Water Resource Report 61

# GROUNDWATER RESOURCES OF THE BERWICK-BLOOMSBURG-DANVILLE AREA, EAST-CENTRAL PENNSYLVANIA

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U.S. Geological Survey

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(in pocket)



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# GROUNDWATER RESOURCES OF THE BERWICK-BLOOMSBURG-DANVILLE AREA, EAST-CENTRAL PENNSYLVANIA

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## ABSTRACT

The area of investigation is in the valley of the North Branch Susquehanna River and surrounding uplands, and occupies parts of Columbia, Luzerne, Montour, and Northumberland Counties in east-central Pennsylvania. Two major towns in the area, Bloomsburg and Danville, are supplied by surface water, but Berwick and other communities depend on groundwater, as do many industrial and commercial facilities and almost all rural homeowners.

The bedrock underlying the area is of Silurian, Devonian, and Mississippian age and includes gradational sequences of noncarbonate and carbonate lithologies. The bedrock units are folded in broad anticlinoria and synclinoria typical of the Appalachian Mountain section of the Valley and Ridge province. In the bedrock aquifers, groundwater flows through secondary-permeability features such as fractures, bedding-plane separations, and solution openings. The bedrock aquifers have a strong directional permeability along bedding strike. The development of secondary permeability is largely controlled by the amount of calcareous material in an aquifer, and the carbonate rock of the Keyser and Tonoloway Formations is, accordingly, the most productive bedrock aquifer.

Unconsolidated deposits of sand, gravel, silt, and clay, primarily of glacial origin, overlie much of the bedrock. The most extensive stratified deposit is the sand and gravel outwash of late Wisconsinan age that occupies the Susquehanna River and Fishing Creek valleys. Because of its high primary permeability, the glacial-outwash aquifer has a great capacity to receive, store, and transmit water.

Well yields for the aquifers were estimated from data on specific capacity, depth to water-bearing zones, and water levels. The median estimated well yields for the aquifers range from 5 gallons per minute for the Trimmers Rock Formation to 190 gallons per minute for glacial outwash. The highest yields from wells in the study area typically can be developed in the glacial-outwash aquifer and in bedrock aquifers containing significant amounts of carbonate rock. About one of every four wells completed in the outwash sand and gravel is capable of yielding 410 gallons per minute or more. About one of every four wells completed in the Keyser and Tonoloway Formations, the Onondaga and Old Port Formations, and the Wills Creek Formation is capable of yielding 620, 310, and 130 gallons per minute or more, respectively.

The results of 139 chemical analyses show that groundwater chiefly is the calcium bicarbonate type. Most groundwater tapped by wells is usable for domestic supply and human consumption, although hardness, iron, manganese, and hydrogen sulfide gas that exceed maximum recommended concentrations may cause problems locally. Water from aquifers containing carbonate rock generally is hard to very hard. Iron concentrations that exceed 300 μg/L were observed in 46 percent of the wells sampled and manganese concentrations that exceed 50 μg/L were observed in 40 percent of the wells. Hydrogen sulfide gas was detected in 9 percent of the wells sampled. Problems with concentrations that exceed recommended limits for these constituents are more common in groundwater from the Devonian rocks that contain black shale, although excess manganese also is a common problem in the glacial-outwash aquifer.

# INTRODUCTION

This report concerns the hydrogeologic system of the Berwick-Bloomsburg-Danville area in east-central Pennsylvania. The aquifers that underlie the area, the groundwater flow system, and the water-yielding capabilities of the aquifers are described, the factors that affect well yields are discussed, and the quality of groundwater in the area is characterized. The study was conducted from September 1979 to September 1982 as part of the continuing appraisal of the groundwater resources of Pennsylvania by the U.S. Geological Survey and the Pennsylvania Geological Survey.

Groundwater is a main source of supply for domestic, municipal, industrial, and commercial use in the Berwick-Bloomsburg-Danville area. As the economic and population growth continues, the importance of developing and managing the groundwater resources becomes crucial. The information in this report will assist municipal and water-authority officials, planning boards, consulting geologists and engineers, well drillers, commercial and industrial concerns, regulatory agencies, and rural homeowners in the development and management of groundwater.

## LOCATION AND PHYSIOGRAPHIC SETTING

The study area is in the valley of the Susquehanna River and surrounding uplands in east-central Pennsylvania (Figure 1). The 370-square-mile area includes the Berwick, Bloomsburg, Mifflinville, Millville, and Washingtonville 7½-minute quadrangles, and the northern halves of the Catawissa, Danville, and Riverside 7½-minute quadrangles. The area occupies central Columbia County, almost all of Montour County, and parts of west-central Luzerne and northern Northumberland Counties.

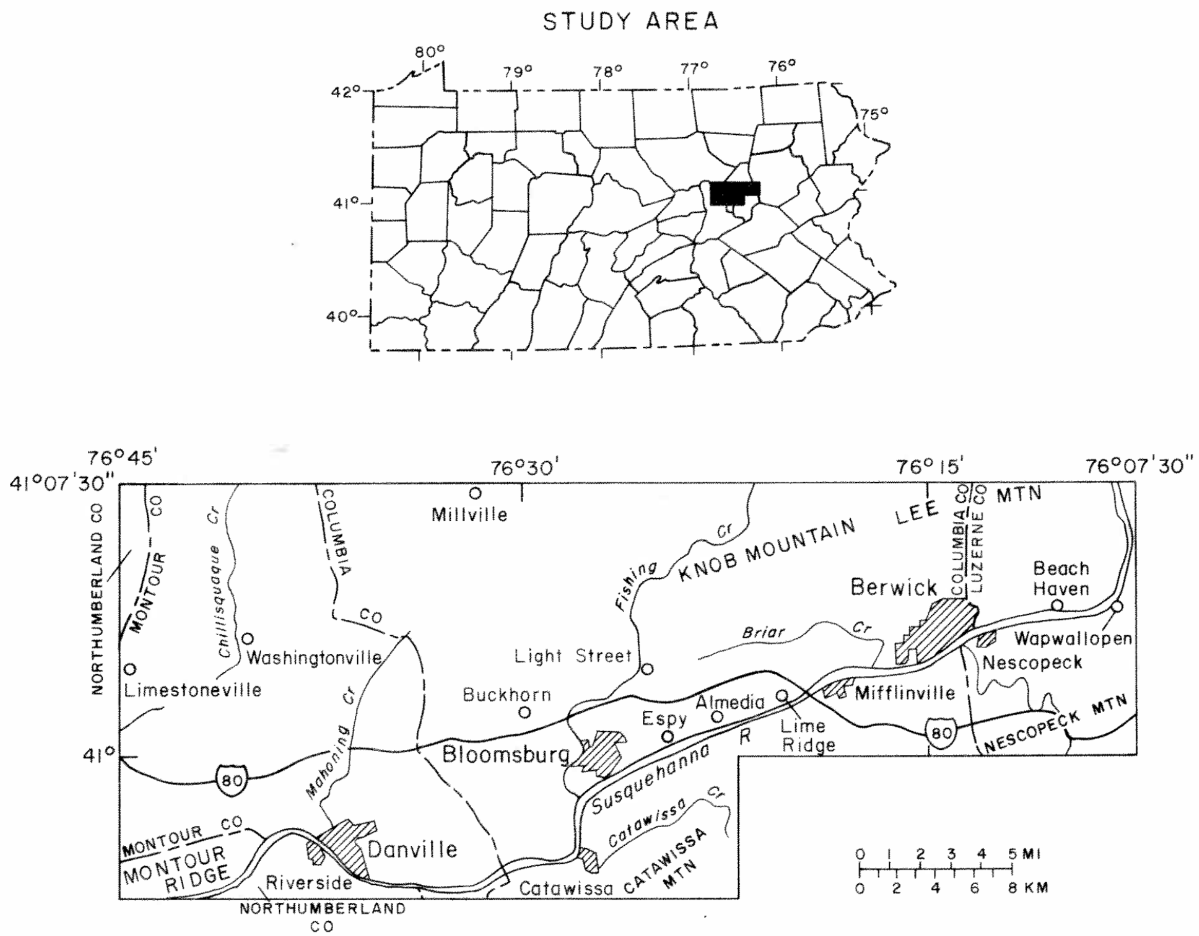



Figure 1. Location, physiographic features, and population centers of the study area.

The area lies within the Appalachian Mountain section of the Valley and Ridge physiographic province. The topography ranges from relatively flat terraces and floodplains along the Susquehanna River and its major tributaries to steeply wooded slopes of mountain ridges. Altitudes range from 440 feet above sea level at the Susquehanna River at Danville to 1,760 feet above sea level on Knob Mountain, east of Orangeville. Major tributaries to the Susquehanna River include parts of Fishing Creek, Mahoning Creek, Catawissa Creek, Briar Creek, and Nescopeck Creek. The northwestern part of the study area is drained by Chillisquaque Creek, which flows to the West Branch Susquehanna River.

The major centers of population are found along the Susquehanna River and include Berwick, Nescopeck, Mifflinville, Bloomsburg, Catawissa, Danville, and Riverside. Interstate Route 80 transects the study area in an east-west direction.

## GROUNDWATER USE

Table 1 shows an inventory of the major groundwater users in the Berwick-Bloomsburg-Danville area in 1980. The boroughs of Berwick, Bloomsburg, Catawissa, Danville, Mifflinville, Millville, and Orangeville have public water supplies and distribution systems. Bloomsburg and Danville are supplied by surface water. The Bloomsburg Water Authority withdraws about 2.5 Mgal/d (million gallons per day) from Fishing Creek, and the Danville Water Authority withdraws about 1.7 Mgal/d from the Susquehanna River. Merck Chemical Company withdraws about 0.5 Mgal/d from the Susquehanna River at Riverside.

In 1980, about 4.7 Mgal/d of water was obtained from wells and springs by the major groundwater users. Additional groundwater is pumped from wells and springs to meet rural domestic, agri-

Table 1. *Major Groundwater Users in the Berwick-Bloomsburg-Danville Area*

| County | Name | Estimated groundwater withdrawal in 1980 (gal/d) | Aquifer | Source and remarks |
|---|---|---|---|---|
| Columbia | Bloomsburg Mills, Inc. | 600,000 | Old Port and Keyser Fms. | 3 drilled wells pumped for 4 months for air conditioning |
| | Champion Valley Farms | 500,000 | Onondaga and Old Port Fms. | 3 drilled wells pumped for cooling and cleaning |
| | Catawissa Water Authority | 155,000 | Catskill Fm. | 6 drilled wells and 3 springs |
| | Consolidated Cigar Co. | — | Wills Creek Fm. | 1 drilled well, pumped at 200 gal/min for air conditioning |
| | Keystone Water Co. (Berwick) | 2,900,000 | Old Port and Keyser Fms. | 3 drilled wells |
| | Mifflin Township Water Authority | 55,000 | Glacial outwash | 2 drilled wells |
| | Millville Water Authority | 85,800 | Alluvium and till; Mahantango Fm. | 1 drilled well and 2 dug wells |
| | Orangeville Water Authority | 13,800 | Catskill Fm. | 1 drilled well and 6 springs |
| | Scenic Knolls Water Co. | 10,000 | Wills Creek and Bloomsburg Fms. | 3 drilled wells |
| | Schultz Electroplating, Inc. | 6,000 | Bloomsburg Fm. | 1 drilled well |
| | Wonderview Water Co. | 28,000 | Trimmers Rock and Mahantango Fms. | 3 drilled wells |
| Luzerne | Citizens Water Co. | 8,000 | Trimmers Rock Fm. | 1 drilled well and 3 springs |
| Montour | Geisinger Medical Center | 148,000 | Mifflintown and Keefer Fms. | 3 drilled wells (70 percent) and 1 spring |
| | Mahoning Township Water Authority | 186,000 | Keyser Fm. and upper member of Rose Hill Fm. | 2 drilled wells |
| | TRW, Inc. | 30,000 | Keyser and Tonoloway Fms. | 2 drilled wells |
| Northumberland | Hillside Estates | 6,000 | Mahantango Fm. | 2 drilled wells |

cultural, and small commercial needs in areas outside those served by public supplies. Groundwater accounts for about half of the total water used in the study area.

## METHODS OF INVESTIGATION

Nearly 800 wells and test holes were inventoried for measurements of well and casing depth, depth to water and water-bearing zones, and well yield and drawdown (Table 23). The inventory included almost all public-supply wells and most industrial and commercial wells. Selected springs also were inventoried (Table 24). Nine observation wells were drilled by the U.S. Geological Survey. Five of these 6-inch-diameter wells were completed in bedrock, and four wells having 6-inch-diameter slotted casing were completed in glacial outwash. Eleven auger holes were drilled in glacial outwash; four of the auger holes were cased with 2-inch-diameter slotted pipe. Information was collected on about 130 pumping tests; U.S. Geological Survey personnel conducted or assisted in most of the tests. Twenty-eight of the pumping tests were multiple-well tests involving a pumping well and one or more observation wells. Borehole geophysical logs were run on 43 wells. Well-bore-flow tests were made in 25 wells (Table 2) by the brine-tracing method outlined by Patten and Bennett (1962). Continuous water-level records were obtained for varying periods of time at 16 wells. Synoptic water-level measurements were made on 79 wells along the Susquehanna River between Bloomsburg and Berwick in December 1980 and April 1981. Field determinations of specific conductance and hardness were obtained from 299 wells (Table 23), and water samples for laboratory analyses were collected from 139 wells (Tables 21 and 22).

The bedrock geology was mapped by Inners (1978, 1981), Way (in press), Williams (1980), Berg and others (1980), and Nickelsen (1978, written communication). The geologic base map (Plate 1) was compiled by the U.S. Geological Survey and the Pennsylvania Geological Survey.

## ACKNOWLEDGEMENTS

The authors gratefully acknowledge the cooperation and assistance of the landowners, companies, municipalities, and state agencies who provided information on wells, granted permission to drill test holes, and allowed access to wells.

Many well drillers provided information and assistance. Special thanks is extended to Gene Wieand of Wieand Brothers Drilling for his interest and time.

The Susquehanna River Basin Commission provided additional funds for detailed work along the Susquehanna River between Berwick and Bloomsburg. The authors thank Gregory Senko of the Commission for his able assistance in field work and data storage and retrieval. The authors also thank Timothy Gregorowicz and David Hassrick of Bloomsburg State College, Department of Geology, for field work on the well inventory.

# GEOLOGIC SETTING

## BEDROCK

The bedrock or consolidated rock that underlies the Berwick-Bloomsburg-Danville area is of Silurian, Devonian, and Mississippian age and includes sedimentary noncarbonate and carbonate lithologies. The bedrock units are briefly described in Table 3, and the areal distribution of the formations is shown on Plate 1.

Large-scale folding and subsequent erosion largely account for the outcrop patterns of the bedrock units shown on Plate 1. The bedrock has been folded into a series of anticlinoria and synclinoria (Figure 2). The major structural trend is N70–75°E. Bedding dips typically are 35 to 45 degrees along the limbs of the folds. The Light Street fault, a major thrust fault, transects the study area. The fault generally follows the structural trend in the stratigraphic sequence of the Wills Creek Formation through the Mahantango Formation.

The bedrock has been systematically fractured by two major sets of joints. One set of planar fractures is oriented parallel to the structural grain (strike joints) and the other set is at right angles to the structural grain (dip joints). The joints range from continuous fractures that transect a large stratigraphic sequence to discontinuous breaks that are restricted to single beds. Most strike and dip joints are oriented normal to bedding planes. Strike joints fan across the major folds. The joints are moderately to steeply inclined and dip north and south in south- and north-dipping beds, respectively. Dip joints are approximately vertical regardless of structural setting (Inners, 1981). Oblique joints, irregular fractures, and cleavage-plane partings are also present. All fractures in the bedrock tend to close with depth because of increasing overburden pressures.

## Table 2. *Index to Geophysical Logs and Well-Bore-Flow Tests for Selected Wells*[1]

| Well no. | Co-45 | Co-60 | Co-61 | Co-62 | Co-70 | Co-85 | Co-154 | Co-190 | Co-205 | Co-206 | Co-212 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth of logs | 270 | 226 | 350 | 120 | 473 | 444 | 40 | 400 | 244 | 60 | 120 |
| TYPE OF LOG | | | | | | | | | | | |
| Temperature | x | x | x | | x | x | x | x | x | x | x |
| Fluid conductance | x | x | x | x | x | x | | x | x | | x |
| Caliper | x | x | x | x | x | x | | x | x | x | x |
| Electric | x | | x | x | x | x | x | x | x | | |
| Gamma | x | x | x | x | x | x | x | x | x | x | |
| *Well-bore flow* | | | | | | | | | | | |
| Nonpumping | | | | | | x | | | x | | x |
| Pumping | x | | x | | | | | | | | x |

| Well no. | Co-245 | Co-304 | Co-305 | Co-306 | Co-307 | Co-308 | Co-310 | Co-448 | Co-452 | Co-459 | Co-460 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth of logs | 440 | 200 | 68 | 124 | 300 | 52 | 220 | 145 | 500 | 136 | 120 |
| Temperature | x | x | x | x | x | x | x | x | x | | x |
| Fluid conductance | x | x | | x | x | | | x | x | | x |
| Caliper | x | x | | x | x | | x | x | x | x | x |
| Electric | x | x | | x | x | | x | x | x | x | x |
| Gamma | x | x | x | x | x | x | | | x | x | |
| *Well-bore flow* | | | | | | | | | | | |
| Nonpumping | x | x | | x | x | | | x | x | | x |
| Pumping | | | | | | | | | | | x |

| Well no. | Co-461 | Co-505 | Co-562 | Lu-438 | Lu-452 | Lu-453 | Lu-454 | Lu-471 | Mt-29 | Mt-30 | Mt-31 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth of logs | 195 | 568 | 152 | 230 | 102 | 300 | 200 | 471 | 300 | 400 | 505 |
| Temperature | x | x | | x | x | x | x | x | x | x | x |
| Fluid conductance | x | x | | x | | x | x | x | x | x | |
| Caliper | x | x | x | x | x | x | x | x | x | x | x |
| Electric | x | x | x | x | | x | x | x | x | x | x |
| Gamma | x | x | | x | x | x | x | x | x | | x |
| *Well-bore flow* | | | | | | | | | | | |
| Nonpumping | | x | | x | | x | x | | x | | |
| Pumping | | | | x | | | | x | | | |

| Well no. | Mt-108 | Mt-154 | Mt-175 | Mt-181 | Mt-186 | Mt-255 | Nu-157 | Nu-158 | Nu-187 | Nu-188 |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth of logs | 265 | 156 | 285 | 250 | 276 | 223 | 300 | 300 | 96 | 72 |
| Temperature | x | x | x | x | x | x | x | x | x | |
| Fluid conductance | x | x | x | x | x | x | x | x | x | x |
| Caliper | x | x | x | x | x | x | x | x | x | x |
| Electric | | x | | x | x | | x | x | x | x |
| Gamma | | x | | x | x | | x | x | x | x |
| *Well-bore flow* | | | | | | | | | | |
| Nonpumping | | | | | x | x | | x | | |
| Pumping | x | | x | | | | | x | x | x |

[1] Logs and data on well-bore-flow tests are on file with the U.S. Geological Survey, Harrisburg, Pennsylvania.

## Table 3. *Description of Bedrock Geologic Units*[1]

| System | Geologic unit | Thickness (feet) | Lithologic description |
|---|---|---|---|
| Mississippian | Mauch Chunk Formation | [2]2,500 | Interbedded grayish-red shale, siltstone, and sandstone; calcareous in part. |
| | Pocono Formation | 600–650 | White to light-gray quartzitic sandstone and pebble conglomerate; some interbeds of dark-gray shale. |
| Devonian | Catskill Formation | | |
| | Duncannon Member | 1,100 | Repetitive fining-upward cycles of greenish-gray and grayish-red sandstone, grayish-red siltstone, and grayish-red shale that are mostly 30 to 65 feet thick. |
| | Sherman Creek Member | 2,500 | Interbedded grayish-red shale, siltstone, and sandstone. |
| | Irish Valley Member | 1,800–2,000 | Interbedded shale, siltstone, and sandstone; alternating gray to greenish gray and grayish red in the upper part; mostly gray to greenish gray in the lower part. |
| | Trimmers Rock Formation | 2,500 | Predominantly interbedded gray to dark-gray siltstone and shale; considerable amount of sandstone in the upper part and shale in the lower. |
| | Harrell Formation | 100 | Dark-gray shale, interbedded with siltstone in the upper part. |
| | Mahantango Formation | | |
| | Tully Member | 50–60 | Interbedded argillaceous limestone and calcareous shale; dark gray, fossiliferous. |
| | Lower member | 1,100–1,200 | Greenish to dark-gray shale, locally calcareous; some calcareous and fossiliferous siltstone beds in the upper part. |
| | Marcellus Formation | 300 | Dark-gray fissile shale, pyritic and carbonaceous. |
| | Onondaga Formation | 50–175 | Interbedded gray argillaceous limestone and calcareous shale in the upper part; gray to dark-gray noncalcareous to very calcareous shale in the lower part. |
| | Old Port Formation | 150 | Variable lithologic sequence, consisting of dark-gray, slightly calcareous chert, locally sandy and fossiliferous, in the upper part; dark-gray calcareous shale in the middle part; dark-gray, fine- to coarse-grained, cherty, fossiliferous limestone in the lower part. |
| Devonian and Silurian | Keyser Formation | 125 | Gray to bluish-gray limestone, fine- to coarse-grained, thin- to thick-bedded; laminated, argillaceous and dolomitic in the upper part; coarse grained and highly fossiliferous in the middle part; nodular, argillaceous, and fossiliferous in the lower part; calcareous shale interbeds increase in frequency in the upper part. |
| Silurian | Tonoloway Formation | 200 | Laminated, gray to dark-gray, fine-grained limestone; considerable dolomitic limestone and dolostone in the lower part; calcareous shale interbeds increase in frequency and thickness toward base. |
| | Wills Creek Formation | 600–700 | Interbedded calcareous shale, argillaceous dolostone and limestone, and calcareous siltstone; gray, yellowish gray, and greenish gray in the upper part; variegated greenish gray, yellowish gray, and grayish red purple in the lower part. |
| | Bloomsburg Formation | 500 | Grayish-red shale containing interbeds of grayish-red siltstone, calcareous in part; 30-foot-thick interval of grayish-red sandstone in the upper part. |
| | Mifflintown Formation | 200 | Dark-gray limestone and calcareous shale in the upper part; dark-gray calcareous shale containing interbeds of coarse-grained limestone in the lower part. |
| | Keefer Formation | 40 | Light-gray quartzitic sandstone and siltstone containing interbeds of greenish-gray shale. |
| | Rose Hill Formation | | |
| | Upper member | 120 | Interbedded shale, limestone, and sandstone; mostly gray to greenish gray. |
| | Middle member | 60 | Reddish-purple hematitic sandstone containing interbeds of greenish-gray to reddish-purple shale in the upper part. |
| | Lower member | 720 | Greenish-gray shale containing interbeds of gray calcareous sandstone and reddish-brown hematitic sandstone. |
| | Tuscarora Formation | 350 | Interbedded light-gray quartzitic sandstone and grayish-green shale. |

[1]Adapted from Inners (1981).
[2]Only the lower 1,000 feet is exposed in the study area.

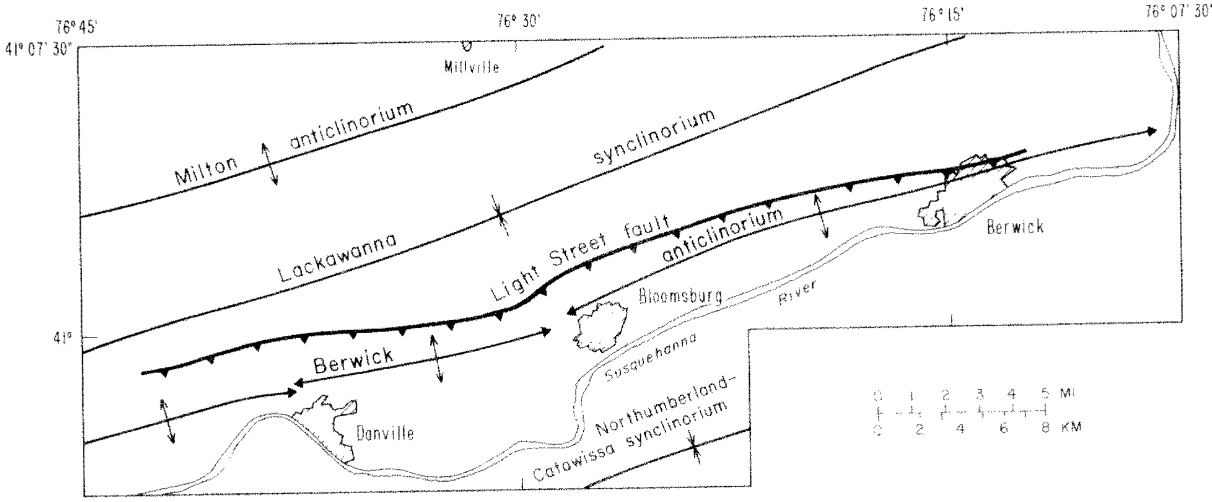



Figure 2. Structural setting of the study area (from Inners, 1978; Inners and Way, 1979; Williams, 1980; Inners, 1981; and Way, in press).

## UNCONSOLIDATED DEPOSITS

The unconsolidated deposits of sand, gravel, silt, and clay that overlie the bedrock are largely the result of glaciation. There is evidence that several glacial advances occurred during Pleistocene time. Early advances in pre-Wisconsinan time covered the study area. Early Wisconsinan glaciation covered approximately 20 percent of the area (Inners, 1978, 1981). The terminal moraine in the Susquehanna River valley near Berwick marks the extent of the latest glacial advance in late Wisconsinan time.

The glacial deposits can be broadly subdivided into two groups—nonstratified and stratified deposits. The nonstratified deposits are till, which is a generally unsorted mixture of clay, silt, sand, gravel, and boulders, largely of local origin, that was directly deposited by a glacier. Pre-Wisconsinan and Wisconsinan tills are found in the study area. Till masks the bedrock in much of the area and has a thickness of generally less than 20 feet, although deposits 50 to 100 feet thick are present locally along the southern base of Knob and Lee Mountains.

Stratified deposits include poorly to well-sorted sand, gravel, silt, and clay that were transported and deposited by glacial meltwater as ice-contact or outwash deposits. Pre-Wisconsinan stratified deposits, locally more than 50 feet thick, are found in the Light Street-Buckhorn area north of Bloomsburg. The most extensive stratified deposits are late Wisconsinan sand and gravel outwash deposits found in the Susquehanna River and Fishing Creek valleys. In general, the thickness and coarseness of the outwash decrease downstream from the late Wisconsinan glacial border. Along the Susquehanna River upstream from Wapwallopen, silt and clay are locally interbedded with the outwash sand and gravel. Many of the recent alluvial and colluvial deposits in the area are reworked glacial sediments.

# HYDROGEOLOGIC DESCRIPTION OF THE AQUIFERS

## BEDROCK AQUIFERS

Groundwater in the bedrock formations is present in secondary openings along fractures and bedding-plane separations (Figure 3). Primary permeability of bedrock in the area is negligible. Solution of calcareous material, especially along fractures and bedding planes, greatly increases the secondary permeability of carbonate rock (Figure 4). The ability of the bedrock aquifers to store and transmit water, as well as to yield water to wells, depends on the size, interconnection, and spacing of secondary openings. Fractures and bedding-plane partings cause hairline separations that allow movement of groundwater. The separations in competent lithologies, such as sandstone, dolostone, and limestone, tend to remain more open than the separations in the less competent shales.

The size of secondary openings in carbonate lithologies may be greatly enlarged by removal of calcareous material. Openings several feet wide have been penetrated in wells drilled into the Tonoloway,

Figure 3. Planar fractures or joints developed in the Mahantango Formation. Groundwater occurs in secondary openings along fractures and bedding-plane separations in the bedrock aquifers.

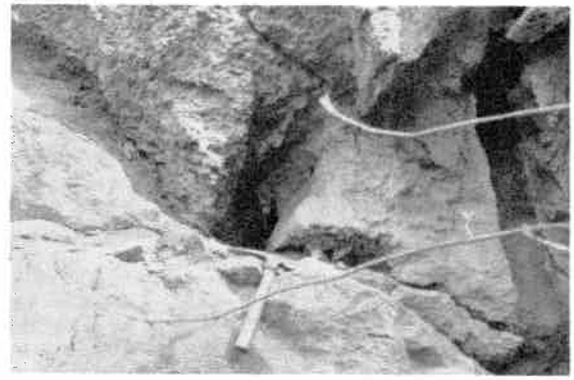


Figure 4. Solution openings in the Keyser Formation. Development of solution openings, primarily along fractures and bedding-plane separations, greatly increases the secondary permeability of carbonate rock.

Keyser, and Old Port Formations. Solution of calcareous material also appears to be important in the development of permeability in the dominantly noncarbonate rocks. As indicated by hydrogeologic logs of wells Co-306 and Nu-158 (Table 4), many water-bearing zones in the noncarbonate-rock aquifers appear to be associated with vein calcite and calcareous cement.

In a stratigraphic sequence, the density of fractures differs from bed to bed, and some fractures may be restricted to single beds. In addition, the susceptibility of the rock to solution differs from bed to bed depending on the amount of calcareous material present. These factors, as well as the presence of bedding-plane separations, create

Table 4. *Hydrogeologic Logs of Selected Wells*

(Yields in parentheses are the discharges produced by the air-rotary drillstem at the given depth)

| Depth (feet below land surface) | Hydrogeologic description |
|---|---|
| Co-305 | |
| | *Glacial outwash* |
| 0-39 | Sand, grayish-brown, medium to coarse, containing quartz and rock fragments, and gravel, fine to coarse; pebble lithologies in gravel include sandstone, siltstone, shale, quartz-pebble conglomerate, quartzite, chert, and metamorphic rock. |
| 39-55 | Sand, grayish-brown, fine to coarse, containing quartz and rock fragments including particulate anthracite coal, and some fine gravel; pebble lithologies in gravel include those listed above plus anthracite coal. |
| 55-65 | Sand, grayish-brown, medium, containing quartz and rock fragments, and gravel, fine to coarse; gravel content increases toward base; casing slotted from 55 to 65 feet. |
| | *Marcellus Formation* |
| 64-68 | Shale, dark-gray, silty, noncalcareous. |
| Co-306 | |
| | *Glacial outwash* |
| 0-5 | Sand, light-brown, silty, fine, and gravel, medium. |
| 0-39 | Sand, light-brown, fine, and gravel, medium to coarse. Water-bearing zone at 35 feet (3 gal/min, cased off). |
| | *Marcellus Formation* |
| 39-55 | Shale, gray, calcareous. |
| 55-60 | Shale, gray, calcareous; some vein calcite; water-bearing zone at 60 feet (3 gal/min). |
| 60-70 | Shale, gray, slightly calcareous; fossil fragment. |
| 70-75 | Shale, gray, calcareous; some vein calcite; water-bearing zone at 74 feet (20 gal/min). |
| 75-80 | Shale, gray, slightly calcareous. |
| 80-85 | Shale, gray, calcareous; calcite veins up to 0.1 inch wide. |
| 85-125 | Shale, gray, slightly calcareous; some vein calcite. |

Table 4. *(Continued)*

| Depth (feet below land surface) | Hydrogeologic description |
|---|---|
| Co-307 | |
| | *Glacial outwash* |
| 0–45 | Sand, light-brown, medium, and gravel, fine to coarse; sandstone boulders at 27 and 32 feet; water-bearing zone at 37 feet (1 gal/min, cased off). |
| | *Tonoloway Formation* |
| 45–55 | Limestone, gray, fine-grained. |
| 55–65 | Limestone, light-gray, fine-grained; some vein calcite; water-bearing zone at 62 feet (3 gal/min). |
| 65–70 | Limestone, dark-gray, fine-grained; cuttings smelled of hydrogen sulfide during drilling. |
| 70–80 | Limestone, dark-gray, fine- and medium-grained; some vein calcite. |
| 80–95 | Limestone, gray and dark-gray, fine- and medium-grained; abundant vein calcite. |
| 95–100 | Limestone, gray, fine-grained, and vein calcite; weathered yellowish brown; water-bearing zone at 96 feet (20 gal/min). |
| 100–105 | Limestone, gray, fine-grained; some vein calcite; cuttings smelled of hydrogen sulfide during drilling. |
| 105–112 | Limestone, dark-gray, medium-grained; vein calcite, some coarse-grained. |
| 112–113 | Vein calcite, coarse-grained. |
| 113–116 | Limestone, dark-gray, fine- to medium-grained; some vein calcite. |
| 116–120 | Limestone, gray, fine- to medium-grained; water-bearing zone at 116 feet (40 gal/min). |
| 120–125 | Limestone, gray, fine-grained; abundant vein calcite. |
| 125–130 | Limestone, gray, fine- and medium-grained; some vein calcite. |
| 130–135 | Limestone, gray, fine-grained. |
| 135–140 | Limestone, light-gray, fine-grained, and vein calcite, coarse-grained. |
| 140–150 | Dolostone, light-gray, fine-grained. |
| 150–155 | Dolostone, light-gray, fine-grained, shaly; some vein calcite. |
| 155–160 | Dolostone, light-gray, fine-grained, shaly, and vein calcite, coarse-grained. |
| 160–170 | Dolostone, light-gray, fine-grained; some fine-grained pyrite. |
| 170–180 | Limestone, light-gray, fine-grained; yield increased between 120 and 180 feet (90 gal/min). |
| 180–185 | Limestone and dolostone, light-gray, fine-grained. |
| 185–210 | Dolostone, light-gray, fine-grained; some vein calcite. |
| 210–215 | Limestone and dolostone, light-gray, fine-grained, shaly; some vein calcite. |
| 215–220 | Limestone, light-gray, fine-grained. |
| | *Wills Creek Formation* |
| 220–225 | Dolostone, light-gray, fine-grained, and shale, greenish-gray. |
| 225–235 | Limestone, light-gray, fine-grained; some fine-grained pyrite. |
| 235–240 | Limestone and dolostone, light-gray, fine-grained, shaly; some fine-grained pyrite. |
| 240–245 | Limestone, gray, fine- and medium-grained. |
| 245–255 | Limestone, light-gray, fine- and medium-grained; some coarse-grained vein calcite. |
| 255–265 | Dolostone, gray, fine- and medium-grained, and shale, greenish-gray. |
| 265–270 | Dolostone and limestone, gray, fine- and medium-grained. |
| 270–275 | Limestone, gray, fine-grained. |
| 275–280 | Shale, greenish-gray, and dolostone, gray, fine-grained, shaly. |
| 280–285 | Dolostone, gray, fine-grained. |
| 285–290 | Limestone and dolostone, dark-gray, fine- and medium-grained. |
| 290–293 | Dolostone, gray, fine- and medium-grained; coarse-grained vein calcite at 292 feet. |
| 293–295 | Dolostone, gray, fine-grained, shaly. |
| 295–300 | Shale, greenish-gray, and dolostone, gray, fine-grained; yield increased between 280 and 300 feet (110 gal/min). |
| Nu-158 | |
| | *Mahantango Formation* |
| 0–15 | Soil, brownish-orange, clayey; some fragments of shale. |
| 15–35 | Shale, gray, calcareous; brownish stains; water-bearing zones at 22 and 30 feet. |
| 35–80 | Shale, dark-gray, calcareous. |
| 80–85 | Shale, dark-gray, slightly calcareous. |
| 85–95 | Shale, dark-gray, calcareous; abundant vein calcite; some finely disseminated pyrite; water-bearing zone at 88 feet. |
| 95–140 | Shale, dark-gray, calcareous; some vein calcite and finely disseminated pyrite; water-bearing zone at 108 feet. |
| 140–155 | Shale, dark-gray, slightly calcareous. |
| 155–160 | Shale, dark-gray, calcareous; some vein calcite. |
| 160–235 | Shale, dark-gray, slightly calcareous; some brownish stains. |
| 235–300 | Shale, dark-gray, slightly calcareous; some finely disseminated pyrite; water-bearing zone at 289 feet. |

abrupt changes in permeability at bedding contacts. These permeability changes at bedding contacts, the presence of strike joints, and a common bedding dip of 35 to 45 degrees cause the characteristic development of directional permeability in the bedrock aquifers along bedding strike.

In general, the bedrock aquifers display relatively small, discrete zones of high permeability that are surrounded by large blocks of unfractured, low-permeability rock. Overall, the bedrock aquifers display relatively low storage capabilities due to the large amount of unfractured rock.

### GLACIAL-OUTWASH AQUIFER

Groundwater is present in primary openings between grains in unconsolidated deposits. The ability of the unconsolidated deposits to store and transmit water depends on grain size, degree of sorting, saturated thickness, and areal extent of saturation. Locally, only the late Wisconsinan outwash deposits have significant permeability and areal saturation. The sand and gravel deposits of the glacial-outwash aquifer are highly permeable and have significant storage capabilities. In general, the thickest saturated deposits are found along Fishing Creek upstream from Orangeville and along the Susquehanna River upstream from Mifflinville.

The areal extent of the outwash aquifer and its thickness observed in wells and test holes are shown on Plate 1. Generalized sections of the outwash aquifer in selected areas are also presented on Plate 1.

The glacial-outwash aquifer is discontinuous. Sections A–A ′ and C–C ′ indicate that thick glacial aquifers are present locally along the upper outwash-terrace area northeast of Beach Haven. The outwash aquifers occur up to 100 feet above the Susquehanna River. Along the Susquehanna River north of Wapwallopen, 70 feet of saturated glacial deposits occurs below the level of the river. However, as previously mentioned, significant amounts of silt and clay are found interbedded with the outwash sand and gravel in this area.

At Nescopeck (section D–D ′), the Susquehanna River flows on bedrock, and the greatest aquifer thickness is present 3,000 feet away from the river. At Mifflinville (section E–E ′), a buried channel is present about 1,000 feet away from the Susquehanna River. A bedrock high, in part, isolates the buried-channel-deposit aquifer from the river. The hydrogeologic log of one well, Co–305, completed in the glacial outwash of the buried channel is presented in Table 4. A hydrogeologic section across the outwash terrace along Fishing Creek north of Orangeville (section F–F ′) indicates a relatively uniform aquifer thickness of about 50 feet of saturated deposits under the creek.

## GROUNDWATER FLOW SYSTEM

### WATER BUDGET

Precipitation in the Berwick-Danville area is about 40 inches per year. The precipitation represents about 700 million gallons per square mile per year and, except for through-flowing streams, is the source of all fresh water in the area. Water leaves the area as water vapor in the atmosphere, as streamflow, and as groundwater flow. A water budget represents a balance of the components of the hydrologic system as follows:

$$P = R + WL$$

where P = annual precipitation, in inches
R = groundwater and surface-water runoff (total streamflow), in inches
WL = water loss (evapotranspiration), in inches

This form of the budget implies that groundwater flow across basin boundaries is negligible, and that changes in groundwater and soil-moisture storage also are negligible for the budget period.

Water budgets were calculated for the East Branch Chillisquaque Creek and Fishing Creek drainage basins above U.S. Geological Survey gaging stations 01553600 and 01539000 (Table 5). The locations of the gaging stations are shown on Plate 1. The period 1962–77 was used to represent average climatic conditions, the period 1963–66 was used for drier than average conditions, and the period 1972–75 was used for wetter than average conditions.

In the East Branch Chillisquaque Creek basin, about 43 percent of the average annual precipitation is discharged as streamflow, and most of the remainder is lost as evapotranspiration. Average annual water losses for the wet and dry periods were 45 and 66 percent, respectively. The basin is located in a lowland underlain by shale and is probably representative of similar settings in the study area.

In the Fishing Creek basin, about 57 percent of the average annual precipitation is discharged as streamflow. Average annual water losses for the wet

Table 5. *Water Budgets for Selected Drainage Basins*

| Basin name | U.S. Geological Survey gaging-station number | Drainage area (square miles) | Water years | Precipitation[1] (inches) | Runoff (inches) | Percent runoff | Water loss (inches) | Percent water loss |
|---|---|---|---|---|---|---|---|---|
| East Branch Chillisquaque Creek | 01553600 | 9.48 | 1962–77 | 40.4 | 17.2 | 43 | 23.2 | 57 |
| | | | 1963–66 | 33.3 | 11.4 | 34 | 21.9 | 66 |
| | | | 1972–75 | 50.3 | 27.1 | 54 | 22.8 | 45 |
| Fishing Creek | 01539000 | 247 | 1962–77 | 40.4 | 22.9 | 57 | 17.5 | 43 |
| | | | 1963–66 | 33.3 | 17.4 | 52 | 15.9 | 48 |
| | | | 1972–75 | 50.3 | 31.9 | 63 | 18.4 | 37 |

[1]National Oceanic and Atmospheric Administration station at Millville.

and dry periods were 37 and 48 percent, respectively. Fishing Creek drains an upland area underlain by sandstone and shale and glacial deposits, mostly north of the study area. On the average, annual water losses are 6 inches less for Fishing Creek than for East Branch Chillisquaque Creek. The lower evapotranspiration for the Fishing Creek basin is attributed to lower annual temperatures and greater runoff from steeper slopes in the upland basin. Although the proportion of precipitation that was annual water loss varied, the amount of water losses remained relatively constant during dry and wet periods in both basins.

## RECHARGE

The main source of groundwater recharge is precipitation. From May to September, when evapotranspiration rates are highest and there is a soil-moisture deficit, only a small proportion of rainfall reaches the water table. During the late fall, winter, and early spring, when evapotranspiration is minimal and the soil-moisture deficit has been satisfied, infiltrating rainfall and snowmelt readily recharge the groundwater system.

Groundwater recharge occurs in all areas upgradient from valley discharge points (streams and springs), but the rate of recharge in any specific area is largely controlled by the slope of the land, the infiltration capacity of surficial cover, and the ability of the underlying aquifer to transmit water from the recharge area. The gentle topography and coarse texture of the glacial-outwash terraces provide important areas for recharge. Road surfaces, parking lots, rooftops, and other impermeable surfaces reduce the area available for groundwater recharge and increase runoff to streams.

Groundwater discharge to streams was determined by separating the base-flow component of total runoff on streamflow hydrographs. The groundwater discharge in Table 6 approximates the amounts of annual recharge (assuming that there is no change in storage from year to year and that groundwater evapotranspiration is negligible) in the selected drainage basins for water years 1964 (below average precipitation), 1970 (average precipitation), and 1973 (above average precipitation). By assuming that recharge equals groundwater discharge, recharge was estimated to average about 8.3 inches per year (270 (gal/min)/mi$^2$ [gallons per minute per square mile]) in the East Branch Chillisquaque Creek basin and about 15 inches per year (490 (gal/min)/mi$^2$) in the Fishing Creek basin. On average, it is estimated that about one fourth of

Table 6. *Groundwater Contribution to Runoff for Selected Drainage Basins*

| Water year | 1964 | | | 1970 | | | 1973 | | | 1964, 1970, 1973 Average | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basin name | Total runoff (inches) | Ground-water contribution (inches) | Percent ground-water | Total runoff (inches) | Ground-water contribution (inches) | Percent ground-water | Total runoff (inches) | Ground-water contribution (inches) | Percent ground-water | Total runoff (inches) | Ground-water contribution (inches) | Percent ground-water |
| East Branch Chillisquaque Creek | 16.2 | 6.7 | 41 | 16.9 | 8.4 | 50 | 23.5 | 9.9 | 42 | 18.9 | 8.3 | 44 |
| Fishing Creek | 19.9 | 14.2 | 72 | 21.6 | 14.9 | 69 | 31.7 | 16.9 | 53 | 24.4 | 15.3 | 63 |

annual precipitation recharges the groundwater system.

## MOVEMENT AND DISCHARGE

Groundwater moves through openings in the aquifer from areas of higher to areas of lower hydraulic head. The water table is a subdued expression of the topography. Therefore, in general, groundwater flow is from areas of higher to areas of lower elevation.

Three types of flow systems in the report area are local, intermediate, and regional. Much of the groundwater flow is local, and the nearest stream serves as the discharge point. Drainage divides of local groundwater flow systems coincide closely with surface-water divides. Groundwater in the intermediate system flows under local stream basins and discharges to downstream points of the streams or to larger streams. Only a very small percentage of groundwater flow bypasses the local and intermediate systems and becomes part of the deep, regional flow system.

As groundwater flows, hydraulic head is lost due to frictional resistance to flow through interstices and fractures. Thus, hydraulic-head gradients are an indication of aquifer permeability. Highly permeable aquifers have less resistance to flow, and, therefore, greater amounts of water are able to move through these rocks under smaller gradients. The relatively low gradients associated with the glacial-outwash terrace, less than 50 feet per mile, indicate high permeabilities. In contrast, head gradients in the upland areas underlain by lower-permeability rock of the Tuscarora and Pocono Formations may be greater than 1,000 feet per mile.

The greatest topographic gradients typically are across bedding strike, which is the direction of minimum permeability. Groundwater follows a steplike flow pattern in response to the variable permeabilities across bedding strike. In valleys where the highly permeable carbonate rocks of the Keyser and Tonoloway Formations form an effective drain, hydraulic-head gradients do not closely follow topographic gradients. Groundwater flow is largely toward the carbonate-rock aquifer and then along bedding strike within that aquifer toward points of discharge.

Wells that penetrate water-bearing zones having different hydraulic heads serve as a short circuit to the natural flow system. The amount of well-bore flow depends on the difference in head between water-bearing zones and the location and permeability of the zones. Well-bore flow may connect local, intermediate, or regional flow systems. Well-bore flow measured in eight wells is illustrated in Figure 5.

In uplands, deeper water-bearing zones have lower hydraulic heads than shallow zones, and the flow is downward. Water levels generally are lower in deeper wells than in shallow wells. Head differences between zones probably are on the order of tens of feet, but may be greater than 100 feet near large topographic breaks. Downward flow was measured in two wells, Co-245 and Nu-158, which are located in upland draws. The wells provide a short circuit that connects the local and intermediate flow systems. Downward flow decreases the amount of available drawdown to a well and may cause local dewatering of the shallow aquifer. Measured downward flows, about 1 to 5 gal/min (gallons per minute), exceed the amount that would normally be pumped from a domestic well, and, where such wells are closely spaced, the downward flow may exceed the local recharge rate.

In valleys, deeper water-bearing zones have higher hydraulic heads than shallow zones, and the flow is upward. Water levels generally are higher in deeper wells than in shallow wells. Composite water levels for wells that tap major deep water-bearing zones in discharge areas may be tens of feet higher than those for surrounding shallow wells. Some deep wells in valleys are flowing wells. In other wells, the upper water-bearing zones act as thieving zones, and no indication of upward flow can be seen at the land surface. Although upward flow increases the available drawdown to a well, it is not always desirable. Water produced from the deeper zones typically is higher in dissolved solids, and upward flow may contaminate shallow aquifers. Calcium sulfate water under high hydraulic head is present at a depth of 290 feet in well Mt-31. This well, located in a valley flat, taps the Old Port and Keyser Formations and yields water having a total-dissolved-solids content of 1,040 mg/L (milligrams per liter), which exceeds the recommended limit for drinking water set by the U.S. Environmental Protection Agency (1976a). Well Co-505, which had 13 gal/min of upward well-bore flow, is contrary to this generalization. The water produced from the major water-bearing zone at 550 feet in the well contained less than one half the total dissolved solids than the water produced from shallower zones.

Downward flow was measured in wells Co-304 and Lu-454, both of which are located in the Sus-

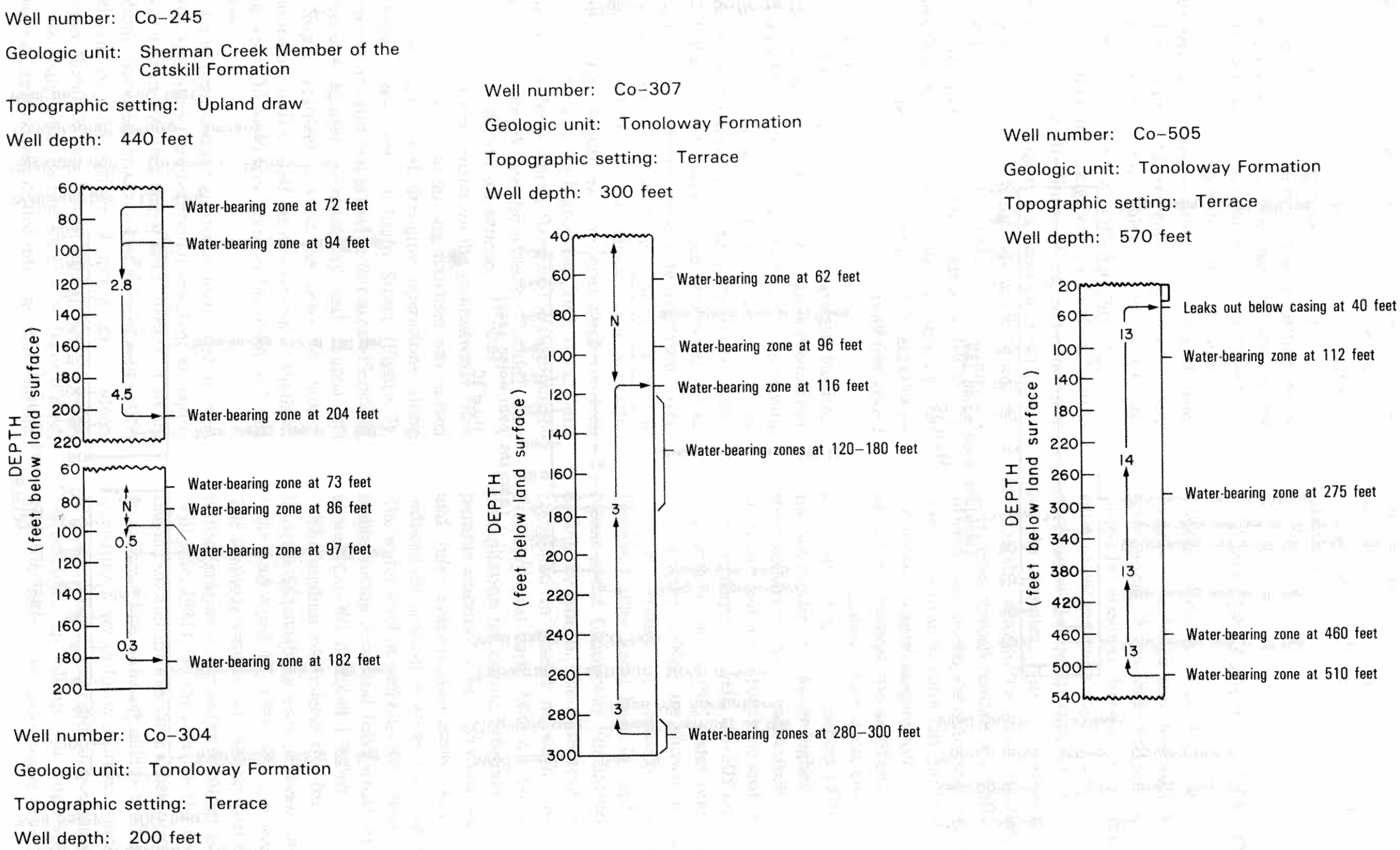


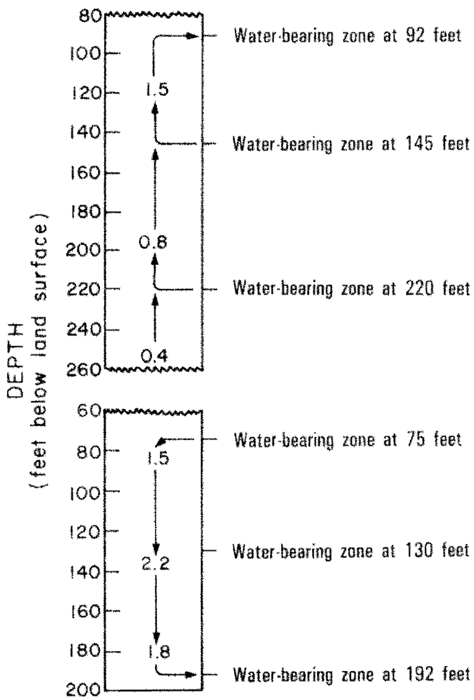

**Figure 5.** **Well-bore flow in selected wells. Arrows and numbers signify direction and rate of flow in gallons per minute; N indicates no measurable flow.**

Well number: Lu-453

Geologic unit: Mahantango Formation

Topographic setting: Terrace

Well depth: 300 feet




Well number: Lu-454

Geologic unit: Tonoloway Formation

Topographic setting: Terrace

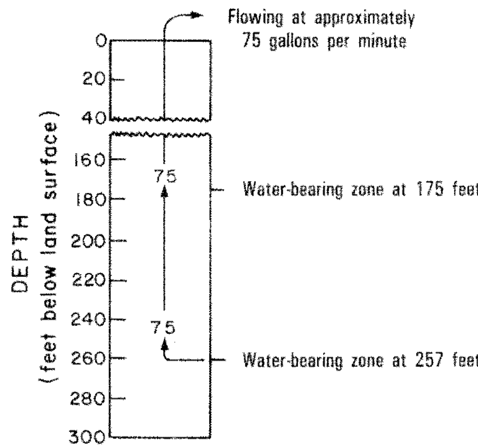
Well depth: 200 feet

Well number: Mt-29

Geologic unit: Lower member of the Rose Hill Formation

Topographic setting: Upland draw

Well depth: 300 feet




Well number: Nu-158

Geologic unit: Mahantango Formation

Topographic setting: Upland draw

Well depth: 300 feet

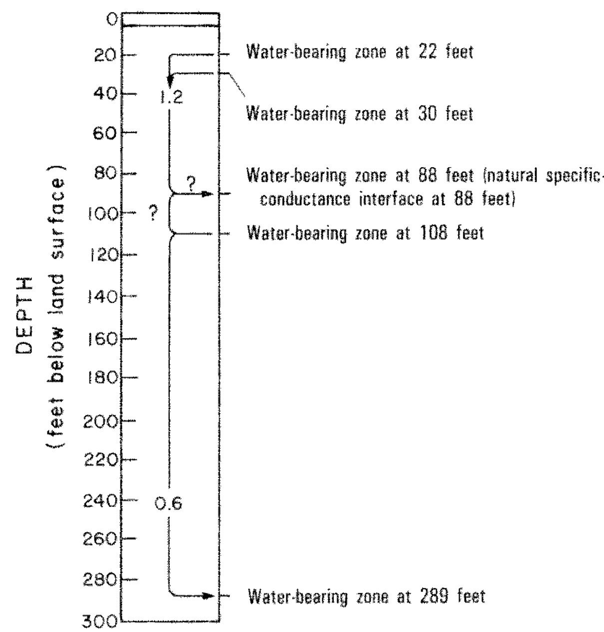



Figure 5. *(Continued).*

quehanna River valley. Possibly, groundwater flows parallel to the river for a distance before discharging, or the lower water-bearing zones in these wells may be part of the regional flow system.

