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THE WATER RESOURCES OF BALTIMORE AND HARFORD COUNTIES

THE GROUND-WATER RESOURCES OF THE PIEDMONT PART

BY

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ABSTRACT

Baltimore and Harford Counties lie in two physiographic provinces, the Coastal Plain to the southeast and the Piedmont to the northwest. This report deals with the Piedmont province, where the rocks are largely hard Precambrian or lower Paleozoic schist, quartzite, granite, gabbro, marble, and phyllite. Ground water in the crystalline rocks generally occurs under water-table conditions, although artesian conditions exist locally. The source of all ground water in the area is precipitation. The precipitation averages about 43 inches per year and is generally rather evenly distributed throughout the year.

More than 70 percent of the drilled wells have yields of 10 gallons per minute or less, and only 2 percent have yields in excess of 50 gallons per minute. The Baltimore gneiss is an important aquifer in which the yields of 116 wells range from 0 to 110 gallons per minute and average a little better than 10 gallons per minute. A value for the coefficient of transmissibility obtained from a pumping test of a well in the gneiss was about 5,000 gallons per day per foot. The Wissahickon formation is divided into two rock types, an oligoclase-mica facies and an albite-chlorite facies. The yields of more than 230 wells in the oligoclase-mica facies average better than 11 gallons per minute. Generally, the best wells are in areas where the rocks are deeply weathered. The average yield of 76 wells ending in the albite-chlorite facies is 10 gallons per minute. The average depth of the wells in the Wissahickon is 92 feet. The Cockeysville marble is the best aquifer in the area. The marble weathers to a sand or sandy clay to depths locally in excess of 100 feet. The yields of 55 wells ending in the marble range from less than 1 to 80 gallons per minute and average about 19 gallons per minute. The average depth of wells in the marble is about 210 feet. The yields of wells are related to the topographic situation. The best wells are in the valleys and the poorest are on hilltops.

The total use of ground water in the area is about 4 million gallons per day, most of which is used for domestic or agricultural purposes. There are no public supplies (municipal) from a ground-water source in the Piedmont section of either county, although formerly several communities had public water supplies derived from wells.

The chemical character of the ground water is generally satisfactory for

most uses, as shown by 61 chemical analyses of water from wells or springs. Dissolved solids in 51 samples average 105 parts per million. The hardness in 60 samples averages 59 parts per million. The hardest water is obtained from wells or springs in marble. The iron content is generally low, but it ranges from 0 to 3.5 parts per million.

Additional ground-water supplies are available for rural and domestic use, but supplies for industrial and irrigation use are limited to an estimated maximum of a few hundred thousand gallons a day.

INTRODUCTION

LOCATION OF THE AREA

Baltimore and Harford Counties are in north-central Maryland. Baltimore County is bounded on the west by the North Branch of the Patapsco River to a point just west of Reisterstown and thence by a northeast-trending line to the Pennsylvania border, on the south by the Patapsco River and Chesapeake Bay, and on the north by the Pennsylvania border. Harford County adjoins Baltimore County on the east. Harford County is bounded on the east by the Susquehanna River, on the south by the Bay, and on the north by the Pennsylvania border. This report is concerned primarily with the hydrology of the parts of the counties that lie in the Piedmont physiographic province (fig. 1), which constitutes about 80 percent of their area. The area southeast of U. S. Highway 40 (the Coastal Plain part of the counties) is described in a previous report (Bennett and Meyer).

PURPOSE, SCOPE, AND METHODS OF INVESTIGATION

The purpose of the investigation was to obtain basic information on the ground-water resources of the parts of Baltimore and Harford Counties that lie in the Piedmont physiographic province. The investigation included a study of the lithologic and hydrologic characteristics of the geologic formations, their utilization as sources of ground water, and the chemical quality of the water that they contain. The fieldwork was begun in the fall of 1952 and was essentially complete in October 1954.

An inventory of 1,174 wells and springs was made in the two counties (Tables 15–18). Logs of wells were compiled from drillers' reports, field observation by the authors at well-drilling sites, or examination of samples submitted by the well drillers to the Maryland Department of Geology, Mines and Water Resources (Pls. 4 and 5). Electric and temperature logs were obtained for a number of wells. Water samples from 41 wells and springs were analyzed for chemical constitutents by the United States Geological Survey, 16 analyses were obtained from the Maryland State Health Department, and 4 analyses were obtained from other sources (Tables 13 and 14). The fluctuations of water levels were determined by means of periodic tape measurements or continuous-recording instruments in observation wells.

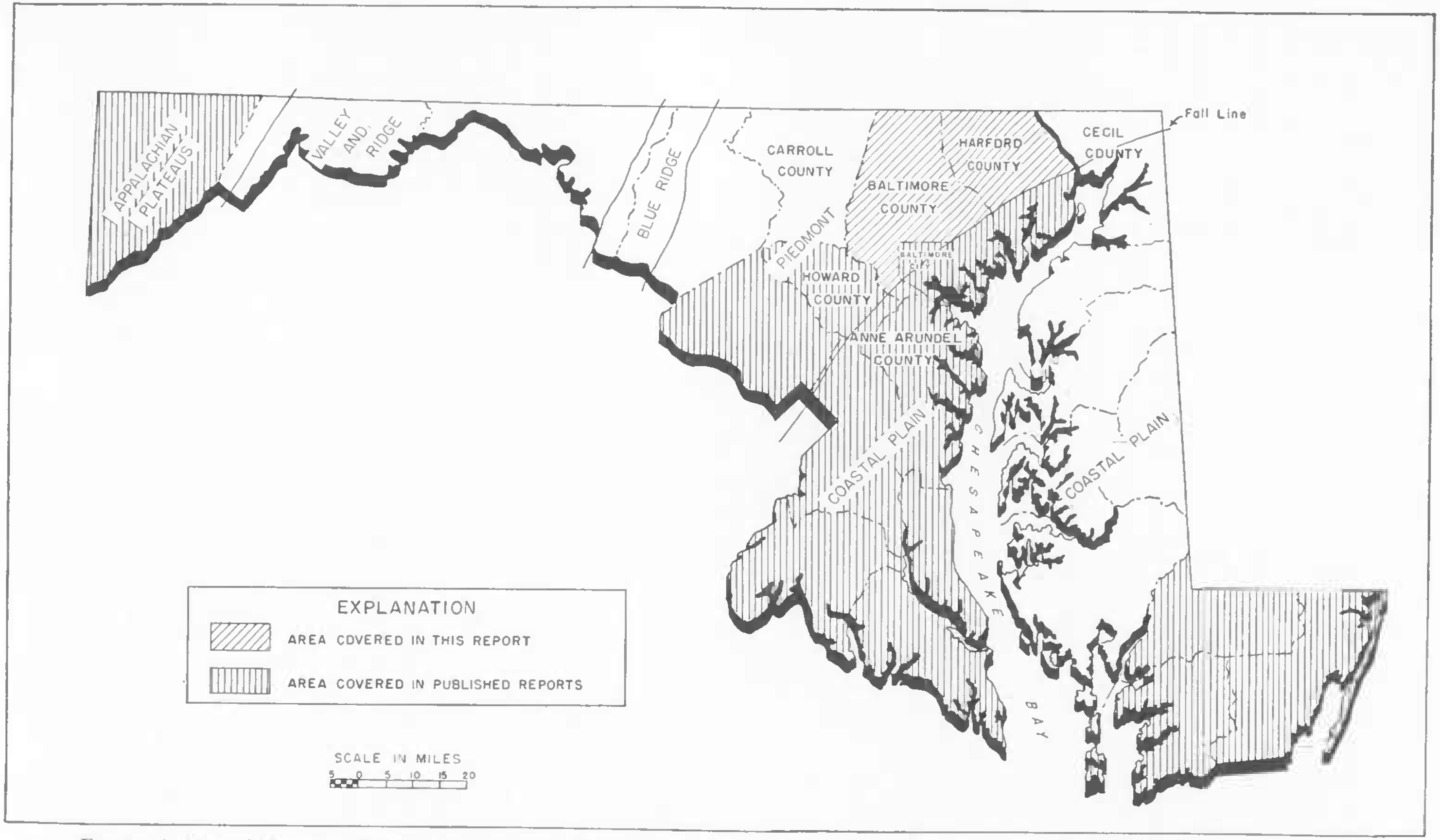

FIGURE 1. Map of Maryland Showing Physiographic Provinces, the Area Covered in this Report, and Areas Covered in Published Reports

The wells inventoried are numbered according to a coordinate system. On the left and right side of the well-location map of each county (Pls. 1 and 2), uppercase letters designate 5-minute intervals of latitude, and on the top and bottom of each map lowercase letters designate 5-minute intervals of longitude. The 5-minute quadrangle formed by the intersection of the lines of latitude and longitude is identified by a combination of the coordinate letters. The abbreviations for Baltimore (Bal) and Harford (Har) Counties are placed before the coordinate letters to differentiate between the wells in the two counties. The wells in each 5-minute quadrangle were assigned consecutive numbers in the order in which they were recorded.

PREVIOUS STUDIES

The water resources of Baltimore and Harford Counties are discussed briefly in a report on the water resources of Maryland, Delaware, and the District of Columbia, by Clark, Mathews, and Berry (p. 413–426). The ground-water resources of the Baltimore area, including Baltimore City and the parts of Baltimore and Harford Counties within the Coastal Plain, were studied by R. R. Bennett and R. R. Meyer during the period 1943 to 1945, and the results of that investigation were published as Bulletin 4 of the Maryland Department of Geology, Mines and Water Resources. The ground-water conditions at several localities in the area were studied by other members of the U. S. Geological Survey during the past few years, and the data have been used in this report.

ACKNOWLEDGMENTS

The well drillers in Baltimore and Harford Counties were very helpful in providing information on wells drilled prior to and during this study. The Maryland State Department of Health provided chemical analyses of water from wells that had been used for public water supplies. The engineers of the Baltimore County Metropolitan District provided data on soil-percolation studies in Baltimore County.

The investigation was under the general supervision of A. N. Sayre, Chief of the Ground Water Branch of the U. S. Geological Survey, and under the immediate supervision of R. R. Bennett, District Geologist until August 1953, and E. G. Otton, District Geologist since August 1953, in charge of the cooperative ground-water investigations in Maryland.

ECONOMY AND CULTURE

Baltimore County has a land area of 610 square miles, of which approximately 68 percent is used for agricultural purposes (Maryland State Planning Commission, p. 14). The most important crops are corn, wheat, and vegetables. Dairy products, beef, pork, and poultry also are produced in substantial quantities. Approximately 20 percent of the industry of Maryland is in Baltimore County, but most of the plants are located in the Coastal Plain area.

The population of Baltimore County was 269,362 in 1950, and as of January 1955 was estimated by the Baltimore County Department of Education to have increased to about 340,000. Most of the population is concentrated in the areas adjacent to Baltimore City.

Harford County has a land area of 448 square miles, of which approximately 70 percent is used for agricultural purposes (Maryland State Planning Commission, p. 32). The agricultural production is highly diversified. The county has a smaller industrial area than Baltimore County, producing approximately 1 percent of the State's manufactured products.

The population of Harford County was 52,014 in 1950. The largest city in the county is Havre de Grace with a 1950 population of 7,811. Suburban developments in the county are relatively few and small.

There has been some development of the mineral resources of the two counties. Large gravel, clay, and sand pits are located along the border of the Coastal Plain, and quarries are operated at several localities in the crystalline rocks. Feldspar, flint, slate, serpentine, marble, and ores of chrome, iron, and copper were mined in the early part of this century and the 19th century. The mineral industry is relatively small today.

CLIMATE

The average annual precipitation is 43.32 inches, based on records 17 to 84 years long at five stations in Baltimore and Harford Counties. The precipitation is rather evenly distributed throughout the year, the average monthly precipitation reaching a maximum of approximately 4.5 inches in August and a minimum of approximately 3.0 inches in February, with a secondary minimum of approximately 3.1 inches in November.

The mean annual temperature is approximately 53°F. The last killing frost usually occurs late in March and the first killing frost late in October or early in November.

GENERAL GEOLOGY AND HYDROLOGY

Baltimore and Harford Counties are underlain by crystalline rocks of Precambrian or of early Paleozoic age (Pl. 3). They extend beneath younger unconsolidated sedimentary rocks, chiefly of Cretaceous age, in the southeastern parts of the two counties. The crystalline rocks are chiefly schist, gneiss, phyllite, and gabbro, with smaller amounts of quartzite, marble, granite, serpentine, slate, and dikelike intrusives of pegmatite and diabase. A mantle of disintegrated and decomposed rock generally overlies the fresh rock.

The Coastal Plain sediments include the Patuxent formation of Early Cretaceous age and the Arundel clay and Patapsco formation of Late Cretaceous age. The sediments dip to the southeast, forming a wedgelike body having a maximum thickness in Baltimore and Harford Counties of about 800 feet. Small areas near the southeastern edge of the Piedmont are covered by these Cretaceous formations, generally in isolated remnants capping hills.

In some parts of the area thin deposits of gravel, sand, and clay of Tertiary and Quaternary age cap hills, form valley-side terrace deposits, or occur as alluvium in the bottoms of valleys.

The boundary between the Coastal Plain physiographic province and the Piedmont physiographic province is called the Fall Line (fig. 1), which coincides roughly with the boundary between the crystalline rocks and the unconsolidated Cretaceous sediments of the Coastal Plain.

The occurrence of ground water in Baltimore and Harford Counties is largely dependent on the character, areal extent, and structure of the rock formations. In general, the ground water moves downward and laterally from upland areas to lowland areas where it is discharged in springs and streams. Although locally the water may pass beneath bodies of soil or rock of low permeability and become confined under artesian pressure, the ground water occurs predominantly under unconfined, or water-table, conditions.

Most of the area is underlain by crystalline rocks. The openings in the crystalline rocks that contain or transmit water are chiefly joints and other fractures, but, in the mantle of weathered rock, water occurs in the pore spaces between the particles. Most of the ground water in the crystalline rocks circulates in this more permeable mantle rock and in the upper few tens of feet of the undecomposed rock. Most of the water for wells is derived from the upper part of the undecomposed rock.

Water in the unconsolidated sedimentary deposits occurs in the pore spaces of the sand, gravel, and clay. Circulation of ground water is greatest in the permeable beds of sand and gravel, and least in the highly porous but relatively impermeable beds of clay and sandy clay. The largest supplies of water from wells in the sedimentary deposits are obtained from beds of sand and gravel.

The character and water-bearing properties of the geologic formations are described in Table 1, and the character and water-bearing properties of the various crystalline rocks are described in Table 2.

OCCURRENCE OF GROUND WATER

General Principles

In Baltimore and Harford Counties ground water is derived entirely from precipitation. Some of the precipitation flows directly from the land surface into streams as surface runoff, some is returned to the atmosphere by evaporation, and some percolates downward into the soil (fig. 2). Some of the water that enters the soil is returned to the atmosphere through transpiration or evaporation without reaching the water table. Only a small part of the pre-

TABLE 1

Geologic Formations in the Piedmont of Baltimore and Harford Counties and their Water-bearing Properties

System	Series	Group	Formation	Approximate thickness (feet)	General character	Water-bearing properties
Quaternary	Recent			0–30	Cobbles, gravel, sand, silt, and clay	May yield large quantities of water where recharge can be induced from nearby stream.
Quaternary	Pleistocene		Lowland deposits	0–100	Gray clay, sand, gravel, and cobbles	Not important aquifer because of limited areal extent. May yield large quantities of water where water-bearing material is 50–100 ft. thick.
Quaternary	Pleistocene		Upland deposits	0–30	Clay, sand, and gravel	Not an important water-bearing formation because deposits are thin. Yield small supplies for domestic purposes from dug wells.
Cretaceous	Upper Cretaceous	Potomac	Patapsco formation	0–100	Lenticular beds of sand, clay, and gravel	Not an important water-bearing formation because of its thinness and limited areal extent north of U. S. Highway 40. Yields small supplies to dug wells in outcrop area.
Cretaceous	Upper Cretaceous	Potomac	Arundel clay	0–150	Dark-gray to red clay, with some indurated layers of "ironstone"	Not a water-bearing formation except where penetrated by a few dug wells along its outcrop.
Cretaceous	Lower Cretaceous	Potomac	Patuxent formation	0–150	Lenticular beds of sand, gravel, and clay	Not an important water-bearing formation because of its thinness and limited areal extent north of U. S. Highway 40.
Lower Paleozoic and Precambrian					Chiefly schist, gneiss, gabbro, granite, marble, and quartzite; some slate, conglomerate, serpentine, pegmatite, and diabase dikes	Contain important water-bearing formations which underlie most of Baltimore and Harford Counties. Water chiefly in porous and permeable weathered overburden; joints and fractures act as conduits, bringing water into wells. Yields range from 0 to 200 g.p.m.

TABLE 2

Crystalline Rocks in Baltimore and Harford Counties and their Water-bearing Properties

Rock type	Geologic unit	Lithology	Water-bearing properties
Schist	Wissahickon formation, albite facies Wissahickon formation, oligoclase facies	Banded quartz-muscovite schist and phyllite of various compositions, may contain chlorite, albite, or oligoclase. Relatively soft and easy to drill.	Domestic supplies available almost everywhere. Large supplies (50 g.p.m. or more) are available in many areas. Poorest wells are on narrow ridges. Highest yields from wells in draws and small valleys. Yields of wells range from 0 to 200 g.p.m. and average 10.5 g.p.m.
Gneissic and granitic rocks (including pegmatites)	Baltimore gneiss Gunpowder granite Port Deposit gneiss Woodstock granodiorite Hartley augen gneiss Relay quartz diorite	Gneissic rocks are banded or foliated, are highly crystalline, and contain much biotite. Granitic rocks are massive, highly siliceous, and somewhat gneissic. Drilling properties variable; siliceous zones drilled with difficulty.	Domestic supplies available almost everywhere. Larger supplies available in some areas. Highest yields obtained from wells in draws and small valleys. Yields of wells range from 0.5 to 55 g.p.m. and average 10.8 g.p.m.
Gabbro, serpentine, and related basic rocks (including Peach Bottom slate and Triassic diabase)		Gabbroic rocks are dark, massive, and hard; most serpentine is greenish, soft, massive, and in places highly fractured. Fresh gabbro difficult to drill. Serpentine soft and easy to drill.	Domestic supplies available nearly everywhere. Weathered mantle is thin and clayey. May decline during summer and fall. Yields of wells range from 0.5 to 80 g.p.m., and average 10.3 g.p.m.
Marble	Cockeysville marble	Coarsely crystalline white marble and limestone; dolomitic in some areas. Relatively soft and easy to drill.	Probably the best crystalline-rock aquifer. Industrial supplies possibly available in valleys where marble has weathered to sand. Yields of wells range from 0.2 to 80 g.p.m. and average 18.8 g.p.m.

Rock type	Geologic unit	Lithology	Water-bearing properties
Quartzite	Peters Creek quartzite Setters formation Cardiff conglomerate	Coarse-grained quartzite with associated mica schist and gneiss. Drilling variable; siliceous zones drilled with difficulty.	Domestic supplies available almost everywhere. Larger supplies available in some areas. Yields of wells range from 0.5 to 135 g.p.m. and average 12.8 g.p.m.

cipitation replenishes, or recharges, the ground-water reservoirs (p. 47–52). Water is discharged from the ground-water reservoirs through springs or by seepage into streams, by evaporation and transpiration, and through wells.

The percentage of the total volume of a rock that is occupied by interstices is its porosity. The porosity of the sedimentary materials and of the weathered mantle of the crystalline rocks is relatively high, probably ranging from a few percent to 20 or 30 percent. It is lowest where the weathered material is only partly decomposed or the sediments are consolidated, cemented, or poorly sorted. In the unweathered crystalline rocks ground water occurs chiefly in joints and other fractures which make up only a small percentage of the total rock volume—probably less than 1 percent in many places.

The permeability of a rock is a measure of its ability to transmit water. Whereas the porosity is the total volume of pore spaces or other openings, permeability is determined or governed chiefly by the number, size, shape, and degree of interconnection of the pore spaces or other openings. The permeability of a rock is not necessarily proportional to its porosity. The porosity of clay is high (more than 50 percent in many clays), but its interstices are so small that water clings to the clay particles by molecular attraction and does not move freely through them; hence, the permeability of clay is low. In sand and gravel, however, the much larger interstices enable the water to be transmitted more readily, and the permeability of these materials is high. Secondary cementation, compaction, and consolidation reduce the permeability of a rock. The permeability of unweathered crystalline rock is determined chiefly by the character of the joints and other fractures. The weathered crystalline rock may be permeable sand-like material (saprolite) or an impermeable clay or silt, depending on the degree of weathering and the nature of the original rock.

Ground water occurs under two types of conditions, water-table and artesian. Water-table conditions exist where the water-bearing material that makes up the ground-water reservoir is not overlain by impervious rock, and water from precipitation may directly enter the reservoir by downward percolation. The upper surface of the saturated zone, which is under atmospheric pressure, is called the water table. Its position is marked by the static water level in wells.

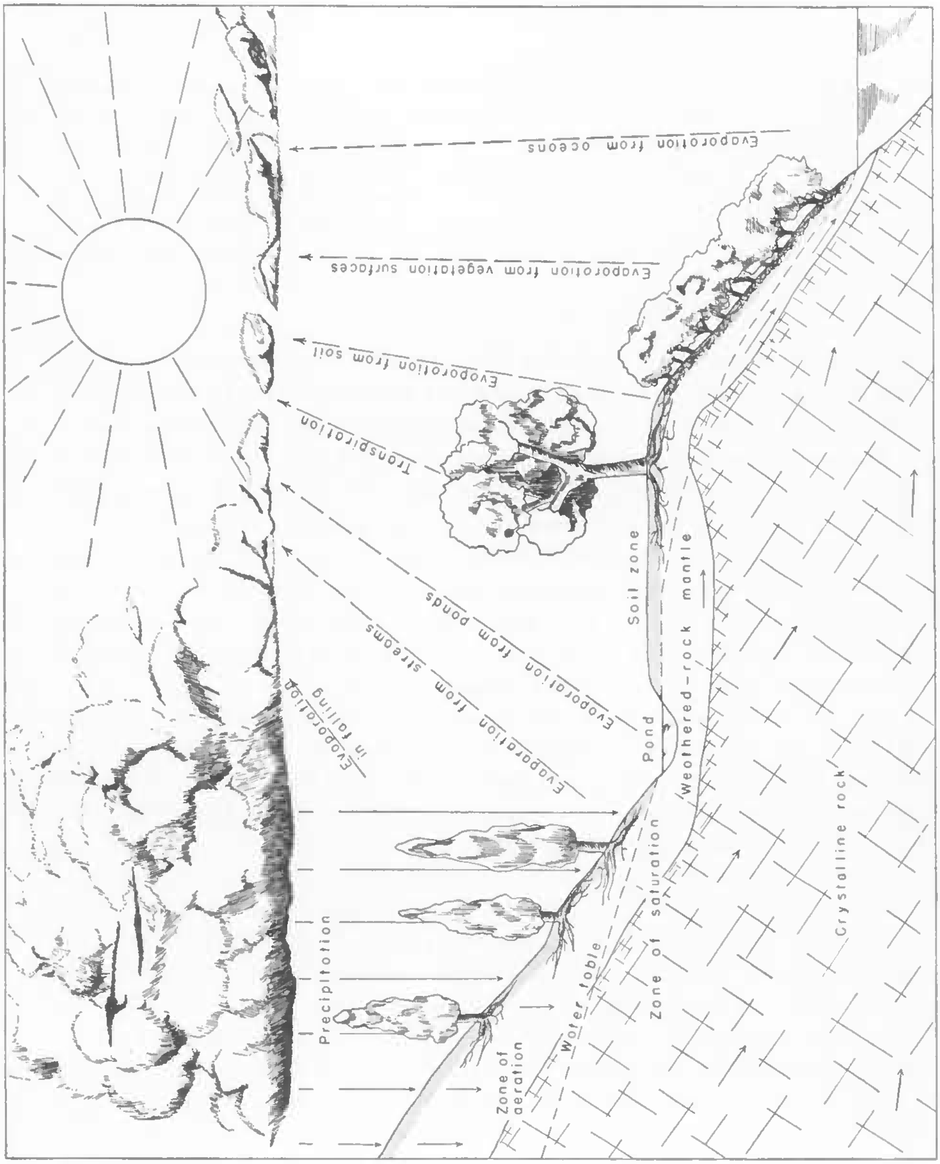

FIGURE 2. The Hydrologic Cycle in the Crystalline-rock Areas in Maryland

Artesian conditions exist where the water, moving through an aquifer, passes beneath relatively impervious rock and becomes confined under pressure. If an artesian reservoir is penetrated by a well, the water level in the well rises above the bottom of the confining rock or layers. A water well penetrating a confined aquifer is classed as artesian whether or not the water rises to, or above, the land surface. In the Piedmont area of Baltimore and Harford Counties practically all the ground water occurs essentially under water-table conditions; artesian conditions exist only locally.

The ground-water reservoirs in Baltimore and Harford Counties discharge water continuously, but at varying rates, by both natural and artificial means. In comparison with the quantity of ground water discharged naturally, the discharge by artificial means, consisting almost entirely of water pumped from wells, is extremely small.

Natural discharge of ground water occurs through springs and by direct discharge into stream beds, evaporation, and transpiration by plants. It is largely the continuous discharge of ground water through springs or into stream beds that maintains the flow of the streams despite the intermittency of precipitation.

Factors that determine the amount of rainfall that becomes ground water are (1) duration, intensity, and periodicity of the rainfall, (2) shape of the land surface, (3) permeability of soil and rock at and beneath the surface, and (4) type and density of vegetation.

OCCURRENCE OF GROUND WATER IN THE SEDIMENTARY ROCKS

PATUXENT FORMATION

The Patuxent formation crops out in an irregular belt along the edge of the Coastal Plain in Baltimore and Harford Counties, forming a thin, interrupted cover over the crystalline rocks in the area along the Fall Line. In Baltimore County the formation is exposed in a belt 1 to 4 miles wide, and in numerous erosional outliers (islands) to the northwest. In Harford County the outcrop of the Patuxent formation is less extensive, occurring mainly as erosional outliers northwest of U. S. Highway 40.

The formation dips to the southeast and thickens rapidly downdip. It is the basal formation of the Coastal Plain wedge of sediments. Where complete, the Patuxent formation is 150 to 300 feet thick in Baltimore County (Bennett and Meyer, p. 40), but the eroded outliers range in thickness from a featheredge to 50 feet.

The formation is of continental origin and consists of a series of irregular and lenticular beds of brown, tan, and white gravel, sand, sandy clay, and clay and thin indurated sandstone layers. The sands and gravels commonly show crossbedding. The character of the sediments changes rapidly both vertically and horizontally.

The Patuxent formation is the source of numerous domestic and small commercial ground-water supplies along U. S. Highway 40. North of U. S. Highway 40, where the formation is thinner and discontinuous, it yields water to dug wells and to a few drilled wells in the thicker erosional outliers. The Patuxent formation thickens rapidly to the southeast beyond the area of this report, and becomes an excellent aquifer yielding up to 1,000 gallons per minute to wells in the Sparrows Point industrial area.

ARUNDEL CLAY

The Arundel clay, which overlies the Patuxent formation, crops out along the Fall Line as an irregular belt half a mile to 3 miles wide, extending northeastward across Baltimore County and to the vicinity of Bush River in Harford County. The formation dips about 40 feet to the mile to the southeast, and ranges in thickness from about 25 feet near the outcrop to 200 feet downdip (Bennett and Meyer, p. 59). The formation consists essentially of a tough red to gray clay which locally contains small concretionary masses of "ironstone."

Although the Arundel clay is not generally considered to be an aquifer, some domestic water supplies are obtained from dug wells in the formation. Downdip the Arundel clay acts as a confining layer or aquiclude permitting the development of artesian pressures in the underlying Patuxent formation.

PATAPSCO FORMATION

The Patapsco formation, which lies unconformably upon the Arundel clay, crops out in the Coastal Plain parts of Baltimore and Harford Counties in a broad belt extending northeast across the southeastern parts of the two counties. In Harford County the outcrop area is discontinuous, owing to the presence of the overlying Pleistocene deposits. Northwest of the Fall Line the outcrop area consists of isolated erosional remnants capping the hills.

The Patapsco formation, also of continental origin, is lithologically similar to the Patuxent formation. The sediments are composed essentially of red, brown, white, or gray gravel, sand, sandy clay, and clay. Crossbedding is common. Most beds are lenticular and change rapidly in character over short distances. The formation ranges in thickness from about 300 feet where fully developed in southeastern Baltimore County to only a few feet on hills northwest of the major belt of outcrop in both counties (Bennett and Meyer, p. 63).

The Patapsco formation is too thin and of too limited areal extent in the area of this report to be of importance as an aquifer. Some domestic dug wells probably obtain water from the Patapsco where it occurs as a cap on some of the hills north of U. S. Highway 40. Beyond the area of the report, in the Baltimore industrial area, yields of 300 to 500 gallons per minute are obtained from wells in the Patapsco formation.

PLEISTOCENE AND RECENT DEPOSITS

Pleistocene deposits overlie much of the outcrop area of the Cretaceous strata in the Coastal Plain area of the two counties, and remnants of these deposits cap the hills and uplands in the part of the Piedmont adjacent to the Fall Line. Scattered outliers of the Pleistocene deposits occur as far northwest of the Fall Line as Cockeysville in Baltimore County and at Level in Harford County. These deposits range in thickness from about 150 feet along Chesapeake Bay to only a few feet northwest of the Fall Line, and lie on the eroded surface of the Precambrian or Cretaceous formations. Bennett and Meyer (p. 68), with respect to the occurrence of ground water, arbitrarily divided the Pleistocene deposits into two ill-defined units—a lowland unit which is essentially equivalent to the Talbot formation, and an upland unit which roughly corresponds to the Brandywine, Sunderland, and Wicomico formations. Most of the Pleistocene deposits northwest of U. S. Highway 40 are part of the upland unit. These deposits are composed of a heterogeneous mixture of cobbles, gravel, sand, and clay. Their thickness is estimated not to exceed 30 feet. The upland deposits are not an important water-bearing formation, as they are thin and occur chiefly on the tops of well-drained hills and ridges. Small supplies of water for domestic use are obtained from dug wells on the flatter parts of the ridges and upland areas. The water-bearing properties of the lowland deposits are discussed by Bennett and Meyer (p. 72), who report that considerable coarse water-bearing material is present in this unit, and that the most permeable material is in the vicinity of Aberdeen and Havre de Grace, Harford County, where yields as high as 500 gallons per minute have been obtained. In the vicinity of Baltimore, salt water from the Patapsco estuary has moved into the lowland deposits, and they are no longer used as a source of ground water. Because of their limited areal extent, the lowland deposits are not an important aquifer in the area of this report.

Alluvial deposits of Recent age underlie the flood plains in the valleys of some of the major streams. In most localities the Recent deposits are narrow and thin, are composed of material derived from the local crystalline rocks, and contain a high percentage of silt and clay. Three test wells were drilled in the spring of 1954 through flood-plain deposits along Broad Creek and Deer Creek in Harford County (Pl. 6, fig. 1). The thickness of the Recent deposits averages 22 feet and they are composed of a mixture of cobbles, gravel, sand, silt, and clay. As only a few feet of the Recent deposits were saturated, the wells were not tested for yield from these sediments. The heterogeneous character of the material and its high content of silt and clay indicate poor permeability, and the wells would have had very small yields if the alluvium could have been satisfactorily tested. In a few places in the Piedmont area the permeability, lateral extent, and thickness of the Recent alluvium may be sufficient to permit pumping of substantial quantities of water from wells or galleries, provided that sufficient recharge can be induced from the adjacent streams. The water-bearing properties of the Recent deposits and their hydraulic connection with the associated streams should be determined before deciding the feasibility of developing a substantial water supply from the alluvium.

OCCURRENCE OF GROUND WATER IN THE CRYSTALLINE ROCKS

GENERAL DESCRIPTION OF GEOLOGIC UNITS

The metasediments that compose the Glenarm series (Setters formation, Cockeysville marble, Wissahickon formation, and Peters Creek quartzite) underlie most of the northern half of Baltimore County and the northwestern third of Harford County. The rest of the area is underlain by the highly metamorphosed Baltimore gneiss and by intrusive masses of igneous rock (gabbro, granite, granodiorite, pyroxenite, diabase, and others) which have been metamorphosed to varying degrees.

The geologic structures generally strike northeast; therefore the Glenarm series is exposed in broad bands that extend across the counties from southwest to northeast (Pl. 3). Many of the bodies of intrusive rock also follow this structural trend; for example, the gabbro extends northeastward from Ellicott City to Conowingo. Table 2 summarizes the lithology and water-bearing properties of the crystalline rocks.

The crystalline rocks of Baltimore and Harford Counties may be roughly classified into two major types: (1) thoroughly metamorphosed sedimentary rocks, and (2) intrusive igneous rocks which, since their injection, have been metamorphosed to varying degrees. In their original state the two types of rock differed greatly in geologic character and in hydrologic properties. The sedimentary rocks must have had a high porosity and, in part, were permeable; the igneous rocks were dense and massive and of very low porosity and permeability. These widely different types of rocks were subjected to extreme heat and pressure, as well as to the chemical action of solutions given off by cooling igneous rocks. Their mineral grains were rearranged, crushed, or stretched, and new minerals were formed. In many places the original rock textures were almost obliterated by the intense folding and recrystallization.

WATER-BEARING PROPERTIES OF THE CRYSTALLINE ROCKS

Porosity

The percentage of pore space in typical crystalline rocks is shown in Table 3. The percentage of pore space is very small in comparison to the porosity of sand and gravel. Many of the pore spaces in the crystalline rocks are so small that water is transmitted through them very slowly, if at all. Wells obtain no significant amounts of water from the pores of the massive rock. In several areas, particularly in Baltimore County, many wells have been drilled 300 to 400 feet deep in the Wissahickon formation and have yielded only a small

TABLE 3

Porosity of Various Rocks[1]

Rock[2]	Porosity (percent by volume)			
	Number of tests	Minimum	Maximum	Average
Igneous rocks:				
Granite	9	0.23	1.75	0.76
Diorite				.25
Diabase	2	.90	1.13	1.01
Gabbro				.6–.7
Gabbro	1			.84
Amphibolite	1			.90
Metamorphic rocks:				
Serpentine	1			.56
Marble	4	.11	.59	.3
Slate	59	1.16	10.28	3.8
Graywacke schist	11	1.28	7.74	3.6
Quartzite	1			1.91
Quartzite	1			.8

[1] Compiled from M. L. Fuller (p. 61), H. Reich, and Buckley (p. 400–403).

[2] Rock types listed more than once indicate porosity determinations by more than one analyst.

fraction of a gallon per minute. Even these small yields are probably derived from pores in the surficial weathered material around the base of the casing or from small fractures in the deeper fresh rock, and not from pores in the fresh rock.

Permeability

JOINT SYSTEMS

Joints and other fractures are the only openings in the fresh crystalline rocks through which water may move with sufficient rapidity and in sufficient volume to supply a well; therefore, the permeability of the crystalline rocks is largely determined by the size and extent of the fractures. The different types of joints in the crystalline rocks and the geologic processes forming them are discussed by Cloos. A joint may be defined as an opening or fracture in the rock of great length and depth as compared to its width. There are generally two systems of joints oriented essentially at right angles to each other and a third system crossing them at an oblique angle. Joints occur at intervals ranging from a few inches or less in closely jointed rock to several tens of feet in more massive rock. Joint systems may be observed in serpentine and the Peters Creek quartzite freshly exposed in deep road cuts along Maryland Highway 623 near Broad Creek in Harford County and in many quarries in the area. The joints near the surface of the unweathered rock may be several inches wide. These relatively wide openings result in part from the slow decomposition and solution of some of the minerals in the rock by ground water. The width of the joints decreases rapidly with depth. Near the bottoms of quarry walls the width of most joints is very small; in most places a knife blade cannot be forced into the openings. The width of the joints probably continues to decrease with depth until they are only hairline cracks or even invisible or "incipient" joints.

SHEET JOINTS

In some of the crystalline rocks, principally the granites, another system of joints is developed that essentially conforms with the configuration of the land surface. This type of joint is known as sheet jointing, or sheeting, and is particularly well developed in the granodiorite intrusive exposed near the town of Granite, Baltimore County (Pl. 6, fig. 2).

SOLUTION OPENINGS

Occasionally, when drilling in the crystalline rocks, the drilling tools suddenly drop, perhaps several inches or more, as though the drill had penetrated an open space in the rocks. Such an opening was encountered in drilling an observation and test well in the Wissahickon formation near Hampstead in adjacent Carroll County. The hole was being drilled by the rotary method, using a fairly thick natural mud as the drilling fluid. The hole had been "tight" from the surface down to 74 feet, showing only a small loss of drilling fluid. At a depth of approximately 74 feet the drill dropped about 6 inches and a complete loss of mud circulation occurred. At this depth the well presumably was still being drilled in the partly weathered rock, as the drilling-time records at a depth of 60 to 80 feet show a rate of penetration of approximately 1½ minutes per foot, whereas drilling time in unweathered Wissahickon formation in other wells using the same equipment averaged approximately 10 minutes per foot.

Inasmuch as crystalline quartz appeared in the cuttings after circulation was re-established, the drill may have dropped as the result of passing through a pegmatite dike from which the feldspar had been removed by solution by ground water, leaving a honeycombed lattice of quartz crystals partly filling the space originally occupied by the pegmatite. Such a honeycombed zone probably would be highly permeable, and if encountered at sufficient depth beneath the water table, should make a good well.

Wells drilled along steeply dipping contacts between the Cockeysville marble and other crystalline rocks have encountered decomposed rock to great depth (Table 4). In addition to the wells listed in Table 4, another well was reported to have been drilled approximately 100 yards east of Bal-Ec 34 to a depth of 500 feet without encountering hard rock. Most of these wells start in the

TABLE 4

Records of Wells Drilled into Formational Contact Zones Adjacent to the Cockeysville Marble

Well number	Contact	Depth of decomposed rock	Yield (gpm)	Remarks
Bal-Cd 7	Setters-Cockeysville	95	3.5	
Db 19	do	100	0	
Ec 34	do	352	2	
Ec 40	do	198	0	Mud all the way
Ec 41	do	76	0	
Ec 42	do	202	5	
Dc 27	Wissahickon-Cockeysville	135	7	Sticky yellow clay 90′–135′

Cockeysville marble but are located within a few tens of feet of a contact with an adjacent formation. Generally, yellow or gray mud is penetrated the entire depth of the well. Weathering to this depth probably is caused by the acidic water from the adjoining silicate rock moving into and dissolving the relatively soluble marble. Some of the faults mapped in the Piedmont along the contact of a marble or limestone with other crystalline rocks probably are zones where slumping has taken place as a result of similar solutional phenomena. Such "faults" would die out beneath the zone of ground-water circulation.

FAULTS

Faults may create openings that increase the permeability of the crystalline rocks. A fault is a fracture along which there has been appreciable slippage. The crushing and fracturing associated with faulting of crystalline or other consolidated rocks may produce a brecciated zone that is more porous and permeable than the original rock. On the other hand, well Fr-Fd 9 in Frederick County (Dingman and Meyer, p. 21) and well Bal-Ed 13 in Baltimore County apparently were drilled in fault zones and yielded little water. Both these wells are approximately 200 feet deep, were reported to have been drilled in mud and clay for their entire depth, and were abandoned as "dry holes." Apparently in these two instances the crushed material or gouge in the fault zone had been reduced to a claylike consistency, either by the mechanical action of the faulting or by decomposition of the original gouge by ground water circulating along the fault zone.

Statistical Analyses

GENERAL PRINCIPLES

The depths of wells in the crystalline rocks range from a few feet in shallow dug wells to 1,800 feet in a well at Lutherville in Baltimore County. The reported yields of the wells range from 0 to 200 gallons a minute. The specific capacity, or rate of yield per unit of drawdown, of a well is a useful indication of productivity. However, a figure based on a single drawdown-yield ratio is of doubtful value in many wells in crystalline rocks, for the specific capacity may vary greatly with depth in a given well. For example, if a 400-foot rock well having a static water level of 50 feet yields 10 gallons a minute with a drawdown of 50 feet, the specific capacity is 0.2 gallon per minute per foot (10 divided by 50). If all the water is derived from a fracture zone at a depth of 100 feet, if the pumping level is lowered to 200 feet (by briefly increasing the pumping), the well may continue to yield only 10 gallons a minute, but the specific capacity has changed to 0.07 gallon per minute per foot (10 divided by 150). With the pumping level at 300 feet the specific capacity has changed to 0.04 (10 divided by 250).

Wells similar to the hypothetical well described above are common in Baltimore and Harford Counties. In some wells drilling is continued after a water-bearing zone has been encountered, either to form a reservoir in the well, or in an attempt to obtain additional water. Often the deeper part of the well is unproductive. Wells of this type will be discussed more fully in the section on the relation of depth of wells to yield.

The yields of wells are a guide to the permeability of an aquifer. In the crystalline rocks there is considerable variation in the yield of adjacent wells, due to differences in the number and size of fractures encountered, rock type, topographic situations, and rock structures. Therefore, the results of a statistical analysis of yields of wells may be applied only in a general way to any given locality.

The importance of the various factors that affect the yields of wells in the crystalline rocks is revealed by statistical analyses. Such analyses may be based on the relation of well yields to the depth of the well, to its topographic position or geologic setting, and to the thickness of the weathered rock mantle in the vicinity. In Baltimore and Harford Counties the depths of the wells and the depth of weathering, as shown by lengths of casing, were obtained largely from the well drillers' completion reports and are reasonably accurate. However, the yields reported for most domestic wells are only approximations, as the wells are seldom pumped or bailed at their maximum capacity and the methods of measurement often somewhat crude. On the other hand, commercial, industrial, and municipal wells are usually tested at full capacity and for longer periods, so that the reported yields of these wells are more accurate.

The topographic position of each well—whether on a slope, in a valley or draw, etc.—was determined at the time the well was inventoried. However, there is no precise dividing line between various topographic positions, and their identification is subject to personal interpretation. For example, a draw (small valley) generally enlarges downslope and becomes what can be called

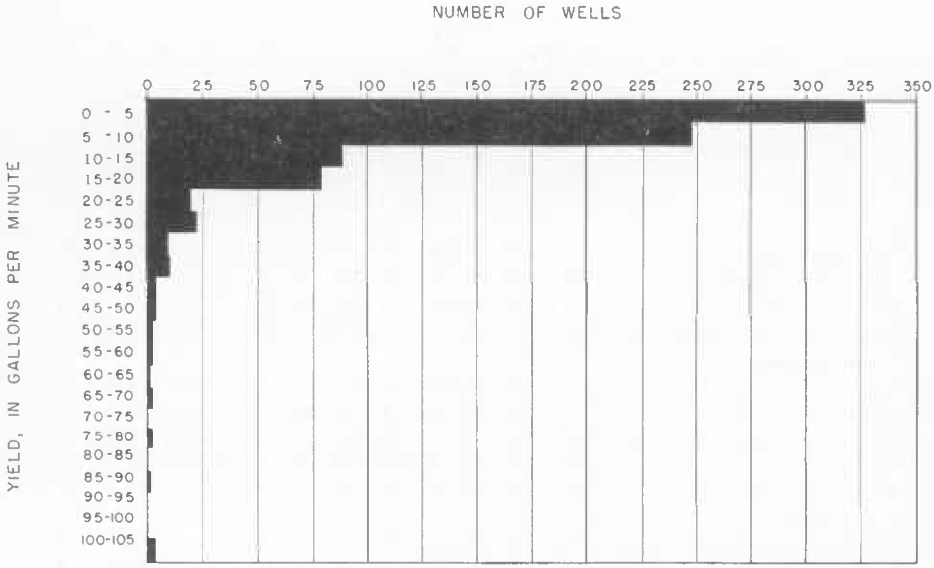

FIGURE 3. Frequency Distribution of Yields of Wells in the Crystalline Rocks

a valley, but there is no definite point where the draw ends and the valley begins; a well in the transition zone might be placed in either of the two classifications.

FREQUENCY DISTRIBUTION OF YIELDS OF WELLS IN THE CRYSTALLINE ROCKS

The relative frequency with which various yields are obtained from wells drilled in the crystalline rocks is shown in figure 3, which is a frequency-distribution graph of the yields of 819 wells in Baltimore and Harford Counties. More than 70 percent of the wells have yields of 10 gallons per minute or less, and only 2 per cent of the wells have yields of more than 50 gallons per minute. This graph indicates the probability of obtaining a required yield.

RELATION OF ROCK TYPE TO DEPTH AND YIELD OF WELLS

The relation of the rock type in which a well was drilled to the depth and yield of the well was analyzed statistically. Although the basic principles of occurrence of ground water apply to all the crystalline rocks, variations in the structure and lithology of the various rocks result in differences in their water-bearing properties (Table 5 and fig. 4). Rocks of five types underlie more than 90 percent of the Piedmont area of Baltimore and Harford Counties. These five types (Baltimore gneiss, Cockeysville marble, Wissahickon formation, Peters Creek quartzite and similar rocks, and the gabbro and diabase) are discussed in some detail. The remaining rocks, which underlie less than 10 percent of the Piedmont area, are discussed in general terms.

TABLE 5

Average Depth, Length of Casing, and Yield of Wells by Geologic Units

Formation	Depth (feet)				Length of casing (feet)				Yield (gpm)			
	Number of wells	Maximum	Minimum	Average	Number of wells	Maximum	Minimum	Average	Number of wells	Maximum	Minimum	Average
Woodstock granodiorite	2	150	56	103	1	22	22	—	2	39	20	29.5
Cockeysville marble	54	1800	50	210	44	202	6	42.2	55	80	.2	18.8
Contact zones	8	433	60	181	5	100	10	48	8	65	1	13.6
Wissahickon formation (oligoclase facies)	232	735	37	143	181	128	4.5	48.2	233	200	0	11.2
Baltimore gneiss	116	432	27	110	98	114	7	38.2	116	110	0	10.8
Pyroxenite	2	100	90	95	1	24	24	—	2	10	10	10
Setters formation	12	365	53	172	11	352	18	97	12	37	2	9.7
Gabbro	148	450	29	75	133	150	6	49.6	149	80	.5	10.3
Wissahickon formation (albite facies)	76	223	40	92	74	96	4	33.3	76	50	2	10.1
Peters Creek quartzite	90	380	35	104	75	135	3.5	49.5	90	135	.5	13.3
Gunpowder granite	17	210	18	110	14	84	11	36	17	30	1.5	8.0
Port Deposit gneiss	60	480	18	94	44	330	2	42.0	60	37	.5	11.3
Serpentine	22	140	45	83	20	71	13	31.6	22	30	2	10.1
Peach Bottom slate	1	80	80	—	—	—	—	—	1	10	10	—
Epidiorite	1	106	106	—	1	100	100	—	1	3	3	—

Baltimore Gneiss

The Baltimore gneiss is the oldest rock in Baltimore and Harford Counties. It occurs in six irregularly shaped domes or anticlines of varying size in Baltimore County and as a northeast-trending body in southern Harford County (Pl. 3). In Baltimore County the domes of gneiss are commonly bordered by the resistant Setters formation. The domes generally are topographically high areas surrounded by broad valleys developed in the Cockeysville marble, which overlies the Setters formation. The topography developed on the domes consists typically of smooth, rounded hills with gentle slopes grading in to U-shaped valleys. In Harford County the topography of the upland areas developed on the gneiss is gently undulating and is more subdued than the topography of the domes of Baltimore County. The gentler topography in Harford County is probably due to the fact that large masses of resistant gabbro surround the gneiss, protecting it to some extent from deep dissection.

The rocks of the Baltimore gneiss vary from heavily banded granitoid biotite gneiss to thinly banded "ribbon" gneiss. Dark bands are usually rich in biotite and light-colored bands are predominantly quartzose.

The Baltimore gneiss is a source of domestic water supply, and in favorable areas limited commercial or small industrial supplies may be obtained. The yields of 116 wells in the gneiss average 10.8 gallons per minute and range from 0 to 110 gallons per minute. The average depth of these wells is 110 feet, and their depths range from 27 to 432 feet. Only one of the wells inventoried was reported to be a complete failure (well Bal-Ed 13, near the southern end of Lake Roland), and only one well had a yield greater than 55 gallons per minute (well Bal-Cc 27), 1 mile north of Shawan. This well yielded 100 gallons a minute in a 72-hour test. Probably other wells in the gneiss, if tested, would prove to be capable of comparable yields.

Transmissibility coefficients.—In September 1953 an aquifer test was run on well Bal-Cc 27, situated in a small valley approximately 200 feet from a stream.

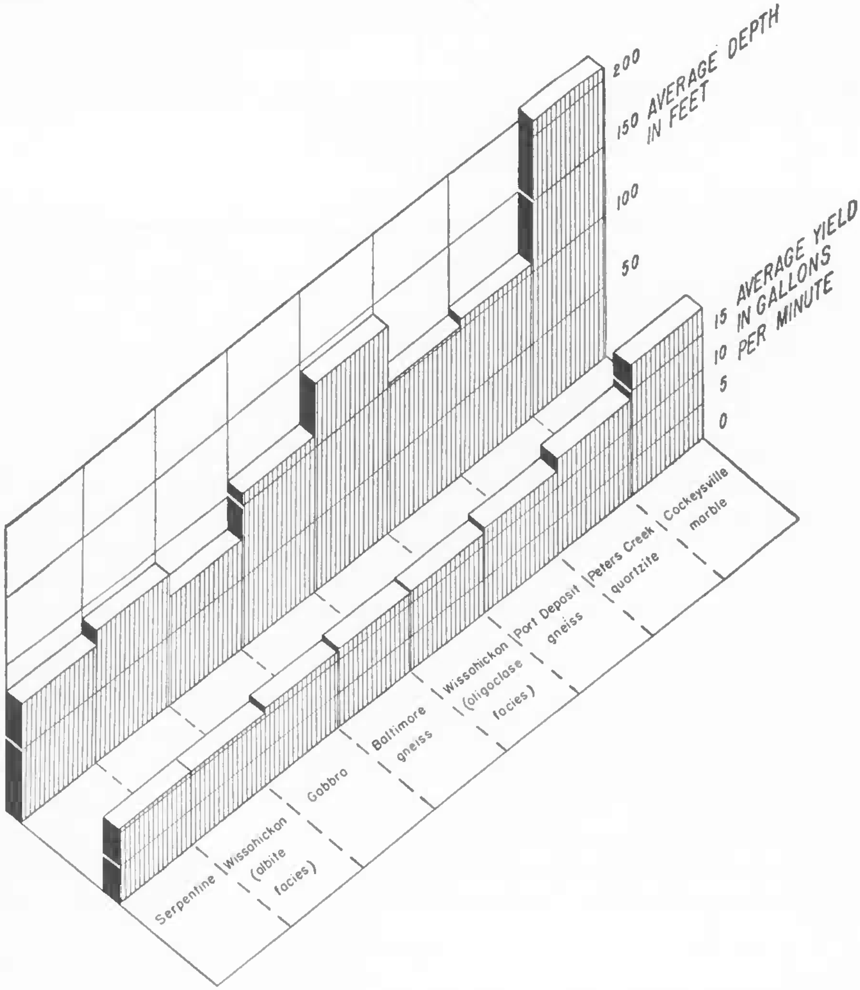

FIGURE 4. Relation of Depth and Yield of Wells to Crystalline-rock Units

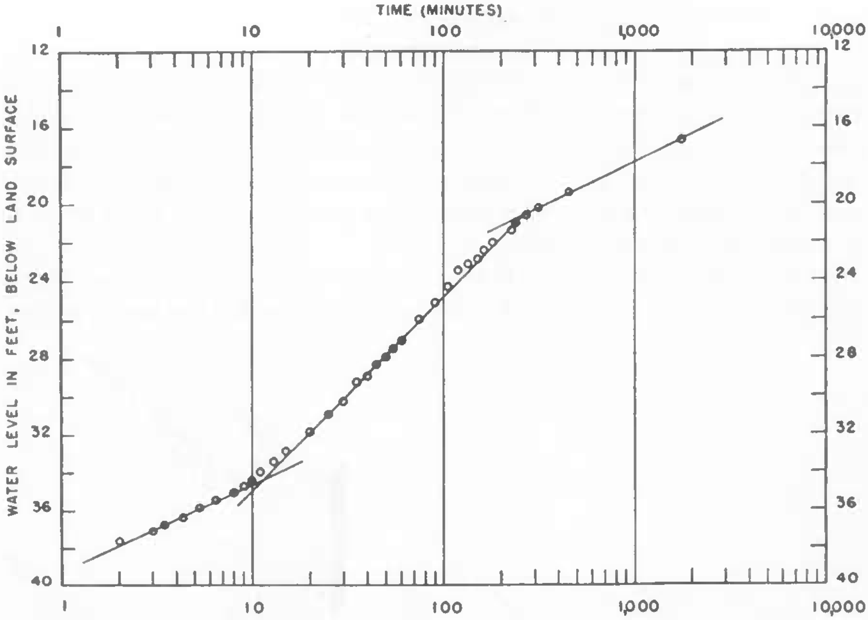

FIGURE 5. Semilog Graph of Recovery for Pumping Test on Well Bal-Cc 27

The well is 93.5 feet deep and contains 6-inch casing of unknown length. The discharge averaged 100 gallons per minute for 72 hours, the final drawdown being 37 feet. Coefficients of transmissibility[1] ranging from 2,300 to 5,300 gallons per day per foot were computed by the Cooper-Jacob semilog method (Cooper and Jacob, p. 526–534) from measurements that were made of the water levels during pumping and during the recovery period after pumping ceased (fig. 5). The highest transmissibility was calculated from the section of the recovery curve representing the period from 1 to 10 minutes and after 300 minutes after the pump was turned off to the end of the test.

Cockeysville Marble

The Cockeysville marble occurs along the flanks of the gneiss domes in Baltimore County, and in several valleys between the domes where the overlying Wissahickon formation has been eroded away, exposing the marble (Pl. 3). In Harford County the Cockeysville marble is of small areal extent, occurring as a very narrow strip along the eastern edge of the Phoenix dome in the vicinity of Hess, and as a small infolded remnant surrounded by the Baltimore gneiss along Winters Run, about 2 miles south of Singer. The thickness of the Cockeys-

[1] The coefficient of transmissibility, T, is expressed as the rate of flow of water, in gallons a day, thru a vertical strip of aquifer 1 foot wide extending the full saturated thickness of the aquifer under a hydraulic gradient of 100 percent.

ville is estimated to be 300 to 500 feet. The impression of much greater thickness suggested by the wide outcrops shown on the geologic map is due to repetition of beds by folding and faulting.

The Cockeysville marble is a completely crystalline marble, ranging from a poorly cemented, coarsely crystalline calcite to a fine-grained dense dolomite (Pl. 7, fig. 1). The calcareous and dolomitic phases are interbedded, as in the quarries at Texas in Baltimore County. In the vicinity of Texas, and in Hydes and Long Green Valleys, the marble weathers to a fine- to- medium-grained somewhat micaceous, calcareous sand. In some places, as in the quarries near Texas, it consists of a very white clean, well-sorted crystalline sand (Pl. 7, fig. 2). In test well Bal-Df 39 near the Hydes Post Office, a white to yellowish-brown calcareous sand was present to a depth of 127 feet. Sand has been reported by well drillers at a depth of about 200 feet in the vicinity of Glenarm in the Long Green Valley.

Broad, flat to gently undulating valleys are typical of areas underlain by the Cockeysville marble. The only sinkholes seen in the formation are about 3 miles west of Butler in the Butler valley. These sinkholes are 10 to 20 feet in diameter. They are restricted to a line just upslope from and paralleling a resistant ledge of the marble, suggesting that geologic structure may be an important factor in their development.

The Cockeysville marble is the best crystalline-rock aquifer in the area. The yields of 55 wells in the Cockeysville range from 0.2 to 80 gallons per minute and average about 19 gallons per minute. The depths of these wells range from 50 to 1,800 feet and average 210 feet. The best wells in the Cockeysville are in flat areas in the valleys, usually where a mantle of sand overlies the unweathered rock. The poorest wells are situated on small rises, which may be the topographic expression of more resistant (dolomitic?) beds in the marble.

Transmissibility coefficients.—An aquifer test was made on test well Bal-Df 39 near Hydes in February 1954. This well is 165 feet deep, and "limestone" sand (disintegrated marble) was encountered from near the surface to 127 feet, and somewhat harder marble from 127 to 165 feet. The well was cased to the harder marble, and 8 feet of screen with 0.025-inch slots was installed opposite a coarse sand layer between 96 and 104 feet. Analysis, by the Cooper-Jacob semilog method, of the rate of recovery of the water level after pumping ceased indicates a coefficient of transmissibility of approximately 35,000 gallons per day per foot. The test indicates that, where the sand (or weathered marble) is thick, as in Hydes and Long Green Valleys, it is likely that large-capacity commercial or irrigation wells can be obtained if the wells are properly screened and developed. Prospecting would be required to outline the favorable parts of the valleys.

Springs.—Many springs are located in the valleys underlain by the Cockeysville marble. The discharge of the largest of these, Chattolanee Spring (Bal-

Ec 5), was 400 gallons per minute on April 17, 1954, and 355 gallons per minute on February 1, 1955. Springs that discharge water at rates in excess of 50 gallons per minute are located in most of the other valleys in the Cockeysville marble.

Resistant ledges of marble crop out in or near the discharge points of most of these springs, indicating that geologic structure and lithology may be the important factors controlling their occurrence. In some of the valleys, as, for example, along the north side of Green Spring Valley, springs, seeps, and ground-water ponds are located in a line paralleling the strike of the rocks, probably reflecting the presence of a relatively impermeable bed within the marble.

Wissahickon Formation

The Wissahickon formation is composed of a great thickness of schist (estimated by some to be as much as 10,000 feet thick), which conformably overlies the Cockeysville marble. The topography developed on the Wissahickon formation consists of gently rolling uplands and elongated ridges separated by steep-sided valleys (Pl. 9, fig. 1). In some areas, as just west of Cockeysville, there is as much as 300 feet of relief between the ridges of the Wissahickon schist and the adjacent valleys in the Cockeysville marble. The formation is divided into an albite-chlorite facies, in the northern part of the two counties, and a more highly metamorphosed oligoclase-mica facies in the central part.

OLIGOCLASE-MICA FACIES.—The oligoclase-mica facies is a closely folded, coarsely crystalline rock composed primarily of biotite, muscovite, quartz, and oligoclase feldspar. Common accessory minerals are garnet, staurolite, and kyanite. The mica in the oligoclase-mica facies is abundant and highly resistant to weathering, and is a conspicuous, glittering constituent of soils in areas underlain by this facies. The rock is chiefly a relatively soft, foliated mica schist with occasional beds of hard white quartzite (Pl. 8, fig. 1).

Hydrologically, the oligoclase-mica facies of the Wissahickon formation is one of the most complex units in the area. The yields of 233 wells in the oligoclase-mica facies average 11.2 gallons per minute and range from 0 to 200 gallons per minute. The average yield of wells in this formation is weighted (downward) by yields from a number of wells drilled along several ridges, particularly in Baltimore County north of the Green Spring Valley, where it is difficult to obtain a well having a yield of even a few gallons per minute for a domestic water supply. Wells on these ridges may average as much as 300 feet in depth, and in some housing developments several wells have been drilled in order to obtain a supply of 1 gallon per minute. In these areas the schist is generally weathered to depths of 80 to 100 feet, and the water table is near the base of the weathered zone. The most likely explanation for the poor yield of the wells on these ridges is that the water table generally lies below the zone of decomposed rock, and therefore wells must depend upon the very small capacity of the unweathered rock to furnish a supply. If this is the case, then even where a well encounters fractures capable of yielding some water, the storage capacity of the rock crevices is so small that the well would maintain its initial yield for only a short time. Another explanation for the low yield along these ridges is that the schist may be of such a nature that a well casing driven into it completely seals off any water stored in the overlying weathered mantle rock. If no water-bearing fractures are encountered at greater depths, the well will be unsuccessful. It is also likely that on the steeply sloping sides of these ridges a high percentage of the precipitation runs off directly at the surface, or after penetrating the surface, is deflected laterally by the upper portion of the B soil horizon, so that there may be an appreciable reduction in recharge to the ground-water reservoirs in areas of high topographic relief, and a correspondingly lowered water table.

ALBITE-CHLORITE FACIES.—The albite-chlorite facies of the Wissahickon formation is an albite schist or gneiss interbedded with beds of chlorite or muscovite schist. Accessory minerals include magnetite, pyrite, calcite, garnet, zircon, tourmaline, and hematite. The albite-chlorite facies is less highly metamorphosed than the oligoclase facies and is also less crinkled and contorted. The yield of 76 wells drilled into the albite-chlorite facies of the Wissahickon formation in Baltimore and Harford Counties ranges from 2 to 50 gallons per minute and averages 10 gallons per minute. These wells range in depth from 40 to 223 feet and average 92 feet. Satisfactory domestic wells can be obtained in most localities from the albite-chlorite facies.

Transmissibility and Storage Coefficients.—An aquifer test was made at Arcadia, Baltimore County, in June 1954. The test site is on a gently rolling upland developed on the albite-chlorite facies of the Wissahickon formation. The pumped well, Bal-Ca 7, is 6 inches in diameter, 224 feet deep, and is owned by the Arcadia Fire Department. Figure 6 shows the location of the pumped well and of the two wells that were augered for observation wells. Observation well 1, 60 feet north of the pumped well, was 90 feet deep and was cased to 80 feet. Observation well 2, 120 feet north of the pumped well, was 105 feet deep and was cased to 90 feet. Each well was cased with 1¼-inch pipe, slotted in the lower 7 feet as a substitute for a well screen. During installation of casing in the observation wells, water was introduced through the casing at a rate of 20 gallons per minute. As both wells accepted water at this rate for at least an hour, it was concluded that they would satisfactorily reflect changes in the position of the water table resulting from pumping well Bal-Ca 7. Although rock was reported by the well driller to have been struck at 60 feet in the pumped well, it was apparent from the ease with which the light power auger penetrated to 90 and 105 feet in the observation wells that the depth of weathering is considerably greater than 60 feet, and that the weathered zone extends at least to 105 feet. The water level in the pumped well remained above 105 feet dur-

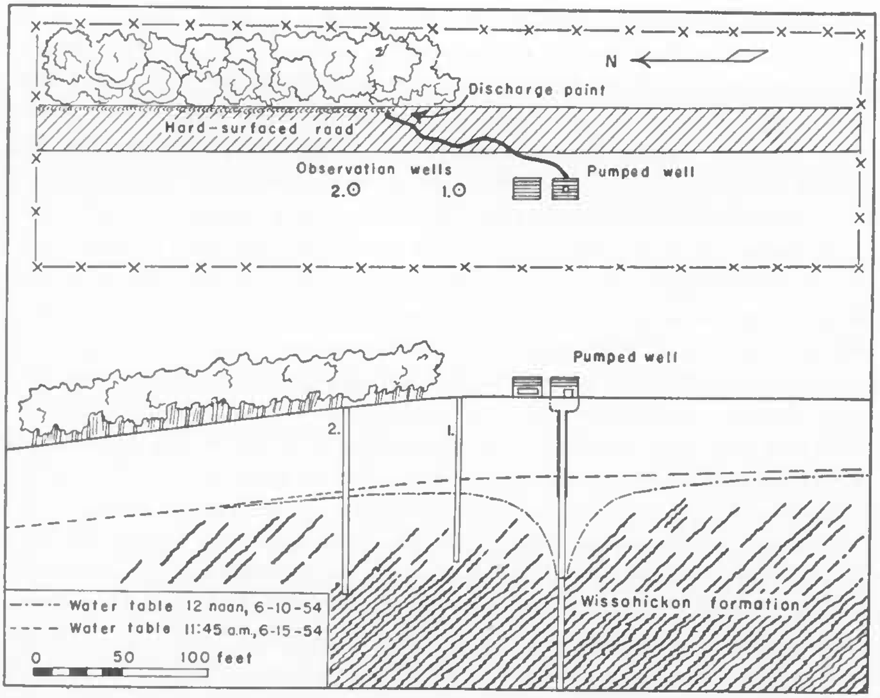

FIGURE 6. Schematic Plan and Cross Section of Well Field at Arcadia, Baltimore County

ing the test. It is believed that the results of this test apply primarily to the weathered material above the schist. Measurements were made of the drawdown in water level in all three wells during the 24-hour period that Bal-Ca 7 was pumped and of the recovery of water levels for 20 hours after pumping stopped. Well Bal-Ca 7 was pumped at a rate of 45 gallons per minute during the test. The data thus obtained (fig. 7) were analyzed by several methods, and the coefficients of transmissibility obtained range from about 3,000 to 10,000 gallons per day per foot and the coefficients of storage[2] range from 0.002 to 0.01 (Table 6).

Figure 8 illustrates the match obtained between the type curve and the drawdown data for observation well 1.

Peters Creek Quartzite, Setters Formation, and Cardiff Conglomerate

The Peters Creek quartzite crops out in a band that ranges in width from 1 to 2 miles in Baltimore County and is as much as 6 miles wide in the northeastern part of Harford County. The Peters Creek occurs in the Peach Bottom

[2] The coefficient of storage of an aquifer is the volume of water it releases from or takes into storage per unit surface area of the aquifer per unit change in the component of head normal to its surface.

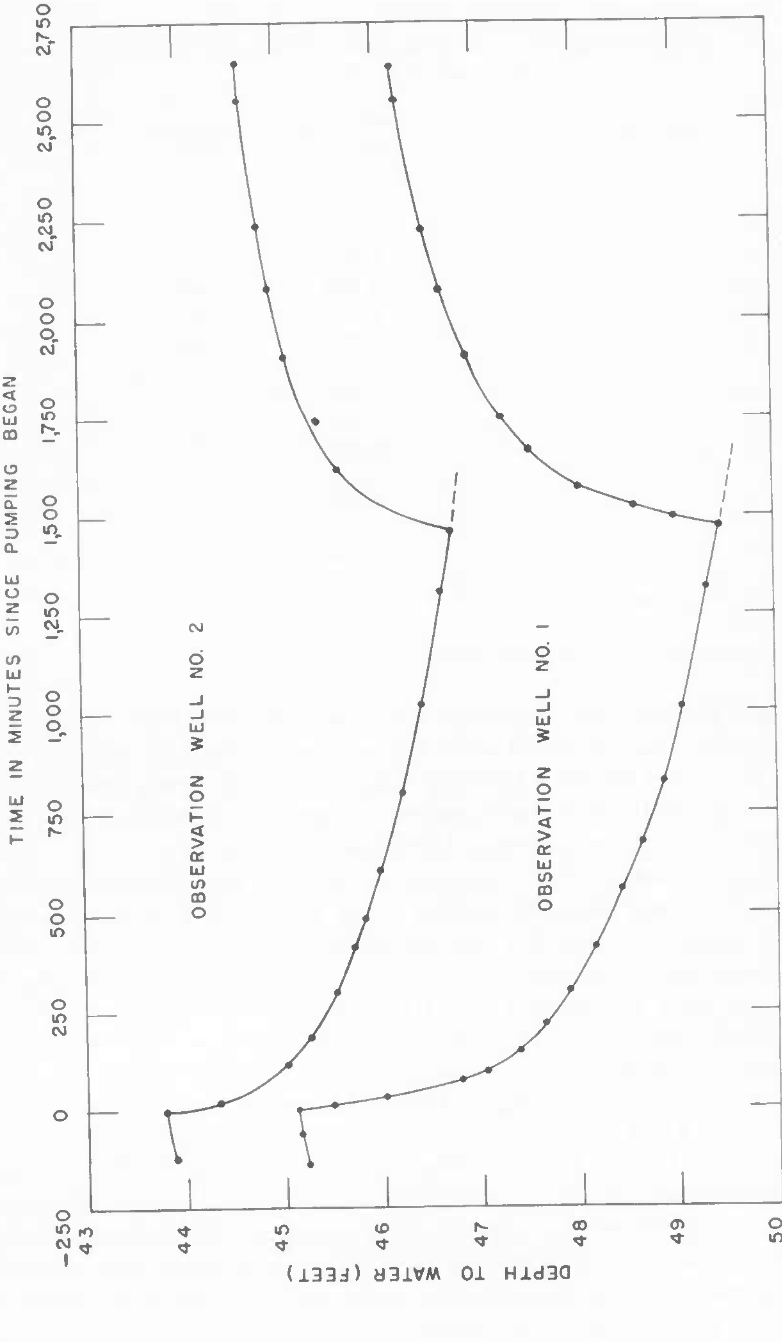

FIGURE 7. Drawdown and Recovery of Water Level in Observation Wells 1 and 2 during the Aquifer Test at Arcadia, Baltimore County

TABLE 6

Hydraulic Coefficients Calculated for the Albite-chlorite Facies of the Wissahickon Formation at Arcadia, Baltimore County

Observation well	Coefficient of transmissibility (gpd/ft.)	Coefficient of storage	Method
No. 1:			
drawdown	6,300	—	(1)
recovery	6,600	—	(1)
drawdown	4,000	0.0047	(2)
drawdown (3)	8,900	.002	(2)
recovery	6,200	.0124	(2)
No. 2:			
drawdown	8,300	—	(1)
recovery	8,300	—	(1)
recovery	10,200	.002	(2)
Bal-Ca 7:			
drawdown	3,200	—	(1)
Wells 1 and 2:			
drawdown after 0.69 day	5,000	.003	Gradient

(1) Cooper and Jacob.
(2) Theis.
(3) Values obtained from late part of test.

syncline in Harford County and in its extension across Baltimore County. The albite-chlorite facies of the Wissahickon adjoins the Peters Creek quartzite on the north, and the oligoclase-mica facies adjoins the Peters Creek on the south. In eastern Harford County several remnants of the Peters Creek quartzite are found in the area between Darlington and Level.

The Peters Creek quartzite consists of interbedded dense, massive greenish-gray quartzite and muscovite-chlorite schist and phyllite. In northeastern Harford County the quartzite beds are predominant, whereas to the southwest, toward and in Baltimore County, the schist or phyllite predominates. The Peters Creek is considered to be the uppermost and least metamorphosed unit of the Glenarm series (Pl. 8, fig. 2). Original bedding is preserved in some of the quartzite facies, and in one locality (25 feet northeast of the east end of the cable that crosses the gorge at The Rocks) crossbedding was observed.

The Peters Creek quartzite is one of the best crystalline-rock aquifers in Baltimore and Harford Counties. The yields of 90 wells in the Peters Creek range from 0.5 to 135 gallons per minute and average about 13 gallons per minute. The depths of these wells range from 35 to 380 feet and average 104 feet. The following are considered responsible for the relatively high yield reported for wells drilled in this formation: 1) the quartzite facies is quite hard and brittle, and would tend to yield to earth stresses by fracturing rather than by

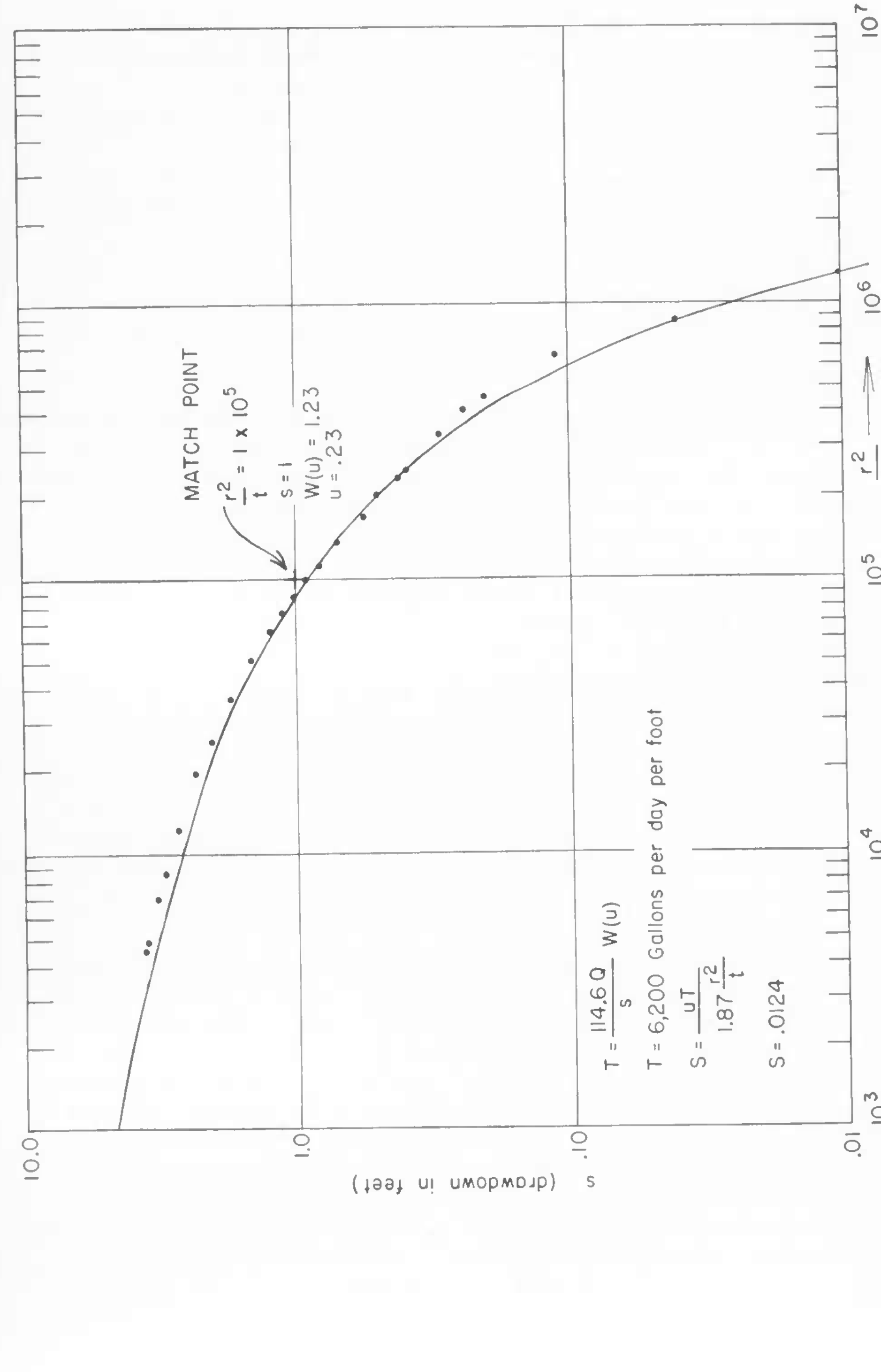

FIGURE 8. Recovery of Water Level in Observation Well 1 and the Theis Type Curve

readjustment within and between mineral grains, so that joint systems probably are relatively continuous and well developed; 2) the upper part of the quartzite weathers into a sandy overburden that is quite permeable. Most of the high-capacity wells in the formation are located in northern Harford County, where the formation is predominantly quartzite.

The Setters formation and Cardiff conglomerate are similar lithologically to the quartzitic facies of the Peters Creek and have similar water-bearing properties. They are, however, of very limited areal extent. The Setters formation flanks the edges of the domes of the Baltimore gneiss, and dips at a high angle under the Cockeysville marble. The Cardiff conglomerate surrounds the Peach Bottom slate in a small syncline in northeastern Harford County.

