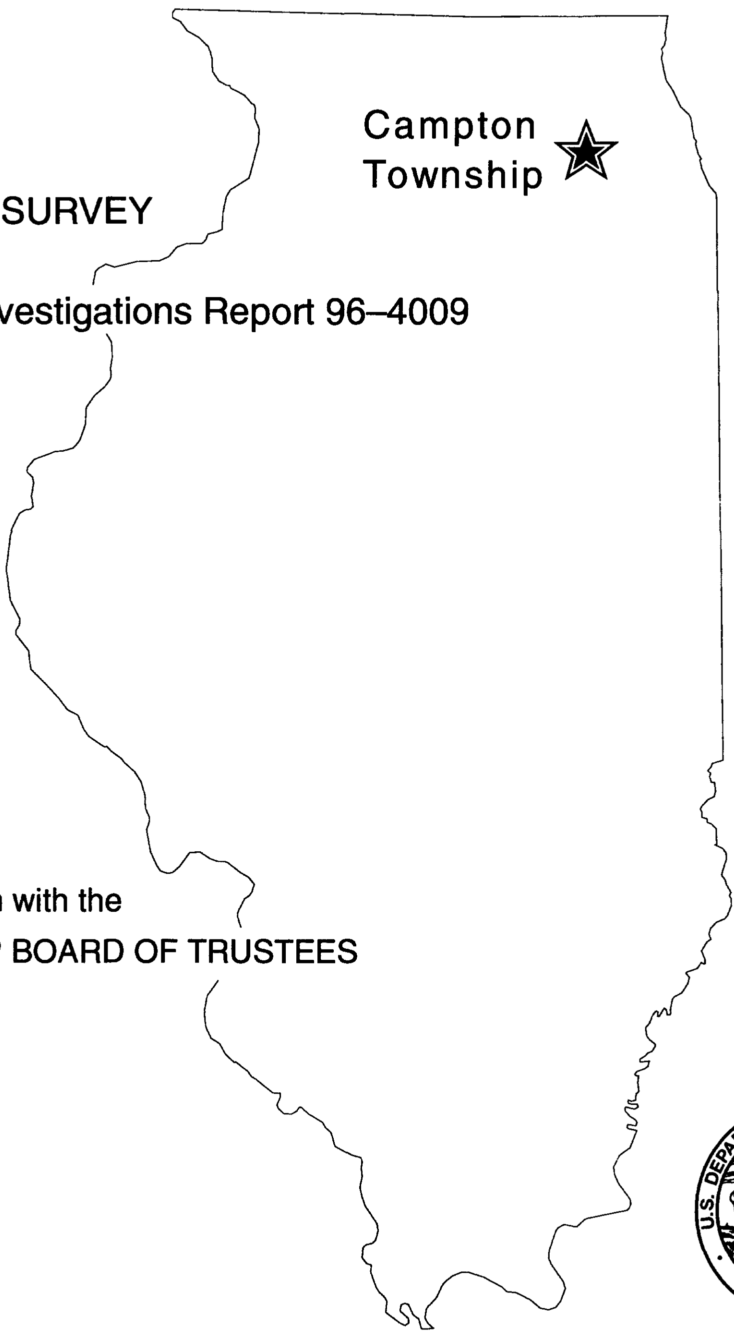
Ground-Water Levels in Aquifers Used for Residential Supply, Campton Township, Kane County, Illinois



U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 96–4009

Prepared in cooperation with the
CAMPTON TOWNSHIP BOARD OF TRUSTEES

U.S. DEPARTMENT OF THE INTERIOR
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CONTENTS

FIGURES

CONTENTS—Continued

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
gallon per minute (gal/min)	0.06309	liter per second
acre	4,047	square meter
gallon per minute per foot [(gal/min)/ft]	0.01923	liter per second per meter
foot per day (ft/d)[1]	0.3048	meter per day
foot squared per day (ft^2/d)[2]	0.09290	meter squared per day

[1]Foot per day is the mathematically reduced term of cubic foot per day per square foot of aquifer cross-sectional area.
[2]Foot squared per day is the mathematically reduced term of cubic foot per day per square foot times foot of aquifer thickness [$(ft^3/d)/ft^2)ft$].

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

Ground-Water Levels in Aquifers Used for Residential Supply, Campton Township, Kane County, Illinois

By Robert T. Kay[1] *and* Kurt A. Kraske[2]

ABSTRACT

The U.S. Geological Survey, in cooperation with the Campton Township Board of Trustees, measured water levels in the aquifers used for residential supply in Campton Township, Kane County, Illinois. Aquifers used for residential supply are the shallow and deep aquifers in the glacial drift, composed of unconsolidated sand and gravels; the Alexandrian-Maquoketa aquifer, composed of dolomite and shale of the Alexandrian Series and the Maquoketa Group; the Galena-Platteville aquifer, composed of dolomite of the Platteville and Galena Groups; and the Ancell aquifer, composed of sandstones of the Glenwood Formation and the St. Peter Sandstone.

Water-level altitudes in the shallow drift aquifers generally follow surface topography. Analysis of water-level data does not clearly indicate overutilization of these aquifers.

Water-level altitudes in the deep drift aquifers decrease from west to east. Comparison of historical depth to water measurements with current (1995) measurements indicates large decreases in water levels in some areas. The deep drift aquifers may be overutilized at these locations.

Water-level altitudes in the Alexandrian-Maquoketa aquifer generally decrease from west to east. The potentiometric surface of the aquifer follows the bedrock-surface topography in some locations. Localized low water-level altitudes and large decreases in water levels indicate the Alexandrian-Maquoketa aquifer is overutilized in several areas.

Water-level altitudes in the wells finished in the Galena-Platteville aquifer vary by more than 300 feet. Large decreases in water levels in wells finished in the Galena-Platteville aquifer indicate the Galena-Platteville and Alexandrian-Maquoketa aquifers are overutilized in the northern part of the township.

Water-level altitudes in the wells finished in the Ancell aquifer are also highly variable. There is no indication that the Ancell aquifer is overutilized.

INTRODUCTION

The population of Campton Township (Township 40 north, Range 7 east) located in the central part of Kane County in northeastern Illinois (fig. 1) has more than doubled in the past 30 years as suburban Chicago expands westward (Edward Malek, Campton Township Board of Trustees, oral commun., 1995).

[1]U.S. Geological Survey
[2]Northern Illinois University

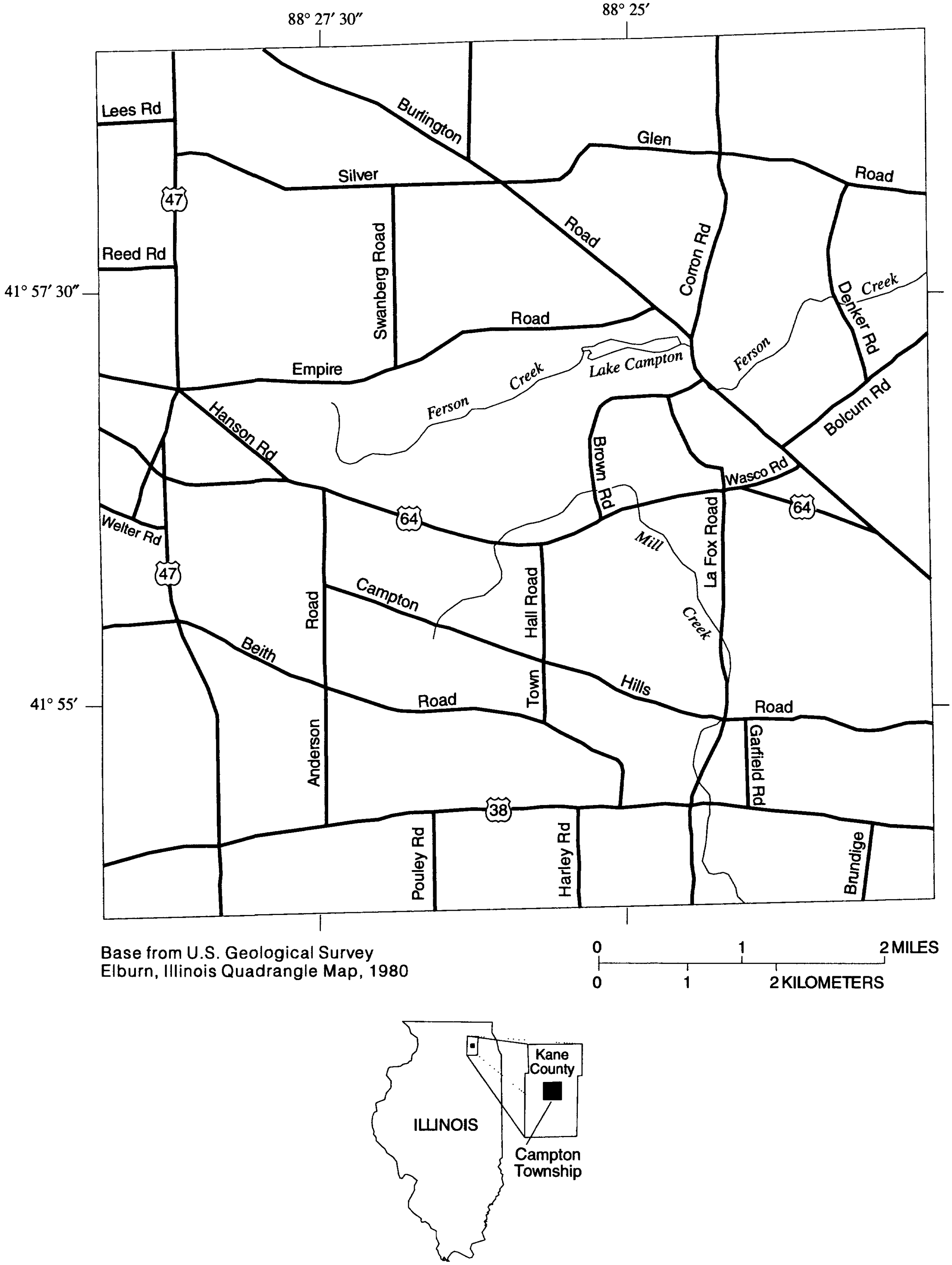


Figure 1. Location of Campton Township, Kane County, Illinois.

This growth is expected to continue. Because most township residents rely on private residential wells for water supply, there is concern about the effect of population growth on the availability of ground-water supplies. To address these concerns, the U.S. Geological Survey (USGS), in cooperation with the Campton Township Board of Trustees, began a study in May 1995, of the water levels in the aquifers underlying Campton Township used for residential supply.

This study was designed to determine the current distribution of, and trends in, water levels in residential-supply wells in the township. Analysis of the current distribution of water levels and the trends in water levels will identify areas where the aquifers used for residential supply may be overutilized and identify the aquifers potentially capable of supporting additional development. For the purposes of this report, aquifer overutilization is assumed when the water level in an aquifer has declined at least 15 ft since the prior measurement and the decline can be plausibly attributed to pumping from the aquifer in a given area. This information can be used by local residents to determine the potential for interruptions in their water supply and the most viable alternate source of water. Study results also can be utilized by local government officials to help minimize the effects of population growth on residential water supplies.

The study was divided into two components: (1) compilation of available geologic and hydrologic data (including water levels), and (2) measurement of water-level altitudes in 282 residential-supply wells located throughout the township. Compilation of the available lithologic and hydrologic data was done to (1) determine the type, thickness, and location of the geologic deposits that compose the aquifers used for residential supply; (2) characterize the hydrology of these aquifers; and (3) obtain historical water-level data for comparison with current (1995) water levels. Measurement of water levels in residential-supply wells was done to (1) determine the direction of flow within and between the aquifers, (2) determine water-level trends in the aquifers underlying the township, and (3) identify areas where the aquifers may be overutilized.

Ideally, determination of the cause of an increase or decrease in water levels would require numerous measurements of water level in several wells over an extended period of time in conjunction with detailed data on water use and precipitation in the vicinity of the well. Collection of such detailed data was beyond the scope and resources of this investigation. Water-level trends were typically based on two measurements; therefore, some uncertainty exists about the cause of the water-level trends measured in some wells. The data and analysis presented in this report are a basis for a preliminary understanding of the trends in water levels in the aquifers used for residential supply in Campton Township and some of the factors that affect these trends.

Purpose and Scope

This report describes the results of a study designed to determine the water levels and trends in water levels in the aquifers used for residential supply in Campton Township, Kane County, Illinois. In addition to a description of the geology and hydrology of the study area, results of static water-level measurements are presented. The general direction of ground-water flow and the trends in water levels within the aquifers used for residential supply are identified.

Acknowledgments

The authors would like to thank Jeff Swanson of Abrahamson's Inc. and Edward Malek and Julia Glas of Campton Township for providing much of the background information needed for this study. The authors also would like to thank the local residents who allowed measurement of water levels in their wells.

DESCRIPTION OF THE STUDY AREA

Land Use

Prior to about 1963, land use in the study area was primarily agricultural except for small residential areas around Lake Campton and the towns of Wasco and Lily Lake (fig. 2). Residential development in Campton Township has increased continuously since 1963, and current land use is about evenly divided between agricultural and residential areas. Land utilized for agricultural activities is primarily in the northern and southern parts of the township. Residential developments primarily are concentrated in the eastern and central parts of the township. Residential development in the township is expected to continue (Edward Malek, Campton Township Board of Trustees, oral commun., 1995).

Geology

The geologic deposits underlying the township have been described by several previous investigators (Willman, 1971; Visocky and others, 1985; Graese and others, 1988; Schumaker, 1990). The stratigraphic nomenclature utilized in this report is that of the Illinois State Geological Survey (ISGS) (Willman and others, 1975, p. 61–80, 94–99, 211–232; Graese and others, 1988) and does not necessarily follow the usage of the USGS (fig. 3).

Bedrock Deposits

The bedrock geologic units of concern to this study consist of sandstones, shales, and dolomites of Ordovician and Silurian age (fig. 3). From oldest to youngest, these units are the St. Peter Sandstone; the Glenwood Formation; the Platteville, Galena, and Maquoketa Groups; and the Alexandrian Series. Bedrock deposits are unconformably overlain by glacial and fluvioglacial deposits of Quaternary age.

The St. Peter Sandstone is a well sorted, coarse- to medium-grained quartz arenite. The sandstone is well rounded, poorly cemented, and is typically between 150 and 250 ft thick beneath Campton Township (Graese and others, 1988, p. 12).

The Glenwood Formation conformably overlies the St. Peter Sandstone and consists of interbedded coarse-grained dolomitic sandstone and sandy and argillaceous dolomite (Schumaker, 1990, p. 23). The thickness of the Glenwood Formation is between 25 and 50 ft in most of the township (Schumaker, 1990, p. 23) but may be as much as 75 ft thick in some areas (Graese and others, 1988, p. 12).

The Platteville Group unconformably overlies the Glenwood Formation and consists of very fine- to medium-grained, pure to argillaceous dolomite (Graese and others, 1988, p. 13). The Platteville Group can be subdivided into a lower, pure dolomite with a sandy base and an upper limestone and dolomite characterized by green and red shale partings (Graese and others, 1988, p. 13). The Platteville Group is about 145 ft thick beneath the township.

The Galena Group, a nonargillaceous, partly cherty dolomite, is lithologically similar to the Platteville Group. The Galena Group can be subdivided into a basal unit of pure dolomite with brown shale partings; a middle unit composed of cherty, vuggy, medium-grained dolomite; and an upper unit of pure dolomite (Graese and others, 1988, p. 13). The thickness of the Galena Group ranges from 160 to 200 ft beneath the township.