Upward flow is common in wells drilled in the interbedded sandstone, limestone, and shale of the Mifflintown, Keefer, and Rose Hill Formations on the limbs of the Berwick anticlinorium. This hydrogeologic setting is along the flanks of Montour Ridge and its eastern extension between Danville and Bloomsburg. Shales commonly are confining beds for coarser grained and calcareous beds in these formations. Large vertical head differences are found along the limbs of the anticlinorium, where steep topographic gradients parallel the bedding dip, and many flowing wells are encountered. Upward flows measured in wells were generally less than 10 gal/min. An extreme example is well Mt-29, where flow in the well was 75 gal/min upward from a water-bearing zone at a depth of 257 feet (Figure 5); the hydraulic head in the well was 69 feet above land surface.

The natural groundwater flow system has been altered along the flanks of the ridge between Danville and Bloomsburg in areas where deep mining of sedimentary iron ore in the upper part of the Rose Hill Formation occurred in the 1800's (Inners and Williams, 1983). Abandoned deep mines can act as a drain, effectively dewatering overlying water-bearing zones. Wells drilled into the mines provide a short circuit for water perched by overlying confining shales (Figure 6). The most extensive deep mines are found in the Mahoning Creek gap at Danville and on the northern flank of the ridge northeast of Danville. Where the mines are flooded, they may serve as significant sources of water.

A more recent impact on the groundwater flow system from surficial mining activities was caused by sand and gravel dredging operations along Fishing Creek west of Light Street (Figure 7). Removal of sand and gravel in this area effectively increased aquifer permeability and caused the hydraulic gradient toward the creek to flatten. Reportedly, this caused the dewatering of shallow, dug wells (30 to 40 feet deep) in the town of Light Street.

Water-temperature gradients measured in most wells approach the geothermal gradient at depths greater than 300 feet below land surface. This indicates that most groundwater flow occurs within 300 feet of land surface. Fresh water circulates deeper than 600 feet below land surface in much of the study area. Saline water was encountered, however, in two wells drilled into the Marcellus and Mahantango Formations at depths of 300 to 350 feet. The wells, Co-382 and Lu-471, are in valleys at altitudes of 580 and 500 feet above sea level, respectively.

## WATER-LEVEL FLUCTUATIONS

Water levels in wells fluctuate in response to changes in recharge and discharge of the groundwater system. Water-level fluctuations primarily are caused by seasonal changes in recharge. Groundwater levels generally start to decline in April and continue to decline throughout the summer. During the summer, high evapotranspiration rates reduce the amount of water reaching the water table, even though rainfall is slightly higher in the summer than during the other seasons. Water levels tend to stabilize in early fall, primarily because of decreased evapotranspiration losses. Rain and snowmelt recharge the aquifers from late fall to early spring, and water levels rise. In well Co-45 at Bloomsburg, for the period 1970 to 1980, April and September showed the highest and lowest mean monthly water levels, respectively. The difference in mean water levels for these months was 2.1 feet.

Hydrographs of wells Co-305 and Co-307, and precipitation for the 1981 water year (October 1980 to September 1981), are shown in Figure 8. The greatest amount of recharge occurred during February. The water level in well Co-307, completed in the Tonoloway Formation, rose 6.4 feet during the month. The water level in well Co-305, completed in glacial outwash, rose 1.8 feet in February and early March. About 6 inches of precipitation fell during February. Although comparable amounts of precipitation occurred in June and July, evapotranspiration losses significantly reduced the amount of water reaching the aquifers. The water level in well Co-305 remained relatively stable during June and July, while the water level in well Co-307 declined 1.3 feet.

The median water-level rise for 79 wells in the Berwick-Bloomsburg area between December 22, 1980, and April 30, 1981, was 2.5 feet (Table 7). The seasonal water-level changes varied according to topography and aquifer lithology (Gerhart and Williams, 1981). On the average, the observed fluctuation on hilltops was three times greater than that in valleys. The wells in valleys are near the Susquehanna River or Fishing Creek, which have nearly constant heads and moderate seasonal water-level fluctuations. In hilltop and slope settings, shale aquifers show the least water-level fluctuation

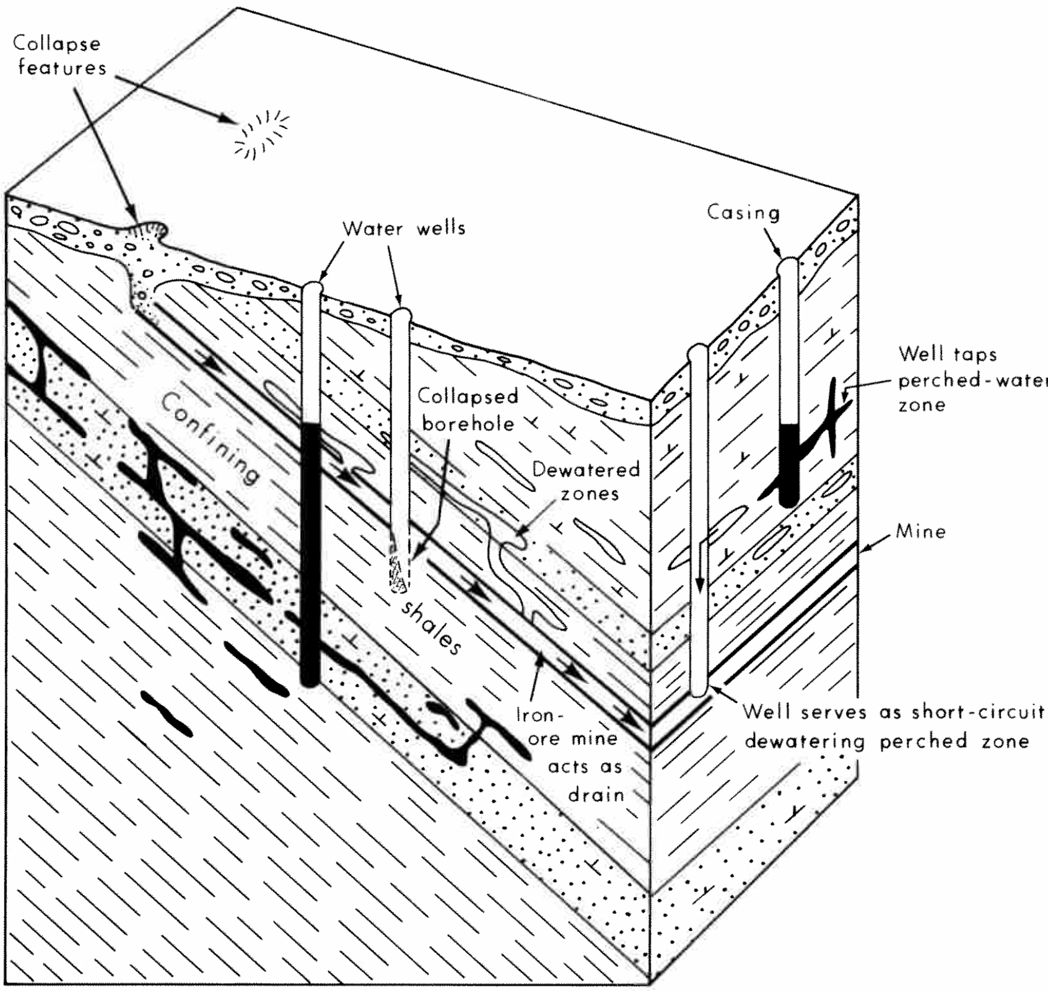



**Figure 6. Effects of deep iron-ore mines on the groundwater resources in areas along the flanks of the ridge between Danville and Bloomsburg (from Inners and Williams, 1983).**

**Figure 7. Sand and gravel dredge pools along Fishing Creek west of Light Street. Dredging operations reportedly caused the dewatering of shallow, dug wells in Light Street.**

because the low permeability of the shale decreases the recharge and drainage capability. In valleys, the sand and gravel aquifer shows less water-level fluctuation than bedrock aquifers because of its greater storage capability (greater storage means greater volumes of water drained per foot of water-level decline).

Groundwater levels also fluctuate in response to changes in discharge from the aquifers due to pumping (Figure 9). The water level in well Co-310 at Bloomsburg, completed in the Keyser Formation, fluctuates in response to pumping of an industrial well field located about 2,500 feet to the east (Figure 9). The well field was pumped from June 2 to September 4, 1981 (except for 5 days in late June and early July) for air-conditioning water at a rate in the range of 500 to 1,000 gal/min. This increased discharge from the aquifer accentuated the seasonal

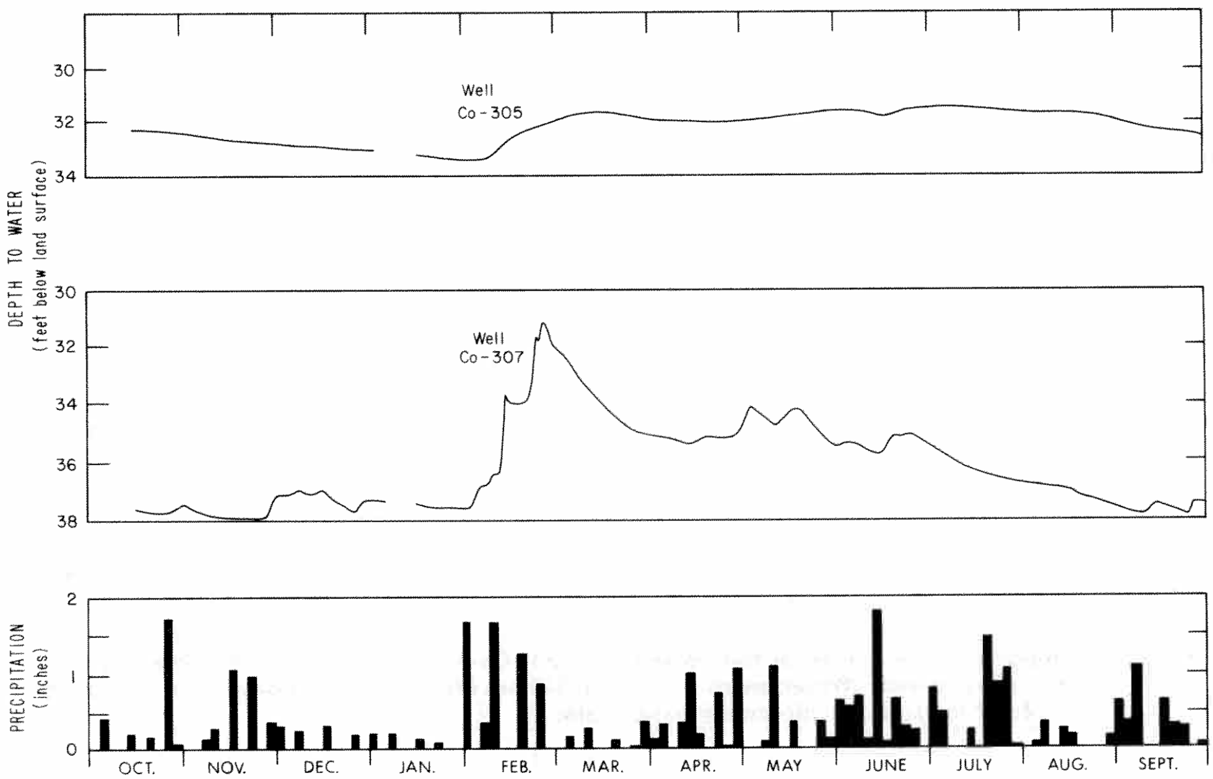



**Figure 8.** Precipitation at Millville in water year 1981 and corresponding water levels in wells Co-305 (glacial outwash) at Mifflinville and Co-307 (Tonoloway Formation) at Berwick.

**Table 7.** *Summary of Water-Level Changes in Selected Wells Between December 1980 and April 1981*

| | Median water-level fluctuation (feet)[1] | | | |
|---|---|---|---|---|
| Lithology | Hilltop | Slope | Valley | All |
| Sand and gravel | — | 1.9 (2) | 1.5 (10) | 1.5 (12) |
| Shale | −0.1 (2) | 3.2 (25) | 2.3 (12) | 2.4 (39) |
| Sandstone and shale | 7.8 (5) | 4.8 (3) | — | 6.3 (39) |
| Sandstone, limestone, and shale | 10.7 (2) | 6.6 (1) | 1.9 (1) | 7.3 (4) |
| Carbonate rock and shale | 6.1 (1) | 1.6 (3) | 3.4 (5) | 2.8 (9) |
| Carbonate rock | — | — | 2.5 (7) | 2.5 (7) |
| All | 6.9 (10) | 3.0 (34) | 2.3 (35) | 2.5 (79) |

[1]Positive number denotes a water-level rise from December 1980 to April 1981. Number of wells is in parentheses.

water-level decline in well Co-310. The water level in well Co-310 declined 6.5 feet during this period. During the same time period, well Co-190, located nearby but not affected by pumpage, showed a water-level decline of less than 1 foot. The well field was pumped on an intermittent basis until September 28. The water level in well Co-310 recovered 4.9 feet from September 28 to December 31, 1981, whereas the water level in well Co-190 rose only 0.3 foot during the same period.

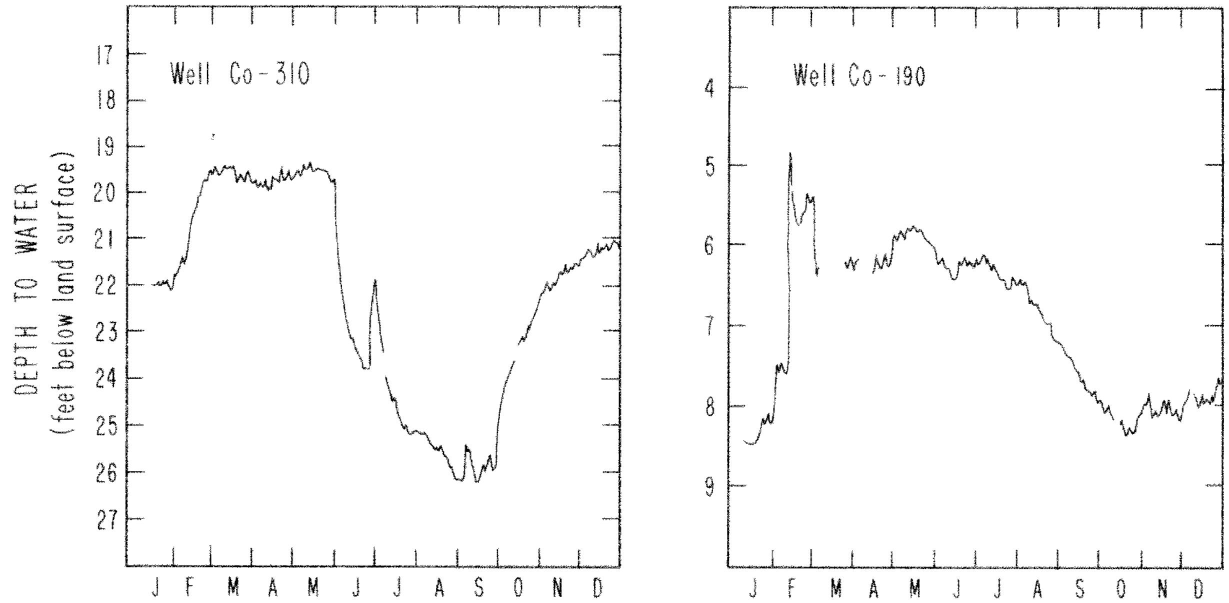



Figure 9. Comparison of water-level fluctuations in wells Co-310 and Co-190 at Bloomsburg for the 1981 calendar year. Water levels in well Co-310 are affected by the pumping of an industrial well field for summer air-conditioning water.

# WATER-YIELDING CHARACTERISTICS OF THE AQUIFERS

## WELL CONSTRUCTION

In the area of investigation, dug wells, springs, and, most commonly, drilled wells are used for groundwater withdrawal. Air-rotary or cable-tool methods are used to drill wells.

Depths of drilled wells that were inventoried range from 33 to 610 feet. About 70 percent of the inventoried wells were drilled for domestic, small commercial, or other purposes for which yields of 5 to 10 gal/min are generally adequate. The median depth of domestic wells is 125 feet. The median depth of wells drilled for public, industrial, or other high-yield uses is 220 feet. Most domestic wells are 6 inches in diameter, and nondomestic wells range from 6 to 10 inches in diameter.

Casing is installed in wells to prevent surficial deposits and weathered bedrock from collapsing into the well bore and to prevent near-surface water from entering the well. Typically, steel casing is seated several feet into solid bedrock and the remainder of the well is completed as an open hole. Although most drillers prefer to complete domestic wells in bedrock, this is not always practical where thick saturated sand and gravel glacial deposits are present. In these areas, the well may be completed as an open-ended cased hole, or the lower part of the casing may be slotted. Where the glacial-outwash aquifer is tapped for high-yield purposes, screens and natural or artificial gravel packs typically are used.

The depth of a domestic well depends on the yield capabilities of the aquifer, depth to water-bearing zones, and, in some cases, depth to solid bedrock. Deep wells are drilled at low-permeability sites not only to penetrate additional water-bearing zones, but also to provide well-bore storage. A statistical summary of well and casing depths of domestic wells for the various geologic units is given in Table 8.

Casing depths are related to the susceptibility of the aquifer to weathering and to the thickness of surficial deposits. The deepest casing depths are found in the Keyser and Tonoloway Formations because these carbonate rocks have the greatest susceptibility to weathering. About one of every four wells in these formations requires more than 100 feet of casing. Wells drilled into the friable sandstone beds locally found at the top of the Old Port Formation may require deep casing to prevent well-bore collapse. A domestic well (Nu-251) in Riverside that penetrated 3 feet of water-bearing sand at depth required 76 feet of casing. About one of every four domestic wells in the Sherman Creek Member of the Catskill Formation requires more

Table 8. *Summary of Well and Casing Depths of Domestic Wells*

| Aquifer | Well depth (feet below land surface) | | | | | Casing depth (feet below land surface) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number of wells | 75 Percent[1] | 50 Percent[1] (median) | 25 Percent[1] | Range | Number of wells | 75 Percent[1] | 50 Percent[1] (median) | 25 Percent[1] | Range |
| Sand and gravel | | | | | | | | | | |
| Glacial outwash | 9 | — | 35 | — | 19–64 | 5 | — | 45 | — | 34–64 |
| Sandstone and shale | | | | | | | | | | |
| Mauch Chunk Formation | 2 | — | 175 | — | 150–200 | 2 | — | 21 | — | 20–21 |
| Catskill Formation | 112 | 100 | 125 | 170 | 30–300 | 111 | 21 | 36 | 47 | 20–106 |
| Duncannon Member | 1 | — | 85 | — | — | 1 | — | 24 | — | — |
| Sherman Creek Member | 58 | 100 | 125 | 175 | 30–300 | 57 | 21 | 36 | 60 | 20–100 |
| Irish Valley Member | 53 | 100 | 130 | 165 | 50–275 | 53 | 20 | 40 | 44 | 20–106 |
| Trimmers Rock Formation | 67 | 123 | 197 | 275 | 35–523 | 53 | 20 | 22 | 39 | 16–81 |
| Shale | | | | | | | | | | |
| Harrell and Mahantango Formations | 146 | 90 | 125 | 175 | 31–470 | 130 | 20 | 22 | 40 | 5–132 |
| Marcellus Formation | 40 | 71 | 87 | 123 | 50–285 | 36 | 20 | 30 | 42 | 11–71 |
| Bloomsburg Formation | 16 | 116 | 175 | 211 | 75–265 | 15 | 20 | 20 | 30 | 16–57 |
| Carbonate rock and shale | | | | | | | | | | |
| Onondaga and Old Port Formations | 30 | 61 | 93 | 156 | 30–335 | 28 | 23 | 35 | 48 | 13–85 |
| Wills Creek Formation | 43 | 70 | 98 | 170 | 25–300 | 37 | 23 | 40 | 71 | 16–190 |
| Carbonate rock | | | | | | | | | | |
| Keyser and Tonoloway Formations | 28 | 80 | 169 | 210 | 47–348 | 26 | 29 | 43 | 100 | 20–250 |
| Sandstone, limestone, and shale | | | | | | | | | | |
| Mifflintown, Keefer, and Rose Hill Formations | 38 | 125 | 182 | 223 | 73–394 | 33 | 21 | 40 | 51 | 13–121 |
| Mifflintown and Keefer Formations | 7 | — | 125 | — | 73–315 | 7 | — | 36 | — | 20–50 |
| Rose Hill Formation | 31 | 128 | 189 | 223 | — | 27 | 20 | 41 | 51 | 13–121 |
| Upper member | 14 | 125 | 195 | 230 | 93–280 | 12 | 38 | 53 | 88 | 20–121 |
| Middle and lower members | 17 | 131 | 175 | 219 | 75–394 | 15 | 20 | 26 | 41 | 13–43 |

[1]Percentage of wells in which depth is equaled or exceeded.

than 60 feet of casing because of thick deposits of till overlying much of its outcrop area.

Some wells drilled through the Mifflintown and Keefer Formations into the upper member of the Rose Hill Formation penetrate abandoned iron-ore mines (Figure 6). Four wells that intersect iron-ore mines required 70 to 121 feet of casing. One well that hit a mine void at 160 feet was abandoned, as casing to that depth was considered to be impractical (Inners and Williams, 1983).

Difficulties may arise where drilling is done through glacial-outwash deposits and highly weathered carbonate rock using an air-rotary rig. Lost air circulation is a common problem in both types of rock. In the outwash deposits, isolated boulders, which are found interbedded with the finer grained deposits, can cause drilling problems. In highly weathered carbonate rock, "floating" boulders (solid rock surrounded by weathered materials) may be a source of difficulty. Where the outwash deposits are saturated, sand, silt, and clay may flow, making it difficult to keep the hole open. A common practice used when drilling sand and gravel and weathered rock is drilling and driving. The repetitious procedure involves drilling very short intervals of rock followed by driving the casing through the drilled interval; in some wells, the casing is driven ahead of the drilled interval.

## WELL YIELD

### Reported Yield

The reported yields presented in Tables 9 and 10 were, for the most part, determined by the driller on the basis of a short-term drillstem or bailer test when the well was completed. Reported yields based on drillers' completion tests appear to approximate the maximum short-term yield of the wells in most cases, but may not be accurate under certain conditions. In aquifers of high permeability, such as sand and gravel or carbonate rock containing solution cavities, much of the water may be forced back into the aquifer during a drillstem test rather than

Table 9. *Summary of Reported Yields of Domestic Wells*

| Aquifer | Number of wells | Median well depth (feet below land surface) | Reported yield (gal/min) | | | |
|---|---|---|---|---|---|---|
| | | | 75 Percent[1] | 50 Percent[1] (median) | 25 Percent[1] | Range |
| Sand and gravel | 4 | 44 | — | 20 | — | 15-50 |
| Shale | 168 | 122 | 5 | 10 | 15 | .5-50 |
| Sandstone and shale | 163 | 150 | 6 | 8 | 10 | .5-60 |
| Sandstone, limestone, and shale | 31 | 191 | 5 | 10 | 20 | 2-50 |
| Carbonate rock and shale | 63 | 110 | 6 | 12 | 20 | 2-100 |
| Carbonate rock | 28 | 165 | 10 | 20 | 30 | 3-150 |

[1]Percentage of wells in which yield is equaled or exceeded.

Table 10. *Summary of Reported Yields of Nondomestic Wells*

| Aquifer | Number of wells | Median well depth (feet below land surface) | Reported yield (gal/min) | | | |
|---|---|---|---|---|---|---|
| | | | 75 Percent[1] | 50 Percent[1] (median) | 25 Percent[1] | Range |
| Sand and gravel | 8 | 58 | — | 40 | — | 18-100 |
| Shale | 31 | 300 | 8 | 15 | 50 | 1-225 |
| Sandstone and shale | 19 | 300 | 20 | 32 | 64 | 3-100 |
| Sandstone, limestone, and shale | 7 | 305 | — | 93 | — | 10-300 |
| Carbonate rock and shale | 22 | 224 | 23 | 38 | 49 | 20-184 |
| Carbonate rock | 14 | 280 | 65 | 160 | 383 | 24-900 |

[1]Percentage of wells in which yield is equaled or exceeded.

pushed to the surface. In deep wells of low or moderate yield, drillers' completion tests may not be long enough to distinguish between well-bore storage and well yield.

Nondomestic wells, which include municipal, industrial, and commercial wells, generally have higher reported yields than domestic wells because (1) nondomestic wells commonly are deeper and penetrate more water-bearing zones; (2) a greater proportion of nondomestic wells are located in valleys, the topographic setting that generally has the highest yields; (3) the average diameter of nondomestic wells is greater; and (4) many of the higher domestic yields are underestimated because drillers commonly do not determine exact discharges for yields exceeding those considered adequate for household use.

## Specific Capacity

A better measure of the yield capabilities of a well is its specific capacity. Specific capacity is the discharge of a well in gallons per minute per foot of drawdown [(gal/min)/ft] (Figure 10). Specific capacities can be determined from drillstem and bailer tests, as well as actual pumping tests. Specific capacities of wells reported by drillers on the basis of drillstem and bailer tests are presented in Table 23. The rate at which the well was blown or bailed is the reported yield. The specific capacities reported by drillers are considered to be rough estimates and were not used in relating well yields to various hydrogeologic factors.

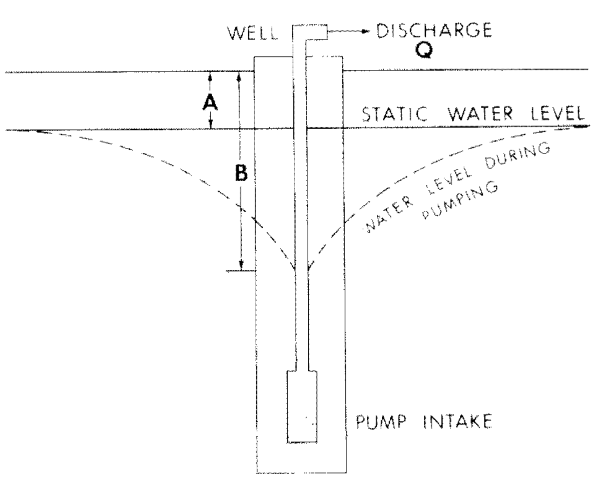
Pumping tests provide the most reliable data on specific capacity. One hundred fifteen wells were pump tested by drillers, consultants, and U.S. Geological Survey personnel. The specific capacities and the pumping rates and durations for these tests are given in Table 23. The specific-capacity data are summarized by aquifer in Table 11.

## Effects of Pumping Rate on Specific Capacity

Variable-rate pumping-test data indicate that specific capacity decreases as the pumping rate increases. Specific capacity decreases with increasing pumping rate because of increases in well loss (i.e., frictional losses due to turbulence) and, in some cases, the lowering of the pumping water level during pumping below water-bearing zones. When the water level in a well is drawn below a producing zone, the zone becomes free flowing and is no longer progressively stressed by increasing drawdown. Any further increase in drawdown causes an increase in yield from lower zones only.

Figure 11 shows the results of variable-rate pumping tests on wells Nu–158 and Nu–187. In well Nu–187, the water levels associated with discharge rates of 16, 29, and 63 gal/min were above both producing zones. Decreases in specific capacity are attributed to aquifer and well losses only. About one third of the drawdown at 29 and 64 gal/min was due to these types of losses.

In well Nu–158, the pumping water level at a 24 gal/min pumping rate was above all of the water-bearing zones. Pumping at 60 gal/min drew the water level below the two shallowest zones at 22 and 30 feet. The pumping rate increase resulted in a 65




EXPLANATION

$$SC = \frac{Q}{B-A}$$

where
SC = Specific capacity, in gallons per minute per foot of drawdown
A = Depth to static water level, in feet below land surface
B = Depth to pumping water level, in feet below land surface
Q = Discharge, in gallons per minute

Figure 10. Schematic drawing of a pumping well and the equation for determining specific capacity.

Table 11. *Summary of Specific Capacities of Pump-Tested Wells*

| Geologic unit or lithology | Number of wells | Median well depth (feet below land surface) | Specific capacity [(gal/min)/ft] | | | |
|---|---|---|---|---|---|---|
| | | | 75 Percent[1] | 50 Percent[1] (median) | 25 Percent[1] | Range |
| Glacial outwash | 10 | 66 | 3.7 | 11 | 19 | 1.4–84 |
| Catskill Formation | 15 | 165 | .16 | .39 | 1.2 | .08–3.8 |
| Sherman Creek Member | 13 | 275 | .14 | .39 | 1.8 | .08–3.8 |
| Irish Valley Member | 2 | 91 | — | .44 | — | .34–.53 |
| Trimmers Rock Formation | 8 | 200 | .06 | .13 | .37 | .03–.55 |
| Harrell and Mahantango Formations | 16 | 263 | .06 | .27 | .79 | .03–2.5 |
| Marcellus Formation | 15 | 255 | .07 | .19 | .50 | .03–18 |
| Onondaga and Old Port Formations | 13 | 259 | 1.2 | 3.2 | 9.3 | .47–350 |
| Keyser and Tonoloway Formations | 18 | 205 | 1.6 | 4.6 | 20 | .35–280 |
| Wills Creek Formation | 15 | 170 | 1.8 | 3.1 | 5.3 | .23–18 |
| Bloomsburg Formation | 5 | 228 | .09 | .18 | .50 | .03–.64 |
| Mifflintown and Keefer Formations | 3 | 250 | — | .13 | — | .10–.37 |
| Rose Hill Formation | 8 | 266 | .05 | .21 | 1.1 | .03–1.4 |
| Upper member | 4 | 264 | .16 | .71 | 1.3 | .10–1.4 |
| Middle and lower members | 4 | 201 | .04 | .06 | .62 | .03–.80 |
| Shale | 35 | 268 | .07 | .23 | .50 | .03–18 |
| Sandstone and shale | 23 | 200 | .12 | .22 | .55 | .03–3.8 |
| Sandstone, limestone, and shale | 11 | 250 | .07 | .13 | .80 | .03–1.4 |
| Carbonate rock and shale | 28 | 202 | 1.5 | 3.1 | 5.5 | .23–350 |
| Carbonate rock | 18 | 205 | 1.6 | 4.6 | 20 | .35–280 |

[1]Percentage of wells in which specific capacity is equaled or exceeded.

percent reduction in specific capacity. At 75 gal/min, the water level was below all but the deepest producing zone. The decrease in specific capacity from the 60 to the 75 gal/min rate was 50 percent. Well-bore-flow tests during the pumping of well Nu-158 at 24 gal/min indicate that 75 percent of the well yield is produced by the water-bearing zones at 22 and 30 feet and 20 percent is produced by the zones at 88 and 108 feet (Figure 12).

The approximate doubling of discharge rate during pumping tests in 10 wells caused a 24 to 67 percent reduction in specific capacity (Table 12). The reduction in specific capacity for five wells in which the pumping water level fell below the water-bearing zone or zones ranged from 50 to 67 percent, and the median was 59 percent. The reduction in specific capacity for five wells in which aquifer and well losses were the only factors ranged from 24 to 41 percent, and the median was 38 percent.

## Effects of Pumping Duration on Specific Capacity

Data from long-term pumping tests indicate that specific capacity decreases with increasing pumping time. The specific capacity of wells that are pumped continuously will decrease until (1) natural discharge from the groundwater system has been decreased by an amount equal to the pumping rate; (2) recharge to the groundwater system is increased by an amount equal to the pumping rate; or (3) the sum of decreased natural discharge and increased recharge equals the pumping rate (Carswell and Lloyd, 1979). Valleys, especially along the Susquehanna River and its major tributaries, are the best areas for decreasing natural discharge or inducing recharge from surface water. Upland areas near drainage-basin divides have the least amount of available water. The reduction of specific capacity after 24 hours of continuous pumping as

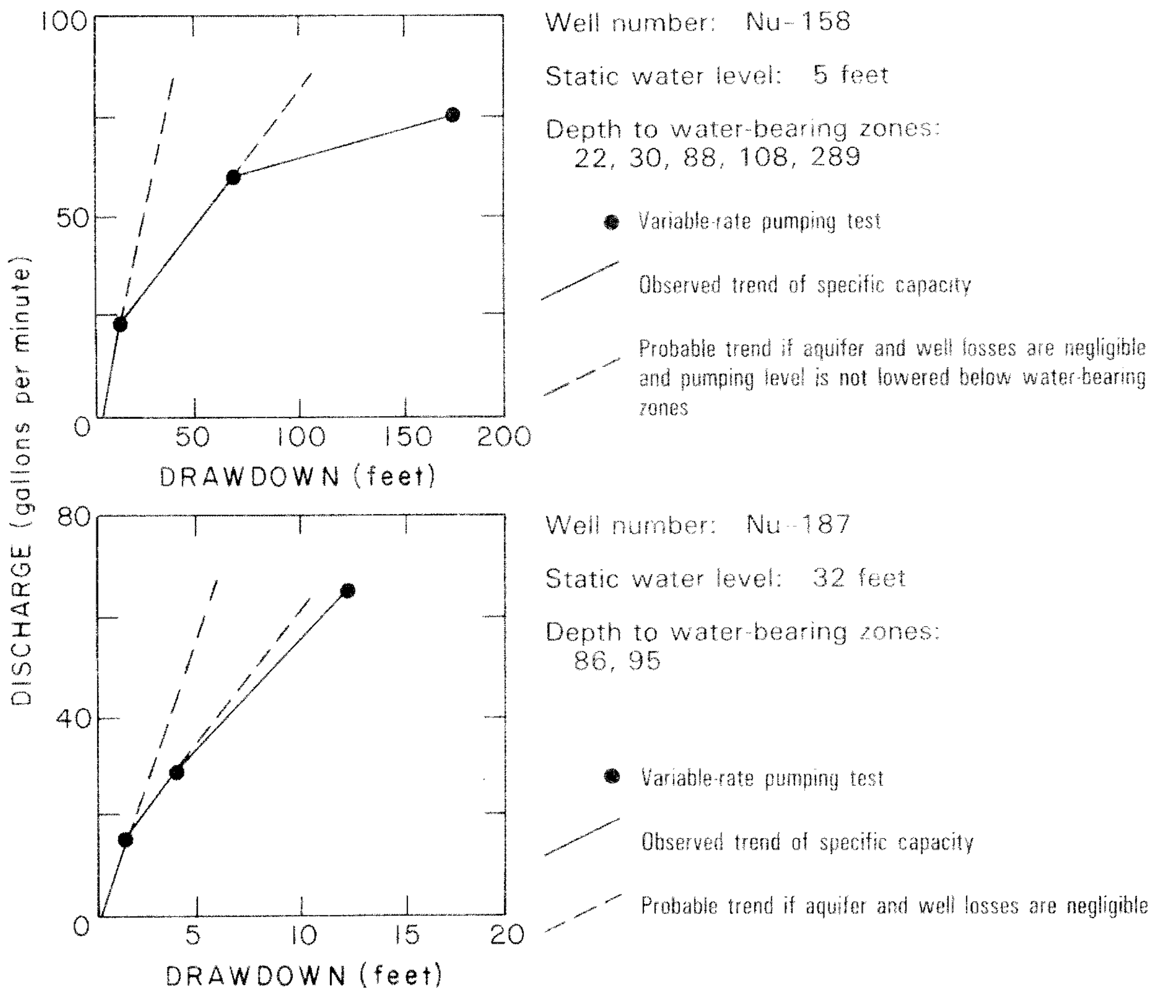



Figure 11. Variable-rate pumping tests of wells Nu-158 and Nu-187.

compared to 1-hour values in 15 wells ranged from 17 to 90 percent, and the median decrease was 38 percent (Table 13). On the average, about two thirds of the decrease in specific capacities occurred after 8 hours of pumping. Six wells pumped continuously for 48 hours had a median decrease in specific capacity of 12 percent from 24 to 48 hours.

## Recovery

All domestic wells and most nondomestic wells are not pumped continuously but are shut off and allowed to recover between pumping periods. Recovery yield, the rate at which water flows into the well bore after pumping has stopped, is critical in low-yield domestic wells that depend on well-bore storage and in nondomestic wells that are pumped beyond their long-term capacity during peak-demand periods. Recovery yield was measured after the completion of pumping tests in 13 wells that tap noncarbonate-rock aquifers. The median recovery yield measured in the wells at 40 feet of residual drawdown was 7.5 gal/min. The median recovery yield divided by the residual drawdown (40 feet) is 0.19 (gal/min)/ft. This recovery "specific capacity" is comparable to median specific capacities calculated from pumping tests for the various noncarbonate rocks. Lack of sufficient recovery data prevented a similar comparison for the other aquifers.

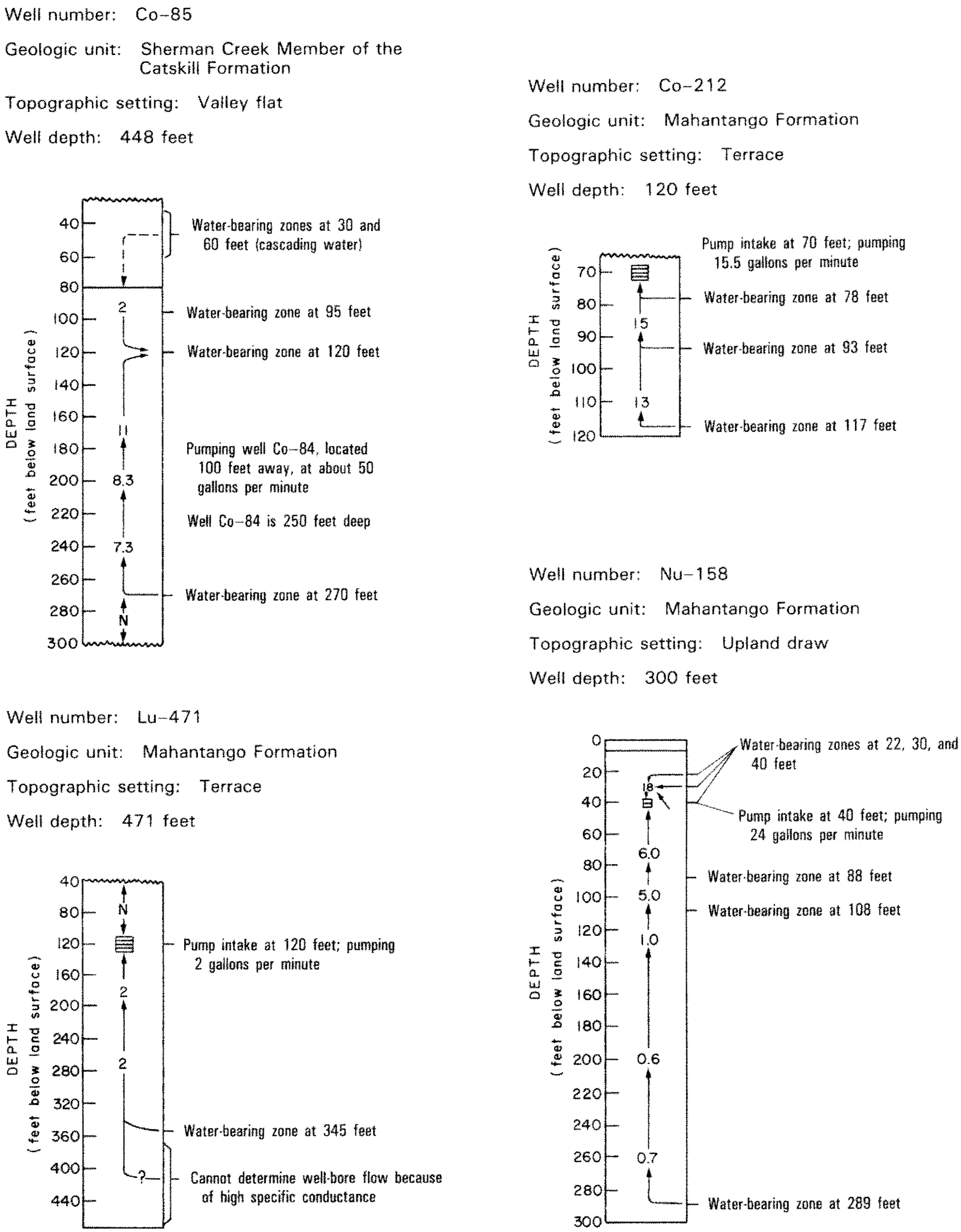



**Figure 12.** Well-bore flow in selected wells under pumping conditions. Arrows and numbers signify direction and rate of flow in gallons per minute; N indicates no measurable flow.

Table 12. *Reduction of Specific Capacity in Selected Wells with Increased Pumping Rate*

| | Well number | Aquifer | Topographic setting | Lower pumping rate (gal/min) | Specific capacity at lower pumping rate [(gal/min)/ft] | Higher pumping rate (gal/min) | Specific capacity at higher pumping rate [(gal/min)/ft] | Percent reduction |
|---|---|---|---|---|---|---|---|---|
| Increased pumping rate caused water level to be drawn below water-bearing zone or zones. | Co-205 | Wills Creek Formation | Terrace | 77 | 2.2 | 136 | 1.1 | 50 |
| | Co-209 | Sherman Creek Member of Catskill Formation | Upland draw | 7 | .16 | 12 | .06 | 62 |
| | Mt-1 | Tonoloway Formation | Valley flat | 25 | 2.1 | 50 | .69 | 67 |
| | Mt-6 | Upper member of Rose Hill Formation | Upland draw | 50 | 1.4 | 110 | .68 | 51 |
| | Nu-158 | Mahantango Formation | Upland draw | 24 | 2.1 | 60 | .87 | 59 |
| | | | | Median percent reduction = 59 | | | | |
| Increased pumping rate did not cause water level to be drawn below water-bearing zone or zones. | Co-52 | Old Port Formation | Terrace | 650 | 17 | 1,170 | 13 | 24 |
| | Co-204 | Wills Creek Formation | Terrace | 85 | 12 | 140 | 7.4 | 38 |
| | Co-307 | Tonoloway Formation | Terrace | 36 | 32 | 89 | 20 | 38 |
| | Mt-2 | Keyser Formation | Valley flat | 100 | 13 | 200 | 7.7 | 41 |
| | Nu-187 | Keyser Formation | Terrace | 16 | 11 | 29 | 7.3 | 34 |
| | | | | Median percent reduction = 38 | | | | |

Table 13. *Reduction of Specific Capacity in Selected Wells with Increased Pumping Duration*

| Well number | Aquifer | Topographic setting | Specific capacity [(gal/min)/ft] | | | |
|---|---|---|---|---|---|---|
| | | | 1-hour | 8-hour[1] | 24-hour[1] | 48-hour[1] |
| Co- 66 | Sherman Creek Member of Catskill Formation | Upland draw | 1.4 | (51) | 0.30 (72) | — |
| 204 | Wills Creek Formation | Terrace | 11 | 9.6 (12) | 9.0 (17) | 7.8 (28) |
| 207 | Glacial outwash | do. | 7.0 | 5.7 (19) | 4.6 (35) | — |
| 448 | Old Port Formation | do. | 25 | 9.0 (64) | 2.6 (90) | — |
| 505 | Tonoloway Formation | do. | 3.0 | 2.1 (30) | 2.0 (34) | — |
| Lu-486 | Glacial outwash | do. | 28 | 21 (25) | 18 (36) | 16 (43) |
| Mt- 1 | Tonoloway Formation | Valley flat | 4.8 | 2.0 (58) | — | — |
| 2 | Keyser Formation | do. | 20 | 12 (38) | 10 (50) | 8.3 (59) |
| 4 | do. | do. | 12 | 7.1 (39) | 5.0 (18) | — |
| 6 | Upper member of Rose Hill Formation | Upland draw | — | — | 3.3 | 1.4 |
| 14 | Keyser Formation | Valley flat | 55 | 47 (15) | — | 41 (25) |
| 16 | Old Port Formation | do. | 6.5 | 5.9 (9) | 5.3 (18) | — |
| 18 | do. | do. | 1.1 | .67 (39) | — | — |
| 29 | Lower member of Rose Hill Formation | Upland draw | — | .92 | .80 | .76 |
| 31 | Keyser Formation | Valley flat | 16 | 13 (20) | 9.9 (38) | 99.0 (44) |
| Nu-187 | do. | do. | 7.4 | 4.7 (36) | 4.2 (43) | — |

[1]Percent reduction from 1-hour specific capacity is in parentheses.

## HYDROGEOLOGIC FACTORS AFFECTING WELL YIELDS

### Water-Bearing Zones

The yield of a well depends largely on the size and number of water-bearing zones that it penetrates. As a well is drilled deeper and more water-bearing zones are penetrated, the yield of the well increases. In general, however, as well depth increases, the size of water-bearing zones decreases and the vertical distance between zones increases.

Figure 13 shows the distribution of water-bearing zones with depth for noncarbonate rocks, and for carbonate and interbedded carbonate and noncarbonate rocks. In general, the vertical spacing between water-bearing zones in noncarbonate aquifers is greater than that for aquifers that contain carbonate rock. In both groups of aquifers, the greatest number of producing zones is between 50 and 100 feet below land surface. Between 100 and 300 feet below land surface, the vertical spacing of water-bearing zones increases more rapidly with depth in aquifers containing noncarbonate rocks than in aquifers containing carbonate beds. In both groups of aquifers, the greatest vertical spacing—about one producing zone for every 200 feet of hole sampled—is between 400 and 600 feet below land surface. The difference in well-yield capabilities between noncarbonate and carbonate aquifers is attributed, in part, to the difference in the number and spacing of producing zones and, in part, to the greater size of openings in the solution-prone rocks.

