U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

In cooperation with the U.S. Environmental Protection Agency

Potentiometric Levels and Water Quality in the Aquifers Underlying Belvidere, Illinois, 1993–96

By P.C. Mills (U.S. Geological Survey), C.A. Thomas (U.S. Environmental Protection Agency), T.A. Brown (U.S. Geological Survey), D.J. Yeskis (U.S. Environmental Protection Agency), and R.T. Kay (U.S. Geological Survey)

Water-Resources Investigations Report 98–4220

Urbana, Illinois
1999

CONTENTS

PLATES

[Plates are in pocket]

FIGURES

TABLES

U.S. DEPARTMENT OF THE INTERIOR
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CONVERSION FACTORS, VERTICLE DATUM, AND ABBREVIATED WATER-QUALITY UNITS

Multiply	By	To obtain
Length		
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
Area		
acre	4,047	square meter
square mile (mi^2)	2.590	square kilometer
Volume		
gallon (gal)	3.785	liter
Flow rate		
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
gallon per minute (gal/min)	3.785	liter per minute
inch per year (in/yr)	25.4	millimeter per year
***Hydraulic conductivity**		
foot per day (ft/d)	0.3048	meter per day

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32$$

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 both the United States and Canada, formerly called Sea Level Datum of 1929.

Altitude, as used in this report, refers to distance above or below sea level.

***Hydraulic conductivity:** The standard unit for hydraulic conductivity is cubic foot per day per square foot of aquifer cross-sectional area $(ft^3/d)/ft^2$. In this report, the mathematically reduced form, foot per day (ft/d), is used for convenience.

Abbreviated water-quality units used in this report: Constituent concentrations, water temperature, and other water-quality measures are given in metric units. Constituent concentrations are given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Constituent concentrations in soil are given in micrograms per kilogram (µg/kg).

Constituent concentrations presented in this report may be estimated. Estimated concentrations are indicated in tables 6–8.

Specific conductance (SC) of water is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 °C). The unit is equivalent to micromhos per centimeter at 25 degrees Celsius (µmho/cm), formerly used by the U.S. Geological Survey.

Dissolved oxygen (DO) is given in milligrams per liter (mg/L).

Oxidation-reduction potential (Eh) is given in millivolts (mv).

Turbidity is given in nephelometric turbidity units (NTU).

Additional abbreviations:
micron (µ)
milliliter (ml)
liter (L)

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By P.C. Mills, C.A. Thomas, T.A. Brown, D.J. Yeskis, *and* R.T. Kay

Abstract

In 1992, the U.S. Geological Survey, in cooperation with the U.S. Environmental Protection Agency (USEPA), began a study of the hydrogeology and water quality of the aquifers underlying the vicinity of Belvidere, Boone County, Ill. Previously, volatile organic compounds (VOC's) and other constituents of industrial origin were detected in one or more ground-water samples from about 100 of the approximately 700 monitoring and water-supply wells in the area, including the 8 municipal wells in Belvidere. A glacial drift aquifer underlies at least 50 percent of the 80-square-mile study area; bedrock aquifers that underlie virtually all of the study area include the Galena-Platteville, St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers.

During 1993, water levels were measured in 152 wells and water-quality samples were collected from 97 wells distributed throughout the study area. During 1994–96, similar data were collected from 31 wells. Potentiometric levels in the glacial drift and Galena-Platteville aquifers are similar and range from about 750 to 900 feet above sea level. The potentiometric surfaces of the aquifers are subdued representations of the land surface. Horizontal ground-water flow in the aquifers primarily is towards the Kishwaukee River, which flows through the central part of the study area, and its principal tributaries. Vertical ground-water flow appears to be downward at most locations in the study area, particularly in the urbanized areas affected by pumping of the Belvidere municipal wells and upland areas remote from the principal surface-water drainages. Flow appears to be upward between the Galena-Platteville and glacial drift aquifers where ground water discharges to the Kishwaukee River and its principal tributaries.

All water samples were analyzed for VOC's. Selected samples also were analyzed for trace metals, cyanide, semivolatile organic compounds, or other constituents. VOC's were detected in samples from 50 wells (52 percent of total wells sampled). Twenty-seven specific VOC's were identified in the samples. Samples were collected from six municipal wells in use during the study; two wells were not in use because one or more VOC's exceeded maximum contaminant levels (MCL's). Two VOC's were detected in one of the samples at concentrations below MCL's established by the USEPA for protection of public-water supplies. Samples from 21 wells had at least one VOC detected at a concentration above MCL's. The VOC's detected above MCL's and their maximum concentrations were 1,2-dichloroethene (total), 470 micrograms per liter (μg/L); trichloroethene (TCE), 360 μg/L; tetrachloroethene (PCE), 82 μg/L; benzene, 53 μg/L; and vinyl chloride, 11 μg/L. TCE and PCE were the most frequently detected VOC's and generally had the highest concentrations. VOC's with concentrations above MCL's were detected in samples from 15 wells open to the glacial drift aquifer and 6 wells open to the Galena-Platteville aquifer.

Generally, the concentrations of VOC's were higher, and number and type of VOC's

detected were greater in the glacial drift aquifer than in the Galena-Platteville aquifer and the deeper bedrock aquifers. The high concentrations and spatial distribution of VOC's in the glacial drift aquifer usually were related to nearby sources of contamination. Except in the immediate vicinity of a known hazardous-waste site, possible sources of VOC's in the bedrock aquifers were difficult to identify in the study area; VOC concentrations at most locations in the bedrock aquifers were below 5 μg/L. Most locations where VOC's were detected in the glacial and bedrock aquifers were within about 1,000 feet of the Kishwaukee River. Hydrogeologic factors that affect the distribution of VOC's in the aquifers include ground-water flow through (1) the glacial drift aquifer with discharge to the nearby Kishwaukee River; and (2) the weathered-surface deposits, bedding-plane partings, and fractures in the Galena-Platteville aquifer. One bedding-plane parting intersecting wells that represent an area of about 1.5 square miles has a horizontal hydraulic conductivity as high as 220 feet per day. Pumping of high-capacity wells may contribute to the widespread distribution of VOC's at low concentrations in the bedrock aquifers.

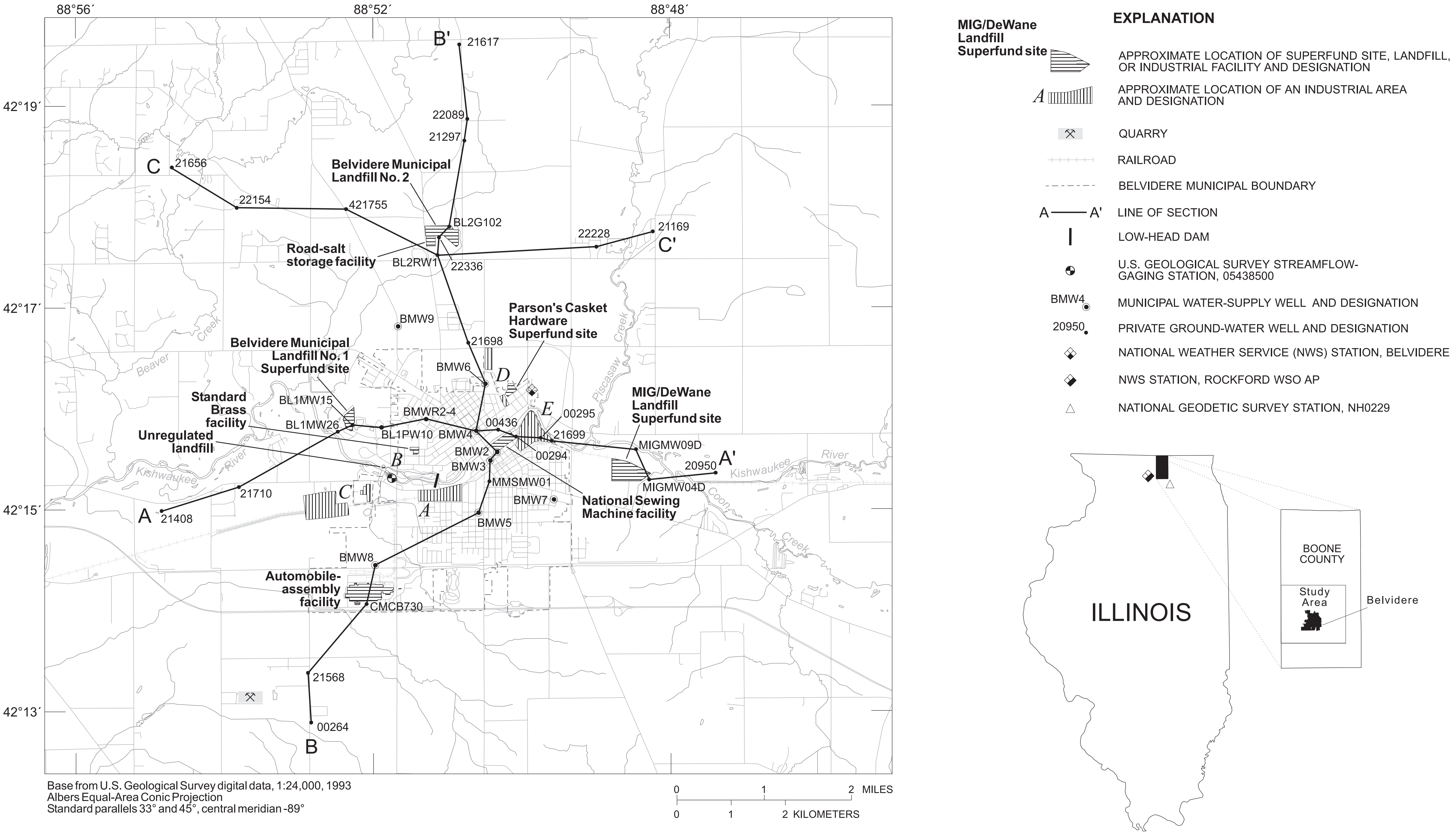
INTRODUCTION

Belvidere, a city of about 18,000 in Boone County, Ill. (fig. 1), has had a mixed agricultural- and industrial-based economy since the late 1800's. Potentially hazardous wastes periodically have been disposed at industrial and commercial facilities and at the three regulated solid-waste landfills in the area (fig. 1). Currently, one industrial facility and two landfills are on the U.S. Environmental Protection Agency (USEPA) National Priorities List established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, established in 1980) and the Superfund Amendment and Reauthorization Act of 1986 (SARA). Such sites typically are referred to as Superfund sites.

Volatile organic compounds (VOC's), semivolatile organic compounds (SVOC's), and inorganic constituents (at concentrations above background levels) have been detected in samples from municipal and private water-supply wells open to the glacial drift and bedrock aquifers underlying Belvidere and vicinity (Brown and Mills, 1995). These organic and inorganic constituents are considered contaminants because they are not naturally present in aquifers. Their presence in the aquifers is attributed primarily to the local disposal of wastes of industrial and commercial origin. VOC's include petroleum-related compounds (benzene, toluene, ethylbenzene, xylene (BTEX)) and chlorinated compounds. Chlorinated compounds are used, in part, for degreasing and dry cleaning or can be byproducts of well disinfection. SVOC's often are used in disinfectants, deodorants, and plasticizers or are byproducts of coal-tar and petroleum processing.

In 1992, the U.S. Geological Survey (USGS), in cooperation with the USEPA, initiated a study of the hydrogeology and water quality of the aquifers underlying the vicinity of Belvidere (fig. 1). The objectives of the study were to (1) determine the regional distribution and factors affecting distribution of contaminants in the aquifers, with emphasis on explaining their presence in water supplied by the Belvidere municipal wells, (2) assess the effect of ground-water contamination associated with nonSuperfund hazardous-waste sites on investigations and remediation options at Superfund sites, and (3) provide the necessary data and analysis to assist other agencies and organizations in developing strategies for remediation of ground-water contamination and protection of the region's ground-water supplies.

To meet the objectives of the study, available well-installation, hydrogeologic, and water-quality data were compiled in a geographical information system (GIS) data base for wells in the vicinity of Belvidere (Brown and Mills, 1995). Review of the data indicated that most were collected (1) during various unrelated sampling efforts over a period of 17 years (1976–93), (2) from the glacial drift aquifer, and (3) from clustered wells for site-specific studies. Additionally, few wells are open to the deep bedrock aquifers pumped by the municipal wells. Thus, the data were inadequate for determining regional ground-water quality and contaminant distribution, and the hydrogeologic factors affecting the distribution of contaminants and their presence at municipal wells. To supplement the available data, additional water-level and water-quality data were collected in a large synoptic (time-synchronous) study during July 19–27, 1993 and in small synoptic studies in 1994–96.



Base from U.S. Geological Survey digital data, 1:24,000, 1993
Albers Equal-Area Conic Projection
Standard parallels 33° and 45°, central meridian -89°

Figure 1. Study area in the vicinity of Belvidere, Ill., with location of U.S. Environmental Protection Agency Superfund sites; landfills; selected industrial facilities and industrial areas; Belvidere municipal water-supply wells; selected private wells; and lines of section A–A′, B–B′, and C–C′.

Purpose and Scope

This report presents the water-level and water-quality data collected by the USGS and USEPA as part of synoptic ground-water studies in the vicinity of Belvidere, Ill., during 1993–96. Data are from about 200 wells and 8 surface-water sites on and near the Kishwaukee River. Selected data collected by other government agencies and private geotechnical contractors also are presented. Emphasis is placed on interpretations of the data collected during July 19–27, 1993. The sampling network, methods of study, and representativeness of the data are discussed.

Water-level data collected from 144 wells in 1993 are presented and summarized in potentiometric maps for the glacial drift aquifer and the Galena-Platteville aquifer, the uppermost bedrock aquifer. Directions of flow in the aquifers are discussed. Potentiometric levels in the St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers are mapped at the well sites.

Water-quality data collected from 115 wells open to glacial drift and bedrock aquifers are presented in (1) tables listing field characteristics of water quality and the concentrations of trace metals, cyanide, SVOC's, and VOC's; and (2) figures showing total concentrations of VOC's and concentrations of selected VOC's where detected. The distribution of organic and inorganic constituents in the aquifers, temporal trends in their concentrations during 1985–96, and hydrogeologic factors that may affect their distribution are discussed.

Acknowledgments

The authors acknowledge several people for their contribution to the study. Jim Grimes, Superintendent of Water and Sewer Department, Belvidere, Ill., and Craig Lawler, Director of Public Works, Belvidere, Ill., authorized the use of municipal facilities as staging sites during the field studies and provided access to municipal wells and municipal properties for ground-water-data collection. The citizens of Boone County, including the city of Belvidere, generously granted access to their wells and properties for ground-water-data collection. Duane Heaton, Steven Peterson, and Luanne Vanderpool, USEPA, Superfund Division, Chicago, Ill., assisted in the synoptic field studies. Mark Sievers of the Illinois State Water Survey (ISWS) assisted in the application of the Global Positioning System (GPS) to survey the position of ground-water wells in the vicinity of Belvidere.

DESCRIPTION OF THE STUDY AREA

The study area comprises an 80-mi^2 area that includes Belvidere, Ill. (fig. 1). The boundary of the study area is based on the maximum area possibly affected by ground-water contamination from known and potential sources in the vicinity of Belvidere. Assumptions concerning the boundary of the area possibly affected by contamination were based on (1) the location of known and potential sources of contamination; (2) the location of municipal wells and other high-capacity pumping wells in the area; and (3) general knowledge of the hydrogeologic setting, including the possible locations of natural barriers to ground-water flow and contaminant movement.

Notable local industries established during the early to middle 1900's include a sewing machine and bicycle manufacturing facility, a casket-hardware manufacturing facility, a brass-plating facility, a regional railroad-transfer yard, a paper-container manufacturing facility, and two food-processing facilities. The latter three facilities are still operating. Industrial facilities established after about 1950 include a machine-tool manufacturing facility, an automobile-assembly facility, a foam-board-insulation manufacturing facility, two fertilizer-distribution facilities, and several other small industrial facilities. Three closed and regulated solid-waste landfills are in the area. Two of the three landfills, Belvidere Municipal Landfill No. 1 (BL1) and MIG/DeWane Landfill (MDL), and one closed industrial facility, Parson's Casket Hardware (PCH), are Superfund sites (fig. 1; abbreviations used for hazardous-waste sites are listed in appendix 1). As of 1992, 14 leaking underground storage tank (UST) sites were identified in the study area (Diana L. Gobelman, Illinois Environmental Protection Agency, written commun., 1992).

Soil- and (or) ground-water-contamination studies have been completed or are in progress at about 25 sites in the study area (Brown and Mills, 1995). The study areas at these sites range in size from less than 1 acre, for UST studies and CERCLA screening inspections, to about 0.5 mi^2, for remedial investigations at the Superfund sites.

Of the 725 wells identified in the study area, about 78 percent are water-supply wells (Brown and Mills, 1995). Many of the wells are potentially affected by ground-water contamination. Eight municipal water-supply wells are operated by the city of Belvidere; seven of the wells are open to more than one aquifer. About 40 percent of the 725 wells in the area are open only to the glacial drift aquifer, and 53 percent are open only to the Galena-Platteville aquifer. Of 157 wells and borings with available water-quality data, about 59 percent are open to the glacial drift aquifer, 24 percent are open to the Galena-Platteville aquifer, and 17 percent are open to more than one aquifer.

VOC's have been detected in the 8 municipal water-supply wells, 18 private water-supply wells, and up to 100 monitoring wells installed for site-specific ground-water-contamination studies (Brown and Mills, 1995). During 1989–96, use of two municipal wells (No. 2 (BMW2) and No. 3 (BMW3) (fig. 1)) had to be discontinued because trichloroethene (TCE) and tetracholoroethene (PCE) concentrations were above maximum contaminant levels (MCL's) established by the USEPA for protection of public-water supplies (abbreviations used for organic constituents are listed in appendix 1; MCL's are listed in appendix 2). Several private water-supply wells near a closed industrial facility also were abandoned because of high concentrations of trace metals (Clay Simonson, Illinois Department of Public Health, oral commun., 1993). Contaminants have been detected mostly in the glacial drift aquifer, possibly because most available water-quality data are from monitoring wells open to this aquifer. Contaminants also have been detected in wells open to the bedrock aquifers.

Physiography and Climate

The study area is in the Rock River Hill Country subdivision of the Till Plains Section of the Central Lowland Physiographic Province (Leighton and others, 1948). The area is characterized by an undulating topography (fig. 2) sculpted by fewer glacial advances and more erosion than adjacent physiographic regions to the north, east, and south.

The city of Belvidere is in a broad lowland valley (fig. 2) that generally overlies the buried ancestral Troy Bedrock Valley (fig. 3). The axis of the Troy Bedrock Valley is about 1 mi northwest of the city. Surface waters in the area discharge to the Kishwaukee River and its principal tributaries: Piscasaw Creek, Beaver Creek, and Coon Creek (fig. 1). The Kishwaukee River flows westward for about 10 mi through the central part of the study area, including the city of Belvidere. Land-surface altitude is about 750 ft along the Kishwaukee River. Uplands that flank the Kishwaukee River valley to the north and south have a maximum altitude of about 900 ft in the northwestern part of the study area.

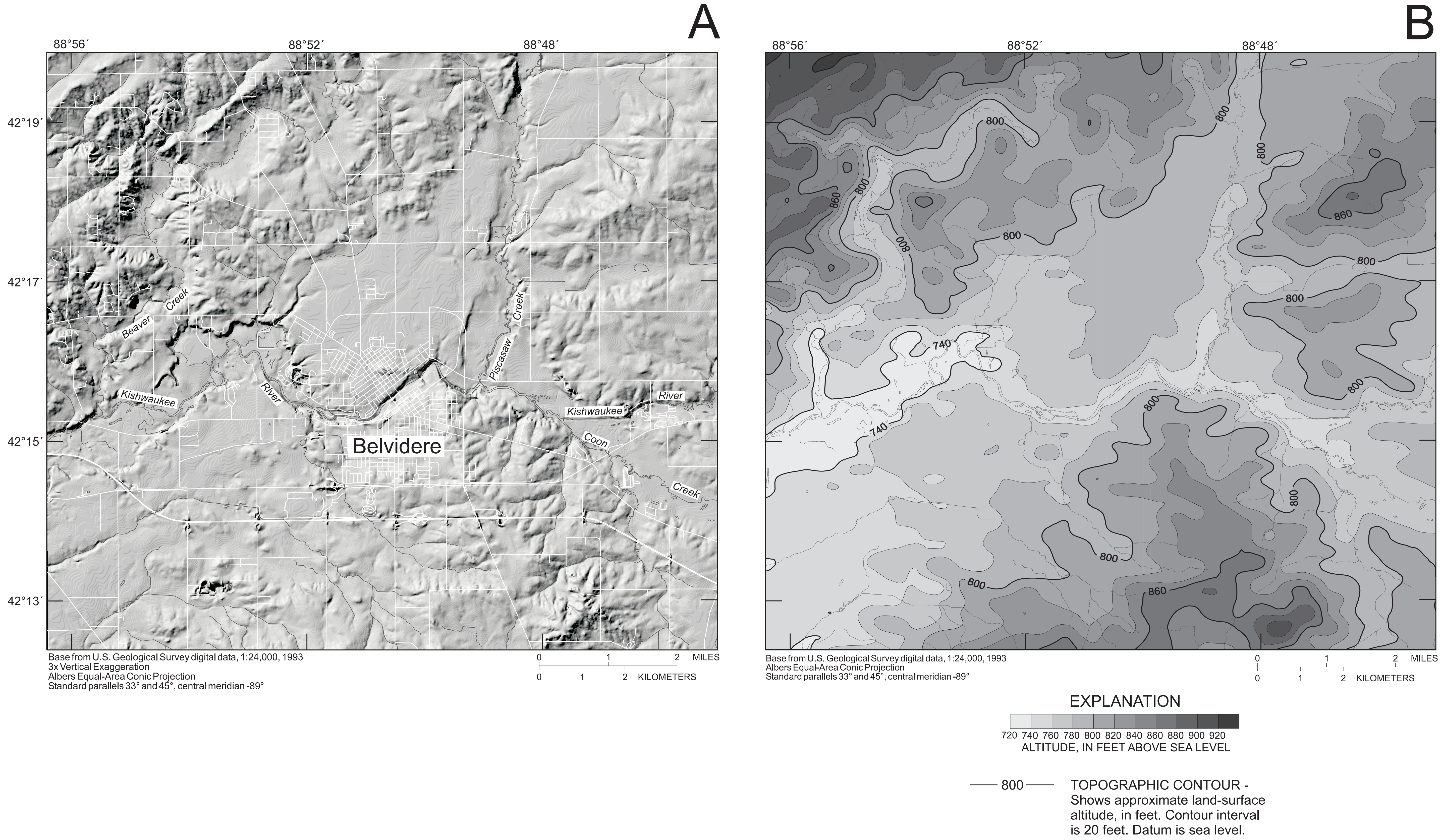
Long-term (1961–90) annual precipitation at the National Weather Service (NWS) station in Rockford, Ill. (Rockford WSO AP), about 15 mi west of Belvidere (fig. 1), averages 36 in/yr (U.S. Department of Commerce, 1961–90). Long-term annual precipitation ranges from 23 in/yr, in 1976, to 56 in/yr, in 1973.

Hydrogeologic Setting

The hydrogeology of the study area has been described by numerous authors. Visocky (1993), Visocky and others (1985), Berg and others (1984), Willman and Kolata (1978), and Willman and others (1975) provide geologic and (or) hydrologic descriptions, based on county- to regional-scale investigations. Mills and others (1998), Clayton Environmental Consultants, Inc. (1996), Mills (1993a, b, c), Science Applications International Corporation (1992), and Roy F. Weston, Inc. (1988) provide geologic and hydrologic descriptions, based on site- to municipal-scale investigations.

A generalized stratigraphic column for Belvidere and vicinity is shown in figure 4. Hydrogeologic sections (A-A′, B-B′, C-C′) through the study area are shown in figures 5–7 (lines of section are shown in fig. 1). The stratigraphic nomenclature used in this report does not necessarily follow the usage of the USGS. The lithostratigraphic nomenclature is that of the Illinois State Geological Survey (ISGS) (Willman and others, 1975). The hydrostratigraphic nomenclature is modified slightly from that of the ISWS (Woller and Sanderson, 1974) to accommodate the scale and water-quality aspect of the study.

In order of increasing age, the principal aquifers in the study area are the glacial drift aquifer of Quaternary and Holocene age and the following bedrock aquifers: the Galena-Platteville and St. Peter Sandstone aquifers of Ordovician age, and the Ironton-Galesville and Elmhurst-Mt. Simon aquifers of Cambrian age. In this report, the aquifer system composed of the Galena-Platteville and St. Peter Sandstone aquifers is referred to as the Ordovician aquifer,



Base from U.S. Geological Survey digital data, 1:24,000, 1993
3x Vertical Exaggeration
Albers Equal-Area Conic Projection
Standard parallels 33° and 45°, central meridian -89°

Base from U.S. Geological Survey digital data, 1:24,000, 1993
Albers Equal-Area Conic Projection
Standard parallels 33° and 45°, central meridian -89°

Figure 2. (A) Shaded relief and (B) contour map of land-surface topography in the vicinity of Belvidere, Ill.

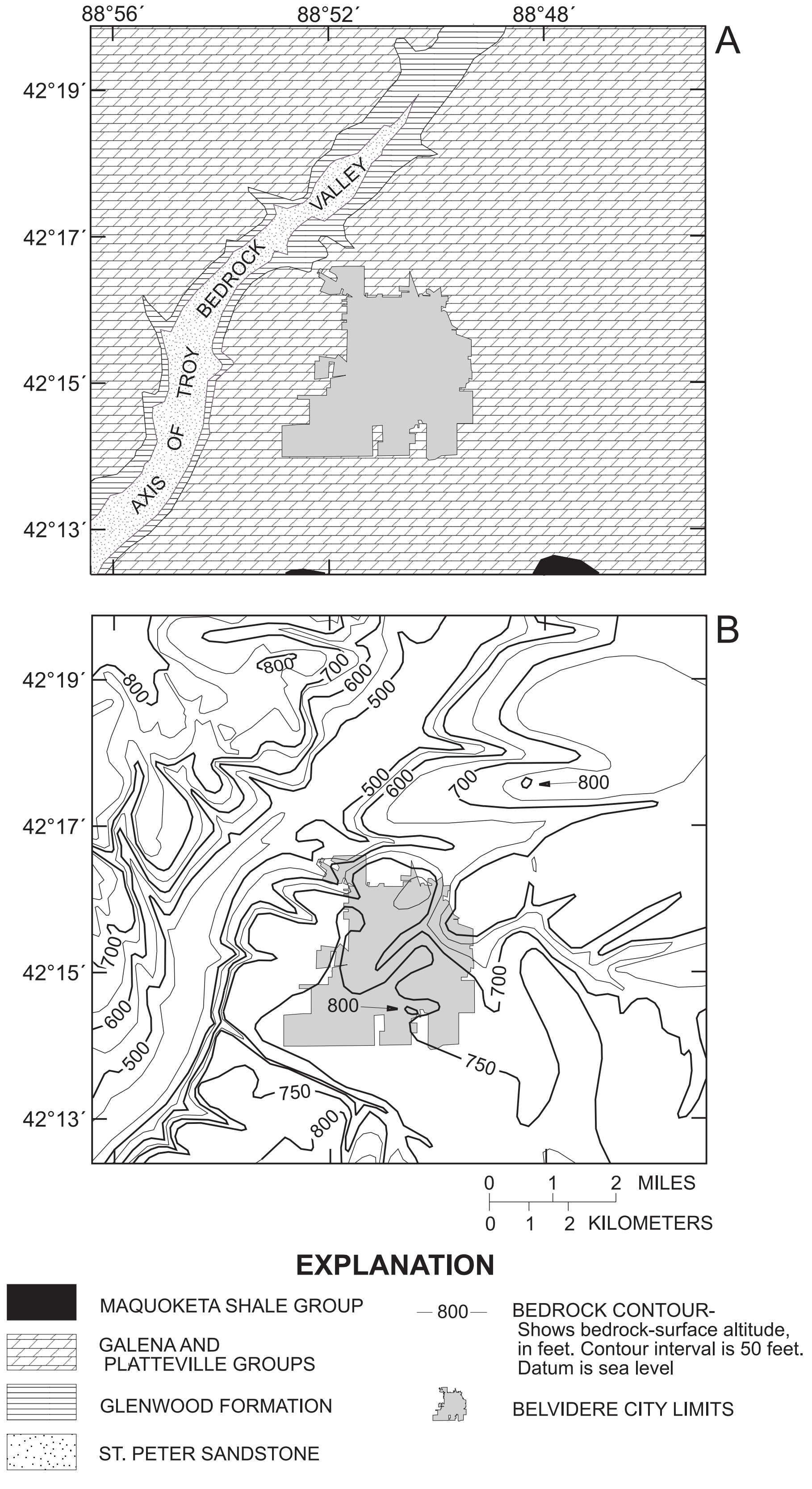
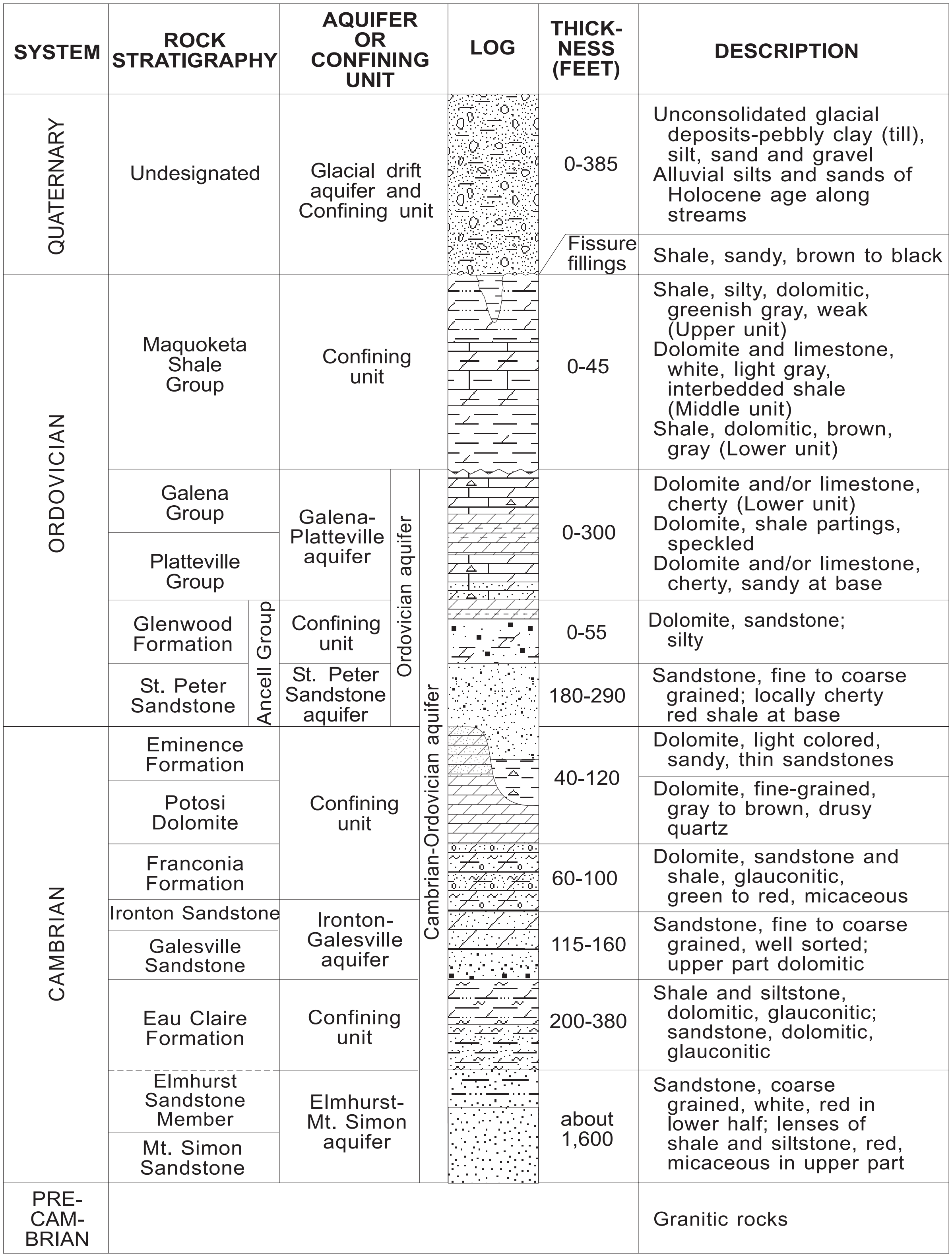


Figure 3. Surficial bedrock geology (A) and bedrock topography (B) in the vicinity of Belvidere, Ill. (modified from Berg and others, 1984, fig. 7 and fig.10)



SYSTEM	ROCK STRATIGRAPHY		AQUIFER OR CONFINING UNIT			LOG	THICKNESS (FEET)	DESCRIPTION
QUATERNARY	Undesignated		Glacial drift aquifer and Confining unit				0-385	Unconsolidated glacial deposits-pebbly clay (till), silt, sand and gravel Alluvial silts and sands of Holocene age along streams
							Fissure fillings	Shale, sandy, brown to black
ORDOVICIAN	Maquoketa Shale Group		Confining unit				0-45	Shale, silty, dolomitic, greenish gray, weak (Upper unit) Dolomite and limestone, white, light gray, interbedded shale (Middle unit) Shale, dolomitic, brown, gray (Lower unit)
	Galena Group		Galena-Platteville aquifer	Ordovician aquifer	Cambrian-Ordovician aquifer		0-300	Dolomite and/or limestone, cherty (Lower unit) Dolomite, shale partings, speckled Dolomite and/or limestone, cherty, sandy at base
	Platteville Group							
	Glenwood Formation	Ancell Group	Confining unit				0-55	Dolomite, sandstone; silty
	St. Peter Sandstone		St. Peter Sandstone aquifer				180-290	Sandstone, fine to coarse grained; locally cherty red shale at base
CAMBRIAN	Eminence Formation		Confining unit				40-120	Dolomite, light colored, sandy, thin sandstones
	Potosi Dolomite							Dolomite, fine-grained, gray to brown, drusy quartz
	Franconia Formation						60-100	Dolomite, sandstone and shale, glauconitic, green to red, micaceous
	Ironton Sandstone		Ironton-Galesville aquifer				115-160	Sandstone, fine to coarse grained, well sorted; upper part dolomitic
	Galesville Sandstone							
	Eau Claire Formation		Confining unit				200-380	Shale and siltstone, dolomitic, glauconitic; sandstone, dolomitic, glauconitic
	Elmhurst Sandstone Member		Elmhurst-Mt. Simon aquifer				about 1,600	Sandstone, coarse grained, white, red in lower half; lenses of shale and siltstone, red, micaceous in upper part
	Mt. Simon Sandstone							
PRE-CAMBRIAN								Granitic rocks

Figure 4. Lithostratigraphic and hydrostratigraphic units in the vicinity of Belvidere, Ill.