The Maquoketa Group of Ordovician age unconformably overlies the Galena Group and is the uppermost bedrock unit in most of the center and western parts of the township as well as its eastern edge (fig. 4). The lithology of the Maquoketa Group is highly variable laterally (Visocky and Schulmeister, 1988, p. 11). The basal unit of the Maquoketa Group is predominately a dolomitic shale with interbedded dolomite. This unit is

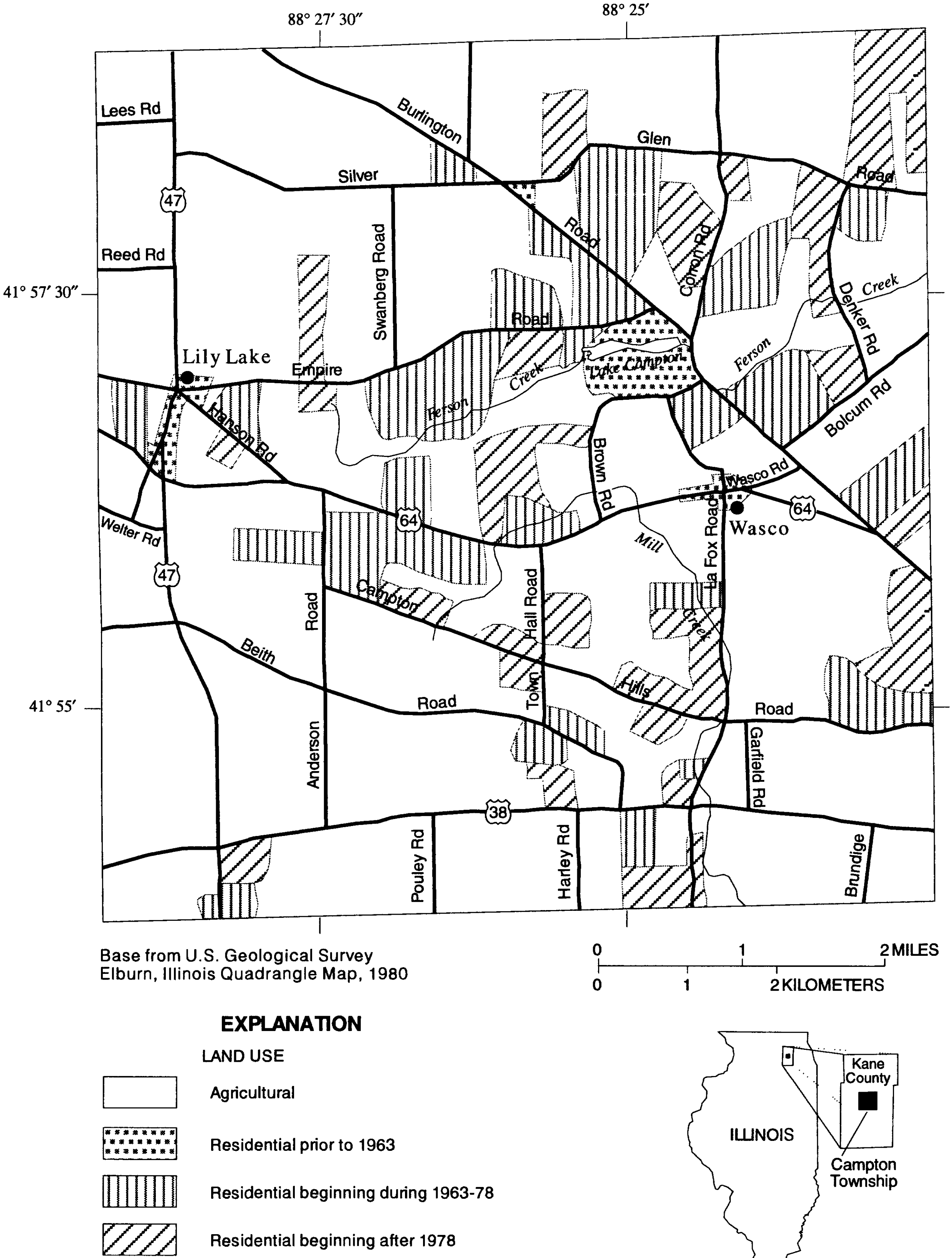


Figure 2. Land use, Campton Township, Illinois.

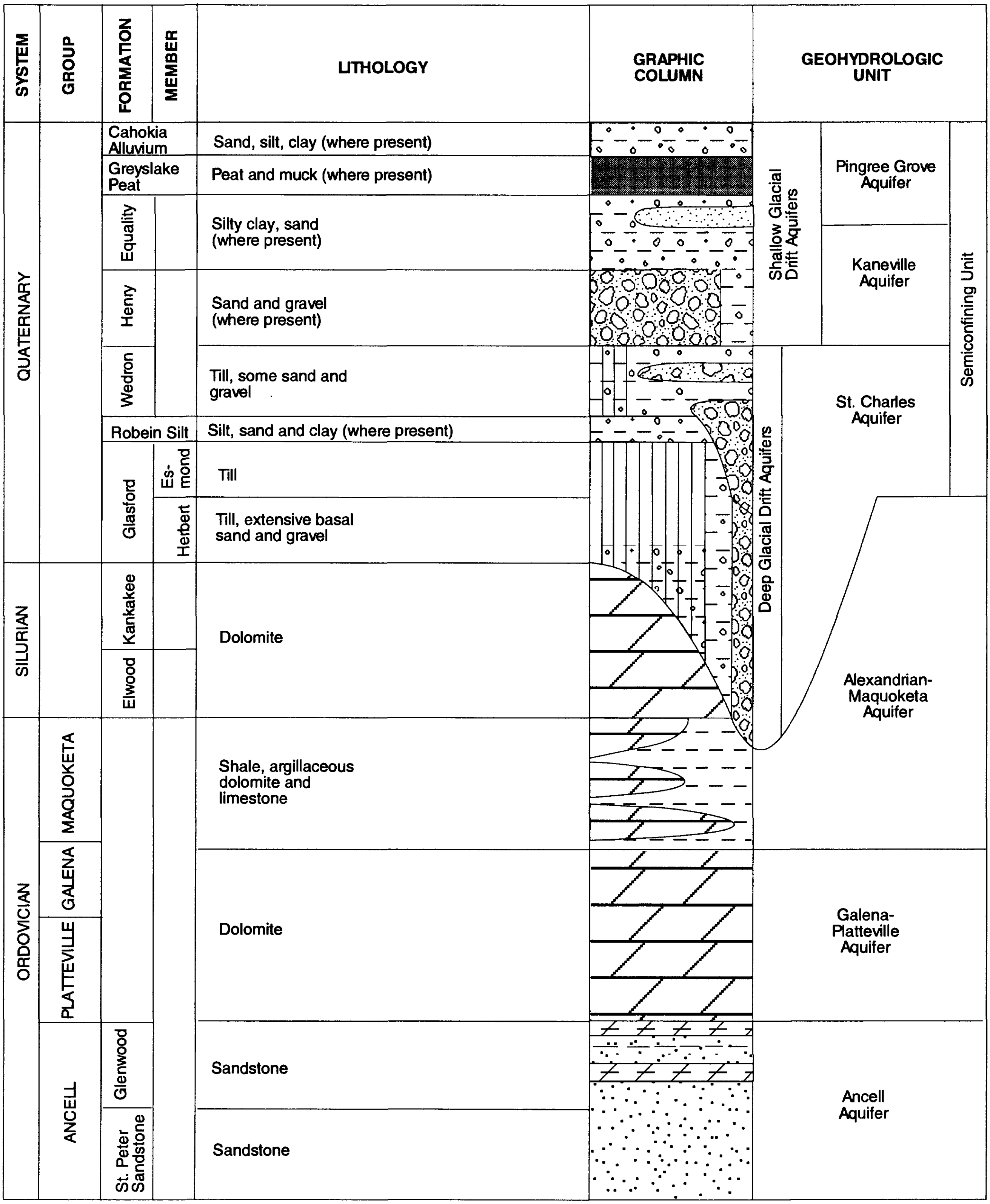


Figure 3. Generalized geohydrologic column showing stratigraphy and geohydrologic units, Campton Township, Illinois.

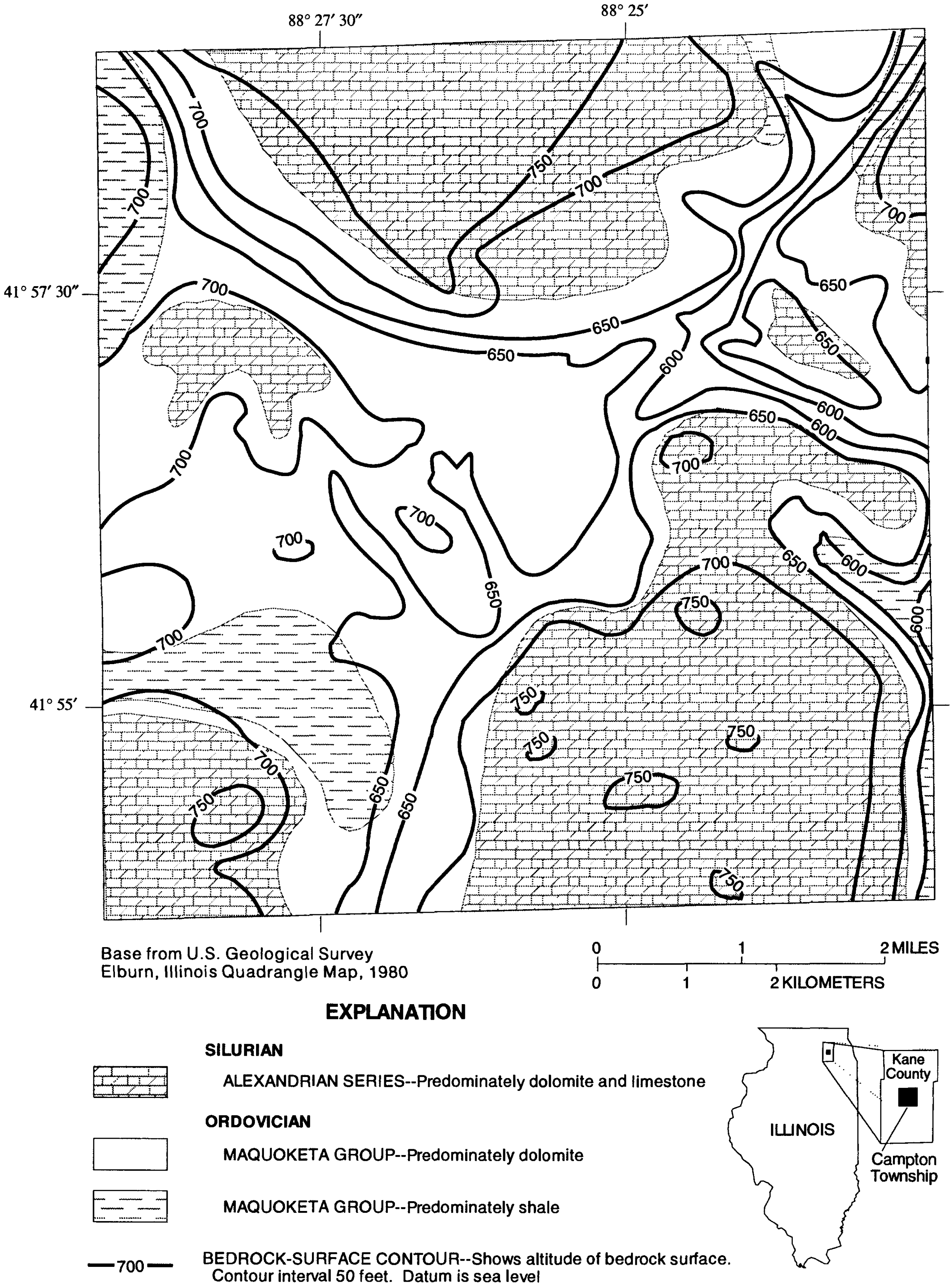


Figure 4. Bedrock topography and bedrock-surface geology, Campton Township, Illinois (from Graese and others, 1988, figs. 14 and 15).

overlain by a pure to argillaceous dolomite or limestone with some shale (Visocky and others, 1985, p. 42). The argillaceous dolomite/limestone is overlain by a dolomitic shale with interbedded dolomite and limestone (Schumaker, 1990, p. 24). The uppermost unit of the Maquoketa Group is a red and green shale. The total thickness of the Maquoketa Group ranges from 130 to 200 ft beneath the township (Graese and others, 1988, p. 13).

The uppermost bedrock deposit beneath the township, where present, is the argillaceous dolomite of the Elwood and Kankakee Formations of the Alexandrian Series of Silurian age (fig. 4). These dolomites unconformably overlie the Maquoketa Group and range from 0 to over 50 ft thick in the township (Graese and others, 1988, fig. 14).

A survey of the orientation of vertical and inclined fractures in the bedrock deposits in northeastern Illinois indicates a primary fracture set oriented about N. 50° W. with a secondary set oriented about N. 47° E. (Graese and others, 1988, p. 57). Fractures, joints, and solution openings are most abundant in the upper 50 ft of the bedrock, where the bedrock is most weathered, and decrease in size and number with depth as the rock becomes more competent (Graese and others, 1988, p. 51).

The altitude of the bedrock surface varies by more than 150 ft beneath the township (fig. 4). Bedrock highs, defined by the 750-ft contour, are located beneath the northern, southwestern, and southern parts of the township as well as the extreme northeastern part of the township. Bedrock valleys, defined by the 650-ft contour, traverse from the northwestern and southwestern parts of the township, joining a north-south trending valley defined by the 600-ft contour near the eastern edge of the township. These bedrock valleys cut through the bedrock highlands and mark the location of pre-Pleistocene erosional surfaces (Visocky and Schulmeister, 1988, p. 9). The dolomites of the Alexandrian Series are the uppermost bedrock deposits at the bedrock highs. Dolomite and shale of the Maquoketa Group are the uppermost bedrock deposits in the vicinity of the bedrock valleys (fig. 4).

Unconsolidated Deposits

The bedrock deposits are unconformably overlain by unconsolidated till, sand and gravel, and silt and clay of Quaternary age throughout the township. The unconsolidated deposits are typically thickest, between 250 and 300 ft, in the western half of the township and thinnest, about 50 ft, near the southeastern corner of the township.

The Herbert Till Member of the Glasford Formation was the oldest unconsolidated deposit encountered in five borings drilled through the unconsolidated deposits in and around Campton Township (Graese and others, 1988, fig. 17). The Herbert Till, where present, is composed of sandy loam with extensive basal sand and gravel (Curry and Seaber, 1990, p. 16). This deposit ranges from 0 to about 150 ft thick in the township (Graese and others, 1988, fig. 17).

The Robein Silt, where present, overlies the Glasford Formation (Graese and others, 1988, fig. 17). It is composed of silt, sand, and clay with abundant organic carbon that has been modified by the process of soil formation (Curry and Seaber, 1990, p. 16). The Robein Silt is typically between 10 and 15 ft thick where it has not been removed by erosion.

The Wedron Formation is present throughout the township, overlying the Robein Silt where present. Where the Robein Silt is absent, the Wedron Formation overlies the Glasford Formation or the bedrock (Graese and others, 1988, fig. 17). The Wedron Formation consists of till interbedded with sand and gravel and lacustrine silt and clay and is from 50 to 200 ft thick in this area.