Gabbro

In Baltimore and Harford Counties the gabbro occurs in three large masses. One is a belt 2 to 4 miles in width extending from Conowingo to southeastern Baltimore City; another extends southwest from the Susquehanna River near Havre de Grace, forming an oval area whose dimensions are approximately 5 by 8 miles; the third extends west 8 miles from Baltimore City and about 12 miles southwest into Howard County. The gabbro is a dark, hard, dense, completely crystalline igneous rock usually composed of plagioclase feldspar and pyroxene. In Baltimore and Harford Counties the rocks mapped as gabbro include areas underlain by other basic rocks such as hornblende gneiss, periodotite, pyroxenite, and norite. The topography developed on the gabbro is somewhat subdued as compared with the topography developed on the other crystalline rocks; in some areas, as in the area northeast of Bel Air and at Dublin, upland flat areas have been developed on the gabbro. The gabbro is broken into large polygonal blocks which near the land surface are rounded by spheroidal weathering. The areas underlain by the gabbro are characterized by many rust-colored blocks or "niggerheads" strewn over the surface. The soil developed on the gabbro is typically a reddish clay loam at the surface, grading downward to a red clay.

The average yield of 149 wells in the gabbro in Baltimore and Harford Counties is about 10 gallons per minute and the yields range from 0.5 to 80 gallons per minute. The average depth of these wells is 92 feet and the depths range from 29 to 450 feet. The gabbro is extremely hard to drill; in some instances drillers have penetrated as little as a few inches in a day. It is common practice for well drillers to charge a daily rate rather than by the foot when drilling in the unweathered gabbro. Practically all the wells obtain their water at or near the contact between the weathered overburden and the unweathered rock. There is some fracturing of the gabbro, however, and a few wells obtain water at considerable depth. It appears to be characteristic of these wells to have comparatively high initial yields as they draw from storage in the fractures, and then to decrease in yield as the storage is depleted.

Gunpowder Granite, Port Deposit Gneiss, Woodstock Granodiorite, and Relay Quartz Diorite

The Gunpowder granite, Port Deposit gneiss, Woodstock granodiorite, and Relay quartz diorite are lithologically similar igneous rocks of acidic to intermediate composition. There is, however, some variation in their water-bearing properties.

The high yield of two wells in the Woodstock granodiorite (20 and 39 gallons per minute) may not truly indicate the water-bearing ability of that formation because of the inadequate sampling. However, the weathering of the Woodstock granodiorite is characterized by the development of sheet jointing (Pl. 6, fig. 2), which probably increases its water-bearing capacity. Le Grand has shown that sheet jointing has greatly increased the permeability and is an important factor in the high yield of wells in the granites of Georgia.

Sheet jointing is much less prominently developed in the Gunpowder granite and the Port Deposit gneiss. The average yield of 17 wells in the Gunpowder is 8 gallons per minute and the average yield of 60 wells in the Port Deposit is 11 gallons per minute. The Gunpowder granite is very similar to the siliceous phases of the Baltimore gneiss in its weathering characteristics and in its topographic expression. It is likely that more data would indicate that it is also very similar to the gneiss in its water-bearing properties.

In some areas these formations are highly siliceous and as a result the rock, where unweathered, is very hard and drilling is very difficult. This difficulty is reflected in the shallow average depth (94 feet) of the wells in the Port Deposit gneiss.

Serpentine

The weathered mantle developed on the serpentine is very thin and in some localities is nonexistent. Ground-water storage in the overburden is essentially nil. Wells in these areas must depend upon ground water stored in the fractures in the rock to obtain a continuous supply. The highest yield of the 22 wells ending in the serpentine is 30 gallons per minute and the average yield is 10 gallons per minute. In most areas the serpentine is closely fractured, and as a result a satisfactory yield for domestic use may be obtained at a relatively shallow depth.

The serpentine is quarried in a shaft more than 300 feet deep at Cardiff in Harford County. Water was pumped from the quarry in the summer of 1952 at a reported rate of approximately 25 gallons per minute for 8 hours a day. However, this does not represent the normal yield of a shaft or "well" of this size and depth, as exploration or shot holes that encounter ground water in large quantity are plugged, and the shaft is extended in such a direction as to minimize ground-water flooding. During the early part of the century the quarry was abandoned for a time, and it filled with water to within a few feet of the land surface.

Peach Bottom Slate, Pyroxenite, Epidiorite, and Triassic Diabase

Insufficient information is available to justify reliable conclusions concerning the water-bearing properties of the Peach Bottom slate, the pyroxenite, epidiorite, or the Triassic diabase. Their very limited areal extent makes them relatively unimportant as sources of ground-water supply. It is likely that the pyroxenite and the epidiorite are somewhat similar to the other crystalline rocks in that at least domestic supplies can be obtained from them in most localities.

RELATION OF YIELD OF WELLS TO DEPTH

The yield of wells in the crystalline rocks is not directly proportional to the depth of the wells because the permeability of the rocks is not uniform. Ordinarily, each increment of depth does not cause a corresponding increase in the yield of a well. Figure 9 shows graphically the data in Table 7, which is an analysis of yield versus depth for 879 wells. The relation of the yield to depth is probably true in only a general way, as the depth of a well in the crystalline rocks is not necessarily the depth from which water is obtained.

Three general conditions in crystalline-rock wells are illustrated schematically in figure 10; many wells, however, produce water as a result of a combination of these conditions. Well "A" derives water from the lower part of the weathered mantle and the upper partially weathered zone of the rock. No increment of water is obtained from the segment of the well penetrating the unweathered rock below, and this segment is useful only as a reservoir to store water. As the storage in a 6-inch well is only about 1 gallon per foot, the well is an expensive reservoir, considering the drilling cost and the lowered pump setting that would be required to retrieve this water. Many of the wells in the crystalline rocks are similar to type A in that the water obtained at the base of the weathered material or within the first few feet of penetration of the solid rock is the only water encountered. Wells of type A are responsive to seasonal fluctuations in the position of the water table. If, during a dry season, the water table declines to the top of the unweathered rock, such a well may "go dry," regardless of the depth of the well. Well Bal-Ca 7 at Arcadia is similar to type A, in that there is at least 45 feet of weathered material between the bottom of the casing and the upper surface of the hard rock. The aquifer test made on this well (p. 61–63) shows that most, if not all, of the water is obtained from this uncased interval.

Wells of type B are cased through the weathered material into the hard rock and derive all their water from a single fracture or a zone of closely spaced fractures that may be located anywhere in the rock segment of the well. When water is not obtained in the overburden or when it is desired to increase a small yield obtained in the upper part of the well, some wells are drilled to depths of several hundred feet in an attempt to encounter fractures such as in well B.

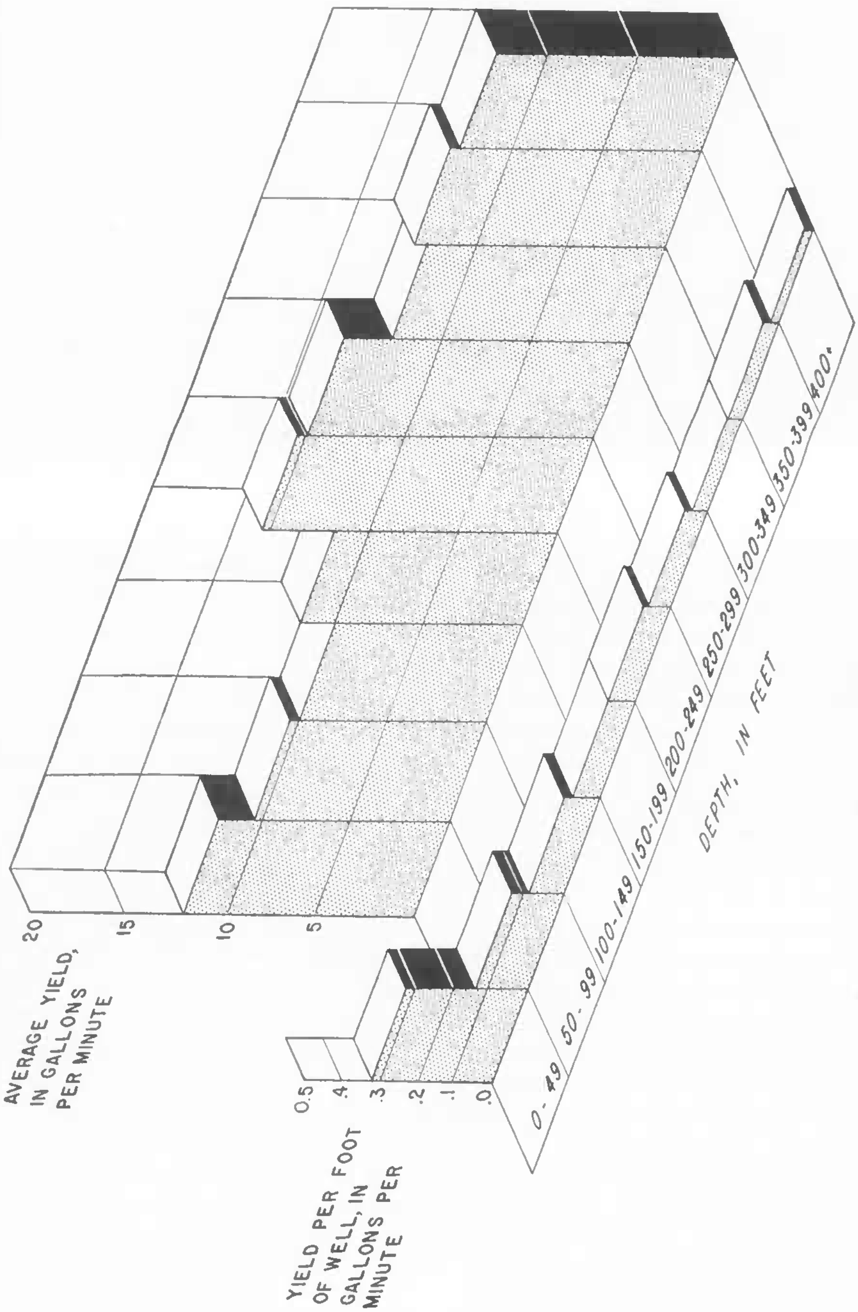

FIGURE 9. Average Yield and Yield per Foot of Well by Depth Intervals

TABLE 7

Relation of Yield of Wells to Depth

Depth range (ft.)	Number of wells	Average depth (ft.)	Yield in gpm			Percent yielding 1 gpm or less
			Range	Average	Per ft. of well	
0–49	98	39	0.5–45	12.1	0.31	1
50–99	380	72	0–110	10.3	.14	3
100–149	201	118	0–200	10.0	.08	9
150–199	71	170	0–60	11.7	.07	15
200–249	40	224	0–135	15.7	.07	32
250–299	11	262	.5–75	15.0	.06	36
300–349	14	315	.5–34	12.5	.04	7
350–399	9	366	1–50	13.2	.04	22
400+	25	526	0–60	12.6	.02	28

Occasionally such attempts are successful. Well Bal-Db 41 is similar to type B; although a small amount of water was obtained in the upper part of the well, most of the water was obtained between 310 and 350 feet. The well was tested at 309 feet and produced 4½ gallons per minute on a 3½-hour test. Drilling continued to 350 feet, where a total of 20 gallons per minute (or an additional 15½ gallons) was obtained in a 5-hour test.

Wells of type C produce water from the base of the weathered zone and from fractures throughout the entire well; well Bal-Dc 71 is of this type. It was drilled by the rotary method, using compressed air to remove the cuttings rather than circulating drilling mud. With this method each increment of water is discernible at the time and depth at which it is obtained. In this well an increase in yield was noted at each of several weathered zones (possibly fractures) from 82 to 132 feet.

Measurements of yield and of rates of decline of water levels (drawdown) in wells of these three types reveal their different hydraulic properties. Wells of type A will produce increasing amounts of water with increased drawdown until the pumping level nears the bottom of the weathered material. Lowering the pumping level beyond this point will cause no significant increase in yield and will be a waste of power, owing to the greater distance the water must be lifted. With increased drawdown wells of type B will yield increased amounts of water until the water level reaches the contributing fracture. Further drawdown will cause no increase in yield. Wells of type C will have a larger yield with increasing drawdown, at least until the reduction in saturated thickness of the permeable material causes a sufficient reduction in transmissibility to lower the yield of the well.

The data in figure 9 and Table 7 do not indicate any significant increase in the yields of wells with increasing depth—in fact, the average yield of the wells in the 0- to 49-foot depth range is only 0.5 gallon per minute less than

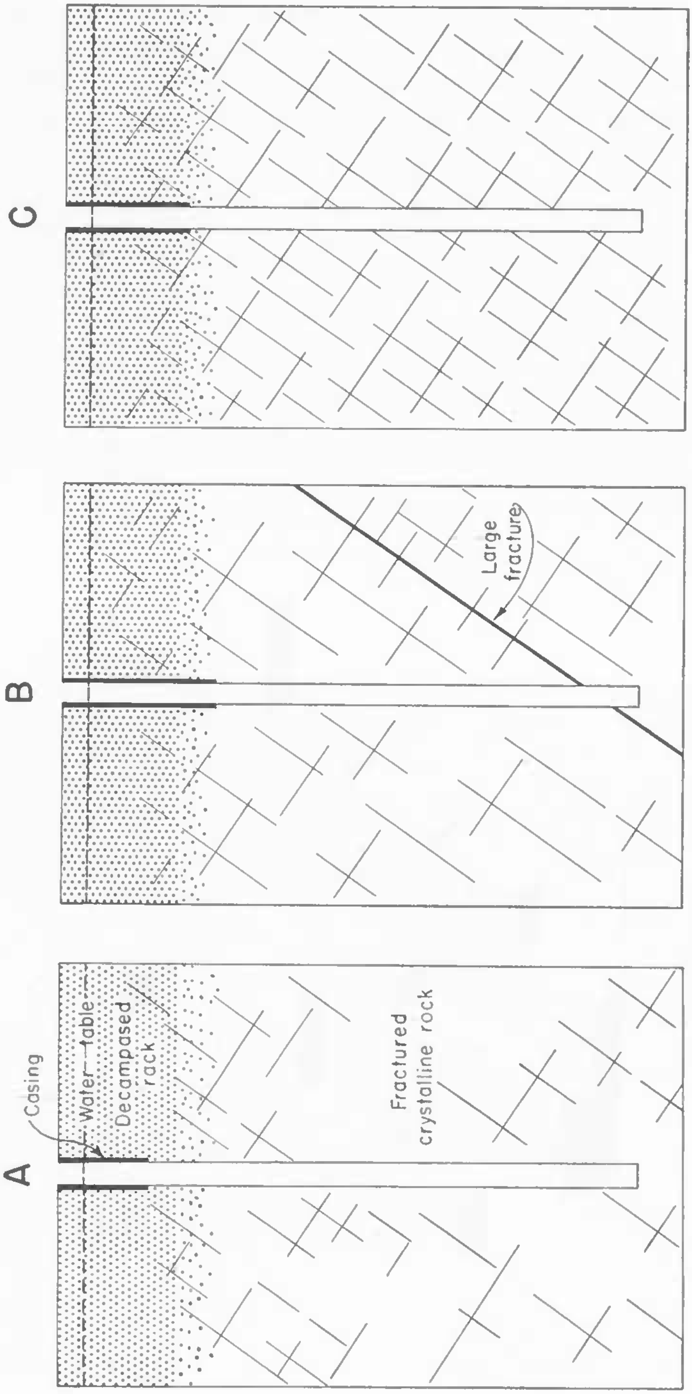

FIGURE 10. Schematic Diagram Showing Three Types of Wells in Crystalline Rocks

the average yield of the wells more than 400 feet deep. There is a consistent decrease in the average yield per foot of well with increasing depth, the yield ranging from 0.31 gallon a minute per foot in the 0- to 49-foot range to 0.02 gallon a minute per foot in the wells more than 400 feet deep. Approximately

TABLE 8

Depth of Wells, Depth of Weathering, and Yield of Wells According to Topographic Position

	Well depth (ft.)		Length of casing (depth of weathering) (ft.)		Yield (gpm)	
	No. of wells	Av. depth	No. of wells	Av. depth	No. of wells	Av. yield
Upland	168	84	156	48	169	10.1
Slope	145	108	206	48	246	11.5
Draw	27	114	15	38	27	29.1
Hilltop	300	120	264	41	300	7.8
Valley	82	172	63	36	84	16.3

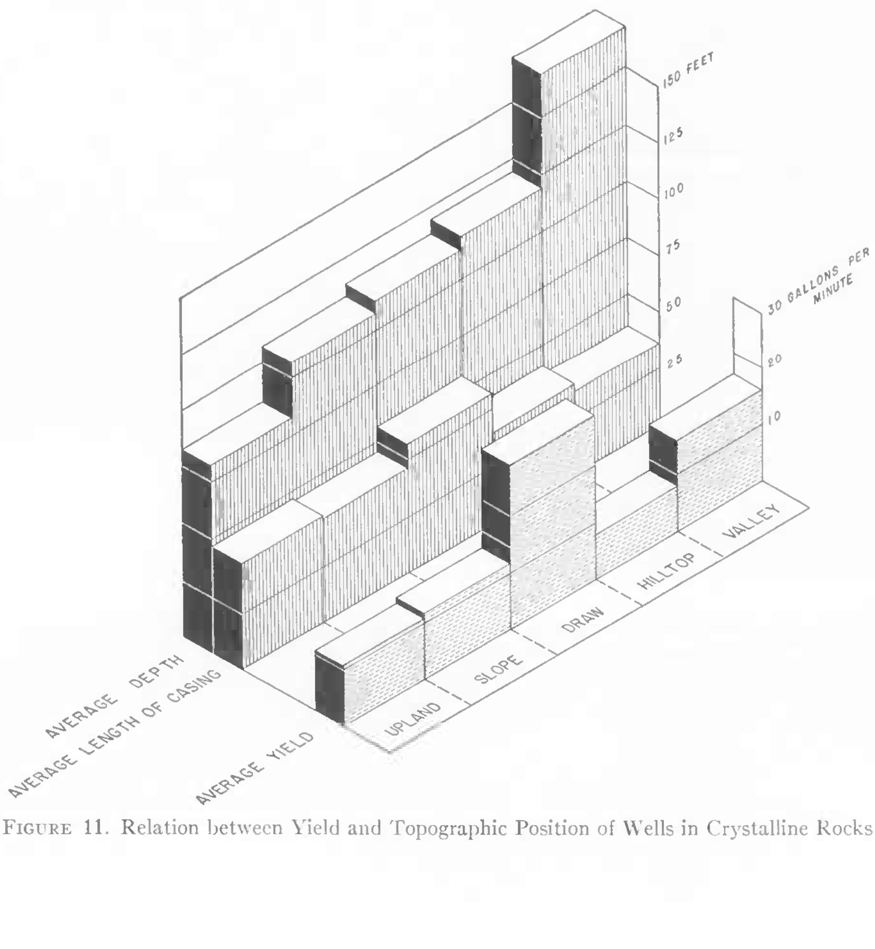

FIGURE 11. Relation between Yield and Topographic Position of Wells in Crystalline Rocks

25 percent of the wells more than 350 feet deep produced less than 1 gallon per minute, so that drilling to these depths is no guarantee of obtaining an adequate water supply.

RELATION OF YIELD OF WELLS TO TOPOGRAPHIC POSITION

In the crystalline rocks the topographic position of wells is one of the most important factors affecting their yield. Table 8 and figure 11 show the relation between yield and topographic position of crystalline-rock wells in Baltimore and Harford Counties. Each well is classified as being in one of the following topographic positions: hilltop, upland, draw (small drainageway), slope, or valley. The best topographic location for a well is in a draw (average yield 29.1 gallons per minute) or in a valley (average yield 16.3 gallons per minute), and the poorest location is on a hilltop (average yield 7.8 gallons per minute). Wells located in level or gently rolling upland areas (average yield 10.1 gallons per minute) are somewhat better than wells located on hilltops. Wells located on slopes have an average yield (11.5 gallons per minute) intermediate between those of wells in the other topographic locations.

Contrary to what might be expected, the deepest wells (average depth 172 feet) are in the valleys and the shallowest wells (average depth 84 feet) are on the uplands. Most of the major valleys in Baltimore County are underlain by the Cockeysville marble, and the ease with which this formation may be drilled is probably a contributing factor to the greater depth of wells in the valleys. Conversely, the hard, resistant gabbro underlies several extensive upland areas and the shallowness of wells drilled in these areas tends to lower the average depth of the wells drilled in upland areas.

RELATION OF YIELD OF WELLS TO DEPTH OF WEATHERING

The weathered rock mantle forms a porous water-bearing zone which may contribute water to wells even though the casing extends through the weathered material. The length of casing in wells in the crystalline rocks generally may be used as a reasonably accurate measure of the thickness of the decomposed rock, as well drillers usually seat the casing on, or just into, the hard rock. According to Table 9 there is a slight increase in average yield with increased depth of

TABLE 9

Average Yield of Wells by Depth of Weathering (Length of Casing)

Depth of weathering (ft.)	Number of wells	Average yield (gpm)
0–24	183	10.1
25–49	294	10.2
50–74	137	11.4
75–99	50	13.3
100–352	27	7.5

weathering, up to 100 feet. The apparent decrease in average yield with depth of weathering exceeding 100 feet is partly the result of the inclusion of wells drilled in the solutional weathering zone at the borders of the Cockeysville marble, where the material is clayey and the yields of wells are small.

WATER-BEARING PROPERTIES OF THE WEATHERED-ROCK MANTLE

The thickness of the decomposed and weathered material ranges from a few feet to more than 300 feet and depends chiefly upon the rock type, topography, and degree of fracturing. The depth of weathering is, on the average, greater beneath the uplands, slopes, and hilltops than beneath the draws and valleys. The relatively shallow depth to which weathered rock extends beneath the draws and valleys is probably the result of the removal of the weathered material by erosive action of the streams. Many of the larger streams, such as Gunpowder Falls, flow over relatively fresh, hard rock.

In central Baltimore County many of the valleys follow the outcrop of the Cockeysville marble. As the marble is subject to rapid solutional weathering, broad flat-bottomed valleys underlain by considerable thicknesses of weathered material have been developed. Some of the hills, ridges, and uplands, such as the quartzite ridge at The Rocks State Park in Harford County or the gabbro uplands of both counties, are composed of masses of resistant rock. The rock underlying these areas may be exposed at the surface or may be only a few feet beneath the surface.

The weathered rock mantle is the direct source of ground water for practically all the dug wells in the Piedmont area of Baltimore and Harford Counties, and indirectly is the source of water for most of the drilled wells. The weathered mantle functions as a reservoir, storing ground water and releasing it to the fractures or joints that contribute water to the wells drilled into the solid rock.

Most of the aquifer tests in the crystalline rocks of Maryland probably measure the hydrologic properties of the unconsolidated material overlying the rocks. The results of these tests indicate a range in transmissibility of 1,000 to 10,000 gallons per day per foot and an average of approximately 5,000 gallons per day. The permeability of the weathered mantle, as determined by laboratory examination of small, relatively undisturbed samples, ranges from less than 1 to 100 gallons per day per square foot (Table 10). The permeability of weathered material varies with the topography, depth beneath land surface, and character of the parent material. The composition of the weathered material ranges from a predominantly silty clay developed on the gabbro to a fine to medium quartz sand developed on the Port Deposit gneiss.

The weathered mantle is the main aquifer in the crystalline-rock areas of Maryland. The immediate local source of water to deep drilled wells must be joints in the rock; however, these joints function chiefly as pipes or conduits conducting water down from storage in the weathered mantle. It is thus possi-

TABLE 10
Permeabilities and Sieve Analyses

Sample number	Location	Geologic formation	Feet below land surface	Soil horizon	Porosity (percent)	Permeability (gpd/ft.²)	Percent (particle size in mm)							
							Clay less than 0.004	Silt 0.004–.0625	Sand					Gravel 2–16
									Very fine 0.0625–.125	Fine 0.125–.25	Medium 0.25–.5	Coarse 0.5–1.0	Very coarse 1.0–2.0	
(a) 54 Md 3	Ridge Road, Baltimore Co.	Wissahickon (oligoclase) facies	4.5	C	48.8	14	9.5	18.1	10.8	21.6	23.3	9.5	2.9	4.3
54 Md 2	do	do	8.0	C	46.2	12	8.5	17.6	25.6	26.4	6.4	1.4	.9	—
54 Md 1	do	do	12.0	C	51.9	93	4.5	12.7	7.7	17.0	22.6	17.3	6.1	12.1
54 Md 4	do	do	16.5	C	45.7	24	11.0	10.3	7.8	18.9	30.5	16.1	3.4	2.0
(b) 54 Md 8	2 miles north of Granite, Baltimore Co.	Woodstock granodiorite	2.5	B	50.4	.2	13.5	23.2	19.4	23.7	12.5	5.5	1.7	.5
54 Md 7	do	do	5.5	C	56.6	39	6.0	15.1	14.7	25.6	21.6	9.6	5.4	2.0
54 Md 6	do	do	8.3	C	52.9	45	5.7	17.4	18.4	25.4	18.1	10.5	3.9	.6
54 Md 5	do	do	12.8	C	51.8	115	4.5	11.9	15.5	25.7	21.7	13.8	6.2	.7
(c) 54 Md 11	Road cut on U. S. Hwy. 1, 2 miles SW of Dublin, Harford Co.	Port Deposit gneiss	10.0	C	34.3	9	3.0	26.1	11.1	21.5	24.7	10.9	2.3	.4
54 Md 9	do	do	14.0	C	39.1	15	3.0	21.6	10.4	21.4	25.1	13.1	4.9	.5
54 Md 10	do	do	19.0	C	40.7	18	5.0	17.4	10.2	20.4	26.2	14.2	6.1	.5
54 Md 12	do	do	19.0	C	35.1	7	5.0	19.9	11.0	22.1	26.6	11.6	3.4	.4
(d) 54 Md 17	Road cut on U. S. Hwy 40, 1/3 mile E of Patapsco River, Baltimore Co.	Gabbro	3.0	C	45.0	4.7	7.2	41.6	22.7	18.0	6.8	2.7	.7	.3
54 Md 16	do	do	10.0	C	41.7	2.9	6.0	25.5	27.5	27.9	10.7	2.1	.3	—

(a) From fresh excavation.
(b) From excavation beginning at bottom of B horizon.
(c) From lower part of pit.
(d) From road cut.

ble to drill through permeable saturated overburden into fresh, relatively unfractured rock and to obtain a well of extremely low yield if the casing is seated so firmly on rock as to cut off the water from the overburden. A great many wells obtain water either from the lower part of the weathered mantle or from fractures in the rock within a few feet after it is encountered. The thickness of saturated weathered material is one of the controlling factors in determining the long-term discharge rate of wells drilled in the rock. If the water table declines to a position below the top of the unweathered rock, yields may drop sharply, as ground-water storage is believed to be essentially nil in the fractures in the rocks.

If wells in the crystalline-rock areas were constructed with gravel envelopes and slotted casings or screens set opposite the weathered mantle, they might be more successful than wells constructed in the usual manner.

Electric Logging as an Aid to Determine Water-bearing Properties of the Crystalline Rocks

Measurements of the electrical properties of sedimentary rocks have been used for many years as an aid in determining their physical characteristics. The record of these measurements in a well is known as the electric log of the well. The record is obtained by lowering an electrode assembly into a well and recording the variations in electrical properties as the assembly passes through the rock material. Two general types of measurements are made; one, known as the self-potential or spontaneous-potential (SP) log, is a measurement of the small voltages (potentials) developed within the well by electrochemical and electrokinetic effects. The second, known as a resistivity log, is a measurement of the electrical resistivity of the rocks and their contained water.

SPONTANEOUS-POTENTIAL LOGS

The chemical and physical processes that produce the electrochemical potential are complex, but as a general rule the electrochemical potential varies with the difference in mineral content of the formation water and the water in the borehole. Disregarding other factors, if the water in a formation has a higher concentration of dissolved solids than the water in the borehole, the electrochemical potential of the formation water is negative with respect to the water in the borehole. If the reverse is true, the formation water is positive with respect to the water in the borehole.

The electrokinetic effect is based on the principle that when a fluid moves through a porous medium, an electromotive force is generated. However, as the differential head between water-bearing zones in this area is small, the rate of movement of water into or out of a borehole is also small, and hence the electrokinetic potentials probably are negligible.

In the crystalline-rock areas of Maryland almost all the wells are drilled by the percussion or cable-tool method. In these wells the water in the borehole generally is almost identical chemically to the water in the permeable zones in the rocks. In general, the self-potential records of these logs show a somewhat lower value near the top of the well and higher values at greater depth. This may indicate that the principal permeable zone is near the top of the wells (in the transitional zone between the weathered and unweathered rock) and that the unweathered rock is relatively tight and impermeable and the water in it is more highly mineralized. Therefore, the high self-potential near the bottom of wells indicates the contrast in ionization between the water from the upper part of the well, which fills the borehole, and the more highly ionized water in the unweathered rock.

If a crystalline-rock well has been pumped shortly before a self-potential log is made, so that the water in the borehole is representative of the water in the more permeable portion of the formation, the portion of the log showing the lowest self-potential should indicate the water-bearing zone, as this should be the zone of the smallest contrast between the formation water and the borehole water and therefore the zone of smallest electrochemical potential.

If the self-potential of such a well were measured while water of a different chemical character was being added to the well, there should be a displacement of the self-potential curve opposite the permeable zones in the well, and the rest of the log should be unchanged. If the points of greatest displacement of the self-potential curve are opposite the low points on the original log that was obtained before water was added to the well, then it would be confirmed that the permeable zones are at those depths.

RESISTIVITY LOGS

The electrical resistivity of the rocks through which a well is drilled may be determined approximately by several electric-logging methods. The most common methods measure either the total resistance of the rock between an electrode on the earth's surface and an electrode being raised or lowered in the well, or the resistivity of the material in a sphere of rock around an electrode as it is lowered into the well. The resisitivity of the rock is governed primarily by the proportion of water in the rock and its mineral content. The resisitivity of most dry rock is extremely high, so the rock itself generally has a negligible effect upon the resistivity. Clay, when saturated, generally has a low resisitivity, and sand or sandstone saturated with fresh water has a relatively high resistivity. Since the crystalline rocks are only slightly porous (Table 3), most of them have very high resistivity even when saturated.

The weathered mantle overlying the crystalline rock has a relatively high porosity, and therefore high water content. Consequently the electric log of a crystalline-rock well normally shows a relatively low resistivity in the weathered zone and a high resisitivity in the underlying unweathered rock. Electric logs indicate that, in general, the transition from the thoroughly weathered and decomposed rock to the hard, relatively unweathered rock is gradational and commonly may be a zone of a few feet or even tens of feet. In many wells the casing terminates in the upper part of the transition zone, and a major part of the water is obtained from the uncased part of this zone. The thickness of the transition zone varies with rock type and topography. In the segments of the well consisting of fresh crystalline rock there is considerable variation in resistance, although it remains high. The zones of lower resistance apparently represent zones of higher porosity, but the increase in porosity may not be enough to increase the permeability of the rock significantly. The fractures in the rock are so narrow that they are not discernible in electric logs compiled using the standard types of electrodes. Perhaps a type of wall-contact electrode or a microlog would give some indication of the fractures. However, even the microlog uses electrode spacing many times the width of crystalline-rock fractures, and normally the narrowest zone that can be logged is equivalent to the spacing of the pickup electrodes. The zones of somewhat lower resistance in the crystalline rocks perhaps represent slightly weathered zones, which would be expected to have a higher porosity. Rock weathering results from movement of ground water along fractures, so that a weathered zone tends to form on the sides of a water-bearing fracture. Although the fracture itself would be too small to be indicated on the log, the porous weathered zone on either side of the fracture should be indicated by lower readings on the resisitivity log. If this condition occurs, premeable zones in the crystalline rock would result in zones or points of lower electrical resistance in the deeper, hard-rock portion of the well. This is in direct contrast to the interpretation of electric logs of wells in sedimentary rocks, in which the fresh-water-bearing sands are indicated zones of higher resistance on the log.

Figure 12 is the electric log of well Har-Aa 14. This well penetrates the albite-chlorite facies of the Wissahickon formation. The spontaneous-potential log was obtained within a few minutes after the well had been tested with a bailing bucket. The low value (65 millivolts) of the spontaneous-potential curve at a depth of 70 feet indicates a major zone from which water is entering the well. When tested the yield of the well increased as the pumping level lowered to approximately 65 to 70 feet. Further drawdown below 70 feet resulted in no additional increase in yield.

The resistivity curve of well Har-Aa 14 shows two points of low resistance at 68 and 70 feet which also may indicate the depth of the producing zone. There are, however, several zones at greater depths that have even lower resistance, but these zones apparently contribute very little, if any, water to the well.

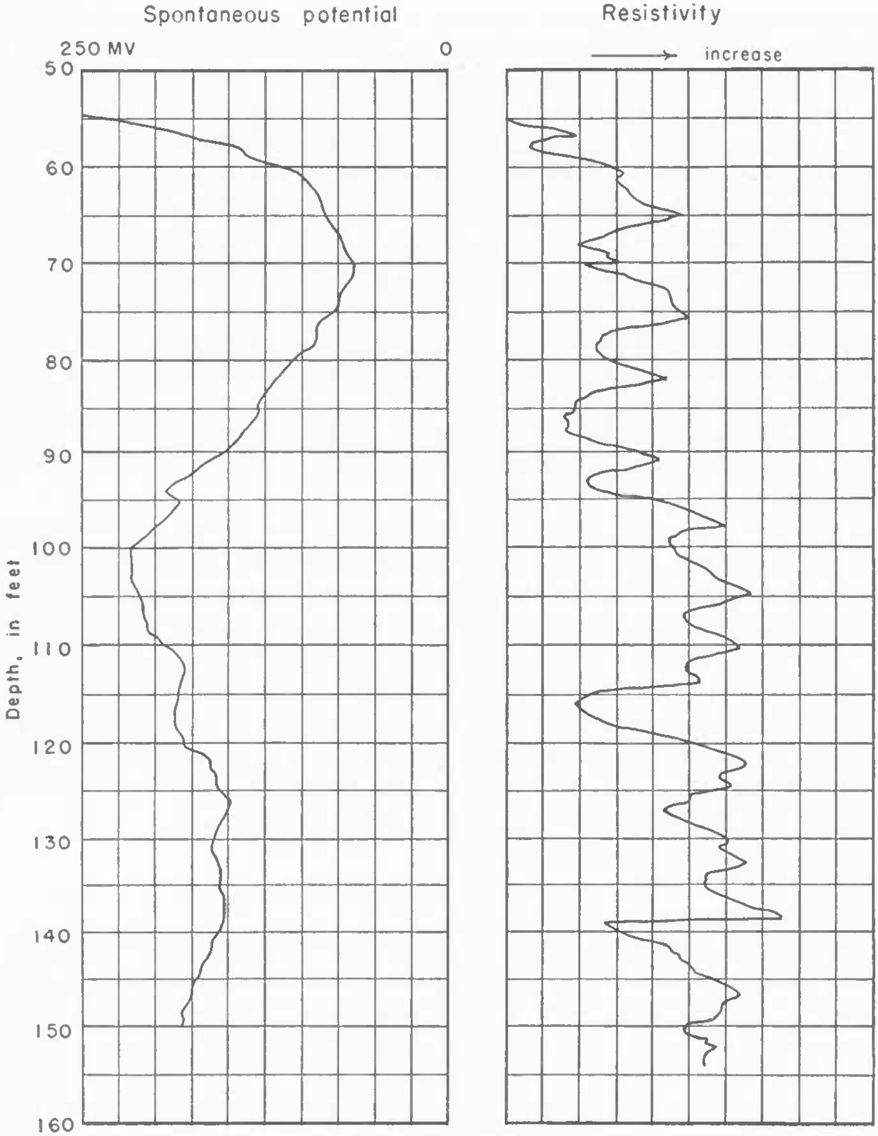

FIGURE 12. Electric Log of Well Har-Aa 14

Recharge, Movement, and Discharge of Ground Water in the Crystalline Rocks

RECHARGE

Many factors govern the rate of recharge to the ground-water reservoirs. Some of these are the permeability of the soil, subsoil, and bedrock; antecedent soil-moisture content at times of rainfall or snow melt; duration and intensity of precipitation; topography; seasonal changes in rates of evaporation and transpiration; and type and density of vegetation.

In Baltimore and Harford Counties one of the most important factors appears to be the type of soil upon which the precipitation falls and the character of the underlying subsoil. The shape, size, and degree of interconnection of the openings in the soil determine the maximum rate at which water may be transmitted downward to the water table. In clayey or silty materials the interstitial openings are minute and there is a tendency for the water to be retained in the openings by molecular attraction. In material having larger interstitial openings, such as sand or gravel, the force of gravity is more effective than the forces of molecular attraction, and water may move more rapidly through this material. Thus a soil material through which water may move readily by gravity is more permeable than one that holds water by molecular attraction.

In most areas the water table lies within the weathered zone, so that recharge to the ground-water reservoirs takes place primarily by water percolating through the soils and subsoils developed from decomposed rock. The soil profile as generally developed in the Piedmont consists of the following zones:

The A horizon, 1 to 2 feet thick, consists of (1) an upper layer rich in accumulated organic material, and (2) a lower layer which is the zone of maximum leaching. This horizon is quite permeable.

The B horizon is considered to be the zone of accumulation of the materials leached from the overlying soil. In the Piedmont the B horizon is typically a compact clay of low permeability 3 to 6 feet thick.

The C horizon or parent material consists of the weathered, decomposed, unconsolidated material derived from the crystalline rock. This material has relatively high permeability.

The D horizon is the unweathered crystalline rock from which the overlying zones have been developed.

Percolation tests conducted by the Baltimore County Health Department[3] show that the permeability of the clayey material in the B horizon is extremely small as compared to the permeability of the C horizon. In these tests the rates at which water percolates out of 1-foot-square pits are measured to determine the suitability of an area for domestic sewage-disposal systems. Tests in the B horizon generally show no measurable decline of the water level after 30 minutes, whereas tests in the C horizon (at the same locality under the same head) show that water levels decline as much as 1½ inches in 2 minutes.

Laboratory permeability tests and sieve analyses were made of 14 samples of the material in the B and C horizons from four localities in Baltimore and Harford Counties (Table 10) by the Water Resources Laboratory of the U. S. Geological Survey. The permeability of the samples from the C horizon ranged

[3] Unpublished data in files of Baltimore County Health Department.

from 3 to 115 Meinzer units (gallons per day per square foot under unit or 100-percent hydraulic gradient) as compared to 0.2 Meinzer unit for the one sample (54Md8) from the B horizon. In the aquifer test on well Bal-Ca 7 at Arcadia, Baltimore County, coefficients of transmissibility of 3,000 to 10,000 gallons per day per foot were computed. On the basis of an effective saturated aquifer thickness of 60 feet, the permeability of the C horizon thus ranges from 50 to 166 Meinzer units. These values compare reasonably well with the values obtained in the laboratory determinations.

The relatively low permeability of the B horizon, as modified by whatever secondary structure may exist, is the limiting factor that determines the rate at which water may be transmitted downward to recharge the ground-water aquifers in the crystalline-rock areas. The permeability of the C horizon generally is sufficiently high to transmit water downward faster than the water can pass through the B horizon. Thus, when the B horizon and the overlying A horizon are saturated, any water that falls on the land surface in excess of the rate at which it can pass through the B horizon must be considered as rejected recharge which will not enter the ground, but will become a part of the surface runoff.

A part of the water that enters the soil is held by the force of adhesion between the water and the soil and by the force of cohesion of the water. Water held by these molecular forces against the force of gravity is known as soil moisture. Between periods of precipitation the soil-moisture content is reduced by evaporation and by absorption by the roots of plants. A soil-moisture deficiency is thus created which must be substantially satisfied by water from precipitation before water can move down to recharge the ground-water reservoirs. The soil-moisture deficiency developed during the summer by the increased demands of evapotranspiration is one of the major reasons for the relative ineffectiveness of summer precipitation in supplying ground-water recharge.

Seasonal changes in the frequency and duration of rainfall also govern the quantity of recharge to the ground-water reservoirs. Gentle rains extending over a period of days occur often in the winter and early spring in the Maryland Piedmont, when much of the water percolates into the ground and becomes ground water. Thundershowers, or deluge-type rains, common in the summer, deposit water at the land surface at a rate much faster than it can be absorbed by the soil. The excess of water flows over the ground as surface runoff. In the winter, rain and snow, aided by the low rates of evaporation and transpiration, maintain soil moisture. Thus a large percentage of the precipitation may recharge the ground-water reservoirs.

In the Piedmont areas of Maryland the effect of topography in controlling the infiltration of precipitation into the upper few inches of the soil is relatively unimportant. During periods of precipitation the upper part of the soil becomes saturated regardless of topographic location, and as water moves downward the soil moisture is constantly replenished from the precipitation whether the area is sloping or flat. Neal determined experimentally that slopes between 1 and 16 percent had little effect on infiltration rates, but that on zero slope infiltration increased slightly owing to the increased pressure head of water accumulated on the soil surface. Although the slope of the land surface may have little effect on the initial infiltration into the soil, it is important in that the slope of the land surface determines to some degree the slope of the upper surface of the B soil horizon. When the infiltrating water reaches the top of a sloping B horizon, an appreciable part may be deflected downslope along the top of the horizon. This downslope movement of water along a relatively impermeable soil horizon is known as interflow. The water moving as interflow will continue to move along the top of the B horizon until it reaches a stream channel or until it comes to the surface at some point downslope from its point of entry into the soil. Interflow starts soon after the soil-moisture deficiency in the A horizon is satisfied and continues for some time after precipitation ceases. Interflow is subject to loss both downward through the B horizon and upward by evapotranspiration. The quantitative effect of interflow on recharge to the ground-water reservoirs is an increase in recharge under gentle slopes and valleys and a decrease under hills and steeply sloping areas. Water moving as interflow is discharged into streams, as seepage areas or "wet spots" along slopes, or into draws that have been eroded to the B horizon.

Evaporation and transpiration are the major factors that reduce recharge to the ground-water reservoirs. Evaporation and transpiration include interception, which primarily is the precipitation that is collected on the surfaces of vegetation and is evaporated without ever reaching the ground. Linsley, Kohler, and Paulhus (p. 260) estimate that vegetal interception commonly amounts to 25 percent of the annual precipitation in areas of heavy forest or other dense cover. Evaporation and transpiration significantly reduce the amount of water recharging the ground-water reservoirs in the Piedmont, but they are insignificant as a means of discharging water once it has reached the water table.

MOVEMENT

The movement of ground water in the crystalline rocks is similar to the movement of ground water in sedimentary rocks, in that the water moves from points of recharge in the interstream areas to points of discharge along the valleys and streams. However, the pattern of flow is not uniform, because most of the movement takes place in the weathered mantle that overlies the firm rock, and only a small part of the water moves, in angular paths, along the fractures in the rock. The pattern of flow is complicated also by the characteristic decrease in permeability of the crystalline rocks with increasing depth. Most of the circulation in the crystalline rock takes place in the upper few hundred feet where the fractures and other openings are relatively large.

DISCHARGE

Ground water is discharged by spring flow or seepage into streams, by evaporation and transpiration, by subsurface movement into neighboring areas, and by pumping from wells.

A certain amount of discharge takes place by subsurface movement out of the area, but the discharge by this means is a very small percentage of the total, and doubtless is approximately compensated by movement into the area.

Evaporation and transpiration affect both the quantity of water received by the ground-water reservoirs and that discharged from them. Much of the water from precipitation is lost by evaporation and transpiration without ever reaching the ground-water reservoirs. Evaporation from the water table is considered by most investigators to be relatively low. Under low terraces or in limited areas of flat upland where the water table lies within a few feet of the surface, root systems of plants may reach the water table and withdraw considerable water from the ground-water reservoirs. An approximation of the total loss of water by evapotranspiration can be made for a drainage basin by subtracting streamflow from precipitation.

A gaging station is maintained by the U. S. Geological Survey and the Maryland Department of Geology, Mines and Water Resources on the Little Gunpowder Falls near Laurel Brook, on the boundary between Baltimore and Harford Counties. Discharge from a 36.1-square-mile drainage basin, which is underlain by the Wissahickon formation and the Baltimore gneiss, is measured continuously. The basin consists of a rolling, well-dissected upland drained by streams having steep-sided valleys. It is representative of the average small drainage basin in the Piedmont, particularly of those in the schistose or gneissic crystalline rocks. The average annual precipitation in this area for the 22-year period 1927–49, based on records from U. S. Weather Bureau stations located at Maryland Line in Baltimore County and Fallston in Harford County, was 42.59 inches. During the same period the average annual runoff at the gaging station on Little Gunpowder Falls was equivalent to 17.14 inches of precipitation over the drainage basin. The difference between these values, 25.45 inches, represents the average annual loss of precipitation by evaporation and transpiration. Thus about 60 percent of the precipitation is lost by evaporation and transpiration. The average loss by evaporation and transpiration is approximately 1.5 times as much as the average annual runoff. Table 11 and figure 13 give the average monthly precipitation and the parts thereof represented by total runoff, ground-water runoff, and evaporation and transpiration. The losses

TABLE 11

Mean Monthly Precipitation, Total Runoff, Estimated Ground-water Runoff, and Loss by Evaporation and Transpiration in the Little Gunpowder Falls Basin for the Period 1927–1949

	Mean monthly precipitation (inches)	Evaporation and transpiration		Total runoff		Ground-water runoff		
		Inches	Percent of precipitation	Inches	Percent of precipitation	Inches	Percent of precipitation	Percent of total runoff
January	3.33	1.70	51	1.63	49	1.03	31	63
February	2.49	.82	33	1.67	67	1.02	41	61
March	3.44	1.57	46	1.87	44	1.32	38	71
April	3.75	1.87	50	1.88	50	1.30	35	70
May	3.93	2.30	59	1.63	41	1.27	32	77
June	3.90	2.43	62	1.47	38	.93	24	63
July	3.91	2.71	69	1.20	31	.75	19	63
August	4.65	3.23	69	1.42	31	.72	15	51
September	3.62	2.64	73	.98	27	.64	18	65
October	3.50	2.47	71	1.03	29	.69	20	67
November	3.07	1.89	62	1.18	38	.78	25	66
December	3.00	1.82	61	1.18	39	.89	30	75
Annual average of period 1927–1949	42.6	25.5	60	17.1	40	11.3	27	66

by evaporation and transpiration are greatest during the summer and early fall months, being approximately 73 percent of the precipitation in September, and they are the least in the winter months, being approximately 45 percent in February. The method used to derive these percentages is explained on the following pages.

The components of the hydrologic cycle for Little Gunpowder Falls differ somewhat from those for Rock Creek, draining an area of similar geology in Montgomery County (Dingman and Meyer, p. 39, Table 13). Table 12 compares the components for these two streams. Although the precipitation is approximately the same in both drainage basins, the total runoff in Little Gunpowder Falls (17.1 inches) is about a third greater than the runoff (12.6 inches) in Rock Creek. The greater topographic relief and the resulting higher stream gradient in the Gunpowder basin may be the controlling factors in causing the difference in total runoff between the two areas.

The "base flow" or "low flow" of most streams is maintained by ground-water runoff. A graph of the streamflow record for Little Gunpowder Falls (fig. 14) shows sharp peaks which represent periods of high streamflow during and shortly after rainfall when direct surface runoff is high. When rainfall ceases, surface runoff decreases rapidly and the flow of streams declines rapidly.

Although interflow (flow through saturated soil and subsoil above the normal position of the water table) may be quantitatively important during precipitation and for a few days thereafter, its role in streamflow in the Piedmont is not well understood. After a few days practically all the streamflow is derived from ground water. The dashed line beneath the total-runoff curve shows the estimated part of the total runoff that consists of ground-water runoff. The ground-water curve was drawn by a method adapted from the procedures employed by Houk (p. 165) and Meinzer and Stearns (p. 107–116). It is subject to certain errors listed by Meinzer and Stearns (p. 111). Houk drew his ground-water line so as to include runoff through shallow drain tiles with the surface runoff. His curve is a conservative line for ground-water flow as part of the flow through the drain tiles could be considered ground water. The curve drawn by Meinzer and Stearns is probably more representative of the true ground-water runoff. They assumed a week was required for all the surface runoff from a rain to pass the gaging station, and that essentially all streamflow that oc-

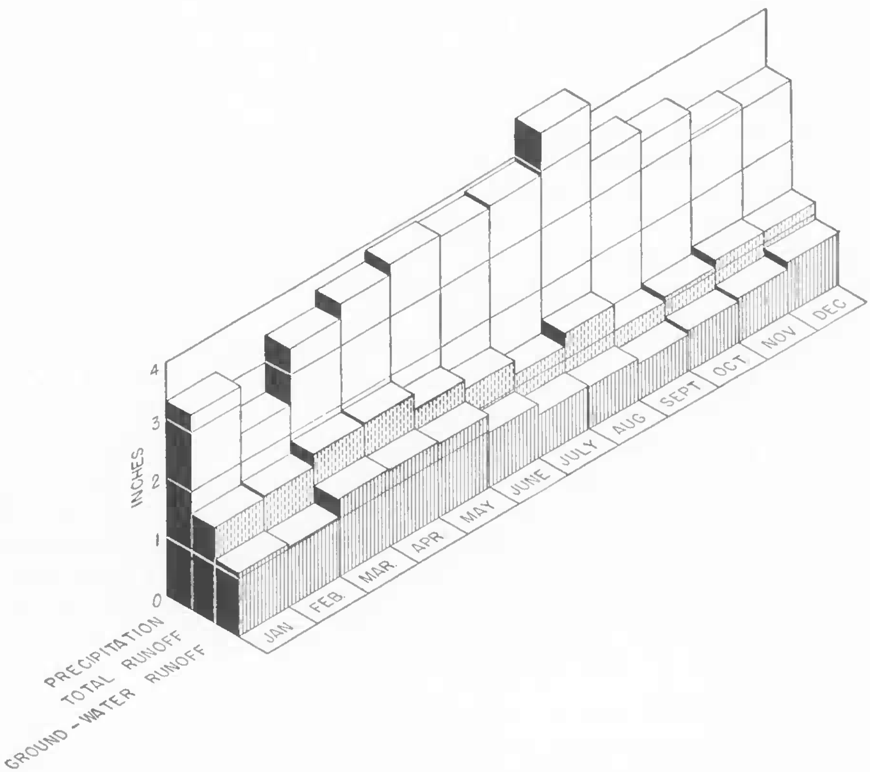

FIGURE 13. Mean Monthly Precipitation, Total Runoff, and Estimated Ground-water Runoff in the Little Gunpowder Falls Basin

TABLE 12

Annual Precipitation and Discharge Characteristics of the Rock Creek Basin (Montgomery County) and the Little Gunpowder Falls Basin (Baltimore and Harford Counties)

Drainage basin	Period of record	Average annual precipitation (inches)	Evaporation and transpiration		Total runoff		Ground-water runoff			Area of drainage basin (square miles)
			Inches	Percent of precipitation	Inches	Percent of precipitation	Inches	Percent of precipitation	Percent of total runoff	
Rock Creek	1933–1949	43.5	30.9	71	12.6	29	8.5	20	67	62.2
Little Gunpowder Falls	1927–1949	42.6	25.5	60	17.1	40	11.3	27	66	36.1

curred more than 1 week after the rain was discharged from the ground-water reservoir. Plate 19 in the report by Meinzer and Stearns shows that for each increase in ground-water runoff there is a corresponding rise in water level in observation wells in the drainage basin. This supports their ground-water curve, as the higher water levels in wells indicates increased head difference between streams and upland areas, and therefore increased rates of flow of ground water toward the streams. Linsley, Kohler, and Paulhus (p. 397–404) describe procedures for establishing the point of the stream hydrograph where the initial flow or total-runoff curve meets the estimated ground-water runoff curve. According to their procedures, the time after a rain at which this point is reached depends upon the area of the drainage basin, slope, and other factors. For basins of less than 100 square miles they give a time of 2 days, with a possible variation of 50 percent.

The hydrograph of streamflow in Little Gunpowder Falls for the period from 1927 to 1949 was analyzed, using the methods cited above as guides. A period of 3 days after the end of precipitation was assumed to be sufficient for the stream to return to base flow. To illustrate the method employed, two years of the streamflow and estimated ground-water runoff are shown in figure 14. The ground-water runoff was determined for 22 years of the streamflow record and is given in summary form in Table 11 and figure 13. The method yields figures for ground-water discharge and evapotranspiration that are only approximations. Accurate figures for ground-water discharge are obtainable only for long dry periods when streamflow can be safely considered to consist entirely of ground-water flow. In addition to the limitations listed by Meinzer and Stearns, field observations of soil profiles by the authors and soil-percolation records of the Baltimore County Health Department both suggest that shallow interflow is quantitatively important in the subsurface movement of water. If this is so, the ground-water runoff determined by streamflow analysis is a maximum value which includes a large part of the interflow.

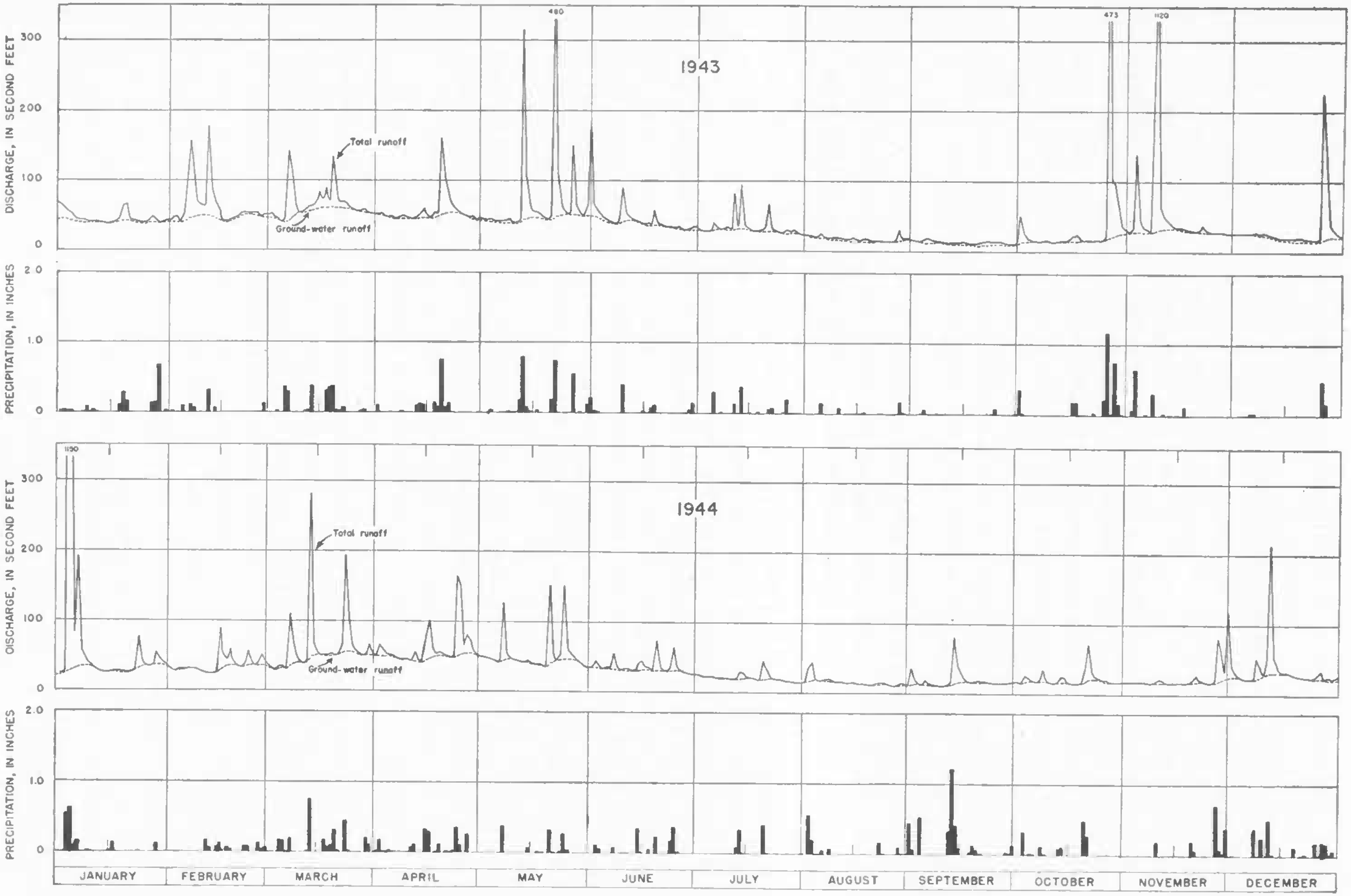

FIGURE 14. Discharge of Little Gunpowder Falls, Estimated Ground-water Runoff, and Precipitation in 1943 and 1944

In the 22-year period from 1927 to 1949, 40 percent of the precipitation was discharged from the area as stream runoff. Sixty-six percent of this runoff, representing 27 percent of the precipitation, was discharge from the ground-water reservoir. The total runoff of the Little Gunpowder Falls basin for the 22-year period averaged 800,000 gallons a day per square mile, and the ground-water runoff, approximately 500,000 gallons a day per square mile. These values may be applied in Baltimore and Harford Counties to areas outside the basin in only a very general way, because of local variations in geology, soil permeability, topography, vegetation, and many other factors. Areas underlain by the Cockeysville marble or by Coastal Plain sediments probably would show higher values than those from the Little Gunpowder Falls basin.

WATER-LEVEL FLUCTUATIONS IN OBSERVATION WELLS

Records of the water-level fluctuations in wells are helpful in understanding the occurrence of ground water and the nature of the recharge and discharge. Fluctuations in three observation wells in or adjacent to the area are shown graphically in figure 15. A rise in water levels indicates a period when the rate of recharge is in excess of discharge, and a decline in water levels indicates a period when the recharge, if any, is less than the discharge.

The elevation of the water table as indicated by the water level in a well represents nature's balance of the recharge to and the discharge from the ground-water reservoir in the vicinity of the well. The rate of discharge from the ground-water reservoir is relatively constant throughout the year, but it increases somewhat during periods of high water table and decreases somewhat during periods of low water table.

The water-level graphs in figure 15 show more or less typical seasonal fluctuations. During the period of record there has been little or no net change in water levels. Although such factors as agricultural developments, or delay in recharge due to frozen ground or to retention of precipitation in the form of snow, may affect the position of the water table temporarily, abnormal changes in the pattern of fluctuations generally can be explained by unusual fluctuations in rainfall, either in frequency or in quantity. Well Car-Bf 1 in Hampstead, which has been measured for 6 years, shows the largest seasonal fluctuation. This well is on the top of a hill and penetrates the Wissahickon formation. It probably derives its water from storage in fractures in the rocks, which have a low capacity for storing water. The range between high water level in the spring and low water level in the fall has been as much as 16 feet.

Well Bal-Cb 2 near Woodensburg was measured for 4½ years. It is a dug well on the crest of a hill and ends in the Peters Creek quartzite. The seasonal fluctuation of the water level in this well has been as great as 10 feet.

Well 4N2W-9 is a drilled well in the northern part of Baltimore City and is in a valley near a stream. The fluctuations of the water level in this well show a maximum range of 5 feet.

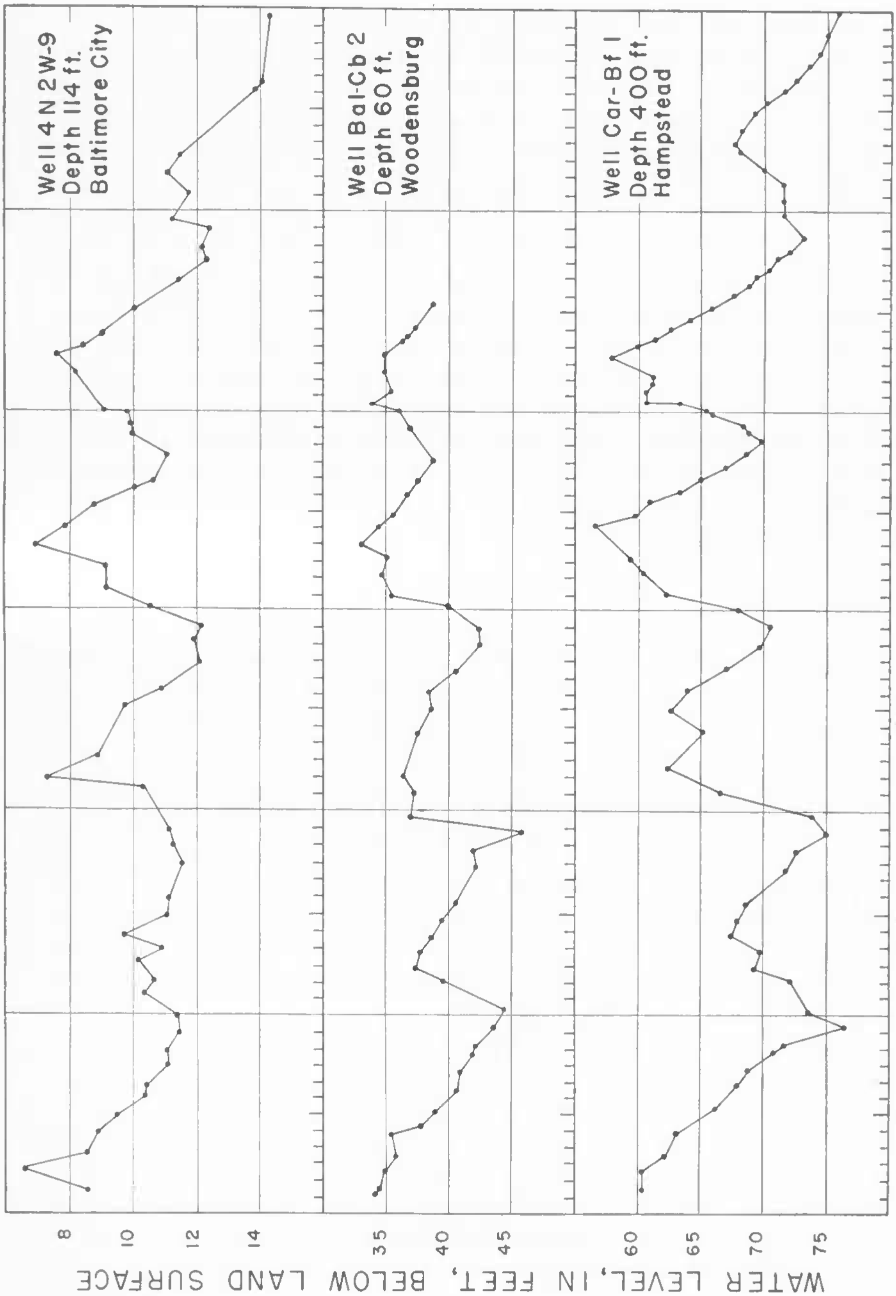

FIGURE 15. Hydrographs Showing the Fluctuations of Water Levels in Observation Wells

These three wells show that during the summer months, though the precipitation is highest, the water levels decline. The rate of recharge during this time is relatively low. In the winter months, although the precipitation is lower, the water levels rise. The months in which the water levels decline are the growing season in these counties, and the months during which the water levels rise are months of plant dormancy.

DEVELOPMENT AND UTILIZATION OF GROUND WATER

The amount of ground water pumped from the crystalline-rock area of Baltimore and Harford Counties is estimated to be about 4,000,000 gallons a day, most of which is from wells used for domestic or agricultural purposes. Only a small amount of ground water is used for light industrial or commercial purposes. During the canning season a few canneries in the counties use an estimated 200,000 gallons per day of ground water for processing.

Bel Air has been the only town in either county with a public supply from a ground-water source. In the fall of 1954 this supply became inadequate, and it was abandoned in favor of a surface-water supply.

QUALITY OF GROUND WATER

The chemical character of the ground water in the Piedmont of Baltimore and Harford Counties is shown by the 61 chemical analyses in Tables 13 and 14. Forty-one water samples from wells or springs were analyzed by the U. S. Geological Survey, 16 analyses are from the Maryland State Department of Health, and 4 analyses are from other sources.

Relation of Chemical Character to the Circulation of Ground Water

The minerals and gases in ground water in the crystalline-rock area of the Maryland Piedmont are dissolved primarily from the soil and weathered rock mantle and to a lesser extent from the unweathered rock and from the atmosphere. The chemical character of the water is not uniform throughout the area, principally because of the differing chemical composition of the rocks and to a lesser degree because of the variations in the rate and pattern of circulation of the ground water.

The relation between circulation of ground water and its chemical character is complex. The longer the ground water is in contact with the rocks, the greater is the opportunity to dissolve mineral matter from the rocks (or under some conditions to deposit it). Upon entering the soil the precipitation immediately begins to dissolve mineral matter. However, some of the mineral matter is soon deposited, as evidenced by the zone of accumulation of mineral matter in the clayey B horizon of the soil. The water continues to dissolve mineral matter as it moves downward through the zone of aeration toward the water

TABLE 13

Chemical Analyses of Ground Water in Baltimore County

(In parts per million, except pH and specific conductance)

Well or spring no. (Bal-)	Water-bearing formation	Date of collection	Dissolved solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Phosphate (PO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Manganese (Mn)	Aluminum (Al)	Zinc (Zn)	Copper (Cu)	Hardness as $CaCO_3$ Total	Hardness as $CaCO_3$ Noncarbonate	Carbon dioxide (CO_2)	pH	Specific conductance ($K \times 10^6$ at 25°C.)	Analyst
Ad 1	Wissahickon (albite)	Mar. 9, 1951	30	7.2	0.03	28	1.1	1.7	0.4	14	0	0.2	—	3.1	0.1	4.5	0.03	0.6	—	—	12	0	—	7.0	38.1	A
Bd 8	Wissahickon (oligoclase)	Sep. 23, 1953	72	—	.20	—	—	—	—	—	—	—	—	5.5	—	3.0	—	—	—	—	27	—	—	—	—	B
Bd 9	Do	May 6, 1953	56	9.2	.07	2.8	1.1	3.1	1.4	22	0	1.9	0.0	3.2	.1	9.5	.02	.0	8.3	.03	12	0	8.9	6.6	72.3	A
Ca 7	Wissahickon (albite)	May 12, 1954	37	14	.16	3.1	1.2	3.3	.8	21	0	1.2	.1	2.4	.0	.4	.02	.0	.18	.00	13	0	17	6.3	41.0	A
Cb 4	Peters Creek quartzite	May 4, 1953	51	14	.12	5.4	1.3	3.4	.8	27	0	1.6	.1	4.9	.1	.2	.02	.4	2.2	.01	19	0	11	6.6	71.1	A
Cc 27	Baltimore gneiss	Sep. 1953	106	25	.20	8.3	5.4	17	—	49	—	31	—	6.4	.2	—	—	.4	—	—	43	—	—	6.0	—	C
Cd 7	Setters	May 12, 1954	76	25	.00	4.6	3.5	6.9	2.8	35	0	1.4	.2	11	.0	1.2	.00	.0	1.4	.02	28	0	5.6	7.0	95.5	A
Cd 11	Baltimore gneiss	Aug. 8, 1928	62	—	.20	—	—	—	—	—	—	—	—	6.4	—	1.2	—	—	—	—	34	—	—	6.2	—	B
Cd 12	Do	Apr. 13, 1950	106	—	.20	—	—	—	—	—	—	—	—	1.0	—	1.4	—	—	—	—	42	—	—	6.5	—	B
Db 3	Wissahickon (oligoclase)	May 4, 1953	48	15	2.1	5.2	1.9	2.5	1.1	24	0	2.0	.0	3.2	.0	2.5	.01	.1	.00	.01	21	1	24	6.2	59.4	A
Db 13	Cockeysville marble	May 11, 1954	128	9.4	.04	31	6.9	1.9	1.0	125	0	2.6	.0	2.1	.0	2.3	.02	.0	.00	.01	106	3	4.0	7.7	217	A
Db 35	Do	Mar. 18, 1946	182	—	1.2	—	—	—	—	—	—	—	—	20	—	8.8	—	—	—	—	93	—	—	6	—	B
Dc 35	Wissahickon (oligoclase)	July 26, 1951	94	—	.70	—	—	—	—	—	—	—	—	8.6	—	4.0	—	—	—	—	46	—	—	6.0	—	B
Dc 39	Do	May 8, 1953	35	12	.07	3.5	.1	2.7	.8	15	0	2.2	.1	1.8	.0	.9	.00	.2	.00	.01	9	0	15	6.2	33.8	A
Dc 64	Do	May 5, 1953	50	—	.10	—	—	—	—	—	—	—	—	6.6	—	.02	—	—	—	—	17	—	—	6.3	—	B
De 2	Cockeysville marble	May 5, 1953	242	17	.16	64	9.4	3.4	2.0	223	0	19	.0	5.6	.1	.6	.01	.3	.04	.05	198	16	8.9	7.6	394	A
De 16	Gunpowder granite	Sep. 11, 1951	170	—	.10	—	—	—	—	—	—	—	—	6.6	—	.60	—	—	—	—	112	—	—	6.5	—	B
De 23	Wissahickon (oligoclase)	May 5, 1953	88	17	1.0	11	5.8	2.3	1.9	48	0	20	.0	.1	.0	.2	.20	1	.00	.02	51	12	6.1	7.1	118	A
Df 22	Gabbro	Nov. 3, 1953	—	12	—	4.9	.0	—	—	—	—	1.2	—	—	—	—	—	.85	—	—	—	—	—	6.2	—	B
Df 22	Do	Mar. 17, 1954	44	14	.09	4.9	3.0	1.6	.3	32	0	2.6	.0	2.5	.1	1.4	.04	.5	1.8	.00	31	5	13	6.6	57.8	A
Df 34	Do	Nov. 7, 1952	60	—	.30	—	—	—	—	—	—	—	—	7.1	—	.04	—	—	—	—	47	—	—	6.0	—	B
Df 39	Cockeysville marble	Feb. 24, 1954	139	11	.09	29	14	1.8	.5	127	0	8.2	.0	5.8	.0	18	.00	.0	.00	.02	130	26	2.5	7.9	246	A
Dg 10	Port Deposit gneiss	Mar. 25, 1953	146	31	2.7	28	1.9	6.8	4.2	121	0	1.4	.0	1.0	.1	.2	.22	.2	.00	.01	78	0	24	6.9	192	A
Ea 11	Serpentine	May 13, 1954	305	33	.09	11	53	4.0	.2	183	0	57	.1	13	.0	36	.00	.1	.20	.02	246	96	3.7	7.9	459	A
Ea 14	Baltimore gneiss	Mar. 17, 1954	146	24	.04	22	8.2	7.5	3.5	81	0	33	—	7.0	.1	.1	.02	—	—	—	89	22	13	7.0	215	A
Eb 28	Cockeysville marble	May 31, 1932	186	—	.0	—	—	—	—	—	—	—	—	64	—	.4	—	—	—	—	138	—	—	8.1	—	B
Eb 36	Wissahickon (oligoclase)	May 7, 1951	52	—	.0	—	—	—	—	—	—	—	—	3.8	—	.10	—	—	—	—	45	—	—	6.3	—	B
Ec 3	Cockeysville marble	Sep. 28, 1949	274	—	.38	—	—	—	—	—	—	—	—	8.8	—	3.2	—	—	—	—	198	—	—	7.4	—	D
Ec 4	Setters and Cockeysville marble	Jan. 16, 1953	111	11	.14	29	5.0	2.0	1.5	113	0	2.2	.0	2.5	.1	1.9	.0	.0	.05	.00	93	0	4.5	7.6	188	A
Ec 7	Cockeysville marble	Sep. 8, 1949	180	—	.05	—	—	—	—	—	—	—	—	5.0	—	1.4	—	—	—	—	115	—	—	7.7	—	D
Ed 22	Serpentine	Mar. 19, 1954	240	31	.06	9.5	51	4.0	2.2	276	0	2.6	.0	12	.0	6.8	.00	.2	.05	.00	235	18	2.2	8.3	427	A
Ef 32	Port Deposit gneiss	Jan. 15, 1953	56	16	1.6	2.7	.4	3.8	1.1	33	0	11	.0	2.7	.0	1.3	.02	2.7	8.8	.00	8	0	4.2	7.1	69.9	A
Ef 47	Gabbro	May 14, 1954	—	—	.76	—	—	—	—	150	0	—	—	—	—	.1	—	—	—	—	92	0	—	7.9	227	A
Ef 50	Patuxent	May 14, 1954	—	—	3.3	—	—	—	—	26	0	—	—	—	—	.3	—	—	—	—	10	0	13	6.5	48.0	A
Ef 51	Do	May 13, 1954	—	—	.64	—	—	—	—	9.0	0	—	—	—	—	3.0	—	—	—	—	6	0	14	6.0	30.3	A
Ef 52	Do	May 14, 1954	—	—	3.7	—	—	—	—	9.0	0	—	—	—	—	25	—	—	—	—	15	8	22	5.8	71.4	A
Ef 53	Do	May 14, 1954	—	—	2.9	—	—	—	—	14	0	—	—	—	—	35	—	—	—	—	9	0	18	6.1	43.5	A
Ef 54	Do	May 14, 1954	—	—	3.5	—	—	—	—	13	0	—	—	—	—	25	—	—	—	—	16	5	13	6.2	71.0	A
Ef 56	Gabbro (?)	May 14, 1954	—	—	.35	—	—	—	—	116	0	—	—	—	—	.2	—	—	—	—	50	0	5.8	7.5	243	A
Ef 57	Patuxent	May 7, 1954	—	—	.65	—	—	—	—	2.0	0	—	—	—	—	76	—	—	—	—	59	57	40	4.8	257	A
Eg 12	Gabbro	Mar. 24, 1947	42	—	.05	—	—	—	—	—	—	—	—	2.5	—	1.3	—	—	—	—	22	—	—	5.7	—	D
Fc 8	Do	Mar. 18, 1954	228	42	.35	36	15	12	3.9	182	0	12	—	17	.2	.2	.02	—	—	—	152	3	9	7.5	341	A

Analyst: A—U. S. Geological Survey
B—Maryland State Health Dept.
C—Sheppard T. Powell
D—Penniman & Browne, Inc.