Reported yields of individual water-bearing zones indicate a decrease in opening size with depth. The amount of decrease in opening size with depth is controlled by lithology. Yields of more than a few gallons per minute are uncommon for water-bearing

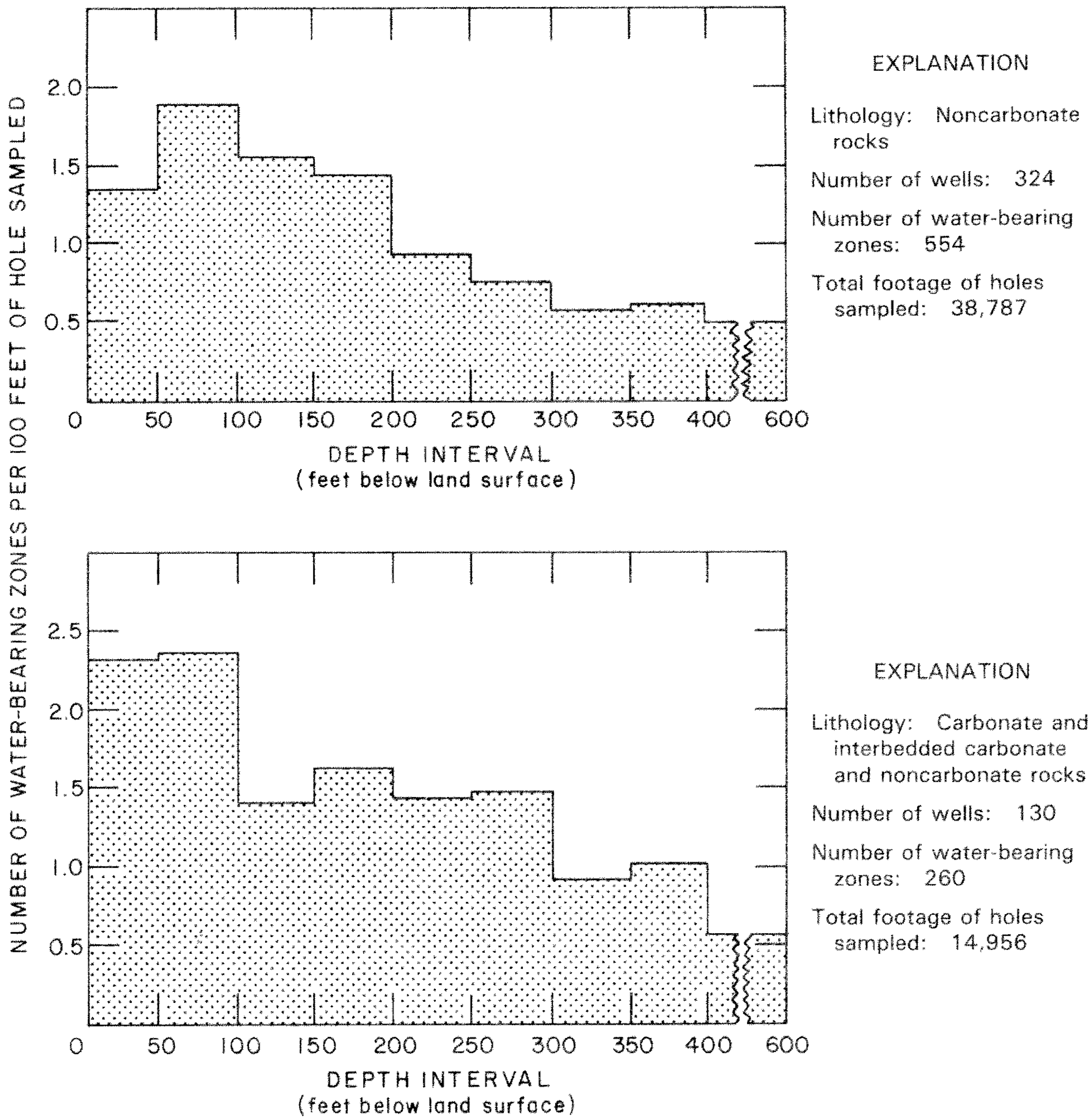



**Figure 13.** Distribution of water-bearing zones with depth.

zones below 300 feet in shale aquifers. Due to the more competent nature of coarse-grained beds, water-bearing zones remain more open to slightly greater depth in aquifers containing sandstones. Although one well reportedly penetrated a water-bearing zone having a yield of 40 gal/min at 450 feet, significant yields below 400 feet are believed to be uncommon in aquifers containing interbedded sandstone and shale.

Large yields may be obtained from deep zones in aquifers containing carbonate beds. In general, the limestones of the Keyser and Tonoloway Formations show the greatest yield capability at depth. In well Co-505, completed in the Tonoloway Formation near Lime Ridge, a water-bearing zone at a depth of 550 feet reportedly yielded over 200 gal/min.

## Lithology

Lithology is a major factor controlling well yield. Wells completed in the glacial-outwash aquifer have the highest specific capacities. Specific capacities of these wells range from 1.4 to 84 (gal/min)/ft and have a median value of 11 (gal/min)/ft. In bedrock aquifers, well yields are closely related to the amount of carbonate rock penetrated. Wells in the carbonate-rock sequence (Keyser and Tonoloway Formations) have a median specific capacity of 4.6 (gal/min)/ft. The interbedded carbonate rocks and shales of the Onondaga, Old Port, and Wills Creek Formations have the next highest median specific capacity, 3.1 (gal/min)/ft. Specific capacities of wells in the Mifflintown, Keefer, and Rose Hill Formations, composed mostly of shale and sandstone with some limestone, have a range of 0.03 to 1.4 (gal/min)/ft. In general, the noncarbonate-rock aquifers, including the shales of the Harrell, Mahantango, Marcellus, and Bloomsburg Formations and the interbedded sandstones and shales of the Catskill and Trimmers Rock Formations, have specific capacities an order of magnitude less than those for the carbonate-rock aquifer.

## Topography

Topographic position is a significant factor that affects well yield. Wells in valleys generally have the highest yields and wells on hilltops have the lowest (Table 14). The median specific capacity for wells in valleys is 3 to 24 times greater than the median for wells on hilltops. Wells on slopes show specific capacities between those for wells in valley and hilltop settings.

Table 14. *Median Specific Capacities of Wells by Topographic Setting*

| Aquifer | Median specific capacity [(gal/min)/ft] Hilltop[1] | Slope[1] | Valley[1,2] |
|---|---|---|---|
| Shale | 0.10 (3) | 0.17 (6) | 0.31 (26) |
| Sandstone and shale | .04 (3) | .18 (7) | .39 (13) |
| Sandstone, limestone, and shale | .04 (2) | .10 (5) | .95 (4) |
| Carbonate rock and shale | .34 (1) | 1.8 (3) | 3.4 (24) |
| Carbonate rock | 1.7 (1) | 4.9 (1) | 6.0 (16) |

[1]Number of wells is in parentheses.
[2]Includes valley flat, terrace, and upland draw settings.

Differences in well yield among topographic settings are related to several factors: (1) valleys commonly are zones of more intense fracturing; (2) hydraulic gradients are toward valleys, and large volumes of water pass through these settings before being discharged; and (3) greater saturated thicknesses of sand and gravel in valleys provide for more recharge, storage, and transmission of water to underlying bedrock aquifers.

## Fracture Traces

Fracture traces are natural linear features visible on aerial photographs that possibly are surface expressions of zones of fracture concentration in the underlying bedrock. They generally consist of topographic, vegetational, and soil-tonal alinements. Hydrogeologists in some areas have reported that wells drilled on fracture traces have higher yields than randomly located wells (Lattman and Parizek, 1964).

Specific capacities of wells intentionally located on fracture traces by hydrogeologists were compared with the median specific capacity for all wells located in the same hydrogeologic settings (Table 15). Only six of the 12 wells located on fracture traces had specific capacities greater than the corresponding median value. These data suggest that only a certain proportion of the linear features that were mapped on aerial photographs as fracture traces were actually underlain by zones of fracture concentration. Inaccurate field location may also

Table 15. *Comparison of the Specific Capacities of Wells Located on Fracture Traces with the Specific Capacities of All Wells in the Same Hydrogeologic Settings*

| Hydrogeologic setting[1] | Fracture-trace wells: Well number | Specific capacity [(gal/min)/ft] | Median specific capacity of all wells in hydrogeologic setting |
|---|---|---|---|
| Carbonate rock; valley | Mt- 1 | 0.70 | 6.0 |
| | 2 | 7.7 | |
| | 14 | 41 | |
| | 15 | 1.1 | |
| | 31 | 23 | |
| Carbonate rock and shale; valley | Mt- 16 | 5.3 | 3.2 |
| | 17 | 2.7 | |
| | 32 | .47 | |
| Shale; valley | Mt- 30 | .07 | .31 |
| | Nu-158 | .87 | |
| Shale; slope | Nu-157 | 1.2 | .15 |
| Sandstone, limestone, and shale; valley | Mt- 29 | .80 | .95 |

[1]"Valley" includes valley flat, terrace, and upland draw settings.

account for the lack of success at some fracture-trace sites.

## ESTIMATED WELL YIELD

Table 16 shows estimated 24-hour well yields for the aquifers. The well yields were estimated from data on specific capacity, depth to water-bearing zones, and water levels. Specific capacities were adjusted to a common 24-hour pumping period based on the data in Table 13. The adjusted specific capacities were multiplied by the median available drawdown for each aquifer to obtain the estimated well yield. Available drawdown was defined as the difference in depth between the static water level and the shallowest water-bearing zone.

## WELL INTERFERENCE

When the cones of depression of closely spaced pumped wells overlap, one well is said to interfere with another because of the increased drawdown that occurs in each well. The amount of interference is largely dependent on the degree of hydraulic connection between the water-bearing zones tapped by the wells, which varies widely from site to site. Data collected during this study, however, reveal the importance of bedding-related permeability in well-interference problems in bedrock aquifers.

The total yield of a group of closely spaced wells that are pumped simultaneously may be significantly less than the sum of yields of the individual wells that make up the well field. A good example of this type of interference problem is found at the Catawissa Water Authority well field. The pumping of well Co-84 at 50 gal/min causes 13 gal/min of cumulative well-bore flow in well Co-85, located about 100 feet away (Figure 12). The wells are connected by a common water-bearing zone penetrated in well Co-85 at 120 feet below land surface. Simultaneous pumping of these two wells significantly decreases their individual yields.

Table 17 shows the results of multiple-well pumping tests conducted by drillers, consultants, and

Table 16. *Estimated 24-Hour Well Yields of the Aquifers*

| Aquifer | Median available drawdown[3] | Estimated well yield[1] (gal/min) 75 Percent[2] | 50 Percent[2] (median) | 25 Percent[2] |
|---|---|---|---|---|
| Sand and gravel | | | | |
| Glacial outwash | 26 | 58 | 190 | 410 |
| Sandstone and shale | 42 | 5 | 10 | 16 |
| Catskill Formation | 41 | 5 | 10 | 36 |
| Sherman Creek Member | 43 | 5 | 11 | 50 |
| Irish Valley Member | 41 | — | 11 | — |
| Trimmers Rock Formation | 43 | — | 5 | — |
| Shale | 42 | 2 | 7 | 15 |
| Harrell and Mahantango Formations | 39 | 1 | 7 | 22 |
| Marcellus Formation | 47 | 3 | 8 | 23 |
| Bloomsburg Formation | 46 | — | 6 | — |
| Carbonate rock and shale | 38 | 46 | 100 | 210 |
| Onondaga and Old Port Formations | 33 | 40 | 91 | 310 |
| Wills Creek Formation | 40 | 47 | 99 | 130 |
| Carbonate rock | | | | |
| Keyser and Tonoloway Formations | 44 | 47 | 180 | 620 |
| Sandstone, limestone, and shale | | | | |
| Mifflintown, Keefer, and Rose Hill Formations | 70 | 3 | 10 | 56 |

[1]Based on specific-capacity data adjusted to 24-hour pumping period and median available drawdown.
[2]Percentage of wells in which yield is equaled or exceeded.
[3]Based on data on depth to water-bearing zones and water levels.

## Table 17. *Results of Multiple-Well Pumping Tests*

| Length of test (hours) | Pumped well | Pumping rate (gal/min) | Drawdown (feet) | Observation well | Drawdown (feet) | Distance (feet) | Observation well | Drawdown (feet) | Distance (feet) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Glacial outwash* | | | | |
| 6 | Co-305 | 38 | 3.7 | Co-311 | 0.5 | 117 | Co-309 | 0.2 | 444 | Aquifer for well Co-309 is Marcellus Formation. |
| 3.5 | Lu-455 | 36 | 2.9 | Lu-454 | 1.0 | 9 | — | — | — | Aquifer for well Lu-454 is Mahantango Formation. |
| 8.5 | Lu-491 | 150 | 22 | Lu-450 | 5.4 | — | Lu-490 | 5.9 | 100 | Aquifer for well Lu-450 is Mahantango Formation. |
| | | | | | | *Catskill Formation* | | | | |
| 3.5 | Co-49 | 45+ | 38 | Co-61 | 3± | 90 | Co-62 | 5.4 | 144 | |
| 2 | Co-61 | 11 | 90 | Co-49 | 1.0 | 90 | Co-62 | 4.4 | 89 | |
| 48 | Co-139 | 40 | 276 | Co-140 | 68 | 350 | — | — | — | Well Co-140 is 60 feet higher in altitude at ground surface than well Co-139. |
| 48 | Co-140 | 55 | 252 | Co-139 | 74 | 350 | — | — | — | |
| | | | | | | *Mahantango Formation* | | | | |
| 3 | Lu-454 | 9.7 | 75 | Lu-455 | .2 | 9 | — | — | — | Aquifer for well Lu-455 is glacial outwash. |
| 2 | Mt-178 | 15 | 50 | Mt-153 | .9 | 385 | — | — | — | |
| 2 | Nu-157 | 18 | 15 | Nu-185 | 2.3 | 390 | — | — | — | |
| 40 | Nu-158 | 60 | 70 | Nu-157 | 1± | 423 | Nu-159 | 1+ | 292 | |
| | | | | Nu-180 | 14 | 787 | — | — | — | |
| | | | | | | *Marcellus Formation* | | | | |
| 24 | Mt-30 | 20 | 284 | Mt-31 | .3 | 400 | Mt-32 | .4 | 530 | Aquifer for well Mt-31 is Keyser Formation; aquifer for well Mt-32 is Old Port Formation. |
| | | | | | | *Onondaga and Old Port Formations* | | | | |
| 24 | Mt-16 | 160 | 30 | Mt-17 | 14 | 15 | — | — | — | |
| 24 | Mt-17 | 120 | 45 | Mt-16 | 12 | 15 | — | — | — | |
| 24 | Mt-32 | 73 | 155 | Mt-30 | .9 | 130 | Mt-31 | None | 530 | Aquifer for well Mt-30 is Marcellus Formation; aquifer for well Mt-31 is Keyser Formation. |
| 28 | Co-448 | 200 | 90 | Co-441 | 1.3 | 500 | Co-447 | None | 1,100 | Aquifer for well Co-447 is Tonoloway Formation. |
| 24 | Co-505 | 290 | 123 | Co-441 | None | 600 | Co-447 | None | 1,000 | Aquifer for well Co-448 is Old Port Formation. |
| | | | | Co-448 | <1 | 190 | — | — | — | |
| 3 | Co-307 | 36 | 1.1 | Co-308 | .1 | 258 | — | — | — | Aquifer for well Co-308 is glacial outwash. |
| | | | | | | *Keyser and Tonoloway Formations* | | | | |
| 48 | Mt-1 | 50 | 63 | Mt-2 | 1.5 | 182 | — | — | — | |
| 72 | Mt-2 | 200 | 26 | Mt-1 | 20 | 182 | — | — | — | |
| 40 | Mt-3 | 250 | 60 | Mt-1 | 6.0 | 183 | — | — | — | |
| 2.3 | Nu-187 | 16 | 1.4 | Nu-188 | .4 | 60 | Nu-189 | None | 80 | |
| 24 | Nu-187 | 63 | 15 | Nu-191 | .8 | 100 | — | — | — | Aquifer for well Nu-191 is glacial outwash. |
| 2 | Nu-188 | 12 | 13 | Nu-187 | .4 | 60 | Nu-189 | None | 30 | |
| | | | | | | *Wills Creek Formation* | | | | |
| 48 | Co-204 | 140 | 19 | Co-205 | 1.6 | 201 | — | — | — | |
| 48 | Co-205 | 136 | 125 | Co-204 | 1.5 | 201 | — | — | — | |
| 5 | Co-571 | 175 | 16 | Co-580 | 2.0 | 24 | Co-581 | .3 | 34 | |
| | | | | Co-582 | 1.9 | 64 | Co-583 | .4 | 66 | |
| | | | | | | *Rose Hill Formation* | | | | |
| 4.3 | Mt-29 | 70 | 65 | Mt-123 | 40 | 460 | Mt-124 | None | 330 | Well Mt-123 is 40 feet higher in altitude at ground surface than the other wells. |

U.S. Geological Survey personnel. If the aquifers were ideal aquifers (isotropic, homogeneous, and areally extensive), drawdown would decrease symmetrically and logarithmically away from the pumped well. However, drawdowns measured in observation wells during pumping tests were erratic, especially in the bedrock aquifers. The relatively low storage capabilities and discrete nature of permeability in the bedrock aquifers cause large differences in drawdown between wells that are in hydraulic connection with the pumped well and wells that are not in hydraulic connection with the pumped well. Drawdown in observation wells having good hydraulic connection with the pumping well may approach that observed in the pumping well, whereas little to no observable drawdown occurs in those wells that are poorly connected.

Saturated sand and gravel generally behaves more like an ideal aquifer than does fractured bedrock. Departure from ideal conditions in the glacial-outwash aquifer is largely caused by variations in the thickness of saturated sand and gravel. Test drilling shows that the thickness of the saturated sand and gravel can change from more than 50 feet to zero within several hundred feet. Drawdowns from a hypothetical pumping well in the outwash aquifer were simulated using the 2-D, finite-difference model of Trescott and others (1976) under some typical hydrologic conditions. Actual drawdown would depart from simulated drawdown depending on the nonhomogeneity and anisotropy of the aquifer and the presence of recharge or impermeable boundaries.

Simulated drawdowns after 48 hours of pumping in the glacial-outwash aquifer are as follows:

| Pumping rate (gal/min) | Hydraulic conductivity (ft/day) | Drawdown (feet): At pumped well | Drawdown (feet): Distance from pumped well (feet): 35 | 100 | 250 |
|---|---|---|---|---|---|
| 50 | 100 | 10 | 4.0 | 1.4 | 0.1 |
| 100 | 100 | 24 | 8.4 | 2.8 | .3 |
| 100 | 200 | 11 | 5.1 | 2.2 | .4 |
| 200 | 200 | 30 | 11 | 4.4 | .8 |

Saturated thickness = 40 feet.
Specific yield = 0.15.

The simulated drawdowns are in the range observed during the limited number of tests conducted on the outwash aquifer.

During multiple-well pumping tests in the bedrock aquifers, significant interference was observed only between wells that tapped at least part of the same stratigraphic interval. Maximum well interference observed during pumping tests 4 to 72 hours long in the various lithologies was as follows:

| Lithology | Pumped well: Pumping rate (gal/min) | Pumped well: Drawdown (feet) | Observation well: Drawdown (feet) | Observation well: Distance from pumped well (feet) |
|---|---|---|---|---|
| Shale | 60 | 70 | 14 | 787 |
| Sandstone and shale | 55 | 252 | 74 | 350 |
| Sandstone, shale, and limestone | 75 | 65 | 40 | 460 |
| Carbonate rock and carbonate rock and shale | 200 | 26 | 20 | 180 |

The observation wells that showed the maximum interference occurred updip, downdip, or along strike from the pumping well. However, in each case, the observation well tapped some of the same beds as the pumping well. This observation reemphasizes the importance of bedding-related permeability in the bedrock.

Individual water-bearing zones developed along selected beds can be recognized over significant distances along strike in the bedrock aquifers. Well interference problems will occur between wells that tap these zones. A good example is found at the Champion Valley Farms well field at Lime Ridge. Well Co–448 is located about 900 feet west of the Champion Valley Farms well field (wells Co–197, Co–198, and Co–199), which is pumped at a rate of about 350 gal/min for 5.5 days per week. The pumping of the well field causes significant drawdown in well Co–448, as shown in Figure 14. Calcareous chert beds yielding about 200 gal/min were penetrated in well Co–448 at depths of 142 and 152 feet below land surface. Although well Co–448 was drilled to 180 feet, the well bore collapsed at the deeper water-bearing cavern at 152 feet. In the driller's log for well Co–199, water-bearing zones were indicated at 170 and 180 feet. Reportedly, well interference occurs between wells Co–198 and Co–199. According to the driller's log, well Co–108 penetrated water-bearing caverns at 120 and 130 feet below land surface. Well Co–108 is located 1,250 feet east of the well field. Wells Co–108, Co–198, Co–199, and Co–448 probably tap the same water-bearing zones developed along two solution-prone, calcareous chert beds in the Old Port Formation for a distance of more than 2,000 feet along bedding strike. Well Co–448 showed a 90 percent reduction in specific capacity from 1 to 24 hours of pumping, the largest reduction observed in all pumping

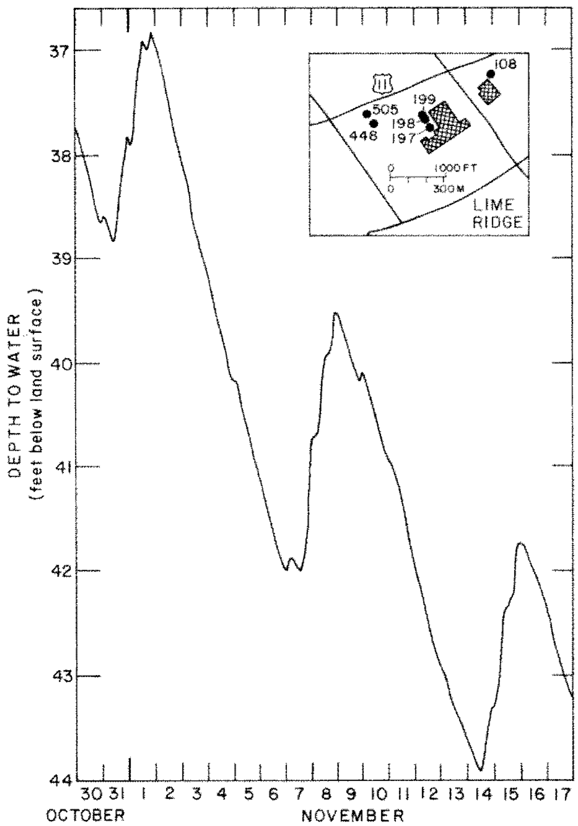



Figure 14. Water-level fluctuations observed in well Co-448 in response to nearby industrial pumping, October 30 to November 17, 1981.

tests. At least part of this decreased capacity caused by lowered water levels can be attributed to interference from pumping at wells Co-198 and Co-199.

It is worthwhile to note that negligible drawdown occurred in well Co-448 during the pumping of well Co-505 at 290 gal/min. Well Co-505 is about 190 feet across bedding strike from well Co-448 and is completed in the Keyser and Tonoloway Formations. The water level in well Co-505 does not appear to be affected by pumping of wells Co-198 and Co-199, even though it is at nearly the same distance from the pumping wells as is well Co-448.

Assuming a bedding dip of 35 degrees, flat topography, and well depths of 400 feet, wells located more than 500 feet across bedding strike typically will not show significant interference (Figure 15). Where bedding dips are more shallow, such as on the noses of major folds, well interference may occur at greater distances across bedding strike. In addition, where steep topographic gradients parallel bedding dip, such as along the flanks of Montour Ridge and its eastern extension, interference may occur between wells located across strike at significant distances.

Well interference has been observed in two areas along the southern flank of the ridge about 1.5 miles east of Danville between nondomestic wells that tap deep, confined water-bearing zones in the Mifflintown, Keefer, and Rose Hill Formations and domestic wells located in an updip direction (Figure 16). In one area, when a deep, nondomestic well (Mt-29) was allowed to flow at 75 gal/min for about 4 hours, 40 feet of drawdown was observed in a domestic well (Mt-123) located about 460 feet updip of well Mt-29. No drawdown was observed during the test in another domestic well (Mt-124) located about 300 feet downdip. In a nearby area, the pumping of the Mahoning Township Water Authority well field (wells Mt-5 and Mt-6) affected water levels in two updip domestic wells located up to 700 feet away. No downdip wells were known to be affected.

The hydraulic connection between the bedrock and glacial-outwash aquifers largely depends on the amount of fracturing in the rock that separates water-bearing zones in the bedrock from the saturated sand and gravel. If a bedrock well penetrates water-bearing zones that intersect the bedrock-unconsolidated rock contact, pumping of the well can cause significant drawdown in wells completed in the glacial-outwash aquifer. An example of good interconnection of the glacial-outwash and bedrock aquifers is shown in Figure 17. Test hole Co-154, completed in glacial outwash and till, and well Co-310, completed in carbonate bedrock, display similar water-level fluctuations caused by the pumping of an industrial well field completed in the carbonate-rock aquifer located, respectively, about 4,000 and 2,500 feet away.

# WATER-QUALITY CHARACTERISTICS OF THE AQUIFERS

## PHYSICAL CHARACTERISTICS

### Temperature

The temperature of groundwater is affected by the geothermal gradient, groundwater flow paths, air temperature, and, to a limited extent, the return of water used for air conditioning. The temperature of discharge water was measured from 85 wells sampled for laboratory analyses. In addition, temperature logs were run on 39 wells ranging in depth from 68 to 558 feet (Table 2).

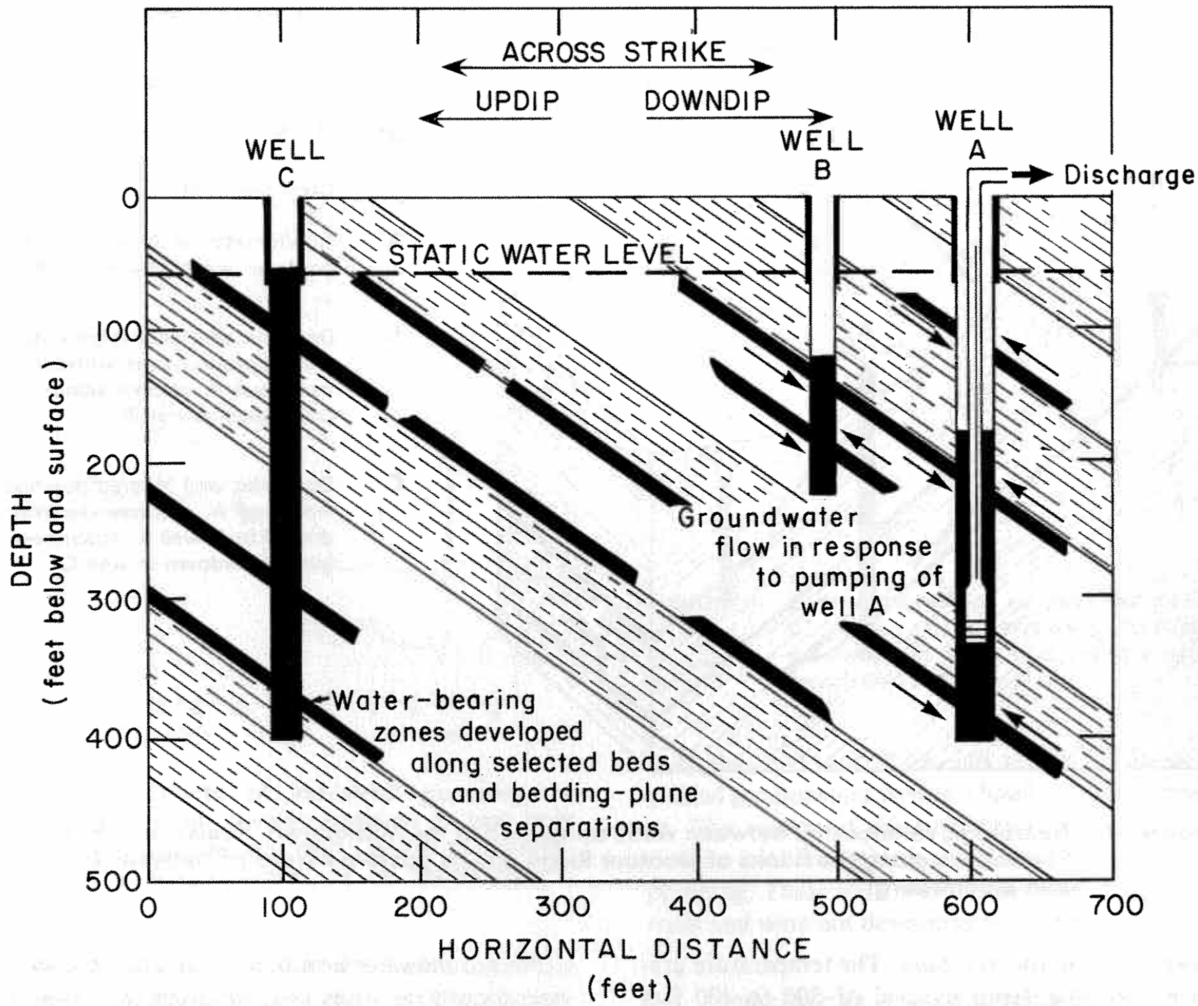



**Figure 15. Relationship among well spacing, bedding-related permeability, and groundwater flow in response to pumping.**

The temperature of groundwater discharged by wells ranged from 51 °F to 59 °F, and the median was 54 °F. The temperature of water discharged from a well is largely dependent on the depth and relative yield of the water-bearing zones that it penetrates. Deeper zones typically produce warmer water than shallow zones due to the effect of the geothermal gradient. The geothermal gradient, as determined from temperature logs in wells at depths having minimal flow, is about 1 °F per 100 feet. For example, well Co-505, which has a major water-bearing zone at 550 feet, produces water having a temperature about 3 °F warmer than the median value for all wells.

Figure 18 shows temperature logs for wells Co-245, Co-452, and Co-505. A composite temperature log based on median values computed at 50-foot intervals for 26 deep wells also is presented. The slope of the composite temperature gradient approaches that of the geothermal gradient below 300 feet. This indicates the lack of significant groundwater flow below 300 feet in most aquifers.

Well Co-452 provides an example of a temperature log representing typical hydrologic conditions. Flow in the well bore between water-bearing zones and, to some limited degree, in the aquifer itself masks the geothermal gradient in the upper 300 feet of the temperature log. Below this depth, the temperature gradient of water in the well bore is controlled by the geothermal gradient.

In wells that have flow between shallow and deep water-bearing zones, the effects of the geothermal gradient on the temperature of water in the well bore may be dampened. Downward flow moves colder water from shallow zones down the well bore, and upward flow moves warmer water from

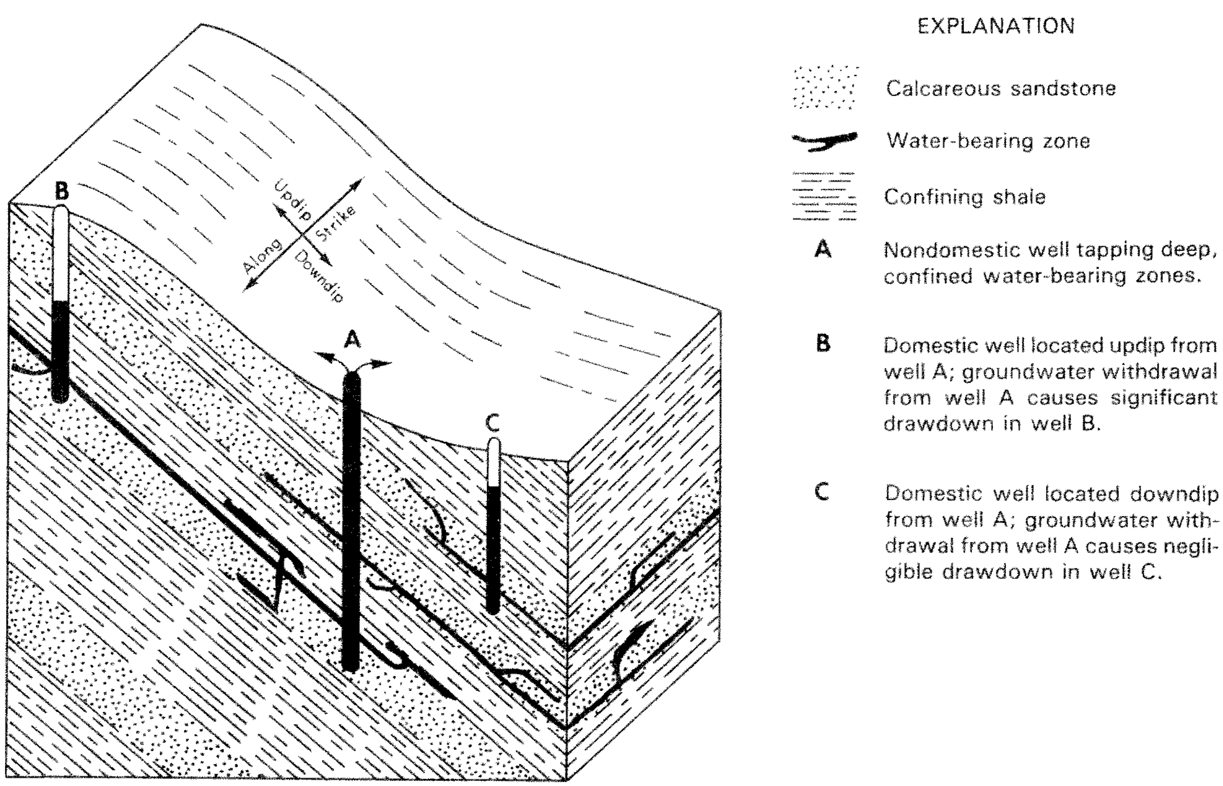



Figure 16. Hydrologic relationship between wells completed in the Mifflintown, Keefer, and Rose Hill Formations along the flanks of Montour Ridge and its eastern extension between Danville and Bloomsburg.

deep zones up the well bore. The temperature gradients for the depth interval of 300 to 400 feet measured in well Co-245 (downward flow) was 0.4 °F per 100 feet and in well Co-505 (upward flow) was 0.1 °F per 100 feet.

Lloyd and Growitz (1977) found that in York County the temperature of shallow groundwater varied with seasonal changes in air temperature. Carswell and Lloyd (1979) found that in Monroe County the temperature of groundwater at about 300 feet below the water table varied with the average annual air temperature. Although sufficient temperature data are unavailable in this area, similar relationships between groundwater and seasonal and average-annual air temperatures are believed to exist in the Berwick-Bloomsburg-Danville area.

The temperature of groundwater also may be affected by the return of water used for cooling to an aquifer. The only well known to be used for the return of cooling water is well Co-69 in Berwick. During the summer, groundwater is pumped from well Co-68 at a rate of about 200 gal/min and is used for air conditioning. The warm water is then returned to the aquifer by well Co-69.

No groundwater heat pumps are known to be in operation in the study area, although there is good potential for the development of this alternative energy source. Groundwater heat pumps extract heat from well water using a refrigeration system. During the summer, the system may be reversed, and the heat pump can be used for cooling. The well yield typically needed for a groundwater heat pump, 5 to 15 gal/min, can be found in most local hydrogeologic settings. In settings where a sufficient yield may not be obtainable, such as on a hilltop underlain by sandstones and shales, more efficient heat pumps requiring less than 5 gal/min could be used.

## Turbidity

Turbidity is a cloudiness in water caused by suspended material such as sand, silt, clay, or colloidal precipitates of iron or manganese. In most cases, turbidity in water produced from bedrock aquifers is negligible after wells have been developed. Turbidity may be a problem in wells that tap glacial deposits, where casing does not adequately seal water from overlying unconsolidated

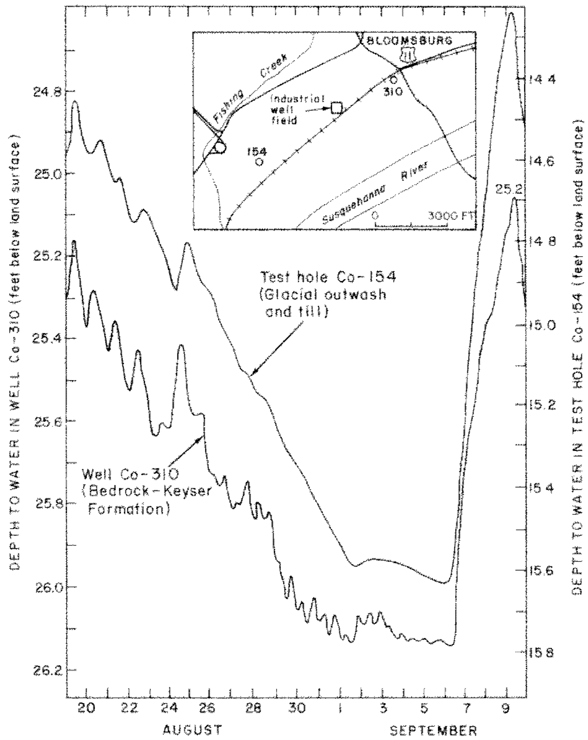



**Figure 17. Effects of industrial pumping on water levels observed in test hole Co-154 and well Co-310 at Bloomsburg, August 19 to September 9, 1981.**

material, or where mud-filled solution zones are present in bedrock. As an example, well Mt-2, completed in the solution-prone Keyser Formation, had to be abandoned because of a recurring problem of suspended clay.

Dewatering of a water-bearing zone may cause a well that normally produces clear water to yield turbid water. The turbidity may be related to the drying and sloughing of clay and oxide coatings along dewatered fractures. Two wells have shown turbidity attributable to dewatering effects. Well Co-157 developed a turbidity problem during a period of low water levels in the early winter of 1980, but the turbidity cleared as water levels rose in February 1981. In well Nu-180, the water level dropped 14 feet during a 48-hour pumping test at a nearby well and turbid water was noticed; the turbidity persisted in well Nu-180 for several days after the pumping test ended.

Domestic wells drilled in glacial outwash commonly use open-ended casing, and fine particulate matter may be suspended in water from some of these wells. The use of well screens and gravel packs tends to prevent turbidity in properly developed wells in glacial outwash.

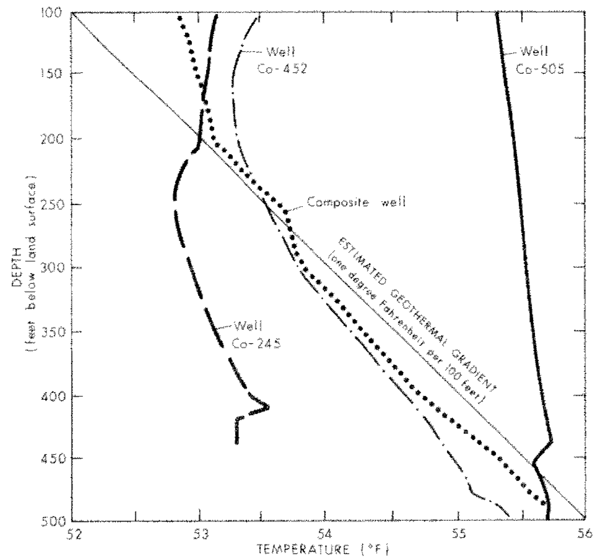



**Figure 18. Temperature logs of selected wells, a composite log based on median values for 26 wells, and the estimated geothermal gradient.**

Wells Co-154 and Co-308 in glacial outwash yielded groundwater having a black-colored turbidity. The source of the turbidity is probably particulate coal that enters the slotted casing during pumping. These wells were installed as observation wells and were not developed for water-supply use.

## CHEMICAL CHARACTERISTICS

The chemical quality of groundwater in the Berwick-Bloomsburg-Danville area was evaluated on the basis of field determinations of specific conductance and hardness of water from 299 wells and laboratory chemical analyses of water from 139 wells. Field values of specific conductance and hardness are presented in Table 23. Results of the laboratory chemical analyses for major ions, metals, nutrients, and other common parameters are reported in Table 21. Most of the chemical analyses were done by the U.S. Geological Survey Laboratory in Doraville, Georgia, but data from other laboratory sources were used selectively. Additional analyses for selected trace metals and organic compounds were made on water from 18 wells (Table 22). The groundwater-quality data are summarized by aquifer in Tables 18 and 19.

In general, groundwater in the study area is mainly of the calcium bicarbonate type. The calcium bicarbonate water occurs in the glacial-outwash and shallow bedrock aquifers (generally less than 300 feet deep) where there is active circulation of

**Table 18.** *Median Concentrations of Selected Dissolved Constituents in the Aquifers*

(Concentrations are in milligrams per liter except where otherwise indicated)

| Aquifer | Number of samples | Silica ($SiO_2$) | Iron (Fe) (μg/L) | Manganese (Mn) (μg/L) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate+nitrite ($NO_3$+$NO_2$, as N) | Orthophosphate ($PO_4$, as P) | Dissolved solids | Hardness ($CaCO_3$): Calcium and magnesium | Hardness ($CaCO_3$): Noncarbonate | Alkalinity ($CaCO_3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Glacial outwash | 7–11 | 12 | 250 | 475 | 13 | 3.8 | 6.7 | 1.3 | 32 | 5.0 | 0.1 | 0.2 | 0.01 | 95 | 49 | 26 | 19 |
| Mauch Chunk Formation | 1 | 5.7 | 10 | 1 | 1.6 | .7 | .4 | .2 | .7 | .6 | .1 | .3 | .01 | 15 | 7 | 0 | 7 |
| Catskill Formation | 19–23 | 12 | 220 | 28 | 12 | 4.0 | 5.4 | .6 | 3.4 | 6.4 | .1 | 1.9 | .01 | 93 | 50 | 12 | 33 |
| Sherman Creek Member | 12–16 | 11 | 175 | 10 | 14 | 3.4 | 5.8 | .6 | 11 | 7.0 | .1 | 2.4 | .02 | 98 | 56 | 14 | 36 |
| Irish Valley Member | 7 | 16 | 260 | 90 | 3.4 | 4.7 | 5.4 | .6 | 1.4 | 4.4 | .1 | .1 | .01 | 63 | 28 | 1 | 16 |
| Trimmers Rock Formation | 8 | 13 | 63 | 35 | 7.8 | 50 | 4.4 | .5 | 8.2 | 3.9 | .1 | 1.6 | .01 | 78 | 42 | 11 | 24 |
| Harrell and Mahantango Formations | 18 | 14 | 660 | 55 | 24 | 3.8 | 8.6 | .6 | 16 | 4.4 | .1 | .1 | .01 | 144 | 76 | 7 | 56 |
| Marcellus Formation | 6–7 | 16 | 1,100 | 180 | 41 | 10 | 12 | .9 | 46 | 23 | .1 | .02 | .01 | 265 | 160 | 22 | 130 |
| Onondaga and Old Port Formations | 3–8 | 7.3 | 510 | 5 | 56 | 18 | 15 | 2.1 | 48 | 20 | .1 | 3.8 | .01 | 301 | 185 | 54 | 118 |
| Keyser and Tonoloway Formations | 8–13 | 11 | 110 | 6 | 70 | 20 | 10 | 1.2 | 78 | 20 | .1 | .9 | .01 | 374 | 240 | 102 | 140 |
| Wills Creek Formation | 8–12 | 8.4 | 25 | 8 | 38 | 12 | 5.3 | .6 | 19 | 18 | .1 | 2.9 | .01 | 196 | 130 | 44 | 108 |
| Bloomsburg Formation | 10–11 | 9.6 | 280 | 30 | 22 | 5.4 | 3.7 | .7 | 20 | 5.2 | .1 | 2.2 | .09 | 125 | 77 | 23 | 43 |
| Mifflintown and Keefer Formations | 7 | 8.1 | 37 | 38 | 22 | 4.7 | 5.4 | .5 | 16 | 9.0 | .1 | .6 | .01 | 135 | 79 | 19 | 84 |
| Rose Hill Formation | 15–17 | 7.4 | 85 | 125 | 21 | 9.9 | 2.5 | .6 | 8.9 | 1.6 | .2 | .08 | .01 | 100 | 91 | 8.0 | 81 |
| Upper member | 4–5 | 9.5 | 28 | 7 | 21 | 4.2 | 4.0 | .3 | 12 | 4.1 | .2 | .04 | .01 | 90 | 84 | 18 | 75 |
| Middle and lower members | 11–12 | 7.0 | 360 | 160 | 17 | 10 | 1.3 | .8 | 6.3 | 1.5 | .2 | .1 | .01 | 100 | 91 | 7 | 93 |
| Recommended limit (U.S. Environmental Protection Agency, 1976a, b) | | — | 300 | 50 | — | — | 250 | — | 250 | 250 | 1.7 | 10 | — | 500 | — | — | — |

Table 19. *Summary of Field Measurements of Specific Conductance and Total Hardness in the Aquifers*

| | Specific conductance (μmho/cm at 25 °C) | | | | Total hardness (mg/L as $CaCO_3$) | | | |
|---|---|---|---|---|---|---|---|---|
| Aquifer | Number of samples | 75 Percent[1] | 50 Percent[1] (median) | 25 Percent[1] | Number of samples | 75 Percent[1] | 50 Percent[1] (median) | 25 Percent[1] |
| Sand and gravel | | | | | | | | |
| Glacial outwash | 13 | 98 | 142 | 291 | 10 | 34 | 50 | 58 |
| Sandstone and shale | 102 | 77 | 111 | 161 | 96 | 34 | 34 | 51 |
| Mauch Chunk Formation | 2 | — | 20 | — | 2 | — | 17 | — |
| Catskill Formation | 68 | 70 | 100 | 156 | 57 | 34 | 34 | 51 |
| Duncannon Member | 1 | — | 60 | — | 1 | — | 17 | — |
| Sherman Creek Member | 34 | 65 | 102 | 179 | 33 | 34 | 51 | 68 |
| Irish Valley Member | 33 | 82 | 100 | 149 | 33 | 34 | 34 | 51 |
| Trimmers Rock Formation | 32 | 103 | 133 | 176 | 27 | 34 | 51 | 51 |
| Devonian shale | 94 | 224 | 320 | 400 | 91 | 86 | 120 | 154 |
| Harrell and Mahantango Formations | 68 | 219 | 300 | 377 | 66 | 86 | 120 | 154 |
| Marcellus Formation | 26 | 299 | 366 | 452 | 25 | 77 | 137 | 162 |
| Carbonate rock and shale | 30 | 218 | 338 | 531 | 26 | 137 | 176 | 263 |
| Onondaga and Old Port Formations | 17 | 207 | 347 | 675 | 14 | 162 | 214 | 330 |
| Wills Creek Formation | 13 | 238 | 320 | 465 | 12 | 136 | 154 | 180 |
| Carbonate rock | | | | | | | | |
| Keyser and Tonoloway Formations | 21 | 360 | 408 | 668 | 20 | 158 | 202 | 280 |
| Silurian shale | | | | | | | | |
| Bloomsburg Formation | 10 | 131 | 205 | 405 | 7 | 51 | 86 | 103 |
| Sandstone, limestone, and shale | 29 | 147 | 180 | 225 | 29 | 60 | 86 | 103 |
| Mifflintown and Keefer Formations | 9 | 147 | 200 | 270 | 9 | 51 | 103 | 103 |
| Rose Hill Formation | 20 | 146 | 175 | 219 | 20 | 68 | 77 | 86 |
| Upper member | 7 | 145 | 200 | 230 | 7 | 68 | 68 | 86 |
| Middle and lower members | 13 | 140 | 70 | 210 | 13 | 60 | 86 | 95 |

[1]Percentage of samples in which field measurement value was equaled or exceeded.

groundwater. A few wells completed in bedrock zones where groundwater does not actively circulate may tap water of the sodium chloride type. Only two of these "salt wells" (Co–471 and Co–382) were inventoried in the study area, and the problem of saline water in shallow aquifers is not widespread in this area of Pennsylvania. Sodium sulfate water was present in one well (Co–190) in the Marcellus Formation, and calcium sulfate water was present in two wells (Mt–31 and Nu–189) in the Keyser and Tonoloway Formations.

Most groundwater tapped by wells is acceptable for domestic supply and human consumption, although hardness, iron and manganese, and hydrogen sulfide gas in excess of recommended limits cause problems locally. These water-quality problems are generally associated with certain bedrock units. Hardess of groundwater, caused primarily by dissolved calcium and magnesium, causes "scale" encrustation in pipes and boilers, and poor lathering of soap products. Iron and manganese may impart a bitter taste to water and cause staining of plumbing fixtures and laundry. Hydrogen sulfide gas commonly is present in groundwater from dark-shale aquifers, such as the Harrell, Mahantango, or Marcellus Formations.

The gas imparts a disagreeable (rotten egg) odor when it effervesces from tap water. In the following sections, these dissolved constituents and others that affect the quality of groundwater in the Berwick-Bloomsburg-Danville area are discussed.

## Dissolved Solids and Specific Conductance

The concentration of dissolved solids typically is used as a criterion of water quality and for comparison of water from different hydrogeologic settings. In groundwater that is not affected significantly by man's activities, the concentration of dissolved solids in groundwater, and the corresponding specific conductance, is governed chiefly by the composition of the rock material through which the water passes and by the length of time the water is in contact with this material. Some of the dissolved solids in groundwater, however, are derived initially from atmospheric precipitation. Wood (1980) estimated that precipitation that has been concentrated by evaporation and transpiration may account for about 35 mg/L of the total dissolved solids reaching the groundwater system. Man's activities, such as application of fertilizers and pesticides, waste disposal in landfill and sewage systems, de-icing of highways using salts, and accidental spills of chemical compounds, may affect the type and increase the amount of dissolved solids in groundwater.

Specific conductance is a measure of the electrical conductivity of an aqueous solution at a given temperature, and results are reported in micromhos per centimeter (μmho/cm) at 25 °C. Because the conductivity of water is directly related to concentrations of certain dissolved constituents in a sample, specific conductance (which is easily measured in the field) commonly is used as a measure of dissolved-solids concentration.

Total dissolved solids, in milligrams per liter, of a sample of groundwater in the Berwick-Bloomsburg-Danville area can be estimated by multiplying the field value of specific conductance in micromhos per centimeter by 0.63. This equivalence factor was developed from data obtained from all aquifers in the area. It agrees with results from other areas in Pennsylvania (Johnson, 1970; Carswell and Lloyd, 1979; Becher and Root, 1981). The relationship between dissolved solids and specific conductance varies from this value for individual geologic units. The differences are due in part to the varying effects on specific conductance of the different dissolved constituents derived from the geologic units.

The highest median dissolved-solids concentrations and specific conductances were observed in groundwater from the Harrell-to-Wills Creek stratigraphic sequence (Tables 18 and 19). Water from the carbonate-rock aquifer, the Keyser and Tonoloway Formations, has the highest median dissolved-solids concentration (374 mg/L) and specific conductance (408 μmho/cm). In general, the dissolved-solids concentration increases as the carbonate content increases in an aquifer. In the calcium bicarbonate groundwater common in most of the Berwick-Bloomsburg-Danville area, calcium and magnesium make up most of the dissolved solids, although sodium, chloride, and sulfate also may contribute.

The maximum recommended limit for total dissolved solids in drinking water is 500 mg/L (U.S. Environmental Protection Agency, 1976a). The equivalent of this level for specific conductance is about 860 μmho/cm. Nine wells (3 percent of total wells) had dissolved-solids concentrations or specific conductances greater than the recommended limit. The high level of dissolved solids in these wells generally is due to excessive sodium chloride, calcium sulfate, or sodium sulfate in bedrock zones where groundwater does not actively circulate.

## Hardness

The hardness of water depends chiefly upon the concentrations of calcium and magnesium in solution. As a result, aquifers containing soluble carbonate rock generally show the greatest hardness. Water having excess hardness causes scale incrustation in pipes and boilers, requires more soap for lathering, and readily leaves a curd deposit on bathtubs and wash basins.