The Henry Formation is at or near the land surface at scattered locations throughout the township (Curry and Seaber, 1988, p. 17). The Henry Formation consists primarily of sand and gravel and has a maximum thickness of about 70 ft in this area (Graese and others, 1990, fig. 17).

The deposits of the Equality Formation are commonly interbedded with the deposits of the Henry Formation. The Equality Formation is typically less than 20 ft thick and is composed primarily of lacustrine deposits of stratified sand, silt, and clay (Graese and others, 1988, p. 27).

The Grayslake Peat and Cahokia Alluvium are at land surface at a few locations in Campton Township. These deposits are typically less than 10 ft thick (Graese and others, 1988, p. 28). The Grayslake Peat consists of interbedded silt, clay, peat, and muck. The Cahokia Alluvium is composed of sand, silt, and clay deposited by streams.

Hydrology

The geologic deposits beneath Campton Township can be subdivided into five zones used for residential supply in the township: the shallow glacial-drift aquifers, the deep glacial-drift aquifers, the Alexandrian-Maquoketa aquifer, the Galena-Platteville aquifer, and the Ancell aquifer (fig. 3). The aquifers in the drift are separated by a semiconfining unit that restricts flow between these aquifers.

Shallow Glacial-Drift Aquifers

The Pingree Grove and Kaneville aquifers compose the shallow glacial-drift aquifers. These aquifers are commonly overlain, and everywhere are underlain, by the semiconfining unit that is composed primarily of the till of the Wedron Formation (fig. 3).

The Pingree Grove aquifer, where present beneath the township, is composed of small, discontinuous deposits of sand, gravel, silt, and clay of the Equality Formation, the Cahokia Alluvium and the Grayslake Peat (Curry and Seaber, 1990, p. 27). This aquifer is up to 30 ft thick in parts of the township and is permeable enough to be utilized for residential supply. The top of the Pingree Grove aquifer is often within 10 ft of the land surface, making it susceptible to contamination.

The Kaneville aquifer, where present beneath the township, is composed of shallow sand and gravel of the Henry and Equality Formations. The aquifer is between 50 and 100 ft thick in the eastern part of the township (fig. 5) and may be capable of supplying water for public supply (Curry and Seaber, 1990, pl. 1). The top of this aquifer is often less than 20 ft below land surface, making it susceptible to contamination.

The shallow glacial-drift aquifers are recharged by local precipitation. Water levels in the aquifers vary by more than 10 ft annually, based primarily on the amount of precipitation and the timing of the precipitation (Graese and others, 1988, p. 38). The direction of horizontal ground-water flow in these aquifers follows surface topography.

The hydraulic properties of the shallow drift vary with lithology. Yields of 50 to 500 gal/min have been reported from wells utilizing the Kaneville aquifer in Kane County (Graese and others, 1988, p. 41). A long-term yield of 5 to 6 gal/min was reported from a 43-in.-diameter well used the shallow part of the semiconfining unit north of Lake Campton (Benson, 1990, p. 7).

Deep Glacial-Drift Aquifers

The deep glacial-drift aquifers, where they are present beneath the township, are composed of discrete sand and gravel deposits imbedded in the semiconfining unit and the St. Charles aquifer (fig. 3). These are the primary drift aquifers used for residential supply in the township.

The St. Charles aquifer is composed primarily of massive sands and gravels of the Wedron and Glasford Formations. The aquifer is located within the bedrock valley in the eastern part of the study area and is about 50 ft thick where present (figs. 4 and 5). The St. Charles aquifer directly overlies the bedrock in most of the area where the aquifer is present. The aquifer is overlain by the semiconfining unit, which is from 50 to 75 ft thick in this area. This aquifer may be capable of supplying water for public supply (Curry and Seaber, 1990, pl. 1). The presence of the semiconfining unit makes the St. Charles aquifer less susceptible to contamination than the Pingree Grove and Kaneville aquifers.

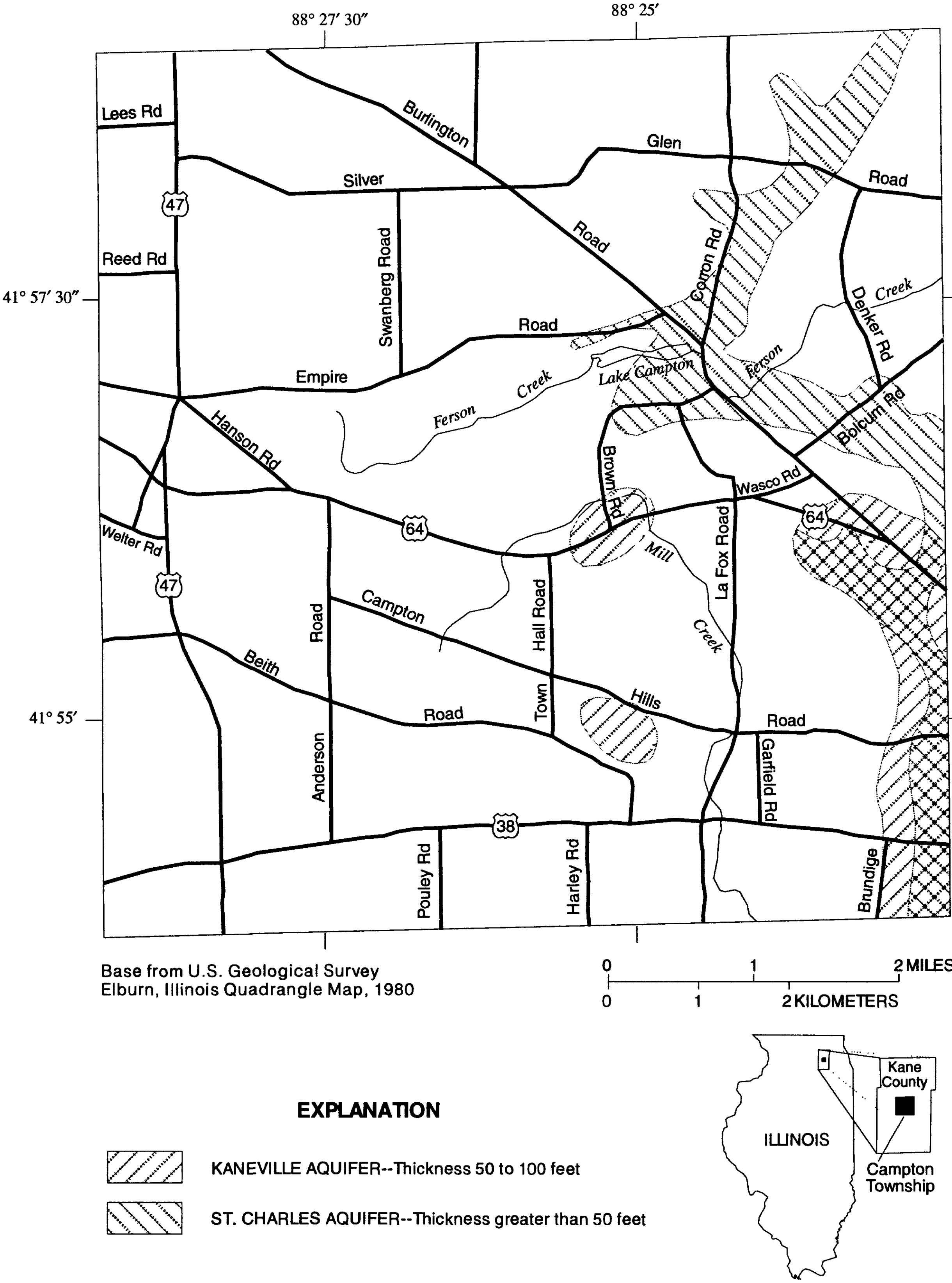


Figure 5. Extent of aquifers in the glacial drift with potential for development of public water supplies, Campton Township, Illinois (from Curry and Seaber, 1990).

The deep glacial-drift aquifers are recharged by flow through the semiconfining unit and possibly the underlying Alexandrian-Maquoketa aquifer in some areas. The direction of ground-water flow in these aquifers cannot be determined because these aquifers are discontinuous.

The hydraulic properties of the deep glacial-drift aquifers vary with lithology. Yields of 50 to 500 gal/min have been reported from wells utilizing the St. Charles aquifer in Kane County (Graese and others, 1988, p. 41). The sand and gravel deposits in the semiconfining unit are capable of yielding water in sufficient quantities for residential use, typically between 10 and 20 gal/min.

Alexandrian-Maquoketa Aquifer

The Alexandrian-Maquoketa aquifer underlies the entire township and is composed of the dolomite of the Alexandrian Series and the dolomite and shales of the Maquoketa Group (fig. 3). This aquifer is in hydraulic connection with the overlying St. Charles aquifer where present (Visocky and Schulmeister, 1988, p. 13), but it is typically confined by the semiconfining unit in the glacial drift.

Ground-water flow though the Alexandrian-Maquoketa aquifer is predominately through the fractures concentrated near the weathering surface in the upper 50 ft of the bedrock surface where it is composed of dolomite (fig. 4) (Csallany and Walton, 1963, p. 16) and through fractures in the dolomitic units deeper within the Maquoketa Group. Shale units in the Maquoketa Group typically do not transmit large amounts of water, even where the shale is at the bedrock surface (Schumaker, 1990, p. 43).

The hydraulic properties of the Alexandrian-Maquoketa aquifer vary over four orders of magnitude and are affected primarily by the number, size, and degree of interconnection of the fractures and weathering features in the aquifer. The horizontal hydraulic conductivity of the Alexandrian-Maquoketa aquifer ranges from 2.8×10^{-3} to 2.8×10^{1} ft/d where the dolomite is at the bedrock surface and between 2.8×10^{-3} and 2.8×10^{0} ft/d where the aquifer is composed of the Maquoketa dolomite (Graese and others, 1988, p. 36). The horizontal hydraulic conductivity of unfractured shale deposits in the aquifer is typically less than 2.8×10^{-2} ft/d. The vertical hydraulic conductivity of the aquifer has been estimated at about 2.8×10^{-6} ft/d in northern Illinois (Schumaker, 1990, p. 53).

The Alexandrian-Maquoketa aquifer can be pumped to produce water in sufficient quantities to support residential use in Campton Township if the deposit is sufficiently fractured at the well. Specific capacity data from wells in shallow dolomite wells in northern Illinois (Csallany and Walton, 1963, p. 16) indicate well yields may be highest in the weathered, upper part of the aquifer; in areas of bedrock highs; and where the overlying St. Charles aquifer is present.

Data collected during a survey of water levels in north-central Illinois in 1987 indicated that ground-water levels in wells finished in the Alexandrian-Maquoketa aquifer decreased from northwest to southeast in Kane County and were lower in parts of Campton Township than in the surrounding area (Visocky and Schulmeister, 1988, figs. 7 and 9). The lower water levels may indicate that more water is pumped from the aquifer in some parts of Campton Township than is replaced by natural recharge.

Water-levels were measured in several piezometers open to the Alexandrian-Maquoketa aquifer in Kane County between 1984 and 1987. Water-level changes in these piezometers that could be attributed to natural variation were typically less than 10 ft during this period (Visocky and Schulmeister, 1988, fig. 15).

Galena-Platteville Aquifer

The Galena-Platteville aquifer also underlies the entire township and is composed of the dolomite of the Platteville and Galena Groups (fig. 3). The aquifer is composed of massive dolomite with some fractures and vugs, which affect flow through the aquifer. Ground-water flow to a well is affected by the number and size of the fractures that intercept the well.

The Galena-Platteville dolomite typically contains few fractures in northeastern Illinois and has a horizontal hydraulic conductivity typically less than 2.8×10^{-3} ft/d in Kane County (Graese and others, 1988, p. 36). These deposits typically are not considered an aquifer in and near the township. The Galena-Platteville deposits, however, yield enough water for residential supply in the township, often in conjunction with the overlying Alexandrian-Maquoketa deposits. Therefore, these deposits meet the strict definition of an aquifer (see Glossary) and are considered an aquifer in this report.

Results of an aquifer test on a 6-in.-diameter well open only to the Galena-Platteville aquifer north of Lake Campton resulted in a specific capacity of 0.057 (gal/min)/ft and a long-term yield of 10 gal/min. Most of the water pumped from residential wells finished in the Galena-Platteville aquifer is derived from storage from within the well bore that is replaced slowly when pumping has ceased (Benson, 1990, p. 8).

Data collected during a survey of water levels in north-central Illinois in 1987 indicated that ground-water levels in wells utilized for residential supply, which were open to both the Alexandrian-Maquoketa and Galena-Platteville aquifers, were lower in much of the northern part of Campton Township than in the surrounding area (Visocky and Schulmeister, 1988, fig. 9). The lower water levels may indicate that more water is pumped from the aquifers in this part of the township than is replaced by natural recharge.

Water levels were measured in several piezometers open to the Galena-Platteville aquifer in Kane County during 1984–87. Water-level changes in these piezometers that could be attributed to natural variation were less than 10 ft during this period (Visocky and Schulmeister, 1988, p. 27–36).

Ancell Aquifer

The Ancell aquifer underlies the entire township and consists of the St. Peter Sandstone and the sandstones of the Glenwood Formation (fig. 3). This is the deepest aquifer utilized for residential supply in the township.

The Ancell is the most productive of the bedrock aquifers utilized for residential supply in Campton Township, yielding between 50 and 200 gal/min (Graese and others, 1988, p. 42). Residential-supply wells typically only penetrate the upper part of the aquifer. The yield of the Ancell aquifer is enhanced by vertical recharge from the overlying Galena-Platteville aquifer.

A constant-discharge aquifer test conducted in a well open to the Ancell aquifer about 1 mi south of the township resulted in a calculated transmissivity of 2,841 ft^2/d, a horizontal hydraulic conductivity of 8.3 ft/d, and a storage coefficient of 2.2×10^{-4} (Visocky and Schulmeister, 1988, p. 44). The hydraulic properties of the aquifer should be similar throughout the township because the St. Peter Sandstone is homogenous.

The Ancell aquifer is the uppermost part of the Cambrian-Ordovician aquifer, which is utilized for municipal water supply in northern Illinois. Horizontal ground-water flow in the Ancell aquifer is from west to east across the township (Visocky and Schulmeister, 1988, fig. 13).

GROUND-WATER LEVELS AND WATER-LEVEL CHANGES

Water levels were measured in 282 residential-supply wells open to each of the aquifers used for residential supply in Campton Township during May and June 1995 (Appendix 1). This was an extended period of above-average rainfall. Little or no watering of lawns was observed during the period of measurement. It is probable that water-level altitudes measured during this period were higher than would be expected during times of above-average water use or a period of extended drought.

Most of the well data (including location, depth of open interval, lithology) were obtained from records on file with the Illinois State Water Survey (ISWS), local well contractors, and local residents. Determination of the aquifer(s) that a well was finished in was made by comparing well depth and lithology at the wellbore with the thickness of the deposits that compose the aquifers utilized for residential supply in the township. The thickness of the unconsolidated, Alexandrian-Maquoketa, and Galena-Platteville deposits was obtained from maps prepared by the ISGS and was included in the reports of previous investigations of Kane County and northern Illinois (Graese and others, 1988, p. 16–19).