TABLE 14

Chemical Analyses of Ground Water in Harford County

(In parts per million, except pH and specific conductance)

Well No. (Har-)	Water-bearing formation	Date of collection	Dissolved solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Phosphate (PO_4)	C loride (Cl)	Fluoride (F)	Ni rate (NO_3)	Manganese (Mn)	Aluminum (Al)	Zinc (Zn)	Copper (Cu)	Hardness as $CaCO_3$		Carbon dioxide (CO_2)	pH	Specific conductance (K × 10⁶ at 25°C.)	Analyst
																					Total	Non-carbonate				
Aa 14	Wissahickon (albite)	Oct. 16, 1953	46	12	0.09	4.6	1.7	2.4	0.2	19	0	1.5	0.1	3.6	0.1	1.0	0.01	0.0	0.00	0.01	18	3	3.8	6.9	49.4	A
Aa 15	Do	May 14, 1954	22	7.5	.01	1.7	.6	1.9	.6	9.2	0	2.2	.1	2.0	.0	.3	.00	.1	.05	.04	7	0	4.6	6.5	25.0	A
Ac 1	Peters Creek quartzite	Nov. 30, 1949	48	—	.4	—	—	—	—	—	—	—	—	5.8	—	.1	—	—	—	—	7	—	—	5.9	—	B
Ac 3	Do	May 16, 1949	80	37	.5	1.6	.6	—	—	—	0	3.1	—	4.5	—	1.2	.0	1.1	—	—	10	—	—	5.9	—	B
Ac 13	Do	Mar. 3, 1954	127	19	.02	18	6.3	6.3	.7	44	0	4.3	.1	18	.1	26	.00	.0	.00	.02	71	35	8.8	6.9	176	A
Ad 13	Do	Jan. 13, 1947	55	18	.86	6.4	2.2	3.2	.6	32	0	.5	—	3.6	.1	1.0	—	—	—	—	25	0	—	7.9	66.7	A
Bb 10	Serpentine	May 11, 1954	160	32	.23	5.7	26	1.1	.9	108	0	18	.0	5.0	.0	12	.02	.0	1.1	.00	123	34	6.8	7.4	239	A
Bb 28	Peters Creek quartzite	Mar. 2, 1954	21	6.3	.46	1.7	.6	1.6	.1	7.2	0	.2	.0	3.3	.0	.3	.02	.0	.92	.11	8	2	47	5.4	24.3	A
Be 6	Port Deposit gneiss	May 14, 1954	118	21	.02	12	5.0	4.5	.6	51	0	4.4	.0	4.6	.1	30	.00	.0	9.5	.19	65	24	32	6.4	151	A
Cb 1	Wissahickon (oligoclase)	Mar. 3, 1954	51	22	.10	3.4	1.5	4.1	1.3	18	0	9.4	.0	1.8	.0	1.1	.01	.0	.44	.02	15	1	5.7	6.7	53.7	A
Cc 7	Port Deposit gneiss	June 18, 1949	140	11	.0	19	4.0	—	—	—	0	2.8	—	10	.1	1.6	.0	.8	—	—	80	—	—	6.5	—	B
Cc 17	Gabbro	May 5, 1954	66	26	.02	5.6	3.2	2.4	.4	38	0	.8	.1	1.9	.1	1.8	.01	.0	3.0	.03	32	—	9.6	6.8	66.5	A
Cd 18	Serpentine (?)	June 7, 1950	—	—	.0	—	—	—	—	—	—	—	—	6.2	—	.4	—	—	—	—	40	—	—	6.7	—	B
Ce 11	Gabbro	Oct. 5, 1954	78	16	.06	8.6	4.6	2.2	.4	28	0	1.2	.0	7.8	.1	16	.01	.0	.47	.00	41	18	7.1	6.8	101	A
Ce 34	Baltimore gneiss	Oct. 5, 1954	80	33	4.6	6.1	2.2	5.3	.9	42	0	1.0	.0	2.7	.1	.8	.01	.0	.01	.00	24	0	.8	7.9	79.1	A
Cf 1	Pleistocene	Sept. 10, 1951	248	14	.3	18	11	—	—	—	0	86	—	27	—	2.0	.0	.0	—	—	100	—	—	5.7	—	B
Cf 28	Port Deposit gneiss	Oct. 5, 1954	134	24	.06	21	3.8	9.5	3.0	103	0	9.4	.0	4.8	.1	1.0	.51	.0	.98	.08	70	0	8.2	7.3	190	A
Dd 29	Do	Oct. 5, 1954	80	19	—	9.7	5.4	3.2	1.1	66	0	.8	.0	2.4	.1	.8	1.4	.0	.37	.01	49	0	6.6	7.2	115	A

Analyst: A—U. S. Geological Survey
B—Maryland State Department of Health

table. As the overall permeability of the crystalline rocks is extremely low, most of the circulation of ground water from the point of recharge to the point of discharge is through the much more permeable weathered rock mantle. The chemical character of the ground water in the weathered rock mantle is closely related to the type of material and the extent and rate of movement of ground water in it. The chemical character of the ground water in the unweathered rocks is dependent upon the mineral content of the water that enters the rock from the weathered mantle plus the additional mineral matter dissolved from the fresh rock. However, because of the small percentage of the total rock that is occupied by the water-bearing fractures in the fresh, hard rock, and the relatively small amount of ground water that circulates through them, the unweathered rocks contribute relatively little to the mineral content of the ground water.

RELATION OF CHEMICAL CHARACTER TO ROCK TYPE

There are two major types of rocks in the counties, acidic or highly siliceous rocks and basic or alkaline rocks rich in calcium and magnesium. The latter include mainly marble, serpentine, and gabbro. The solubility of the rocks is not uniform. The marble is readily soluble and the serpentine somewhat so, but the composition of the other rocks, whether acidic or basic, is such as to make them relatively insoluble.

The pH and hardness of a number of water samples from wells, springs, and streams in the Green Spring Valley and its vicinity were determined as an aid in understanding the circulation of ground water. The pH was measured at the time of collection with a portable pH meter. The hardness of the water was determined in the laboratory by titration with a solution of ethylene diamine tetraacetic acid. The results of pH and hardness determinations indicate changes in geology and the pattern of ground-water flow in the area.

The Green Spring Valley is underlain by the Cockeysville marble and is bordered on the south by the Setters formation and the Baltimore gneiss and on the north by the Wissahickon formation. The water shows abrupt changes in hardness and pH along the contact between the carbonate rocks of the valley and the noncarbonate rocks of the ridges. The changes are sharp enough to indicate formational contacts in areas where the rocks are not exposed.

The water derived from the schist, gneiss, or quartzite usually has a pH lower than 7, whereas water derived from the marble has a pH of more than 7. The pH of water from wells in the marble ranges from 6.8 to 8.4, and the pH of water from the noncarbonate rocks ranges from 4.3 to 7.4. There is no evident correlation between the pH of the water and the path of circulation within any single rock type.

The hardness of the water in the marble, ranging from 98 to 270 parts per million, is everywhere much higher than that of water in the noncarbonate

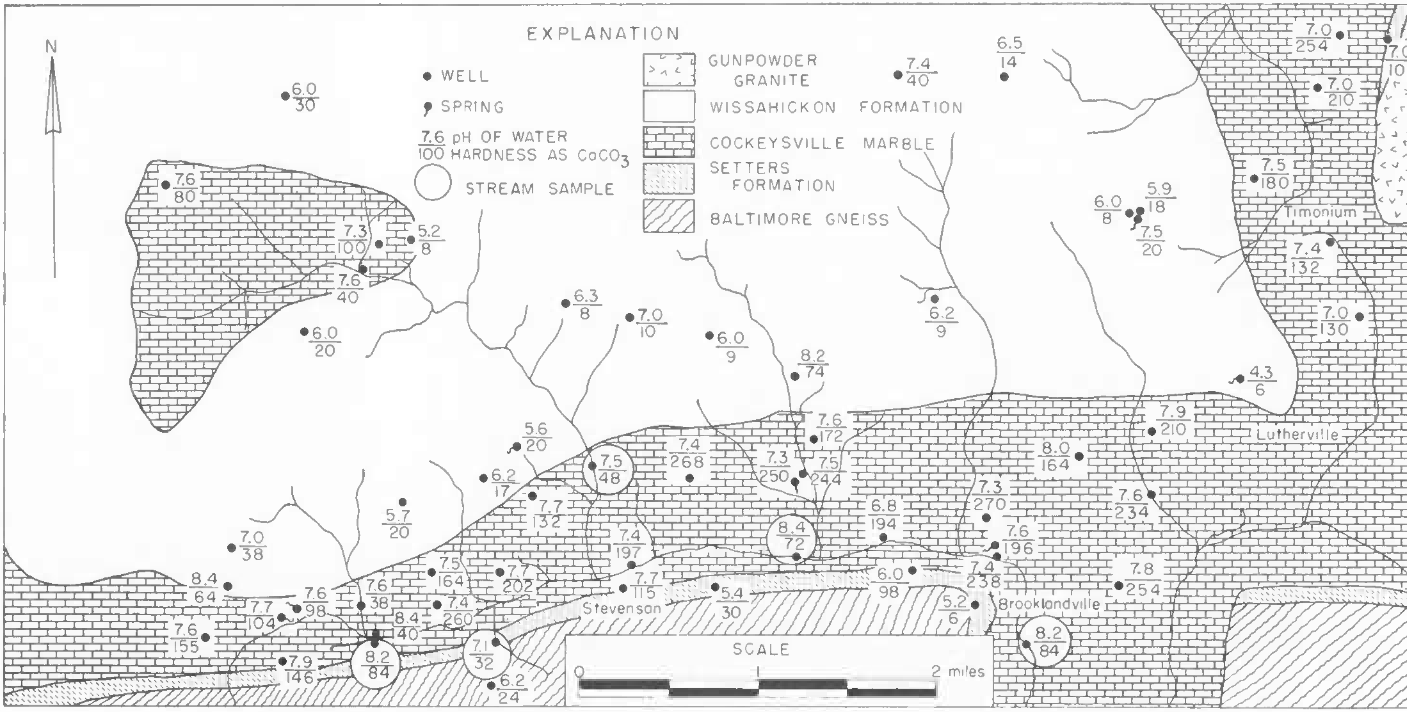

FIGURE 16. Geologic Map of Green Spring Valley and Vicinity Showing Location of Sampling Sites

rocks—the gneiss, schist, and quartzite—which ranges from 6 to 74 parts per million. In the areas underlain by the marble the pattern of movement of ground water is shown by changes in hardness of the water. Figure 17 shows that the hardness of the water increases from the sides toward the center of the valley and it increases also from west to east in the direction of flow of the surface stream.

In a subsidiary valley also underlain by marble, which trends northward (in the northwest corner of fig. 16), the direction of streamflow is north and the same pattern of increasing hardness toward the center of the valley and in the direction of streamflow exists. These data indicate that the ground-water flow is in the direction of increasing hardness, the water dissolving more and more of the hardness-forming constituents (calcium, magnesium, etc.) from the marble as it moves through it.

The hardness of water in the noncarbonate rocks is extremely low, generally below 25 parts per million, a number of analyses showing less than 10 parts per million. The hardness of water from wells in the marble ranges from 115 to 270 parts per million, and the range from springs is from 98 to 250 parts per million.

The water from streams flowing across the gneiss, schist, and quartzite is relatively soft and of a low pH, whereas water from streams flowing thru the marble has a higher pH and is harder.

Water samples from The Caves valley (northwest corner of fig. 16), which is a large area of Cockeysville marble exposed in an erosional window in the surrounding Wissahickon formation, reveal a similar increase in hardness in the direction of ground-water movement.

The principal basic radicals (cations) shown in the analyses in Tables 13 and 14 are calcium, magnesium, and sodium, and the principal acidic radicals (anions) are bicarbonate and sulfate, although some of the analyses show a predominance of other constituents. Most of the waters may be classed as of the calcium-magnesium bicarbonate type.

The principal cations in 33 complete analyses of water from five general rock types are plotted in figure 18 against the principal anions (in percent reacting values) to show the predominant types of water in the rocks. This form of presentation of the chemical analyses of ground water is adapted from the method presented by Langelier and Ludwig. All but 4 of the 33 analyses fall in the lower right block, indicating that the water is principally of the calcium-magnesium bicarbonate type. There is also a general grouping by rock types. The analyses of water from the schist and quartzite plot near the center of the graph, showing the water to be of the calcium-magnesium bicarbonate type but with a greater proportion of sodium than the other types. The analyses of water from the gneiss, granite, and gabbro plot mostly in the lower right block,

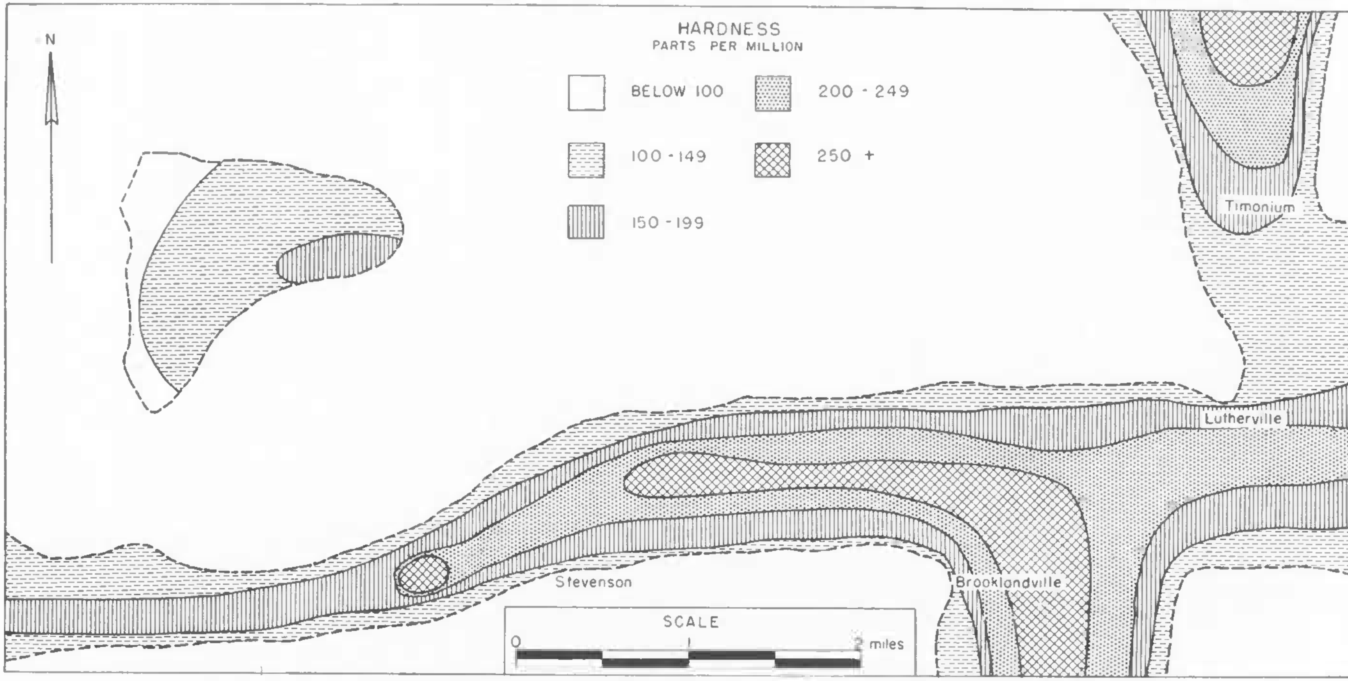

FIGURE 17. Map of Green Spring Valley and Vicinity Showing Distribution of Hardness

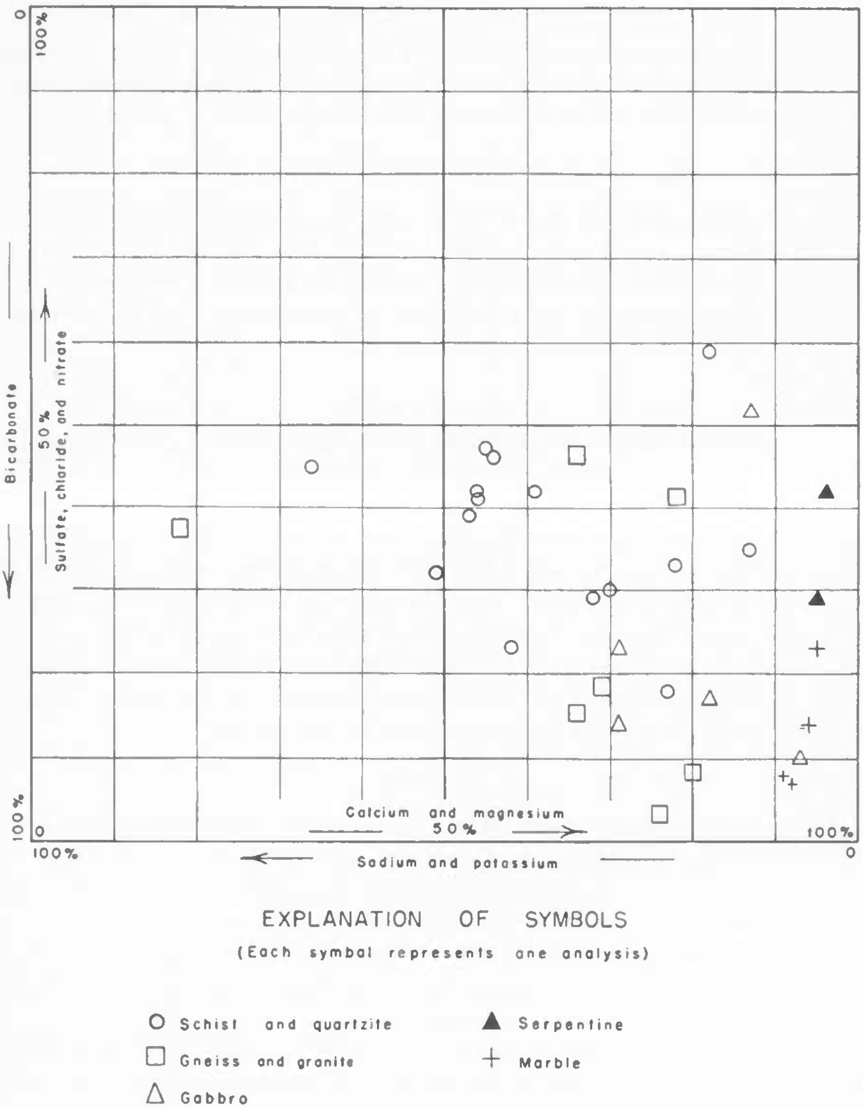

FIGURE 18. Diagram Showing, by Percent Reacting Value, the Chemical Character of Ground Water

indicating water of the calcium-magnesium bicarbonate type. The analyses of water from the serpentine and marble also generally plot in the lower right corner, indicating a water that is relatively high in calcium and magnesium bicarbonate.

Evidence of contamination from sewage-disposal systems or from soil fertilizers is found in two analyses in the upper right block which are high in nitrate and chloride. Some of the other analyses also show water containing excess nitrate and chloride, and in some cases metals such as zinc or aluminum.

RELATION OF CHEMICAL CHARACTER TO USE

The chemical quality of ground water governs its suitability for certain uses. In the Piedmont area dissolved solids, hardness, iron, pH, and carbon dioxide are generally the most important with regard to the utilization of ground water, although for certain uses other properties or constituents may be more important.

DISSOLVED SOLIDS

The dissolved solids are the residue on complete evaporation of a water sample. They consist almost entirely of the mineral constituents reported in Tables 13 and 14. The residue may contain also minor quantities of other mineral constituents, small quantities of organic matter, and water of crystallization. Most natural waters containing less than 500 parts per million of dissolved solids are satisfactory for most uses. The dissolved solids in 51 of the samples of ground water from the crystalline rocks of Baltimore and Harford Counties range from 21 to 305 parts per million and average 105. The lowest concentrations are in the samples from the schist and quartzite and the highest concentrations are in the samples from the serpentine and marble.

HARDNESS

The terms "hardness" and "softness" refer to the relative capacity of water to consume or precipitate soap. If mineral constituents causing hardness are present in water in relatively large quantities, the addition of soap to the water results in formation of a sticky, insoluble curd. Excessive hardness of water is objectionable because the curd is difficult to remove from containers and fabrics, a greater quantity of soap is required to produce a lather, and a scale is deposited in steam boilers, water pipes, and cooking utensils.

The chief cause of hardness in ground water in the crystalline rocks in Baltimore and Harford Counties is the presence of relatively large quantities of calcium and magnesium. Other mineral constituents that cause hardness, such as aluminum, iron, manganese, copper, barium, lead, zinc, and other trace elements, are seldom present in natural water in large enough concentrations to have an appreciable effect. The hardness column in Tables 13 and 14 shows total and noncarbonate hardness. Carbonate hardness (formerly designated "temporary" hardness) is the part of the hardness equivalent to the carbonate and bicarbonate ions. Carbonate hardness may be removed from water by boiling. The noncarbonate hardness (formerly called "permanent" hardness) constitutes the remaining hardness and is formed chiefly by calcium or magnesium sulfate or chloride; it cannot be removed by boiling. Both types of hardness have the objectionable properties described, but a more resistant scale that cannot readily be dissolved is formed by noncarbonate hardness.

Water having a hardness of about 50 parts per million or less is generally considered soft; water having hardness between 50 and 150 parts may be used for most purposes without treatment. Hardness in water greater than 150 parts per million is noticeable to most consumers.

The hardness of ground water in the crystalline-rock areas of Baltimore and Harford Counties, as indicated by 60 analyses, ranges from 6 to 246 parts per million and averages 59. Water from the Cockeysville marble and serpentine is relatively hard. Seven samples from the marble range in hardness from 93 to 198 parts per million and average 133. Three samples from the serpentine range from 123 to 246 parts per million and average 201. The softest water (generally below 50 parts per million) is usually in the schist, quartzite, and gneiss.

IRON

In many parts of Baltimore and Harford Counties iron is present in the ground water in sufficient quantities to give the water a disagreeable taste and to stain sanitary fixtures, cooking utensils, and laundry. Iron, when in excess of 0.3 part per million, commonly forms a reddish-brown precipitate upon exposure to the air. Occasionally when domestic water supplies contain excessive iron, trouble may be experienced with the growth of iron bacteria (*Crenothrix*) in water pipes, in the casing of wells, and on other plumbing surfaces.

Water from 60 wells and springs in Baltimore and Harford Counties ranges in iron content from 0.0 to 3.5 parts per million. The iron content in 18 samples is 0.3 part per million or higher; 5 samples showed 0.0 parts per million of iron.

HYDROGEN-ION CONCENTRATION

The hydrogen-ion concentration (pH) is the negative logarithm of the hydrogen-ion concentration in moles per liter. An aqueous solution or a natural water with a pH of 7 is said to be neutral. Since the pH values of water are logarithmic, a water having a pH of 6 has 10 times the concentration of hydrogen ions as a water having a pH of 7. Water having a low pH may corrode well casings, pumping equipment, and distribution systems, and may dissolve iron, zinc, copper, or lead from this equipment. The pH of 53 samples of ground water from the crystalline-rocks of Baltimore and Harford Counties ranges from 5.4 to 8.3. Water in most of the acid crystalline rocks such as quartzite, gneiss, and schist commonly has a pH below 7. The pH of a sample of ground water may change upon contact of the sample with the atmosphere; however, the pH values in the tables are considered to be approximately the same as those determined at the time of sampling.

CARBON DIOXIDE

Carbon dioxide dissolved in ground water increases the solvent action or corrosiveness of the water. Water having a low dissolved solids content and a pH of about 5 or 6 generally is high in carbon dioxide. Although no simple relation exists between corrosion potential and the quantity of carbon dioxide in the ground water, water having a carbon dioxide content in excess of about 10 parts per million is likely to be corrosive. The carbon dioxide content of the samples in Tables 13 and 14 ranges from 2.2 to 47 parts per million. In 15 of the samples it exceeds 10 parts per million.

MINOR CONSTITUENTS

Minor constituents determined in many of the samples are shown in Tables 13 and 14. Generally they are present in small quantities, but in places they may be present in sufficient quantity to be significant.

The copper content in 28 samples ranges from 0.00 to 0.19 part per million. Eight samples contain no copper. The zinc content of 28 samples ranges from 0.00 to 9.5 parts per million; only 3 samples contain more than 3 parts per million. The aluminum content in 34 samples ranges from 0.0 to 2.7 parts per million; in only 2 samples is the aluminum content 1.0 part per million or more. The copper and zinc in some of the samples may be higher than at their source because of the solvent action of the water on the well casing, pumping equipment, and water lines. The fluoride content of all the samples is 0.2 part per million or less.

RECORDS OF WELLS

Descriptions of the wells and springs inventoried in Baltimore and Harford Counties are given in Tables 15 to 18. The locations of the wells and springs are shown on Plates 1 and 2. Plate 3 is a geologic map of the two counties.

The altitude of the land surface at the wells was taken chiefly from topographic maps having a 20-foot contour interval.

"Type of well" refers to the method of construction. The wells that were drilled by the cable-tool percussion method are described as "drilled," and those that were dug manually or by some form of mechanical digger are described as "dug." A few wells drilled through the bottom of existing dug wells are described as "dug and drilled." Logs of selected wells are shown in graphic form on Plates 4 and 5.

The well depths are reasonably accurate, except where indicated as approximate. Most of the depths were reported by well drillers, some were reported by the well owners, and some were measured.

Wherever it was practicable, depths to water level were measured. Otherwise the depths to water level were reported by drillers and well owners. Because many wells are not tested for their maximum capacity, many reported yields are less than the maximum rate at which the wells could be pumped.

TAB

Records of Wells

Water level: Reported water levels are designated by "a".
Pumping equipment: *Method of lift*: B, bucket; C, cylinder; J, jet; NI, pump to be installed; N, none; S, suction; T, turbine.
Type of power: E, electric motor; G, gasoline engine; H, hand.
Use of water: C, commercial; D, domestic; F, farming; I, institutional, camp, church, or school; M, military; N, not used;
Remarks: Chemical analyses referred to are in Table 13.
Well logs referred to are on Plate 4.

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Ab 1	C. J. Price, Jr.	Stanford	1946	880	Drilled	65	6	15	Upland	Wissahickon (albite)
Ab 2	Elvin E. Baer	Sterner	1952	900	do	70	5⅝	28	Slope	do
Ab 3	G. H. Lawson	—	Before 1850	750	Dug	28	36	—	do	do
Ab 4	C. H. Bailey	—	1893	860	Drilled	75–80	6	—	Hilltop	do
Ab 5	B. M. Harris	—	Between 1826–1850	720	Dug	100	156	—	do	do
Ac 1	James Thomas	Ray Urey	1948	780	Drilled	100	6	22	do	do
Ac 2	Donald Turnbaugh	do	1949	760	do	100	6	34	Slope	do
Ac 3	Paul H. Bollinger	Ed Urey	1946	890	do	97	6	21	Hilltop	do
Ac 4	Fred Atkinson	Ray Urey	1948	750	do	58	6	35	Valley	do
Ac 5	Do	do	1953	750	do	40	6	9	do	do
Ac 6	Mrs. Vertie Bowman	Ed Urey	1947	860	do	98	6	34	Hilltop	do
Ac 7	Drew Williams	Ray Urey	1953	640	do	49	6	42	Valley	do
Ac 8	Ernest Morris	do	1952	810	do	103	6	21	Hilltop	do
Ac 9	Do	do	1950	790	do	69	6	32	Slope	do
Ac 10	Wm. R. Ratliff	Ed Urey	1946	810	do	51	6	41	do	do
Ac 11	Aaron Biesecker	Ray Urey	1952	860	do	144	6	17	do	do
Ac 12	Kenneth Tracey	do	1951	860	do	84	6	30	do	do
Ac 13	Gunpowder Baptist Church	do	1950	820	do	91	6	56	Hilltop	do
Ac 14	Jos. A. Graw	do	1953	720	do	98	6	23	Slope	do
Ac 15	Paul Crouse	do	1950	860	do	101	6	64	Hilltop	do
Ad 1	Edwin Wineholt	do	1949	790	do	125	6	75	Slope	do
Ad 2	H. C. Krout	do	1948	840	do	88	6	12	Hilltop	do
Ad 3	Wm. E. Brown	do	1949	680	do	86	6	35	Slope	do
Ad 4	Robert Piereman	do	1953	650	do	48	6	14	Valley	do
Ad 5	E. Brown	do	1947	650	do	101	6	57	Hilltop	do
Ad 6	Harry Ebaugh	do	1947	780	do	97	6	24	do	do
Ad 7	Nellie Rosier	do	1947	740	do	114	6	37	do	do
Ad 8	Harry Gibbs	do	1951	790	do	92	6	23	do	do
Ad 9	Nolan Jones	do	1950	795	do	80	6	30	do	do
Ad 10	David Hammond	do	1950	690	do	52	6	40	Upland	do
Ad 11	Clyde McCullough	do	1948	700	do	80	6	41	Hilltop	do
Ad 12	J. G. McCullough	—	Before 1930	680	Dug	15	30	—	Slope	do
Ad 13	Clarence Wilson	Ray Urey	1950	670	Drilled	91	6	32	Hilltop	do
Ae 1	R. W. Burns	do	1952	670	do	78	6	24	do	do
Ae 2	Do	A. C. Reider & Son	1948	650	do	190	6	—	Slope	do

LE 15
in Baltimore County

P, public supply.

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
35[a]	1946	—	—	10+	1946	—	—	J, E	D	
23[a]	1952	—	—	12	1952	—	—	C, E	D	See well log.
—	—	—	—	—	—	—	—	J, E	D, F	Goes dry in dry weather.
—	—	—	—	—	—	—	—	J, E	D, F	Water reported "hard and irony".
89[a]	1953	—	—	—	—	—	—	J, E	D	
—	—	—	—	4.5	1948	—	—	J, E	D	See well log.
50[a]	Oct. 31, 1949	—	—	5	1949	—	—	J, E	D	Do.
53[a]	Feb. 13, 1946	71[a]	Feb. 13, 1946	3	Feb. 13, 1946	½	0.2	J, E	D	Do.
36[a]	May 24, 1948	36[a]	May 24, 1948	10	May 24, 1948	½	—	J, E	D	Do.
6[a]	June 26, 1953	6[a]	June 26, 1953	10	June 26, 1953	1	—	J, E	D	Do.
48[a]	May 31, 1947	87[a]	May 31, 1947	3	May 31, 1947	½	.1−	J, E	D	
8[a]	May 4, 1953	15[a]	May 4, 1953	10	May 4, 1953	1	1.4	J, E	D	
48[a]	Mar. 17, 1952	50[a]	Mar. 17, 1952	10	Mar. 17, 1952	1	5	NI	D	
15[a]	July 24, 1950	15[a]	July 24, 1950	20	July 24, 1950	¾	—	S, E	D, F	
10[a]	Oct. 23, 1946	12[a]	Oct. 23, 1946	20	Oct. 23, 1946	½	10	J, E	D	
60[a]	Oct. 8, 1952	80[a]	Oct. 8, 1952	5.5	Oct. 8, 1952	1	3	C, H	D	
40[a]	May 14, 1951	60[a]	May 14, 1951	6	May 14, 1951	¾	.3	J, E	D	
35[a]	Dec. 18, 1950	80[a]	Dec. 18, 1950	5	Dec. 18, 1950	¾	.1	J, E	I	
30[a]	Sep. 30, 1953	70[a]	Sep. 30, 1953	5	Sep. 30, 1953	¾	.1	J, E	D	
32[a]	Nov. 25, 1950	80[a]	Nov. 25, 1950	12	Nov. 25, 1950	1	.5	J, E	D	Do.
44[a]	Dec. 14, 1949	—	—	12	Dec. 14, 1949	¼	—	C, E	D	See chemical analysis.
40[a]	Apr. 7, 1948	45[a]	Apr. 7, 1948	15	Apr. 7, 1948	½	3	J, E	D	
40[a]	July 22, 1949	60[a]	July 22, 1949	2.5	July 22, 1949	¼	—	J, E	D	
18[a]	Feb. 9, 1953	18[a]	Feb. 9, 1953	10	Feb. 9, 1953	¾	—	J, E	D	
34[a]	May 1, 1947	34[a]	May 1, 1947	15	May 1, 1947	½	—	—	F	
36[a]	Dec. 6, 1947	70[a]	Dec. 6, 1947	12	Dec. 6, 1947	¾	—	C, E	D	
52[a]	Aug. 30, 1947	—	—	2	Aug. 30, 1947	—	—	J, E	D	
65[a]	Dec. 29, 1951	70[a]	Dec. 29, 1951	5	Dec. 29, 1951	¾	1.6	J, E	D	
64[a]	Feb. 3, 1950	68[a]	Feb. 3, 1950	11	Feb. 3, 1950	½	2.8	J, E	D	
25[a]	May 17, 1950	25[a]	May 17, 1950	5	May 17, 1950	¾	—	J, E	D	
25[a]	June 1, 1948	30[a]	June 1, 1948	12	June 1, 1948	2	2.4	J, E	D	
7.60	Aug. 25, 1953	—	—	—	—	—	—	J, E and H	D	
52[a]	Oct. 13, 1950	—	—	.8	Oct. 13, 1950	—	—	C, H	D	See well log.
40[a]	Mar. 3, 1952	60[a]	Mar. 3, 1952	10	Mar. 3, 1952	1	.5	J, E	D, F	
—	—	—	—	—	—	—	—	N	N	Yield inadequate; well abandoned.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Bb 1	B. Martin	R. H. Leppo	1951	810	Drilled	80	6	12	Upland	Wissahickon (albite)
Bb 2	C. E. Long	Easterday	1951	810	do	100	6	20	Hilltop	do
Bb 3	Grace Methodist Church	R. H. Leppo	1950	775	do	81	6	30	Upland	do
Bb 4	W. L. Driskill	do	1949	600	do	70	6	8	Slope	do
Bb 5	Do	do	1949	600	do	80	6	11	do	do
Bb 6	Foreston Parsonage	do	1950	710	do	70	6	45	Upland	do
Bb 7	G. R. Wilhelm	do	1950	700	do	75	6	22	do	do
Bb 8	Donald Martin	do	1953	680	do	70	6	—	Slope	do
Bb 9	R. Pilling, Jr.	G. E. Harr Sons	1949	620	do	83	6	—	Hilltop	do
Bb 10	A. L. Mays	—	—	640	Dug	40	48	—	do	do
Bc 1	B. G. Peters	G. E. Harr Sons	1953	640	Drilled	111	6	—	do	Peters Creek quartzite
Bc 2	Clyde Foster	A. C. Reider & Son	1951	650	do	265	6	62	do	do
Bc 3	Do	do	1951	630	do	56	6	20	Draw	do
Bc 4	Arthur Wells	Ray Urey	1948	680	do	89	6	23	Hilltop	Wissahickon (albite)
Bc 5	G. C. Heagy	G. E. Harr Sons	1953	740	do	136	6	78	do	Peters Creek quartzite
Bc 6	Nelson Carter	Matthews	1947	650	do	68	6	35	Draw	do
Bc 7	G. W. Turnbaugh	Ray Urey	1952	680	do	107	6	47	Hilltop	do
Bc 8	A. W. Mathews	do	1950	770	do	100	6	13	do	Wissahickon (albite)
Bc 9	Arthur Bollinger	do	1953	820	do	154	6	24	do	do
Bc 10	W. O. Baker	do	1950	720	do	82	6	26	Slope	do
Bc 11	J. W. Tracey	do	1948	720	do	112	6	26	Hilltop	do
Bc 12	A. W. Stiffler	do	1952	790	do	120	6	22	do	do
Bc 13	E. J. Stallknect	do	1948	740	do	112	6	14	do	do
Bc 14	Do	do	1948	740	do	200	6	—	do	do
Bc 15	G. S. Lang	do	1949	680	do	91	6	38	do	do
Bc 16	S. H. Molesworth	do	1948	720	do	128	6	33	Upland	do
Bc 18	Duncan Black	A. C. Reider & Son	1948	480	do	101	6	49	Valley	do
Bd 1	Ray Grubb	Ray Urey	1950	700	do	90	6	22	Hilltop	do
Bd 2	Jacob Troyer	Werneke Bros.	1952	670	do	90	6	18	do	do
Bd 3	Baltimore County Highway Dept.	G. E. Harr Sons	1953	600	do	150	6	18	do	do
Bd 4	L. Ruhl	A. C. Reider & Son	1950	640	do	82	6	42	Upland	do
Bd 5	E. W. Rodabaugh	Ray Urey	1948	610	do	61	6	29	Slope	do
Bd 6	Ralph Taylor	A. C. Reider & Son	1952	410	do	82	6	38	do	Peters Creek quartzite
Bd 7	Summers	Ed Urey	1948	380	do	67	6	38	do	Wissahickon (oligoclase) (?)
Bd 8	Hereford High School	G. E. Harr Sons	1951	600	do	432	6	33	Hilltop	Wissahickon (oligoclase)
Bd 9	Do	do	1951	600	do	308	6	42	do	do
Bd 10	Do	do	1951	530	do	319	6	43	Valley	do
Bd 11	Do	do	1952	600	do	341	6	42	Hilltop	do

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Water-level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
40[a]	Mar. 20, 1951	—	—	6	Mar. 20, 1951	1	—	J, E	D	
40[a]	Nov. 29, 1951	80[a]	Nov. 29, 1951	8	Nov. 29, 1951	—	0.2	J, E	D	
40[a]	Jan. 21, 1950	—	—	6	Jan. 21, 1950	2	—	—	I	
33[a]	July 13, 1949	—	—	8	July 13, 1949	1	—	J, E	D, F	
50[a]	Aug. 3, 1949	—	—	3½	Aug. 3, 1949	2	—	J, E	D, F	
30[a]	Apr. 24, 1950	37[a]	Apr. 24, 1950	4	Apr. 24, 1950	1	.5	J, E	D	
35[a]	June 14, 1950	—	—	—	—	—	—	J, E	D	
30[a]	Mar. 2, 1953	—	—	—	—	—	—	J, E	D	
—	—	—	—	—	—	—	—	C, E	D	
24.05	Aug. 6, 1953	—	—	—	—	—	—	J, E	D	Well reported to be very old.
26[a]	May 1, 1953	—	—	2	May 1, 1953	—	—	C, E	D, F	Water reported hard; softener installed.
42.77	May 1, 1953	—	—	1	1951	—	—	N	N	Yield inadequate; well abandoned.
17[a]	Dec. 26, 1951	50[a]	Dec. 26, 1951	9	Dec. 26, 1951	1	.3	C, E	D, F	
50[a]	May 11, 1948	50[a]	May 11, 1948	5	May 11, 1948	½	—	C, E	D	
51[a]	May 25, 1953	—	—	7	May 25, 1953	—	—	NI	D	
30[a]	July 16, 1947	66[a]	July 16, 1947	20	July 16, 1947	1	.6	J, E	D	
44[a]	Apr. 23, 1952	44[a]	Apr. 23, 1952	12	Apr. 23, 1952	1	—	J, E	D	
60[a]	Oct. 22, 1950	60[a]	Oct. 22, 1950	20	Oct. 22, 1950	¾	—	C, H	D	
39[a]	Mar. 21, 1953	—	—	—	—	—	—	J, E	D	
32[a]	May 13, 1950	54[a]	May 13, 1950	10	May 13, 1950	¾	.5	J, E	D, F	
40[a]	July 26, 1948	—	—	4.5	July 26, 1948	¼	—	C, H	D	
55[a]	Sep. 17, 1952	70[a]	Sep. 17, 1952	8	Sep. 17, 1952	1	.5	C, H	D	
40[a]	Oct. 22, 1948	—	—	3	—	—	—	C, E	D	
—	—	—	—	.5	—	—	—	N	N	Do.
56[a]	Aug. 13, 1949	70[a]	Aug. 13, 1949	5	Aug. 13, 1949	4	.3	J, E	D	pH: 6.7 (field test). See well log.
41[a]	Mar. 11, 1948	—	—	1	Mar. 11, 1948	¾	—	C, E	D	
30[a]	Nov. 18, 1948	70[a]	Nov. 18, 1948	20	Nov. 18, 1948	2	.5	—	D	
36[a]	Apr. 28, 1950	—	—	—	—	—	—	—	D	
28[a]	May 26, 1952	—	—	—	—	—	—	J, E	D	
22[a]	Feb. 24, 1953	63[a]	Feb. 24, 1953	7	Feb. 24, 1953	8	.1−	—	D	
40[a]	Oct. 27, 1950	70[a]	Oct. 27, 1950	10	Oct. 27, 1950	1	.3	C, E	C	
33[a]	May 10, 1952	—	—	12	May 10, 1952	1	—	J, E	D	
34[a]	May 10, 1952	—	—	6	May 10, 1952	1	—	J, E	D	
20[a]	Apr. 12, 1948	50[a]	Apr. 12, 1948	4	Apr. 12, 1948	½	.1−	J, E	D	
39[a]	1951	—	—	5	1951	—	—	C, E	I	Owner's well no. 1. See chemical analysis.
35[a]	1951	—	—	10	1951	—	—	C, E	I	Owner's well no. 2. See chemical analysis. Temperature 54°F.
17[a]	1951	—	—	13	1951	—	—	C, E	I	Owner's well no. 3.
40[a]	1952	—	—	9	1952	—	—	C, E	I	Owner's well no. 4.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Bd 12	Lem Rosenbloom	Ray Urey	1951	560	Drilled	94	6	52	Slope	Wissahickon (albite)
Bd 13	Hereford Baptist Church	do	1952	650	do	100	6	86	Hilltop	Wissahickon (oligoclase)
Bd 14	T. C. Hackler	do	1951	640	do	91	6	45	Slope	do
Bd 15	E. G. Noel	do	1947	630	do	84	6	21	Hilltop	Serpentine
Bd 16	Do	do	1947	630	do	57	6	45	do	do
Bd 17	G. S. Parker	do	1948	620	do	80	6	23	do	Wissahickon (oligoclase)
Bd 18	George Heaps	do	1948	620	do	134	6	40	do	do
Bd 19	T. E. Crow	do	1950	590	do	209	6	72	Slope	do
Bd 20	Chesapeake & Potomac Telephone Co.	do	1948	620	do	45	6	4	Hilltop	Wissahickon (albite)
Bd 21	Marie Dixson	do	1953	560	do	123	6	22	do	Peters Creek quartzite
Bd 22	C. F. Turnbaugh, Jr.	do	1950	640	do	75	6	30	Slope	Wissahickon (albite)
Bd 23	Bertha Downs	Showers	1951	560	do	60	6	22	do	Peters Creek quartzite
Bd 24	Benny Turnbaugh	Ray Urey	1953	640	do	109	6	10	do	Wissahickon (albite)
Be 1	L. P. Brown	do	1951	680	do	52	6	24	Upland	do
Be 2	Tom Ensor	A. C. Reider & Son	1948	710	do	96	6	58	do	Wissahickon (oligoclase)
Be 3	W. N. Billingsley	Ray Urey	1952	650	do	170	6	45	Hilltop	do
Be 4	Charles H. Gay	do	1952	670	do	116	6	47	do	do
Ca 1	C. Rill	R. H. Leppo	1951	690	do	80	6	12	do	Wissahickon (albite)
Ca 2	Parker Bailey	do	1950	710	do	85	6	30	do	do
Ca 3	J. C. Grady	do	1951	720	do	75	6	20	do	do
Ca 4	Rex King	do	1950	770	do	55	6	53	Upland	do
Ca 5	Ralph Muldoon	do	1950	780	do	92	6	86	do	do
Ca 6	D. S. Watts	do	1951	720	do	82	6	80	do	Peters Creek quartzite
Ca 7	Arcadia Fire Dept.	do	1950	810	do	223	6	88	do	Wissahickon (albite)
Ca 8	G. R. Debnam	G. E. Harr Sons	1952	780	do	83	6	67	do	do
Ca 9	John Marchey	H. R. Leppo	1947	700	do	85	6	73	do	Peters Creek quartzite
Ca 10	R. Wooden	do	1947	700	do	116	6	107	do	do
Ca 11	Donald McKinney	Williams	1949	680	do	117	6	87	do	do
Ca 12	Joe Elmo	R. H. Leppo	1949	670	do	65	6	60	Valley	do
Cb 1	Alfred H. Clifford	G. E. Harr Sons	1934	400	do	100+	6	—	do	Cockeysville marble
Cb 2	H. F. Schaefer	—	1850(?)	710	Dug	60	48	—	Hilltop	Peters Creek quartzite
Cb 3	James McHenry	G. E. Harr Sons	1950	380	Drilled	271	6	10	Valley	Cockeysville marble
Cb 4	I. Small	R. H. Leppo	1948	660	do	90	6	10	Hilltop	Peters Creek quartzite
Cb 5	W. F. Cochran, Jr.	G. E. Harr Sons	1952	400	do	133	6	31	Valley	Cockeysville marble
Cb 6	Trenton Methodist Church	R. H. Leppo	1950	720	do	90	6	70	Slope	Wissahickon (albite)
Cb 7	Carroll E. Palmer	G. E. Harr Sons	1951	680	do	90	6	70	Upland	Peters Creek quartzite
Cb 8	John K. Shaw	do	1948	390	do	183	6	11	Valley	Cockeysville marble

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Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
—	—	—	—	4	June 14, 1951	—	—	J, E	D	Drilled inside 30-ft. dug well.
51[a]	Oct. 24, 1952	80[a]	Oct. 24, 1952	10	Oct. 24, 1952	2	0.3	—	I	
52[a]	Sep. 18, 1951	—	—	15	Sep. 18, 1951	1	—	C, H	D	Water reported very hard.
44[a]	Sep. 4, 1947	—	—	3	Sep. 4, 1947	½	—	C, E	D	Water reported soft.
34[a]	Sep. 1947	—	—	2	Sep. 1947	½	—	C, E	D	
50[a]	June 11, 1948	—	—	6	June 11, 1948	6	—	C, E	D	
65[a]	Apr. 20, 1948	—	—	1.8	Apr. 20, 1948	½	—	C, E	D	See well log.
44[a]	Oct. 31, 1950	—	—	.5	Oct. 31, 1950	¾	—	C, E	D	Do.
26[a]	Dec. 2, 1948	30[a]	Dec. 2, 1948	8	Dec. 2, 1948	1	2	J, E	D	Driller reported rock very hard.
68[a]	Sep. 8, 1953	70[a]	Sep. 8, 1953	14	Sep. 8, 1953	½	7	N1	D	
42[a]	June 20, 1950	42[a]	June 20, 1950	20	June 20, 1950	¾	—	J, E	D	
44[a]	May 18, 1951	—	—	2	May 18, 1951	—	—	C, H	D	
53[a]	July 8, 1953	102[a]	July 8, 1953	6.5	July 8, 1953	½	.1	J, E	D	
16[a]	June 6, 1951	—	—	15	June 6, 1951	—	—	J, E	D	
30[a]	Sep. 25, 1948	40[a]	Sep. 25, 1948	10	Sep. 25, 1948	10	1.0	—	D	
24[a]	June 3, 1952	160[a]	June 3, 1952	1	June 3, 1952	¼	—	J, E	D	
44[a]	Apr. 15, 1952	47[a]	Apr. 15, 1952	10	Apr. 15, 1952	¼	3	C, E	D	
31.18	Oct. 22, 1952									
40[a]	Oct. 10, 1951	—	—	15	Oct. 10, 1951	1	—	J, E	D	
40[a]	Oct. 2, 1950	—	—	12	Oct. 2, 1950	2	—	J, E	D	
35[a]	Aug. 9, 1951	—	—	10	Aug. 9, 1951	10	—	J, E	D	
—	—	—	—	8	Aug. 29, 1950	2	—	J, E	D	
—	—	—	—	—	—	—	—	J, E	D	
—	—	—	—	5	Apr. 30, 1951	2	—	J, E	D	
43[a]	July 24, 1950	—	—	50	—	12	—	T, E	C	See chemical analysis and well log. Pumping level did not go below 150 ft. during test.
25[a]	June 15, 1952	—	—	—	—	—	—	J, E	D	
12[a]	Feb. 19, 1947	—	—	—	—	—	—	J, E	—	
50[a]	1947	—	—	2	1947	2	—	J, E	D	
40[a]	Nov. 9, 1949	60[a]	Nov. 9, 1949	7.5+	Nov. 9, 1949	5	.3	J, E	D	See well log.
—	—	—	—	10	Apr. 20, 1949	1	—	S, E	D	
—	—	—	—	2	—	—	—	C, E	D	Yield inadequate.
34.26	Feb. 4, 1949	—	—	—	—	—	—	N	N	Observation well 1949–1953. Well destroyed 1953.
26[a]	Feb. 27, 1950	160[a]	Feb. 27, 1950	12	Feb. 27, 1950	18	.1—	C, E	D	
30[a]	May 20, 1948	—	—	10	May 20, 1948	2	—	J, E	D	See chemical analysis.
25[a]	July 8, 1952	40[a]	July 8, 1952	10	July 8, 1952	8	.6	J, E	D	
—	—	—	—	2	Aug. 19, 1950	2	—	C, E	I	
35[a]	June 4, 1951	60[a]	June 4, 1951	20	June 4, 1951	4	.8	J, E	D	
12[a]	Oct. 30, 1948	60[a]	Oct. 30, 1948	60	Oct. 30, 1948	10	1.2	T, E	D, F	

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Cb 9	Donald Curtis	H. R. Leppo	1946	640	Drilled	82	6	60	Hilltop	Peters Creek quartzite
Cb 10	Howard Buck	G. E. Harr Sons	1951	600	do	125	6	41	do	Wissahickon (albite)
Cb 11	E. Brown	H. R. Leppo	1946(?)	640	do	109	6	10	do	Wissahickon (oligoclase)
Cb 12	D. Bosley	do	1947	640	do	96	6	11	do	Peters Creek quartzite
Cb 13	G. Herbert Wisner, Jr.	do	1946(?)	700	do	165	6	89	Slope	do
Cb 14	George Ruby	do	1946	750	do	93	6	20	Upland	Wissahickon (albite)
Cb 15	Thomas Bradhoon	do	1953	680	do	130	6	105	Hilltop	Peters Creek quartzite
Cb 16	Wm. McMillan	G. E. Harr Sons	1954	580	do	188	6	—	do	Wissahickon (oligoclase)
Cb 17	Do	do	1954	590	do	130	6	—	do	do
Cb 18	Do	do	1954	550	do	90	6	—	Draw	do
Cb 19	Do	do	1954	500	do	103	6	0	do	do
Cb 20	Do	do	1954	580	do	175	6	0	Hilltop	do
Cc 2	Wm. T. Benson	do	1948	460	do	92	6	34	do	Baltimore gneiss
Cc 3	Andrew M. Eastwick	do	1949	450	do	95	6	36	Slope	do
Cc 4	Hesse Rosenbloom	do	1948	500	do	149	6	12	Hilltop	Wissahickon (oligoclase)
Cc 5	M. H. Kessler	R. H. Leppo	1951	350	do	75	6	46	Valley	Cockeysville marble
Cc 6	Jacob Cole	H. R. Leppo	1946	360	do	75	6	48	do	do(?)
Cc 7	Edwin Nicholson	do	1947	420	do	70	6	65	do	Cockeysville marble
Cc 8	George Palmer	G. E. Harr Sons	1949	490	do	150	6	150	Slope	Setters
Cc 9	R. P. Akehurst	do	1947	620	do	104	6	86	do	Wissahickon (oligoclase)
Cc 10	G. R. Faustman	R. H. Leppo	1949	630	do	109	6	30	Hilltop	Peters Creek quartzite
Cc 11	R. H. Lomas	G. E. Harr Sons	1949	500	do	204	6	47	Draw	Baltimore gneiss
Cc 14	R. C. Herd	do	1948	480	do	125	6	33	Slope	Serpentine
Cc 16	John D. Gadd	do	1950	380	do	326	6	34	Draw	Baltimore gneiss
Cc 17	N. B. Merryman	do	1952	400	do	107	6	36	Slope	do
Cc 20	Webster Bosley	do	1951	400	do	74	6	—	do	Wissahickon (oligoclase)
Cc 22	Mrs. Anna Bacon	do	1950	410	do	105	6	36	Valley	Cockeysville marble
Cc 23	Donald F. Brown	do	1950	390	do	130	6	14	do	do
Cc 24	R. A. Reitz, Jr.	R. H. Leppo	1949	420	do	105	6	32	do	do
Cc 25	Howard Scarff	G. E. Harr Sons	1953	640	do	137	6	26	Upland	Peters Creek quartzite
Cc 26	C. W. Miller	do	1953	440	do	113	8	30	Draw	Baltimore gneiss
Cc 27	Olin Mathieson Chemical Corp.	do	—	450	do	94	8	—	do	do
Cc 28	George Carey, Jr.	do	1951	450	do	161	6	45	Hilltop	do
Cc 29	Edward Nickelson	do	1954	420	do	156	6	56	Valley	Cockeysville marble
Cd 1	Olin L. Russum	A. C. Reider & Son	1951	320	do	63	6	40	do	Baltimore gneiss
Cd 2	Dr. W. C. Bryan	G. E. Harr Sons	1952	540	do	146	6	24	Hilltop	do
Cd 3	Henry Finkham	H & H Drilling Co.	1947	300	do	90	6	44	do	do

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Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
42[a]	1946	82[a]	1946	12	1946	—	0.3	C, E	D	
50[a]	July 31, 1951	80[a]	July 31, 1951	10	July 31, 1951	8	.3	J, E	D, F	
69[a](?)	1946(?)	109[a]	1946(?)	3(?)	1946(?)	—	—	J, E	D	
10[a]	Mar. 17, 1947	10[a]	Mar. 17, 1947	15	Mar. 17, 1947	1	—	J, E	D	
75[a]	1946(?)	—	—	10	1946(?)	—	—	C, E	D	
53[a]	1946	93[a]	1946	12	1946	12	.3	J, E	D	
60[a]	Feb. 24, 1953	—	—	2	Feb. 24, 1953	—	—	J, E	D	
—	—	—	—	0	July 1954	—	—	N	N	Abandoned and filled.
—	—	—	—	1	July 1954	—	—	N	N	Do.
—	—	—	—	2	July 1954	—	—	N	N	Do.
—	—	—	—	4	July 1954	—	—	N	N	Do.
—	—	—	—	5	July 1954	—	—	N	N	To be deepened.
44[a]	Apr. 19, 1948	75[a]	Apr. 19, 1948	1	Apr. 19, 1948	3	.1—	C, E	D	
28[a]	May 6, 1949	65[a]	May 6, 1949	12	May 6, 1949	8	.3	C, E	D	
50[a]	Oct. 18, 1948	120[a]	Oct. 18, 1948	1.5	Oct. 18, 1948	5	.1—	C, E	D	
50[a]	Mar. 8, 1951	—	—	8	Mar. 8, 1951	—	—	J, E	D	
20[a]	Oct. 1946	75[a]	Oct. 1946	8	Oct. 1946	—	—	J, E	D	
10[a]	Apr. 24, 1947	—	—	—	—	—	—	J, E	D	Owner reports yield less than 4 gal. a min.
25[a]	Feb. 4, 1949	85[a]	Feb. 4, 1949	2	Feb. 4, 1949	8	.1—	C, E	D	
45[a]	Oct. 22, 1947	75[a]	Oct. 22, 1947	3	Oct. 22, 1947	8	.1—	C, E	D	
70[a]	July 21, 1949	—	—	.5	July 21, 1949	—	—	N	N	Abandoned. Owner uses spring supply.
14[a]	May 2, 1949	85[a]	May 2, 1949	35	May 2, 1949	8	.5	C, E	D, F	
25[a]	Feb. 25, 1948	60[a]	Feb. 25, 1948	4	Feb. 25, 1948	8	.1—	J, E	D	
35[a]	Oct. 10, 1950	250[a]	Oct. 10, 1950	5	Oct. 10, 1950	8	.1—	C, E	D, F	See well log.
33[a]	June 22, 1952	60[a]	June 22, 1952	10	June 22, 1952	8	.3	J, E	D	
—	—	—	—	1	—	—	—	C, H	D	New 120-ft. well abandoned because of turbid water.
5[a]	June 22, 1950	20[a]	June 22, 1950	8	June 22, 1950	8	.5	J, E	D	Water reported hard; softener on water system. See well log.
16[a]	Oct. 30, 1950	—	—	—	—	—	—	J, E	D	
15[a]	Sep. 6, 1949	—	—	3	Sep. 6, 1949	4	—	J, E	D	Water reported hard.
50.24	May 13, 1953	89[a]	May 1953	10	May 1953	8	.2	C, E	D	
5[a]	May 22, 1953	30[a]	May 22, 1953	42	May 22, 1953	9½	1.7	T, E	D, F	See well log. Temperature 52.5°F.
16.62	Sep. 14, 1953	53[a]	Sep. 14, 1953	110	Sep. 14, 1953	72	3	T, E	C	See pumping test data and chemical analysis. Temperature 53°F.
36[a]	Oct. 26, 1951	85[a]	Oct. 26, 1951	10	Oct. 26, 1951	8	.2	C, E	D	
11[a]	Aug. 11, 1953	80[a]	Aug. 11, 1953	6	Aug. 11, 1953	8	.1—	C, E	D	90 gallons of gravel around pipe.
30.32	Dec. 15, 1952	50[a]	Sep. 7, 1951	11	Sep. 7, 1951	—	.5	J, E	D	
35[a]	Jan. 30, 1952	—	—	2	Jan. 30, 1952	—	—	C, E	D	Pumped dry in fall of 1952.
105.0	Dec. 5, 1952									
50[a]	Feb. 1, 1947	80[a]	Feb. 1, 1947	4	Feb. 1, 1947	—	.1—	—	D	See well log.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Cd 4	Tom Moriarty	G. E. Harr Sons	1950	320	Drilled	67	6	24	Slope	Baltimore gneiss
Cd 5	Ross Ensor	Henry Thomas	1950	580	do	140	6	35	Hilltop	do
Cd 6	Fay	C. L. Benson	1948	360	do	86	6	32	Valley	do
Cd 7	A. D. Barnes	G. E. Harr Sons	1953	500	do	123	6	44	Slope	Setters
Cd 8	Richard Taylor	A. C. Reider & Son	1952	420	do	133	6	28	Hilltop	Baltimore gneiss
Cd 9	Mary McCullough	G. E. Harr Sons	1949	520	do	108	6	24	Draw	do
Cd 10	T. A. Charshee	do	1950	360	do	149	6	23	Slope	do
Cd 11	Sparks High School	do	1951	300	do	432	6	33	do	do
Cd 12	Sparks School No. 22	R. H. Leppo	1949	420	do	99	6	24	Hilltop	do
Cd 13	B. Sacks	G. E. Harr Sons	1945	480	do	226	6	52	do	do
Cd 14	Alice Krale	do	1947	380	do	128	6	40	Slope	do
Cd 15	M. F. Mace	do	1947	310	do	140	6	33	Hilltop	do
Cd 16	Charles Cummings	A. C. Reider & Son	1951	580	do	140	6	12	do	do
Cd 17	Tillman J. Gressitt	G. E. Harr Sons	1952	370	do	125	6	22	do	do
Cd 18	Sedonia Causion	do	1948	440	do	50	6	25	do	do
Cd 19	Dr. Dudley C. Babb	do	1951	350	do	91	6	48	Slope	do
Cd 20	Daniel Raffel	do	1946	360	do	235	6	16	Valley	Cockeysville marble
Cd 21	Towson Nurseries	do	1953	360	do	311	6	73	Slope	Setters
Cd 22	Fay	F. H. Lancaster	1953	460	do	90	6	18	Hilltop	Baltimore gneiss
Cd 24	Sparks State Bank	G. E. Harr Sons	1953	360	do	98	6	37	Slope	do
Ce 1	Frances Wier	Lynch	1946	590	do	112	6	36	do	Wissahickon (oligoclase)
Ce 2	Ernest Schoelkopf	do	1947	580	do	69	6	69	do	do
Ce 3	Reginald Groom	F. H. Lancaster	1949	590	do	90	6	27	Hilltop	do
Ce 4	Charles Schrufer	do	1949	570	do	45	6	41	Slope	do
Ce 5	Everett Bennett	Werneke Bros.	1952	610	do	72	6	20	Hilltop	do
Ce 6	D. R. Small	Lynch	1950	520	do	142	6	32	Slope	do
Ce 7	Ethel Miller	Werneke Bros.	1952	500	do	90	6	45	Hilltop	Baltimore gneiss
Ce 8	J. Mandell	Lynch	1952	570	do	65	6	—	Upland	do
Ce 9	A. B. Griswold	Lancaster	1949	540	do	230	6	64	do	do
Ce 10	H. W. Sichard	Werneke Bros.	1947	540	do	90	6	50	Hilltop	do
Ce 11	G. E. Mays	do	1952	560	do	58	6	47	Upland	do
Ce 12	L. Murray Warfield	H & H Drilling Co.	1949	560	do	56	6	24	do	do
Ce 13	George Hanlon	Benson	1947	580	do	60	6	34	Hilltop	Wissahickon (oligoclase)
Ce 14	Charles E. Tracey	R. H. Leppo	1948	480	do	218	6	215	Slope	Setters
Ce 16	Grayson Wheeler	G. E. Harr Sons	1948	620	do	77	6	30	Upland	Baltimore gneiss
Ce 17	W. T. Ford	H & H Drilling Co.	1949	480	do	180	6	180	Slope	Setters
Ce 18	Manor Inn	G. E. Harr Sons	1954	580	do	111	6	35	Hilltop	Wissahickon (oligoclase)
Ce 19	Sinclair Oil Co.	H & H Drilling Co.	1954	390	do	350+	6	57	Upland	do
Da 1	Edward Unkart	L. G. Edmondson	1948	670	do	65	6	20	Hilltop	Serpentine

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
18[a]	May 26, 1950	50[a]	May 26, 1950	2.5	May 26, 1950	—	0.1—	J, E	D	
40[a]	Apr. 21, 1950	135[a]	Apr. 21, 1950	1	Apr. 21, 1950	—	.1—	J, E	N	Well was dynamited; no increase in yield.
15[a]	Sep. 22, 1948	60[a]	Sep. 22, 1948	15	Sep. 22, 1948	—	.3	C, E	D, F	See well log.
39.10	Feb. 19, 1953	90[a]	Feb. 19, 1953	3.5	Feb. 19, 1953	8	.1—	NI	D	See pumping test data, chemical analysis, and well log.
72[a]	June 8, 1952	122[a]	June 8, 1952	1.5	June 8, 1952	2	.1—	C, E	D	
5[a]	Apr. 12, 1949	50[a]	Apr. 12, 1949	6	Apr. 12, 1949	8	.1	C, E	D	
30[a]	Jan. 16, 1950	100[a]	Jan. 16, 1950	1.5	Jan. 16, 1950	5	.1—	C, E	D	
39[a]	Oct. 20, 1951	200[a]	Oct. 20, 1951	10	Oct. 20, 1951	8	.1—	C, E	I	Supplies 600 students. See chemical analysis.
42[a]	Sep. 6, 1949	—	—	4	Sep. 6, 1949	2	—	C, E	I	Supplies 80 students. See chemical analysis.
40[a]	Dec. 3, 1945	195[a]	Dec. 3, 1945	1	Dec. 3, 1945	6	.1—	C, E	D, F	Continually pumps dry.
25[a]	Dec. 31, 1947	75[a]	Dec. 31, 1947	10	Dec. 31, 1947	8	.2	—	D	
55[a]	Oct. 27, 1947	110[a]	Oct. 27, 1947	2	Oct. 27, 1947	8	.1—	—	D	
95[a]?	Dec. 12, 1951	—	—	4	Dec. 12, 1951	—	—	J, E	D	
22[a]	July 1, 1952	70[a]	July 1, 1952	2	July 1, 1952	—	.1—	J, E	D	
25[a]	Sep. 23, 1948	35[a]	Sep. 23, 1948	2	Sep. 23, 1948	6	.2	C, H	D	
30[a]	Sep. 14, 1951	60[a]	Sep. 14, 1951	5	Sep. 14, 1951	4	.2	G, H	D	
20[a]	Apr. 2, 1946	140[a]	Apr. 2, 1946	10	Apr. 2, 1946	8	.1—	C, E	D	
15[a]	Aug. 4, 1953	145[a]	Aug. 4, 1953	14	Aug. 4, 1953	8	.1	NI	C, D	
—	—	—	—	5	Oct. 31, 1953	—	—	NI	D	
5[a]	Dec. 1953	60[a]	Dec. 1953	10	Dec. 1953	—	.2	NI	D	
29.5	July 19, 1946	—	—	—	—	—	—	C, E	D	See well log.
35[a]	July 31, 1947	—	—	0.8	July 31, 1947	—	—	C, E	D	
—	—	—	—	2.5	Mar. 23, 1949	—	—	—	D	
25.38	Nov. 7, 1952	—	—	18	Mar. 28, 1949	—	—	J, E	D	
30[a]	Mar. 8, 1952	55[a]	Mar. 8, 1952	1	Mar. 8, 1952	—	.1—	C, E	D	
33.5	Aug. 30, 1950	80[a]	Aug. 30, 1950	15	Aug. 30, 1950	—	.3	C, E	D, F	Drilled dry hole 200 ft. deep, in draw 300 ft. away.
19.01	Nov. 7, 1952	50[a]	1952	8	1952	—	.3	J, E	D	
10[a]	Nov. 7, 1952	—	—	—	—	—	—	NI	D	Driller could not bail dry.
—	—	—	—	7	—	—	—	C, E	D	
40[a]	1947	—	—	—	—	—	—	J, E	D	
16.10	Dec. 16, 1952	58[a]	Sep. 6, 1952	5	Sep. 6, 1952	—	.2	J, E	D	
32[a]	Oct. 4, 1949	50[a]	Oct. 4, 1949	5	Oct. 4, 1949	—	.3	J, E	D, F	Formerly used spring, pumped water with ram.
40[a]	Dec. 30, 1947	—	—	10+	Dec. 30, 1947	—	—	—	D	See well log.
143[a](?)	Feb. 11, 1948	—	—	8	Feb. 11, 1948	—	—	C, H	D	
30[a]	Mar. 30, 1948	60[a]	Mar. 30, 1948	10	Mar. 30, 1948	8	.3	—	D	
59.45	Dec. 10, 1952	160[a]	Mar. 21, 1949	5	Mar. 21, 1949	5	.1—	J, E	D	Do.
40[a]	Mar. 1954	90[a]	Mar. 1954	10	Mar. 1954	—	.2	—	D	
43[a]	1954	350+[a]	1954	2	1954	—	—	NI	C	
15[a]	Aug. 16, 1948	20[a]	Aug. 16, 1948	8	Aug. 16, 1948	1	1.6	C, H	D	

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Da 2	W. E. Carr	R. H. Leppo	1950	660	Drilled	75	6	26	Hilltop	Wissahickon (oligoclase)
Da 3	Andrew Trumpower	G. E. Harr Sons	1949	600	do	85	6	32	Slope	do
Da 4	Charles Forbes	do	1948	600	do	87	6	54	Upland	do
Da 5	Wm. C. Schmitt	do	1948	680	do	85	6	20	do	do
Da 6	W. A. Rothe, Jr.	R. H. Leppo	1949	700	do	100	6	80	do	do
Da 7	Earl Tawney	G. E. Harr Sons	1950	660	do	127	6	90	do	do
Db 2	Carl A. Reter	do	1950	700	do	130	6	34	Hilltop	do
Db 3	Hunter-Wilson Distilling Co., Inc.	—	1937	570	do	180	6	—	Slope	do
Db 4	Do	—	1937	570	do	120	6	—	Draw	do
Db 5	Do	Edmondson	—	520	do	40–50	—	—	Valley	do
Db 6	Do	do	—	520	do	45–50	—	—	do	do
Db 7	Do	do	—	520	do	45–50	—	—	do	do
Db 8	Do	do	—	520	do	45–50	—	—	do	do
Db 9	Do	do	—	520	do	45–50	—	—	do	do
Db 10	Do	do	—	520	do	300	—	—	do	do
Db 11	Do	do	—	520	do	500	—	—	do	do
Db 12	Thomas Johnson	Owings	1952	660	do	87	6	76	Upland	do
Db 14	L. D. Bowen	Benson	1946	700	do	59	6	45	do	do
Db 15	Dr. I. W. Frock	R. H. Leppo	1946	620	do	56	6	52	Valley	do
Db 16	Ambrose Weaver	Williams	1950	640	do	49	6	40	Slope	do
Db 17	Victor G. Copestake	R. H. Leppo	1951	680	do	86	6	80	do	do
Db 18	Henry S. Clark	G. E. Harr Sons	1952	540	do	378	6	32	Valley	Cockeysville marble
Db 19	Do	do	1952	540	do	100	6	—	do	Wissahickon (oligoclase) and Cockeysville marble
Db 20	Do	do	1952	540	do	55–65	6	—	do	do
Db 21	Hugdins	—	—	580	do	105	6	—	do	Cockeysville marble
Db 22	Arthur Carter	Dillon	1950	480	do	127	6	—	do	do
Db 23	Thomas S. Nichols	G. E. Harr Sons	1951	500	do	120	6	95	do	Wissahickon (oligoclase)
Db 24	Frank Fisher	do	1950	640	do	108	6	65	Upland	do
Db 25	Franklin Foster	do	1951	660	do	433	6	60	Hilltop	Wissahickon (oligoclase) and Cockeysville marble
Db 26	E. M. Hosball	H. R. Leppo	1946	620	do	66	6	30	Upland	Wissahickon (oligoclase)
Db 27	Lillian M. Yox	do	1949	690	do	85	6	70	Hilltop	do
Db 28	Paul Kagey	Utermahlen	1951	660	do	60	6	—	Slope	do
Db 29	Pikesville Sporting Club	G. D. Edmondson	1952	630	do	71	6	44	do	do
Db 30	R. H. Huff	Dillon	1948	646	do	60	6	37	Hilltop	do
Db 31	J. G. Walk	T. N. Smith	1946	620	do	102	6	84	Upland	do
Db 33	J. Gephardt	Owings	1950	640	do	72	6	72	Hilltop	do
Db 34	Do	do	1951	660	do	145	6	60	Slope	do
Db 35	Park & Tilford Distillers Corp.	—	About 1931	500	do	50	6	—	Valley	Cockeysville marble

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping-equipment	Use of water	Remarks
45[a]	May 26, 1950	47[a]	May 26, 1950	6	May 26, 1950	1	3	C, E	D	
32[a]	May 6, 1949	55[a]	May 6, 1949	9	May 6, 1949	8	0.3	J, E	D	
26[a]	Sep. 26, 1948	65[a]	Sep. 26, 1948	18	Sep. 26, 1948	8	.5	J, E	D	
60[a] (?)	Apr. 26, 1948	—	—	3	Apr. 26, 1948	1	—	J, E	D	
20[a]	Apr. 12, 1949	—	—	5	Apr. 12, 1949	2	—	J, E	D	
34[a]	Jan. 30, 1950	100[a]	Jan. 30, 1950	3	Jan. 30, 1950	8	.1–	J, E	D	
40[a]	Feb. 16, 1950	95[a]	Feb. 16, 1950	.5	Feb. 16, 1950	3	—	C, E	D	
—	—	—	—	18	Apr. 9, 1953	—	—	T, E	C	See chemical analysis.
—	—	—	—	—	—	—	—	T, E	C	
—	—	—	—	—	—	—	—	—	N	Did not penetrate hard rock.
—	—	—	—	—	—	—	—	—	N	Did not penetrate hard rock. Original yield small.
—	—	—	—	—	—	—	—	—	N	Do.
—	—	—	—	—	—	—	—	—	N	
—	—	—	—	—	—	—	—	T, E	C	Water used for cooling purposes in summer.
—	—	—	—	—	—	—	—	—	N	Abandoned and covered.
—	—	—	—	20–25	—	—	—	—	N	Do.
20[a]	Feb. 25, 1952	76[a]	Feb. 25, 1952	20	Feb. 25, 1952	½	.4	C, E	D	
20[a]	Sep. 7, 1946	40[a]	Sep. 7, 1946	3	Sep. 7, 1946	4	.1–	J, E	D	See well log.
6[a]	July 1946	—	July 1946	18	July 1946	—	—	J, G	D	
25[a]	Dec. 20, 1950	36[a]	Dec. 20, 1950	3	Dec. 20, 1950	4	.3	J, E	D	
20[a]	June 11, 1951	—	—	2	June 11, 1951	2	—	C, E	D	
25[a]	Sep. 5, 1952	—	—	1	Sep. 5, 1952	—	—	N	N	Filled and abandoned.
—	—	—	—	—	—	—	—	N	N	Water would not clear.
—	—	—	—	—	—	—	—	S, E	D, F	
—	—	—	—	—	—	—	—	N	N	Dry hole; filled and abandoned.
—	—	—	—	—	—	—	—	N	N	Do.
50[a]	Oct. 2, 1951	65[a]	Oct. 2, 1951	15	Oct. 2, 1951	8	1	J, E	D	
30[a]	Oct. 28, 1950	65[a]	Oct. 28, 1950	3	Oct. 28, 1950	3	.1–	J, E	D	
100[a]	Oct. 3, 1951	216[a]	Oct. 3, 1951	3	Oct. 3, 1951	8	—	C, E	D	See well log.
40[a]	1946	—	—	—	—	—	—	C, H and E	D	
20[a]	May 5, 1949	—	—	—	—	—	—	J, E	D	
18[a]	Aug. 10, 1951	—	—	8	Aug. 10, 1951	¼	—	C, H	D	
40[a]	Oct. 19, 1952	—	—	20	Oct. 19, 1952	1	—	J, E	D	
30[a]	June 10, 1948	—	—	2	June 10, 1948	—	—	J, E	D	
27.5	Oct. 10, 1946	—	—	—	—	—	—	J, E	D	Do.
15[a]	Nov. 3, 1950	25[a]	Nov. 3, 1950	20	Nov. 3, 1950	½	2	C, H	D	
45[a]	Sep. 22, 1951	65[a]	Sep. 22, 1951	20	Sep. 22, 1951	1	1	C, E	D	
—	—	—	—	13	June 5, 1953	—	—	T, E	C	See chemical analysis.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Db 36	C. L. Ingram	R. H. Leppo	1951	580	Drilled	125	6	20	Slope	Wissahickon (oligoclase)
Db 37	Charles Grimes	G. D. Edmondson	1952	680	do	73	6	48	Hilltop	do
Db 38	L. Robertson	G. E. Harr Sons	1948	640	do	101	6	101	Slope	do
Db 39	Guy Tregoe, Jr.	R. H. Leppo	1949	700	do	80	6	72	Upland	do
Db 40	Hugh J. O'Donovan	G. E. Harr Sons	1949	600	do	240	6	30	Slope	do
Db 41	W. D. Groff	do	1953	640	do	350	6	33	do	do
Db 42	Park & Tilford Distillers Corp.	—	About 1931	500	do	—	6	—	Valley	Cockeysville marble
Db 43	Do	Columbia Pump & Well Co.	1946	500	do	400	8	56	do	do
Db 44	Calvin Burnham	Dillon	1950	670	do	158	6	60	Upland	Wissahickon (oligoclase)
Db 45	H. K. Robertson	—	—	550	do	385	6	—	Slope	Wissahickon (oligoclase) and Cockeysville marble
Dc 1	Alvin LeRoy	—	—	360	Dug	22	36±	—	—	Cockeysville marble
Dc 2	Do	G. E. Harr Sons	1950	360	Drilled	200	6	23	Valley	do
Dc 3	J. Henry Weil	do	1937	675	do	735	6	—	Hilltop	Wissahickon (oligoclase)
Dc 4	Charles Akeley	do	1950	560	do	560	6	—	Slope	do
Dc 5	Burton	do	1949	540	do	185	6	—	do	do
Dc 6	Do	do	—	525	do	—	6	—	do	do
Dc 7	C. B. Edwards	do	1950	580	do	225	6	35	do	do
Dc 8	W. L. Harr	do	1949	550	do	175	6	—	do	do
Dc 9	H. L. Hoffman	do	1944	520	do	156	6	—	Hilltop	do
Dc 10	Ambler H. Moss	do	1951	510	do	304	6	46	do	do
Dc 11	Herbert Ehlers	do	1951	590	do	130	6	—	do	do
Dc 12	C. L. Litzsinger	do	1952	660	do	210	6	37	Slope	do
Dc 13	Marshall Bosley	R. H. Leppo	1950	660	do	112	6	10	Hilltop	do
Dc 14	B. C. Zink	G. E. Harr Sons	1947	630	do	132	6	45	do	do
Dc 15	Harry Leaf	do	1948	630	do	88	6	—	Draw	do
Dc 16	John Kessler	do	1946	460	do	70	6	—	Slope	do
Dc 17	Consol. Gas, Elec. Light & Power Co.	do	1951	340	do	216	6	29	Valley	Cockeysville marble
Dc 19	Thomas Kirkpatrick	do	1953	540	do	234	6	37	Hilltop	Wissahickon (oligoclase)
Dc 20	Clarence Robinson	do	1947	600	do	115	6	25	Upland	do
Dc 21	E. F. Berman	Dillon	1949	590	do	275	6	—	Hilltop	do
Dc 22	Do	do	1949	590	do	125	6	25	do	do
Dc 23	Carl Brockman	G. E. Harr Sons	1953	550	do	125	6	40	do	do
Dc 24	Do	do	1953	560	do	375	6	—	do	do
Dc 25	Robert H. Levi	do	1945	320	do	440	6	20	Valley	Cockeysville marble
Dc 27	Lebow	do	1953	480	do	135	6	122	do	Wissahickon (oligoclase)

