Prepared in cooperation with New York State Department of Environmental Conservation

Ground-Water Quality in the Genesee River Basin, New York, 2005-2006

Open-File Report 2007–1093

**U.S. Department of the Interior
U.S. Geological Survey**

This page has been left blank intentionally.

Prepared in cooperation with New York State Department of Environmental Conservation

Ground-Water Quality in the Genesee River Basin, New York, 2005-2006

By David A.V. Eckhardt, J.E. Reddy, and Kathryn L. Tamulonis

Open-File Report 2007–1093

**U.S. Department of the Interior
U.S. Geological Survey**

U.S. Department of the Interior
DIRK KEMPTHORNE, Secretary

U.S. Geological Survey
Mark D. Myers, Director

U.S. Geological Survey, Reston, Virginia 2007
Revised June 2008

For more information on the USGS—the Federal source for science about the Earth,
its natural and living resources, natural hazards, and the environment:
World Wide Web: <http://www.usgs.gov>
Telephone: 1-888-ASK-USGS

Suggested citation:
Eckhardt, D.A., Reddy, J.E., and Tamulonis, K.L., 2007, Ground-water quality in the Genesee River Basin,
New York, 2005-2006: U.S. Geological Survey Open-File Report 2007-1093, 26 p., online only.
Revised June 2008.

Any use of trade, product, or firm names is for descriptive purposes only and does not imply
endorsement by the U.S. Government.

Although this report is in the public domain, permission must be secured from the individual
copyright owners to reproduce any copyrighted material contained within this report.

Contents

Abstract.....	1
Introduction	2
Purpose and Scope	3
Study Area	3
Methods	6
Site Selection	6
Sampling and Analytical Methods.....	8
Ground–Water Quality.....	9
Physical Properties	9
Nutrients.....	10
Major Ions.....	10
Trace Elements and Radionuclides.....	10
Pesticides.....	11
Volatile Organic Compounds	11
Bacteria	11
Summary	12
References Cited	13

Figures

1. Map showing geographic features of Genesee River Basin and locations of the 22 wells sampled in 2005-2006. (Well data are given in table 1)	2
2. Map showing land use in the Genesee River Basin and locations of the 22 wells sampled in 2005-2006. (Well data are given in table 1)	4
3. Map showing surficial geology in the Genesee River Basin and locations of the 11 wells in sand and gravel aquifers sampled in 2005-2006. (Well data are given in table 1)	5
4. Map showing generalized bedrock geology in the Genesee River Basin and locations of the 11 bedrock wells sampled in 2005-2006. (Well data are given in table 1).....	7

Tables

1. Well information and physical properties of ground-water samples from selected wells in the Genesee River Basin, New York, 2005-2006	15
2. Compounds for which ground-water samples from the Genesee River Basin were analyzed but not detected, New York, 2005-2006 ..	16
3. Concentrations of nutrients, total organic carbon, and total phenols in ground-water samples from the Genesee River Basin, New York, 2005-2006	20
4. Concentrations of inorganic constituents in ground-water samples from the Genesee River Basin, New York, 2005-2006 ..	21

5. Concentrations of trace elements, metals, and radionuclides in ground-water samples from the Genesee River Basin, New York, 2005-2006	22
6. Concentrations of pesticides and caffeine detected in ground-water samples from the Genesee River Basin, New York, 2005-2006	24
7. Concentrations of volatile organic compounds (VOCs) in ground-water samples from the Genesee River Basin, New York, 2005-2006	25
8. Concentrations of bacteria in unfiltered ground-water samples from the Genesee River Basin, New York, 2005-2006	26

Conversion Factors

Inch/Pound to SI

Multiply	By	To obtain
Length		
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi ²)	2.590	square kilometer (km ²)

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

$$^{\circ}\text{F}=(1.8\times^{\circ}\text{C})+32$$

Abbreviations

AMCL	Alternative maximum contaminant level
GC-MS	Gas chromatography-mass spectrometry
GPS	Global positioning unit
GWSI	Ground-Water Site Inventory
HA	Health Advisory for drinking water
HPLC-MS	High-performance liquid chromatography-mass spectrometry
LCMS	Liquid chromatography-mass spectrometry
MCL	Maximum contaminant level
MTBE	Methyl- <i>tert</i> -butyl ether
NWQL	USGS National Water Quality Laboratory
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OGRL	USGS Organic Geochemistry Research Laboratory
SMCL	Secondary maximum contaminant level
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VOC	Volatile organic compound

Other abbreviations in this report:

micrometer (μm)
micrograms per liter (μg/L)
milligrams per liter (mg/L)
picocuries per liter (pCi/L)
microsiemens per centimeter (μS/cm)

Datum: Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

This page has been left blank intentionally.

Ground-Water Quality in the Genesee River Basin, New York, 2005–2006

By David A.V. Eckhardt, J.E. Reddy, and Kathryn L. Tamulonis

Abstract

Water samples were collected from 7 community water system wells and 15 private domestic wells throughout the Genesee River Basin in New York State (downstream from the Pennsylvania border) from October 2005 through March 2006 and analyzed to characterize the chemical quality of ground water in the basin. The wells were selected to represent areas of greatest ground-water use and to provide a representative sampling from the 2,439 square-mile basin area in New York. Samples were analyzed for five physical properties and 226 constituents that included nutrients, major inorganic ions, trace elements, radionuclides, pesticides, volatile organic compounds, and bacteria.

The results show that ground water used for drinking water is generally of good quality in the Genesee River Basin, although concentrations of seven constituents exceeded drinking water standards. The cations that were detected in the highest concentrations were calcium, magnesium, and sodium; the anions that were detected in the greatest concentrations were bicarbonate, chloride, and sulfate. The predominant nutrient was nitrate, and nitrate concentrations were greater in samples from sand and gravel aquifers than in samples from bedrock aquifers. The trace elements barium, boron, cobalt, copper, and nickel were detected in every sample; the highest concentrations were barium, boron, chromium, iron, manganese, strontium, and lithium. Fourteen pesticides including seven pesticide degradates were detected in water from 12 of the 22 wells, but none of the concentrations exceeded Maximum Contaminant Levels (MCLs). Eight volatile organic compounds (VOCs) were detected in six samples, but none of the concentrations exceeded MCLs.

Seven chemical analytes and three types of bacteria were present in concentrations that exceeded Federal and New York State water-quality standards, which are typically identical. Sulfate concentrations exceeded the U.S. Environmental Protection Agency (USEPA) Secondary Maximum Contaminant Level (SMCL) of 250 milligrams per liter (mg/L) in three samples; the chloride SMCL (250 mg/L) was exceeded in one sample. Sodium concentrations exceeded the USEPA Drinking Water Health Advisory of 60 mg/L in five samples. The SMCL for iron (300 µg/L) was exceeded in 11 filtered samples; the USEPA SMCL for manganese (50 µg/L) was exceeded in 10 filtered samples, and the New York State MCL (300 µg/L) was exceeded in 1 filtered sample. The MCL for aluminum (200 µg/L) was exceeded in 1 sample, and the MCL for arsenic (10 µg/L) was exceeded in 1 sample. Radon-222 exceeded the proposed USEPA MCL of 300 picocuries per liter in 16 samples. Any detection of total coliform or fecal coliform bacteria is considered a violation of New York State health regulations; in this study, total coliform was detected in eight samples; fecal coliform was detected in two samples, and *Escherichia coli* was detected in one sample.

Introduction

The Genesee River Basin encompasses 2,439 mi² in west-central New York and 95 mi² in north-central Pennsylvania (fig. 1). The Genesee River drains northward from its headwaters in Pennsylvania to its confluence with Lake Ontario. The basin is about 40 miles wide in its central part and about 90 miles long. Gilbert and Kammerer (1971) and the U.S. Army (1969) have described the geography and hydrology of the Genesee River Basin, but a comprehensive assessment of the quality of ground water throughout the basin has been needed.

Figure 1. Geographic features of Genesee River Basin and locations of the 22 wells sampled in 2005-2006. (Well data are given in table 1)

Section 305(b) of the Federal Clean Water Act Amendments of 1977 (U.S. Environmental Protection Agency, 1997) requires all states to undertake a comprehensive water-quality monitoring program for surface-water and ground-water resources. In 2001, the U.S. Geological Survey (USGS), in cooperation with the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (USEPA), initiated an assessment of ground-water quality in river basins throughout the State, as specified in Section 305(b). As part of this program, ground-water-quality studies have been conducted in the Mohawk River Basin, the Chemung River Basin (Hetcher-Aguila, 2004), the Lake Champlain Basin (Nystrom, 2006), the upper Susquehanna River basin (Hetcher-Aguila and Eckhardt, 2006), the Delaware River basin (Nystrom, 2007a), and the St. Lawrence River basin (Nystrom, 2007b).