Water levels were measured with steel and electric tapes. Most measurements taken in wells finished in the drift aquifers and the Alexandrian-Maquoketa aquifer were taken with tapes calibrated to 0.01 ft and are accurate to within 0.02 ft. Most measurements from wells finished in the Galena-Platteville and Ancell aquifers were taken with tapes calibrated to 1.0 ft and are accurate to about 0.30 ft. Estimates of measurement accuracy assume that the actual water level clearly can be identified, which is not always the case. In many wells where the water level is below the well casing, condensate and cascading water from the aquifer can interfere with measurement accuracy. To minimize the potential for erroneous water-level measurements using the steel tape, successive measurements typically were made until two measurements resulted in water levels within 0.10 ft. If repeated measurements did not agree, the deepest value was utilized. To minimize the potential for erroneous water-level measurements using the electric tape, the tape was shaken at the suspected water depth to remove condensate and to double check the reading. Shaking the tape in water also produces the sound of the tape hitting the water, which can verify the measurement.

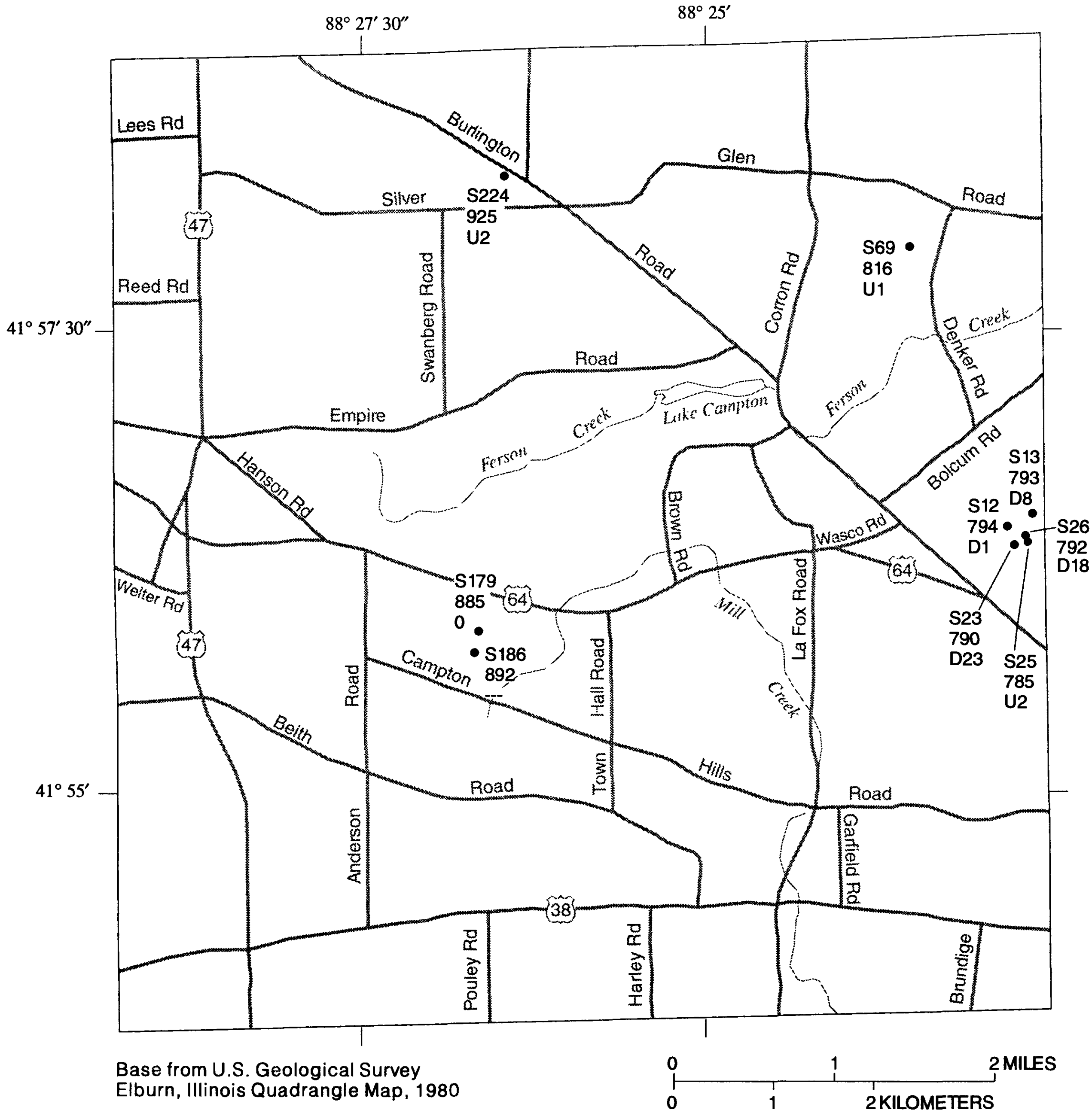
Prior to measurement, well owners were asked if the well was being, or recently had been, pumped. If the pump was in operation just prior to measurement, the measurement was postponed a minimum of 10 minutes after the end of pumping to allow water levels to recover. After 10 minutes, water levels were measured until they stabilized.

The measuring point for all water-level measurements was the top of the well casing. The altitude of the top of the well casing was estimated from topographic maps provided by the Kane County Development Department. These maps show the precise location of the residential lots containing the wells. The contour interval of the maps was 2 ft for most of the township and never more than 10 ft. The altitude of the measuring point of the well should be accurate to within about 1 ft for most wells and accurate to within about 5 ft for all wells.

Changes in water levels were calculated by comparing historical measurements of depth to water in a well with measurements of depth to water in the same well collected during this study. Most historical water-level data were obtained from records on file with the ISWS and well contractors in the area. Historical measurements typically were taken immediately after well construction was completed at a residence and are not, therefore, contemporaneous with each other. It is possible that there will be some bias toward larger changes in water level in the older wells in comparison with newer wells. Though historical water levels reported by well contractors to the ISWS are often only approximations, it is assumed that the reported measurements are accurate. Residents provided pertinent information on the wells (including total depth, well contractor, summary of maintenance, and date drilled) and the property (including address, lot number and subdivision, and name of previous owners) to verify the information on the well records.

Shallow Glacial-Drift Aquifers

Water levels were measured in wells S12, S13, S23, S25, S26, S69, S179, S186, and S224 finished in the Pingree Grove or Kaneville aquifers (Appendix 1 and fig. 6). These wells are from about 60 to 160 ft deep in the eastern part of the township where the Kaneville aquifer is present (fig. 5) and less than 60 ft deep in the remainder of



EXPLANATION

S13 ●
793
D8

WELL LOCATION--Top number is well name. Middle number is the altitude of the water level in well, in feet above sea level. Bottom number is change in water level (U-up, D-down) since prior measurement, in feet. --- indicates no prior measurement available. 0 indicates water level unchanged

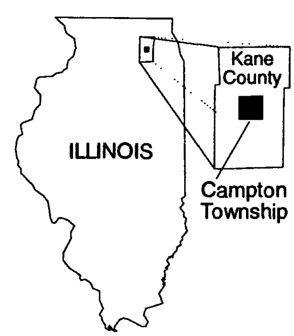


Figure 6. Water levels and water-level change in residential-supply wells finished in the shallow glacial-drift aquifers, Campton Township, Illinois, May–June, 1995.

the township. Water-level altitudes in wells S12, S13, S23, S25, S26, S69, S179, S186, and S224 were from 785 to 925 ft above sea level. Depth to water ranged from about 4 to 83 ft below land surface.

The Pingree Grove and Kaneville aquifers are not hydraulically connected throughout the township. It is inappropriate, therefore, to contour water-level altitudes from wells finished in these aquifers. The water-level altitude in these aquifers, however, follows surface topography for the wells less than 100 ft deep (wells S12, S13, S69, S179, S186, and S224) (Appendix 1). Water levels were highest where the land surface is highest and lowest where the land surface is lowest.

In the eastern part of the township north of Route 64, water levels from wells S23, S25, and S26 finished in the Kaneville aquifer are lower than water levels in wells S12 and S13 finished in the Kaneville aquifer. The altitudes of the bottom of wells S12, S13, and S26 are between 735 and 748 ft above sea level. The altitudes of the bottom of wells S23 and S25 are between 705 and 725 ft above sea level. This may indicate the potential for downward flow within the Kaneville aquifer in this area.

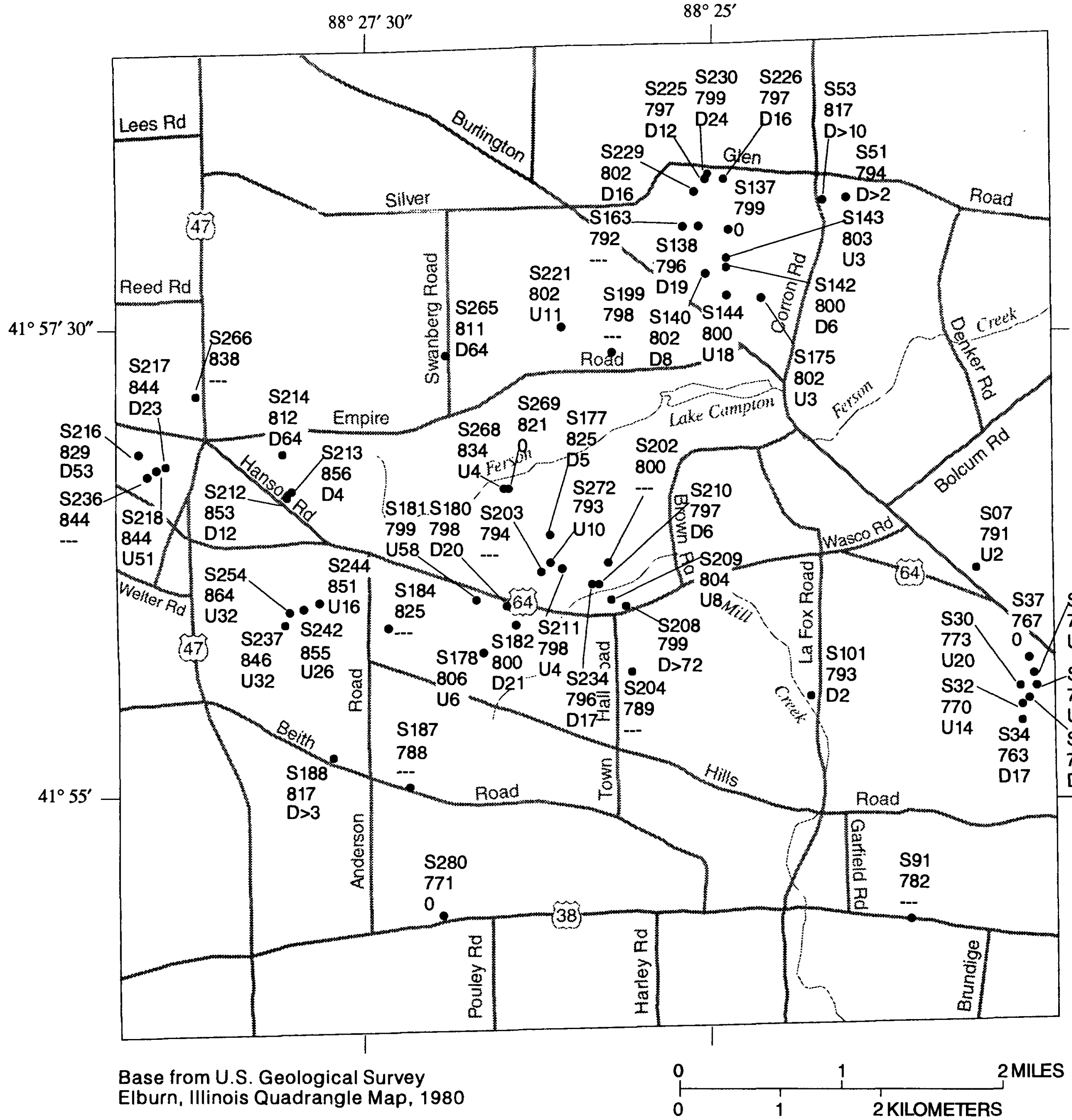
Comparison of water-level measurements taken during this study with the prior water-level measurements indicates water levels decreased 1, 8, 18, and 23 ft in wells S12, S13, S26, and S23, respectively; were unchanged in well S179; and increased less than 3 ft in wells S25, S69, and S224. No prior measurement was available at well S186. The large changes in water levels measured at wells S26 and S23 may be because of overutilization of the shallow glacial-drift aquifer near these wells or the large natural variations in water level in these aquifers on an annual and multiannual basis; the changes may reflect the difficulties in determining the cause of water-level declines based on only two measurements. Water-level changes in the remaining wells can be attributed to natural fluctuations resulting from changes in recharge from precipitation. There is no clear indication that the shallow glacial-drift aquifers are overutilized.

Deep Glacial-Drift Aquifers

Water levels were measured in 57 wells finished in deep (typically greater than 100 ft below the land surface) sand and gravel deposits that compose the deep glacial-drift aquifers (fig. 7). The deep glacial-drift aquifers include the St. Charles aquifer and any thin, discontinuous, water-producing zones that may be isolated within the semiconfining unit. Water-level altitudes in these wells ranged from 864 ft above sea level in the western part of the township to 763 ft above sea level at the eastern edge of the township.

The deep glacial-drift aquifers are not hydraulically connected throughout the township. It is inappropriate, therefore, to contour water-level altitudes from the wells finished in these aquifers. However, water-level altitudes in wells finished in the deep glacial-drift aquifers typically exceeded 825 ft above sea level in the western part of the township, were 794 to 825 ft above sea level in the central and northern parts of the township, and were less than 794 ft above sea level in the eastern and southern parts of the township (fig. 7).

Comparison of water-level measurements taken during this study with prior water-level measurements in these wells shows no consistent pattern. Water levels in wells finished in the deep glacial-drift aquifers decreased more than 15 ft in 12 wells, decreased 1 to 15 ft in 9 wells, were unchanged in 2 wells, increased between 1 and 15 ft in 10 wells, and increased more than 15 ft in 10 wells. No prior measurements were available for the remaining wells. It is assumed that water-level changes of 15 ft or less can be attributed to differences in the method of measurement, the choice of measuring point, drawdown from short-term pumping near the measured well, and natural changes in water levels resulting from variations in recharge from precipitation. Water-level decreases greater than 15 ft may indicate areas where the aquifers are overutilized. Aquifer overutilization would be indicated further if large decreases were observed in several wells in a particular area.



Base from U.S. Geological Survey
Elburn, Illinois Quadrangle Map, 1980

EXPLANATION

S216 ● WELL LOCATION--Top number is well name. Middle number is the altitude of the water level in well, in feet above sea level. Bottom number is change in water level (U-up, D-down, >-greater than) since prior measurement, in feet. --- indicates no prior measurement available. 0 indicates water level unchanged
829
D53

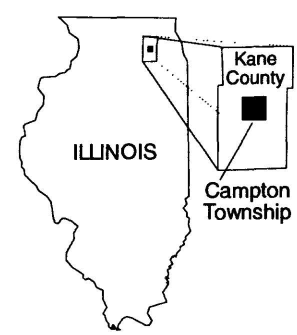


Figure 7. Water levels and water-level change in residential-supply wells finished in the deep glacial-drift aquifers, Campton Township, Illinois, May–June, 1995.

Of the 12 wells finished in the deep glacial-drift aquifer where water levels decreased more than 15 ft, 3 are near Route 47 north of Route 64, 4 are near Silver Glen Road west of Corron Road, and 4 are near Route 64 and Town Hall Road, indicating the deep glacial-drift aquifer may be overutilized in these areas. However, wells finished in the deep glacial-drift aquifer with water-level increases greater than 15 ft also are present in most of these areas. It is possible, therefore, that the decreasing water levels in many of these areas may be attributed to some cause other than overutilization of the aquifer in these areas.