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Water level (feet below land surface)				Yield			Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)				
50[a]	Sep. 7, 1951	—	—	7	Sep. 7, 1951	—	—	J, E	D	
30[a]	July 24, 1952	—	—	20	July 24, 1952	—	—	J, E	D	
30[a]	July 4, 1948	85[a]	July 4, 1948	1.5	July 4, 1948	4	0.1–	J, E	D	
—	—	—	—	—	—	—	—	J, E	D	
52[a]	Oct. 26, 1949	140[a]	Oct. 26, 1949	9	Oct. 26, 1949	8	.1	C, E	D	
45[a]	Nov. 30, 1953	200[a]	Nov. 30, 1953	12	Nov. 30, 1953	8	.1–	NI	D	
—	—	—	—	8–10	June 5, 1953	—	—	T, E	C	See well log.
10[a]	June 1, 1946	260[a]	June 1, 1946	39	June 1, 1946	37	.2	T, E	C	
20[a]	June 2, 1953	—	—	—	—	—	—	C, E	D	
—	—	—	—	—	—	—	—	C, E	D, F	Field analysis: pH, 7.6; hardness, 80 ppm.
21.20	Jan. 11, 1950	—	—	—	—	—	—	S, E	D	Yield inadequate.
21[a]	Feb. 18, 1950	125[a]	Feb. 18, 1950	1	Feb. 18, 1950	4	—	J, E	D	
—	—	—	—	less than 1	1937	—	—	N	N	
40[a]	Mar. 10, 1950	140[a]	Mar. 10, 1950	3	Mar. 10, 1950	—	—	NI	D	
—	—	—	—	20	1949	—	—	C, E	D	
—	—	—	—	less than 1	—	—	—	N	N	Well abandoned.
40[a]	June 1950	—	—	1.5	June 1950	—	—	—	D	
—	—	—	—	18–20	May 26, 1950	—	—	C, E	D	
—	—	—	—	3.5	Mar. 1944	—	—	C, E	D	
36[a]	May 3, 1951	236[a]	May 3, 1951	2	May 3, 1951	8	.1–	C, E	D	
35.07	Nov. 4, 1952	100[a]	Feb. 6, 1951	2	Feb. 6, 1951	—	.1–	J, E	D	
53.92	Nov. 4, 1952	—	—	2.5	Nov. 4, 1952	—	—	NI	D	
—	—	—	—	2	Apr. 2, 1950	—	—	J, E	D	
29.1	Nov. 4, 1952	40[a]	Sep. 4, 1947	15	Sep. 4, 1947	—	—	C, E	D	
20[a]	Nov. 9, 1948	61[a]	Nov. 9, 1948	5	Nov. 9, 1948	8	.1–	C, E	F	
20[a]	Nov. 1946	—	—	—	—	—	—	J, E	D	See well log.
6[a]	Jan. 5, 1951	60[a]	Jan. 5, 1951	15	Jan. 5, 1951	8	.3	—	C	
30[a]	Dec. 7, 1953	85[a]	Dec. 7, 1953	18+	Dec. 7, 1953	8	.2	NI	D	Quartz vein from 215 to 230 ft.
30[a]	Mar. 1947	—	—	1	Mar. 1947	5	—	C, E	D	
—	—	—	—	—	—	—	—	N	N	Dry; filled and abandoned.
37[a]	Apr. 17, 1949	—	—	1.5	Apr. 17, 1949	—	—	J, E	D, F	
45[a]	Mar. 1953	90[a]	Mar. 1953	4	Mar. 1953	5	.1	C, E	D	Located 200 ft. east of dry well.
—	—	—	—	—	—	—	—	N	N	Dry; shot with 200 lbs. of dynamite; no increase in yield.
6[a]	Oct. 21, 1945	60[a]	Oct. 21, 1945	60	Oct. 21, 1945	8	1.1	T, E	D, F	Field test: pH, 7.5; hardness, 250 ppm. Temperature 57°F. See well log.
35[a]	May 25, 1953	63[a]	May 25, 1953	7	May 25, 1953	7	.2	J, E	D	Field test: pH, 5.2; hardness 8 ppm. See well log.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Dc 28	Green Spring Inn	G. E. Harr Sons	1948	300	Drilled	784	8	15	Valley	Cockeysville marble
Dc 29	Do	do	—	300	do	150	6	—	do	do
Dc 30	A. C. Bunting	do	1948	290	do	164	6	24	do	do
Dc 31	Martin Boskin	do	1951	600	do	200	6	75	Hilltop	Wissahickon (oligoclase)
Dc 32	R. R. McKinzie	do	1953	400	do	275	6	44	Slope	Cockeysville marble
Dc 33	Milton Grover	Maryland Drilling Co.	1950	600	do	111	6	69	do	Wissahickon (oligoclase)
Dc 34	J. Fisher	—	—	510	Dug	54	42	—	do	do
Dc 35	T. L. Alt	H. R. Leppo	1947	540	Drilled	60	6	54	Hilltop	do
Dc 36	Parke Plowman	G. E. Harr Sons	1952	560	do	260	6	21	do	do
Dc 37	W. R. Armstrong	do	1951	610	do	150	6	32	do	do
Dc 38	George Deshong	do	1947	630	do	152	6	30	do	do
Dc 39	Brooklandwood Farms	do	1931	430	do	148	6	—	Draw	do
Dc 43	Thomas Deford	do	1951	500	do	193	6	27	Slope	Cockeysville marble
Dc 44	John T. Burnham	do	1947	580	do	135	6	27	do	Wissahickon (oligoclase)
Dc 45	Do	do	1951	560	do	112	6	46	do	do
Dc 46	Gustav Griesser	do	1947	620	do	220	6	26	Hilltop	do
Dc 47	H. B. Cummings	do	1953	490	do	237	6	—	Valley	do
Dc 48	Talbott Kelly	do	1948	620	do	145	6	32	Hilltop	do
Dc 49	Francis H. Miller	do	1948	590	do	200	6	40	do	do
Dc 50	W. J. Hudson	do	1950	630	do	214	6	43	do	do
Dc 51	H. B. Cummings	do	1953	490	do	117	6	20	Slope	do
Dc 52	Celeste Hutton	do	1953	460	do	206	6	—	Valley	do
Dc 53	W. J. Clements	do	1954	600	do	410	6	35	Hilltop	do
Dc 54	Richard L. Riggs	do	1950	600	do	197	6	67	Slope	do
Dc 55	Wm. A. Boykin, 3rd	do	1954	550	do	314	6	48	Hilltop	do
Dc 56	Foster Fenton	do	1955	380	do	405	6	28	Valley	Cockeysville marble
Dc 57	Charles Litzinger	do	1953	620	do	128	6	66	Upland	Wissahickon (oligoclase)
Dc 58	L. M. Fisher	—	1938	450	do	—	6	—	Valley	Cockeysville marble
Dc 61	W. Long	G. E. Harr Sons	1954	650	do	126	6	83	Hilltop	Wissahickon (oligoclase)
Dc 62	Villa Julie Junior College	do	—	380	do	385	6	—	Valley	Cockeysville marble
Dc 63	Trinity College Preparatory School	—	—	380	do	282	6	—	Draw	Wissahickon (oligoclase) and Cockeysville marble
Dc 64	F. H. Clauser	G. E. Harr Sons	—	520	do	142	6	—	Hilltop	Wissahickon (oligoclase)
Dc 65	Edgar Lucas	do	1954	320	do	195	6	39	Valley	Cockeysville marble
Dc 66	R. V. Cranston	do	1954	520	do	202	6	—	Hilltop	Wissahickon (oligoclase)
Dc 67	Do	do	1954	480	do	78	6	22	Draw	do
Dc 68	Millett	do	1953	380	do	202	6	16	Valley	Cockeysville marble
Dc 69	Do	do	1953	380	do	225	6	—	do	do
Dc 70	J. Doyle	do	1953	540	do	120	6	34	Slope	Wissahickon (oligoclase)
Dc 71	Mrs. J. W. Y. Martin	do	1954	430	do	165	6	61	Valley	Cockeysville marble
Dc 72	Do	do	1954	500	do	125	6	—	Hilltop	Baltimore gneiss
Dc 73	Do	do	1954	450	do	185	6	28	Draw	do

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
5[a]	May 21, 1948	90[a]	May 21, 1948	42	May 21, 1948	72	0.5	T, E	C	Used for air conditioning. See well log.
—	—	—	—	10	Apr. 1, 1953	—	—	C, E	C	
6[a]	June 4, 1948	36[a]	June 4, 1948	30	June 4, 1948	8	.7	J, E	C	
50[a]	Mar. 29, 1951	150[a]	Mar. 29, 1951	2	Mar. 29, 1951	8	—	C, E	D	
45[a]	Oct. 19, 1951	—	—	.5	Oct. 19, 1951	—	—	NI	D	
51[a]	June 1950	60[a]	June 1950	40+	June 1950	2	4.5	C, E	D	
30[a]	Apr. 8, 1953	—	—	—	—	—	—	C, H	N	Abandoned.
17[a]	Mar. 22, 1947	—	—	8	Mar. 22, 1947	—	—	J, E	D	See chemical analysis.
125[a]	Dec. 5, 1952	—	—	.5	—	—	—	C, E	D	
40[a]	May 2, 1951	63[a]	May 2, 1951	4	May 2, 1951	8	.2	C, E	D	
50[a]	Oct. 29, 1947	100[a]	Oct. 29, 1947	6	Oct. 29, 1947	6	.1	C, E	D	
—	—	—	—	200	1931	—	—	C, E	S	Flowed 19.3 gal. a min., May 1953. Temperature 49.5°F. See chemical analysis.
20[a]	May 30, 1951	42[a]	May 30, 1951	5	May 30, 1951	8	.2	C, E	D	
40[a]	Nov. 4, 1947	—	—	1	Nov. 4, 1947	—	—	J, E	D	
35[a]	Sep. 14, 1951	60[a]	Sep. 14, 1951	15	Sep. 14, 1951	6	.6	J, E	D	
35[a]	Dec. 17, 1947	150[a]	Dec. 17, 1947	.5	Dec. 17, 1947	6	.1—	C, E	D	
—	—	—	—	less than .3	May 7, 1953	—	—	N	N	Abandoned.
50[a]	Jan. 12, 1948	110[a]	Jan. 12, 1948	2	Jan. 12, 1948	6	—	C, E	D	
75[a]	June 18, 1948	150[a]	June 18, 1948	1	June 18, 1948	5	—	C, E	D	
22[a]	Mar. 30, 1950	145[a]	Mar. 30, 1950	7	Mar. 30, 1950	8	.1—	C, E	D	
5[a]	May 19, 1953	41[a]	May 19, 1953	7	May 19, 1953	5	.2	NI	D	About 200 ft. east of dry hole Dc 47. See well log.
—	—	—	—	1	1953	—	—	T, E	D	
145[a]	Jan. 29, 1954	—	—	.3—	Jan. 29, 1954	—	—	NI	D	
21[a]	Oct. 12, 1950	85[a]	Oct 12, 1950	13	Oct. 12, 1950	8	.2	C, E	D	For swimming pool.
45[a]	Feb. 24, 1954	—	—	2	Feb. 24, 1954	—	—	NI		
25[a]	Feb. 16, 1955	200[a]	Feb. 16, 1955	3	Feb. 16, 1955	—	.1—	NI	—	
17[a]	Sep. 2, 1953	—	—	—	—	—	—	NI	D	
—	—	—	—	—	—	—	—	J, E	D	Field analysis: pH, 7.6; hardness, 140 ppm.
30[a]	Mar. 25, 1954	40[a]	Mar. 25, 1954	4	Mar. 25, 1954	4	.4	NI	D	
—	—	—	—	50	Oct. 1953	—	—	C, E	I	Field analysis: pH, 7.;4 hardness, 385 ppm.
—	—	—	—	—	—	—	—	C, E	I	Supplies all needs of school.
—	—	—	—	—	—	—	—	J, E	D	See chemical analysis.
18[a]	Mar. 24, 1954	19[a]	Mar. 24, 1954	30	Mar. 24, 1954	—	—	NI	D	See well log.
—	—	—	—	—	—	—	—	N	N	
17[a]	Mar. 9, 1954	30[a]	Mar. 9, 1954	10	Mar. 9, 1954	6½	.8	NI	D	
—	—	—	—	.3	Mar. 1953	—	—	NI	D	
—	—	—	—	—	—	—	—	—	N	Dry; filled and abandoned.
21[a]	June 15, 1954	22[a]	June 15, 1954	8	June 15, 1954	—	8	NI	D	
19.19	June 30, 1954	40[a]	June 30, 1954	60	June 30, 1954	8	2.9	T, E	D	For swimming pool.
—	—	—	—	2	June 1954	—	—	N	N	Filled and abandoned.
—	—	—	—	4	June 1954	—	—	N	N	do.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Dd 1	James Peake	G. E. Harr Sons	1950	320	Drilled	197	6	44	Valley	Cockeysville marble
Dd 2	John C. Boyce	Maryland Drilling Co.	1949	540	do	560	6	—	Hilltop	Wissahickon (oligoclase)
Dd 3	Do	do	1949	540	do	404	6	28	do	do
Dd 4	George Quinan	R. H. Leppo	1948	390	do	62	6	6	Valley	Cockeysville marble
Dd 5	J. A. W. Iglehart	G. E. Harr Sons	1937	550	do	170	6	—	Draw	Wissahickon (oligoclase)
Dd 6	Do	do	1951	570	do	217	6	—	Slope	do
Dd 7	Baltimore County Alms House	do	1932	460	do	200+	6	—	Hilltop	Gunpowder granite
Dd 8	Roy F. Sandridge	do	1948	340	do	190	6	20	Valley	Cockeysville marble
Dd 9	Walter Wertz	do	1949	415	do	70	6	30	do	do
Dd 11	Walter Weisbrod	—	1910	350	do	1,800	10-8-6	—	do	do
Dd 12	Boyce	—	—	290	do	90	6	—	do	do
Dd 13	E. Tileston Mudge, 3rd	G. E. Harr Sons	1951	360	do	180	6	40	do	do
Dd 14	W. A. Tracey	Dillon	1947	320	do	110	6	—	Slope	do
Dd 15	R. W. Stenersen	G. E. Harr Sons	1951	280	do	76	6	24	Valley	do
Dd 16	Cockeysville School	—	1925	370	do	370	6	—	do	do
Dd 17	Raymond T. Talbott	Maryland Drilling Co.	1949	440	do	105	6	94	Hilltop	Wissahickon (oligoclase)
Dd 18	H. McKinley Miller	Lynch	1950	540	do	100	6	43	do	do
Dd 19	Roger A. Clapp	G. E. Harr Sons	1949	500	do	86	6	11	do	Gunpowder granite
Dd 20	J. D. Brown	do	1948	360	do	55	6	10	Valley	Cockeysville marble
Dd 21	John Zink	do	1948	420	do	230	6	24	do	do
Dd 23	J. R. Montgomery	do	1951	350	do	208	6	25	do	do
Dd 24	T. C. Price	do	1951	310	do	95	6	19	Slope	do
Dd 26	Creswell	do	—	390	do	113	6	—	Valley	do
Dd 27	Bruce Campbell	do	1932	350	do	120	6	—	do	do
Dd 28	Jack Symington	—	—	440	Dug	8	—	—	Draw	Wissahickon (oligoclase)
Dd 29	McMillan	G. E. Harr Sons	—	350	Drilled	200	6	—	Valley	Cockeysville marble
Dd 30	Frank B. Rodabaugh	do	1953	380	do	155	6	—	do	do
Dd 31	Emmett	—	—	—	do	270	6	—	do	do
Dd 32	Torbin	G. E. Harr Sons	—	380	do	192	6	—	do	do
De 2	Sisters of Notre Dame	Maryland Drilling Co.	1949	260	do	95	6	95	Slope	do
De 5	Trinity Church	Lynch	1949	500	do	104	6	60	Hilltop	Wissahickon (oligoclase)

—Continued

Water level (feet below land surface)				Yield			Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)				
20[a]	Aug. 31, 1950	60[a]	Aug. 31, 1950	12	Aug. 31, 1950	8	0.3	C, E	D	
—	—	—	—	1/8	Jan. 1949	—	—	N	N	
52[a]	Jan. 1949	—	—	1/6	Jan. 1949	—	—	C, E	D	
40[a]	Mar. 18, 1949	41[a]	Mar. 18, 1949	5	Mar. 18, 1949	—	5	C, E	D	
—	—	—	—	—	—	—	—	C, E	D	For swimming pool.
18[a]	Mar. 1951	—	—	20	Mar. 1951	—	—	J, E	D, F	
—	—	—	—	—	—	—	—	C, E	F, I	
15[a]	Aug. 11, 1948	40[a]	Aug. 11, 1948	10	Aug. 11, 1948	—	.4	J, E	D	
3.5	Feb. 3, 1949	23.5	Feb. 3, 1949	10	Feb. 3, 1949	—	1	S, E	D	
3.47	Nov. 5, 1952	—	—	—	—	—	—	N	N	Well never used. Drilled for Lutherville municipal supply. Shot with dynamite; yield not increased.
—	—	—	—	—	—	—	—	C, H	N	
25[a]	Mar. 19, 1951	80[a]	Mar. 19, 1951	10	Mar. 19, 1951	8	.2	C, E	D	
35[a]	Oct. 10, 1947	—	—	—	—	—	—	—	D	
16[a]	May 12, 1951	40[a]	May 12, 1951	6	May 12, 1951	4	.2	J, E	D	
—	—	—	—	18	—	—	—	N	N	Abandoned and cemented over in 1947.
52[a]	May 1949	—	—	—	—	—	—	J, E	D	See well log.
32[a]	Jan. 25, 1950	—	—	12	Jan. 25, 1950	—	—	J, E	D	
33.04	Dec. 17, 1952	65[a]	Aug. 6, 1949	7	Aug. 6, 1949	7	.2	J, E	D	Water reported rusty. See well log.
5[a]	Nov. 5, 1948	20[a]	Nov. 5, 1948	10	Nov. 5, 1948	8	.6	S, E	D	See well log.
22[a]	Oct. 29, 1948	140[a]	Oct. 29, 1948	9	Oct. 29, 1948	9	.1–	T, E	D, F	
12[a]	July 21, 1951	60[a]	July 21, 1951	15	July 21, 1951	8	.3	T, E	D	
10[a]	June 22, 1951	60[a]	June 22, 1951	15	June 22, 1951	6	.3	J, E	D	
—	—	—	—	90	—	—	—	J, E	D	
17[a]	Oct. 1953	—	—	15	Oct. 1953	—	—	C, E	D, F	Field test: pH, 7.9; hardness, 210 ppm.
—	—	—	—	—	—	—	—	—	D	Field test: pH, 4.3; hardness, 6 ppm. Water flows from well to cistern; pumped to reservoir on hill.
—	—	—	—	—	—	—	—	C, E	D	Field test: pH, 8; hardness, 164 ppm.
—	—	—	—	—	—	—	—	N	N	0–155′ mud. No water-bearing zones. Filled and abandoned.
—	—	—	—	—	—	—	—	C, H	D	
—	—	—	—	—	—	—	—	J, E	D	Field test: pH, 7.0; hardness, 130 ppm.
39[a]	Oct. 1949	45[a]	Oct. 1949	80	Oct. 1949	—	13.3	T, E	F, I	19 ft. of slotted casing. See chemical analysis and well log.
24[a]	Aug. 19, 1949	—	—	9	Aug. 19, 1949	—	—	J, E	I	

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
De 6	B. Calvin Ellers	G. E. Harr Sons	1952	250	Drilled	124	6	50	Slope	Cockeysville marble and pegmatite
De 7	Carroll Manor School	do	1947	600	do	440	6	—	Upland	Wissahickon (oligoclase)
De 8	Joseph T. Young	Werneke Bros.	1950	360	do	75	6	50	Slope	Cockeysville marble(?)
De 9	Blenheim Lutheran Church	Lynch	1950	500	do	68	6	60	do	Wissahickon (oligoclase)
De 10	A. P. McInturff	do	1945	550	do	102	6	47	do	do
De 11	G. E. Yeggy	G. E. Harr Sons	1949	340	do	268	6	40	do	do
De 12	John M. Pringle	H & H Drilling Co.	1947	340	do	55±	6	50	Valley	Cockeysville marble
De 13	E. J. Manthey	F. H. Lancaster	1949	540	do	198	6	100	Hilltop	Wissahickon (oligoclase)
De 14	Milton J. Smith	R. H. Leppo	1948	500	do	105	6	20	do	do
De 15	Mrs. Alfred Smithwick	Lynch	1947	460	do	135	6	32	Slope	do
De 16	Jesse Benesch, Jr.	R. H. Leppo	1948	200	do	60	6	20	Valley	Gunpowder granite and pegmatite
De 17	William Fahey	Lynch	1952	480	do	165	6	67	Slope	Wissahickon (oligoclase)
De 18	Benjamin Goldberg	G. E. Harr Sons	1950	320	do	130	6	20	Hilltop	Gunpowder granite
De 19	Wm. H. Phillips	Maryland Drilling Co.	1950	360	do	77	6	16	do	do
De 20	Beal Teague	G. E. Harr Sons	1948	480	do	70	6	28	do	Wissahickon (oligoclase)
De 21	Wm. Engle	Dillon	1949	460	do	93	6	57	do	do
De 22	Jesse Bennett	Lynch	1952	480	do	111	6	41	Upland	do
De 23	H. J. Vennes	G. E. Harr Sons	1953	460	do	103	6	51	Slope	do
De 24	Ray V. Watson	Lynch	1953	400	do	200	6	—	Hilltop	do
De 25	Do	do	1953	480	do	135	6	45	do	do
De 26	Roland T. Hamburg	G. E. Harr Sons	1953	460	do	132	6	24	do	do
De 27	Richard C. Faber	Lynch	1954	540	do	193	6	40	do	do
De 28	Charles Street	do	1953	500	do	100	6	56	do	do
De 29	Susquehanna Power & Transmission Co.	Ray Urey	1938	320	do	130	6	90	Valley	Cockeysville marble
De 30	Richard Danilmeiers	F. H. Lancaster	1953	460	do	378	6	69	Slope	Wissahickon (oligoclase)
De 31	J. R. Sandstrom	G. E. Harr Sons	1953	320	do	129	6	34	Valley	Cockeysville marble
De 32	Lands and Simms	do	1953	500	do	115	6	—	Slope	Wissahickon (oligoclase)
De 33	A. C. Severin	F. H. Lancaster	1954	340	do	138	6	10	do	Cockeysville marble and pegmatite
Df 1	Edward Maxwell	Carl Lancaster	1931	260	Dug & Drilled	80	6	—	Hilltop	Gabbro
Df 2	F. X. Hooper Co.	Lancaster	—	320	do	109(?)	6	—	Valley	Cockeysville marble
Df 3	Do	Lynch	1946	340	do	108	6	108	Slope	do
Df 6	Dr. C. H. Burton	—	—	490	do	150	6	—	Hilltop	Wissahickon (oligoclase)
Df 7	Do	—	—	350	do	65	6	—	Valley	Cockeysville marble
Df 9	Glenn Scarff, Jr.	Henry Thomas	1948	480	do	62	6	22	Slope	Wissahickon (oligoclase)
Df 10	J. W. Edelen	—	1933	240	do	80	6	—	Valley	Gunpowder granite—Cockeysville marble contact
Df 11	Do	F. H. Lancaster	—	310	do	—	6	—	Hilltop	Wissahickon (oligoclase)

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Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
46.03	Dec. 18, 1952	75[a]	Dec. 19, 1952	1+	Dec. 19, 1952	—	—	NI	D	
34[a]	Jan. 20, 1947	179[a]	Jan. 20, 1947	25	Jan. 20, 1947	8	0.2	C, E	I	See well log.
35[a]	June 1950	—	—	—	—	—	—	J, E	D	
37.71	Dec. 17, 1952	—	—	10	Jan. 6, 1950	—	—	J, E	I	
40[a]	Dec. 2, 1945	—	—	5	Dec. 2, 1945	—	—	J, E	D	
35.15	Dec. 17, 1952	100[a]	Apr. 18, 1949	30	Apr. 18, 1949	8	—	T, E	—	For swimming pool.
10[a]	Nov. 5, 1947	35[a]	Nov. 5, 1947	11	Nov. 5, 1947	1	1.4	C, H	D	See well log.
55.87	Dec. 12, 1952	—	—	1.5	1949	—	—	C, E	D	
—	—	—	—	.5	May 28, 1948	1	—	—	D	
26[a]	Mar. 20, 1947	—	—	5	Mar. 20, 1947	—	—	C, E	D	
20	Dec. 1, 1948	—	—	6	Dec. 1, 1948	18	—	J, E	D	See chemical analysis.
34[a]	Apr. 23, 1952	—	—	2	Apr. 23, 1952	—	—	J, E	D	
30.46	Jan. 15, 1953	60[a]	Jan. 15, 1953	10	Jan. 15, 1953	8	.3	C, H	D	
38[a]	June 1950	—	—	3	June 1950	—	—	J, E	D	See well log.
30[a]	Aug. 19, 1948	50[a]	Aug. 19, 1948	5	Aug. 19, 1948	5	.2	J, E	D	
40[a]	June 29, 1949	—	—	10	June 29, 1949	—	—	J, E	D	
20[a]	Mar. 31, 1953	—	—	25	Mar. 31, 1953	—	—	NI	D	
27[a]	Apr. 1, 1953	—	—	30+	Apr. 1, 1953	—	—	J, E	D	See chemical analysis.
—	—	—	—	—	—	—	—	N	N	Dry hole, abandoned.
18[a]	Mar. 4, 1953	—	—	15	Mar. 4, 1953	—	—	NI	D	Successful well located about 150 ft. from dry hole.
30[a]	Feb. 20, 1953	66[a]	Feb. 20, 1953	10	Feb. 20, 1953	7	.3	NI	D	
49[a]	Mar. 6, 1954	—	—	15	Mar. 6, 1954	15	—	NI	D	
21[a]	Feb. 24, 1954	84[a]	Feb. 24, 1954	17	Feb. 24, 1954	24	.3	J, E	D	
—	—	—	—	—	—	—	—	C, E	D	
—	—	—	—	1	Sep. 1, 1953	—	—	C, E	D	
45[a]	Jan. 9, 1953	84[a]	Jan. 9, 1953	5	Jan. 9, 1953	8	.1	J, E	D	
8[a]	Apr. 29, 1953	60[a]	Apr. 29, 1953	5	Apr. 29, 1953	5	.1	J, E	D	
—	—	—	—	4	Apr. 16, 1954	—	—	—	D	Graphite in cuttings.
—	—	—	—	4	1931	—	—	C, E	N	Went dry during summer of 1950.
—	—	—	—	—	—	—	—	N	N	Well probably plugged.
28[a]	Feb. 2, 1946	42[a]	Feb. 2, 1946	17	Feb. 2, 1946	4	1.2	J, E	C, D	Supplies water to factory and 7 homes.
—	—	—	—	—	—	—	—	C, E	D, F	
19.57	Feb. 26, 1953	—	—	—	—	—	—	S, E	D	Water reported hard.
28[a]	Dec. 21, 1948	40[a]	Dec. 21, 1948	2.5	Dec. 21, 1948	1	.1—	J, E	D	
—	—	—	—	12	—	—	—	S, E	D	Driller hit no rock; all sand.
40[a]	Feb. 26, 1950	—	—	—	—	—	—	N	N	

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Df 12	Harry Mullan	F. H. Lancaster	1951	440	Drilled	89	6	31	Hilltop	Wissabickon (oligoclase)
Df 13	Robert Heista	do	1949	420	do	122	6	22	do	do
Df 14	Donald Cosner	do	1950	480	do	112	6	36	do	do
Df 15	Conrad	do	1950	500	do	61	6	32	Slope	do
Df 16	Albert Greenlaw	do	1950	500	do	157	6	26	Hilltop	do
Df 17	Henry Fischer, Jr.	H & H Drilling Co.	1950	460	do	88	6	30	Slope	do
Df 18	Arthur Lauf	Lynch	1951	480	do	179	6	29	Hilltop	do
Df 19	Christian Lauf	do	1949	500	do	234	6	12	do	do
Df 20	Fork Methodist Church	H & H Drilling Co.	1950	480	do	150	6	64	do	do
Df 21	Danny Shea	Werneke Bros.	1946	290	do	less than 50	6	—	Valley	Cockeysville marble
Df 22	Kingsville School	G. E. Harr Sons	1953	400	do	99	6	46	Hilltop	Gabbro
Df 23	Edward Maxwell	H & H Drilling Co.	1950	260	do	62	6	49	do	do
Df 24	E. G. Kramer	Maryland Drilling Co.	1951	260	do	31	6	31	Upland	do
Df 25	Maryland State Roads Comm.	Washington Pump & Well Co.	1947	270	do	144	6	39	Valley	Port Deposit gneiss
Df 26	Fork Christian Church Parsonage	H. A. Thomas	1948	440	do	33	6	30	Upland	Gabbro
Df 27	Fork Christian Church	—	1892(?)	430	Dug	14	36	—	do	do
Df 28	Sam Fine	Werneke Bros.	1951	400	Drilled	18	6	18	Draw	Gunpowder granite
Df 29	M. H. Kessler	R. H. Leppo	1949	380	do	156	6	46	Upland	do
Df 30	Boy Scouts of America	Eiler	1946	320	do	90	6	20	Hilltop	do
Df 31	Do	do	1946	400	do	75	6	—	do	do
Df 35	Bernard Kelly	Werneke Bros.	1953	360	do	96	6	35	Valley	Cockeysville marble
Df 36	J. F. Otto, Jr.	F. H. Lancaster	1953	460	do	100	6	65	Upland	Wissahickon (oligoclase)
Df 37	R. B. Hahn	Werneke Bros.	1952	320	do	38	6	—	do	Gabbro
Df 38	Maryland & Pennsylvania R. R.	do	—	300	do	60	6	—	Valley	Cockeysville marble
Df 39	U. S. Geological Survey	G. E. Harr Sons	1954	335	do	164	6	127	do	do
Df 40	W. A. Reed	Lynch	—	320	do	62	6	—	do	do
Df 41	Do	do	—	330	do	54	6	—	do	do
Df 42	Mr. Smith	—	—	320	Dug & Drilled	—	—	—	do	do
Df 43	J. E. Kelly	—	—	340	Dug	30	48	—	do	do
Df 44	Baltimore County Roads Garage	—	—	330	do	20	36	—	do	do
Dg 1	Walter Chapman	Lancaster, Scarff	1932	160	Dug & Drilled	57	5⅝	—	Hillside	Port Deposit gneiss
Dg 2	W. J. Martin	Benson	1950	170	Drilled	65	6	23	Upland	do
Dg 3	Ernest Fischer	H & H Drilling Co.	1950	250	do	75	6	68	do	do

—*Continued*

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
—	—	—	—	5	Dec. 20, 1951	—	—	J, E	D	
78[a]	Jan. 18, 1949	—	—	25	Jan. 18, 1949	—	—	C, E	D	
—	—	—	—	—	—	—	—	J, E	D	
—	—	—	—	12	Oct. 5, 1950	—	—	J, E	D	
—	—	—	—	1	Nov. 3, 1950	—	—	C, E	D	First hole dry, 270 ft. deep.
32[a]	Apr. 17, 1950	60[a]	Apr. 17, 1950	20	Apr. 17, 1950	1	0.7	J, E	D	
39[a]	Jan. 29, 1951	—	—	1.5	Jan. 29, 1951	—	—	C, E	D	
38[a]	Dec. 31, 1949	—	—	40	Dec. 31, 1949	—	—	C, E	D, F	
30[a]	Mar. 23, 1950	—	—	1	Mar. 23, 1950	—	—	J, E	I	
—	—	—	—	—	—	—	—	J, E	D, F	
22.88	Feb. 4, 1953	38.55	Feb. 4, 1953	30	Feb. 4, 1953	8	1.9	J, E	I	See chemical analyses and well log.
35[a]	Oct. 6, 1950	48[a]	Oct. 6, 1950	8	Oct. 6, 1950	1	.6	C, E	D	See well log.
6[a]	Feb. 1951	13[a]	Feb. 1951	15	Feb. 1951	—	2.1	S, H	D	
8[a]	Mar. 6, 1947	88[a]	Mar. 6, 1947	8	Mar. 6, 1947	6	.1	J, E	C	See well log.
14[a]	Nov. 11, 1948	25[a]	Nov. 11, 1948	2	Nov. 11, 1948	2	.2	C, E	D	
4.38	Jan. 30, 1953	—	—	—	—	—	—	S, E	I	Went dry during summer and fall of 1953.
5[a]	July 30, 1951	10[a]	July 30, 1951	30	July 30, 1951	1	6	S, H	D	Well flowing Jan. 27, 1953.
35[a]	Mar. 5, 1949	—	—	5	Mar. 5, 1949	2	—	J, E	D	
31.54	Mar. 25, 1953	75[a]	Sep. 14, 1946	5	Sep. 14, 1946	8	.1	C, H	I	Scout camp.
22[a]	Sep. 29, 1946	60[a]	Sep. 29, 1946	5	Sep. 29, 1946	9	.2	C, H	I	Do.
20[a]	Feb. 21, 1953	—	—	—	—	—	—	J, E	D	See well log.
13.93	Feb. 4, 1953	—	—	6	Feb. 4, 1953	—	—	NI	D	
25[a]	Aug. 9, 1952	—	—	—	—	—	—	J, E	D	
—	—	—	—	—	—	—	—	C, H	D	
19.17	Mar. 27, 1954	63.46	Feb. 25, 1954	25	Feb. 25, 1954	8	1.6	N	N	Observation well. See chemical analysis. Temperature 55°F.
—	—	—	—	—	—	—	—	J, E	D	
24.49	Jan. 6, 1954	—	—	—	—	—	—	S, E	D	Water reported hard and irony.
—	—	—	—	—	—	—	—	C, E	D	
23.2	Oct. 6, 1953	—	—	—	—	—	—	B	D	
—	—	—	—	—	—	—	—	S, E	D	Dry Oct. 6, 1953.
—	—	—	—	5	1932	—	—	—	—	Dug to 50 ft.
20[a]	July 22, 1950	55[a]	July 22, 1950	5	July 22, 1950	4	.1	J, E	D	
8[a]	July 24, 1950	60[a]	July 24, 1950	3	July 24, 1950	2	.1–	J, E	D	See well log.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Dg 4	Bernard A. Smith	H & H Drilling Co.	1950	60	Drilled	52	6	45	—	Gabbro
Dg 5	L. M. Edwards	Werneke Bros.	1951	170	do	45	6	32	Slope	Port Deposit gneiss
Dg 6	Paul E. Butler	R. B. Mathews	1946	260	do	52	6	45	Hilltop	Gabbro
Dg 7	W. M. Hann	Maryland Drilling Co.	1947	280	do	75	6	52	Slope	Pleistocene and gabbro
Dg 8	St. Stephens Catholic Church	G. E. Harr Sons	1953	220	do	243	6	—	Hilltop	Port Deposit gneiss
Dg 9	Do	do	1953	190	do	480	6	—	Slope	do
Dg 10	Do	do	1953	180	do	167	8	—	Draw	do
Dg 11	Frederick N. Newcomb, Jr.	Maryland Drilling Co.	1950	280	do	83	6	39	Upland	Gabbro
Ea 1	City of Baltimore	Riley Engr. & Drilling Co.	1944	505	do	202	3	9	—	Wissahickon (oligoclase)
Ea 2	Do	do	1944	569	do	270	3	45	—	do
Ea 3	Do	do	1944	408	do	114	3	—	—	do
Ea 4	Do	do	1944	438	do	148	3	34	—	do
Ea 5	Do	do	1944	479	do	192	3	7	—	do
Ea 6	John K. Ruff	—	1944	680	do	130	6	—	Hilltop	do
Ea 7	Do	G. E. Harr Sons	1950	660	do	443	6	—	do	do
Ea 8	Do	do	1950	660	do	82	6	44	Draw	do
Ea 9	Associated Gun Club	J. A. Edmondson	1950	280	do	48	6	25	Valley	do
Ea 10	Russell Gore	G. D. Edmondson	1953	550	do	68	6	23	Upland	Baltimore gneiss
Ea 11	H. C. C. Grimes	J. R. Edmondson	1948	520	do	76	6	13	Slope	Serpentine
Ea 12	W. J. Wolbert	J. W. Williams	1950	550	do	89	6	50	do	do
Ea 13	Woodstock College	—	—	350	do	300	6	—	Valley	Baltimore gneiss
Ea 14	Do	Hoshall	1923	400	do	248	6	35	Hilltop	do
Ea 15	M. E. Reisberg	J. R. Edmondson	1949	520	do	80	6	80	Slope	do
Ea 16	U. S. Army	G. E. Harr Sons	1954	509	do	150	10–6	58	do	Woodstock granodiorite
Eb 1	City of Baltimore	Riley Engr. & Drilling Co.	1944	510	do	225	3	63(?)	—	Wissahickon (oligoclase)
Eb 2	Do	do	1944	620	do	242	3	76	—	do
Eb 3	Do	do	1944	412	do	210	3	11	—	Gabbro
Eb 4	Do	do	1944	418	do	309	3	38	—	Wissahickon (oligoclase)
Eb 5	Do	do	1944	545	do	285	3	34	—	do
Eb 6	Do	do	1944	533	do	250	3	10	—	do
Eb 7	Do	do	1944	525	do	280	3	56	—	Wissahickon (oligoclase) and gabbro
Eb 9	W. J. Meekins	Benson	1948	360	do	63	6	42	Slope	Baltimore gneiss
Eb 10	J. W. Campbell	G. E. Harr Sons	1951	430	do	107	6	54	Upland	do
Eb 11	H. A. Scbreiber	do	1951	410	do	118	6	37	do	do
Eb 12	Frank Buck	G. D. Edmondson	1952	500	do	106	6	60	Slope	Wissahickon (oligoclase)
Eb 13	W. C. Barry	do	1952	500	do	127	6	50	do	do
Eb 14	Lem Bobbletts	do	1952	520	do	80	6	36	do	do
Eb 16	Vernon Storm	J. R. Edmondson	1949	560	do	100	6	75	do	do
Eb 17	Francis Dorsey	Benson	1947	520	do	55	6	41	Upland	do
Eb 18	J. S. Nott	do	1948	530	do	80	6	67	do	Gabbro
Eb 19	August E. Liebno	J. R. Edmondson	1950	510	do	40	6	35	do	do
Eb 20	R. A. Gilbert	do	1950	520	do	48	6	20	do	do

—Continued

Water level (feet below land surface)				Yield			Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)				
8[a]	Oct. 6, 1950	12[a]	Oct. 6, 1950	8	Oct. 6, 1950	1	2	C, E	D	Water flows from well after a rain.
18[a]	Dec. 21, 1951	30[a]	Dec. 21, 1951	15	Dec. 21, 1951	1	1.2	J, E	D	
25[a]	Sep. 23, 1946	45[a]	Sep. 23, 1946	5	Sep. 23, 1946	½	.3	J, E	D	
26[a]	Sep. 18, 1947	—	—	—	—	—	—	J, E	D	
—	—	—	—	2	—	—	—	—	N	
—	—	—	—	4	—	—	—	—	N	
—	—	—	—	10	—	—	—	T, E	I	See chemical analysis.
33[a]	June 1950	—	—	.5	June 1950	½	—	J, E	D	
—	—	—	—	—	—	—	—	N	—	Test well.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	C, E	D	
—	—	—	—	—	—	—	—	N	N	Dry; filled and abandoned.
22[a]	June 10, 1953	60[a]	June 10, 1953	10	June 10, 1953	8	.3	C, E	D	
8[a]	May 20, 1953	8[a]	May 20, 1953	3.5	May 20, 1953	½	—	J, E	D	
24[a]	Mar. 13, 1953	38[a]	Mar. 13, 1953	5	Mar. 13, 1953	—	.3	J, E	D	
30[a]	Oct. 6, 1948	40[a]	Oct. 6, 1948	4.5	Oct. 6, 1948	5	.4	C, H	D	See chemical analysis.
25[a]	Feb. 27, 1950	60[a]	Feb. 27, 1950	2	Feb. 27, 1950	5	.1−	J, E	D	
—	June 1950	—	—	30	June 1950	—	—	T, E	I	
—	—	—	—	24	1935	—	—	T, E	I	Original yield Jan. 15, 1923, 60 gal. a min. See chemical analysis.
40[a]	July 12, 1949	—	—	—	—	—	—	J, E	D	
29[a]	Sep. 16, 1954	61[a]	Sep. 17, 1954	39	Sep. 1954	28	1.2	NI	M	
7[a]	1944	—	—	—	—	—	—	N	—	Test well.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	N	—	Do.
—	—	—	—	—	—	—	—	N	—	Do.
20[a]	Oct. 28, 1948	20[a]	Oct. 28, 1948	20+	Oct. 28, 1948	4	—	J, E	D	
17[a]	Feb. 27, 1951	70[a]	Feb. 27, 1951	4	Feb. 27, 1951	8	.1−	—	D	
27[a]	June 12, 1951	60[a]	June 12, 1951	10	June 12, 1951	4	.3	J, E	D	
40[a]	July 19, 1952	40[a]	July 19, 1952	5	July 19, 1952	5	—	—	D	
50[a]	July 15, 1952	—	—	10	July 15, 1952	1	—	J, E	D	
40[a]	Aug. 25, 1952	40[a]	Aug. 25, 1952	18	Aug. 25, 1952	1	—	J, E	D	
10[a]	Sep. 18, 1949	60[a]	Sep. 18, 1949	5	Sep. 18, 1949	1	.2	J, E	D	
25[a]	Oct. 15, 1947	30[a]	Oct. 15, 1947	20+	Oct. 15, 1947	4	4.0	J, E	D	
20[a]	Nov. 10, 1948	35[a]	Nov. 10, 1948	7	Nov. 10, 1948	4	5	J, E	D	
30[a]	Oct. 2, 1950	36[a]	Oct. 2, 1950	6	Oct. 2, 1950	1	2.5	J, E	D	
12[a]	Oct. 10, 1950	12[a]	Oct. 10, 1950	10	Oct. 10, 1950	1	—	S, E	D	

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Eb 21	Wm. Walther	Dillon	1953	490	Drilled	90	6	—	Upland	Pyroxenite
Eb 22	E. Rupert	do	1953	410	do	135	6	130	do	Gabbro
Eb 23	Liberty Road Vol. Fire Dept.	do	1953	640	do	72	6	—	do	Wissahickon (oligoclase)
Eb 24	J. Edward Hilbline	G. E. Harr Sons	1949	530	do	200	6	22	Hilltop	do
Eb 25	George Redding	Dillon	1949	530	do	40	6	25	Valley	do
Eb 26	J. D. Kegan	L. G. Edmondson	1948	560	do	100	6	—	Slope	Wissahickon (oligoclase) or serpentine
Eb 27	Clyde C. Miller	J. R. Edmondson	1951	600	do	70	6	40	do	Wissahickon (oligoclase)
Eb 28	Green Spring Valley Hunt Club	O'Donovan	1896	450	do	113	6	—	Valley	Cockeysville marble
Eb 29	Do	G. E. Harr Sons	1950	430	do	177	6	22	do	do
Eb 30	Wm. Pabletts	Williams	1946	590	do	107	6	73	Upland	Wissahickon (oligoclase)
Eb 31	H. J. Snyder	G. E. Harr Sons	1949	595	do	211	6	51	Hilltop	do
Eb 32	Harry Dillon	Dillon	1946	550	do	80	6	40	Upland	do
Eb 33	G. B. Hunter	do	1950	640	do	75	6	60	do	do
Eb 34	Richard Jones	G. E. Harr Sons	1948	580	do	83	6	22	do	Baltimore gneiss
Eb 35	Edgar A. Levi	do	1947	640	do	400	6	45	Hilltop	Wissahickon (oligoclase)
Eb 36	Bart Arconti	do	1949	640	do	429	6	61	do	do
Eb 37	J. A. Weikert	J. R. Edmondson	1950	620	do	68	6	15	do	do
Ec 1	City of Baltimore	Riley Engr. & Drilling Co.	1944	355	do	185	3	—	—	Gabbro
Ec 2	Do	do	1944	313	do	223	3	—	—	do
Ec 3	Gaylord Clark	G. E. Harr Sons	1951		do	129	6	—	—	Cockeysville marble
Ec 6	Blanch Jones	do	1953	—	do	78	6	56	Valley	do
Ec 8	M. A. Mitnick	Dillon	1952	420	do	115	6	40	Slope	Setters
Ec 9	Edgar Lucas	—	—	280	Dug	20	—	—	Valley	Cockeysville marble
Ec 10	L. B. Meacham	G. E. Harr Sons	1949	410	Drilled	134	6	32	Slope	Baltimore gneiss
Ec 12	Randolph Rothschild	do	1950	420	do	176	6	67	Hilltop	do
Ec 13	Corbin Cogswell	do	1951	520	do	211	6	48	Upland	do
Ec 14	Albert Miller	Dillon	1952	540	do	85	6	40	do	do
Ec 15	Paul Gambrill	R. H. Leppo	1952	430	do	75	6	15	do	Gabbro
Ec 16	G. H. Burnham	G. E. Harr Sons	1952	540	do	55	6	53	do	Baltimore gneiss
Ec 17	Eillene Snapp	do	1949	540	do	90	6	51	do	do
Ec 18	Nathan Patz	do	1950	480	do	168	6	15	do	do
Ec 19	R. I. Murray	Dillon	1951	480	do	91	6	30	do	do
Ec 20	Raymond Feinberg	J. R. Edmondson	1952	460	do	117	6	23	Hilltop	Setters
Ec 21	Walter Nassauer	Dillon	1952	520	do	140	6	48	do	do
Ec 22	R. L. Jackson	Howard Hilton	1950	460	do	400	6	—	Slope	Cockeysville marble and Wissahickon (oligoclase)
Ec 23	S. G. Gorn	G. E. Harr Sons	1950	340	do	60	6	33	Valley	Cockeysville marble
Ec 24	Sara A. Weisberg	Dillon	1951	460	do	80	6	—	Upland	Gabbro
Ec 25	Pikesville Tire & Supply Co.	C. L. Benson	1948	475	do	72	6	71	do	do

—Continued

Water level (feet below land surface)				Yield			Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)				
10[a]	Jan. 23, 1953	20[a]	Jan. 23, 1953	10	Jan. 23, 1953	2	1	J, E	D	
5[a]	Feb. 7, 1953	—	—	1.5	Feb. 7, 1953	—	—	J, E	D	
35[a]	Feb. 25, 1950	—	—	20	Feb. 25, 1950	—	—	J, E	D	
21[a]	May 3, 1949	85[a]	May 3, 1949	5	May 3, 1949	8	0.1—	C, E	D	
8[a]	Oct. 24, 1949	18[a]	Oct. 24, 1949	7	Oct. 24, 1949	2	1.5	J, E	D	
25[a]	Nov. 12, 1948	25[a]	Nov. 12, 1948	6	Nov. 12, 1948	1	—	S, E	D	
20[a]	Mar. 1, 1951	20[a]	Mar. 1, 1951	10	Mar. 1, 1951	1	—	J, E	D	
18[a]	June 4, 1953	—	—	65	1896	—	—	C, E	C	For club bouse and swimming pool. See chemical analysis.
25[a]	Apr. 22, 1950	42[a]	Apr. 22, 1950	35	Apr. 22, 1950	30	2.0	C, E	C	
40[a]	Apr. 11, 1946	73[a]	Apr. 11, 1946	7.5+	Apr. 11, 1946	5	.2	J, E	D	
38[a]	Apr. 12, 1949	120[a]	Apr. 12, 1949	3	Apr. 12, 1949	8	.1—	C, E	D	
12[a]	Aug. 24, 1946	30[a]	Aug. 24, 1946	8	Aug. 24, 1946	2	.4	J, E	D	
32[a]	Dec. 12, 1950	—	—	—	—	—	—	J, E	D	
30[a]	Jan. 21, 1948	70[a]	Jan. 21, 1948	4	Jan. 21, 1948	6	.1	—	D	
50[a]	Mar. 1947	180[a]	Mar. 1947	7	Mar. 1947	8	.1—	C, E	D	
50[a]	Oct. 12, 1949	200[a]	Oct. 12, 1949	4	Oct. 12, 1949	8	.1—	C, E	D	See chemical analysis.
20[a]	Oct. 25, 1950	—	—	5	Oct. 25, 1950	—	—	J, E	D	
—	—	—	—	—	—	—	—	N	N	Test well. Capped and covered.
—	—	—	—	—	—	—	—	N	N	Do.
8.42	Mar. 9, 1951	40.42	Mar. 9, 1951	35	Mar. 9, 1951	24	1.1	N	D	Reserve supply; spring used. See chemical analysis.
10.90	Feb. 5, 1953	40.90	Feb. 5, 1953	5	Feb. 5, 1953	5	.2	N	D	
8	Dec. 5, 1952	22	Dec. 5, 1952	15	Dec. 5, 1952	3	1.0	J, E	D	
—	—	—	—	—	—	—	—	S, E	D, F	Field test: hardness, 165 ppm.
7[a]	Feb. 15, 1949	84[a]	Feb. 15, 1949	5	Feb. 15, 1949	8	.1—	C, E	D	
65[a]	June 7, 1950	80[a]	June 7, 1950	8	June 7, 1950	8	.5	C, E	D	Neutralizer installed, but water still corrodes fixtures.
27[a]	Jan. 26, 1951	100[a]	Jan. 26, 1951	20	Jan. 26, 1951	8	.3	J, E	D	
25[a]	Feb. 26, 1952	—	—	10	Feb. 26, 1952	—	—	J, E	D	
40[a]	Sep. 8, 1952	—	—	7	Sep. 8, 1952	—	—	J, E	D	
10[a]	Aug. 29, 1952	30[a]	Aug. 29, 1952	10	Aug. 29, 1952	5	.5	J, E	D	
14[a]	July 21, 1949	80[a]	July 21, 1949	5	July 21, 1949	5	.1	J, E	D	
16[a]	Nov. 13, 1950	80[a]	Nov. 13, 1950	15	Nov. 13, 1950	8	.2	C, E	D	
11[a]	Apr. 1, 1951	—	—	10	Apr. 1, 1951	—	—	S, E	D	
50[a]	Apr. 29, 1952	—	—	10	Apr. 29, 1952	—	—	J, E	D	
40[a]	Nov. 30, 1951	60[a]	Nov. 30, 1951	10	—	4	.5	J, E	D	
65[a]	Sep. 8, 1950	72[a]	Sep. 8, 1950	15	Sep. 8, 1950	10	2.1	J, E	D	
6[a]	Oct. 20, 1950	30[a]	Oct. 20, 1950	15	Oct. 20, 1950	8	.6	J, E	D	
25[a]	Sep. 28, 1951	—	—	2	Sep. 28, 1951	—	—	J, E	D	
42[a]	Mar. 13, 1948	52[a]	Mar. 13, 1948	12	Mar. 13, 1948	4	1.2	J, E	D	

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Ec 26	Charles Kern	Dillon	1949	410	Drilled	36	6	—	Draw	Gabbro
Ec 27	Louis Scharon	do	1947	460	do	80	6	—	Upland	do
Ec 28	William S. Tracey	do	1948	460	do	50	6	—	do	do
Ec 29	Dr. J. Gaber	G. E. Harr Sons	1953	540	do	122	6	64	do	Baltimore gneiss
Ec 30	L. J. Weiss	C. L. Benson	1947	490	do	55	6	30	do	Gunpowder granite
Ec 31	Mrs. Sumner Parker	G. E. Harr Sons	1949	480	do	106	6	24	Hilltop	Setters
Ec 32	Jeff J. Miller	Dillon	—	490	do	162	6	95	Draw	Baltimore gneiss
Ec 33	Harry D. Heubeck, Jr.	G. E. Harr Sons	—	400	do	82	6	58	Slope	Setters
Ec 34	A. G. Larrimore	do	1954	320	do	365	6	352	do	do
Ec 35	Lambert	—	1913	470	do	60	6	—	Draw	Baltimore gneiss
Ec 36	Baetjer	—	1938±	380	do	325	—	—	Valley	Cockeysville marble
Ec 37	Do	—	—	370	do	—	—	—	do	do
Ec 38	Niel Luray	G. E. Harr Sons	1953	540	do	113	6	39	Upland	Baltimore gneiss
Ec 39	Michael Sheehan	do	1954	320	do	81	6	39	Valley	Cockeysville marble
Ec 40	Do	do	1954	330	do	198	6	129	Slope	do
Ec 41	Do	do	1954	340	do	76	6	—	do	do
Ec 42	Do	do	1954	340	do	202	6	202	do	do
Ed 1	D. M. J. Cromwell	O'Donovan	1899	270	do	206	6	—	do	Baltimore gneiss
Ed 2	Blake	do	1897	310	do	—	—	—	do	do
Ed 3	Dr. James D. Harrison	G. E. Harr Sons	1952	400	do	175	6	—	do	do
Ed 4	Norman Greene	do	1945	380	do	160	6	35	Hilltop	do
Ed 5	Francis Harwood	do	1950	300	do	217	6	37	do	Cockeysville marble
Ed 6	James R. Cupit	do	1953	340	do	140	6	33	Slope	do
Ed 8	Dr. W. R. Milnor	Dillon	1951	320	do	62	6	25	do	Baltimore gneiss
Ed 9	John D. Bitner	G. E. Harr Sons	1948	300	do	101	6	33	do	do
Ed 10	M. J. Cromwell	do	1948	280	do	155	6	28	do	do
Ed 11	E. N. Dinning	do	1948	260	do	135	6	37	Hilltop	Serpentine
Ed 12	Dr. H. B. Taussig	do	1949	250	do	163	6	23	Draw	Baltimore gneiss
Ed 13	Do	do	—	220	do	195	—	—	Hilltop	do
Ed 14	Milton Turner	do	1949	380	do	100	6	—	Slope	Gabbro
Ed 15	Rockland Bleach & Dye Works	do	1948	240	do	141	6	28	Valley	Wissahickon (oligoclase)
Ed 16	J. Knott	Maryland Drilling Co.	1951	380	do	211	6	19	Slope	Baltimore gneiss
Ed 17	A. Shaneybrook	Dillon	1953	400	do	106	6	—	Hilltop	Gabbro
Ed 18	George S. Shaffer	L. B. Anderson (Greene)	1953	460	do	110	6	—	do	Baltimore gneiss(?)
Ed 19	William H. Parsons	G. E. Harr Sons	1951	340	do	77	6	75	Slope	Setters
Ed 20	George Woodward	do	1953	280	do	158	6	13	do	Cockeysville marble
Ed 21	Rockland Bleach & Dye Works	Maryland Drilling Co.	1954	240	do	315	6	44	Valley	Wissahickon (oligoclase)
Ed 22	Kleenize Rug Cleaners	G. E. Harr Sons	1954	350	do	140	6	28.3	Hilltop	Serpentine
Ed 23	Mrs. Ann Hill	do	1953	340	do	128	6	13	Slope	do

—Continued

Water level (feet below land surface)				Yield			Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)				
18[a]	Nov. 1, 1949	29[a]	Nov. 1, 1949	6	Nov. 1, 1949	4	0.5	—	D	
35[a]	Dec. 7, 1947	—	—	2	Dec. 7, 1947	—	—	J, E	D	
27[a]	Oct. 22, 1948	40[a]	Oct. 22, 1948	10	Oct. 22, 1948	4	.7	J, E	D	
12[a]	May 18, 1953	12[a]	May 18, 1953	10	May 18, 1953	8	—	—	D	
25[a]	June 21, 1947	40[a]	June 21, 1947	8–10	June 21, 1947	4	.6	J, E	D	
6[a]	June 30, 1949	—	—	—	—	—	—	—	D	
5[a]	May 22, 1948	27[a]	May 22, 1948	25	May 22, 1948	12	1.1	T, E	—	For swimming pool.
—	—	—	—	3	—	—	—	N	D	
45[a]	Mar. 16, 1954	147[a]	Mar. 16, 1954	2	Mar. 16, 1954	8	.1–	NI	D	
—	—	—	—	—	—	—	—	C, E	D	Temperature 56°F.
—	—	—	—	30	—	72	—	J, E	D	
flowing	—	—	—	3–5	—	—	—	C, —	N	Water from stream used to power water wheel driving cylinder pump. Temperature 54°F.
22[a]	June 1953	60[a]	June 1953	15	June 1953	8	.4	—	D	
29.77	Sep. 11, 1953	—	—	30	Sep. 1953	—	—	J, E	D	
—	—	—	—	—	—	—	—	—	—	No water; filled and abandoned.
—	—	—	—	—	—	—	—	—	—	Do.
40[a]	June 25, 1954	—	—	5	June 25, 1954	—	—	—	—	Filled and abandoned.
—	—	—	—	35	—	—	—	—	—	Exact location unknown.
—	—	—	—	Dry	—	—	—	—	—	Do.
20[a]	Apr. 15, 1952	44[a]	Apr. 15, 1952	10	Apr. 15, 1952	8	.4	J, E	D	
40[a]	Nov. 7, 1945	—	—	12	Nov. 7, 1945	—	—	C, E	—	For swimming pool.
35[a]	Sep. 21, 1950	150[a]	Sep. 21, 1950	2	Sep. 21, 1950	—	.1–	C, E	D	
33[a]	May 15, 1953	60[a]	May 15, 1953	5	May 15, 1953	5	.2	J, E	D	
25[a]	July 6, 1951	—	—	—	—	—	—	C, E	D	
20[a]	Jan. 18, 1948	60[a]	Jan. 18, 1948	10	Jan. 18, 1948	8	.4	J, E	D	
23[a]	Mar. 25, 1948	100[a]	Mar. 25, 1948	1	Mar. 25, 1948	6	.1–	C, E	D	Pumped dry several times.
30[a]	July 8, 1948	80[a]	July 8, 1948	5	July 8, 1948	8	.1	C, E	D	
1[a]	Mar. 2, 1949	60[a]	Mar. 2, 1949	4	Mar. 2, 1949	8	.1–	C, E	D	
Dry	—	—	—	—	—	—	—	—	—	Near the Ruxton fault.
20[a]	June 3, 1949	60[a]	June 3, 1949	3	June 3, 1949	8	.1	J, E	D	
8[a]	Dec. 2, 1948	60[a]	Dec. 2, 1948	8	Dec. 2, 1948	8	—	J, E	D	Water contaminated; well never used.
32[a]	Sep. 1951	—	—	—	—	—	—	N	N	
14.1	Nov. 17, 1953	—	—	4–5	Nov. 17, 1953	—	—	J, E	D	
14.51	Feb. 9, 1954	24[a]	Jan. 1954	40	Jan. 1954	8	4(?)	—	C	
36[a]	Sep. 18, 1951	63[a]	Sep. 18, 1951	3	Sep. 18, 1951	8	.1	J, E	D	
—	—	—	—	—	—	—	—	C, E	D	
0	July 1954	—	—	2	July 1954	—	—	NI	N	Well was dynamited; no increase in yield.
80[a]	Feb. 1954	120[a]	Feb. 1954	15	Feb. 1954	8	.37	T, E	C	For rug cleaning. See chemical analysis.
65[a]	June 5, 1953	84[a]	June 5, 1953	10	June 5, 1953	5	.5	—	D	

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Ed 24	Harry T. Campbell Sons' Corp.	G. E. Harr Sons	1954	460	Drilled	211	8	30	Upland	Setters
Ee 1	W. M. Meise	—	1920	140	Dug	12	48	—	Valley	—
Ee 2	J. C. Hammerbacker	Hoshall	1922	340	Drilled	170	6	—	—	Gunpowder granite
Ee 3	James Primus	do	1921	340	do	140	—	—	—	do
Ee 4	Peter Quivalier	—	1919	200	do	73	—	—	—	Patuxent(?)
Ee 5	Harrison Rider	Hoshall	1919	340	do	205	—	—	—	Port Deposit gneiss
Ee 6	G. A. Fritz	do	1919	200	do	110	—	—	—	Patuxent
Ee 7	Dr. Benson	do	1926	100	do	104	6	—	—	Gabbro
Ee 8	John Suess	G. E. Harr Sons	1946	270	do	110	—	—	Slope	Port Deposit gneiss
Ee 9	Marshall Ferguson	C. L. Benson	1946	380	do	100	5	—	Hilltop	Patuxent
Ee 10	Bernard C. Kube	W. A. Lynch	1946	480	do	85	6	84	do	Gunpowder granite
Ee 11	Walter Keene	C. L. Benson	1950	480	do	145	6	71	do	do
Ee 12	Wiespoufen	Maryland Drilling Co.	1949	410	do	63	6	34	Slope	do
Ee 13	American Telephone & Telegraph Co.	G. E. Harr Sons	1952	390	do	182	6	80	Hilltop	do
Ee 14	A. W. Chenoweth	do	1947	400	do	75	—	22	do	do
Ee 15	W. G. Bowles	Maryland Drilling Co.	—	460	do	148	6	89	Slope	Wissahickon (oligoclase)
Ee 16	C. H. Brown, Jr.	Werneke Bros.	1951	400	do	113	—	30	do	do
Ee 17	A. D. Schearer	Dillon	1948	420	do	71	6	25	do	Cockeysville marble
Ee 20	Dr. Howard Howe	—	1938	370	do	200	—	—	do	Wissahickon (oligoclase)
Ee 21	W. A. Wickline	G. E. Harr Sons	1953	290	do	158	6	81	do	Cockeysville marble
Ee 22	Read Drug & Chemical Co.	L. B. Anderson (Greene)	1954	360	do	210	6	36	do	Gunpowder granite
Ee 23	Albert Ernst	Maryland Drilling Co.	1950	360	do	130	6	53.6	Hilltop	do
Ef 1	Baltimore Brick Co.	—	1900	90	do	87	6	—	—	Patuxent
Ef 2	Do	—	—	90	do	90	6	—	—	do
Ef 3	Do	—	—	90	do	—	—	—	—	—
Ef 4	Kruse	G. E. Harr Sons	1944	125	do	123	6	123	—	Patuxent
Ef 5	Jos. Foreacre	do	1944	125	do	138	6	138	—	do
Ef 6	Do	—	—	130	Dug	12	—	—	—	Patapsco
Ef 7	Louis Madl	—	—	105	do	91	4	—	—	Patuxent
Ef 8	—	G. E. Harr Sons	1944	105	Drilled	115	6	115	—	do
Ef 9	—	Eiler	1943	120	do	134	2	—	—	do
Ef 10	—	do	1943	60	do	135	2	90	—	Patuxent(?)
Ef 11	H. T. Campbell (Nottingham Farms)	G. E. Harr Sons	1944	70	do	199	6	112	Slope	Gabbro
Ef 12	Jos. J. Hofmeister	do	1944	140	do	128	6	128	—	Patuxent
Ef 13	H. T. Campbell Sons' Corp. (Gravel Quarry)	do	1942	50	do	385	6	—	—	Gabbro
Ef 14	John H. Kopleman	Hoshall	1921	40	do	227	6	—	—	Arundel(?)

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
—	—	—	—	37	Oct. 1954	—	—	NI	C	For air-conditioning.
8[a]	Sep. 1944	—	—	—	—	—	—	—	D	Water reported contaminated.
—	—	—	—	7	—	—	—	—	—	Exact location unknown.
—	—	—	—	3	—	—	—	—	—	Do.
—	—	—	—	20	—	—	—	—	—	Do.
—	—	—	—	5	—	—	—	—	—	Do.
—	—	—	—	15	—	—	—	—	—	Do.
—	—	—	—	8	—	—	—	—	—	Do.
25[a]	Mar. 1946	60[a]	Mar. 1946	5	Mar. 1946	8	0.1	C, E	D	
40[a]	Nov. 2, 1946	60[a]	Nov. 2, 1946	3	Nov. 2, 1946	2	.2	J, E	D	
48[a]	June 28, 1946	—	—	9	June 28, 1946	—	—	J, E	D	Water reported to have 40. ppm of iron
60[a]	June 13, 1950	72[a]	June 13, 1950	1.5	June 13, 1950	4	.1	J, E	D	
32[a]	May 1949	—	—	10	—	—	—	J, E	D	
58.17	Jan. 15, 1952	—	—	1.5	Jan. 15, 1952	—	—	C, E	D	Water reported high in iron.
35[a]	Oct. 22, 1947	60[a]	Oct. 22, 1947	2	Oct. 22, 1947	8	.1—	J, E	D	
44[a]	—	—	—	—	—	—	—	J, E	D	Water cloudy after heavy rain; filter installed.
50[a]	June 23, 1951	80[a]	June 23, 1951	5	June 23, 1951	1	.16	J, E	D	
15[a]	Feb. 20, 1948	25[a]	Feb. 20, 1948	15	Feb. 20, 1948	—	1.5	J, E	D	
—	—	—	—	—	—	—	—	—	D	
40[a]	Sep. 14, 1953	60[a]	Sep. 14, 1953	10	Sep. 14, 1953	4	.5	—	D	
20[a]	—	—	—	20	Apr. 6, 1954	10	—	—	C	Yield 60 gal. a min. in first hour of test, then declined to 20 gal. a min.
42[a]	Sep. 1950	110[a]	Sep. 1950	7	Sep. 1950	2	.1	J, E	D	
—	—	—	—	50	Apr. 25, 1944	24	—	C, S	D, C	Supplies water to several homes. Temperature: 56°F.
31.30	Apr. 25, 1944	—	—	—	—	—	—	N	N	Measured depth: 52 ft.
—	—	—	—	—	—	—	—	N	N	Well covered; exact location unknown.
—	—	—	—	10	Aug. 1944	—	—	—, E	D	
106[a]	Aug. 1944	—	—	15	Aug. 1944	—	—	H	D	
—	—	—	—	—	—	—	—	H	D	Dry in 1943–44.
90.8	Aug. 23, 1944	—	—	0	Aug. 1944	—	—	C, E	D	
80[a]	Aug. 31, 1944	—	—	—	—	—	—	H	D	
—	—	—	—	—	—	—	—	H	D	
30	1944	—	—	—	—	—	—	C, H	D	
—	—	—	—	1.5	Sep. 1944	—	—	NI	D	
102[a]	Sep. 1944	—	—	—	—	—	—	H	D	
—	—	—	—	—	—	—	—	C, E	D	Depth to rock: 185 ft.
—	—	—	—	15	—	—	—	—	—	

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Ef 15	—	—	1904	100	Drilled	52	—	—	—	—
Ef 16	State of Maryland	—	1944	100	Dug	8	36	—	—	Patuxent
Ef 17	—	—	—	100	do	37	36	—	—	do
Ef 18	John R. Dodson	—	—	110	Dug & Drilled	92	—	60–92	—	do
Ef 19	United Clay Mines Corp.	—	1933	100	do	66	6	—	—	do
Ef 20	H. T. Campbell (Nottingham Farms)	G. E. Harr Sons	1944	90	do	492	6	139.6	—	—
Ef 21	Do	—	—	80	do	400(?)	—	—	—	Precambrian
Ef 22	Shiebeck	Eiler	1943	60	do	105	2 or 3	—	—	Patuxent(?)
Ef 23	C. H. Scheeler	do	—	85	do	59	2	—	—	do
Ef 24	Herbert LaBudd	G. E. Harr Sons	1951	180	do	210	6	115	Hilltop	Gabbro
Ef 25	H. V. Scheide	Maryland Drilling Co.	1949	240	do	155	6	67	Upland	Port Deposit gneiss
Ef 26	A. Reichert	Werneke Bros.	1952	250	do	62	6	50	Slope	Gabbro
Ef 27	Do	—	1927	250	Dug	36	36	—	do	do
Ef 28	Nicholas Regert	Maryland Drilling Co.	1947	280	Drilled	83	38	38	Hilltop	do
Ef 29	F. M. Gambrill	G. E. Harr Sons	1949	240	do	75	6	23	do	do
Ef 30	Wm. E. Bauscher	Werneke Bros.	1951	100	do	160	6	100	Slope	do
Ef 31	Wm. Gross	G. E. Harr Sons	1951	160	do	255	6	150	Hilltop	do
Ef 32	Consol. Gas, Elec. Light & Power Co.	—	1950	320	do	196	6	—	Slope	Port Deposit gneiss
Ef 33	Harry Bickford	Dillon	1952	300	do	76	6	45	do	Patuxent
Ef 34	Smith Bros.	Maryland Drilling Co.	1948	20	do	122	6	76	do	Gabbro
Ef 35	Thomas DiGregorio	do	1949	150	do	53	6	46	do	do
Ef 36	Woods	do	1947	240	do	80	6	57	do	Port Deposit gneiss
Ef 37	Herbert Kline	—	—	290	Dug	10	48	—	do	Patuxent
Ef 38	Peter F. Mullen	G. E. Harr Sons	1946	60	Drilled	153	6	—	—	Gabbro
Ef 39	H. T. Campbell Sons' Corp.	Maryland Drilling Co.	1950	40	do	—	—	—	—	Patuxent
Ef 40	Do	G. E. Harr Sons	—	30	do	220	6	—	—	Gabbro
Ef 41	Do	do	1948	40	do	327	6	145	—	do
Ef 42	R. E. Akehurst	do	1953	220	do	306	6	119	Hilltop	Port Deposit gneiss
Ef 43	Smith Motor Co.	do	1953	70	do	192	6	105	Slope	Gabbro
Ef 44	Ridgley	Maryland Drilling Co.	1953	210	do	180	6	145	do	Patuxent and gabbro
Ef 45	Glenn F. Gall Lumber Co.	do	1947	40	do	94	6	84	—	Patuxent
Ef 46	Richard E. Stanley	Layne-Atlantic Co.	1953	95	do	160	4	155	—	do
Ef 47	Mrs. Margaret Weidner	G. E. Harr Sons	1953	185	do	200	6	147	do	Gabbro
Ef 48	William V. May	do	1951	130	do	115	6	114	—	Patuxent and gabbro
Ef 49	Esso Standard Oil Co.	do	1950	100	do	126	6	119	—	Patuxent
Ef 50	R. A. Masters	do	1954	80	do	116	6	116	—	do
Ef 51	I. H. Taylor	do	1948	85	do	88	6	79	—	do

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
52[a]	1944	—	—	—	—	—	—	C, E	D	Dry in 1943–44.
7.13	Nov. 18, 1944	—	—	—	—	—	—	N	—	Observation well.
36.46	Nov. 18, 1944	—	—	—	—	—	—	N	N	Abandoned.
81[a]	Nov. 18, 1944	—	—	—	—	—	—	—	D	
60.05	Nov. 18, 1944	—	—	—	—	—	—	H	N	Observation well. Dry in 1934 and 1944.
37.18	Nov. 1, 1944	—	—	24	Oct. 25, 1944	—	—	—	F	
—	—	—	—	4	1944	—	—	—	D	
—	—	—	—	—	—	—	—	—	D	
—	—	—	—	—	—	—	—	—	D	
60[a]	Apr. 20, 1951	—	—	.5	Apr. 20, 1951	—	—	C, E	D	
50[a]	Dec. 1949	—	—	2.5	Dec. 1949	—	—	C, E	D	Drilled in bottom of dry dug well.
30[a]	Sep. 18, 1952	50[a]	Sep. 18, 1952	1	Sep. 18, 1952	1	0.1—	J, E	D	
27.34	Feb. 25, 1953	—	—	—	—	—	—	C, E	F	Water polluted.
35[a]	Apr. 12, 1947	—	—	—	—	—	—	C, E	D	Water reported irony.
37[a]	Nov. 1, 1949	60[a]	Nov. 1, 1949	.5	Nov. 1, 1949	2	.1—	C, E	D	
60[a]	July 7, 1951	130[a]	July 7, 1951	1	July 7, 1951	2	.1—	C, E	D	
50[a]	Feb. 3, 1951	200[a]	Feb. 3, 1951	.5	Feb. 3, 1951	3	—	C, E	D	
3[a]	Nov. 25, 1950	120[a]	Nov. 25, 1950	4	Nov. 25, 1950	12	.1—	J, E	C	"Coppery" taste; precipitate forms after boiling. See chemical analysis.
5[a]	May 15, 1952	—	—	—	—	—	—	J, E	D	
8[a]	Feb. 1948	—	—	4	Feb. 1948	—	—	J, E	C	
36[a]	Apr. 1949	—	—	—	—	—	—	J, E	D	
14[a]	Sep. 30, 1947	—	—	—	—	—	—	J, E	D	
—	—	—	—	—	—	—	—	S, E	D	Dry in drought periods.
40[a]	Mar. 25, 1946	—	—	—	—	—	—	C, E	D	
—	—	—	—	—	—	—	—	J, E	D, C	
—	—	—	—	—	—	—	—	C, E	D	
32[a]	Jan. 16, 1948	180[a]	Jan. 16, 1948	37	Jan. 16, 1948	8	.3	J, E	D	
50[a]	Sep. 18, 1953	—	—	.5	Sep. 18, 1953	—	—	NI	D	
59[a]	Mar. 3, 1953	—	—	1	Mar. 3, 1953	—	—	NI	D	
95[a]	Jan. 26, 1953	—	—	1.5	Jan. 26, 1953	—	—	J, E	D	Casing slotted at 100 feet.
15[a]	Sep. 13, 1947	—	—	—	—	—	—	N	N	Abandoned.
84[a]	Sep. 14. 1953	98[a]	Sep. 14, 1953	15	Sep. 14, 1953	3	1.1	J, E	D	
100[a]	Feb. 18, 1953	—	—	.5	Feb. 18, 1953	—	—	C, E	D	See chemical analysis.
58[a]	Nov. 1951	75[a]	Nov. 1951	6	Nov. 1951	3	.1—	J, E	D	
60[a]	June 1950	90[a]	June 1950	14	June 1950	—	.5	J, E	C	
60[a]	Mar. 1954	70[a]	Mar. 1954	30	Mar. 1954	—	3.0	T, E	D	Do.
32[a]	Apr. 1948	—	—	—	—	—	—	J, E	D	Do.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Ef 52	Albert Bethke	Maryland Drilling Co.	1950	150	Drilled	105	4	99	—	Patuxent
Ef 53	Tru-Rol Co.	Eiler	1953	95	do	114	4	109	—	do
Ef 54	Charles Zalme	G. E. Harr Sons	1953	135	do	124	6	—	—	do
Ef 55	J. R. Reinhardt	Lancaster	1953	95	do	212	6	150	—	Gabbro(?)
Ef 56	Harry Mashalot	Werneke Bros.	1953	70	do	200	6	—	—	do
Ef 57	D. F. Flurie	Eiler	1953	100	do	97	4–2.5	97	—	Patuxent
Eg 1	Methodist Churcb Parsonage	G. E. Harr Sons	1944	60	do	405	6	—	—	Gabbro
Eg 2	N. Lay	—	1942	20	do	65	1.5	—	—	Patapsco
Eg 3	Chase Consolidated School	Washington Pump & Well Co.	1939	30	do	331	6	321	—	Patuxent
Eg 4	Do	do	1943	30	do	345	8–6	—	—	do
Eg 5	Do	do	1939	30	do	158	6	—	—	Patuxent(?)
Eg 6	Leonberger	Eiler	1945	6–8	do	107	2	107	—	do
Eg 7	W. S. Webster	C. L. Benson	1950	170	do	143	5	118	—	Gabbro
Eg 8	George Counts	H & H Drilling Co.	1949	230	do	67	6	65	Hilltop	do
Eg 9	The Frank L. Wight Distilling Co.	Columbia Pump & Well Co.	—	40	do	100	8	17	Valley	do
Eg 10	Do	do	1953	40	do	450	—	11	do	do
Eg 11	Do	do	1946	40	do	155	8	16	do	do
Eg 13	Loreley School	Eiler	1947	160	do	59	6	49	Upland	do
Eg 14	Llewelyn A. Diggs	Werneke Bros.	1951	110	do	138	6	110	do	do
Eg 15	Chase Consolidated School	Eiler	1946	10	do	320	3–2	320	—	Patuxent
Eg 16	Carl Neilson	G. E. Harr Sons	1953	140	do	47	6	23	Slope	Gabbro
Fb 1	Consol Gas, Elec. Light & Power Co.	—	1902	100	do	700	8–6	—	Valley	Woodstock granodiorite
Fb 2	Gilgash	Irving Yowell	1890	100	Dug	26	36	—	do	do
Fb 3	Dr. L. B. Whiting	Edward Brown	1948	250	Drilled	72	6	36	Slope	do
Fb 4	Alfred Marquess	C. L. Benson	1947	370	do	56	6	22.5	do	do
Fb 5	Anna E. O'Neill	J. R. Edmondson	1949	430	do	60	5⅜	18	do	Gabbro
Fb 6	Austin Shores	Dillon	1951	460	do	50	6	30	Upland	do
Fb 7	Henry Frederick	do	1952	426	do	65	6	45	do	do
Fb 8	Charles Hildebrant	do	1952	430	do	100	6	24.5	do	Pyroxenite
Fb 9	Burton Shover	—	1950	460	do	50±	6	—	do	do
Fb 10	W. D. Mansfield	J. R. Edmondson	1952	430	do	63	6	23	Hilltop	Gabbro
Fb 11	Methodist Church	Dillon	1951	430	do	55	6	—	Upland	do
Fb 12	Elwood L. Bridner	C. L. Benson	1949	540	do	78	6	23	do	Baltimore gneiss(?)
Fb 13	George W. Sauter	Dillon	1952	340	do	100	6	40	do	do
Fc 1	Howard Cleaners of Balto., Inc.	Bunker	1940	150	do	250	—	—	—	Precambrian
Fc 2	Do	do	1940	150	do	200	—	—	—	do

—*Continued*

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
79[a]	Mar. 1950	—	—	1.5	Mar. 1950	—	—	C, E	D	Screen: 99–105 ft. See chemical analysis.
66[a]	Aug. 6, 1953	73[a]	Aug. 6, 1953	10	Aug. 6, 1953	8	1.4	J, E	D	Screen: 109–114 ft. See chemical analysis.
82[a]	Oct. 4, 1953	100[a]	Oct. 4, 1953	10	Oct. 4, 1953	6	.6	J, E	D	See chemical analysis.
—	—	—	—	2.5	Nov. 1953	—	—	J, E	D	
30[a]	July 2, 1953	—	—	—	—	—	—	C, E	D	Do.
61[a]	June 1953	69[a]	June 1953	5	June 1953	4	.6	J, E	D	Do.
47.85	Sep. 4, 1944	—	—	2	1944	—	—	—	D	Hard rock at 204 ft.
—	—	—	—	—	—	—	—	S, E	D	
—	—	—	—	—	—	—	—	C, E	I	Screen: 321–331 ft.
—	—	—	—	30	—	—	—	C, E	I	
—	—	—	—	3.5	—	—	—	N	N	
—	—	—	—	—	—	—	—	N	D	Flows 3 gal. a min.
10[a]	Jan. 20, 1950	50[a]	Jan. 20, 1950	1	Jan. 20, 1950	4	.1−	J, E	D	Drilled in bottom of dug well.
20[a]	Sep. 30, 1949	55[a]	Sep. 30, 1949	6	Sep. 30, 1949	2	.2	J, E	D	
—	—	—	—	5	—	—	—	N	N	
3.62	Jan. 23, 1953	—	—	35	Jan. 23, 1953	—	—	T, E	C	Yields 17 gal. a min.
5[a]	May 1, 1946	150[a]	May 1, 1946	12	May 1, 1946	8	.1−	C, E	C	
25[a]	Feb. 11, 1947	40[a]	Feb. 11, 1947	4	Feb. 11, 1947	4	.3	J, E	I	
78[a]	May 3, 1951	83[a]	May 3, 1951	4	May 3, 1951	2	.8	C, E	D	
3[a]	Feb. 1946	11[a]	Feb. 1946	8	Feb. 1946	—	1.0	C, H	I	
27[a]	Sep. 10, 1953	—	—	3	Sep. 10, 1953	—	—	NI	D	
—	—	—	—	—	—	—	—	N	C	Drilled in a stream bed.
20[a]	Dec. 1949	—	—	—	—	—	—	N	D	Went dry in 1949; deepened from 19 ft.
12.99	Jan. 12, 1950	—	—	—	—	—	—	C, E	D, F	Water reported slightly irony.
26[a]	Dec. 2, 1947	46[a]	Dec. 2, 1947	20+	Dec. 2, 1947	4	1	J, E	D	
20[a]	Dec. 30, 1949	30[a]	Dec. 30, 1949	5	Dec. 30, 1949	3	.5	J, E	D	
10[a]	June 20, 1951	—	—	—	—	—	—	J, E	D	
13[a]	Sep. 16, 1952	—	—	—	—	—	—	C, H	D	
15[a]	Dec. 15, 1952	—	—	10	Dec. 15, 1952	—	—	J, E	D	
23.42	Oct. 23, 1950	—	—	—	—	—	—	C	D	
18[a]	Mar. 25, 1952	25[a]	Mar. 25, 1952	20	Mar. 25, 1952	1	2.8	—	D	
12[a]	Oct. 14, 1951	—	—	—	—	—	—	C, H	I	
25[a]	Sep. 30, 1949	45[a]	Sep. 30, 1949	10+	Sep. 30, 1949	4	.5	J, E	D	
—	—	—	—	3	Oct. 30, 1952	—	—	—	D	
25[a]	Oct. 19, 1943	—	—	75	Oct. 19, 1943	—	—	T, E	C	Owner's well A.
—	—	—	—	50	Oct. 19, 1943	—	—	T, E	N	Owner's well B.