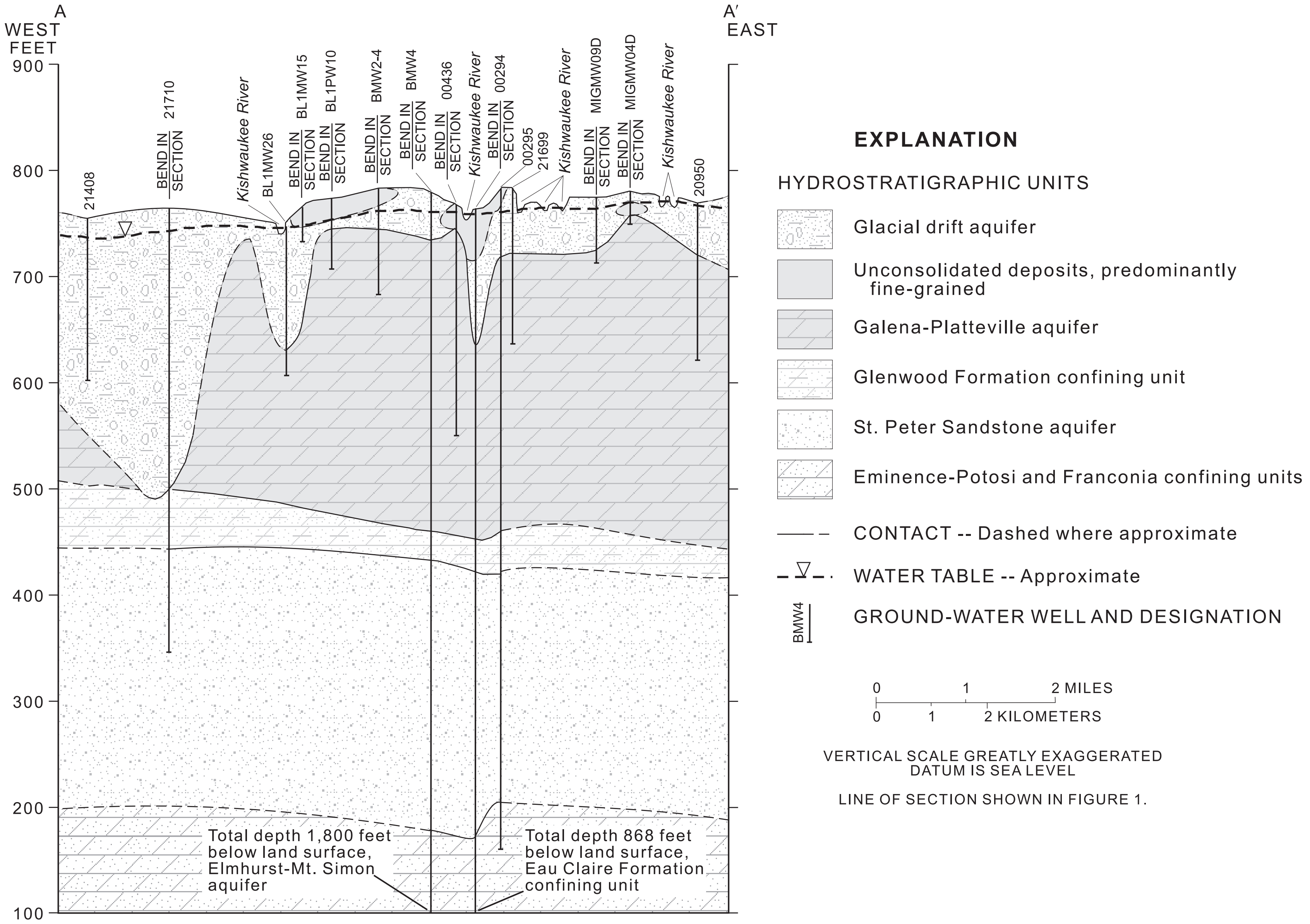


Figure 5. Hydrostratigraphic section A-A′ in the vicinity of Belvidere, Ill.

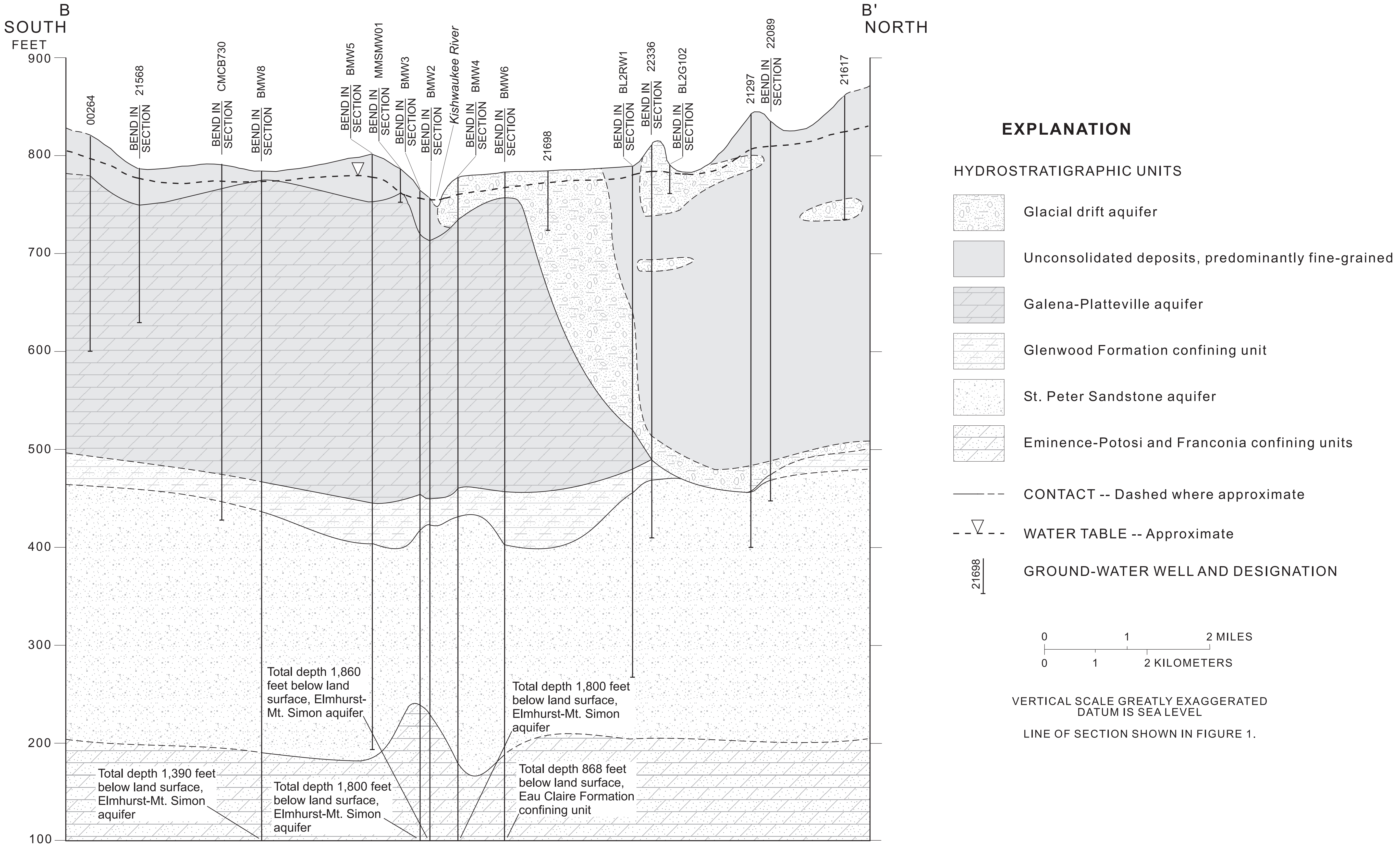


Figure 6. Hydrogeologic section B-B′ in the vicinity of Belvidere, Ill.

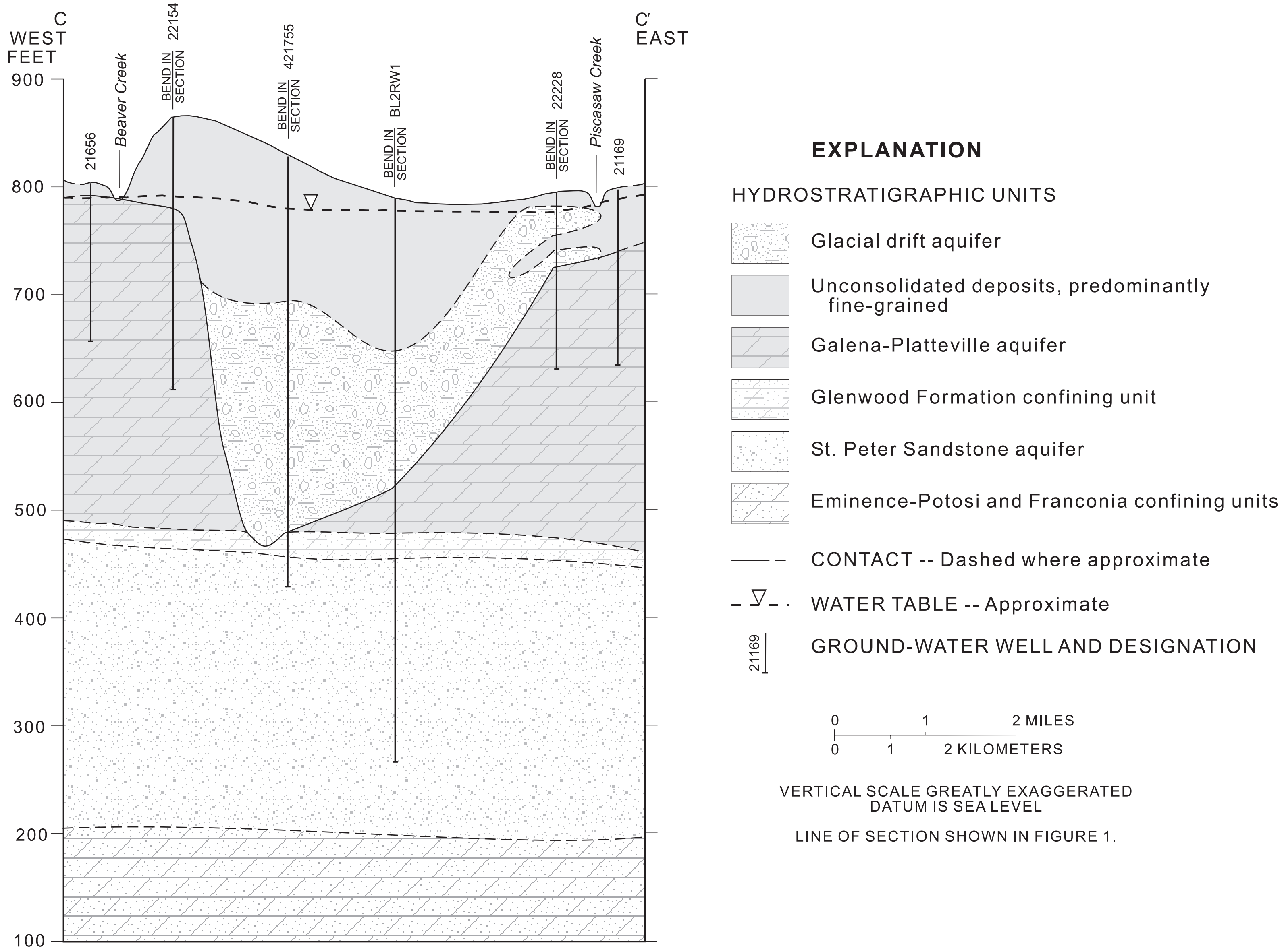


Figure 7. Hydrostratigraphic section C-C′ in the vicinity of Belvidere, Ill.

and the aquifer system composed of the aquifers of Ordovician and Cambrian age is referred to as the Cambrian-Ordovician aquifer (fig. 4). Individual aquifers within the aquifer systems generally are separated by confining units. This nomenclature is used to contrast the water quality in individual aquifers and multiple-aquifer systems that vary in lithology and depth.

The glacial drift aquifer, primarily composed of sand-and-gravel deposits, underlies at least 50 percent of the study area. The deposits are up to 260 ft thick within the axis of the Troy Bedrock Valley (figs. 3–7). Along the eastern flanks of the valley, near the city of Belvidere, the sand-and-gravel deposits range from less than 10 ft to almost 90 ft thick but generally are about 30–40 ft thick (Hunter and Kempton, 1967). Locally, the sand-and-gravel deposits that compose the aquifer are interbedded with glacial till or fine-grained, glacio-fluvial deposits (Clayton Environmental Consultants, Inc., 1996; Science Applications International Corporation, 1992). Along the flanks of the Kishwaukee River and its tributaries, alluvial sand-and-gravel deposits are present. Near the southwest side of Belvidere and in the uplands northwest of Belvidere, the glacial drift aquifer and the fine-grained deposits that overlie the aquifer are absent. The glacial drift primarily consists of fine-grained deposits in the southern and northeastern parts of the study area.

The thick sand-and-gravel deposits that compose the Troy Bedrock Valley represent the Mackinaw Member, and to a lesser extent the Wasco Member, of the Henry Formation (Berg and others, 1984). Sand-and-gravel deposits elsewhere in the study area likely represent these members of the Henry Formation, as well as the unnamed outwash deposit of the Glasford Formation, interbedded sands within the various till members of the Winnebago and Glasford Formations, and alluvial deposits of Holocene (Recent) age. For the purpose of this study, all sand-and-gravel deposits in the study area are considered to be a single glacial drift aquifer. When considering ground-water flow on a regional scale, this assumption is reasonable. On a local scale, however, specific sand-and-gravel deposits may compose units that are hydraulically isolated or represent alluvial deposits of Holocene age.

Water-level data from well-installation records indicate that the average depth to water in wells is about 15–20 ft below land surface. Depths to water are expected to be less where ground water discharges to the Kishwaukee River and its tributaries and more below topographic rises. The shallow depth of the glacial drift aquifer in the study area contributes to its high susceptibility to contamination (Berg and others, 1984).

The Galena-Platteville aquifer is composed primarily of dolomite. Although limestone and shale units also may be present (Willman and Kolata, 1978), no limestone units and only a few shale beds less than 2 in. thick were detected in lithologic cores collected within the study area (Mills and others, 1998; 1993b, c). Within the study area, the maximum thickness of the aquifer is about 300 ft (figs. 3–7). The aquifer is absent where it has been eroded away in the axis of the Troy Bedrock Valley. Ground water flows through a network of subvertical fractures and subhorizontal bedding-plane partings (separations), often enlarged by solution of the carbonate units. The principal orientations of the subvertical fractures in the area are about N. 60° W. and N. 30° E. but may vary considerably about these principal orientations (Mills and others, 1998; Foote, 1982). Regionally, ground-water flow in the Galena-Platteville aquifer generally is unconfined (Young, 1992). Where present in the study area, the Maquoketa Shale Group (figs. 3 and 4) or fine-grained unconsolidated deposits confine the Galena-Platteville aquifer from the overlying glacial drift aquifer (Berg and others, 1984). Regionally, the Harmony Hill Shale Member of the Glenwood Formation (figs. 4–7) confines the Galena-Platteville aquifer from the underlying St. Peter Sandstone aquifer (Kay and others, 1989). Investigations in Belvidere (Mills, 1993b, c) and Rockford, Ill. (Kay and others, 1994) indicate that locally the Galena-Platteville aquifer is connected hydraulically with the overlying glacial drift aquifer and underlying St. Peter Sandstone aquifer. Currently (1998), the magnitude of the connection is undetermined. The network of fractures and partings in the Galena-Platteville aquifer increase the potential for contaminant migration within the aquifer (Mills, 1993a, b, c; Mills and others, 1994; Kay and others, 1994, 1997)(Robert T. Kay, U.S. Geological Survey, written commun., 1998). In the carbonate units of Silurian age in northern Illinois, the fracture/parting density and hydraulic conductivity are greatest in the upper part of the units (Csallany and Walton, 1963). A similar distribution of fractures/partings in the Galena-Platteville aquifer is indicated by borehole-ground-penetrating-radar and aquifer-test data collected in Belvidere (Robert T. Kay, U.S. Geological Survey, written commun., 1998).

The upper part of the St. Peter Sandstone aquifer is composed of well-rounded, well-sorted quartz arenite. In the study area, the thickness of the aquifer ranges from about 180 to 290 ft (fig. 4). The Ironton-Galesville and Elmhurst-Mt. Simon aquifers are composed primarily of sandstone. In the study area, the Ironton-Galesville aquifer is about 115–160 ft thick and the Elmhurst-Mt. Simon aquifer is about 1,600 ft thick (fig. 4). Over most of northern Illinois, the sandstone aquifers are the primary source of water to high-capacity municipal and industrial wells; the Ironton-Galesville aquifer is the most productive (Visocky, 1993). These aquifers typically are assumed to be deep enough to be unaffected by contamination.

In the study area, hydrogeologic boundaries for flow in the glacial drift aquifer are considered to be Piscasaw Creek and Coon Creek to the east of Belvidere; and Kishwaukee River and South Branch (not shown in fig. 1 because the stream is outside the study area) to the west of Belvidere. Ground-water divides possibly are present beneath the uplands north and south of Belvidere (fig. 2). The Kishwaukee River, flowing through the central part of the study area (fig. 1), and the Troy Bedrock Valley, trending northeast to southwest through the study area (fig. 3), are considered discharge areas for shallow ground-water flow in the glacial drift aquifer and also may be discharge areas for shallow ground-water flow in the Galena-Platteville aquifer. Regional flow in the deep bedrock aquifers (lower part of Galena-Platteville aquifer to Elmhurst-Mt. Simon aquifer) generally is westward toward cones of depression resulting from ground-water pumping near Rockford, Ill. (Visocky, 1993), and toward the Rock River and the Mississippi River (Young, 1992).

METHODS OF STUDY

The methods of study used in the synoptic ground-water studies during 1993–96 are described in the following sections of the report. Included are general descriptions of the ground- and surface-water monitoring networks, the field and laboratory methods, and the quality-assurance measures. The methods of study also are described, in part, in Mills and others (1998) and the sampling and analysis plan for the Belvidere ground-water study (U.S. Geological Survey and U.S. Environmental Protection Agency, 1993).

Water-level and (or) water-quality data were collected from 183 wells during July 19–27, 1993 (sampling period 1). Supplemental data were collected during May 31–June 3, 1994 (sampling period 2), May 31–June 1, 1995 (sampling period 3), and August 25–October 17, 1996 (sampling period 4). A total of 12 wells used in the 1993 study and 19 newly selected or installed wells were used in the supplemental sampling periods. The wells used to collect water-level and water-quality data during each sampling period are listed in tables 1 and 2.

Data collection during sampling period 1 was designed to (1) provide data from parts of the study area where little or no data were available for regional analysis of ground-water flow and contaminant distribution, (2) identify possible source areas for the contaminants detected in the municipal and private water-supply wells in and around Belvidere, and (3) provide additional data for analysis of the hydrogeologic factors that affect the distribution of contaminants. Data collection during sampling periods 2–4 was designed to (1) further identify contaminant-source areas and wells where contaminants are present, (2) verify water-quality analytical results from sampling period 1, and (3) analyze temporal trends in potentiometric levels and water quality.

Ground- and Surface-Water Monitoring Network

Wells in the ground-water-monitoring network (tables 1 and 2, figs. 8 and 9) were selected for (1) measurement of water levels or (2) measurement of water levels and water-quality sampling. Water levels were measured at 144 wells distributed to analyze regional directions of ground-water flow and the effect of municipal-well pumping on flow directions. The number of available wells in the vicinity of the municipal wells, however, proved to be inadequate for analysis of the effect of municipal-well pumping. Water-quality samples were collected from 115 wells. The wells were located in areas that possibly were contaminated with organic and inorganic constituents from known or potential sources of hazardous waste, as well as areas that represented regional background water quality. Thirty-three previously sampled wells were selected to analyze temporal trends in water quality in each of the aquifers underlying the study area. Most of the wells were within or near the city limits of Belvidere, where most of the hazardous-waste sites and the municipal wells are located (figs. 1, 8, and 9). Owner's permission was obtained for all wells used

Table 1. Installation information, water levels, and types of water-quality data collected from selected water-supply and monitoring wells in the vicinity of Belvidere, Ill., 1993–96

Hydrostratigraphic unit: GP, Galena-Platteville aquifer; GF, Glenwood Formation confining unit; OR, Ordovician (Galena-Platteville/St. Peter Sandstone) aquifer; GD, glacial drift aquifer; SP, St. Peter Sandstone aquifer; CO, Cambrian-Ordovician aquifer; ?, information is undocumented; --, unknown

Depth of well: in feet below land surface; water levels measured July 19–27, 1993, unless otherwise noted; --, depth of well not measured

Depth to water: in feet below land surface; water levels measured July 19–27, 1993, unless otherwise noted; --, depth to water not measured

Sampled for organic compounds: volatile organic compounds unless otherwise noted; Y, yes and sampling period 1 (July 19–27, 1993), 2 (May 31–June 3, 1994), 3 (May 31–June 1, 1995), and (or) 4 (August 25–October 17, 1996); N, no

Sampled for metals and cyanide: Y, yes and sampling period 1 (July 19–27, 1993) or 3 (May 31–June 1, 1995); N, no

Type of well: P, private water supply; B, Belvidere, Ill., municipal water supply; M, monitoring; T, test boring

Well designation	Latitude	Longitude	Hydrostratigraphic unit	Depth of well	Depth to water	Sampled for organic compounds	Sampled for metals and cyanide	Type of well
00007	42°14′23″	88°51′13″	GP	157	--	Y1	N	P
00048	42°17′29″	88°52′23″	GF	338	27.46	N	N	P
00051	42°16′14″	88°50′38″	GP	120	--	Y1	N	P
00059	42°15′51″	88°51′44″	GP	60	--	Y1	N	P
00060	42°15′57″	88°51′47″	GP	62	[1]25.00	Y1	N	P
00065	42°15′08″	88°50′55″	OR	427	--	Y1	N	P
00157	42°17′36″	88°51′07″	GD	318	--	Y1	N	P
00163	42°14′58″	88°47′22″	GP	143	--	Y1	N	P
00195	42°15′16″	88°52′20″	GP	120	--	Y2	N	P
00213	42°13′31″	88°53′22″	GP	169	35.88	N	N	P
00234	42°15′52″	88°48′38″	GD	38	5.68	Y1	N	P
00239	42°17′53″	88°52′16″	SP	365	75.36	Y1	N	P
00240	42°14′33″	88°49′08″	GP	170	33.53	N	N	P
00256	42°14′51″	88°47′28″	GP	146	13.40	N	N	P
00264	42°12′54″	88°52′49″	GP	220	--	N	N	P
00288	42°16′35″	88°52′02″	OR	317	16.40	N	N	P
00289	42°16′50″	88°50′31″	GD	61	10.08	N	N	P
00291	42°16′24″	88°50′23″	GP	147	12.27	N	N	P
00294	42°15′43″	88°50′04″	CO	868	--	Y1	N	P
00295	42°15′43″	88°49′44″	CO	627	--	N	N	P
00296	42°15′42″	88°49′52″	OR	550	--	Y1	N	P
00299	42°15′18″	88°52′37″	GP	116	--	Y1	N	P
00312	42°14′33″	88°49′06″	GP	158	27.77	N	N	P
00316	42°14′59″	88°48′34″	GP	179	--	Y1	N	P
00346	42°14′21″	88°54′34″	GD	110	13.86	N	N	P

Table 1. Installation information, water levels, and types of water-quality data collected from selected water-supply and monitoring wells in the vicinity of Belvidere, Ill., 1993–96—Continued

Well designation	Latitude	Longitude	Hydrostratigraphic unit	Depth of well	Depth to water	Sampled for organic compounds	Sampled for metals and cyanide	Type of well
00401	42°15′42″	88°49′40″	GP	110	31.55	Y1	N	P
00436	42°15′48″	88°50′18″	GP	215	18.80	Y3	N	P
00482	42°16′32″	88°53′55″	GD	164	29.12	N	N	P
00492	42°15′49″	88°48′10″	GP	155	5.85	Y1	N	P
00501	42°14′21″	88°54′25″	GD	45	--	Y1	N	P
00505	42°13′31″	88°53′03″	GD	71	--	Y1	N	P
00701	42°16′17″	88°54′30″	GD	75	24.45	N	N	P
20727	42°13′27″	88°53′03″	GP	160	2.16	N	N	P
20753	42°17′41″	88°48′25″	GD	60	17.97	N	N	P
20781	42°12′56″	88°51′44″	GD	32	5.15	N	N	P
20804	42°18′48″	88°52′24″	GP	249	50.39	N	N	P
20832	42°17′29″	88°51′28″	GD	86	[2]23.53	Y12	[3]N	P
20950	42°15′22″	88°47′23″	GP	150	--	N	N	P
21090	42°12′53″	88°47′02″	GP	210	90.96	N	N	P
21096	42°13′27″	88°53′03″	GD	34	4.48	N	N	P
21101	42°13′31″	88°53′19″	GP	140	--	Y1	N	P
21163	42°15′06″	88°54′08″	GD	123	24.72	Y1	N	P
21169	42°17′45″	88°48′13″	GP	165	13.42	N	N	P
21171	42°17′35″	88°49′05″	GD	64	16.10	N	N	P
21261	42°16′22″	88°51′06″	GD	48	12.96	Y1	N	P
21265	42°17′30″	88°48′59″	GD	65	15.24	N	N	P
21296	42°17′54″	88°52′15″	GD	100	44.13	Y1	N	P
21297	42°18′39″	88°50′45″	SP	440	--	N	N	P
21315	42°16′18″	88°54′27″	GD	75	22.20	N	N	P
21326	42°17′47″	88°48′14″	GP	78	13.73	N	N	P
21374	42°15′44″	88°48′00″	GD	60	--	Y1	N	P
21375	42°14′56″	88°48′25″	GP	145	5.18	Y1	N	P
21404	42°18′56″	88°52′47″	GP	108	13.04	N	N	P
21406	42°19′01″	88°54′44″	GP	195	36.91	N	N	P
21408	42°14′59″	88°54′50″	GD	150	--	N	N	P

Table 1. Installation information, water levels, and types of water-quality data collected from selected water-supply and monitoring wells in the vicinity of Belvidere, Ill., 1993–96—Continued

Well designation	Latitude	Longitude	Hydrostratigraphic unit	Depth of well	Depth to water	Sampled for organic compounds	Sampled for metals and cyanide	Type of well
21473	42°14′39″	88°49′06″	GP	160	23.05	N	N	P
21498	42°15′00″	88°53′50″	GD	60	15.51	Y1	N	P
21541	42°18′54″	88°50′16″	SP	410	70.86	Y1	N	P
21568	42°13′23″	88°52′52″	GP	155	--	N	N	P
21576	42°19′23″	88°52′58″	GP	188	44.68	N	N	P
21593	42°13′02″	88°54′00″	GP	127	16.24	N	N	P
21598	42°12′47″	88°49′56″	GP	249	[4]41.89	N	N	P
21613	42°18′52″	88°50′21″	GD	100	19.86	Y1	N	P
21617	42°19′37″	88°50′49″	GD	124	--	N	N	P
21622	42°19′27″	88°53′01″	GP	180	38.81	N	N	P
21632	42°18′57″	88°54′25″	GP	185	30.14	N	N	P
21656	42°18′24″	88°54′42″	GP	148	20.43	N	N	P
21658	42°18′32″	88°54′43″	GP	230	23.11	N	N	P
21660	42°18′36″	88°54′45″	OR	311	17.75	N	N	P
21663	42°18′03″	88°53′56″	GP	125	78.72	N	N	P
21664	42°17′28″	88°53′19″	GD	68	50.20	N	N	P
21674	42°17′05″	88°52′51″	GD	42	13.32	N	N	P
21696	42°16′33″	88°52′58″	GD	65	20.26	N	N	P
21698	42°16′39″	88°50′42″	GD	57	--	N	N	P
21699	42°15′41″	88°49′35″	GP	145	26.19	Y1	N	P
21709	42°15′09″	88°54′07″	OR	390	[4]54.96	Y1	N	P
21710	42°15′14″	88°53′48″	OR	420	35.83	Y1	N	P
21779	42°19′27″	88°52′51″	GP	168	37.90	N	N	P
21851	42°13′31″	88°52′54″	GP	148	22.32	N	N	P
21860	42°19′27″	88°52′55″	GP	250	49.25	N	N	P
22003	42°19′30″	88°53′20″	GP	180	30.22	N	N	P
22057	42°19′22″	88°55′07″	GP	200	10.73	N	N	P
22076	42°14′22″	88°54′08″	GD	84	13.01	N	N	P
22083	42°15′43″	88°48′06″	GD	55	4.76	Y1	N	P
22089	42°18′52″	88°50′43″	OR	390	--	N	N	P

Table 1. Installation information, water levels, and types of water-quality data collected from selected water-supply and monitoring wells in the vicinity of Belvidere, Ill., 1993–96—Continued

Well designation	Latitude	Longitude	Hydrostratigraphic unit	Depth of well	Depth to water	Sampled for organic compounds	Sampled for metals and cyanide	Type of well
22094	42°16′27″	88°50′24″	GD	63	--	Y1	N	P
22154	42°18′00″	88°53′49″	GP	250	89.81	N	N	P
22156	42°17′38″	88°53′19″	GD	108	43.44	N	N	P
22203	42°18′54″	88°52′37″	GD	75	18.08	N	N	P
22223	42°16′35″	88°52′11″	GD	60	16.94	N	N	P
22228	42°17′36″	88°48′59″	GP	168	17.99	N	N	P
22336	42°17′42″	88°51′06″	OR	400	29.60	Y1	N	P
22337	42°15′12″	88°52′40″	GP	230	23.51	N	N	P
22369	42°19′15″	88°55′07″	GP	265	27.54	N	N	P
22380	42°16′36″	88°49′25″	GD	105	12.36	N	N	P
22547	42°18′50″	88°50′21″	GD	87	15.69	N	N	P
421307	42°13′06″	88°46′59″	GP	132	26.42	N	N	P
421402	42°14′02″	88°51′17″	OR	400	--	Y1	N	P
421414	42°14′13″	88°54′03″	GP	121	11.55	Y1	N	P
421422	42°14′20″	88°50′53″	OR	600	40.01	Y1	N	P
421456	42°14′56″	88°47′19″	GP	183	6.51	Y1	N	P
421755	42°17′59″	88°52′21″	SP	398	52.04	Y1	N	P
AGTG305GPS	42°15′08″	88°51′16″	GP	115.0	[5]30.10	[6]Y34	Y3	M
AGTG305GPD	42°15′08″	88°51′16″	GP	251.4	[5]49.86	[6]Y34	Y3	M
AGTG305SP	42°15′08″	88°51′16″	SP	357.8	[5]63.41	[6]Y3	Y3	M
BCHP	42°15′01″	88°52′02″	GP	--	--	Y2	N	P
BFS1	42°16′19″	88°50′23″	--	--	12.89	N	N	P
BL1MW15	42°15′50″	88°52′16″	GD	37.1	--	N	N	M
BL1MW26	42°15′47″	88°52′28″	GP	142.5	--	N	N	M
BL1PW02	42°15′59″	88°51′47″	GD	40	--	Y1	N	P
BL1PW08	42°15′30″	88°52′05″	GD?	--	--	Y1	N	P
BL1PW10	42°15′49″	88°51′53″	GP	66	23.30	Y1	Y1	P
BL1PW12	42°15′15″	88°52′50″	GP	59	--	Y1	N	P
BL2G11D	42°17′43″	88°51′08″	GD	51.1	25.37	N	N	M
BL2G11S	42°17′43″	88°51′08″	GD	--	25.21	N	N	M

Table 1. Installation information, water levels, and types of water-quality data collected from selected water-supply and monitoring wells in the vicinity of Belvidere, Ill., 1993–96—Continued

Well designation	Latitude	Longitude	Hydrostratigraphic unit	Depth of well	Depth to water	Sampled for organic compounds	Sampled for metals and cyanide	Type of well
BL2G102	42°17′48″	88°50′58″	GD	25.2	4.80	N	N	M
BL2G103	42°17′48″	88°51′07″	GD	34.8	11.31	N	N	M
BL2G115	42°17′44″	88°50′51″	GD	23.7	1.92	N	N	M
BL2G116	42°17′38″	88°50′54″	GD	43.4	15.51	N	N	M
BL2G117	42°17′48″	88°51′17″	GD	52.9	14.75	N	N	M
BL2G118	42°17′43″	88°51′16″	GD	52.7	25.07	N	N	M
BL2G118S	42°17′43″	88°51′16″	GD	46.3	23.64	N	N	M
BL2RW1	42°17′31″	88°51′07″	OR	520	35.84	Y1	N	P
BL2RW3	42°17′30″	88°50′38″	GD	52	8.04	Y1	N	P
BMW2	42°15′34″	88°50′19″	CO	1,860	2.62	N	N	B
BMW3	42°15′30″	88°50′25″	CO	1,800	--	N	N	B
BMW4	42°15′47″	88°50′36″	CO	1,800	52.41	Y1	Y1	B
BMW5	42°14′58″	88°50′34″	OR	610	--	Y12	N	B
BMW6	42°16′15″	88°50′28″	CO	868	43.69	Y1	N	B
BMW7	42°15′06″	88°49′33″	CO	969	--	Y1	N	B
BMW8[2]	42°14′27″	88°51′58″	CO	1,390	--	Y1	N	B
BMW9	42°16′49″	88°51′39″	GD	122	--	Y1	N	B
BMWR2-4	42°15′54″	88°51′17″	GP	96.5	--	N	N	P
BMWR2-6	42°16′39″	88°50′31″	GD	46.5	9.55	Y1	N	P
BMWR3-6	42°16′25″	88°51′41″	--	--	--	Y1	N	P
BMWR4-5	42°15′36″	88°49′45″	--	--	--	Y1	N	P
CMCB730	42°14′04″	88°52′05″	GP	354	--	N	N	T
CMCMW301	42°14′05″	88°51′56″	GP	27	[7]4.32	N	N	M
CMCMW609	42°14′16″	88°51′48″	GP	22.5	[7]4.56	N	N	M
CMCMW610	42°14′20″	88°51′53″	GP	22.5	[7]7.52	N	N	M
HGM1	42°17′33″	88°51′24″	GD	125	33.29	Y2	[3]N	P
HGM2	42°17′40″	88°51′18″	GD	80	24.73	Y12	[3]N	P
LA1025	42°15′12″	88°51′23″	--	--	--	Y1	N	P
MIGMW04D	42°15′18″	88°48′16″	GD	31	--	N	N	M
MIGMW09D	42°15′36″	88°48′27″	GD	62	--	N	N	M

Table 1. Installation information, water levels, and types of water-quality data collected from selected water-supply and monitoring wells in the vicinity of Belvidere, Ill., 1993–96—Continued

Well designation	Latitude	Longitude	Hydrostratigraphic unit	Depth of well	Depth to water	Sampled for organic compounds	Sampled for metals and cyanide	Type of well
MGS1	42°14′31″	88°50′32″	GD	12.1	5.84	N	N	M
MGS2	42°14′30″	88°50′32″	GD	13.6	6.34	N	N	M
MMSMW01	42°15′17″	88°50′25″	GP	45	--	N	N	M
NSMG101	42°15′34″	88°50′16″	GD	37.9	6.39	Y2	N	M
NSMG102	42°15′28″	88°50′24″	GD	49.6	15.62	Y2	N	M
NSMG103	42°15′32″	88°50′22″	GD	54.9	6.29	Y14	Y1	M
NSMG104	42°15′36″	88°50′21″	GD	59.0	3.7	[6]Y234	Y3	M
NSMG105	42°15′30″	88°50′27″	GD	47.8	5.54	[6]Y234	Y3	M
PCHG115B	42°16′07″	88°50′11″	GP	48.6	14.30	Y1	N	M
PCHG115BD	42°16′07″	88°50′11″	GP	151.5	25.46	Y13	N	M
PCHG115D	42°16′07″	88°50′11″	GD	37.5	14.09	N	N	M
PCHG116S	42°16′09″	88°50′12″	GD	24.6	15.38	N	N	M
PCHG116D	42°16′09″	88°50′12″	GD	33.6	16.12	Y12	N	M
PCHG119D	42°16′03″	88°50′10″	GD	36.5	15.90	Y1	N	M
PCHG120D	42°16′08″	88°50′08″	GD	35.1	14.53	Y1	N	M
PCHG125BD	42°16′08″	88°50′15″	GP	147.7	18.27	Y1	N	M
PCHG125D	42°16′08″	88°50′15″	GD	28.4	13.72	Y12	N	M
PCHG127GP	42°16′08″	88°50′13″	GP	294.2	47.04	Y1234	N	M
PCHG127SP	42°16′08″	88°50′13″	SP	375.7	57.80	Y1234	N	M
PCHG128GPS	42°16′15″	88°50′27″	GP	121.0	[5]48.89	Y234	N	M
PCHG128GPD	42°16′15″	88°50′27″	GP	258.5	[5]49.07	Y234	N	M
PCHG202	42°16′00″	88°49′42″	GP?	102	--	Y1	N	P
PCHP436B	42°15′48″	88°50′18″	GP	35.0	[8]11.20	Y4	N	M
PCHG436GPS	42°15′48″	88°50′18″	GP	107.3	[8]12.20	Y4	N	M
SQ4329	42°13′04″	88°51′37″	GD?	--	11.27	Y1	N	P

[1] Estimated by well owner.

