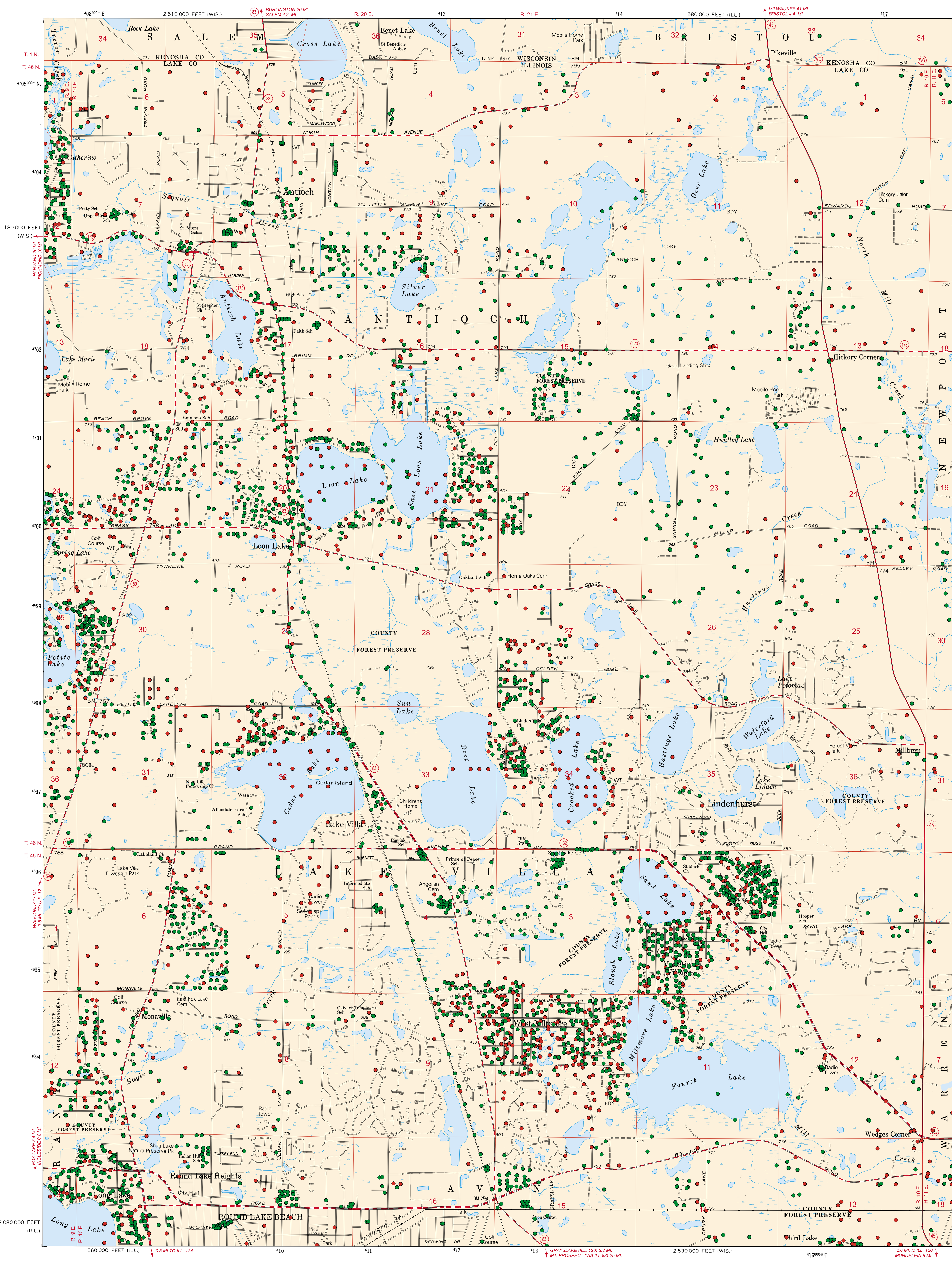
Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief

Well Locations of Antioch Quadrangle
Lake County, Illinois and Kenosha County, Wisconsin

Illinois Preliminary Geologic Map
IPGM Antioch-WL

Compiled by Barbara J. Stiff and Michael L. Barnhardt
2005



Verified
Unverified

Methodology

The value of a borehole is related to its location within the project area, the quality of its geologic information, and the accuracy with which it can be positioned. Specifically, the type of map or product (e.g., surficial geology, bedrock topography, 3-D stratigraphic model) will determine the level of positional accuracy and the quality of geologic information that is acceptable. The majority of the boreholes in the study area are residential water wells, which are usually located to a 10-acre or greater plot of land (i.e., quarter-quarter-quarter location using the Public Land Survey System (PLSS)). Generally, this level of accuracy is not sufficient for our mapping objectives because elevation and materials described at a point are used to calculate top and bottom elevations for subsurface geologic units. For this reason, we developed and refined a protocol for verifying the location of each borehole used for mapping and modeling in this project.