TABLE 15

Well number (Bal-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Fc 3	Howard Cleaners of Balto., Inc.	Bunker	1937	150	Drilled	—	—	—	—	—
Fc 4	Do	do	1937	150	do	70	—	—	—	Patuxent
Fc 5	R. B. Tippett	Downin	1910	540	do	137	6	—	Slope	Gabbro
Fc 6	United Railways	—	—	310	do	161	6	—	do	do
Fc 7	Thayer Stock Farm	Hoshall	1911	420	do	108	6	—	do	do
Fc 8	U. S. Army	Maryland Drilling Co.	1952	260	do	157	6	27	Hilltop	do
Fc 9	John E. Hoerl	Williams	1949	500	do	60	6	41	Slope	do
Fc 10	W. S. Miller	J. R. Edmondson	1950	500	do	61	—	43	Upland	do
Fc 11	Glen Burk	do	1949	430	do	53	5⅝	40	do	do
Fc 12	R. W. Jackson	Dillon	1950	460	do	52	6	18	Hilltop	do
Fc 13	Robert Layman	J. W. Williams	1949	400	do	62	6	60	Upland	do

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remaks
—	—	—	—	—	—	—	—	N	N	Owner's well C.
—	—	—	—	—	—	—	—	N	N	Owner's well D.
18[a]	1910	—	—	8	—	—	—	—	—	
—	—	—	—	20	—	—	—	—	—	
30[a]	—	—	—	80	—	—	—	—	—	
34[a]	Oct. 1953	150[a]	Oct. 1953	28	Oct. 1953	10	0.2	—	M	See chemical analysis.
15[a]	Mar. 3, 1949	25[a]	Mar. 3, 1949	8	Mar. 3, 1949	5	.8	J, E	D	
20[a]	July 21, 1950	—	—	20	July 21, 1950	1	—	J, E	D	
20[a]	Oct. 23, 1946	25[a]	Oct. 23, 1946	5	Oct. 23, 1946	1	1	J, E	D	
10[a]	Nov. 27, 1950	—	—	6	Nov. 27, 1950	—	—	J, E	D	
15[a]	July 12, 1949	20[a]	July 12, 1949	8	July 12, 1949	5	1.6	C, E	D	

TABLE 16

Records of Springs in Baltimore County

Pumping equipment: *Method of lift:* C, cylinder; N, none; S, suction; T, turbine.
Type of power: E, electric motor.
Use of water: C, commercial; D, domestic; F, farming; I, institutional; N, none.
Remarks: Chemical analyses referred to are in Table 13.

Well number (Bal-)	Owner or name	Altitude (feet)	Type of spring	Topographic situation	Water-bearing formation	Yield (g.p.m.)	Yield Date	Pumping equipment	Use of water	Temperature (°F.)	Remarks
Bc 17	Duncan Black	480	Gravity	Slope	Wissahickon (albite)	⅛	Aug. 25, 1953	N	N	—	Flows into concrete catchment basin.
Cb 21	Wm. McMillan	400	Depression	Valley	Cockeysville marble	40	July 13, 1954	N	F	53.8	
Cc 1	Community of Butler	340	do	do	do	—	—	N	D	54.5	No surface discharge; acts like a dug well.
Cc 12	Fred Boone, Jr.	410	do	do	do	10+	Apr. 28, 1953	S, E	D	54	Field test: hardness 70 ppm.
Cc 13	Do	410	do	do	do	—	—	N	N	—	No improvement of spring. Discharge difficult to estimate.
Cc 15	John D. Gadd	380	do	Draw	Baltimore gneiss	2	May 13, 1953	N	D, F	—	Spring used for 100 years.
Cc 18	Webster Bosley	320	do	Valley	Cockeysville marble	—	—	S, E	F	—	Supplies dairy house and 60 cows.
Cc 19	Do	400	do	Slope	Wissahickon (oligoclase)	2	May 12, 1953	—	D	—	Gravity-fed to house.
Cc 21	Mrs. Anna Bacon	400	do	do	Cockeysville marble and Wissahickon (oligoclase) contact	—	—	—	F	—	Used for cooling milk and for 50 cows.
Cd 23	Clynmalira Estate	460	do	do	Baltimore gneiss	5–7	—	S, E	D, F	—	
Ce 15	Roy E. Perry	500	do	do	Setters	3	Dec. 10, 1952	S, E	D	—	Supplies water to 4 homes.
Db 1	Mrs. J. W. Y. Martin	550	do	do	Wissahickon (oligoclase) and/or Baltimore gneiss	—	—	—	D, F	—	Water system consists of 5–7 improved springs in a draw on a hillside above a valley.
Db 13	Alfred G. Vanderbilt	420	do	Valley	Cockeysville marble	50+	1953	S, E	D, F	53	Supplies horse farm. See chemical analysis.
Db 32	J. Gephardt	620	do	Draw	Wissahickon (oligoclase)	20+	1953	S, E	D, F	—	Supplies 200 cows, swimming pool, and house.
Dc 18	Mrs. J. W. Y. Martin	400	do	Valley	Cockeysville marble	—	—	S, E	D, F	—	Cannot estimate discharge.
Dc 26	Robert H. Levi	320	do	do	do	10–20	Mar. 31, 1953	S, E	D, F	57	Used only occasionally.
Dc 40	Brooklandwood Farms	500	do	Draw	Wissahickon (oligoclase)	—	—	C, E	C, F	—	Combined flow of Dc 40 and 41 17 gal. a min.
Dc 41	Do	500	do	do	do	—	—	C, E	C, F	—	
Dc 42	Do	470	do	do	do	—	—	C, E	C, F	—	
Dc 59	S. Haruta	460	do	Valley	Cockeysville marble	20	Oct. 1953	S, E	D, F	—	Field test: pH, 7.3; hardness, 100 ppm.
Dc 60	C. E. Tuttle	550	Gravity	Slope	Wissahickon (oligoclase)	—	—	N	D, F	—	Field test: pH, 6.0; hardness, 20 ppm.
Dd 10	Baltimore County Police Dept.	480	Depression	Draw	Gunpowder granite	5+	Oct. 31, 1952	N	D	—	Water reported corrosive.
Dd 22	John Zink	540	do	do	Wissahickon (oligoclase)	10+	Mar. 27, 1953	S, E	D	—	
Dd 25	Kelly	460	do	Valley	Cockeysville marble(?)	20	October 1953	S, E	D	—	Field test: pH, 7.0; hardness, 44 ppm.
De 1	Sisters of Notre Dame	240	Contact	do	Cockeysville marble and pegmatite	15–20	Sep. 20, 1949	T, E	I, F	—	
De 3	Do	420	do	Slope	Wissahickon (oligoclase) and pegmatite	5	Oct. 21, 1952	C, E	I	—	

De 4	Maryland National Guard	280	Depression	Draw	Gunpowder granite	2.5	Oct. 21, 1952	S, E	D	—	
Df 4	Dr. C. H. Burton	330	do	Slope	Cockeysville marble	23.2	Feb. 26, 1953	N	F	—	
Df 5	Do	440	do	do	Wissahickon (oligoclase)	5	Feb. 26, 1953	N	F	—	
Df 8	J. W. Edelen	300	do	do	Setters	—	—	—	D, F	—	Supplies 3 houses and 50 cows. Low flow in summer.
Df 32	F. X. Hooper Co.	400	do	do	Wissahickon (oligoclase) and pegmatite	3+	Oct. 24, 1952	N	—	55	For swimming pool and pond for fire protection.
Df 33	Do	400	do	do	do	—	—	C, E	D, C	—	
Df 34	Ritchie (Calvert Spring)	300	Contact	Valley	Gabbro	14	Oct. 13, 1952	S, E	D, C	54	See chemical analysis.
Eb 8	McDonough School	450	Depression	do	Cockeysville marble	35–40	Oct. 27, 1952	C, —	I	53.5	Pumps powered by water wheel. See chemical analysis.
Ec 4	Chattolanee Water Co.	410	Contact	do	Setters and Cockeysville marble	55+	Oct. 24, 1952	S, E	C, D	—	Bottled and sold commercially.
Ec 5	Paul Steinmetz	410	do	do	do	400	—	S, E	D	—	Formerly supplied hotel on hillside.
Ec 7	Mason Janney Estate	320	do	do	Cockeysville marble	—	—	C, E	—	—	Supplies village of Stevenson (pop. 250). See chemical analysis.
Ec 11	L. B. Meacham	360	do	Slope	Baltimore gneiss or Setters	4–5	—	S, E	D	—	
Ed 7	Raymond Long	260	Depression	Valley	Baltimore gneiss	10	—	N	N	—	
Ee 18	Dr. Howard Howe	340	do	Slope	Cockeysville marble	5	Feb. 18, 1953	S, E	—	—	For watering lawn and garden.
Ee 19	Do	320	do	do	do	10	Feb. 18, 1953	N	D	—	
Eg 12	The Frank L. Wight Distilling Co.	100	do	—	Gabbro	2±	Jan. 23, 1953	N	C	—	Springs used with wells to furnish water for processing. Some river water used. See chemical anaylsis.

TAB

Records of Wells

Water level: Reported water levels are designated by "a"
Pumping equipment: *Method of lift:* B, bucket; C, cylinder; J, jet; NI, pump to be installed; N, none; S, suction; T, turbine
Type of power: E, electric motor; G, gasoline engine; H, hand
Use of water: C, commercial; D, domestic; F, farming; I, institutional, camp, church, or school; M, military; N, not used; P, pub
Remarks: Chemical analyses referred to are in Table 14.
Well logs referred to are on Plate 5.

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Aa 2	Paul McElwain	Ray Urey	1946	740	Drilled	109	6	70	Slope	Wissahickon (albite)
Aa 3	Pearl McElwain	do	1947	700	do	100	6	18	Hilltop	do
Aa 4	Robert B. Redden	do	1952	600	do	60	6	12	Slope	do
Aa 5	Walter Swift	do	1952	660	do	72	6	23	do	do
Aa 6	William O. Heaps	R. B. Matthews	1947	750	do	78	6	67	Upland	do
Aa 7	William L. Nelson	Ray Urey	1951	790	do	89	6	23	do	do
Aa 8	John Plummer	do	1952	750	do	86	6	68	do	do
Aa 10	K. S. Nevin	do	1950	620	do	76	6	28	Slope	do
Aa 11	Milton Ober	do	1948	700	do	68	6	34	do	do
Aa 12	Allen Gibson	do	1948	600	do	115	6	44	do	Peters Creek quartzite
Aa 13	Lutheran Inner Mission Society	G. E. Harr Sons	1953	460	do	161	6	23	Valley	Wissahickon (albite)
Aa 14	Do	do	1953	520	do	151	8	55	Slope	do
Aa 15	Girl Scouts Council Inc.	H & H Drilling Co.	1953	660	do	150	8	19	do	do
Ab 1	Cleveland Waltermeyer	Ray Urey	1953	670	do	120	6	—	Hilltop	do
Ab 2	Daniel Muller	do	1953	680	do	121	6	16	do	do
Ab 3	Roy King	A. C. Reider & Son	1949	670	do	154	6	52	do	do
Ab 4	Ora Willis	Henry Thomas	1949	570	do	70	6	45	Slope	Peters Creek quartzite
Ab 5	Hugh Devoe	Ray Urey	1951	540	do	110	6	96	Hilltop	Wissahickon (albite)
Ab 6	William Neal	A. C. Reider & Son	1950	620	do	135	6	56	Slope	do
Ab 7	Raymond Heaps	Ray Urey	1952	630	do	48	6	30	do	do
Ab 8	Charles McGreevy	A. C. Reider & Son	1952	450	do	67	6	35	do	Peters Creek quartzite
Ab 9	R. M. Scarborough	Ray Urey	1952	600	do	104	6	17	Hilltop	do
Ab 10	Louis Walter	do	1952	520	do	73	6	65	Slope	do
Ab 11	Charles Morrison	R. B. Matthews	1946	500	do	56	6	—	do	do
Ac 1	North Harford High School	Henry Thomas	1949	520	do	100	6	61	do	do
Ac 2	Do	do	1949	520	do	140	6	102	do	do
Ac 3	Do	do	1949	520	do	185	6	75	do	do

LE 17

in Harford County

lic supply

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
25[a]	Apr. 24, 1946	40[a]	Apr. 24, 1946	15	Apr. 24, 1946	¾	1.0	J, E	D	See well log.
70[a]	Apr. 26, 1946	85[a]	Apr. 26, 1946	20	Apr. 26, 1946	½	1.3	J, E	D	Water reported entering at bottom of well.
48[a]	Jan. 4, 1952	54[a]	Jan. 4, 1952	6	Jan. 4, 1952	1	1.0	J, E	D	
34[a]	May 21, 1952	39[a]	May 21, 1952	10	May 21, 1952	1	2.0	J, E	D	
8[a]	July 7, 1947	40[a]	July 7, 1947	25	July 7, 1947	1½	.8	J, E	D	Water reported to flow over top of casing 4 ft. below land surface during the spring.
38[a]	Apr. 13, 1951	38[a]	Apr. 13, 1951	20	Apr. 13, 1951	½	—	J, E	D	
—	—	—	—	10	Oct. 14, 1952	1	—	J, E	D	
22[a]	Sep. 27, 1953	22[a]	Sep. 27, 1953	20	Sep. 27, 1953	¾	—	J, E	D	
18[a]	Apr. 16, 1948	30[a]	Apr. 16, 1948	8	Apr. 16, 1948	½	.7	J, E	D	
40[a]	Nov. 4, 1948	—	—	3.5	Nov. 4, 1948	¼	—	J, E	D	
12[a]	Sep. 24, 1953	105[a]	Sep. 24, 1953	5	Sep. 24, 1953	48	—	J, E	I	Camp Jolly Acres. See chemical analysis.
28[a]	Oct. 20, 1953	59[a]	Oct. 20, 1953	60	Oct. 20, 1953	64	2.0	T, E	I	Camp Jolly Acres. For swimming pool. See chemical analysis.
—	—	140[a]	Dec. 1, 1953	25	Dec. 1, 1953	8	.2	J, E	I	For swimming pool. Well flows 3–4 gal. a min. See chemical analysis.
35[a]	Jan. 26, 1953	100[a]	Jan. 26, 1953	6	Jan. 26, 1953	1	.1	C, H	D	
56[a]	Feb. 4, 1953	58[a]	Feb. 4, 1953	14	Feb. 4, 1953	1	7.0	C, H	D	
60.41	June 23, 1953									
60[a]	Sep. 3, 1949	145[a]	Sep. 3, 1949	5	Sep. 3, 1949	1	.1–	J, E	D	
44[a]	Dec. 15, 1949	65[a]	Dec. 15, 1949	4	Dec. 15, 1949	—	.2	N	N	
46.00	June 25, 1953									
7[a]	May 5, 1951	40[a]	May 5, 1951	16	May 5, 1951	1	.5	—	D	See well log.
58[a]	Jan. 17, 1950	125[a]	Jan. 17, 1950	2	Jan. 17, 1950	—	.1–	—	D	
32[a]	Oct. 6, 1952	35[a]	Oct. 6, 1952	10	Oct. 6, 1952	1	3.3	C, H	D	
35[a]	Apr. 21, 1952	55[a]	Apr. 21, 1952	12	Apr. 21, 1952	1	.6	C, H	D	
53[a]	Oct. 2, 1952	70[a]	Oct. 2, 1952	9	Oct. 2, 1952	¾	.5	J, E	D	
31.91	June 25, 1953									
30[a]	July 21, 1952	40[a]	July 21, 1952	10	July 21, 1952	1	1.0	J, E	D	
20[a]	Dec. 26, 1946	50[a]	Dec. 26, 1946	1	Dec. 26, 1946	1	.1–	C, H	D	
13[a]	Apr. 8, 1949	36[a]	Apr. 8, 1949	68	Apr. 8, 1949	12	2.9	T, E	I	Owner's well no. 1. See chemical analysis.
7[a]	Apr. 29, 1949	115[a]	Apr. 29, 1949	12	Apr. 29, 1949	12	.1	N	N	Insufficient water; casing removed and well plugged with clay. See well log.
15[a]	May 16, 1949	70.5[a]	May 16, 1949	56	May 16, 1949	12	1.0	T, E	I	See chemical analysis and well log.

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Ac 4	Harry McAllister	Ed Urey	1952	520	Drilled	94	6	19	Hilltop	Peters Creek quartzite
Ac 5	John C. Webster	R. B. Matthews	1948	430	do	100	6	—	Slope	do
Ac 6	Leslie Johnson	A. C. Reider & Son	1951	350	do	50	6	35	Valley	do
Ac 7	Watson McAllister	Ed Urey	1951	380	do	70	6	40	do	do
Ac 8	D. G. Harry	Henry Thomas	1951	400	do	110	6	82	Hilltop	do
Ac 9	Do	do	1951	400	do	150	6	135	Slope	do
Ac 10	Highland Elementary School	do	1952	510	do	190	6	84	Hilltop	do
Ac 11	Paul Keesee	Ed Urey	1951	520	do	73	6	26.7	Slope	Serpentine
Ac 12	Everett Pyle	do	1946	550	do	111	6	69.5	Hilltop	Peters Creek quartzite
Ac 13	Whiteford Packing Co.	—	—	520	do	200	6	—	Slope	do
Ac 14	Do	—	—	520	do	200	6	—	do	do
Ac 15	Do	A. C. Reider & Son	1950	520	do	216	8	98.5	do	do
Ac 16	Do	—	—	520	do	250	6	—	do	do
Ac 17	Do	—	—	520	do	200	6	—	do	do
Ac 18	Do	—	—	520	do	200	6	—	do	do
Ac 19	L. J. Brodie	Ray Urey	1947	580	do	56	6	28.6	do	do
Ac 20	Walter Pruitt	A. C. Reider & Son	1953	460	do	122	6	—	do	do
Ac 21	James H. Spencer	Ray Urey	1953	440	do	99	6	20.5	Hilltop	do
Ac 22	E. Paul Snodgrass	do	1947	520	do	84	6	59	do	do
Ac 23	Thomas F. Petty	A. C. Reider & Son	1953	460	do	128	6	—	do	do
Ac 24	L. M. Thornton	H & H Drilling Co.	1952	520	do	125	6	30	do	do
Ac 25	Harford County Highway Dept.	Ed Urey	1952	620	do	80	6	—	Slope	Peach Bottom slate
Ac 26	Sidney Fore	Ray Urey	1953	520	do	50	6	22	do	Peters Creek quartzite(?)
Ad 1	Mr. Garrett	Henry Thomas	1949	440	do	98	6	83	do	Peters Creek quartzite
Ad 2	Frank R. Davis	George Thomas	1947	420	do	78	6	15	Hilltop	do
Ad 3	Robert Rutledge	Henry Thomas	1947	350	do	82	6	14	Slope	do
Ad 4	Freeman Rutledge	do	1948	410	do	98	6	16	do	do
Ad 5	Paul McNabb	do	1948	480	do	99	6	99	Hilltop	do
Ad 6	Tabernacle Church	Ed Urey	1950	320	do	114	6	11.5	do	do
Ad 7	Charles Adams	do	1949	250	do	56	6	—	Valley	do
Ad 8	James Kerr	do	1948	300	do	70	6	25	Slope	do
Ad 9	Gerald Heaps	do	1951	380	do	77	6	68	Valley	do
Ad 10	Owen Ford	Ray Urey	1949	470	do	86	6	34	Slope	do
Ad 11	Henry Ford	do	1949	500	do	122	6	—	Hilltop	do
Ad 12	Boy Scouts of America	Eiler	1947	200	do	75	6	15	Slope	do
Ad 13	Do	do	1947	260	do	90	6	22	do	do

—*Continued*

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
47[a]	Sep. 10, 1952	80[a]	Sep. 10, 1952	8	Sep. 10, 1952	5	0.2	J, E	D	
50[a]	Mar. 30, 1948	80[a]	Mar. 30, 1948	10	Mar. 30, 1948	1	.3	J, E	D, F	
18[a]	Dec. 10, 1951	45[a]	Dec. 10, 1951	8	Dec. 10, 1951	1	.3	J, E	D	Driller reported slate 32-50 ft.
25[a]	June 7, 1951	—	—	—	—	—	—	C, H	D	
60[a]	Oct. 29, 1951	88[a]	Oct. 29, 1951	15	Oct. 29, 1951	1	.5	C, H	D	
32[a]	Oct. 29, 1951	94[a]	Oct. 29, 1951	30	Oct. 29, 1951	5	.5	S, E	D, F	
65[a]	Apr. 17, 1952	66[a]	Apr. 17, 1952	25	Apr. 17, 1952	12	25	C, E	I	
9[a]	Aug. 13, 1951	—	—	5.5	Aug. 13, 1951	¾	—	J, E	D	
61[a]	June 25, 1946	83[a]	June 25, 1946	10	June 25, 1946	½	.4	—	D	
—	—	—	—	135	July 8, 1953	—	—	T, E	C	Owner's well no. 1. Wel. flows during winterl Pumped 70-100 gal. a min. during summer. Flowing 25 gal. a min., Mar. 3, 1954. See chemical analysis.
—	—	—	—	10-20	July 8, 1953	—	—	T, E	C	Owner's well no. 2.
18[a]	Jan. 27, 1950	155[a]	Jan. 27, 1950	70	Jan. 27, 1950	12	.5	T, E	C	Owner's well no. 3.
—	—	—	—	20	—	—	—	C, E	C	Owner's well no. 4.
—	—	—	—	—	—	—	—	—	N	Owner's well no. 5. Abandoned because of low yield.
—	—	—	—	—	—	—	—	—	N	Abandoned because of low yield.
—	—	—	—	12	—	¼	12	J, E	D	
32[a]	Feb. 5, 1953	110[a]	Feb. 5, 1953	7	Feb. 5, 1953	1	.1—	J, E	D	
52[a]	Mar. 10, 1953	56[a]	Mar. 10, 1953	8	Mar. 10, 1953	1	2	J, E	D	
63[a]	Jan. 10, 1947	72[a]	Jan. 10, 1947	16	Jan. 10, 1947	¼	1.7	C, E	D	
65[a]	June 4, 1953	90[a]	June 4, 1953	8	June 4, 1953	2	.3	J, E	D	
65[a]	Jan. 2, 1952	120[a]	Jan. 2, 1952	5	Jan. 2, 1952	1	.1—	J, E	D	
30[a]	J[illegible] 5, 1952	40[a]	July 5, 1952	10	July 5, 1952	½	1.0	—, E	D	
14[a]	Aug. 7, 1953	—	—	6	Aug. 7, 1953	¼	—	J, E	D	
18[a]	Aug. 13, 1949	55[a]	Aug. 13, 1949	20	Aug. 13, 1949	1	.5	J, E	D	
52[a]	Aug. 30, 1947	58[a]	Aug. 30, 1947	16	Aug. 30, 1947	1	2.6	N	N	
60[a]	Sep. 5, 1947	62[a]	Sep. 5, 1947	20	Sep. 5, 1947	1	10	J, E	D	
48[a]	May 26, 1948	60[a]	May 26, 1948	20	May 26, 1948	2	1.6	J, E	D	
45[a]	Oct. 20, 1948	65[a]	Oct. 20, 1948	12	Oct. 20, 1948	2	.6	J, E	D	
45[a]	Oct. 27, 1950	100[a]	Oct. 27, 1950	6	Oct. 27, 1950	1	.1	—	I	
12[a]	Jan. 18, 1949	32[a]	Jan. 18, 1949	10	Jan. 18, 1949	½	.5	C, H	D	
37[a]	Dec. 12, 1948	55[a]	Dec. 12, 1948	6.3	Dec. 12, 1948	—	.3	C, H	D	
33[a]	Aug. 30, 1951	—	—	3	Aug. 30, 1951	1	—	J, E	D	
40[a]	May 28, 1949	—	—	10	May 28, 1949	¼	—	J, E	D	
80[a]	May 20, 1949	—	—	10	May 20, 1949	½	—	J, E	D	See well log.
24[a]	Jan. 6, 1947	60[a]	Jan. 6, 1947	25	Jan. 6, 1947	24	.7	T, E	I	
—	—	70[a]	Jan. 22, 1947	25	Jan. 6, 1947	24	—	T, E	I	See chemical analysis.

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Ae 1	Donald Miller	Ray Urey	1946	320	Drilled	98	6	21.5	Hilltop	Peters Creek quartzite
Ae 2	Thomas Knight	S. D. Smith	1951	290	do	87	6	61.5	Slope	Serpentine
Ae 3	Marshall Hamilton	Ed Urey	1950	280	do	55	6	37	do	Peters Creek quartzite
Ba 1	John C. Duval	do	1953	600	do	99	6	13	Hilltop	do
Ba 2	Millard J. Almony	do	1950	640	do	92	6	33.5	do	do
Ba 3	Walter Slade	do	1950	620	do	85	6	25.5	Slope	do
Ba 4	Md. Dept. of Forests and Parks	H & H Drilling Co.	1953	720	do	152	6	102	Hilltop	Wissahickon (oligoclase)
Ba 5	Wm. Wagenfuehr	do	1950	600	do	64	6	40	do	do
Ba 6	Arthur Jackson	R. B. Matthews	1947	600	do	68	6	—	Slope	Peters Creek quartzite
Ba 8	J. R Anderson	do	1947	620	do	53	6	—	do	do
Ba 10	Kenneth W. Kirkwood	Ed Urey	1953	610	do	82	6	66.5	Hilltop	do
Ba 11	William Ford	Ray Urey	1947	620	do	93	6	77.5	do	do
Ba 12	Arthur Edie	do	1950	600	do	51	6	22	Slope	do
Ba 13	A. R. Anderson	R. B. Matthews	1947	580	do	35	6	—	do	do
Ba 14	Lynn Kinhart	Ed Urey	1946	690	do	90	6	29.5	Hilltop	Wissahickon (oligoclase)
Ba 15	D. W. Kinhart	do	1948	670	do	122	6	57.7	do	do
Ba 16	Frank Titman	Ray Urey	1951	670	do	160	6	56.1	do	do
Ba 17	Geo. Lachman	Ed Urey	1946	650	do	90	6	28	do	do
Ba 18	William Butcher	G. E. Harr Sons	1951	640	do	125	6	—	do	do
Ba 19	Chester L. Cogswell	A. C. Reider & Son	1953	600	do	53	6	—	do	Setters
Ba 20	T. C. Rove	R. B. Matthews	1948	720	do	70	6	—	do	Wissahickon (oligoclase)
Ba 21	Ross E. Markline	do	1948	710	do	100	6	—	do	do
Ba 22	Ross Hanna	Ray Urey	1949	700	do	60	6	47	do	do
Ba 23	A. S. Hess	Ed Urey	1946	660	do	128	6	78	Slope	do
Ba 24	Howard Turner	Ray Urey	1949	640	do	57	6	46.1	do	do
Ba 25	Louis Neilson	R. B. Matthews	1947	580	do	55	6	—	do	do
Ba 26	R. D. Copenhaven	do	1948	630	do	41	5	33	Rolling upland	do
Bb 1	Karl C. Ascherfeld	—	1919	670	Dug	45	36	—	Upland	do
Bb 2	Stanley Dixon	H & H Drilling Co.	1951	710	Drilled	76	6	40	do	do
Bb 3	J. H. Amrein	Ray Urey	1953	600	do	90	6	40	Hilltop	do
Bb 4	Thomas R. Lytle	H & H Drilling Co.	1950	620	do	61	6	36	do	do
Bb 5	Melvin Kefauver	do	1951	620	do	154	6	102	Slope	do
Bb 6	E. A. Zimmerman	do	1951	580	do	44	6	17	Hilltop	do
Bb 7	Melvin Kefauver	do	1948	590	do	79	6	79	do	do
Bb 8	Earl Belcher	do	1948	550	do	137	6	44	do	do
Bb 9	S. W. Emerson	do	1948	640	do	39	6	—	Slope	do
Bb 10	Thurman Ellis	do	1952	520	do	83	6	16	do	Serpentine
Bb 11	Mrs. Elsie Gross	do	1946	600	do	93	6	—	do	Wissahickon (oligoclase)
Bb 12	Wm. Maslin	do	1952	630	do	89	6	70	Upland	do
Bb 13	Archer J. Taylor	do	1952	640	do	86	6	47	do	do

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Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
61[a]	Apr. 30, 1946	—	—	6	Apr. 30, 1946	—	—	C, E	D	Water in quartz at 79–81 ft. See well log.
10[a](?)	Jan. 30, 1951	22[a](?)	Jan. 30, 1951	12	Jan. 30, 1951	5	1.0	—, E	D	
16[a]	Apr. 22, 1950	25[a]	Apr. 22, 1950	10	Apr. 22, 1950	½	1.1	C, E	D	
51[a]	Jan. 5, 1953	60[a]	Jan. 5, 1953	10	Jan. 5, 1953	1	1.1	C, H	D	
50[a]	Jan. 27, 1950	50[a]	Jan. 27, 1950	5	Jan. 27, 1950	¼	5	J, E	D	
33[a]	Sep. 9, 1950	53[a]	Sep. 9, 1950	20	Sep. 9, 1950	¾	20	J, E	D, F	
43[a]	Jan. 24, 1953	145[a]	Jan. 24, 1953	.8	Jan. 24, 1953	1	.1—	C, E	D	See well log.
38[a]	July 8, 1950	55[a]	July 8, 1950	12	July 8, 1950	1	.7	J, E	D	
30[a]	Nov. 10, 1947	50[a]	Nov. 10, 1947	20	Nov. 10, 1947	1	1	J, E	D, F	
25[a]	Nov. 20, 1947	—	—	10	Nov. 20, 1947	—	—	J, E	D, F	
57[a]	Jan. 18, 1953	67[a]	Jan. 18, 1953	10	Jan. 18, 1953	1	1	J, E	D, F	
—	—	68[a]	Nov. 24, 1947	12	—	1½	—	J, E	D, F	
16[a]	Sep. 6, 1950	16[a]	Sep. 6, 1950	20	Sep. 6, 1950	¾	20	J, E	F	
18[a]	Apr. 8, 1947	23[a]	Apr. 8, 1947	30	Apr. 8, 1947	1	6	J, E	D	Dug well, same depth, 15 ft. from drilled well, produces very little water.
38[a]	June 17, 1946	75[a]	June 17, 1946	5.5	June 17, 1946	½	.1	J, E	D	
28[a]	Aug. 3, 1948	—	—	—	—	—	—	J, E	D	
10[a]	Dec. 19, 1951	27[a]	Dec. 19, 1951	.8	Dec. 19, 1951	¾	.1—	C, E	D	See well log.
41[a]	June 11, 1946	70[a]	June 11, 1946	5	June 11, 1946	½	.2	J, E	D	
40[a]	Oct. 12, 1951	100[a]	Oct. 12, 1951	4	Oct. 12, 1951	8	.1	J, E	D	
20[a]	May 15, 1953	45[a]	May 15, 1953	7	May 15, 1953	1	.3	N	D	
35[a]	Aug. 6, 1948	50[a]	Aug. 6, 1948	15	Aug. 6, 1948	1	.6	J, E	D	
25[a]	Apr. 9, 1948	85[a]	Apr. 9, 1948	10	Apr. 9, 1948	½	.2	C, E	D	
26[a]	June 13, 1949	38[a]	June 13, 1949	20	June 13, 1949	½	1.6	C, E	D, F	
22[a]	Mar. 22, 1946	24[a]	Mar. 22, 1946	20	Mar. 22, 1946	½	10	C, E	D, F	Do.
30[a]	June 9, 1949	40[a]	June 9, 1949	5	June 9, 1949	¼	.5	J, E	D, F	
27[a]	May 16, 1947	30[a]	May 16, 1947	27	May 16, 1947	¼	9	J, E	D, F	
30[a]	Aug. 23, 1948	40[a]	Aug. 23, 1948	20	Aug. 23, 1948	3	2	—	D	
32.12	Aug. 22, 1946	—	—	—	—	—	—	C, E	D, F	170-ft. well drilled inside dug well is not used.
32[a]	Feb. 7, 1951	60[a]	Feb. 7, 1951	5	Feb. 7, 1951	1	.2	—	D	
28[a]	Feb. 13, 1953	80[a]	Feb. 13, 1953	3	Feb. 13, 1953	¾	.1—	J, E	D	
35[a]	Apr. 10, 1950	45[a]	Apr. 10, 1950	20	Apr. 10, 1950	2	2	J, E	D	
30[a]	Jan. 7, 1951	90[a]	Jan. 7, 1951	1.5	Jan. 7, 1951	1	.1—	J, E	D	
16[a]	Feb. 1, 1951	20[a]	Feb. 1, 1951	30	Feb. 1, 1951	1	7.5	C, E	D	
27[a]	Oct. 12, 1948	65[a]	Oct. 12, 1948	7	Oct. 12, 1948	1	.2	J, E	D	
30[a]	Nov. 9, 1948	130[a]	Nov. 9, 1948	1	Nov. 9, 1948	2	.1—	J, E	D	See well log.
14[a]	Oct. 20, 1948	—	—	—	—	—	—	N	D	Measured water level 12.48 ft. below land surface, July 14, 1953.
10[a]	Apr. 22, 1952	80[a]	Apr. 22, 1952	2	Apr. 22, 1952	1	.1—	J, E	D	See chemical analysis.
10[a]	Nov. 12, 1946	70[a]	Nov. 12, 1946	3	Nov. 12, 1946	1	.1—	N	N	Insufficient supply for commercial use; well destroyed.
20[a]	Jan. 2, 1952	80[a]	Jan. 2, 1952	3	Jan. 2, 1952	1	.1—	J, E	D	
32[a]	Dec. 22, 1952	65[a]	Dec. 22, 1952	20	Dec. 22, 1952	1	.6	J, E	D	

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Bb 14	Kurtz Fuller	Ed Urey	1948	640	Drilled	469	6	67.6	Upland	Wissahickon (oligoclase)
Bb 15	Charles St. Claire	A. C. Reider & Son	1951	640	do	89	6	40	do	do
Bb 16	C. Edwin Henderson	do	1950	640	do	273	6	56	do	do
Bb 17	Charles Morris	Ray Urey	1953	510	do	50	6	41	Slope	do
Bb 18	Earl Schilling	H & H Drilling Co.	1948	580	do	93	6	65	Hilltop	do
Bb 19	William F. Green	Ray Urey	1951	640	do	110	6	34	do	do
Bb 20	Charles E. Grimmel	H & H Drilling Co.	1947	680	do	72	6	22	Upland	do
Bb 21	Walter Grimmel	do	1951	670	do	63	6	54	do	do
Bb 22	Miss M. E. Foard	do	1948	570	do	122	6	76	do	Peters Creek quartzite
Bb 23	Do	do	1948	590	do	100	6	60	Hilltop	do
Bb 24	Edward Swann	do	1948	520	do	100	6	24	Slope	do
Bb 25	Oscar Swann	do	1951	520	do	91	6	50	do	do
Bb 26	Harry W. Wright	R. B. Matthews	1947	600	do	90	6	75	Hilltop	do
Bb 20	Baptist W. M. U. of Md.	H & H Drilling Co.	1952	380	do	50	8	35	Slope	do
Bb 28	Do	do	1952	500	do	138	8	2	do	do
Bb 29	Do	do	1953	560	do	190	—	—	do	do
Bb 30	Joseph Bowers	do	1949	400	do	360	6	59	Hilltop	do
Bb 31	Charles Atkins	do	1949	500	do	105	6	44	do	do
Bb 32	Wiley DeBoard	do	1948	410	do	72	6	13	do	do
Bb 33	Do	do	1947	420	do	47	6	6	Slope	do
Bb 34	Joseph Masel	do	1947	460	do	46	6	36	Hilltop	do
Bb 35	Allen St. Clair	do	1948	320	do	55	6	22	Slope	do
Bb 36	U. S. Geological Survey	G. E. Harr Sons	1954	310	do	106	6	22	Valley	do
Bb 37	Jarrettsville Volunteer Fire Dept.	—	—	640	Dug	27	60+	—	Slope	Wissahickon (oligoclase)
Bb 38	Howard Phillips	Werneke Bros.	1953	620	Drilled	50	6	26	do	do
Bb 39	Do	do	1953	620	do	97	6	16	do	do
Bc 1	J. Walter Webster	H & H Drilling Co.	1952	440	do	30	6	28	Valley	Peters Creek quartzite
Bc 2	Lawrence W. Cameron	Ray Urey	1951	480	do	144	6	—	Slope	do
Bc 3	Van Sheppard	Ed Urey	1949	520	do	103	6	98	do	do
Bc 4	C. T. Walker	do	1947	440	do	124	6	103	do	do
Bc 5	Howard Cox	A. C. Reider & Sons	1952	420	do	145	6	—	Hilltop	do
Bc 6	Allen West	H & H Drilling Co.	1952	360	do	78	4	72	do	Wissahickon (oligoclase)
Bc 7	Harry E. Snider	Werneke Bros.	1953	280	do	50	6	50	Slope	do
Bc 8	Grace Tolliver	do	1946	300	do	76	6	40	Hilltop	do
Bc 9	B. C. Reeves	H & H Drilling Co.	1951	490	do	50	6	40	do	do
Bc 10	Ralph Moxley	Ray Urey	1952	400	do	97	6	—	Slope	do
Bc 11	Worth Sturgil	H & H Drilling Co.	1950	460	do	61	6	44	Hilltop	do
Bc 12	Arthur Devoe	R. B. Matthews	1947	450	do	60	6	58	do	do
Bc 13	Guy Bugh	H & H Drilling Co.	1948	510	do	80	6	44	do	do
Bc 14	Frank S. Clark	Ray Urey	1952	530	do	72	6	41.5	do	do
Bc 15	Charles Harward	H & H Drilling Co.	1949	560	do	90	6	60	Slope	do
Bc 16	John Miller	Werneke Bros.	1950	550	do	75	6	45	do	do
Bc 17	Charles H. Wilson	do	1946	550	do	99	$5\frac{5}{8}$	77	Upland	do
Bc 18	Do	—	1912	550	Dug	38	36	—	Slope	do

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
169[a]	Aug. 30, 1948	455[a]	Aug. 30, 1948	0.8	Aug. 30. 1948	2	0.1—	C, E	D	Supply reported adequate. See well log.
35[a]	Sep. 26, 1951	80[a]	Sep. 26, 1951	10	Sep. 26, 1951	2	.2	J, E	D	
40[a]	Aug. 11, 1950	250[a]	Aug. 11, 1950	10	Aug. 11, 1950	1	.1—	J, E	D	
18[a]	Mar. 11, 1953	30[a]	Mar. 11, 1953	10	Mar. 11, 1953	1	.8	N	D	
20[a]	Aug. 8, 1948	—	—	2	Aug. 8, 1948	1	—	J, E	D	
47[a]	Sep. 28, 1951	—	—	3	Sep. 28, 1951	½	—	J, E	D	
30[a]	May 25, 1951	—	—	6	May 25, 1951	½	—	J, —	D	
12[a]	May 28, 1951	—	—	2.5	May 28, 1951	1	—	J, E	D	
80[a]	Apr. 21, 1948	110[a]	Apr. 21, 1948	4	Apr. 21, 1948	1	.1	C, E	D	
72[a]	Apr. 17, 1948	90[a]	Apr. 17, 1948	4	Apr. 17, 1948	1	.2	C, H	D	
48[a]	Apr. 28, 1948	90[a]	Apr. 28, 1948	1	Apr. 28, 1948	1	.1—	C, H	D	
70[a]	May 28, 1951	80[a]	May 28, 1951	5	May 28, 1951	1	.5	J, E	D	
50[a]	June 10, 1947	80[a]	June 10, 1947	15	June 10, 1947	½	.5	J, E	D	
35[a]	Oct. 7, 1952	44[a]	Oct. 7, 1952	12	Oct. 7, 1952	2	1.3	J, E	I	
38[a]	Oct. 7, 1952	42[a]	Oct. 7, 1952	17	Oct. 7, 1952	10	4.2	J, E	I	Camp for 120 people. See chemical analysis.
46.35	Feb. 1, 1954									
—	—	—	—	—	—	—	—	S, E	I	Water used for swimming pool.
75[a]	Aug. 18, 1949	300[a]	Aug. 18, 1949	5	Aug. 18, 1949	2	.1—	—	D, F	See well log.
72[a]	Feb. 19, 1954	80[a]	Feb. 19, 1954	12	Feb. 19, 1954	1	1.5	C, E	D	
42[a]	Mar. 12, 1948	35[a]	Mar. 12, 1948	10	Mar. 12, 1948	—	.4	J, E	D	
17[a]	June 24, 1947	30[a]	June 24, 1947	4	June 24, 1947	1	.3	J, E	D, F	
27[a]	June 14, 1947	35[a]	June 14, 1947	10	June 14, 1947	1	1.2	J, E	D	
30[a]	Mar. 27, 1948	45[a]	Mar. 27, 1948	2	Mar. 27, 1948	1	.1	C, H	D	
7[a]	Mar. 3, 1954	60[a]	Mar. 3, 1954	2	Mar. 3, 1954	—	—	N	N	Plugged and abandoned.
21.32	Jan. 11, 1953	—	—	—	—	—	—	C, H	N	
—	—	—	—	20	Apr. 1, 1953	1	—	J, E	D	
35[a]	Apr. 28, 1953	—	—	—	—	—	—	J, E	D	
2[a]	Jan. 29, 1954	6[a]	Jan. 29, 1954	40	Jan. 29, 1954	1	10	S, E	D	
40[a]	Dec. 20, 1951	—	—	4	Dec. 20, 1951	—	—	J, E	D	See well log.
43[a]	Oct. 26, 1949	85[a]	Oct. 26, 1949	8	Oct. 26, 1949	¾	.2	J, E	D	
37[a]	Apr. 14, 1947	110[a]	Apr. 14, 1947	2.5	Apr. 14, 1947	¼	.1—	C, E	D	
—	—	—	—	3	Apr. 1952	—	—	J, E	D	
35[a]	Jan. 10, 1952	60[a]	Jan. 10, 1952	8	Jan. 10, 1952	2	.3	C, H	D	
10[a]	Apr. 8, 1953	—	—	—	—	—	—	J, E	D	
40[a]	Feb. 4, 1946	—	—	2	—	2	—	J, E	D	
28[a]	Jan. 8, 1951	35[a]	Jan. 8, 1951	8	Jan. 8, 1951	1	1	J, E	D	
36[a]	Dec. 8, 1952	70[a]	Dec. 8, 1952	1	Dec. 8, 1952	¾	.1—	N	D	
25[a]	Jan. 28, 1950	50[a]	Jan. 28, 1950	10	Jan. 28, 1950	1	.4	J, E	D	
15[a]	Mar. 25, 1947	38[a]	Mar. 25, 1947	10	Mar. 25, 1947	1	.4	J, E	D	
37[a]	Feb. 16, 1948	60[a]	Feb. 16, 1948	4	Feb. 16, 1948	1	.2	J, E	D	
30[a]	May 9, 1952	35[a]	May 9, 1952	15	May 9, 1952	1	3	J, E	D	
32[a]	Mar. 24, 1949	50[a]	Mar. 24, 1949	15	Mar. 24, 1949	1	.8	J, E	D	
25[a]	July 29, 1950	55[a]	July 29, 1950	20	July 29, 1950	1½	.6	C, E	D	
30[a]	Feb. 21, 1946	—	—	10	Feb. 21, 1946	½	—	J, E	D	
35.34	May 6, 1954	—	—	—	—	—	—	C, H	N	

TABLE 1

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Bd 1	U. S. Geological Survey	G. E. Harr Sons	1954	240	Drilled	124	6	22	Valley	Peters Creek quartzite
Bd 2	Do	do	1954	240	do	71	6	21	do	do
Bd 3	Willard M. Johnson	Ed Urey	1953	340	do	62	6	46	Hilltop	Wissahickon (oligoclase)
Bd 4	Fred Kelly	Ray Urey	1950	360	do	70	6	16	Slope	Serpentine
Bd 5	F. L. Goodwin	H & H Drilling Co.	1951	360	do	68	6	45	Hilltop	do
Bd 6	Mrs. Fanny Wilson	do	1952	290	do	19	6	16	Slope	Wissahickon (oligoclase)
Bd 7	Wilton Walter	do	1952	370	do	52	6	46	do	do
Bd 8	Garvey Wilmoth	Geo. Thomas	1947	410	do	37	6	34	Hilltop	do
Bd 9	Dennis Scarborough	H & H Drilling Co.	1952	430	do	220	6	113	Upland	Serpentine
Bd 10	Delmar Huff	Ed Urey	1953	420	do	73	6	35	do	Wissahickon (oligoclase)
Bd 11	Kenneth A. Coulson	do	1953	410	do	75	6	17	Hilltop	do
Bd 12	Arthur Moore	Ray Urey	1951	460	do	81	6	26	do	do
Bd 13	Frank Ward	do	1950	430	do	96	6	—	do	do
Bd 14	Webb Pomraning	do	1950	440	do	89	6	30	do	do
Bd 15	Britton Woods	do	1952	420	do	96	6	23	do	Serpentine
Bd 16	Howard R. Marrs	do	1952	420	do	53	6	13	do	do
Bd 17	J. R. Williams	Ed Urey	1949	410	do	52	6	4.5	do	Wissahickon (oligoclase)
Bd 18	Frank L. Conley	do	1951	400	do	130	6	35	Slope	do
Bd 19	Frank Taylor	H & H Drilling Co.	1949	440	do	46	6	—	Upland	Gabbro
Bd 20	Leon Dudeck	do	1949	420	do	64	6	60	do	do
Bd 21	Lester Dorney, Jr.	A. C. Reider & Son	1953	420	do	70	6	51	do	do
Bd 22	James Webster	H & H Drilling Co.	1949	400	do	39	6	38	Hilltop	do
Bd 23	Charles Durham	do	1953	320	do	32	6	32	Slope	do
Bd 24	Roy Maxley	Herbert Morgan	1948	380	do	73	6	—	Hilltop	do
Bd 25	Harry Gorrell	H & H Drilling Co.	1951	220	do	105	6	45	do	Port Deposit gneiss
Bd 26	Warren Wertman	Howard Thomas	1949	320	do	36	6	34	do	Gabbro
Bd 27	Elmore Kennard	H & H Drilling Co.	1950	420	do	66	6	58	do	do
Bd 28	Stevenson W. Sherman	do	1948	440	do	62	6	61	do	do
Bd 29	Do	A. C. Reider & Son	1952	420	do	43	6	—	do	do
Bd 30	Do	H & H Drilling Co.	1952	410	do	32	6	27	do	do
Bd 31	R. Lamar McCann	—	1800	440	Dug	26	36	—	Upland	do
Bd 32	Do	—	old	440	do	37	36	—	do	do
Be 1	Samuel Orr, Sr.	Herbert Morgan	1949	320	Drilled	—	6	72	do	do
Be 2	C. Eugene Weaver	H & H Drilling Co.	1952	340	do	37	6	32	Hilltop	do
Be 3	Earl Pressberry	do	1952	400	do	82	6	79	do	do
Be 4	E. R. P. Smith	Ed Urey	1950	350	do	41	6	11.5	Slope	do
Be 5	M. Anthony	G. E. Rinier	1948	320	do	59	6	50	Upland	do
Be 6	Harvey Jourdan	F. H. Dougherty	1953	300	do	55	6	18	Hilltop	Port Deposit gneiss
Be 7	Lily E. Lee	Henry Thomas	1950	320	do	30	6	30	Slope	Gabbro
Be 8	John D. Cooley	H & H Drilling Co.	1952	320	do	83	6	80	Upland	do
Be 9	Charles Brown	G. E. Rinier	1950	340	do	71	6	68	do	do
Be 10	Mrs. Francis Silver	George Thomas	1949	330	do	60	6	—	Hilltop	do
Be 11	Frederick McArthur	Henry Thomas	1948	300	do	61	5	—	Slope	do
Be 12	Thomas Reynolds	G. E. Rinier	1948	260	do	64	6	58	Upland	do

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
4.46	Feb. 2, 1954	66[a]	Feb. 2, 1954	10	Feb. 2, 1954	2	0.2	N	N	U.S.G.S. test well 2. Abandoned and filled.
4.0	Feb. 1954	42.4	Feb. 1954	5	Feb. 1954	1¼	.1	N	N	U.S.G.S. test well 3. Abandoned and filled.
32[a]	May 14, 1953	54[a]	May 14, 1953	5	May 14, 1953	½	.2	J, E	D	
36[a]	June 2, 1950	60[a]	June 2, 1950	9	June 2, 1950	½	.3	J, E	D	
35[a]	Feb. 1, 1951	45[a]	Feb. 1, 1951	15	Feb. 1, 1951	1	1.5	J, E	D	
8[a]	Feb. 28, 1952	12[a]	Feb. 28, 1952	20	Feb. 28, 1952	1	5	J, E	D, F	
34[a]	Jan. 29, 1952	52[a]	Jan. 29, 1952	52	Jan. 29, 1952	1	2.8	C, H	D, F	
13[a]	Jan. 20, 1947	25[a]	Jan. 20, 1947	6	Jan. 20, 1947	1	.5	J, E	D	
—	—	—	—	—	—	—	—	N	N	Casing pulled, abandoned and plugged.
22[a]	May 20, 1953	22[a]	May 20, 1953	10	May 20, 1953	½	—	J, E	D	
42[a]	May 27, 1953	42[a]	May 27, 1953	10	May 27, 1953	½	—	N	D	
45.72	Mar. 19, 1954									
32[a]	Oct. 23, 1951	—	—	2.5	Oct. 23, 1951	½	—	J, E	D	
32[a]	Aug. 31, 1950	40[a]	Aug. 31, 1950	6	Aug. 31, 1950	¾	.8	—	D	
28[a]	June 26, 1950	58[a]	June 26, 1950	6	June 26, 1950	¾	.2	J, E	D	
30[a]	Feb. 19, 1952	50[a]	Feb. 19, 1952	4	Feb. 19, 1952	1	.2	J, E	D	
16[a]	Feb. 22, 1952	40[a]	Feb. 22, 1952	2	Feb. 22, 1952	1	.1−	C, H	D	
17.20	Mar. 19, 1954									
18[a]	Sep. 6, 1949	40[a]	Sep. 6, 1949	5	Sep. 6, 1949	1½	.2	C, E	D	
30[a]	Apr. 23, 1951	125[a]	Apr. 23, 1951	3	Apr. 23, 1951	½	.1−	C, E	D, F	
12[a]	Oct. 24, 1949	30[a]	Oct. 24, 1949	5	Oct. 24, 1949	1	.3	J, E	D	
9[a]	July 13, 1949	54[a]	July 13, 1949	2	July 13, 1949	1	.1−	J, E	D	
29[a]	Mar. 27, 1953	60[a]	Mar. 27, 1953	6	Mar. 27, 1953	2	.2	J, E	D	
20[a]	Mar. 17, 1949	28[a]	Mar. 17, 1949	10	Mar. 17, 1949	1	1.2	J, E	D	
20[a]	Dec. 1, 1953	28[a]	Dec. 1, 1953	30	Dec. 1, 1953	1	3.7	C, H	D, F	
20[a]	Sep. 3, 1948	22[a]	Sep. 3, 1948	15	Sep. 3, 1948	—	7.5	J, E	D	
44[a]	Jan. 8, 1951	65[a]	Jan. 8, 1951	15	Jan. 8, 1951	1	.7	J, E	D	
—	—	—	—	5	Jan. 29, 1949	—	—	C, H	D	
13[a]	Mar. 19, 1950	25[a]	Mar. 19, 1950	20	Mar. 19, 1950	1	1.6	C, H	D	
20[a]	Feb. 28, 1948	50[a]	Feb. 28, 1948	6	Feb. 28, 1948	1	.2	J, E	D	
16[a]	Aug. 2, 1952	38[a]	Aug. 2, 1952	6	Aug. 2, 1952	2	.3	J, E	D	
20[a]	Jan. 29, 1952	29[a]	Jan. 29, 1952	8	Jan. 29, 1952	1	.9	J, E	D	
9.22	May 11, 1954	—	—	—	—	—	—	N	N	Observation well.
8.08	May 11, 1954	—	—	—	—	—	—	N	N	
—	—	—	—	19	Aug. 19, 1949	4	—	J, E	D	
14[a]	Mar. 19, 1952	—	—	—	—	—	—	J, E	D	
18[a]	Mar. 19, 1952	65[a]	Mar. 19, 1952	6	Mar. 19, 1952	1	.1	J, E	D	See well log.
15[a]	Nov. 6, 1950	36[a]	Nov. 6, 1950	3	Nov. 6, 1950	½	.1	J, E	D	
20[a]	Oct. 19, 1948	50[a]	Oct. 19, 1948	7	Oct. 19, 1948	—	.2	J, —	D	
44[a]	Sep. 17, 1953	52[a]	Sep. 17, 1953	7	Sep. 17, 1953	5	.9	J, E	D	See chemical analysis.
4[a]	Mar. 15, 1950	15[a]	Mar. 15, 1950	15	Mar. 15, 1950	1	1.4	J, E	D	
8[a]	Jan. 29, 1952	65[a]	Jan. 29, 1952	10	Jan. 29, 1952	1	.2	J, E	D	
30[a]	Mar. 18, 1950	—	—	8	Mar. 18, 1950	—	—	J, E	D	
30[a]	July 25, 1949	35[a]	July 25, 1949	20	July 25, 1949	1	4.0	—, E	D	
20[a]	Mar. 20, 1948	35[a]	Mar. 20, 1948	3	Mar. 20, 1948	1	.2	C, H	D	
30[a]	Oct. 21, 1948	—	—	5	Oct. 21, 1948	—	—	J, E	D	Well redrilled to 112 ft.

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Be 13	Isadore Cohn	George Thomas	1947	320	Drilled	58	6	—	Hilltop	Port Deposit gneiss
Be 14	Do	do	1947	260	do	18	5⅝	—	Slope	do
Be 15	Do	H & H Drilling Co.	1952	260	do	54	6	30	do	do
Be 16	Do	do	—	320	do	48	6	—	Hilltop	do
Be 17	Do	do	1953	240	do	37	6	28	Slope	do
Be 18	Do	do	1953	240	do	42	6	—	do	do
Be 19	Do	do	1948	260	do	50	6	—	do	do
Be 20	Do	—	—	320	do	57	6	—	Hilltop	do
Be 21	Do	H & H Drilling Co.	1954	220	do	43	8	—	Valley	do
Be 22	Robert Detamore	W. L. Gray	1954	370	do	29	5⅝	24	Slope	Gabbro
Be 23	C. A. Foley	George Thomas	1947	260	do	55	6	—	do	Gabbro(?)
Be 24	Woodrow Browning	H & H Drilling Co.	1952	340	do	64	6	12	Hilltop	Epidiorite(?)
Be 25	Laurner Bros.	G. E. Rinier	1951	320	do	75	6	70	Slope	Peters Creek quartzite
Be 26	Ben G. Denny, Jr.	Henry Thomas	1949	100	do	34	6	19	Valley	Port Deposit gneiss
Be 27	G. J. Leonard	G. E. Rinier	1949	160	do	55	6	30	Slope	do
Be 28	Watts	do	1954	350	do	58	6	30	Hilltop	do
Be 29	F. Killeen	do	1954	360	do	38	6	20	do	do
Be 30	William C. Craig, Sr.	—	very old	380	Dug	25	48	—	Upland	do
Be 31	S. Craig	G. E. Rinier	1952	380	Drilled	31	6	20	do	do
Cb 1	Youth's Benefit School	H & H Drilling Co.	1953	560	do	362	8	45	Hilltop	Wissahickon (oligoclase)
Cb 2	Bruce Phipps	do	1951	570	do	101	6	41	do	do
Cb 3	Ralph Minton	Geo. L. Thomas	1947	540	do	90	6	30	do	do
Cb 4	Ralph Crouse	H & H Drilling Co.	1951	540	do	117	6	47	do	do
Cb 5	Do	do	1951	560	do	100	6	10	do	do
Cb 6	Clarence Bay	Henry Thomas	1950	510	do	101	6	57	do	do
Cb 7	J. Orville Cooper	H & H Drilling Co.	1952	420	do	95	6	32	Slope	do
Cb 8	Robert Bay	Howard Thomas	1954	520	do	62	6	50	Valley	do
Cb 9	Upper Crossroads Baptist Church	H & H Drilling Co.	1950	470	do	112	6	40	Slope	do
Cb 10	Orville Scarff	do	1952	450	do	155	6	72	Hilltop	do
Cb 11	G. Ross Scarff	Henry Thomas	1949	560	do	164	6	88	Upland	do
Cb 12	Carl H. Lewis	H & H Drilling Co.	1953	600	do	53	6	42	do	do
Cb 13	Nelson Scarff	do	1951	550	do	78	6	18	Hilltop	do
Cb 14	Paul Givens	Henry Thomas	1948	510	do	75	6	39	Slope	do
Cb 15	Col. Logan O. Shutt	do	1949	400	do	127	6	60	Hilltop	do
Cb 16	Crawford Harrison	M. H. Thomas, Jr.	1946	510	do	250	5⅝	—	do	do
Cb 17	Do	do	1947	540	do	120	6	—	do	do
Cb 18	Robert Lang	Howard Thomas	1954	470	do	65	6	18	Slope	do
Cb 19	Paul W. Ammon	do	1949	490	do	145	6	7	do	do
Cb 20	Norman Watson	Henry Thomas	1949	500	do	98	6	70	Upland	do
Cb 21	Spencer E. Osborne	do	1950	500	do	132	6	84	do	do
Cb 22	Fair View A.M.E. Church	Werneke Bros.	1950	560	do	82	6	55	Hilltop	do

—*Continued*

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
16[a]	June 10, 1947	35[a]	June 10, 1947	30	June 10, 1947	2	1.6	C, E	I	Camp Ramblewood.
8[a]	June 7, 1947	10[a]	June 7, 1947	25	June 7, 1947	1½	12.5	—	I	Do.
28[a]	Jan. 3, 1952,	45[a]	Jan. 3, 1952	15	Jan. 3, 1952	2	.9	J, —	I	Do.
—	—	—	—	6–7	—	—	—	J, E	I	Do.
21[a]	Dec. 1, 1953	27[a]	Dec. 1, 1953	30	Dec. 1, 1953	2	5.0	J, E	I	Do.
—	—	—	—	30	Dec. 1, 1953	2	—	J, E	I	Do.
—	—	—	—	6–7	—	—	—	J, E	I	Do.
—	—	—	—	2	—	—	—	C, E	I	Do.
5.52	July 22, 1954	—	—	45	—	—	—	NI	I	Do.
15[a]	Feb. 28, 1954	—	—	18	Feb. 28, 1954	2	—	C, E	D	
30[a]	Aug. 21, 1947	—	—	10	Aug. 21, 1947	½	—	C, E	D	
30[a]	Jan. 2, 1952	58[a]	Jan. 2, 1952	6	Jan. 2, 1952	—	.2	J, E	D	Driller reports "serpentine".
12[a]	June 2, 1951	—	—	8	June 2, 1951	—	—	C, H	D	
4[a]	Apr. 20, 1949	16[a]	Apr. 20, 1949	25	Apr. 20, 1949	2	2.1	—, E	D	
10[a]	Jan. 3, 1949	—	—	—	—	—	—	J, E	D	
20[a]	Jan. 29, 1954	—	—	10	Jan. 29, 1954	—	—	J, E	D	
12[a]	Jan. 15, 1954	—	—	5	Jan. 15, 1954	—	—	J, E	D	
19.5[a]	July 19, 1954	—	—	—	—	—	—	N	N	
15[a]	July 17, 1952	—	—	9	July 17, 1952	—	—	J, E	D	
47[a]	Jan. 24, 1953	70[a]	Jan. 24, 1953	25	Jan. 24, 1953	10	1.1	T, E	I	See chemical analysis and well log.
45[a]	Feb. 1, 1951	90[a]	Feb. 1, 1951	5	Feb. 1, 1951	1	.1	J, E	D	
33[a]	Dec. 31, 1947	—	—	1	Dec. 31, 1947	1	—	J, E	D	
35[a]	Feb. 7, 1951	100[a]	Feb. 7, 1951	—	—	2	—	J, E	D	
35[a]	Feb. 1, 1951	90[a]	Feb. 1, 1951	1	Feb. 1, 1951	2	.1–	J, E	D	
41[a]	Mar. 11, 1950	85[a]	Mar. 11, 1950	4	Mar. 11, 1950	2	.1–	C, E	D	
38[a]	Dec. 15, 1952	80[a]	Dec. 15, 1952	10	Dec. 15, 1952	1	.2	N	D	
48.84	Apr. 20, 1954									
4[a]	Feb. 24, 1954	4[a]	Feb. 24, 1954	30	Feb. 24, 1954	1	—	—, E	D	
30[a]	July 12, 1950	100[a]	July 12, 1950	2	July 12, 1950	2	.1–	—, E	I	
70[a]	Jan. 2, 1952	100[a]	Jan. 2, 1952	20	Jan. 2, 1952	1	.6	J, E	D	
47[a]	Mar. 7, 1949	150[a]	Mar. 7, 1949	5	Mar. 7, 1949	2	.1–	C, E	D	See well log.
30[a]	Oct. 19, 1953	45[a]	Oct. 19, 1953	10	Oct. 19, 1953	1	.6	J, E	D	
33.52	Apr. 20, 1954									
32[a]	Feb. 7, 1951	50[a]	Feb. 7, 1951	10	Feb. 7, 1951	1	.5	J, E	D	
30[a]	Mar. 13, 1948	35[a]	Mar. 13, 1948	25	Mar. 13, 1948	—	5	J, E	D	
31.71	Apr. 27, 1954									
32[a]	Dec. 2, 1949	120[a]	Dec. 2, 1949	2	Dec. 2, 1949	—	.1–	J, E	D	
43[a]	Aug. 8, 1946	—	—	15	Aug. 8, 1946	2	—	C, E	D	Water supply inadequate. See well log.
50[a]	Apr. 26, 1947	70[a]	Apr. 26, 1947	10	Apr. 26, 1947	½	.5	N	D	Plugged and abandoned.
28[a]	Feb. 6, 1954	—	—	6	Feb. 6, 1954	1	—	J, E	D	
32[a]	Sep. 26, 1949	130[a]	Sep. 26, 1949	2	Sep. 26, 1949	2	.1–	C, E	D	
24[a]	Oct. 19, 1949	—	—	4	Oct. 19, 1949	1	—	J, E	D	
36[a]	Mar. 9, 1950	—	—	2	Mar. 9, 1950	2	—	C, E	D	
40[a]	June 1950	—	—	5	June 1950	2	—	C, H	I	

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Cc 1	Maryland Water Works Co.	Shannahan	1925	460	Drilled	300	5⅝	80	Draw	Wissahickon (oligoclase)
Cc 2	Do	do	1925	460	do	330	5⅝	—	do	do
Cc 3	Do	do	—	460	do	300	—	—	do	do
Cc 4	Do	do	1941	460	do	90	8	—	do	do
Cc 5	Do	do	1941–42	460	do	58	5⅝	—	do	do
Cc 7	Do	do	1946	410	do	330	5⅝	330	do	Port Deposit gneiss
Cc 8	Do	Shannahan & Edmondson	1940	410	do	50	—	50	do	do
Cc 9	Baltimore Fresh Air Camp	—	1930	300	do	110	6	—	Slope	Baltimore gneiss
Cc 10	Do	—	—	290	do	75	6	—	do	do
Cc 11	Do	—	—	340	do	139	6	—	do	Port Deposit gneiss
Cc 12	Do	—	—	325	do	190	6	—	do	do
Cc 13	Do	—	—	340	do	70	6	—	do	do
Cc 14	Do	—	—	340	do	128	6	—	do	do
Cc 15	J. O. Ryan	H & H Drilling Co.	1953	440	do	39	6	35	Upland	Gabbro
Cc 16	Charles H. Trust	George Thomas	1947	460	do	70	6	—	do	Serpentine
Cc 17	Charles Marchant	H & H Drilling Co.	1951	340	do	60	6	60	do	Gabbro
Cc 18	D. Grafton	do	1954	380	do	89	6	76	do	do
Cc 19	Alton R. Irwin	Werneke Bros.	1951	240	do	52	5⅝	35	Slope	do
Cc 20	Wm. Nagle	A. C. Reider & Son	1953	250	do	66	6	—	Hilltop	do
Cc 21	J. E. Wells	H & H Drilling Co.	1952	260	do	49	6	9	Slope	Port Deposit gneiss
Cc 22	Clay Jackson	Henry Thomas	1948	360	do	65	6	64	Upland	Gabbro
Cc 23	Bertha Murry	do	1948	340	do	56	6	54	do	do
Cc 24	B. D. Tucker & Son	Wm. A. Lynch	1946	340	do	100	5⅝	84	do	do
Cc 25	Ralph G. Norman	Henry Thomas	1947	350	do	44	6	37	Hilltop	do
Cc 26	Clarence Walker	do	1948	320	do	44	6	44	Slope	do
Cc 27	Curtis W. Kroh	H & H Drilling Co.	1952	380	do	81	6	67	Upland	do
Cc 28	Twin-Kiss Drive In	Henry Thomas	1954	340	do	64	6	60	do	do
Cc 29	K. & L. Corporation	do	1948	370	do	100	8	69	do	do
Cc 30	Do	H & H Drilling Co.	1950	370	do	96	8	81	do	do
Cc 31	Leonard McGrady	G. E. Rinier	1949	380	do	44	6	11	Slope	do

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
—	—	80[a]	Oct. 4, 1925	20.5	1944–45	—	—	C, E	P	Owner's well no. 1. Yield 17 gal. a min. in 1939. See chemical analysis.
19[a]	Oct. 4, 1925	35[a]	Oct. 4, 1925(?)	34.5	Oct. 4, 1925	—	—	C, E	P	Owner's well no. 2. Yield 29 gal. a min. in 1939. Temperature 55°F. See chemical analysis.
—	—	—	—	7	1945(?)	—	—	C, E	P	Owner's well no. 3. Well seldom used. See chemical analysis.
22.17	Aug. 23, 1946	33.04	Aug. 23, 1946	19.8	Jan. 1946		1.8	T, E	P	Owner's well no. 4. Temperature 53.5°F. See chemica analysis.
37.3[a]	Aug. 29, 1946	—	—	33.7	Aug. 29, 1946	—	—	T, E	P	Owner's well no. 5. Gravell packed. See chemical analysis.
55[a]	Jan. 24, 1946	—	—	24.5	Jan. 24, 1946	—	—	C, E	P	Gravel-packed. Temperature 55°F. See chemical analysis.
8[a]	Jan. 1941	30.5[a]	Jan. 1941	3	Jan. 1941	—	—	S, —	N	
4.06	Aug. 23, 1946									
2[a]	July 7, 1950	18[a]	July 7, 1950	3–4	July 6, 1950	¼	.1±	C, E	I	Owner's well no. 1. Yield dropped to 3–4 gal. a min. after 7 min. pumping.
—	—	—	—	5	—	—	—	—	N	Owner's well no. 2. Abandoned and covered.
—	—	—	—	2–3	July 7, 1950	—	—	C, —	I	Owner's well no. 3.
—	—	—	—	—	—	—	—	—	N	Owner's well no. 4. Plugged at 27.5 ft.
—	—	—	—	6–7	July 7, 1950	—	—	C, —	I	Owner's well no. 5. Reportedly yielded 35 gal. a min. when drilled.
16.8	July 7, 1950	—	—	—	—	—	—	N	N	Owner's well no. 6. Partially obstructed at about 17 ft.
20[a]	Dec. 1, 1953	30[a]	Dec. 1, 1953	15	Dec. 1, 1953	1	1.5	J, E	D	
20[a]	May 16, 1947	60[a]	May 16, 1947	22	May 16, 1947	1	.5	J, E	D	
15[a]	Jan. 8, 1951	40[a]	Jan. 8, 1951	10	Jan. 8, 1951	1	.4	J, E	D	See chemical analysis.
13[a]	Jan. 10, 1952	60[a]	Jan. 10, 1952	20	Jan. 10, 1952	1	.4	—, E	D	
15[a]	July 18, 1951	—	—	20	July 18, 1951	1	—	J, E	D	
18[a]	June 6, 1953	55[a]	June 6, 1953	4.5	June 6, 1953	2	.1	J, E	D	
15[a]	Jan. 2, 1952	35[a]	Jan. 2, 1952	15	Jan. 2, 1952	1	.7	C, E	D	
4[a]	June 23, 1948	40[a]	June 23, 1948	8	June 23, 1948	1	.2	S, E	D	
4[a]	June 21, 1948	40[a]	June 21, 1948	8	June 21, 1948	1	.2	J, E	D	
14[a]	Mar. 26, 1946	—	—	10	Mar. 26, 1946	—	—	C, E	C	
30[a]	Dec. 10, 1947	33[a]	Dec. 10, 1947	10	Dec. 10, 1947	1	3.3	J, E	D	
1.5[a]	May 17, 1948	29.8[a]	May 17, 1948	6	May 17, 1948	—	.2	C, E	D	
14[a]	Feb. 28, 1952	70[a]	Feb. 28, 1952	5	Feb. 28, 1952	2	.1—	J, E	C	
2[a]	Apr. 15, 1954	7[a]	Apr. 15, 1954	40	Apr. 15, 1954	1	8	J, E	C	
18[a]	May 20, 1948	65[a]	May 20, 1948	25	May 20, 1948	3	.5	J, E	C	
18[a]	Aug. 30, 1950	70[a]	Aug. 30, 1950	30	Aug. 30, 1950	3	.5	T, E	C	See well log.
20[a]	Oct. 10, 1949	—	—	6	Oct. 10, 1949	—	—	J, E	D	