[2] Water level measured in sampling period 2.

[3] Water sample analyzed for chloride in sampling period 2.

[4] Water level fluctuating.

[5] Water level measured in sampling period 3.

[6] Water sample analyzed for semivolatile organic compounds in sampling period 3.

[7] Water level measured by GZA GeoEnvironmental, Inc.

[8] Water level measured in sampling period 4.

Table 2. Installation information, water levels, and types of water-quality data collected from temporary wells in the vicinity of Belvidere, Ill., 1993–94

Depth of well: in feet below land surface; depth data collected during July 19–27, 1993, unless otherwise noted

Depth to water: in feet below land surface; depth data collected during July 19–27, 1993, unless otherwise noted; R, water table not encountered or water level could not be measured; --, depth to water not measured

Sampled for volatile organic compounds: Y, yes and sampling period 1 (July 19–27, 1993) or 2 (May 31–June 3, 1994); N, no

Sampled for metals and cyanide: Y, yes and sampling period 1 (July 19–27, 1993) or 2 (May 31–June 3, 1994); N, no

Temporary-well designation	Latitude	Longitude	Property owner	Installation method	Depth of well	Depth to water	Sampled for volatile organic compounds	Sampled for metals and cyanide
TW1	42°15′33″	88°51′46″	Town of Belvidere	Geoprobe	21	18.2	Y1	Y1
					24	17.2	N	N
TW2	42°15′32″	88°51′38″	Town of Belvidere	Geoprobe	15	R	N	N
TW3	42°15′33″	88°51′33″	Town of Belvidere	Geoprobe	17	R	N	N
				Geoprobe[1]	23.5	R	N	N
TW4	42°15′33″	88°51′22″	Town of Belvidere	Geoprobe	16	R	N	N
TW5	42°15′37″	88°51′22″	Town of Belvidere	Geoprobe	14	R	N	N
TW7	42°14′51″	88°50′36″	Town of Belvidere	Geoprobe	14	R	N	N
TW8	42°14′44″	88°50′37″	Town of Belvidere	Geoprobe	14.5	5.9	Y1	N
TW9	42°15′21″	88°50′29″	Town of Belvidere	Hydropunch[2]	23	R	Y1	N
				Geoprobe[1]	29.5	R	N	N
TW9A	42°15′17″	88°50′24″	Town of Belvidere	Geoprobe[1]	26.5	R	N	N
TW9B	42°15′23″	88°50′39″	Belvidere Park District	Geoprobe[1]	20.5	4.6	Y2	N
TW10	42°15′28″	88°50′18″	Town of Belvidere	Geoprobe	27	R	N	N
TW11	42°15′35″	88°50′19″	Town of Belvidere	Hydropunch	28	--	Y1	N
TW12	42°15′39″	88°50′12″	Town of Belvidere	Geoprobe	12	8.7	Y1	N
TW13	42°15′41″	88°50′07″	Town of Belvidere	Geoprobe	15	12.7	Y1	N
TW14	42°15′47″	88°50′37″	Town of Belvidere	Hydropunch	28	17	Y1	N
TW15	42°15′55″	88°50′25″	Town of Belvidere	Geoprobe	15	R	N	N
TW16	42°16′03″	88°50′24″	Town of Belvidere	Geoprobe	18	15.2	Y1	N
TW17	42°16′09″	88°50′21″	Town of Belvidere	Geoprobe	20	13.8	Y1	N
TW18	42°16′15″	88°50′27″	Town of Belvidere	Hydropunch	19	10.0	Y1	N
				Geoprobe[1]	20.5	14.9	Y2	N
TW18A	42°16′16″	88°50′26″	Town of Belvidere	Geoprobe[1]	20.5	16.1	Y2	N
TW19	42°16′01″	88°49′58″	Town of Belvidere	Geoprobe	21	R	N	N
TW19A	42°15′59″	88°50′03″	Town of Belvidere	Geoprobe[1]	29.5	R	N	N
TW20	42°14′28″	88°51′53″	Town of Belvidere	Geoprobe	9	R	N	N
TW21	42°14′02″	88°52′15″	Town of Belvidere	Geoprobe	16	[3]15.5	N	N
TW22	42°15′07″	88°49′32″	Town of Belvidere	Hydropunch	25	18.7	Y1	N
TW23	42°15′23″	88°51′24″	Belvidere Park District	Geoprobe	21	15	Y1	N
TW24	42°15′26″	88°51′38″	Belvidere Park District	Geoprobe	12	7.5	Y1	Y1
TW25	42°15′20″	88°51′31″	Belvidere Park District	Geoprobe	6	4	Y1	N

Table 2. Installation information, water levels, and types of water-quality data collected from temporary wells in the vicinity of Belvidere, Ill., 1993–94—Continued

Temporary-well designation	Latitude	Longitude	Property owner	Installation method	Depth of well	Depth to water	Sampled for volatile organic compounds	Sampled for metals and cyanide
TW26	42°15′14″	88°51′17″	Belvidere Park District	Geoprobe[4]	9	7.5	Y1	N
				Geoprobe[5]	12	6.9	Y1	N
				Geoprobe[1]	23.5	13.5	Y2	N
TW26A	42°15′13″	88°51′17″	Belvidere Park District	Geoprobe[1]	9	R	N	N
TW27	42°15′15″	88°51′07″	Belvidere Park District	Geoprobe	12	2	Y1	N
				Geoprobe[1]	20.5	--	Y2	N
TW27A	42°15′13″	88°51′06″	Belvidere Park District	Geoprobe[1]	14.5	R	N	N
TW27C	42°15′14″	88°51′07″	Belvidere Park District	Geoprobe[1]	20.5	15	Y2	N
TW28	42°15′30″	88°50′36″	Belvidere Park District	Hydropunch	15	--	Y1	N
TW29	42°15′23″	88°50′44″	Belvidere Park District	Geoprobe	21	10.2	N	N
TW30	42°15′38″	88°52′14″	Boone County Conservation District	Geoprobe	9	4	Y1	Y1
TW31	42°15′29″	88°52′02″	Boone County Conservation District	Geoprobe	9	8.1	Y1	Y1
TW32	42°15′28″	88°51′46″	Boone County Conservation District	Geoprobe	14	7.4	Y1	Y1
TW33	42°15′04″	88°50′48″	Community School District 100	Hydropunch	33	--	Y1	N
TW34	42°15′01″	88°52′47″	Boone County	Hydropunch	23	17.35	Y1	N
TW35	42°15′16″	88°52′50″	Private	Geoprobe	27	23	Y1	N
TW36	42°15′18″	88°52′37″	Private	Geoprobe	24	22.1	Y1	N
TW37	42°15′41″	88°52′36″	Private	Geoprobe	18	13.9	Y1	N
TW39	42°14′52″	88°50′33″	Private	Geoprobe	14.5	R	N	N
TW40	42°16′13″	88°50′25″	Private	Geoprobe	12	9.7	Y1	N
TW42	42°15′51″	88°50′05″	Private	Geoprobe	9	2.5	Y1	N
TW43	42°15′49″	88°50′06″	Private	Geoprobe	12	4	Y1	N
TW44	42°15′47″	88°50′11″	Private	Geoprobe	9	1.8	Y1	N
TW45	42°15′46″	88°50′16″	Private	Geoprobe	6	1.8	Y1	N
TW46A	42°15′18″	88°51′56″	Town of Belvidere	Geoprobe[1]	20.5	15.4	Y2	N
TW46B	42°15′18″	88°52′15″	Town of Belvidere	Geoprobe[1]	26.5	R	N	N
TW46C	42°15′03″	88°52′08″	Private	Geoprobe[1]	7.5	R	N	N

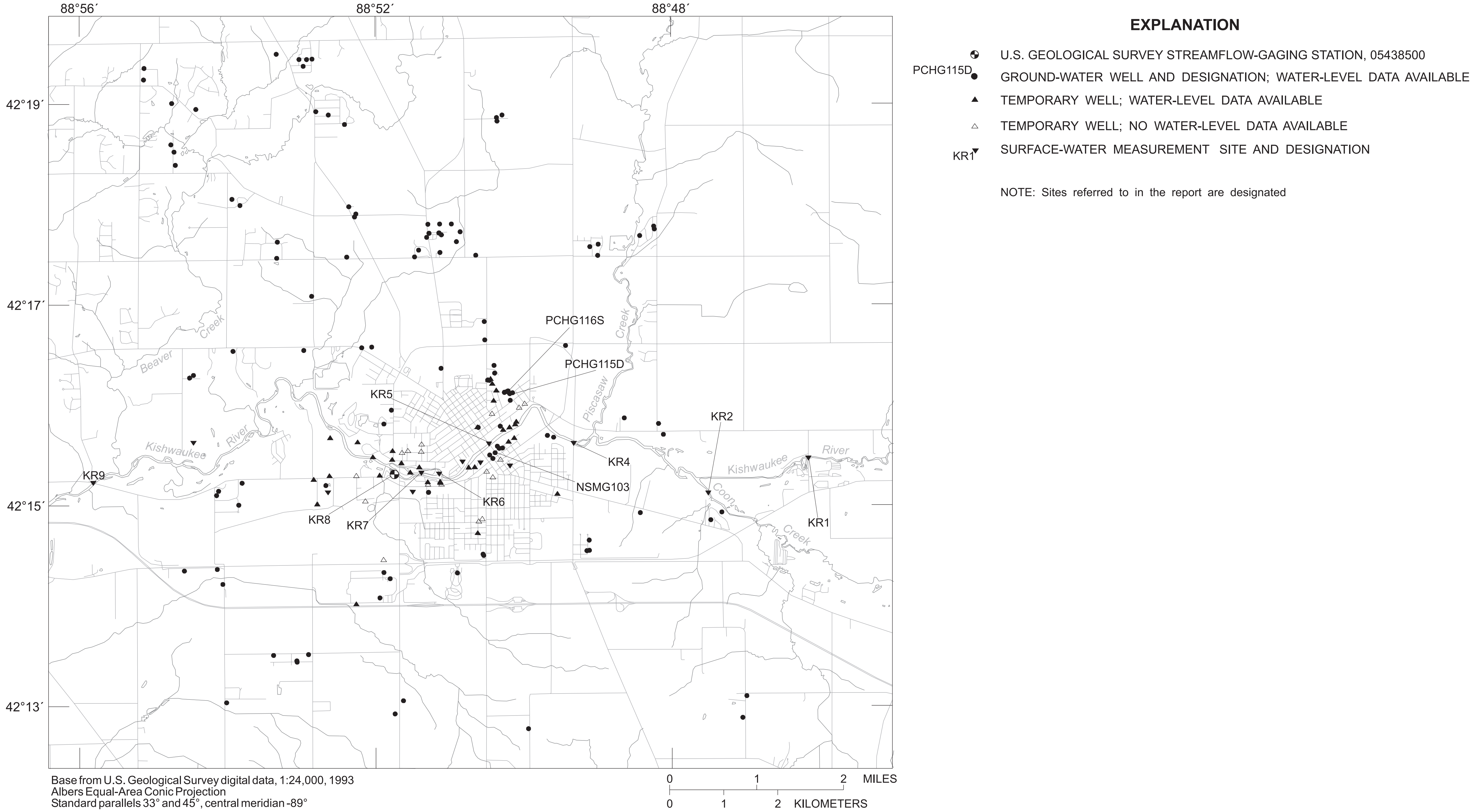
[1] Depth to water and (or) depth of well data collected during May 31–June 3, 1994.

[2] Soil samples collected only; also analyzed for semivolatile organic compounds.

[3] Water level is about 13 feet lower than static level in nearby wells. Well probably is open to fine-grained deposits with insufficient time allowed for water level to reach equilibrium after well installation.

[4] Data collected July 21, 1993.

[5] Data collected July 26, 1993.



EXPLANATION

◉ U.S. GEOLOGICAL SURVEY STREAMFLOW-GAGING STATION, 05438500

PCHG115D ● GROUND-WATER WELL AND DESIGNATION; WATER-LEVEL DATA AVAILABLE

▲ TEMPORARY WELL; WATER-LEVEL DATA AVAILABLE

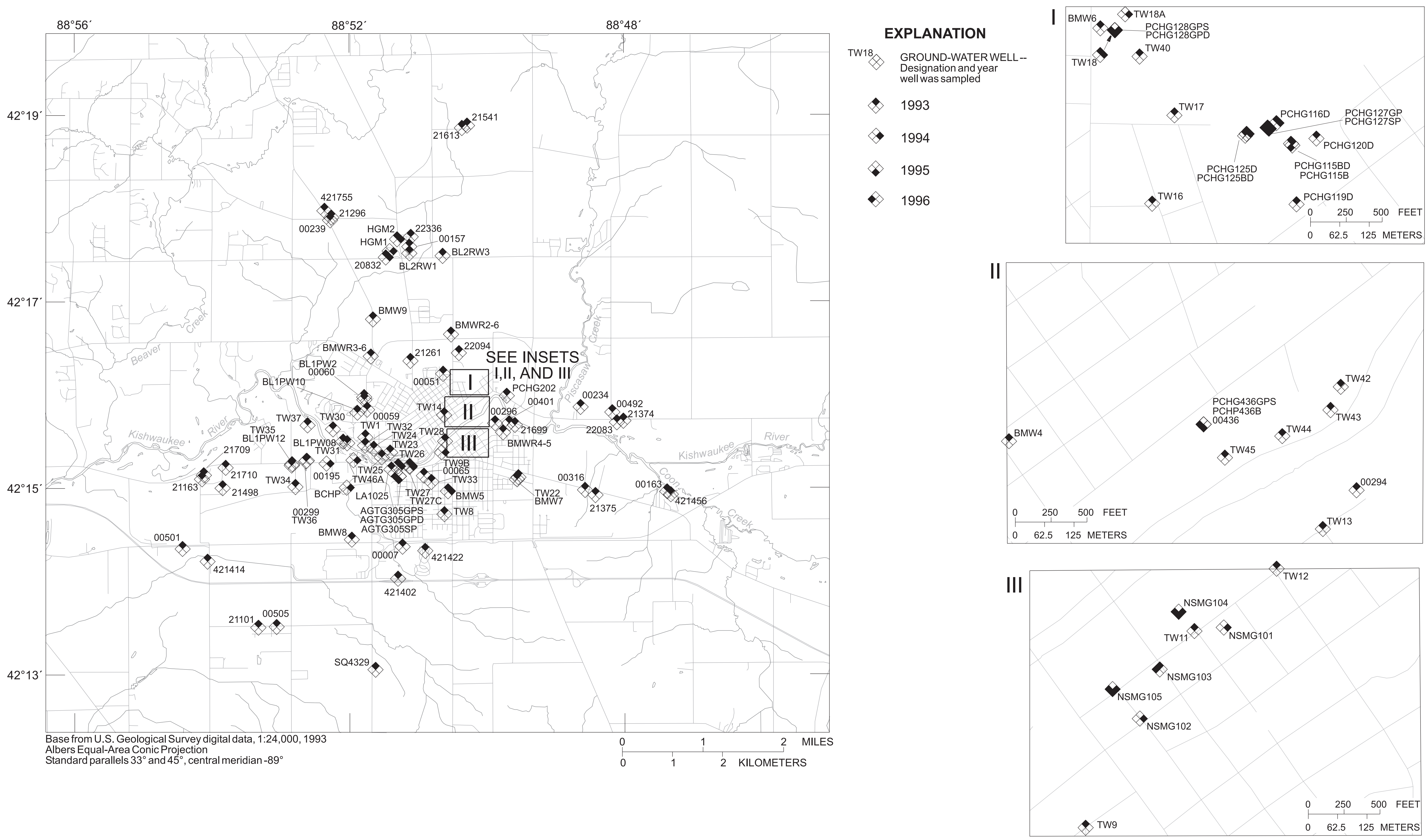
△ TEMPORARY WELL; NO WATER-LEVEL DATA AVAILABLE

KR1 ▼ SURFACE-WATER MEASUREMENT SITE AND DESIGNATION

NOTE: Sites referred to in the report are designated

Base from U.S. Geological Survey digital data, 1:24,000, 1993
Albers Equal-Area Conic Projection
Standard parallels 33° and 45°, central meridian -89°

Figure 8. Water-level measurement sites in the vicinity of Belvidere, Ill., 1993–96.



Base from U.S. Geological Survey digital data, 1:24,000, 1993
Albers Equal-Area Conic Projection
Standard parallels 33° and 45°, central meridian -89°

Figure 9. Wells at which water-quality samples were collected in the vicinity of Belvidere, Ill., July 1993, May–June 1994, May–June 1995, and August–October 1996.

in the study; well-installation information was available for most wells. Six water-supply wells without installation information were sampled because the wells were in areas possibly affected by contamination. The surface-water sites on the Kishwaukee River were selected to represent water levels along the river's extent within the study area.

The GIS data base compiled by Brown and Mills (1995) was used to select wells for the synoptic studies. The areal distribution of wells included in the data base and the well-installation and water-quality data available for the wells were examined. Most private water-supply wells used in the study were selected randomly. All well owners with a reasonably documented mailing address (about 250) were contacted by mail to obtain permission to use their well. The wells of all positive respondees from the mailing were used. The temporary wells, the Belvidere municipal wells, and certain monitoring wells and private water-supply wells were targeted for selection. The targeted wells were selected because they were near a known or potential hazardous-waste site in an underrepresented aquifer or location, or had available water-quality data. Data were not collected from about 25 wells that were originally selected for the study because of technical factors discovered at the time of sampling.

Of the 189 wells used in the study to collect water-level and water-quality data, 110 were private water-supply wells, 37 were monitoring wells, 7 were municipal wells, and 35 were temporary wells (table 1 and 2). Most temporary wells were within the city limits of Belvidere, where there was an inadequate distribution of available wells (fig. 9). The temporary wells were installed with the Geoprobe and Hydropunch methods. Details regarding the installation of these wells are provided in Mills and others (1998) and the sampling and analysis plan for the Belvidere ground-water study (U.S. Geological Survey and U.S. Environmental Protection Agency, 1993).

The 189 wells used in the study were open to one of the five aquifers underlying the study area: the glacial drift aquifer, Galena-Platteville aquifer, St. Peter Sandstone aquifer, Ordovician aquifer, and Cambrian-Ordovician aquifer. One well was open to the Glenwood Formation confining unit. Aquifer information was not available for six wells. However, reasonable assumptions can be made about aquifer associations for three of the wells (table 1).

Limited by the method of installation, temporary wells only were open to the glacial drift aquifer. Installation depths ranged from 6 to 29.5 ft below land surface. Seventeen of the temporary wells were installed (1) in fine-grained glacial deposits that provided little or no water to the wells, (2) to depths that were too shallow to intercept the water table, or (3) in locations where the water table was below the bedrock surface. As a result, no water levels were measured or water-quality samples were collected at these well sites. These sites are included in figures 8 and table 2, as are several water-supply and monitoring well sites listed in table 1, because data associated with the sites were used in the hydrogeologic characterization of the study area.

Surface-water levels in the Kishwaukee River were measured at seven sites. The surface-water level also was measured in Coon Creek (fig. 8), near its confluence with the Kishwaukee River. The extreme upstream and downstream sites on the Kishwaukee River were near the eastern and western boundaries of the study area. Five sites were upstream and three were downstream from a low-head dam located in the city of Belvidere (fig. 1). One of the downstream sites (KR8) is the USGS streamflow-gaging station Kishwaukee River at Belvidere, Ill. (05438500) (figs. 1 and 8).

Well-installation information, and water-level and water-quality data were archived in the project GIS data base (Brown and Mills, 1995). Well-installation information and water-level data also were archived in the Ground-Water Site Inventory, a national data base maintained by the USGS. Selective water-quality data also were archived in Storage and Retrieval (STORET), a national data base maintained by the USEPA. Well-identification nomenclature used in the study is based on the nomenclature established and described in Brown and Mills (1995) and Mills and others (1998).

Measuring-point datums for all wells and surface-water sites were established primarily by the GPS rapid-static-survey method (Leica Heerbrugg AG, 1992). A centrally positioned reference station was established at the PCH Superfund site (fig. 1). The station was surveyed by way of a traverse from a National Geodetic Survey station located about 13 mi southeast of Belvidere near Genoa, Ill. (NH0229) (fig. 1). After establishing the vertical and horizontal positions (World Geodetic Survey of 1984) of the reference station, each well and water-level measurement site was visited twice over a 2-day period with a roving GPS receiving unit. By manipulating satellite selections and monitoring the statistical indicators included as part of the post-processing software (Leica Heerbrugg AG, 1992), inherent measurement error associated with each site was minimized. Average vertical and horizontal positions were determined from multiple measurements of the sites. Conventional surveying methods were used to establish vertical positions for clustered wells or sites where ambiguities in the GPS measurements could not be resolved. Altitudes at such sites were referenced to nearby sites measured by GPS, a USGS benchmark, or other previously surveyed landmarks. Horizontal positions of measurement sites where ambiguities in the GPS measurements could not be resolved were determined by locating the sites on a USGS 1:24,000 scale topographic quadrangle. For consistency, positions determined by GPS were converted and referenced to the National Geodetic Vertical Datum of 1929 and North American Datum of 1927 (horizontal). Conversions were made by the use of software available on the World Wide Web (National Geodetic Survey, 1994).

To evaluate the accuracy of the GPS-based positions, five conventionally surveyed USGS benchmarks in the vicinity of Belvidere were visited from 5 to 14 times during the GPS survey. The altitudes of four sites surveyed by GPS were cross referenced based on conventional surveying methods. Altitudes of the USGS benchmarks determined by GPS were within about 0.1 ft of the recorded altitudes for the benchmarks. Similar differences in altitude were noted among the cross-referenced sites surveyed by GPS methods. Horizontal positions determined by GPS were within 1 second (about 60 ft) of known positions. Because of the availability of nearby landmarks at most sites, errors in the horizontal position of sites located using USGS quadrangle maps were reduced to about 1 second.

Water-Level Measurements and Mapping

Water levels were measured using steel tapes marked with chalk. When measuring water levels in pumping wells with pitless adapters, the weight was removed from the tape to ease access to the wells and prevent loss of the weight in the well. Water-level measurements were made from the top of the surface casing with the well cover removed or from the top of the well cover when an access hole was available. Measurement-point and other site-condition information were recorded on field logs completed at each well and surface-water site. Where possible, water levels in pumping wells were allowed to recover a minimum of 30 minutes to near-static levels before measurements were made. Water levels also were measured during pumping in selected municipal wells. Measurements were made to the nearest 0.01 ft and verified by repeated measurement.

Measuring tapes were decontaminated before and after use to prevent cross contamination among wells. Tapes used in monitoring wells and municipal water-supply wells with chlorination systems were washed with soapy water that was prepared with tap water and phosphate-free laboratory soap and rinsed with deionized or distilled water.

Tapes used in nonmunicipal water-supply wells were washed with a bleach and tap-water solution (about 1 tablespoon of bleach per gallon of water) before washing with soapy water and rinsing with deionized or distilled water.

Surface-water levels generally were measured near midchannel from a stable point on an overlying bridge. At the site immediately upstream from the low-head dam (fig. 1), the measurement was made from a staff gage on the north side of the river. At the site immediately downstream from the low-head dam, the measurement was made from an observation deck on the north side of the river. At the USGS streamflow-gaging station (fig. 1), measurements were made from the float-wheel potentiometer, the staff gage, and the mercury manometer. These three measurements were within 0.02 ft; the float-wheel measurement is considered the official measurement and is the measurement used to compute the discharge presented in the USGS annual water-data report for Illinois (Maurer and others, 1994).

Potentiometric levels in aquifers, as determined from water levels in tightly cased wells, are mapped to interpret horizontal ground-water-flow directions. Ground water flows from areas of higher potentiometric level, as indicated by the water-level altitude, to areas of lower potentiometric level. Flow is in the direction of the hydraulic gradient, which is perpendicular to the contours of equal potentiometric level. The potentiometric surface may be indicative of an unconfined aquifer and the position of the water table, if it is a subdued representation of the land surface. Potentiometric levels, as determined from water levels measured in vertically spaced (nested) wells, can be used to interpret vertical flow directions within and among aquifers.

Potentiometric maps (pls. 1 and 2) were prepared for the glacial drift and Galena-Platteville aquifers using the water-level data collected during sampling period 1 (1993). Some interpretation was necessary to estimate water levels in areas where water levels were not measured. In the parts of the study area with limited water-level data, potentiometric contours are dashed or not shown in plates 1 and 2.

Four USGS 1:24,000-scale topographic maps, including the Belvidere North (1970; photo revised, 1993), Belvidere South (1969; photo revised, 1993), Caledonia (1970; photo revised, 1993), and Cherry Valley (1968; photo revised, 1993) quadrangles, were used to identify locations where topographic contours intersect streams and drainage ways. The intermittent streams and drainage ways at these locations were considered to be partially filled with discharging ground water because ground-water levels in the area were uncharacteristically high in July 1993 (this will be discussed in the section "Representativeness of the Data"). The approximated water levels at these locations provide additional control for mapping potentiometric levels in the glacial drift aquifer, as does available information on water levels in and near a bedrock quarry in the southwest part of the study area (Dan Fischer, Rockford Sand and Gravel, Inc., written commun., 1996) (fig. 1). Locations where water levels are approximated are not identified on the potentiometric maps.

Mapped potentiometric contours in the glacial drift aquifer were used to estimate water levels in many areas of the Galena-Platteville aquifer. Data from studies in the area (Mills and others, 1998; Clayton Environmental Consultants, Inc., 1996; Mills, 1993a, b; Science Applications International Corporation, 1992; Roy F. Weston, Inc., 1988) indicate that potentiometric levels in the Galena-Platteville aquifer are similar to those in the overlying glacial drift aquifer. The studies also provide some information on directions of vertical flow between the two aquifers. Based on data from about five locations in Belvidere, vertical flow was assumed to be downward between the glacial drift and Galena-Platteville aquifers in areas considered upland recharge areas and areas considered affected by municipal-well pumpage in the Galena-Platteville aquifer. Flow was assumed to be upward between the Galena-Platteville and glacial drift aquifers near streams. Available data on vertical-fracture orientation (Mills and others, 1998) were used to approximate the orientation of potentiometric contours near the municipal wells open to the Galena-Platteville aquifer.

Water-Quality Sampling

Analyses for VOC's were performed on all water-quality samples collected. Field characteristics of water quality (temperature, pH, specific conductance (SC), oxidation-reduction potential (Eh), dissolved oxygen (DO), and turbidity) were determined for samples from 57 wells. Samples were collected at 16 wells for analysis of SVOC's, trace metals, cyanide, and (or) chloride (tables 1 and 2). Two soil samples were collected at one location for analysis of VOC's and SVOC's.

The study focused on analysis for VOC's in ground water because (1) VOC's are the most frequently detected contaminants in samples from wells in the vicinity of Belvidere, including the Belvidere municipal water-supply wells, and (2) VOC's are considered to be an indicator of other contaminants that may be present in ground water, based on the mobility of VOC's and the frequency of their detection. Samples were collected at selected wells for analysis of constituents other than VOC's to evaluate specific concerns at those well locations. The wells were near facilities with previous metal-plating operations, landfills, and (or) road-salt storage facilities. The soil samples were collected after drilling of a temporary well was terminated because of high atmospheric concentrations of VOC's. Concentrations that approached 200 μg/L were indicated by onsite screening with an organic vapor analyzer.

Depth to water in wells and the total depth of monitoring wells were determined with a decontaminated measuring tape. From these measurements and the measurement of well diameter, the volume of water in the well was determined. Water was removed from wells using a positive-displacement sampling pump, consisting of a stainless-steel pump head and Teflon tubing. Where possible, pump heads were positioned at least 5 ft below the water surface in a well and about 2 ft above the top of the well screen. If the water in a well was drawn down to the pump-intake level before three well-water volumes could be removed, the water in a well was allowed to recover before pumping continued. Prior to sampling, the pumping rate was 1–2 gal/min; during sampling, the rate was 0.25–0.5 gal/min.

As water was pumped from a well, the values of temperature, pH, and SC were measured using a flow-through cell attached to a field water-quality meter. Eh, DO, and turbidity of the water also were measured at some wells. When a minimum of three well-water volumes were removed from a well and the values of temperature, pH, and SC stabilized, the well was ready for sampling. To be considered stable, temperature, pH, and SC were required to differ by less than the following values when measured after three consecutive one-half well volumes were removed: temperature, 0.2°C; pH, 0.1 standard units; SC, 5-percent difference in value.

Water samples for analysis of VOC's were collected first. Forty-milliliter, borosilicate-glass sample bottles were filled completely with water free of air bubbles. If air bubbles were detected in a bottle, the sample was discarded and another sample was collected in an unused bottle. Prior to sampling, sufficient hydrochloric acid (HCl) was added to the sample bottles to ensure the water samples were preserved at a pH of less than 2.0. The samples were chilled to about 4°C for handling and shipment.

Water samples for analysis of SVOC's were collected in 1-L, brown-glass bottles. The bottles were prerinsed with sample water. No preservatives were added to the samples. The samples were chilled to about 4°C for handling and shipment.

Most water samples collected from monitoring and water-supply wells for analysis of trace metals were filtered through a 0.45-μ-mesh filter. Samples collected from temporary wells and two monitoring wells at the closed National Sewing Machine (NSM) facility (fig. 1) were not filtered. For sampling of monitoring and temporary wells, the filter was attached to the discharge outlet of the sampling pump. For sampling of water-supply wells, the filter was attached to a 1-ft section of Teflon tubing; the tubing was secured to the sampling tap with a threaded brass hose barb. Before the sample was collected, the filter was flushed with at least 250 ml of sample water. Samples were collected in 1-L, high-density polyethylene bottles. The trace-metal samples were preserved with nitric acid (HNO_3), and the cyanide samples were preserved with sodium hydroxide (NaOH). Metal samples required a pH of less than 2; cyanide samples required a pH of greater than 10. Both analytical samples were chilled to about 4°C for handling and shipment. The field measurement of chloride concentration was done using a chloride-ion probe, calibrated in millivolts against two chloride standards.

Water-supply wells, including municipal and private wells, were pumped at least 10 minutes before values of temperature, pH, and SC were measured. During this initial period of pumping, water was allowed to discharge from the sampling tap at a rate of about 5 gal/min. During measurement of the field characteristics, the pumping rate was 1–2 gal/min; during the final 5 minutes of pumping and during sampling, the rate was 0.25–0.5 gal/min. When values of temperature, pH, and SC were stable for three consecutive measurements taken at 5-minute intervals, the well was ready for sampling. In cases where the measurements failed to stabilize, sampling began after 30 minutes of pumping.

Taps were selected that allowed sampling of the well water before the water was chemically treated; for municipal water-supply wells, the taps were at the well head. Aerators, strainers, hoses, or other attachments were removed from the tap, and the tap was cleaned with a soapy-water wash and rinsed with deionized or distilled water before sampling. Collection of the water samples followed the general methods described for monitoring wells.

The sampling methods for the temporary wells depended on the method of well installation. For wells installed with the Geoprobe method, a peristaltic pump was used to withdraw water from the 2-ft long by 0.5-in. diameter screen. Water was withdrawn through polyethylene tubing attached to a short segment of silicone tubing fed through the pump rotors. About 0.5–1 gal of water was pumped from the well before samples were collected. For wells installed by the Hydropunch method, water samples were collected from either the self-contained sample chamber (a sample volume of about 150 ml), the Hydropunch bailer (3-ft long by 0.75-in. diameter bottom-draining bailer), or a peristaltic pump similar to that used for Geoprobe sampling. Field characteristics generally were not measured during the sampling of temporary wells.

The soil samples were collected from the drill cuttings with a stainless-steel spatula. Samples were placed in glass jars with Teflon-coated caps and shipped to the laboratory unchilled.

Sampling equipment was decontaminated; quality-assurance samples were collected; and samples were shipped to analytical laboratories, following procedures described in the sampling and analysis plan for the Belvidere ground-water study (U.S. Geological Survey and U.S. Environmental Protection Agency, 1993). Quality-assurance procedures included, in part, daily calibration of the field water-quality meters and periodic checks of the pH of preserved samples. Quality-assurance sample information is specified in table 3.

Table 3. Quality-assurance samples collected for the study of ground-water quality in the vicinity of Belvidere, Ill., 1993–96

[VOC's, volatile organic compounds; SVOC's, semivolatile organic compounds; MS/MSD, matrix spike/matrix-spike duplicate]

Type of quality-assurance sample	Approximate ratio of quality-assurance samples to ground-water samples	Group or type of analytical constituent	Number of samples per constituent group or type
Duplicate	1:10	VOC's, SVOC's, metals, cyanide	19, 1, 4, 4
MS/MSD	1:20	VOC's, metals	11, 2
Method	1:10	VOC's, metals, cyanide	18, 3, 3
Trip	1:shipment (greater than 1:20)	VOC's	17

Analytical results of duplicate samples are used to evaluate the random variation of sampling and laboratory analytical procedures. Matrix-spike/matrix-spike-duplicate (MS/MSD) samples are used for quality assurance of laboratory analytical procedures. Duplicate samples were collected at the same time and with the same procedures as the associated ground-water samples. Analytical results of method-blank samples are used to evaluate the sampling-pump-decontamination procedure. Method blanks consisted of a distilled or deionized water sample collected from each of the pumps used to collect ground-water samples. Method blanks were collected from decontaminated pumps after the pumps were used at sample sites suspected of having high concentrations of VOC's or trace metals. Analytical results of trip blanks are used to identify post-collection contamination of ground-water samples. Trip blanks consisted of sample vials filled with laboratory-grade, organic-free water; vials generally were filled at the beginning of each sampling period.

The water samples collected during sampling periods 1, 2, and 4 were analyzed by laboratories selected and certified by the USEPA Contract Laboratory Program (CLP), and the water samples collected during sampling period 3 were analyzed by the USEPA Region 5 Central Laboratory (CRL). Documentation of all laboratory analytical procedures accompanied the analytical data submitted to the USEPA. The documented procedures and data were reviewed and validated by the USEPA.

REPRESENTATIVENESS OF THE DATA

Several measures were taken to determine if the data collected primarily during sampling period 1 (July 1993) were adequate for characterizing potentiometric levels, ground-water-flow directions, and water quality of the aquifers underlying the vicinity of Belvidere. The completion depths and horizontal distributions of the wells included in the study were evaluated to ensure that gaps in the spatial coverage of data were avoided. Meteorologic data collected during sampling periods 1 and 2 (May–June 1994) at the PCH Superfund site and two nearby NWS stations (fig. 1) were evaluated to determine possible consequences of short- and long-term meteorologic trends on the measured water levels and sample concentrations. Sampling and laboratory quality-assurance procedures were evaluated to ensure the accuracy of the water-quality data.