Data Sources

Where and How the Information is Stored
Borehole information is housed in the Geologic Records Unit (GRU) and the Geologic Samples Library (GSL) at the Illinois State Geological Survey. The GRU contains both digital and hard-copy descriptive logs and other information for boreholes made for water wells, engineering and commercial construction projects, highway and bridge construction, resource exploration such as coal, oil and gas, and building aggregate, and geologic mapping and research. The GSL stores individual samples and cores from some of these boreholes, in addition to samples collected during fieldwork by geologists working on past projects. The records for any chemical, mineralogical, or other laboratory and engineering data, descriptive logs and the physical samples are linked using a unique identifier (API number) assigned to each borehole record. Depending on the type of borehole, data pertaining to well diameter, pump capacity, ownership, etc. may also be available in the database. The digital records are managed within a relational Oracle database and can be retrieved using queries based on specific attributes such as location, type of borehole, total depth of boring, property owner, etc. We created a working database comprised of all boreholes that were located within the boundaries of the Antioch, IL-WI 7.5-minute quadrangle, plus a one-mile-wide buffer (in total, approximately 7000 boreholes).

Verifying the Data
A variety of sources and techniques were used to verify the location and other information associated with a particular borehole, including archived data; field observation, personal communication with landowners and drillers; plat book and digital tax parcel record searches; proprietary records from drilling companies and engineering consulting companies, reviewing historical aerial and/or ground photographs; digital orthophoto quadrangles; topographic maps; telephone directories; and web-based tools. Most often, we used a combination of the above to locate wells, reposition them when necessary, and assign them a verification rank (Table 1).

The Oracle database (digital) and original paper drillers' records were searched for particular borehole types, e.g., ISGS project boreholes or engineering boreholes. Our goal was to prioritize higher quality or more complete descriptive data including 1) ISGS boreholes, 2) boreholes to bedrock, 3) engineering boreholes, 4) boreholes with good descriptive geologic logs, and 5) boreholes located in areas with few others (i.e., located where "gaps" in data occur). Various combinations of these boreholes were used to develop the different maps and model.

The ISGS boreholes are those drilled during our project or previous projects and comprise the group of boreholes with the highest verification rank and with the most accurate and complete geologic information. These boreholes were used to help interpret the drilling logs of neighboring water wells. By associating (correlating) the descriptive terminology used by drillers with our more specific geologic terminology and stratigraphic correlation, we could incorporate many additional boreholes from our archival database into our mapping and modeling process.

The development of the 3-dimensional model of the glacial geology relies more heavily on the boreholes with the highest quality geologic information than the other maps because the model requires more detailed subsurface geologic data than the other maps produced in the project. Boreholes to bedrock assist in the development of the bedrock topography and drift thickness maps. These boreholes need not necessarily contain high quality descriptive geologic information, rather they need contain only reliable references to depth to bedrock.

As the development of the 3-D model and the surficial geology, drift thickness, and bedrock topography maps progresses, additional data points (boreholes) may be added to provide a more uniform coverage. Shallow engineering boreholes and water wells located in areas of sparse geologic information may then be verified and used. Even though the 3-D model and thematic maps have specific purposes they may share the use of the best boreholes, while incorporating additional boreholes very selectively to achieve their goals. The distribution and type of borehole used to produce the 3-D model (Hansel, 2003) and the surficial geology (Stumpf and Barnhardt, 2003), drift thickness (Dixon-Warren and O'Malley, 2003a), and bedrock topography (Dixon-Warren and O'Malley, 2003b) maps are presented as an inset map on each of those products. Luman (2003) and Luman et al. (2003) present, respectively, examples of the value of integrating the use of modern digital orthophoto quadrangles and historical aerial photography in locating and assessing changes in land use and land cover over a 60 year period in Lake County.

Base map compiled by Illinois State Geological Survey from digital data provided by the United States Geological Survey. Topography and PLSS compiled 1960, digital revision 1993. Planimetry derived from imagery taken 1988.

North American Datum of 1983 (NAD 83)
Projection: transverse Mercator
10,000-foot ticks: Illinois State Plane coordinate system, west zone (transverse Mercator)
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24 000
1 — 1/2 — 0 — 1 MILE
1000 — 0 — 1000 — 2000 — 3000 — 4000 — 5000 — 6000 — 7000 FEET
1 — .5 — 0 — 1 KILOMETER

BASE MAP CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Released by the authority of the State of Illinois: 2005

Digital cartography by M. Barrett, Illinois State Geological Survey.

This Illinois Preliminary Geologic Map (IPGM) is a lightly edited product, subject to less scientific and cartographic review than our Illinois Geological Quadrangle (IGQ) series. It will not necessarily correspond to the format of IGQ series maps, or to those of other IPGM series maps. Whether or when this map will be upgraded depends on the resources and priorities of the ISGS.

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6	7	8

ADJOINING QUADRANGLES
1 Silver Lake
2 Paddock Lake
3 Pleasant Prairie
4 Fox Lake
5 Wadsworth
6 Wauconda
7 Grayslake
8 Libertyville

2½°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2005

ROAD CLASSIFICATION
Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Unimproved road
64 Interstate Route
50 U.S. Route
158 State Route