Purpose and Scope

The objective of this report is to describe the quality of ground water that is used for drinking water in the Genesee River Basin in New York. The report describes the sampling and analytical methods and presents the results of the water-quality analyses conducted on ground-water samples from 22 wells throughout the basin. Results are given in tables 1–8 (at end of report). Analytical results for selected constituents are compared with Federal and State drinking-water standards, which are typically identical. The standards include Maximum Contaminant Levels (MCLs), Secondary Maximum Contaminant Levels (SMCLs), and Health Advisories (HAs) established by the U.S. Environmental Protection Agency (2002; 2004; 2006) and the New York State Department of Health (NYSDOH, 2006). MCLs are typically based on human health criteria and are legally enforceable by Federal and State authorities; SMCLs are non-enforceable guidelines based on cosmetic and aesthetic criteria; and HAs are non-enforceable guidelines on contaminants that can effect human health.

Study Area

The Genesee River drains northward from north-central Pennsylvania to its outlet at Lake Ontario north of Rochester, N.Y. (fig. 1). Its drainage area is 2,534 mi², of which 95 mi² are in Pennsylvania. The central and southern parts of the basin lie within the glaciated Appalachian Plateau physiographic province, and the northern part of the basin is in Lake Ontario Lowlands province. Forest and pasture are the main land uses in the steep uplands and narrow valleys that dominate the southern area of the basin; row-crop and dairy agriculture is concentrated in the broad alluvial valley and the low rolling hills of the central basin; and the Rochester metropolitan area dominates the relatively flat plain of the northern basin (fig. 2). The Genesee River Basin contains four of the western Finger Lakes (Conesus, Hemlock, Canadice, and Honeoye Lakes) and is crossed by the New York State Barge (Erie) Canal near Rochester. The main tributaries to the Genesee River are Black Creek, Canaseraga Creek, Oatka Creek, and Honeoye Creek. In New York, the basin lies mostly within Allegany, Genesee, Livingston, Monroe, Ontario, and Wyoming Counties.

During deglaciation of the region, thick deposits of fluvial sand and gravel (deposited beneath, in front of, or alongside a glacier by meltwater streams) and lacustrine clay, silt, and fine sand (deposited within proglacial lakes) were left within the Genesee River valley. As a result, glacially derived landforms are present throughout the study area (fig. 3); these include the sand and gravel deposits that form outwash plains, eskers, kettles, kames, and kame terraces, and the fine-grained, poorly-sorted morainal deposits that form valley plugs and low ridges. The glaciers also left a thin mantle of poorly-sorted till on top of the bedrock in upland areas. Recent alluvium covers some of the glacial deposits and forms the flood plains along the larger streams and rivers.

The glacial and alluvial deposits within the study area are described in detail by Fairchild (1928), Coates (1966), Gilbert and Kammerer (1971), Cadwell and Muller (1986), Miller (1988), and Randall (2001).

Figure 2. Land use in the Genesee River Basin and locations of the 22 wells sampled in 2005-2006. (Well data are given in table 1)

Figure 3. Surficial geology in the Genesee River Basin and locations of the 11 wells in sand and gravel aquifers sampled in 2005-2006. (Well data are given in table 1.)

Land surface elevations range from about 250 ft at Lake Ontario to about 2,500 ft in the central and southern uplands. The basin has a humid climate, and temperatures are moderated by its proximity to Lake Ontario and Lake Erie. Precipitation is the primary source of water in the basin and averages about 33 in/yr. About 15 percent of the annual precipitation infiltrates the land surface and recharges ground-water storage in the bedrock and sand and gravel aquifers (Gilbert and Kammerer, 1971).

The south and central parts of the study area are predominantly rural, although there are several large villages (Avon, Dansville, Geneseo, LeRoy, Mount Morris, Warsaw, and Wellsville [fig. 1]) and many small villages and hamlets. Most of the developed area is in the City of Rochester and its suburbs in Monroe County. Total population of the study area in 2000 was about

805,000 people; about 70 percent of the people were in the Rochester area (U.S. Department of Commerce, 2000). Community water system wells provide water to about 95,000 people in the villages, towns, and cities within the study area (NYSDOH, 2005). The largest water suppliers are the Monroe County Water Authority and the City of Rochester, which serve most of the residents in the Rochester area with surface water from Lake Ontario (15 miles northwest of the city) and Hemlock and Canadice Lakes (23 miles south of the city). In the southern and central areas of the basin, many of the rural community water systems use ground water from surficial deposits of sand and gravel. In areas where the surficial aquifers are thin or absent, some systems use surface water from small reservoirs and lakes, and others use a combination of surface water and ground water. Most rural homeowners that live beyond the service areas of community water systems rely on private wells that tap ground water from bedrock and surficial deposits for their domestic water use.

The most productive aquifers within the study area are the glacial and alluvial deposits of sand and gravel (fig. 3). Lacustrine and till deposits are relatively impermeable and yield little water to wells; the lacustrine beds may confine underlying sand and gravel aquifers. Bedrock aquifers are used for water supply in areas where significant thicknesses of saturated sand and gravel are unavailable, typically in upland areas (fig. 4). The bedrock aquifers are relatively flat-lying, interbedded sedimentary units of shale, siltstone, sandstone, limestone, and dolostone of Silurian and Devonian age (Broughton and others, 1962).

Methods

In the Genesee River Basin, 22 wells were selected for sample collection. Wells at 11 of the sites are in sand and gravel aquifers (fig. 3) and 11 are in bedrock aquifers (fig. 4). Of the 11 wells in sand and gravel, 7 are community water system wells and 4 are private domestic wells; the 11 bedrock wells are all private domestic wells. Sampling commenced in October 2005 and was completed in March 2006. The water samples were analyzed for 226 constituents and 5 physical properties. Two samples were collected for quality assurance (QA) and quality control (QC)—one field blank and one replicate sample—as required for the Federal 305(b) program.

Site Selection

The wells were identified through the USGS Ground-Water Site Inventory (GWSI) database and NYSDEC Water-Well Reporting Program and through contacts with representatives from county health departments. The Water-Well Reporting Program was implemented in 2000 to collect information about newly drilled wells throughout New York from licensed well drillers; the subsequent database provides useful information for ground-water studies. A letter that described the project and requested permission to sample the water was sent to the owner of each well that was identified as a potential sampling site. It included a questionnaire asking the location of the well, the most convenient times for sampling, any safety concerns around the well, and other information.

Community water system wells were identified through the New York State Department of Health Public-Water Supply Database and local officials, including the Departments of Health from Allegany, Genesee, Livingston, and Wyoming Counties, and water managers of villages and cities throughout the basin. The water managers were sent a project description and a questionnaire similar to those sent to residential-well owners. Telephone calls were made to well owners who responded favorably to clarify information about the wells and to arrange sampling dates.

Most of the wells finished in sand and gravel were in the valleys and ranged from 20 to 161 ft deep (table 1); the community water system wells have slotted screens, but most domestic wells simply have an open-bottomed casing in the sand and gravel. The bedrock wells were generally in

upland terrain and ranged from 65 to 360 ft deep; the wells typically have casing set into competent rock with open boreholes in the bedrock.

Site selection did not target specific municipalities, industries, or agricultural practices; rather, sample sites were selected to represent areas of greatest ground-water use and to obtain a geographical representation of the basin and its aquifers (figs. 2-4). Site selection included wells in each of four predominant land-use categories—agriculture, urban, forest, and wetland. The land-use classification was done through satellite-image analysis to describe the predominant land uses within a half-mile radius of each well (fig. 2). Most were surrounded by a predominant land use that represented more than 50 percent of the radial well-site area; the other well sites contained a combination of land uses.

Figure 4. Generalized bedrock geology in the Genesee River Basin and locations of the 11 bedrock wells sampled in 2005-2006. (Well data are given in table 1.)

Shallow wells that tap sand and gravel aquifers are susceptible to contamination by several types of compounds, including volatile organic compounds (VOCs), pesticides, deicing chemicals, and nutrients from nearby highways and industrial, agricultural, and residential areas (Eckhardt and Stackelberg, 1995). The movement of these contaminants to the water table through the soils and surficial sand and gravel can be relatively rapid. Bedrock wells in rural upland areas are generally less susceptible to contamination from industrial and urban sources, which are mainly in the valleys; also, water movement in the bedrock is generally slower than in sand and gravel. Agricultural areas that surround several of the wells are a potential source of contamination from fertilizers, pesticides, and animal wastes; residential lawns and domestic septic systems are also a potential source of these contaminants. In addition to human contaminants, the aquifers contain naturally derived elements that may adversely affect water quality, such as sodium, chloride, iron, manganese, and trace elements such as arsenic; some may also contain hydrogen sulfide, methane, and radon gases from natural sources.

Sampling and Analytical Methods

Water samples that were analyzed for nutrients (table 3), inorganic constituents (table 4), trace elements and radionuclides (table 5), and VOCs (table 7) were collected from every well and processed by methods described in the USGS manual for the collection of water-quality data (U.S. Geological Survey, 2006). In addition, pesticide samples (table 6) were collected and processed by the methods of Shelton (1994) and Sandstrom and others (2001). These samples were analyzed at the USGS National Water Quality Laboratory (NWQL) and the USGS Kansas Organic Geochemistry Research Laboratory (OGRL) for 139 pesticides and pesticide degradates through methods described by Zaugg and others (1995), Meyer and others (1993), Furlong and others (2001), and Lee and Strahan (2003). The analytical method devised by Zaugg and others (1995) was developed in cooperation with the USEPA and allows detection of the nation's most commonly used pesticides. Samples for bacteria analyses (table 8) were collected and processed in accordance with NYSDOH regulations.