Wells selected for the study were distributed within the five aquifers underlying the study area. Water levels were measured in 26 percent (84 wells) of the available wells open to the glacial drift aquifer, 14 percent (53 wells) of the available wells open to the Galena-Platteville aquifer, and 44 percent (15 wells) of the available wells open to the bedrock aquifers deeper than the Galena-Platteville aquifer. More than 80 percent of the wells in which water levels in the Galena-Platteville aquifer were measured were open to the upper one-half or less of the aquifer. Available wells in the aquifer are predominantly private water-supply wells that tap the most transmissive and (or) economically accessible part of the aquifer. Available wells include those identified by Brown and Mills (1995), as well as those subsequently installed either permanently or temporarily as part of this study.

The distribution of water levels, as measured or estimated in wells and streams, is considered adequate for regional characterization of potentiometric levels and horizontal flow directions in the glacial drift and Galena-Platteville aquifers. Spatial gaps in the water-level data were evident for the Galena-Platteville aquifer in some parts of the study area. The distribution of water levels is inadequate for characterization of vertical-flow directions in the aquifers. The few number of wells open to the bedrock aquifers that are deeper than the glacial drift and Galena-Platteville aquifers preclude characterizing flow directions in the deep bedrock aquifers.

During sampling periods 1 and 2, precipitation and barometric data were collected, and water levels were measured continuously in two monitoring wells (PCHG115D, PCHG116S) open to the glacial drift aquifer (figs. 8 and 10). These data were evaluated to determine short-term effects of meteorologic conditions on ground-water levels during each sampling period. During sampling periods 1–4 and at other times during 1989–96, water levels were measured in three monitoring wells open to the glacial drift aquifer (PCHG115D, PCHG116S, and NSMG103), and river levels were measured at the eight surface-water sites (KR1, KR2, KR4–KR9) (table 4 and fig. 8). Streamflow data from the USGS streamflow-gaging station Kishwaukee River at Belvidere (fig. 8) and precipitation data from the NWS stations in Belvidere and Rockford, Ill. (Science Applications International Corporation, 1996) (fig. 1) also were compiled for the period 1990–95 (fig. 11). These data were evaluated as indicators of seasonal and annual water-level trends.

No precipitation fell during sampling periods 1 or 2. During sampling period 1, water levels in the two continuously monitored wells (PCHG115D, PCHG116S) fluctuated over a range of less than 0.1 ft in apparent response to changes in barometric pressure (fig. 10a). There was a general decline in water level of about 0.2 ft in both monitoring wells (fig. 10a). The slight fluctuation in water level during the sampling period was determined to be within acceptable limits for the preparation of potentiometric maps; thus, no meteorologic-related adjustments to the water levels measured in the study were necessary. Because water-level fluctuations during sampling period 2 were similar to those during sampling period 1, no adjustments to the water levels measured in the study were considered to be necessary (fig. 10b).

Water levels measured in wells open to the glacial drift aquifer underlying Belvidere were substantially higher during sampling period 1 in July 1993 than at other times during 1990–96 (table 4). Local annual precipitation in 1993 was near average. Thirty-nine inches of precipitation fell in 1993 compared with a long-term (1961–90) average of 36 in. (U.S. Department of Commerce, 1961–1990) and a short-term (1990–95) range of 32–45 in. (Clayton Environmental Consultants, Inc., 1996). During the spring and summer of 1993, however, precipitation was more than 150 percent of average in much of the Mississippi Valley region of the Midwest, including the vicinity of Belvidere (Dana Kolpin, U.S. Geological Survey, written commun., 1993). In June 1993, 14.1 in. of precipitation fell in the vicinity of Belvidere (fig. 11a). Long-term (1961–90) average precipitation in June is about 4 in.

Higher than average annual precipitation, and elevated water levels (table 4) and discharge rates (figs. 11b and 11c) were recorded in the Kishwaukee River during sampling period 1. Annual mean (1940–93) discharge at the USGS streamflow-gaging station in Belvidere is 370 ft^3/s. The highest annual mean on record, 992 ft^3/s, was established in water year[1] 1993 (October 1992–September 1993) (Maurer and others, 1994). The highest mean for July on record, 1,815 ft^3/s, was established in 1993.

The observed potentiometric levels, directions of flow, and ground-water quality in the vicinity of Belvidere during July 1993 were considered with respect to the atypical hydrologic conditions of spring and early summer 1993. The potentiometric levels, flow directions, and gradients observed during this period may not be representative of periods of typical hydrologic conditions. Concentrations of contaminants and ground-water-flow patterns could be affected most in the near-surface glacial drift aquifer. Concentrations of VOC's could be lower, as the result of dilution, or higher, as the result of increased movement, than those detected during periods of average precipitation and recharge. The effect of dilution possibly is indicated by the water sample collected at temporary well TW30 (fig. 9). The sample from well TW30 was collected near the water table and presumably at a shallower depth than the sample from the adjacent (within 10 ft) water-supply well BL1PW08. VOC's were detected in well BL1PW08 but not in well TW30. It also is possible that well BL1PW08 is not open to the glacial drift aquifer. No installation information was available for well BL1PW08, so the aquifer to which the well is open was determined from installation information available for nearby wells.

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[1] The water year is the 12-month period from October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months.

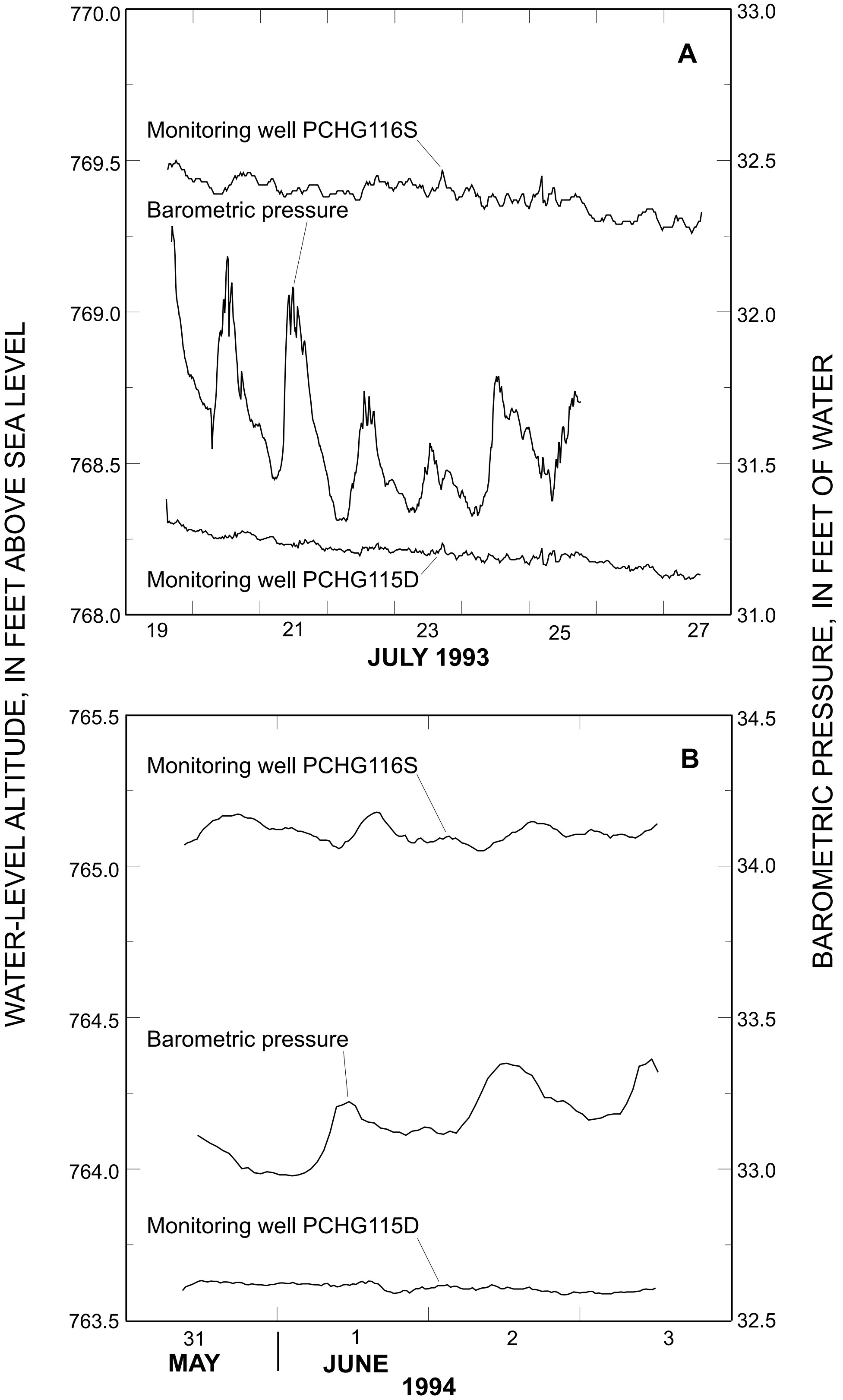


Figure 10. Barometric pressure and water levels in monitoring wells PCHG115D and PCHG116S open to the glacial drift aquifer underlying Belvidere, Ill., (A) July 1993 and (B) May–June 1994.

Table 4. Water levels at selected locations on the Kishwaukee River and in wells open to the glacial drift aquifer underlying Belvidere, Ill., 1990–96

Designation of measurement location	River or aquifer location	Measurement date	Water-level altitude (feet above sea level)	Change in water level from initial measurement in 1993 (feet)
KR1	Kishwaukee River	07-20-93	763.96	0.00
do.	do.	07-21-93	763.79	–.17
do.	do.	06-16-94	761.43	–2.53
KR2	do.	07-21-93	759.94	.00
do.	do.	06-16-94	754.06	–5.88
KR4	do.	07-20-93	755.17	.00
do.	do.	07-21-93	755.06	–.11
do.	do.	06-16-94	751.51	–3.66
KR5	do.	07-20-93	753.58	.00
do.	do.	07-21-93	753.43	–.15
do.	do.	06-16-94	751.47	–2.11
KR6	do.	07-20-93	753.5	.00
do.	do.	07-21-93	753.45	–.05
do.	do.	06-16-94	752.9	–.6
KR7	do.	07-20-93	748.19	.00
do.	do.	07-21-93	747.95	–.24
do.	do.	06-16-94	743.27	–4.90
KR8	do.	07-20-93	745.68	.00
do.	do.	07-21-93	745.30	–.38
do.	do.	06-16-94	739.57	–6.11
KR9	do.	07-20-93	726.71	.00
do.	do.	07-21-93	726.83	–.12
do.	do.	06-16-94	722.17	–4.54
NSMG103	glacial drift aquifer	07-19-93	755.27	.00
do.	do.	06-01-94	752.28	–2.98
do.	do.	09-22-94	751.71	–3.55
do.	do.	05-08-96	743.66	–11.60
do.	do.	08-27-96	752.57	–2.69
do.	do.	09-12-96	752.30	–2.96
PCHG115D	do.	06-26-89	760.16	–7.97
do.	do.	01-30-90	759.66	–8.47
do.	do.	08-24-90	764.25	–3.88
do.	do.	07-10-91	762.86	–5.27
do.	do.	07-14-92	761.85	–6.28
do.	do.	11-13-92	762.02	–6.11
do.	do.	07-19-93	768.14	.00
do.	do.	06-03-94	763.66	–4.47
do.	do.	05-30-95	763.06	–5.07
do.	do.	10-14-95	762.09	–6.04
do.	do.	05-08-96	760.53	–7.60
PCHG116S	do.	06-26-89	762.86	–6.47
do.	do.	01-30-90	762.88	–6.45
do.	do.	08-24-90	765.97	–3.36
do.	do.	07-10-91	764.48	–4.85
do.	do.	11-12-92	765.04	–4.29
do.	do.	07-19-93	769.33	.00
do.	do.	05-31-94	765.07	–4.26
do.	do.	05-30-95	765.11	–4.22
do.	do.	05-08-96	763.35	–5.98

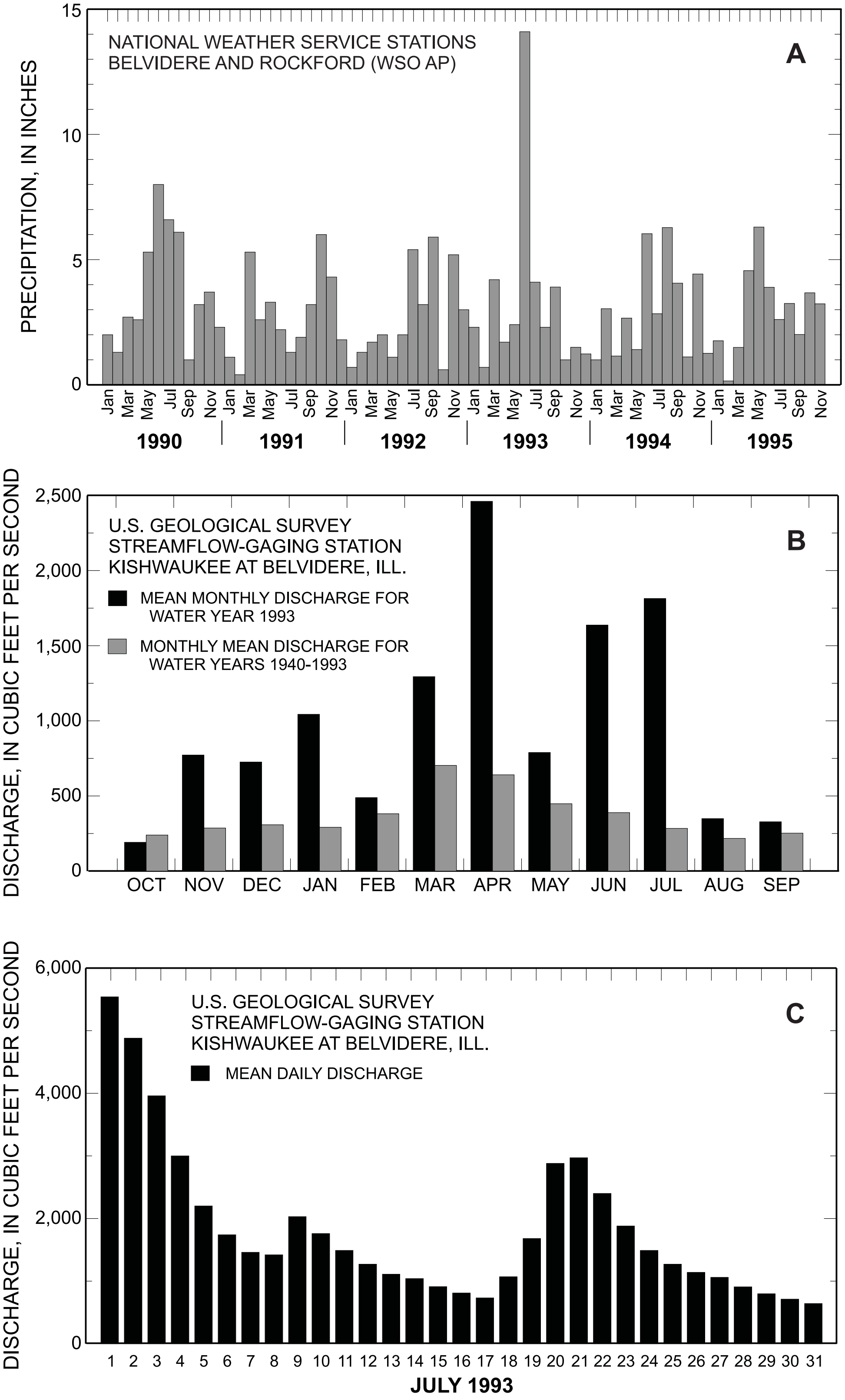


Figure 11. Selected meteorological and associated streamflow data in the vicinity of Belvidere, Ill., (A) monthly precipitation, 1990–95; (B) mean monthly (1993) and monthly mean (1940–93) discharge in the Kishwaukee River; and (C) mean daily discharge in the Kishwaukee River, July 1993.

Water-quality samples were collected from 19 percent (63 wells) of the available wells open to the glacial drift aquifer, 8 percent (30 wells) of the available wells open to the Galena-Platteville aquifer, and 58 percent (19 wells) of the available wells open to the bedrock aquifers deeper than the Galena-Platteville aquifer. Ninety percent of the wells from which water samples from the Galena-Platteville aquifer were collected were open to the upper one-half or less of the aquifer.

Water-quality samples were collected from at least 30 percent and as many as 64 percent of the available wells within 0.5 mi of five Belvidere municipal wells. At least 10 percent of the available wells were sampled near three municipal wells that were surrounded by few nearby wells and (or) were away from known or potential sources of ground-water contamination. Water-quality samples were collected from at least 20 percent and as many as 78 percent of the available wells within 0.5 mi of known or potential sources of ground-water contamination. The sampled wells included 21 percent of the wells with previous water-quality data (Brown and Mills, 1995), including the 6 municipal wells in use during the study and 37 percent of the private water-supply wells.

At locations where a large number of wells were clustered in the glacial drift and Galena-Platteville aquifers, several wells were sampled. The wells were representative of various vertical positions within the aquifers. Locations with clustered wells typically included hazardous-waste sites and housing developments. Difficulty in arranging access to industrial or hazardous-waste sites with monitoring wells (about 10 sites identified in the area) resulted in the collection of water-quality samples from only two such sites: the PCH Superfund site and the NSM facility (fig. 1).

The distribution of VOC data from contaminated and background areas and from each of the aquifers underlying Belvidere and vicinity are considered sufficient for characterizing water quality in the glacial drift and bedrock aquifers at a regional scale. Regional characterization of water quality could be enhanced if the data available from sites not accessed by the USGS were collected during the period of this study. The distribution of the data is inadequate for characterizing contaminant plumes and pathways within the aquifers at a local scale.

Quality-assurance procedures for collection of water samples were described previously in the section “Water-Quality Sampling.” Review of the analytical data by quality-assurance personnel from USEPA indicated that most of the data are acceptable for use. In this report, the qualified data are indicated by estimated concentrations. Specific reasons for the qualifications are not provided because of the variety of reasons for qualification. Information regarding the qualifications is available from the USGS. Most qualifications are the result of concentrations below instrument reporting limits and detection of analyzed compounds in sample blanks. Detections in sample blanks generally are attributed to laboratory contamination.

Analytical results of the duplicate-sample pairs were evaluated by the relative percent difference (RPD) method (U.S. Environmental Protection Agency, 1989). Review of the 19 VOC duplicate-sample pairs indicated detections of VOC’s in 3 pairs. The first pair, in which a single VOC was detected, had a RPD of 0 percent. The second pair had RPD’s that ranged from about 4 to 66 percent, with the largest RPD associated with a constituent pair with concentrations near the reporting levels. The third pair had RPD’s that ranged from about 4 to 53 percent, with the highest concentrations of all constituents always in the same sample of the pair. Review of the four trace-metal and cyanide duplicate-sample pairs indicated detections of eight trace metals. Six trace metals were detected in both samples of at least one duplicate-sample pair. RPD’s in the four duplicate-sample pairs ranged from about 6 to 200 percent, with six of the RPD’s greater than 50 percent and four greater than 200 percent. The variability in the trace-metal results cannot be readily explained. With the exception of bis (2-ethylhexyl) phthalate, a suspected laboratory contaminant, no SVOC’s were detected in the one duplicate-sample pair analyzed for these constituents. Evaluation of the duplicate-sample pairs indicates that the sampling methods generally were consistent.

Review of MS/MSD-blank data by quality-assurance personnel from the analytical laboratories and USEPA indicated few concerns associated with laboratory analytical procedures. Although most lead, selenium, and mercury data from sampling period 1 are qualified, the concentrations of these constituents in ground-water samples were below MCL’s.

Review of method-blank data indicates few VOC’s were detected. The VOC’s that were detected included methylene chloride, acetone, toluene, 2-butanone, chloroform, and bromodichloromethane. In most cases, the concentrations were below instrument reporting limits and were not detected in ground-water samples collected immediately before or after testing of decontaminated pumps. Most of the detected VOC's are attributed to laboratory contamination or chlorination byproducts in the tap water used for pump decontamination. In one method-blank sample, PCE, TCE, and 1,2-dichloroethene (1,2-DCE; represents the total concentration of the isomers *cis*-1,2-DCE and *trans*-1,2-DCE) were detected at the respective concentrations of 170, 3, and 3 µg/L. The source of these VOC's is uncertain because the previous ground-water sample contained PCE and TCE at concentrations of 31 and 180 µg/L, respectively. The pump used to collect this sample was not used for subsequent sampling. Because the validity of the VOC analytical results of this one quality-assurance sample is uncertain and only a few VOC's were detected at low concentrations in the other quality-assurance samples, the method used to decontaminate the sampling pumps of VOC's after use generally appears effective.

Review of method-blank data indicates the method of sampling may affect the quality of ground-water samples analyzed for trace metals. Two blanks were collected for analysis of trace metals during sampling period 1 and one blank during sampling period 3. Aluminum, barium, copper, iron, sodium, and zinc were detected at elevated concentrations in the blanks collected during sampling period 1. Based on these results, quality-assurance personnel from USEPA considered the ground-water samples from sampling period 1 to be affected by the method of sampling and qualified the concentrations of these constituents. The method-blank data from sampling period 3, however, indicated the quality of ground-water samples was unaffected by the method of sampling. Of the trace metals qualified in sampling period 1, only aluminum was detected in ground-water samples at concentrations of regulatory concern. The concentrations of aluminum were above the secondary maximum contaminant level (SMCL) (app. 2) in two samples.

Because of the inconsistency in the method-blank data, the method used to decontaminate the sampling pumps of trace metals after use generally appears effective. The elevated concentrations of the trace metals in the method blanks collected during sampling period 1 possibly are related to the chemistry of the commercially purchased distilled water used for the blanks.

Although the concentrations of chromium, manganese, and nickel are not qualified on the basis of the method blanks, the concentrations of these trace metals may be elevated in some ground-water samples collected using stainless-steel sampling pumps or from stainless-steel monitoring wells. These trace metals are components of the steel and may leach into the ground water when pH is acidic.

Review of trip-blank data indicates few VOC's were detected, including methylene chloride, acetone, and toluene. The detection of methylene chloride and acetone typically are attributed to laboratory contamination. When detected in an accompanying shipment of water samples, quality-assurance personnel from USEPA often report these compounds as undetected. Toluene was detected at a concentration of 1 µg/L in one sample.

The methods used to collect water samples from the temporary wells have a demonstrated or expected potential for underrepresenting the actual VOC concentrations (Richard Duwelius, U.S. Geological Survey, written commun., 1992). Bailers can agitate and expose a water sample to the atmosphere. Peristaltic pumps produce negative pressure to withdraw a water sample from the aquifer. Although the potential for underrepresenting VOC concentrations can not be verified or quantified for the temporary-well samples collected during this study, the potential should be considered when evaluating the analytical data and distribution of VOC's in the aquifers.

POTENTIOMETRIC LEVELS

Water levels measured in water-supply, monitoring, and temporary wells during sampling period 1 (July 1993) are presented in tables 1 and 2. Selected water levels measured during sampling periods 2–4 (1994–96) are presented to provide a general indication of depths to water in the wells not measured in 1993. In this report, analysis and description of water-level data are limited to the data collected in 1993. A complete listing of water levels measured during all sampling periods is provided in Mills and others (1998).

Water levels in the wells open to the glacial drift and Galena-Platteville aquifers are presented as contours of equal potentiometric level in plates 1 and 2. Generalized directions of horizontal ground-water flow also are indicated in plates 1 and 2. Potentiometric levels at the few locations in the St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers where data were available are presented in figure 12.

Glacial Drift Aquifer

Depth to water in wells open to the glacial drift aquifer ranged from about 2 to 50 ft below land surface. The shallowest depths generally were along streambanks. The greatest depths to water generally were in wells open to the sand-and-gravel deposits in the Troy Bedrock Valley (fig. 3). Most of the wells where depths to water were greater than 30 ft are in the upland areas on the north side of the Troy Bedrock Valley and are completed at depths greater than 100 ft (tables 1 and 2).

Potentiometric levels in the glacial drift aquifer are shown in plate 1. The potentiometric levels were determined from water levels measured in various drift units composed of various lithologies. The aquifer may be unconfined or confined, depending on location. As such, the water levels are considered to represent the potentiometric level of ground water in the aquifer.

Potentiometric levels in the glacial drift aquifer range from about 900 ft above sea level in the southern and northwestern uplands to about 750 ft above sea level along the Kishwaukee River (pl. 1). Because the potentiometric surface of the aquifer is a subdued representation of the land surface of the study area (figs. 5–7), the surface is considered a regional approximation of the water table. Horizontal hydraulic gradients generally are greatest in the upland areas in the northwest and southeast parts of the study area and least in the lowlands flanking the Kishwaukee River and Piscasaw Creek and overlying the Troy Bedrock Valley. Regional horizontal ground-water flow is from the uplands in the northern and southern parts of the study area toward the Kishwaukee River and its principal tributaries (pl. 1). Ground water also flows toward the Troy Bedrock Valley from the uplands northwest of the valley.

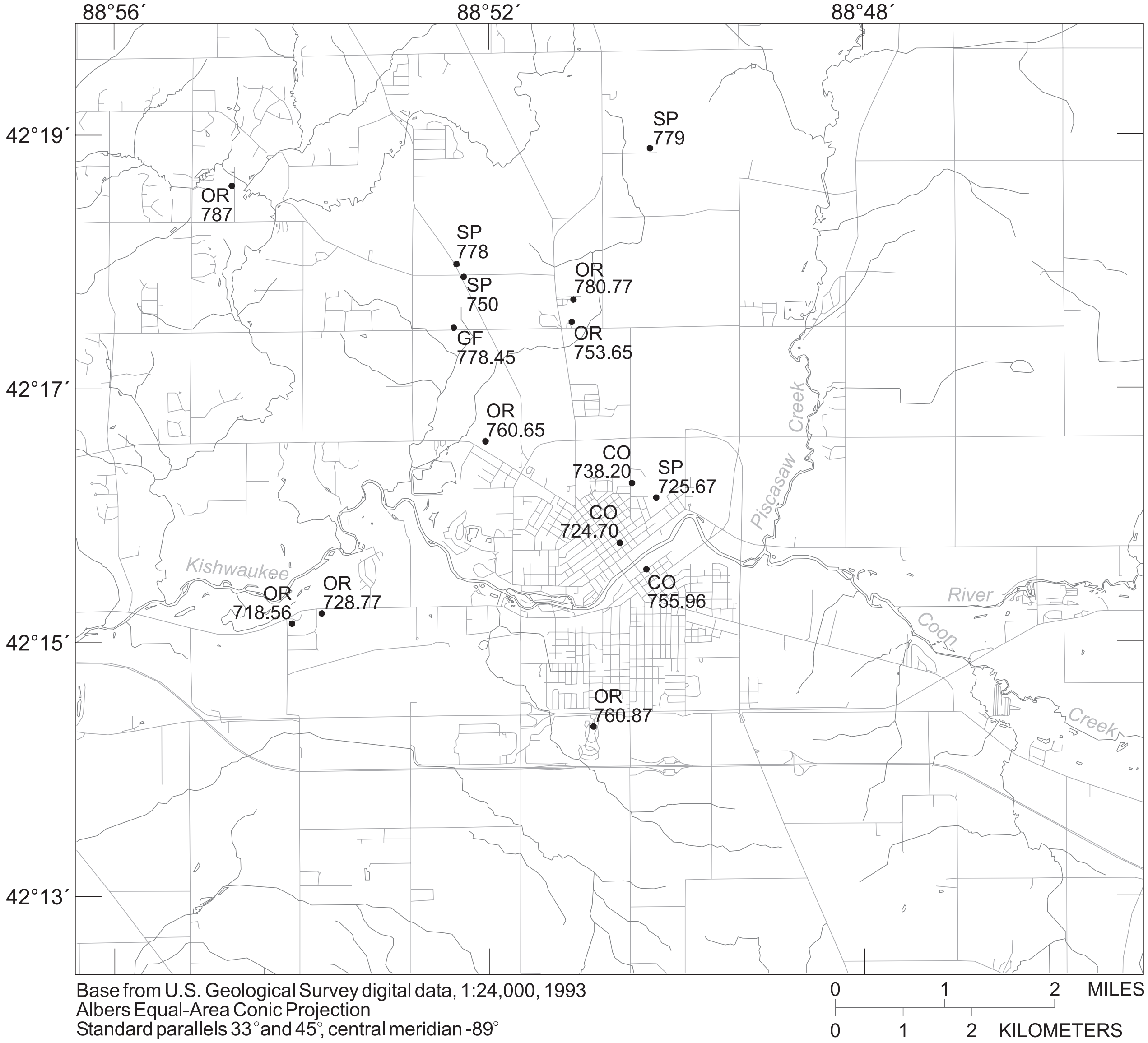
The glacial-drift deposits are unsaturated in three general areas (pl. 1). One area is along a bedrock high that trends southwest to northeast in the southwest part of the study area. A second area, which also coincides with a bedrock high, is in the northwest part of the study area. The third area, in the southwest part of the study area, is associated with dewatering at a dolomite quarry.

Galena-Platteville Aquifer

Depth to water in wells open to the Galena-Platteville aquifer ranged from about 2 to 91 ft below land surface. The shallowest depths generally were in wells near the Kishwaukee River and its principal tributaries. The greatest depths to water generally were in the upland recharge areas.

Potentiometric levels in the Galena-Platteville aquifer are shown in plate 2. As previously discussed, water-level data collected in July 1993 and historical data indicate that potentiometric levels in the Galena-Platteville aquifer are similar to the potentiometric levels in the glacial drift aquifers. Potentiometric levels in the Galena-Platteville aquifer range from about 900 ft above sea level in the southern and northwestern uplands to about 750 ft above sea level along the Kishwaukee River. Horizontal hydraulic gradients generally are greatest in the upland areas in the northwest and southeast parts of the study area and least in the lowlands flanking the Kishwaukee River and Piscasaw Creek and overlying the Troy Bedrock Valley (fig. 3). Regional horizontal ground-water flow in the aquifer generally is from the uplands in the northern and southern parts of the study area toward the Kishwaukee River (pl. 2). Ground water in the upper part of the aquifer appears to discharge to the major tributaries of the Kishwaukee River and to the Troy Bedrock Valley, where the Galena and Platteville Groups have been eroded (figs. 3 and 5–7). About 80 percent of the wells in which water levels were measured were open to the upper one-half or less of the Galena-Platteville aquifer; therefore, it is possible that flow in the deeper part of the aquifer discharges outside the study area.

Bedrock highs are present in the southwest and northwest parts of the study area. At these locations, the dolomite deposits of the Galena Group are exposed or close to land surface, and locally, the deposits are unsaturated. The unsaturated deposits in the southwest part of the study area can be attributed, in part, to dewatering where the dolomite is quarried. The approximate areas where the dolomite deposits of the Galena Group are unsaturated are shown in plate 1. Areas where the dolomite deposits of the Galena Group are unsaturated are principal areas of ground-water recharge to the Galena-Platteville aquifer. Another likely area of recharge is near municipal wells BMW4 and BMW6, where permeable sand-and-gravel deposits less than 45 ft thick directly overlie the aquifer.



Base from U.S. Geological Survey digital data, 1:24,000, 1993
Albers Equal-Area Conic Projection
Standard parallels 33° and 45°, central meridian -89°

EXPLANATION

● OR 718.56	GROUND-WATER WELL -- Hydrostratigraphic-unit designation and altitude at which water would have stood in tightly cased wells, in feet above sea level
	HYDROSTRATIGRAPHIC-UNIT DESIGNATION
GF	Glenwood Formation confining unit
SP	St. Peter Sandstone aquifer
OR	Ordovician aquifer
CO	Cambrian-Ordovician aquifer

Figure 12. Potentiometric levels in the Glenwood Formation confining unit and the St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers underlying Belvidere, Ill., July 1993.

The major axes of the drawdown cones near Belvidere's municipal wells are shown in plate 2 to coincide with the principle orientation of vertical fractures in the aquifer. Evidence from quarries in the area (Foote, 1982) and square-array-resistivity logging (Mills and others, 1998) indicates a predominate fracture orientation of about N. 45° W. However, because there are several principal orientations that vary over a range of about 50°, the orientation of the drawdown cones shown in plate 2 should be considered approximate. Because of limited well control, the area of the drawdown cones also should be considered approximate.

St. Peter Sandstone, Ordovician, and Cambrian-Ordovician Aquifers

Depth to water in wells open to the St. Peter Sandstone aquifer ranged from about 52 to 75 ft below land surface. Potentiometric levels (fig. 12) ranged from about 726 to 779 ft above sea level. The few available data indicate that potentiometric levels are about 25–50 ft higher in the northern part than in the central part of the study area. Seven municipal wells in the central part of the study area pump water from the Ordovician or the Cambrian-Ordovician aquifer, which includes the St. Peter Sandstone aquifer (figs. 1 and 4; table 1). The scarcity of available wells precludes evaluation of water levels in the St. Peter Sandstone, within and outside the Troy Bedrock Valley. Within the valley, the St. Peter Sandstone aquifer is overlain by the Glenwood Formation confining unit and (or) the glacial drift aquifer; outside the valley, the St. Peter Sandstone aquifer is overlain by the Glenwood Formation confining unit and the Galena-Platteville aquifer (figs. 3, and 5–7).

In the central part of the study area affected by pumping of municipal wells, vertical ground-water flow between the Galena-Platteville and St. Peter Sandstone aquifers generally is downward (Mills and others, 1998). Upward flow has been recorded at wells open to a prominent bedding-plane fracture (Mills and others, 1998; Mills, 1993b). Flow directions in these wells appear to be transient, in relation to municipal-well pumping activity.

Depth to water in wells open to the Ordovician aquifer ranged from about 16 to 55 ft below land surface. Potentiometric levels (fig. 12) ranged from about 719 to 790 ft above sea level. Depth to water below land surface in wells open to the Cambrian-Ordovician aquifer ranged from about 3 to 52 ft. Potentiometric levels ranged from about 725 to 756 ft. The shallowest depth to water and highest potentiometric level were recorded in municipal well BMW2 (fig. 1). The uncharacteristically high potentiometric level was similar to the potentiometric level in the overlying glacial drift aquifer and to the water level in the Kishwaukee River, located about 250 ft to the northwest of the well. The similarity indicates that the well casing may be damaged, thus, allowing a direct hydraulic connection with the glacial drift aquifer. Vertical-flow directions in and between the St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers could not be determined because of the lack of water-level data.

WATER QUALITY

The water-quality data collected at 115 wells during the synoptic studies in 1993–96 are presented in tables 5–8 located at the end of the report (field characteristics, trace metals and cyanide, SVOC's, and VOC's, respectively). Selected water-quality data collected by government agencies other than the USGS or USEPA, or by private geotechnical contractors also are presented in tables 6–8. Sources of the data are indicated in the tables. Various methods were used to collect and analyze the data not obtained as part of this study. This limitation should be considered in the following interpretations of the spatial and temporal distribution of industrial constituents in the aquifers underlying Belvidere, Ill.

Wells in which VOC's were detected in samples in 1993 and 1994–96 are shown in figures 13 and 14. The total concentration of VOC's at the sampled wells is shown in figure 13. The maximum concentration of five selected VOC's and total concentration of one related group of VOC's (BTEX compounds) at the sampled wells is shown in figure 14. The VOC's presented in figure 14 were the most frequently detected, had the highest concentrations, or had the lowest MCL's. Data presented in figure 13 for wells sampled more than once represent the samples in which the total concentration of VOC's were highest. Results shown in figures 13 and 14 are limited to concentrations of VOC's because of the few data available for other constituents. In addition, concentrations of the trace metals and cyanide generally represented background concentrations or were below MCL's.