The water-level altitude in the shallow glacial-drift aquifers is from 2 to 10 ft higher than the water-level altitude in the deep glacial-drift aquifers near the eastern edge of the township north of Route 64 and is generally about 100 ft higher in the west-central part of the township between Route 64, Campton Hills Road, Townhall Road, and Anderson Road (compare figs. 6 and 7). This indicates the potential for downward flow within the glacial drift. The small differences in water level (2–10 ft) near the eastern edge of the township are in the area where the Kaneville aquifer overlies the St. Charles aquifer (compare figs. 5–7), and the semiconfining unit is less than 100 ft thick. In the remainder of the township, where the differences in water level between the drift aquifers is large, the semiconfining unit is typically over 100 ft thick.

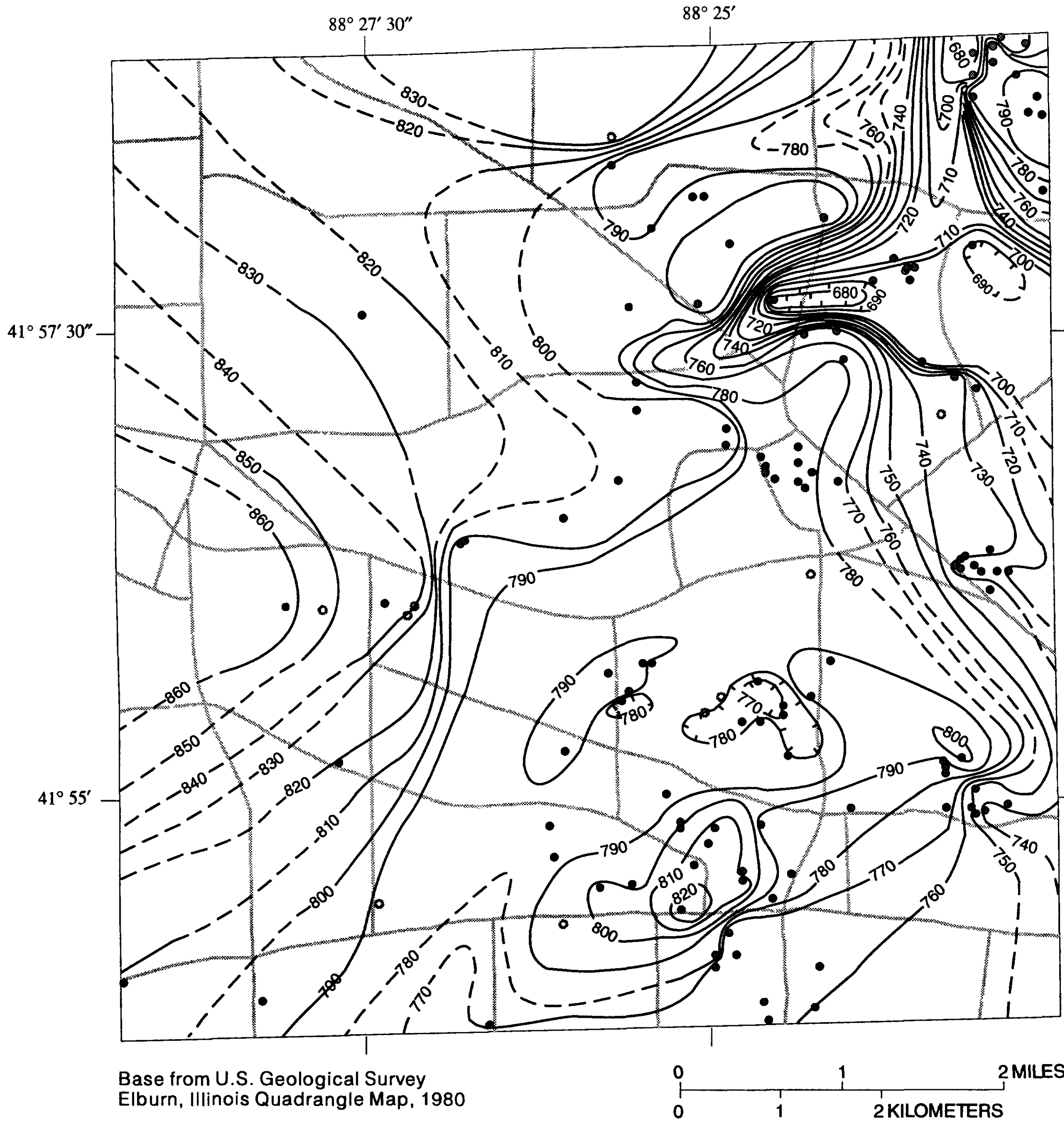
Though there is some indication that the deep glacial-drift aquifers may be overutilized in a few small areas within the township, there is no indication of the widespread overutilization of either the shallow or deep aquifers in the glacial drift. These aquifers may be capable of sustaining additional development in some parts of the township. Determination of the amount of additional development these aquifers can maintain is beyond the scope of this study. The potential for water-quality degradation in some of the shallow glacial-drift aquifers may limit their potential for development.

Alexandrian-Maquoketa Aquifer

Water levels were measured in 120 wells finished in the Alexandrian-Maquoketa aquifer. All of these wells were constructed with an iron or polyvinyl chloride surface casing extending through the unconsolidated deposits to the top of the bedrock. The wells are open to the aquifer from the bottom of the casing to the bottom of the well bore. It is assumed that the surface casing is effectively preventing the drainage of water from the overlying unconsolidated deposits down to the open interval of the well and that the water level in the well is representative of the hydraulic pressures in the open interval of the well. The potentiometric surface of the Alexandrian-Maquoketa aquifer is shown in figure 8. Water levels in many of these wells are likely to be affected by the potentiometric surface of the upper 50 ft of the aquifer because this interval is likely to contribute most of the water to a given well. Water levels from some of the wells open to the Alexandrian-Maquoketa and Galena-Platteville aquifers were utilized to provide a lower limit to the potentiometric surface of the Alexandrian-Maquoketa aquifer where measurements from wells in the Alexandrian-Maquoketa aquifers were not available.

Water-level altitudes in the Alexandrian-Maquoketa aquifer decrease overall from west to east in Campton Township, ranging from a high of 865 ft above sea level in the western part of the township to a low of 671 ft above sea level in the northeastern part of the township. Ground-water flow in an aquifer is in the direction of declining water levels. Therefore, the general direction of ground-water flow in the Alexandrian-Maquoketa aquifer underlying the township is from west to east.

The potentiometric surface of the Alexandrian-Maquoketa aquifer follows the topography of the bedrock surface in some parts of the township. The high water levels defined by the 800-ft contour in the western and central parts of the township approximately coincide with the area where the bedrock-surface altitude is above 650 ft above sea level (compare figs. 4 and 8). The high water levels defined by the 800-ft contour near



Base from U.S. Geological Survey
Elburn, Illinois Quadrangle Map, 1980

EXPLANATION

—790 – – POTENTIOMETRIC CONTOUR--Shows altitude at which water would have stood in tightly cased wells. Dashed where inferred. Contour interval 10 feet. Datum is sea level

• LOCATION OF WELL FINISHED IN THE ALEXANDRIAN-MAQUOKETA AQUIFER

○ LOCATION OF WELL FINISHED IN THE GALENA-PLATTEVILLE AQUIFER--Used to determine minimum probable water level in Alexandrian-Maquoketa aquifer

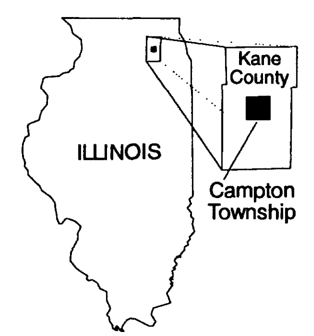


Figure 8. Potentiometric surface of the Alexandrian-Maquoketa aquifer, Campton Township, Illinois, May–June, 1995.

Beith Road, Town Hall Road, and Route 38 correspond to an area where the bedrock-surface altitude is near or above 750 ft above sea level. The large changes in the potentiometric surface at the northeast corner of the township correspond to an area where bedrock topography increases from less than 600 to almost 750 ft above sea level. The lower water levels defined by the 770- and 780-ft contours west of Pouley Road correspond to an area where the altitude of the bedrock surface is below 650 ft above sea level, and the low water level defined by the 670-ft contour near Corron Road corresponds to an area where the bedrock surface is less than 600 ft above sea level.

Areas of localized low water-level altitudes are approximately defined by the 700-ft contour between Denker and Corron Roads, the 790-ft contour near the bend in Silver Glen Road, the 780- and 770-ft contours near La Fox Road between Campton Hills Road and Route 64, the bend in the 740-ft contour north of Campton Hills Road at the eastern edge of the township, the bend in the 730-ft contour north of Route 64 at the eastern edge of the township, and the 770-ft contour near Town Hall Road (fig. 8). The low water-level altitude in these areas cannot be attributed to variations in bedrock topography. Land use in each of these areas is residential, and most of these residences were built prior to 1978 (fig. 2).

Within the areas of low water levels, the water-level altitude tends to be lowest in the wells at the center of the residential area and highest in the wells at the edges of the residential areas (compare figures 2 and 8). In the area of low water levels north of Route 64 in the eastern part of the township, water levels in the western and southern edges of the residential area are near or above 730 ft above sea level. Water levels decline to about 719 ft above sea level toward the north and east, which is the center of this residential area. Water-level trends in the area of low water levels in the eastern part of the township north of Campton Hills Road are greater than 770 ft above sea level in the northern and western edges of the residential area. Water levels decline to less than 740 ft above sea level to the south and east, which is toward the center of this residential area. The correlation of low water levels with areas where the aquifer is pumped, combined with the trends in water-level altitude within the areas of residential land use, indicates the Alexandrian-Maquoketa aquifer may be overutilized in parts of the township.

Comparison of current and historical water-level measurements in wells finished in the Alexandrian-Maquoketa aquifer (fig. 9) indicates that water levels decreased by more than 15 ft in 25 wells, decreased by less than 15 ft in 28 wells, were unchanged in 3 wells, increased less than 15 ft in 24 wells, and increased more than 15 ft in 15 wells. Water levels in nine additional wells decreased a minimum of 1 to 15 ft. Of the wells in which the water level decreased 15 ft or more, eight are in the area of low water levels north of Route 64 in the eastern part of the township, two are in the area of low water levels in the eastern part of the township north of Campton Hills Road, six are in the eastern part of the township south of Silver Glen Road near Denker Road, one is near the area of low water levels near La Fox Road, and three are in the areas of low water levels near Burlington and Silver Glen Roads. Water levels increased, or decreased slightly, in most of the remainder of the township. The relation between areas of low water-level altitude and large decreases in water level is further indication that the aquifer may be overutilized in parts of the township.

Information provided by residents and well contractors indicates problems with water supply in at least some wells finished in the Alexandrian-Maquoketa aquifer in the areas where the aquifer appears to be overutilized north of Route 64, north of Campton Hills Road, and near La Fox Road. Numerous wells finished in the Alexandrian-Maquoketa aquifer in the residential area near Burlington, Empire, Silver Glen, and Corron Roads have been redrilled to penetrate the deeper aquifers.

In the area where the aquifer appears to be overutilized near Route 64, approximately 60 lots are in an area of about 56 acres (Edward Malek, Campton Township Board of Trustees, written commun., 1995). Well records obtained from the

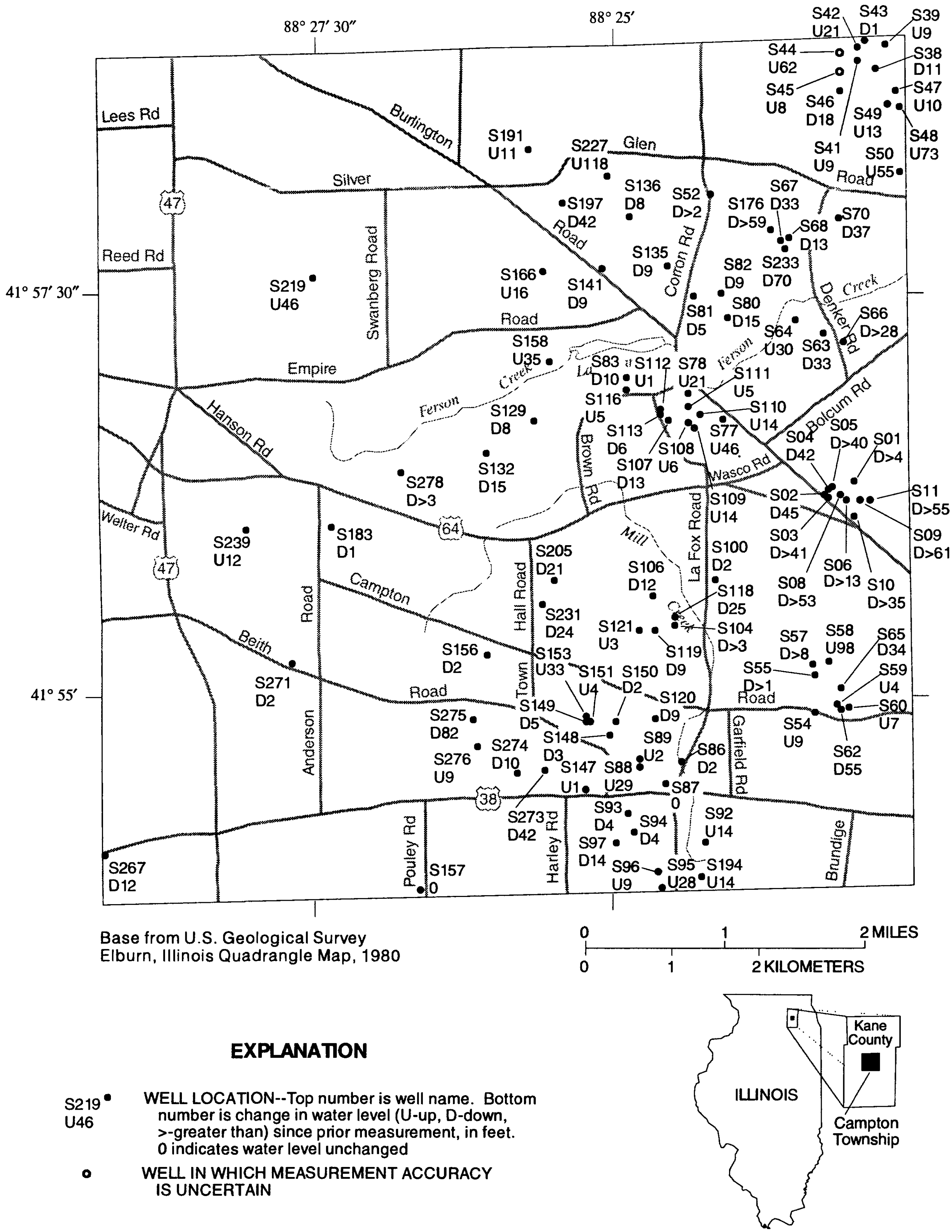


Figure 9. Water-level change in residential-supply wells finished in the Alexandrian-Maquoketa aquifer, Campton Township, Illinois, May–June, 1995.