At the sample sites, the well pump was turned on (many of the community water system wells were already running) and allowed to run until at least five casing-volumes of well water had passed the sampling point. A raw-water spigot between the well and the pressure tank was opened, and the water was allowed to run for several more minutes to flush the spigot. During this time, a general visual evaluation of the area surrounding the sampling site was conducted to identify obvious potential nonpoint and point sources of contamination that could affect the well water. Samples were collected from the raw-water spigot to avoid all water-treatment systems and to ensure that the water collected was representative of the water in the aquifer.

At each sampling site, a Teflon discharge line was connected to the spigot, and samples were analyzed with a multiprobe meter for physical properties, including temperature, specific conductance, dissolved-oxygen concentration, and pH. After the measurements of these properties had stabilized, a second Teflon discharge line was connected to the first with a stainless-steel quick-connect fitting, and the second line was directed into a sampling-chamber bag mounted on a plastic box; this sample-collection chamber was used to minimize sample exposure to dust and other potential sources of contamination. The bottom of the sampling-chamber bag was pierced above a plastic funnel in the top of the box to allow water to run to waste for several minutes to flush the Teflon line. Bottles were filled within the chamber bag according to standard USGS field methods (U.S. Geological Survey, 2006).

Analyses for physical properties, most trace elements and metals, radionuclides, and VOCs were conducted on unfiltered water samples (tables 1, 5, and 7) to obtain the whole-water

concentrations. Concentrations of most nutrients, major inorganic constituents, three metals, and pesticides were obtained from filtered samples (tables 3, 4, 5, and 6). Unfiltered-water concentrations were compared with filtered concentrations to estimate the difference between the total and dissolved concentrations of some constituents. Sulfuric acid was added to the phenol samples, hydrochloric acid was added to the total organic carbon and the VOC samples, and nitric acid was added to some trace element samples to prevent degradation of the samples. For samples for the dissolved inorganic analytes, filtrate was collected through a 0.45- μm cellulose capsule filter that was attached to the Teflon discharge line inside the sample chamber bag; pesticide samples were filtered through a 0.7- μm furnace-baked glass-fiber plate filter.

All Teflon discharge lines were cleaned in the laboratory before each sampling day and in the field between each sample. New chamber bags were used at each sampling site. Samples for radon analysis were obtained through an in-line septum chamber with a disposable syringe to avoid atmospheric contamination. Samples for bacterial analysis were collected within the sampling chamber in sterile containers provided by the bacteriological laboratory; the connection of the sampling tube to the well tap was not sterilized.

The samples were stored on ice in coolers and delivered directly or shipped by overnight delivery to one of four laboratories: (1) the USGS National Water Quality Laboratory in Denver, Colo., for analysis for nutrients (table 3), inorganic constituents (table 4), trace elements and radon-222 (table 5), some pesticides (table 6), and VOCs (table 7); (2) the USGS Kansas Organic Geochemical Research Laboratory in Lawrence, Kans., for other pesticides (table 6); (3) a New York State-certified private laboratory in Waverly, N.Y., for total organic carbon and phenolic compounds (table 3); and (4) a local laboratory in Ithaca, N.Y., approved by New York State for bacteria analysis (table 8).

Ground–Water Quality

The 22 ground-water samples collected during this study were analyzed for 5 physical properties and 226 constituents. Most (157) constituents were not detected in any sample (table 2); the concentrations of the 69 detected constituents are listed in tables 3–8. The quality of the sampled ground water was generally good, except where concentrations of certain constituents exceeded recommended MCLs, SMCLs, or HAs set by the U.S. Environmental Protection Agency (2006) and the New York State Department of Health (2006).

The QA/QC field blank contained no constituent in concentrations above the laboratory reporting levels; this indicates that no constituents were affected by artificial contamination from the sampling or analytical procedures. The results of the two QA/QC replicate samples showed that variability in sample results met the precision requirements of the study. The largest percent differences between concentrations in a ground-water sample and the replicate sample were in acid-neutralizing capacity, residue on evaporation, and low-concentration trace elements (concentrations near the reporting level for the elements).

Physical Properties

The pH of the samples (table 1) ranged from 6.7 to 7.9; none of the 22 samples exceeded the accepted SMCL range of 6.5 to 8.5 (U.S. Environmental Protection Agency, 2006). Specific conductance of the samples ranged from 298 to 2,750 $\mu\text{S}/\text{cm}$. Dissolved oxygen concentrations (table 1) ranged from less than 0.2 mg/L at six wells to 13.8 mg/L. None of the samples had a water color that exceeded the SMCL of 15 (table 1). The odor of hydrogen sulfide gas was noted by field personnel in water from 10 of the 22 wells.

Nutrients

Nitrate and ammonia were the predominant nutrients in the ground-water samples (table 3). Nitrate concentrations ranged from less than 0.06 (the analytical detection limit) to 6.04 mg/L as nitrogen (N); ammonia concentrations ranged from less than 0.04 to 1.80 mg/L as N. The nitrate MCL of 10 mg/L (as nitrogen) was not exceeded in any sample, and 12 of the 22 samples had non-detected concentrations (<0.06 mg/L). When nitrate was detected, samples from wells finished in sand and gravel had a higher median nitrate concentration (5.30 mg/L) than in wells finished in bedrock (0.12 mg/L). Orthophosphate was detected in 5 of the 22 samples, and the maximum concentration was 0.14 mg/L (as phosphorus).

Major Ions

Water from the wells was generally a calcium-bicarbonate type, although water from three wells was a calcium-sulfate type and one well was a sodium-bicarbonate type (Hem, 1985). The cations that were detected in the highest concentrations were calcium, magnesium, and sodium (table 4). Calcium concentrations ranged from 24.3 to 531 mg/L, and magnesium concentrations ranged from 4.58 to 197 mg/L. Calcium and magnesium contribute to water hardness, and 18 of the 22 wells yielded water with hardness greater than 180 mg/L, which is very hard (Hem, 1985). Sodium concentrations ranged from 3.87 to 173 mg/L, and five samples exceeded the USEPA Health Advisory (HA), which recommends that sodium concentrations in drinking water not exceed 60 mg/L to minimize the taste. The HA for sodium is not federally enforceable but is intended as a guideline for consumers (U.S. Environmental Protection Agency, 2002; 2006).

The anions that were detected in the highest concentrations were bicarbonate (alkalinity), chloride, and sulfate. Bicarbonate concentrations ranged from 127 to 640 mg/L (as CaCO_3), chloride concentrations ranged from 1.89 to 271 mg/L, and sulfate concentrations ranged from less than 0.2 to 1,470 mg/L (table 4). The chloride SMCL of 250 mg/L was exceeded in one sample, and the sulfate SMCL of 250 mg/L was exceeded in three samples.

Trace Elements and Radionuclides

The most commonly detected trace elements were barium, boron, chromium, cobalt, copper, lithium, nickel, and strontium, all of which were detected in every sample. The elements detected in the highest concentrations were barium, boron, iron, lithium, manganese, and strontium (table 5). Barium concentrations ranged from 7 to 1,100 $\mu\text{g/L}$, but the MCL for barium (2,000 $\mu\text{g/L}$) was not exceeded. Boron concentrations ranged from 12 to 913 $\mu\text{g/L}$, but MCLs have not been established for boron. Iron was detected in 20 filtered samples at concentrations ranging from 5 to 2,580 $\mu\text{g/L}$, and the SMCL for iron (300 $\mu\text{g/L}$) was exceeded in 11 samples. Lithium concentrations ranged from 2.6 to 221 $\mu\text{g/L}$, but MCLs have not been established for lithium. Manganese was detected in 19 filtered samples at concentrations ranging from 0.4 to 304 $\mu\text{g/L}$; the Federal SMCL for manganese (50 $\mu\text{g/L}$) was exceeded in 10 samples, and the New York State MCL (300 $\mu\text{g/L}$) was exceeded in 1 sample. Strontium concentrations ranged from 55.4 to 10,700 $\mu\text{g/L}$, but MCLs have not been established for strontium.

Aluminum was detected in 21 samples, and the SMCL (200 $\mu\text{g/L}$) was exceeded in 1 sample. Arsenic was detected in 19 samples, and the MCL for arsenic (10 $\mu\text{g/L}$) was exceeded in 1 sample. Lead was detected in 19 samples, but the MCL (15 $\mu\text{g/L}$) was not exceeded. Uranium was detected in 16 samples, but none exceeded the MCL of 30 $\mu\text{g/L}$.

Beryllium, silver, and thallium were not detected in any sample (table 2). The MCLs for antimony (6 µg/L), cadmium (5 µg/L), chromium (100 µg/L), mercury (2 µg/L), and selenium (50 µg/L) and the SMCLs for copper (1,000 µg/L) and zinc (5,000 µg/L) were not exceeded in any sample.