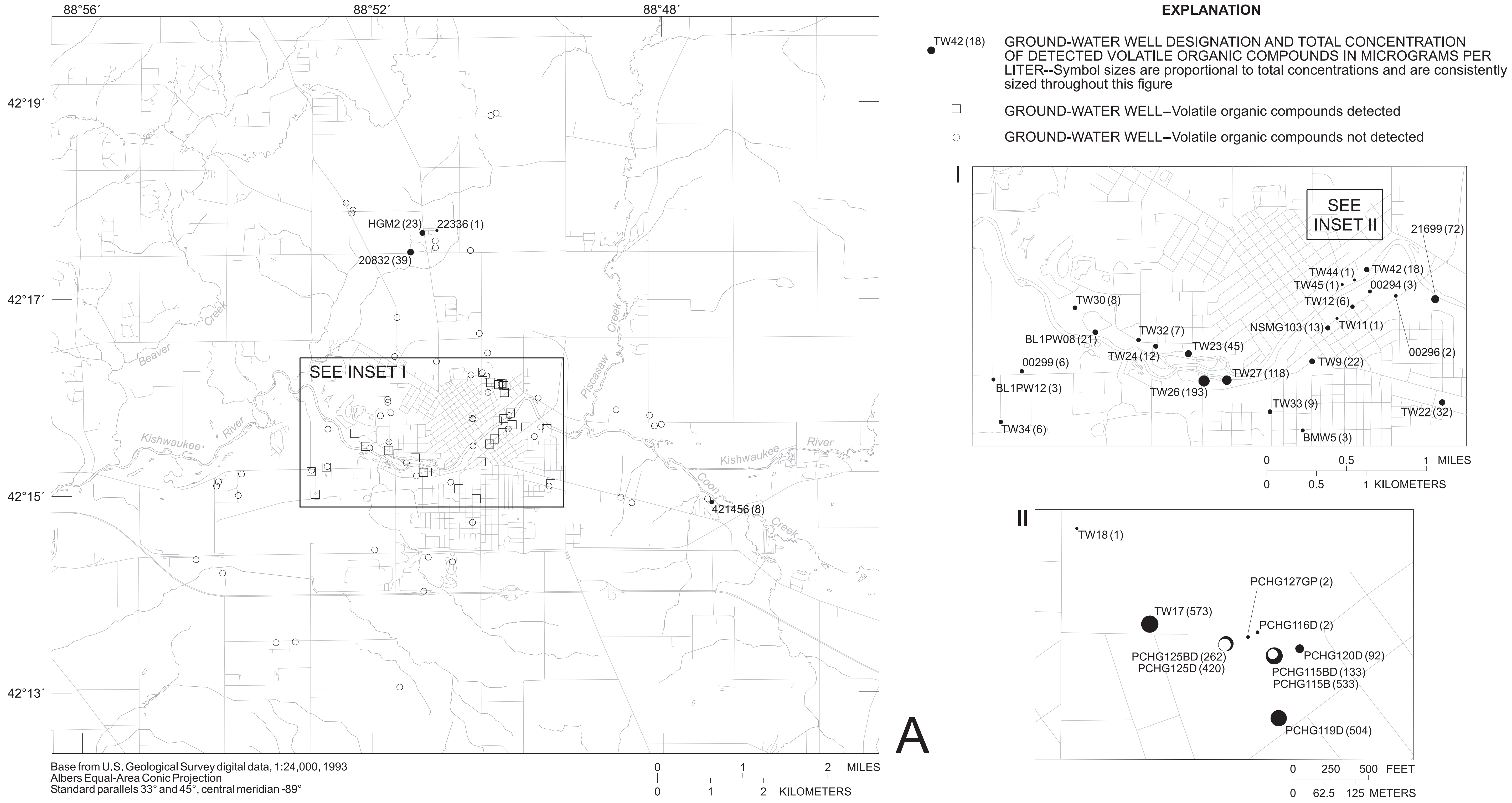


Figure 13. Total concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., July 1993.

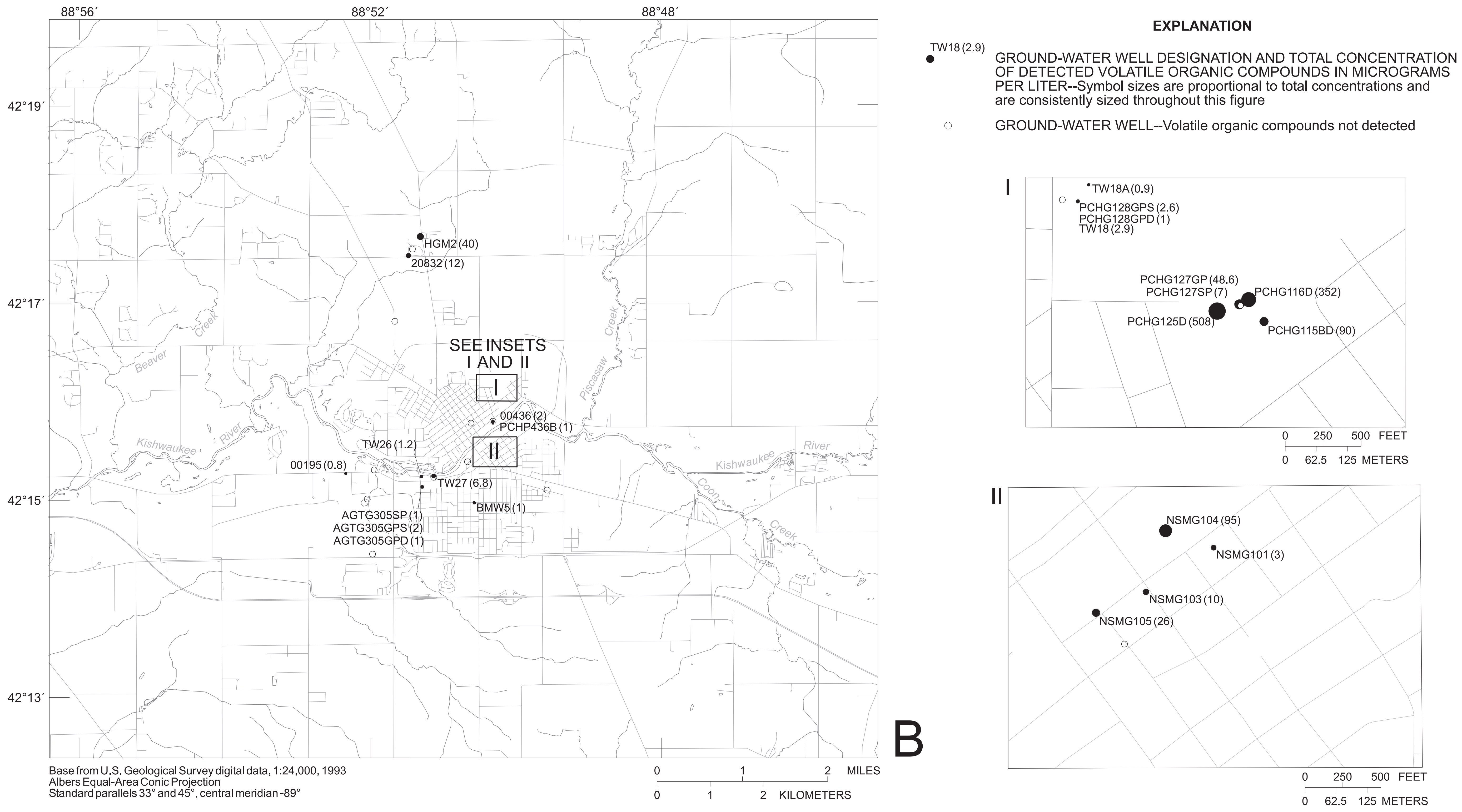
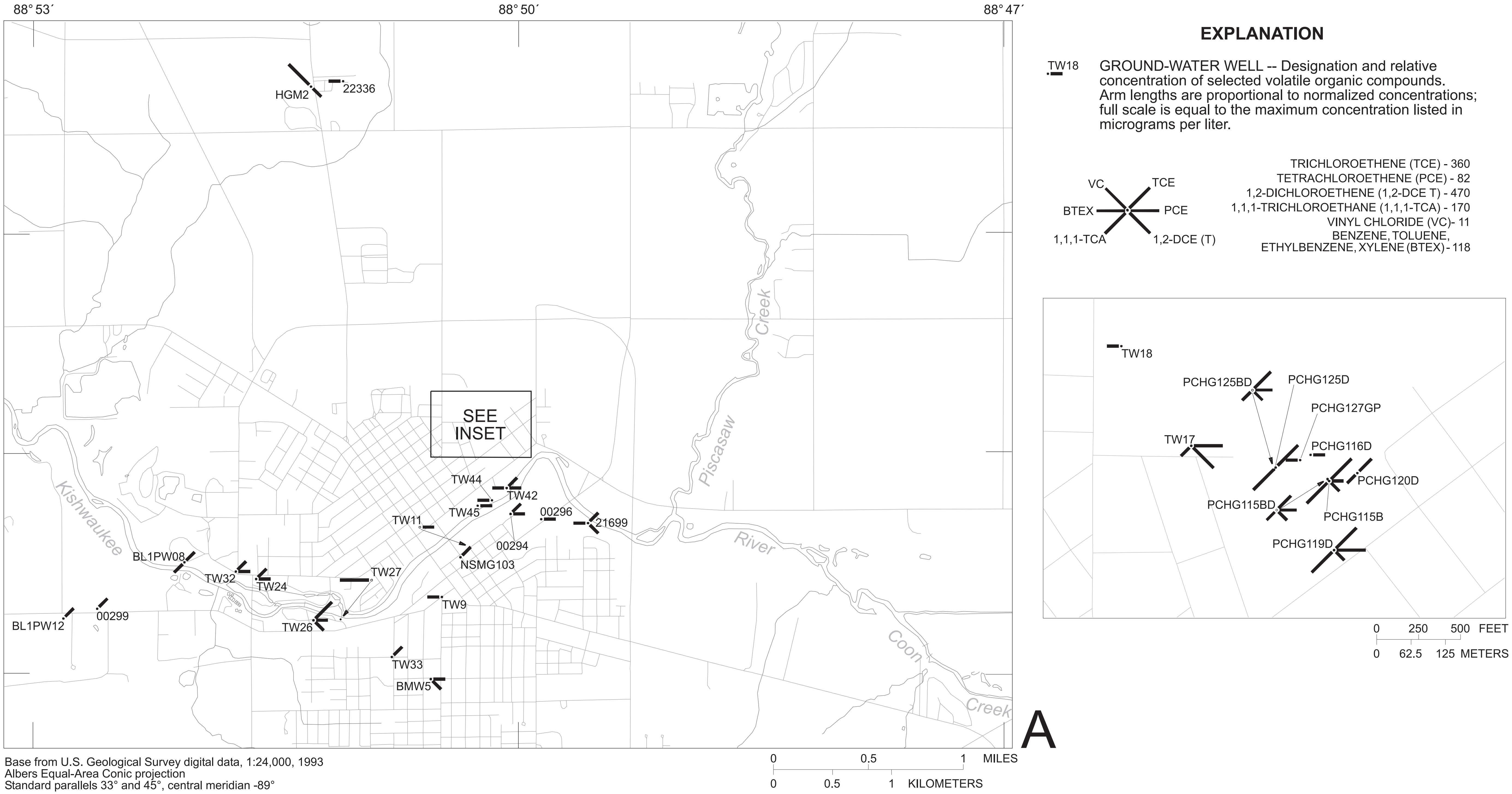
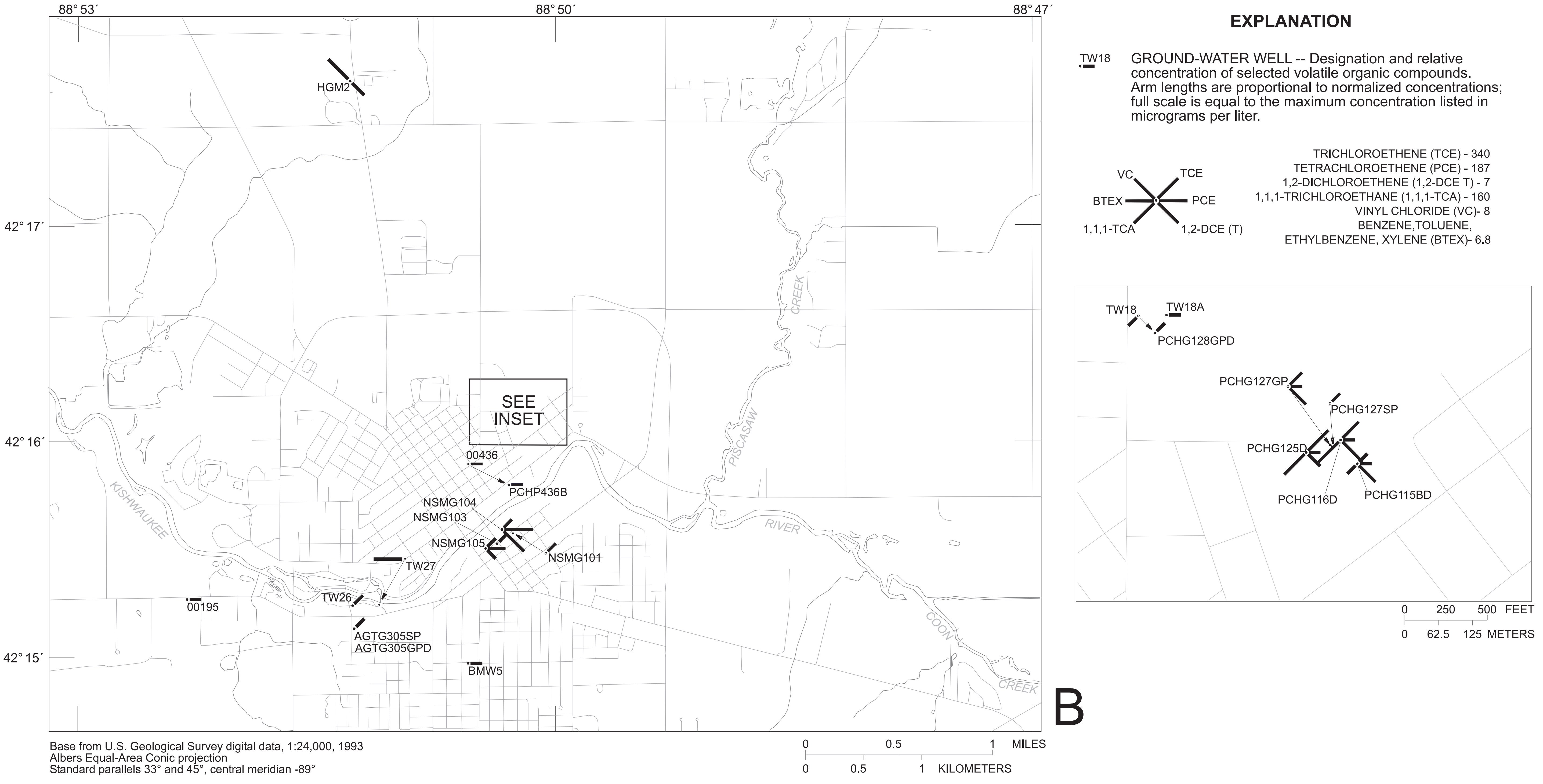


Figure 13. Total concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., May–June 1994, May–June 1995, and August–October 1996.



Base from U.S. Geological Survey digital data, 1:24,000, 1993
Albers Equal-Area Conic projection
Standard parallels 33° and 45°, central meridian -89°

Figure 14. Concentrations of selected volatile organic compounds in the aquifers underlying Belvidere, Ill., July 1993.



Base from U.S. Geological Survey digital data, 1:24,000, 1993
Albers Equal-Area Conic projection
Standard parallels 33° and 45°, central meridian -89°

Figure 14. Concentrations of selected volatile organic compounds in the aquifers underlying Belvidere, Ill., May–June 1994, May–June 1995, and August–October 1996.

In the following discussion of the water quality of the glacial drift and bedrock aquifers, analytical results are referenced to MCL's and other regulatory standards (app. 2). Such standards are established by the USEPA for protection of water resources supplied to the public from municipal wells. These standards do not apply to water supplied to most private wells and collected from monitoring wells.

Glacial Drift Aquifer

Field characteristics were determined from samples at 24 wells open to the glacial drift aquifer (table 5). pH values ranged from 6.6 to 8.0. Specific conductance ranged from 485 to 1,600 µS/cm. Conductance was above 1,000 µS/cm at wells near Belvidere Municipal Landfill No. 2 (BL2) and the road-salt storage facility (water-supply well HGM2), near the NSM facility on the south side of the Kishwaukee River (monitoring wells NSMG101–NSMG105), and near an industrial area (designated A) on the south side of the Kishwaukee River (temporary well TW33) (figs. 1 and 9). An industrial area is considered to contain at least two moderately sized industrial or commercial facilities. Specific-conductance values for all samples from wells NSMG101–NSMG105 were among the highest recorded in the study area (1,060–1,580 µS/cm) (table 5). DO concentrations ranged from 0.05 to 4.70 mg/L but generally were greater than 0.1 mg/L. Eh values ranged from –140 to 293 mv. The DO and Eh values at about 65 percent of the wells where values were measured indicate primarily oxidizing conditions in the aquifer. Negative Eh values, suggesting reducing conditions, generally were associated with the deepest wells. For most wells sampled multiple times, Eh values increased with time. Some negative values became positive indicating a possible change from reducing to oxidizing conditions. The increase in Eh values could be related to a recharge pulse associated with the elevated precipitation in 1993. The traveltime for such a pulse is consistent with estimated flow velocities in the aquifer. The variability in values also may be attributable to the difficulty in accurately measuring Eh (Hem, 1985).

Water samples collected from eight wells were analyzed for trace-metal and cyanide concentrations during sampling period 1 (July 1993) and 3 (May–June 1995) (table 6). All wells were within about 0.25 mi of the closed NSM facility or the closed Standard Brass facility (fig. 1). The Standard Brass facility engaged in metal plating (Illinois Environmental Protection Agency, 1987). The NSM facility had a foundry and also engaged in metal plating (Illinois Environmental Protection Agency, 1988). At present, part of the NSM facility property is used for metal recycling (fig. 1). One sample, from monitoring well NSMG105 (fig. 9) near the NSM facility, had a nickel concentration of 267 µg/L that was above the MCL of 100 µg/L and a chromium concentration of 98 µg/L that approached the MCL of 100 µg/L. Two samples, one from monitoring well NSMG105 and one from temporary well TW31 (fig. 9), had aluminum concentrations of 807 µg/L and 339 µg/L, respectively, that were above the SMCL of 200 µg/L. Concentrations of arsenic, copper, lead, selenium, vanadium, zinc (all less than 35 µg/L) and barium (less than 110 µg/L) were detected in samples from one or more wells.

Historical trace-metal and cyanide data for wells sampled in 1993–96 are available for monitoring wells NSMG103, NSMG104, and NSMG105 (Illinois Environmental Protection Agency, 1988) (table 6; fig. 9). Concentrations of antimony, cadmium, copper, lead, and cyanide have decreased and nickel have increased since these wells were sampled initially in 1988. At that time, the cadmium concentration was above the MCL (5 µg/L) in wells NSMG103 and NSMG104, and nickel was not detected (table 6).

Data from other wells that are in the area but were not included in this study indicate that in at least one sample from the wells, concentrations of antimony, arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, thallium, and cyanide were at or above MCL's. Concentrations of these constituents at levels of regulatory concern (at or above SMCL's) were detected in samples from as many as 50 percent of the wells at the three Superfund sites in the area (Roy F. Weston, Inc., 1988; Science Applications International Corporation, 1992; Clayton Environmental Consultants, Inc., 1996). All samples with high concentrations were collected from wells within about 500 ft of the Superfund sites. Generally, detection of the high concentrations in samples was intermittent. Chromium and nickel, components of the stainless-steel monitoring wells (along with manganese and iron), were detected at most of the sites. Manganese concentrations above the SMCL of 50 µg/L were detected in samples from the three Superfund sites; concentrations exceeded the SMCL in about 50 percent of the wells at the MDL Superfund site. Aluminum concentrations exceeded the SMCL of 200 µg/L in samples collected at the PCH and MDL Superfund sites (fig. 1). At the BL1 Superfund site (fig. 1), aluminum was detected in samples from all 25 wells open to the glacial drift aquifer. The maximum concentration was 91,300 µg/L.

Three private water-supply wells were sampled for chloride (table 5) following previous detection of high concentrations of this constituent at well HGM2 (Donald D. Grenke, Highland Garden of Memories, oral commun., 1993) (fig. 9). Chloride concentrations were 140 mg/L in the sample from well HGM2 and about 40 mg/L in samples from the nearby wells HGM1 and 20832. Chloride concentrations in the glacial drift aquifer at municipal well BMW9, about 0.75 mi southwest of the three private wells (fig. 9), range from about 8 to 29 mg/L (Brown and Mills, 1995). The private wells are within about 0.25 mi of BL2 and a road-salt storage facility (fig. 1).

Water samples collected from two wells at the NSM facility were analyzed for SVOC's during sampling period 3 (table 7; fig. 1). bis (2-Ethylhexyl) Phthalate was detected in both samples at a maximum concentration of 120 µg/L. However, because this compound was detected in the laboratory blank, it may be a laboratory contaminant. Three analine-type compounds, with a maximum concentration of 7 µg/L, and 3,3'-dichlorobenzidine (6 µg/L) were detected in the sample from monitoring well NSMG104 (fig. 9). MCL's have not been established for these compounds.

Historical SVOC data available for monitoring wells NSMG104 and NSMG105 (table 7) indicate that of the compounds detected during 1993–96, only bis (2-ethylhexyl) phthalate was detected previously (Illinois Environmental Protection Agency, 1988). In 1988, as many as six additional compounds were detected in samples from the wells, at a maximum concentration of 79 µg/L (diethyl phthalate, from well NSMG104).

Sampling and analysis of SVOC's has been completed at as many as seven hazardous-waste or industrial sites in the area, including extensive sampling at the three Superfund sites (fig. 1). As many as 20 water-supply wells previously have been sampled for analysis of SVOC's (Brown and Mills, 1995; Roy F. Weston, Inc., 1988; Science Applications International Corporation, 1992; Clayton Environmental Consultants, Inc., 1996). Thirty-five SVOC's have been detected at the BL1 Superfund site (fig. 1). The maximum concentration detected was 820 µg/L (phenanthrene). No MCL's have been established for most of the compounds detected. Concentrations of 12 of the compounds, detected in about 5 wells, were above Ambient Water Quality Criteria standards established under the Clean Water Act (Roy F. Weston, Inc., 1988). A ground-water-treatment system was installed at the BL1 Superfund site in 1991, after these data were collected. At the PCH Superfund site (fig. 1), six SVOC's with a maximum concentration of 210 µg/L (2-methylnaphthalene) were detected in water sampled from one well in the immediate vicinity of the former waste-disposal pond (Science Applications International Corporation, 1992). At all other hazardous-waste and industrial sites in the area, including the MDL Superfund site (Clayton Environmental Consultants, Inc., 1996) (fig. 1), about 30 recognized SVOC's were identified in samples at concentrations less than 30 µg/L (additional compounds were tentatively identified). The highest concentrations were associated with bis (2-ethylhexyl) phthalate, the frequently recognized laboratory contaminant.

Seventy-three water samples were collected from 63 wells during sampling periods 1–4 for analysis of VOC's (table 8). VOC's were detected in samples from 28 (44 percent) of the wells. Total concentrations of VOC's detected in the samples ranged from 0.9 µg/L (at temporary well TW18A) to 573 µg/L (at temporary well TW17) (figs. 9, 13, and 14). Well TW17 was about 500 ft west of the PCH Superfund site. Maximum concentrations and frequency of detections of the 24 VOC's detected are presented in table 9. 1,2-DCE had the highest concentration at 470 µg/L. TCE, PCE, 1,1,1-trichloroethane (1,1,1-TCA), and 1,2-DCE (identified either as a total concentration or an isomer concentration) were the most frequently detected VOC's, accounting for about 60 percent of the total detections. These VOC's also had the highest maximum concentrations. Concentrations were above MCL's at 11 wells for TCE (MCL is 5 µg/L), 6 wells for PCE (MCL is 5 µg/L), 1 well for 1,2-DCE (MCL is 70 µg/L for *cis*-1,2-DCE and 100 µg/L for *trans*-1,2-DCE), 1 well for vinyl chloride (MCL is 2 µg/L), and 1 well for benzene (MCL is 5 µg/L).

Generally, samples with the highest concentrations of one or more VOC's were from monitoring wells at the PCH Superfund site (fig. 1). One temporary well, TW17, was within 500 ft of the PCH Superfund site (fig. 9). High concentrations of VOC's also were detected at several other locations. TCE and PCE concentrations as high as 20 and 78 µg/L, respectively, were detected in samples from monitoring wells

NSMG104 and NSMG105, located in the immediate vicinity of the closed NSM facility on the south side of the Kishwaukee River (figs. 1, 13, and 14). TCE was detected at a concentration of 180 µg/L in a sample from temporary well TW26, located about 300 ft north of Industrial area A on the south side of the Kishwaukee River (figs. 1, 13, and 14). TCE (Robert B. Cannestra, The Earth Technology Corporation, oral commun., 1995) and BTEX compounds (James S. Paulson, Huff and Huff, Inc., oral commun., 1995) have been detected in the ground water underlying the western part of Industrial area A, near temporary well TW26. Maximum concentrations of the BTEX compounds were detected in a sample from temporary well TW27 (figs. 9, 13, and 14; table 9). This well also is within 500 ft of Industrial area A (fig. 1). A closed coal-gasification facility is south of temporary well TW27 (Larry Milner, Black and Veatch, Inc., oral commun., 1995). During installation of nearby temporary wells TW27 and TW27C (fig. 9), a black, oily substance and petroleum odor were detected. However, no VOC's were detected in the water sample collected from TW27C. Temporary well TW27 was installed adjacent to a sanitary sewer main, which also may have been a source for the VOC's.

Table 9. Maximum concentrations of volatile organic compounds in the glacial drift aquifer underlying Belvidere, Ill., 1993–96

[µg/L, micrograms per liter]

Volatile organic compound	Maximum concentration (µg/L)	Sampled well with maximum concentration	Number of wells in which compound detected
1,2-Dichloroethene[1]	470	TW17	4
Trichloroethene	280	PCHG119D	14
1,1,1-Trichloroethane	160	PCHG116D, PCHG125D	7
Tetrachloroethene	82	TW17	12
Benzene	53	TW27	1
Methylene chloride	42	TW23	3
Ethylbenzene	30	TW27	1
Xylene[1]	26	TW27	1
Toluene	[2]20, [3]9	[2]TW9, TW27	5
Vinyl chloride	11	HGM2	1
Dichlorofluoromethane	[4]10	HGM2	1
1,1-Dichloroethane	[3]8	TW17	2
Aldehyde	[5]6	TW12	1
cis-1,2-Dichloroethene	5	G116D	4
1,1-Dichloroethene	4	PCHG119D	3
Acetone	[3]4	TW30	1
Chloroform	[3]3	TW23	1
trans-1,2-Dichloroethene	2	NSMG104	1
2-Butanone	[2,3]2	TW9	1
Chloroethane	[3]1	HGM2	1
1,2-Dichloropropane	[3]1	NSMG105	1
1,2-Dichloroethane	[3].6	TW26	1
Bromodichloromethane	[3].5	TW18	1
Chlorodibromomethane	[3].4	TW18	1

[1] Total concentration of all isomers.

[2] Analysis of a soil sample collected after installation of the temporary well was terminated. Atmospheric screening of soil cuttings with an organic vapor analyzer indicated total concentrations of volatile organic compounds approaching 200 micrograms per liter.

[3] Estimated concentration is below the established reporting limit.

[4] Tentatively identified compound.

[5] Estimated concentration; tentatively identified compound.

Toluene, with a concentration of 20 µg/L, was detected in one soil sample collected during the attempted installation of temporary well TW9 (figs. 13 and 14). The well was on the grounds of a former school on the southwest edge of downtown Belvidere. Within about 500 ft of TW9, a leaking UST containing petroleum liquids previously had been removed.

Maximum concentrations of vinyl chloride and dichlorofluoromethane were detected in samples from private water-supply well HGM2, located north of Belvidere, and within about 0.25 mi of the BL2 site (figs. 1, 13, and 14; table 9). Vinyl chloride also has been detected in samples from two monitoring wells at the BL2 site (Ecology and Environment, Inc., 1990).

Maximum concentrations of 14 µg/L of TCE and 6 µg/L of PCE were detected in samples from two temporary wells (TW24, TW32) and a private hand-pumped water-supply well (BL1PW08) on the west side of Belvidere, north of the Kishwaukee River (figs. 13 and 14). The hand-pumped well and temporary wells are within 1,000–2,000 ft of a closed unregulated landfill (Illinois Environmental Protection Agency, 1989), the closed Standard Brass facility, and the BL1 Superfund site (fig. 1). Information is limited regarding the size of the landfill, the dates of waste disposal, or the type of waste that may have been disposed in the landfill.

At temporary well TW33, in the south-central part of Belvidere, no apparent source area is known for the VOC's (figs. 13 and 14). Industrial facilities within 500 ft of the well are downgradient, as indicated by the measurement of water levels in wells open to the glacial drift aquifer in July 1993.

VOC's were detected at only 3 of the 55 private water-supply wells that were sampled. Two of the wells (HGM2, 20832) are within about 0.25 mi of the BL2 site in the northern part of the study area, and one well (BL1PW08) is near the closed unregulated landfill (figs. 1 and 13). VOC's were not detected in the sample from a temporary well (TW31) located within 10 ft of well BL1PW08.

The VOC's were detected in water-supply wells with completion depths of about 80 ft below land surface. The depth of well BL1PW08 is unknown. VOC's were detected in monitoring wells with depths from 9 to 59 ft below land surface.

The types of VOC's detected in this study are similar to the VOC's detected in samples from wells that were not included in this study, particularly wells at hazardous-waste and industrial sites (Brown and Mills, 1995) (fig. 1). Maximum concentrations for ethylbenzene (32,000 µg/L) and xylene (4,500 µg/L, which represents the total concentration of the isomers *m*+*p*-xylene and *o*-xylene), detected in samples collected at the BL1 Superfund site in 1986, were substantially greater than those detected during this study (Roy F Weston, Inc., 1988). Maximum concentrations of vinyl chloride detected in samples from wells that were not included in this study also were greater than the concentrations detected during this study. Vinyl chloride concentrations of 28 µg/L and 91 µg/L, respectively, were detected in samples from the MDL and PCH Superfund sites (Clayton Environmental Consultants, Inc., 1996; Science Applications International Corporation, 1996) (fig. 1). During the study, trichlorofluoromethane (TCFM) was detected at a concentration of 2 µg/L in monitoring well PCHG128GPS, open to the Galena-Platteville aquifer. However, TCFM was not detected in samples from the glacial drift aquifer. TCFM was detected, at a maximum concentration of 15 µg/L, while installing monitoring well PCHG128GPS (fig. 9). Well PCHG128GPS is near municipal well BMW6 and industrial area D (fig. 1). Concentrations of other VOC's detected in ground water at the hazardous-waste and industrial sites not included in this study generally are lower than the concentrations detected at the PCH Superfund site and the NSM facility, both of which were included in the study. VOC's detected in ground water at all hazardous-waste and industrial sites not included in this study appear to be restricted to wells within about 1,000 ft of the sites.

Historical VOC data were available for 13 wells included in this study (table 8). At the PCH Superfund site (fig. 1), no temporal trend in the concentrations of VOC's could be identified in samples from four monitoring wells (PCHG116D, PCHG119D, PCHG120D, PCHG125D) (fig. 9). However, for most of the wells, the highest concentrations were detected in the early part of the sampling period of 1989–95. Near the closed NSM facility (fig. 1), the lowest concentrations of VOC's in samples from three of four monitoring wells (NSMG103, NSMG104, NSMG105) (fig. 9) were collected in 1996. The decrease in concentrations may be attributed to the initiation of limited pumping of two nearby (within 500 ft) municipal wells (BMW2 and BMW3) (fig. 1) in 1996 (Jim Grimes, Belvidere Water and Sewer Department, oral commun., 1996). Concentrations of VOC's in samples from two temporary wells (TW26 and TW27) installed near Industrial area A on the south side of the Kishwaukee River (figs. 1 and 9), decreased between sampling periods 1 and 2. The differences in concentrations may be attributed to differences in sample depths and ground-water levels during the two sampling periods (table 2). Trends in VOC concentrations at the other wells in the study area were not apparent.

Galena-Platteville Aquifer

Field characteristics were determined from samples at 16 wells open to the Galena-Platteville aquifer (table 5). pH values ranged from 6.7 to 7.5. Specific conductance ranged from 485 to 970 µS/cm. DO concentrations ranged from 0.05 to 6.5 mg/L but generally were less than 0.1 mg/L. Eh values ranged from –113 to 289 mv. The DO and Eh at about 60 percent of the wells in which values were measured indicate primarily oxidizing conditions in the aquifer. Although the values at some wells sampled multiple times varied between negative and positive, indicating possible changes in oxidation-reduction conditions in the aquifer; the few number of wells sampled multiple times preclude analysis of general trends. The variability in values also may be attributable to the difficulty in accurately measuring Eh (Hem, 1985).

Water samples collected from three wells were analyzed for trace metals and cyanide during sampling periods 1 and 3 (table 6). Concentrations of arsenic, chromium, lead (all less than 15 µg/L), aluminum, barium, copper, and zinc (all less than about 130 µg/L) were detected in samples from one or more of the wells. All concentrations of the trace metals and cyanide were below MCL's.

Historical trace-metal and cyanide data for the wells sampled during 1993–96 are available for private water-supply well BL1PW10 (fig. 9) (Roy F. Weston, Inc., 1988). Trace-metal and cyanide concentrations have remained low since the well was originally sampled in 1986.

Historical trace-metal and cyanide data available for wells in the area that were not included in this study (Brown and Mills, 1995) indicate that concentrations of these constituents were below MCL's. Manganese, at a maximum concentration of 382 µg/L, and aluminum, at a maximum concentration of 2,860 µg/L, periodically were above the SMCL's in samples from the four monitoring wells open to the upper 20 ft of the Galena-Platteville aquifer at the MDL Superfund site (fig. 1) (Clayton Environmental Consultants, Inc., 1996). Concentrations of aluminum also were above the SMCL in one sample at the BL1 Superfund site (fig. 1) (Roy F. Weston, Inc., 1988).

Water samples collected from two wells were analyzed for SVOC's during sampling period 3 (table 7). bis (2-Ethylhexyl) Phthalate was detected in each sample at a maximum concentration of 73 µg/L. However, because detected in the laboratory blank, this compound may be a laboratory contaminant. Other SVOC's were not detected in samples.

Historical SVOC data are unavailable for the wells sampled in 1993–96. Data for wells that were not included in this study (Brown and Mills, 1995) indicate intermittent detection of similar compounds in samples from wells typically located at hazardous-waste and industrial sites. The SVOC concentrations did not exceed 30 µg/L. The highest concentrations were associated with bis (2-ethylhexyl) phthalate.

Forty water samples were collected from 30 wells during sampling periods 1–4 for analysis of VOC's (table 8). VOC's were detected in samples from 14 (47 percent) of the wells. Total concentrations of VOC's in the samples ranged from 0.8 µg/L, at private water-supply well 00195, to 563 µg/L, at monitoring well PCHG115B. Well PCHG115B is at the PCH Superfund site (figs. 1 and 13). Maximum concentrations and frequency of detections of the 18 types of VOC's that were detected are presented in table 10. TCE had the highest concentration at 360 µg/L. TCE, PCE, and 1,2-DCE (identified either as a total concentration or as *cis*-1,2-DCE) were the most frequently detected VOC's, accounting for about 50 percent of the detections. Excluding methylene chloride, a suspected laboratory contaminant, 1,1,1-TCA and PCE had the second and third highest maximum concentrations, respectively. TCE concentrations were above MCL's in samples from five wells. PCE concentrations were above MCL's in samples from three wells.