ISWS indicate that at least 42 of these lots contain wells open only to the Alexandrian-Maquoketa aquifer. Therefore, a density of about 0.75 wells per acre is calculated for the aquifer in this area. In the area where the aquifer appears to be overutilized near Campton Hills Road, about 119 lots are located on an area of about 131 acres. Of the 54 well logs for this area obtained from the ISWS and other sources, 48 wells are open only to the Alexandrian-Maquoketa aquifer. If the well logs in the records are representative of the total number of wells, about 106 wells in this area are open only to the Alexandrian-Maquoketa aquifer. This results in a well density of about 0.81 wells per acre. In the area near Denker Road where the aquifer may be overutilized, four wells within an area of about 6 acres penetrate the aquifer to the same elevation. This results in a well density of 0.66 wells per acre open only to the Alexandrian-Maquoketa aquifer. Well records from other areas where the aquifer may be overutilized are too sparse and too obsolete to allow a realistic analysis of well density. The data indicate that apparent overutilization of the Alexandrian-Maquoketa aquifer tends to occur in areas where well density is greater than 0.60 wells per acre.

A well density of about 0.54 wells per acre was calculated at a subdivision south of the intersection of Brown and Burlington Roads. A well density of about 0.44 wells per acre was calculated northwest of the intersection of La Fox Road and Route 38, a well density of about 0.89 wells per acre was calculated at a subdivision south of Beith Road and Route 38, and a well density of about 0.53 wells per acre was calculated at the subdivisions in the northeastern corner of the township. The configuration of the potentiometric surface of the Alexandrian-Maquoketa aquifer, the absence of large decreases in water level, and an absence of large-scale problems with water supply give no indication that the aquifer is overutilized in these areas.

Calculations indicate that a well density in the Alexandrian-Maquoketa aquifer greater than 0.60 wells per acre does not always indicate a potential area of aquifer overutilization. Overutilization of the aquifer, however, appears to be more likely where well density is greater than 0.60 wells per acre. Overutilization of the Alexandrian-Maquoketa aquifers does not appear to be occurring where the well density is less than 0.60 wells per acre.

Comparison of water-level altitudes in the deep glacial-drift aquifers (fig. 7) with water levels and potentiometric contours of the Alexandrian-Maquoketa aquifer (figs. 8 and 9) in a given location indicates that water-level altitudes in these aquifers are within 10 ft in most of the township. The small differences in water level between the aquifers indicate that they are hydraulically connected. Water-level altitudes in the drift aquifers are not clearly greater or less than those in the Alexandrian-Maquoketa aquifer in most of the township. For example, wells S51 and S53 are finished in a deep glacial-drift aquifer. Well S52 is finished in the Alexandrian-Maquoketa aquifer. All of these wells are located near the southeastern corner of Silver Glen and Corron Roads. The water-level altitude in well S52 was greater than in well S53 but less than in well S51. This is one example of the complex flow between the drift and Alexandrian-Maquoketa aquifers within the township. The vertical direction of flow between the aquifers may be affected by the amount of pumping from the aquifers at any location.

Most of the areas with differences in water level of more than 20 ft are either areas where data from one of the aquifers are sparse or absent (at Route 38 between Garfield and Brundige Roads, north of Ferson Creek to the southeast of the intersection of Swanberg and Empire Roads) or areas where the Alexandrian-Maquoketa aquifer apparently is overutilized. For example, water levels in the deep aquifers in the glacial drift (well S07) are more than 60 ft higher than water levels in the Alexandrian-Maquoketa aquifer (wells S06 and S08) north of Route 64 in the eastern edge of the township and about 100 ft higher than water levels in the Alexandrian-Maquoketa aquifer near Burlington and Corron Roads (wells S135 and S175). In these areas, water has the potential to flow from the unconsolidated deposits down into the bedrock.

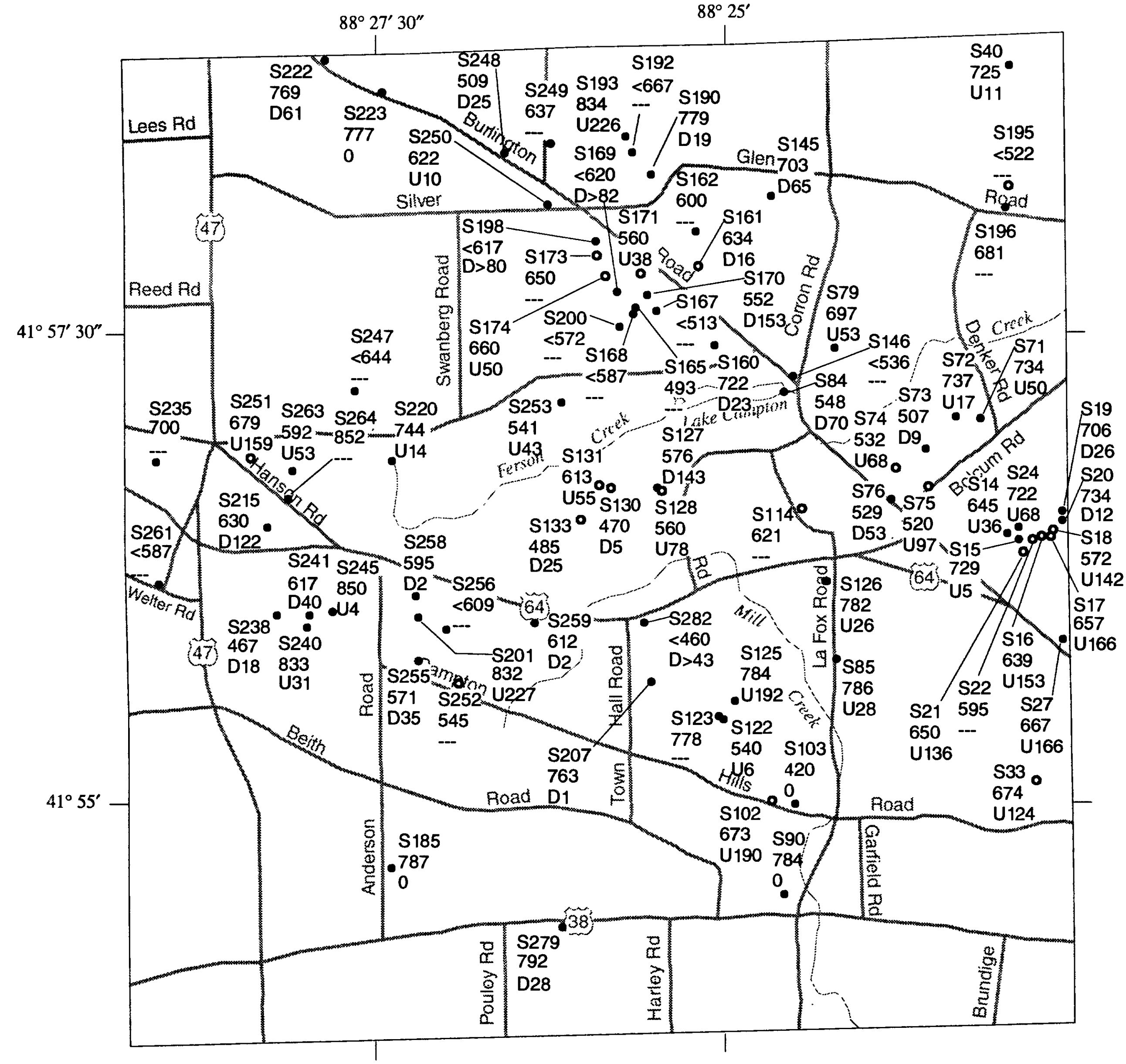
Galena-Platteville Aquifer

Water levels were measured in 32 wells finished in the Galena-Platteville aquifer. All but two of these wells (S19, S73) are open holes from the top of the bedrock (which is composed of Alexandrian or Maquoketa deposits) to the bottom of the well (which is composed of Galena or Platteville deposits). Water-level altitudes in the wells finished in the Galena-Platteville aquifer (fig. 10) vary from 420 to 850 ft above sea level. The large variation in water levels in these wells is probably the result of differences in the amount of inflow to the well from the Alexandrian-Maquoketa aquifer, not natural variations in the potentiometric surface of the Galena-Platteville aquifer. Where the water-level altitude is low, for example well S238, it is probable that the well receives only small amounts of water from the Alexandrian-Maquoketa aquifer and the water level in the well is somewhat reflective of the potentiometric surface of the Galena-Platteville aquifer. Where the water-level altitude is high, for example well S245, it is probable that the well receives large amounts of water from the Alexandrian-Maquoketa aquifer and that the water level in the well is more reflective of the potentiometric surface of the Alexandrian-Maquoketa aquifer. The water level in most of the wells is probably a composite of the potentiometric surfaces of the Galena-Platteville and Alexandrian-Maquoketa aquifers. Because water levels in almost all of the wells finished in the Galena-Platteville aquifer do not accurately represent the potentiometric surface of the Galena-Platteville aquifer, the potentiometric surface of the aquifer cannot be contoured with the available data.

Wells S19 and S73 are open only to the Galena-Platteville aquifer. The top of the open interval of each well is about 500 ft above sea level. The bottom of well S19 is about 300 ft above sea level, whereas the bottom of well S73 is about 415 ft above sea level. The water-level altitude in the Galena-Platteville aquifer was 706 ft above sea level at well S19 and 507 ft above sea level at well S73. Well S19 is east of well S73. Though based on water-level measurements from only two wells, these measurements indicate that ground-water flow in the Galena-Platteville aquifer is from east to west in the eastern part of the township. This is consistent with the data from wells utilized for residential supply collected by Visocky and Schulmeister (1988, fig. 8) in Campton Township. This is also consistent with flow toward an area in the north-central part of the township where the water-level altitude in the Alexandrian-Maquoketa and Galena-Platteville aquifers may have been lowered because of pumping from these aquifers (Visocky and Schulmeister, 1988, p. 17, fig. 9). Other data collected by Visocky and Schulmeister (1988, fig. 11) indicate that ground-water flow in the Galena-Platteville aquifer is from west to east in Kane County.

Comparison of current and historical water levels in the wells finished in the Galena-Platteville aquifer indicates that water levels decreased by more than 15 ft in 18 wells, decreased less than 15 ft in 5 wells, were unchanged in 4 wells, increased less than 15 ft in 6 wells, and increased more than 15 ft in 19 wells (fig. 10). Wells where water levels decreased 15 ft or more are scattered throughout the township, as are wells where the water level increased 15 ft or more. The large increases in water level, often greater than 100 ft, in some of the wells may be attributed to an increase in the amount of flow from the overlying aquifers, well development since the prior measurement, or incorrect water-level measurements. Water levels decreased by 60 ft or more in five wells in the residential area in the vicinity of Burlington Road west of Corron Road and Silver Glen Road, indicating the aquifer may be overutilized in this area. This is consistent with the data collected by Visocky and Schulmeister (1988, fig. 9). This is also consistent with information provided by residents, which indicates that many of the wells in this area originally finished in either the Alexandrian-Maquoketa or the shallower parts of the Galena-Platteville aquifers were redrilled to provide an adequate water supply.

The water-level altitude in the Galena-Platteville aquifer at well S73 was 507 ft above sea level. This is more than 160 ft less than the lowest water-level altitude measured in a well finished in



Base from U.S. Geological Survey
Elburn, Illinois Quadrangle Map, 1980

0 1 2 MILES
0 1 2 KILOMETERS

EXPLANATION

S279 792 D28 • WELL LOCATION--Top number is well name. Middle number is the altitude of the water level in well, in feet above sea level. Bottom number is change in water level (U-up, D-down, <-less than, >-greater than) since prior measurement, in feet. --- indicates no prior measurement available. 0 indicates water level unchanged

o WELL IN WHICH MEASUREMENT ACCURACY IS UNCERTAIN

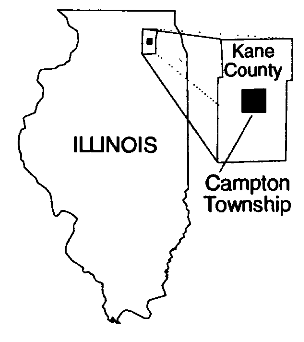


Figure 10. Water levels and water-level change in residential-supply wells finished in the Galena-Platteville aquifer, Campton Township, Illinois, May–June, 1995.

the Alexandrian-Maquoketa aquifer, indicating the potential for downward flow from the Alexandrian-Maquoketa aquifer to the Galena-Platteville aquifer.

Ancell Aquifer

Water levels were measured in 14 wells finished in the Ancell aquifer. All of these wells are open to the Alexandrian-Maquoketa, Galena-Platteville, and Ancell aquifers. Water-level altitudes in the wells finished in the Ancell aquifer vary from 434 to 716 ft above sea level (fig. 11). The large variation in water levels in these wells is probably the result of differences in the amount of inflow to the well from the Alexandrian-Maquoketa aquifer, not natural variations in the potentiometric surface of the Ancell aquifer. Where the water-level altitude is low, for example well S134, it is probable that the well receives only small amounts of water from the Alexandrian-Maquoketa aquifer and the water level in the well approximates the potentiometric surface of the Ancell aquifer. Where the water-level altitude is high, for example wells S35 and S36, it is probable that the well receives large amounts of water from the Alexandrian-Maquoketa aquifer and the water level in the well partially reflects the potentiometric surface of the Alexandrian-Maquoketa aquifer. The water levels in most of the wells are probably a composite of the potentiometric surfaces of the Alexandrian-Maquoketa and Ancell aquifers. Because water levels in most or all of the wells finished in the Ancell aquifer do not accurately represent the potentiometric surface of the aquifer, the potentiometric surface of the aquifer cannot be contoured with the available data and the direction of ground-water flow in the aquifer cannot be determined. It is probable that flow in the Ancell aquifer is from west to east in the township.

Comparison of current and historical water levels in the wells finished in the Ancell aquifer indicates that water levels decreased by more than 15 ft in two wells, decreased by less than 15 ft in three wells, and increased by more than 15 ft in four wells (fig. 11). Water-level decreases greater than 15 ft were measured in a well west of Swanberg Road (well S246) and a well in the subdivision west of La Fox Road between Campton Hills Road and Route 64 (S124). A decline in water level was not observed in another well finished in the Ancell aquifer near well S246.

