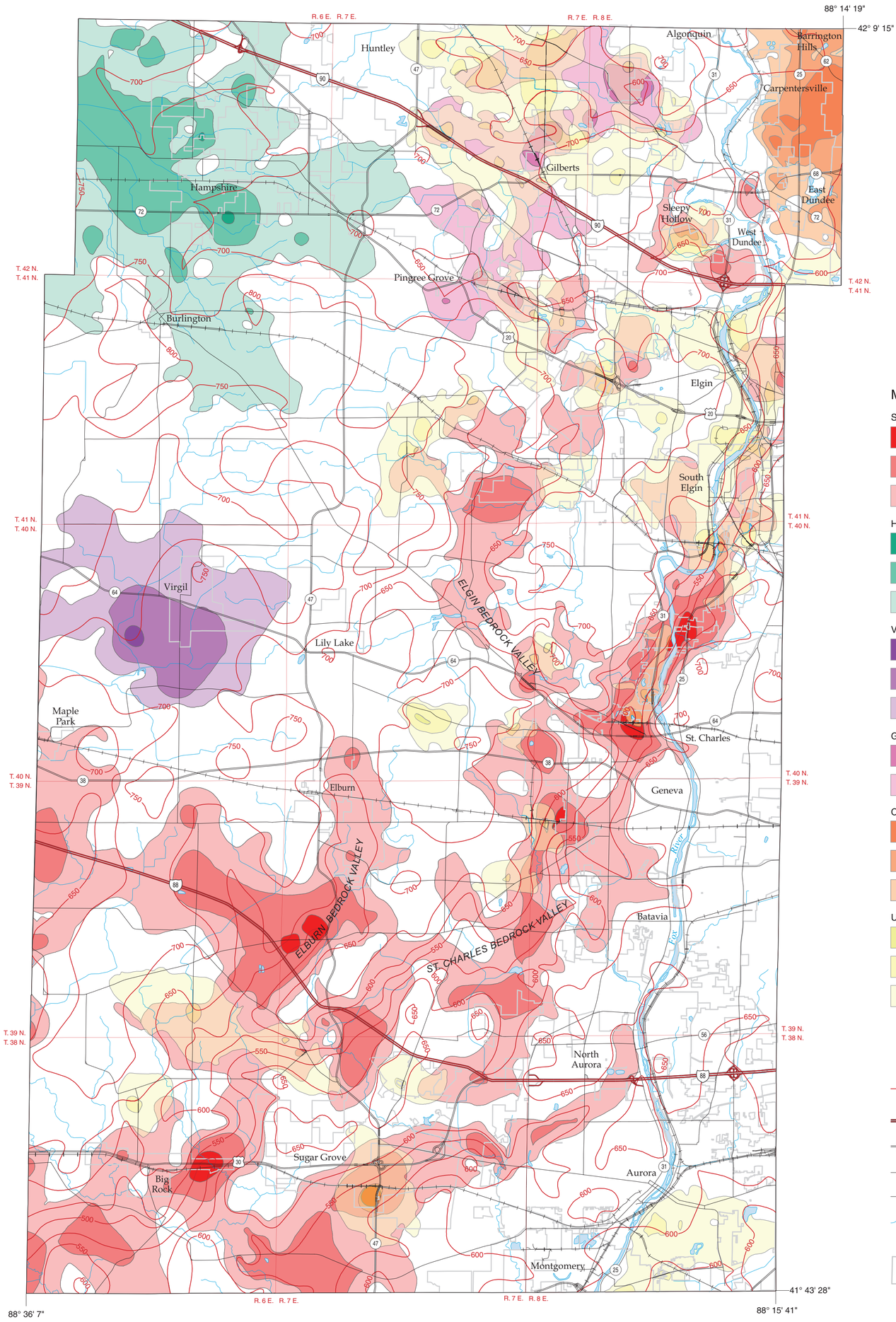

Major Aquifers (thickness in feet)

- St. Charles: >100; 50–100; 20–50
- Hampshire: >100; 50–100; 20–50
- Virgil: >100; 50–100; 20–50
- Gilberts: 50–100; 20–50
- Carpentersville: >100; 50–100; 20–50
- Unnamed: >100; 50–100; 20–50

750 — Bedrock surface elevation
Contour interval 50 feet
(above mean sea level)

Interstate highways
U.S. and state routes
Other roads
Railroads
Rivers and lakes
Municipal boundaries

SCALE 1:100,000
1 0 1 2 3 4 5 6 7 8 MILES
1 0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

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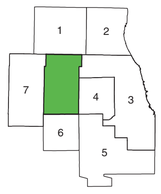

ADJACENT COUNTIES
1 McHenry
2 Lake
3 Cook
4 DuPage
5 Will
6 Kendall
7 DeKalb

APPROXIMATE MEAN DECLINATION, 2007

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Digital cartography by A.M. Davis and W.S. Dey, Illinois State Geological Survey.

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Base map compiled from the United States Geological Survey 1:100,000-scale Digital Line Graph data. North American Datum 1983. Transverse Mercator projection.