Samples with maximum or near-maximum concentrations of one or more VOC's were collected from monitoring wells at the PCH Superfund site (fig. 1). At other locations, the maximum concentration of a VOC detected was 66 µg/L of methylene chloride (private water-supply well 21699) (fig. 13a). Assuming this compound is a laboratory contaminant, the maximum concentration of a VOC in ground water from locations other than the PCH Superfund site was 6 µg/L of TCE (private water-supply well 00299) (figs. 13 and 14).

Table 10. Maximum concentrations of volatile organic compounds in the Galena-Platteville aquifer underlying Belvidere, Ill., 1993–96

[µg/L, micrograms per liter]

Volatile organic compound	Maximum concentration (µg/L)	Sampled well with maximum concentration	Number of wells in which compound detected
Trichloroethene	360	PCHG115B	9
1,1,1-Trichloroethane	170	PCHG115B	3
Methylene chloride	66	21699	1
Tetrachloroethene	31	PCHG125BD	7
1,1-Dichloroethene	14	PCHG115B	3
1,2-Dichloroethene[1]	9	PCHG115B	4
1,1-Dichloroethane	[2]7	PCHG115BD	4
cis-1,2-Dichloroethane	4	PCHG115BD	2
Bromodichloromethane	3	421456	1
Chlorodibromomethane	[2]3	421456	1
Chloroform	[2]2	421456	1
Trichlorofluoromethane	[3]2	PCHG128GPS	1
1,1,2-Trichloro-1,2,2-trifluoroethane[4]	2	AGTG305GPS	1
Xylene[5]	[2]2	21699	1
Ethylbenzene	[2]1	21699	1
Toluene	[2]1	21699	2
1,1,2-Trichloroethane	[2]1	PCHG115BD	1
Dichlorofluoromethane	[3].6	PCHG128GPS	1

[1] Total concentration of the isomers *cis*-1,2-dichloroethene and *trans*-1,2-dichloroethene.

[2] Estimated concentration is below the established reporting limit.

[3] Estimated concentration; tentatively identified compound.

[4] 1,1,2-trichloro-1,2,2-trifluoroethane. Estimated concentration; tentatively identified compound.

[5] Total concentration of all isomers.

TCE or PCE were detected at concentrations that did not exceed 6 µg/L in samples from three private water-supply wells (00195, 00299, and BL1PW12) open to the Galena-Platteville aquifer west of Belvidere (figs. 13 and 14). VOC's were not detected in samples from temporary wells adjacent to wells 00299 and BL1PW12, and open to the overlying glacial drift aquifer. A closed industrial facility, several warehouses and material-distribution facilities, a rail-switching yard, and a fertilizer-distribution facility are within 100–300 ft east and 500–2,000 ft south of the three wells. The facilities south of the wells are upgradient (figs. 1 and 9; pls. 1 and 2). BTEX compounds have been detected in the ground water from the fine-grained glacial-drift deposits and the Galena-Platteville aquifer that underlie an automobile-assembly facility about 1 mi south of the sampled wells. Although TCE has not been detected, low concentrations of other chlorinated solvents have been detected in soil samples at the facility (Fred C. Hart Associates, Inc., 1986; GZA GeoEnvironmental, Inc.,1993; Brown and Mills, 1995).

TCE was detected at a concentration of 1 µg/L in samples from two monitoring wells open to a bedding-plane fracture at a depth of about 255 ft below land surface (525 ft above sea level) (Mills and others, 1998). Well PCHG128GPD (fig. 9) is within 50 ft of Belvidere municipal well BMW6 and about 1,000 ft of Industrial area D and the PCH Superfund site (fig. 1). Industrial area D includes industrial, construction, and fertilizer-distribution facilities. Well AGTG305GPD (fig. 9) is within Industrial area A (fig. 1).

Only fluorinated hydrocarbons, at concentrations of 2 µg/L or less, were detected in samples from monitoring wells open to a bedding-plane fracture at a depth of about 120 ft below land surface (660 ft above sea level) (Mills and others, 1998). Monitoring wells PCHG128GPS and AGTG305GPS, respectively (fig. 9; table 8), are nested vertically with the wells open to a fracture at about 250 ft below land surface. TCE and BTEX compounds have been detected in samples from wells within 200 ft of AGTG305GPS and AGTG305GPD in the glacial drift aquifer (Robert B. Cannestra, The Earth Technology Corporation, oral commun., 1995; James S. Paulson, Huff and Huff, Inc., oral commun., 1995).

Concentrations of three BTEX compounds (each 2 µg/L or less), TCE (1 µg/L), and 1,2-DCE (1 µg/L) were detected in samples from a private water-supply well (21699) located on the northeast side of Belvidere (figs. 13 and 14). The nearest possible source area(s) for the VOC's appear to be Industrial area E or the NSM facility, about 1,000 and 3,000 ft west of the well, respectively (fig. 1). Industrial area E includes a food-processing facility, machine shops, and metal-recycling facilities. However, despite the relative proximity of these possible source areas to well 21699, the areas appear to be crossgradient to downgradient from well 21699. In addition, VOC's were not detected in the water sample from water-supply well 00401, located between well 21699 and the possible source areas (fig. 9). Well 00401 is within 500 ft of well 21699 and is open to a similar depth in the aquifer (table 1). A site near well 21699 may have been used for illegal disposal of wastes in past years (Francis R. James, private-well owner, oral commun., 1993). No verifiable information is available regarding the presence, location, or size of this site; the dates of waste disposal; or the type of waste that may have been disposed at the site.

VOC's were detected in samples from six private water-supply wells and eight monitoring wells. The water-supply wells ranged in depth from 120 to 215 ft below land surface. The monitoring wells ranged in depth from 48.6 to 293.9 ft below land surface.

Historical VOC data are available for nine monitoring wells sampled during the study, including four at the PCH Superfund site and five elsewhere within the city of Belvidere (fig. 1). At the PCH Superfund site, VOC concentrations in samples from a well open to the uppermost part of the Galena-Platteville aquifer (PCHG115B) fluctuated during the sampling period of 1989–95 (fig. 9; table 8). TCE concentrations, for example, fluctuated between 95 and 400 µg/L. VOC concentrations generally decreased in samples from wells open to the middle and lower part of the aquifer (PCHG115BD, PCHG125BD, PCHG127GP) (fig. 9; table 8). TCE concentrations, for example, decreased from one to two orders of magnitude. Decreases in the VOC concentrations may be attributed to movement away from the source area and natural attenuation. Vinyl chloride, an expected degradation compound, was detected during the most recent sampling in 1995 (Science Applications International Corporation, 1996). Trends in VOC concentrations at other wells sampled in the study were not identified. A few chlorinated and fluorinated hydrocarbons have been detected intermittently at low concentrations.

Few VOC data are available for wells open to the Galena-Platteville aquifer at hazardous-waste and industrial sites in the study area other than the PCH Superfund site (Brown and Mills, 1995; Clayton Environmental Consultants, Inc., 1996). One well is at the BL1 Superfund site and 12 wells are at the MDL Superfund site (fig. 1). No wells penetrate more than the top 25 ft of the aquifer. VOC's were not detected in samples from the well at the BL1 Superfund site. Detections of VOC's at the MDL Superfund site include 1,2-dichloroethane at 190 µg/L (which was not detected in subsequent samples from the well), chloroethane at a maximum concentration of 21 µg/L, and various other VOC's at concentrations typically less than 5 µg/L.

St. Peter Sandstone Aquifer

Field characteristics were determined from samples at five wells open to the St. Peter Sandstone aquifer (table 5). pH values ranged from 6.8 to 7.7. Specific conductance ranged from 547 to 932 µS/cm. DO concentrations ranged from 0.00 to 0.28 mg/L. Eh values ranged from −197 to 113 mv. The few number of wells sampled precludes analysis of oxidation-reduction conditions in the aquifer. Monitoring well PCHG127SP (fig. 9) was sampled four times during 1993–96. Eh fluctuated over a wide range of negative and positive values. The variability in values may be attributable to the effects of nearby municipal-well pumping on water levels in the well or to the difficulty in accurately measuring Eh (Hem, 1985).

One water sample collected from monitoring well AGTG305SP (fig. 9) was analyzed for trace metals and cyanide during sampling period 3 (table 6). Low concentrations of antimony, arsenic (each 0.3 µg/L) and barium (59 µg/L) were detected. Historical trace-metal- and cyanide-concentration data are unavailable from this or other wells in the study area for analysis of temporal trends.

One water sample collected from monitoring well AGTG305SP was analyzed for SVOC's during sampling period 3 (table 7). bis (2-Ethylhexyl) Phthalate was the only compound detected in the sample, at a concentration of 24 µg/L. Historical

SVOC-concentration data are unavailable from this or other wells in the study area for analysis of temporal trends.

Eight water samples collected from five wells during sampling periods 1–4 for analysis of VOC's (table 8). VOC's were detected in samples from two (40 percent) of the wells. Maximum concentrations of the three VOC's that were detected are presented in table 11. All concentrations were below MCL's with none exceeding 3 µg/L. TCE was detected in samples collected during sampling period 3 from monitoring well AGTG305SP and during sampling period 4 from monitoring well PCHG127SP (figs. 13 and 14). Both wells are open to the top 10 ft of the aquifer and are in industrial areas (AGTG305SP in Industrial area A and PCHG127SP at the PCH Superfund site (fig. 1)). TCE has been detected in samples from wells within 200 ft of AGTG305SP and PCHG127SP in the overlying Galena-Platteville and glacial drift aquifers (Robert B. Cannestra, The Earth Technology Corporation, oral commun., 1995; Mills, 1993a, b, c; Science Applications International Corporation, 1992). Toluene and methylene chloride also were detected in the sample from well PCHG127SP. Methylene chloride is a suspected laboratory contaminant. Six wells open to the St. Peter Sandstone aquifer in the study area were not sampled. The wells are private water-supply wells located at least 5,000 ft from any known or potential sources of VOC's (Brown and Mills, 1995).

Historical water-quality data are available for monitoring well PCHG127SP (fig. 9; table 8). TCE, at a concentration of 880 µg/L, and numerous other compounds were detected during initial sampling in 1992 (Mills, 1993a). VOC's were not detected in subsequent samplings until October 1995, when TCE (0.8 µg/L) and high concentrations of BTEX compounds (maximum concentration was 270 µg/L, toluene) were detected (Science Applications International Corporation, 1996). Toluene and xylene also were detected in a quality-assurance blank collected in October 1995, indicating that the high concentrations of BTEX compounds may not represent the water quality of the aquifer.

Table 11. Maximum concentrations of volatile organic compounds in the St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers underlying Belvidere, Ill., 1993–96

[µg/L, micrograms per liter]

Volatile organic compound	Maximum concentration[1] (µg/L)	Sampled well with maximum concentration	Aquifer in which well is open
Trichloroethene	3	PCHG127SP	St. Peter Sandstone
do.	2	00294	Cambrian-Ordovician
Tetrachloroethene	2	00296, BMW5	Ordovician
Methylene chloride	2	PCHG127SP	St. Peter Sandstone
Toluene	2	PCHG127SP	St. Peter Sandstone
do.	1	22336	Ordovician
1,1-Dichloroethene	1	BMW5	Ordovician

[1] Estimated concentrations; below the established reporting limits.

Ordovician and Cambrian-Ordovician Aquifers

Field characteristics were determined from samples at 10 wells open to the Cambrian and Cambrian-Ordovician aquifers (table 5). pH values ranged from 6.7 to 7.9. Specific conductance ranged from 550 to 790 µS/cm. DO concentrations ranged from 0.04 to 5.45 mg/L. The highest concentration of DO was associated with municipal well BMW6. The relatively high concentration of DO in the sample from this 610-ft deep well could indicate that air is being entrained in the pumped water. Eh values ranged from –230 to 254 mv. The highest Eh value was associated with municipal well BMW4. No apparent explanation is available for the relatively high Eh value associated with this 1,800-ft deep well.

One water sample collected from municipal well BMW4 was analyzed for trace metals and cyanide during sampling period 1 (fig. 1; table 6). Low concentrations of aluminum, barium, zinc (all less than about 200 µg/L), and lead (less than 2 µg/L) were detected. Lead and zinc were not detected when the well water was sampled in 1985 by the city of Belvidere (Brown and Mills, 1995). Review of available data from well BMW4 and the other municipal wells open to the Cambrian and Cambrian-Ordovician aquifers indicates that the concentrations of all trace metals and cyanide are consistently below MCL's (Brown and Mills, 1995). No samples were collected for analysis of SVOC's from wells open to the Ordovician and Cambrian-Ordovician aquifers during 1993–96. Historical SVOC data also are unavailable.

Fifteen water samples collected from 14 wells during sampling period 1–4 for analysis of VOC's (table 8). VOC's were detected in samples from four (29 percent) wells. Maximum concentrations of the four VOC's detected are presented in table 11 (tentatively identified VOC's are not included in the table). All concentrations were below MCL's. Total concentrations of VOC's in all samples did not exceed 3 µg/L. One well where VOC's were detected is open to the Cambrian-Ordovician aquifer (industrial water-supply well 00294), and three wells are open to the Ordovician aquifer (Belvidere municipal well BMW5, industrial water-supply well 00296, and private water-supply well 22336) (figs. 1, 13, and 14; table 8). PCE, the most frequently detected compound, was detected in samples from three of the wells.

The wells where VOC's were detected were not always in close proximity to known or potential source areas for the VOC's. Distances from potential source areas ranged from about 500 ft (private water-supply well 22336 from the BL2 site) to about 0.5 mi (Belvidere municipal well BMW5 from Industrial area A) (figs. 1 and 13).

VOC data available for wells not included in this study (Brown and Mills, 1995) indicate that VOC's are detected intermittently in samples from all of the Belvidere municipal wells (table 8, fig. 1). VOC's also are detected intermittently in samples from industrial water-supply wells 00294 and 00296 (Clay Simonson, Illinois Department of Public Health, oral commun., 1993). Concentrations of the detected VOC's are below MCL's and similar to concentrations detected during sampling period 1.

Between 1985, when sampling and analysis for VOC's at the Belvidere municipal wells began, and about 1993, when use of the wells stopped temporarily, concentrations of TCE and PCE in samples from municipal wells BMW2 and BMW3 regularly exceeded MCL's (Brown and Mills, 1995) (table 8, fig. 15). During this period, the maximum total concentrations of VOC's in samples from wells BMW2 and BMW3 were 23.5 and 40 µg/L, respectively (well BMW2 in 1990; well BMW3 in 1989). These wells are in the immediate vicinity of the closed NSM facility (fig. 1). Similar VOC's have been detected in nearby monitoring wells open to the overlying glacial drift aquifer (NSMG101–NSMG105) (fig. 9). In 1997, the wells were outfitted with an air-stripper to eliminate VOC's in water supplied to the public (Jim Grimes, Belvidere Water and Sewer Department, oral commun., 1996).

At the other municipal wells in Belvidere, concentrations of three VOC's exceeded MCL's on one occasion. The VOC's include TCE (well BMW6), benzene (wells BMW4 and BMW7), and dichloromethane (well BMW5). The maximum total concentrations of VOC's detected in other municipal wells during 1985–93 were 69 µg/L at well BMW4 (in 1987) and 21.1 µg/L at well BMW6 (in 1991) (table 8).

FACTORS AFFECTING DISTRIBUTION OF INDUSTRIAL CONSTITUENTS

Analysis of the hydrogeologic and water-quality data collected from the aquifers underlying the city of Belvidere and vicinity permits identification of possible source areas and receptors for the industrial constituents detected in the aquifers, and factors that may affect distribution of the constituents in the aquifers. The following interpretations should be considered preliminary and as a basis for future site-specific investigations. The biologic, aqueous-geochemical, and hydrogeologic factors that may affect the spatial and temporal distribution of the industrial constituents are considered only to a limited extent, and the available water-quality and hydrogeologic data were collected in a regional context.

Trace metals and SVOC's are not widely distributed in the aquifers underlying Belvidere. These constituents have been detected at concentrations above MCL's primarily at two Superfund sites. Typically, high concentrations of trace metals and SVOC's are limited to the glacial drift aquifer in the vicinity of the source sites. Interpretations regarding the distribution of trace metals and SVOC's may be biased by the few data available from sites other than the Superfund sites and the Belvidere municipal water-supply wells.

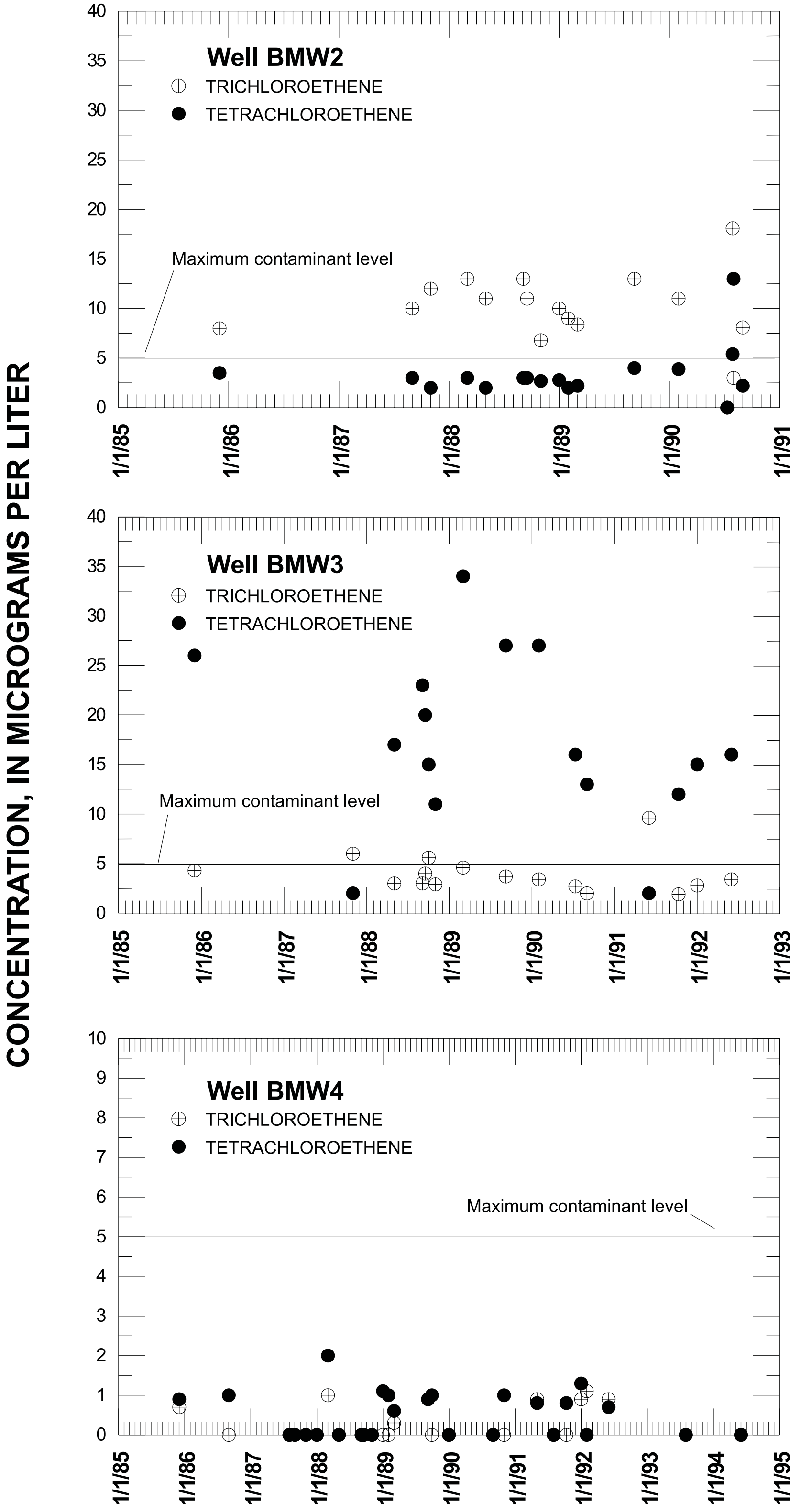


Figure 15. Concentrations of trichloroethene and tetrachloroethene in ground water at selected municipal wells in Belvidere, Ill., 1985–94.

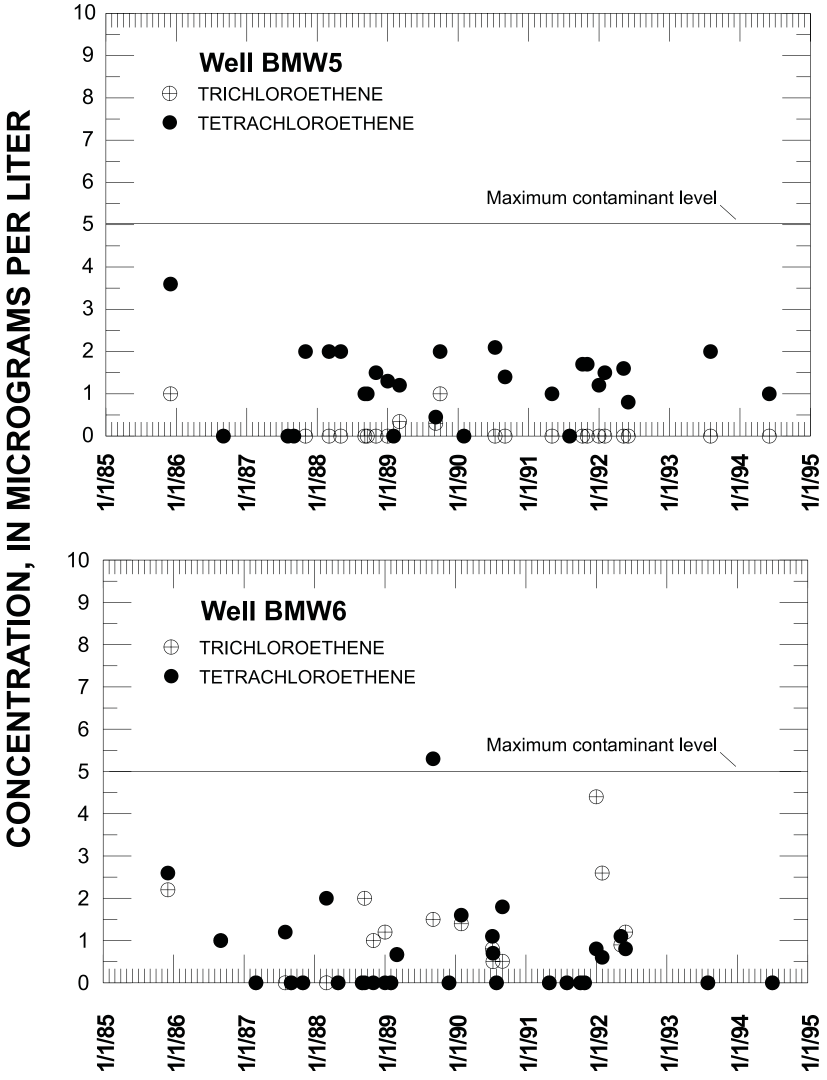


Figure 15. Continued.

Several factors may account for the limited movement of trace metals and SVOC's in ground water. Sorption likely restricts the mobilization of the trace metals (Science Applications International Corporation, 1992). Ion exchange within the organic materials and fine-grained sediments, primarily clay, in the glacial deposits that compose the unsaturated zone and glacial drift aquifer restrict movement of trace metals. Under appropriate hydrogeologic and aqueous-chemical conditions, fixation by precipitation reactions also may account for the limited movement of trace metals. Fixation is controlled primarily by the aqueous chemistry and the Eh of the soil- or ground-water system. Fixation is most likely to occur in soil- and ground-water systems with high concentrations of trace metals, such as the shallow glacial drift aquifer underlying the hazardous-waste sites.

The mobilization of SVOC's may be restricted by their low solubility and propensity for sorbing to organic materials and fine-grained sediments, primarily clay (Science Applications International Corporation, 1992). Organic materials and fine-grained sediments are readily available in the glacial deposits in the study area. Although usually a slow process, biodegradation in the biologically active parts of the glacial drift aquifer also may limit the concentrations of SVOC's that move to the deeper bedrock aquifers, where biological activity is lower. Although there is no current evidence of such conditions in the study area, chemical oxidation in waters with sufficient concentrations of chlorine or ozone also may be an important process affecting the fate of some SVOC's (Science Applications International Corporation, 1992).

Remediation activities also may contribute to the limited movement of trace metals and SVOC's in the study area. The BL1 Superfund site (fig. 1), the site with the greatest number of detections and highest concentrations of SVOC's and trace metals above MCL's, has a pumping system that intercepts ground-water flow from the site. The collected ground water is treated at the Belvidere Wastewater Plant to remove industrial constituents that have moved from the site (Richard Lanham, Illinois Environmental Protection Agency, oral commun., 1997).

VOC's are the principal industrial constituents affecting ground-water quality in the vicinity of Belvidere. VOC's have been detected in each of the aquifers underlying Belvidere, including the glacial drift, Galena-Platteville, Ordovician, and Cambrian-Ordovician aquifers. The number of detections, types, and concentrations of VOC's detected generally decrease in relation to the depth of the aquifer below land surface (table 12). As VOC's are detected in increasingly deeper aquifers, the lateral distance of the detections generally increases from known or potential sources.

Table 12. Types and maximum concentration of volatile organic compounds in the glacial drift and bedrock aquifers underlying Belvidere, Ill., 1993–96

Aquifer	Types of volatile organic compounds	Maximum concentrations of volatile organic compounds (micrograms per liter)
Glacial drift	24	470
Galena-Platteville	18	360
St. Peter Sandstone	3	3
Ordovician	3	2
Cambrian-Ordovician	1	2

During the study, most VOC's were detected in the glacial drift aquifer, within about 1,000 ft and downgradient from known or potential sources (typically a Superfund site or an industrial area), and within about 0.5 mi of the Kishwaukee River. VOC's were detected in two wells open to the glacial drift aquifer in the Troy Bedrock Valley, about 2.5 mi north of the Kishwaukee River. The wells are downgradient from the BL2 site and a road-salt facility. A few wells open to the glacial drift aquifer were far from either known or potential source areas. The VOC's detected in samples from most of these wells are suspected well-disinfectant byproducts (chloroform, bromodichloromethane, chlorodibromomethane) or laboratory contaminants (methylene chloride, acetone).

Generally, VOC concentrations were higher and the number and type of VOC's detected were greater in the glacial drift aquifer than in the Galena-Platteville aquifer and deeper bedrock aquifers. VOC concentrations at most locations in the Galena-Platteville aquifer and in the St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers did not exceed 5 μg/L. The high concentrations and spatial distribution of VOC's in the glacial drift aquifer usually were related to nearby sources of contamination. Except in the immediate vicinity of a known hazardous-waste site, possible sources of VOC's in the bedrock aquifers were difficult to identify.

TCE and PCE were the most frequently detected VOC's, and the concentrations of these constituents were the highest or among the highest detected in each of the aquifers underlying Belvidere. 1,2-DCE (identified either as a total concentration or as an isomer concentration) and 1,1,1-TCA also were detected frequently and at relatively high concentrations in each of the aquifers. BTEX compounds were detected at relatively high concentrations at one location in the glacial drift aquifer and at lower concentrations at four other locations. Where BTEX compounds were detected in the bedrock aquifers, the concentrations were low (fig. 14). In other studies in the area, BTEX compounds, particularly benzene, commonly have been detected at relatively high concentrations in the glacial drift aquifer; the highest concentrations have been detected at the BL1 Superfund site (Roy F. Weston, Inc., 1988). With the exception of TCE and PCE, benzene was the most frequently detected VOC above the MCL in samples from Belvidere municipal wells that are open to the Cambrian-Ordovician aquifer.

The synoptic study confirmed that the three Superfund sites (fig. 1) are principal source areas for the input of VOC's into ground water in the vicinity of Belvidere. The closed BL2 site and NSM facility (fig. 1) also are likely source areas for VOC's, as are the five industrial areas discussed below (fig. 1).

Industrial area A contains at least two industrial facilities and a petroleum-distribution facility. Previously, a petroleum-distribution facility and a coal-gasification facility operated in the area. TCE, petroleum, and petroleum-related compounds have been detected in the soils and ground water underlying the area. Belvidere municipal well BMW5, which is open to the Ordovician aquifer, is about 3,000 ft southeast of the area. Since analysis for VOC's began in 1985, PCE has been detected intermittently at concentrations below the MCL in water samples from the well (table 8).

Industrial area B contains an unregulated landfill, the Standard Brass metal-plating facility, and a cemetery. The landfill and Standard Brass facility are not in operation. Organic compounds, including TCE, and trace metals have been detected in the soils and ground water underlying the area.

Industrial area C contains a closed industrial facility, a rail-switching yard, a fertilizer-distribution facility, and warehouses. An automobile-assembly facility and Belvidere municipal well BMW8 are about 1 mi south of this industrial area. BTEX compounds and other VOC's have been detected in the soils, the partially saturated fine-grained glacial-drift deposits, and the Galena-Platteville aquifer underlying the area. VOC's have been detected infrequently at concentrations below MCL's in water samples from well BMW8 (table 8). The well is open to the St. Peter Sandstone and deeper aquifers.

Industrial area D contains operating industrial and commercial facilities and a closed rail yard that once included storage and repair facilities. Belvidere municipal well BMW6, which is open to the Cambrian-Ordovician aquifer, also is in the area. North of the well are a foam-board-insulation manufacturing facility, a fertilizer-distribution facility, and an asphalt-production facility. Southeast of the well are three or more industrial facilities and the PCH Superfund site. VOC's, including TCE, PCE, *cis*-1,2-DCE, 1,1,1-TCA, and TCFM (used in the manufacture of foam-board insulation) have been detected intermittently in samples from the glacial drift aquifer and well BMW6. Concentrations typically are below MCL's (table 8). 1,1,1-TCA and PCE also were detected at low concentrations in samples from the glacial drift aquifer collected within 150 ft of well BMW6. VOC's were not detected in a sample from the glacial drift aquifer collected about 1,000 ft north of well BMW6. With the exception of TCFM, the VOC's listed above were detected at concentrations substantially above MCL's in samples collected in the vicinity of the industrial facilities and the PCH Superfund site southeast of well BMW6. The affected wells are open to the glacial drift and Galena-Platteville aquifers, and possibly to the St. Peter Sandstone aquifer.

Industrial area E contains a food-processing facility, machine shops, and metal-recycling facilities. The area is east of Belvidere municipal wells BMW2 and BMW3, and the closed NSM facility. In addition, an unregulated landfill may have operated in this area. VOC's were detected at concentrations below MCL's in a sample from a private water-supply well open to the Galena-Platteville aquifer.

Additional source areas may be present within the city limits of Belvidere. VOC's were detected at concentrations below MCL's at isolated locations throughout the city. As of 1992, eight sites in Belvidere were listed by IEPA as leaking UST sites (Brown and Mills, 1995). Site investigations at most of the sites were limited to soil sampling and removal of soils containing BTEX compounds. VOC's were detected in the underlying ground water at only three of the sites (Brown and Mills, 1995). At each site, the investigation was limited to the property boundaries of the site.

Several factors may account for the low concentrations of VOC's detected at sites without apparent nearby sources. These factors include (1) sources that may be remote from the sample locations; (2) relatively small source volumes to ground water; (3) relatively low source concentrations; and (4) sources that were not recent, allowing for natural attenuation by dilution, dispersion, and volatization, or biodegradation processes.

The locations of the source areas for the VOC's; the biologic, aqueous-geochemical, and hydrogeologic characteristics of the aquifers; and the physical characteristics of the detected VOC's likely are factors that account for the more restricted lateral distribution, greater number of detections, and higher concentrations of VOC's in the glacial drift aquifer than in the deeper bedrock aquifers. Some of these factors also may contribute to the general association of various types of VOC's within specific aquifers.

Most of the identified source areas of VOC's are within about 1,000 ft of the Kishwaukee River, the principal discharge outlet for ground-water flow in the glacial drift aquifer (fig.1, pl. 1). Apparently, VOC's and other constituents discharge to the river before there is substantial downward movement into the bedrock aquifers. Horizontal hydraulic conductivities in the Galena-Platteville aquifer typically are lower than conductivities in the glacial drift aquifer (Mills and others, 1998), suggesting that the vertical movement of ground water and any contained industrial contaminants from the glacial drift aquifer to the Galena-Platteville aquifer is restricted. Where fine-grained sediments are present in the glacial drift aquifer, vertical movement of VOC's and other constituents into the underlying Galena-Platteville aquifer is restricted further. The concentrations of BTEX compounds are low in the bedrock aquifers. Because of their low density, BTEX compounds tend to float on the free-water surface within the glacial drift aquifer. Aerobic conditions that generally are present within the aquifer, as indicated by DO concentrations greater than about 1 mg/L and positive values of Eh, enhance the degradation of these compounds and further restricts their lateral and vertical distribution.

Several factors may account for the wide distribution and low concentrations of VOC's, such as TCE and PCE, that have migrated into the bedrock aquifers. In a nonaqueous phase, many chlorinated solvents have a higher density than water and, thus, tend to sink in ground water (such solvents are often referred to as dense nonaqueous phase liquids or DNAPL's). After entering the Galena-Platteville aquifer, the VOC's may move laterally and downward, possibly into deeper aquifers, under the effect of natural flow gradients, density gradients, and pumping at wells that may be relatively remote from the source areas. The six Belvidere municipal wells (BMW2–BMW7) open to the Galena-Platteville aquifer and deeper bedrock aquifers, have the potential to draw VOC's and other constituents deep into the aquifers and large distances from source areas (Mills and others, 1998; 1993a, b, c). Relative to other wells in the area, the municipal wells are pumped at a higher flow rate and collectively are pumped nearly continuously. Although indicated only by limited potentiometric-level data from the Galena-Platteville aquifer (pl. 2), it appears that recharge areas for the municipal wells open to the bedrock aquifers could include much of the industrialized area of Belvidere (fig. 1, pl. 2).

Investigations by Mills (1993a, b, c) indicate that the Galena-Platteville aquifer is a dual-porosity aquifer in which water flows through the matrix and through discrete fractures. Matrix flow is primarily through interconnected solutional pores (vugs and vesicles). Subvertical fractures and subhorizontal bedding-plane partings have been identified in the aquifer (Mills and others, 1998; Mills, 1993b). The fractures and bedding-plane partings are the most likely pathways for rapid movement of VOC's and other industrial constituents, particularly when water is pumped from the aquifer. Studies of VOC distribution in the Galena-Platteville aquifer at three sites in north-central Illinois (Mills,1993a, b, c; Kay and others, 1994, 1997) demonstrate the contribution of the fractures and bedding-plane partings to VOC movement in the aquifer. In addition, the fractures and bedding-plane partings may allow DNAPL's to be distributed in spatial patterns that does not necessarily coincide with the general direction of ground-water flow (Fetter, 1993).

One notable bedding-plane parting in the Galena-Platteville aquifer is identified in geophysical logs of three wells in Belvidere. The distribution of the wells indicates that the parting may be present across 1.5 mi^2 of the aquifer (Mills and others, 1998; Mills, 1993b). The parting is about 250 ft below land surface (about 525 ft above sea level). The maximum horizontal hydraulic conductivity estimated for the parting is 220 ft/d. Vertical-flow rates of up to 13 gal/min have been measured for flow exiting or entering boreholes that are open to the parting (Mills and others, 1998).