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Cc 32	James C. Fulton	Ed. Urey	1950	420	Drilled	67	6	34	Hilltop	Gabbro
Cc 33	Clarence Boyle	Henry Thomas	1948	460	do	38	6	37	Upland	do
Cc 34	Sam Miles	George Thomas	1947	450	do	60	6	—	do	do
Cc 35	James Underwood	Henry Thomas	1949	470	do	38	5	34	do	do
Cc 36	Do	George Thomas	1947	470	do	35	6	30	do	do
Cc 37	Boggs	G. E. Rinier	1950	480	do	57	6	55	do	Port Deposit gneiss
Cc 38	James Underwood	H & H Drilling Co.	1942	310	do	100	6	91	do	Gabbro
Cc 39	Central Consolidated High School	Henry Thomas	1949	440	do	133	6	21	do	Port Deposit gneiss
Cc 40	Do	do	1949	450	do	70	6	39	do	do
Cc 41	Lt. Col. John H. Rollins	F. H. Lancaster	1950	280	do	71	6	34	Slope	Baltimore gneiss
Cc 42	Walter Magness	H & H Drilling Co.	1953	280	do	52	6	49	Hilltop	do
Cc 43	S. W. Guercio	Henry Thomas	—	360	do	67	5⅝	15	do	do
Cc 44	George S. Hanna, Sr.	do	1947	360	do	33	6	16	Draw	Port Deposit gneiss
Cc 45	Hohn D. Worthington	do	1948	360	do	60	6	22.4	Hilltop	Baltimore gneiss
Cc 46	Edward Pyle	F. H. Lancaster	1951	390	do	55	6	41	Valley	Gabbro
Cc 47	Richard P. Streett	Henry Thomas	1948	440	do	125	6	2	Hilltop	Port Deposit gneiss
Cc 48	Raymond Haskins	Werneke Bros.	1952	540	do	112	6	—	Upland	Wissahickon (oligoclase)
Cc 49	H. H. Cole	A. C. Reider & Son	1948	540	do	79	6	—	Hilltop	do
Cc 50	P. A. Hammond	Maryland Drilling Co.	1953	420	do	54	6	46	Upland	Gabbro
Cd 1	Andrew Taylor	Werneke Bros.	1952	290	do	55	6	30	Hilltop	Port Deposit gneiss
Cd 2	William Magness	Henry Thomas	1947	340	do	148	6	40	do	Baltimore gneiss
Cd 3	James C. Smith	L. D. Moore	1954	405	do	32	6	12	Upland	do
Cd 4	J. C. Plummer	George Thomas	1947	360	do	62	6	54	do	do
Cd 5	Thomas Gentry	H & H Drilling Co.	1950	365	do	34	6	28	do	do
Cd 6	Albert E. Ragan	—	—	360	Dug	—	36	—	do	do
Cd 7	William A. Shipley	H & H Drilling Co.	1950	340	Drilled	86	6	82	do	do
Cd 8	David Joesting	Howard Thomas	1954	310	do	52	6	48	Hilltop	do
Cd 9	Robert W. Vaught	G. E. Rinier	1950	430	do	56	6	42	Upland	do
Cd 10	Mount Zion Methodist Church	Henry Thomas	1950	400	do	76	6	60	do	do
Cd 11	R. G. Nagle	do	1949	440	do	82	6	59	Slope	do
Cd 12	Joseph Umbarger	Cliff Barber	1954	440	do	54	5⅝	44	Upland	do
Cd 13	Shirley Peters	Herbert Morgan	1949	380	do	101	6	40	do	do
Cd 14	Theo Thorpe	H & H Drilling Co.	1951	420	do	84	6	19	Hilltop	do
Cd 15	Consolidated Gas, Electric Light, & Power Co.	do	1953	300	do	74	6	63	Slope	Gabbro
Cd 16	Martin Leatherman	do	1951	360	do	81	8	71	Hilltop	Serpentine
Cd 17	Do	do	1948	360	do	72	5⅝	33	do	do
Cd 18	Harford Christian Youth Center	Henry Thomas	1949	340	do	80	8	41	Slope	do
Cd 19	Tracy Farmer	Werneke Bros.	1952	400	do	45	6	—	Hilltop	do
Cd 20	Dean Davis	Henry Thomas	1948	420	do	66	6	23	do	do

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Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
32[a]	Nov. 20, 1950	60[a]	Nov. 20, 1950	2.5	Nov. 20, 1950	1	0.1–	J, E	D	Static level 32.58 ft. below land surface, May 6, 1954.
16[a]	Apr. 26, 1948	20[a]	Apr. 26, 1948	20	Apr. 26, 1948	1	5	J, E	D	
17[a]	Sep. 16, 1946	18[a]	Sep. 16, 1946	10	Sep. 16, 1946	1	10	S, E	D	
7[a]	Jan. 15, 1949	20[a]	Jan. 15, 1949	12	Jan. 15, 1949	1	.9	J, E	D	Casing pulled; plugged and abandoned.
12[a]	Aug. 26, 1947	16[a]	Aug. 26, 1947	10	Aug. 26, 1947	1	2.5	N	D	Do.
8[a]	Aug. 18, 1950	—	—	12	Aug. 18, 1950	—	—	J, E	D	
12[a]	Jan. 2, 1942	80[a]	Jan. 2, 1942	10	Jan. 2, 1942	1	.1	J, E	D	
16[a]	July 30, 1949	80[a]	July 30, 1949	8	July 30, 1949	10	.1	T, E	S	See chemical analysis.
11[a]	July 30, 1949	40[a]	July 30, 1949	50	July 30, 1949	14	1.7	T, E	S	
—	—	—	—	3	July 24, 1950	—	—	J, —	D	
18[a]	Sep. 8, 1953	45[a]	Sep. 8, 1953	9	Sep. 8, 1953	1	.3	J, E	D	
18[a]	—	60[a]	—	3	—	2	.1–	J, E	D	
12[a]	Sep. 17, 1947	16[a]	Sep. 17, 1947	15	Sep. 17, 1947	1	3.7	J, E	D	
4[a]	July 6, 1948	20[a]	July 6, 1948	20	July 6, 1948	—	1.2	J, E	D	
—	—	—	—	4	Sep. 26, 1951	—	—	J, E	D	
52[a]	Dec. 1, 1948	120[a]	Dec. 1, 1948	4	Dec. 1, 1948	2	.1–	C, E	D	Static level dropped 15 ft. and yield decreased to ½ gal. a min. since well was drilled. See well log.
52[a]	Apr. 5, 1952	120[a]	Apr. 5, 1952	12	Apr. 5, 1952	1	.2	J, E	D	
45[a]	June 17, 1948	—	—	10	June 17, 1948	2	—	J, E	D	
4[a]	June 1953	—	—	15	June 1953	2	—	J, E	D	
40[a]	Feb. 20, 1952	55[a]	Feb. 20, 1952	4	Feb. 20, 1952	1	.3	J, E	D	
33[a]	Oct. 27, 1947	120[a]	Oct. 27, 1947	1	Oct. 27, 1947	3	.1–	J, E	D	
8[a]	Mar. 3, 1954	—	—	5	Mar. 3, 1954	—	—	J, E	D	
16[a]	Aug. 13, 1947	50[a]	Aug. 13, 1947	8	Aug. 13, 1947	1	.2	J, E	D	
8[a]	Apr. 7, 1950	25[a]	Apr. 7, 1950	10	Apr. 7, 1950	1	.6	C, E	D	
10.02	July 15, 1954	—	—	—	—	—	—	S, —	D	
22[a]	Mar. 18, 1950	70[a]	Mar. 18, 1950	5	Mar. 18, 1950	1	.1	C, E	D	See well log.
22[a]	Feb. 15, 1954	50[a]	Feb. 15, 1954	8	Feb. 15, 1954	1	.3	J, E	D	
15[a]	July 18, 1950	—	—	10	July 18, 1950	—	—	—, E	D	
28[a]	Feb. 14, 1950	60[a]	Feb. 14, 1950	20	Feb. 14, 1950	1	.6	J, E	I	
29[a]	June 6, 1949	50[a]	June 6, 1949	15	June 6, 1949	1	.7	—, E	D	
20[a]	May 21, 1954	50[a]	May 21, 1954	5	May 21, 1954	1	.2	J, E	D	
15[a]	Aug. 6, 1949	75[a]	Aug. 6, 1949	5	Aug. 6, 1949	3	.8	J, E	D	Water reported irony and very hard.
19[a]	May 28, 1951	70[a]	May 28, 1951	10	May 28, 1951	2	.2	C, E	D	
8[a]	Feb. 9, 1953	20[a]	Feb. 9, 1953	30	Feb. 9, 1953	3	2.5	J, E	C	
18[a]	Oct. 29, 1951	50[a]	Oct. 29, 1951	25	Oct. 31, 1951	3	.8	J, E	D	
32[a]	Sep. 11, 1948	60[a]	Sep. 11, 1948	10	Sep. 11, 1948	2	.4	J, E	D	
11[a]	Feb. 5, 1949	17[a]	Feb. 5, 1949	30	Feb. 5, 1949	2	5	J, E	I	See chemical analysis.
23.10	—									
6[a]	July 2, 1952	30[a]	July 2, 1952	8	July 2, 1952	—	.3	J, E	D	
23[a]	Oct. 27, 1948	60[a]	Oct. 27, 1948	2.5	Oct. 27, 1948	1	.1–	J, E	D	

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Cd 21	Ancel Howell	Henry Thomas	1948	420	Drilled	65	6	19	Hilltop	Serpentine
Cd 22	George Adams	Cliff Barber	1954	380	do	65	6	22	do	Gabbro
Cd 23	Max Dixon	Howard Thomas	1954	380	do	60	6	44	do	do
Cd 24	Wint Walls	B. F. Miller	1951	340	do	59	6	—	do	Baltimore gneiss
Cd 25	Erna Rhodes	H & H Drilling Co.	1952	380	do	50	6	47	do	do
Cd 26	J. D. Duncan	Henry Thomas	1949	380	do	60	6	50	do	do
Cd 27	D. L. Houck	H & H Drilling Co.	1952	380	do	51	6	42	do	do
Cd 28	R. T. Caudill	Henry Thomas	1948	200	do	80	6	78	do	Port Deposit gneiss
Cd 29	Frank S. Rather	Herbert Morgan	1949	290	do	75	6	15	Valley	Baltimore gneiss
Cd 30	George Miller	H & H Drilling Co.	1953	160	do	27	6	14	do	do
Cd 31	Albert H. Magness	Henry Thomas	1950	370	do	44	6	40	Hilltop	do
Cd 32	F. H. Scotten	H & H Drilling Co.	1951	340	do	69	6	14	do	do
Cd 33	John Scotten	Henry Thomas	1948	340	do	69	6	22	do	do
Cd 34	Joseph Pannill	H & H Drilling Co.	1950	400	do	61	6	28	Slope	Port Deposit gneiss
Cd 35	W. J. Denhan	do	1951	320	do	70	6	20	Hilltop	do
Cd 36	Churchville Protestant Church	do	1953	400	do	44	6	42	Upland	Baltimore gneiss
Ce 1	Town of Aberdeen	—	—	120	do	30	11-8	18	—	Patuxent
Ce 2	Do	—	—	120	do	46	11-8	36	—	do
Ce 3	Do	—	—	125	do	35	12-8	24	—	do
Ce 4	Do	—	—	130	do	34	12-8	21	—	do
Ce 5	Do	—	—	130	do	32	—	—	—	do
Ce 6	Do	Shannahan	—	115	do	31	—	—	—	do
Ce 7	Do	do	—	140	do	33	—	—	—	do
Ce 8	Do	do	—	125	do	—	—	—	—	do
Ce 9	Do	do	—	120	do	—	—	—	—	do
Ce 10	J. G. Osborn	Miller	1945	160	do	35	6	—	Slope	Gabbro
Ce 11	Do	Henry Thomas	1947	140	do	45	6	43	Valley	do
Ce 12	Do	G. E. Rinier	1948	140	do	35	6	—	do	do
Ce 13	Do	do	1952	120	do	129	6	75	do	do
Ce 14	Harry Shafer	H & H Drilling Co.	1952	400	do	37	6	28	Upland	do
Ce 15	Guy Hix, Jr.	Cliff Barber	1954	380	do	43	6	24	do	Baltimore gneiss
Ce 16	Guy Hix	do	1954	380	do	49	6	37	do	do
Ce 17	Murray Moritz	G. E. Rinier	1953	390	do	106	6	100	do	Gabbro-Baltimore gneiss
Ce 18	Wilson R. Mitchell	H & H Drilling Co.	1952	380	do	39	6	34	do	Gabbro
Ce 19	Marvin D. Rather	G. E. Rinier	1948	280	do	57	6	27	Valley	do
Ce 20	James Hawk	do	1951	380	do	61	6	58	Upland	do
Ce 21	William E. Shippley	do	1951	380	do	40	6	20	do	do
Ce 22	Do	do	1951	370	do	38	6	8	do	do
Ce 23	John Scott	do	1952	330	do	104	6	45	Hilltop	do
Ce 24	John Tomilison	do	1950	330	do	117	6	80	do	do
Ce 25	W. J. Murphy	do	1951	320	do	40	6	39	Upland	do
Ce 26	Harold Noble	do	1951	180	do	70	6	63	do	do
Ce 27	Salvador Uzzo	do	1950	160	do	38	6	20	do	do
Ce 28	Dan Jones	do	1951	120	do	42	6	35	do	—
Ce 29	Richard F. Cronin	do	1949	180	do	45	6	35	Slope	Gabbro
Ce 30	Elmer Parks	do	1949	340	do	35	6	23	Hilltop	do
Ce 31	B. Curry	do	1952	410	do	60	6	50	Upland	do
Ce 32	Basil Sampson	do	1948	400	do	41	6	30	do	do
Ce 33	Beverly Knight	do	1948	400	do	71	6	60	do	do
Ce 34	Hopewell Parsonage	do	1949	420	do	62	6	58	do	Baltimore gneiss
Ce 35	C. Broyles	do	1951	400	do	55	6	50	do	Gabbro
Ce 36	C. L. Jose	do	1951	400	do	52	6	47	do	do

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
22[a]	Oct. 22, 1948	60[a]	Oct. 22, 1948	2	Oct. 22, 1948	1	0.1—	J, E	D	
30[a]	Jan. 23, 1954	50[a]	Jan. 23, 1954	5	Jan. 23, 1954	2	.3	J, E	D	
26[a]	Feb. 20, 1954	50[a]	Feb. 20, 1954	26	Feb. 20, 1954	—	1.1	J, E	D	
10[a]	Jan. 15, 1951	50[a]	Jan. 15, 1951	4	Jan. 15, 1951	1	.1	J, E	D	
11[a]	Jan. 20, 1952	40[a]	Jan. 20, 1952	8	Jan. 29, 1952	1	.3	J, E	D	
5[a]	Apr. 1949	35[a]	Apr. 1949	15	Apr. 1949	1	.5	J, E	D	
8[a]	Jan. 29, 1952	25[a]	Jan. 29, 1952	20	Jan. 29, 1952	1	1.2	J, E	D	
30[a]	Apr. 10, 1948	60[a]	Apr. 10, 1948	4	Apr. 10, 1948	1	.1	J, E	D	
10[a]	Aug. 16, 1949	60[a]	Aug. 16, 1949	5	Aug. 16, 1949	3	.1	J, E	D	
10[a]	July 20, 1953	18[a]	July 20, 1953	10	July 20, 1953	1	1.3	J, E	D	
18[a]	Jan. 13, 1950	40[a]	Jan. 13, 1950	5	Jan. 13, 1950	—	.2	J, E	D	
28[a]	Oct. 29, 1951	40[a]	Oct. 29, 1951	20	Oct. 29, 1951	2	1.7	J, E	D	
27[a]	May 29, 1948	50[a]	May 29, 1948	4	May 29, 1948	1	.2	J, E	D	
35[a]	May 3, 1950	40[a]	May 3, 1950	10	May 3, 1950	1	2	J, E	D	
24[a]	Feb. 1, 1951	50[a]	Feb. 1, 1951	24	Feb. 1, 1951	2	.9	J, E	D	
15[a]	July 21, 1953	38[a]	July 21, 1953	20	July 21, 1953	1	.9	N	I	
17.03	July 22, 1954									
—	—	—	—	35	July 6, 1944	—	—	T, E	P	
17[a]	1944	—	—	38	July 6, 1944	—	—	T, E	P	
—	—	—	—	17	July 6, 1944	—	—	J, E	P	
—	—	—	—	17	July 6, 1944	—	—	J, E	P	
—	—	—	—	30	July 6, 1944	—	—	J, E	P	
—	—	—	—	28	July 6, 1944	—	—	T, E	P	
—	—	—	—	40	July 6, 1944	—	—	—	P	
—	—	—	—	30	July 6, 1944	—	—	J, E	P	
—	—	—	—	11	July 6, 1944	—	—	T, E	—	
—	—	—	—	—	—	—	—	J, E	C	
3[a]	Sep. 15, 1947	20[a]	Sep. 15, 1947	30–35	Sep. 15, 1947	4	±1.9	J, E	C	See chemical analysis.
2.42	July 22, 1954									
—	—	—	—	10	1948	—	—	J, E	C	
1.54	July 22, 1954	—	—	—	—	—	—	N	N	
18[a]	Jan. 30, 1952	35[a]	Jan. 30, 1952	6	Jan. 30, 1952	1	.4	J, E	D	
10[a]	Mar. 6, 1954	30[a]	Mar. 6, 1954	32	Mar. 6, 1954	2	1.6	S, E	D	
3[a]	Mar. 2, 1954	10[a]	Mar. 2, 1954	32	Mar. 2, 1954	1	4.5	S, —	D	
30[a]	Dec. 30, 1953	—	—	3	Dec. 30, 1953	—	—	J, E	D	
4[a]	Jan. 29, 1952	23[a]	Jan. 29, 1952	15	Jan. 29, 1952	2	.8	S, E	D	
4[a]	July 21, 1948	50[a]	July 21, 1948	—	—	—	—	J, E	D	
10[a]	Sep. 20, 1951	—	—	5	Sep. 20, 1951	—	—	J, E	D	
12[a]	Sep. 11, 1951	—	—	4	Sep. 11, 1951	—	—	S, E	D	
12[a]	Sep. 8, 1951	—	—	5	Sep. 8, 1951	—	—	S, E	D	
28[a]	June 6, 1952	—	—	5	June 6, 1952	—	—	J, E	D	Water reported high in iron.
20[a]	Apr. 20, 1950	—	—	2	Apr. 20, 1950	—	—	J, E	D	Do.
15[a]	May 7, 1951	—	—	5	May 7, 1951	—	—	J, E	D	Do.
16[a]	May 3, 1951	—	—	2	May 3, 1951	—	—	J, E	D	
12[a]	Oct. 5, 1950	—	—	8	Oct. 5, 1950	—	—	J, E	D	
8[a]	Feb. 27, 1951	—	—	—	—	—	—	J, E	D	
25[a]	July 2, 1949	—	—	5	July 2, 1949	—	—	J, E	D	
9[a]	Sep. 10, 1949	—	—	10	Sep. 10, 1949	—	—	J, E	D	
15[a]	Nov. 25, 1952	—	—	6	Nov. 25, 1952	—	—	J, E	D	
—	—	—	—	—	—	—	—	J, E	D	
10[a]	June 21, 1948	—	—	2.5	June 21, 1948	—	—	J, E	D	
3[a]	May 28, 1949	18[a]	July 22, 1954	6	May 28, 1949	—	—	J, E	D	See chemical analysis.
12[a]	Oct. 11, 1951	—	—	3	Oct. 11, 1951	—	—	J, E	D	
11[a]	Oct. 15, 1951	—	—	4	Oct. 15, 1951	—	—	J, E	D	

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Ce 37	R. A. Stallings	G. E. Rinier	1952	380	Drilled	123	6	114	Upland	Baltimore gneiss
Ce 38	Laurence Bowman	do	1951	400	do	71	6	61	do	Gabbro
Ce 39	Elden Sheridan	do	1949	400	do	40	6	35	do	do
Ce 40	Leroy O'Conner	L. D. Moore	1954	100	do	60	5⅝	40	Hilltop	Pleistocene
Ce 41	William Sherry	do	1954	100	do	60	5⅝	40	do	do
Cf 1	Harford Distillery	Artesian Well Co.	—	45	do	50–60	—	—	—	Pleistocene(?)
Cf 2	Do	do	1943	45	do	58	10	28	—	do
Cf 3	Henry Rause	G. E. Rinier	1950	80	do	31	6	15	Slope	Gabbro
Cf 4	Charles E. Gross	do	1950	140	do	41	6	23	do	do
Cf 5	J. W. Beach	H & H Drilling Co.	1951	220	do	62	6	44	Hilltop	do
Cf 6	Serge Zarodny	G. E. Rinier	1950	200	do	59	6	21	do	do
Cf 7	J. W. Apgar	H & H Drilling Co.	1951	260	do	41	6	21	do	do
Cf 8	Eugene Sharkoff	Jones A. Douglas	1954	200	do	35	6	6	do	do
Cf 9	M. G. Denny	G. E. Rinier	1949	350	do	42	6	35	Slope	do
Cf 10	William W. Zink	L. D. Moore	1953	280	do	46	5⅝	10	do	do
Cf 11	W. Debonis	G. E. Rinier	1954	350	do	59	5⅝	50	Upland	do
Cf 12	Richard Comer	do	1953	370	do	69	6	66	Hilltop	do
Cf 13	Allyn W. Bowie	do	1948	400	do	130	6	110	Slope	do
Cf 14	Dwight H. Winters	do	1948	390	do	109	6	95	do	do
Cf 15	L. S. Thompson	do	1950	390	do	60	6	60	do	do
Cf 16	Andrew Howell	do	1950	250	do	53	6	40	do	do
Cf 17	Claude T. Booker	L. D. Moore	1953	180	Dug and drilled	34	—	34	Upland	Port Deposit gneiss
Cf 18	James E. Hummer	Henry Thomas	1949	190	Drilled	81	6	35	Slope	do
Cf 19	Grady Pruitt	G. E. Rinier	1949	60	do	200	6	50	—	do
Cf 20	W. Earl Carroll	do	1950	380	do	62	6	46	Upland	Gabbro
Cf 21	A. Mitchell	do	1949	380	do	50	6	40	Hilltop	do
Cf 22	J. Dolce	do	1952	380	do	175	6	128	Upland	do
Cf 23	John Saven	do	1949	340	do	57	6	40	Hilltop	Port Deposit gneiss
Cf 24	Reno M. Black	do	1950	300	do	42	6	35	Upland	Gabbro
Cf 25	Robert Keesee	do	1952	280	do	43	6	35	Hilltop	do
Cf 26	M. Colette	do	1952	270	do	85	6	80	do	do
Cf 27	Albert Di Minico	Day & West	1954	80	do	54	6	46	—	Port Deposit gneiss
Cf 28	Do	Maryland Drilling Co.	1954	90	do	87	8	22	—	do
Dc 1	Arthur Forney	G. E. Harr Sons	1944	145	do	290	6	—	do	Precambrian
Dc 2	Mountain View Tourist Camp	—	—	145	do	230	—	—	do	do
Dc 3	Rose Haven Inn	—	—	145	do	180	—	—	do	do
Dc 4	Townsley	James Parker	1928	150	do	50	5⅝	—	Slope	Patuxent
Dc 5	John D. Cadwalader	do	1927	160	do	75	5⅝	—	do	Baltimore gneiss
Dc 6	Tom Preston	do	1927	130	do	55	5⅝	—	do	Patuxent
Dc 7	George M. Lester	Werneke Bros.	1952	320	do	32	5⅝	30	do	Gabbro
Dc 8	Carl Winskowski	Henry Thomas	1948	340	do	50	5	38	do	do
Dc 9	Charles W. Campbell	do	1948	340	do	45	5	31	do	do
Dc 10	Fred Dube	do	1948	420	do	90	6	86	Hilltop	do
Dc 11	U. R. Unzell	do	1948	380	do	60	6	60	Slope	do
Dc 12	Arthur Loignon	F. H. Lancaster	1950	460	do	38	6	26	Upland	do
Dc 13	R. V. Mair	do	1951	460	do	40	6	23	do	do
Dc 14	L. P. Chilcote	do	1951	460	do	39	6	22	do	do

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
20[a]	Dec. 6, 1952	—	—	4	Dec. 6, 1952	—	—	J, E	D	
—	—	—	—	3	Apr. 6, 1951	—	—	S, E	D	
8[a]	Aug. 1949	—	—	5	Aug. 1949	—	—	J, E	D	
10[a]	Feb. 15, 1954	60[a]	Feb. 15, 1954	3	Feb. 15, 1954	1	0.1−	J, E	D	
8[a]	Mar. 1, 1954	60[a]	Mar. 1, 1954	2.5	Mar. 1, 1954	—	.1−	S, —	D	
—	—	32[a]	Oct. 1943	200	1943	—	—	T, E	C	Water reported corrosive. See chemical analysis.
28.25	Nov. 1, 1943	29.70	Nov. 1, 1943	100	Nov. 1, 1943	—	68.9	Air lift	C(?)	
10[a]	Mar. 28, 1950	—	—	8	Mar. 28, 1950	—	—	J, E	D	
12[a]	June 3, 1950	—	—	5	June 3, 1950	—	—	—, E	D	
38[a]	Mar. 12, 1951	—	—	10	Mar. 12, 1951	1	—	J, E	D	
21[a]	Jan. 28, 1950	—	—	4	Jan. 28, 1950	—	—	J, E	D	
6[a]	Mar. 12, 1951	16[a]	Mar. 12, 1951	36	Mar. 12, 1951	2	3.6	J, E	D	
15[a]	Apr. 8, 1954	20[a]	Apr. 8, 1954	5	Apr. 8, 1954	2	1	J, E	D	
12[a]	Nov. 25, 1949	—	—	4	Nov. 25, 1949	—	—	J, E	D	
18	Nov. 20, 1953	18[a]	Nov. 20, 1953	12	Nov. 20, 1953	5	—	C, H	D	
6.41	Aug. 3, 1954									
—	—	—	—	8	Apr. 17, 1954	—	—	J, E	D	
15[a]	May 12, 1953	—	—	10	May 12, 1953	—	—	J, E	D	
30[a]	Sep. 15, 1948	110[a]	Sep. 15, 1948	2.5	Sep. 15, 1948	—	.3	J, E	D	Water reported high in iron.
20[a]	Sep. 20, 1948	60[a]	Sep. 20, 1948	4.5	Sep. 20, 1948	—	.1	J, E	D	
15[a]	June 7, 1950	—	—	8	June 7, 1950	—	—	J, E	D	
15[a]	Sep. 2, 1950	—	—	3	Sep. 2, 1950	—	—	J, E	D	Water reported irony.
25[a]	Oct. 7, 1953	—	—	2	Oct. 7, 1953	2	—	C, E	D	Drilled in 27-ft. dug well.
21[a]	Oct. 3, 1949	65[a]	Oct. 3, 1949	1	Oct. 3, 1949	1	.1−	C, E	D	See well log.
10[a]	Mar. 14, 1949	—	—	1	Mar. 14, 1949	—	—	C, E	C	
15[a]	Aug. 10, 1950	—	—	8	Aug. 10, 1950	—	—	J, E	D	Water reported irony.
15[a]	Oct. 19, 1949	—	—	10	Oct. 19, 1949	—	—	J, E	D	
30[a]	Nov. 25, 1952	—	—	8	Nov. 25, 1952	—	—	J, E	D	
12[a]	June 23, 1949	—	—	3	June 23, 1949	—	—	C, H	D	
5[a]	Jan. 10, 1950	—	—	8	Jan. 10, 1950	—	—	J, E	D	
12[a]	Aug. 5, 1952	—	—	4	Aug. 5, 1952	—	—	J, E	D	
10[a]	Mar. 10, 1952	—	—	4	Mar. 10, 1952	—	—	J, E	D	
—	—	—	—	—	—	—	—	N	N	
18[a]	July 1954	80[a]	July 1954	37	July 1954	4	.6	T, E	C	In first week of use, yield declined to 15 gal. a min. See chemical analysis.
60[a]	Aug. 1944	250[a]	Aug. 1944	—	—	—	—	C, E	D	Chloride, 5 ppm; pH, 7.3.
—	—	—	—	—	—	—	—	E	C	
—	—	—	—	—	—	—	—	—	C	
—	—	—	—	10	—	—	—	—	—	Exact location unknown.
—	—	—	—	18	—	—	—	—	—	Do.
—	—	—	—	12	—	—	—	—	—	Do.
8[a]	Jan. 12, 1952	35[a]	Jan. 12, 1952	8	Jan. 12, 1952	1	.3	J, E	D	Water reported irony.
24[a]	Jan. 10, 1948	48[a]	Jan. 10, 1948	12	Jan. 10, 1948	1	.5	J, E	D	
6[a]	Jan. 29, 1948	36[a]	Jan. 29, 1948	3	Jan. 29, 1948	1	.1	—, H	D	
20[a]	June 8, 1948	50[a]	June 8, 1948	24	June 8, 1948	3	.8	N	D	
10[a]	Mar. 11, 1948	40[a]	Mar. 11, 1948	4	Mar. 11, 1948	1	.1	J, E	D	
—	—	—	—	3	July 7, 1950	—	—	J, E	D	
10±[a]	Sep. 18, 1951	—	—	3.5	Sep. 18, 1951	—	—	S, E	D	Do.
10±[a]	Sep. 14, 1951	—	—	2	Sep. 14, 1951	—	—	S, —	D	Do.

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Dc 15	Dr. C. Haymen	Maryland Drilling Co.	1947	400	Drilled	50	6	32	Valley	Gabbro
Dc 16	S. L. Apple	do	1946	420	do	87	6	—	Hilltop	do
Dc 17	Dr. Dill	H & H Drilling Co.	1953	340	do	74	6	65	Slope	do
Dc 18	William E. McAllister	F. H. Lancaster	1950	460	do	80	6	32	Hilltop	do
Dc 19	John Knight	Leonard Drilling Co.	1954	410	do	45	6	45	Upland	do
Dc 20	John Walker	H & H Drilling Co.	1954	420	do	56	6	54	Slope	do
Dc 21	Pullen	F. H. Lancaster	1951	140	do	38	6	20	Valley	Port Deposit gneiss
Dc 22	G. M. Cornelius	Maryland Drilling Co.	1947	260	do	40	6	22	Hilltop	do
Dc 23	W. J. Byrd	do	1947	260	do	44	6	33	do	do
Dc 24	F. Hackett	G. E. Rinier	1951	300	do	260	6	38	Upland	do
Dc 25	Samuel Hirsch	H & H Drilling Co.	1951	280	do	100	6	67	Slope	Patuxent
Dc 26	Frank Suda	Maryland Drilling Co.	1948	160	do	247	6	—	Hilltop	do
Dc 27	Ivan Limbert	Werneke Bros.	1950	100	do	162	6	90	do	Baltimore gneiss
Dc 28	Calvin Johnson, Jr.	Henry Thomas	1949	120	do	108	6	70	Slope	do
Dc 29	Walter M. Cook	Maryland Drilling Co.	1948	110	do	75	6	65	Upland	do
Dc 30	H. A. Dunker	do	1947	220	do	89	6	44	do	Port Deposit gneiss
Dc 31	R. Price	Werneke Bros.	1953	140	do	140	6	140	do	Baltimore gneiss
Dc 32	T. C. Bainbridge	G. E. Rinier	1953	170	do	105	6	60	Slope	do
Dc 33	Charles B. Day	H & H Drilling Co.	1952	120	do	59	6	36	Hilltop	do
Dc 34	Harold W. Hobel	do	1952	320	do	46	6	24	do	Port Deposit gneiss
Dc 35	Lee Page	do	1951	300	do	48	6	38	do	do
Dc 36	Francis Marzulli	do	1952	340	do	34	6	28	do	do
Dc 37	Edward Howard	Theo. Werneke	1954	370	do	65	6	65	do	do
Dc 38	Robert Natwick	Howard Thomas	1954	140	do	60	6	35	Slope	Baltimore gneiss
Dc 39	James Clayton	do	1954	140	do	48	6	35	do	do
Dd 1	Federal Housing Authority	—	1942	80	do	—	—	—	—	—
Dd 2	Do	—	1942	60	do	—	—	—	—	—
Dd 3	Board of Education	—	1927	100	do	145	6	—	Upland	Patuxent
Dd 4	Altwater & Schoenhals	Baltimore Artesian Well Co.	1905	90	do	127	3	—	Hilltop	do
Dd 5	F. Bauer	do	1905	90	do	116	6–3	—	Upland	do
Dd 6	Emmorton School	—	1919±	310	Bored	50	6	—	do	Baltimore gneiss
Dd 7	Rogers	William Lynch	1933	240	Drilled	102	6	—	—	do
Dd 8	Pennsylvania Railroad Co.	—	1891	40	do	114	—	—	—	Patapsco
Dd 9	Willoughby Beach Water Co.	James Parker	1932	10	do	146	5⅝	—	—	Patuxent(?)
Dd 10	Hudson Garage	H & H Drilling Co.	1950	25	do	155	6	128	—	Baltimore gneiss(?)
Dd 11	R. D. Bateman	Maryland Drilling Co.	1954	20	do	96	6	96	—	Patuxent(?)
Dd 12	Pennsylvania Railroad Co.	do	1952	25	do	142	6	136	—	Patuxent
Dd 13	Frank Stoller	G. E. Rinier	1948	35	do	244	6	—	—	do
Dd 14	Paul W. Pritchard	H & H Drilling Co.	1953	60	do	183	6	156	—	Precambrian
Dd 15	Richard Martin	do	1953	20	do	62	6	59	—	Patuxent or Pleistocene
Dd 16	Fred L. Hiser	Day & West	1954	40	do	95	6	75	—	Patuxent

—Continued

Water level (feet below land surface)				Yield						
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)	Specific capacity (g.p.m./ft.)	Pumping equipment	Use water	Remarks
10[a]	May 17, 1947	—	—	—	—	—	—	—	D	
16[a]	Nov. 13, 1946	—	—	—	—	—	—	J, E	D	
20[a]	Sep. 10, 1953	65[a]	Sep. 10, 1953	20	Sep. 10, 1953	1	0.4	—	D	
—	—	—	—	6	July 12, 1950	—	—	J, E	D	
20[a]	Apr. 22, 1954	22[a]	Apr. 22, 1954	45	Apr. 22, 1954	4	22.5	S, E	D	
16[a]	June 18, 1954	24[a]	June 18, 1954	8	June 18, 1954	1	.2	J, E	D	
—	—	—	—	5	Apr. 30, 1951	—	—	—, E	D	
22[a]	Apr. 23, 1947	—	—	—	—	—	—	J, E	D	Well goes dry in summer. Water reported irony.
21[a]	May 3, 1947	—	—	—	—	—	—	J, E	D	Water reported irony.
28[a]	June 15, 1951	—	—	2	June 15, 1951	—	—	—, E	D	
55[a]	Feb. 7, 1951	60[a]	Feb. 7, 1951	8	Feb. 7, 1951	1	1.6	—, E	D	
88[a]	Mar. 1948	—	—	8	Mar. 1948	—	—	C, E	C, D	Water reported irony. See well log.
50[a]	Oct. 30, 1950	—	—	2	Oct. 30, 1950	2	—	C, E	D	Water reported irony.
19[a]	Aug. 27, 1949	100[a]	Aug. 27, 1949	1	Aug. 27, 1949	1	.1−	J, E	D	
.2[a]	Dec. 1948	—	—	55	Dec. 1948	—	—	C, H	D	
47[a]	Nov. 1947	—	—	—	—	—	—	—, E	D	Do.
20[a]	Oct. 15, 1953	—	—	—	—	—	—	T, E	D	
30[a]	July 18, 1953	—	—	2	July 18, 1953	—	—	J, E	D	Do.
14[a]	Feb. 28, 1952	57[a]	Feb. 28, 1952	2.5	Feb. 28, 1952	1	.1−	S, H	D	Do.
28[a]	Jan. 2, 1952	44[a]	Jan. 2, 1952	4	Jan. 2, 1952	1	.3	J, E	D	
8[a]	Feb. 1, 1951	20[a]	Feb. 1, 1951	20	Feb. 1, 1951	1	1.7	S, E	D	
22[a]	Jan. 29, 1952	32[a]	Jan. 29, 1952	8	Jan. 29, 1952	1	.8	S, E	D	
16[a]	Apr. 14, 1954	58[a]	Apr. 14, 1954	4	Apr. 14, 1954	1	.1−	J, E	D	
29[a]	Jan. 16, 1954	50[a]	Jan. 16, 1954	8	Jan. 16, 1954	1	.4	J, E	D	
23[a]	Feb. 16, 1954	44[a]	Feb. 16, 1954	5	Feb. 16, 1954	1	.2	J, E	D	
43.18	Aug. 9, 1944	—	—	—	—	—	—	T, E	N	Abandoned 1942.
—	—	—	—	—	—	—	—	J, E	N	Do.
—	—	—	—	15	Aug. 1944	—	—	C, —	I	Water reported irony.
—	—	—	—	3	—	—	—	—, H	N	
16[a]	—	26[a]	—	50	—	—	5	N	N	Abandoned and covered.
—	—	—	—	6	—	—	—	—	I	Exact location unknown.
—	—	—	—	20	—	—	—	—	—	Do.
—	—	—	—	—	—	—	—	—	N	Abandoned. Exact location unknown.
—	—	—	—	38	—	—	—	—	N	Do.
25[a]	July 1950	150[a]	July 1950	2.5	July 1950	2	.1−	C, E	C	
22[a]	Feb. 1954	45[a]	Feb. 1954	30	Feb. 1954	—	1.3	NI	D	
28[a]	1952	100[a]	1952	10	1952	3	.1	J, E	C	
40[a]	June 15, 1948	80[a]	June 15, 1948	100	June 15, 1948	—	2.5	N	N	Plugged and abandoned.
62[a]	Jan. 1953	180[a]	Jan. 1953	2	Jan. 1953	1	.1−	—	D	
23[a]	Dec. 1953	50[a]	Dec. 1953	30	Dec. 1953	1	1.1	J, E	D	
40[a]	Mar. 1954	—	—	6	Mar. 1954	4	—	J, E	D	

TABLE 17

Well number (Har-)	Owner or name	Driller	Date completed	Altitude (feet)	Type of well	Depth of well (feet)	Diameter of well (inches)	Length of casing (feet)	Topographic situation	Water-bearing formation
Dd 17	El Dorado Motel	G. E. Harr Sons	1952	20	Drilled	185	6	121	—	Baltimore gneiss
Dd 18	James F. Myers	H & H Drilling Co.	1950	320	do	36	6	35	Slope	do(?)
Dd 19	Isaac Hoffecker	do	1950	280	do	161	6	137	Hilltop	Baltimore gneiss
Dd 20	William D. Westhall	do	1948	340	do	61	6	36	do	do
Dd 21	Mrs. Estes Rose	do	1948	300	do	35	6	22	Upland	do
Dd 22	Reed Caudill	do	1948	320	do	62	6	22	do	do
Dd 23	John C. Walker	do	1947	340	do	42	6	24	do	do
Dd 24	Lillian and Edna Grafton	do	1949	320	do	38	6	27	do	do
Dd 25	Donald Scarborough	Henry Thomas	1949	320	do	68	5⅝	44	do	Port Deposit gneiss
Dd 26	Thomas Briggs	do	1949	300	do	33	6	19	do	do
Dd 27	Warren Johnson	do	1949	300	do	32	6	15	do	do
Dd 28	Necker	do	1949	300	do	24	6	4	do	do
Dd 29	John Cook	H & H Drilling Co.	1950	140	do	47	6	46	Slope	do
Dd 30	Caroleen Magness	Henry Thomas	1948	100	do	110	6	72	do	do
Dd 31	John W. Spencer	do	1948	180	do	150	6	150	Hilltop	Patuxent
Dd 32	Donald Harwood	H & H Drilling Co.	1953	140	do	182	4	146	do	Gabbro(?)
Dd 33	E. Hutson	G. E. Rinier	1954	100	Dug and drilled	154	5⅝	150	Slope	Patuxent
Dd 34	W. Hamilton	do	1954	100	Drilled	94	6	7	do	Baltimore gneiss
Dd 35	S. H. Anderson	F. H. Lancaster	1953	80	do	301	6	264	—	do
Dd 36	Mrs. Myrtle Merrick	H & H Drilling Co.	1953	130	do	151	6	80	Slope	do
Dd 37	Florence C. Burnett	Day & West	1954	70	do	85	—	—	do	Pleistocene(?)
Dd 38	St. Marys Protestant Episcopal Church	Henry Thomas	1950	300	do	198	6	138	Hilltop	do
De 1	Bata Shoe Co.	—	1939	10	Dug	33	156	—	—	do
De 2	Do	—	1939	10	do	33	120	—	—	do
De 3	Do	Van Hoy	1939	10	Drilled	345	—	—	—	Precambrian
De 4	Do	—	1939	15	Dug	24	120	—	—	Pleistocene(?)
De 5	Do	Shannahan	1944	15	Drilled	60	—	—	—	do
De 6	U. S. Army	Layne-Atlantic Co.	1942	54	do	83	24–10	73	—	Pleistocene
De 7	Do	do	1942	59	do	121	18–10	71	—	do
De 8	Crabbe	James Parker	1932	120	do	—	6	—	Slope	—
De 9	F. O. Mitchell	H. R. Morris	1930	65	do	50	6	—	—	Pleistocene
De 10	Norman Lee	Carl Lancaster	1933	60	do	52	6	—	—	do
De 11	Do	do	1933	60	do	52	6	—	—	do
De 12	Dr. Delaney	—	—	40	do	50±	6	—	—	do
De 13	L. D. Boyce	—	—	40	do	43	2	—	—	do
De 14	Smith Michael Canning Co.	—	—	60	do	52	6	—	—	do
De 15	Do	—	—	60	do	41	8	—	—	do
De 16	Do	—	—	60	do	49	6	—	—	do
De 17	Do	—	—	60	do	53	6	—	—	do
De 18	Do	Shannahan	1944	60	do	61	16–12–10	38	—	do
De 19	U. S. Army	—	—	45	do	252	—	—	—	—
De 20	L. Longley	G. E. Rinier	1952	20	do	68	6	68	—	Pleistocene(?)
De 21	Lyle M. DePuy	Werneke Bros.	1951	120	do	96	6	82	Slope	Gabbro(?)
De 22	Early Younce	—	1954	100	Dug	48	36	—	do	Patuxent
De 23	Ernest Stein	Henry Thomas	1948	160	Drilled	100	6	68	do	Gabbro
De 24	G. J. Leishman	H & H Drilling Co.	1952	80	do	169	6	90	do	do
De 25	Leon M. Rottenberg	do	1952	50	do	130	6	105	do	Patuxent

—Continued

Water level (feet below land surface)				Yield			Specific capacity (g.p.m./ft.)	Pumping equipment	Use of water	Remarks
Static	Date	Pumping	Date	(g.p.m.)	Date	Duration of test (hours)				
60[a]	Aug. 1952	85[a]	Aug. 1952	10	Aug. 1952	14	0.4	C, E	C	
16[a]	Jan. 29, 1950	42[a]	Jan. 29, 1950	10	Jan. 29, 1950	1	.4	J, E	D	
40[a]	May 6, 1950	150[a]	May 6, 1950	2.5	May 6, 1950	2	.1−	J, E	D	See well log.
22[a]	Nov. 26, 1948	50[a]	Nov. 26, 1948	7	Nov. 26, 1948	2	.3	J, E	D	
20[a]	Dec. 23, 1948	25[a]	Dec. 23, 1948	10	Dec. 23, 1948	2	2	S, E	D	
16[a]	Nov. 6, 1948	50[a]	Nov. 6, 1948	6	Nov. 6, 1948	2	.2	J, E	D	
14[a]	Sep. 20, 1947	30[a]	Sep. 20, 1947	4	Sep. 20, 1947	1	.3	J, E	D	
17[a]	Oct. 2, 1949	30[a]	Oct. 2, 1949	5	Oct. 2, 1949	1	.4	J, E	D	
6[a]	Feb. 15, 1949	48[a]	Feb. 15, 1949	8	Feb. 15, 1949	1	.2	J, E	D	
9[a]	Apr. 23, 1949	25[a]	Apr. 23, 1949	10	Apr. 23, 1949	1	.6	J, E	D	
5[a]	Apr. 21, 1949	14[a]	Apr. 21, 1949	20	Apr. 21, 1949	1	2.2	J, E	D	
15[a]	Mar. 19, 1949	16[a]	Mar. 19, 1949	10	Mar. 19, 1949	1	10	J, E	D	
7[a]	Feb. 2, 1950	35[a]	Feb. 2, 1950	10	Feb. 2, 1950	1	.4	C, H	D	See chemical analysis.
30[a]	Feb. 6, 1948	90[a]	Feb. 6, 1948	4	Feb. 6, 1948	2	.1−	J, E	D	Water reported irony.
125[a]	Aug. 16, 1948	130[a]	Aug. 16, 1948	15	Aug. 16, 1948	2	3	J, E	D	Do.
62[a]	Dec. 1, 1953	160[a]	Dec. 1, 1953	6	Dec. 1, 1953	1	.1−	C, E	D	
100[a]	Apr. 4, 1954	—	—	8	Apr. 4, 1954	3	—	J, E	D	Drilled in 48-ft. dug well. Water reported irony.
12[a]	June 31, 1954	—	—	18	June 31, 1954	—	—	T, E	C	
100[a]	Mar. 18, 1953	—	—	.5	Mar. 18, 1953	—	—	—	D	
45[a]	Feb. 9, 1953	70[a]	Feb. 9, 1953	20	Feb. 8, 1953	2	.8	J, E	D	Water reported irony.
40[a]	May 3, 1954	—	—	7	May 3, 1954	8	—	—, E	D	
60[a]	Feb. 10, 1950	175[a]	Feb. 10, 1950	4	Feb. 10, 1950	2	.1−	J, E	I	See well log.
8.69	Oct. 2, 1943	—	—	—	—	—	—	T, E	C	Depth when drilled about 70 ft. Water reported irony.
—	—	17.30	Oct. 2, 1943	—	—	—	—	T, E	C	Do.
3.04	Oct. 2, 1943	—	—	12	—	—	—	T, E	N	
—	—	—	—	small	—	—	—	N	N	
16[a]	May 1944	30[a]	May 1944	40	May 1944	—	2.1	—	P	
29[a]	1942	67.5[a]	1942	260	1942	—	6.7	T, E	M	July 7, 1944, pH, 5.5; Cl, 17 ppm
27[a]	1942	69[a]	1942	253	1942	—	6.0	T, E	M	
—	—	—	—	6-7	—	—	—	—, H	N	
16[a]	—	—	—	100	—	—	—	—, E	D	Water reported irony.
—	—	—	—	8	Aug. 1944	—	—	S, E	D	Do.
—	—	—	—	8	Aug. 1944	—	—	S, E	D	Do.
—	—	—	—	—	—	—	—	J, E	D	
25[a]	Aug. 1944	—	—	—	—	—	—	C, E	D	Do.
14.3[a]	Sep. 12, 1944	—	—	—	—	—	—	N	N	
14.9[a]	Sep. 12, 1944	—	—	—	—	—	—	N	N	
14.5[a]	Sep. 12, 1944	—	—	—	—	—	—	S, E	N	
—	—	18.8[a]	Sep. 12, 1944	40	Sep. 12, 1944	—	—	S, E	P	
15.3[a]	Nov. 1944	32[a]	Nov. 1944	358	Nov. 1944	—	21.4	NI	—	
—	—	—	—	—	—	—	—	—	—	Test well.
25[a]	Apr. 1952	—	—	12	Apr. 1952	7	—	—	D	
45[a]	Dec. 4, 1951	86[a]	Dec. 4, 1951	1	Dec. 4, 1951	1	.1−	J, E	D	Water reported irony.
47.9[a]	Aug. 3, 1954	—	—	—	—	—	—	J, E	D	
47[a]	Feb. 2, 1948	80[a]	Feb. 2, 1948	10	Feb. 2, 1948	1	.3	J, E	D	Do.
23[a]	Jan. 2, 1952	165[a]	Jan. 2, 1952	.5	Jan. 2, 1952	1	.1−	C, E	D	
15[a]	Apr. 16, 1952	95[a]	Apr. 16, 1952	10	Apr. 16, 1952	6	.1	J, E	C	

TABLE 18

Records of Springs in Harford County

Use of water: I, institutional or camp; N none.

Well number (Har-)	Owner or name	Altitude (feet)	Type of spring	Topographic situation	Water-bearing formation	Yield: Gallons a minute	Yield: Date	Pumping equipment	Use of water	Temperature (° F.)	Remarks
Aa 1	Lutheran Inner Mission Society	540	Depression	Slope	Wissahickon (albite)	4–7	May 1950	Gravity	I	—	Camp Jolly Acres
Aa 9	—	660	do	Valley	do	20	June 1953	None	N	—	
Ba 7	Tom Anderson	630	do	Draw	Wissahickon (oligoclase)	5	—	None	N	—	
Ba 9	J. Robert Anderson	610	do	do	do	3–4	—	—	N	—	
Cc 6	Maryland Water Works Co.	460	do	Valley	do	15	Mar. 1940	None	N	—	

The Surface-Water Resources

BY

ROBERT O. R. MARTIN

Introduction

Human life and progress are closely dependent upon water, and man can exist but a few days without it. The conservation and control of water, therefore, have become one of his vital problems. The demands of an advancing civilization have placed limitations on the use of water, especially after man abandoned his nomadic way of life and established a permanent home rather than moving continually from water hole to water hole. In densely populated areas, the demand for water very often approaches the limit of supply. Areas lacking in water are most often sparsely settled because the expense of transporting water is a burden to the homemaker. An adequate water supply is a prerequisite to the growth of our cities. With increased demand for water many complex problems arise, such as pollution and contamination from known or unknown sources within the drainage basin. Water as precipitated by rain is pure, but man has a trying task to maintain this quality. Outbreaks of sickness and epidemics have been traced to impure drinking water. Clean, pure streams and lakes are important assets to a community for recreational purposes in addition to their value as sources of public water supplies.

Navigation was one of the earliest uses of surface waters, but with increased farming and industry, the use of streams for irrigation and industrial purposes has become more important. There are manifold industrial uses of surface waters in our cities for which temperature and chemical quality have become important factors.

The never-ending circulation of water in various forms from ocean and land surfaces to the atmosphere by evaporation and transpiration, from the atmosphere to the land by precipitation, and then back to the ocean is called the hydrologic cycle. As water travels from the land to the ocean, a part runs off directly into the streams and part enters ground water storage before later appearing as streamflow.

Although streamflow is indispensable to man, excessive amounts can cause tremendous damage and even loss of life. It has been the inclination of man to establish his home on or near a stream in order to have a readily accessible supply of water or means of transportation. As river settlements grow, the usual trend is for the flood plains of the stream to be encroached upon, and even for the normal stream channel to be crowded and its carrying capacity reduced by structures of all kinds. Thus, the tendency toward flooding is aggravated, and the actual or potential flood damages are vastly increased. The problem of flood control then arises. For the proper planning of flood-control works such as dams, levees, or channel improvements, and the designing of bridges with adequate waterways, records of streamflow are needed over a sufficient number of years to establish the flood-flow characteristics of the stream.

STREAMFLOW MEASUREMENT STATIONS

To study systematically the range of streamflow in order to derive maximum benefits from it, the U. S. Geological Survey has installed numerous stream-gaging stations throughout the country. In cooperation with the Maryland Department of Geology, Mines and Water Resources, and other State, Federal, and municipal agencies, 89 stations are in operation in Maryland. All of them are equipped with automatic water-stage recorders, which collect a continuous record of the stage of the stream (fig. 19). In conjunction with the stage record, flow determinations must be made periodically by means of a precise instrument known as a current meter in order to correlate stage with discharge. (Pl. 10, fig. 1). The discharge corresponding to a given stage can be determined by interpolation, provided the channel conditions of the stream remain unchanged.

The selection of a site for a gaging station requires a careful appraisal of the stream channel to be assured that hydraulic conditions are stable and that a fixed relation between stage and discharge will be maintained. The gage must be accessible under adverse conditions of storm and high water, and the measurement of discharge of the stream must be possible at all stages. To avoid building expensive structures it is economical to benefit by the proximity of a bridge suitable for discharge measurements. In some cases there is no alternative except to erect a cableway across a stream. This cableway is generally suspended from high A-frames on each bank and is used to support a cable car. The elevation of the cableway must be sufficient to support an engineer and his measuring equipment with clearance above the stages of anticipated floods.

Present-day construction practice favors a permanent-type recording-gage structure. The usual gage well and house in Maryland is constructed of concrete block or reinforced concrete and has inside dimensions of about 4 feet square. The structure is provided with steel doors for house and well and is connected to the stream by one or more horizontal pipes or intakes to permit the water in the well to fluctuate simultaneously with the stream. The height of the structure is governed by the height of the maximum anticipated flood.

A continuous graphic record of stage with respect to time is obtained by means of a water-stage recorder installed in the gage house to record the fluctuations of the water level in the gage well (fig. 19). The modern water-stage

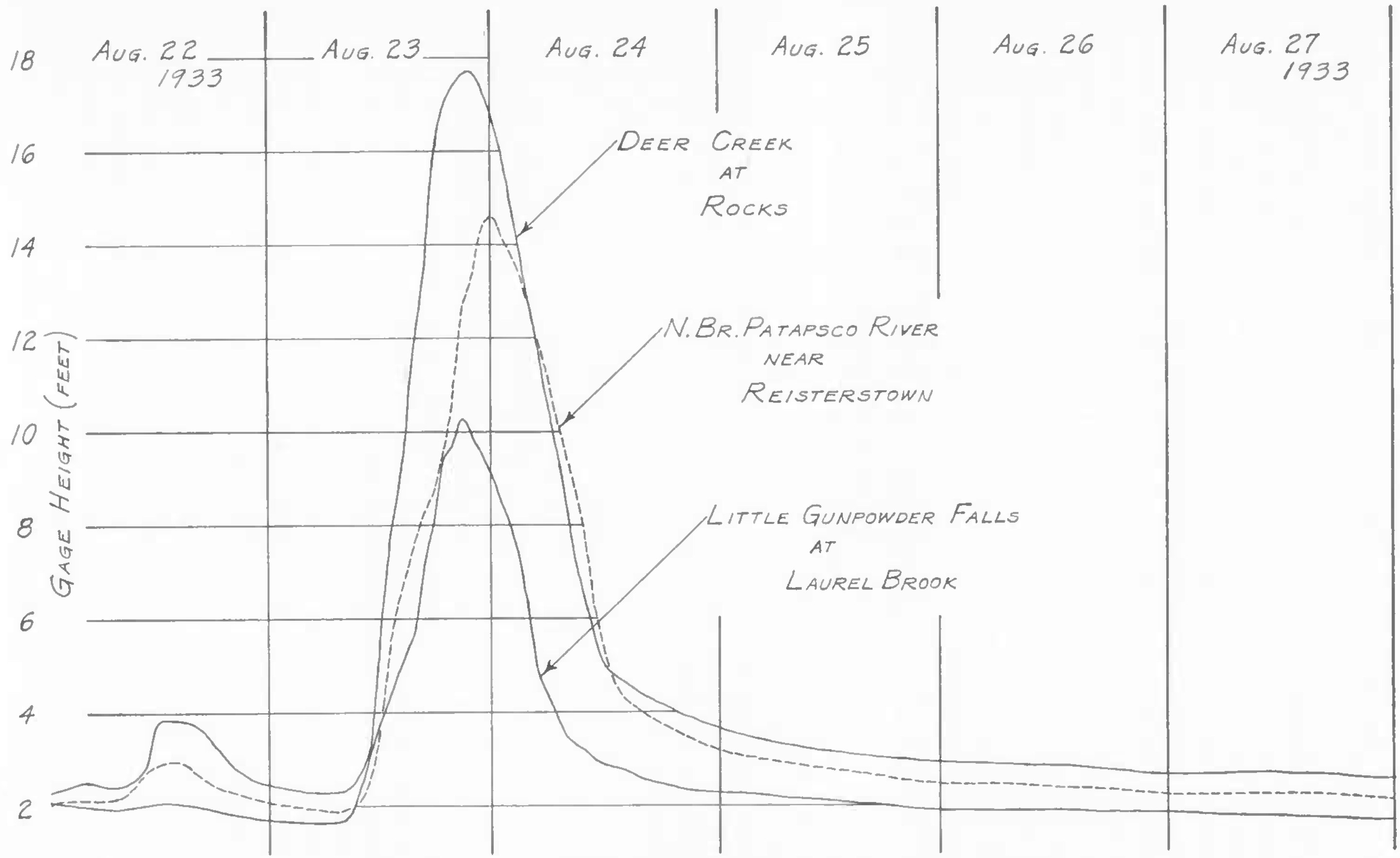

FIGURE 19. Graphs of River Stages from Automatic Water-stage Recorders

recorder requires very little attention. Inspections to change the continuous recorder charts can be made once a month or even less frequently. In silt-laden streams it is necessary to clean the intake pipes by forcing water through them by means of a flushing device. Most of the streams in Maryland contain enough silt to require an intake-pipe flushing system.

The rate of flow of a stream, or the discharge, is the quantity of water passing any point in a given time. This quantity is expressed in terms of cubic feet per second, commonly called second-feet. Discharge varies with precipitation and with basin characteristics such as depth and texture of the soils and steepness of the terrain. The discharge at any point on a stream can readily be determined by multiplying the cross-sectional area of the water by its velocity. Streamflow measurements are made periodically by means of a current meter which determines the velocity of the water. Plate 10, figure 1, shows a standard Price current meter mounted on a rod for use in making a discharge measurement by wading a stream and the smaller Pygmy meter designed for shallow streams. Plate 10, figure 2, shows the heavier crane and reel equipment used to measure deep swift streams. The purpose of a discharge measurement is to define the stage-discharge relation existing at that time (fig. 20).

Daily discharge records for the gaging-stations are published in annual water-supply papers of the United States Geological Survey, in Part 1 (Part 1 B subsequent to 1950) of the series called "Surface-Water Supply of the United States."

DEFINITION OF TERMS

The following technical terms are used in stream-flow records:

Second-feet.—An abbreviation for "cubic feet per second." A cubic foot per second (cfs) is the rate of discharge of a stream whose channel is 1 square foot in cross-sectional area and whose average velocity is 1 foot per second.

Discharge.—A rate of flow of water, usually expressed in second-feet. One second-foot flowing for one day equals 86,400 cubic feet, equals 646,317 gallons, equals about 2.0 acre-feet (an area of one acre covered with two feet of water).

Cubic feet per second per square mile.—An average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the runoff is distributed uniformly as regards both time and area.

Million gallons per day per square mile.—An average number of gallons of water flowing per day from each square mile of area drained, on the assumption that the runoff is distributed uniformly as regards both time and area. One million gallons per day equals 1.5472 cfs, equals 3.07 acre-feet per day.

Runoff in inches.—The depth to which an area would be covered if all the water draining from it in a given period were uniformly distributed on its surface.

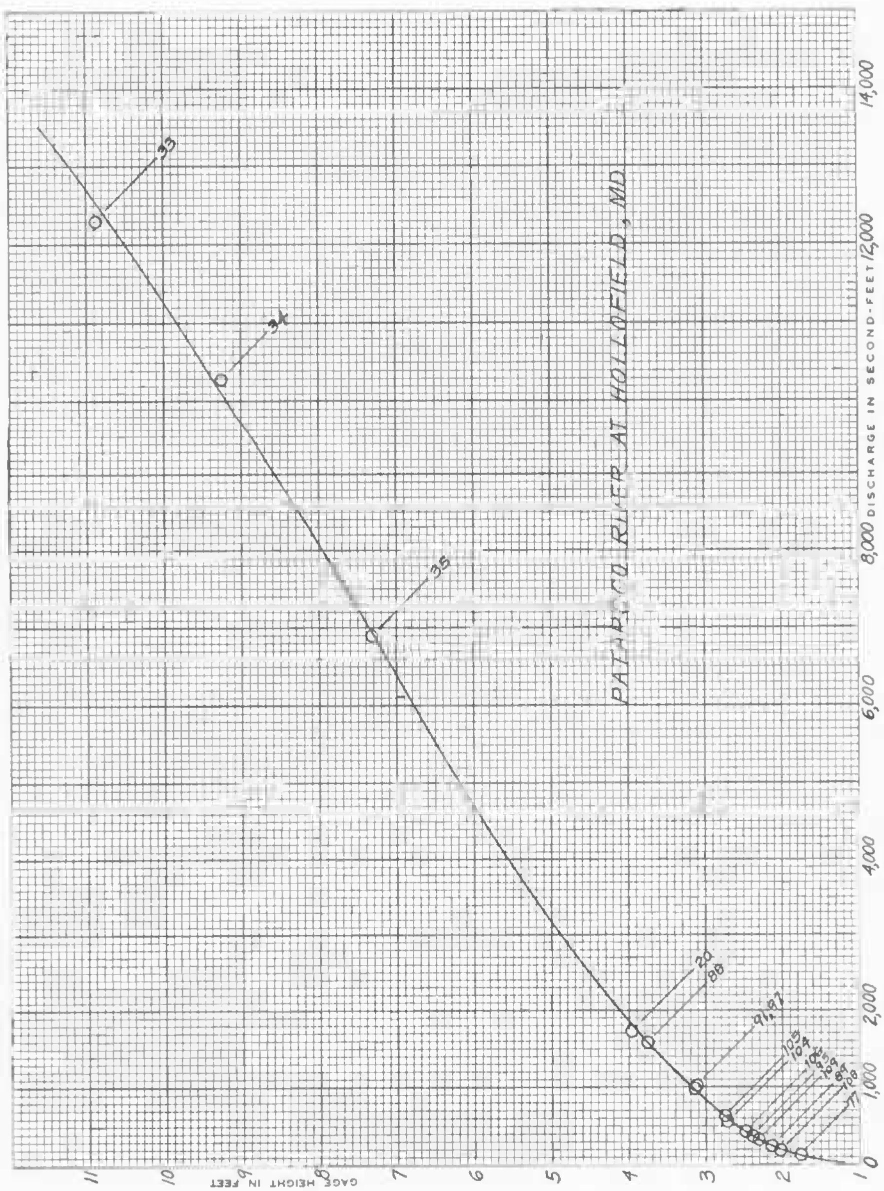

FIGURE 20. Typical Rating Curve Showing Stage-discharge Relation

Drainage basin.—The area drained by a stream or stream system, usually expressed in square miles.

Water year.—A special annual period selected to facilitate water studies, commencing October 1 and ending September 30.

SURFACE-WATER RESOURCES

Baltimore and Harford Counties lie principally in the Piedmont province, but include also some of the Coastal Plain bordering on Chesapeake Bay. The "Fall Line" defining the eastern edge of the Piedmont and the western edge of the Coastal Plain extends northeastward from the City of Baltimore approximately along U. S. Highway 1. The topography consists of low, rolling hills, with an eastward slope, so that all streams flow southeastward into Chesapeake Bay from drainage basins that are more or less parallel. Major streams form most of the natural boundaries for both counties as well as the boundary between them along the Little Gunpowder Falls to a point at its extreme headwaters where the boundary extends northward to the Pennsylvania State line.

Baltimore County lies northward of the Patapsco River and eastward of the North Branch Patapsco River with a straight-line boundary of 17 miles running north-northeastward from Glen Falls to the Pennsylvania State line. The Susquehanna River flowing southeastward across the Pennsylvania State line forms the entire northeastern boundary of Harford County. Both counties front on Chesapeake Bay and the northern border of both is the historic Pennsylvania State line, referred to as the Mason-Dixon Line (fig. 21).

Streambeds are composed mostly of sand and gravel. Outcrops of ledge rock become more numerous upstreamwards (Pl. 9, fig. 2). The soft loam banks of the streams are densely wooded except where pastures have been cleared. The drainage basins are for the greater part occupied by farms or pastoral land. Floods overflow the low banks of these streams several times every year and the critical channel sections have been gradually eroded by floods so that many of the channels follow meandering courses through woods or rich farm land (Pl. 6 fig. 1). The highest elevation in Baltimore or Harford Counties is less than 900 feet above mean sea level, so there are no steep stream channel gradients except in small drainage basins in the headwaters near the Pennsylvania State line. Most streams flow sluggishly along poorly-defined channels but well above tidal effect so that all streams are free from marshes and brackish water except in the immediate vicinity of Chesapeake Bay. A few natural and artificial ponds and lakes, as well as the flat topography and the sinuous stream channels, tend to delay runoff. The three major streams—Patapsco River, Gunpowder Falls, and Susquehanna River—are highly developed, and their natural flow is regulated by storage of water for a better economy of distribution.

Interest in the surface-water resources of Baltimore and Harford Counties increases with time. About 1¼ million users of public water-supplies in Balti-

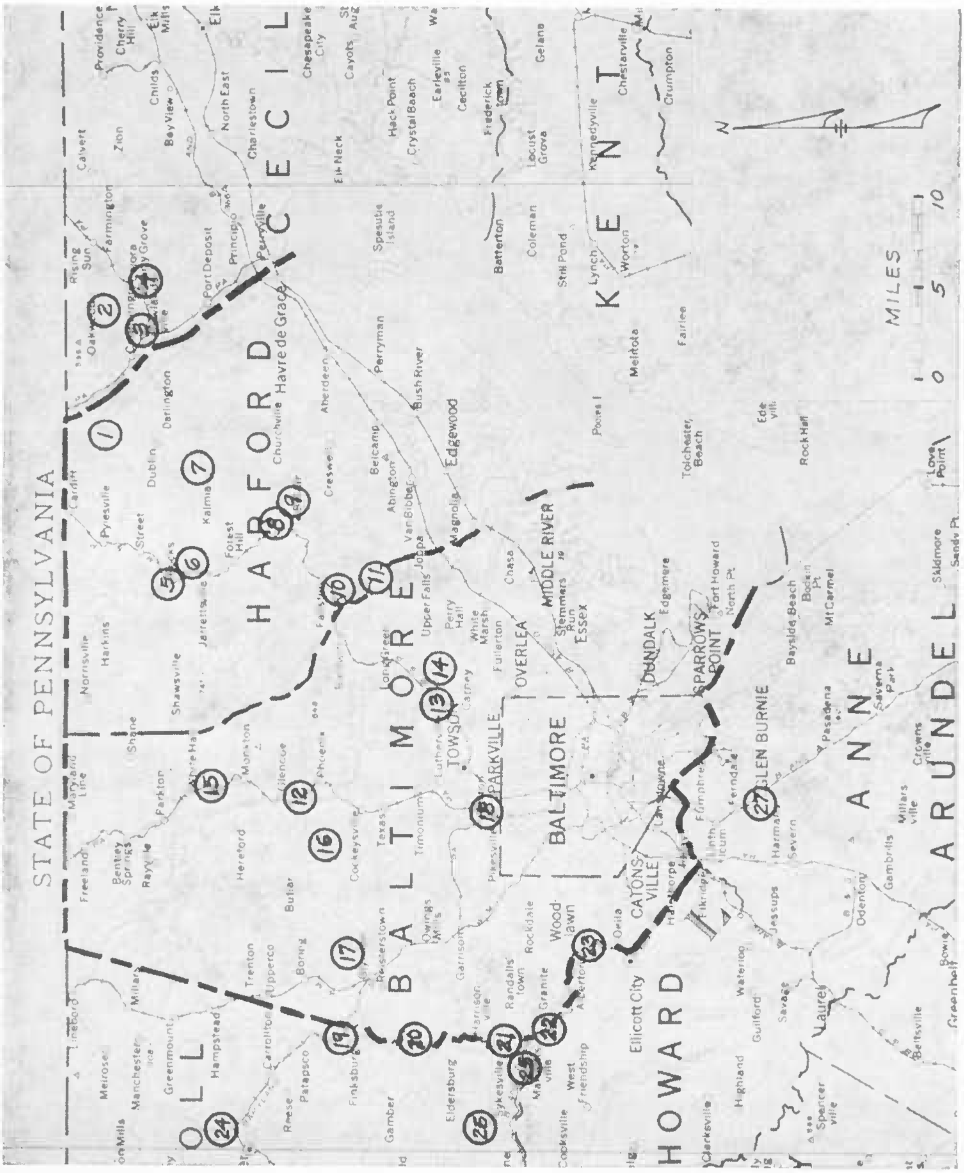

FIGURE 21. Map Showing Principal Streams and Gaging Stations

more City and Baltimore and Harford Counties are dependent on those resources. The history of providing water to the public began in 1787 when special commissioners of Baltimore-Town erected public pumps. By 1804 the Baltimore Water Company began furnishing water from Jones Falls at Lake Roland, and in 1854 the company was purchased by the City. This was supplemented by the Gunpowder Falls supply placed in service on September 28, 1881. By means of a rated spillway and recorded venturi-tube measurement of all diversion, together with the known adjustments for change in storage contents in all reservoirs, the Baltimore City Bureau of Water Supply has collected and published a complete average monthly discharge since January 1883 on Gunpowder Falls. Similar records were collected for Jones Falls at Lake Roland from 1883 to 1915.

Stream-gaging by the U. S. Geological Survey began August 16, 1896, on Patapsco River at Woodstock on a daily basis. Discharge records were published in the annual series called "Surface-Water Supply of the United States." Similar daily records are available for 10 streams within the Baltimore and Harford Counties area, having been obtained at 19 gaging stations of which 10 are still in operation. A total of 27 streamflow records were used in the appraisal of surface water for this bi-county area, which amounted to more than 450 station-years of records including the water year ending September 30, 1955.

Surface-water supplies for the City of Baltimore are obtained from reservoirs at Loch Raven Dam (Pl. 11, fig. 1) and Prettyboy Dam on Gunpowder Falls and Liberty Dam on North Branch Patapsco River. The past, present, and estimated future water consumption in the Baltimore area is shown on figure 22, which reveals the gradual progression, such as the Loch Raven and Prettyboy Dam system becoming inadequate and the supplemental supply from a new source (Liberty Dam) being required. This combined Gunpowder-Patapsco system is expected to reach its limit of safe yield during 1962–65 at which time a pipe line for diversion from the Susquehanna River is to be available.

The use of water by the larger towns in this area such as Aberdeen, Bel Air, and Havre de Grace is dwarfed by Baltimore's consumption and eventually they might be absorbed into the large Baltimore water-supply system. A maximum daily consumption of 237 mgd occurred during 1954 in spite of water curtailments which were in effect. With restricted summer use of water for lawns, washing cars, and for other purposes, the years 1953 and 1954 averaged 199.2 and 199.3 mgd. respectively.

An unprecedented consumption rate of 268 mgd was reported for July 18, 1955, which invoked a ban on lawn sprinkling from 4 p.m. to midnight. The trend in population of the Baltimore Water Service Area and estimates of future population are shown on figure 23.

There are no other streams of sufficient size, except Deer Creek (Pl. 11 fig.

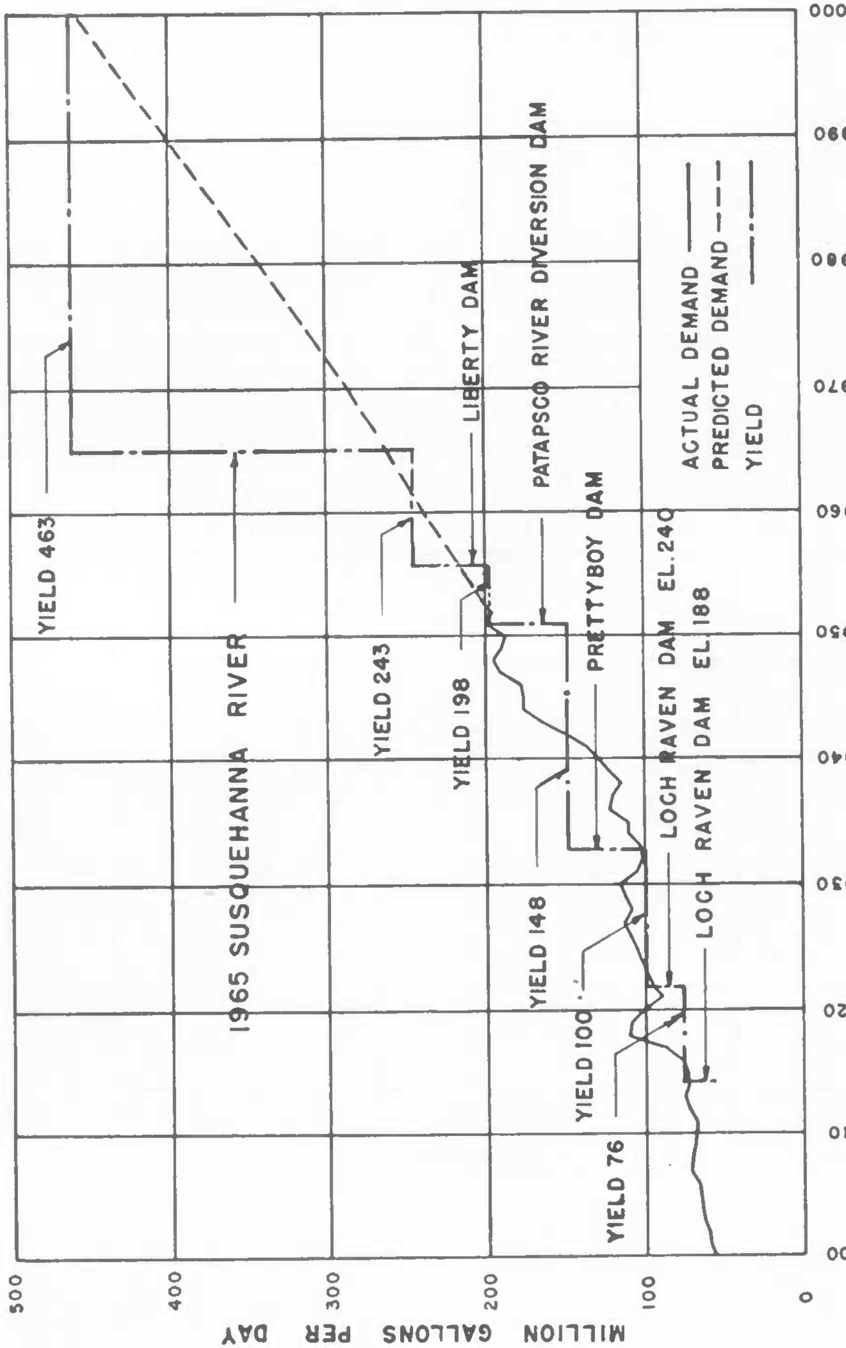

FIGURE 22. Average Daily Raw Water Demand and Safe Yield of Water Supply Sources for Baltimore (From "Report to the City of Baltimore on Future Sources of Water Supply etc." Dec. 15, 1953 by Board of Advisory Engineers on Future Water Supply)

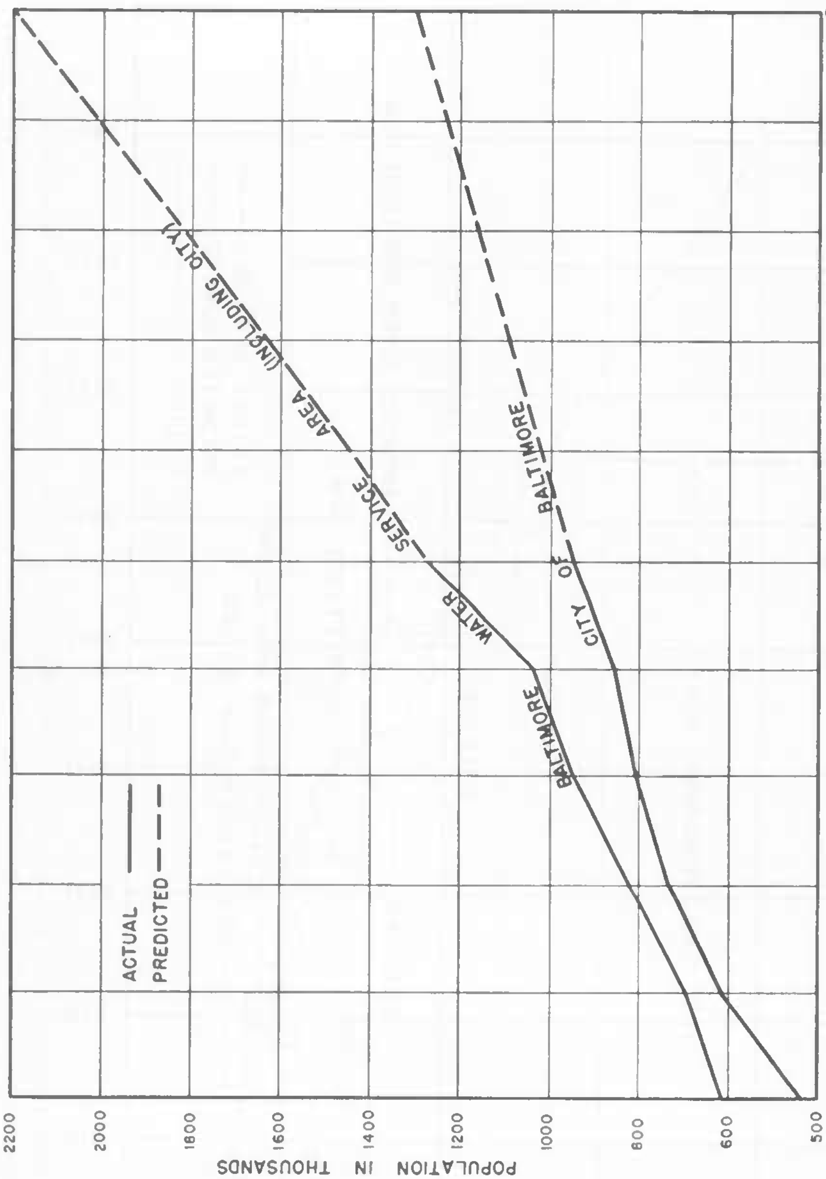

FIGURE 23. Population of the Baltimore Water Service Area from 1900 to 2000 (From "Report to the City of Baltimore on Future Sources of Water Supply etc." Dec. 15, 1953 by Board of Advisory Engineers on Future Water Supply)

2) or Winters Run, to warrant consideration for municipal water-supply. The City of Baltimore anticipates no deficiencies in water supply for the next four decades after the Susquehanna River pipe line comes into service. Beyond the year 2000, future supplies undoubtedly will be derived by more rigorous control of the Patapsco and Gunpowder basins, and possibly by expanding westward into the upper Monocacy River basin. A much closer source to the south, the Patuxent River, is preempted for use of the Washington Suburban Sanitary Commission.