Radon-222 was detected in every sample, and concentrations ranged from 160 to 1,550 picocuries per liter (pCi/L). The proposed MCL of 300 pCi/L for radon-222 in drinking water was exceeded in 16 samples, but the proposed Alternate Maximum Contaminant Level (ACML) of 4,000 pCi/L was not exceeded in any sample. The AMCL is the proposed allowable concentration of radon in raw-water samples where programs have been implemented to address the health risks of radon in indoor air, but none of the 22 well sites sampled in the Genesee River Basin had such implementation. The proposed MCL and AMCL for radon are under review and have not been adopted (U.S. Environmental Protection Agency, 2004; 2006).

Pesticides

Fourteen pesticides (including seven pesticide degradates) were detected in water from 12 of the 22 wells (table 6), but none of the concentrations exceeded MCLs. Eight of the samples containing pesticides were from sand and gravel aquifers; the other four samples were from bedrock aquifers. Caffeine, which is not a pesticide and can be an indicator of human wastes, is included in table 6 because it is measured as part of the pesticide analyses; it was detected at trace levels in 12 samples. The pesticide compounds that were detected most frequently were herbicide degradation products — CIAT (2-chloro-4-isopropylamino-6-amino-*s*-triazine, also called deethylatrazine, a degradation product of atrazine), alachlor ESA (a degradation product of alachlor), and metolachlor ESA and OA (degradation products of metolachlor). CIAT was detected in 5 samples; the maximum concentration was 0.018 µg/L. Atrazine was detected in 3 samples with a maximum concentration of 0.1 µg/L, and metolachlor was detected in 2 samples with a maximum concentration of 0.03 µg/L; alachlor was not detected. No Federal MCLs currently have been established for pesticide degradation products, and no pesticide concentration exceeded the New York State MCL of 50 µg/L. These findings of trace-level detections of pesticides are similar to those reported by Eckhardt and others (2001) and Phillips and others (1999) from studies of pesticides in ground water throughout New York State.

Volatile Organic Compounds

Eight volatile organic compounds (VOCs) were detected in six samples (table 7), but none of the concentrations exceeded MCLs. The compounds bromodichloromethane and trichloromethane were detected in two samples, and tribromomethane and dibromochloromethane were detected in one sample; these four compounds are called trihalomethanes and are typically formed as disinfection by-products that result from chlorination of water. Methyl *tert*-butyl ether (MTBE), a gasoline additive that can infiltrate into ground water from leaking fuel tanks, was detected in one sample at 3.6 µg/L. The New York State MCL for MTBE is 10 µg/L, which was not exceeded. No Federal MCL has been established for MTBE, although the USEPA has suggested a limit of 20 to 40 µg/L on the basis of taste and odor of drinking water (U.S. Environmental Protection Agency, 2006).

Bacteria

All samples were analyzed for total coliform, fecal coliform, and *Escherichia coli* (*E. coli*). Total coliform was detected in eight samples, fecal coliform was in two samples, and *E. coli* was in

one sample (table 8). The bacteria were detected in samples from sand and gravel and bedrock aquifers; six of the eight wells were private domestic wells. Any detection of these bacteria is considered a violation of New York State health regulations. The raw-water samples collected in this study were collected prior to disinfection treatments, and most community water system wells have chlorination systems that eliminate potential contamination by bacteria before the water is distributed to consumers; however, private domestic wells are generally not chlorinated.

Summary

In 2001, the U.S. Geological Survey (USGS), in cooperation with the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency (USEPA), initiated an assessment of ground-water quality in river basins throughout the State. Water samples collected from 22 community water system and private domestic wells throughout the Genesee River Basin from October 2005 through March 2006 were analyzed for five physical properties and 226 constituents that included nutrients, inorganic constituents, trace elements, radionuclides, VOCs, pesticides, and bacteria. The quality of the sampled ground water was generally good, except where concentrations of certain constituents exceeded recommended MCLs, SMCLs, or HAs set by the U.S. Environmental Protection Agency and the New York State Department of Health. Of the 69 constituents that were detected, seven exceeded Federal and State drinking-water standards at specific sites.

The cations that were detected in the highest concentrations were calcium, magnesium, and sodium; the anions that were detected in the highest concentrations were bicarbonate, chloride, and sulfate. The predominant nutrients were nitrate and ammonia. The Health Advisory for sodium in drinking water (60 mg/L) was exceeded in five samples; the sulfate SMCL (250 mg/L) was exceeded in three samples; and the chloride SMCL (250 mg/L) was exceeded in one sample.

The trace elements detected in the highest concentrations were barium, boron, iron, lithium, manganese, and strontium, but only dissolved iron and manganese concentrations exceeded SMCLs. Dissolved iron was detected in 20 samples at concentrations ranging from 5 to 2,580 µg/L, and the SMCL for iron (300 µg/L) was exceeded in 11 samples. Dissolved manganese was detected in 19 samples at concentrations ranging from 0.4 to 304 µg/L; the USEPA SMCL for manganese (50 µg/L) was exceeded in 10 samples, and the New York State MCL (300 µg/L) was exceeded in 1 sample. Aluminum was detected in 21 samples, and the SMCL (200 µg/L) was exceeded in 1 sample. Arsenic was detected in 19 samples, and the NYSDOH MCL for arsenic (10 µg/L) was exceeded in 1 sample. Lead was detected in 19 samples, but the MCL (15 µg/L) was not exceeded. Radon was detected in every sample; the proposed Federal MCL for radon-222 in drinking water (300 pCi/L) was exceeded in 16 samples, but the proposed AMCL (4,000 pCi/L) was not exceeded in any sample.

Fourteen pesticides including seven pesticide degradates were detected in water from 12 of the 22 wells; most of the concentrations were at or near the detection limits, and no concentration exceeded an MCL. Eight of the samples containing pesticides were from sand and gravel aquifers; the other four samples were from bedrock aquifers. Caffeine was detected at trace levels in 12 samples. Eight VOCs were detected in 6 samples, but no concentration exceeded an MCL. Any detection of total coliform or fecal coliform bacteria is considered a violation of New York State health regulations; in this study, total coliform was detected in eight samples; fecal coliform was detected in two samples, and *Escherichia coli* was detected in one sample.

References Cited

- Broughton, J.G., Fisher, D.W., Isachsen, Y.W., Rickard, L.V., and Offield, T.W., 1962, The geology of New York State: Albany, New York State Museum—Geological Survey, Map and Chart Series no. 5, 5 sheets, scale 1:250,000.
- Cadwell, D.H. and Muller, E.H., 1986, Surficial geologic map of New York: Albany, New York State Museum—Geological Survey, Map and Chart Series no. 40, 5 sheets, scale 1:250,000, digital compilation by Beckie Ugolini, 1998, from New York State Geological Survey 90-meter Digital Elevation Model.
- Coates, D.R., 1966, Glaciated Appalachian Plateau—Till shadows on hills: *Science*, v. 152, p. 1617–1619.
- Eckhardt, D.A. and Stackelberg, P.E., 1995, Relation of ground-water quality to land use of Long Island, New York: *Ground Water*, v. 33, no. 6, p. 1019–1033.
- Eckhardt, D.A., Hetcher, K.K., Phillips, P.J., and Miller, T.S., 2001, Pesticides and their metabolites in community water-supply wells of central and western New York, August 1999: U.S. Geological Survey Water-Resources Investigations Report 00-4128, 12 p.
- Fairchild, H.L., 1928, Geologic story of the Genesee Valley and drainage history of western New York: Rochester, Gas and Electric News, July 1926 to July 1928.
- Furlong, E.T., Anderson, B.D., Werner, S.L., Soliven, P.P., Coffey, L.J., and Burkhardt, M.R., 2001, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of pesticides in water by graphitized carbon-based solid-phase extraction and high-performance liquid chromatography/mass spectrometry: U.S. Geological Survey Water-Resources Investigations Report 01-4134, 73 p.
- Gilbert, B.K. and Kammerer, J.C., 1971, Hydrology of the Genesee River Basin, New York and Pennsylvania: U.S. Geological Survey Hydrologic Investigations Atlas HA-368, 4 sheets.
- Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water: U.S. Geological Survey Water Supply Paper 2254, Third edition, 264 p.
- Hetcher-Aguila, 2004, Ground-water quality in the Chemung River Basin, New York, 2003: U.S. Geological Survey Open-File Report 04-1329, 19 p.
- Hetcher-Aguila, K.K. and Eckhardt, D.A., 2006, Ground-water quality in the upper Susquehanna River Basin, New York, 2004-05: U.S. Geological Survey Open-File Report 06-1161, 20 p.
- Lee, E.A. and Strahan, A.P., 2003, Determination of acetamide herbicides and their degradation products in water using online solid-phase extraction and liquid chromatography/mass spectrometry: U.S. Geological Survey Open-File Report 03-173, 17 p.
- Meyer, M.T., Mills, M.S., and Thurman, E.M., 1993, Automated solid-phase extraction of herbicides from water for gas chromatographic-mass spectrometric analysis: *Journal of Chromatography*, v. 629, p. 55–59.
- Miller, T.S., 1988, Unconsolidated aquifers in upstate New York – Finger Lakes sheet: U.S. Geological Survey Water-Resources Investigations Report 87-4122, 1 sheet, scale 1:250,000.
- New York State Department of Health, 2005, Drinking water protection program: Troy, N.Y., Bureau of Public Water Supply Protection.
- New York State Department of Health, 2006, Drinking water protection program: Albany, N.Y., accessed January 25, 2007, at <http://www.health.state.ny.us/nysdoh/water/part5/tables.htm>.
- Nystrom, E.A., 2006, Ground-water quality in the Lake Champlain basin, New York, 2004: U.S. Geological Survey Open-File Report 2006-1088, 22 p.
- Nystrom, E.A., 2007a, Ground-water quality in the Delaware River basin, New York, 2001 & 2005-2006: U.S. Geological Survey Open-File Report 2007-1098, 37 p.