Total hardness may be expressed as milligrams per liter of $CaCO_3$. Ranges of hardness are expressed in the following descriptive terms (Hem, 1970):

| | |
|---|---|
| Soft | 0–60 mg/L |
| Moderately hard | 61–120 mg/L |
| Hard | 121–180 mg/L |
| Very hard | >180 mg/L |

Hardness increases as the carbonate content increases in an aquifer, as shown in Figure 19. Groundwater from glacial-outwash and Mississip-

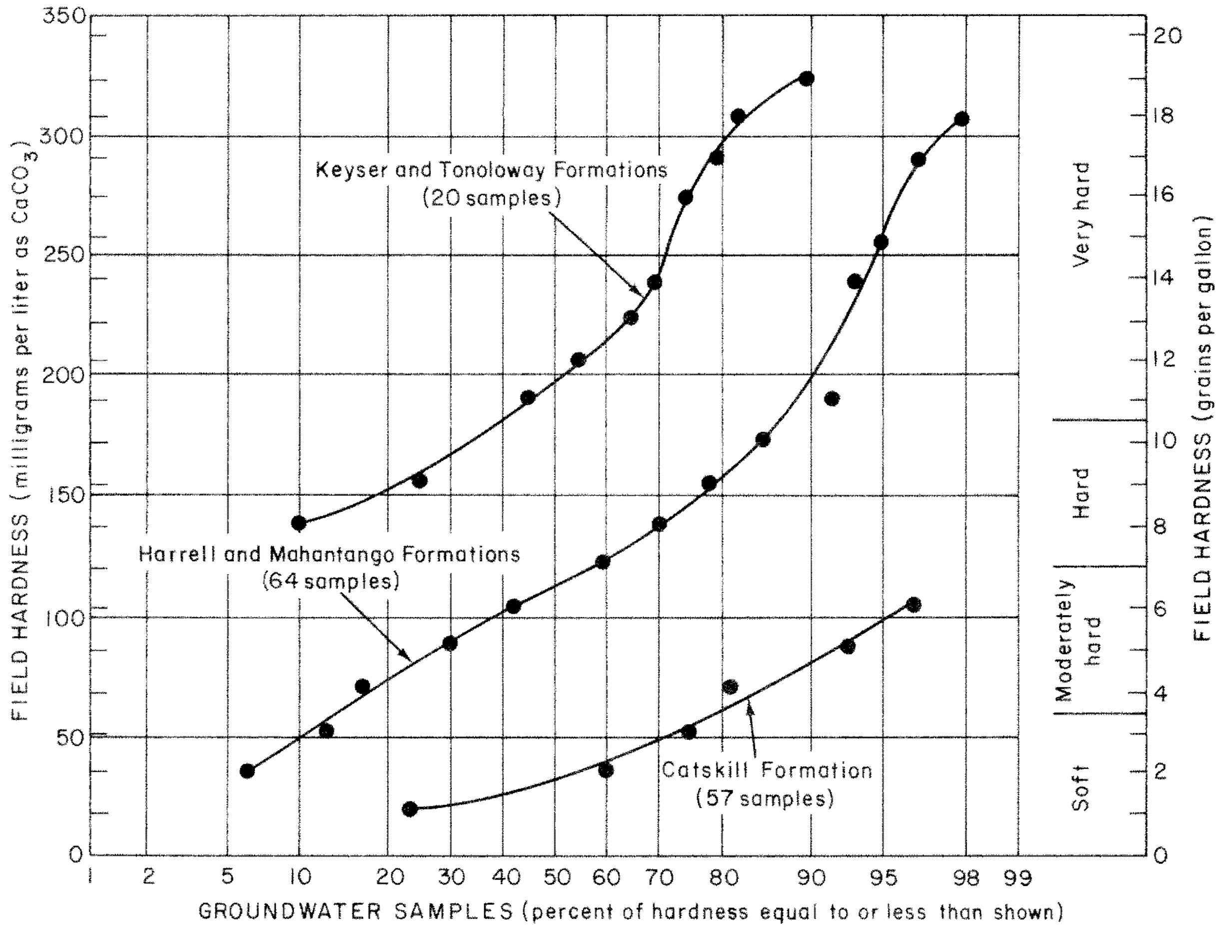



Figure 19. Cumulative percentages of hardness for the Keyser and Tonoloway Formations, Harrell and Mahantango Formations, and Catskill Formation.

pian and Devonian sandstone and shale aquifers, such as the Mauch Chunk, Catskill, and Trimmers Rock Formations, generally is soft, whereas groundwater from aquifers containing shales that are locally calcareous, such as the Harrell, Mahantango, and Bloomsburg Formations, is moderately hard. The carbonate rocks of the Keyser and Tonoloway Formations commonly yield very hard water.

The U.S. Environmental Protection Agency does not specify drinking-water standards for total hardness, but the American Water Works Association (Bean, 1962) suggests that water should not contain more than 80 mg/L of hardness. Fifty-three percent of the field measurements for hardness (Table 23) exceeded the suggested limit. Water conditioners installed in plumbing systems reduce hardness to more acceptable levels by replacing calcium and magnesium ions in solution with sodium ions, but those people who must reduce their dietary intake of sodium should be aware of this.

## Iron and Manganese

Iron and manganese commonly are found in low concentrations in groundwater, but these metals may constitute an objectionable impurity even at low concentrations. Recommended limits for iron (300 μg/L [micrograms per liter]) and for manganese (50 μg/L) have been established by the U.S. Environmental Protection Agency (1976a) because an excess of either metal may cause a bitter taste and staining on laundry and plumbing fixtures. Natural sources of iron and manganese are sulfides, oxides, and hydroxides common in most rocks and soils. Slightly acidic, poorly buffered groundwater may dissolve up to 5,000 μg/L of iron (Hem, 1970). As water pressure is lowered during withdrawal of groundwater from an aquifer and the water is exposed to air, ferrous iron in solution oxidizes and precipitates as reddish-brown ferric iron. This precipitate may stain or even clog pumps, pipes, and plumbing fixtures. Manganese precipitation leaves a black stain and also may clog pumps and plumbing systems. Concentrations of less than 1,000 μg/L iron or 300 μg/L manganese may be effectively treated by filters attached to the plumbing systems.

Concentrations of iron greater than the recommended limit may be found in groundwater from any aquifer in the Berwick-Bloomsburg-Danville area. Dissolved iron exceeded 300 μg/L in 46 percent of water samples. The problem of iron is most noticeable in the Devonian shales of the Harrell, Mahantango, and Marcellus Formations, from which 17 of the 25 samples exceeded the recommended limit. The median concentration of iron was 660 μg/L in the Harrell and Mahantango Formations and 1,100 μg/L in the Marcellus Formation. The highest concentration of iron was observed in the Harrell and Mahantango Formations in well Co-60 (2,900 μg/L). Iron concentrations greater than 1,000 μg/L also were observed in groundwater from glacial outwash, and from the Marcellus, Onondaga, and Old Port Formations.

Excessive concentration of manganese is also a problem in many aquifers. About 40 percent of the water samples exceeded the recommended limit for manganese. Groundwater from glacial outwash had the highest median concentration of manganese (600 μg/L) and the highest individual concentration (8,100 μg/L) in well Co-308. Fourteen of 17 samples from the Marcellus Formation and the middle and lower members of the Rose Hill Formation contained manganese in excess of the recommended limit.

## Nitrate

Nitrate typically is the principal form of nitrogen in groundwater, but nitrite or ammonium may be present in reducing environments where dissolved oxygen has been depleted from the groundwater. Sources of nitrate generally are associated with biological material. This includes fecal waste from stock animals and humans, and nitrate produced in soils and leguminous plants by nitrification of atmospheric nitrogen. Fertilizers and decaying mulch also supply nitrate. In general, excess nitrate in soils dissolves with infiltrating water and reaches the groundwater system primarily during recharge events.

The maximum recommended concentration of nitrate in drinking water is 10 mg/L, expressed as nitrogen (U.S. Environmental Protection Agency, 1976a). Nitrate levels higher than this may cause methemoglobinemia in infants, and families using springs, dug wells, or inadequately cased drilled wells near on-lot septic systems or other sources of nitrates should be aware of potential problems with their water.

Median nitrate concentrations for the geologic units are less than 1 mg/L, except for the Bloomsburg, Catskill, Trimmers Rock, Old Port and Onondaga, and Wills Creek Formations. The elevated median concentrations may be traced to agricultural fertilizers and rural septic systems in these areas. Only one well sampled, Co-188, contained nitrate (17 mg/L as N) in excess of the recommended limit, and failure of the on-lot septic system at this site is the suspected cause.

## Chloride

Primary sources of chloride in groundwater in the study area are evaporite deposits and connate brines, and contamination by de-icing salts, septic and sewage systems, and solid-waste disposal. The highest median concentrations of dissolved chloride were observed in the groundwater from the Marcellus-to-Wills Creek stratigraphic sequence. The concentrations in these formations probably reflect the lithologic presence of chloride in this stratigraphic sequence, although man-made contamination may affect concentrations in some wells.

The recommended limit for chloride in drinking water is 250 mg/L (U.S. Environmental Protection Agency, 1976b), primarily for reasons of taste. One well (Lu-471) tapped saline water in the Mahantango Formation that contained 1,500 mg/L of chloride. Another well in the Marcellus Formation, Co-382, contained water with 1,300 mg/L of chloride. Both of these wells are deeper than 300 feet, are located in valleys, and tap saline water from shales of low permeability. The saline water from deep zones in the valleys probably represents connate water that has been diluted but not flushed completely in areas of restricted groundwater circulation. Although the potential exists for saline water in deep wells in valleys underlain by shale, the problem does not appear to be widespread in the study area.

## Sulfate

Solution of evaporite deposits (for example, gypsum) and oxidation of pyrite ($FeS_2$) and other sulfides are the most common sources of sulfate in the study area, although industrial and municipal wastes also may introduce sulfate to groundwater. The highest median concentrations of sulfate were observed in groundwater from the Marcellus, Onondaga and Old Port, and Keyser and Tonoloway Formations. Groundwater from four wells contained sulfate concentrations that exceeded the recommended limit of 250 mg/L (U.S. Environmental Protection Agency, 1976a) for drinking water; these wells were Co-307 (Tonoloway and Wills Creek Formations), Mt-31 (Keyser Formation), Nu-189 (Tonoloway Formation), and Co-190 (Marcellus Formation). Man-made contamination is suspected in well Co-190.

The upper part of the Silurian stratigraphic sequence contains evaporite deposits. As exemplified by wells Co-307 and Mt-31, wells drilled in valley-discharge areas that penetrate the Keyser-to-Wills Creek sequence at depth may produce groundwater having relatively high sulfate concentrations. In general, however, the shallow flow system in this gypsum-bearing sequence has been flushed of sulfate by active circulation of groundwater. Well Nu-189, which is only 120 feet deep and produced water having a sulfate concentration of 1,300 mg/L, is an exception to this generalization.

## Hydrogen Sulfide

Hydrogen sulfide is a gas formed from decomposition of organic matter and sulfide or sulfate minerals in an acidic reducing environment. The rotten egg odor of hydrogen sulfide is distinctive and can be detected in water containing concentrations less than 0.5 mg/L (Hem, 1970). Hydrogen sulfide concentrations may be reduced to less objectionable levels by aeration or chemical treatment.

Hydrogen sulfide was detected in 58 of 651 wells, or in about 9 percent of the wells. It was observed most commonly in wells in Devonian shale aquifers (Table 20), such as the Harrell, Mahantango, and Marcellus Formations. Williams (1980) noted that about 28 percent of wells in the Devonian shale in the Danville area contained hydrogen sulfide. Hydrogen sulfide was detected in two wells, Co-154 and Co-308, drilled in glacial outwash. In both of these wells, the dissolved gas may come from upward flow of groundwater and gas into the glacial outwash from underlying Devonian shale bedrock.

Table 20. *Occurrence of Hydrogen Sulfide in the Aquifers*

| Aquifer | Number of wells containing $H_2S$ | Number of wells inventoried | Percent occurrence |
|---|---|---|---|
| Glacial outwash | 2 | 20 | 10 |
| Mauch Chunk Formation | 0 | 3 | 0 |
| Pocono Formation | 0 | 0 | — |
| Catskill Formation | 1 | 122 | .8 |
| Trimmers Rock Formation | 11 | 82 | 13 |
| Harrell and Mahantango Formations | 26 | 157 | 17 |
| Marcellus Formation | 10 | 48 | 21 |
| Onondaga and Old Port Formations | 5 | 50 | 10 |
| Keyser and Tonoloway Formations | 1 | 45 | 2.2 |
| Wills Creek Formation | 1 | 55 | 1.8 |
| Bloomsburg Formation | 1 | 26 | 3.8 |
| Mifflintown and Keefer Formations | 0 | 12 | 0 |
| Rose Hill Formation | 0 | 31 | 0 |
| Total | 58 | 651 | 8.9 |

## Trace Elements

Elements that typically are present in groundwater at concentrations of less than 1.0 mg/L commonly are called trace elements (Hem, 1970). Results of 18 analyses for selected trace elements in the groundwater of Columbia and Luzerne Counties are in Table 22. Many of the wells were selected for analyses because contamination was suspected, and the results may not represent widespread water-quality characteristics of the aquifers. The analyses show that concentrations of analyzed trace elements, except for concentrations in test hole Co-154, are lower than the recommended limits for drinking water set by the U.S. Environmental Protection Agency (1976a, 1976b). The concentration of nickel in test hole Co-154 was 16,000 μg/L, which may indicate local contamination caused by nearby waste disposal.

## Petroleum Products

Spills or leaks of gasoline and other petroleum products can seriously degrade groundwater quality. The solubility of gasoline in water is about 50 mg/L (McKee and others, 1972), but an odor and taste threshold exists at about 0.005 mg/L (Matis, 1971). Petroleum products readily absorb to soil particles, particularly in the unsaturated zone, and slow release of the fuel to infiltrating water may preclude use of groundwater in an affected area for an extended period of time. The odor of a petroleum product was detected in two isolated wells in the study area, well Co-60 at Millville and well Co-310 at Bloomsburg. The source or cause of contamination was not determined for either well.

## SUMMARY DESCRIPTION OF THE AQUIFERS

### GLACIAL OUTWASH

Stratified deposits of glacial-outwash sand and gravel are present in the Susquehanna River and Fishing Creek valleys. The thickest, most areally extensive saturated sand and gravel deposits are found along the Susquehanna River upstream from Mifflinville and along Fishing Creek above Orangeville.

The median estimated well yield for the glacial-outwash aquifer is 190 gal/min. About one of every four wells is capable of yielding 410 gal/min or more. Where the outwash aquifer is tapped for high yields, well screens and natural or artificial gravel packs are used. Drilling problems associated with the outwash deposits include the loss of air circulation when using air-rotary equipment, isolated boulders deflecting drilling bits, and flowing sand, silt, and clay filling the well bore.

Water from the glacial-outwash aquifer generally is soft and has very low to moderate concentrations of dissolved solids. The median dissolved-solids concentration is 95 mg/L. Manganese concentrations in excess of the recommended limit are a common problem. Wells that are without screens or are improperly developed may produce water containing suspended sediment.

### MAUCH CHUNK FORMATION

The Mauch Chunk Formation consists of interbedded grayish-red shale, siltstone, and sandstone, and is in part calcareous. It crops out only in the northeastern and southeastern corners of the study area, and little information is available on the water-yielding and water-quality characteristics of the aquifer. Reported yields for two domestic wells, 150 and 200 feet deep, that are located in valleys are 10 and 20 gal/min, respectively. Water-quality data from two wells indicate that the aquifer yields soft water having very low concentrations of dissolved solids.

### POCONO FORMATION

The Pocono Formation, which consists of white to light-gray quartzitic sandstone and conglomerate and some interbeds of dark-gray shale, forms the crest of Knob, Lee, and Catawissa Mountains. No information is available on the water-yielding and water-quality characteristics of the Pocono Formation, but its upland setting suggests that wells completed in the aquifer would be deep and low yielding. The aquifer probably yields soft water having a low concentration of dissolved solids.

### CATSKILL FORMATION

The Catskill Formation consists of interbedded shale, siltstone, and sandstone that form a broad, dissected highland. The formation is divided into the Duncannon, Sherman Creek, and Irish Valley Members.

Only limited information on the water-yielding and water-quality characteristics of the Duncannon Member is available. An 85-foot-deep well reportedly yielded 30 gal/min of soft water having a very low concentration of dissolved solids.

The median estimated well yield for the Sherman Creek Member is 11 gal/min. About one of every four wells drilled in the Sherman Creek Member is capable of yielding 50 gal/min or more. The median depth of domestic wells is 125 feet. About one of every four domestic wells requires 60 feet of casing or more, because thick glacial deposits overlie much of the outcrop area at the base of Knob and Lee Mountains. The aquifer generally yields soft to moderately hard water having a very low to low concentration of dissolved solids. The median dissolved-solids concentration is 98 mg/L.

The median estimated well yield for the Irish Valley Member, based on only two pump-tested wells, is 11 gal/min. The median depth of domestic wells is 130 feet, and about three of every four domestic wells are 165 feet deep or less. The aquifer generally yields soft water that has very low to low concentrations of dissolved solids. The median dissolved-solids concentration is 63 mg/L.

The maximum interference observed between wells in the Catskill Formation occurred during a 48-hour test, in which the pumping of a well at 55 gal/min caused 74 feet of drawdown in a well located 350 feet away.

## TRIMMERS ROCK FORMATION

The Trimmers Rock Formation consists of interbedded gray to dark-gray siltstone and shale, with sandstone in the upper part. It has a median estimated well yield of 5 gal/min. The aquifer underlies a wide range of topographic settings, and well yields vary accordingly. About one of every four domestic wells is more than 275 feet deep. The median depth of casing for domestic wells completed in the aquifer is 22 feet. Water from the aquifer generally yields soft water having a low dissolved-solids concentration. The median dissolved-solids concentration is 78 mg/L. Hydrogen sulfide is a common problem in water from the lower part of the aquifer, where dark-gray shale is abundant.

## HARRELL AND MAHANTANGO FORMATIONS

The Harrell Formation consists of dark-gray shale. Interbeds of siltstone are present in the upper part. The Mahantango Formation is composed of greenish-gray to dark-gray shale, which is locally calcareous.

The median estimated well yield for the Harrell and Mahantango Formations is 7 gal/min. About one of every four wells completed in the aquifer is capable of yielding 22 gal/min or more. About three of every four domestic wells are 175 feet deep or less and have less than 40 feet of casing.

The aquifer generally yields moderately hard to hard water that has moderate amounts of dissolved solids. The median concentration of dissolved solids is 144 mg/L. Excessive iron and manganese are common water-quality problems. About 17 percent of wells completed in the aquifer yield water containing hydrogen sulfide. One 470-foot-deep domestic well yielded saline water having a chloride concentration of 1,500 mg/L.

The maximum interference between wells observed in the aquifer occurred during a 40-hour test in which the pumping of one well at 60 gal/min caused 14 feet of drawdown in another well located 787 feet away.

## MARCELLUS FORMATION

The Marcellus Formation consists of dark-gray fissile shale. The median estimated well yield for the aquifer is 8 gal/min. About one of every four wells completed in the Marcellus Formation is capable of yielding 23 gal/min or more. The median well and casing depths for domestic wells are 87 feet and 30 feet, respectively.

The Marcellus Formation generally yields the poorest quality water of all aquifers in the study area. It contains moderately hard to hard water that has moderate to high concentrations of dissolved solids. The median concentration of dissolved solids is 265 mg/L. High concentrations of iron and manganese are a common water-quality problem. Hydrogen sulfide was found to be a problem in about 21 percent of the wells in the Marcellus Formation. A 320-foot-deep domestic well produced saline water having a chloride concentration of 1,300 mg/L.

## ONONDAGA AND OLD PORT FORMATIONS

The Onondaga Formation is composed of interbedded gray to dark-gray calcareous shale and gray argillaceous limestone. The Old Port Formation consists of interbedded dark-gray chert, calcareous shale, and limestone. Friable sandstone is present locally in the upper part of the Old Port Formation.

The median estimated yield of the Onondaga and Old Port Formations is 91 gal/min. About one of every four wells drilled in the aquifer will potentially yield 310 gal/min or more. About three of every four domestic wells are less than 157 feet deep. The median depth of casing for domestic wells is 35 feet, although one well that penetrated friable sandstone at depth required 76 feet of casing to prevent the well from filling with sand.

In one example, individual water-bearing solution zones developed along two calcareous chert beds in the Old Port Formation were penetrated by wells over a distance of 2,000 feet. High-yield wells that tap such common zones will show significant well interference.

The Old Port and Onondaga Formations generally yield hard to very hard water having moderate to very high concentrations of dissolved solids. The median dissolved-solids concentration is 301 mg/L.

Water-quality problems caused by hydrogen sulfide and excessive iron and manganese concentrations occur locally.

## KEYSER AND TONOLOWAY FORMATIONS

The Keyser Formation is composed of gray to bluish-gray, thin- to thick-bedded limestone. The limestone is, in part, argillaceous and dolomitic. The Tonoloway Formation consists of laminated, gray to dark-gray limestone; dolostone occurs in the lower part. These two formations are the primary carbonate-rock aquifer in the study area.

The median estimated well yield for the Keyser and Tonoloway Formations is 180 gal/min. About one of every four wells completed in the carbonate-rock aquifer will potentially yield 620 gal/min or more. Deep water levels and significant thicknesses of weathered rock are associated with the aquifer. As a result, about one of every four domestic wells is more than 210 feet deep and requires 100 feet, or more, of casing. Wells that penetrate mud-filled solution zones that are not cased off may produce turbid water.

During a multiple-well pumping test lasting 72 hours in the carbonate-rock aquifer, a well pumped at 200 gal/min caused 20 feet of drawdown in an observation well located 182 feet away. Twenty-six feet of drawdown was observed in the pumping well. In another example of well interference in the aquifer, pumping during the summer months from a high-production well field caused significant drawdown (about 5 feet) in a well located 2,500 feet away.

The Keyser and Tonoloway Formations generally yield hard to very hard water that has moderate to high concentrations of dissolved solids. The median dissolved-solids concentration of 374 mg/L is the highest of all of the aquifers. The highest median sulfate concentration, 78 mg/L, was also observed in water from the carbonate-rock aquifer, and water from three wells exceeded the recommended limit for sulfate. High concentrations of sulfate are most common in water from deep wells drilled in valley discharge areas of the carbonate-rock aquifer.

## WILLS CREEK FORMATION

The Wills Creek Formation is composed of interbedded calcareous shale, argillaceous dolostone and limestone, and calcareous siltstone. The formation is gray, yellowish gray, and greenish gray in the upper part and variegated greenish gray, yellowish gray, and grayish red purple in the lower part. The median estimated well yield for the Wills Creek Formation is 99 gal/min. About one of every four wells completed in the aquifer is capable of yielding 130 gal/min or more. Domestic wells have a median depth of 98 feet. About one of every four domestic wells completed in the aquifer requires 71 feet or more of casing because of significant thicknesses of weathered bedrock.

The Wills Creek Formation generally yields hard to very hard water that has moderate to high concentrations of dissolved solids. The median dissolved-solids concentration for the aquifer is 196 mg/L.

## BLOOMSBURG FORMATION

The Bloomsburg Formation consists of grayish-red shale containing interbeds of siltstone. The median estimated well yield for the aquifer is 6 gal/min. About one of every four domestic wells is 211 or more feet deep, and about three of every four domestic wells have 30 feet or less of casing.

The Bloomsburg Formation generally yields soft to moderately hard water having moderate to high concentrations of dissolved solids. The median dissolved-solids concentration is 125 mg/L. In general, the water quality of the aquifer is good, and concentrations of dissolved constituents in excess of recommended limits are uncommon.

## MIFFLINTOWN, KEEFER, AND ROSE HILL FORMATIONS

The Mifflintown Formation consists mostly of dark-gray calcareous shale and limestone. The Keefer Formation is composed of light-gray quartzitic sandstone and siltstone containing interbeds of greenish-gray shale. The Rose Hill Formation is divided into three members. The upper member consists of mostly gray to greenish-gray, interbedded shale, limestone, and sandstone; the middle member consists of reddish-purple sandstone containing interbeds of greenish-gray to reddish-purple shale in the upper part; and the lower member consists of greenish-gray shale containing interbeds of gray calcareous sandstone and reddish-brown hematitic sandstone.

The median estimated well yield for the Mifflintown, Keefer, and Rose Hill Formations is 10 gal/min. About one of every four wells completed in the aquifer is capable of yielding 56 gal/min or more. The aquifer underlies a wide range of topographic settings, and well yields vary accordingly. Specific-capacity data suggest that valley wells drilled in the aquifer are about 10 and 20 times more productive than wells drilled on slopes and hilltops, respectively. In general, deep domestic wells are drilled in upland areas because of significant depths to water-bearing zones. About one of every four domestic wells in the aquifer is 223 feet deep or more.

During the 1800's, deep mining of iron ore in the uppermost Rose Hill Formation occurred in areas along the flanks of the ridge between Danville and Bloomsburg. Now abandoned, these deep mines serve as effective drains that dewater overlying rocks in the Mifflintown and Keefer Formations. Deep wells that are cased below the mines may be required in this setting. It is possible that flooded deep mines could provide significant quantities of good-quality water.

In the Mifflintown, Keefer, and Rose Hill Formations the median depth of casing in domestic wells is 40 feet. However, four domestic wells that penetrated iron ore mines at depth required 70 to 121 feet of casing.

During a multiple-well test lasting 4 hours in the Rose Hill Formation, allowing a well to flow at 75 gal/min caused 40 feet of drawdown in a well located 460 feet away. Interference between wells also was reported during the pumping of a municipal well field. Significant drawdown occurred in domestic wells up to 700 feet away.

The Mifflintown, Keefer, and Rose Hill Formations generally yield moderately hard water having low to moderate concentrations of dissolved solids. Median dissolved-solids concentrations are as follows: Mifflintown and Keefer Formations, 135 mg/L; upper member of the Rose Hill Formation, 90 mg/L; and middle and lower members of the Rose Hill Formation, 100 mg/L. Iron and manganese concentrations that exceed recommended limits are common problems in the middle and lower members of the Rose Hill Formation.

### TUSCARORA FORMATION

The Tuscarora Formation consists of interbedded light-gray quartzitic sandstone and grayish-green shale. No information is available on the groundwater resources of the Tuscarora Formation, but its upland setting suggests that wells completed in the aquifer will be deep and low yielding. The aquifer probably yields soft water having a low dissolved-solids concentration.

## SUMMARY AND CONCLUSIONS

The Berwick-Bloomsburg-Danville area annually receives an average of 40 inches of precipitation, about one fourth of which recharges the groundwater system. Groundwater is contained in unconsolidated glacial deposits and the underlying bedrock, and it flows from areas of greater altitude to points of discharge (springs and streams) under the gravitational influence of hydraulic-head gradients. In 1980, about 4.7 Mgal/d of water was obtained from wells and springs by the major groundwater users in the study area.

The most important unconsolidated-rock aquifer is the glacial-outwash deposits found along the Susquehanna River and Fishing Creek. The sand and gravel deposits of the glacial-outwash aquifer are highly permeable and have significant storage capabilities. Locally, up to 50 to 70 feet of saturated outwash is present in the Susquehanna River and Fishing Creek valleys.

The bedrock aquifers are gradational sequences of sandstone, shale, and carbonate rock. Groundwater in the bedrock aquifers moves along secondary permeability features, such as fractures and bedding-plane separations. The size of secondary openings in carbonate rocks can be greatly enlarged by removal of calcareous material. The most significant amount of carbonate rock is found in the Wills Creek-to-Onondaga stratigraphic sequence. Within this sequence, the carbonate rock of the Keyser and Tonoloway Formations forms the most favorable bedrock aquifer for obtaining high-yield wells.

The yield of a well depends largely on the size and number of water-bearing zones that it penetrates. The size and number of water-bearing zones decreases with increasing depth, although high yields may occur from deep water-bearing zones in aquifers containing carbonate beds.

Lithology is a major factor controlling well yields. Carbonate-rock and interbedded carbonate-rock and shale aquifers have median specific capacities more than 10 times greater than shale and interbedded sandstone and shale aquifers. Wells completed in sand and gravel of the glacial-outwash aquifer may have the highest specific capacities.

Topography is another significant factor that affects well yields. The median specific capacities for wells in valleys is from 3 to 24 times greater than the medians for wells on hilltops. Wells on slopes have specific capacities between those for wells in valley and hilltop settings.

The specific capacity of a well decreases with increasing pumping rate and duration of pumping. Doubling of the pumping rate in selected wells caused a 24 to 67 percent reduction in specific capacity. The median reduction for wells in which the pumping water level fell below a water-bearing zone or zones was 59 percent. The median reduction for wells in which aquifer and well losses were the only factors was 38 percent. The reduction of specific capacity after 24 hours of continuous pumping as compared to 1-hour values in selected wells ranged from 17 to 90 percent, and the median decrease was 38 percent. On the average, about two thirds of the decrease in specific capacities occurred after 8 hours of pumping.

The bedrock aquifers have a strong directional permeability along bedding strike. During multiple-well pumping tests in the bedrock aquifers, significant interference was observed only between wells that tapped at least part of the same stratigraphic interval. Interference between wells that are competing for the same water increases the drawdown in each well and will reduce the available specific capacity of each well. The degree of interference is largely dependent on the hydraulic connection between the water-bearing zones that the wells mutually tap.

The groundwater in the Berwick-Bloomsburg-Danville area is chiefly of the calcium bicarbonate type, and most water tapped by wells is acceptable for domestic supply and human consumption. Concentrations of hardness, iron, and manganese that exceed recommended limits, however, may cause some problems in certain aquifers. Hardness in water, caused principally by dissolved calcium and magnesium, is chiefly a problem in aquifers containing carbonate rock. Accordingly, the carbonate rocks of the Keyser and Tonoloway Formations generally yield very hard water, whereas water from shales that are locally calcareous, such as in the Mahantango and Marcellus Formations, is moderately hard. Groundwater from the glacial-outwash aquifer and the sandstone and shale aquifers, such as the Catskill and Trimmers Rock Formations, generally is soft.

Iron and manganese concentrations that exceed recommended limits can be found in groundwater from any aquifer in the study area, although problems are most noticeable in the Devonian shales of the Harrell, Mahantango, and Marcellus Formations. Excessive dissolved manganese commonly was observed in groundwater from glacial outwash, the Marcellus Formation, and the middle and lower members of the Rose Hill Formation. Excessive iron and manganese are problems to the extent that the metals impart a bitter taste to water, stain fixtures and laundry, and clog plumbing systems, but water conditioning will alleviate the most serious problems.

Hydrogen sulfide gas, which imparts a rotten egg odor to groundwater, was detected in 58 of 651 wells, or in about 9 percent of the total. It was present most commonly in wells in the Devonian shale aquifers, such as the Harrell, Mahantango, and Marcellus Formations.

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## FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

| *Multiply inch-pound units* | *By* | *To obtain SI units* |
|---|---|---|
| inch | 2.540 | centimeter (cm) |
| foot (ft) | 0.3048 | meter (m) |
| mile (mi) | 1.609 | kilometer (km) |
| square mile ($mi^2$) | 2.590 | square kilometer ($km^2$) |
| gallon per minute (gal/min) | 0.06308 | liter per second (L/s) |
| million gallons per day (Mgal/d) | 3,785 | kiloliter per day (kL/d) |
| gallon per minute per foot [(gal/min)/ft] | 0.2069 | liter per second per meter [(L/s)/m] |
| gallon per minute per square mile [(gal/min)/$mi^2$] | 0.2436 | liter per second per square kilometer [(L/s)/$km^2$] |
| micromhos (μmho) | 1.0 | microsiemens (μS) |

Temperature in degrees Fahrenheit (°F) can be converted to degrees Celsius (°C) as follows: °F = 1.8°C + 32

Milligrams per liter (mg/L) is an expression of concentration that is equivalent to parts per million (ppm) and is equal to 1,000 micrograms per liter (μg/L). Micrograms per liter is equivalent to parts per billion (ppb).

## TABLE 21. CHEMICAL ANALYSES OF WATER FROM SELECTED WELLS

(Quantities are in milligrams per liter except where otherwise indicated)

| Well number | Date of sample | Silica ($SiO_2$) | Iron (Fe) (μg/L) | Manganese (Mn) (μg/L) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrogen ($NO_2$+$NO_3$, as N) | Orthophosphorus (P) | Dissolved solids | Hardness ($CaCO_3$) | Noncarbonate hardness ($CaCO_3$) | Alkalinity ($CaCO_3$) | pH (units) | Specific conductance (μmho/cm at 25°C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | GLACIAL OUTWASH | | | | | | | | | | |
| Co- 80 | 8/10/71 | -- | 100 | 70 | -- | -- | -- | -- | 31 | 10 | 0.1 | 0.41 | -- | 144 | 110 | 34 | 76 | 6.9 | -- |
| 111 | 3/ 3/82 | 7.8 | 230 | 21 | 9.4 | 3.7 | 2.8 | 1.1 | 16 | 4.7 | <.1 | 3.5 | <0.010 | 66 | 39 | 31 | 8 | 6.2 | 109 |
| 154 | 12/ 8/81 | 10 | 10 | 2,100 | 80 | 20 | 11 | 3.5 | 33 | 13 | .2 | .04 | .050 | 331 | 280 | 22 | 260 | 7.9 | 608 |
| 305 | 10/20/80 | 12 | 250 | 350 | 11 | 3.5 | 3.9 | .8 | 22 | 5.0 | .1 | 2.8 | .000 | 80 | 42 | 27 | 15 | 6.1 | 123 |
| 308 | 8/ 3/81 | 17 | 14,000 | 8,100 | 110 | 22 | 15 | 1.3 | 32 | 12 | <.1 | .04 | .010 | 472 | 370 | 0 | 400 | 6.7 | 804 |
| 379 | 6/ 3/81 | 9.9 | 60 | 10 | 7.1 | 3.1 | 3.2 | 1.3 | 14 | 3.6 | .0 | 3.2 | .040 | 59 | 31 | 26 | 5 | 5.7 | 93 |
| Lu-452 | 7/ 2/81 | 19 | 8,200 | 3,000 | 17 | 3.9 | 7.5 | .8 | 35 | 17 | <.1 | .01 | <.010 | 125 | 59 | 36 | 23 | 6.4 | 180 |
| 455 | 11/ 6/80 | 15 | 1,600 | 600 | 7.2 | 1.4 | 2.6 | 1.3 | 11 | 2.5 | .0 | .01 | .100 | 55 | 24 | 5 | 19 | 6.4 | 73 |
| 486 | 1/25/73 | 11 | 3,550 | -- | 14 | 5.0 | 12 | -- | 46 | 10 | -- | .20 | -- | -- | 56 | -- | 17 | 6.0 | 180 |
| 490 | 12/ 6/73 | 15 | 280 | -- | 14 | 3.4 | 7.3 | -- | 35 | 3.0 | -- | .16 | -- | 95 | 49 | -- | 24 | 6.5 | 142 |
| 491 | 11/13/73 | 11 | 40 | -- | 12 | 3.9 | 6.1 | -- | 37 | 1.8 | -- | 4.6 | -- | -- | 46 | -- | 15 | 6.2 | 136 |
| | | | | | | | | | MAUCH CHUNK FORMATION | | | | | | | | | | |
| Lu-422 | 6/24/81 | 5.7 | 10 | <1 | 1.6 | .7 | .4 | .2 | .7 | .6 | <.1 | .28 | <.010 | 15 | 7 | 0 | 7 | 6.0 | 18 |
| | | | | | | | | | CATSKILL FORMATION | | | | | | | | | | |
| | | | | | | | | | Sherman Creek Member | | | | | | | | | | |
| Co- 49 | 2/ 8/68 | -- | 150 | 0 | -- | -- | -- | -- | 51 | 4.0 | .0 | 3.7 | -- | 108 | 60 | 40 | 20 | 6.0 | -- |
| 61 | 8/12/80 | 12 | 370 | 70 | 14 | 3.6 | 6.3 | .9 | 29 | 9.6 | .1 | 1.9 | .000 | 95 | 50 | 33 | 17 | -- | 155 |
| 66 | 1/ 8/68 | -- | 200 | -- | -- | -- | -- | -- | -- | 8.0 | .0 | 1.4 | -- | 110 | 46 | 0 | 75 | 7.8 | -- |
| 84 | 6/23/76 | -- | <10 | <10 | -- | -- | -- | -- | 12 | 6.5 | <.1 | 4.8 | .020 | 90 | 60 | 34 | 26 | 6.5 | -- |
| 85 | 6/23/76 | -- | 550 | <10 | -- | -- | -- | -- | 51 | 16 | <.1 | 5.4 | .020 | 162 | 83 | 37 | 46 | 6.8 | -- |
| 245 | 8/18/81 | 13 | 920 | 380 | 33 | 6.4 | 27 | 1.2 | 35 | 50 | <.1 | 4.5 | <.010 | 230 | 110 | 37 | 72 | 6.9 | 388 |
| 372 | 4/14/81 | <.1 | 30 | <1 | 12 | 6.8 | 12 | 2.2 | 17 | 5.3 | .1 | .47 | .090 | 2 | 58 | 0 | 59 | 7.0 | 183 |
| 411 | 6/10/81 | 11 | 10 | 1 | 15 | 3.1 | 4.2 | .5 | 14 | 2.4 | <.1 | 1.7 | .040 | 78 | 50 | 16 | 34 | 7.9 | 123 |
| 436 | 8/27/81 | 11 | 40 | 20 | 26 | 7.2 | 10 | .9 | 11 | 34 | <.1 | 2.5 | .070 | 134 | 95 | 57 | 38 | 7.8 | 222 |
| 501 | 8/19/81 | 7.2 | 620 | 10 | 3.5 | 2.6 | 3.2 | .8 | .8 | 6.4 | <.1 | 4.7 | <.010 | 50 | 19 | 12 | 7 | 5.8 | 75 |
| 503 | 8/27/81 | 11 | 30 | <10 | 4.0 | 1.5 | 2.6 | .5 | .3 | 1.9 | <.1 | 1.6 | .020 | 37 | 16 | 3 | 13 | 7.0 | 46 |
| 504 | 11/ 5/81 | 9.9 | 520 | 26 | 4.2 | 1.9 | 4.0 | .2 | 2.3 | 7.4 | .0 | 2.4 | .010 | 46 | 18 | 10 | 8 | 5.8 | 63 |
| 522 | 9/22/81 | 12 | 50 | 1,200 | 15 | 4.0 | 8.1 | .6 | 2.5 | 9.7 | <.1 | 4.7 | .030 | 100 | 54 | 10 | 44 | 6.9 | 164 |
| 565 | 11/ 5/81 | 8.6 | 2,000 | 29 | 1.9 | 1.1 | 1.1 | .4 | 1.0 | 1.1 | .0 | .03 | .010 | 26 | 9 | 0 | 14 | 6.1 | 21 |
| 584 | 2/18/82 | 17 | 47 | 8 | 22 | 7.3 | 10 | .5 | 2.0 | 23 | <.1 | 7.7 | .060 | 143 | 85 | 40 | 45 | 6.7 | 228 |
| Lu-512 | 9/29/81 | 17 | 220 | 340 | 30 | 3.0 | 5.3 | .3 | 1.6 | .6 | .1 | .02 | <.010 | 125 | 87 | 0 | 110 | 7.8 | 206 |
| | | | | | | | | | Irish Valley Member | | | | | | | | | | |
| Co-244 | 2/23/82 | 9.8 | 260 | 13 | 2.8 | 3.2 | 2.7 | .6 | 1.4 | 2.7 | <.1 | 3.7 | <.010 | 43 | 20 | 14 | 6 | 5.9 | 58 |
| 377 | 6/ 3/81 | 16 | 210 | 90 | 2.0 | 2.8 | 3.2 | .5 | .5 | .3 | .1 | .14 | .050 | 36 | 17 | 1 | 16 | 6.1 | 49 |
| 421 | 6/25/81 | 10 | 260 | 40 | 2.9 | 4.3 | 6.7 | .8 | .2 | 14 | <.1 | 1.5 | <.010 | 53 | 25 | 13 | 12 | 5.2 | 100 |
| 562 | 10/ 8/81 | 18 | 260 | 150 | 17 | 6.5 | 8.6 | .7 | 1.0 | 5.7 | .3 | .11 | <.010 | 101 | 69 | 0 | 71 | 7.6 | 170 |
| 567 | 11/ 9/81 | 16 | 36 | 130 | 12 | 5.4 | 14 | .6 | 11 | 4.4 | .1 | .09 | <.010 | 100 | 52 | 0 | 60 | 7.8 | 148 |
| 585 | 2/23/82 | 20 | 2,500 | 480 | 3.4 | 4.7 | 5.4 | .4 | 4.2 | 1.4 | .2 | .02 | .020 | 63 | 28 | 0 | 33 | 6.9 | 79 |
| Nu-162 | 8/ 6/80 | 14 | 1,600 | 40 | 12 | 4.8 | 4.4 | .7 | 28 | 7.7 | .1 | 2.6 | .000 | 93 | 50 | 37 | 13 | -- | 150 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | TRIMMERS ROCK FORMATION | | | | | | | | | | | |
| Co-215 | 4/ 8/82 | 11 | 9 | 8 | 3.8 | 2.2 | 2.6 | 0.1 | 5.0 | 2.9 | <.1 | 3.6 | <0.010 | 49 | 19 | 10 | 9 | 6.0 | 67 |
| 354 | 2/23/82 | 12 | 1,700 | 220 | 11 | 3.4 | 3.9 | .3 | 6.9 | 3.8 | <.1 | 1.4 | <.010 | 68 | 41 | 10 | 31 | 6.6 | 100 |
| 364 | 4/ 2/82 | 9.7 | 42 | 9 | 5.8 | 5.4 | 3.7 | 1.2 | 8.3 | 6.6 | <.1 | 6.0 | <.010 | 73 | 37 | 27 | 10 | 6.1 | 112 |
| 365 | 2/18/82 | 20 | 190 | 85 | 5.2 | 7.0 | 9.6 | .5 | 5.6 | 2.6 | .2 | .28 | .020 | 82 | 42 | 0 | 50 | 7.4 | 119 |
| 368 | 8/ 3/81 | 13 | 120 | 20 | 9.8 | 6.9 | 4.9 | 1.0 | 24 | 5.6 | <.1 | 4.9 | <.010 | 96 | 53 | 38 | 15 | 6.6 | 153 |
| Mt-160 | 2/23/82 | 10 | 74 | 34 | 5.9 | 3.3 | 3.6 | .3 | 8.1 | 1.6 | <.1 | 1.9 | <.010 | 51 | 28 | 12 | 16 | 7.0 | 74 |
| 186 | 11/12/81 | 13 | 26 | 65 | 18 | 4.7 | 5.8 | .7 | 15 | 4.0 | .2 | .90 | <.010 | 97 | 64 | 12 | 52 | 7.9 | 149 |
| 237 | 3/ 3/82 | 19 | 52 | 35 | 23 | 8.5 | 13 | .5 | 14 | 4.2 | .1 | .02 | .050 | 143 | 92 | 0 | 100 | 8.0 | 233 |
| | | | | | | | | HARRELL FORMATION | | | | | | | | | | | |
| Co-336 | 8/20/81 | 15 | 1,700 | 90 | 3.0 | 2.5 | 3.0 | .3 | 9.7 | .9 | <.1 | .06 | <.010 | 44 | 18 | 5 | 13 | 6.9 | 55 |
| Lu-371 | 8/26/81 | 86 | 900 | 40 | 8.0 | 2.3 | 3.3 | 1.4 | 14 | 4.6 | <.1 | 1.1 | <.010 | 54 | 29 | 19 | 10 | 6.6 | 86 |
| | | | | | | | | MAHANTANGO FORMATION | | | | | | | | | | | |
| Co- 56 | 12/18/73 | 8.5 | 860 | 40 | 26 | 3.5 | 107 | 27 | 15 | 172 | .2 | .28 | .100 | 429 | 80 | 0 | 11 | 8.0 | 820 |
| 60 | 5/14/81 | 12 | 29,000 | 590 | 35 | 11 | 29 | 2.2 | 31 | 83 | <.1 | .02 | <.010 | 267 | 130 | 77 | 56 | 6.1 | 492 |
| 126 | 8/20/81 | 6.7 | 2,200 | 40 | 4.1 | 2.5 | 3.0 | .6 | .4 | 5.7 | <.1 | 4.1 | <.010 | 48 | 21 | 13 | 8 | 6.1 | 72 |
| 212 | 6/ 3/81 | 17 | 1,800 | 50 | 35 | 9.9 | 18 | .6 | 18 | 15 | .2 | <.01 | .050 | 194 | 130 | 0 | 130 | 7.8 | 324 |
| 320 | 6/24/81 | 24 | 7,900 | 3,000 | 53 | 12 | 11 | .8 | 22 | 86 | <.1 | 2.5 | <.010 | 261 | 180 | 130 | 51 | 7.1 | 464 |
| 333 | 8/13/81 | 19 | 20 | 30 | 18 | 3.2 | 5.7 | .3 | 5.2 | 2.0 | .1 | .49 | .030 | 91 | 58 | 0 | 59 | 7.3 | 136 |
| 335 | 8/13/81 | 14 | 20 | 20 | 13 | 3.4 | 3.8 | .4 | 16 | 5.5 | <.1 | 1.1 | .010 | 77 | 46 | 19 | 27 | 6.6 | 124 |
| 454 | 7/22/81 | 14 | 410 | 10 | 4.9 | 1.7 | 1.3 | 1.0 | 13 | 2.0 | <.1 | 1.9 | <.010 | 48 | 19 | 17 | 2 | 4.8 | 71 |
| 468 | 8/12/81 | 16 | 100 | 20 | 32 | 7.4 | 16 | 1.9 | 22 | 12 | .2 | .06 | .040 | 174 | 110 | 0 | 110 | 8.4 | 284 |
| Lu-372 | 8/13/81 | 17 | 50 | 80 | 31 | 6.9 | 9.1 | .2 | 21 | 1.3 | .2 | .07 | .020 | 153 | 110 | 0 | 110 | 7.4 | 248 |
| 434 | 7/30/81 | 16 | 120 | 140 | 32 | 6.4 | 12 | .3 | 27 | 6.3 | .2 | .60 | <.010 | 161 | 110 | 9 | 97 | 7.7 | 248 |
| 453 | 11/18/81 | 13 | 16 | 28 | 19 | 3.4 | 30 | .4 | 14 | 3.6 | .2 | .06 | <.010 | 144 | 61 | 0 | 100 | 8.0 | 234 |
| 456 | 8/26/81 | 11 | 30 | 10 | 23 | 3.7 | 5.3 | .6 | 16 | 4.1 | .1 | .15 | <.010 | 99 | 73 | 16 | 57 | 7.4 | 162 |
| 471 | 1/22/81 | 8.1 | 3,500 | 200 | 70 | 20 | 1,000 | 3.1 | 2.8 | 1,500 | .6 | .02 | .010 | 2,670 | 260 | 150 | -- | 8.0 | 4,720 |
| Mt-153 | 8/ 6/80 | 20 | 580 | 430 | 33 | 7.5 | 8.2 | .6 | 20 | 1.6 | .2 | .07 | .050 | 165 | 110 | 0 | 120 | -- | 280 |
| 178 | 8/18/81 | 21 | 120 | 60 | 27 | 6.7 | 9.4 | .5 | 23 | 1.4 | .1 | .01 | .070 | 145 | 95 | 2 | 93 | 8.0 | 220 |
| Nu-157 | 11/ 4/81 | 19 | 740 | 130 | 9.4 | 3.8 | 4.7 | .3 | 9.4 | .7 | .1 | <.01 | .040 | 72 | 39 | 0 | 39 | 7.0 | 98 |
| | | | | | | | | MARCELLUS FORMATION | | | | | | | | | | | |
| Co-187 | 4/14/81 | 9.5 | 180 | <1 | 60 | 13 | 9.6 | 1.0 | 46 | 28 | <.1 | 3.0 | <.010 | 265 | 200 | 63 | 140 | 7.4 | 480 |
| 190 | 8/26/81 | 11 | 1,100 | 270 | 32 | 8.6 | 500 | 2.4 | 760 | 23 | .1 | .02 | <.010 | 1,600 | 120 | 0 | 430 | 7.8 | 2,180 |
| 306 | 6/23/81 | 15 | 320 | 200 | 55 | 9.6 | 4.5 | .4 | 47 | 14 | <.1 | .01 | <.010 | 212 | 180 | 67 | 110 | 7.8 | 364 |
| 452 | 7/15/81 | 18 | 530 | 70 | 37 | 10 | 14 | .4 | 38 | 2.0 | .1 | <.01 | .020 | 198 | 130 | 4 | 130 | 6.6 | 314 |
| Lu-438 | 8/ 5/80 | 16 | 3,000 | 160 | 41 | 7.2 | 7.3 | .8 | 26 | 3.2 | .2 | .13 | .000 | 178 | 130 | 12 | 120 | -- | 300 |
| Mt- 30 | 9/13/73 | -- | 7,000 | -- | 78 | 26 | -- | -- | 20 | 155 | -- | .00 | -- | 840 | 300 | -- | 100 | -- | -- |
| 175 | 4/13/81 | 20 | 14,000 | 1,500 | 40 | 15 | 30 | 1.6 | 61 | 35 | .2 | .03 | <.010 | 297 | 160 | 32 | 130 | 6.9 | 489 |
| | | | | | | | | ONONDAGA FORMATION | | | | | | | | | | | |
| Co-188 | 9/23/81 | 7.3 | 60 | <10 | 100 | 23 | 28 | 2.7 | 76 | 59 | <0.1 | 17 | 0.000 | 492 | 340 | 140 | 200 | 7.7 | 782 |
| 441 | 8/ 4/81 | 7.3 | 400 | 20 | 72 | 15 | 15 | 2.1 | 40 | 38 | <.1 | 3.2 | <.010 | 306 | 240 | 72 | 170 | 7.0 | 571 |
| Mt- 17 | 9/17/73 | -- | 3,350 | 0 | 38 | 8.0 | -- | -- | 46 | 2.0 | -- | .02 | -- | 268 | 126 | -- | 100 | -- | -- |
| | | | | | | | | OLD PORT FORMATION | | | | | | | | | | | |
| Co- 58 | 4/ 1/68 | -- | 100 | -- | -- | -- | -- | -- | -- | 20 | .0 | 5.0 | -- | 296 | 170 | 54 | 116 | 7.2 | -- |
| 59 | 4/ 1/68 | -- | 0 | -- | -- | -- | -- | -- | -- | 20 | .0 | 7.0 | -- | 274 | 140 | 26 | 114 | 7.4 | -- |
| 183 | 8/13/81 | 7.7 | 620 | 10 | 35 | 6.2 | 5.4 | .7 | 34 | 11 | <.1 | 4.3 | .020 | 156 | 110 | 53 | 60 | 6.5 | 264 |
| Mt- 16 | 9/ 4/73 | -- | 11,000 | 0 | 48 | 20 | -- | -- | 210 | 7.0 | -- | .10 | -- | 832 | 200 | -- | 120 | -- | -- |
| 32 | 1/29/74 | -- | 1,100 | 0 | 65 | 20 | -- | -- | 50 | 72 | -- | .03 | -- | 438 | 240 | -- | 128 | -- | -- |
| | | | | | | | | KEYSER FORMATION | | | | | | | | | | | |
| Co- 57 | 4/ 1/68 | -- | 0 | -- | -- | -- | -- | -- | 78 | 132 | .0 | 4.8 | -- | 434 | 120 | 0 | 125 | 7.3 | -- |
| 310 | 8/ 4/81 | 2.3 | 2,000 | 430 | 94 | 18 | 18 | 1.3 | 62 | 66 | <.1 | .01 | <.010 | 372 | 310 | 130 | 180 | 6.8 | 686 |
| Mt- 2 | 5/24/71 | 6.6 | 40 | 10 | 65 | 11 | 8.7 | -- | 20 | 20 | .1 | 4.0 | .010 | 250 | 210 | 43 | 167 | 7.7 | 416 |
| 14 | 4/16/74 | -- | 1,100 | 0 | 33 | 25 | -- | -- | 61 | 20 | -- | 1.4 | -- | 374 | 180 | -- | 184 | -- | -- |