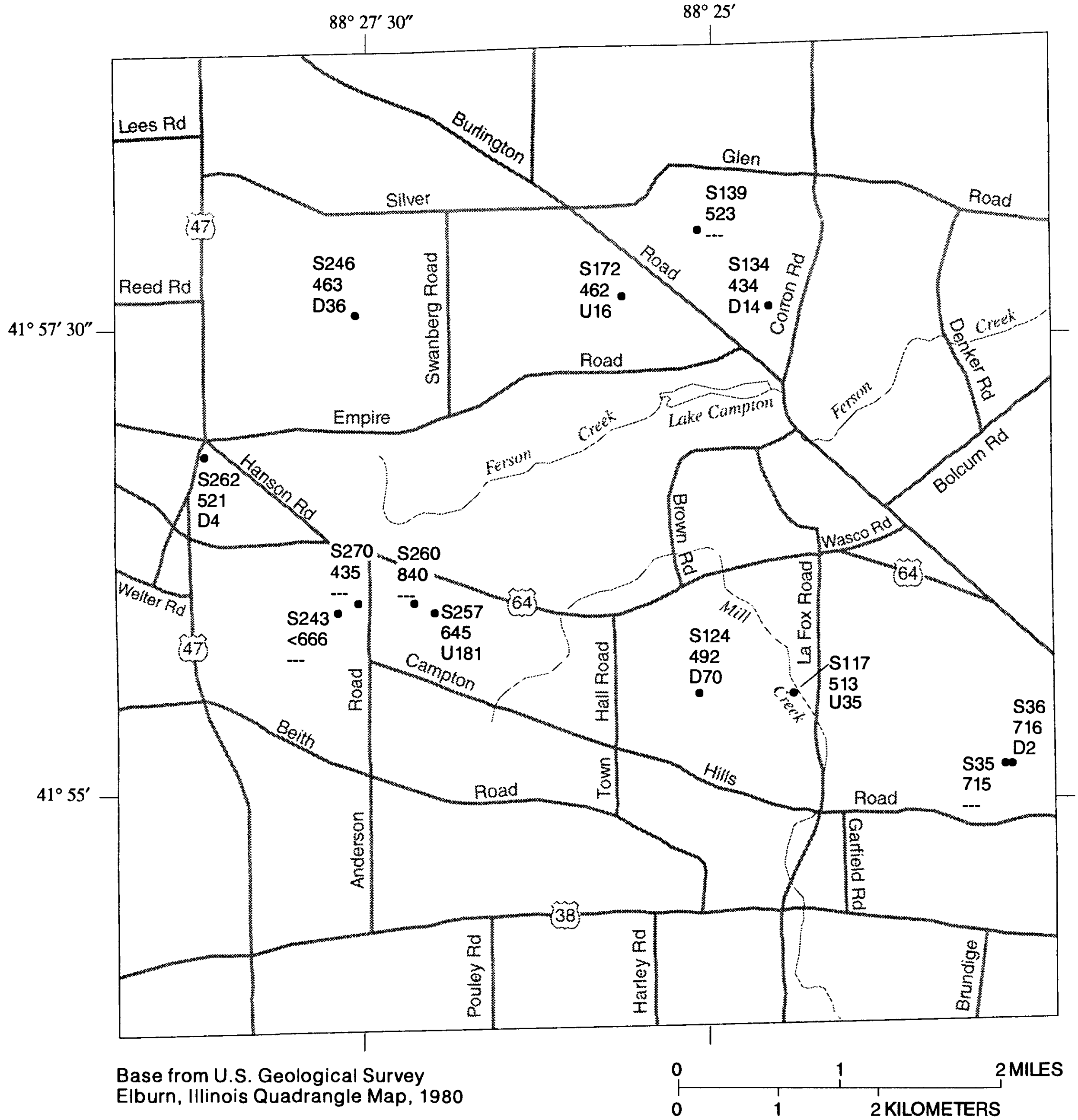
There is no indication that the Ancell aquifer currently is overutilized in the township. It is probable that the Ancell aquifer is capable of sustaining additional development. Determining the amount of additional development the aquifer can sustain is beyond the scope of this study.

Water-level altitudes in the wells finished in the Ancell aquifer are typically lower than the water-level altitudes in the Galena-Platteville aquifer, indicating the potential for downward flow. The effects of inflow from the overlying aquifers make determination of the magnitude of the difference in water levels between the aquifers difficult.

SUMMARY AND CONCLUSIONS

Population growth in Campton Township has caused concern about the availability of ground-water supplies from aquifers used for residential supply. In 1995, the U.S. Geological Survey, in cooperation with the Campton Township Board of Trustees, began a study of the water levels in the aquifers to determine the current distribution of, and trends in, water levels in the shallow and deep aquifers in the glacial drift, the Alexandrian-Maquoketa aquifer, the Galena-Platteville aquifer, and the Ancell aquifer. These are the aquifers beneath the township used for residential supply.

Water levels were measured in 282 residential-supply wells open to each of the aquifers used for residential supply in Campton Township during May and June 1995. Changes in water level were calculated by comparing historical measurements of depth to water in a well with measurements of depth to water in the same well collected during this study.



EXPLANATION

S172 462 • U16 WELL LOCATION--Top number is well name. Middle number is the altitude of the water level in well, in feet above sea level. Bottom number is change in water level (U-up, D-down, <-less than) since prior measurement, in feet. --- indicates no prior measurement available

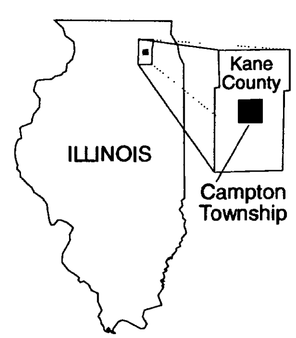


Figure 11. Water levels and water-level change in residential-supply wells finished in the Ancell aquifer, Campton Township, Illinois, May–June, 1995.

The water-level altitude in the wells finished in the shallow aquifers in the glacial drift varied from about 785 to 925 ft above sea level. Water-level altitudes in wells finished in the deep aquifers in the glacial drift were typically greater than 825 ft above sea level in the western part of the township, from 794 to 825 ft above sea level in the central and northern parts of the township, and less than 794 ft above sea level in the eastern and southern parts of the township. Large decreases in water levels indicate that some of the deep aquifers in the glacial drift may be overutilized in some areas. The Kaneville and Pingree Grove aquifers in the shallow glacial drift and the St. Charles aquifer in the deep glacial drift do not appear to be widely overutilized in Campton Township at this time. These aquifers, and some of the other aquifers in the deep glacial drift, appear to be capable of sustaining additional development where they are present beneath the township. Determination of the amount of additional development these aquifers can sustain requires further study.

Water-level altitudes in the Alexandrian-Maquoketa aquifer generally decrease from west to east in the township, ranging from about 865 ft above sea level in the western part of the township to about 671 ft above sea level in the northeastern part of the township. The potentiometric surface of the Alexandrian-Maquoketa aquifer follows the topography of the bedrock surface in some parts of the township. Areas of localized low water-level altitudes between Denker and Corron Roads, near the bend in Silver Glen Road, near La Fox Road between Campton Hills Road and Route 64, north of Campton Hills Road at the eastern edge of the township, north of Route 64 at the eastern edge of the township, and near Town Hall Road indicate the Alexandrian-Maquoketa aquifer is apparently overutilized in these areas. Where the aquifers appear to be overutilized, water-level altitudes tended to be lowest in the centers of the subdivisions.

Comparison of current and historical water-level measurements in wells finished in the Alexandrian-Maquoketa aquifer also indicates the aquifer is apparently overutilized in these areas. Well densities greater than 0.60 wells per acre were calculated in three areas where the aquifer apparently is overutilized. Well densities greater than 0.80 wells per acre also were calculated in an area where the aquifer does not appear to be overutilized. Well densities were less than 0.60 wells per acre in three other areas where the aquifer does not appear to be overutilized. Flow between the Alexandrian-Maquoketa aquifer and the overlying deposits appears complex.

Water-level altitudes in the wells finished in the Galena-Platteville aquifer vary from 420 to 850 ft above sea level. The large variation in water levels in these wells is probably the result of differences in the amount of inflow to these wells from the Alexandrian-Maquoketa aquifer, not natural variations in the potentiometric surface of the Galena-Platteville aquifer. Comparison of current and historical water levels in the wells finished in the Galena-Platteville aquifer indicates that the Galena-Platteville and Alexandrian-Maquoketa aquifers apparently are overutilized in the vicinity of Burlington Road west of Corron Road and Silver Glen Road. Water-level altitudes indicate the potential for downward flow from the Alexandrian-Maquoketa aquifer to the Galena-Platteville aquifer.

Water-level altitudes in the wells finished in the Ancell aquifer range from 434 to 716 ft above sea level. The large differences in water level in the wells finished in the Ancell aquifer can be attributed to differences in the amount of inflow to the well from overlying aquifers, not variations in the potentiometric surface of the Ancell aquifer. There is no indication that the Ancell aquifer is currently overutilized in the township. The Ancell aquifer underlies the entire township and appears capable of sustaining additional development. Determination of the amount of sustainable development is beyond the scope of this study. Water-level altitudes indicate the potential for downward flow from the Galena-Platteville aquifer into the Ancell aquifer.

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GLOSSARY

Alluvium. Detrital material transported and deposited by a river.

Aquifer. A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Aquifer test. A test to determine hydrologic properties of the aquifer, involving the withdrawal of measured quantities of water from or addition of water to a well and the measurement of resulting changes in head in the aquifer during and after the period of discharge or additions.

Arenite. Sedimentary rock in which the particles range in size from 1/16 mm to 2 mm.

Argillaceous. Containing clay minerals.

Cascading water. In reference to wells, ground water that trickles or pours through cracks or perforations down the casing or uncased borehole above the water level in the well.

Clay. Detrital particles less than 1/256 mm in size or an unconsolidated detrital sedimentary deposit composed primarily of particles less than 1/256 mm in size.

Conformable. Sequence of beds representing an unbroken period of deposition.

Dolomite. Rock composed of calcium and magnesium carbonate.

Drawdown. The decline in water level at a point caused by the withdrawal of water from a hydrogeologic unit.

Drift. All glacial and fluvioglacial deposits.

Formation. Aggregation of related strata distinguishable from beds above and below and of mapping extent.

Fracture. Breakage in the rock not related to the crystalline structure of the minerals which compose the rock, often having a preferred orientation.

Gravel. Coarse-grained particles between 2 and 4 mm in size. Loosely used to denote unconsolidated detrital sedimentary deposits composed primarily of particles greater than 2 mm in size.

Ground water. Subsurface water that fills available openings in rock or soil materials to the extent they are considered water saturated.

Ground-water flow. The movement of water in the zone of saturation.

Group. Two or more superadjacent formations having prominent features in common.

Hydraulic conductivity. A proportionality constant relating hydraulic gradient to specific discharge which for an isotropic medium and homogeneous fluid equals the volume of water at the prevailing kinematic viscosity that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.

Joint. A fracture in the rock along which there is no observable movement. Joints often have a preferred orientation.

Lacustrine. Pertaining to deposition in lakes.

Limestone. Sedimentary rock composed primarily of calcium carbonate.

Lithology. Term usually applied to sedimentary rocks, referring to their general characteristics.

Member. Units of lesser rank in a heterogeneous formation that are lithologically distinct.

Ordovician System. Period of geologic time extending from 500 to 435 million years before the present.

Peat. A partially decomposed mass of vegetation that has typically grown in a marsh or shallow lake.

Permeability. A measure of the relative ease with which a porous medium can transmit a fluid under a potential gradient and is a property of the medium alone.

Piezometer. A device used to measure ground-water-pressure head at a point in the subsurface.

Pleistocene. Period of geologic time extending from the present to about 40,000 years before the present.

Potentiometric surface. An imaginary surface representing the static head of ground water and defined by the level to which water will rise in a tightly cased well.

Recharge. The process of addition of water to the saturated zone or a well.

Sand. Typically a silicate mineral between 1/16 and 2 mm in size or an unconsolidated detrital sedimentary deposit composed of particles between 1/16 and 2 mm in size.

Sandstone. Detrital sedimentary rocks composed primarily of silicate minerals that typically vary in size between 1/16 mm and 2 mm.

Semiconfining unit. A confining unit that retards but does not prevent the flow of water to or from an adjacent aquifer. It does not readily yield water to wells or springs but may serve as a storage unit for ground water.

Shale. Detrital sedimentary rock composed primarily of particles less than 1/256 mm in size.

Silt. Particle between 1/16 and 1/256 mm in size or an unconsolidated detrital sedimentary deposit composed primarily of particles between 1/16 and 1/256 mm in size.

Silurian System. Period of geologic time extending from 435 to 395 million years before the present.

Solution opening. A large cavity in a rock formed by chemical dissolution.

Specific capacity. The rate of discharge of water from the well divided by the drawdown of the water level within the well.

Storage coefficient. The volume of water an aquifer releases from storage per unit surface area of the aquifer per unit change in head.

Stratigraphy. The study of stratified sedimentary and volcanic rocks, especially their sequence in time, the character of the rocks, and the correlation of beds in different localities.

Till. Unsorted material deposited beneath glacial ice or deposited out of melting glacial ice.

Transmissivity. The rate at which water of the prevailing kinematic viscosity is transmitted through the unit width of the aquifer under a unit hydraulic gradient. It is equal to an integration of the hydraulic conductivities across the saturated part of the aquifer perpendicular to the flow paths.

Unconformable. Plane between beds representing an interruption in deposition.

Vug. A cavity in a rock.

APPENDIX

30 —> 32 NEXT

Appendix 1. Summary of well information and water-level measurements taken during the survey of residential-supply wells in Campton Township, Illinois, May and June, 1995

[AM—Alexandrian-Maquoketa aquifer; D—down; >—greater than; DD—Deep drift aquifer; U—up; SD—Shallow drift aquifer; AMGP—Alexandrian-Maquoketa and Galena-Platteville aquifers; *—uncertain about data; ?—unknown; AMGPAn—Alexandrian-Maquoketa, Galena-Platteville and Ancell aquifers; GPAn, Galena-Platteville and Ancell aquifers]

Well name	Longitude/ latitude	Open interval (feet below land surface)	Aquifer open to	Altitude of water level (feet above sea level)	Change since prior measurement (feet)	Altitude of land surface (feet above sea level)
S01	415620/882259	163–235	AM	736	D>4	820
S02	415615/882314	147–220	AM	727	D45	812
S03	415614/882312	167–220	AM	724	D>41	825
S04	415617/882312	149–205	AM	730	D42	812
S05	415618/882310	149–220	AM	732	D>40	812
S06	415613/882303	186–250	AM	726	D>13	839
S07	415614/882305	125–147	DD	791	U2	836
S08	415615/882306	175–225	AM	727	D>53	830
S09	415613/882256	196–250	AM	726	D>61	847
S10	415607/882259	171–220	AM	732	D>35	826
S11	415613/882251	186–250	AM	719	D>55	834
S12	415626/882248	44– 78	SD	794	D1	813
S13	415630/882237	57– 63	SD	793	D8	811
S14	415626/882258	150–400	AMGP	645	U36	804
S15	415624/882253	159–440	AMGP	729	U5	820
S16	415625/882243	198–500	AMGP	639*	U153*	827
S17	415625/882239	198–500	AMGP	657*	U166*	831
S18	415627/882238	190–460	AMGP	572*	U142*	820
S19	415633/882234	300–500	AMGP	706	D26	802
S20	415630/882234	175–400	AMGP	734	D12	812
S21	415620/882251	195–470	AMGP	650*	U136*	846
S22	415624/882247	?–470	AMGP	595*	?	836
S23	415620/882245	?–158	SD	790	D23	863
S24	415628/882253	156–450	AMGP	722	U68	804
S25	415621/882239	?–143	SD	785	U2	868
S26	415623/882240	?–116	SD	792	D18	851
S27	415552/882234	165–400	AMGP	667	U166	800
S28	415540/882240	150–165	DD	772	U6	801
S29	415536/882239	155–175	DD	772	U15	807
S30	415536/882246	?–175	DD	773	U20	814
S31	415532/882242	162–182	DD	768	D8	816
S32	415530/882245	?–182	DD	770	U14	816
S33	415507/882246	163–445	AMGP	674*	U124*	850
S34	415525/882245	140–150	DD	763	D17	830
S35	415511/882252	126–680	AMGPAn	715	?	818
S36	415511/882249	124–660	AMGPAn	716	D2	818
S37	415545/882242	145–165	DD	767	0	792
S38	415852/882247	88–240	AM	793	D11	824
S39	415901/882242	?–250	AM	759	U9	825
S40	415854/882256	110–280	AMGP*	725	U11	834
S41	415855/882256	120–175	AM	787	U9	838
S42	415900/882256	135–185	AM	782	U21	841
S43	415904/882253	200–320	AM	702	D1	843
S44	415858/882305	210–325	AM	672*	U62*	850
S45	415851/882305	208–340	AM	685*	U8*	856
S46	415844/882305	148–240	AM	788	D18	846
S47	415844/882237	91–145	AM	791	U10	830
S48	415838/882235	76–180	AM	796	U73	818
S49	415839/882241	84–115	AM	797	U13	819
S50	415814/882235	66–200	AM	776	U55	821