- Nystrom, E.A., 2007b, Ground-water quality in the St. Lawrence River basin, New York, 2005-2006: U.S. Geological Survey Open-File Report 2007-1066, 33p.
- Phillips, P.J., Eckhardt, D.A., Terracciano, S.A., and Rosenmann, L.R., 1999, Pesticides and their metabolites in wells of Suffolk County, New York, 1998: U.S. Geological Survey Water-Resources Investigations Report 99-4095, 12 p.
- Randall, A.D., 2001, Hydrogeologic framework of stratified-drift aquifers in the glaciated Northeastern United States: U.S. Geological Survey Professional Paper 1415-B, 179 p.
- Sandstrom, M.W., Stoppel, M.E., Foreman, W.T., and Schroeder, M.P., 2001, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of moderate-use pesticides and selected degradates in water by C-18 solid-phase extraction and gas chromatography/mass spectrometry: Water-Resources Investigations Report 01-4098, 70 p.
- Shelton, L.R., 1994, Field guide for collecting and processing stream-water samples for the National Water-Quality Assessment Program: U.S. Geological Survey Open-File Report 94-455, 42 p.
- U.S. Army, 1969, Genesee River basin study—Summary report: Buffalo, N.Y., Corps of Engineers, Buffalo District Office, 179 p.
- U.S. Department of Commerce, 2000, Redistricting Census 2000: Washington D.C., Bureau of the Census Geography Division, accessed January 2007, at <http://www.census.gov/geo/www/index.html>.
- U.S. Environmental Protection Agency, 1997, Guidelines for preparation of the comprehensive state water quality assessments (305(b) reports and electronic updates: Washington, D.C., Office of Water, EPA 841-B-97-002A and EPA 841-B-97-002B, PL 95-217.
- U.S. Environmental Protection Agency, 2002, Drinking-water advisory—Consumer acceptability advice and health effects analysis on sodium: Washington, D.C., Office of Water, EPA 822-R-02-032, 34 p.
- U.S. Environmental Protection Agency, 2004, Proposed radon in drinking water rule: Washington, D.C., Office of Water, accessed January 2007, at <http://www.epa.gov/safewater/radon/proposal.html>.
- U.S. Environmental Protection Agency, 2006, Drinking water standards and health advisories: Washington, D.C., Office of Water, EPA 822-R-06-013, August 2006 [variously paged].
- U.S. Geological Survey, 2006, Field methods: accessed January 2007, at <http://water.usgs.gov/owq/Fieldprocedures.html>.
- Zaugg, S.D., Sandstrom, M.W., Smith, S.G., and Fehlberg, K.M., 1995, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of pesticides in water by C-18 solid-phase extraction and capillary-column gas chromatography with selective-ion monitoring: U.S. Geological Survey Open-File Report 95-181, 49 p.

Table 1. Well information and physical properties of ground-water samples from selected wells in the Genesee River Basin, New York, 2005-2006.

[Well locations are shown in figure 1. All samples unfiltered except where noted. mg/L, milligrams per liter; ° C, degrees Celsius; µS/cm, microsiemens per centimeter at 25°C; (00080), USGS National Water Information System (NWIS) parameter code; --, no data; <, less than]

Well number ¹	Aquifer type ²	Well type ³	Casing Depth (feet below land surface)	Well depth (feet below land surface)	Sample Date	Water color, filtered (platinum cobalt units) (00080)	Dissolved- oxygen concentration, field (mg/L) (00300)	pH, field, (standard units) (00400)	Specific conductance, field (µS/cm) (00095)	Temperature (°C) (00010)
AG 263	SG	C	--	160	1/19/2006	2	3.8	7.8	404	9.3
AG 264	SG	C	128	144	1/11/2006	5	<0.2	7.4	350	10.9
AG 1235	SG	P	161	161	11/1/2005	10	<0.2	7.4	650	10.8
GS 312	SG	P	56	60	1/11/2006	5	0.8	7.1	396	11.0
LV 329	SG	C	96	106	12/15/2005	5	<0.2	7.9	532	9.4
LV 331	SG	C	40	40	2/14/2006	<1	1.6	7.4	775	12.7
LV 637	SG	P	119	119	11/3/2005	2	5.7	7.2	1,008	10.7
LV 865	SG	P	75	102	2/8/2006	<1	<0.2	6.7	2,750	9.3
WO 349	SG	C	32	32	12/1/2005	2	5.6	7.1	615	13.7
WO 350	SG	C	150	150	12/1/2005	8	0.5	7.4	397	9.8
WO 445	SG	C	20	20	12/8/2005	2	2.8	7.0	700	10.6
AG 1225	B	P	33	170	2/14/2006	2	3.1	6.7	331	8.6
AG 1277	B	P	131	135	11/1/2005	12	0.4	7.4	860	10.5
GS 617	B	P	25	65	3/16/2006	5	2.8	7.1	1,545	5.8
LV 620	B	P	80	360	10/27/2005	<1	7.6	7.5	298	10.0
LV 838	B	P	31	130	11/17/2005	2	3.0	7.7	316	8.6
LV 847	B	P	36	100	3/16/2006	5	2.8	7.3	336	8.7
LV 905	B	P	64	205	11/9/2005	5	<0.2	7.7	880	12.2
MO 1524	B	P	216	260	2/8/2006	8	0.3	7.0	2,501	8.9
MO 1605	B	P	67	80	11/3/2005	8	6.4	7.0	1,948	11.4
OT 1559	B	P	64	200	11/9/2005	5	<0.2	7.3	835	11.3
WO 821	B	P	31	70	3/9/2006	<10	2.8	7.3	749	10.2

¹LV, Livingston County; AG, Allegany County; MO, Monroe County; OT, Ontario County; WO, Wyoming County; GS, Genesee County;
number is local well-identification number assigned by U.S. Geological Survey.

²SG, Sand and Gravel; B, Bedrock

³C, Production well; P, Private domestic well

Table 2. Compounds for which ground-water samples from the Genesee River Basin were analyzed but not detected, 2005-2006.—Continued

USGS parameter code	Constituent	Laboratory reporting level (micrograms per liter, except as noted)
<u>Nutrients in filtered water</u>		
00613	Nitrite, milligrams per liter as nitrogen	0.008
<u>Trace elements in unfiltered water</u>		
01012	Beryllium	.06
01077	Silver	.16
01059	Thallium	.2
<u>Pesticides in filtered water</u>		
50470	2,4-D methyl ester	.016
39732	2,4-D	.04
38746	2,4-DB	.02
82660	2,6-Diethylaniline	.006
04038	2-Chloro-6-ethylamino-4-amino-s-triazine (CEAT)	.08
49308	3-Hydroxy carbofuran	.008
50295	3-Ketocarbofuran	.02
61029	Acetochlor ethanesulfonic acid	.02
63782	Acetochlor ethanesulfonic acid second amide	.02
61030	Acetochlor oxanilic acid	.02
62847	Acetochlor sulfynilacetic acid	.02
49315	Acifluorfen	.028
62849	Alachlor ethanesulfonic acid secondary amide	.02
61031	Alachlor oxanilic acid	.02
62848	Alachlor sulfynilacetic acid	.02
46342	Alachlor	.005
49313	Aldicarb sulfone	.02
49314	Aldicarb sulfoxide	.022
49312	Aldicarb	.04
34253	<i>alpha</i> -HCH	.005
82686	Azinphos-methyl	.050
50299	Bendiocarb	.02
82673	Benfluralin	.010
50300	Benomyl	.022
61693	Bensulfuron	.02
38711	Bentazon	.01
04029	Bromacil	.02
49311	Bromoxynil	.03
04028	Butylate	.004
49310	Carbaryl	.02
82680	Carbaryl	.041
49309	Carbofuran	.016
82674	Carbofuran	.020

Table 2. Compounds for which ground-water samples from the Genesee River Basin were analyzed but not detected, 2005-2006.—Continued