TABLE 21. (CONTINUED)

| Well number | Date of sample | Silica ($SiO_2$) | Iron (Fe) (µg/L) | Manganese (Mn) (µg/L) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrogen ($NO_2$+$NO_3$, as N) | Orthophosphorus (P) | Dissolved solids | Hardness ($CaCO_3$) | Noncarbonate hardness ($CaCO_3$) | Alkalinity ($CaCO_3$) | pH (units) | Specific conductance (µmho/cm at 25°C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KEYSER FORMATION (CONTINUED) | | | | | | | | | | | | | | | | | | | |
| Mt -31 | 12/29/72 | -- | 300 | 0 | 152 | 28 | -- | -- | 625 | 76 | -- | .00 | -- | 1,040 | 550 | -- | 140 | -- | -- |
| Nu-187 | 12/ 3/81 | 11 | 9 | 3 | 75 | 13 | 22 | 1.7 | 84 | 38 | .1 | 6.4 | .090 | 345 | 240 | 120 | 120 | 7.8 | 557 |
| 188 | 11/24/81 | 11 | 13 | 3 | 107 | 24 | 34 | 2.0 | 190 | 46 | .2 | 4.4 | <.010 | 518 | 370 | 230 | 140 | 7.7 | 796 |
| 189 | 11/24/81 | 20 | 390 | 10 | 350 | 120 | 10 | .9 | 1,300 | 13 | 1.4 | .12 | <.010 | 1,890 | 1,400 | 1,200 | 130 | 7.6 | 2,070 |
| TONOLOWAY FORMATION | | | | | | | | | | | | | | | | | | | |
| Co-304 | 10/20/80 | 12 | 10 | 10 | 38 | 8.7 | 4.9 | .6 | 28 | 6.3 | .1 | 1.7 | .010 | 163 | 130 | 37 | 94 | 7.7 | 282 |
| 307 | 7/ 1/81 | 16 | 460 | 80 | 110 | 33 | 7.5 | 1.0 | 270 | 6.6 | .3 | .86 | <.010 | 521 | 410 | 290 | 120 | 7.5 | 736 |
| 410 | 6/ 3/81 | 8.4 | 110 | 20 | 64 | 18 | 13 | 1.7 | 48 | 31 | .1 | .83 | .060 | 278 | 230 | 84 | 150 | 7.4 | 505 |
| 505 | 10/13/81 | 9.2 | 4 | 2 | 34 | 19 | 2.3 | .5 | 23 | 2.9 | .1 | .05 | .010 | 175 | 160 | 23 | 140 | 8.2 | 294 |
| Mt- 15 | 4/23/74 | -- | 370 | 0 | 64 | 20 | -- | -- | 110 | 7.0 | -- | .00 | -- | 382 | 258 | -- | 160 | -- | -- |
| WILLS CREEK FORMATION | | | | | | | | | | | | | | | | | | | |
| Co- 70 | 7/ 7/81 | 12 | 1,900 | 50 | 63 | 25 | 17 | .9 | 140 | 29 | .2 | .46 | <.010 | 375 | 260 | 120 | 140 | 7.7 | 644 |
| 86 | 5/13/73 | -- | 20 | 50 | -- | -- | -- | -- | 15 | 18 | <.1 | .11 | -- | 220 | 110 | 5 | 105 | 5.0 | -- |
| 87 | 5/13/73 | -- | 20 | 50 | -- | -- | -- | -- | 12 | 19 | <.1 | .13 | -- | 219 | 110 | 0 | 110 | 5.0 | -- |
| 106 | 8/13/81 | 11 | 10 | <1 | 37 | 8.7 | 4.6 | .7 | 26 | 10 | <.1 | 4.8 | <.010 | 166 | 130 | 51 | 77 | 7.9 | 276 |
| 159 | 8/ 4/81 | 9.3 | 30 | 10 | 53 | 23 | 7.0 | .8 | 82 | 18 | <.1 | 8.4 | <.010 | 296 | 230 | 120 | 110 | 7.8 | 509 |
| 201 | 8/ 5/80 | 9.6 | 420 | 2 | 39 | 20 | 6.0 | .6 | 32 | 12 | .1 | 3.0 | .000 | 217 | 180 | 40 | 140 | -- | 400 |
| 204 | 10/23/80 | -- | 10 | 3 | -- | -- | -- | -- | 23 | 71 | -- | 2.8 | -- | -- | 150 | -- | 140 | 7.5 | -- |
| 205 | 10/29/80 | -- | 10 | 2 | -- | -- | -- | -- | 32 | 35 | -- | 1.6 | -- | -- | 80 | -- | 120 | 8.2 | -- |
| 404 | 6/25/81 | 7.0 | 20 | <1 | 45 | 7.6 | 2.4 | .5 | 2.3 | 29 | <.1 | 6.3 | <.010 | 174 | 140 | 57 | 87 | 7.3 | 316 |
| 413 | 6/23/81 | 7.6 | 230 | 60 | 37 | 10 | 8.0 | .7 | 14 | 15 | <.1 | 2.5 | <.010 | 163 | 130 | 36 | 98 | 7.6 | 392 |
| 453 | 7/22/81 | 7.1 | 170 | 6 | 25 | 15 | 1.2 | .6 | 8.6 | 7.4 | <.1 | 7.5 | .020 | 143 | 120 | 49 | 75 | 8.1 | 244 |
| 457 | 7/30/81 | 7.2 | 70 | 10 | 38 | 7.5 | 3.9 | .6 | 2.4 | 10 | <.1 | 7.7 | <.010 | 160 | 130 | 33 | 93 | 7.1 | 262 |
| BLOOMSBURG FORMATION | | | | | | | | | | | | | | | | | | | |
| Co- 45 | 4/ 9/81 | 12 | 280 | 130 | 43 | 11 | 9.3 | 1.1 | 30 | 56 | 0.1 | 5.0 | 0.710 | 213 | 150 | 110 | 46 | 7.7 | 387 |
| 88 | 5/13/73 | -- | 250 | 30 | -- | -- | -- | -- | 20 | 2.5 | <.1 | .10 | -- | 130 | 64 | 0 | 67 | 5.0 | -- |
| 357 | 7/21/81 | 14 | 760 | 8 | 9.1 | 3.0 | 3.0 | .6 | 7.3 | 1.0 | <.1 | 2.2 | .110 | 60 | 35 | 16 | 19 | 6.7 | 89 |
| 371 | 7/21/81 | 20 | 1,100 | 180 | 12 | 3.4 | 2.7 | .7 | 16 | 1.0 | .2 | .01 | .130 | 76 | 44 | 13 | 31 | 7.7 | 102 |
| 437 | 7/ 1/81 | 8.8 | 980 | 30 | 15 | 3.4 | 1.7 | .3 | 2.0 | 5.2 | <.1 | 2.9 | <.010 | 70 | 51 | 20 | 31 | 6.8 | 112 |
| 455 | 7/21/81 | 9.2 | 60 | 2 | 32 | 6.7 | 4.6 | .6 | 7.7 | 1.0 | <.1 | 4.3 | .070 | 128 | 110 | 29 | 79 | 6.9 | 234 |
| 460 | 7/29/81 | 8.1 | 6,200 | 50 | 21 | 6.9 | 3.4 | 1.5 | 20 | 8.5 | <.1 | 2.5 | <.010 | 113 | 81 | 38 | 43 | 6.2 | 188 |
| 461 | 7/28/81 | 10 | 8,000 | 5,300 | 97 | 18 | 37 | 6.0 | 36 | 100 | <.1 | .74 | .020 | 459 | 320 | 86 | 230 | 6.5 | 864 |
| 462 | 7/29/81 | 8.1 | 70 | 2 | 24 | 4.2 | 9.6 | 5.4 | 32 | 11 | <.1 | 8.9 | .220 | 148 | 77 | 54 | 23 | 6.5 | 226 |
| 463 | 7/29/81 | 8.7 | 30 | 1 | 28 | 6.9 | 3.7 | .5 | 19 | 6.7 | <.1 | 1.5 | <.010 | 125 | 98 | 23 | 75 | 7.8 | 208 |
| 569 | 12/ 8/81 | 16 | 8 | 7 | 18 | 3.6 | 3.7 | .7 | 20 | 1.5 | .1 | 1.5 | .110 | 93 | 60 | 22 | 38 | 7.2 | 152 |
| MIFFLINTOWN AND KEEFER FORMATIONS | | | | | | | | | | | | | | | | | | | |
| Co-128 | 2/17/82 | 8.3 | 7 | 3 | 46 | 6.8 | 2.9 | .4 | 30 | 9.0 | <.1 | .58 | <.010 | 166 | 140 | 43 | 100 | 7.9 | 287 |
| 157 | 2/23/82 | 7.2 | 100 | 13 | 18 | 3.3 | 3.2 | .4 | 7 | 12 | <.1 | 2.9 | .020 | 83 | 59 | 28 | 31 | 6.5 | 135 |
| 331 | 2/17/82 | 14 | 11 | 1,500 | 38 | 4.7 | 11 | .8 | 24 | 12 | .2 | 3.6 | .020 | 179 | 110 | 19 | 95 | 7.4 | 300 |
| 332 | 2/17/82 | 7.9 | 37 | 38 | 20 | 4.6 | 25 | .2 | 19 | 8.5 | .2 | .11 | .010 | 136 | 69 | 0 | 84 | 7.9 | 225 |
| 355 | 2/18/82 | 6.2 | 410 | 27 | 11 | 4.4 | 8.4 | .8 | .7 | 32 | <.1 | 4.8 | <.010 | 88 | 46 | 42 | 4 | 6.1 | 164 |
| 570 | 12/17/81 | 8.1 | 8 | 100 | 22 | 5.8 | 2.1 | .5 | 16 | 3.5 | .1 | .04 | <.010 | 97 | 79 | 14 | 65 | 8.0 | 171 |
| 586 | 3/ 3/82 | 10 | 200 | 65 | 30 | 8.7 | 5.4 | .7 | 5.5 | 2.4 | .1 | .02 | <.010 | 135 | 110 | 0 | 120 | 7.8 | 229 |

ROSE HILL FORMATION

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper Member | | | | | | | | | | | | | | | | | | | |
| Mt-181 | 10/ 6/81 | 8.4 | 140 | 76 | 24 | 12 | 2.7 | .6 | 12 | 4.1 | .2 | .04 | <.010 | 117 | 110 | 21 | 88 | 7.9 | 216 |
| 185 | 11/12/81 | 11 | 54 | 140 | 23 | 11 | 4.0 | .3 | 32 | 1.6 | .1 | .03 | <.010 | 128 | 100 | 28 | 75 | 7.9 | 208 |
| 221 | 2/23/82 | 9.5 | 54 | 140 | 23 | 11 | 66 | <.1 | 21 | 20 | .2 | .01 | <.010 | 46 | -- | -- | 81 | 8.0 | 262 |
| 227 | 4/ 8/82 | 9.7 | 9 | 7 | 20 | 4.2 | 4.6 | <.1 | 8.9 | 1.0 | .2 | <.10 | <.010 | 90 | 67 | 0 | 69 | 7.7 | 146 |
| 235 | 2/23/82 | 7.6 | 28 | 3 | 21 | 3.3 | 2.4 | .4 | 2.2 | 9.8 | <.1 | 1.6 | <.010 | 84 | 66 | 15 | 51 | 6.7 | 156 |
| Middle and Lower Members | | | | | | | | | | | | | | | | | | | |
| Mt- 29 | 7/14/80 | 7.2 | 400 | 90 | 24 | 13 | .6 | 1.2 | 6.5 | .6 | .2 | -- | -- | 126 | 110 | 0 | 120 | 7.6 | 240 |
| 36 | 9/22/81 | 10 | -- | -- | -- | -- | -- | -- | 14 | 4.0 | .2 | .40 | .010 | -- | -- | -- | 110 | 7.6 | 246 |
| 123 | 8/18/81 | 7.5 | 360 | 160 | 28 | 13 | .9 | 1.0 | 4.7 | 1.9 | .2 | .01 | .010 | 118 | 120 | 23 | 100 | 7.7 | 200 |
| 176 | 8/17/81 | 7.3 | 1,500 | 340 | 17 | 14 | .6 | .6 | 3.3 | 1.4 | .2 | .01 | .010 | 102 | 100 | 7 | 93 | 7.1 | 178 |
| 214 | 9/22/81 | 6.1 | 700 | 120 | 11 | 6.3 | .6 | .4 | 2.6 | .8 | .1 | .30 | .000 | 57 | 53 | 8 | 45 | 7.3 | 96 |
| 245 | 9/17/81 | 6.0 | 30 | 10 | 17 | 8.8 | 3.2 | .9 | 14 | 1.6 | .2 | .02 | .140 | 93 | 79 | 11 | 68 | 7.4 | 164 |
| 247 | 9/22/81 | 6.3 | 10 | <10 | 63 | 12 | 2.5 | .6 | 37 | 8.6 | <.1 | 4.2 | .020 | 233 | 210 | 67 | 140 | 7.8 | 374 |
| 248 | 9/22/81 | 6.2 | 90 | 130 | 14 | 10 | 3.9 | .6 | 11 | 1.8 | .2 | .20 | .000 | 93 | 76 | 2 | 74 | 7.4 | 164 |
| 249 | 9/23/81 | 6.1 | 80 | 200 | 21 | 9.4 | 1.4 | .8 | 3.2 | 1.4 | .2 | .03 | .000 | 100 | 91 | 0 | 93 | 8.0 | 184 |
| 250 | 9/23/81 | 6.7 | 30 | 330 | 7 | 9.7 | 7.0 | .8 | 11 | 7.2 | .2 | 5.7 | .060 | 100 | 57 | 16 | 41 | 7.2 | 162 |
| 251 | 9/30/81 | 7.6 | 1,300 | 510 | 1.9 | 8.4 | .4 | .6 | .3 | .8 | .1 | .05 | <.010 | 44 | 39 | 3 | 36 | 6.6 | 78 |
| 255 | 4/28/82 | 7.4 | 940 | 440 | 22 | 16 | 1.3 | 1.5 | 6.0 | 1.1 | .2 | <.10 | <.010 | 129 | 120 | 1 | 120 | 7.5 | 237 |

TABLE 22. TRACE-ELEMENT AND ORGANIC-INDICATOR ANALYSES OF WATER FROM SELECTED WELLS

| Well number | Geologic unit[2] | Date of sample | Dissolved trace metals (μg/L) | | | | | | | | | | | | Organic indicator (mg/L) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Arsenic (As) | Beryllium (Be) | Cadmium (Cd) | Chromium (Cr) | Hexavalent chromium ($Cr^{+6}$) | Copper (Cu) | Cyanide (CN) | Lead (Pb) | Mercury (Hg) | Nickel (Ni) | Selenium (Se) | Zinc (Zn) | Oil and grease | Dissolved organic carbon | Suspended organic carbon | Phenol (μg/L) |
| Co-154 | Qgo | 12- 8-81 | 1 | <1 | 1 | <10 | <1 | 42 | <10 | 3 | <0.1 | 1,600 | <1 | 400 | <1 | 7.2 | 3.3 | 3 |
| 190 | Dmr | 8-26-81 | 5 | <10 | 2 | 10 | <1 | 3 | <10 | 5 | .2 | 5 | <1 | 10 | 1 | 3.7 | >5.0 | <1 |
| 308 | Qgo | 8- 3-81 | 20 | 0 | 1 | 10 | <1 | 2 | <10 | 1 | <.1 | 5 | <1 | 10 | 2 | 1.0 | --- | --- |
| 310 | DSk | 8- 4-81 | 12 | 1 | 1 | 10 | <1 | 1 | <10 | 1 | <.1 | 4 | <1 | 4 | 1 | 2.0 | --- | 0 |
| 357 | Sb | 7-21-81 | 2 | <1 | 1 | <10 | 0 | 35 | <10 | 3 | <.1 | 1 | 0 | 7 | 0 | 8.5 | --- | 0 |
| 371 | Sb | 7-21-81 | 10 | <1 | <1 | <10 | 0 | 13 | <10 | 3 | <.1 | 1 | 0 | 10 | 1 | .4 | --- | 0 |
| 436 | Dcs | 8-27-81 | 1 | <10 | 2 | <10 | <1 | 8 | <10 | 3 | .2 | 4 | <1 | 10 | 1 | 6.0 | .2 | <1 |
| 453 | Swc | 7-22-81 | 1 | <1 | <1 | 10 | 0 | 24 | <10 | 12 | <.1 | 1 | 0 | <4 | 0 | .6 | --- | 0 |
| 454 | Dmh | 7-22-81 | 1 | <1 | <1 | <10 | 0 | 98 | <10 | 19 | <.1 | 18 | 1 | 60 | 1 | <.3 | --- | 0 |
| 455 | Sb | 7-21-81 | 2 | <1 | 3 | <10 | 0 | 13 | <10 | 3 | .1 | 2 | 0 | 20 | 1 | .3 | --- | 0 |
| 457 | Swc | 7-30-81 | 3 | 1 | 1 | 10 | <1 | 3 | <10 | 1 | <.1 | 2 | 1 | 9 | 1 | 3.4 | .2 | 8 |
| 460 | Sb | 7-29-81 | 1 | <1 | 2 | <10 | <1 | 14 | --- | 32 | <.1 | 4 | 0 | 90 | --- | --- | --- | --- |
| 461 | Sb | 7-28-81 | 22 | <1 | 1 | <10 | <1 | 11 | <10 | 12 | .1 | 15 | 0 | 160 | 0 | 15 | 3.4 | 0 |
| 462 | Sb | 7-29-81 | 2 | 1 | 1 | 10 | <1 | 53 | <10 | 1 | <.1 | 4 | <1 | 100 | 0 | 4.0 | .3 | 2 |
| 463 | Sb | 7-29-81 | 4 | 1 | 1 | 10 | <1 | 8 | <10 | 1 | <.1 | 4 | <1 | 20 | 0 | 10 | --- | 4 |
| 569 | Sb | 12- 8-81 | 2 | <1 | <1 | <10 | <1 | 24 | <10 | 1 | <.1 | 5 | <1 | 15 | <1 | 5.6 | .1 | <1 |
| 570 | Sm | 12-17-81 | 1 | <1 | 2 | 10 | <1 | <1 | <10 | <1 | .1 | <1 | <1 | 5 | <1 | .3 | .2 | 5 |
| Lu-434 | Dmh | 7-30-81 | 1 | 1 | 1 | 10 | <1 | 5 | <10 | 1 | <.1 | 2 | <1 | 4 | 0 | 4.2 | --- | 6 |
| Recommended limit[3] | | | 50 | --- | 10 | 50 | 50 | [4]1,000 | 200 | 50 | 2 | --- | 10 | [4]5,000 | --- | --- | --- | [4]1 |

[1]Analyzing agency: U.S. Geological Survey, Central Laboratory, Atlanta, Georgia.

[2]Geologic unit: Qgo, Glacial outwash; Dcsc, Sherman Creek Member of Catskill Formation; Dmh, Mahantango Formation; Dmr, Marcellus Formation; DSk, Keyser Formation; Swc, Wills Creek Formation; Sb, Bloomsburg Formation; Smk, Mifflintown and Keefer Formations.

[3]U.S. Environmental Protection Agency (1976a, 1976b).

[4]The given level is for controlling undesirable taste and odor quality.

TABLE 23. RECORD OF SELECTED WELLS AND TEST HOLES

Well location: The number is that assigned to identify the well or test hole. It is prefixed by a two-letter abbreviation of the county. The lat-long is the coordinates, in degree and minutes, of the southeast corner of a 1-minute quadrangle within which the well is located.

Use: A, air conditioning; C, commercial; H, domestic and small commercial; I, irrigation; N, industrial; O, observation; P, public supply; R, recreation; S, stock; T, institution; U, test hole.

Topographic setting: C, stream channel; H, hilltop; S, hillside; T, terrace; V, valley flat; W, upland draw.

Aquifer: Qal, alluvium; Qgo, glacial outwash; Qt, till; Mmc, Mauch Chunk Formation; Dcd, Duncannon Member of Catskill Formation; Dcsc, Sherman Creek Member of Catskill Formation; Dciv, Irish Valley Member of Catskill Formation; Dtr, Trimmers Rock Formation; Dh, Harrell Formation; Dmh, Mahantango Formation; Dmr, Marcellus Formation; Don, Onondaga Formation; Do, Old Port Formation; DSk, Keyser Formation; Sto, Tonoloway Formation; Swc, Wills Creek Formation; Sb, Bloomsburg Formation; Smk, Mifflintown and Keefer Formations; Sru, upper member of Rose Hill Formation; Srm, middle member of Rose Hill Formation; Srl, lower member of Rose Hill Formation.

Lithology: dls, dolostone, limestone, and shale; ls, limestone; lsd, limestone and dolostone; lss, limestone and shale; sd, sand; sg, sand and gravel; sh, shale; sls, sandstone, limestone, and shale; slt, silt; sssh, sandstone and shale.

Static water level: Depth--F, flows but head is not known; minus sign indicates that water level is above land surface.
Date--month/last two digits of year.

Reported yield: gal/min, gallons per minute.

Specific capacity: (gal/min)/ft, gallons per minute per foot of drawdown.

Pumping rate: gal/min, gallons per minute. Where no pumping rate is indicated, specific capacities were determined from drillstem and bailer test data reported by drillers.

Hardness: mg/L, milligrams per liter.

Specific conductance: μmho/cm at 25°C, micromhos per centimeter at 25 degrees Celsius.

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| | | | | | | | | COLUMBIA |
| Co- 1 | 4100-7627 | Howers | --- | --- | H | 490 | T | Qgo/sg |
| 45 | 4100-7626 | U.S. Geological Survey | Ralph Meyers | 1970 | O | 690 | H | Sb/sh |
| 47 | 4107-7632 | Millville Water Authority | --- | --- | P | 630 | V | Qal/sg |
| 48 | 4059-7627 | Magee Carpet Co. | --- | --- | N | 475 | T | Do/lss |
| 49 | 4057-7627 | Catawissa Water Authority | --- | --- | P | 480 | V | Dcsc/sssh |
| 51 | 4059-7627 | Bloomsburg Mills, Inc. | Kohl Brothers | 1940 | A | 490 | T | Do/lss |
| 52 | 4059-7627 | do. | do. | 1944 | A | 490 | T | Do/lss |
| 53 | 4059-7627 | do. | do. | 1964 | A | 490 | T | Do/lss |
| 56 | 4107-7632 | Millville Water Authority | Norman Hagenbuch | 1953 | P | 630 | V | Dmh/sh |
| 57 | 4103-7613 | Keystone Water Co. | Cresswell | 1957 | P | 500 | T | DSk/ls |
| 58 | 4103-7613 | do. | do. | 1957 | P | 500 | T | Do/lss |
| 59 | 4103-7613 | do. | do. | 1957 | P | 500 | T | Do/lss |
| 60 | 4107-7631 | Jerre Wright | --- | --- | C | 630 | V | Dmh/sh |
| 61 | 4056-7627 | Catawissa Water Authority | --- | --- | P | 480 | V | Dcsc/sssh |
| 62 | 4056-7627 | do. | --- | --- | P | 485 | V | Dcsc/sssh |
| 63 | 4059-7626 | Bloomsburg Packing Co. | Kohl Brothers | 1946 | N | 480 | V | Dmr/sh |
| 66 | 4104-7624 | Orangeville Water Co. | R. R. Hornberger | 1963 | P | 670 | W | Dcsc/sssh |
| 68 | 4103-7614 | Consolidated Cigar Corp. | Joseph Wright | 1957 | A | 540 | T | Swc/dls |
| 69 | 4103-7614 | do. | do. | 1957 | A | 540 | T | Swc/dls |
| 70 | 4103-7615 | Keystone Water Co. | Cresswell | 1957 | P | 525 | T | Swc/dls |
| 84 | 4057-7627 | Catawissa Water Authority | --- | --- | P | 475 | V | Dcsc/sssh |
| 85 | 4057-7627 | do. | Alvin Swank and Son | 1981 | P | 480 | V | Dcsc/sssh |
| 86 | 4102-7619 | Scenic Knolls | --- | 1950 | P | 605 | S | Swc/dls |
| 87 | 4102-7619 | do. | --- | 1964 | P | 610 | S | Swc/dls |
| 88 | 4102-7619 | do. | R. R. Hornberger | 1966 | P | 675 | S | Sb/sh |
| 90 | 4104-7619 | Yohey | Champion | 1978 | H | 980 | H | Dciv/sh |
| 91 | 4100-7621 | G. Breisch | do. | 1978 | H | 920 | H | Dtr/sssh |
| 92 | 4101-7621 | J. Johnson | Stackhouse | 1972 | H | 500 | V | Dmr/sh |
| 93 | 4100-7618 | Pete Diehl | Champion | 1977 | H | 670 | S | Dciv/sssh |
| 94 | 4100-7618 | B. Diehl | do. | 1977 | H | 740 | S | Dciv/sssh |
| 95 | 4104-7616 | Steve Yeager | do. | 1978 | H | 630 | S | Dmh/sh |
| 96 | 4105-7616 | Stanley Belles | W. C. Fenstemaker | 1970 | H | 970 | S | Dcsc/sssh |
| 97 | 4105-7616 | Ronald Davis | Champion | 1968 | H | 1,055 | H | Dciv/sssh |
| 98 | 4101-7618 | Don Shrader | Roy Zimmerman | 1967 | H | 510 | T | Dmr/sh |
| 99 | 4105-7620 | Alan Nagle | Champion | 1973 | H | 940 | S | Dcsc/sssh |
| 100 | 4105-7620 | Edward Fink | do. | 1971 | H | 930 | S | Dcsc/sssh |
| 101 | 4104-7621 | Robert Markle | do. | 1978 | H | 945 | S | Dcsc/sssh |
| 102 | 4101-7622 | Bloomsburg Carpet | R. R. Hornberger | 1966 | N | 495 | T | DSk/ls |
| 103 | 4103-7618 | St. Peter's Church | do. | 1967 | H | 700 | H | Sb/sh |
| 104 | 4100-7615 | Pennsylvania Department of Transportation | do. | 1966 | H | 880 | S | Dcsc/sssh |
| 105 | 4104-7618 | --- | do. | 1966 | H | 500 | T | Dmr/sh |
| 106 | 4102-7621 | D. Dickson | Stackhouse | 1977 | H | 645 | S | Swc/dls |
| 108 | 4101-7620 | Poloron | R. R. Hornberger | 1970 | N | 510 | V | Do/lss |
| 109 | 4102-7622 | Schultz Electroplating | do. | 1973 | N | 705 | S | Sb/sh |
| 110 | 4102-7622 | do. | do. | 1973 | N | 705 | S | Sb/sh |
| 111 | 4106-7622 | Fred Cleaver, Jr. | Clifton Buck | 1968 | H | 616 | T | Qgo/sg |
| 112 | 4105-7624 | Norpole | R. R. Hornberger | --- | H | 580 | T | Qgo/sg |
| 113 | 4105-7624 | Raymond Ribble | Virgil Buck | 1980 | H | 590 | T | Dcsc/sssh |
| 114 | 4106-7622 | Ray Messersmith | Stackhouse | --- | H | 580 | T | Dcsc/sssh |
| 115 | 4104-7624 | Keith Musselman | Champion | 1975 | H | 920 | S | Dcsc/sssh |
| 116 | 4102-7624 | Donald Thomas | Stackhouse | 1973 | H | 690 | H | Swc/dls |
| 117 | 4103-7625 | Judy Krumheller | do. | 1972 | H | 550 | S | Dcsc/sssh |
| 118 | 4103-7623 | Graig Gibney | Champion | 1974 | H | 955 | S | Dciv/sssh |
| 119 | 4103-7625 | Ed Campbell | Stackhouse | 1977 | H | 555 | S | Dcsc/sssh |
| 120 | 4103-7624 | R. Whitmeyer | Alvin Swank and Son | 1979 | H | 1,000 | S | Dtr/sssh |
| 121 | 4102-7604 | Charles Baylor | R. R. Hornberger | 1973 | H | 820 | S | Dtr/sssh |
| 122 | 4104-7623 | Edward Haugh | do. | 1966 | H | 890 | W | Dciv/sssh |
| 123 | 4104-7623 | James Cox | do. | 1968 | H | 880 | W | Dciv/sssh |
| 124 | 4102-7624 | Harry Wenner | Stackhouse | 1977 | H | 775 | S | Dmh/sh |
| 125 | 4102-7624 | Kingston | Champion | 1975 | H | 650 | S | Dmh/sh |
| 126 | 4102-7625 | Steve Truesdale | Ronald Randler | 1978 | H | 620 | W | Dmh/sh |
| 127 | 4102-7625 | Robert Beers | R. R. Hornberger | 1977 | H | 530 | T | Dmh/sh |
| 128 | 4101-7624 | Pennsylvania Power and Light Co. | do. | 1972 | C | 720 | S | Smk/lss |
| 129 | 4101-7628 | Carl Welliver | do. | 1967 | H | 560 | S | Dmh/sh |
| 130 | 4101-7628 | do. | --- | --- | H | 520 | V | Qgo/sg |
| 131 | 4101-7628 | Jim Kreamer | Clifton Buck | 1974 | H | 615 | S | Smk/sls |
| 132 | 4100-7624 | Joe Crawford | Stackhouse | 1976 | H | 485 | V | DSk/ls |
| 133 | 4100-7624 | Venice Koons | Champion | 1970 | H | 485 | V | Dmr/sh |

(CONTINUED)

| Total depth below land surface (feet) | Casing | | Depth(s) to water-bearing zone(s) (feet) | Static water level | | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hardness (mg/L) | Specific conductance (µmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depth (feet) | Diameter (inches) | | Depth below land surface (feet) | Date measured (mo/yr) | | | | | | |
| COUNTY | | | | | | | | | | | |
| 18 | --- | --- | --- | 11 | 6/80 | --- | --- | --- | --- | --- | Co- 1 |
| 282 | 32 | 6 | 115;163 | 83 | 4/81 | 1 | .03/1 | 1 | --- | 480 | 45 |
| 12 | --- | --- | --- | --- | --- | 60 | --- | --- | --- | --- | 47 |
| 202 | 48 | 8 | --- | 42 | 1/30 | --- | 5.6/185 | 24 | --- | --- | 48 |
| 205 | 14 | 10 | --- | 11 | 8/80 | --- | 1.2/45 | 3 | --- | --- | 49 |
| 498 | 94 | 8 | --- | 25 | 3/58 | --- | 3.2/542 | 8 | --- | --- | 51 |
| 550 | 115 | 10 | --- | 35 | 11/64 | --- | 13/1,170 | 24 | 462 | 980 | 52 |
| 420 | 77 | 12 | --- | 30 | 11/64 | --- | 3.8/620 | 24 | --- | --- | 53 |
| 500 | 21 | 8 | --- | --- | --- | 60 | .23/39 | 5 | 57 | 345 | 56 |
| 160 | 63 | 12 | --- | 31 | 6/81 | --- | 280/300 | 24 | 200 | --- | 57 |
| 90 | 75 | 12 | --- | 30 | 6/81 | --- | 340/200 | 24 | 240 | --- | 58 |
| 87 | 58 | 12 | --- | 32 | 6/81 | --- | 350/300 | 24 | 184 | --- | 59 |
| 225 | 40 | 8 | 92;140;200 | 5 | 5/81 | --- | 2.5/15 | 1 | 124 | 540 | 60 |
| 375 | --- | --- | --- | 14 | 7/80 | --- | .19/8 | 1 | --- | --- | 61 |
| 275 | 14 | 6 | --- | 11 | 8/80 | --- | .42/16 | 1 | 51 | 100 | 62 |
| 525 | 42 | 8 | --- | 7 | 5/46 | 225 | --- | --- | --- | --- | 63 |
| 465 | 16 | 6 | --- | 64 | 10/63 | --- | .39/28 | 25 | --- | --- | 66 |
| 284 | --- | 10 | --- | --- | --- | 200 | --- | --- | --- | --- | 68 |
| 151 | --- | 10 | --- | --- | --- | --- | --- | --- | --- | --- | 69 |
| 473 | 75 | 12 | 120;140;260; 340;390;420; 450 | 37 | 5/81 | 380 | 5.3/83 | 1 | 240 | 675 | 70 |
| 250 | 28 | 8 | --- | --- | --- | 55 | --- | --- | --- | --- | 84 |
| 448 | 30 | 8 | 30;60;95; 120;270 | --- | --- | 100 | --- | --- | --- | --- | 85 |
| 190 | --- | --- | --- | --- | --- | 8 | --- | --- | --- | --- | 86 |
| 402 | --- | --- | --- | --- | --- | 5 | --- | --- | --- | --- | 87 |
| 415 | 42 | 7 | 70;103;157 | 80 | 8/66 | 8 | .02/--- | --- | --- | --- | 88 |
| 275 | 20 | 6 | 205 | --- | --- | 5 | --- | --- | --- | --- | 90 |
| 200 | 20 | 6 | 125;160 | --- | --- | 6 | --- | --- | --- | --- | 91 |
| 70 | 22 | 6 | 42;68 | --- | --- | 30 | --- | --- | 290 | 470 | 92 |
| 165 | 20 | 6 | 130;158 | 48 | 9/81 | 15 | --- | --- | 34 | 90 | 93 |
| 150 | 20 | 6 | 135 | --- | --- | 5 | --- | --- | --- | --- | 94 |
| 150 | 44 | 6 | 130 | --- | --- | 10 | --- | --- | --- | --- | 95 |
| 75 | 40 | 6 | 60;70 | --- | --- | 20 | --- | --- | --- | --- | 96 |
| 100 | 20 | 6 | 74;98 | --- | --- | 5 | --- | --- | --- | --- | 97 |
| 120 | 71 | 6 | --- | --- | --- | 12 | --- | --- | 68 | 183 | 98 |
| 150 | 20 | 6 | 120 | --- | --- | --- | --- | --- | --- | --- | 99 |
| 100 | 20 | 6 | 75 | 25 | 5/71 | 15 | --- | --- | --- | --- | 100 |
| 125 | 90 | 6 | 105 | --- | --- | 8 | --- | --- | 17 | 51 | 101 |
| 95 | 36 | 6 | 60;90 | --- | 8/66 | 40 | .44/--- | --- | 222 | 516 | 102 |
| 175 | 30 | 6 | --- | 114 | 11/80 | 3 | .04/--- | --- | 102 | 200 | 103 |
| 80 | 47 | 6 | 75 | 32 | 5/66 | 30 | 1.7/--- | --- | --- | --- | 104 |
| 67 | 50 | 6 | 62 | 20 | 12/66 | 30 | 2.0/--- | --- | --- | --- | 105 |
| 173 | 21 | 6 | 110;165 | 101 | 11/80 | --- | --- | --- | 120 | 140 | 106 |
| 300 | 184 | 8 | 130;220;280 | 34 | 7/70 | 350 | 1.1/200 | 24 | 254 | 600 | 108 |
| 390 | 27 | 6 | --- | 40 | 6/73 | 9 | --- | --- | --- | --- | 109 |
| 495 | 21 | 6 | --- | 40 | 6/73 | 5 | --- | --- | --- | --- | 110 |
| 47 | 46 | 6 | --- | 18 | 7/68 | 20 | 1.7/--- | --- | 51 | 101 | 111 |
| 33 | 34 | 6 | 33 | 13 | --- | 50 | --- | --- | 34 | 82 | 112 |
| 62 | 55 | 6 | 62 | 24 | 4/76 | 20 | --- | --- | 51 | 70 | 113 |
| 120 | --- | --- | --- | 12 | 6/80 | --- | --- | --- | 68 | 125 | 114 |
| 175 | 70 | 6 | 105;150 | 80 | 6/80 | 7 | --- | --- | 17 | 50 | 115 |
| 151 | 98 | 6 | 150 | --- | --- | 14 | --- | --- | --- | --- | 116 |
| 61 | 31 | 6 | 38;60 | --- | --- | 8 | --- | --- | 85 | 135 | 117 |
| 100 | 40 | 6 | 75 | 7 | 6/80 | 12 | --- | --- | 17 | 100 | 118 |
| 193 | 42 | 6 | 165;190 | --- | --- | 8 | --- | --- | 68 | 120 | 119 |
| 400 | 60 | 6 | 175 | --- | --- | 1 | --- | --- | 34 | 58 | 120 |
| 215 | 20 | 6 | --- | 48 | --- | 5 | --- | --- | --- | --- | 121 |
| 75 | 33 | 6 | --- | 7 | 10/66 | 8 | .13/--- | --- | --- | --- | 122 |
| --- | 33 | 6 | 59;89;91 | 18 | 6/80 | 5 | .07/--- | --- | --- | --- | 123 |
| 223 | 50 | 6 | 190 | 40 | 4/77 | --- | --- | --- | 103 | 218 | 124 |
| 125 | 65 | 6 | 105;116 | --- | --- | 8 | --- | --- | --- | --- | 125 |
| 100 | 100 | 6 | --- | 43 | 6/80 | 13 | --- | --- | 34 | 65 | 126 |
| 66 | 36 | 6 | 40;63 | 5 | 4/77 | 30 | --- | --- | --- | --- | 127 |
| 200 | 41 | 6 | --- | 6 | 10/72 | --- | .37/12 | 24 | 171 | 260 | 128 |
| 175 | 24 | 6 | 76;93;130 | 44 | 8/80 | 3 | .02/--- | --- | 137 | 185 | 129 |
| --- | --- | --- | --- | 2 | 6/80 | --- | --- | --- | 68 | 90 | 130 |
| 125 | 50 | 6 | 105 | 100 | 10/74 | 10 | 1.00/--- | --- | 51 | 75 | 131 |
| 47 | 27 | 6 | 47 | 3 | 4/76 | 10 | 1.4/--- | --- | 308 | 380 | 132 |
| 53 | 35 | 6 | 45 | 15 | 3/70 | 30 | --- | --- | --- | --- | 133 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Co-134 | 4100-7624 | Isola | Champion | 1970 | H | 480 | V | Dmr/sh |
| 135 | 4101-7625 | Donald Meckley | --- | 1967 | H | 750 | S | Sru/sls |
| 136 | 4100-7625 | Amoco | Champion | 1974 | H | 495 | V | Sto/lsd |
| 137 | 4100-7627 | Mary Hill | Stackhouse | 1978 | H | 840 | S | Sru/sls |
| 138 | 4057-7626 | Catawissa Water Authority | --- | --- | P | 480 | V | Dcsc/sssh |
| 139 | 4056-7626 | do. | Alvin Swank and Son | 1979 | P | 780 | W | Dcsc/sssh |
| 140 | 4056-7626 | do. | do. | 1979 | P | 720 | W | Dcsc/sssh |
| 141 | 4101-7619 | U.S. Geological Survey | --- | 1979 | O | 500 | T | Qgo/sg |
| 142 | 4101-7618 | do. | --- | 1979 | O | 505 | T | Qgo/sg |
| 143 | 4102-7617 | do. | --- | 1979 | O | 490 | T | Qgo/sg |
| 144 | 4100-7618 | do. | --- | 1979 | U | 570 | S | Qt/sd |
| 146 | 4102-7618 | do. | --- | 1979 | U | 505 | T | Qgo/sg |
| 147 | 4102-7618 | do. | --- | 1979 | U | 500 | T | Qgo/sg |
| 148 | 4102-7617 | do. | --- | 1979 | U | 520 | T | Qgo/slt |
| 149 | 4102-7618 | do. | --- | 1979 | U | 510 | T | Qgo/sg |
| 150 | 4103-7616 | do. | --- | 1979 | U | 495 | T | Qgo/sg |
| 151 | 4104-7625 | do. | --- | 1979 | U | 585 | W | Qt/sd |
| 152 | 4059-7628 | do. | --- | 1979 | U | 470 | T | Qgo/sd |
| 153 | 4059-7628 | U.S. Geological Survey | --- | 1979 | U | 465 | T | Qgo/sg |
| 154 | 4059-7628 | do. | --- | 1979 | O | 470 | T | Qgo/sg |
| 155 | 4056-7627 | Susquehanna Dairy Association | --- | --- | N | 520 | S | Dcsc/sssh |
| 156 | 4102-7625 | Willard Thomas | Clifton Buck | 1956 | H | 550 | T | Swc/dls |
| 157 | 4101-7624 | James Magee | R. R. Hornberger | 1968 | H | 785 | S | Smk/sls |
| 158 | 4102-7621 | Robert Neyhard | do. | 1966 | H | 760 | H | Sb/sh |
| 159 | 4102-7617 | Harold Wertman | do. | 1975 | H | 485 | V | Swc/dls |
| 160 | 4102-7617 | do. | --- | --- | H | 485 | V | Qgo/sg |
| 161 | 4101-7622 | Bloomsburg Carpet Industries | R. R. Hornberger | 1977 | N | 495 | V | Sto/lsd |
| 162 | 4101-7621 | Col-Mont Vo-Tech | do. | 1967 | P | 565 | S | Swc/dls |
| 163 | 4101-7622 | Robert Holdren | do. | 1966 | H | 500 | V | Sto/lsd |
| 164 | 4101-7622 | John Wolf | --- | 1880 | H | 520 | S | Swc/dls |
| 165 | 4101-7621 | Cindy Yorty | Alvin Swank and Son | 1980 | H | 485 | V | Dmh/sh |
| 166 | 4101-7621 | Claire Wagner | Stackhouse | 1972 | H | 490 | V | Dmh/sh |
| 167 | 4101-7620 | Gerald Young | R. R. Hornberger | 1966 | H | 495 | V | Dmh/sh |
| 168 | 4101-7619 | Walter Hause | Alvin Swank and Son | 1979 | H | 520 | V | DSk/ls |
| 169 | 4101-7619 | John Horeck | Champion | 1973 | H | 520 | V | Sto/lsd |
| 170 | 4103-7614 | Pennsylvania Department of Transportation | --- | 1977 | U | 548 | T | Qgo/sg |
| 173 | 4103-7613 | do. | --- | 1977 | U | 472 | C | Do/lss |
| 182 | 4101-7620 | David Belles | Virgil Buck | 1975 | H | 525 | V | Don/lss |
| 183 | 4101-7620 | Richard Huber | Champion | 1976 | H | 515 | V | Do/lss |
| 184 | 4106-7637 | Allen Gardner | Virgil Buck | 1977 | H | 780 | H | Dmh/sh |
| 185 | 4104-7614 | Drew Heckman | Champion | 1968 | H | 660 | S | Dmh/sh |
| 186 | 4058-7628 | J. Streater | R. R. Hornberger | 1968 | I | 470 | V | Dmh/sh |
| 187 | 4059-7628 | L. Wintersteen | --- | --- | H | 490 | V | Dmr/sh |
| 188 | 4059-7628 | do. | --- | 1935 | H | 490 | V | Don/lss |
| 189 | 4059-7626 | Kawneer, Inc. | R. R. Hornberger | 1966 | N | 470 | V | Dmr/sh |
| 190 | 4100-7626 | do. | do. | 1966 | N | 475 | V | Dmr/sh |
| 191 | 4059-7624 | Wonderview Water Co. | do. | 1967 | P | 630 | S | Dtr/sssh |
| 192 | 4059-7624 | do. | --- | --- | P | 760 | S | Dtr/sssh |
| 193 | 4059-7624 | do. | R. R. Hornberger | 1977 | P | 760 | S | Dtr/sssh |
| 195 | 4103-7616 | Joseph Alley | Champion | 1972 | H | 515 | V | Swc/dls |
| 196 | 4101-7620 | Champion Valley Farms | --- | 1963 | N | 500 | T | Do/lss |
| 197 | 4101-7621 | do. | --- | 1963 | N | 500 | T | Do/lss |
| 198 | 4101-7621 | do. | --- | 1964 | N | 500 | T | Do/lss |
| 199 | 4101-7621 | do. | R. R. Hornberger | 1968 | N | 500 | T | Do/lss |
| 200 | 4103-7637 | Paul Whalon | Virgil Buck | 1972 | H | 575 | S | Dmh/sh |
| 201 | 4103-7615 | John DiBattista | Champion | 1975 | H | 530 | V | Swc/dls |
| 202 | 4101-7620 | Scott Sweeny | --- | --- | H | 505 | T | Qgo/sg |
| 203 | 4101-7620 | do. | --- | --- | H | 505 | T | Dmr/sh |
| 204 | 4102-7619 | Columbia County Development Authority | R. E. Kresge | 1970 | N | 510 | T | Swc/dls |
| 205 | 4102-7619 | do. | do. | 1970 | N | 510 | T | Swc/dls |
| 206 | 4102-7617 | Mifflin Township Water Authority | R. R. Hornberger | 1971 | P | 490 | T | Qgo/sg |
| 207 | 4102-7617 | do. | do. | 1974 | P | 490 | T | Qgo/sg |
| 209 | 4100-7618 | do. | Kohl Brothers | 1970 | P | 600 | W | Dcsc/sssh |
| 210 | 4056-7627 | Catawissa Lumber Co. | --- | --- | N | 550 | S | Dcsc/sssh |
| 211 | 4056-7627 | do. | --- | --- | N | 525 | S | Dcsc/sssh |
| 212 | 4101-7620 | Helen Rupert | --- | --- | H | 500 | T | Dmr/sh |
| 213 | 4101-7620 | do. | --- | --- | H | 500 | T | Qgo/sg |
| 214 | 4101-7625 | Paul Eyerly | R. R. Hornberger | 1978 | H | 695 | H | Smk/sls |
| 217 | 4202-7617 | Lupini | --- | --- | H | 505 | T | Dmr/sh |
| 218 | 4106-7633 | R. Eckroth | Stackhouse | 1978 | H | 740 | S | Dmh/sh |