Appendix 1. Summary of well information and water-level measurements taken during the survey of residential-supply wells in Campton Township, Illinois, May and June, 1995—Continued

Well name	Longitude/ latitude	Open interval (feet below land surface)	Aquifer open to	Altitude of water level (feet above sea level)	Change since prior measurement (feet)	Altitude of land surface (feet above sea level)
S51	415812/882401	?–251	DD	794	D>2	896
S52	415806/882410	264–295	AM	802	D>2	900
S53	415811/882414	?–253	DD	817	D>10	907
S54	415454/882319	115–210	AM	774	U9	845
S55	415508/882319	88–160	AM	783	D>1	814
S56	415510/882319	84–160	AM	783	?	808
S57	415512/882320	72–150	AM	785	D>8	803
S58	415513/882312	101–170	AM	802	U98	804
S59	415457/882308	128–240	AM	754	U4	840
S60	415456/882302	160–210	AM	737	U7	860
S61	415458/882252	>160	AM*	746	?	845
S62	415455/882306	161–260	AM	745	D55	880
S63	415715/882314	104–160	AM	736	D33	784
S64	415720/882328	133–260	AM	700	U30	790
S65	415503/882306	130–180	AM	743	D34	836
S66	415711/882308	78–160	AM	725	D>28	783
S67	415749/882335	165–300	AM	697	D33	840
S68	415750/882331	153–270	AM	693	D13	826
S69	415756/882330	?– 50	SD	816	U1	826
S70	415757/882306	218–350	AM	690	D37	893
S71	415602/882319	149–320	AMGP	734	U50	804
S72	415703/882320	146–308	AMGP	737	U17	805
S73	415653/882333	316–420	GP	507	D9	837
S74	415647/882346	166–455	AMGP	532*	U68*	824
S75	415641/882332	165–445	AMGP	520*	U97*	818
S76	415637/882348	163–440	AMGP	529	D53	831
S77	415625/882407	172–210	AM	775	U46	829
S78	415653/882422	163–200	AM	784	U21	823
S79	415725/882412	196–335	AMGP	697	U53	840
S80	415721/882402	165–200	AM	779	D15	814
S81	415729/882419	203–260	AM	765	D5	850
S82	415730/882405	220–280	AM	764	D9	863
S83	415659/882453	200–240	AM	806	D10	861
S84	415711/882434	?–400	AMGP	548	D70	819
S85	415546/882412	110–260	AMGP	786	U28	854
S86	415436/882426	50–120	AM	781	D2	793
S87	415428/882434	87–200	AM	783	0	822
S88	415434/882447	95–140	AM	815	U29	836
S89	415437/882447	85–150	AM	808	U2	824
S90	415431/882435	93–375	AMGP	784	0	831
S91	415421/882334	?– ?	DD*	782	?	813
S92	415406/882414	53–170	AM	764	U14	780
S93	415417/882453	94–140	AM	767	D4	831
S94	415410/882450	93–200	AM	767	D4	821
S95	415349/882436	88–107	AM	763	U28	805
S96	415355/882438	91–200	AM	762	U9	813
S97	415406/882459	100–115	AM	768	D14	827
S98	415410/882459	?– ?	AM*	781	?	840
S99	415439/882508	110–205	AM	818	?	863
S100	415544/882412	180–195	AM	797	D2	849
S101	415333/882417	45–120	DDAM	793	D2	802
S102	415501/882440	100–500	AMGP	673*	U190*	843
S103	415460/882430	91–500	AMGP	420	0	830
S104	415527/882429	93–175	AM	770	D>3	833
S105	415514/882427	?– ?	AM*	780	?	835

Appendix 1. Summary of well information and water-level measurements taken during the survey of residential-supply wells in Campton Township, Illinois, May and June, 1995—Continued

Well name	Longitude/ latitude	Open interval (feet below land surface)	Aquifer open to	Altitude of water level (feet above sea level)	Change since prior measurement (feet)	Altitude of land surface (feet above sea level)
S106	415538/882440	?–180	AM	770	D12	842
S107	415643/882432	172–225	AM	781	D13	829
S108	415642/882422	163–220	AM	781	U6	825
S109	415640/882419	163–220	AM	782	U14	827
S110	415645/882416	162–200	AM	780	U14	826
S111	415648/882422	172–260	AM	785	U5	827
S112	415647/882436	174–220	AM	782	U1	826
S113	415645/882436	169–200	AM	783	D6	829
S114	415634/882431	162–>345	AMGP*	621*	?	825
S115	415650/882438	?– ?	AM*	781	?	823
S116	415651/882453	?–>160	AM*	802	U5	857
S117	415534/882424	?–665	AMGPAn	513	U35	808
S118	415530/882429	79–200	AM	773	D25	828
S119	415525/882439	86–295	AM	781	D9	840
S120	415452/882439	80–160	AM	782	D9	821
S121	415525/882447	89–170	AM	773	U3	830
S122	415527/882501	95–515	AMGP	540	U6	834
S123	415528/882503	?–485	AMGP	778	?	834
S124	415534/882505	360–700	GPAn	492	D70	862
S125	415533/882456	90–380	AMGP	784	U192	832
S126	415611/882416	147–350	AMGP	782	U26	816
S127	415641/882529	206–450	AMGP	576	D143	849
S128	415640/882527	205–460	AMGP	560*	U78*	842
S129	415643/882540	248–290	AM	804	D8	872
S130	415641/882549	10–500	AMGP	470*	D5*	840
S131	415642/882554	177–490	AMGP	613*	U55*	838
S132	415631/882604	234–238	AM	803	D15	898
S133	415631/882602	245–600	AMGP	485*	D25*	920
S134	415738/882434	370–660	GPAn	434	D14	830
S135	415740/882432	193–260	AM	671	D9	840
S136	415758/882451	198–260	AM	807	D8	865
S137	415802/882452	?–200	DD	799	0	869
S138	415803/882505	200–210	DD	796	D19	885
S139	415802/882505	328–700	GPAn	523	?	883
S140	415748/882502	?–170	DD	802	D8	861
S141	415739/882505	200–240	AM	806	D9	870
S142	415750/882453	?–178	DD	800	D6	859
S143	415753/882453	?–170	DD	803	U3	856
S144	415741/882453	139–145	DD	800	U18	851
S145	415813/882439	199–500	AMGP	703	D65	868
S146	415716/882430	253–498	AMGP	<536	?	836
S147	415423/882514	105–150	AM	824	U1	840
S148	415446/882502	120–230	AM	810	D3	858
S149	415451/882514	182–287	AM	805	D5	930
S150	415451/882459	166–240	AM	811	D2	902
S151	415451/882512	175–240	AM	854	U4	910
S152	415502/882520	?–320*	AM*	789	?	920
S153	415453/882514	204–295	AM	793	U33	920
S154	415532/882539	163–280	AM	770	?	902
S155	415541/882545	?–>240*	AM*	797	?	910

Appendix 1. Summary of well information and water-level measurements taken during the survey of residential-supply wells in Campton Township, Illinois, May and June, 1995—Continued

Well name	Longitude/ latitude	Open interval (feet below land surface)	Aquifer open to	Altitude of water level (feet above sea level)	Change since prior measurement (feet)	Altitude of land surface (feet above sea level)
S156	415516/882604	230–285	AM	793	D2	960
S157	415348/882635	?–218	*AM	771	0	830
S158	415705/882532	202–320	AM*	803	U35	858
S159	415714/882532	?– ?	AM*	797	?	850
S160	415726/882504	202–360	AMGP	722	D23	865
S161	415751/882511	270–510	AMGP	634*	D16*	880
S162	415802/882512	?–>400	AMGP	600	?	888
S163	415803/882512	?–200	DD	792	?	877
S164	415750/882334	?–270	AM	692	?	830
S165	415738/882538	240–600	AMGP	493	?	899
S166	415738/882535	225–300	AM	797	U16	901
S167	415737/882529	233–595	AMGP	<513	?	893
S168	415736/882539	?–500	AMGP	<587	?	887
S169	415743/882546	236–500	AMGP	<620	D>82	882
S170	415742/882533	242–500	AMGP	552	D153	905
S171	415651/882542	245–495	AMGP	560*	U38*	902
S172	415741/882538	253–700	AMGPAn	462	U16	906
S173	415754/882554	?–540	AMGP	650*	?	912
S174	415748/882551	246–620	AMGP	660*	U50*	910
S175	415740/882438	176–186	DD	802	U3	834
S176	415753/882340	171–296	AM	716	D>59	845
S177	415625/882610	?–225	DD	825	D5	900
S178	415547/882639	?–252	DD	806	U6	910
S179	415553/882639	33– 41	SD	885	0	900
S180	415603/882627	?–212	DD	798	D20	908
S181	415604/882642	200–235	DD	799	U58	911
S182	415556/882625	218–228	DD	800	D21	901
S183	415604/882722	211–300	AM	842	D1	893
S184	415555/882720	?–240	DD	825	?	906
S185	415440/882724	?–380	AMGP	787	0	892
S186	415546/882641	?– 50	SD	892	?	911
S187	415504/882711	?–200	DD	788	?	918
S188	415513/882445	?–230	DD	817	D>3	920
S189	415455/882401	?–200	AM	782	?	794
S190	415820/882531	219–380	AMGP	779	D19	898
S191	415823/882542	225–250	AM	790	U11	909
S192	415827/882539	221–500	AMGP	<667	?	902
S193	415832/882542	165–365	AMGP	834	U226	908
S194	415353/882416	57–160	AM	760	U14	781
S195	415816/882257	?–400	AMGP	<522	?	822
S196	415809/882258	?–440	AMGP	681	?	844
S197	415803/882525	226–325	AM	790	D42	892
S198	415759/882555	222–600	AMGP	<617	D>80	917
S199	415723/882543	?–205	DD	798	?	877
S200	415732/882545	220–600	AMGP	<572	?	872
S201	415600/882712	238–600	AMGP	832	U227	905
S202	415616/882545	?–210	DD	800	?	880
S203	415613/882614	?	DD*	794	?	904
S204	415541/882535	?–226	DD	789	?	920
S205	415544/882530	231–300	AM	803	D21	904
S206	415544/882526	147–210	AM	788	?	886
S207	415539/882532	255–360	AM	763	D1	894
S208	415600/882539	?–234	DD	799	D>72	901
S209	415603/882543	?–215	DD	804	U8	886
S210	415609/882549	210–238	DD	797	D6	883

Appendix 1. Summary of well information and water-level measurements taken during the survey of residential-supply wells in Campton Township, Illinois, May and June, 1995—Continued

Well name	Longitude/ latitude	Open interval (feet below land surface)	Aquifer open to	Altitude of water level (feet above sea level)	Change since prior measurement (feet)	Altitude of land surface (feet above sea level)
S211	415614/882605	?–235	DD	798	U4	902
S212	415637/882804	?–210	DD	853	D12	920
S213	415639/882802	?–210	DD	856	D4	925
S214	415651/882806	?–242	DD	812	D64	946
S215	415629/882817	205–360	AMGP	630	D122	902
S216	415651/882909	?–230	DD	829	D53	932
S217	415647/882857	?–213	DD	844	D23	942
S218	415646/882901	?–215	DD	844	U51	933
S219	415736/882731	242–365	AM	824	U46	938
S220	415650/882723	222–600	AMGP	744	U14	910
S221	415731/882605	?–252	DD	802	U11	921
S222	415858/882758	303–440	AMGP	769	D61	990
S223	415845/882728	162–400	AMGP	777	0	926
S224	415819/882627	42– 46	SD	925	U2	929
S225	415818/882502	?–199	DD	797	D12	891
S226	415818/882454	?–185	DD	797	D16	873
S227	415813/882502	240–280	AM	799	U118	878
S228	415813/882507	?– ?	AM*	795	?	866
S229	415814/882507	?–200	DD	802	D16	888
S230	415819/882502	175–185	DD	799	D24	893
S231	415535/882536	160–260	AM	791	D24	908
S232	415746/882349	196–300	AM	691	?	855
S233	415746/882333	179–296	AM	694	D70	854
S234	415609/882552	236–240	DD	796	D17	883
S235	415650/882905	235–520	AMGP	700	?	946
S236	415644/882905	?–235	DD	844	?	926
S237	415556/882805	?–248	DD	846	U32	964
S238	415601/882813	236–520	AMGP	467	D18	925
S239	415603/882805	259–300	AM	865	U12	954
S240	415557/882800	265–544	AMGP	833	U31	956
S241	415601/882759	260–560	AMGP	617	D40	957
S242	415601/882757	?–276	DD	855	U26	967
S243	415600/882742	?–800	AMGPAn	<666	?	966
S244	415603/882750	?–270	DD	851	U16	960
S245	415602/882749	280–420	AMGP	850	U4	966
S246	415735/882734	232–720	AMGPAn	463	D36	939
S247	415712/882739	252–560	AMGP	<644	?	944
S248	415825/882635	153–580	AMGP	509	D25	934
S249	415830/882615	152–505	AMGP	637	?	931
S250	415809/882615	168–590	AMGP	622	U10	922
S251	415651/882824	231–600	AMGP	679*	U159*	930
S252	415631/882756	248–600	AMGP	545*	?	906
S253	415708/882610	243–540	AMGP	541	U43	888
S254	415600/882803	?–245	DD	864	U32	953
S255	415546/882712	240–540	AMGP	571	D35	906
S256	415556/882700	244–600	AMGP	<609	?	909
S257	415600/882700	240–710	AMGPAn	645	U181	904
S258	415607/882713	225–530	AMGP	595	D2	897
S259	415558/882622	243–600	AMGP	612	D2	914
S260	415603/882709	?–850	AMGPAn	840	?	899
S261	415611/882904	?–505	AMGP	<587	?	887
S262	415650/882840	375–800	AMGPAn	521	D4	950
S263	415647/882806	226–540	AMGP	592	U53	918
S264	415638/882808	?–>300	AMGP*	852	?	912
S265	415722/882655	?–226	DD	811	D64	931

Appendix 1. Summary of well information and water-level measurements taken during the survey of residential-supply wells in Campton Township, Illinois, May and June, 1995—Continued

Well name	Longitude/ latitude	Open interval (feet below land surface)	Aquifer open to	Altitude of water level (feet above sea level)	Change since prior measurement (feet)	Altitude of land surface (feet above sea level)
S266	415709/882841	?–250	DD	838	?	960
S267	415402/882916	?–190	AM	803	D12	895
S268	415640/882630	?–186	DD	834	U4	851
S269	415640/882628	?–186	DD	821	0	846
S270	415603/882733	?– ?	AMGPAn*	435	?	910
S271	415513/882742	220–240	AM	819	D2	922
S272	415616/882610	?–230	DD	793	U10	898
S273	415433/882535	148–220	AM	793	D42	895
S274	415432/882549	119–190	AM	812	D10	882
S275	415452/882611	207–280	AM	783	D82	925
S276	415442/882609	177–260	AM	789	U9	900
S277	415623/882649	261–280	AM	793	?	869
S278	415624/882647	194–280	AM	798	D>3	866
S279	415433/882534	111–300	AMGP	792	D28	850
S280	415421/882656	?–212	DD	771	0	901
S281	415356/882816	240–275	AM	<812	?	910
S282	415558/882535	233–580	AMGP	<460	D>43	901