USGS parameter code	Constituent	Laboratory reporting level (micrograms per liter, except as noted)
61188	Chloramben methyl ester	.02
50306	Chlorimuron	.032
04039	Chlorodiamino-s-triazine	.04
49306	Chlorothalonil	.04
38933	Chlorpyrifos	.005
82687	<i>cis</i> -Permethrin	.006
49305	Clopyralid	.02
04041	Cyanazine	.018
04031	Cycloate	.01
49304	Dacthal monoacid	.03
82682	DCPA	.003
63778	Dechloroacetochlor	.02
63777	Dechloroalachlor	.02
63779	Dechlorodimethenamid	.02
63780	Dechlorometolachlor	.02
62170	Desulfinyl fipronil	.012
39572	Diazinon	.005
38442	Dicamba	.04
49302	Dichlorprop	.03
39381	Dieldrin	.009
61951	Dimethenamid ethanesulfonic acid	.02
62482	Dimethenamid oxanilic acid	.02
61588	Dimethenamid	.02
04033	Diphenamid	.01
82677	Disulfoton	.02
49300	Diuron	.02
82668	EPTC	.004
82663	Ethalfuralin	.009
82672	Ethoprop	.005
49297	Fenuron	.02
62169	Desulfinylfipronil amide	.029
62167	Fipronil sulfide	.013
62168	Fipronil sulfone	.024
62166	Fipronil	.016
61952	Flufenacet ethanesulfonic acid	.02
62483	Flufenacet oxanilic acid	.02
62481	Flufenacet	.02
61694	Flumetsulam	.04
38811	Fluometuron	.02
04095	Fonofos	.003
63784	Hydroxyacetochlor	.02
63783	Hydroxyalachlor	.02
63785	Hydroxymetolachlor	.02

Table 2. Compounds for which ground-water samples from the Genesee River Basin were analyzed but not detected, 2005-2006.—Continued

USGS parameter code	Constituent	Laboratory reporting level (micrograms per liter, except as noted)
64045	Hydroxydimethenamid	.02
50356	Imazaquin	.02
61695	Imidacloprid	.020
39341	Lindane	.004
38478	Linuron	.01
82666	Linuron	.035
39532	Malathion	.027
38482	MCPA	.03
38487	MCPB	.01
50359	Metalaxyl	.01
38501	Methiocarb	.010
49296	Methomyl	.020
82667	Methyl parathion	.015
82630	Metribuzin	.006
61697	Metsulfuron	.07
82671	Molinate	.003
61692	<i>N</i> -(4-Chlorophenyl)- <i>N'</i> -methylurea	.04
82684	Napropamide	.007
49294	Neburon	.01
50364	Nicosulfuron	.04
49293	Norflurazon	.02
49292	Oryzalin	.01
38866	Oxamyl	.03
34653	<i>p,p'</i> -DDE	.003
39542	Parathion	.010
82669	Pebulate	.004
82683	Pendimethalin	.022
82664	Phorate	.011
49291	Picloram	.03
82676	Propyzamide	.004
62766	Propachlor ethanesulfonic acid	.05
62767	Propachlor oxanilic acid	.02
04024	Propachlor	.025
82679	Propanil	.011
82685	Propargite	.02
49236	Propham	.030
50471	Propiconazole	.01
38538	Propoxur	.008
38548	Siduron	.02
50337	Sulfometuron	.091
82670	Tebuthiuron	.02
82665	Terbacil	.034
04032	Terbacil	.016

Table 2. Compounds for which ground-water samples from the Genesee River Basin were analyzed but not detected, 2005-2006.—Continued

USGS parameter code	Constituent	Laboratory reporting level (micrograms per liter, except as noted)
82675	Terbufos	.02
82681	Thiobencarb	.010
82678	Triallate	.006
49235	Triclopyr	.03
82661	Trifluralin	.009
Volatile organic compounds, in unfiltered water		
34506	1,1,1-Trichloroethane	.1
77652	1,1,2-Trichloro-1,2,2-trifluoroethane	.1
34496	1,1-Dichloroethane	.1
34501	1,1-Dichloroethene	.1
34536	1,2-Dichlorobenzene	.1
32103	1,2-Dichloroethane	.2
34541	1,2-Dichloropropane	.1
34566	1,3-Dichlorobenzene	.1
34571	1,4-Dichlorobenzene	.1
34030	Benzene	.1
34301	Chlorobenzene	.1
34496	1,1-Dichloroethane	.1
77093	<i>cis</i> -1,2-Dichloroethene	.1
32105	Dibromochloromethane	.2
34423	Dichloromethane	.2
34668	Dichlorodifluoromethane	.2
81576	Diethyl ether	.2
81577	Diisopropyl ether	.2
34371	Ethylbenzene	.1
50005	Methyl <i>tert</i> -pentyl ether	.2
77128	Styrene	.1
50004	<i>tert</i> -Butyl ethyl ether	.1
34475	Tetrachloroethene	.1
32102	Tetrachloromethane	.2
34546	<i>trans</i> -1,2-Dichloroethene	.1
34506	1,1,1-Trichloroethane	.1
39180	Trichloroethene	.1
34488	Trichlorofluoromethane	.2
77135	<i>o</i> -Xylene	.1

Table 3. Concentrations of nutrients, total organic carbon, and total phenols in ground-water samples from the Genesee River Basin, New York, 2005-2006.

[Well locations are shown in figure 1. mg/L, milligrams per liter; N, nitrogen; P, phosphorus; <, less than; (00623), USGS National Water Information System (NWIS) parameter code; E, estimated value—constituent was detected in the sample but with low or inconsistent recovery]

Well number ¹	Ammonia plus organic nitrogen, filtered (mg/L as N) (00623)	Ammonia, filtered (mg/L as N) (00608)	Nitrate, filtered (mg/L as N) (00618)	Orthophosphate, filtered (mg/L as P) (00671)	Total organic carbon, unfiltered (mg/L) (00680)	Phenols, total recoverable, unfiltered (mg/L) (32730)
AG 263	0.12	0.12	E 0.06	< 0.02	< 1.0	< 0.004
AG 264	0.74	0.66	< 0.06	0.11	< 1.0	< 0.004
AG 1235	0.52	0.53	< 0.06	0.14	< 1.0	< 0.004
GS 312	E .10	0.05	< 0.06	< 0.18	< 1.0	< 0.004
LV 329	<.10	< 0.04	< 0.06	< 0.02	< 1.0	.004
LV 331	0.10	< 0.04	1.08	< 0.02	< 1.0	< 0.004
LV 637	E 0.08	< 0.04	6.04	< 0.02	< 1.0	< 0.004
LV 865	0.13	0.05	< 0.06	< 0.02	1.2	< 0.004
WO 349	E 0.09	< 0.04	5.57	< 0.02	< 1.0	< 0.004
WO 350	0.13	0.10	< 0.06	E 0.01	< 1.0	< 0.004
WO 445	0.17	< 0.04	5.30	< 0.02	< 1.0	< 0.004
AG 1225	<.10	< 0.04	0.12	< 0.02	< 1.0	< 0.004
AG 1277	0.40	0.39	< 0.06	E 0.01	< 1.0	< 0.004
GS 617	0.15	< 0.04	0.16	< 0.04	1.1	< 0.004
LV 620	<.10	< 0.04	1.58	< 0.02	< 1.0	< 0.004
LV 838	<.10	< 0.04	E 0.05	< 0.02	< 1.0	< 0.004
LV 847	2.0	1.80	E 0.03	0.04	1.1	< 0.004
LV 905	1.8	1.69	< 0.06	< 0.02	< 1.0	< 0.004
MO 1524	0.28	0.27	< 0.06	< 0.02	< 1.0	< 0.004
MO 1605	0.28	0.28	< 0.06	< 0.02	< 1.0	< 0.004
OT 1559	0.97	0.85	< 0.06	< 0.02	< 1.0	< 0.004
WO 821	0.34	0.27	< 0.06	< 0.02	1.4	< 0.004

¹LV, Livingston County; AG, Allegany County; MO, Monroe County; OT, Ontario County; WO, Wyoming County; GS, Genesee County; Genesee County; number is local well-identification number assigned by U.S. Geological Survey.

Table 4. Concentrations of inorganic constituents in ground-water samples from the Genesee River Basin, New York, 2005-2006.