(CONTINUED)

| Total depth below land surface (feet) | Casing Depth (feet) | Casing Diameter (inches) | Depth(s) to water-bearing zone(s) (feet) | Static water level: Depth below land surface (feet) | Static water level: Date measured (mo/yr) | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (μmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 75 | 30 | 6 | 40;60 | 20 | 3/70 | 12 | --- | --- | --- | --- | Co-134 |
| 280 | 51 | 6 | 210;270 | 60 | 1/67 | 8 | --- | --- | 111 | 220 | 135 |
| 75 | 40 | 6 | 52 | 5 | 6/80 | 15 | --- | --- | --- | --- | 136 |
| 173 | 61 | 6 | 165 | 33 | 6/80 | 8 | .10/3 | 1 | 68 | 85 | 137 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 138 |
| 400 | 43 | 8 | --- | --- | --- | 60 | .16/45 | 48 | --- | --- | 139 |
| 400 | 42 | 8 | 135;270 | --- | --- | 60 | .22/55 | 48 | --- | --- | 140 |
| 37 | 32 | 2 | --- | 20 | 6/80 | --- | --- | --- | --- | --- | 141 |
| 47 | 42 | 2 | --- | 23 | 6/80 | --- | --- | --- | --- | --- | 142 |
| 62 | 57 | 2 | --- | 21 | 6/80 | --- | --- | --- | --- | --- | 143 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 144 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 146 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 147 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 148 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 149 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 150 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 151 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 152 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 153 |
| 40 | 35 | 2 | --- | 12 | 6/80 | --- | --- | --- | --- | --- | 154 |
| 200 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 155 |
| 68 | 63 | 6 | --- | --- | --- | --- | --- | --- | 135 | 220 | 156 |
| 73 | 41 | 6 | 67 | 43 | 6/80 | 20 | 1.1/--- | --- | 51 | 135 | 157 |
| 215 | 18 | 6 | 90;148;174 | 50 | 6/66 | 15 | --- | --- | 103 | 210 | 158 |
| 70 | 24 | 6 | --- | 16 | 6/80 | 12 | --- | --- | 290 | 515 | 159 |
| 30 | --- | --- | --- | 17 | 6/80 | --- | --- | --- | 256 | 345 | 160 |
| 40 | 17 | 6 | --- | 10 | 12/80 | --- | --- | --- | --- | --- | 161 |
| 155 | 74 | 6 | 89;130;148 | 53 | 6/80 | --- | 1.8/40 | 48 | --- | --- | 162 |
| 95 | 22 | 6 | 45;71;90 | 1 | 8/66 | 12 | .13/--- | --- | 325 | 360 | 163 |
| 25 | --- | --- | --- | 13 | 6/80 | --- | --- | --- | 307 | 455 | 164 |
| 175 | --- | --- | --- | 13 | 6/80 | 2 | --- | --- | 256 | 380 | 165 |
| 60 | 47 | 6 | 59 | --- | --- | 14 | --- | --- | 290 | 420 | 166 |
| 63 | 31 | 6 | 50 | 25 | 6/80 | 3 | .08/--- | --- | 188 | 260 | 167 |
| 80 | 72 | 6 | --- | 49 | 6/80 | 35 | --- | --- | 222 | 360 | 168 |
| 100 | 40 | 6 | 85 | --- | --- | 7 | --- | --- | --- | --- | 169 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 170 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 173 |
| 80 | 50 | 6 | 50;80 | --- | --- | 10 | --- | --- | 188 | 280 | 182 |
| 225 | 40 | 6 | 175 | 30 | 6/80 | 5 | --- | --- | 137 | 205 | 183 |
| 275 | 20 | 6 | 100;200;250 | --- | --- | 3 | --- | --- | --- | --- | 184 |
| 75 | 20 | 6 | --- | F | 8/68 | 12 | --- | --- | --- | --- | 185 |
| 500 | 32 | 8 | 35;70;165; 360;470 | 12 | 7/68 | --- | 1.4/250 | 12 | --- | --- | 186 |
| 86 | --- | --- | --- | 16 | 7/80 | 30 | 18/32 | 1 | 188 | 490 | 187 |
| 119 | --- | --- | --- | --- | --- | 12 | --- | --- | 308 | 820 | 188 |
| 355 | 26 | 6 | 41;59;94;177 | 30 | 12/66 | --- | .06/20 | 3 | --- | --- | 189 |
| 415 | 24 | 10 | 40;68;118; 156;308 | 6 | 7/80 | 100 | .41/20 | 1 | 120 | 2,500 | 190 |
| 395 | 81 | 6 | 92;109;132; 261 | 35 | 1/67 | 30 | .11/28 | 48 | --- | --- | 191 |
| 375 | --- | --- | 265;335;367 | --- | --- | --- | .10/15 | 48 | --- | --- | 192 |
| 410 | 62 | 6 | --- | --- | --- | 30 | --- | --- | --- | --- | 193 |
| 75 | 31 | 6 | 53 | 21 | 7/80 | 10 | --- | --- | --- | --- | 195 |
| 268 | 45 | 7 | --- | 47 | 7/80 | 80 | --- | --- | --- | --- | 196 |
| 550 | 41 | 12 | --- | --- | --- | 250 | --- | --- | --- | --- | 197 |
| 600 | 40 | 8 | --- | --- | --- | 440 | --- | --- | --- | --- | 198 |
| 500 | 43 | 10 | 50;170;180 | 25 | 6/68 | --- | 1.3/218 | 24 | --- | --- | 199 |
| 92 | 21 | 6 | 85;92 | --- | --- | 6 | --- | --- | --- | --- | 200 |
| 100 | 70 | 6 | 70 | 35 | 8/80 | --- | 1.9/10 | 1 | 154 | 400 | 201 |
| 34 | --- | --- | --- | 33 | 7/80 | --- | --- | --- | --- | --- | 202 |
| 110 | --- | --- | --- | 38 | 12/80 | --- | --- | --- | 170 | 400 | 203 |
| 273 | --- | --- | --- | 31 | 10/80 | 85 | 7.4/141 | 48 | 180 | 430 | 204 |
| 248 | 62 | 6 | 130;160;190 | 32 | 8/80 | 77 | 1.1/136 | 48 | --- | --- | 205 |
| 60 | 57 | 6 | --- | 29 | 8/80 | 85 | 11/55 | --- | --- | --- | 206 |
| 63 | 53 | 8 | --- | --- | --- | 70 | 4.4/102 | --- | --- | --- | 207 |
| 310 | 70 | 8 | 80;200 | 42 | 8/70 | 12 | .06/--- | --- | --- | --- | 209 |
| 500 | --- | --- | --- | 78 | 8/80 | 3 | --- | --- | 86 | 295 | 210 |
| 465 | --- | --- | --- | --- | --- | 3 | --- | --- | 120 | 300 | 211 |
| 120 | 55 | 6 | 78;93;117 | 32 | 12/80 | --- | .50/16 | 2 | 137 | 340 | 212 |
| 33 | --- | --- | --- | 20 | 9/80 | --- | --- | --- | --- | --- | 213 |
| 315 | 37 | 6 | 180;300 | 90 | 1/78 | 2 | --- | --- | --- | --- | 214 |
| 65 | --- | --- | --- | 52 | 12/80 | --- | --- | --- | 137 | 250 | 217 |
| 348 | 21 | 6 | 110 | --- | --- | 1 | --- | --- | 137 | 360 | 218 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Co-219 | 4105-7633 | Dale Stiner | R. R. Hornberger | 1967 | H | 845 | H | Dmh/sh |
| 220 | 4106-7633 | S and S Auto Works | Clifton Buck | 1978 | H | 660 | V | Dmh/sh |
| 222 | 4106-7633 | Ted Heaps | Stackhouse | 1980 | H | 670 | V | Dmh/sh |
| 223 | 4106-7633 | do. | do. | 1980 | H | 680 | V | Dmh/sh |
| 224 | 4106-7633 | do. | do. | 1980 | H | 675 | V | Dmh/sh |
| 226 | 4106-7633 | James Nolan | Virgil Buck | 1978 | H | 750 | H | Dmh/sh |
| 227 | 4104-7630 | Stackhouse | Stackhouse | 1978 | H | 800 | S | Dtr/sssh |
| 228 | 4103-7631 | Dave Ortman | do. | 1978 | H | 1,000 | H | Dtr/sssh |
| 229 | 4103-7631 | do. | --- | --- | H | 1,000 | H | Dtr/sssh |
| 230 | 4103-7631 | Jack Rowe | Stackhouse | 1973 | H | 985 | H | Dtr/sssh |
| 231 | 4102-7631 | Roy Ruckle | Clifton Buck | 1975 | H | 750 | V | Dtr/sssh |
| 232 | 4102-7631 | do. | do. | 1960 | H | 770 | V | Dtr/sssh |
| 233 | 4102-7631 | do. | Stackhouse | 1978 | H | 770 | V | Dtr/sssh |
| 234 | 4106-7631 | Charles Laver | Clifton Buck | 1974 | H | 795 | S | Dmh/sh |
| 235 | 4106-7631 | Stine | --- | --- | H | 620 | V | Dmh/sh |
| 236 | 4104-7631 | do. | R. R. Hornberger | 1980 | S | 760 | V | Dtr/sssh |
| 237 | 4103-7632 | Eckroth | Virgil Buck | 1969 | H | 940 | H | Dtr/sssh |
| 238 | 4104-7630 | Frank Stackhouse | Stackhouse | 1973 | C | 775 | C | Dtr/sssh |
| 239 | 4104-7630 | do. | do. | 1963 | H | 770 | V | Dtr/sssh |
| 240 | 4103-7631 | Sandler | --- | --- | H | 930 | S | Dtr/sssh |
| 241 | 4104-7631 | L. Millard | Stackhouse | 1978 | H | 980 | H | Dciv/sssh |
| 242 | 4104-7631 | Cluane Bardo | do. | 1974 | S | 760 | S | Dtr/sssh |
| 243 | 4103-7632 | David Bowers | Stackhouse | 1973 | H | 840 | S | Dtr/sssh |
| 244 | 4103-7632 | Dutch Hill Church | do. | 1977 | H | 935 | S | Dtr/sssh |
| 245 | 4057-7627 | Catawissa Bottling | Alvin Swank and Son | 1981 | N | 550 | W | Dcsc/sssh |
| 246 | 4104-7630 | Randy Lawton | Stackhouse | 1972 | H | 590 | S | Dciv/sssh |
| 248 | 4104-7636 | James Cyphers | Ronald Randler | 1966 | H | 555 | V | Dmh/sh |
| 249 | 4104-7634 | Dale Zeisloft | Stackhouse | --- | H | 645 | S | Dmh/sh |
| 250 | 4105-7634 | Donald Zeisloft | Clifton Buck | 1974 | H | 680 | S | Dmh/sh |
| 251 | 4104-7634 | Steve Zeisloft | do. | 1975 | H | 650 | S | Dmh/sh |
| 252 | 4102-7633 | Urlich | Stackhouse | 1978 | H | 1,050 | H | Dtr/sssh |
| 253 | 4103-7635 | Myron Diehl | Clifton Buck | 1967 | H | 940 | S | Dtr/sssh |
| 254 | 4105-7634 | Rishel | do. | 1980 | H | 635 | W | Dmh/sh |
| 255 | 4106-7631 | Jerry Boone | do. | --- | H | 740 | H | Dmh/sh |
| 256 | 4135-7606 | Raymond Williams | R. R. Hornberger | 1966 | H | 745 | S | Dmh/sh |
| 257 | 4106-7633 | William Schneeweis | do. | 1976 | H | 720 | S | Dmh/sh |
| 258 | 4107-7632 | Dale Stackhouse | Virgil Buck | 1978 | H | 805 | H | Dmh/sh |
| 301 | 4100-7622 | U.S. Radium Corp. | Wieand Brothers | 1979 | O | 490 | T | Qgo/sg |
| 302 | 4100-7622 | do. | do. | 1980 | O | 490 | T | Qgo/sg |
| 303 | 4100-7622 | do. | do. | 1979 | O | 490 | T | Qgo/sg |
| 304 | 4102-7617 | U.S. Geological Survey | Alvin Swank and Son | 1980 | O | 490 | T | Sto/lsd |
| 305 | 4101-7618 | do. | do. | 1980 | O | 515 | T | Qgo/sg |
| 306 | 4101-7621 | do. | do. | 1980 | O | 490 | T | Dmr/sh |
| 307 | 4102-7616 | do. | do. | 1980 | O | 505 | T | Sto/lsd |
| 308 | 4102-7616 | do. | do. | 1980 | O | 495 | T | Qgo/sg |
| 309 | 4102-7618 | R. Lupini | --- | --- | H | 510 | T | Dmr/sh |
| 310 | 4100-7626 | William Coombs | Alvin Swank and Son | 1980 | C | 490 | T | DSk/ls |
| 311 | 4101-7618 | Foster Hudelson | --- | --- | H | 510 | T | Qgo/sg |
| 312 | 4058-7631 | Ray Gross | R. R. Hornberger | 1968 | H | 630 | S | Don/lss |
| 313 | 4101-7616 | Wilkes Pools | --- | --- | C | 880 | S | Dscs/sssh |
| 314 | 4058-7631 | Lycoming Sand Co. | Champion | 1977 | H | 645 | V | DSk/ls |
| 315 | 4059-7630 | James Roth | R. R. Hornberger | 1977 | H | 700 | S | Sb/sh |
| 316 | 4102-7620 | Arden Sitler | Champion | 1970 | H | 740 | S | Sb/sh |
| 317 | 4103-7619 | Orvil Weaver | do. | 1972 | H | 745 | T | Dh/sh |
| 318 | 4103-7619 | do. | do. | 1976 | H | 740 | T | Dmh/sh |
| 320 | 4103-7619 | Charles Sheatler | --- | 1971 | U | 720 | T | Dmh/sh |
| 321 | 4103-7619 | do. | --- | 1976 | H | 720 | T | Dmh/sh |
| 322 | 4103-7619 | do. | Champion | 1976 | H | 705 | T | Dmh/sh |
| 323 | 4103-7619 | Powlus | do. | 1971 | H | 580 | V | Swc/dls |
| 324 | 4103-7619 | C. Hornberger | do. | 1971 | H | 585 | V | Swc/dls |
| 325 | 4103-7619 | James Powlus | do. | 1971 | H | 585 | V | Swc/dls |
| 326 | 4103-7618 | Carl Strausser | --- | 1958 | H | 560 | V | Swc/dls |
| 327 | 4103-7618 | Jesse Traugh | R. R. Hornberger | 1967 | H | 540 | V | Swc/dls |
| 328 | 4103-7619 | Orvil Weaver | Champion | 1972 | H | 750 | T | Dh/sh |
| 329 | 4102-7613 | Lew Andrezzi | do. | 1969 | H | 500 | T | Dmh/sh |
| 330 | 4100-7624 | Liberty Chevrolet | --- | --- | H | 490 | T | Sto/lsd |
| 331 | 4059-7628 | Jeff Fritz | Stackhouse | 1980 | H | 500 | V | Smk/sls |
| 332 | 4059-7629 | Bell Telephone Co. | Wieand Brothers | 1974 | C | 500 | V | Smk/sls |
| 333 | 4104-7614 | Randall Kishbaugh | Champion | 1978 | H | 800 | S | Dmh/sh |
| 334 | 4104-7614 | do. | do. | 1975 | H | 805 | S | Dmh/sh |
| 335 | 4104-7618 | D. Tyson | do. | 1977 | H | 700 | S | Dmh/sh |
| 336 | 4104-7618 | Slovic | do. | 1975 | H | 785 | S | Dh/sh |
| 337 | 4104-7615 | Eskin | Roy Zimmerman | 1967 | H | 710 | S | Dmh/sh |
| 340 | 4103-7618 | Ralph Kelchner | Champion | 1972 | H | 580 | T | DSk/ls |
| 341 | 4103-7618 | Lillian Robbins | do. | 1974 | H | 570 | T | Swc/dls |

(CONTINUED)

| Total depth below land surface (feet) | Casing | | Depth(s) to water-bearing zone(s) (feet) | Static water level | | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (µmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depth (feet) | Diameter (inches) | | Depth below land surface (feet) | Date measured (mo/yr) | | | | | | |
| 205 | 21 | 6 | 25;63 | 26 | 9/80 | 2 | .03/--- | --- | 120 | 285 | Co-219 |
| 320 | --- | --- | --- | 10 | 9/80 | --- | .03/5 | 1 | 17 | 750 | 220 |
| 300 | 20 | 6 | --- | 12 | 9/80 | 1 | .03/1 | 1 | 17 | 775 | 222 |
| --- | 20 | 6 | --- | 18 | 9/80 | 1 | --- | --- | --- | --- | 223 |
| --- | 20 | 6 | --- | 15 | 9/80 | 1 | --- | --- | --- | --- | 224 |
| 185 | 40 | 6 | 130;175 | 18 | 9/80 | 4 | .03/--- | --- | 188 | 520 | 226 |
| --- | --- | --- | --- | 40 | 10/80 | --- | --- | --- | 68 | 190 | 227 |
| --- | --- | --- | --- | --- | --- | 2 | --- | --- | 51 | 130 | 228 |
| --- | --- | --- | --- | 31 | 10/80 | --- | --- | --- | 34 | 78 | 229 |
| 72 | --- | --- | --- | --- | --- | --- | --- | --- | 51 | 135 | 230 |
| 30 | 20 | 6 | 27 | --- | --- | 1 | .06/--- | --- | --- | --- | 231 |
| 80 | --- | --- | --- | --- | --- | --- | --- | --- | 34 | 92 | 232 |
| 40 | --- | --- | --- | --- | --- | --- | --- | --- | 51 | 210 | 233 |
| 90 | 20 | --- | 65;87 | --- | --- | 6 | .07/--- | --- | 188 | 360 | 234 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | 120 | 350 | 235 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | 51 | 144 | 236 |
| 65 | --- | --- | --- | --- | --- | --- | --- | --- | 34 | 92 | 237 |
| 123 | --- | --- | --- | 13 | 10/80 | --- | --- | --- | 34 | 165 | 238 |
| 123 | --- | --- | --- | 15 | 10/80 | --- | --- | --- | 34 | 125 | 239 |
| 240 | --- | --- | --- | 37 | 11/80 | --- | --- | --- | --- | --- | 240 |
| 123 | 41 | 6 | 118 | --- | --- | 10 | --- | --- | --- | --- | 241 |
| 200 | 21 | 6 | 180 | 1 | 10/80 | 12 | --- | --- | 51 | 200 | 242 |
| 104 | 21 | 6 | 101 | --- | --- | 6 | --- | --- | 51 | 195 | 243 |
| 142 | 40 | 6 | 62;128 | 49 | 11/80 | 15 | --- | --- | 34 | 58 | 244 |
| 440 | 40 | 8 | 72;94;204; 412 | 32 | 2/81 | --- | .12/40 | 22 | 120 | 385 | 245 |
| 90 | 28 | 6 | 85 | --- | --- | 8 | --- | --- | --- | --- | 246 |
| 90 | 22 | 6 | 55;85 | 10 | 7/66 | 4 | .05/--- | --- | --- | --- | 248 |
| 420 | --- | --- | --- | 16 | 11/80 | --- | --- | --- | 103 | 315 | 249 |
| 123 | 22 | 6 | 70;120 | 27 | 11/80 | 10 | .15/--- | --- | 86 | 305 | 250 |
| 70 | 20 | 6 | 65 | 32 | 5/75 | 6 | .20/--- | --- | --- | --- | 251 |
| 175 | --- | --- | --- | 40 | 11/80 | --- | --- | --- | --- | 120 | 252 |
| 55 | 20 | 6 | 51 | 19 | 5/67 | 6 | .21/--- | --- | --- | --- | 253 |
| 60 | --- | --- | --- | 12 | 11/80 | --- | --- | --- | 120 | 385 | 254 |
| 130 | 52 | 6 | 80;130 | --- | --- | --- | --- | --- | --- | --- | 255 |
| 115 | 21 | 6 | 45;65;108 | 15 | 6/66 | 5 | .05/--- | --- | --- | --- | 256 |
| 175 | 20 | 6 | 30 | 8 | 10/76 | --- | --- | --- | --- | --- | 257 |
| 140 | 22 | 6 | 110;130 | 30 | 2/78 | 6 | .06/--- | --- | 137 | 420 | 258 |
| 35 | 35 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 301 |
| 35 | 30 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 302 |
| 37 | 37 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 303 |
| 200 | 58 | 6 | 73;86;97; 182 | 28 | 12/80 | 100 | 21/19 | 1 | 154 | 280 | 304 |
| 68 | 68 | 6 | --- | 32 | 12/80 | 50 | 10/38 | 6 | 54 | 118 | 305 |
| --- | 42 | 6 | 60;74 | 21 | 6/81 | 25 | 1.7/17 | 1 | 188 | 395 | 306 |
| 300 | 47 | 6 | 62;96;116; 150;275 | 37 | 12/80 | 120 | 89/20 | 1 | 428 | 800 | 307 |
| 53 | 50 | --- | --- | 26 | 7/81 | 6 | 1.4/12 | 1 | --- | 800 | 308 |
| 69 | 40 | 6 | --- | 38 | 9/80 | --- | .44/5 | 1 | 86 | 220 | 309 |
| 360 | 40 | 8 | --- | 21 | 12/80 | 250 | 3.9/75 | 1 | 19 | 730 | 310 |
| 35 | --- | --- | --- | 32 | 10/80 | --- | --- | --- | --- | --- | 311 |
| 52 | 22 | 6 | 42 | 15 | 6/68 | 9 | .24/--- | --- | --- | --- | 312 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 313 |
| 150 | 45 | 6 | 130 | --- | --- | --- | --- | --- | --- | --- | 314 |
| 95 | 20 | 6 | 90 | 10 | 11/77 | --- | --- | --- | --- | --- | 315 |
| 175 | 20 | 6 | 75;145 | --- | --- | 8 | --- | --- | --- | --- | 316 |
| 75 | 40 | 6 | 40;63 | 8 | 7/72 | 6 | --- | --- | --- | --- | 317 |
| 100 | 20 | 6 | 70 | --- | --- | 8 | --- | --- | --- | --- | 318 |
| 100 | --- | --- | --- | 27 | 11/80 | --- | --- | --- | --- | --- | 320 |
| 200 | --- | 6 | --- | 35 | 11/80 | --- | --- | --- | 137 | 340 | 321 |
| 150 | 20 | 6 | 127 | --- | --- | 15 | --- | --- | --- | --- | 322 |
| 40 | 40 | 6 | --- | 8 | 11/80 | --- | --- | --- | --- | --- | 323 |
| 50 | 30 | 6 | 45 | --- | --- | 20 | --- | --- | --- | --- | 324 |
| 50 | --- | 6 | 45 | 12 | 2/71 | 20 | --- | --- | --- | --- | 325 |
| 85 | 16 | 6 | --- | 15 | 11/80 | 10 | --- | --- | 154 | 435 | 326 |
| 93 | 80 | 6 | 88 | 7 | 10/67 | 50 | 3.9/--- | --- | --- | --- | 327 |
| 100 | 40 | 6 | 75 | 50 | 8/72 | 5 | --- | --- | --- | --- | 328 |
| 125 | 28 | 6 | 100;115 | --- | --- | 10 | --- | --- | --- | --- | 329 |
| --- | --- | --- | --- | 11 | 12/80 | 20 | --- | --- | --- | 345 | 330 |
| 125 | 30 | 6 | --- | 12 | 12/80 | 5 | --- | --- | 103 | 300 | 331 |
| 350 | 43 | 6 | 84;262 | 2 | 11/74 | --- | .13/30 | 48 | 68 | 280 | 332 |
| 150 | 20 | 6 | --- | 31 | 12/80 | --- | --- | --- | --- | --- | 333 |
| 100 | 20 | 6 | 80 | 44 | 12/80 | 10 | --- | --- | --- | --- | 334 |
| 150 | 20 | 6 | 130 | 50 | 12/80 | 8 | --- | --- | --- | --- | 335 |
| 100 | 40 | 6 | 85 | 36 | 12/80 | --- | --- | --- | --- | --- | 336 |
| 133 | 26 | 6 | 88;100;128 | --- | --- | 10 | --- | --- | --- | --- | 337 |
| 75 | 22 | 6 | 48 | 23 | 11/72 | 14 | --- | --- | --- | --- | 340 |
| 75 | 45 | 6 | 55 | 15 | 8/74 | 20 | --- | --- | --- | --- | 341 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Co-342 | 4103-7619 | Bertie Dennis | Clifton Buck | 1967 | H | 565 | W | Dmh/sh |
| 343 | 4103-7619 | Nelson Kulf | do. | 1967 | H | 605 | S | Dmh/sh |
| 344 | 4101-7620 | Columbia County Development Authority | --- | 1977 | U | 515 | T | Qgo/sg |
| 345 | 4102-7619 | do. | --- | 1977 | U | 510 | T | Qgo/sg |
| 346 | 4102-7619 | do. | --- | 1977 | U | 520 | T | Qgo/sg |
| 347 | 4101-7619 | do. | --- | 1977 | U | 520 | T | Qgo/sg |
| 348 | 4102-7619 | Robert Krum | Stackhouse | 1980 | H | 510 | T | Do/lss |
| 349 | 4101-7619 | do. | --- | --- | H | 510 | T | Do/lss |
| 350 | 4058-7630 | W. Diehl | R. R. Hornberger | 1960 | H | 910 | H | Dtr/sssh |
| 351 | 4058-7630 | R. Fetterman | Wieand Brothers | 1960 | --- | 575 | S | Dmh/sh |
| 353 | 4100-7631 | R. Snyder | Stackhouse | 1973 | H | 625 | S | Dmh/sh |
| 354 | 4100-7632 | Eugene Wagner | R. R. Hornberger | 1966 | C | 880 | W | Dtr/sssh |
| 355 | 4101-7625 | James Vance | --- | --- | H | 700 | H | Smk/sls |
| 356 | 4103-7623 | Robert Thomas | Alvin Swank and Son | 1976 | H | 755 | S | Dmh/sh |
| 357 | 4102-7622 | Roland Michael | --- | 1940 | H | 735 | W | Sb/sh |
| 358 | 4102-7624 | Hock | --- | --- | H | 670 | S | Sb/sh |
| 359 | 4102-7624 | do. | --- | --- | H | 700 | S | Sb/sh |
| 360 | 4102-7621 | B. F. Haney | Clifton Buck | 1969 | H | 640 | W | Swc/dls |
| 361 | 4102-7622 | Robert Eckrote | do. | 1968 | H | 630 | S | Swc/dls |
| 362 | 4103-7621 | George Acornley | Alvin Swank and Son | 1975 | H | 700 | S | Dmh/sh |
| 363 | 4057-7628 | Charles Karns | --- | --- | H | 480 | V | Dcsc/sssh |
| 364 | 4058-7629 | Mildred Deussen | --- | --- | H | 860 | H | Dtr sssh |
| 365 | 4058-7627 | Pierce Breech | --- | --- | H | 775 | H | Dtr/sssh |
| 366 | 4059-7626 | Fay Young | Alvin Swank and Son | 1973 | H | 825 | H | Dtr/sssh |
| 367 | 4058-7626 | Charles Creasy | --- | --- | H | 830 | H | Dtr/sssh |
| 368 | 4058-7625 | William Slusser | Clifton Buck | --- | H | 885 | H | Dtr/sssh |
| 369 | 4104-7616 | Kenneth Helm | --- | --- | H | 640 | S | Dmh/sh |
| 370 | 4104-7615 | Jay Welsh | Champion | 1976 | H | 675 | S | Dmh/sh |
| 371 | 4102-7622 | Benard Bafile | Stackhouse | 1978 | H | 745 | S | Sb/sh |
| 372 | 4103-7629 | Clair Hock | Clifton Buck | 1971 | C | 540 | V | Dcsc/sssh |
| 373 | 4059-7627 | ARCO | Wieand Brothers | 1980 | O | 480 | T | Swc/dls |
| 374 | 4104-7617 | John Fester | R. R. Hornberger | 1967 | H | 680 | T | Dmh/sh |
| 375 | 4106-7628 | George Duncan | Virgil Buck | 1977 | H | 730 | S | Dmh/sh |
| 376 | 4106-7628 | do. | do. | 1963 | H | 700 | W | Dmh/sh |
| 377 | 4104-7628 | N. Gross | do. | 1978 | H | 1,010 | H | Dciv/sssh |
| 378 | 4105-7626 | Richard Puterbaugh | R. R. Hornberger | 1966 | H | 945 | S | Dciv/sssh |
| 379 | 4105-7624 | Matthew Zoppetti | --- | 1971 | H | 580 | V | Qgo/sg |
| 380 | 4107-7632 | Millville Water Authority | --- | 1980 | P | 630 | V | Qal/sg |
| 381 | 4102-7624 | William Botke | Alvin Swank and Son | --- | H | 760 | S | Sto/lsd |
| 382 | --- | --- | --- | --- | H | 585 | V | Dmh/sh |
| 383 | 4106-7626 | Amos Harvey | Clifton Buck | 1976 | H | 970 | S | Dtr/sssh |
| 384 | 4106-7626 | P. Cain | Virgil Buck | 1978 | H | 1,005 | S | Dtr/sssh |
| 385 | 4107-7625 | Calvin Brown | Clifton Buck | 1967 | H | 635 | V | Dmh/sh |
| 386 | 4106-7624 | Joseph White | do. | 1974 | H | 810 | H | Dtr/sssh |
| 387 | 4103-7625 | R. Kile | Stackhouse | 1978 | H | 785 | S | Dcsc/sssh |
| 388 | 4105-7627 | Francis Purcell | Clifton Buck | 1974 | H | 860 | S | Dciv/sssh |
| 389 | 4103-7615 | Sam's Auto Sales | --- | 1981 | H | 520 | T | Swc/dls |
| 390 | 4104-7628 | Robert Dewald | Clifton Buck | 1968 | H | 945 | H | Dcsc/sssh |
| 391 | 4104-7628 | Carl Shaner | R. R. Hornberger | 1966 | H | 890 | W | Dcsc/sssh |
| 392 | 4104-7628 | Harry Welliver | Clifton Buck | 1967 | H | 940 | H | Dciv/sssh |
| 393 | 4103-7628 | Howard Funk | do. | 1967 | H | 960 | H | Dcsc/sssh |
| 394 | 4102-7628 | Charles Turner | R. R. Hornberger | 1966 | H | 820 | H | Dtr/sssh |
| 395 | 4104-7629 | David Walters | --- | 1974 | H | 655 | V | Dtr/sssh |
| 396 | 4104-7630 | do. | --- | 1974 | H | 585 | V | Dciv/sssh |
| 397 | 4104-7630 | do. | Clifton Buck | 1974 | H | 585 | V | Dciv/sssh |
| 398 | 4103-7629 | Columbia Asphalt Co. | --- | --- | H | 620 | S | Dcsc/sssh |
| 399 | 4103-7629 | do. | --- | --- | C | 590 | S | Dcsc/sssh |
| 400 | 4104-7615 | John Magrone | --- | --- | H | 565 | W | Qgo/sg |
| 401 | 4104-7615 | do. | J. F. Harrison | 1979 | H | 565 | W | Dmr/sh |
| 402 | 4102-7618 | Briar Heights Lodge | R. R. Hornberger | 1976 | C | 590 | W | Sb/sh |
| 404 | 4100-7629 | Quality Inn | do. | 1973 | C | 645 | H | Swc/dls |
| 405 | 4101-7630 | Joseph Levan | Stackhouse | 1972 | H | 590 | W | Dmh/sh |
| 406 | 4105-7615 | Rothery | Champion | 1974 | H | 1,055 | S | Dciv/sssh |
| 407 | 4106-7621 | Earl Eveland | R. R. Hornberger | 1977 | H | 635 | V | Qgo/sg |
| 408 | 4104-7620 | Donald Miller | do. | 1966 | H | 685 | W | Dtr/sssh |
| 409 | 4105-7624 | Matthew Zoppetti | --- | 1973 | H | 575 | V | Qgo/sg |
| 410 | 4101-7629 | Craig Laidacker | R. R. Hornberger | 1966 | H | 475 | W | Sto/lsd |
| 411 | 4104-7628 | George Crawford | Stackhouse | 1975 | H | 950 | H | Dcsc/sssh |
| 412 | 4101-7627 | Barbara Pfleegor | R. R. Hornberger | 1973 | H | 585 | W | Dmh/sh |
| 413 | 4100-7625 | Mariano Construction Co. | Stackhouse | 1981 | H | 500 | V | Swc/dls |
| 414 | 4105-7615 | Richard Dent | Champion | 1974 | H | 1,015 | S | Dciv/sssh |
| 415 | 4105-7615 | Edward Shultz | do. | 1976 | H | 1,030 | S | Dciv/sssh |
| 416 | 4105-7615 | Alex Keris | do. | 1975 | H | 1,020 | S | Dciv/sssh |
| 417 | 4105-7615 | Edmund Persans | do. | 1974 | H | 1,020 | S | Dciv/sssh |
| 418 | 4105-7615 | Harold Grasley | do. | 1972 | H | 1,050 | H | Dcsc/sssh |
| 419 | 4105-7615 | Drue Hoffman | --- | 1966 | H | 1,040 | S | Dciv/sssh |
| 420 | 4105-7615 | Gary Kreischer | Champion | 1977 | H | 980 | S | Dciv/sssh |

(CONTINUED)

| Total depth below land surface (feet) | Casing: Depth (feet) | Casing: Diameter (inches) | Depth(s) to water-bearing zone(s) (feet) | Static water level: Depth below land surface (feet) | Static water level: Date measured (mo/yr) | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (μmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | 25 | 6 | 42 | 7 | 5/67 | 9 | .26/--- | --- | --- | --- | Co-342 |
| 65 | 40 | 6 | 61 | 28 | 5/67 | 10 | .43/--- | --- | --- | --- | 343 |
| 25 | 23 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 344 |
| 25 | 20 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 345 |
| 25 | 24 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 346 |
| 25 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 347 |
| 120 | 85 | 6 | --- | --- | --- | 6 | --- | --- | --- | --- | 348 |
| 54 | 39 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 349 |
| 303 | 35 | 6 | --- | 67 | 12/80 | 1 | --- | --- | --- | --- | 350 |
| 98 | --- | --- | --- | 19 | 11/78 | --- | --- | --- | --- | --- | 351 |
| 147 | 30 | 6 | --- | 26 | 12/78 | --- | --- | --- | --- | --- | 353 |
| 300 | 29 | 7 | 82;198;258 | 48 | 10/78 | 30 | .12/--- | --- | 51 | 101 | 354 |
| --- | --- | --- | --- | 57 | 12/80 | --- | --- | --- | 51 | 169 | 355 |
| 125 | 75 | 6 | --- | 50 | 12/80 | --- | --- | --- | --- | --- | 356 |
| 115 | 18 | 6 | --- | 45 | 12/80 | --- | --- | --- | --- | --- | 357 |
| --- | --- | --- | --- | 37 | 12/80 | --- | --- | --- | --- | --- | 358 |
| --- | --- | --- | --- | 13 | 12/80 | --- | --- | --- | --- | --- | 359 |
| 81 | --- | --- | --- | 25 | 12/80 | --- | --- | --- | --- | --- | 360 |
| 47 | 28 | 6 | 45 | 18 | 8/68 | 20 | 1.3/--- | --- | --- | --- | 361 |
| 125 | 20 | 6 | --- | 28 | 12/80 | --- | --- | --- | --- | --- | 362 |
| 82 | --- | --- | --- | 33 | 12/80 | --- | --- | --- | --- | --- | 363 |
| --- | --- | --- | --- | 32 | 12/80 | --- | --- | --- | 51 | 109 | 364 |
| 160 | --- | --- | --- | 66 | 12/80 | --- | --- | --- | 51 | 98 | 365 |
| 300 | --- | --- | --- | 31 | 12/80 | --- | --- | --- | --- | --- | 366 |
| --- | --- | --- | --- | 31 | 12/80 | --- | --- | --- | --- | --- | 367 |
| 120 | 32 | 6 | --- | 42 | 12/80 | --- | --- | --- | --- | --- | 368 |
| 150 | 55 | 6 | --- | 14 | 12/80 | --- | --- | --- | --- | --- | 369 |
| 125 | 40 | 6 | 70;120 | 43 | 12/80 | --- | --- | --- | --- | --- | 370 |
| 174 | --- | --- | --- | 37 | 3/81 | --- | .18/3 | 1 | 51 | 110 | 371 |
| 85 | --- | --- | --- | 9 | 4/81 | --- | .67/17 | 2 | 51 | 177 | 372 |
| --- | --- | --- | --- | 15 | 4/81 | --- | --- | --- | --- | --- | 373 |
| 115 | 35 | 6 | 75;85;108 | 75 | 5/67 | 8 | .20/--- | --- | --- | --- | 374 |
| 130 | 23 | 6 | 90;120 | 17 | 5/81 | 7 | .06/--- | --- | 103 | 210 | 375 |
| 68 | 20 | 6 | --- | 17 | 5/81 | --- | --- | --- | 137 | 340 | 376 |
| 170 | 32 | 6 | 87;155 | 56 | 6/81 | 7 | .06/--- | --- | 17 | 45 | 377 |
| 90 | 45 | 6 | 50;78 | 27 | 5/81 | 5 | .14/--- | --- | 34 | 63 | 378 |
| 45 | 45 | 6 | --- | --- | --- | --- | --- | --- | 34 | 94 | 379 |
| 18 | 18 | 48 | --- | --- | --- | 100 | --- | --- | 34 | 140 | 380 |
| 200 | 184 | 6 | --- | 139 | 5/81 | 70 | 4.9/7 | 1 | --- | --- | 381 |
| 320 | --- | --- | --- | F | 1/81 | --- | --- | --- | --- | 4500 | 382 |
| 100 | 31 | 6 | 60;100 | --- | --- | 4 | --- | --- | --- | --- | 383 |
| 230 | 20 | 6 | 175;210 | 90 | 12/78 | 5 | .04/--- | --- | --- | --- | 384 |
| 51 | 40 | 6 | 48 | 12 | 9/67 | 21 | 1.1/--- | --- | 34 | 85 | 385 |
| 207 | 23 | 6 | 175 | 145 | 11/74 | 4 | .06/--- | --- | 68 | 125 | 386 |
| 248 | 62 | 6 | 123;241 | --- | --- | 20 | --- | --- | 34 | 104 | 387 |
| 76 | 47 | 6 | 72 | 28 | 9/74 | 8 | .17/--- | --- | --- | --- | 388 |
| --- | --- | --- | --- | 38 | 5/81 | --- | --- | --- | 180 | 495 | 389 |
| 133 | 23 | 6 | 78;130 | 64 | 12/68 | 7 | .12/--- | --- | --- | --- | 390 |
| 175 | 20 | 6 | 71;138 | --- | --- | 8 | --- | --- | 68 | 160 | 391 |
| 134 | --- | 6 | 77;130 | 71 | 11/67 | 10 | .18/--- | --- | 34 | 86 | 392 |
| 127 | 20 | 6 | 94;125 | 72 | 4/67 | 10 | .20/--- | --- | --- | --- | 393 |
| 255 | 23 | 6 | 176 | 67 | 8/66 | 2 | .03/--- | --- | 51 | 110 | 394 |
| 56 | 41 | 6 | 56 | --- | --- | --- | --- | --- | --- | --- | 395 |
| 50 | 30 | 6 | 45 | --- | --- | 7 | --- | --- | --- | --- | 396 |
| 50 | 30 | 6 | 43 | 8 | 8/74 | 10 | .37/--- | --- | --- | --- | 397 |
| --- | --- | --- | --- | 29 | 4/81 | --- | --- | --- | --- | --- | 398 |
| --- | --- | --- | --- | 60 | 4/81 | --- | --- | --- | --- | --- | 399 |
| 30 | --- | --- | --- | 23 | 5/81 | --- | --- | --- | --- | --- | 400 |
| 67 | 65 | 6 | 65 | 28 | 5/81 | 40 | 4.0/--- | --- | --- | --- | 401 |
| 414 | 20 | 6 | --- | 19 | 2/76 | 200 | --- | --- | --- | --- | 402 |
| 179 | 106 | 10 | --- | 69 | 5/73 | 75 | --- | --- | 154 | 300 | 404 |
| 75 | 29 | 6 | 74 | --- | --- | 17 | --- | --- | 51 | 148 | 405 |
| 100 | 40 | 6 | 80 | --- | --- | 8 | --- | --- | --- | --- | 406 |
| 40 | 43 | 6 | --- | 19 | 1/77 | 15 | --- | --- | --- | --- | 407 |
| 435 | 24 | 6 | 45;97;376 | 15 | 6/66 | 3 | --- | --- | 34 | 300 | 408 |
| 64 | 64 | 6 | --- | 10 | 4/73 | 20 | 1.00/--- | --- | --- | --- | 409 |
| 63 | 30 | 6 | 60 | 34 | 10/66 | 10 | .53/--- | --- | 189 | 425 | 410 |
| 198 | 21 | 6 | 198 | 93 | 6/81 | 6 | --- | --- | 51 | 120 | 411 |
| 31 | 22 | 6 | --- | 6 | 6/81 | 30 | --- | --- | --- | --- | 412 |
| 73 | --- | --- | --- | 9 | 6/81 | 20 | 3.6/8 | 1 | 137 | 320 | 413 |
| 150 | 21 | 6 | 115 | --- | --- | 6 | --- | --- | --- | --- | 414 |
| 175 | 75 | 6 | 135 | --- | --- | 6 | --- | --- | --- | --- | 415 |
| 150 | 60 | 6 | 120 | --- | --- | 7 | --- | --- | --- | --- | 416 |
| 175 | 60 | 6 | 154 | --- | --- | 10 | --- | --- | 17 | 47 | 417 |
| 150 | 20 | 6 | 133 | 76 | 6/81 | 8 | --- | --- | 34 | 71 | 418 |
| 130 | 106 | 6 | 110;125 | 65 | 10/66 | 7 | .13/--- | --- | 86 | 200 | 419 |
| 100 | 70 | 6 | 78 | --- | --- | 8 | --- | --- | --- | --- | 420 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Co-421 | 4105-7615 | William Kreischer | Champion | 1977 | H | 890 | S | Dciv/sssh |
| 422 | 4106-7616 | Camp Louise | do. | 1969 | H | 1,120 | S | Mmc/sssh |
| 423 | 4107-7616 | do. | --- | --- | H | 1,130 | S | Mmc/sssh |
| 424 | 4105-7615 | Eugene Collins | Champion | 1970 | H | 1,040 | H | Dciv/sssh |
| 425 | 4106-7615 | Kenneth Hess | do. | 1973 | H | 1,020 | S | Dcsc/sssh |
| 426 | 4106-7615 | Donald Lynn | do. | 1973 | H | 990 | S | Dcsc/sssh |
| 427 | 4106-7616 | Leonard Wilkinson | do. | 1974 | H | 930 | S | Dcsc/sssh |
| 428 | 4105-7616 | Lester Seely | do. | 1975 | H | 925 | S | Dciv/sssh |
| 429 | 4104-7617 | Lewis Abrams | R. R. Hornberger | 1977 | H | 900 | S | Dtr/sssh |
| 430 | 4106-7616 | David Hook | Champion | 1974 | H | 940 | S | Dcsc/sssh |
| 431 | 4105-7616 | Joseph Zowalski | do. | 1972 | H | 985 | S | Dcsc/sssh |
| 432 | 4105-7616 | Kenneth Slusser | do. | 1974 | H | 990 | S | Dcsc/sssh |
| 433 | 4105-7616 | David Whitenight | do. | 1977 | H | 960 | S | Dciv/sssh |
| 434 | 4105-7616 | John Stevens | do. | 1976 | H | 950 | S | Dciv/sssh |
| 435 | 4106-7614 | Jack Dent | do. | 1973 | H | 1,000 | S | Dciv/sssh |
| 436 | 4104-7625 | Klingerman Boarding | --- | 1960 | H | 580 | V | Dcsc/sssh |
| 437 | 4101-7625 | Light Street Grange | --- | 1929 | H | 595 | S | Sb/sh |
| 438 | 4106-7614 | Curtis Fultz | Champion | 1972 | H | 1,020 | S | Dciv/sssh |
| 439 | 4106-7614 | Jack Beck | do. | 1973 | H | 980 | W | Dcsc/sssh |
| 440 | 4105-7613 | Reba Richards | --- | --- | H | 710 | W | Dtr/sssh |
| 441 | 4101-7621 | Gary Swisher | --- | --- | H | 500 | T | Don/lss |
| 443 | 4101-7621 | William Jones | --- | --- | H | 500 | T | Dmr/sh |
| 446 | 4101-7621 | Baker Trailer Park | --- | --- | P | 520 | S | Sto/lss |
| 448 | 4101-7621 | Champion Valley Farms | Wieand Brothers | 1981 | N | 500 | T | Do/lss |
| 452 | 4101-7622 | Bloomsburg Water Co. | R. R. Hornberger | 1967 | P | 500 | T | Dmr/sh |
| 453 | 4101-7627 | Gary Hock | Alvin Swank and Son | 1979 | H | 650 | S | Swc/dls |
| 454 | 4101-7627 | Thomas Shaffer | --- | 1980 | H | 610 | S | Dmh/sh |
| 455 | 4102-7622 | E. O. Franz, Sr. | --- | 1960 | H | 695 | S | Sb/sh |
| 456 | 4101-7627 | Columbia County Waste Authority 1 | Stackhouse | 1974 | O | 640 | W | Sto/lsd |
| 457 | 4101-7627 | Columbia County Waste Authority 4 | --- | --- | H | 650 | S | Swc/dls |
| 458 | 4101-7627 | Columbia County Waste Authority 5 | Stackhouse | 1974 | O | 655 | S | Swc/dls |
| 459 | 4101-7627 | Columbia County Waste Authority 6 | do. | 1974 | O | 665 | H | Sto/lsd |
| 460 | 4101-7627 | Columbia County Waste Authority 7 | do. | 1974 | O | 530 | W | Sb/sh |
| 461 | 4101-7627 | Columbia County Waste Authority 8 | do. | 1974 | O | 640 | W | Sb/sh |
| 462 | 4101-7627 | M. Anderson | --- | --- | H | 490 | V | Sb/sh |
| 463 | 4101-7627 | Shultz | --- | --- | H | 490 | V | Sb/sh |
| 464 | 4100-7614 | Cy Mowery | R. R. Hornberger | 1966 | H | 1,025 | S | Dcd/sssh |
| 465 | 4100-7614 | Lee Schell | --- | 1976 | H | 930 | H | Dcsc/sssh |
| 466 | 4102-7613 | Richard Yoder | Champion | 1974 | H | 782 | S | Dtr/sssh |
| 467 | 4101-7620 | Helen Rupert | --- | 1981 | H | 500 | T | Dmr/sh |
| 468 | 4101-7620 | do. | --- | 1981 | H | 500 | T | Dmr/sh |
| 469 | 4106-7613 | William Carrathers | Champion | 1972 | H | 1,010 | S | Dcsc/sssh |
| 470 | 4106-7613 | Martin Carrathers | do. | 1972 | H | 982 | S | Dcsc/sssh |
| 471 | 4100-7614 | Pennsylvania Department of Transportation | R. R. Hornberger | 1966 | H | 835 | W | Dcsc/sssh |
| 472 | 4101-7614 | Arlen Payne | Champion | 1974 | H | 804 | S | Dciv/sssh |
| 473 | 4105-7618 | Frank Rivera | --- | 1975 | H | 950 | S | Dcsc/sssh |
| 474 | 4105-7618 | Jay Welsh | Champion | 1974 | H | 940 | S | Dcsc/sssh |
| 501 | 4105-7618 | David Laubach | do. | 1973 | H | 950 | S | Dcsc/sssh |
| 502 | 4103-7617 | Briar Creek Park | Alvin Swank and Son | 1973 | P | 670 | H | Swc/dls |
| 503 | 4105-7617 | Darvin Bower | Champion | 1977 | H | 1,010 | S | Dcsc/sssh |
| 504 | 4105-7618 | John Hrinda | --- | 1958 | H | 880 | W | Dcsc/sssh |
| 505 | 4101-7621 | Champion Valley Farms | Wieand Brothers | 1981 | N | 500 | T | Sto/lsd |
| 506 | 4104-7619 | Wayne Girton | Champion | 1975 | H | 950 | S | Dcsc/sssh |
| 507 | 4105-7618 | Clarence O'Neal | do. | 1973 | H | 975 | H | Dcsc/sssh |
| 508 | 4105-7618 | Robert Gower | do. | 1972 | H | 965 | H | Dcsc/sssh |
| 509 | 4105-7618 | Doyle Keck | do. | 1972 | H | 980 | H | Dcsc/sssh |
| 510 | 4105-7617 | William Farrell | do. | 1973 | H | 970 | H | Dcsc/sssh |
| 511 | 4105-7617 | Karl Pennebaker | do. | 1974 | H | 1,000 | S | Dcsc/sssh |
| 512 | 4105-7618 | John Shultz | do. | 1978 | H | 940 | S | Dcsc/sssh |
| 513 | 4105-7618 | Shultz | do. | 1974 | H | 950 | S | Dcsc/sssh |
| 514 | 4104-7617 | Thelma Keck | do. | 1972 | H | 750 | S | Dciv/sssh |
| 515 | 4104-7617 | do. | Stackhouse | 1979 | H | 750 | S | Dciv/sssh |
| 516 | 4105-7618 | Rodney Diehl | Champion | 1972 | H | 910 | S | Dcsc/sssh |
| 517 | 4105-7618 | Cindy Weaver | do. | 1974 | H | 910 | S | Dcsc/sssh |
| 518 | 4105-7618 | R. Samsel | do. | 1977 | H | 925 | S | Dcsc/sssh |
| 519 | 4105-7618 | Eldon Benjamin | do. | 1968 | H | 1,025 | S | Dcsc/sssh |
| 520 | 4104-7621 | John Babich | --- | 1968 | H | 825 | W | Dtr/sssh |
| 521 | 4058-7629 | A and S Auto Body | Stackhouse | 1979 | H | 495 | V | Dmr/sh |
| 522 | 4100-7614 | Michael Bobraski | R. R. Hornberger | 1977 | H | 925 | W | Dcsc/sssh |
| 523 | 4101-7615 | Gary Frace | Champion | 1970 | H | 870 | H | Dciv/sssh |