Irrigation has not been an economic requirement in Baltimore and Harford Counties as average rainfall has been ample for most farms. In recent years farmers have become interested in supplemental irrigation by means of portable sprinkler systems. This use will have an appreciable effect on the flow of small streams, especially during periods of minimum flow. If irrigation proves to be economically justified the loss to streamflow may amount to 90 to 100 percent of the water pumped, which would change the natural low-flow regimen at many gaging stations.

There are no multiple-purpose dams that are used for irrigation, but there has been a recent trend towards construction of small farm ponds in cooperation with the U. S. Soil Conservation Service for the purpose of conserving rainfall for distribution as needed. The U. S. Soil Conservation Service reports 97 and 122 farm ponds for Baltimore and Harford Counties, respectively, under its direct jurisdiction as of July 1, 1955. There are also additional privately built ponds.

Long-term records of the U. S. Weather Bureau in Baltimore show that annual rainfall has averaged between 42 and 43 inches, with a daily maximum of 7.62 inches on August 23, 1933. The hurricane "Connie" produced a new record 24-hour precipitation on August 12–13, 1955, of 7.82 inches at the Baltimore City Custom House rain gage. The rainfall pattern has been quite evenly distributed throughout the year with all months except November averaging 3 inches or more. Most summer rainfall occurs in the form of thundershowers, which average 32 per year. Extreme temperatures range from 107° to −7°. The summers are warm and humid and the winters mild, and the growing season averages 207 days.

The more important streams of Baltimore and Harford Counties and their drainage areas at selected points are listed in Table 19, based chiefly on data in the "Report to the General Assembly of Maryland by the Water Resources Commission of Maryland, January 1933." The principal streams are shown in figure 21.

GAGING STATIONS IN AND NEAR BALTIMORE AND HARFORD COUNTIES

This report contains streamflow records ending September 30, 1954, from 16 active gaging stations, representing nearly 320 station-years. The longest

TABLE 19

Drainage Areas of Streams in Baltimore and Harford Counties

Name of stream in downstream order	Tributary to:	Drainage area (square miles)		
		At point	Outside of Md.	U.S.G.S. gage
Susquehanna River at Pennsylvania line	Chesapeake	26,960	26,952	
Susquehanna River at Conowingo Dam	Chesapeake	27,098	27,028	
Susquehanna River at mouth	Chesapeake	27,469	27,187	
Right bank tributary to Broad Creek at Pylesville	Susquehanna	3.96		
Branch of Broad Creek near Macton, 0.5 mi. upstream from mouth	Susquehanna	0.7		
Broad Creek at Mill Green	Susquehanna	16.4		16.4
Broad Creek at mouth	Susquehanna	41.4	0.56	
Pedler Run at Castleton, 1.0 mi. upstream from mouth	Susquehanna	4.6		
Deer Creek at Pennsylvania line	Susquehanna	12.3	12.2	
Little Deer Creek at Md. Hwy. 146	Deer	9.50		
Little Deer Creek at Md. Hwy. 165	Deer	13.9		
Little Deer Creek at mouth	Deer	14.1		
Deer Creek at Rocks, above Kellogg Branch	Susquehanna	92.1	25.2	92.1
Deer Creek at Rocks	Susquehanna	94.4	25.2	94.4
Deer Creek near Churchville	Susquehanna	141	25.2	141
Deer Creek at mouth	Susquehanna	170.7	25.2	
Swan Creek at Swan Creek, at highway bridge	Chesapeake	15.7		
Swan Creek at mouth	Chesapeake	26.5		
Romey Creek at mouth	Chesapeake	25.2		
Bynum Run near Bel Air, on side road off Md. Hwy. 22	Bush	7.7		7.7
Bynum Run at Bel Air, at Md. Hwy. 22	Bush	8.8		8.8
James Run at mouth	Bynum	11.5		
Bynum Run at mouth	Bush	23.8		
Bush River at head of estuary	Chesapeake	35.7		
East Branch Winters Run at mouth	Bush	10.4		
West Branch Winters Run at mouth	Winters	9.64		
Winters Run below Bear Cabin Branch	Bush	30.7		
Winters Run at U. S. Hwy. 1	Bush	37.0		
Winters Run upstream from Singer, at Atkisson Reservoir	Bush	44.9		
Winters Run downstream from Singer at Atkisson Reservoir	Bush	48.0		
Winters Run at Van Bibber, at highway bridge	Bush	55.4		
Otter Point Creek at mouth	Bush	63.6		
Bush River at mouth	Chesapeake	139.7		
Georges Run at mouth	Gunpowder	20.9		
Gunpowder Falls at Prettyboy Dam	Chesapeake	79.8	6.95	
Little Falls at Blue Mount, at railroad bridge	Gunpowder	52.9	4.14	52.9
Little Falls at mouth	Gunpowder	53.1	4.14	
Gunpowder Falls at Glencoe	Chesapeake	160		160
Slade Run near Glyndon	Western	2.27		2.27

TABLE 19—*Continued*

Name of stream in downstream order	Tributary to:	Drainage area (square miles)		
		At point	Outside of Md.	U.S.G.S gage
Western Run above Indian Run	Gunpowder	14.9		
Western Run at Western Run, at old dam	Gunpowder	59.2		
Western Run at Western Run	Gunpowder	59.8		59.8
Beaver Dam Run at mouth	Western	21.2		
Western Run at mouth	Gunpowder	85.4		
Gunpowder Falls at (new) Loch Raven Dam	Chesapeake	303		303
Gunpowder Falls at (old) Loch Raven Dam	Chesapeake	304		304
Gunpowder Falls near Carney	Chesapeake	314		314
Gunpowder Falls at mouth	Chesapeake	350.1	11.1	
Little Gunpowder Falls at Laurel Brook	Gunpowder	36.1		36.1
Little Gunpowder Falls near Bel Air	Gunpowder	43		43
Little Gunpowder Falls at mouth	Gunpowder	58.3		
Whitemarsh Run at Whitemarsh, at highway bridge	Gunpowder	15.9		
Bird River at mouth	Gunpowder	26.7		
Gunpowder River at mouth	Chesapeake	471.5	11.1	
Back River at head of estuary (Herring Run)	Chesapeake	26.8		
Back River at mouth	Chesapeake	62.4		
North Branch Patapsco River at Cedarhurst	Patapsco	56.6		56.6
Beaver Run at mouth	N. Br. Patapsco	16.2		
North Branch Patapsco River near Reisterstown	Patapsco	91.0		91.0
Morgan Run at mouth	N. Br. Patapsco	44.6		
North Branch Patapsco River at Liberty Dam	Patapsco	164		
North Branch Patapsco River near Marriottsville	Patapsco	165.0		165.0
North Branch Patapsco River at mouth	Patapsco	171.0		
South Branch Patapsco River at mouth	Patapsco	85.7		
Patapsco River at Woodstock	Chesapeake	260		260
Patapsco River at Hollofield, at Md. Hwy. 100	Chesapeake	285.4		285.4
Patapsco River at Avalon, at highway bridge	Chesapeake	310.3		
Patapsco River at Landsdowne, at Md. Hwy. 167	Chesapeake	358.7		
Patapsco River near Landsdowne, at Md. Hwy. 301	Chesapeake	360		
Gwynns Falls at mouth	Patapsco	65.5		
Jones Falls at mouth	Patapsco	59.0		
Stony Run at Johns Hopkins University	Jones Falls	2.84		2.84
Stony Run at mouth	Jones Falls	3.05		

continuous record is the 28-year (1926-54) record for Deer Creek at Rocks. These records average more than 20 complete water-years per station and include records of 28-year, 27-year, 25-year, 23-year, 22-year, three 10-year, 9-year, 7-year, two 6-year, two 5-year, and one 4-year. A 71-year continuous monthly record since 1883 is available for Gunpowder Falls at Loch Raven Dam. The records for the discontinued stations average more than 10 water-years, but include a 32-year (1883-1915) continuous monthly record on Jones Falls at Lake Roland. Average discharge in cubic feet per second per square mile for the period of record is summarized in Table 21. These gaging stations are fairly well distributed geographically.

TABLE 20

Stream-gaging Stations in and near Baltimore and Harford Counties

Number on Figure 21	Stream-gaging Station	Drainage area (sq. mi.)	Stream-flow records
1	Broad Creek at Mill Green	16.4	Dec. 14, 1904–Mar. 31, 1909
2	Octoraro Creek near Rising Sun	193	Apr. 9, 1932–
3	Octoraro Creek at Rowlandsville	210	Nov. 22, 1896–Sept. 30, 1899
4	Basin Run at Liberty Grove	5.31	Oct. 1, 1948–
5	Deer Creek above Kellogg Branch at Rocks	92.1	July 27, 1933–Feb. 28, 1934
6	Deer Creek at Rocks	94.4	Oct. 1, 1926–
7	Deer Creek near Churchville	141	Dec. 14, 1904–Mar. 31, 1909
8	Bynum Run near Bel Air	7.7	July 7, 1950–
9	Bynum Run at Bel Air	8.8	June 3, 1944–Apr. 5, 1951
10	Little Gunpowder Falls at Laurel Brook	36.1	Dec. 7, 1926–
11	Little Gunpowder Falls near Bel Air	43	Dec. 13, 1904–Mar. 31, 1909
12	Gunpowder Falls at Glencoe	160	Dec. 15, 1904–Mar. 31, 1909
13	Gunpowder Falls at Lock Raven Dam	303	Jan. 1, 1883–
14	Gunpowder Falls near Carney	314	Sept. 29, 1949–
15	Little Falls at Blue Mount	52.9	June 24, 1944–
16	Western Run at Western Run	59.8	Sept. 1, 1944–
17	Slade Run near Glyndon	2.27	Sept. 17, 1947–
18	Jones Falls at Lake Roland Dam	40	1883– 1915
19	North Branch Patapsco River at Cedarhurst	56.6	Sept. 22, 1945–
20	North Branch Patapsco River near Reisterstown	91.0	June 30, 1927–Dec. 31, 1953
21	North Branch Patapsco River near Marriottsville	165	Oct. 1, 1929–
22	Patapsco River at Woodstock	260	Aug. 16, 1896—Mar. 31, 1909
23	Patapsco River at Hollofield	285	May 22, 1944–
24	Cranberry Branch near Westminster	3.40	Sept. 27, 1949–
25	South Branch Patapsco River at Henryton	64.4	Aug. 18, 1948–
26	Piney Run near Sykesville	11.4	Sept. 22, 1931–
27	Sawmill Creek at Glen Burnie	5.1	May 11, 1944–Sept. 30, 1952

Stations for which no closing dates are shown are still in operation.

The drainage areas and the available years of records for all gaging stations are presented in Table 20, and their locations are shown on figure 21.

Included in this report is the yearly runoff record since 1932 for the farthest downstream gaging station on the Susquehanna River. The drainage area of the Susquehanna River at Marietta, Pennsylvania, comprises more than 96 percent of the drainage area at the Pennsylvania-Maryland State line and hence should be representative of flow conditions for the Susquehanna River basin in Maryland. The effect of power regulation on runoff should be negligible on a yearly basis but the monthly tables have been omitted from this report.

STORAGE RESERVOIRS IN BALTIMORE AND HARFORD COUNTIES

The old Loch Raven Dam was operated from 1881 to 1914 and was rebuilt in 1915 at a new site three-fourths of a mile upstream. The dam at the new site was raised in 1923 to its present spillway elevation of 240 feet with a storage capacity of 17,800 million gallons at spillway elevation. The drainage area at the present dam is 303 square miles, and was 304 square miles at the old site. Loch Raven storage was augmented in 1933 by Prettyboy Reservoir, which has a capacity of 19,400 million gallons at spillway elevation. The drainage area at Prettyboy Dam is 80 square miles. The minimum dependable yield of the Gunpowder Falls system of Loch Raven and Prettyboy reservoirs was calculated by consulting engineers employed by the city to be 148 mgd with a combined dependable net storage of 36,650 million gallons based on drought studies for 1930–34.

Diversion began at the Liberty Dam site on the Patapsco River on February 26, 1953 from an original low-level diversion dam. This original low dam was replaced by a high dam with spillway elevation at 420 feet. The available storage at full capacity of Liberty Reservoir is expected to amount to 37,200 million gallons, and the drainage area at Liberty Dam is 164 square miles. The safe yield of Liberty Reservoir is 45 mgd from storage and 50 mgd from runoff, or 95 mgd. The most critical drought period during 1930–34 occurred July 1, 1930 to September 30, 1932, and was used by consulting engineers in their safe-yield computations. The combined Gunpowder Falls and Patapsco system should safely yield $148 + 95 = 243$ mgd under the worst conditions of the maximum recorded drought.

Conowingo Reservoir on the Susquehanna River, 5 miles below the State Line, is the largest in the area. The drainage area at the dam is about 27,100 square miles, and at the spillway elevation of 108.5 feet the storage capacity is about 55 billion gallons. Conowingo Dam, placed in operation in 1928, has operated as a hydroelectric project but the pipe line proposed for Baltimore will introduce water supply as well. The Susquehanna River drainage basin lies mostly outside of Maryland, but there is a channel reach within Maryland of more than 5 miles of the deepest part of the impounded water.

TABLE 21

Average Discharge from Streams in Baltimore and Harford Counties (in cfs per sq. mi.)

Period of record			Susquehanna River								Gunpowder Falls							Patapsco River								
			Drainage area (sq. mi.)								Drainage area (sq. mi.)							Drainage area (sq. mi.)								
From	To	Years	5.31	7.7	8.8	16.4	94.4	141	193	210	2.27	36.1	43	52.9	59.8	160	303	3.40	5.1	11.4	56.6	64.4	91.0	165	260	285
1884	1954	71															*1.50									
1884	1915	32															1.79								—	
1897	1898	2								—							1.46								1.32	
1898	1899	2								*1.88							1.66								—	
1902	1903	2				—		—		—			—			—	2.27								2.25	
1906	1908	3				*1.61	—	*1.77					*1.86			*1.62	2.19								*1.67	
1927	1945	19				—	1.30	—				—	—			—	1.25						—		—	
1928	1945	18					1.29					1.28					1.24						1.05	—		
1930	1945	16					1.24					1.24					1.16			—			1.01	1.00		
1932	1945	14					1.30					1.27					1.22			1.04			1.05	1.04		
1933	1945	13			—		1.35		—			1.33		—	—		1.27		—	1.08			1.09	1.08		—
1945	1951	7			*1.23		1.33		1.27			1.28		1.32	1.21		1.31		1.57	1.23			1.14	1.16		1.15
1945	1952	8			—		1.43		1.37			1.41		1.41	1.31		1.41		*1.62	1.30			1.23	1.25		1.23
1927	1953	27					1.35		—			—		—	—		1.32		—	—			—	—		—
1928	1953	26					1.34					1.35		—	—		1.31			—			*1.13	—		
1932	1953	22					1.36		—			1.36		—	—		1.31			1.16			1.14	1.20		—
1945	1953	9					—		1.42			—		1.45	1.35		1.45			1.32			1.27	1.29		1.27
1946	1953	8					—		1.45			—		1.46	1.38		1.47			1.36			1.30	1.32		1.30
1927	1954	28					*1.33		—			—		—	—		1.30			—			—	—		—
1928	1954	27					1.33					*1.33					1.29							—		
1930	1954	25					1.30					1.29					1.25			—				*1.09		
1932	1954	23					1.34					1.33					1.29			*1.13				1.13		
1933	1954	22					1.37		—			1.37		—	—		1.32			1.16				1.15		—
1945	1954	10					1.41		*1.36			1.40		*1.39	*1.30		1.39			1.25	—			1.24		*1.22
1946	1954	9					1.41		1.38			1.42		1.40	1.32		1.40			1.28	*1.30			1.26		1.24
1948	1954	7	—				1.48		1.42		*1.21	1.52		1.46	1.37		1.45			1.31	1.31	—		1.30		1.29
1949	1954	6	*1.31				1.50		1.42		1.22	1.54		1.46	1.39		1.47	—		1.31	1.30	*1.28		1.32		1.30
1950	1954	5	1.30	—			1.49		1.42		1.19	1.54		1.43	1.37		1.44	*1.28		1.26	1.28	1.22		1.29		1.27
1951	1954	4	1.39	*1.82	—	—	1.62	—	1.52	—	1.30	1.66	—	1.55	1.49	—	1.56	1.36		1.32	1.37	1.30		1.39		1.36

Station No. on map	Gaging Station
4	Basin Run
8	Bynum Run near Bel Air
9	Bynum Run at Bel Air
1	Broad Creek
6	Deer Creek (Rocks)
7	Deer Creek (Churchville)
2	Octoraro Creek (Rising Sun)
3	Octoraro Creek (Rowlandsville)
17	Slade Run
10	Little Gunpowder Falls (Laurel Brook)
11	Little Gunpowder Falls (Bel Air)
15	Little Falls
16	Western Run
12	Gunpowder Falls (Glencoe)
13	Gunpowder Falls (Loch Raven)
24	Cranberry Branch
27	Sawmill Creek
26	Piney Run
19	North Branch Patapsco River (Cedarhurst)
25	South Branch Patapsco River
20	North Branch Patapsco River (Reisterstown)
21	North Branch Patapsco River (Marriottsville)
22	Patapsco River (Woodstock)
23	Patapsco River (Hollofield)

• = Longest period of record

RUNOFF IN BALTIMORE AND HARFORD COUNTIES

Maximum Flood Runoff

Information on major floods in Maryland was published in U. S. Geological Survey Water-Supply Paper 771, "Floods in the United States—magnitude and frequency." The continuous 72-year monthly record (January 1883 to date) for Gunpowder Falls at Loch Raven Dam is one of the oldest and longest records available for the Eastern United States.

During the period of records for gaging stations, the greatest flood in Baltimore and Harford Counties resulted from a general storm on August 23, 1933. Greater floods at scattered sites have resulted from thundershowers rather than from general storms. Such an example was the unique flash flood at Pylesville, Harford County, on a Sunday afternoon, July 15, 1951, on a small unnamed and ungaged tributary to Broad Creek with a drainage area less than 4 square miles. Although property damage was slight, four persons from one family were swept to their deaths in an automobile while attempting to ford the flooded Highway 165. No outstanding rainfall catches were reported, but according to observers, the downpour was so thick that the accident could scarcely be seen. This rainfall should be remembered, however, for producing the highest runoff intensity ever recorded on a Maryland stream. An indirect determination of discharge gave a peak flow of at least 1,100 second-feet per square mile.

Storm damage in Maryland was most widespread on August 23, 1933, when 7.62 inches of rain fell. It established August 1933 (13.83 inches) as the wettest month up to that time since statistical tabulation began in 1871, and probably the wettest since 1817. The monthly total was exceeded, however, in August 1955 when 17.69 inches was recorded by the U. S. Weather Bureau rain gage at the Baltimore City Custom House.

The recurrence interval of floods based on Deer Creek at Rocks is shown on figure 24. The analysis was based on the maximum momentary flood peak that occurred during each of the 28 water years as listed on Table 22. In such an annual flood series the recurrence interval is the average interval in which a flood of a given size will recur. In order to approximate a straight-line graph these data have been plotted on Gumbel probability paper adopted by the U. S. Geological Survey, in accordance with the theory that the mean annual flood will have a recurrence interval of 2.33 years.

The ratio of the 25-year flood to the mean annual flood, therefore, would be $12{,}700 \div 4{,}400 = 2.89$, or almost identical with that given in the open-file report "Floods in North Carolina" by H. C. Riggs, U. S. Geological Survey, 1955, for streams of similar type in the Piedmont Plateau and Coastal Plain of that State. From studies of many frequency curves the U. S. Geological Survey found that for relatively large areas the flood frequency characteristics

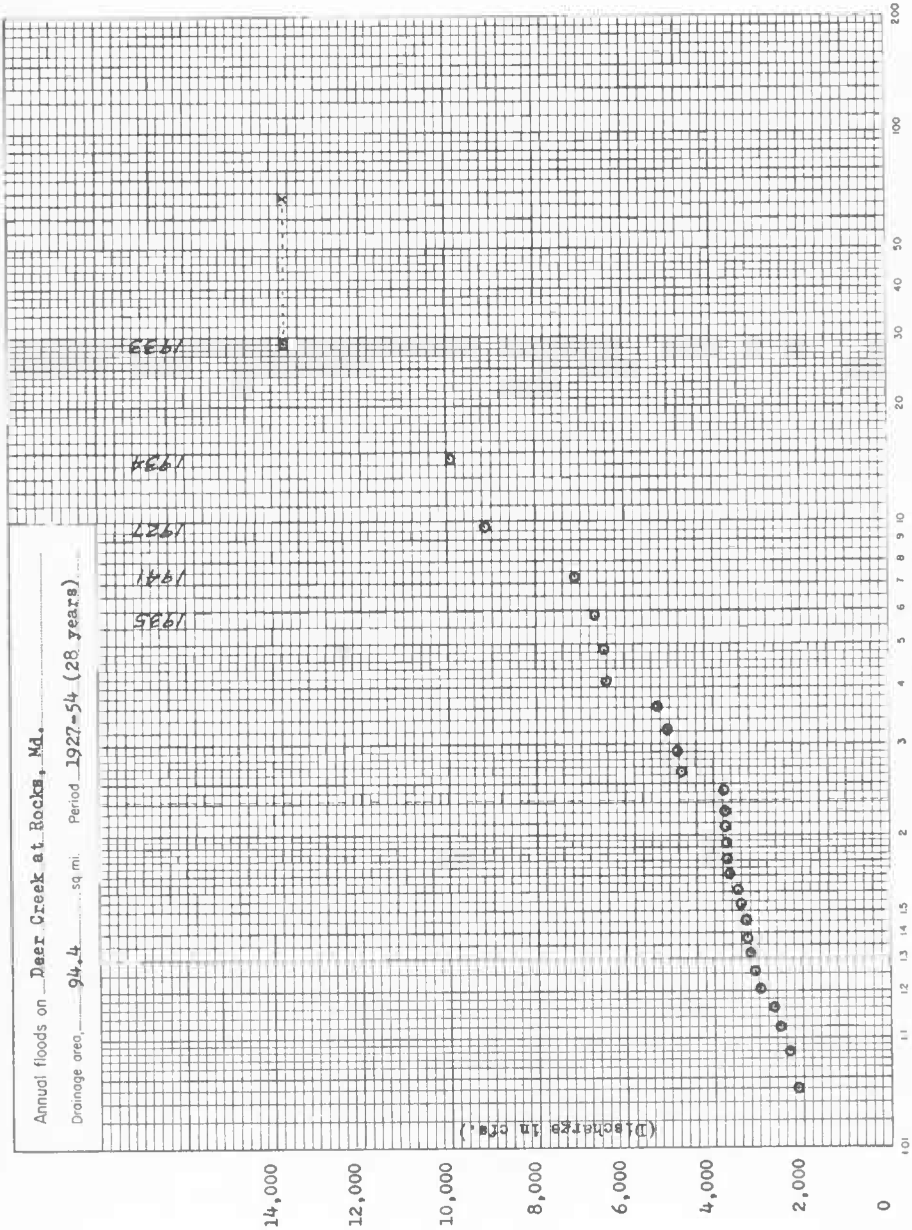

FIGURE 24. Flood-frequency Plotting for Deer Creek at Rocks, Harford County

TABLE 22

Flood Peak-flows for Deer Creek at Rocks, Harford County

Drainage area 94.4 square miles. Period of record Oct. 1, 1926 to date

Water year	Date	Gage height	Peak discharge (second-feet)	Momentary peak annual floods	
				Order (M)	Recurrence interval (years)
1888	*(Peak for 1927 reported highest since 1888)*				
1927	Nov. 17, 1926	15.45	9,160	3	9.67
1928	Aug. 17	11.08	4,740	11	2.64
1929	Feb. 26	7.05	2,310	27	1.08
1930	Oct. 22, 1929	9.61	3,800	12	2.42
1931	Aug. 10	7.50	2,560	26	1.12
1932	Mar. 28	7.67	2,650	25	1.16
1933	Aug. 23	17.73	12,700*	1	29.00
1934	Sept. 17	15.92	9,940	2	14.50
1935	Sept. 4	13.44	6,640	5	5.80
1936	Mar. 11	8.71	3,260	21	1.38
1937	July 5	13.20	6,420	7	4.14
1938	Nov. 13, 1937	11.78	5,240	8	3.62
1939	June 13	9.04	3,450	18	1.61
1940	Sept. 25	8.26	2,990	24	1.21
1941	June 23	13.91	7,110	4	7.25
1942	May 22	8.77	3,290	20	1.45
1943	July 13	8.94	3,390	19	1.53
1944	Nov. 9, 1943	11.16	4,800	10	2.90
1945	Jan. 1	9.47	3,710	14	2.07
1946	June 2	9.32	3,620	17	1.71
1947	June 14	8.41	3,080	23	1.26
1948	July 23	9.42	3,680	16	1.81
1949	July 13	11.53	5,060	9	3.22
1950	Aug. 31	9.48	3,720	13	2.22
1951	Aug. 10	13.23	6,450	6	4.83
1952	Sept. 1	9.43	3,690	15	1.93
1953	Nov. 21, 1952	8.62	3,200	22	1.32
1954	May 2	6.71	2,130	28	1.04

* Provisional figure; discharge uncertain.

Recurrence interval $= \frac{N+1}{M} = \frac{28+1}{M}$.

are fairly stable, that is, the ratios to the mean annual floods tend to be fairly uniform.

Streamflow records in Baltimore and Harford Counties with few exceptions are less than 25 years in length so that the reliability of flood frequency curves extended beyond 25 years may be questioned. For a more rigorous application of such data the compilation of all known data into a regional analysis is necessary and would be particularly suitable for highway planning.

Minimum Drought Runoff

Maryland's most extreme drought prevailed from 1930 to 1934. The annual precipitation in 1930 was only 24 inches, or an 18-inch deficiency from the 54-year normal. The drought is described in detail in U. S. Geological Survey Water-Supply Paper 680, "Droughts of 1930–34." The decrease of 57 percent from normal precipitation in Maryland in 1930 was the most severe ever recorded at any time by any of the thirty humid States of the United States. For recent studies of the Baltimore drought situation, consulting engineers selected July 1, 1930 to September 30, 1932 as the most critical period.

Average Runoff

The streamflow records presented in this report are of various lengths in the overall period from 1883 to 1954. Because of the variation in precipitation and resulting runoff from year to year, comparisons between different streams should be made for similar periods of time. In order to facilitate such comparisons Table 22 gives the average discharge, in cubic feet per second per square mile, for selected gaging stations for different periods of time, each period corresponding to the full length of record at one of the gaging stations. In any one year, total rainfall is probably substantially the same in all three of the major drainage basins. Figures of average discharge in the table represent unregulated, or natural, flow.

The discharge per square mile in Table 21 reveals the characteristics of the different river basins as well as definite trends with respect to time. The most representative record selected for each basin indicated that runoff increases northward. This tendency has been found true for the basins of the Potomac, Anacostia, Patuxent, and Patapsco Rivers, and Little Gunpowder Falls, respectively, as each gives progressively larger runoff than the adjoining basin on the south.

The discharge per square mile for the latest 4-year period (1951–54) exceeds all other periods of record. It is about 13 percent greater than for the 10-year period (1945–54), which in turn is about 10 percent greater than for the 25-year period (1930–54). The discharge per square mile in Baltimore and Harford Counties for the past decade, therefore, may be assumed to have been 8 percent greater than averages for the past three decades. This trend in runoff is consistent with the trend indicated in the precipitation records of the U. S. Weather Bureau.

Mean monthly discharges for the gaging station on Deer Creek at Rocks during the 28 water-years of record (1927–54) are presented in figure 25. The

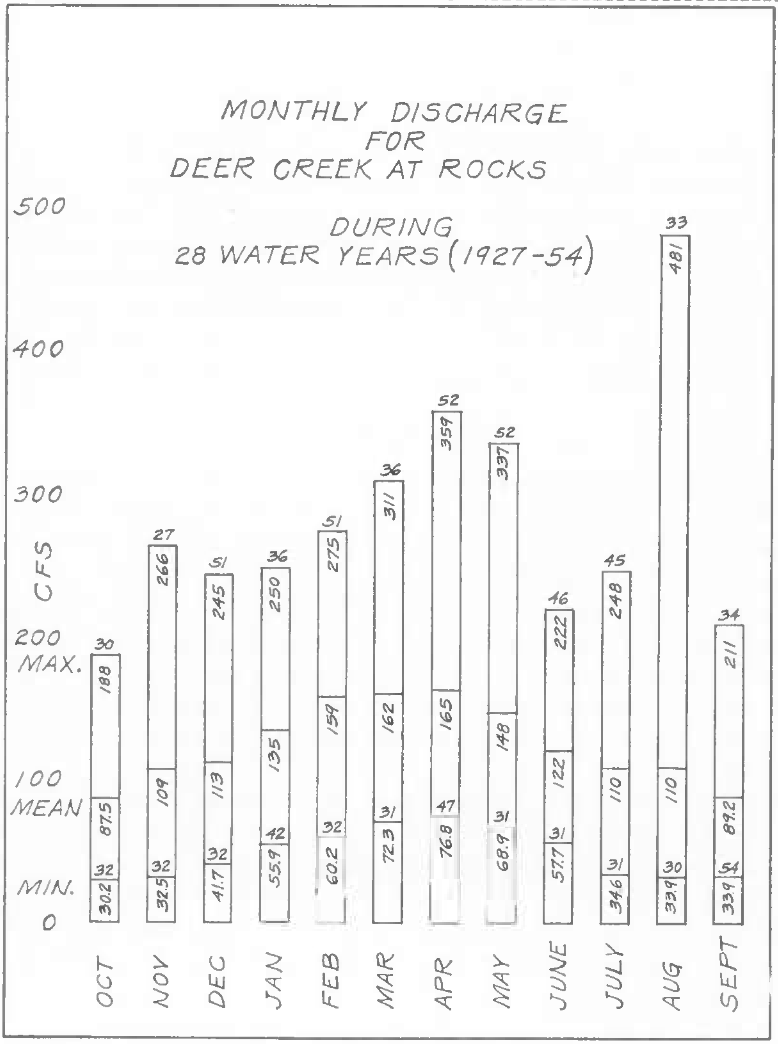

FIGURE 25. 28-Year Mean and Extreme Monthly Discharge for Deer Creek at Rocks, Harford County

discharges have been plotted as maximum, minimum, and average for each of the calendar months, with the year of occurrence indicated for each extreme.

Miscellaneous Discharge Measurements

Important contributions to the hydrology pertaining to Baltimore and Harford Counties are the current-meter measurements made at selected sites other than regular gaging stations, and which are on file and available for inspection at the College Park office of the U. S. Geological Survey. These measurements usually were made, not according to an arbitrary time schedule, but when streamflow was moderately high or low. Relationships can be derived between such measurements and continuous records for nearby gaged streams that permits a much wider interpretation of their results. Many of the 118 discharge measurements made in this bi-county area were in response to specific requests by cooperating parties, and nearly half were made during the 1930 and 1931 drought years. The computed results for 75 of these (up to October 1943) were compiled and published in State Bulletin No. 1 as well as by individual water years in the annual series of the U. S. Geological Survey Water-Supply papers, Part 1 (Part 1B since 1950).

Streamflow Regulation

More money probably is spent each year in obtaining water than for any other natural resources. Every industry must use water either directly or indirectly and the history of stream-gaging in Baltimore and Harford Counties illustrates the gradual development in water-resources use. Gaging stations were first established on unregulated streams but many of these streams have since become seriously affected by artificial regulation from storage reservoirs or from diversion of flow into or out of the stream. A diversified use of water provides the best economy in water utilization and derives the greatest benefits from a stream. Fortunately, diversion has not seriously impaired the quality of the three major water-supply streams.

The gaging station on North Branch Patapsco River near Reisterstown, Baltimore County, furnishes a striking illustration of the effect of regulation on streamflow. After establishment on June 30, 1927, under natural streamflow conditions, a small amount of water was later diverted from the headwaters into the Monocacy River basin for the municipal supply of Westminister, Carroll County. Finally, storage in Liberty Dam began on July 22, 1954, which gradually flooded the gage site as the reservoir filled. When filled this pool level will be more than 75 feet higher than the zero of the Reisterstown gage datum. On December 31, 1953, the forced discontinuance of this gaging station terminated an unbroken 26½-year streamflow record extremely valuable for water-supply planning.

The 1954 diversion for Baltimore's municipal water-supply from the North Branch Patapsco River above Marriottsville amounted to 39 percent of the actual flow passing that gage. After storage in Liberty Reservoir began on July 22, 1954, practically no flow passed Marriottsville for the remainder of the water year.

Atkisson Reservoir on Winters Run, controlled by the U. S. Army Chemical Center, had a storage capacity of 292 million gallons in 1942. The drainage area at the dam is 38 square miles. A sedimentation survey by the U. S. Soil

Conservation Service in May 1954 revealed a loss of at least 21 percent in capacity of Atkisson reservoir, after 12 years of operation, or nearly a 2 percent decrease per year due to the accumulation of sediment in the reservoir with a reduction from 292 million to 230 million gallons in usable capacity. Atkisson Reservoir is an example of possible losses in storage capacity along the Piedmont Plateau.

The operation of Conowingo Dam on the Susquehanna River undoubtedly will continue near full-pond level for most efficient hydroelectric purposes and should not reflect any marked change due to the diversion proposed for Baltimore water supply. The operation of dams at Safe Harbor and Holtwood, upstream from Conowingo, should overcome any effect of diversion on Conowingo Reservoir.

QUALITY OF WATER

Pollution

Streams, lakes and coastal estuaries have played such a vital role in the development of Maryland that their legitimate use should be controlled so as to maintain a satisfactory standard of quality. Most bodies of moving water can dispose of limited amounts of waste material, converting them through chemical and biological action into stable compounds that will not create nuisances or into usable products for animal and plant life. Nature's processes, however, are seldom efficient enough to provide a safe water supply at random locations along a stream.

Much pollution improvement was initiated by the Maryland Department of Health. Pollution control was the function of the Department of Tidewater Fisheries and the Department of Game and Inland Fish from 1937 to 1947. The Water Pollution Control Commission, created on June 1, 1947, has steadily brought about better control in the disposal of industrial and municipal wastes. Along a stream course of intermittent rural development the natural quality of a stream is rarely impaired as its waste-carrying capacity is seldom exceeded by sporadic sewage contamination. The danger zones are in areas of rapid or concentrated expansion where the physical limitations of a stream are not always recognized or observed.

Chemical Analyses

Data on the quality of surface waters in Baltimore and Harford Counties are quite limited except for those in the files of the Bureau of Water Supply, City of Baltimore. For surface water in general, the chemical quality and sediment content vary with rainfall, geology, season, and use of the land and of the water, but may be summarized as having low concentrations of dissolved solids and low hardness. There are no continuous records of sediment discharge for estimating the sediment loads transported by the streams even though sedimentation has become a serious problem.

During the 1954–55 winter period, systematic samples were obtained at 9 selected gaging-station sites and 3 miscellaneous sites. Samples at a moderately low flow as well as a moderately high flow were obtained at all 12 sites. The samples were taken about 3 months apart by the U. S. Geological Survey in conjunction with simultaneous determinations of discharge. The results of the chemical samples are summarized in Table 23. This table reflects an up-to-date condition of the principal streams and their more important tributaries in and near Baltimore and Harford Counties.

Use of Sewage Effluent

At Sparrows Point the Bethlehem Steel Company exercises a unique contract with the City of Baltimore. Since starting in 1942 the company has found an increasing need for treated sewage effluent so that it has built at its own expense a 60-inch pipe line and more recently an additional 96-inch pipe line running to the Sewage treatment plant of the City. In 1954 the City was paid $38,000 for this effluent, which was used primarily for cooling purposes. According to the Department of Public Works, the annual calendar year consumption of this treated effluent, in mgd, has increased as follows:

1942	(began operation)
1943	23.5 mgd
1944	24.2 mgd
1945	23.8 mgd
1946	20.5 mgd
1947	27.2 mgd
1948	32.5 mgd
1949	35.0 mgd
1950	42.0 mgd
1951	46.2 mgd
1952	42.7 mgd
1953	53.0 mgd
1954	59.6 mgd
1955	68.9 mgd

The Bethlehem Steel Company is using half of the total available treated effluent. All indications point to a continuing increase both in use and supply of the treated effluent

FLOW-DURATION STUDIES OF DEER CREEK AT ROCKS, HARFORD COUNTY

The duration of streamflow when plotted as a flow-duration curve presents a generalized picture of the relation of flows of various magnitude to their

TABLE 23.

Chemical Analyses, in Parts per Million, for Streams at Low and High Discharge

Date of collection	Instantaneous disch e (cfs)	Silica (SiO_2)	Lithium (Li)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
Deer Creek at Rocks, Harford County																				
Dec. 13, 1954	47.4	8.8	0.1	0.07	0.00	4.5	2.0	3.2	1.3	12	9.0	3.0	0.1	10	51	20	10	60.0	6.7	5
Mar. 7, 1955	158	6.5	.1	.09	.00	6.8	1.8	2.6	1.4	14	9.5	5.0	.1	6.2	53	25	13	74.8	6.8	20
Little Gunpowder Falls at Laurel Brook, Harford County																				
Dec. 13, 1954	20.5	12	0.1	0.10	0.00	6.9	3.1	3.3	1.8	30	4.0	3.0	0.2	8.8	70	30	6	81.4	7.4	7
Mar. 7, 1955	52.2	8.8	.1	.06	.00	7.7	2.3	2.7	1.8	20	10	4.0	.1	6.8	63	29	12	87.7	6.9	7
Jones Falls above Lake Roland, Baltimore County																				
Dec. 17, 1954	9.93	9.9	0.0	0.02	0.00	21	7.8	3.4	1.4	88	8.2	4.0	0.1	6.2	113	84	13	176	7.9	5
Mar. 7, 1955	38.2	8.1	.2	.07	.00	19	6.5	2.8	1.8	70	16	5.0	.1	5.2	107	74	17	170	7.4	18
Gunpowder Falls near Carney, Baltimore County																				
Dec. 13, 1954	4.15	8.7	0.3	0.01	0.00	27	12	5.0	2.4	122	13	6.2	0.2	9.5	157	117	17	247	7.7	15
Mar. 7, 1955	155	8.7	.3	.06	.00	18	6.5	3.9	2.6	68	15	6.0	.2	5.5	106	72	16	174	7.4	15
North Branch Patapsco River Near Reisterstown, Baltimore County																				
Feb. 13, 1952	135	8.1		0.04	0.00	8.2	2.0	3.2	1.9	19	6.2	5.4	0.1	8.0	58	29	13	82.3	7.2	10

respective duration. In order to be truly representative the curve should be based on long-term continuous records. The curve reveals the percentage of time that any selected discharge was equaled or exceeded. In order to represent natural-flow condition the discharge should be based on records that are not materially affected by artificial storage or regulation.

Daily discharge data for the gaging station on Deer Creek at Rocks were used as the basis for a flow-duration study in this report, primarily because this gaging-station record was the longest and was not seriously affected by diversion or sustained storage (Table 24 and fig. 26).

Flow-duration studies are used to ascertain the sustained flow of a stream, especially during low-water periods, so the year starting April 1 was adopted rather than the customary water year (ending September 30). Thus, the duration of the seasonal low-water period (during the fall months) remains unbroken so that the study of any prolonged drought will be entirely contained within a single year. The Deer Creek minimum year starting April 1, 1931, for example, includes October, November and December of 1931 which are the lowest October, November and December recorded in the past 28 years, and these months have been included as part of the 1931 drought year.

A summary of the 27-year flow-duration data indicates that the minimum and maximum years were those starting April 1 in 1931 and 1952, respectively. These years were analyzed and the results presented in Table 24 and separate flow-duration curves plotted in figure 26 for the maximum year, the minimum year, and the 27-year period.

DISCHARGE RECORDS

Discharge records by calendar months prior to October 1943 were published in Bulletin 1, Maryland Department of Geology, Mines and Water Resources. Howard County and Anne Arundel County records, which more or less overlap Baltimore County, were published from October 1, 1943 to September 30, 1952 in Bulletin 14 and to September 30, 1948 in Bulletin 5, respectively. Continued or new records follow from these dates to September 30, 1954, as well as some earlier periods for stations not included in Bulletin 1. The yearly record for Patapsco River at Woodstock is republished in this report because of drainage area revision. Records to September 30, 1953 in Cecil County pertinent to studies for Harford County will be published in a tricounty report for Cecil, Queen Annes and Kent Counties (Stations 2, 3, and 4). Yearly records with a station description for the Susquehanna River at Marietta, Pennsylvania, are included in this report. The records for Gunpowder Falls at Loch Raven Dam (Station 13) are published in the 1953 Annual Report of the Department of Public Works of Baltimore City. The records for Jones Falls at Lake Roland Dam (Station 18) are available from the Baltimore City Bureau Water Supply. Yearly summaries follow also for 11 discontinued stations.

TABLE 24

Flow-duration Data for Deer Creek at Rocks, Harford County
[for the years starting April 1 during 1927–53]
(Drainage area 94.4 square miles)

Discharge		Number of Days when Discharge Equaled or Exceeded that shown					
		1931		1952		1927–53	
cfs per sq. mi.	cfs	Sum	Percent	Sum	Percent	Sum	Percent
		Minimum Year		Maximum Year		27-year period	
0.14	12.9	366	100.00			9,862	100.00
.22	20.8	364	99.45			9,860	99.97
.23	21.7	362	98.91			9,857	99.94
.25	23.6	359	98.09			9,851	99.88
.28	26.4	342	93.44			9,825	99.62
.31	29.3	320	87.43			9,777	99.14
.34	32.1	284	77.60			9,686	98.22
.38	35.9	256	69.95			9,600	97.34
.42	39.6	223	60.93			9,413	95.45
.46	43.4	207	56.56			9,247	93.76
.50	47.2	185	50.55			9,022	91.48
.55	51.9	152	41.53	365	100.00	8,749	88.71
.60	56.6	116	31.69	364	99.73	8,266	83.82
.65	61.4	92	25.14	350	95.89	7,829	79.39
.70	66.1	76	20.77	332	90.96	7,323	74.25
.80	75.5	64	17.49	317	86.85	6,544	66.36
.90	85.0	50	13.66	308	84.38	5,783	58.64
1.00	94.4	39	10.66	289	79.18	4,967	50.37
1.1	104	32	8.74	278	76.16	4,348	44.09
1.2	113	26	7.10	261	71.51	3,766	38.19
1.4	132	20	5.46	227	62.19	2,824	28.64
1.7	160	14	3.83	198	54.25	1,835	18.61
2.0	189	8	2.19	148	40.55	1,199	12.16
2.4	227	6	1.64	96	26.30	769	7.80
2.8	264	4	1.09	66	18.08	564	5.72
3.4	321	3	.82	41	11.23	390	3.95
4.0	378	—	—	28	7.67	284	2.88
5.0	472	2	.55	18	4.93	181	1.84
6.0	566	—	—	14	3.84	104	1.05
7.5	708	—	—	8	2.19	45	.46
9.0	850	1	.27	6	1.64	27	.27
12.0	1,133	—	—	4	1.10	9	.09
30.0	2,832	—	—	—	—	3	.03

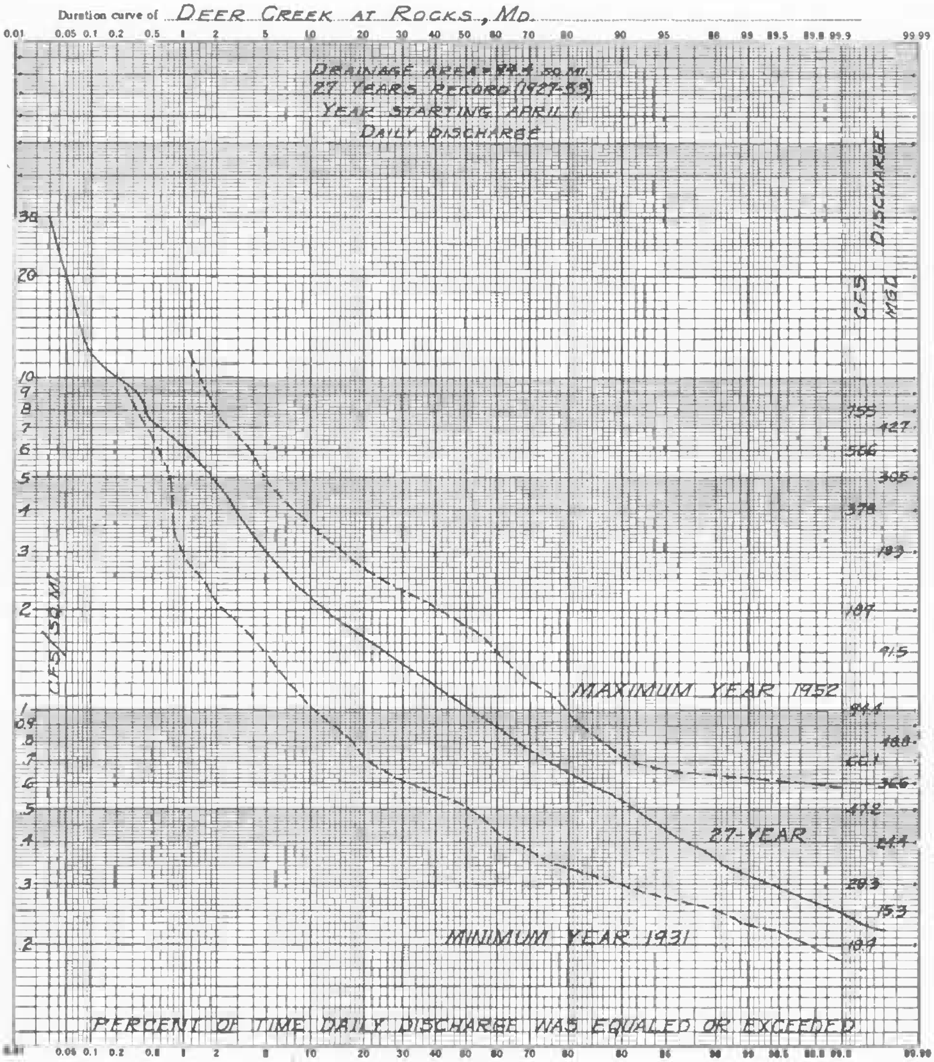

FIGURE 26. Daily Flow-duration Curves for Deer Creek at Rocks, Harford County

SUSQUEHANNA RIVER BASIN

1. Broad Creek at Mill Green

Location.—Chain gage, lat. 39°39′53″, long. 76°19′30″, at highway bridge in Mill Green, Harford County, and 8 miles upstream from mouth.

Drainage area.—16.4 square miles.

Records available.—December 1904 to March 1909. Monthly records published in Bulletin 1.

Extremes.—Maximum daily discharge observed, 509 second-feet Feb. 26, 1908; minimum daily observed, 8 second-feet Oct. 18, 1905.

Yearly discharge of Broad Creek at Mill Green

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1905	—	—	—	—	25.6	1.56	21.31	1.01
1906	22.5	1.37	18.60	.885	22.8	1.39	18.85	.898
1907	24.0	1.46	19.84	.944	28.3	1.72	23.50	1.11
1908	32.6	1.99	27.04	1.29	26.7	1.63	22.10	1.05
Highest	32.6	1.99	27.04	1.29	28.3	1.72	23.50	1.11
Average	26.4	1.61	21.86	1.04	25.8	1.57	21.31	1.01
Lowest	22.5	1.37	18.60	.885	22.8	1.39	18.85	.898

SUSQUEHANNA RIVER BASIN

5. Deer Creek above Kellogg Branch, at Rocks

Location.—Staff gage, lat. 39°38′08″, long. 76°24′41″, at Rocks, Harford County, and 0.2 mile upstream from Kellogg Branch. From July 27 to Aug. 17, 1933 water-stage recorder at same site and datum.

Drainage area.—92.1 square miles.

Records available.—July 27, 1933 to February 28, 1934. Monthly records published in Bulletin 1.

Extremes.—Maximum daily discharge, 6,780 second-feet Aug. 23, 1933; minimum daily, 65 second-feet Dec. 12, 1933, Feb. 17–20, 25–28, 1934.

Remarks.—Low flow regulated by mills above station.

6. Deer Creek at Rocks

Location.—Water-stage recorder and concrete control, lat. 39°37′49″, long. 76°24′13″, on right bank a quarter of a mile downstream from Maryland & Pennsylvania Railroad bridge, three quarters of a mile southeast of Rocks, Harford County, 1.2 miles upstream from Stirrup Run, and 7 miles northwest of Bel Air. Datum of gage is 250.40 feet above mean sea level (City of Baltimore benchmark).

Drainage area.—94.4 square miles.

Records available.—October 1926 to September 1954.

Average discharge.—28 water years, 126 second-feet.

Extremes.—Maximum discharge uncertain, occurred Aug. 23, 1933 (gage height, 17.7 feet from floodmarks); minimum daily, 13 second-feet Aug. 2, 1931.

Remarks.—Records excellent except those for periods of ice effect, which are fair. Low flow slightly affected by mills above station.

Monthly discharge of Deer Creek at Rocks

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1943–44						
October	1,160	40	116	1.23	1.41	0.795
November	1,500	70	159	1.68	1.88	1.09
December	529	51	89.8	.951	1.10	.615
January	1,950	56	206	2.18	2.51	1.41
February	171	56	83.4	.883	.95	.571
March	772	72	175	1.85	2.14	1.20
April	513	110	171	1.81	2.03	1.17
May	346	105	156	1.65	1.91	1.07
June	531	78	116	1.23	1.37	.795
July	91	48	63.1	.668	.77	.432
August	110	34	49.4	.523	.60	.338
September	221	36	66.3	.702	.78	.454
The year	1,950	34	121	1.28	17.45	.827
1944–45						
October	202	42	61.3	0.649	0.75	0.419
November	268	42	61.5	.651	.73	.421
December	626	56	101	1.07	1.23	.692
January	1,140	70	148	1.57	1.81	1.01
February	683	60	224	2.37	2.47	1.53
March	252	92	135	1.43	1.65	.924
April	815	82	141	1.49	1.67	.963
May	175	82	114	1.21	1.39	.782
June	338	64	98.0	1.04	1.16	.672
July	1,330	58	248	2.63	3.03	1.70
August	385	94	160	1.69	1.96	1.09
September	821	90	162	1.72	1.92	1.11
The year	1,330	42	137	1.45	19.77	.937

Monthly discharge of Deer Creek at Rocks—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1945–46						
October	229	88	110	1.17	1.34	0.756
November	410	86	129	1.37	1.52	.885
December	533	115	179	1.90	2.18	1.23
January	260	119	153	1.62	1.87	1.05
February	547	105	150	1.59	1.66	1.03
March	200	113	136	1.44	1.66	.931
April	121	87	98.8	1.05	1.17	.679
May	788	78	158	1.67	1.93	1.08
June	1,930	99	222	2.35	2.62	1.52
July	640	62	111	1.18	1.35	.763
August	324	69	98.7	1.05	1.21	.679
September	207	53	70.1	.743	.83	.480
The year	1,930	53	134	1.42	19.34	.918
1946–47						
October	129	55	68.2	0.722	0.83	0.467
November	74	54	59.7	.632	.71	.408
December	292	49	66.4	.703	.81	.454
January	200	68	94.1	.997	1.15	.644
February	80	38	66.3	.702	.73	.454
March	369	64	101	1.07	1.23	.692
April	104	64	76.8	.814	.91	.526
May	284	72	118	1.25	1.45	.808
June	618	77	117	1.24	1.38	.801
July	456	66	109	1.15	1.33	.743
August	78	49	57.8	.612	.71	.396
September	82	41	51.0	.540	.60	.349
The year	618	38	82.4	.873	11.84	.564
1947–48						
October	130	34	42.6	0.451	0.52	0.291
November	599	44	124	1.31	1.47	.847
December	126	53	62.4	.661	.76	.427
January	804	60	137	1.45	1.67	.937
February	1,060	60	192	2.03	2.20	1.31
March	217	108	136	1.44	1.66	.931
April	389	117	156	1.65	1.84	1.07
May	731	115	207	2.19	2.53	1.42
June	333	122	156	1.65	1.84	1.07
July	1,040	93	142	1.50	1.73	.969
August	222	76	106	1.12	1.30	.724
September	132	62	75.3	.798	.89	.516
The year	1,060	34	128	1.36	18.41	.879

Monthly discharge of Deer Creek at Rocks—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1948–49						
October	134	63	74.2	0.786	0.91	0.508
November	383	66	102	1.08	1.21	.698
December	741	84	148	1.57	1.81	1.01
January	690	126	224	2.37	2.73	1.53
February	290	185	218	2.31	2.40	1.49
March	554	149	185	1.96	2.26	1.27
April	280	142	177	1.87	2.09	1.21
May	322	117	158	1.67	1.93	1.08
June	140	88	101	1.07	1.20	.692
July	1,480	77	202	2.14	2.47	1.38
August	217	68	86.3	.914	1.05	.591
September	82	46	63.3	.671	.75	.434
The year	1,480	46	148	1.57	20.81	1.01
1949–50						
October	137	42	64.5	0.683	0.79	0.441
November	103	44	57.2	.606	.68	.392
December	238	42	72.9	.772	.89	.499
January	92	52	62.0	.657	.76	.425
February	256	74	120	1.27	1.32	.821
March	753	66	142	1.50	1.74	.969
April	138	93	107	1.13	1.27	.730
May	179	90	111	1.18	1.35	.763
June	249	64	88.8	.941	1.05	.608
July	84	37	54.3	.575	.66	.372
August	947	36	76.0	.805	.93	.520
September	598	53	124	1.31	1.46	.847
The year	947	36	89.7	.950	12.90	.614
1950–51						
October	321	52	78.3	0.829	0.96	0.536
November	1,860	62	161	1.71	1.91	1.11
December	1,790	112	245	2.60	2.99	1.68
January	803	110	173	1.83	2.11	1.18
February	1,070	163	275	2.91	3.03	1.88
March	344	138	164	1.74	2.01	1.12
April	449	136	170	1.80	2.01	1.16
May	170	98	120	1.27	1.47	.821
June	476	92	153	1.62	1.81	1.05
July	1,330	92	193	2.04	2.36	1.32
August	929	71	138	1.46	1.68	.944
September	478	63	94.1	.997	1.11	.644
The year	1,860	52	163	1.73	23.45	1.12

Monthly discharge of Deer Creek at Rocks—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1951–52						
October	113	60	68.2	0.722	0.83	.467
November	584	85	150	1.59	1.77	1.03
December	940	80	171	1.81	2.09	1.17
January	404	158	211	2.24	2.57	1.45
February	516	149	200	2.12	2.29	1.37
March	1,060	151	253	2.68	3.09	1.73
April	1,240	190	359	3.80	4.24	2.46
May	721	210	337	3.57	4.11	2.31
June	369	158	208	2.20	2.46	1.42
July	634	101	167	1.77	2.04	1.14
August	158	87	111	1.18	1.36	.763
September	1,290	77	143	1.51	1.69	.976
The year	1,290	60	198	2.10	28.54	1.36
1952–53						
October	100	61	68.0	0.720	0.83	0.465
November	1,240	56	173	1.83	2.05	1.18
December	600	109	161	1.71	1.97	1.11
January	1,020	124	246	2.61	3.00	1.69
February	342	168	199	2.11	2.20	1.36
March	608	163	255	2.70	3.11	1.75
April	356	179	220	2.33	2.60	1.51
May	500	150	210	2.22	2.56	1.43
June	400	110	156	1.65	1.85	1.07
July	700	82	120	1.27	1.47	.821
August	186	53	77.5	.821	.95	.531
September	514	50	102	1.08	1.20	.698
The year	1,240	50	165	1.75	23.79	1.13
1953–54						
October	327	50	68.8	0.729	0.84	0.471
November	236	58	87.7	.929	1.04	.600
December	571	67	153	1.62	1.86	1.05
January	207	68	95.4	1.01	1.16	.653
February	107	62	82.6	.875	.91	.566
March	346	94	124	1.31	1.51	.847
April	161	79	94.2	.998	1.11	.645
May	603	79	140	1.48	1.71	.957
June	79	46	63.9	.677	.76	.438
July	63	30	44.1	.467	.54	.302
August	118	30	43.3	.459	.53	.297
September	82	25	33.9	.359	.40	.232
The year	603	25	86.0	.911	12.37	.589

SUSQUEHANNA RIVER BASIN—*Continued*

Yearly discharge of Deer Creek at Rocks

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1927*	140	1.48	20.05	0.957	120	1.27	17.29	0.821
1928	171	1.81	24.70	1.17	171	1.81	24.70	1.17
1929	134	1.42	19.33	.918	140	1.48	20.17	.957
1930	101	1.07	14.54	.692	77.5	.821	11.12	.531
1931	62.0	.657	8.89	.425	60.0	.636	8.60	.411
1932	65.1	.690	9.38	.446	83.7	.887	12.07	.573
1933	173	1.83	24.90	1.18	169	1.79	24.26	1.16
1934	119	1.26	17.10	.814	123	1.30	17.73	.840
1935	128	1.36	18.35	.879	121	1.28	17.46	.827
1936	138	1.46	19.86	.944	134	1.42	19.34	.918
1937	125	1.32	17.92	.853	144	1.53	20.75	.989
1938	118	1.25	16.90	.808	99.6	1.06	14.33	.685
1939	118	1.25	16.91	.808	116	1.23	16.66	.795
1940	113	1.20	16.31	.776	122	1.29	17.56	.834
1941	113	1.20	16.21	.776	97.7	1.03	14.05	.666
1942	98.6	1.04	14.17	.672	130	1.38	18.67	.892
1943	150	1.59	21.52	1.03	138	1.46	19.78	.944
1944	121	1.28	17.45	.827	109	1.15	15.77	.743
1945	137	1.45	19.77	.937	154	1.63	22.10	1.05
1946	134	1.42	19.34	.918	116	1.23	16.65	.795
1947	82.4	.873	11.84	.564	85.2	.903	12.24	.584
1948	128	1.36	18.41	.879	136	1.44	19.59	.931
1949	148	1.57	20.81	1.01	134	1.42	19.24	.918
1950	89.7	.950	12.90	.614	114	1.21	16.40	.782
1951	163	1.73	23.45	1.12	155	1.64	22.28	1.06
1952	198	2.10	28.54	1.36	199	2.11	28.70	1.36
1953	165	1.75	23.79	1.13	158	1.67	22.68	1.08
1954	86.0	.911	12.37	.589				
Highest	198	2.10	28.54	1.36	199	2.11	28.70	1.36
Average	126	1.33	18.05	.860	126	1.33	18.05	.860
Lowest	62.0	.657	8.89	.425	60.0	.636	8.60	.411

* Nov. 16–Dec. 1, 1926 estimated

SUSQUEHANNA RIVER BASIN

7. Deer Creek near Churchville

Location.—Chain gage, lat. 39°36′07″, long. 76°15′39″, at highway bridge 3.0 miles north of Churchville, Harford County, and 0.9 mile upstream from Coolbranch Run.

Drainage area.—141 square miles.

Records available.—December 1904 to March 1909. Monthly records published in Bulletin 1.

Extremes.—Maximum daily discharge, 8,460 second-feet Feb. 26, 1908; minimum daily, 80 second-feet July 20, 21, Aug. 22–24, Oct. 17–24, 1908.

Yearly discharge of Deer Creek near Churchville

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1905	—	—	—	—	210	1.49	20.33	0.963
1906	229	1.62	22.02	1.05	227	1.60	21.82	1.03
1907	210	1.49	20.17	.963	244	1.73	23.54	1.12
1908	312	2.21	30.18	1.43	272	1.93	26.11	1.25
Highest	312	2.21	30.18	1.43	272	1.93	26.11	1.25
Average	250	1.77	24.03	1.14	238	1.69	22.94	1.09
Lowest	210	1.49	20.17	.963	210	1.49	20.33	.963

8. Bynum Run near Bel Air

Location.—Water-stage recorder, lat. 39°32′51″, long. 76°19′44″, on left bank at downstream side of small highway bridge, just upstream from small tributary, and 1.4 miles northeast of Bel Air, Harford County. Records include flow of small tributary.

Drainage area.—7.7 square miles (approximately).

Records available.—October 1950 to September 1954 published in U. S. Geological Survey Water-Supply Papers. July 7 to September 30, 1950 unpublished. June 1944 to April 1951 at site 0.5 mile downstream, published as "at Bel Air"; records not equivalent.

Average discharge.—4 water years (1951–54), 14.0 second-feet (unadjusted for diversion).

Extremes.—Maximum discharge, 2,190 second-feet July 4, 1951, Nov. 21, 1952 (gage height, 7.15 feet) from rating curve extended above 1,100 second-feet by logarithmic plotting; minimum, 0.2 second-foot Sept. 14, 15, 1954 (gage height, 1.89 feet); minimum daily, 0.3 second-foot many times during August and September 1954.

Remarks.—Records good except those for periods of ice effect, fragmentary or no gage-height record, which are fair. Low-flows possibly slightly affected by a fairly constant daily diversion of about 0.1 second foot out of Bynum Run upstream from gaging station. These records collected and furnished by the Maryland Water Works Company, Bel Air. Monthly and yearly tables not adjusted for any diversion.

Monthly discharge of Bynum Run near Bel Air

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1950–51						
October	103	2.8	7.84	1.02	1.17	0.659
November	291	3.1	14.7	1.91	2.13	1.23
December	281	4.9	22.5	2.92	3.36	1.89
January	67	6.0	12.3	1.60	1.84	1.03
February	129	7.7	22.6	2.94	3.06	1.90
March	65	7.1	13.8	1.79	2.06	1.16
April	136	6.4	14.6	1.90	2.12	1.23
May	19	3.5	6.62	.860	.99	.556
June	63	3.1	9.54	1.24	1.38	.801
July	231	2.3	13.2	1.71	1.98	1.11
August	2.8	1.2	1.84	.239	.28	.154
September	19	1.2	2.54	.330	.37	.213
The year	291	1.2	11.8	1.53	20.74	.989
1951–52						
October	4.1	1.2	2.08	0.270	0.31	0.175
November	141	3.1	14.5	1.88	2.11	1.22
December	434	3.8	31.7	4.12	4.74	2.66
January	95	8.2	21.9	2.84	3.28	1.84
February	101	5.7	13.4	1.74	1.87	1.12
March	432	6.8	33.0	4.29	4.94	2.77
April	328	6.3	35.0	4.55	5.07	2.94
May	282	6.3	29.0	3.77	4.34	2.44
June	116	3.7	10.9	1.42	1.58	.918
July	331	3.0	18.8	2.44	2.82	1.58
August	42	1.7	5.46	.709	.82	.458
September	270	2.7	12.6	1.64	1.82	1.06
The year	434	1.2	19.1	2.48	33.70	1.60

Monthly discharge of Bynum Run near Bel Air—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1952–53						
October	7.0	2.1	2.61	0.339	0.39	0.219
November	638	2.0	40.0	5.19	5.80	3.35
December	314	5.3	27.3	3.55	4.08	2.29
January	422	8.2	44.3	5.75	6.64	3.72
February	105	8.0	18.1	2.35	2.45	1.52
March	226	7.0	30.4	3.95	4.56	2.55
April	52	9.0	17.6	2.29	2.55	1.48
May	167	5.5	23.5	3.05	3.52	1.97
June	71	3.0	10.4	1.35	1.51	.873
July	21	2.0	3.64	.473	.54	.306
August	4.0	.6	1.43	.186	.21	.120
Setpember	40	.6	4.53	.588	.66	.380
The year	638	.6	18.7	2.43	32.91	1.57
1953–54						
October	52	0.9	3.53	0.458	0.53	0.296
November	29	1.6	7.85	1.02	1.14	.659
December	147	2.7	16.8	2.18	2.52	1.41
January	39	3.1	7.84	1.02	1.17	.659
February	31	2.0	5.56	.722	.75	.467
March	89	5.4	14.3	1.86	2.13	1.20
April	35	3.1	8.40	1.09	1.22	.704
May	56	2.4	6.75	.877	1.01	.567
June	2.5	.8	1.83	.238	.27	.154
July	2.5	.4	.93	.121	.14	.078
August	8.8	.3	1.12	.145	.17	.094
September	1.2	.3	.40	.052	.06	.034
The year	147	.3	6.30	.818	11.11	.529

Yearly discharge of Bynum Run near Bel Air

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1950	—	—	—	—	—	—	—	—
1951	11.8	1.53	20.74	0.989	12.0	1.56	21.24	1.01
1952	19.1	2.48	33.70	1.60	20.8	2.70	36.81	1.75
1953	18.7	2.43	32.91	1.57	15.2	1.97	26.83	1.27
1954	6.30	.818	11.11	.529				
Highest	19.1	2.48	33.70	1.60	20.8	2.70	36.81	1.75
Average	14.0	1.82	24.70	1.18	16.0	2.08	28.24	1.34
Lowest	6.30	.818	11.11	.529	12.0	1.56	21.24	1.01

9. Bynum Run at Bel Air

Location.—Water-stage recorder and concrete control, lat. 39°32′30″, long. 76°19′54″, on left bank 75 feet downstream from bridge on State Highway 22, and 1.0 mile east of Bel Air, Harford County.

Drainage area.—8.8 square miles.

Records available.—June 3, 1944 to April 5, 1951. Due to highway construction a substitute temporary gage was established July 7, 1950 at site 0.5 mile upstream, published as "near Bel Air"; records not equivalent.

Average discharge.—6 water years (1945–50), 10.3 second feet. (unadjusted for diversion.)

Extremes.—Maximum discharge, 3,620 second-feet (revised) July 19, 1945 (gage height, 6.25 feet), from rating curve extended above 560 second-feet on basis of contracted-opening determination at gage height 6.18 feet; minimum daily, 0.7 second-foot Aug. 25–29, Sept. 8, 10, 11, 1944.

Remarks.—Records good except those for periods of ice effect or no gage height record, which are fair. A small but fairly constant diversion of about 0.1 second-foot out of Bynum Run began upstream from the gaging station in the fall of 1948 and until the spring of 1949 was combined with other pumpage from some wells. Since April 10, 1949 this daily diversion has been separated from that from the wells and collected and furnished by the Maryland Water Works Company, Bel Air. Monthly and yearly tables not adjusted for any diversion which would have little effect except on low daily flows as maximum diversion per day is less than 0.3 second-foot.

Monthly discharge of Bynum Run at Bel Air

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1944						
June 3–30	9.3	2.2	4.10	0.466	0.49	0.301
July	2.2	1.1	1.51	.172	.20	.111
August	3.4	.7	1.15	.131	.15	.085
September	70	.7	4.23	.481	.54	.311
The year	—	—	—	—	—	—
1944–45						
October	20	1.3	3.00	0.341	0.39	0.220
November	56	2.2	7.15	.812	.91	.525
December	87	4.3	10.4	1.18	1.36	.763
January	130	4.3	11.8	1.34	1.55	.866
February	56	4.1	19.9	2.26	2.35	1.46
March	32	5.3	10.5	1.19	1.37	.769
April	70	4.3	9.90	1.12	1.26	.724
May	17	2.7	6.65	.756	.87	.489
June	13	1.7	3.49	.397	.44	.257
July	354	1.2	21.7	2.47	2.85	1.60
August	85	3.3	11.4	1.30	1.49	.840
September	152	3.3	11.0	1.25	1.40	.808
The year	354	1.2	10.5	1.19	16.24	.769

Monthly discharge of Bynum Run at Bel Air—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1945–46						
October	10	3.7	4.57	0.519	0.60	0.335
November	91	3.5	12.7	1.44	1.61	.931
December	102	5.5	19.8	2.25	2.59	1.45
January	23	5.4	10.6	1.20	1.39	.776
February	38	5.4	12.5	1.42	1.47	.918
March	46	5.7	10.8	1.23	1.42	.795
April	9.6	3.9	5.35	.608	.68	.393
May	77	3.3	11.9	1.35	1.56	.873
June	236	3.1	16.0	1.82	2.03	1.18
July	104	2.0	7.48	.850	.98	.549
August	16	2.0	4.32	.491	.57	.317
September	26	1.1	3.28	.373	.42	.241
The year	236	1.1	9.93	1.13	15.32	.730
1946–47						
October	19	1.9	3.86	0.439	0.51	0.284
November	6.0	2.4	3.05	.347	.39	.224
December	52	2.1	5.24	.595	.69	.385
January	48	4.4	10.9	1.24	1.43	.801
February	8.0	3.2	5.24	.595	.62	.385
March	64	4.6	12.0	1.36	1.58	.879
April	53	4.2	8.27	.940	1.05	.608
May	100	4.6	16.2	1.84	2.12	1.19
June	252	4.2	16.4	1.86	2.07	1.20
July	49	3.1	11.1	1.26	1.45	.814
August	4.4	1.7	2.78	.316	.36	.204
September	5.5	1.5	2.26	.257	.29	.166
The year	252	1.5	8.14	.925	12.56	.598
1947–48						
October	7.7	1.3	1.82	0.207	0.24	0.134
November	120	1.6	16.9	1.92	2.15	1.24
December	42	3.9	6.24	.709	.82	.458
January	186	3.8	17.0	1.93	2.23	1.25
February	78	3.7	18.2	2.07	2.23	1.34
March	42	7.0	14.8	1.68	1.94	1.09
April	112	6.3	16.5	1.87	2.09	1.21
May	200	5.7	25.2	2.86	3.30	1.85
June	150	5.5	14.1	1.60	1.79	1.03
July	24	2.4	5.63	.640	.74	.414
August	14	1.7	4.29	.487	.56	.315
September	7.9	1.5	2.18	.248	.28	.160
The year	200	1.3	11.9	1.35	18.37	.873

BUSH RIVER BASIN—*Continued*

Monthly discharge of Bynum Run at Bel Air—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1948–49						
October	8.5	2.3	3.07	0.349	0.40	0.226
November	80	2.6	8.73	.992	1.11	.641
December	122	5.2	17.6	2.00	2.30	1.29
January	108	7.9	23.6	2.68	3.10	1.73
February	50	11	21.5	2.44	2.54	1.58
March	112	8.2	16.1	1.83	2.11	1.18
April	47	6.6	14.7	1.67	1.87	1.08
May	53	5.2	12.8	1.45	1.67	.937
June	8.0	2.2	3.45	.392	.44	.253
July	35	1.5	5.40	.614	.71	.397
August	32	2.0	4.50	.511	.59	.330
September	9.7	1.6	2.91	.331	.37	.214
The year	122	1.5	11.2	1.27	17.21	.821
1949–50						
October	47	2.0	6.61	0.751	0.87	0.485
November	11	3.1	4.31	.490	.55	.317
December	60	3.1	7.65	.869	1.00	.562
January	30	3.9	5.91	.672	.77	.434
February	50	5.5	16.8	1.91	1.99	1.23
March	126	4.5	19.0	2.16	2.49	1.40
April	31	5.2	7.97	.906	1.01	.586
May	43	4.6	9.96	1.13	1.31	.730
June	11	2.2	4.47	.508	.57	.328
July	18	1.6	3.09	.351	.40	.227
August	251	1.1	10.9	1.24	1.43	.801
September	263	2.7	26.8	3.05	3.40	1.97
The year	263	1.1	10.2	1.16	15.79	.750
1950–51						
October	98	3.5	8.64	0.982	1.13	0.635
November	290	3.9	15.6	1.77	1.98	1.14
December	287	6.3	24.7	2.81	3.24	1.82
January	77	7.0	15.0	1.70	1.96	1.10
February	127	9.6	26.0	2.95	3.08	1.91
March	77	7.6	15.2	1.73	2.00	1.12
April	37	10	17.6	2.00	.37	1.29

BUSH RIVER BASIN—*Continued*

Yearly discharge of Bynum Run at Bel Air

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1944	—	—	—	—	—	—	—	—
1945	10.5	1.19	16.24	0.769	11.9	1.35	18.38	0.873
1946	9.93	1.13	15.32	.730	7.84	.891	12.11	.576
1947	8.14	.925	12.56	.598	9.19	1.04	14.18	.672
1948	11.9	1.35	18.37	.873	12.3	1.40	18.97	.905
1949	11.2	1.27	17.21	.821	10.2	1.16	15.82	.750
1950	10.2	1.16	15.79	.750	12.8	1.45	19.72	.937
1951	—	—	—	—	—	—	—	—
Highest	11.9	1.35	18.37	.873	12.8	1.45	19.72	.937
Average	10.3	1.17	15.88	.756	10.7	1.22	16.56	.789
Lowest	8.14	.925	12.56	.598	7.84	.891	12.11	.576

10. Little Gunpowder Falls at Laurel Brook

Location.—Water-stage recorder, lat. 39°30′18″, long. 76°25′56″, on right bank 700 feet upstream from Laurel Brook, 0.4 mile southwest of Laurel Brook railroad station, Harford County, 1 mile downstream from Maryland & Pennsylvania Railroad bridge, and 5 miles southwest of Bel Air. Datum of gage is 261.43 feet above mean sea level (City of Baltimore benchmark).

Drainage area.—36.1 square miles.

Records available.—December 1926 to September 1954.

Average discharge.—27 water years (1928–54), 47.9 second-feet.

Extremes.—Maximum discharge, 9,200 second-feet Aug. 23, 1933 (gage height, 10.3 feet), from rating curve extended above 2,300 second-feet on basis of slope-area determinations at gage heights 5.70, 6.15, and 10.3 feet; minimum, 3.1 second-feet Feb. 15, 1931, Mar. 15, 1932, Feb. 20, 1947; minimum daily, 5.8 second-feet Aug. 1, 2, 8, 9, 1931; minimum gage height, 0.59 foot Feb. 20, 1947.

Remarks.—Records excellent except those for periods of ice effect, which are fair.