[Well locations are shown in figure 1. mg/L, milligrams per liter; ANC, acid neutralizing capacity;

(90410), USGS National Water Information System (NWIS) parameter code; °C, degrees Celsius; <, less than;

E, estimated value—constituent was detected in the sample but with low or inconsistent recovery]

Well number ¹	ANC, ²	Alkalinity, ²	Bicarb- onate, ³	Calcium, filtered	Hardness, filtered	Magnesium, filtered	Potassium, filtered	Sodium, filtered	Chloride, filtered	Fluoride, filtered	Silica, filtered	Sulfate, filtered	Residue on evaporation, at 180°C, filtered
	unfiltered (mg/L, as CaCO ₃) (90410)	filtered (mg/L, as CaCO ₃) (29801)	filtered (mg/L, as CaCO ₃) (29805)										
AG 263	172	172	208	26.4	92	6.39	2.19	53.0	10.0	0.3	9.99	28.1	231
AG 264	230	234	283	57.3	190	12.2	1.59	29.1	17.8	0.2	12.3	5.5	269
AG1235	274	293	355	58.1	230	20.0	1.59	56.3	16.8	0.1	13.9	< 0.2	354
GS 312	291	292	353	66.0	290	30.1	1.31	3.87	1.89	1.0	15.0	12.1	308
LV 329	177	170	206	75.9	270	18.9	1.18	9.85	31.3	0.1	8.39	53.0	313
LV 331	208	208	252	82.0	290	21.2	3.29	54.8	87.4	0.2	6.78	57.3	453
LV 637	160	184	223	113	460	42.6	1.60	32.4	109	0.1	15.2	50.6	556
LV 865	527	529	640	373	1,700	197	3.25	102	20.8	0.3	21.3	1,270	2,510
WO 349	252	273	330	96.2	310	16.6	3.07	38.9	48.4	E 0.1	8.78	17.1	442
WO 350	185	190	230	64.0	240	19.0	1.11	21.3	37.1	0.1	12.7	25.5	310
WO 445	215	235	284	99.9	320	17.8	1.44	20.5	35.1	E 0.1	7.58	32.0	396
AG1225	192	192	232	50.3	260	31.6	2.63	7.53	5.78	0.2	14.5	52.8	286
AG1277	304	300	363	33.7	120	7.80	2.12	150	90.2	0.3	9.98	E 0.1	492
GS 617	387	386	467	129	460	32.9	8.03	156	271	0.2	8.69	38.3	914
LV 620	103	105	127	41.0	140	10.2	0.86	4.29	8.34	0.1	8.81	32.8	178
LV 838	162	172	208	50.7	200	18.3	2.33	6.30	9.90	0.1	15.6	29.8	263
LV 847	267	280	339	44.3	210	23.1	3.63	32.5	4.96	0.6	12.2	6.3	289
LV 905	373	354	428	24.3	80	4.58	3.43	173	72.0	0.4	8.91	< 0.2	543
MO1524	164	164	198	531	1,500	51.8	5.32	32.5	6.32	0.7	14.3	1,470	2,460
MO1605	176	141	171	424	1,200	29.9	6.00	25.3	4.83	0.5	16.3	1,010	1,740
OT1559	379	372	450	65.8	310	34.8	3.71	70.1	9.93	0.6	12.6	26.3	492
WO 821	191	193	234	103	340	20.6	2.07	11.6	115	0.1	18.5	21.2	455

¹LV, Livingston County; AG, Allegany County; MO, Monroe County; OT, Ontario County; WO, Wyoming County; GS, Genesee County;
number is local well-identification number assigned by U.S. Geological Survey.²fixed-endpoint titration at pH 4.5.³calculated from alkalinity.

Table 5. Concentrations of trace elements and radionuclides in ground-water samples from the Genesee River Basin, New York, 2005-2006.

[Well locations are shown in figure 1. µg/L, micrograms per liter; (01105), USGS National Water Information System NWIS) parameter code; >, less than; E, estimated value—constituent was detected in the sample but with low or inconsistent recovery; M, constituent was detected in the sample but was not quantified]

Well number ¹	Aluminum, unfiltered (µg/L) (01105)	Antimony, unfiltered (µg/L) (01097)	Arsenic, unfiltered (µg/L) (01002)	Barium, unfiltered (µg/L) (01007)	Boron, filtered (µg/L) (01020)	Cadmium, unfiltered (µg/L) (01027)	Chromium, unfiltered (µg/L) (01034)	Cobalt, unfiltered (µg/L) (01037)	Copper, unfiltered (µg/L) (01042)	Iron, filtered (µg/L) (01046)	Iron, unfiltered (µg/L) (01045)	Lead, unfiltered (µg/L) (01051)	Lithium, unfiltered (µg/L) (01132)
AG 263	3	< 0.2	0.31	70	145	< 0.04	0.05	0.057	0.8	28	40	0.13	29.6
AG 264	E 1	< 0.2	26.0	770	78	< 0.04	0.14	0.164	29.9	1,490	1,520	< 0.06	8.3
AG 1235	4	< 0.2	7.2	724	154	< 0.04	0.07	0.162	E 0.5	2,580	2,470	0.29	16.8
GS 312	< 2	< 0.2	< 0.12	179	22	< 0.04	0.16	0.225	1.1	309	344	0.07	10.4
LV 329	E 1	< 0.2	1.3	146	14	< 0.04	0.21	0.197	4.8	320	322	0.12	7.9
LV 331	E 1	E 0.1	0.27	82	34	E 0.02	0.14	0.274	1.1	11	10	< 0.06	4.9
LV 637	3	< 0.2	E 0.09	180	25	< 0.04	0.34	0.312	5.5	8	40	3.01	7.6
LV 865	E 2	< 0.4	0.88	35	103	< 0.08	0.19	4.63	15.5	678	680	0.72	63.3
WO 349	E 1	< 0.2	0.18	52	31	< 0.04	0.25	0.420	3.2	< 6	12	0.10	3.4
WO 350	E 2	< 0.2	8.8	164	24	< 0.04	0.20	0.366	2.4	422	397	< 0.06	7.7
WO 445	7	< 0.2	E 0.10	43	31	E 0.02	2.3	0.465	2.7	16	69	0.43	2.6
AG 1225	4	< 0.2	0.52	55	71	< 0.04	0.15	0.203	6.0	45	392	0.19	19.3
AG 1277	E 1	< 0.2	4.0	615	294	< 0.04	0.08	0.080	1.6	855	762	E 0.03	54.1
GS 617	5	< 0.2	0.31	193	78	E 0.04	0.18	0.790	58.7	14	59	0.60	16.4
LV 620	12	< 0.2	E 0.06	25	12	< 0.04	0.15	0.103	2.5	< 6	22	0.17	6.0
LV 838	3	< 0.2	1.0	79	35	< 0.04	E 0.02	0.159	3.1	E 5	30	0.94	14.0
LV 847	12	E 0.1	0.15	118	913	< 0.04	0.08	0.218	1.5	78	336	3.27	32.1
LV 905	9	< 0.2	< 0.12	208	818	< 0.04	0.07	0.080	1.5	338	382	0.34	221
MO 1524	E 1	E 0.1	0.88	7	529	< 0.04	0.17	1.33	8.5	2,010	2,190	0.08	42.0
MO 1605	2	0.2	3.2	11	486	< 0.04	0.08	0.760	5.1	1,280	1,240	0.40	26.4
OT 1559	778	< 0.2	< 0.12	570	645	< 0.04	2.4	0.860	1.3	112	2,060	0.20	145
WO 821	4	< 0.2	0.16	1,100	23	< 0.04	0.15	0.219	1.1	338	394	0.09	12.0

¹LV, Livingston County; AG, Allegany County; MO, Monroe County; OT, Ontario County; WO, Wyoming County; GS, Genesee County; number is local well-identification number assigned by U.S. Geological Survey.

Table 5. Concentrations of trace elements and radionuclides in ground-water samples from the Genesee River Basin, New York, 2005-2006. - Continued

Well number ¹	Manganese, filtered (µg/L) (01056)	Manganese, unfiltered (µg/L) (01055)	Mercury, unfiltered (µg/L) (71900)	Molybdenum, unfiltered (µg/L) (01062)	Nickel, unfiltered (µg/L) (01067)	Selenium, unfiltered (µg/L) (01147)	Strontium, unfiltered (µg/L) (01082)	Radon-222, unfiltered (picocuries per liter) (pCi/L) (82303)	Uranium, (natural), unfiltered (µg/L) (28011)	Zinc, unfiltered (µg/L) (01092)
AG 263	13.4	13.8	< 0.01	0.5	E 0.13	< 0.08	377	280	0.032	20
AG 264	67.4	67.8	< 0.01	8.0	0.74	< 0.08	439	410	< 0.012	< 2
AG 1235	74.7	74.0	< 0.01	0.3	0.88	< 0.08	512	810	< 0.012	E 1
GS 312	3.5	3.7	< 0.01	0.4	0.72	< 0.08	1,280	160	< 0.012	2
LV 329	44.1	44.0	< 0.01	1.4	1.32	0.11	99.3	300	0.758	E 2
LV 331	9.3	9.3	< 0.01	0.7	1.69	0.31	155	450	0.492	< 2
LV 637	E 0.4	0.8	< 0.01	0.3	1.86	0.29	238	410	0.929	E 2
LV 865	304	304	< 0.01	0.7	7.01	0.12	2,420	210	13.4	11
WO 349	< 0.6	< 0.6	< 0.01	E 0.2	2.78	0.09	131	690	0.161	E 2
WO 350	83.5	81.8	< 0.01	2.7	1.68	E 0.05	280	470	0.405	< 2
WO 445	< 0.6	0.7	< 0.01	0.5	5.90	0.19	157	460	0.445	6
AG 1225	95.5	190	< 0.01	< 0.2	0.68	E 0.05	88.3	500	E 0.011	7
AG 1277	59.2	56.0	< 0.01	E 0.1	0.47	< 0.08	133	940	< 0.012	4
GS 617	5.8	9.1	< 0.01	0.5	6.92	0.10	540	350	1.01	1,180
LV 620	< 0.6	< 0.6	< 0.01	0.3	0.57	0.08	55.4	1,550	0.375	3
LV 838	35.5	50.0	< 0.01	3.6	1.07	< 0.08	167	640	0.029	E 1
LV 847	6.9	7.3	< 0.01	0.4	1.24	< 0.08	2,090	550	0.030	E 2
LV 905	49.1	45.6	< 0.01	< 0.2	0.69	< 0.08	752	390	< 0.012	18
MO 1524	73.2	72.0	< 0.01	1.6	9.21	0.16	10,700	520	0.239	7
MO 1605	57	55.5	< 0.01	3.0	6.25	E 0.07	9,860	280	0.187	8
OT 1559	129	155	E 0.01	< 0.2	3.10	0.77	4,000	230	0.134	6
WO 821	114	115	< 0.01	0.8	0.63	< 0.08	328	390	< 0.012	E 1

¹LV, Livingston County; AG, Allegany County; MO, Monroe County; OT, Ontario County; WO, Wyoming County; GS, Genesee County; number is local well-identification number assigned by U.S. Geological Survey.