(CONTINUED)

| Total depth below land surface (feet) | Casing Depth (feet) | Casing Diameter (inches) | Depth(s) to water-bearing zone(s) (feet) | Static water level: Depth below land surface (feet) | Static water level: Date measured (mo/yr) | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hardness (mg/L) | Specific conductance (µmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 70 | 6 | 76 | --- | --- | 6 | --- | --- | 34 | 93 | Co-421 |
| 150 | 20 | 6 | 110;135 | --- | --- | 8 | --- | --- | 17 | 19 | 422 |
| --- | --- | --- | --- | 32 | 6/81 | --- | --- | --- | 17 | 20 | 423 |
| 185 | 60 | 6 | 140;175 | 113 | 6/81 | 10 | --- | --- | 17 | 41 | 424 |
| 100 | 40 | 6 | 85 | --- | --- | 8 | --- | --- | 17 | 47 | 425 |
| 100 | 20 | 6 | 80 | 10 | 1/79 | 12 | --- | --- | 34 | 78 | 426 |
| 125 | 20 | 6 | 115 | 26 | 6/81 | 8 | --- | --- | 68 | 158 | 427 |
| 125 | 40 | 6 | 95 | --- | --- | 8 | --- | --- | 34 | 74 | 428 |
| 90 | 20 | 6 | 60 | 40 | 1/77 | 5 | --- | --- | --- | --- | 429 |
| 100 | 20 | 6 | 80 | --- | --- | 10 | --- | --- | --- | --- | 430 |
| 100 | 30 | 6 | 84 | 30 | 8/72 | 7 | --- | --- | --- | --- | 431 |
| 175 | 20 | 6 | 140 | --- | --- | 5 | --- | --- | --- | --- | 432 |
| 100 | 20 | 6 | 74 | --- | --- | 6 | --- | --- | --- | --- | 433 |
| 125 | 40 | 6 | 104 | 55 | 6/81 | 7 | --- | --- | 17 | 47 | 434 |
| 150 | 40 | 6 | 60;120 | --- | --- | 12 | --- | --- | --- | --- | 435 |
| 90 | --- | --- | --- | 15 | 8/81 | --- | .12/4 | 3 | 103 | 278 | 436 |
| 145 | 90 | 6 | --- | 29 | 7/81 | --- | .64/3 | 1 | 51 | 112 | 437 |
| 175 | 60 | 6 | 80;162 | 80 | 7/72 | 16 | --- | --- | 34 | 87 | 438 |
| 175 | 100 | 6 | 155 | --- | --- | 10 | --- | --- | --- | --- | 439 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | 34 | 150 | 440 |
| --- | --- | --- | --- | 19 | 4/82 | --- | --- | --- | 291 | 580 | 441 |
| --- | --- | --- | --- | 19 | 4/82 | --- | --- | --- | --- | --- | 443 |
| --- | --- | --- | --- | 14 | 4/82 | --- | --- | --- | --- | --- | 446 |
| 155 | 32 | 8 | 142;152 | 26 | 8/81 | 150 | 2.2/200 | 28 | 395 | 750 | 448 |
| 500 | 54 | 7 | 110;171;330; 361;410 | 28 | 5/81 | 60 | .84/34 | 1 | 137 | 335 | 452 |
| --- | --- | --- | --- | 25 | 7/81 | --- | --- | --- | 120 | 255 | 453 |
| --- | --- | --- | --- | 63 | 7/81 | --- | --- | --- | 34 | 70 | 454 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 234 | 455 |
| 220 | 62 | 6 | --- | 120 | 6/79 | 24 | --- | --- | --- | --- | 456 |
| --- | --- | --- | --- | 101 | 7/81 | --- | 2.7/9 | 1 | 171 | 290 | 457 |
| 170 | 29 | 6 | 92 | 54 | 7/79 | --- | --- | --- | --- | 213 | 458 |
| 190 | 39 | 6 | 130 | 114 | 7/81 | --- | 1.7/11 | 1 | 137 | 275 | 459 |
| 125 | 26 | 6 | 26 | 9 | 7/81 | 15 | .36/3 | 1 | 86 | 200 | 460 |
| 200 | 29 | --- | 86;96;125;170 | 77 | 7/81 | 12 | .05/2 | 2 | --- | 920 | 461 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 462 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 463 |
| 85 | 24 | 6 | 80 | 45 | 12/66 | 30 | --- | --- | 17 | 60 | 464 |
| 125 | 30 | 6 | 90;105 | 40 | 4/76 | 22 | --- | --- | 34 | 97 | 465 |
| 100 | 20 | 6 | 75 | --- | --- | 6 | --- | --- | 34 | 108 | 466 |
| 106 | --- | --- | 78;93 | 30 | 6/81 | --- | .13/5 | 1 | 120 | 300 | 467 |
| 90 | --- | --- | --- | 33 | 7/81 | --- | .05/3 | 1 | 120 | 330 | 468 |
| 105 | 60 | 6 | 90 | 65 | 9/72 | 8 | --- | --- | --- | --- | 469 |
| 100 | 80 | 6 | 85 | --- | --- | 8 | --- | --- | --- | --- | 470 |
| 80 | 65 | 6 | 72 | 7 | 6/66 | 50 | 3.9/--- | --- | --- | --- | 471 |
| 165 | 40 | 6 | 80;155 | --- | --- | 10 | --- | --- | --- | --- | 472 |
| --- | --- | --- | --- | 27 | 8/81 | --- | --- | --- | 17 | 34 | 473 |
| 125 | 42 | 6 | 96 | --- | --- | 8 | --- | --- | --- | --- | 474 |
| 100 | 35 | 6 | 65 | 23 | 8/81 | 7 | --- | --- | --- | --- | 501 |
| 250 | --- | --- | --- | 111 | 8/81 | --- | .34/25 | 8 | --- | --- | 502 |
| 125 | 60 | 6 | 100 | 84 | 8/81 | 6 | 3.4/9 | 1 | 34 | 50 | 503 |
| 36 | --- | --- | --- | 15 | 11/81 | --- | 2.4/20 | 1 | 34 | 67 | 504 |
| 570 | 40 | 8 | 112;275;460; 550 | 15 | 9/81 | 360 | 2.0/280 | 24 | 154 | 300 | 505 |
| --- | 30 | 6 | --- | 113 | 8/81 | --- | .08/3 | 1 | 34 | 70 | 506 |
| 125 | 40 | 6 | 95 | 74 | 8/81 | 6 | --- | --- | --- | --- | 507 |
| 120 | 25 | 6 | 105 | --- | --- | 8 | --- | --- | --- | --- | 508 |
| 135 | 36 | 6 | 118 | 40 | 7/72 | 10 | --- | --- | 34 | 84 | 509 |
| 200 | 40 | 6 | 80 | --- | --- | 5 | --- | --- | 34 | 60 | 510 |
| 150 | 80 | 6 | 120 | --- | --- | 8 | --- | --- | --- | --- | 511 |
| 100 | 35 | 6 | 78 | --- | --- | 8 | --- | --- | --- | --- | 512 |
| 125 | 42 | 6 | 103 | --- | --- | 6 | --- | --- | --- | --- | 513 |
| 125 | 20 | 6 | 98 | 48 | 8/72 | 7 | --- | --- | --- | --- | 514 |
| 323 | --- | --- | --- | --- | --- | 3 | --- | --- | 86 | 205 | 515 |
| 75 | 42 | 6 | 63 | 5 | 11/72 | 8 | --- | --- | --- | --- | 516 |
| 150 | 40 | 6 | 95;120 | --- | --- | 8 | --- | --- | --- | --- | 517 |
| 150 | 80 | 6 | 130 | --- | --- | 10 | --- | --- | 17 | 47 | 518 |
| 150 | 70 | 6 | 130 | 29 | 8/81 | 10 | --- | --- | --- | --- | 519 |
| 85 | 20 | 6 | 39;71;80 | 15 | 4/68 | 5 | .07/--- | --- | 51 | 180 | 520 |
| 123 | 41 | 6 | 112 | 5 | 9/81 | --- | --- | --- | 68 | 350 | 521 |
| 135 | 23 | 6 | 55;127 | 60 | 3/77 | 10 | --- | --- | --- | 185 | 522 |
| 150 | 40 | 6 | 75;150 | --- | --- | 6 | --- | --- | 51 | 153 | 523 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Co-524 | 4101-7615 | Glen Whitmore | Champion | 1970 | H | 830 | H | Dciv/sssh |
| 525 | 4101-7616 | James Hyde | do. | 1974 | H | 865 | S | Dtr/sssh |
| 526 | 4106-7621 | Twin Bridges County Park | Wieand Brothers | 1976 | P | 625 | T | Qgo/sg |
| 527 | 4106-7621 | Ruth Sterner | --- | 1967 | H | 625 | T | Qgo/sg |
| 528 | 4105-7619 | David McMurtrie | Champion | 1973 | H | 900 | S | Dcsc/sssh |
| 555 | 4100-7614 | Mike Grant | --- | 1981 | H | 925 | H | Dcsc/sssh |
| 556 | 4100-7614 | Kenneth Haskell | Champion | 1969 | H | 870 | W | Dcsc/sssh |
| 557 | 4100-7615 | Gordon Derr | do. | 1970 | H | 902 | S | Dciv/sssh |
| 558 | 4101-7618 | Charmaine Keefer | Clifton Buck | 1968 | H | 510 | T | Dmh/sh |
| 559 | 4104-7619 | Edward Ruckel | --- | 1976 | H | 875 | W | Dcsc/sssh |
| 560 | 4104-7619 | John Rakich | Champion | 1973 | H | 960 | S | Dciv/sssh |
| 561 | 4104-7619 | Charles Wike | do. | 1976 | H | 960 | S | Dciv/sssh |
| 562 | 4058-7625 | Hitoshi Sato | Ronald Randler | 1981 | H | 880 | H | Dtr/sssh |
| 563 | 4104-7620 | Rodney Grasley | Champion | 1973 | H | 685 | V | Dtr/sssh |
| 564 | 4103-7619 | Gerald Wolfe | Clifton Buck | 1968 | H | 600 | S | Dmh/sh |
| 565 | 4105-7621 | Lester Dietterick | Champion | 1978 | H | 1,000 | S | Dcsc/sssh |
| 566 | 4105-7616 | Ronald Davis | do. | 1974 | H | 1,055 | H | Dciv/sssh |
| 567 | 4104-7621 | William Correll | Stackhouse | 1981 | H | 780 | W | Dciv/sssh |
| 568 | 4058-7631 | William Berger | Clifton Buck | 1968 | H | 595 | S | Dmr/sh |
| 569 | 4102-7622 | Evelyn Stauffer | Stackhouse | 1973 | H | 730 | H | Sb/sh |
| 570 | 4101-7625 | Harold Buch | --- | 1979 | H | 770 | S | Smk/sls |
| 571 | 4059-7627 | ARCO | Wieand Brothers | 1980 | O | 480 | T | Swc/dls |
| 572 | 4059-7627 | do. | do. | 1980 | O | 480 | T | Swc/dls |
| 573 | 4059-7627 | do. | do. | 1980 | O | 480 | T | Swc/dls |
| 574 | 4100-7631 | R. Snyder | --- | 1973 | H | 625 | S | Dmh/sh |
| 575 | 4059-7630 | Benard George | Alvin Swank and Son | 1972 | H | 1,000 | W | Srl/sls |
| 576 | 4059-7631 | William McGinley | do. | 1977 | H | 900 | W | Srl/sls |
| 577 | 4059-7632 | Ben Mourey | R. R. Hornberger | 1969 | H | 825 | W | Sru/sls |
| 578 | 4059-7633 | Kenneth Girton | do. | 1974 | H | 790 | W | Sru/sls |
| 584 | 4055-7627 | Rohrbach Farms | Roy Zimmerman | 1968 | H | 965 | H | Dcsc/sssh |
| 585 | 4104-7631 | R. Faust | --- | 1974 | H | 970 | S | Dciv/sssh |
| 586 | 4101-7625 | Scerbo Medical Center | Stackhouse | 1981 | H | 685 | H | Smk/sls |
| | | | | | | | | LUZERNE |
| Lu-368 | 4104-7609 | Beach Haven Fire | Champion | 1973 | C | 540 | S | Dmh/sh |
| 369 | 4105-7612 | Virgil Rhinard | R. R. Hornberger | 1966 | H | 1,010 | S | Dciv/sssh |
| 370 | 4105-7611 | Arthur Varner | Champion | 1974 | H | 820 | S | Dh/sh |
| 371 | 4105-7610 | Herb Brader | do. | 1972 | H | 840 | S | Dh/sh |
| 372 | 4105-7611 | Bill Weadon | do. | 1974 | H | 810 | S | Dmh/sh |
| 373 | 4104-7611 | Nebbie DiAugstine | do. | 1974 | H | 640 | S | Dmr/sh |
| 375 | 4106-7612 | Bart Gunther | R. R. Hornberger | 1967 | H | 1,020 | W | Dcsc/sssh |
| 376 | 4105-7613 | Harold Kessler | Champion | 1973 | H | 910 | W | Dtr/sssh |
| 377 | 4105-7612 | Larue Bogart | do. | 1976 | H | 880 | W | Dtr/sssh |
| 378 | 4106-7612 | Earl Keller | do. | 1973 | H | 1,010 | S | Dciv/sssh |
| 380 | 4102-7609 | Larry Kline | --- | 1974 | H | 880 | W | Dtr/sssh |
| 381 | 4102-7610 | do. | Champion | 1974 | H | 940 | W | Dciv/sssh |
| 382 | 4102-7610 | Donald Steinhaver | --- | 1974 | H | 910 | W | Dciv/sssh |
| 383 | 4102-7610 | Whitmire | Champion | 1974 | H | 900 | W | Dciv/sssh |
| 384 | 4102-7610 | Tom Aten | do. | 1974 | H | 875 | W | Dciv/sssh |
| 385 | 4102-7608 | Roland Deischaine | do. | 1974 | H | 960 | W | Dcsc/sssh |
| 417 | 4103-7613 | Pennsylvania Department of Transportation | --- | 1977 | U | 480 | C | Dmr/sh |
| 418 | 4103-7613 | do. | --- | 1977 | U | 486 | C | Dmr/sh |
| 419 | 4104-7608 | Salem Township | Champion | 1970 | H | 580 | S | Dmh/sh |
| 420 | 4105-7608 | Michail Mont | do. | 1972 | H | 560 | S | Dmh/sh |
| 421 | 4104-7610 | Steven Zwolinski | Clifton Buck | 1968 | H | 540 | S | Dmh/sh |
| 422 | 4104-7610 | Gene Kmetovicz | do. | 1967 | H | 570 | S | Dmh/sh |
| 423 | 4104-7610 | Wellington Davenport | --- | --- | H | 515 | V | Dmh/sh |
| 424 | 4104-7610 | Gene Killian | Clifton Buck | 1967 | H | 535 | S | Dmh/sh |
| 425 | 4104-7610 | Steve Molnor | Champion | 1976 | H | 560 | S | Dmh/sh |
| 426 | 4104-7609 | Robert Price | R. R. Hornberger | 1967 | H | 645 | T | Dmh/sh |
| 427 | 4104-7609 | George Griffin | Reichard | 1957 | H | 645 | T | Dmh/sh |
| 428 | 4104-7609 | Robert Price | R. R. Hornberger | 1973 | H | 560 | S | Dmh/sh |
| 429 | 4106-7608 | Fred Hummel | Champion | 1976 | P | 540 | T | Dtr/sssh |
| 430 | 4104-7608 | Clarence Fox | --- | 1946 | H | 500 | V | Dmh/sh |
| 431 | 4104-7613 | Bennie Naunczek | Champion | 1977 | H | 640 | S | Dmh/sh |
| 432 | 4104-7613 | do. | do. | 1976 | C | 640 | S | Dmh/sh |
| 433 | 4104-7613 | Robert Pinterich | do. | 1976 | H | 640 | S | Dmr/sh |
| 434 | 4104-7609 | William Davis | do. | 1973 | H | 525 | V | Dmh/sh |
| 436 | 4104-7609 | Russel Burke | do. | 1973 | H | 560 | S | Dmh/sh |
| 437 | 4104-7610 | Sheldon Molyneaux | do. | 1974 | H | 538 | S | Dmh/sh |
| 438 | 4104-7611 | Watts | Virgil Buck | 1980 | H | 740 | H | Dmr/sh |
| 439 | 4105-7608 | Pennsylvania Power and Light Co. | --- | 1970 | U | 820 | S | Dmh/sh |
| 440 | 4105-7608 | do. | --- | 1970 | U | 722 | S | Dmh/sh |
| 441 | 4105-7608 | do. | --- | 1970 | U | 677 | T | Qgo/sg |
| 442 | 4105-7608 | do. | --- | 1970 | U | 661 | T | Dmh/sh |

(CONTINUED)

| Total depth below land surface (feet) | Casing | | Depth(s) to water-bearing zone(s) (feet) | Static water level | | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (μmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depth (feet) | Diameter (inches) | | Depth below land surface (feet) | Date measured (mo/yr) | | | | | | |
| 90 | 40 | 6 | 70 | --- | --- | 10 | --- | --- | 34 | 95 | Co-524 |
| 175 | 20 | 6 | 145 | 64 | 9/81 | 6 | --- | --- | 51 | 111 | 525 |
| 50 | 47 | 8 | --- | 7 | 9/81 | 60 | --- | --- | --- | --- | 526 |
| 28 | 31 | 6 | --- | 10 | 7/67 | 20 | --- | --- | --- | --- | 527 |
| 200 | 35 | 6 | 115;173 | --- | --- | 8 | --- | --- | --- | --- | 528 |
| 300 | --- | --- | --- | 67 | 9/81 | --- | --- | --- | --- | --- | 555 |
| 75 | 40 | 6 | 65 | --- | --- | 30 | --- | --- | --- | --- | 556 |
| 150 | 40 | 6 | 90;130 | --- | --- | 20 | --- | --- | 17 | 53 | 557 |
| 55 | 56 | 6 | 52 | 19 | 7/68 | 20 | .65/--- | --- | 68 | 225 | 558 |
| 275 | 33 | 6 | 150;250 | --- | --- | 8 | --- | --- | --- | --- | 559 |
| 200 | 40 | 6 | 160 | --- | --- | 10 | --- | --- | --- | --- | 560 |
| 200 | 45 | 6 | 176 | --- | --- | 6 | --- | --- | --- | --- | 561 |
| 151 | 28 | 6 | 70 | 46 | 10/81 | 20 | .14/9 | 4 | 68 | 160 | 562 |
| 75 | 20 | 6 | 55 | 4 | 9/81 | 6 | --- | --- | 51 | 115 | 563 |
| 40 | 20 | 6 | 38 | --- | 9/81 | 10 | .30/--- | --- | 120 | 120 | 564 |
| 80 | 80 | 6 | --- | 35 | 11/81 | 20 | 3.8/17 | 1 | 17 | 26 | 565 |
| 175 | 20 | 6 | 70;160 | --- | --- | 8 | --- | --- | --- | --- | 566 |
| 98 | --- | --- | --- | 7 | 11/81 | 20 | .34/12 | 2 | 51 | 148 | 567 |
| 81 | 57 | 6 | 62;78 | 20 | 10/68 | 16 | 2.0/--- | --- | --- | --- | 568 |
| 120 | 20 | 6 | --- | --- | --- | 16 | --- | --- | 68 | 137 | 569 |
| 300 | 20 | 6 | --- | 109 | 12/81 | 20 | --- | --- | 103 | 158 | 570 |
| 68 | 68 | 10 | --- | 18 | 9/80 | --- | 11/175 | 5 | --- | --- | 571 |
| 30 | 30 | 6 | --- | 20 | 9/80 | --- | 3.1/10 | 5 | --- | --- | 572 |
| 30 | 30 | 10 | --- | 14 | 4/82 | --- | --- | --- | --- | --- | 573 |
| 147 | 30 | 6 | --- | 26 | 12/78 | --- | --- | --- | --- | --- | 574 |
| 175 | 40 | 6 | --- | --- | --- | 19 | --- | --- | --- | --- | 575 |
| 125 | 42 | 6 | --- | 29 | 10/78 | --- | --- | --- | --- | --- | 576 |
| 190 | 90 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 577 |
| 115 | 80 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 578 |
| 235 | 64 | 6 | 81;120;230 | --- | --- | 18 | --- | --- | 68 | 225 | 584 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | 34 | 86 | 585 |
| 198 | --- | --- | --- | --- | --- | 15 | --- | --- | 103 | 220 | 586 |
| COUNTY | | | | | | | | | | | |
| 100 | 25 | 6 | 70 | 40 | 4/73 | 12 | --- | --- | 128 | 255 | Lu-368 |
| 95 | 40 | 6 | 55;85 | 25 | 10/66 | 9 | .14/--- | --- | 85 | 111 | 369 |
| 125 | 113 | 6 | 120 | --- | --- | 7 | --- | --- | --- | --- | 370 |
| 100 | 68 | 6 | 75 | 34 | 12/80 | 12 | --- | --- | --- | --- | 371 |
| 125 | 40 | 6 | 98 | 38 | 12/80 | 6 | --- | --- | --- | --- | 372 |
| 275 | 30 | 6 | 60;240 | --- | --- | 4 | --- | --- | 103 | 210 | 373 |
| 215 | 21 | 6 | 119;210 | 80 | 9/67 | 3 | .26/--- | --- | --- | --- | 375 |
| 300 | 35 | 6 | 180;215 | --- | --- | 5 | --- | --- | --- | --- | 376 |
| 125 | 20 | 6 | 86 | --- | --- | 7 | --- | --- | --- | --- | 377 |
| 125 | 80 | 6 | 105 | --- | --- | 8 | --- | --- | --- | --- | 378 |
| 140 | 42 | 6 | 80;130 | --- | --- | --- | --- | --- | --- | --- | 380 |
| 140 | 20 | 6 | 85;135 | --- | --- | 15 | --- | --- | --- | --- | 381 |
| 170 | 42 | 6 | 125;165 | 35 | 4/74 | 25 | --- | --- | 85 | 220 | 382 |
| 175 | 20 | 6 | 130;155 | --- | --- | 6 | --- | --- | --- | --- | 383 |
| 125 | 40 | 6 | 95 | --- | --- | 8 | --- | --- | 34 | 125 | 384 |
| 275 | 21 | 6 | 140;270 | --- | --- | --- | --- | --- | --- | --- | 385 |
| 16 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 417 |
| 49 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 418 |
| 175 | 20 | 6 | 155 | --- | --- | 12 | --- | --- | 171 | 295 | 419 |
| 100 | 20 | 6 | 76 | 5 | 7/80 | 6 | --- | --- | 171 | 230 | 420 |
| 145 | 20 | 6 | --- | 36 | 8/68 | 20 | 1.4/--- | --- | 171 | 300 | 421 |
| 85 | 21 | 6 | 64;82 | 22 | 12/67 | 14 | .35/--- | --- | 103 | 120 | 422 |
| --- | --- | --- | --- | 11 | 7/80 | --- | .32/2 | 1 | 120 | 220 | 423 |
| 100 | 29 | 6 | 57;92 | --- | --- | 20 | .41/--- | --- | 171 | 340 | 424 |
| 150 | 20 | 6 | 132 | --- | --- | 6 | --- | --- | 171 | 345 | 425 |
| 160 | 109 | 6 | 120;155 | 63 | 10/80 | 20 | .31/--- | --- | 86 | 200 | 426 |
| 98 | --- | --- | --- | 62 | 7/80 | --- | --- | --- | 86 | 220 | 427 |
| 125 | 62 | 6 | --- | 48 | 8/73 | --- | --- | --- | 68 | 190 | 428 |
| 90 | 80 | 6 | 87 | --- | --- | 10 | --- | --- | --- | --- | 429 |
| 55 | 16 | 6 | --- | --- | --- | --- | --- | --- | 154 | 310 | 430 |
| 125 | 20 | 6 | 120 | 25 | 7/80 | 15 | --- | --- | --- | --- | 431 |
| 100 | 20 | 6 | 72 | 14 | 7/80 | 10 | --- | --- | 120 | 255 | 432 |
| 175 | 20 | 6 | 140 | 35 | 7/80 | 5 | --- | --- | 154 | 335 | 433 |
| 100 | 20 | 6 | 80 | 7 | 7/80 | 6 | .08/5 | 1 | 137 | 295 | 434 |
| 100 | 20 | 6 | 85 | --- | --- | 8 | --- | --- | 154 | 410 | 436 |
| 50 | 20 | 6 | 35 | 2 | 7/80 | 15 | --- | --- | 137 | 340 | 437 |
| 230 | 21 | 6 | 85;220 | 71 | 8/70 | 15 | .10/2 | 1 | 137 | 300 | 438 |
| 445 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 439 |
| 74 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 440 |
| 231 | 117 | 6 | --- | 65 | 12/70 | --- | --- | --- | --- | --- | 441 |
| 198 | 68 | 6 | --- | 54 | 12/70 | --- | --- | --- | --- | --- | 442 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Lu-443 | 4105-7608 | Pennsylvania Power and Light Co. | --- | 1970 | U | 657 | S | Dmh/sh |
| 444 | 4105-7608 | do. | --- | 1970 | U | 643 | S | Dmh/sh |
| 445 | 4105-7608 | do. | --- | 1970 | U | 663 | S | Dmh/sh |
| 446 | 4105-7608 | do. | --- | 1970 | U | 642 | S | Qal/sg |
| 447 | 4105-7608 | do. | --- | 1970 | U | 640 | S | Dmh/sh |
| 448 | 4105-7608 | do. | --- | 1970 | U | 683 | S | Dmh/sh |
| 449 | 4105-7608 | do. | --- | 1970 | U | 663 | T | Qgo/sg |
| 450 | 4105-7608 | do. | --- | 1970 | U | 607 | T | Qgo/sg |
| 451 | 4105-7611 | Samuel Knorr | Clifton Buck | 1967 | H | 860 | S | Dtr/sssh |
| 452 | 4104-7609 | U.S. Geological Survey | Alvin Swank and Son | 1980 | O | 645 | T | Qgo/sg |
| 453 | 4104-7609 | do. | --- | 1980 | O | 550 | S | Dmh/sh |
| 454 | 4103-7611 | do. | Alvin Swank and Son | 1980 | O | 530 | T | Dmh/sh |
| 455 | 4103-7611 | do. | do. | 1980 | O | 530 | T | Qgo/sg |
| 456 | 4104-7609 | Brad Smith | do. | 1980 | H | 580 | T | Dmh/sh |
| 457 | 4101-7613 | John Robbins | Champion | 1976 | H | 510 | V | Dtr/sssh |
| 458 | 4104-7608 | Malvern Wolfe | do. | 1970 | H | 500 | T | Dh/sh |
| 459 | 4202-7609 | Hoyt Readler | R. R. Hornberger | 1967 | H | 975 | S | Dciv/sssh |
| 460 | 4203-7612 | Robert Selic | Champion | 1975 | H | 580 | T | Dmh/sh |
| 461 | 4105-7611 | Wilson Vandermark | R. R. Hornberger | 1959 | H | 945 | S | Dtr/sssh |
| 462 | 4105-7611 | Gerald Karchner | do. | 1967 | H | 835 | S | Dh/sh |
| 463 | 4105-7612 | Richard Bognar | --- | 1976 | H | 880 | S | Dtr/sssh |
| 464 | 4105-7611 | Debra Golomb | Champion | 1970 | H | 700 | W | Dmh/sh |
| 465 | 4104-7613 | Bennie Naunczek | do. | 1971 | H | 780 | S | Dmh/sh |
| 466 | 4104-7613 | Larry Feissnor | do. | 1973 | H | 760 | S | Dmh/sh |
| 468 | 4103-7612 | William Seigfred | --- | 1976 | H | 500 | T | Dmr/sh |
| 469 | 4103-7612 | Walter Ryman | --- | 1980 | S | 590 | H | Dmh/sh |
| 471 | 4103-7609 | Rudy Felix | --- | --- | H | 500 | T | Dmh/sh |
| 472 | 4105-7608 | Pennsylvania Power and Light Co. | --- | 1970 | U | 649 | S | Dmh/sh |
| 473 | 4105-7608 | do. | --- | 1970 | U | 702 | S | Dmh/sh |
| 474 | 4105-7608 | do. | --- | 1970 | U | 667 | S | Dmh/sh |
| 475 | 4105-7608 | do. | --- | 1970 | U | 680 | S | Dmh/sh |
| 476 | 4105-7608 | do. | --- | 1970 | U | 683 | S | Dmh/sh |
| 477 | 4105-7608 | do. | --- | 1970 | U | 646 | W | Dmh/sh |
| 478 | 4105-7608 | do. | --- | 1970 | U | 667 | S | Dmh/sh |
| 479 | 4105-7608 | do. | --- | 1970 | U | 704 | S | Dmh/sh |
| 481 | 4105-7609 | William Sink | --- | --- | H | 675 | T | Dmh/sh |
| 482 | 4103-7611 | William Zettle | --- | 1958 | H | 615 | T | Dmh/sh |
| 483 | 4106-7607 | Pennsylvania Power and Light Co. | --- | 1973 | U | 505 | T | Dtr/sssh |
| 484 | 4105-7607 | do. | --- | 1973 | U | 505 | T | Qgo/sg |
| 485 | 4105-7607 | do. | --- | --- | U | 505 | T | Qgo/sg |
| 486 | 4105-7607 | do. | --- | 1973 | N | 501 | T | Qgo/sg |
| 487 | 4105-7607 | do. | --- | 1972 | N | 505 | T | Qgo/sg |
| 488 | 4105-7607 | do. | --- | 1972 | U | 505 | T | Qgo/sg |
| 489 | 4105-7608 | do. | --- | 1972 | U | 505 | T | Qgo/sg |
| 490 | 4105-7608 | do. | --- | 1973 | N | 615 | T | Qgo/sg |
| 491 | 4105-7608 | do. | --- | 1973 | N | 620 | T | Qgo/sg |
| 492 | 4106-7610 | John Krisanda | Champion | 1975 | H | 940 | S | Dtr/sssh |
| 493 | 4106-7610 | Lemuel Sitler | do. | 1973 | H | 885 | W | Dciv/sssh |
| 494 | 4106-7610 | George Honse | do. | 1975 | H | 805 | W | Dciv/sssh |
| 495 | 4106-7610 | Frank Peters | do. | 1976 | H | 930 | S | Dciv/sssh |
| 496 | 4106-7610 | do. | do. | 1972 | H | 940 | S | Dciv/sssh |
| 497 | 4106-7609 | Russel Baer | do. | 1981 | H | 880 | S | Dciv/sssh |
| 498 | 4106-7610 | Thomas Holloway | do. | 1974 | H | 960 | S | Dcsc/sssh |
| 499 | 4106-7611 | Frank Bloom | do. | 1976 | H | 1,040 | S | Dcsc/sssh |
| 500 | 4101-7610 | Harold Seward | --- | 1976 | H | 922 | S | Dcsc/sssh |
| 501 | 4102-7610 | Mark Adams | --- | 1974 | H | 910 | H | Dciv/sssh |
| 502 | 4101-7611 | Callahan | Champion | 1974 | H | 930 | H | Dcsc/sssh |
| 503 | 4102-7611 | Orville Benjamin | --- | 1974 | H | 903 | S | Dtr/sssh |
| 504 | 4105-7613 | Harry Bombushime | Champion | 1973 | H | 1,040 | H | Dtr/sssh |
| 505 | 4105-7613 | Donald McCoy | do. | 1974 | H | 960 | W | Dtr/sssh |
| 506 | 4105-7613 | Michael Kennedy | do. | 1974 | H | 1,000 | W | Dtr/sssh |
| 507 | 4100-7608 | Charles Jurewicz | --- | 1974 | H | 990 | H | Mmc/sssh |
| 508 | 4101-7612 | David Fuller | --- | 1974 | H | 865 | S | Dcsc/sssh |
| 509 | 4106-7612 | Jim Switzer | Champion | 1972 | H | 1,015 | S | Dciv/sssh |
| 510 | 4101-7612 | Wilton Shiner | Roy Zimmerman | 1967 | H | 842 | W | Dcsc/sssh |
| 512 | 4107-7609 | Robert Boston | Champion | 1973 | H | 878 | S | Dcsc/sssh |
| 513 | 4107-7610 | William Crisbell | do. | 1972 | U | 885 | S | Dcsc/sssh |
| 514 | 4106-7610 | Nick Dalberto | do. | 1976 | U | 1,030 | W | Dciv/sssh |
| 515 | 4106-7610 | Paul Reichard | do. | 1973 | H | 950 | W | Dciv/sssh |
| 516 | 4104-7610 | Beach Haven Community Board | --- | 1968 | H | 510 | V | Dmh/sh |
| 517 | 4106-7608 | Pennsylvania Power and Light Co. | Champion | 1977 | H | 520 | T | Dtr/sssh |

(CONTINUED)

| Total depth below land surface (feet) | Casing | | Depth(s) to water-bearing zone(s) (feet) | Static water level | | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (µmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depth (feet) | Diameter (inches) | | Depth below land surface (feet) | Date measured (mo/yr) | | | | | | |
| 110 | 9 | 6 | --- | 17 | 9/70 | --- | --- | --- | --- | --- | Lu-443 |
| 227 | 47 | 6 | --- | 32 | 12/70 | --- | --- | --- | --- | --- | 444 |
| 144 | --- | --- | --- | 21 | 12/70 | --- | --- | --- | --- | --- | 445 |
| 168 | 38 | --- | --- | 29 | 12/70 | --- | --- | --- | --- | --- | 446 |
| 263 | 42 | --- | --- | 35 | 12/70 | --- | --- | --- | --- | --- | 447 |
| 117 | 17 | --- | --- | 29 | 12/70 | --- | --- | --- | --- | --- | 448 |
| 208 | 101 | --- | --- | 62 | 12/70 | --- | --- | --- | --- | --- | 449 |
| 176 | 95 | 2 | --- | 14 | 12/70 | --- | --- | --- | --- | --- | 450 |
| 117 | 52 | 6 | 113 | 32 | 8/80 | 8 | .09/--- | --- | 34 | 75 | 451 |
| --- | 100 | 6 | --- | 62 | 10/80 | 20 | 84/60 | 1 | --- | 237 | 452 |
| 300 | 56 | 6 | 92;145;220 | 51 | 10/80 | 5 | .05/4 | 2 | 68 | 233 | 453 |
| 200 | 56 | 6 | 75;130 | 22 | 12/80 | 6 | .13/10 | 3 | 103 | 138 | 454 |
| 55 | 55 | 6 | --- | 20 | 12/80 | 30 | 12/36 | 4 | 34 | 82 | 455 |
| 130 | 50 | 6 | --- | 36 | 10/80 | --- | --- | --- | 86 | 135 | 456 |
| 35 | 30 | 6 | 33 | 12 | --- | 12 | --- | --- | --- | --- | 457 |
| 175 | 45 | 6 | 120;135 | --- | --- | 5 | --- | --- | --- | --- | 458 |
| --- | 55 | 6 | 110 | --- | --- | 15 | --- | --- | --- | --- | 459 |
| --- | --- | --- | 145 | --- | --- | 10 | --- | --- | 86 | 142 | 460 |
| 90 | --- | --- | --- | 64 | 12/80 | --- | --- | --- | --- | --- | 461 |
| 130 | 110 | 6 | 120 | 25 | 11/67 | 10 | .10/--- | --- | --- | --- | 462 |
| 200 | 23 | 6 | 140;195 | 60 | 6/76 | 25 | --- | --- | --- | --- | 463 |
| 125 | 30 | 6 | 90 | 8 | 12/80 | --- | --- | --- | --- | --- | 464 |
| 100 | 20 | 6 | 70;95 | 30 | 8/71 | 12 | --- | --- | --- | --- | 465 |
| 175 | 30 | 6 | 155 | 100 | 3/73 | 10 | --- | --- | --- | --- | 466 |
| 85 | --- | --- | 40;70 | 5 | 6/76 | 25 | --- | --- | --- | --- | 468 |
| 340 | 132 | 6 | --- | 81 | 12/80 | 35 | --- | --- | --- | --- | 469 |
| 470 | 48 | 6 | 340 | 22 | 12/80 | --- | .03/2 | 1 | --- | 4450 | 471 |
| --- | 20 | 6 | --- | 31 | 12/70 | --- | --- | --- | --- | --- | 472 |
| --- | 11 | 6 | --- | 34 | 12/70 | --- | --- | --- | --- | --- | 473 |
| --- | 45 | 1 | --- | 27 | 12/70 | --- | --- | --- | --- | --- | 474 |
| --- | --- | --- | --- | 28 | 12/70 | --- | --- | --- | --- | --- | 475 |
| --- | --- | --- | --- | 18 | 10/70 | --- | --- | --- | --- | --- | 476 |
| --- | 25 | 1 | --- | 5 | 12/70 | --- | --- | --- | --- | --- | 477 |
| --- | --- | --- | --- | 26 | 12/70 | --- | --- | --- | --- | --- | 478 |
| --- | --- | --- | --- | 6 | 12/70 | --- | --- | --- | --- | --- | 479 |
| 50 | --- | --- | --- | 4 | 4/81 | --- | --- | --- | --- | --- | 481 |
| 196 | --- | --- | --- | 93 | 4/81 | --- | --- | --- | --- | --- | 482 |
| 54 | 52 | 8 | --- | 16 | 1/73 | --- | --- | --- | --- | --- | 483 |
| 91 | 91 | 8 | --- | --- | --- | --- | --- | --- | --- | --- | 484 |
| 44 | 44 | 2 | --- | 12 | 5/81 | --- | --- | --- | --- | --- | 485 |
| 58 | 58 | 12 | --- | 7 | 5/81 | --- | 16/495 | 54 | 54 | 180 | 486 |
| 75 | 75 | 3 | --- | 24 | 8/72 | --- | 27/9 | 1 | 70 | 200 | 487 |
| 55 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 488 |
| 23 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 489 |
| --- | --- | --- | --- | 9 | 12/73 | --- | 1.6/65 | 7 | 49 | 142 | 490 |
| --- | --- | --- | --- | 17 | 11/73 | --- | 7.0/150 | 9 | 46 | 136 | 491 |
| 100 | 20 | 6 | 45;80 | --- | --- | 6 | --- | --- | --- | --- | 492 |
| 100 | 20 | 6 | 76 | --- | --- | 12 | --- | --- | 34 | 102 | 493 |
| 150 | 20 | 6 | 85 | --- | --- | 5 | --- | --- | --- | --- | 494 |
| 150 | 20 | 6 | 130 | --- | --- | 6 | --- | --- | 34 | 88 | 495 |
| 130 | 20 | 6 | 110 | 10 | 11/72 | 8 | --- | --- | 34 | 94 | 496 |
| 125 | 25 | 6 | 112 | --- | --- | 10 | --- | --- | --- | --- | 497 |
| 125 | 32 | 6 | 95 | --- | --- | 6 | --- | --- | --- | --- | 498 |
| 150 | 60 | 6 | 103 | --- | --- | 8 | --- | --- | --- | --- | 499 |
| 245 | 37 | 6 | 80;220 | 50 | 2/76 | 22 | --- | --- | --- | --- | 500 |
| 230 | 32 | 6 | 140;215 | 30 | 3/74 | 18 | --- | --- | --- | --- | 501 |
| 300 | 20 | 6 | 230 | 160 | 4/74 | 2 | --- | --- | --- | --- | 502 |
| 125 | 32 | 6 | 65;110 | 20 | 7/74 | --- | --- | --- | --- | --- | 503 |
| 300 | 20 | 6 | 180;205 | --- | --- | 6 | --- | --- | --- | --- | 504 |
| 250 | 20 | 6 | 190 | --- | --- | 6 | --- | --- | --- | --- | 505 |
| 250 | 20 | 6 | 210 | --- | --- | 7 | --- | --- | --- | --- | 506 |
| 200 | 21 | 6 | 105;180 | 50 | 8/74 | 20 | --- | --- | --- | --- | 507 |
| 185 | 24 | 6 | 125;160 | 40 | 3/74 | 20 | --- | --- | 51 | 140 | 508 |
| 75 | 30 | 6 | 60 | 35 | 11/72 | 6 | --- | --- | 34 | --- | 509 |
| 112 | 30 | 6 | 81;107 | --- | --- | 3 | --- | --- | --- | --- | 510 |
| 175 | 70 | 6 | 153 | --- | --- | 6 | --- | --- | 102 | 200 | 512 |
| 110 | 20 | 6 | 93 | 35 | 11/72 | 10 | --- | --- | --- | --- | 513 |
| 150 | 20 | 6 | 120 | --- | --- | 6 | --- | --- | --- | --- | 514 |
| 125 | 35 | 6 | 104 | 45 | 1/73 | 6 | --- | --- | --- | --- | 515 |
| 51 | 21 | 6 | 42;47 | 12 | 10/68 | 40 | --- | --- | --- | --- | 516 |
| 100 | 62 | 6 | 73 | 24 | 8/80 | --- | .43/15 | 8 | --- | 140 | 517 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| | | | | | | | | MONTOUR |
| Mt- 1 | 4058-7634 | Mahoning Township Authority | Moody and Associates | 1969 | P | 610 | V | Sto/lsd |
| 2 | 4058-7634 | do. | do. | 1969 | P | 610 | V | DSk/ls |
| 3 | 4058-7634 | do. | Wieand Brothers | 1978 | P | 610 | V | DSk/ls |
| 4 | 4058-7634 | do. | do. | 1978 | P | 610 | V | DSk/ls |
| 5 | 4058-7635 | do. | R. R. Hornberger | 1966 | P | 790 | W | Sru/sls |
| 6 | 4058-7635 | do. | do. | 1960 | P | 790 | W | Sru/sls |
| 7 | 4058-7635 | do. | do. | 1960 | P | 850 | S | Srm/sls |
| 8 | 4058-7635 | do. | do. | 1960 | P | 850 | S | Srm/sls |
| 9 | 4057-7634 | Maria Joseph Manor | do. | 1960 | T | 535 | V | Dmh/sh |
| 10 | 4057-7634 | do. | do. | 1961 | T | 535 | V | Dmh/sh |
| 11 | 4057-7634 | do. | do. | --- | T | 540 | V | Dmh/sh |
| 12 | 4057-7634 | do. | --- | 1965 | T | 535 | V | Dmh/sh |
| 14 | 4059-7638 | Red Roof Inn | Wieand Brothers | 1973 | C | 500 | V | DSk/ls |
| 15 | 4059-7638 | do. | do. | 1973 | C | 500 | V | Sto/lsd |
| 16 | 4059-7638 | Sheraton Inn | do. | 1978 | C | 505 | V | Do/lss |
| 17 | 4059-7638 | do. | do. | 1973 | C | 505 | V | Don/lss |
| 18 | 4059-7638 | Holiday Inn | --- | 1967 | C | 515 | V | Do/lss |
| 19 | 4058-7636 | Geisinger Medical Center | R. R. Hornberger | 1961 | T | 560 | W | Smk/sls |
| 20 | 4058-7636 | do. | --- | 1961 | T | 560 | W | Smk/sls |
| 21 | 4058-7636 | do. | --- | 1965 | T | 560 | W | Smk/sls |
| 22 | 4058-7634 | Frosty Valley Country Club | R. R. Hornberger | 1966 | I | 640 | W | Swc/dls |
| 23 | 4058-7633 | C. Seitz | Ronald Randler | 1978 | H | 660 | S | DSk/ls |
| 24 | 4059-7637 | Sunnybrook Park | do. | 1978 | H | 490 | V | Sru/sls |
| 25 | 4057-7636 | TRW, Inc. | R. R. Hornberger | 1975 | N | 467 | T | DSk/ls |
| 26 | 4057-7636 | do. | do. | --- | --- | 467 | T | Sto/lsd |
| 27 | 4057-7636 | Roselon Yarns, Inc. | do. | 1967 | N | 470 | T | Swc/dls |
| 29 | 4058-7634 | Charles Keiter | Wieand Brothers | 1979 | P | 895 | W | Srl/sls |
| 30 | 4059-7638 | Holiday Inn | do. | 1973 | C | 520 | V | Dmr/sh |
| 31 | 4059-7638 | do. | do. | 1972 | C | 515 | V | DSk/ls |
| 32 | 4059-7638 | do. | do. | 1973 | C | 515 | V | Do/lss |
| 33 | 4059-7637 | David Shoemaker | R. R. Hornberger | 1975 | H | 580 | S | Swc/dls |
| 34 | 4058-7644 | Steve Rine | Wieand Brothers | 1975 | H | 670 | H | DSk/ls |
| 35 | 4057-7632 | Brown Catering | R. R. Hornberger | 1968 | C | 900 | W | Dtr/sssh |
| 36 | 4058-7641 | Mitchell Duffy | do. | 1976 | H | 955 | H | Srl/sls |
| 37 | 4058-7642 | Eugene Appleman | Wieand Brothers | 1972 | H | 620 | S | Dmr/sh |
| 38 | 4059-7642 | Robert Foust | Ronald Randler | 1976 | H | 660 | S | Dmh/sh |
| 39 | 4059-7642 | Earnest Bower | R. R. Hornberger | 1967 | H | 638 | W | Dmh/sh |
| 40 | 4059-7641 | Robert Reedy | Ronald Randler | 1967 | H | 620 | W | Dtr/sssh |
| 41 | 4059-7641 | Paul Appleman | R. R. Hornberger | 1975 | H | 590 | W | Dmh/sh |
| 42 | 4058-7643 | Donald Golder | do. | 1968 | H | 630 | S | Dmh/sh |
| 43 | 4058-7642 | George Buckley | Ronald Randler | 1967 | H | 590 | S | Dmh/sh |
| 44 | 4059-7642 | P. Kohl | do. | 1967 | H | 650 | S | Dmh/sh |
| 45 | 4059-7641 | Arthur Reedy | R. R. Hornberger | 1966 | H | 630 | S | Dmh/sh |
| 46 | 4058-7633 | Pennsylvania Society for Prevention of Cruelty to Animals | do. | 1968 | H | 645 | S | Sto/lsd |
| 47 | 4058-7633 | Chester Adams | do. | 1967 | H | 660 | S | DSk/ls |
| 48 | 4058-7632 | Robert Fry | do. | 1975 | H | 670 | S | Do/lss |
| 49 | 4058-7632 | Stuart Hartman | Ronald Randler | 1974 | H | 690 | S | DSk/ls |
| 50 | 4058-7632 | Clewell Vending | do. | 1967 | H | 630 | V | Dmr/sh |
| 51 | 4058-7632 | William Linker | Wieand Brothers | 1975 | H | 670 | S | Dmh/sh |
| 52 | 4058-7634 | Harry Stamey | R. R. Hornberger | 1973 | H | 750 | S | Sb/sh |
| 53 | 4058-7634 | D. Schuller | do. | 1974 | H | 650 | S | Swc/dls |
| 54 | 4058-7634 | Harold Henry | do. | 1968 | H | 730 | S | Sb/sh |
| 55 | 4058-7634 | Harvey Houseknect | do. | 1977 | H | 630 | S | Sto/lsd |
| 56 | 4058-7634 | Robert Albertini | do. | 1975 | H | 715 | S | Sb/sh |
| 57 | 4058-7639 | Paul Earlston | Ronald Randler | 1973 | H | 900 | S | Srl/sls |
| 58 | 4058-7639 | George Lewellyn | R. R. Hornberger | 1967 | H | 780 | W | Srl/sls |
| 59 | 4101-7638 | Randall Billmeyer | Wieand Brothers | 1977 | H | 880 | H | Dtr/sssh |
| 60 | 4100-7642 | Peter Cooper | do. | 1977 | H | 600 | S | Dh/sh |
| 61 | 4100-7642 | R. Hedding | Ronald Randler | 1978 | H | 720 | S | Dh/sh |
| 62 | 4100-7642 | James Dunkle | do. | 1969 | H | 730 | S | Dmh/sh |
| 63 | 4101-7640 | William Starr | do. | 1977 | H | 740 | S | Dtr/sssh |
| 64 | 4100-7643 | Henry Schmidt | do. | 1978 | H | 520 | V | Dmr/sh |
| 65 | 4101-7642 | M. Stahl | Wieand Brothers | 1979 | H | 530 | S | Do/lss |
| 66 | 4101-7643 | Kenneth Permar | R. R. Hornberger | 1967 | H | 580 | S | Do/lss |
| 67 | 4102-7641 | Rick Burkhart | Ronald Randler | 1977 | H | 540 | S | Do/lss |
| 68 | 4102-7641 | John Tanner | R. R. Hornberger | 1970 | H | 580 | S | Don/lss |
| 69 | 4101-7643 | Ralph Swartz | Ronald Randler | 1976 | H | 525 | S | Do/lss |
| 70 | 4101-7638 | William McMichael | R. R. Hornberger | 1966 | H | 635 | W | Dtr/sssh |

(CONTINUED)

| Total depth below land surface (feet) | Casing: Depth (feet) | Casing: Diameter (inches) | Depth(s) to water-bearing zone(s) (feet) | Static water level: Depth below land surface (feet) | Static water level: Date measured (mo/yr) | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (μmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COUNTY | | | | | | | | | | | |
| 332 | 114 | 8 | 122 | 47 | 8/69 | 50 | .70/50 | 12 | 205 | 370 | Mt- 1 |
| 328 | 92 | 8 | 99;191;241 | 46 | 8/69 | 300 | 7.7/200 | 72 | --- | 416 | 2 |
| 298 | 42 | 6 | 99;277 | --- | --- | 15 | --- | --- | --- | --- | 3 |
| 298 | 112 | 10 | --- | 116 | 11/78 | --- | 3.8/200 | 48 | --- | --- | 4 |
| 305 | 59 | 7 | 95;130;198; 287;290;302 | --- | 1/66 | 300 | 1.1/75 | 72 | --- | --- | 5 |
| 312 | 43 | 6 | 60;207;245; 258;275;312 | --- | 9/60 | 125 | 1.4/50 | --- | --- | --- | 6 |
| --- | --- | --- | --- | --- | --- | 10 | --- | --- | --- | --- | 7 |
| --- | --- | --- | --- | --- | --- | 10 | --- | --- | --- | --- | 8 |
| 610 | 35 | 8 | 210;350;430 | --- | --- | 62 | --- | --- | --- | --- | 9 |
| 257 | 45 | 7 | --- | --- | --- | 50 | --- | --- | --- | --- | 10 |
| 210 | --- | --- | --- | --- | --- | 50 | --- | --- | --- | --- | 11 |
| 350 | --- | --- | --- | 7 | 11/80 | 10 | --- | --- | --- | --- | 12 |
| 205 | 65 | 8 | --- | 19 | 4/74 | 200 | 41/330 | 24 | --- | --- | 14 |
| 259 | 70 | 8 | --- | 15 | 4/74 | 80 | 1.1/73 | 24 | --- | --- | 15 |
| 309 | 45 | 8 | 51;88;210; 237;239;285 | 15 | 10/73 | 600 | 5.3/158 | 24 | --- | --- | 16 |
| 95 | 36 | 8 | 40;50;65; 70;80 | 15 | 10/73 | 125 | 2.7/122 | 24 | --- | --- | 17 |
| --- | --- | --- | --- | 5 | 9/67 | --- | .67/80 | 8 | --- | --- | 18 |
| 300 | 34 | 7 | --- | --- | --- | 60 | --- | --- | --- | --- | 19 |
| 400 | 34 | 7 | --- | --- | --- | 60 | --- | --- | --- | --- | 20 |
| 314 | 63 | 7 | --- | --- | --- | 190 | --- | --- | --- | --- | 21 |
| 213 | 22 | 8 | 45;183;207 | F | 7/66 | 100 | 2.5/--- | --- | --- | --- | 22 |
| 213 | 119 | 6 | 175;210 | 96 | 7/78 | 30 | .88/--- | --- | --- | --- | 23 |
| 93 | 21 | 6 | 90 | 5 | 8/78 | 30 | .67/--- | --- | --- | --- | 24 |
| 200 | 109 | 10 | --- | 23 | 4/75 | 450 | 19/500 | 24 | --- | --- | 25 |
| 100 | --- | 6 | --- | 28 | --- | --- | 38/85 | 8 | --- | --- | 26 |
| 308 | 73 | 10 | 150;185;230; 280 | 30 | 6/67 | --- | 18/380 | 24 | --- | --- | 27 |
| 300 | 42 | 8 | 175;257 | -69 | 7/80 | 200 | .80/103 | --- | 120 | 240 | 29 |
| 438 | 36 | 8 | 82;130;280 | --- | --- | 10 | .07/20 | 24 | --- | --- | 30 |
| 505 | 31 | 8 | 290 | F | 6/80 | 900 | 9.0/207 | 60 | --- | 1,000 | 31 |
| 218 | 35 | 8 | 45;80;95; 130;155 | 12 | 1/74 | 80 | .47/73 | 24 | --- | --- | 32 |
| 215 | 63 | 6 | 140;203 | 68 | 10/78 | 4 | --- | --- | --- | --- | 33 |
| 223 | 93 | 6 | 202 | --- | --- | 25 | --- | --- | --- | --- | 34 |
| 390 | 40 | 7 | 84;140;256; 315;369;384 | 115 | 5/68 | 60 | .22/60 | --- | --- | --- | 35 |
| 215 | 20 | 6 | 140;195 | 80 | 11/78 | 2 | --- | --- | 120 | 239 | 36 |
| 127 | 20 | 6 | 50;70;85 | --- | --- | 15 | --- | --- | --- | --- | 37 |
| 40 | 27 | 5 | 40 | 15 | 6/76 | 30 | 3.0/--- | --- | --- | --- | 38 |
| 90 | 21 | 6 | 70;82 | 20 | 3/67 | 5 | .07/--- | --- | --- | --- | 39 |
| 223 | 20 | 6 | 200 | 7 | 7/67 | 1 | .03/--- | --- | --- | --- | 40 |
| 33 | 20 | 6 | --- | 1 | 11/78 | 25 | --- | --- | --- | --- | 41 |
| 95 | 5 | 6 | 31;60;80 | --- | --- | 5 | .06/--- | --- | --- | --- | 42 |
| 76 | 51 | 6 | 74 | --- | --- | 30 | --- | --- | --- | --- | 43 |
| 35 | 15 | 6 | 34 | 4 | 11/78 | 20 | 1.00/--- | --- | --- | --- | 44 |
| 200 | 21 | 6 | 190 | 8 | 7/66 | 5 | .03/--- | --- | --- | --- | 45 |
| 75 | 57 | 6 | 65 | 35 | 7/68 | 40 | 1.00/--- | --- | --- | --- | 46 |
| 165 | 21 | 6 | 70;118;163 | 60 | 8/67 | 20 | .31/--- | --- | --- | --- | 47 |
| 215 | 41 | 6 | --- | 41 | 11/78 | 2 | --- | --- | --- | --- | 48 |
| 169 | 42 | 6 | 165 | 82 | 11/78 | 5 | --- | --- | --- | --- | 49 |
| 88 | 44 | 6 | 75;85 | --- | --- | 10 | .13/--- | --- | --- | --- | 50 |
| 123 | 20 | 6 | 74;86 | 19 | 11/78 | 8 | --- | --- | --- | --- | 51 |
| 150 | 21 | 6 | --- | 44 | 8/73 | 8 | --- | --- | --- | --- | 52 |
| 155 | 42 | 6 | --- | 20 | 10/74 | 8 | --- | --- | --- | --- | 53 |
| 215 | 51 | 6 | 102;164;189 | 50 | 7/68 | 12 | .07/--- | --- | --- | --- | 54 |
| 185 | 124 | 6 | 170 | 125 | 8/77 | 20 | --- | --- | --- | --- | 55 |
| 195 | 41 | 6 | --- | --- | --- | 6 | --- | --- | --- | --- | 56 |
| 153 | 26 | 5 | --- | --- | --- | 5 | --- | --- | --- | --- | 57 |
| 75 | 40 | 6 | 53;60;64;68 | 1 | 6/67 | 30 | .41/--- | --- | --- | --- | 58 |
| 398 | 21 | 6 | --- | 125 | 6/80 | 1 | .03/5 | 1 | --- | 270 | 59 |
| 98 | 20 | 6 | 42;68 | F | 6/80 | 20 | .55/9 | 1 | 154 | 368 | 60 |
| 150 | 31 | 6 | 145 | 26 | 10/78 | 4 | .03/--- | --- | --- | --- | 61 |
| 122 | 20 | 6 | 90;120 | 60 | 9/69 | --- | --- | --- | --- | --- | 62 |
| 202 | 27 | 6 | 188 | 48 | 6/80 | 3 | .03/--- | --- | --- | 107 | 63 |
| 93 | 11 | 6 | 80 | 11 | 10/78 | 10 | .14/--- | --- | --- | --- | 64 |
| 173 | 64 | 6 | 136;150 | 28 | 6/80 | 20 | --- | --- | --- | 315 | 65 |
| 95 | 51 | 6 | 65;90;91 | 30 | 4/67 | 50 | .77/--- | --- | --- | 440 | 66 |
| 83 | 50 | 6 | 80 | 44 | 12/77 | 20 | .51/--- | --- | --- | 105 | 67 |
| 90 | 46 | 6 | 56;68;86 | 43 | 7/70 | 12 | --- | --- | --- | 205 | 68 |
| 86 | 39 | 6 | 80 | 33 | 6/80 | 20 | .77/--- | --- | --- | 165 | 69 |
| 175 | 20 | 6 | 40;75;130 | --- | 12/66 | 3 | .03/--- | --- | --- | --- | 70 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Mt- 71 | 4100-7639 | Anna Schenk | Ronald Randler | 1967 | H | 895 | S | Dtr/sssh |
| 72 | 4100-7639 | Andras | do. | 1966 | H | 900 | S | Dtr/sssh |
| 73 | 4100-7639 | Roland Reedy | do. | 1966 | H | 900 | S | Dtr/sssh |
| 74 | 4101-7640 | Harry Hawkins | do. | 1969 | H | 542 | S | Dmr/sh |
| 75 | 4102-7639 | Russell Hendrickson | R. R. Hornberger | 1976 | H | 620 | S | Dmr/sh |
| 76 | 4102-7638 | Leon Vandine | do. | 1976 | H | 620 | S | Dmr/sh |
| 77 | 4100-7639 | Edward Barry | Wieand Brothers | 1976 | H | 680 | W | Dtr/sssh |
| 78 | 4100-7640 | Ronald Horne | Ronald Randler | 1977 | H | 825 | S | Dtr/sssh |
| 79 | 4102-7640 | Village Inn | R. R. Hornberger | 1974 | C | 509 | V | Don/lss |
| 80 | 4103-7640 | Danville Area Jointure Schools | do. | 1968 | T | 565 | S | Do/lss |
| 81 | 4103-7640 | Bell Telephone Co. | Champion | 1975 | H | 540 | S | Do/lss |
| 82 | 4103-7640 | Rand Parker | R. R. Hornberger | 1966 | H | 520 | S | Do/lss |
| 83 | 4102-7641 | Wayne Leighow | Wieand Brothers | 1977 | H | 530 | V | Do/lss |
| 84 | 4102-7641 | Jesse Kelley | --- | --- | H | 530 | V | Do/lss |
| 85 | 4102-7640 | Marvin Funk | --- | 1957 | H | 525 | V | Dmr/sh |
| 86 | 4104-7641 | L. Martz | R. R. Hornberger | 1968 | H | 520 | V | Do/lss |
| 87 | 4103-7642 | Jerry Gresh | Wieand Brothers | 1977 | H | 760 | S | Sto/lsd |
| 88 | 4103-7642 | Richard Hoffman | do. | 1976 | H | 740 | S | Sto/lsd |
| 89 | 4104-7642 | Dean Hebner | R. R. Hornberger | 1976 | H | 665 | S | Do/lss |
| 90 | 4103-7641 | Jay Sitler | Wieand Brothers | 1976 | H | 582 | S | DSk/ls |
| 91 | 4103-7641 | Lon Tarr | do. | 1977 | H | 680 | S | DSk/ls |
| 92 | 4104-7640 | William McMichael | R. R. Hornberger | 1969 | H | 515 | V | Dmr/sh |
| 93 | 4105-7638 | Clarence McMichael | do. | 1967 | H | 580 | W | Dmh/sh |
| 94 | 4105-7638 | Jimmy Holdren | do. | 1966 | H | 605 | S | Dmh/sh |
| 95 | 4106-7638 | Dale Sommers | do. | 1968 | H | 665 | S | Dmh/sh |
| 96 | 4107-7638 | Karl McWilliams | do. | 1966 | H | 720 | S | Dmh/sh |
| 97 | 4106-7637 | Allen Dewald | do. | 1967 | H | 712 | S | Dmh/sh |
| 98 | 4106-7637 | Hershey | do. | 1966 | H | 712 | S | Dmh/sh |
| 99 | 4106-7637 | McGargle | Clifton Buck | 1968 | H | 680 | S | Dmh/sh |
| 100 | 4106-7637 | George Holdren | R. R. Hornberger | 1968 | H | 730 | S | Dmh/sh |
| 101 | 4106-7637 | Bryon Sheatler | Virgil Buck | 1978 | H | 660 | S | Dmh/sh |
| 102 | 4103-7639 | Richard Baker | Ronald Randler | 1966 | H | 530 | V | Dmr/sh |
| 103 | 4102-7638 | Fred Moser | R. R. Hornberger | 1967 | H | 565 | V | Dmr/sh |
| 104 | 4103-7637 | Norma Bartlett | Virgil Buck | 1972 | H | 525 | S | Dmh/sh |
| 105 | 4103-7636 | Harvey Davis | R. R. Hornberger | 1973 | H | 640 | W | Dmh/sh |
| 106 | 4103-7637 | Wayne Day | do. | 1973 | H | 550 | S | Dmh/sh |
| 107 | 4104-7637 | S. Stoltzfus | Ronald Randler | 1979 | H | 535 | S | Dmh/sh |
| 108 | 4104-7638 | Jonas Beiler | do. | 1976 | H | 535 | S | Dmr/sh |
| 109 | 4104-7639 | Robert McMichael | R. R. Hornberger | 1967 | H | 545 | V | Dmr/sh |
| 110 | 4104-7638 | Sanford Brown | Wieand Brothers | 1974 | H | 565 | V | Dmh/sh |
| 112 | 4106-7643 | David Strouse | Ronald Randler | 1980 | H | 610 | S | Dmr/sh |
| 113 | 4106-7643 | Mary Hall | do. | 1966 | H | 605 | S | Dmr/sh |
| 114 | 4106-7641 | Joseph Davis | Stackhouse | 1972 | H | 575 | V | Dmr/sh |
| 115 | 4106-7641 | Exchange Grange | Ronald Randler | 1967 | H | 580 | V | Dmh/sh |
| 116 | 4106-7641 | Warrior Run School | R. R. Hornberger | 1966 | T | 645 | S | Dmr/sh |
| 117 | 4106-7640 | Franklin Shupp | Ronald Randler | 1967 | H | 665 | H | Dmh/sh |
| 118 | 4106-7641 | David Litchard | R. R. Hornberger | 1967 | H | 640 | S | Dmh/sh |
| 119 | 4106-7642 | Robert Brouse | Ronald Randler | 1968 | H | 590 | S | Dmh/sh |
| 120 | 4107-7642 | Hal Thomas | Wieand Brothers | 1976 | H | 650 | S | Dmh/sh |
| 121 | 4107-7640 | Leonard Lyons | Ronald Randler | 1969 | S | 685 | S | Dmh/sh |
| 122 | 4107-7640 | James Turri | R. R. Hornberger | 1975 | H | 670 | S | Dmh/sh |
| 123 | 4058-7634 | Edward James | Stackhouse | 1975 | H | 940 | W | Srl/sls |
| 124 | 4058-7634 | Kenneth Ackerman | Kraemer | 1979 | H | 875 | W | Srl/sls |
| 125 | 4102-7641 | Roy Ulrich | R. R. Hornberger | 1967 | H | 560 | S | Do/lss |
| 126 | 4102-7644 | D. Fleming | Norman Hagenbuch | 1969 | H | 670 | H | Swc/dls |
| 127 | 4102-7644 | James Temple | R. R. Hornberger | 1967 | H | 550 | V | Swc/dls |
| 128 | 4102-7644 | Wayne Mincemoyer | Wieand Brothers | 1972 | H | 560 | V | Sto/lsd |
| 129 | 4104-7643 | Earl Harris | do. | 1976 | H | 660 | S | Sto/lsd |
| 130 | 4103-7642 | Guy McCollum | R. R. Hornberger | 1967 | H | 700 | S | Sto/lsd |
| 131 | 4102-7643 | Frank Smith | Wieand Brothers | 1977 | H | 720 | S | DSk/ls |
| 132 | 4105-7644 | Edward Beachel | R. R. Hornberger | 1966 | H | 540 | V | Don/lss |
| 133 | 4106-7642 | Ronald Miller | do. | 1967 | H | 565 | V | Dmh/sh |
| 134 | 4106-7643 | Albert Brown | do. | 1967 | H | 605 | S | Dmr/sh |
| 135 | 4100-7643 | Ronald Randler | Ronald Randler | 1976 | H | 600 | S | Dmh/sh |
| 136 | 4100-7643 | Alicia Bridge | do. | 1979 | H | 620 | S | Dmh/sh |
| 137 | 4100-7643 | Richard Smith | do. | 1977 | H | 600 | S | Dmh/sh |
| 138 | 4100-7641 | Kenneth Burrows | R. R. Hornberger | 1972 | R | 740 | S | Dmh/sh |
| 139 | 4101-7641 | Loren Girton | do. | 1972 | H | 660 | S | Dmh/sh |
| 140 | 4101-7643 | D. Ale | Wieand Brothers | 1978 | H | 620 | S | Do/lss |
| 141 | 4101-7643 | Grace Bankus | Ronald Randler | 1968 | H | 510 | V | Do/lss |
| 142 | 4101-7644 | John Styer | R. R. Hornberger | 1968 | H | 580 | S | Do/lss |
| 143 | 4102-7640 | James Betz | Ronald Randler | 1967 | H | 520 | V | Do/lss |
| 144 | 4104-7641 | Maynard Lawton | do. | 1969 | H | 525 | V | Do/lss |
| 145 | 4104-7640 | Kenneth Bryfogle | Gordon Hill | 1980 | C | 525 | V | Do/lss |
| 146 | 4106-7640 | Pennsylvania Power and Light Co. | R. R. Hornberger | 1974 | R | 645 | H | Dmr/sh |
| 147 | 4105-7639 | do. | do. | 1972 | R | 560 | S | Dmr/sh |
| 148 | 4106-7639 | do. | do. | 1974 | R | 605 | W | Dmh/sh |