Protective casings are installed in wells open to bedrock aquifers, in part, to prevent the inflow of ground water from shallow units, such as the glacial drift aquifer, that are susceptible to contamination. The casings of six of the seven Belvidere municipal wells open to the Ordovician or Cambrian-Ordovician aquifers (wells BMW2–BMW7) (fig. 4) only penetrate the upper part of the Galena-Platteville aquifer. Thus, the bedding-plane parting at the depth of about 250 ft and other partings and fractures probably intersect the well bore of the municipal wells. The relation between ground-water movement through the partings and fractures, and pumping of the municipal wells is demonstrated by the near-instantaneous changes in water level of almost 20 ft recorded in monitoring well PCHG127GP at the PCH Superfund site (fig. 9). The water-level changes are in response to pumping at municipal wells BMW6 and BMW4 (fig. 1) (Mills and others, 1998). The monitoring well, which is from 0.25 to 0.5 mi from the municipal wells, is open to an apparent bedding-plane parting at about 300 ft below land surface (about 485 ft below land surface) (Mills and others, 1998). Presently (1998), specific partings or fractures in the Galena-Platteville aquifer are not confirmed as preferential pathways for movement of VOC's into the municipal wells.

At most locations in the study area, movement of industrial constituents into the Galena-Platteville aquifer is from the overlying glacial drift aquifer in response to unstressed (nonpumped) vertical hydraulic gradients. In much of the urbanized part of the study area, pumping of the municipal wells appears to increase downward flow from the glacial drift aquifer (Mills and others, 1998).

In the west-central part of the study area, vertical hydraulic gradients in the Galena-Platteville aquifer are less likely to be affected by municipal-well pumping than in the urbanized areas to the east. BMW8 is the only municipal well in the west-central part of the study area (fig. 1), and the well is cased into the top of the St. Peter Sandstone aquifer. The bedrock surface in most of this area is close to land surface, and the glacial-drift deposits are thin (fig. 6). Industrial constituents seem to have moved into the Galena-Platteville aquifer, in part, where the glacial-drift deposits are unsaturated or seasonally saturated (shown, in part, in pl. 1) (Fred C. Hart Associates, Inc., 1986). Because vertical hydraulic gradients in the Galena-Platteville aquifer probably are relatively unaffected by pumping of well BMW8, industrial constituents likely move northward toward the Kishwaukee River in response to regional horizontal hydraulic gradients (pl. 2).

Available water-quality and hydraulic data are insufficient to determine the extent or potential for industrial constituents to move into the St. Peter Sandstone and deeper aquifers. VOC's have been detected infrequently in two monitoring wells, PCHG127SP and AGTG305SP (figs. 9 and 13b; table 8), open exclusively to the St. Peter Sandstone aquifer and one municipal well, BMW8 (fig. 1), open to the St. Peter Sandstone and deeper aquifers.

The detection of VOC's in samples from well BMW8 at concentrations that do not exceed 2 µg/L possibly indicates that VOC's are capable of limited movement through the Glenwood Formation confining unit. The unit typically is considered to confine the St. Peter Sandstone aquifer. In the vicinity of Belvidere, the permeability of the argillaceous dolomites and sandstones that compose the Glenwood Formation confining unit may not be low enough to prevent movement of VOC's through the unit. Cores collected in the area indicate that the uppermost Harmony Hill Shale Member of the Glenwood Formation, which is considered the least permeable horizon in the confining unit, is present in the area as relatively permeable argillaceous sandstone (Mills and others, 1998). In addition, inclined fractures detected in the lower part of the Galena-Platteville aquifer (John Lane, U.S. Geological Survey, written commun., 1993) possibly penetrate the Glenwood Formation confining unit and contribute further to the movement of VOC's into the St. Peter Sandstone aquifer.

TCE was detected at a concentration of 1 µg/L in the initial sampling of well AGTG305SP (fig. 13b; table 8). However, the unused water-supply well in which the monitoring well was constructed had been open to the Galena-Platteville and St. Peter Sandstone aquifers for decades. The TCE likely was introduced into the St. Peter Sandstone aquifer through the open borehole, but TCE concentrations detected in monitoring wells open to the Galena-Platteville aquifer at the same location were too low to account for the concentration detected in the St. Peter Sandstone aquifer. The TCE detected in the St. Peter Sandstone aquifer at well AGTG305SP may represent movement into the aquifer at another location.

VOC's have been detected intermittently in samples collected from well PCHG127SP. Chlorinated compounds, primarily TCE, 1,1,1-TCA, and PCE, were detected at concentrations up to 880 µg/L in samples collected within 4 and 7 weeks of installation of the well in 1992 (table 8) (Mills, 1993c). VOC's were not detected again until 1995, when BTEX compounds were detected at concentrations up to 270 µg/L. The analytical results from 1995, however, are not conclusive because the compounds also were detected in the field blanks and were not found at such high concentrations in the bedrock aquifers at other locations in the Belvidere area. BTEX concentrations in samples from the other wells did not exceed 6 µg/L.

It is unclear whether VOC's (specifically, non-BTEX compounds) detected in samples from well PCHG127SP were introduced into the St. Peter Sandstone aquifer during drilling of the well or prior to drilling through the porous matrix and fractures in units that overlie the aquifer. Because high concentrations of VOC's were detected only during the weeks immediately following drilling and well installation, and the Glenwood Formation confining unit possibly limits hydraulic connection between the Galena-Platteville and St. Peter Sandstone aquifers, VOC's may have been introduced into the aquifer during drilling. Conversely, the upflow of agitated water from the borehole during drilling and well development, the evidence of the presence of inclined fractures at depth and the moderate matrix porosity and horizontal hydraulic conductivity of the lower units of the Galena-Platteville aquifer (means are 6.2 percent and 0.5 ft/d, respectively) (Mills and others, 1998), and the detection of VOC's in samples from other wells open to the St. Peter Sandstone aquifer indicate that VOC's may have moved through the Glenwood Formation confining unit and into the St. Peter Sandstone aquifer under conditions prior to the drilling of well PCHG127SP. Downward gradients increased by the pumping of the nearby municipal wells could have affected the movement of VOC's into the St. Peter Sandstone aquifer before, during, and after drilling and well installation.

SUMMARY AND CONCLUSIONS

In 1992, the U.S.Geological Survey, in cooperation with the U.S. Environmental Protection Agency, began a study of the water quality and hydrogeology of the aquifers underlying the vicinity of Belvidere, Boone County, Ill. Previously, volatile organic compounds (VOC's) and other industrial constituents were detected in one or more ground-water samples from about 100 of the approximately 700 monitoring and water-supply wells in the area, including the 8 municipal wells in Belvidere. A glacial drift aquifer underlies at least 50 percent of the 80-mi^2 study area; bedrock aquifers that underlie virtually all of the study area include the Galena-Platteville, St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers.

During July 1993, water levels were measured in 152 wells and water-quality samples were collected from 97 wells distributed throughout the study area. The data were collected to determine potentiometric levels, directions of ground-water flow, and the distribution of industrial constituents in the underlying aquifers. During May–June 1994, May–June 1995, and August–October 1996, similar data were collected from a total of 31 wells.

Potentiometric levels in the glacial drift and Galena-Platteville aquifers are similar and range from about 750 to 900 ft above sea level. The potentiometric surfaces of the aquifers are subdued representations of the land surface. Horizontal ground-water flow in the aquifers primarily is towards the Kishwaukee River, which flows through the central part of the study area, and its principal tributaries. Vertical ground-water flow appears to be downward at most locations in the study area, particularly in the urbanized areas affected by pumping of the Belvidere municipal wells and in upland areas remote from the principal surface-water drainages. Flow appears to be upward between the Galena-Platteville and glacial drift aquifers where ground water discharges to the Kishwaukee River and its principal tributaries.

All water samples were analyzed for VOC's. Selected samples also were analyzed for trace metals, cyanide, semivolatile organic compounds, or other constituents. VOC's were detected in samples from 50 wells. Twenty-seven specific VOC's were identified in samples. Samples were collected from six municipal wells in use during the study; two wells were not in use because one or more VOC's exceeded maximum contamination levels (MCL's). Two VOC's were detected at concentrations below MCL's in one of the samples. Samples from 21 wells had at least one VOC detected at a concentration above MCL's. The VOC's detected above MCL's and their maximum concentrations were 1,2-dichloroethene, 470 µg/L; trichloroethene (TCE), 360 µg/L; tetrachloroethene (PCE), 82 µg/L; benzene, 53 µg/L; and vinyl chloride, 11 µg/L. TCE and PCE were the most frequently detected VOC's and generally had the highest concentrations. VOC's with concentrations above MCL's were detected in samples from 15 wells open to the glacial drift aquifer and 6 wells open to the Galena-Platteville aquifer. VOC's with concentrations below MCL's also were detected in the St. Peter Sandstone, Ordovician, and Cambrian-Ordovician aquifers. Nickel was detected at a concentration above the MCL in one sample. Concentrations of all other constituents were below MCL's.

Previous studies detected high concentrations of nine trace metals in samples collected within about 500 ft of three Superfund sites. The samples were detected intermittently at about 50 percent of the wells at each site. Wells where high metal concentrations have been detected are open to the glacial drift aquifer. Previous studies detected high concentrations of semivolatile organic compounds in the glacial drift aquifer at one Superfund site.

The three Superfund sites are the principal source areas for the input of VOC's into the aquifers underlying Belvidere. The closed Belvidere Municipal Landfill No. 2 site and National Sewing Machine facility also are possible source areas. Numerous hazardous-waste-disposal sites and industrial facilities located primarily within five designated industrial areas also may contribute to the input of VOC's into aquifers.

Generally, the concentrations of VOC's were higher and the number and type of VOC's detected were greater in the glacial drift aquifer than in the Galena-Platteville aquifer and the deeper bedrock aquifers. The high concentrations and spatial distribution of VOC's in the glacial drift aquifer usually were related to nearby sources of contamination. Except in the immediate vicinity of a known hazardous-waste site, possible sources of VOC's in the bedrock aquifers were difficult to identify; VOC concentrations at most locations in the bedrock aquifers did not exceed 5 μg/L. Most locations where VOC's were detected in the glacial drift and bedrock aquifers were within about 1,000 ft of the Kishwaukee River. Biologic, aqueous-geochemical, and hydrogeologic factors likely affect the distribution of VOC's and other constituents in the aquifers. Hydrogeologic factors include ground-water flow through (1) the glacial drift aquifer with discharge to the nearby Kishwaukee River and (2) the weathered-surface deposits, bedding-plane partings, and fractures in the Galena-Platteville aquifer. Pumping of high-capacity wells, such as the municipal wells, may contribute to the widespread distribution of VOC's at low concentrations in the bedrock aquifers. One bedding-plane parting detected in wells that represent a potential area of about 1.5 mi^2 has a horizontal hydraulic conductivity as high as 220 ft/d. The parting is present at an altitude of about 525 ft above sea level (about 250 ft below land surface). Six of the municipal wells in Belvidere are open to the partings and fractures within the Galena-Platteville aquifer.

Above-normal amounts of precipitation fell in the area during spring and summer 1993. Depth to water in the glacial drift aquifer was less than in preceding and following years. Flow directions and water quality in the aquifers, as determined in July 1993, may not be representative of conditions during other more climatically normal periods.

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TABLES 5–8

Table 5. Field characteristics of water quality in the aquifers underlying Belvidere, Ill., 1993–96

[All data collected by the U.S. Geological Survey; depth of well in feet below land surface; °C, degree Celsius; µS/cm, microsiemens per centimeter at 25° Celsius; mv, millivolts; mg/L, milligrams per liter; NTU, nephelometric turbidity units; --, no data]

Well designation	Sample date	Depth of well (feet)	pH (standard unit)	Temperature (°C)	Specific conductance (µS/cm)	Oxidation-reduction potential (Eh) (mv)	Dissolved oxygen (mg/L)	Chloride (mg/L)	Turbidity (NTU)
00051	07-20-93	120	6.83	12.3	485	73	--	--	--
00065	07-21-93	427	6.74	14.9	730	26	--	--	--
00157	07-20-93	318	7.60	15.5	925	14	--	--	--
00239	07-21-93	365	7.50	12.1	630	−150	--	--	--
00294	07-21-93	868	7.07	12.3	715	--	1.50	--	--
00296	07-20-93	550	7.09	11.6	675	--	.04	--	--
00299	07-21-93	116	7.19	12.3	690	--	--	--	--
00401	07-20-93	110	6.71	12.6	630	−2	--	--	--
00436	06-01-95	[1]215	6.86	12.9	970	174	--	--	
do.	06-01-95	[2]215	6.86	12.4	871	142	--	--	--
									--
20832	07-20-93	86	7.52	12.0	680	3	--	--	--
do.	06-01-94	86	--	10.2	740	165	1.93	45	--
21261	07-20-93	48	6.77	12.5	610	75	--	--	--
21296	07-20-93	100	7.31	12.5	695	−140	--	--	--
21541	07-19-93	410	7.73	13.5	615	−197	--	--	--
21613	07-20-93	100	7.27	12.7	790	−87	--	--	--
21699	07-20-93	145	6.85	11.9	685	−36	--	--	--
22094	07-19-93	63	6.91	11.1	485	44	--	--	--
22336	07-20-93	400	7.80	12.0	560	−230	--	--	--
421755	07-21-93	398	7.40	14.0	580	−124	--	--	--
AGTG305GPS	05-31-95	115.0	6.93	12.3	826	67	.07	--	0.46
do.	09-19-96	115.0	7.12	11.9	774	27	.05	--	2.8
AGTG305GPD	05-31-95	251.4	6.89	12.8	576	27	.09	--	58
do.	09-19-96	251.4	7.10	11.7	753	10	.05	--	27
AGTG305SP	05-31-95	357.8	6.88	13.4	932	113	.00	--	.22
BL1PW12	07-20-93	59	7.01	14.3	735	--	--	--	--
BL2RW1	07-20-93	520	7.90	12.9	575	52	--	--	--
BL2RW3	07-20-93	52	7.33	11.3	735	81	--	--	--
BMW4	07-23-93	1,800	7.04	12.2	730	--	3.61	--	--
do.	05-31-94	1,800	7.09	13.1	650	254	1.69	--	--
BMW5	07-21-93	610	6.71	11.7	715	--	.60	--	--
do.	05-31-94	610	6.99	11.9	790	18	.16	--	--
BMW6	07-21-93	868	7.18	11.5	685	--	5.45	--	--
do.	06-02-94	868	7.09	11.4	725	76	5.35	--	--
BMW7	07-21-93	969	7.27	12.9	555	--	.52	--	--
do.	05-31-94	969	7.15	13.1	575	−46	.23	--	--
BMW8	05-31-94	1,390	7.13	13.1	550	−45	.06	--	--
BMW9	07-21-93	122	7.35	10.9	615	--	.98	--	--
do.	05-31-94	122	7.19	10.9	600	−7	.92	--	--
BMWR2-6	07-21-93	46.5	6.91	12.0	540	69	--	--	--

Table 5. Field characteristics of water quality in the aquifers underlying Belvidere, Ill., 1993–96—Continued

Well designation	Sample date	Depth of well (feet)	pH (standard unit)	Temperature (°C)	Specific conductance (μS/cm)	Oxidation-reduction potential (Eh) (mv)	Dissolved oxygen (mg/L)	Chloride (mg/L)	Turbidity (NTU)
BMWR3-6	07-21-93	--	7.16	11.2	725	17	--	--	--
BMWR4-5	07-19-93	--	6.64	14.0	695	59	--	--	--
HGM1	06-01-94	125	--	11.5	725	134	1.24	40	--
HGM2	07-20-93	80	6.86	12.1	1,600	−30	--	--	--
do.	06-01-94	--	7.95	12.5	1,485	20	.05	140	--
NSMG101	06-01-94	37.9	7.06	11.6	1,175	−25	.21	--	1
NSMG102	06-01-94	49.6	7.09	14.7	1,110	115	3.80	--	--
NSMG103	07-19-93	54.9	6.86	13.8	1,200	--	1.71	--	--
do.	09-12-96	54.9	6.80	13.8	1,145	293	2.47	--	--
NSMG104	06-02-94	59.0	7.45	12.6	1,060	−128	--	--	14
do.	06-01-95	59.0	7.00	13.1	1,280	−116	.10	--	1.06
do.	09-12-96	59.0	6.93	12.5	1,144	−10	.12	--	--
NSMG105	06-01-94	47.8	7.06	14.7	1,380	77	.08	--	1
do.	06-01-95	47.8	6.87	15.3	1,280	103	.27	--	133
do.	09-12-96	47.8	6.76	14.3	1,580	223	.24	--	--
PCHG115B	07-20-93	48.6	6.96	13.2	830	119	2.27	--	--
PCHG115BD	07-20-93	151.5	6.83	12.0	645	−39	.05	--	--
do.	05-31-95	151.5	7.25	14.1	662	113	--	--	1.0
PCHG116D	07-20-93	33.6	6.77	11.5	675	119	.06	--	1.53
do.	05-31-94	33.6	7.04	11.4	610	150	--	--	--
PCHG119D	07-21-93	36.5	6.81	12.8	820	105	4.23	--	--
PCHG120D	07-20-93	35.1	6.95	12.8	820	34	1.11	--	--
PCHG125BD	07-21-93	147.7	7.00	12.5	715	−33	.05	--	--
PCHG125D	07-21-93	28.4	6.83	15.8	925	138	4.70	--	--
do.	06-01-94	28.4	--	12.8	810	164	4.50	--	--
PCHG127GP	07-21-93	294.2	7.02	13.8	580	44	.22	--	--
do.	06-01-94	294.2	7.37	12.2	620	155	--	--	--
do.	05-31-95	294.2	6.89	12.0	541	175	--	--	8.25
do.	09-25-96	294.2	7.08	11.6	631	42	.05	--	--
PCHG127SP	07-20-93	375.7	7.15	12.7	547	−31	.28	--	--
do.	05-31-94	375.7	--	12.3	515	7	.05	--	5.53
do.	05-31-95	375.7	6.84	12.5	583	80	--	--	.4
do.	09-25-96	375.7	7.21	11.5	530	−113	.05	--	--
PCHG128GPS	06-02-94	121.0	7.37	12.3	897	29	--	--	2
do.	06-01-95	121.0	6.68	12.6	830	85	--	--	1.9
PCHG128GPD	06-02-94	258.5	7.20	12.3	622	−8	.12	--	1
do.	06-01-95	258.5	7.46	12.7	717	92	--	--	.9
PCHP436B	08-29-96	35.0	6.96	12.6	965	289	6.52	--	79
PCHG436GPS	08-29-96	107.3	7.02	12.6	572	−1	.11	--	78
SQ4329	07-21-93	--	6.60	10.4	880	--	1.79	--	--
TW18	07-22-93	19	7.39	16.8	335	168	--	--	--
TW28	07-21-93	15	6.83	20.3	970	10	--	--	--
TW33	07-23-93	33	7.13	17.9	1,025	147	--	--	--

[1] Sample collected about 30 feet below land surface (about 1 foot below water surface), after pumping 15 gallons of water.

[2] Sample collected about 100 feet below land surface (about 70 feet below water surface), after pumping 10 gallons of water.

Table 6. Concentrations of trace metals and cyanide in the aquifers underlying Belvidere, Ill., 1985–95

[All samples collected by the U.S. Geological Survey unless otherwise noted; all concentrations of metals represent dissolved fraction unless otherwise noted; all concentrations of cyanide represent total fraction; depth of well below land surface; µg/L, micrograms per liter; ND, not detected]

Well designation	Sample date	Depth of well (feet)	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Cyanide (µg/L)	Lead (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
AGTG305GPS	05-31-95	115.0	ND	ND	0.2	62	ND	9	ND	ND	3	ND	ND	ND	ND	ND
AGTG305GPS	05-31-95	115.0	ND	ND	.3	62	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AGTG305GPD	05-31-95	251.4	ND	ND	.2	88	ND	ND	ND	ND	3	ND	ND	ND	ND	ND
AGTG305SP	05-31-95	357.8	ND	ND	.3	59	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BL1PW10	[1]01-15-86	66	ND	ND	ND	ND	ND	13	67	ND	ND	ND	ND	ND	ND	420
BL1PW10	07-20-93	66	47.2	ND	ND	[2]46.8	ND	ND	12.8	ND	3.6	ND	ND	ND[2]	ND	[2]126
BL1PW10	07-20-93	66	ND	ND	ND	[2]48.4	ND	ND	10.1	ND	3	ND	ND	ND[2]	ND	[2]131
BMW4	11-19-85	1,800	ND	ND	ND	297	ND	ND	12	ND	ND	0.12	ND	ND	ND	ND
BMW4	07-23-93	1,800	63.2	ND	ND	197	ND	ND	ND	ND	[2]1.4	ND[2]	ND	ND[2]	ND	[2]13.4
BMW4	07-23-93	1,800	ND	ND	ND	202	ND	ND	ND	ND	[2]1.7	ND[2]	ND	ND[2]	ND	[2]22.2
NSMG103	[3]08-25-88	54.9	260	120	ND	[2]56	7	ND	169	7	[2]5	ND	ND	[2]3	ND	52
NSMG103	07-19-93	54.9	[2]87.3	ND	ND	[2]106	ND	ND	ND	ND	ND[2]	ND[2]	ND	[2]5.2	ND	[2]10.6
NSMG103	07-19-93	54.9	[2]68.4	ND	ND	[2]63.5	ND	ND	[2]6	ND	ND[2]	ND[2]	17	ND[2]	ND	[2]23.5
NSMG104	[3]08-25-88	59.0	[2]160	100	ND	[2]63	11	10	55	5	8	ND	ND	ND	ND	ND
NSMG104	[4]06-01-95	59.0	ND	ND	.2	53	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NSMG105	[3]08-25-88	47.8	[2]150	160	ND	[2]75	6	ND	215	ND	37	ND	ND	ND	ND	ND
NSMG105	[4]06-01-95	47.8	807	ND	1.6	81	ND	98	8	ND	3	ND	267	ND	6	ND
TW1	07-22-93	21	ND	ND	ND	[2]13.6	ND	ND	[2]5.7	ND	ND[2]	ND[2]	ND	ND[2]	ND	ND
TW24	07-20-93	12	[2]59.4	ND	ND	[2]35.9	ND	ND	ND	ND	[2]1.4	ND[2]	ND	[2]3.2	ND	ND
TW30	07-26-93	9	[2]15.2	ND	ND	[2]34.1	ND	ND	[2]5.6	ND	ND[2]	ND	ND	ND[2]	ND	[2]14.7
TW31	07-19-93	9	[2]339	ND	1.1	[2]57.3	ND	ND	[2]8.9	ND	[2]1.9	ND[2]	ND	ND[2]	ND	[2]22.6
TW32	07-20-93	14	ND	ND	ND	[2]23.9	ND	ND	[2]5.2	ND	ND[2]	ND[2]	ND	ND[2]	ND	[2]31

[1] Sample collected by a private contractor or by the Illinois Environmental Protection Agency.

[2] Concentration is estimated. Specific reason for estimate can be obtained from the U.S. Geological Survey.

[3] Sample collected by the Illinois Environmental Protection Agency.

[4] Unfiltered sample; represents total fraction of metals in ground water.

Table 7. Concentrations of semivolatile organic compounds in the aquifers underlying Belvidere, Ill., 1988–95

[All samples collected by the U.S. Geological Survey unless otherwise noted; depth of well in feet below land surface; µg/L, micrograms per liter; ND, not detected]

Well designation	Sample date	Depth of well (feet)	Benzoic acid (µg/L)	Benzyl alcohol (µg/L)	4-Chloro-aniline (µg/L)	3-Nitro-aniline (µg/L)	4-Nitro aniline (µg/L)	Nitro-benzene (µg/L)	3,3'-Di-chloro-benzidine (µg/L)	bis(2-Ethylhexyl) phthalate (µg/L)	Di-n-butyl-phthalate (µg/L)	Di-ethyl-phthalate (µg/L)	Di-n-octyl-phthalate (µg/L)
AGTG305GPS	[1]05-31-95	115.0	ND	ND	ND	ND	ND	ND	ND	[2]73	ND	ND	ND
AGTG305GPS	05-31-95	115.0	ND	ND	ND	ND	ND	ND	ND	[2]26	ND	ND	ND
AGTG305GPD	05-31-95	251.4	ND	10	ND	ND	ND	ND	ND	[2]18	ND	ND	ND
AGTG305SP	05-31-95	357.8	ND	ND	ND	ND	ND	ND	ND	[2]24	ND	ND	ND
NSMG104	[3]08-25-88	59.0	[2]22	ND	ND	ND	ND	[2]2	ND	[2]4	[2]47	[2]79	[2]2
NSMG104	[4]06-01-95	59.0	ND	ND	7	6	2	ND	6	[2]36	ND	ND	ND
NSMG105	[5]08-25-88	47.8	ND	ND	ND	ND	ND	[2]2	ND	[2]3	[2]42	[2]71	[2].9
NSMG105	06-01-95	47.8	ND	ND	ND	ND	ND	ND	ND	[2]120	ND	ND	ND
TW9	07-27-93	23.0	ND	ND	ND	ND	ND	ND	ND	[6]1,100	ND	ND	ND
TW9	07-27-93	23.0	ND	ND	ND	ND	ND	ND	ND	[7]870	ND	ND	ND

[1] Also detected unknown ester, 7 µg/L.

[2] Also detected in trip blank.

[3] Sample collected by the Illinois Environmental Protection Agency. Also detected butylbenzyl phthalate, 0.2 µg/L; compound also detected in trip blank.

[4] Other than 3,3'-dichlorobenzidine, compounds detected in sample are suspected laboratory contaminants.

[5] Sample collected by the Illinois Environmental Protection Agency. Also detected butylbenzyl phthalate, 0.02 µg/L; compound also detected in trip blank.

[6] Concentrations in a dry clay sample in µg/kg. Also detected the following constituents; concentrations are estimated: phenanthrene, 81 µg/kg; fluoranthene, 130 µg/kg; pyrene, 100 µg/kg; benzo(a)anthracene, 67 µg/kg; chrysene, 51 µg/kg; benzo(b)fluoranthene, 94 µg/kg; benzo(k)fluoranthene, 94 µg/kg; benzo(a)pyrene, 42 µg/kg. Tentatively identified compounds; concentrations are estimated: tetrachloroethane, 81 µg/kg; 2-cyclohexen-1-one, 120 µg/kg; unknowns at 81, 320, 240, 570, and 730 µg/kg, respectively.

[7] Concentration in a wet silt sample in µg/kg. Tentatively identified compounds; concentrations are estimated: 2-cyclohexen-1-one, 120 µg/kg; unknown, 310 µg/kg.

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96

[All samples collected by the U.S. Geological Survey unless otherwise noted; depth of well in feet below land surface; all concentrations are in micrograms per liter (µg/L); ND, not detected; NA, not analyzed; T, trace, concentration less than 0.01 µg/L; --, depth of well unknown]