Table 6. Concentrations of pesticides and caffeine detected in ground-water samples from the Genesee River Basin, New York, 2005-2006.

[Well locations are shown in figure 1. <, less than; --, no data; (04040), USGS National Water Information System (NWIS) parameter code; CIAT, 2-Chloro-4-isopropyl-amino-6-amino-s-triazine; OIET, 2-Hydroxy-4-isopropyl-amino-6-ethyl-amino-s-triazine; ESA, ethanesulfonic acid; OA, oxanilic acid; SA, second amide; E, estimated value—constituent was detected in the sample but with low or inconsistent recovery; M, constituent was detected in the sample but was not quantified]

Well number ¹	CIAT, filtered (µg/L) (04040)	OIET, filtered (µg/L) (50355)	Atrazine, filtered (µg/L) (39632)	Caffeine, filtered (µg/L) (50305)	Dinoseb, filtered (µg/L) (49301)	Alachlor ESA, filtered (µg/L) (50009)	Metol- chlor ESA, filtered (µg/L) (61043)	Metol- chlor OA, filtered (µg/L) (61044)	Metol- achlor, filtered (µg/L) (39415)	Acet- achlor, filtered (µg/L) (49260)	Acet- achlor / metol- achlor SA, filtered (µg/L) (63781)	Acet- achlor / metolachlor ESA-SA, filtered (µg/L) (62850)	Prom- eton, filtered (µg/L) (04037)	Sim- azine, filtered (µg/L) (04035)	Imaze- thapyr, filtered (µg/L) (50407)
AG 263	< 0.006	--	< 0.007	E 0.014	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	M
AG 264	E 0.018	< 0.032	0.100	< 0.018	< 0.04	0.03	< 0.02	< 0.02	0.030	0.85	< 0.02	< 0.02	E 0.01	0.070	< 0.04
AG 1235	< 0.006	--	< 0.007	< 0.018	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	E 0.01
GS 312	< 0.006	< 0.032	< 0.007	E 0.013	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
LV 329	< 0.006	< 0.032	< 0.007	E 0.004	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
LV 331	E 0.002	--	< 0.007	E 0.018	< 0.04	0.03	0.21	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
LV 637	< 0.006	--	< 0.007	< 0.018	0.05	< 0.02	0.41	0.03	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
LV 865	< 0.006	--	< 0.007	< 0.018	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
WO 349	< 0.006	< 0.032	< 0.007	0.019	< 0.04	< 0.02	0.48	0.28	< 0.006	< 0.006	< 0.02	0.05	< 0.01	< 0.005	< 0.04
WO 350	< 0.006	< 0.032	< 0.007	0.020	< 0.04	0.03	< 0.02	0.04	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
WO 445	E 0.002	< 0.032	< 0.007	E 0.015	< 0.04	< 0.02	0.93	0.10	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
AG 1225	< 0.006	--	< 0.007	< 0.018	< 0.04	0.03	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
AG 1277	< 0.006	--	< 0.007	< 0.018	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
GS 617	E 0.005	E 0.010	E 0.005	E 0.010	< 0.04	< 0.02	1.01	< 0.02	E 0.003	< 0.006	0.14	< 0.02	< 0.01	< 0.005	< 0.04
LV 620	E 0.011	--	0.008	< 0.018	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
LV 838	< 0.006	< 0.032	< 0.007	0.034	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
LV 847	< 0.006	< 0.032	< 0.007	0.026	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
LV 905	< 0.006	--	< 0.007	< 0.018	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
MO 1524	< 0.006	--	< 0.007	E 0.007	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	M
MO 1605	< 0.006	--	< 0.007	< 0.018	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
OT 1559	< 0.006	--	< 0.007	< 0.018	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04
WO 821	< 0.006	< 0.032	< 0.007	E 0.052	< 0.04	< 0.02	< 0.02	< 0.02	< 0.006	< 0.006	< 0.02	< 0.02	< 0.01	< 0.005	< 0.04

¹LV, Livingston County; AG, Allegany County; MO, Monroe County; OT, Ontario County; WO, Wyoming County; GS, Genesee County;
number is local well-identification number assigned by U.S. Geological Survey.

Table 7. Concentrations of volatile organic compounds (VOCs) in ground-water samples from the Genesee River Basin, New York, 2005-06.

[Well locations are shown in figure 1. µg/L, micrograms per liter;

(32101), USGS National Water Information System (NWIS) parameter code; <, less than]

Well number ¹	Bromo- dichloro- methane, unfiltered (µg/L) (32101)	Dibromo- chloro- methane, unfiltered (µg/L) (32105)	Methyl <i>tert</i> - butyl ether, unfiltered (µg/L) (78032)	Vinyl chloride, unfiltered (µg/L) (39175)	Tribromo- methane, unfiltered (µg/L) (32104)	Trichloro- methane, unfiltered (µg/L) (32106)	Toluene, unfiltered (µg/L) (34010)	<i>meta</i> - + <i>para</i> -Xylene, unfiltered (µg/L) (85795)
AG 263	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
AG 264	< 0.1	< 0.2	< 0.2	0.3	< 0.2	< 0.1	< 0.1	< 0.2
AG 1235	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
GS 312	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
LV 329	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
LV 331	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	0.1	< 0.2
LV 637	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
LV 865	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
WO 349	0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.8	< 0.1	< 0.2
WO 350	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
WO 445	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
AG 1225	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
AG 1277	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
GS 617	1.8	2.2	< 0.2	< 0.2	1.5	1.4	< 0.1	< 0.2
LV 620	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
LV 838	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
LV 847	< 0.1	< 0.2	3.6	< 0.2	< 0.2	< 0.2	< 0.1	< 0.2
LV 905	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
MO 1524	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
MO 1605	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2
OT 1559	< 0.2	< 0.4	< 0.4	< 0.4	< 0.4	< 0.2	< 0.2	0.5
WO 821	< 0.1	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	< 0.2

¹LV, Livingston County; AG, Allegany County; MO, Monroe County; OT, Ontario County; WO, Wyoming County; GS, Genesee County; number is local well-identification number assigned by U.S. Geological Survey.

Table 8. Concentrations of bacteria in unfiltered ground-water samples from the Genesee River Basin, New York, 2005-2006.

[Well locations are shown in figure 1. mL, milliliter; <, less than; >, greater than; CFU, colony forming units]

Well number ¹	<i>Escherichia coli</i> (colonies per 100 mL) (31691)	Fecal coliform (colonies per 100 mL) (61215)	Total coliform (colonies per 100 mL) (61213)	Heterotrophic plate count (CFUs per mL) (31692)
AG 263	<1	< 5	< 1	2
AG 264	<1	< 5	< 1	< 1
AG 1235	<1	< 5	< 1	40
GS 312	<1	< 5	< 1	< 1
LV 329	<1	< 5	< 1	2
LV 331	<1	< 5	< 1	6
LV 637	<1	< 5	10	2
LV 865	<1	< 5	< 1	4
WO 349	<1	< 5	< 1	5
WO 350	<1	< 5	1	2
WO 445	<1	< 5	1	1
AG 1225	<1	< 5	< 1	2
AG 1277	<1	< 5	< 1	< 1
GS 617	<1	< 5	< 1	4
LV 620	<1	< 5	1	2
LV 838	<1	< 5	> 200	23
LV 847	<1	< 5	< 1	115
LV 905	<1	5	> 500	131
MO 1524	<1	< 5	< 1	2
MO 1605	<1	< 5	< 1	24
OT 1559	3	15	37	15
WO 821	<1	< 5	1	< 1

¹LV, Livingston County; AG, Allegany County; MO, Monroe County; OT, Ontario County; WO, Wyoming County; GS, Genesee County; number is local well-identification number assigned by U.S. Geological Survey.

For additional information write to:
New York Water Science Center
U.S. Geological Survey
30 Brown Rd.
Ithaca, N.Y. 14850

Information requests:
(518) 285-5602
or visit our Web site at <http://ny.water.usgs.gov>

Eckhardt, Reddy, Tamulonis

Ground-Water Quality in the Genesee River Basin, New York, 2005-2006—U.S. Geological Survey Open-File Report 2007-1093