(CONTINUED)

| Total depth below land surface (feet) | Casing: Depth (feet) | Casing: Diameter (inches) | Depth(s) to water-bearing zone(s) (feet) | Static water level: Depth below land surface (feet) | Static water level: Date measured (mo/yr) | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (μmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 167 | 20 | 6 | 50;70;165 | 36 | 5/67 | 40 | .82/--- | --- | --- | --- | Mt- 71 |
| 195 | 27 | 6 | 55;135;193 | 55 | 6/66 | 10 | .07/--- | --- | --- | --- | 72 |
| 173 | 31 | 6 | 45;125;170 | 35 | 6/66 | 5 | .04/--- | --- | --- | --- | 73 |
| 82 | 20 | 6 | 80 | 1 | 7/69 | 6 | .07/--- | --- | --- | --- | 74 |
| 110 | 20 | 6 | 55;95 | 42 | 6/80 | 12 | --- | --- | --- | 265 | 75 |
| 80 | 20 | 6 | 68 | 1 | 6/80 | 15 | --- | --- | --- | 295 | 76 |
| 398 | 20 | 6 | 65 | 20 | 6/80 | 1 | --- | --- | --- | 183 | 77 |
| 160 | 16 | 6 | 155 | 73 | 6/80 | 7 | .08/--- | --- | --- | 162 | 78 |
| 29 | 23 | 6 | --- | 5 | 6/80 | 12 | --- | --- | 170 | 347 | 79 |
| 215 | 44 | 7 | 85;158;210 | 60 | 1/68 | 30 | .19/--- | --- | --- | --- | 80 |
| 150 | 30 | 6 | 75;130 | --- | --- | 8 | --- | --- | 900 | 2,400 | 81 |
| 130 | 25 | 6 | 86;115 | 17 | 7/66 | 3 | --- | --- | --- | --- | 82 |
| 73 | 20 | 6 | 37 | 16 | 6/80 | 60 | --- | --- | 171 | 328 | 83 |
| 30 | --- | --- | --- | --- | --- | --- | --- | --- | 103 | 388 | 84 |
| 210 | --- | --- | --- | 15 | 6/80 | --- | --- | --- | 68 | 401 | 85 |
| 60 | 23 | 6 | 29;49;56 | 2 | 2/68 | 50 | .86/--- | --- | --- | --- | 86 |
| 298 | 20 | 6 | 255 | --- | --- | 10 | --- | --- | --- | --- | 87 |
| 298 | 60 | 6 | 248 | --- | --- | --- | --- | --- | 188 | 379 | 88 |
| 155 | 20 | 6 | 60 | 46 | 5/76 | 3 | --- | --- | --- | --- | 89 |
| 173 | 38 | 6 | 120;147 | --- | --- | 15 | --- | --- | --- | --- | 90 |
| 348 | 250 | 6 | 316;330 | 157 | 7/80 | 30 | --- | --- | 282 | 605 | 91 |
| 205 | 20 | 6 | 175;205 | 7 | 7/80 | 3 | --- | --- | 120 | 381 | 92 |
| 415 | 30 | 6 | 45;87;196;296 | 7 | 7/80 | 2 | .03/--- | --- | 137 | 554 | 93 |
| 225 | 20 | 6 | 175;215 | 5 | 6/66 | 1 | .03/--- | --- | --- | --- | 94 |
| 304 | 26 | 6 | 117 | 25 | 4/68 | 1 | .03/--- | --- | 120 | 399 | 95 |
| 70 | 19 | 6 | 50;56 | 20 | 8/66 | 30 | .67/--- | --- | 103 | 253 | 96 |
| 130 | 18 | 6 | 100;120 | 17 | 7/80 | 2 | .03/--- | --- | --- | --- | 97 |
| 170 | 36 | 6 | 164 | 25 | 8/66 | 20 | .14/--- | --- | --- | --- | 98 |
| 257 | --- | --- | 210 | 10 | 5/68 | 4 | .03/--- | --- | --- | --- | 99 |
| 155 | 24 | 6 | 121;149 | 6 | 2/68 | 5 | .03/--- | --- | --- | --- | 100 |
| 155 | 20 | 6 | 30;80;140 | 20 | 5/78 | 4 | .03/--- | --- | --- | --- | 101 |
| 84 | 16 | 6 | 25;50;84 | 16 | 5/66 | 6 | .09/--- | --- | --- | --- | 102 |
| 50 | 26 | 6 | 46;48 | 5 | 6/67 | 15 | .33/--- | --- | --- | --- | 103 |
| 218 | 20 | 6 | 75;210;218 | --- | --- | 4 | --- | --- | --- | --- | 104 |
| 80 | 30 | 6 | --- | 26 | 2/73 | 10 | --- | --- | --- | --- | 105 |
| 250 | 21 | 6 | --- | 10 | 8/73 | 1 | --- | --- | 34 | 399 | 106 |
| 180 | 16 | 6 | 180 | 12 | 7/80 | 2 | .03/--- | --- | --- | --- | 107 |
| 268 | 19 | 6 | 60;260 | 14 | 7/80 | 1 | .03/--- | --- | --- | --- | 108 |
| 81 | 42 | 6 | 63 | --- | --- | 4 | .06/--- | --- | --- | --- | 109 |
| 346 | 21 | 6 | 236;251 | 25 | 7/80 | 4 | --- | --- | 17 | 460 | 110 |
| 118 | --- | --- | --- | --- | --- | 11 | --- | --- | 67 | --- | 112 |
| 75 | 22 | 6 | 73 | 15 | 12/66 | 7 | .12/--- | --- | --- | --- | 113 |
| 70 | 28 | 6 | 68 | --- | --- | 12 | --- | --- | --- | --- | 114 |
| 35 | 25 | 6 | 33 | 4 | 3/67 | 15 | .48/--- | --- | --- | --- | 115 |
| 215 | 82 | 7 | 118;184 | 60 | 12/66 | 15 | .10/--- | --- | --- | --- | 116 |
| 122 | 52 | 6 | 85;120 | 32 | 6/67 | 10 | .11/--- | --- | --- | --- | 117 |
| 184 | --- | --- | 50;105;180 | 22 | 11/67 | 8 | .05/--- | --- | 530 | 1,150 | 118 |
| 80 | 35 | 6 | 45;78 | --- | --- | 50 | 3.3/--- | --- | --- | --- | 119 |
| 248 | 18 | 6 | 203 | 46 | 7/80 | 10 | --- | --- | --- | --- | 120 |
| 200 | 10 | 6 | 105 | 15 | 5/69 | 1 | .03/--- | --- | 180 | 448 | 121 |
| 175 | 20 | 6 | --- | 10 | 7/73 | 3 | --- | --- | --- | --- | 122 |
| 150 | 21 | 6 | --- | --- | 7/80 | 30 | --- | --- | 86 | 210 | 123 |
| 136 | --- | --- | --- | 1 | 7/80 | 25 | --- | --- | 68 | 120 | 124 |
| 128 | 26 | 6 | 120 | 2 | 7/80 | 40 | .41/--- | --- | 120 | 208 | 125 |
| 300 | --- | --- | 165;225;285 | 150 | 4/69 | 20 | --- | --- | --- | --- | 126 |
| 33 | 20 | 6 | 25;27 | 11 | 5/67 | 40 | 1.8/--- | --- | 239 | --- | 127 |
| 80 | 41 | 6 | --- | 12 | 7/80 | 30 | --- | --- | --- | --- | 128 |
| 223 | 63 | 6 | 185 | 93 | 7/80 | 20 | --- | --- | 154 | 408 | 129 |
| 195 | 136 | 6 | 170;189 | 100 | 5/67 | 5 | .05/--- | --- | 171 | 367 | 130 |
| 248 | 63 | 6 | 150;198 | 115 | 7/80 | 12 | --- | --- | --- | --- | 131 |
| 215 | 23 | 6 | 26;195 | 6 | 7/80 | 3 | .03/--- | --- | --- | --- | 132 |
| 51 | 50 | 6 | 50 | 4 | 8/67 | 40 | .85/--- | --- | --- | --- | 133 |
| 123 | 29 | 6 | 69 | 22 | 9/67 | 2 | .03/--- | --- | --- | --- | 134 |
| 102 | 8 | 6 | 100 | 36 | 12/76 | --- | .15/10 | --- | --- | --- | 135 |
| 77 | 22 | 6 | 75 | 33 | 7/79 | 20 | .45/--- | --- | --- | --- | 136 |
| 82 | 8 | 6 | 78 | 36 | 7/77 | 40 | 4.0/--- | --- | --- | --- | 137 |
| 430 | 18 | 6 | --- | 21 | 7/80 | 1 | --- | --- | 154 | 325 | 138 |
| 150 | 20 | 6 | --- | --- | --- | 3 | --- | --- | 120 | 300 | 139 |
| 122 | 84 | 6 | 97;101 | 40 | 7/78 | 30 | --- | --- | --- | --- | 140 |
| 45 | 30 | 6 | 30;44 | 7 | 6/68 | 40 | --- | --- | --- | --- | 141 |
| 160 | 48 | 6 | 69;157 | 50 | 3/68 | 5 | .05/--- | --- | --- | --- | 142 |
| 48 | 43 | 6 | 42 | 20 | 3/67 | 20 | 2.0/--- | --- | --- | --- | 143 |
| 38 | 31 | 6 | 38 | 5 | 9/69 | 6 | .18/--- | --- | --- | --- | 144 |
| 150 | 20 | 6 | --- | 18 | 7/80 | 45 | --- | --- | --- | --- | 145 |
| 255 | 52 | 6 | --- | 60 | 7/80 | --- | .19/30 | 12 | 188 | 442 | 146 |
| 200 | 41 | 6 | 75;90;140;200 | 7 | 7/80 | 23 | --- | --- | 137 | 480 | 147 |
| 150 | 42 | 6 | --- | 20 | 7/80 | 30 | .44/30 | 12 | 307 | 640 | 148 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Mt-149 | 4106-7640 | Richard Hess | --- | 1969 | H | 570 | S | Dmr/sh |
| 150 | 4107-7639 | Joseph Murray | R. R. Hornberger | 1975 | H | 700 | W | Dmh/sh |
| 151 | 4107-7637 | Ross McCollum | do. | 1977 | H | 765 | H | Dmh/sh |
| 152 | 4100-7641 | Kenneth Burrows | do. | 1968 | H | 780 | S | Dtr/sssh |
| 153 | 4100-7636 | Daniel Wetzel | Alvin Swank and Son | 1980 | H | 550 | V | Dmh/sh |
| 154 | 4059-7635 | Pinebrook Homes | Stackhouse | 1980 | H | 735 | S | Sru/sls |
| 156 | 4100-7636 | Carl Hartman | R. R. Hornberger | 1976 | H | 560 | S | Dmh/sh |
| 157 | 4102-7635 | Linda Synder | do. | 1967 | H | 825 | V | Dtr/sssh |
| 158 | 4100-7636 | Gary Morris | --- | 1976 | H | 690 | H | Dmh/sh |
| 159 | 4100-7637 | Joe Hess | R. R. Hornberger | 1975 | H | 808 | S | Dtr/sssh |
| 160 | 4100-7637 | do. | do. | 1974 | H | 760 | S | Dtr/sssh |
| 161 | 4100-7637 | Ben Hess | do. | 1975 | H | 810 | S | Dtr/sssh |
| 162 | 4100-7637 | do. | do. | 1977 | H | 849 | H | Dtr/sssh |
| 163 | 4100-7637 | do. | Neil Negley | 1978 | H | 852 | H | Dtr/sssh |
| 164 | 4102-7635 | Clyde Gray | R. R. Hornberger | 1977 | H | 890 | S | Dciv/sssh |
| 165 | 4102-7633 | Mike Mausteller | do. | 1968 | H | 1,143 | H | Dciv/sssh |
| 166 | 4104-7637 | Donald Robbins | Ronald Randler | 1967 | H | 549 | V | Dmh/sh |
| 167 | 4059-7636 | Kocker Lot 3 | Virgil Buck | 1978 | H | 540 | S | Swc/dls |
| 168 | 4059-7636 | Kocker Lot 4 | do. | 1978 | H | 540 | S | Swc/dls |
| 169 | 4059-7636 | Kocker Lot 5 | do. | 1978 | H | 540 | S | Swc/dls |
| 170 | 4059-7636 | Kocker Lot 6 | do. | 1978 | H | 540 | S | Swc/dls |
| 171 | 4059-7636 | Kocker Lot 7 | do. | 1978 | H | 540 | S | Swc/dls |
| 172 | 4059-7636 | Kocker Lot 9 | do. | 1978 | H | 540 | S | Swc/dls |
| 173 | 4104-7604 | Kenneth Bryfogle | Gordon Hill | 1980 | C | 525 | V | Do/lss |
| 175 | 4104-7638 | Jonas Beiler | Ronald Randler | 1976 | H | 535 | S | Dmr/sh |
| 176 | 4058-7634 | Mark Cook | do. | 1981 | H | 1,030 | S | Srl/sls |
| 177 | 4059-7634 | L. Santini | --- | --- | H | 1,280 | H | Srl/sls |
| 178 | 4100-7636 | Joseph Siats | Wieand Brothers | 1981 | H | 555 | V | Dmh/sh |
| 181 | 4059-7635 | Joseph Cady | Stackhouse | 1981 | H | 725 | S | Sru/sls |
| 182 | 4059-7636 | Kocker Lot 14 | Virgil Buck | 1979 | H | 540 | S | Swc/dls |
| 183 | 4059-7636 | Kocker Lot 9 | do. | 1979 | H | 540 | S | Swc/dls |
| 184 | 4059-7636 | Kocker Lot 8 | do. | 1979 | H | 540 | S | Swc/dls |
| 185 | 4058-7635 | Pinebrook Homes | Stackhouse | 1981 | H | 810 | S | Sru/sls |
| 186 | 4057-7632 | Keener | do. | 1981 | H | 930 | H | Dtr/sssh |
| 187 | 4058-7631 | William Barnes | do. | 1981 | H | 740 | S | Dtr/sssh |
| 188 | 4058-7631 | do. | R. R. Hornberger | --- | H | 760 | S | Dtr/sssh |
| 189 | 4058-7634 | Robert McCaffery | do. | 1975 | H | 650 | S | Swc/dls |
| 190 | 4103-7640 | Washingtonville Town Hall | --- | 1928 | U | 570 | V | Do/lss |
| 191 | 4104-7639 | Dairyman's Coop Association | --- | 1928 | T | 545 | V | Dmh/sh |
| 194 | 4058-7636 | Geisinger Medical Center | --- | 1930 | T | 590 | S | Sb/sh |
| 202 | 4059-7638 | Dutch Pantry | R. R. Hornberger | 1974 | C | 510 | V | Do/lss |
| 203 | 4059-7638 | do. | do. | 1973 | C | 510 | V | Do/lss |
| 204 | 4059-7638 | Metal Wire Recovery | do. | 1967 | N | 510 | V | Swc/dls |
| 205 | 4059-7638 | do. | do. | 1966 | N | 510 | V | Swc/dls |
| 206 | 4059-7639 | Howard Johnson's | Kohl Brothers | 1973 | C | 630 | V | Dmr/sh |
| 207 | 4059-7639 | do. | do. | 1973 | C | 630 | V | Dmr/sh |
| 208 | 4058-7638 | Wayne Bassett | --- | 1977 | H | 905 | H | Srl/sls |
| 209 | 4058-7638 | James Connell | Alvin Swank and Son | 1978 | H | 940 | S | Srl/sls |
| 210 | 4059-7643 | E. Hildebrand | Ronald Randler | 1978 | H | 685 | S | Dmh/sh |
| 211 | 4058-7643 | M. Prowant | Roy Zimmerman | 1973 | H | 615 | U | DSk/ls |
| 212 | 4059-7644 | R. Schreck | do. | 1976 | H | 600 | H | Dmh/sh |
| 213 | 4058-7644 | C. Rine | R. R. Hornberger | 1958 | H | 520 | W | Dmh/sh |
| 214 | 4059-7634 | Milton Hartman | do. | 1975 | H | 875 | W | Srl/sls |
| 215 | 4058-7635 | Truman Mitchell | do. | 1976 | H | 740 | S | Sb/sh |
| 216 | 4058-7635 | Russell Weaver | do. | 1966 | H | 600 | S | Swc/dls |
| 217 | 4057-7636 | Myron Fenstermac | Norman Hagenbuch | 1968 | H | 515 | S | Swc/dls |
| 218 | 4058-7635 | Lewis Riley | R. R. Hornberger | 1967 | H | 600 | S | Swc/dls |
| 219 | 4057-7635 | Charles Confer | do. | 1976 | H | 585 | S | Sto/lsd |
| 220 | 4058-7634 | George Pappas | Wieand Brothers | 1977 | H | 720 | S | Sb/sh |
| 221 | 4058-7635 | W. Raup | Virgil Buck | 1978 | H | 765 | S | Sru/sls |
| 222 | 4058-7636 | John Hubicki | R. R. Hornberger | 1967 | H | 680 | S | Sru/sls |
| 223 | 4058-7634 | James Blue | --- | 1966 | H | 810 | S | Smk/sls |
| 224 | 4057-7635 | Kline Albeck | R. R. Hornberger | 1967 | H | 565 | S | Swc/dls |
| 225 | 4058-7637 | Glen Hagenbuch | Ronald Randler | 1968 | H | 570 | S | Srl/sssh |
| 226 | 4057-7635 | John Krum | do. | 1967 | H | 582 | S | Sto/lsd |
| 227 | 4058-7636 | Goven Saienni | R. R. Hornberger | 1966 | H | 680 | S | Sru/sls |
| 228 | 4058-7636 | John Hubicki | do. | 1968 | H | 680 | S | Sru/sls |
| 229 | 4059-7638 | Pennsylvania Department of Transportation | Kohl Brothers | 1970 | H | 515 | V | Swc/dls |
| 231 | 4100-7639 | George Dietr | --- | 1968 | H | 620 | W | Dh/sh |
| 232 | 4059-7638 | May's Drive-In | --- | 1968 | H | 510 | W | Do/lss |
| 233 | 4100-7636 | Jay Hummer | Wieand Brothers | 1974 | H | 670 | S | Dmh/sh |
| 234 | 4059-7635 | John Burke | --- | 1975 | H | 605 | S | Dmr/sh |
| 235 | 4059-7637 | Larry Mordan | Ronald Randler | 1977 | H | 575 | S | Sru/sls |
| 236 | 4059-7639 | Mobil | --- | 1966 | H | 580 | S | Dmh/sh |
| 237 | 4100-7636 | Scott Edmeads | Wieand Brothers | 1977 | H | 555 | V | Dtr/sssh |

(CONTINUED)

| Total depth below land surface (feet) | Casing | | Depth(s) to water-bearing zone(s) (feet) | Static water level | | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (µmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depth (feet) | Diameter (inches) | | Depth below land surface (feet) | Date measured (mo/yr) | | | | | | |
| 70 | --- | --- | --- | 14 | 7/80 | --- | --- | --- | 188 | 450 | Mt-149 |
| 135 | 31 | 6 | --- | 5 | 7/80 | 4 | --- | --- | 120 | 310 | 150 |
| 195 | 20 | 6 | 90;185 | 25 | 7/80 | --- | --- | --- | --- | --- | 151 |
| 506 | 20 | 6 | 89;134;291 | 60 | 8/68 | 3 | .03/--- | --- | --- | --- | 152 |
| 125 | 25 | 6 | 25 | 4 | 8/80 | 15 | .25/13 | 2 | 239 | 280 | 153 |
| 153 | 35 | 6 | 120 | --- | --- | --- | --- | --- | 200 | 86 | 154 |
| 100 | 40 | 6 | 92;98 | --- | --- | 15 | --- | --- | 86 | 250 | 156 |
| 215 | 20 | 6 | 80 | 11 | 9/80 | 1 | --- | --- | 52 | 252 | 157 |
| --- | --- | --- | --- | 51 | 10/80 | --- | --- | --- | 103 | 285 | 158 |
| 195 | 43 | 6 | --- | 40 | 4/75 | 10 | --- | --- | 34 | 90 | 159 |
| 135 | 21 | 6 | --- | --- | --- | 3 | --- | --- | 34 | 77 | 160 |
| 275 | 20 | 6 | --- | --- | --- | 6 | --- | --- | 51 | 180 | 161 |
| 275 | 20 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 162 |
| 315 | 20 | 6 | --- | 95 | 11/80 | 3 | --- | --- | --- | --- | 163 |
| 105 | 20 | 6 | 92;101 | --- | --- | --- | --- | --- | --- | --- | 164 |
| 153 | --- | --- | --- | 35 | 11/80 | 5 | .04/--- | --- | 34 | 132 | 165 |
| 76 | 16 | 6 | 25;73 | 5 | 9/67 | 15 | .21/--- | --- | 103 | 355 | 166 |
| 95 | 20 | 6 | 60;75 | 30 | 11/78 | 15 | .23/--- | --- | --- | --- | 167 |
| 140 | 68 | 6 | 90;120 | 50 | 7/78 | 5 | .06/--- | --- | --- | --- | 168 |
| 170 | 19 | 6 | 85;160 | 40 | 7/78 | 5 | .04/--- | --- | --- | --- | 169 |
| 170 | 20 | 6 | 95;160 | 45 | 11/78 | 12 | .10/--- | --- | --- | --- | 170 |
| 170 | 32 | 6 | 90;150 | 40 | 9/78 | 5 | .04/--- | --- | --- | --- | 171 |
| 155 | 31 | 6 | 80;110;145 | 40 | 11/78 | 7 | .06/--- | --- | --- | --- | 172 |
| 250 | 31 | 6 | --- | 18 | 7/80 | 25 | --- | --- | --- | --- | 173 |
| 285 | 14 | 6 | 50;198 | 6 | 4/81 | --- | .03/3 | 1 | 154 | 550 | 175 |
| 189 | --- | --- | --- | 17 | 8/81 | --- | .07/3 | 1 | 103 | 185 | 176 |
| --- | --- | --- | --- | 165 | 8/81 | --- | .03/1 | .5 | 68 | 115 | 177 |
| 175 | --- | --- | --- | 2 | 8/81 | 25 | .29/15 | 2 | 86 | 222 | 178 |
| 250 | 121 | 6 | 160;235 | 73 | 10/81 | 6 | .10/--- | --- | 103 | 200 | 181 |
| 170 | 71 | 6 | 60;115;160 | 30 | 5/79 | 6 | .04/--- | --- | --- | --- | 182 |
| 200 | 20 | 6 | 95;170 | 30 | 5/79 | 5 | .03/--- | --- | --- | --- | 183 |
| 145 | 20 | 6 | 95;140 | 35 | 5/79 | 20 | .18/--- | --- | --- | --- | 184 |
| 223 | --- | --- | --- | 60 | 11/81 | 18 | .32/9 | 1 | 86 | 230 | 185 |
| 273 | --- | --- | --- | 39 | 11/81 | 5 | .04/3 | 1 | 51 | 160 | 186 |
| 200 | 45 | 6 | 100;160 | 58 | 11/81 | --- | .18/7 | 6 | 68 | 160 | 187 |
| 197 | 60 | 6 | --- | 68 | --- | 14 | --- | --- | --- | --- | 188 |
| 115 | 61 | 6 | --- | --- | --- | 50 | --- | --- | --- | --- | 189 |
| 230 | 40 | 6 | --- | 25 | --- | 10 | --- | --- | --- | --- | 190 |
| 200 | --- | --- | --- | 20 | --- | 25 | --- | --- | --- | --- | 191 |
| 528 | 28 | 10 | --- | 68 | 1/30 | --- | .15/26 | 11 | --- | --- | 194 |
| 75 | 20 | 6 | --- | 15 | 4/74 | 28 | --- | --- | --- | --- | 202 |
| 190 | 22 | 6 | --- | 20 | 9/73 | 120 | --- | --- | --- | --- | 203 |
| 70 | 36 | 8 | 36;50;65 | 11 | 1/67 | --- | 3.1/165 | 8 | --- | --- | 204 |
| 175 | 119 | 7 | 35;105;165 | -3 | 8/66 | --- | 3.5/55 | 4 | --- | --- | 205 |
| 300 | 98 | 8 | 120;180;240 | 5 | 5/73 | --- | .50/70 | 19 | --- | --- | 206 |
| 400 | 60 | 8 | 95;160;245; 320;370 | 20 | 6/73 | --- | .14/30 | 24 | --- | --- | 207 |
| 394 | 42 | 6 | 215;370 | 70 | 10/77 | 2 | --- | --- | --- | --- | 208 |
| 263 | 41 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 209 |
| 126 | 20 | 6 | --- | 8 | 11/78 | --- | --- | --- | --- | --- | 210 |
| 110 | 40 | 6 | --- | 52 | 6/78 | --- | --- | --- | --- | --- | 211 |
| 305 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 212 |
| 120 | 60 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 213 |
| 175 | 41 | 6 | --- | 3 | 10/78 | --- | --- | --- | 51 | 98 | 214 |
| 215 | 20 | 6 | --- | --- | --- | 6 | --- | --- | --- | --- | 215 |
| 190 | --- | --- | 135;185 | 50 | 11/66 | 7 | .05/--- | --- | --- | --- | 216 |
| 80 | 43 | 6 | 53;68 | 28 | 3/68 | 6 | .19/--- | --- | --- | --- | 217 |
| 95 | 81 | 6 | 85 | 40 | 12/67 | 15 | .27/--- | --- | --- | --- | 218 |
| 190 | --- | --- | 180 | 66 | 10/66 | 3 | .03/--- | --- | --- | --- | 219 |
| 198 | 20 | 6 | 135 | 30 | 8/77 | 5 | --- | --- | --- | --- | 220 |
| 200 | 20 | 6 | 120;180 | 30 | 7/78 | 4 | .03/--- | --- | 17 | 280 | 221 |
| 115 | 51 | 6 | 69;96 | 57 | 12/67 | 5 | .09/--- | --- | --- | --- | 222 |
| 100 | 34 | 6 | 60;90;98 | --- | --- | 6 | --- | --- | --- | --- | 223 |
| 216 | 91 | 6 | 150;205 | 49 | 6/67 | 7 | .04/--- | --- | --- | --- | 224 |
| 210 | 20 | 6 | 65;205 | 102 | 9/81 | 20 | --- | --- | 68 | 165 | 225 |
| 88 | 81 | 6 | 84 | 57 | 8/67 | 30 | --- | --- | --- | --- | 226 |
| 255 | 46 | 6 | 120;150;248 | 20 | 10/66 | 4 | .03/--- | --- | 68 | 145 | 227 |
| 205 | --- | 6 | 86;175;200 | 30 | 2/68 | 20 | .11/--- | --- | --- | --- | 228 |
| 260 | 190 | 6 | --- | 15 | 1/70 | --- | 2.8/34 | 28 | --- | --- | 229 |
| 155 | 22 | 6 | 38;81;124;137 | 10 | 5/68 | 10 | .07/--- | --- | --- | --- | 231 |
| 175 | 21 | 6 | 114;165 | 30 | 6/68 | 6 | .04/--- | --- | --- | --- | 232 |
| 175 | 21 | 6 | 43;80;143;165 | 41 | 10/78 | 6 | --- | --- | --- | --- | 233 |
| 155 | 30 | 6 | --- | 26 | 10/78 | 4 | --- | --- | --- | --- | 234 |
| 128 | 54 | 6 | 120 | 58 | 11/78 | 10 | .50/--- | --- | 68 | 148 | 235 |
| 95 | 21 | 6 | 40;89 | 25 | 11/66 | 20 | .31/--- | --- | --- | --- | 236 |
| 198 | 18 | 6 | 180 | 40 | 5/77 | 60 | --- | --- | 103 | 220 | 237 |

TABLE 23.

| Well location | | Owner | Driller | Year completed | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Mt-238 | 4059-7639 | ARCO | --- | 1974 | H | 560 | S | Dmh/sh |
| 239 | 4100-7637 | Joseph Kistner | --- | 1968 | H | 605 | S | Dmh/sh |
| 240 | 4100-7637 | Darwin Ditty | --- | 1967 | H | 640 | S | Dmh/sh |
| 241 | 4100-7636 | Howard Tanner | --- | 1967 | H | 680 | H | Dmh/sh |
| 242 | 4059-7638 | Stewart Venblehn | --- | 1967 | H | 495 | W | Sb/sh |
| 243 | 4100-7637 | Mark Roberts | Ronald Randler | 1968 | H | 635 | S | Dmh/sh |
| 244 | 4059-7637 | First Baptist Church | --- | 1977 | H | 530 | S | Swc/dls |
| 245 | 4058-7637 | James Hagenbuch | Ronald Randler | 1979 | H | 595 | S | Srl/sls |
| 247 | 4059-7637 | Walter Halterman | do. | 1980 | H | 545 | H | Sb/sh |
| 248 | 4058-7637 | Gordon Raup | do. | 1981 | H | 565 | W | Srl/sls |
| 249 | 4058-7638 | Wayne Myers | Virgil Buck | 1978 | H | 800 | S | Srl/sls |
| 250 | 4058-7637 | George Wagner | Ronald Randler | 1978 | H | 870 | H | Srl/sls |
| 251 | 4058-7641 | B. Ludwig | --- | 1980 | H | 1,010 | H | Srl/sls |
| 252 | 4108-7643 | E. Donahue | Wieand Brothers | 1979 | H | --- | H | Dtr/sssh |
| 253 | 4108-7643 | G. Leonard | do. | 1979 | H | --- | S | Dtr/sssh |
| 254 | 4058-7635 | J. Stanko | R. R. Hornberger | --- | H | 750 | S | Sru/sls |
| 255 | 4058-7634 | Thomas Forney | Stackhouse | 1982 | H | 1,030 | H | Srl/sls |
| | | | | | | | | NORTHUMBERLAND |
| Nu-157 | 4056-7637 | Fisher Realty | Wieand Brothers | 1980 | P | 595 | S | Dmh/sh |
| 158 | 4056-7637 | do. | do. | 1980 | P | 570 | W | Dmh/sh |
| 159 | 4056-7637 | Haefner | --- | 1979 | H | 605 | S | Dmh/sh |
| 160 | 4056-7637 | Larry Bohner | R. R. Hornberger | 1967 | H | 565 | S | Dmh/sh |
| 161 | 4056-7634 | Allen Shaffer | do. | 1966 | H | 465 | V | Dciv/sssh |
| 162 | 4056-7635 | Wayne Brouse | do. | 1960 | H | 485 | V | Dciv/sssh |
| 164 | 4106-7644 | Thelma Strouse | Ronald Randler | 1974 | H | 580 | S | Don/lss |
| 165 | 4106-7644 | James Styer | do. | 1974 | H | 560 | S | Don/lss |
| 166 | 4057-7637 | William Snyder | R. R. Hornberger | 1972 | H | 525 | T | Swc/dls |
| 167 | 4056-7639 | Richard Heller | Ronald Randler | 1969 | H | 475 | T | DSk/ls |
| 168 | 4056-7639 | Harold Whitenight | R. R. Hornberger | 1967 | H | 460 | T | Dmh/sh |
| 169 | 4057-7637 | Daniel Fitzgerald | do. | 1967 | H | 470 | T | Swc/dls |
| 170 | 4057-7638 | Ralph Shannon | do. | 1966 | H | 530 | T | Dmr/sh |
| 171 | 4057-7638 | Fred Reed | do. | 1966 | C | 530 | T | Dmr/sh |
| 172 | 4057-7637 | Arthur Fryling | do. | 1966 | H | 500 | T | Swc/dls |
| 173 | 4056-7637 | Nevin Beishline | do. | 1966 | H | 610 | S | Dmh/sh |
| 174 | 4057-7637 | Stanley Adler | Norman Hagenbuch | 1966 | H | 550 | V | Dmh/sh |
| 175 | 4057-7639 | Riverside Church | Virgil Buck | 1978 | H | 495 | T | Swc/dls |
| 176 | 4056-7638 | Schmidt | R. R. Hornberger | 1970 | H | 540 | S | Dtr/sssh |
| 177 | 4057-7637 | Alex Oshirak | Ronald Randler | 1976 | H | 470 | T | Don/lss |
| 178 | 4057-7637 | Raymond Howell | R. R. Hornberger | 1967 | H | 480 | T | Do/lss |
| 179 | 4057-7639 | Terry Fry | do. | 1977 | H | 485 | T | Swc/dls |
| 180 | 4056-7637 | F. Maresa | --- | 1976 | H | 605 | S | Dmh/sh |
| 184 | 4056-7637 | Adam Rivito | Wieand Brothers | 1977 | H | 705 | S | Dtr/sssh |
| 185 | 4056-7637 | Pinebrook Homes | Stackhouse | 1981 | H | 615 | S | Dmh/sh |
| 186 | 4057-7638 | Shirley Steffen | R. R. Hornberger | 1966 | H | 470 | T | Sb/sh |
| 187 | 4057-7637 | Time Markets | Alvin Swank and Son | 1973 | H | 480 | T | DSk/ls |
| 188 | 4057-7637 | David Cooper | --- | --- | H | 480 | T | DSk/ls |
| 189 | 4057-7637 | Fred Geringer | Alvin Swank and Son | 1972 | H | 480 | T | Sto/lsd |
| 190 | 4057-7637 | do. | --- | --- | H | 480 | T | Qgo/sg |
| 191 | 4057-7637 | S. Wintersteen | --- | --- | H | 465 | T | Qgo/sg |
| 193 | 4055-7646 | Beverly Cook | --- | 1977 | H | 640 | S | Dtr/sssh |
| 194 | 4055-7645 | Richard Smith | --- | 1974 | H | 560 | V | Sto/lsd |
| 195 | 4055-7645 | Steve Klinger | --- | 1977 | H | 540 | S | Dmh/sh |
| 196 | 4055-7645 | Scott Erdman | --- | 1977 | H | 550 | S | Dmr/sh |
| 197 | 4057-7639 | D. Barnhart | Ronald Randler | 1978 | H | 470 | V | Sb/sh |
| 198 | 4057-7640 | James Thomas | R. R. Hornberger | 1977 | H | 470 | V | Swc/dls |
| 199 | 4056-7640 | Charles Brogan | do. | 1976 | H | 470 | V | Swc/dls |
| 200 | 4056-7641 | William Cole | do. | 1975 | H | 500 | S | Sb/sh |
| 251 | 4157-7638 | C. Benjamin | Ronald Randler | 1980 | H | 510 | T | Do/lss |

(CONTINUED)

| Total depth below land surface (feet) | Casing: Depth (feet) | Casing: Diameter (inches) | Depth(s) to water-bearing zone(s) (feet) | Static water level: Depth below land surface (feet) | Static water level: Date measured (mo/yr) | Reported yield (gal/min) | Specific capacity [(gal/min)/ft]/ pumping rate (gal/min) | Pumping period (hours) | Hard-ness (mg/L) | Specific conduc-tance (μmho/cm at 25°C) | Well number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 131 | 45 | 6 | --- | 29 | 5/74 | 8 | --- | --- | --- | --- | Mt-238 |
| 74 | 22 | 6 | 40;61 | 20 | 5/68 | 6 | .11/--- | --- | --- | --- | 239 |
| 70 | 34 | 6 | 60;68 | 30 | 10/67 | 10 | .25/--- | --- | --- | --- | 240 |
| 95 | 40 | 6 | 55;68;85 | 30 | 4/67 | 7 | .12/--- | --- | --- | --- | 241 |
| 76 | 23 | 6 | 65 | 13 | 7/67 | 25 | .68/--- | --- | --- | --- | 242 |
| 82 | 20 | 6 | 65;70;80 | 42 | 7/68 | 30 | 3.8/--- | --- | --- | --- | 243 |
| 70 | 20 | 6 | 55;65 | 10 | 1/77 | 20 | --- | --- | --- | --- | 244 |
| 261 | 13 | 6 | 100;255 | 116 | 9/81 | 20 | .36/--- | --- | 68 | 160 | 245 |
| 265 | 16 | 6 | 260 | 59 | 9/81 | 3 | --- | --- | 171 | 380 | 247 |
| 137 | 15 | 6 | 130 | 59 | 9/81 | 20 | .27/--- | --- | 86 | 160 | 248 |
| 80 | 20 | 6 | 60;75 | 20 | 9/78 | 8 | .13/--- | --- | 86 | 180 | 249 |
| 191 | 14 | 6 | 185 | 82 | 11/78 | 7 | .08/--- | --- | 51 | 170 | 250 |
| 97 | 43 | 6 | 87 | --- | --- | 10 | --- | --- | 51 | 78 | 251 |
| 523 | 42 | 6 | 178 | --- | --- | --- | --- | --- | --- | --- | 252 |
| 448 | 39 | 6 | 100 | 82 | 6/79 | 1 | --- | --- | --- | --- | 253 |
| 200 | 105 | 6 | --- | --- | --- | --- | --- | --- | --- | --- | 254 |
| 223 | 40 | 6 | 76 | 46 | 4/82 | 6 | .05/3 | 1 | 86 | 210 | 255 |
| COUNTY | | | | | | | | | | | |
| 300 | 42 | 6 | 56;91;115;148 | 26 | 5/80 | 20 | 1.2/18 | 2 | 51 | 100 | Nu-157 |
| 300 | 22 | 6 | 22;30;88; 108;289 | 4 | 7/80 | 60 | .87/60 | 40 | 86 | 181 | 158 |
| 130 | --- | --- | --- | 56 | 5/80 | --- | --- | --- | --- | --- | 159 |
| 95 | 39 | 6 | 45;87;91 | 44 | 7/67 | 8 | .16/--- | --- | --- | --- | 160 |
| 80 | 32 | 6 | 60;75 | 29 | 6/80 | 7 | .14/--- | --- | 51 | 190 | 161 |
| 83 | --- | --- | 41 | 25 | 8/80 | 35 | .53/15 | 1 | 51 | 150 | 162 |
| 80 | 14 | 6 | 75 | --- | --- | --- | --- | --- | --- | --- | 164 |
| 74 | 13 | 6 | 70 | --- | --- | --- | --- | --- | --- | --- | 165 |
| 175 | 106 | 6 | --- | 40 | 10/72 | 6 | --- | --- | --- | --- | 166 |
| 75 | 21 | 6 | --- | 25 | 2/69 | 35 | 1.2/--- | --- | --- | --- | 167 |
| 105 | 20 | 6 | 27;103 | 25 | 6/67 | 40 | .50/--- | --- | --- | --- | 168 |
| 150 | 31 | 6 | 140 | 20 | 3/67 | 3 | .03/--- | --- | --- | --- | 169 |
| 63 | 32 | 6 | 58 | 10 | 9/66 | 6 | .14/--- | --- | --- | --- | 170 |
| 75 | 38 | 6 | 45;61 | 20 | 12/66 | 10 | .20/--- | --- | --- | --- | 171 |
| 95 | 69 | 6 | --- | 40 | 9/66 | 7 | .16/--- | --- | --- | --- | 172 |
| 155 | 31 | 6 | 71;109;146 | 20 | 11/66 | 4 | .03/--- | --- | --- | --- | 173 |
| 65 | 27 | 6 | 40;55;60 | 16 | 11/66 | 25 | .74/--- | --- | --- | --- | 174 |
| 110 | 87 | 6 | 110 | --- | --- | 10 | --- | --- | --- | --- | 175 |
| 180 | 60 | 6 | --- | 17 | 11/78 | --- | --- | --- | --- | --- | 176 |
| 61 | 29 | 6 | 55 | 13 | 4/76 | 18 | .49/--- | --- | --- | --- | 177 |
| 335 | 41 | 6 | 48;71;104; 203;309 | 43 | 7/67 | 20 | .07/--- | --- | --- | --- | 178 |
| 98 | 92 | 6 | 98 | 53 | 11/78 | 40 | --- | --- | --- | --- | 179 |
| 125 | --- | --- | --- | 38 | 5/80 | --- | --- | --- | --- | --- | 180 |
| 398 | 20 | 6 | 300 | 76 | 12/78 | 2 | --- | --- | --- | --- | 184 |
| 123 | --- | --- | --- | 38 | 11/81 | 12 | --- | --- | 51 | 135 | 185 |
| 70 | 20 | 6 | 50;60 | 20 | 7/66 | 20 | .57/--- | --- | --- | --- | 186 |
| 96 | 83 | 6 | 86;95 | 32 | 11/81 | 40 | 4.2/63 | 24 | 188 | 600 | 187 |
| 80 | --- | --- | 69 | 32 | 11/81 | --- | .88/12 | 2 | 274 | 795 | 188 |
| 120 | --- | --- | --- | 31 | 11/81 | --- | .35/7 | 1 | 855 | 2,100 | 189 |
| 47 | --- | --- | --- | 32 | 11/81 | --- | --- | --- | --- | 625 | 190 |
| --- | --- | --- | --- | 21 | 12/81 | --- | --- | --- | --- | --- | 191 |
| 205 | 60 | 6 | 134;175 | 100 | 5/77 | 7 | --- | --- | --- | --- | 193 |
| 185 | 167 | 6 | --- | 20 | 6/74 | 150 | --- | --- | --- | --- | 194 |
| 226 | 42 | 6 | 165;195 | 85 | 11/77 | 5 | --- | --- | --- | --- | 195 |
| 151 | 63 | 6 | 64;140 | 2 | 11/77 | 8 | --- | --- | --- | --- | 196 |
| 137 | 21 | 6 | 130 | 16 | 8/78 | 20 | .24/--- | --- | --- | --- | 197 |
| 42 | 33 | 6 | 38 | --- | --- | 100 | --- | --- | --- | --- | 198 |
| 53 | 40 | 6 | 49 | 16 | 1/76 | 50 | --- | --- | --- | --- | 199 |
| 75 | 57 | 6 | --- | 20 | 8/75 | 10 | --- | --- | --- | --- | 200 |
| 90 | 76 | 6 | 70 | 68 | 1/80 | 14 | --- | --- | --- | --- | 251 |

## TABLE 24. RECORD OF SELECTED SPRINGS

Spring location: The number is that assigned to identify the spring. It is prefixed by a two-letter abbreviation of the county. The lat-long is the coordinates, in degrees and minutes, of the southeast corner of a 1-minute quadrangle within which the spring is located.

Use: H, domestic; P, public supply; T, institution.

Topographic setting: S, hillside; T, terrace; W, upland draw.

Aquifer: Qgo, glacial outwash; Dcsc, Sherman Creek Member of the Catskill Formation; Smk, Mifflintown and Keefer Formations.

Lithology: sg, sand and gravel; sls, sandstone, limestone, and shale; sssh, sandstone and shale.

Reported discharge: gal/min, gallons per minute.

| Spring location | | Owner | Name of spring | Use | Altitude of land surface (feet) | Topographic setting | Aquifer/ lithology | Reported discharge (gal/min) |
|---|---|---|---|---|---|---|---|---|
| Number | Lat-Long | | | | | | | |
| Co-Sp-2 | 4104-7624 | Orangeville Water Co. | No. 1 | P | 670 | W | Dcsc/sssh | 18 |
| 4 | 4056-7626 | Catawissa Water Authority | Upper Hoffman | P | 1,280 | S | Dcsc/sssh | 14 |
| 5 | 4056-7626 | do. | Lower Hoffman | P | 1,200 | S | Dcsc/sssh | 14 |
| 6 | 4056-7626 | do. | Gensel | P | 770 | W | Dcsc/sssh | 10 |
| 9 | 4101-7622 | P. Hartkorn | --- | H | 490 | T | Qgo/sg | 2 |
| Mt-Sp-1 | 4058-7636 | Geisinger Medical Center | --- | T | 540 | W | Smk/sls | --- |