

Figure 2. Altitude of the Galena-Platteville bedrock unit within the subcrop area of Illinois and Wisconsin.

ALTITUDE, DEPTH, AND THICKNESS OF THE GALENA-PLATTEVILLE BEDROCK UNIT IN THE SUBCROP AREA OF ILLINOIS AND WISCONSIN

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INTRODUCTION

The Galena-Platteville bedrock unit is a carbonate deposit of Ordovician age, composed of the Galena and Platteville Groups in Illinois and the Sippewee Group in Wisconsin. It is the uppermost bedrock unit (subcrop) in most of northern Illinois and southern and eastern Wisconsin. The subcrop area is shaded in figure 1 of sheet 1 (Batten and others, 1987). The unit is present in Wisconsin, Illinois, Indiana, Michigan, and Ohio, and in Minnesota, Wisconsin, and Iowa. Across the Wisconsin-Illinois border, the hydrologic characteristics of the bedrock unit vary substantially. The bedrock unit may be either a confining unit or an aquifer. In areas where the Galena-Platteville bedrock unit is an aquifer, the unit is a dependable source of water for many private wells and some municipal water-supply systems. In Wisconsin, the bedrock unit is near land surface in much of the study area, and the fractures in the unit allow rapid movement of water providing limited capacity to attenuate contaminants. The subcrop (study) area covers approximately 7,650 square miles in northern Illinois and Wisconsin. In the study area, the bedrock unit is present beneath the surface in Wisconsin, Illinois, Indiana, Michigan, and Ohio (Mills, 1983; Kay and others, 1994). Many sources of contaminants, including landfills and industrial facilities, are known or suspected. In order to determine the possible effects of contamination on the ground-water supply, an understanding of the regional hydrogeologic framework of the Galena-Platteville bedrock unit is

Published and unpublished map and point data describing the geologic properties of the Galena-Platte bedrock unit are available from many sources. The U.S. Geological Survey (USGS), in cooperation with the U.S. Environmental Protection Agency (USEPA), has selected and compiled a large portion of the available data to create computer data bases and maps. The objective of this effort is to compile and publish these data in a series of reports (U.S. Geological Survey Water-Resources Investigations Report (WRI) 87-4054-A, WRI 87-4054-B, WRI 87-4054-C). This is the third in that series of reports. The report describes the altitude, thickness, and depth from land surface of the subunit within the Galena-Platte bedrock unit. The data were collected by the investigator and are intended to be used in specific studies within the subunit area to interpret the regional geospatial framework of the bedrock unit and to find additional reference sources.

This report consists of four sheets that show the altitude (sheet 1), depth from land surface (sheet 2), total thickness (sheet 3), and location of altitude data (sheet 4) of the lithologic units that constitute the Galena-Platteville bedrock unit within the subcrop area. The sheets also show major known geologic features within the Galena-Platteville study area in Illinois and Wisconsin. A geographic information system (GIS) was used to generate data layers (coverages) from point data and from published and unpublished contour maps at various scales and detail. Standard GIS procedures were used to change the coverages into the maps shown on the sheets presented in this report. A list of references for the data used to prepare the maps is provided.

SHEET 1-ALTITUDE OF THE GALENA-PLATTEVILLE BEDROCK UNIT WITHIN THE SUBCROP AREA

The surface of the ana-Platteville bedrock unit ranges in altitude from 600 feet in the eroded valley areas to 1,200 feet in upland areas of Wisconsin. The contours shown in figure 2 of sheet 1 represent the attitude of the top of the unit. The contours were drawn on the basis of available point and contour data. The resulting maps were digitized into a GIS coverage. In Illinois, contour data are available for most of the study area (sheet 4, table 1). Where contour data were not available (Jo Davies County, Ill.), point data were used to generate contours. Contours were generated at 10-foot intervals. The contours for each State were joined into a single GIS coverage for each data type (point or line). The joined coverages were processed using an ARC/INFO module (TOPOGRID) to produce an interpolated, continuous surface grid. This grid was then compared to the original contour map to determine if the grid values differed from the land-surface grid and corrected where necessary. In areas where the bedrock-surface grid value exceeded the values of the land-surface grid values, the bedrock-surface grid values were set to equal the land-surface grid values. The final result was a continuous surface grid that more closely approximated the actual surface and produced more detail than the original point data. This detail is most apparent for areas of the bedrock surface in western Illinois and Wisconsin. The resulting grid was digitally contoured to produce a coverage of isolines representing elevations of 100 feet and greater. The resulting isoline coverage was edited to remove the editing consisted of smoothing contours or removing extraneous lines for the final maps.

The scales of the source data range from 1:62,500 to 1:500,000 and are mapped at a scale of 1:500,000. Therefore, the maps presented should be used at scales at or smaller than 1:500,000. Also, because of the paucity of data outside the subcrop area, care should be taken when considering the digitally created contours depicted near boundaries such as the bedrock valleys and fault zones.

In addition to the altitude contours, major structural features of the Galena-Platteville bedrock unit are shown in figure 2 of sheet 1. These features include faults, arches, and bedrock valleys eroded by ancient rivers. Some faults and eroded bedrock valleys are particularly important because they form boundaries of the subcrop area.