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
00007	[2]07-20-93	157	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00051	07-20-93	120	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00059	07-19-93	60	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00060	07-19-93	62	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00065	07-21-93	427	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	427	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00157	07-20-93	318	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00163	07-19-91	143	ND	ND	ND	NA	ND	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	NA	ND	NA	NA	ND
do.	07-21-93	143	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00195	[3]05-31-94	120	ND	0.8	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00234	07-20-93	38	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00239	07-21-93	365	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00294	07-20-93	868	2	1	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	868	2	1	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00296	07-20-93	550	ND	2	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00299	07-21-93	116	6	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00316	07-20-93	179	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00401	07-20-93	110	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00436	06-01-95	215	1	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	06-01-95	215	1	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
00492	07-20-93	155	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00501	07-20-93	45	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
00505	07-19-93	71	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
20832	[4]07-20-93	86	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	86	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
20832	[5]06-01-94	86	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21101	07-19-93	140	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21163	07-21-93	123	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21261	07-20-93	48	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21296	07-20-93	100	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21374	07-20-93	60	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21375	07-20-93	145	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21498	07-19-93	60	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21541	07-19-93	410	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21613	07-20-93	100	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21699	07-20-93	145	1	ND	ND	1	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	2	NA	NA	1
21709	07-20-93	390	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
21710	07-21-93	420	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
22083	07-20-93	55	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
22094	07-19-93	63	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
22336	07-20-93	400	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	1
421402	07-21-93	400	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
421414	07-21-93	121	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
421422	07-02-86	600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	600	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
421456	07-20-93	183	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
421755	07-21-93	398	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
AGTG305GPS	[6]05-31-95	115.0	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[6]05-31-95	115.0	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[7]09-19-96	115.0	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
AGTG305GPD	05-31-95	251.4	1	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	09-19-96	251.4	.4	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
AGTG305SP	05-31-95	357.8	1	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BCHP	06-02-94	--	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BL1PW02	[8]01-15-86	40	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[8]08-29-89	40	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-19-93	40	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BL1PW08	[8]01-15-86	--	17	ND	15	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-19-93	--	14	ND	7	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BL1PW10	[8]01-15-86	66	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	66	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	66	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BL1PW12	[8]05-19-87	59	13	ND	ND	NA	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	59	3	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	59	3	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BL2RW1	[9]03-22-89	520	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	520	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BL2RW3	[9]03-22-89	52	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	52	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[10]BMW2	11-20-85	1,860	8	3.5	ND	NA	ND	ND	ND	ND	ND	3.5	ND	NA	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-31-87	1,860	10	3	ND	NA	ND	ND	ND	ND	ND	3	ND	NA	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-26-87	1,860	12	2	ND	NA	ND	ND	ND	ND	ND	2	ND	NA	ND	ND	ND	ND	ND	NA	NA	2
do.	02-11-88	1,860	13	3	ND	NA	ND	ND	ND	ND	ND	3	ND	NA	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-25-88	1,860	11	2	ND	NA	ND	ND	ND	ND	ND	2	ND	NA	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-03-88	1,860	13	3	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
[10]BMW2	08-16-88	1,860	11	3	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-03-88	1,860	6.8	2.7	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-13-88	1,860	10	2.8	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-10-89	1,860	9	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
do.	02-01-89	1,860	8.4	2.2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	1.4
do.	08-07-89	1,860	13	4	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	01-31-90	1,860	11	3.9	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	0.31	ND	.48
do.	06-08-90	1,860	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-26-90	1,860	18.1	5.4	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-10-90	1,860	3	13	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-27-90	1,860	8.1	2.2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND
[10]BMW3	11-20-85	1,800	4.3	26	0.7	NA	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	10-26-87	1,800	6	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	04-25-88	1,800	3	17	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-03-88	1,800	3	23	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-16-88	1,800	4	20	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	09-07-88	1,800	5.6	15	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	10-03-88	1,800	2.9	11	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	12-13-88	1,800	4.1	28	ND	NA	ND	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	01-10-89	1,800	3	22	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	02-01-89	1,800	4.6	34	.57	NA	ND	.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-07-89	1,800	3.7	27	4.2	NA	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	NA	.38	ND	ND
do.	01-31-90	1,800	3.4	27	.53	NA	ND	.62	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	.81
do.	06-08-90	1,800	2.7	16	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-27-90	1,800	2	13	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	**Sample date**	**Depth of well (feet)**	**Trichloroethene**	**Tetrachloroethene**	**1,1,1-Trichloroethane**	**1,2-Dichloroethene[1]**	***trans*-1,2-Dichloroethene**	***cis*-1,2-Dichloroethene**	**1,1-Dichloroethane**	**1,1-Dichloroethene**	**1,2-Dichloroethane**	**1,1,2-Trichloroethane**	**1,1,2,2-Tetrachloroethane**	**Trichlorofluoromethane**	**Benzene**	**Chlorobenzene**	**Ethylbenzene**	**Chloroethane**	**Xylene[1]**	**Xylene(m+p)**	**Xylene(o)**	**Toluene**
[10]BMW3	05-01-91	1,800	9.6	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	09-10-91	1,800	1.9	12	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	12-10-91	1,800	2.8	15	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	04-30-92	1,800	3.4	16	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
[10]BMW4	11-19-85	1,800	.7	.9	1.3	NA	3.9	ND	ND	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-26-86	1,800	ND	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-10-87	1,800	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-31-87	1,800	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-26-87	1,800	ND	ND	ND	NA	ND	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-21-87	1,800	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	02-11-88	1,800	1	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-25-88	1,800	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-03-88	1,800	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-16-88	1,800	ND	ND	ND	NA	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-03-88	1,800	ND	ND	ND	NA	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-13-88	1,800	ND	1.1	ND	NA	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-10-89	1,800	ND	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	ND	ND	NA	NA	ND
do.	02-01-89	1,800	.3	.6	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	.6	ND	ND	ND	ND	NA	NA	ND
do.	08-07-89	1,800	.9	.9	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-29-89	1,800	ND	1	ND	1	NA	NA	ND	ND	ND	ND	ND	ND	6	ND	ND	ND	ND	NA	NA	ND
do.	12-12-89	1,800	ND	ND	ND	NA	ND	ND	ND	1	ND	ND	ND	ND	6	ND	ND	ND	NA	ND	ND	ND
do.	08-27-90	1,800	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-31-90	1,800	ND	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-30-91	1,800	.9	.8	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-10-91	1,800	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
[10]BMW4	09-10-91	1,800	ND	0.8	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	12-10-91	1,800	0.9	1.3	ND	NA	ND	4.2	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-08-92	1,800	1.1	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	2.4	ND	ND	ND	NA	ND	ND	ND
do.	04-30-92	1,800	.9	.7	ND	NA	ND	1.9	ND	ND	ND	ND	ND	1.8	2.3	ND	ND	ND	ND	NA	NA	ND
do.	07-23-93	1,800	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-23-93	1,800	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-94	1,800	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[10]BMW5	11-19-85	610	1	3.6	ND	NA	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-26-86	610	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-10-87	610	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-31-87	610	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-26-87	610	ND	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	02-11-88	610	ND	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-25-88	610	ND	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-03-88	610	ND	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-16-88	610	ND	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-03-88	610	ND	1.5	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-13-88	610	ND	1.3	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-10-89	610	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	02-01-89	610	.34	1.2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-07-89	610	.3	.45	ND	NA	ND	ND	ND	ND	0.78	ND	ND	ND	ND	ND	ND	ND	NA	0.27	ND	ND
do.	08-30-89	610	1	2	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-31-90	610	ND	ND	0.62	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	0.42
do.	06-08-90	610	ND	2.1	ND	NA	ND	ND	ND	ND	ND	ND	ND	.50	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-27-90	610	ND	1.4	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
[10]BMW5	04-30-91	610	ND	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-10-91	610	ND	ND	ND	NA	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	09-05-91	610	ND	1.7	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	10-07-91	610	ND	1.7	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	12-10-91	610	ND	1.2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	2.3	ND	ND	ND	ND	NA	NA	ND
do.	01-08-92	610	ND	1.5	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	04-06-92	610	ND	1.6	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	04-30-92	610	ND	.8	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	610	ND	2	ND	1	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-94	610	ND	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[10]BMW6	11-19-85	868	2.2	2.6	2.6	NA	ND	ND	ND	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-26-86	868	1	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	02-09-87	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-10-87	868	ND	1.2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-31-87	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-26-87	868	ND	ND	ND	NA	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	02-11-88	868	ND	2	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-25-88	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-03-88	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-16-88	868	2	ND	ND	NA	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-03-88	868	1	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-13-88	868	1.2	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-10-89	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	02-01-89	868	.67	.66	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-07-89	868	1.5	5.3	1.1	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	0.23	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
[10]BMW6	10-29-89	868	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-31-90	868	1.4	1.6	0.58	NA	ND	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	0.39
do.	06-08-90	868	.8	1.1	ND	NA	ND	2.1	ND	ND	ND	ND	ND	1.4	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-11-90	868	.5	.7	ND	NA	ND	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.3	ND	NA	NA	ND
do.	07-10-90	868	ND	ND	ND	NA	ND	.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-27-90	868	.51	1.8	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-30-91	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-10-91	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	09-10-91	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-07-91	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-10-91	868	4.4	.8	5.3	NA	ND	5.2	ND	ND	ND	ND	ND	2.7	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-08-92	868	2.6	.6	1	NA	ND	4.1	ND	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-06-92	868	.9	1.1	ND	NA	ND	4.4	ND	ND	ND	ND	ND	2.1	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-30-92	868	1.2	.8	ND	NA	ND	6.7	ND	ND	ND	ND	ND	3.1	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	868	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	868	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[12]11-23-93	868	1.0	.5	1.2	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-13-93	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-02-94	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-02-94	868	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[10]BMW7	11-19-85	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-10-87	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-03-88	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-13-88	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	02-01-89	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
[10]BMW7	07-12-89	969	ND	ND	0.74	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	01-31-90	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	06-08-90	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-27-90	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	10-31-90	969	ND	1	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	NA	ND	ND	ND
do.	04-30-91	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	10-10-91	969	ND	ND	ND	NA	ND	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	12-10-91	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	01-08-92	969	0.9	ND	.6	NA	ND	3.6	ND	ND	ND	ND	ND	ND	3	ND	ND	ND	NA	ND	ND	ND
do.	04-30-92	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	969	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-94	969	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[10]BMW8	04-01-86	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-03-88	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-16-88	1,390	ND	ND	ND	NA	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	12-13-88	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	02-01-89	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	07-12-89	1,390	ND	ND	1.5	NA	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	01-31-90	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	06-08-90	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-27-90	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	04-30-91	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	09-09-91	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-10-91	1,390	ND	1.7	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	12-10-91	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
[10]BMW8	04-30-92	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[12]07-13-93	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-94	1,390	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[10]BMW9	06-05-85	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-31-85	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-16-86	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-19-87	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	08-03-88	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-13-88	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	02-01-89	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	07-12-89	122	ND	ND	1.4	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	01-31-90	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	06-08-90	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	08-27-90	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	09-12-90	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	03-27-91	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-30-91	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-17-91	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	09-10-91	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-10-91	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-10-91	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	04-30-92	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	122	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-94	122	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BMWR2-6	[9]06-28-89	46.5	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
BMWR2-6	[9]10-29-89	46.5	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	46.5	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BMWR3-6	[9]10-29-89	--	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	--	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
BMWR4-5	[9]08-30-89	--	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-19-93	--	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
HGM1	06-01-94	125	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
HGM2	[13]07-20-93	80	ND	ND	ND	1	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	NA	NA	ND
do.	[14]06-01-94	80	ND	ND	ND	NA	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[15]06-01-94	80	ND	ND	ND	NA	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
LA1025	07-20-93	--	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
NSMG101	[8]08-25-88	37.9	2	8	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	06-01-94	37.9	3	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
NSMG102	[8]08-25-88	49.6	ND	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	06-01-94	49.6	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
NSMG103	[8]08-25-88	54.9	13	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	07-19-93	54.9	13	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[16]09-12-96	54.9	4	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
NSMG104	[8]08-25-88	59.0	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	06-02-94	59.0	15	78	ND	NA	1	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-01-95	59.0	20	68	ND	NA	2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	09-12-96	59.0	13	41	ND	1	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
NSMG105	[8]08-25-88	47.8	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	06-01-94	47.8	1	25	ND	NA	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-01-95	47.8	1	19	ND	NA	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
NSMG105	09-12-96	47.8	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[17]PCHG115B	06-27-89	48.6	110	10	52	ND	NA	NA	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	09-27-89	48.6	160	1	72	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-06-90	48.6	400	ND	200	ND	NA	NA	ND	15	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-16-91	48.6	230	3	110	3	NA	NA	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	48.6	360	7	170	9	NA	NA	2	14	ND	1	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-03-95	48.6	290	7	130	10	NA	NA	1	14	ND	.6	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[17]PCHG115BD	12-17-90	151.5	520	86	200	9	NA	NA	3	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-16-91	151.5	310	63	130	[18]11	NA	NA	4	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	151.5	84	19	16	6	NA	NA	7	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-95	151.5	59	14	7	NA	ND	4	5	1	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	09-27-95	151.5	48	10	6	6	NA	NA	5	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[17]PCHG116D	06-28-89	33.6	130	ND	110	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	09-26-89	33.6	230	2	180	5	NA	NA	7	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	12-06-90	33.6	1,400	ND	1,200	17	NA	NA	11	21	ND	3	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-15-91	33.6	1,100	ND	990	16	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	33.6	ND	2	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-94	33.6	180	1	160	NA	ND	5	4	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[19]05-31-94	33.6	170	1	160	NA	ND	5	4	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[20]09-27-95	33.6	95	ND	58	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[17]PCHG119D	12-07-90	36.5	200	180	130	160	NA	NA	4	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-15-91	36.5	210	180	100	140	NA	NA	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	36.5	280	58	150	11	NA	NA	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	09-25-95	36.5	140	120	62	36	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.9	ND	NA	NA	ND
[17]PCHG120D	12-07-90	35.1	1,700	ND	160	3	NA	NA	6	22	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
[17]PCHG120D	01-15-91	35.1	800	ND	78	ND	NA	NA	6	17	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	35.1	84	ND	8	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	09-26-95	35.1	380	2	33	1	NA	NA	5	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	0.09
[17]PCHG125D	12-10-90	28.4	8	9	5	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-15-91	28.4	11	ND	8	ND	NA	NA	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[21]07-21-93	28.4	270	ND	150	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[22]06-01-94	28.4	340	2	160	NA	ND	2	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	09-23-95	28.4	97	3	46	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[17]PCHG125BD	12-09-90	147.7	1,200	180	600	58	NA	NA	8	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-16-91	147.7	600	88	280	35	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	147.7	130	18	23	4	NA	NA	3	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	147.7	180	31	34	5	NA	NA	4	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	10-05-95	147.7	70	4	9	1	NA	NA	1	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
PCHG127GP	01-30-92	294.2	150	6	ND[23]	5	NA	NA	4	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	11-12-92	294.2	54	ND	ND	2	NA	NA	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-21-93	294.2	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	2
do.	06-01-94	294.2	44	.6	ND	NA	ND	2	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-95	294.2	43	ND	ND	NA	ND	2	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	[8]10-05-95	294.2	41	.3	ND	3	NA	NA	.6	.2	ND	ND	ND	ND	0.09	ND	ND	ND	ND	NA	NA	ND
do.	09-25-96	294.2	22	ND	ND	1	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
PCHG127SP	01-06-92	375.7	710	49	500	NA	ND	25	6.4	9.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[24]01-30-92	375.7	880	50	610	31	NA	NA	7	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-30-92	375.7	670	36	450	21	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	01-30-92	375.7	650	42	500	NA	ND	31	7.7	36	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	11-12-92	375.7	2	1	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
PCHG127SP	07-20-93	375.7	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	375.7	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-94	375.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	05-31-95	375.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	[8,25]10-04-95	375.7	0.5	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	85	ND	47	ND	240	NA	NA	270
do.	09-25-96	375.7	3	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	2
PCHG128GPS	06-02-94	121.0	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[26]06-01-95	121.0	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	NA	ND	ND	ND
do.	10-17-96	121.0	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
PCHG128GPD	06-02-94	258.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-01-95	258.5	1	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND
do.	09-20-96	258.5	1	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
[17]PCHG202	09-13-82	102	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
do.	00-00-90	102	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-20-93	102	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
PCHP436B	08-29-96	35.0	ND	1	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
PCHG436GPS	08-29-96	107.3	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
SQ4329	07-21-93	--	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW1	07-22-93	21	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW8	07-21-93	14.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW9	[27]07-27-93	23	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	20
TW9B	06-03-94	20.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW11	07-27-93	28	ND	1	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-27-93	28	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW12	[28]07-22-93	12	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
TW13	07-21-93	15	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW14	07-19-93	28	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW16	07-22-93	18	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	NA	NA	ND
TW17	[16]07-21-93	20	ND	82	13	470	NA	NA	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW18	07-22-93	19	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	1
do.	[29]07-22-93	19	T	ND	T	NA	ND	ND	ND	ND	ND	ND	ND	0.05	ND	ND	ND	ND	ND	NA	NA	ND
do.	[30]06-02-94	20.5	ND	ND	2	NA	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	ND	ND	ND	NA	NA	ND
TW18A	06-02-94	20.5	ND	.9	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW22	07-26-93	25	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW23	07-26-93	21	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW24	07-20-93	12	6	6	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW25	07-20-93	6	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW26	07-21-93	9	ND	ND	ND	3	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	[31]07-26-93	12	180	2	ND	11	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-02-94	23.5	.6	ND	ND	NA	ND	ND	ND	ND	0.6	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	06-02-94	23.5	.6	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW27	[32]07-21-93	12	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	53	ND	30	ND	26	NA	NA	9
do.	[33]06-02-94	20.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	.7	ND	2	ND	2	NA	NA	1
do.	[34]06-02-94	20.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	.8	ND	3	ND	2	NA	NA	1
TW27C	06-03-94	20.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW28	07-21-93	15	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW30	07-26-93	9	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW31	07-19-93	9	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-19-93	9	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW32	07-20-93	14	2	5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Trichloroethene	Tetrachloroethene	1,1,1-Trichloroethane	1,2-Dichloroethene[1]	*trans*-1,2-Dichloroethene	*cis*-1,2-Dichloroethene	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane	Trichlorofluoromethane	Benzene	Chlorobenzene	Ethylbenzene	Chloroethane	Xylene[1]	Xylene(m+p)	Xylene(o)	Toluene
TW33	07-23-93	33	9	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
do.	07-23-93	33	2	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW34	[28]07-22-93	23	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW35	07-23-93	27	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW36	07-23-93	24	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW37	07-23-93	18	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW40	07-22-93	12	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW42	07-20-93	9	7	10	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	1
TW43	07-20-93	12	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW44	07-21-93	9	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	1
TW45	07-21-93	6	ND	1	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND
TW46A	06-03-94	20.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
00007	[2]07-20-93	157	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00051	07-20-93	120	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00059	07-19-93	60	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00060	07-19-93	62	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00065	07-21-93	427	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-21-93	427	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00157	07-20-93	318	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00163	07-19-91	143	ND	NA	NA	NA	NA	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	NA	NA
do.	07-21-93	143	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00195	[3]05-31-94	120	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00234	07-20-93	38	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00239	07-21-93	365	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00294	07-20-93	868	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-20-93	868	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00296	07-20-93	550	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00299	07-21-93	116	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00316	07-20-93	179	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00401	07-20-93	110	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00436	06-01-95	215	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	06-01-95	215	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00492	07-20-93	155	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00501	07-20-93	45	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
00505	07-19-93	71	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
20832	[4]07-20-93	86	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-20-93	86	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
20832	[5]06-01-94	86	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21101	07-19-93	140	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21163	07-21-93	123	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21261	07-20-93	48	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21296	07-20-93	100	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21374	07-20-93	60	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21375	07-20-93	145	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21498	07-19-93	60	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21541	07-19-93	410	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21613	07-20-93	100	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21699	07-20-93	145	66	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21709	07-20-93	390	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
21710	07-21-93	420	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
22083	07-20-93	55	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
22094	07-19-93	63	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
22336	07-20-93	400	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
421402	07-21-93	400	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
421414	07-21-93	121	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
421422	07-02-86	600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	600	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
421456	07-20-93	183	ND	ND	NA	NA	ND	ND	ND	2	ND	ND	ND	ND	ND	NA	ND	ND	3	3	NA	ND
421755	07-21-93	398	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
AGTG305GPS	[6]05-31-95	115.0	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[6]05-31-95	115.0	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[7]09-19-96	115.0	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
AGTG305GPD	05-31-95	251.4	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	09-19-96	251.4	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
AGTG305SP	05-31-95	357.8	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BCHP	06-02-94	--	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND
BL1PW02	[8]01-15-86	40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	[8]08-29-89	40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-19-93	40	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BL1PW08	[8]01-15-86	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-19-93	--	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BL1PW10	[8]01-15-86	66	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	66	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-20-93	66	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BL1PW12	[8]05-19-87	59	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	59	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-20-93	59	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BL2RW1	[9]03-22-89	520	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	520	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BL2RW3	[9]03-22-89	52	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	52	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[10]BMW2	11-20-85	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND
do.	08-31-87	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND
do.	10-26-87	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND
do.	02-11-88	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND
do.	04-25-88	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND
do.	08-03-88	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
[10]BMW2	08-16-88	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-03-88	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-13-88	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-10-89	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-01-89	1,860	ND	ND	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-07-89	1,860	ND	ND	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-31-90	1,860	ND	ND	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-08-90	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-26-90	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-90	1,860	ND	ND	ND	ND	ND	ND	4	2	ND	ND	ND	ND	ND	ND	ND	ND	7	10	ND	ND
do.	08-27-90	1,860	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
[10]BMW3	11-20-85	1,800	ND	ND	ND	ND	ND	ND	ND	.3	ND	ND	ND	ND	ND	ND	ND	ND	.2	ND	ND	ND
do.	10-26-87	1,800	ND	ND	ND	ND	ND	ND	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	18	16	ND	ND
do.	04-25-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-03-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-16-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	09-07-88	1,800	ND	ND	ND	ND	ND	ND	ND	2.3	ND	ND	ND	ND	ND	ND	ND	ND	8.7	14.1	ND	ND
do.	10-03-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-13-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-10-89	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-01-89	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-07-89	1,800	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-31-90	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	.29	ND	ND
do.	06-08-90	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-27-90	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
[10]BMW3	05-01-91	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	09-10-91	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-10-91	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-92	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
[10]BMW4	11-19-85	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-26-86	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-87	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-31-87	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-26-87	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-21-87	1,800	ND	ND	ND	ND	ND	ND	2	23	ND	ND	ND	ND	ND	ND	ND	ND	15	9	ND	ND
do.	02-11-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-25-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-03-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-16-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-03-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-13-88	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-10-89	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	26	ND	ND	ND	ND	ND	ND
do.	02-01-89	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-07-89	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-29-89	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-12-89	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-27-90	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-31-90	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-91	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-91	1,800	ND	ND	ND	ND	ND	ND	ND	.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
[10]BMW4	09-10-91	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-10-91	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-08-92	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-92	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-23-93	1,800	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-23-93	1,800	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-94	1,800	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND
[10]BMW5	11-19-85	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-26-86	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-87	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-31-87	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-26-87	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-11-88	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-25-88	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-03-88	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-16-88	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-03-88	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-13-88	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-10-89	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-01-89	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-07-89	610	ND	ND	6.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-30-89	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-31-90	610	ND	ND	ND	ND	ND	ND	ND	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-08-90	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-27-90	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
[10]BMW5	04-30-91	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-91	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	1.3	ND	ND
do.	09-05-91	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-07-91	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-10-91	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-08-92	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-06-92	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-92	610	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-21-93	610	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-94	610	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[10]BMW6	11-19-85	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-26-86	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-09-87	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-87	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-31-87	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-26-87	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-11-88	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-25-88	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-03-88	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-16-88	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-03-88	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-13-88	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-10-89	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-01-89	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-07-89	868	ND	ND	4.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
[10]BMW6	10-29-89	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-31-90	868	ND	ND	ND	ND	ND	ND	ND	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-08-90	868	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-11-90	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-90	868	ND	ND	ND	ND	ND	ND	ND	.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-27-90	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-91	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-91	868	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	1.1	1.1	ND	ND
do.	09-10-91	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-07-91	868	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	.7	.6	ND	ND
do.	12-10-91	868	ND	ND	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-08-92	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-06-92	868	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-92	868	ND	ND	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-21-93	868	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-21-93	868	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[12]11-23-93	868	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	12-13-93	868	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	06-02-94	868	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	06-02-94	868	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[10]BMW7	11-19-85	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-10-87	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-03-88	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-13-88	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-01-89	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
[10]BMW7	07-12-89	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-31-90	969	ND	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-08-90	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-27-90	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-31-90	969	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-91	969	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-10-91	969	ND	ND	NA	NA	ND	ND	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	1.6	ND	ND
do.	12-10-91	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-08-92	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-92	969	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-21-93	969	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-94	969	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
[10]BMW8	04-01-86	1,390	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-03-88	1,390	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-16-88	1,390	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-13-88	1,390	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-01-89	1,390	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-12-89	1,390	ND	ND	ND	ND	ND	ND	ND	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-31-90	1,390	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-08-90	1,390	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-27-90	1,390	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-91	1,390	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	09-09-91	1,390	ND	ND	ND	ND	ND	ND	.6	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-10-91	1,390	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-10-91	1,390	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
[10]BMW8	04-30-92	1,390	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	[12]07-13-93	1,390	ND	ND	NA	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	NA	NA
do.	05-31-94	1,390	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[10]BMW9	06-05-85	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-31-85	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-16-86	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	05-19-87	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-03-88	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-13-88	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	02-01-89	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-12-89	122	ND	ND	4.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-31-90	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-08-90	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	08-27-90	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	09-12-90	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	03-27-91	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-91	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-17-91	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	09-10-91	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	10-10-91	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	0.9	ND	ND
do.	12-10-91	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	04-30-92	122	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-21-93	122	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-94	122	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BMWR2-6	[9]06-28-89	46.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
BMWR2-6	[9]10-29-89	46.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-21-93	46.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BMWR3-6	[9]10-29-89	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-21-93	--	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
BMWR4-5	[9]08-30-89	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-19-93	--	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
HGM1	06-01-94	125	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
HGM2	[13]07-20-93	80	ND	ND	NA	NA	11	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[14]06-01-94	80	ND	ND	NA	NA	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
do.	[15]06-01-94	80	ND	ND	NA	NA	8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
LA1025	07-20-93	--	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND
NSMG101	[8]08-25-88	37.9	7	ND	ND	NA	ND	ND	ND	ND	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-01-94	37.9	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
NSMG102	[8]08-25-88	49.6	13	ND	ND	NA	ND	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-01-94	49.6	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
NSMG103	[8]08-25-88	54.9	10	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-19-93	54.9	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[16]09-12-96	54.9	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
NSMG104	[8]08-25-88	59.0	12	ND	ND	NA	ND	ND	ND	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-02-94	59.0	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	06-01-95	59.0	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	09-12-96	59.0	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
NSMG105	[8]08-25-88	47.8	20	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	06-01-94	47.8	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	06-01-95	47.8	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1	ND	ND	ND	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
NSMG105	09-12-96	47.8	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[17]PCHG115B	06-27-89	48.6	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	09-27-89	48.6	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-06-90	48.6	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-16-91	48.6	ND	ND	ND	NA	ND	ND	ND	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	48.6	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	10-03-95	48.6	ND	ND	ND	NA	ND	ND	ND	0.3	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[17]PCHG115BD	12-17-90	151.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-16-91	151.5	ND	ND	ND	NA	ND	ND	ND	ND	190	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	151.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-95	151.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	09-27-95	151.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[17]PCHG116D	06-28-89	33.6	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	09-26-89	33.6	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	12-06-90	33.6	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-15-91	33.6	76	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	33.6	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-94	33.6	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[19]05-31-94	33.6	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[20]09-27-95	33.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[17]PCHG119D	12-07-90	36.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-15-91	36.5	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-21-93	36.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	09-25-95	36.5	ND	ND	ND	NA	ND	ND	ND	.9	490	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[17]PCHG120D	12-07-90	35.1	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
[17]PCHG120D	01-15-91	35.1	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	35.1	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	09-26-95	35.1	ND	ND	ND	NA	ND	ND	ND	4	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[17]PCHG125D	12-10-90	28.4	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-15-91	28.4	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	[21]07-21-93	28.4	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[22]06-01-94	28.4	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
do.	09-23-95	28.4	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[17]PCHG125BD	12-09-90	147.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-16-91	147.7	26	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-21-93	147.7	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-21-93	147.7	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	10-05-95	147.7	ND	0.3	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
PCHG127GP	01-30-92	294.2	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	11-12-92	294.2	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND
do.	07-21-93	294.2	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	06-01-94	294.2	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-95	294.2	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[8]10-05-95	294.2	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	09-25-96	294.2	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
PCHG127SP	01-06-92	375.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	[24]01-30-92	375.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-30-92	375.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	01-30-92	375.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	11-12-92	375.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
PCHG127SP	07-20-93	375.7	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-20-93	375.7	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-94	375.7	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	05-31-95	375.7	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[8,25]10-04-95	375.7	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	09-25-96	375.7	2	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
PCHG128GPS	06-02-94	121.0	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[26]06-01-95	121.0	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	10-17-96	121.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
PCHG128GPD	06-02-94	258.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	06-01-95	258.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	09-20-96	258.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
[17]PCHG202	09-13-82	102	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
do.	00-00-90	102	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
do.	07-20-93	102	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
PCHP436B	08-29-96	35.0	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
PCHG436GPS	08-29-96	107.3	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
SQ4329	07-21-93	--	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW1	07-22-93	21	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW8	07-21-93	14.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW9	[27]07-27-93	23	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	2
TW9B	06-03-94	20.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW11	07-27-93	28	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-27-93	28	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW12	[28]07-22-93	12	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
TW13	07-21-93	15	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW14	07-19-93	28	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW16	07-22-93	18	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW17	[16]07-21-93	20	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW18	07-22-93	19	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[29]07-22-93	19	ND	NA	NA	NA	ND	ND	ND	ND	ND	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	ND
do.	[30]06-02-94	20.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	0.5	0.4	NA	ND
TW18A	06-02-94	20.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW22	07-26-93	25	32	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW23	07-26-93	21	42	ND	NA	NA	ND	ND	ND	3	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW24	07-20-93	12	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW25	07-20-93	6	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW26	07-21-93	9	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[31]07-26-93	12	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	06-02-94	23.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	NA	ND
do.	06-02-94	23.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	ND	ND	NA	ND
TW27	[32]07-21-93	12	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[33]06-02-94	20.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	[34]06-02-94	20.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW27C	06-03-94	20.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW28	07-21-93	15	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW30	07-26-93	9	4	ND	NA	NA	ND	ND	ND	ND	4	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW31	07-19-93	9	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-19-93	9	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW32	07-20-93	14	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND

Table 8. Concentrations of volatile organic compounds in the aquifers underlying Belvidere, Ill., 1982–96—Continued

Well designation	Sample date	Depth of well (feet)	Methylene chloride	Chloromethane	Dichloromethane	Methylether	Vinyl chloride	Carbon tetrachloride	Bromoform	Chloroform	Acetone	Carbon disulfide	4-Methyl-2-pentanone	2-Hexanone	Styrene	2-Methoxy 2-methylpropane	1,2-Dichloropropane	*trans*-1,3-Dichloropropene	Bromodichloromethane	Chlorodibromomethane	Dichlorodifluoromethane	2-Butanone
TW33	07-23-93	33	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
do.	07-23-93	33	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW34	[28]07-22-93	23	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW35	07-23-93	27	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW36	07-23-93	24	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW37	07-23-93	18	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW40	07-22-93	12	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW42	07-20-93	9	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW43	07-20-93	12	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW44	07-21-93	9	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW45	07-21-93	6	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND
TW46A	06-03-94	20.5	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND

[1] Total concentration of all isomers.

[2] Reporting limit for samples collected in November 1992 and July 1993 are 10 µg/L (micrograms per liter). Concentrations less than 10 µg/L are estimated. Other samples collected before July 1993 have various reporting limits, all less than or equal to 10 µg/L; samples were collected and analyzed by various Federal and State agencies and private contractors (Brown and Mills, 1995)

[3] Reporting limit for samples collected in May–June 1994 and May–June 1995 is 1 µg/L. Concentrations less than 1 µg/L are estimated.

[4] Tentatively identified compound: chlorodifluoromethane, 39 µg/L (estimated).

[5] Tentatively identified compound: chlorodifluoromethane, 12 µg/L (estimated).

[6] Tentatively identified compound: 1,1,2-trichloro-1,2,2-trifluoroethane, 2 µg/L (estimated).

[7] Reporting limit for samples collected in August–October 1996 is 10 µg/L. Concentrations less than 10 µg/L are estimated.

[8] Sample collected by a private contractor for or by the Illinois Environmental Protection Agency (IEPA).

[9] Sample collected by a private contractor for the U.S. Environmental Protection Agency.

[10] Samples during 1986–92 were collected by the IEPA or city of Belvidere, Water and Sewer Department.

[11] Reporting limit for sample is 3 µg/L. Concentrations less than 3 µg/L are estimated.

[12] Sample collected by a private contractor for the Chrysler Corporation.

[13] Tentatively identified compound: dichlorofluoromethane, 10 µg/L (estimated).

[14] Tentatively identified compounds: chlorodifluoromethane, 23 µg/L (estimated); dichlorofluoromethane, 7 µg/L (estimated).

[15] Tentatively identified compounds: chlorodifluoromethane, 22 µg/L (estimated); dichlorofluoromethane, 8 µg/L (estimated).

[16] Unknown tentatively identified compound, 6 µg/L (estimated).

[17] Samples during 1982–91 and during September–October 1995 were collected by a private contractor for or by the IEPA.

[18] Concentration is estimated.

[19] Tentatively identified compound: unknown methylnaphthalene, 4 µg/L (estimated).

[20] Acetone in field blank.

[21] Reporting limit is 25 µg/L; concentrations less than 25 µg/L are estimated.

[22] Tentatively identified compound: unknown methylnaphthalene, 3 µg/L (estimated).

[23] 1,1,1-trichloroethane detected in sample duplicate, 48 µg/L (estimated).

[24] First sample collected on January 30, 1992 was obtained after three well volumes of water were removed from the well; second sample was obtained after six well volumes were removed. Third sample is duplicate of sample obtained after six well volumes of water were removed; sample was analyzed by the U.S. Geological Survey Central Laboratory, Arvada, Colo.

[25] Toluene and xylene in field blank.

[26] Tentatively identified compound: dichlorofluoromethane, 0.6 µg/L (estimated).

[27] Concentrations in a dry clay sample in µg/kg; no volatile organic compounds were detected in a wet silt sample collected at the same approximate depth.

[28] Tentatively identified compound: unknown aldehyde, 6 µg/L (estimated).

[29] Sample was analyzed by the U.S. Geological Survey Central Laboratory, Arvada, Colo.

[30] Tentatively identified compound: unknown, 2 µg/L (estimated).

[31] Reporting limit is 12 µg/L.

[32] Tentatively identified compounds: alkylbenzene, 28 µg/L (estimated); alkylbenzene, 5 µg/L (estimated); trimethylbenzene, 10 µg/L (estimated).

[33] Tentatively identified compound: indene, 2 µg/L (estimated).

[34] Tentatively identified compound: indene, 3 µg/L (estimated).

APPENDIXES

APPENDIX 1. ABBREVIATIONS USED FOR ORGANIC CONSTITUENTS AND HAZARDOUS-WASTE SITES

Organic constituents

1,2-Dichloroethene	1,2-DCE
cis-1,2-Dichloroethene	*cis*-1,2-DCE
trans-1,2-Dichloroethene	*trans*-1,2-DCE
Trichloroethene	TCE
Trichlorofluoromethane	TCFM
Tetrachloroethene	PCE
1,1,1-Trichloroethane	1,1,1-TCA

Hazardous-waste sites

Belvidere Municipal Landfill No. 1	BL1
Belvidere Municipal Landfill No. 2	BL2
MIG/DeWane Landfill	MDL
National Sewing Machine	NSM
Parson's Casket Hardware	PCH

APPENDIX 2. U.S. ENVIRONMENTAL PROTECTION AGENCY DRINKING-WATER STANDARDS ESTABLISHED UNDER GUIDELINES OF THE SAFE DRINKING WATER ACT OF 1986

[All values in milligrams per liter unless noted otherwise. --, no established regulation; TT, treatment technique; pCi/L, picocuries per liter; mrem, milliroentgens equilvalent man per year; MFL, million fibers per liter; CU, Color Unit; TON, Threshold Odor Number; PS, performance standard 0.5–1.0 nephelometric turbidity units (NTU)]

	Primary drinking-water standard[1]				Secondary drinking-water standard[2]	
Constituent or Property	MCLG[3]	MCL[4]	Proposed MCLG[3]	Proposed MCL[4]	SMCL[5]	Proposed SMCL[5]
Inorganic Constituents and Nutrients						
Aluminum	--	--	--	--	0.05 to 0.2	--
Antimony	0.006	0.006	--	--	--	--
Arsenic	--	.05	--	--	--	--
Asbestos, MFL[6]	7	7	--	--	--	--
Barium	2	2	--	--	--	--
Beryllium	0	.001	--	--	--	--
Cadmium	.005	.005	--	--	--	--
Chloride	--	--	--	--	250	--
Chromium	.1	.1	--	--	--	--
Copper	1.3	TT	--	--	1	--
Cyanide	.2	.2	--	--	--	--
Fluoride	4	4	--	--	2	--
Iron	--	--	--	--	.3	--
Lead	0	TT	--	--	--	--
Manganese	--	--	--	--	.05	--
Mercury	.002	.002	--	--	--	--
Nickel	.1	.1	--	--	--	--
Nitrate (As N)	10	10	--	--	--	--
Nitrate + Nitrite (As N)	10	10	--	--	--	--
Nitrite (As N)	1	1	--	--	--	--
Selenium	.05	.05	--	--	--	--
Silver	--	--	--	--	.1	--
Sulfate	--	--	400/500	400/500	250	--
Thallium	.0005	.002	--	--	--	--
Total Dissolved Solids	--	--	--	--	500	--
Zinc	--	--	--	--	5	--
Organic Compounds						
Acrylamide	0	TT	--	--	--	--
Alachlor	0	.002	--	--	--	--
Aldicarb	--	--	.001	.003	--	--
Aldicard Sulfone	--	--	.001	.002	--	--
Aldicard Sulfoxide	--	--	.001	.004	--	--
Atrazine	.003	.003	--	--	--	--
Benzene	0	.005	--	--	--	--
Benzo (a) pyrene	0	.0002	--	--	--	--
Carbofuran	.04	.04	--	--	--	--
Carbon Tetrachloride	0	.005	--	--	--	--
Chlordane	0	.002	--	--	--	--
2,4-D (2,4-Dichloro-phenoxyacetic Acid)	.07	.07	--	--	--	--
Dalapon	.2	.2	--	--	--	--
Di (2-ethylhexyl) adipate	.5	.5	--	--	--	--
Di (2-ethylhexyl) phthalate	0	.006	--	--	--	--

	Primary drinking-water standard[1]				**Secondary drinking-water standard[2]**	
Constituent or Property	**MCLG[3]**	**MCL[4]**	**Proposed MCLG[3]**	**Proposed MCL[4]**	**SMCL[5]**	**Proposed SMCL[5]**
Dibromochloropropane (DBCP)	0	0.0002	--	--	--	--
p-Dichlorobenzene	.075	.075	--	--	--	--
o-Dichlorobenzene	.6	.6	--	--	--	--
1,2-Dichloroethane	0	.005	--	--	--	--
1,1-Dichloroethylene	.007	.007	--	--	--	--
cis-1,2-Dichloroethylene	.07	.07	--	--	--	--
trans-1,2-Dichloroethylene	.1	.1	--	--	--	--
Dichloromethane (methylene chloride)	0	.005	--	--	--	--
1,2-Dichloropropane	0	.005	--	--	--	--
Dinoseb	.007	.007	--	--	--	--
Diquat	.02	.02	--	--	--	--
Endothall	.1	.1	--	--	--	--
Endrin	.002	.002	--	--	--	--
Epichlorohydrin	0	TT	--	--	--	--
Ethylbenzene	.7	.7	--	--	--	--
Ethylene Dibromide (EDB)	0	.00005	--	--	--	--
Glyphosate	.7	.7	--	--	--	--
Heptachlor	0	.0004	--	--	--	--
Heptachlor Epoxide	0	.0002	--	--	--	--
Hexachlorobenzene	0	.001	--	--	--	--
Hexachlorocyclopentadiene	.05	.05	--	--	--	0.008
Lindane	.0002	.0002	--	--	--	--
Methoxychlor	.04	.04	--	--	--	--
Monochlorobenzene	.1	.1	--	--	--	--
Oxamyl (vydate)	.2	.2	--	--	--	--
Pentachlorophenol	0	.001	--	--	--	--
Pichloram	.5	.5	--	--	--	--
Polychlorinated Biphenyls (PCB's)	0	.0005	--	--	--	--
Simazine	.004	.004	--	--	--	--
Styrene	.1	.1	--	--	--	--
2,3,7,8-Tetrachlorodibenzo-P-Dioxin (TCDD, dioxin)	0	5×10^{-8}	--	--	--	--
Tetrachloroethylene	0	.005	--	--	--	--
Toluene	1	1	--	--	--	--
Toxaphene	.05	.05	--	--	--	--
2,4,5-Trichlorophenoxy-propionic Acid (silvex)	.05	.05	--	--	--	--
1,2,4-Trichlorobenzene	.07	.07	--	--	--	--
1,1,1-Trichloroethane	.2	.2	--	--	--	--
1,1,2-Trichloroethane	.003	.005	--	--	--	--
Trichloroethylene	0	.005	--	--	--	--
Trihalomethanes, total[7]	--	.1	--	--	--	--
Vinyl Chloride	0	.002	--	--	--	--
Xylenes (Total)	10	10	--	--	--	--
Microbiological						
Giardia Lamblia[8]	0	TT	--	--	--	--
Legionella[8]	0	TT	--	--	--	--
Total Coliforms (including Fecal Coliform and E. Coli)	0	[8]--	--	--	--	--
Viruses[9]	0	TT	--	--	--	--
Radioactivity						
Beta Particle and Photon emitters	--	[10]4 mrem	0 pCi/L	4 mrem	--	--
Alpha emitters	--	15 pCi/L	0 pCi/L	15 pCi/L	--	--
Radium-226 + 228	--	5 pCi/L	--	--	--	--
Radium-226	--	--	0 pCi/L	20 pCi/L	--	--

	Primary drinking-water standard[1]				Secondary drinking-water standard[2]	
Constituent or Property	MCLG[3]	MCL[4]	Proposed MCLG[3]	Proposed MCL[4]	SMCL[5]	Proposed SMCL[5]
Radioactivity—Continued						
Radium-228	--	--	0 pCi/L	20 pCi/L	--	--
Radon	--	--	0 pCi/L	300 pCi/L	--	--
Uranium	--	--	0 pCi/L	20 µg/L	--	--
Miscellaneous Properties						
Color	--	--	--	--	15 CU	--
Corrosivity	--	--	--	--	non-corrosive	--
Foaming Agents	--	--	--	--	.5	--
Odor	--	--	--	--	3 TON	--
pH	--	--	--	--	6.5–8.5 (standard units)	--
Standard plate count	--	TT	--	--	--	--
Total dissolved solids (TDS)	--	--	--	--	500	--
Turbidity	--	PS	--	--	--	--

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[1] From Pontius (1993).

[2] From Pontius (1992).

[3] MCLG, Maximum Contaminant Level Goal. Nonenforceable health goal that is to be set at the level at which no known or anticipated adverse effects on the health of person occur and that allows an adequate margin of safety. Formerly called Recommended Maximum Contaminant Level (RMCL).

[4] MCL, Maximum Contaminant Level. Enforceable, health-based regulation that is to be set as close to the MCLG as is feasible. The definition of feasible means the use of best technology, treatment techniques, and other means that the Administrator of U.S. Environmental Protection Agency finds, after examination for efficacy under field conditions and not solely under laboratory conditions that are generally available (taking cost into consideration).

[5] SMCL, Secondary Maximum Contaminant Level. Contaminants that affect the aesthetic quality of drinking water. At high concentrations or values, health implications, as well as aesthetic degradation also may be present. SMCL's are not Federally enforceable but are intended as guidelines for the States.

[6] Fiber length greater than 10 micrometers.

[7] The sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane, and trichloromethane.

[8] MCL is based on presence/absence of total coliforms in sample rather than on an estimate of coliform density. No more than 5 percent of the samples per month may be positive. (For systems collecting fewer than 40 samples per month, no more than 1 sample per month may be positive.)

[9] Treatment-technique requirements have been established.

[10] Average annual concentrations assumed to produce a total body (or organ) dose of 4 mrem/yr—tritium 20,000 pCi/L (strontium-90, 8 pCi/L).

REFERENCES

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