The Sandwich Fault Zone is present in the southeastern part of the study area in Illinois. In southern De Kalb County and western Kendall County, the Sandwich Fault Zone forms a boundary between the Galena-Platteville bedrock unit and older units. The Plum River Fault Zone is present in the western part of the study area in Illinois. The zone forms a boundary between the Galena Group and younger stratigraphic units in Carroll and Ogle Counties. In the central part of the study area, part or all of the Galena-Platteville bedrock unit was eroded during the late Paleozoic.

**SHEET 2-DEPTH FROM LAND SURFACE OF THE GALENA-PLATTEVILLE BEDROCK UNIT
WITHIN THE SUBCROP AREA**

The lines shown in Figure 1 sheet 2 represent depth from the land surface to the top of the bedrock unit. Digital Elevation Models (DEMs) of the land surface with a resolution of 3-by-3 arc-seconds were obtained from the USGS, Earth Resources Observation Systems (EROS) Data Center in Sioux Falls, South Dakota, and paneled together for the entire study area. Standard routines were used to fill "sinks" (depressions or pits) and smooth the DEM. This filling and smoothing is common practice when using DEMs because, usually, only grid elevations are needed for hydrologic modeling (e.g., Environmental Systems Research Institute, Inc., 1992). The resulting GIS file included the bedrock-structure grid (the grid used to produce Fig. 1 sheet 1) was subtracted from the land-surface DEM to produce a "depth" grid. The resulting grid was digitally contoured, visually inspected, and edited where necessary.

The depth to the top of the bedrock unit ranges from more than 500 feet in the valley areas to 0 feet in outcrop areas. Although the Galena-Platteville bedrock unit is known to crop out in areas within the study area, the source data did not provide enough resolution to depict outcrops with certainty. The deepening Galena-Platteville bedrock unit is overlain by shallower bedrock east and southwest of the subcrop boundary. The Galena-Platteville bedrock unit also is overlain by shallower bedrock in areas north of the Plum River Fault Zone. These areas lie outside the subcrop area and are not shaded in figure 1.

**SHEET 3-TOTAL THICKNESS OF THE GALENA-PLATTEVILLE BEDROCK UNIT
WITHIN THE SUBCROP AREA**

The lines shown in *Figure 1* sheet 3 represent the thickness of the Galena-Platteville bed unit. Point and line data were compiled from available sources. Point data were hand contoured for areas within Wisconsin. The resulting maps were digitized into a GIS coverage. In Illinois, point data were used to create a TIN. The TIN then was digitally contoured using the GIS coverage. The resulting map was then converted to a continuous surface using the TIN. The resulting map was then processed using TOPGRID to produce an interpolated continuous bottom surface of the Galena-Platteville bed unit. Map algebra arithmetic operations were used to subtract the grid that represents the bottom of the Galena-Platteville bed unit from the grid that represents the top of the unit. The resulting grid was machine processed, visually inspected, and edited. The resulting thickness map ranges from 0 feet to 900 feet. The Galena-Platteville bed has been completely eroded away from more than 900 feet in the southern and eastern parts of the bed unit.

A shaded map of the thickness of the bedrock unit is shown in figure 2. This map is included as an aid in the interpretation of the thickness lines.

**SHEET 4—LOCATIONS OF ALTITUDE POINT DATA FOR THE GALENA-PLATTEVILLE BEDROCK UNIT
WITHIN THE SUBCROP AREA**

Contour data obtained from published and unpublished reports were available for a large part of the study area. The sources of contour data, by county, used in the study are shown in table 1 of sheet 4. In addition to contour data, point data were used where available. The points shown in figure 1 of sheet 4 are locations where altitude data are available for the top and/or bottom of the Galena-Platteville bedrock unit. The data were obtained from the USGS Ground Water Site Inventory (GWSI) data bases for Illinois and Wisconsin, the Illinois State Geological Survey well data base, and the Wisconsin Department of Natural Resources Well and Test Results (WATR) data base.

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* Companion reports to this report

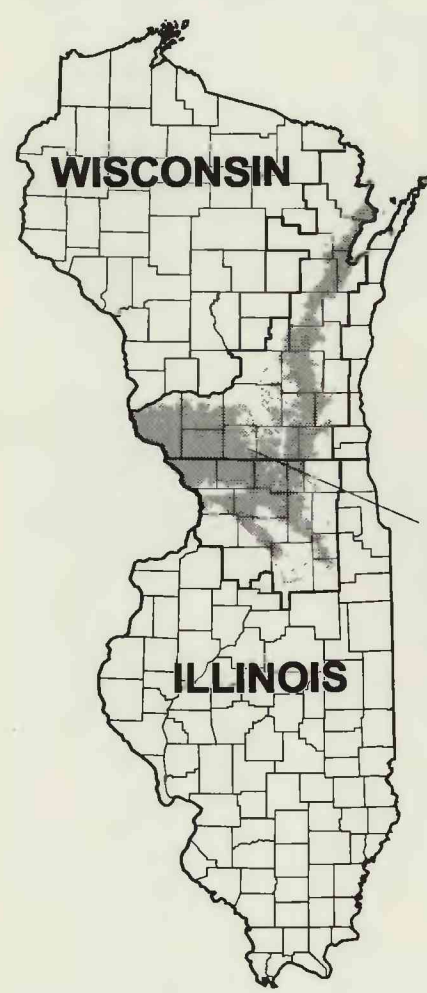


Figure 1. Subcrop (study) area of the Galena-Platteville bedrock unit in Illinois and Wisconsin