Monthly discharge of Little Gunpowder Falls at Laurel Brook

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1943–44						
October	473	16	42.5	1.18	1.36	0.763
November	1,120	28	79.9	2.21	2.47	1.43
December	228	20	35.0	.970	1.12	.627
January	1,050	24	96.8	2.68	3.09	1.73
February	86	24	36.9	1.02	1.10	.659
March	277	30	64.7	1.79	2.07	1.16
April	163	42	62.4	1.73	1.93	1.12
May	150	35	54.2	1.50	1.73	.969
June	73	25	36.2	1.00	1.12	.646
July	44	14	21.0	.582	.67	.376
August	43	11	16.0	.443	.51	.286
September	79	11	19.2	.532	.59	.344
The year	1,120	11	47.1	1.30	17.76	.840
1944–45						
October	71	15	21.9	0.607	0.70	0.392
November	109	16	25.0	.693	.77	.448
December	211	22	36.0	.997	1.15	.644
January	854	25	63.2	1.75	2.02	1.13
February	173	23	71.2	1.97	2.06	1.27
March	78	30	41.6	1.15	1.33	.743
April	158	26	39.1	1.08	1.21	.698
May	50	21	32.6	.903	1.04	.584
June	66	16	24.3	.673	.75	.435
July	887	15	82.5	2.29	2.63	1.48
August	148	22	34.8	.964	1.11	.623
September	320	21	47.5	1.32	1.47	.853
The year	887	15	43.2	1.20	16.24	.776

Monthly discharge of Little Gunpowder Falls at Laurel Brook—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1945–46						
October	57	27	31.3	0.867	1.00	0.560
November	154	26	40.3	1.12	1.24	.724
December	241	32	62.3	1.73	1.99	1.12
January	81	39	50.0	1.39	1.60	.898
February	121	38	52.5	1.45	1.51	.937
March	83	40	47.8	1.32	1.53	.853
April	46	30	34.9	.967	1.08	.625
May	207	28	44.8	1.24	1.43	.801
June	845	27	71.4	1.98	2.21	1.28
July	322	21	39.7	1.10	1.27	.711
August	181	22	37.6	1.04	1.20	.672
September	178	15	27.3	.756	.84	.489
The year	845	15	44.9	1.24	16.90	.801
1946–47						
October	49	20	27.4	0.759	0.88	0.491
November	33	21	23.8	.659	.74	.426
December	140	20	27.7	.767	.88	.496
January	80	26	35.8	.992	1.14	.641
February	30	14	24.9	.690	.72	.446
March	129	23	36.2	1.00	1.15	.646
April	59	23	28.6	.792	.88	.512
May	172	26	51.5	1.43	1.64	.924
June	444	29	58.3	1.61	1.80	1.04
July	78	21	32.3	.895	1.03	.578
August	55	15	20.6	.571	.66	.369
September	47	16	20.8	.576	.64	.372
The year	444	14	32.4	.898	12.16	.580
1947–48						
October	51	14	16.7	0.463	0.53	0.299
November	214	18	49.7	1.38	1.53	.892
December	74	24	29.4	.814	.94	.526
January	561	24	66.0	1.83	2.11	1.18
February	474	23	75.2	2.08	2.25	1.34
March	98	40	51.0	1.41	1.63	.911
April	175	42	58.4	1.62	1.81	1.05
May	585	42	92.1	2.55	2.94	1.65
June	291	44	65.4	1.81	2.02	1.17
July	90	29	39.6	1.10	1.27	.711
August	75	25	37.3	1.03	1.19	.666
September	70	22	29.6	.820	.92	.530
The year	585	14	50.7	1.40	19.14	.905

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1948–49						
October	65	24	32.5	0.900	1.04	0.582
November	203	27	47.4	1.31	1.46	.847
December	296	36	61.0	1.69	1.95	1.09
January	224	48	79.8	2.21	2.55	1.43
February	119	62	79.4	2.20	2.29	1.42
March	289	57	72.6	2.01	2.32	1.30
April	129	58	73.2	2.03	2.26	1.31
May	139	44	61.6	1.71	1.97	1.11
June	57	34	39.2	1.09	1.21	.704
July	435	25	55.0	1.52	1.76	.982
August	145	21	33.1	.917	1.06	.593
September	46	17	23.5	.651	.73	.421
The year	435	17	54.8	1.52	20.60	.982
1949–50						
October	90	22	31.5	0.873	1.01	0.564
November	41	24	28.3	.784	.87	.507
December	106	24	35.1	.972	1.12	.628
January	57	29	32.5	.900	1.04	.582
February	99	29	49.3	1.37	1.42	.885
March	283	26	55.0	1.52	1.76	.982
April	66	36	42.4	1.17	1.31	.756
May	201	36	51.5	1.43	1.64	.924
June	52	23	33.5	.928	1.03	.600
July	54	16	23.2	.643	.74	.416
August	133	14	22.1	.612	.71	.396
September	465	18	65.1	1.80	2.01	1.16
The year	465	14	39.0	1.08	14.66	.698
1950–51						
October	169	24	35.2	0.975	1.12	0.630
November	562	28	51.0	1.41	1.58	.911
December	792	33	85.6	2.37	2.74	1.53
January	314	42	64.0	1.77	2.04	1.14
February	539	56	100	2.77	2.89	1.79
March	162	52	64.9	1.80	2.07	1.16
April	318	51	70.7	1.96	2.18	1.27
May	87	38	49.2	1.36	1.57	.879
June	128	32	49.3	1.37	1.52	.885
July	440	30	68.5	1.90	2.19	1.23
August	129	22	32.1	.889	1.03	.575
September	555	22	46.3	1.28	1.43	.827
The year	792	22	59.5	1.65	22.36	1.07

Monthly discharge of Little Gunpowder Falls at Laurel Brook—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1951–52						
October	47	21	25.9	0.717	0.83	0.463
November	310	33	61.8	1.71	1.91	1.11
December	528	30	73.9	2.05	2.36	1.32
January	165	54	76.2	2.11	2.43	1.36
February	221	58	72.8	2.02	2.17	1.31
March	748	60	106	2.94	3.40	1.90
April	520	65	120	3.32	3.69	2.15
May	633	76	133	3.68	4.25	2.38
June	193	54	77.7	2.15	2.40	1.39
July	494	40	88.5	2.45	2.82	1.58
August	134	35	51.3	1.42	1.64	.918
September	1,370	36	91.0	2.52	2.81	1.63
The year	1,370	21	81.5	2.26	30.71	1.46
1952–53						
October	50	32	35.5	0.983	1.13	0.635
November	868	31	92.1	2.55	2.85	1.65
December	300	52	76.0	2.11	2.43	1.36
January	576	56	103	2.85	3.30	1.84
February	174	67	83.7	2.32	2.41	1.50
March	370	64	118	3.27	3.78	2.11
April	155	70	93.2	2.58	2.88	1.67
May	241	53	82.5	2.29	2.64	1.48
June	144	38	53.9	1.49	1.67	.963
July	108	26	33.8	.936	1.08	.605
August	72	18	27.4	.759	.87	.491
September	133	16	31.4	.870	.97	.562
The year	868	16	69.2	1.92	26.01	1.24
1953–54						
October	165	18	26.4	0.731	0.84	0.472
November	85	24	32.4	.898	1.00	.580
December	234	26	51.9	1.44	1.66	.931
January	84	23	34.2	.947	1.09	.612
February	49	23	30.0	.831	.87	.537
March	191	32	45.9	1.27	1.47	.821
April	74	28	33.7	.934	1.04	.604
May	113	24	37.8	1.05	1.21	.679
June	23	12	17.9	.496	.55	.321
July	27	9.0	14.7	.407	.47	.263
August	43	8.1	15.3	.424	.49	.274
September	20	8.4	10.7	.296	.33	.191
The year	234	8.1	29.3	.812	11.02	.525

GUNPOWDER RIVER BASIN—*Continued*

Yearly discharge of Little Gunpowder Falls at Laurel Brook

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1928	78.9	2.19	29.75	1.42	78.7	2.18	29.64	1.41
1929	50.7	1.40	18.98	.905	52.4	1.45	19.66	.937
1930	36.6	1.01	13.77	.653	27.1	.751	10.19	.485
1931	20.2	.560	7.60	.362	18.9	.524	7.11	.339
1932	20.2	.560	7.63	.362	27.5	.762	10.35	.492
1933	63.5	1.76	23.88	1.14	62.6	1.73	23.53	1.12
1934	47.1	1.30	17.73	.840	49.2	1.36	18.51	.879
1935	50.5	1.40	18.98	.905	49.9	1.38	18.74	.892
1936	57.5	1.59	21.69	1.03	54.3	1.50	20.47	.969
1937	53.9	1.49	20.28	.963	64.6	1.79	24.31	1.16
1938	48.5	1.34	18.24	.866	38.6	1.07	14.50	.692
1939	50.1	1.39	18.86	.898	50.2	1.39	18.90	.898
1940	45.7	1.27	17.22	.821	47.5	1.32	17.91	.853
1941	37.4	1.04	14.04	.672	31.8	.881	11.94	.569
1942	29.8	.825	11.21	.533	39.6	1.10	14.90	.711
1943	49.8	1.38	18.71	.892	49.0	1.36	18.43	.879
1944	47.1	1.30	17.76	.840	40.9	1.13	15.43	.730
1945	43.2	1.20	16.24	.776	47.5	1.32	17.85	.853
1946	44.9	1.24	16.90	.801	40.3	1.12	15.17	.724
1947	32.4	.898	12.16	.580	33.7	.934	12.66	.604
1948	50.7	1.40	19.14	.905	54.6	1.51	20.59	.976
1949	54.8	1.52	20.60	.982	50.9	1.41	19.15	.911
1950	39.0	1.08	14.66	.698	45.5	1.26	17.10	.814
1951	59.5	1.65	22.36	1.07	58.6	1.62	22.02	1.05
1952	81.5	2.26	30.71	1.46	85.0	2.35	32.02	1.52
1953	69.2	1.92	26.01	1.24	61.4	1.70	23.10	1.10
1954	29.3	.812	11.02	.525				
Highest	81.5	2.26	30.71	1.46	85.0	2.35	32.02	1.52
Average	47.9	1.33	18.05	.860	48.5	1.34	18.19	.866
Lowest	20.2	.560	7.60	.362	18.9	.524	7.11	.339

GUNPOWDER RIVER BASIN

11. Little Gunpowder Falls near Bel Air

Location.—Chain gage, lat. 39°28′31″, long. 76°24′32″, at highway bridge 0.6 mile upstream from Wildcat Branch and 5.3 miles southwest of Bel Air, Harford County.

Drainage area.—43 square miles.

Records available.—December 1904 to March 1909. Monthly records published in Bulletin 1.

Extremes.—Maximum daily discharge, 1,600 second-feet Feb. 26, 1908; minimum daily, 13 second-feet Sept. 25, 1908.

Yearly discharge of Little Gunpowder Falls near Bel Air

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1905	—	—	—	—	64.5	1.50	20.44	0.969
1906	71.8	1.67	22.66	1.08	76.1	1.77	24.00	1.14
1907	77.8	1.81	24.58	1.17	85.6	1.99	27.13	1.29
1908	90.3	2.10	28.63	1.36	76.8	1.79	24.18	1.16
Highest	90.3	2.10	28.63	1.36	85.6	1.99	27.13	1.29
Average	80.0	1.86	25.25	1.20	75.8	1.76	23.89	1.14
Lowest	71.8	1.67	22.66	1.08	64.5	1.50	20.44	.969

GUNPOWDER RIVER BASIN

12. Gunpowder Falls at Glencoe

Location.—Chain gage, lat. 39°33′00″, long. 76°38′10″, at highway bridge in Glencoe, Baltimore County, and 0.7 mile upstream from Piney Creek.

Drainage area.—160 square miles.

Records available.—December 1904 to March 1909. Monthly records published in Bulletin 1.

Other records available.—From Feb. 7 to Sept. 26, 1931 daily gage-height readings were obtained from vertical staff gage on right bank in Mays Picnic Grove, 150 feet upstream from old dam, about 200 feet upstream from highway bridge at Phoenix, Baltimore County, 1.8 miles downstream from Glencoe. From Dec. 15, 1930 to May 28, 1931, 8 current-meter measurements were made near the Phoenix highway bridge and 2 current-meter measurements were made near the Glencoe highway bridge. None of these records were published.

Extremes.—Maximum daily discharge, 5,530 second-feet Feb. 26, 1908; minimum daily, 71 second-feet July 19–21, 1908.

Yearly discharge of Gunpowder Falls at Glencoe

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1905	—	—	—	—	256	1.60	21.86	1.03
1906	250	1.56	21.18	1.01	237	1.48	20.06	.957
1907	223	1.39	18.88	.898	254	1.59	21.59	1.03
1908	304	1.90	25.66	1.23	266	1.66	22.55	1.07
Highest	304	1.90	25.66	1.23	266	1.66	22.55	1.07
Average	259	1.62	21.99	1.05	253	1.58	21.45	1.02
Lowest	223	1.39	18.88	.898	237	1.48	20.06	.957

GUNPOWDER RIVER BASIN

14. Gunpowder Falls near Carney

Location.—Water-stage recorder and concrete control, lat. 39°25′25″, long. 76°30′40″, on left bank 1 mile downstream from Cowen Run, 2 miles north of Carney, Baltimore County, and 2¾ miles downstream from Loch Raven Dam. Altitude of gage is 135 feet (from topographic map).

Drainage area.—314 square miles.

Records available.—September 1949 to September 1954 in reports of Geological Survey. January 1883 to September 1954 (prior to 1937, monthly means only) at site 2¾ miles upstream, published as "at Loch Raven" in reports of Baltimore Department of Public Works.

Average discharge.—5 water years (1950–54), 166 second-feet. (unadjusted)

Extremes.—Maximum discharge, 7,000 second-feet July 9, 1952 (gage height, 9.50 feet), from rating curve extended above 2,800 second-feet by logarithmic plotting; minimum, 1.2 second-feet Sept. 7, 1954; minimum daily, 1.4 second-feet Sept. 7–8, 1954.

Remarks.—Records good except those for periods of ice effect or no gage-height record, which are fair. Records do not include water diverted at Loch Raven Dam for municipal supply of Baltimore and occasional small diversions just below Loch Raven Dam to maintain Lake Montebello at capacity. Flow completely regulated by Prettyboy and Loch Raven Reservoirs (combined usable capacity, 43,270 million gallons).

Cooperation.—Records of diversion and change in reservoir contents furnished by Baltimore Department of Public Works.

Monthly discharge of Gunpowder Falls near Carney

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1949–50						
October	22	2.8	5.91			
November	15	3.5	4.87			
December	29	5.0	6.97			
January	17	4.1	5.41			
February	34	6.4	14.5			
March	86	5.6	26.0			
April	44	8.0	15.2			
May	300	7.2	83.1			
June	98	5.7	24.6			
July	17	4.3	5.97			
August	20	3.8	5.21			
September	999	3.9	87.6			
The year	999	2.8	23.8			

Monthly discharge of Gunpowder Falls near Carney—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1950–51						
October	39	7.4	10.0			
November	750	7.7	66.5			
December	1,120	11	201			
January	459	14	150			
February	1,330	280	514			
March	520	185	288			
April	853	175	295			
May	255	60	122			
June	980	32	241			
July	1,240	6.3	151			
August	182	3.0	22.9			
September	92	2.8	7.67			
The year	1,330	2.8	170			
1951–52						
October	8.9	3.8	4.72			
November	304	6.7	59.8			
December	406	6.3	75.8			
January	832	122	319			
February	797	179	329			
March	1,820	220	508			
April	3,840	293	857			
May	4,320	406	945			
June	706	182	344			
July	3,080	29	408			
August	367	6.0	66.1			
September	2,090	5.4	213			
The year	4,320	3.8	344			
1952–53						
October	8.8	5.7	6.41			
November	3,910	5.4	284			
December	909	140	307			
January	1,570	173	485			
February	650	233	360			
March	1,550	252	617			
April	696	326	492			
May	660	140	358			
June	605	11	152			
July	33	5.3	10.6			
August	27	3.5	6.40			
September	902	3.0	64.6			
The year	3,910	3.0	261			

GUNPOWDER RIVER BASIN—*Continued*

Monthly discharge of Gunpowder Falls near Carney—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1953–54						
October	182	4.4	17.5			
November	24	4.8	7.90			
December	538	6.3	76.4			
January	15	5.6	7.64			
February	16	6.3	8.32			
March	342	32	97.6			
April	155	13	37.5			
May	435	6.3	82.8			
June	13	4.4	6.27			
July	14	2.4	4.44			
August	12	1.7	3.30			
September	3.6	1.4	1.95			
The year	538	1.4	29.7			

Yearly discharge of Gunpowder Falls near Carney

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet				Discharge in second-feet			
	Actual mean	Adjustment for regulaton	Adjusted mean	Per square mile	Actual mean	Adjustment for regulaton	Adjusted mean	Per square mile
1949	—	—	—	—	—	—	—	—
1950	23.8	+278	301.8	0.961	45.6	+309	354.6	1.13
1951	170	+309	479	1.53	158	+306	464	1.48
1952	344	+312	656	2.09	382	+307	689	2.19
1953	261	+289	550	1.75	220	+283	503	1.60
1954	29.7	+236	265.7	.846				
Average	166	+285	451	1.44	201	+301	502	1.60

GUNPOWDER RIVER BASIN

15. Little Falls at Blue Mount

Location.—Water-stage recorder, lat. 39°36′16″, long. 76°37′16″, on left bank at downstream side of Pennsylvania Railroad bridge, 0.2 mile north of Blue Mount, Baltimore County, 0.6 mile upstream from mouth, 0.9 mile downstream from First Mine Branch, and 1.2 miles south of White Hall. Altitude of gage is 305 feet (from topographic map).

Drainage area.—52.9 square miles.

Records available.—June 1944 to September 1954.

Average discharge.—10 water years (1945–54), 73.7 second-feet.

Extremes.—Maximum discharge, 5,730 second-feet Sept. 10, 1950 (gage height, 11.93 feet in gage well, 13.32 feet from flood mark), from rating curve extended above 1,300 second-feet on basis of slope-area determination at gage height 11.10 feet, and contracted-opening determination of peak flow at gage height 11.93 feet; minimum, 6.0 second-feet Feb. 20, 1947; minimum daily, 16 second-feet Sept. 7, 8, 10, 12–15, 1954. Flood of August 1933 reached a stage of about 14 feet, from information furnished by Pennsylvania Railroad.

Remarks.—Records excellent except those for periods of ice effect, which are good. Occasional slight diurnal fluctuation at low flow caused by mill at Whitehorse.

Monthly discharge of Little Falls at Blue Mount

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1944						
June 24–30	84	49	59.9	1.13	0.29	0.730
July	78	26	39.0	.737	.85	.476
August	52	17	25.6	.484	.56	.313
September	112	17	32.2	.609	.68	.394
1944–45						
October	92	22	34.2	0.647	0.75	0.418
November	156	23	34.7	.656	.73	.424
December	268	32	53.6	1.01	1.17	.653
January	532	40	69.9	1.32	1.52	.853
February	261	40	107	2.02	2.10	1.31
March	114	53	69.6	1.32	1.52	.853
April	564	49	80.9	1.53	1.71	.989
May	80	42	56.6	1.07	1.23	.692
June	148	32	48.1	.909	1.02	.588
July	727	33	127	2.40	2.77	1.55
August	253	53	92.7	1.75	2.02	1.13
September	378	55	98.9	1.87	2.09	1.21
The year	727	22	72.5	1.37	18.63	.885

Monthly discharge of Little Falls at Blue Mount—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1945–46						
October	142	63	74.0	1.40	1.61	0.905
November	207	56	79.0	1.49	1.67	.963
December	248	60	95.4	1.80	2.08	1.16
January	143	74	92.4	1.75	2.01	1.13
February	295	68	89.7	1.70	1.77	1.10
March	126	66	81.7	1.54	1.78	.995
April	72	53	60.0	1.13	1.27	.730
May	493	48	88.5	1.67	1.93	1.08
June	1,100	62	116	2.19	2.44	1.42
July	197	35	65.4	1.24	1.42	.801
August	313	36	75.6	1.43	1.65	.924
September	115	30	41.6	.786	.88	.508
The year	1,100	30	79.9	1.51	20.51	.976
1946–47						
October	104	31	41.7	0.788	0.91	0.509
November	44	30	35.1	.664	.74	.429
December	167	27	37.8	.715	.82	.462
January	142	30	53.1	1.00	1.16	.646
February	62	22	44.4	.839	.87	.542
March	178	40	58.1	1.10	1.27	.711
April	71	35	45.6	.862	.96	.557
May	164	39	61.1	1.16	1.33	.750
June	146	38	56.3	1.06	1.19	.685
July	167	28	43.8	.828	.95	.535
August	70	18	26.3	.497	.57	.321
September	45	17	25.3	.478	.53	.309
The year	178	17	44.1	.834	11.30	.539
1947–48						
October	63	20	24.5	0.463	0.54	0.299
November	234	24	93.6	1.77	1.97	1.14
December	124	68	72.8	1.38	1.59	.892
January	346	55	91.1	1.72	1.99	1.11
February	484	51	103	1.95	2.11	1.26
March	124	63	79.8	1.51	1.74	.976
April	171	63	83.9	1.59	1.77	1.03
May	231	71	106	2.00	2.30	1.29
June	216	66	87.2	1.65	1.84	1.07
July	598	52	95.8	1.81	2.09	1.17
August	120	36	57.1	1.08	1.24	.698
September	60	31	37.4	.707	.79	.457
The year	598	20	77.6	1.47	19.97	.950

Monthly discharge of Little Falls at Blue Mount—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1948–49						
October	102	35	43.9	0.830	0.96	0.536
November	162	39	59.6	1.13	1.26	.730
December	377	52	85.0	1.61	1.85	1.04
January	293	81	128	2.42	2.78	1.56
February	148	112	126	2.38	2.47	1.54
March	201	96	108	2.04	2.35	1.32
April	153	86	106	2.00	2.23	1.29
May	165	72	93.9	1.78	2.05	1.15
June	74	49	58.8	1.11	1.24	.717
July	1,220	48	120	2.27	2.62	1.47
August	66	36	45.7	.864	1.00	.558
September	55	30	36.2	.684	.76	.442
The year	1,220	30	84.0	1.59	21.57	1.03
1949–50						
October	83	31	38.6	0.730	0.84	0.472
November	59	30	35.1	.664	.74	.429
December	127	27	41.8	.790	.91	.511
January	65	32	38.4	.726	.84	.469
February	116	41	63.4	1.20	1.25	.776
March	273	34	69.7	1.32	1.52	.853
April	76	51	58.5	1.11	1.23	.717
May	101	48	60.8	1.15	1.33	.743
June	82	34	46.7	.883	.98	.571
July	52	24	33.9	.641	.74	.414
August	328	20	36.9	.698	.80	.451
September	675	26	76.3	1.44	1.61	.931
The year	675	20	49.9	.943	12.79	.609
1950–51						
October	137	32	41.5	0.784	0.90	0.507
November	599	34	69.6	1.32	1.47	.853
December	786	52	113	2.14	2.47	1.38
January	357	63	92.2	1.74	2.01	1.12
February	550	84	138	2.61	2.71	1.69
March	158	81	94.8	1.79	2.07	1.16
April	160	74	87.7	1.66	1.85	1.07
May	92	57	68.4	1.29	1.49	.834
June	196	55	89.1	1.68	1.88	1.09
July	378	36	70.6	1.33	1.54	.860
August	431	33	67.8	1.28	1.48	.827
September	200	38	53.7	1.02	1.13	.659
The year	786	32	81.8	1.55	21.00	1.00

Monthly discharge of Little Falls at Blue Mount—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1951–52						
October	55	31	39.2	0.741	0.85	0.479
November	253	49	80.0	1.51	1.69	.976
December	380	48	92.4	1.75	2.01	1.13
January	232	88	120	2.27	2.62	1.47
February	232	86	110	2.08	2.25	1.34
March	489	88	134	2.53	2.92	1.64
April	606	108	194	3.67	4.10	2.37
May	565	132	202	3.82	4.40	2.47
June	160	75	107	2.02	2.25	1.31
July	310	62	97.4	1.84	2.12	1.19
August	105	38	56.8	1.07	1.24	.692
September	770	40	81.0	1.53	1.71	.989
The year	770	31	109	2.06	28.16	1.33
1952–53						
October	59	33	38.2	0.722	0.83	0.467
November	722	33	101	1.91	2.14	1.23
December	317	67	94.8	1.79	2.07	1.16
January	422	70	129	2.44	2.80	1.58
February	182	92	111	2.10	2.18	1.36
March	330	92	143	2.70	3.12	1.74
April	205	103	129	2.44	2.72	1.58
May	158	78	106	2.00	2.30	1.29
June	141	51	70.3	1.33	1.48	.860
July	533	38	64.8	1.22	1.41	.788
August	151	28	44.5	.841	.97	.544
September	349	26	56.9	1.08	1.20	.698
The year	722	26	90.5	1.71	23.22	1.11
1953–54						
October	167	30	39.5	0.747	0.86	0.483
November	100	34	46.1	.871	.97	.563
December	290	38	75.7	1.43	1.65	.924
January	112	38	54.4	1.03	1.19	.666
February	68	37	47.6	.900	.94	.582
March	245	53	69.6	1.32	1.52	.853
April	96	43	53.3	1.01	1.12	.653
May	295	46	78.5	1.48	1.71	.957
June	46	26	35.8	.677	.76	.438
July	41	18	26.2	.495	.57	.320
August	54	17	24.4	.461	.53	.298
September	40	16	19.6	.371	.41	.240
The year	295	16	47.7	.902	12.23	.583

GUNPOWDER RIVER BASIN—*Continued*

Yearly discharge of Little Falls at Blue Mount

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1944	—	—	—	—	—	—	—	—
1945	72.5	1.37	18.63	0.885	83.1	1.57	21.34	1.01
1946	79.9	1.51	20.51	.976	68.6	1.30	17.62	.840
1947	44.1	.834	11.30	.539	50.4	.953	12.93	.616
1948	77.6	1.47	19.97	.950	77.4	1.46	19.94	.944
1949	84.0	1.59	21.57	1.03	77.9	1.47	19.99	.950
1950	49.9	.943	12.79	.609	59.0	1.12	15.14	.724
1951	81.8	1.55	21.00	1.00	80.7	1.53	20.71	.989
1952	109	2.06	28.16	1.33	111	2.10	28.65	1.36
1953	90.5	1.71	23.22	1.11	84.4	1.60	21.66	1.03
1954	47.7	.902	12.23	.583				
Highest	109	2.06	28.16	1.33	111	2.10	28.65	1.36
Average	73.7	1.39	18.87	.898	76.9	1.45	19.68	.937
Lowest	44.1	.834	11.30	.539	50.4	.953	12.93	.616

16. Western Run at Western Run

Location.—Water-stage recorder, lat. 39°30′38″, long. 76°40′37″ on right bank 100 feet downstream from bridge on Western Run Road, 0.3 mile southeast of Western Run, Baltimore County, 2.5 miles northwest of Cockeysville, and 3.2 miles upstream from Beaverdam Run. Altitude of gage is 260 feet (from topographic map).

Drainage area.—59.8 square miles.

Records available.—September 1944 to September 1954.

Average discharge.—10 water years (1945–54), 77.8 second-feet.

Extremes.—Maximum discharge, probably in excess of 5,500 second-feet Aug. 18, 1946 (gage height, 10.62 feet), from rating curve extended above 1,020 second-feet on basis of slope-area determinations at gage heights 8.55 feet and 9.99 feet; minimum 16 second-feet Sept. 14, 15, 1954; minimum daily, 16 second-feet Sept. 14, 15, 1954.

Remarks.—Records good except those for periods of no gage-height record or ice effect, which are fair.

Monthly discharge of Western Run at Western Run

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1944						
September	94	18	26.2	0.438	0.49	0.283
1944–45						
October	101	23	31.2	0.522	0.60	0.337
November	116	24	31.5	.527	.59	.341
December	314	29	54.0	.903	1.04	.584
January	521	39	81.5	1.36	1.57	.879
February	276	40	122	2.04	2.13	1.32
March	128	48	74.4	1.24	1.43	.801
April	185	41	59.4	.993	1.11	.642
May	85	35	51.9	.868	1.00	.561
June	126	27	40.0	.669	.75	.432
July	718	24	138	2.31	2.65	1.49
August	167	37	64.5	1.08	1.24	.698
September	334	37	77.6	1.30	1.45	.840
The year	718	23	68.6	1.15	15.56	.743
1945–46						
October	113	47	57.2	0.957	1.10	0.619
November	464	47	76.7	1.28	1.43	.827
December	408	62	106	1.77	2.05	1.14
January	138	66	84.8	1.42	1.63	.918
February	214	62	81.1	1.36	1.41	.879
March	135	66	81.3	1.36	1.57	.879
April	77	54	61.0	1.02	1.14	.659
May	323	49	87.7	1.47	1.69	.950
June	1,520	60	147	2.46	2.74	1.59
July	257	44	65.9	1.10	1.27	.711
August	949	47	104	1.74	2.00	1.12
September	141	37	47.4	.793	.88	.513
The year	1,520	37	83.4	1.39	18.91	.898

Monthly discharge of Western Run at Western Run—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1946–47						
October	78	37	45.9	0.768	0.88	0.496
November	49	33	38.7	.647	.72	.418
December	156	31	42.6	.712	.82	.460
January	142	42	61.7	1.03	1.19	.666
February	57	30	46.9	.784	.82	.507
March	163	41	63.4	1.06	1.22	.685
April	70	41	49.5	.828	.92	.535
May	216	46	79.5	1.33	1.53	.860
June	196	46	70.1	1.17	1.31	.756
July	99	36	51.4	.860	.99	.556
August	96	28	36.8	.615	.71	.397
September	36	24	28.6	.478	.53	.309
The year	216	24	51.3	.858	11.64	.555
1947–48						
October	58	23	26.3	0.440	0.51	0.284
November	220	27	65.5	1.10	1.22	.711
December	73	35	40.1	.671	.77	.434
January	624	60	105	1.76	2.03	1.14
February	781	55	126	2.11	2.28	1.36
March	142	66	84.1	1.41	1.62	.911
April	166	66	83.2	1.39	1.55	.898
May	400	72	107	1.79	2.07	1.16
June	265	70	103	1.72	1.92	1.11
July	160	57	77.5	1.30	1.50	.840
August	143	46	65.7	1.10	1.27	.711
September	81	36	44.3	.741	.83	.479
The year	781	23	77.2	1.29	17.57	.834
1948–49						
October	88	36	46.4	0.776	0.89	0.502
November	260	41	78.5	1.31	1.47	.847
December	533	73	122	2.04	2.36	1.32
January	354	86	141	2.36	2.71	1.53
February	185	113	134	2.24	2.34	1.45
March	325	96	116	1.94	2.24	1.25
April	192	90	116	1.94	2.16	1.25
May	162	71	94.0	1.57	1.81	1.01
June	83	59	67.3	1.13	1.26	.730
July	397	44	76.4	1.28	1.47	.827
August	62	35	41.4	.692	.80	.447
September	40	30	32.5	.543	.61	.351
The year	533	30	88.6	1.48	20.12	.957

Monthly discharge of Western Run at Western Run—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1949–50						
October	71	32	37.8	0.632	0.73	0.408
November	50	30	34.5	.577	.64	.373
December	111	31	43.9	.734	.85	.474
January	64	35	40.1	.671	.77	.434
February	125	46	70.1	1.17	1.22	.756
March	353	42	77.9	1.30	1.50	.840
April	68	52	57.5	.962	1.07	.622
May	101	44	57.8	.967	1.12	.625
June	79	35	47.2	.789	.88	.510
July	68	26	36.3	.607	.70	.392
August	110	20	28.8	.482	.56	.312
September	748	22	92.4	1.55	1.72	1.00
The year	748	20	51.8	.866	11.76	.560
1950–51						
October	174	38	52.1	0.871	1.00	0.563
November	551	49	94.6	1.58	1.77	1.02
December	589	78	125	2.09	2.40	1.35
January	303	73	94.1	1.57	1.81	1.01
February	534	88	139	2.32	2.41	1.50
March	168	86	97.6	1.63	1.88	1.05
April	244	79	95.4	1.60	1.78	1.03
May	97	60	71.6	1.20	1.38	.776
June	275	57	96.4	1.61	1.80	1.04
July	293	45	82.3	1.38	1.59	.892
August	181	34	50.3	.841	.97	.544
September	78	32	40.9	.684	.76	.442
The year	589	32	86.2	1.44	19.55	.931
1951–52						
October	51	28	34.5	0.577	0.67	0.373
November	227	47	71.0	1.19	1.32	.769
December	480	52	96.9	1.62	1.87	1.05
January	235	85	116	1.94	2.23	1.25
February	267	81	103	1.72	1.86	1.11
March	546	83	135	2.26	2.61	1.46
April	981	99	209	3.49	3.89	2.26
May	857	146	227	3.80	4.37	2.46
June	237	96	127	2.12	2.38	1.37
July	640	86	131	2.19	2.52	1.42
August	294	52	77.8	1.30	1.50	.840
September	1,060	52	101	1.69	1.88	1.09
The year	1,060	28	119	1.99	27.10	1.29

GUNPOWDER RIVER BASIN—*Continued*

Monthly discharge of Western Run at Western Run—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1952–53						
October	74	44	51.4	0.860	0.99	0.556
November	1,050	42	131	2.19	2.44	1.42
December	317	72	102	1.71	1.97	1.11
January	495	74	136	2.27	2.63	1.47
February	208	99	118	1.97	2.06	1.27
March	449	96	158	2.64	3.04	1.71
April	180	109	129	2.16	2.41	1.40
May	263	89	123	2.06	2.38	1.33
June	171	58	83.1	1.39	1.55	.898
July	190	41	54.8	.916	1.06	.592
August	230	30	51.4	.860	.99	.556
September	701	28	76.9	1.29	1.43	.834
The year	1,050	28	101	1.69	22.95	1.09
1953–54						
October	176	33	44.5	0.744	0.86	0.481
November	147	39	53.3	.891	1.00	.576
December	336	45	89.2	1.49	1.72	.963
January	133	43	60.5	1.01	1.17	.653
February	81	44	55.6	.930	.97	.601
March	281	57	78.8	1.32	1.52	.853
April	105	47	59.3	.992	1.11	.641
May	197	40	58.2	.973	1.12	.629
June	88	25	36.1	.604	.67	.390
July	81	18	28.8	.482	.56	.312
August	55	17	23.0	.385	.44	.249
September	27	16	19.0	.318	.36	.206
The year	336	16	50.6	.846	11.50	.547

GUNPOWDER RIVER BASIN—*Continued*

Yearly discharge of Western Run at Western Run

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1944	—	—	—	—	—	—	—	—
1945	68.6	1.15	15.56	0.743	78.9	1.32	17.91	0.853
1946	83.4	1.39	18.91	.898	73.8	1.23	16.75	.795
1947	51.3	.858	11.64	.555	51.7	.865	11.72	.559
1948	77.2	1.29	17.57	.834	86.9	1.45	19.79	.937
1949	88.6	1.48	20.12	.957	77.6	1.30	17.62	.840
1950	51.8	.866	11.76	.560	64.8	1.08	14.71	.698
1951	86.2	1.44	19.55	.931	80.4	1.34	18.24	.866
1952	119	1.99	27.10	1.29	126	2.11	28.64	1.36
1953	101	1.69	22.95	1.09	93.0	1.56	21.13	1.01
1954	50.6	.846	11.50	.547				
Highest	119	1.99	27.10	1.29	126	2.11	28.64	1.36
Average	77.8	1.30	17.65	.840	81.5	1.36	18.46	.879
Lowest	50.6	.846	11.50	.547	51.7	.865	11.72	.559

17. Slade Run near Glyndon

Location.—Water-stage recorder and concrete control, lat. 39°29′40″, long. 76°47′45″, on left bank at downstream side of bridge on Longenecker Road, 1.6 miles northeast of Glyndon, Baltimore County, 1.1 miles upstream from mouth, and 2.6 miles northeast of Reisterstown. Altitude of gage is 420 feet (from topographic map).

Drainage area.—2.27 square miles.

Records available.—September 1947 to September 1954.

Average discharge.—7 water years (1948–54), 2.74 second-feet.

Extremes.—Maximum discharge, 448 second-feet Sept. 1, 1952 (gage height, 4.53 feet); minimum, 0.2 second-foot Aug. 18, 1954, minimum daily, 0.4 second-foot Sept. 12–14, 1954.

Remarks.—Records good except those for periods of ice effect or doubtful or no gage-height record, which are fair.

Monthly discharge of Slade Run near Glyndon

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
September 17–30, 1947	1.3	0.8	0.92	0.405	0.21	0.262
1947–48						
October	2.6	0.8	0.92	0.405	0.47	0.262
November	9.4	.9	2.41	1.06	1.18	.685
December	1.9	1.3	1.39	.612	.71	.396
January	28	1.3	3.07	1.35	1.56	.873
February	10	1.3	2.96	1.30	1.41	.840
March	6.5	1.7	2.38	1.05	1.21	.679
April	5.8	1.7	2.34	1.03	1.15	.666
May	9.1	2.1	3.57	1.57	1.81	1.01
June	21	2.3	4.50	1.98	2.21	1.28
July	7.1	1.9	2.84	1.25	1.44	.808
August	4.6	1.4	2.13	.938	1.08	.606
September	2.8	1.1	1.34	.590	.66	.381
The year	28	.8	2.48	1.09	14.89	.704
1948–49						
October	5.3	1.1	1.60	0.705	0.81	0.456
November	8.7	1.1	2.43	1.07	1.20	.692
December	19	2.1	4.23	1.86	2.15	1.20
January	15	2.8	4.55	2.00	2.31	1.29
February	7.7	3.5	4.44	1.96	2.03	1.27
March	16	3.7	4.65	2.05	2.36	1.32
April	7.6	3.5	4.59	2.02	2.25	1.31
May	7.4	2.6	3.56	1.57	1.81	1.01
June	3.1	1.9	2.19	.965	1.08	.624
July	14	1.4	2.42	1.07	1.23	.692
August	3.6	1.2	1.70	.749	.86	.484
September	2.2	1.2	1.34	.590	.66	.381
The year	19	1.1	3.14	1.38	18.75	.892

Monthly discharge of Slade Run near Glyndon—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1949–50						
October	3.4	1.1	1.33	0.586	0.68	0.379
November	2.2	1.2	1.37	.604	.67	.390
December	5.3	1.3	1.80	.793	.91	.513
January	2.8	1.4	1.58	.696	.80	.450
February	5.1	1.6	2.68	1.18	1.23	.763
March	6.0	1.3	2.54	1.12	1.29	.724
April	2.6	1.9	2.13	.938	1.05	.606
May	3.8	1.6	2.18	.960	1.11	.620
June	2.4	1.2	1.57	.692	.77	.447
July	3.1	1.1	1.55	.683	.79	.441
August	2.9	.7	1.08	.476	.55	.308
September	14	.9	2.26	.996	1.11	.644
The year	14	.7	1.83	.806	10.96	.521
1950–51						
October	8.0	1.2	1.78	0.784	0.90	0.507
November	19	1.4	2.41	1.06	1.18	.685
December	18	1.9	3.75	1.65	1.91	1.07
January	9.7	2.2	3.19	1.41	1.62	.911
February	20	2.8	4.68	2.06	2.14	1.33
March	6.9	2.8	3.39	1.49	1.72	.963
April	10	2.8	3.44	1.52	1.69	.982
May	4.6	2.2	2.65	1.17	1.35	.756
June	27	2.1	4.40	1.94	2.16	1.25
July	2.5	1.4	1.80	.793	.91	.513
August	1.7	1.1	1.37	.604	.69	.390
September	3.1	.8	1.14	.502	.56	.324
The year	27	.8	2.82	1.24	16.83	.801
1951–52						
October	1.3	0.7	0.87	0.383	0.44	0.248
November	6.2	1.0	1.75	.771	.86	.498
December	13	1.1	2.44	1.07	1.24	.692
January	7.0	1.9	2.91	1.28	1.48	.827
February	6.9	2.4	2.98	1.31	1.42	.847
March	18	2.4	3.82	1.68	1.94	1.09
April	35	3.2	7.04	3.10	3.46	2.00
May	30	3.5	6.92	3.05	3.51	1.97
June	11	3.0	4.35	1.92	2.14	1.24
July	22	2.6	4.12	1.81	2.09	1.17
August	12	2.1	2.92	1.29	1.48	.834
September	41	1.9	3.82	1.68	1.88	1.09
The year	41	.7	3.66	1.61	21.94	1.04

GUNPOWDER RIVER BASIN—*Continued*

Monthly discharge of Slade Run near Glyndon—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1952–53						
October	2.6	1.7	1.98	0.872	1.00	0.564
November	30	1.7	3.94	1.74	1.94	1.12
December	12	2.6	3.65	1.61	1.85	1.04
January	18	2.8	4.87	2.15	2.47	1.39
February	8.7	3.2	3.96	1.74	1.82	1.12
March	20	3.2	6.28	2.77	3.19	1.79
April	7.6	3.7	4.72	2.08	2.32	1.34
May	11	3.0	4.43	1.95	2.25	1.26
June	5.0	1.9	2.77	1.22	1.36	.788
July	4.6	1.2	1.80	.793	.91	.513
August	2.3	1.1	1.38	.608	.70	.393
September	23	1.0	2.44	1.07	1.20	.692
The year	30	1.0	3.51	1.55	21.01	1.00
1953–54						
October	4.2	1.1	1.45	0.639	0.74	0.413
November	4.9	1.3	1.61	.709	.79	.458
December	12	1.4	2.70	1.19	1.37	.769
January	3.3	1.5	1.87	.824	.95	.533
February	2.9	1.5	1.84	.811	.84	.524
March	12	2.2	3.00	1.32	1.52	.853
April	4.2	2.1	2.43	1.07	1.19	.692
May	7.1	1.4	2.22	.978	1.13	.632
June	1.4	.8	1.10	.485	.54	.313
July	8.5	.6	1.23	.542	.62	.350
August	2.0	.6	.84	.370	.42	.239
September	1.4	.4	.64	.282	.31	.182
The year	12	.4	1.75	.771	10.42	.498

GUNPOWDER RIVER BASIN—*Continued*

Yearly discharge of Slade Run near Glyndon

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1947	—	—	—	—	—	—	—	—
1948	2.48	1.09	14.89	0.704	2.78	1.22	16.69	0.788
1949	3.14	1.38	18.75	.892	2.82	1.24	16.85	.801
1950	1.83	.806	10.96	.521	2.12	.934	12.69	.604
1951	2.82	1.24	16.83	.801	2.57	1.13	15.38	.730
1952	3.66	1.61	21.94	1.04	4.03	1.78	24.19	1.15
1953	3.51	1.55	21.01	1.00	3.20	1.41	19.12	.911
1954	1.75	.771	10.42	.498				
Highest	3.66	1.61	21.94	1.04	4.03	1.78	24.19	1.15
Average	2.74	1.21	16.42	.782	2.92	1.29	17.51	.834
Lowest	1.75	.771	10.42	.498	2.12	.934	12.69	.604

19. North Branch Patapsco River at Cedarhurst

Location.—Water-stage recorder and concrete control, lat. 39°30′00″, long. 76°53′00″, on left bank at downstream side of private footbridge of Congoleum-Nairn, Inc. at Cedarhurst, Carroll County, 0.8 mile downstream from Roaring Run, and 8 miles southeast of Westminister.

Drainainge area.—56.6 square miles.

Records available.—September 1945 to September 1954.

Average discharge.—9 water years, 73.6 second-feet.

Extremes.—Maximum discharge, 3,510 second-feet July 4, 1951 (gage height, 9.59 feet), from rating curve extended above 1,700 second-feet by logarithmic plotting; minimum, 2.8 second-feet Oct. 11, 1953 (regulated) minimum daily, 12 second-feet Aug. 2, Sept. 14, 1954.

Remarks.—Records good except those for periods of doubtful or no gage-height record, which are fair. Slight regulation at low and medium stages by mill above station. Records do not include small amount of water usually less than 1 second-foot diverted above station into Monocacy River basin for municipal supply of Westminster.

Monthly discharge of North Branch Patapsco River at Cedarhurst

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1945						
September (22–30)	68	50	59.9	1.06	0.35	0.685
1945–46						
October	95	40	48.4	0.855	0.98	0.553
November	543	40	75.5	1.33	1.49	.860
December	318	53	98.7	1.74	2.01	1.12
January	168	63	88.1	1.55	1.80	1.01
February	249	54	75.8	1.34	1.39	.866
March	116	57	70.2	1.24	1.43	.801
April	66	42	47.7	.843	.94	.545
May	512	36	77.3	1.37	1.57	.885
June	1,360	44	132	2.33	2.60	1.51
July	226	36	75.7	1.34	1.54	.866
August	841	43	106	1.87	2.15	1.21
September	376	34	63.8	1.13	1.26	.730
The year	1,360	34	79.9	1.41	19.16	.911
1946–47						
October	206	39	51.5	0.910	1.05	0.588
November	54	36	41.9	.740	.83	.478
December	528	30	54.8	.968	1.12	.626
January	528	42	85.5	1.51	1.74	.976
February	64	29	48.1	.850	.89	.549
March	783	43	106	1.87	2.16	1.21
April	244	43	59.0	1.04	1.16	.672
May	746	40	93.8	1.66	1.91	1.07
June	546	29	80.7	1.43	1.59	.924
July	374	27	64.8	1.14	1.32	.737
August	275	23	40.1	.708	.82	.458
September	31	19	22.5	.398	.44	.257
The year	783	19	62.7	1.11	15.03	.717

Monthly discharge of North Branch Patapsco River at Cedarhurst—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1947–48						
October	98	16	21.9	0.387	0.45	0.250
November	627	20	107	1.89	2.11	1.22
December	116	22	30.0	.530	.61	.343
January	744	24	76.4	1.35	1.56	.873
February	478	25	102	1.80	1.94	1.16
March	190	59	91.5	1.62	1.86	1.05
April	250	52	83.6	1.48	1.65	.957
May	572	60	134	2.37	2.72	1.53
June	347	57	119	2.10	2.35	1.36
July	212	46	76.7	1.36	1.56	.879
August	156	34	54.0	.954	1.10	.617
September	54	27	34.2	.604	.67	.390
The year	744	16	77.3	1.37	18.58	.885
1948–49						
October	82	28	37.6	0.664	0.77	0.429
November	240	30	55.2	.975	1.09	.630
December	748	47	104	1.84	2.11	1.19
January	489	76	150	2.65	3.05	1.71
February	179	105	131	2.31	2.41	1.49
March	158	73	92.4	1.63	1.88	1.05
April	176	69	93.2	1.65	1.84	1.07
May	168	52	76.3	1.35	1.55	.873
June	73	40	47.3	.836	.93	.540
July	827	31	102	1.80	2.07	1.16
August	68	31	40.2	.710	.82	.459
September	47	24	29.4	.519	.58	.335
The year	827	24	79.7	1.41	19.10	.911
1949–50						
October	100	24	33.8	0.597	0.69	0.386
November	52	24	29.9	.528	.59	.341
December	201	22	44.4	.784	.90	.507
January	68	27	35.4	.625	.72	.404
February	172	40	76.9	1.36	1.41	.879
March	558	38	96.7	1.71	1.97	1.11
April	84	50	62.6	1.11	1.23	.717
May	155	50	69.9	1.23	1.42	.795
June	116	34	53.4	.943	1.05	.609
July	122	26	39.1	.691	.80	.447
August	167	19	27.8	.491	.57	.317
September	202	20	53.0	.936	1.04	.605
The year	558	19	51.7	.913	12.39	.590

Monthly discharge of North Branch Patapsco River at Cedarhurst—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1950–51						
October	157	27	37.5	0.663	0.76	0.428
November	567	31	68.1	1.20	1.34	.776
December	906	48	116	2.05	2.37	1.32
January	331	54	83.4	1.47	1.70	.950
February	750	85	155	2.74	2.85	1.77
March	194	68	88.7	1.57	1.81	1.01
April	117	61	76.5	1.35	1.51	.873
May	78	42	55.5	.981	1.13	.634
June	491	39	106	1.87	2.09	1.21
July	500	40	80.9	1.43	1.65	.924
August	190	25	50.3	.889	1.02	.575
September	52	21	29.3	.518	.58	.335
The year	906	21	78.4	1.39	18.81	.898
1951–52						
October	40	19	24.7	0.436	0.50	0.282
November	297	31	62.6	1.11	1.23	.717
December	310	31	74.4	1.31	1.52	.847
January	237	74	115	2.03	2.34	1.31
February	248	66	91.7	1.62	1.75	1.05
March	605	68	127	2.24	2.59	1.45
April	1,060	80	204	3.60	4.02	2.33
May	565	113	201	3.55	4.09	2.29
June	318	78	114	2.01	2.25	1.30
July	293	54	87.6	1.55	1.78	1.00
August	117	40	56.4	.996	1.15	.644
September	843	34	72.2	1.28	1.42	.827
The year	1,060	19	102	1.80	24.64	1.16
1952–53						
October	59	30	34.0	0.601	0.69	0.388
November	926	28	114	2.01	2.25	1.30
December	327	56	93.3	1.65	1.90	1.07
January	407	61	137	2.42	2.78	1.56
February	227	84	107	1.89	1.98	1.22
March	451	86	150	2.65	3.06	1.71
April	219	92	126	2.23	2.48	1.44
May	251	75	108	1.91	2.20	1.23
June	152	46	69.2	1.22	1.36	.788
July	75	29	39.3	.694	.80	.449
August	173	23	41.9	.740	.85	.478
September	190	20	41.9	.740	.83	.478
The year	926	20	88.3	1.56	21.18	1.01

PATAPSCO RIVER BASIN—*Continued*

Monthly discharge of North Branch Patapsco River at Cedarhurst—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1953–54						
October	92	22	29.1	0.514	0.59	0.332
November	85	25	35.0	.618	.69	.399
December	355	30	80.8	1.43	1.65	.924
January	123	30	44.3	.783	.90	.506
February	76	29	40.0	.707	.74	.457
March	310	46	70.2	1.24	1.43	.801
April	116	37	49.3	.871	.97	.563
May	268	36	65.8	1.16	1.34	.750
June	44	16	26.4	.466	.52	.301
July	98	14	27.2	.481	.55	.311
August	70	12	24.3	.429	.50	.277
September	31	12	17.2	.304	.34	.196
The year	355	12	42.6	.753	10.22	.487

Yearly discharge of North Branch Patapsco River at Cedarhurst

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1945	—	—	—	—	—	—	—	—
1946	79.9	1.41	19.16	0.911	73.7	1.30	17.68	0.840
1947	62.7	1.11	15.03	.717	63.4	1.12	15.20	.724
1948	77.3	1.37	18.58	.885	80.6	1.42	19.38	.918
1949	79.7	1.41	19.10	.911	72.2	1.28	17.31	.827
1950	51.7	.913	12.39	.590	61.3	1.08	14.68	.698
1951	78.4	1.39	18.81	.898	73.3	1.30	17.59	.840
1952	102	1.80	24.64	1.16	109	1.93	26.23	1.25
1953	88.3	1.56	21.18	1.01	80.3	1.42	19.27	.918
1954	42.6	.753	10.22	.487				
Highest	102	1.80	24.64	1.16	109	1.93	26.23	1.25
Average	73.6	1.30	17.65	.840	76.7	1.36	18.46	.879
Lowest	42.6	.753	10.22	.487	61.3	1.08	14.68	.698

20. North Branch Patapsco River near Reisterstown

Location.—Water-stage recorder and concrete control, lat. 39°26′31″, long. 76°53′14″, on left bank at upstream side of highway bridge on Louisville-Delight road, 600 feet upstream from Cooks Branch and 3½ miles southwest of Reisterstown, Baltimore County. Datum of gage is 344.35 feet above mean sea level, adjustment of 1912. This station is now submerged by the storage from Liberty Dam. Storage began July 22, 1954.

Drainage area.—91.0 square miles.

Records available.—June 1927 to December 1953 (discontinued).

Average discharge.—26 water years, 103 second-feet.

Extremes.—Maximum discharge, 11,000 second-feet Aug. 24, 1933 (gage height, 14.6 feet), from rating curve extended above 2,400 second-feet; minimum 8.0 second-feet Feb. 21, 1947; minimum daily, 11 second-feet Aug. 9, 1931, Aug. 28, 29, 1932.

Remarks.—Records good except those for periods of ice effect and no gage-height record, which are fair. Slight diurnal fluctuation at low and medium flow caused by mill above station. Records do not include small amount of water usually less than 1 second-foot diverted above station into Monocacy River basin for municipal supply of Westminster. All monthly and yearly figures are unaffected by change in storage contents in Liberty Dam Reservoir.

Monthly discharge of North Branch Patapsco River near Reisterstown

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1943–44						
October	473	22	57.1	0.627	0.72	0.405
November	1,650	48	131	1.44	1.60	.931
December	410	33	59.8	.657	.76	.425
January	2,140	45	175	1.92	2.21	1.24
February	111	47	66.2	.727	.78	.470
March	625	64	171	1.88	2.16	1.22
April	221	100	139	1.53	1.71	.989
May	429	69	116	1.27	1.47	.821
June	200	46	73.4	.807	.90	.522
July	66	24	37.5	.412	.48	.266
August	71	15	25.0	.275	.32	.178
September	112	14	30.6	.336	.37	.217
The year	2,140	14	90.2	.991	13.48	.640
1944–45						
October	177	31	46.7	0.513	0.59	0.332
November	162	30	42.9	.471	.53	.304
December	576	34	79.7	.876	1.01	.566
January	516	42	79.0	.868	1.00	.561
February	402	42	168	1.85	1.92	1.20
March	203	68	106	1.16	1.34	.750
April	314	59	92.2	1.01	1.13	.653
May	132	49	75.1	.825	.95	.533
June	226	35	57.2	.629	.70	.407
July	1,130	30	166	1.82	2.10	1.18
August	245	54	92.5	1.02	1.17	.659
September	388	50	101	1.11	1.24	.717
The year	1,130	30	91.7	1.01	13.68	.653

Monthly discharge of North Branch Patapsco River near Reisterstown—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1945–46						
October	143	61	72.8	0.800	0.92	0.517
November	748	57	111	1.22	1.36	.788
December	579	84	160	1.76	2.03	1.14
January	255	92	138	1.52	1.75	.982
Feburary	338	82	122	1.34	1.40	.866
March	219	96	122	1.34	1.54	.866
April	113	70	81.2	.892	1.00	.577
May	888	62	132	1.45	1.67	.937
June	2,510	76	228	2.51	2.79	1.62
July	396	60	122	1.34	1.54	.866
August	1,300	60	172	1.89	2.18	1.22
September	516	50	95.8	1.05	1.17	.679
The year	2,510	50	130	1.43	19.35	.924
1946–47						
October	167	61	77.4	0.851	0.98	0.550
November	84	57	63.5	.698	.78	.451
December	234	48	66.7	.733	.84	.474
January	286	64	99.9	1.10	1.27	.711
February	100	38	75.1	.825	.86	.533
March	320	68	103	1.13	1.31	.730
April	105	58	71.4	.785	.87	.507
May	336	58	99.4	1.09	1.26	.704
June	410	56	89.9	.988	1.10	.639
July	195	43	68.4	.752	.87	.486
August	204	34	50.1	.551	.63	.356
September	44	28	33.5	.368	.41	.238
The year	410	28	75.0	.824	11.18	.533
1947–48						
October	75	21	29.3	0.322	0.37	0.208
November	316	31	88.6	.974	1.09	.630
December	84	40	48.2	.530	.61	.343
January	804	41	111	1.22	1.41	.788
February	613	40	142	1.56	1.68	1.01
March	228	94	124	1.36	1.57	.879
April	296	85	120	1.32	1.47	.853
May	922	92	177	1.95	2.24	1.26
June	558	100	172	1.89	2.11	1.22
July	251	70	105	1.15	1.34	.743
August	164	51	78.1	.858	.99	.555
September	79	42	49.6	.545	.61	.352
The year	922	21	103	1.13	15.49	.730

Monthly discharge of North Branch Patapsco River near Reisterstown—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1948–49						
October	135	44	59.7	0.656	0.76	0.424
November	351	50	84.6	.930	1.04	.601
December	1,130	71	166	1.82	2.10	1.18
January	694	124	232	2.55	2.94	1.65
February	275	166	207	2.27	2.37	1.47
March	307	128	155	1.70	1.96	1.10
April	258	117	153	1.68	1.88	1.09
May	247	90	128	1.41	1.62	.911
June	115	61	74.3	.816	.91	.527
July	1,150	50	137	1.51	1.74	.976
August	101	47	61.5	.676	.78	.437
September	74	40	46.6	.512	.57	.331
The year	1,150	40	125	1.37	18.67	.885
1949–50						
October	134	38	52.9	0.581	0.67	0.376
November	79	39	49.0	.538	.60	.348
December	264	40	72.3	.795	.92	.514
January	108	46	59.0	.648	.75	.419
February	258	70	125	1.37	1.43	.885
March	759	64	145	1.59	1.84	1.03
April	126	82	97.4	1.07	1.19	.692
May	197	76	103	1.13	1.30	.730
June	198	55	83.4	.916	1.02	.592
July	201	42	65.2	.716	.83	.463
August	174	30	41.3	.454	.52	.293
September	331	34	79.9	.878	.98	.567
The year	759	30	80.8	.888	12.05	.574
1950–51						
October	217	44	60.2	0.662	0.76	0.428
November	766	50	98.9	1.09	1.21	.704
December	1,050	70	167	1.84	2.12	1.19
January	453	83	125	1.37	1.59	.885
February	980	130	231	2.54	2.65	1.64
March	310	114	144	1.58	1.83	1.02
April	182	103	126	1.38	1.54	.892
May	143	73	93.8	1.03	1.19	.666
June	658	68	169	1.86	2.08	1.20
July	758	60	107	1.18	1.36	.763
August	260	38	69.5	.764	.88	.494
September	97	31	45.3	.498	.56	.322
The year	1,050	31	119	1.31	17.77	.847

PATAPSCO RIVER BASIN—*Continued*

Monthly discharge of North Branch Patapsco River near Reisterstown—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1951–52						
October	68	31	39.0	0.429	0.49	0.277
November	431	49	98.0	1.08	1.20	.698
December	430	48	115	1.26	1.46	.814
January	333	120	178	1.96	2.25	1.27
February	360	112	152	1.67	1.80	1.08
March	839	114	208	2.29	2.63	1.48
April	1,870	142	336	3.69	4.12	2.38
May	1,410	181	345	3.79	4.37	2.45
June	478	124	182	2.00	2.23	1.29
July	569	79	145	1.59	1.84	1.03
August	240	63	94.7	1.04	1.20	.672
September	1,560	56	128	1.41	1.57	.911
The year	1,870	31	168	1.85	25.16	1.20
1952–53						
October	106	50	57.7	0.634	0.73	0.410
November	1,620	50	197	2.16	2.41	1.40
December	591	100	161	1.77	2.04	1.14
January	772	107	218	2.40	2.76	1.55
February	393	130	171	1.88	1.95	1.22
March	795	128	255	2.80	3.23	1.81
April	349	150	206	2.26	2.52	1.46
May	450	120	177	1.95	2.25	1.26
June	280	74	110	1.21	1.35	.782
July	136	48	63.5	.698	.80	.451
August	300	34	62.5	.687	.79	.444
September	395	32	69.2	.760	.85	.491
The year	1,620	32	145	1.59	21.68	1.03
1953						
October	128	37	46.4	0.510	0.59	0.330
November	139	42	55.5	.610	.68	.394
December	637	46	129	1.42	1.64	.918

PATAPSCO RIVER BASIN—*Continued*

Yearly discharge of North Branch Patapsco River near Reisterstown

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1928	141	1.55	21.09	1.00	128	1.41	19.10	0.911
1929	108	1.19	16.13	.769	118	1.30	17.53	.840
1930	89.7	.986	13.35	.637	71.0	.780	10.57	.504
1931	44.6	.490	6.66	.317	41.7	.458	6.24	.296
1932	47.3	.520	7.10	.336	70.0	.769	10.49	.497
1933	149	1.64	22.23	1.06	138	1.52	20.56	.982
1934	92.0	1.01	13.71	.653	98.7	1.08	14.71	.698
1935	102	1.12	15.19	.724	93.6	1.03	13.95	.666
1936	119	1.31	17.84	.847	118	1.30	17.70	.840
1937	110	1.21	16.40	.782	133	1.46	19.87	.944
1938	94.4	1.04	14.07	.672	70.9	.779	10.58	.503
1939	88.5	.973	13.19	.629	86.1	.946	12.85	.611
1940	87.0	.956	13.03	.618	97.5	1.07	14.59	.692
1941	83.4	.916	12.44	.592	68.3	.751	10.19	.485
1942	73.0	.802	10.90	.518	104	1.14	15.52	.737
1943	114	1.25	17.06	.808	96.5	1.06	14.37	.685
1944	90.2	.991	13.48	.640	83.8	.921	12.53	.595
1945	91.7	1.01	13.68	.653	106	1.16	15.86	.750
1946	130	1.43	19.35	.924	118	1.30	17.64	.840
1947	75.0	.824	11.18	.533	71.4	.785	10.65	.507
1948	103	1.13	15.49	.730	116	1.27	17.32	.821
1949	125	1.37	18.67	.885	114	1.25	16.96	.808
1950	80.8	.888	12.05	.574	93.6	1.03	13.95	.666
1951	119	1.31	17.77	.847	113	1.24	16.83	.801
1952	168	1.85	25.16	1.20	182	2.00	27.19	1.29
1953	145	1.59	21.68	1.03	130	1.43	19.41	.924
Highest	168	1.85	25.16	1.20	182	2.00	27.19	1.29
Average	103	1.13	15.34	.730	102	1.12	15.20	.724
Lowest	44.6	.490	6.66	.317	41.7	.458	6.24	.296

PATAPSCO RIVER BASIN

21. North Branch Patapsco River near Marriottsville

Location.—Water-stage recorder, lat. 39°21′56″, long. 76°53′06″, on left bank at downstream side of highway bridge 0.9 mile downstream from Liberty Dam, 1.2 miles northeast of Marriottsville, Howard County, and 2.3 miles upstream from confluence with South Branch. Datum of gage is 269.78 feet above mean sea level (City of Baltimore bench mark).

Drainage area.—165 square miles.

Records available.—October 1929 to September 1954. Monthly records published to Sept. 30, 1943 in Bulletin 1, from Oct. 1, 1943 to Sept. 30, 1952 in Bulletin 14.

Average discharge.—25 water years (1930–54), 180 second-feet (adjusted for Liberty Dam diversion and storage).

Extremes.—Maximum discharge, 19,500 second-feet Aug. 24, 1933 (gage height, 20.8 feet), from rating curve extended above 2,700 second-feet on basis of velocity-area studies; minimum unregulated, 6 second-feet Sept. 29, 1941; minimum daily unregulated, 9 second-feet Sept. 20, 1941.

Remarks.—Records good except those for periods of ice effect, fragmentary or no gage-height record, or shifting control, which are fair. Some diurnal fluctuation at low and medium flow caused by power plants above station. Diversion for water-supply purposes from Liberty Dam did not begin until Feb. 26, 1953. Storage began July 22, 1954. All figures in Yearly table have been adjusted for diversion from and change in storage contents in Liberty Dam Reservoir. Records do not include small amount of water usually less than 1 second-foot diverted above station into Monocacy River basin for municipal supply of Westminster.

Cooperation.—Records of diversions and change in reservoir contents furnished by the Bureau of Water Supply, City of Baltimore.

Monthly discharge of North Branch Patapsco River near Marriottsville

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1952–53						
October	188	98	116	0.703	0.81	0.454
November	2,940	96	353	2.14	2.39	1.38
December	965	185	296	1.79	2.07	1.16
January	1,270	207	398	2.41	2.78	1.56
February	612	248	317			
March	1,340	234	478			
April	636	294	402			
May	859	213	339			
June	538	113	203			
July	276	34	91.0			
August	391	20	66.0			
September	628	7.7	79.6			
The year	2,940	7.7	261			
1953–54						
October	238	23	50.9			
November	249	17	62.6			
December	864	9.9	203			
January	290	28	98.1			
February	219	35	79.9			
March	686	150	210			
April	308	61	139			
May	1,090	70	187			
June	64	2.8	15.4			
July	208	.4	42.9			
August	1.8	.3	.53			
September	.5	.2	.25			
The year	1.090	.2	91.3			

PATAPSCO RIVER BASIN—*Continued*

Yearly discharge of North Branch Patapsco River near Marriottsville

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1930*........	158	0.958	13.03	0.619	122	0.739	10.07	0.478
1931.........	75.8	.459	6.23	.297	73.4	.445	6.04	.288
1932.........	87.8	.532	7.24	.344	124	.752	10.22	.486
1933.........	262	1.59	21.56	1.03	245	1.48	20.19	.957
1934.........	164	.994	13.44	.642	175	1.06	14.40	.685
1935.........	188	1.14	15.49	.737	176	1.07	14.48	.692
1936.........	211	1.28	17.42	.827	208	1.26	17.16	.814
1937.........	195	1.18	16.09	.763	239	1.45	19.66	.937
1938.........	177	1.07	14.54	.692	133	.806	10.96	.521
1939.........	169	1.02	13.86	.659	167	1.01	13.73	.653
1940.........	154	.933	12.72	.603	167	1.01	13.82	.653
1941.........	139	.842	11.41	.544	113	.685	9.33	.443
1942.........	123	.745	10.13	.482	177	1.07	14.58	.692
1943.........	206	1.25	16.93	.808	174	1.05	14.29	.679
1944.........	159	.964	13.15	.623	150	.909	12.39	.588
1945.........	170	1.03	13.99	.666	198	1.20	16.26	.776
1946.........	229	1.39	18.82	.898	206	1.25	16.98	.808
1947.........	142	.861	11.66	.556	137	.830	11.25	.538
1948.........	197	1.19	16.23	.769	222	1.35	18.33	.873
1949.........	237	1.44	19.47	.931	211	1.28	17.38	.827
1950.........	151	.915	12.40	.591	175	1.06	14.38	.685
1951.........	215	1.30	17.68	.840	201	1.22	16.56	.789
1952.........	304	1.84	25.07	1.19	331	2.01	27.32	1.30
1953.........	272	1.65	22.40	1.07	243	1.47	19.95	.950
1954.........	126	.764	10.37	.494				
Highest......	304	1.84	25.07	1.19	331	2.01	27.32	1.30
Average......	180	1.09	14.80	.704	182	1.10	14.93	.711
Lowest.......	75.8	.459	6.23	.297	73.4	.445	6.04	.288

* Oct. 1–27, 1929 estimated

PATAPSCO RIVER BASIN

22. Patapsco River at Woodstock

Location.—Chain gage, lat. 39°19′52″, long. 76°52′23″, on upstream side of highway bridge at Woodstock, Howard County, 1.7 miles downstream from confluence of North and South Branches. Prior to Nov. 11, 1903 a wire-weight gage at same site and datum.

Drainage area.—260 square miles (revised); published as 251 square miles.

Records available.—August 1896 to March 1909. Monthly records published in Bulletin 1 and yearly records in Bulletin 14 (unrevised).

Average discharge.—7 complete water years (1897, 98, 1902, 03, 06–08), 450 second-feet.

Extremes.—Maximum daily discharge, 11,000 second-feet Feb. 26, 1908 (gage height, 14.9 feet); minimum daily, 50 second-feet July 17, 21, Aug. 7–9, 12, 14–16, 18, 1900, June 25, Sept. 11, 1904.

Remarks.—Low and medium flow regulated by operation of mills above station. Conditions of flow relatively permanent, although subject to change at times of extreme flood. Winter discharge affected by ice. Stream bed and banks are mostly of rock and very little of the land is subject to overflow. Yearly table recomputed on basis of revised drainage area.

Yearly discharge of Patapsco River at Woodstock

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1896	—	—	—	—	—	—	—	—
1897	360	1.38	18.73	0.892	417	1.60	21.72	1.03
1898	323	1.24	16.83	.801	—	—	—	—
1899	—	—	—	—	—	—	—	—
Average	342	1.32	17.92	.853	417	1.60	21.72	1.03
1900	—	—	—	—	—	—	—	—
1901	—	—	—	—	—	—	—	—
1902	489	1.88	25.52	1.22	476	1.83	24.84	1.18
1903	679	2.61	35.43	1.69	645	2.48	33.66	1.60
1904	—	—	—	—	—	—	—	—
Average	584	2.25	30.54	1.45	560	2.15	29.18	1.39
1905	—	—	—	—	—	—	—	—
1906	441	1.70	23.08	1.10	464	1.78	24.16	1.15
1907	421	1.62	21.99	1.05	397	1.53	20.77	.989
1908	439	1.69	22.94	1.09	404	1.55	21.04	1.00
1909	—	—	—	—	—	—	—	—
Average	434	1.67	22.67	1.08	422	1.62	21.99	1.05

PATAPSCO RIVER BASIN

23. Patapsco River at Hollofield

Location.—Water-stage recorder, lat. 39°18′36″, long. 76°47′39″, on right bank at downstream side of highway bridge at Hollofield, Howard County, 0.3 mile downstream from Dogwood Run and 3.0 miles north of Ellicott City. Altitude of gage is 190 feet (from topographic map).

Drainage area.—285 square miles.

Records available.—May 1944 to September 1954. Monthly records published to Sept. 30, 1952 in Bulletin 14.

Average discharge.—10 water years (1945–54), 348 second-feet (adjusted for storage and diversion).

Extremes.—Maximum discharge, 13,500 second-feet June 2, 1946 (gage height, 11.62 feet); minimum, 6 second-feet Sept. 6, 1944 (gage height, 0.83 foot); minimum daily (since regulation), 18 second-feet Sept. 14, 1954; minimum daily (prior to regulation), 32-second-feet Sept. 10, 1944.

Flood of August 1933 reached a stage of 19.5 feet, from information by Maryland State Roads Commission.

Remarks.—Records excellent except those for period of ice effect, or no gage-height record, which are fair. Low flow regulated by mills above station through June 1954. Flow regulated by Liberty Dam Reservoir beginning July 22, 1954. All figures in Yearly table have been adjusted for diversion from and change in storage contents in Liberty Dam Reservoir. Diversion began Feb. 26, 1953. Records do not include small amount of water usually less than 1 second-foot diverted above station into Monocacy River basin for municipal supply of Westminster.

Cooperation.—Records of diversion and change in reservoir contents furnished by the Bureau of Water Supply, City of Baltimore.

Monthly discharge of Patapsco River at Hollofield

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1952–53						
October	296	166	188	0.660	0.76	0.427
November	4,690	160	590	2.07	2.31	1.34
December	1,620	295	495	1.74	2.00	1.12
January	2,210	344	666	2.34	2.69	1.51
February	951	412	524			
March	2,310	389	804			
April	1,050	500	675			
May	1,700	344	561			
June	1,090	218	361			
July	711	105	195			
August	571	66	135			
September	1,370	47	171			
The year	4,690	47	446			

PATAPSCO RIVER BASIN—*Continued*

Monthly Discharge of Patapsco River at Hollofield—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1953–54						
October	424	59	106			
November	440	75	135			
December	1,490	71	348			
January	470	100	194			
February	399	80	172			
March	1,210	236	342			
April	549	138	249			
May	1,730	144	316			
June	141	38	69.1			
July	360	20	76.7			
August	69	19	33.6			
September	48	18	24.2			
The year	1,730	18	173			

Yearly discharge of Patapsco River at Hollofield

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1945	294	1.03	14.00	0.666	341	1.20	16.22	0.776
1946	385	1.35	18.34	.873	340	1.19	16.21	.769
1947	229	.804	10.92	.520	225	.789	10.71	.510
1948	341	1.20	16.26	.776	393	1.38	18.75	.892
1949	416	1.46	19.89	.944	367	1.29	17.49	.834
1950	261	.916	12.42	.592	306	1.07	14.60	.692
1951	369	1.29	17.59	.834	339	1.19	16.16	.769
1952	515	1.81	24.57	1.17	561	1.97	26.80	1.27
1953	458	1.61	21.86	1.04	409	1.44	19.55	.931
1954	208	.730	9.91	.472				
Highest	515	1.81	24.57	1.17	561	1.97	26.80	1.27
Average	348	1.22	16.56	.789	365	1.28	17.38	.827
Lowest	208	.730	9.91	.472	225	.789	10.71	.510

24. Cranberry Branch near Westminster

Location.—Water-stage recorder and concrete control, lat. 39°35′35″, long. 76°58′05″, 80 feet upstream from small wooden bridge, ½ mile upstream from mouth, and 1.8 miles northeast of Westminster, Carroll County. Altitude of gage is 670 feet (from topographic map).

Drainage area.—3.40 square miles.

Records available.—September 1949 to September 1954.

Average discharge.—5 water years (1950–54), 4.35 second-feet.

Extremes.—Maximum discharge, 720 second-feet July 4, 1951 (gage height, 5.14 feet, from high-water mark in well) from rating curve extended above 200 second-feet by logarithmic plotting; minimum, 0.6 second-foot July 25, 31, 1954 (gage height, 1.41 feet); minimum daily 0.7 second-foot July 31–Aug. 2, 1954.

Remarks.—Records good except those for periods of ice effect or doubtful, fragmentary, or no gage-height record, which are fair.

Monthly discharge of Cranberry Branch near Westminster

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1949–50						
October	6.8	1.5	2.16	0.635	0.73	0.410
November	3.9	1.7	2.06	.606	.68	.392
December	10	1.7	2.89	.850	.98	.549
January	5.6	2.3	2.77	.815	.94	.527
February	9.1	2.3	4.48	1.32	1.37	.853
March	26	2.1	5.34	1.57	1.81	1.01
April	4.9	2.9	3.70	1.09	1.22	.704
May	9.7	2.9	4.22	1.24	1.43	.801
June	7.1	2.1	3.13	.921	1.03	.595
July	7.0	1.7	2.45	.721	.83	.466
August	12	1.3	2.14	.629	.73	.407
September	33	1.6	4.19	1.23	1.37	.795
The year	33	1.3	3.29	.968	13.12	.626
1950–51						
October	11	2.0	2.69	0.791	0.91	0.511
November	32	2.1	3.82	1.12	1.25	.724
December	49	3.1	6.55	1.93	2.22	1.25
January	16	3.5	4.95	1.46	1.68	.944
February	32	4.3	8.15	2.40	2.50	1.55
March	10	4.1	5.52	1.62	1.87	1.05
April	8.0	3.3	4.54	1.34	1.49	.866
May	6.2	2.9	3.86	1.14	1.31	.737
June	33	2.7	6.24	1.84	2.05	1.19
July	55	2.4	5.27	1.55	1.79	1.00
August	7.6	2.0	3.20	.941	1.08	.608
September	4.8	1.7	2.18	.641	.72	.414
The year	55	1.7	4.73	1.39	18.87	.898

Monthly discharge of Cranberry Branch near Westminster—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1951–52						
October	3.1	1.6	1.93	0.568	0.66	0.367
November	16	2.1	3.98	1.17	1.31	.756
December	18	2.3	4.57	1.34	1.55	.866
January	15	4.3	6.37	1.87	2.16	1.21
February	15	3.9	5.54	1.63	1.76	1.05
March	38	3.9	8.09	2.38	2.74	1.54
April	47	5.2	11.9	3.50	3.92	2.26
May	36	4.9	11.3	3.32	3.84	2.15
June	30	4.9	7.55	2.22	2.48	1.43
July	18	3.1	5.54	1.63	1.88	1.05
August	7.3	2.1	3.39	.997	1.15	.644
September	36	2.3	3.91	1.15	1.28	.743
The year	47	1.6	6.17	1.81	24.73	1.17
1952–53						
October	5.3	2.1	2.46	0.724	0.83	0.468
November	58	2.0	6.66	1.96	2.19	1.27
December	20	3.5	5.76	1.69	1.95	1.09
January	22	3.9	7.58	2.23	2.57	1.44
February	16	4.9	6.25	1.84	1.91	1.19
March	25	4.9	8.44	2.48	2.86	1.60
April	15	4.9	7.12	2.09	2.34	1.35
May	16	3.7	6.18	1.82	2.10	1.18
June	11	2.7	4.06	1.19	1.33	.769
July	3.9	2.1	2.51	.738	.85	.477
August	10	1.6	2.59	.762	.88	.492
September	6.5	1.4	2.11	.621	.69	.401
The year	58	1.4	5.14	1.51	20.50	.976
1953–54						
October	7.3	1.3	1.73	0.509	0.59	0.329
November	5.9	1.4	2.15	.632	.71	.408
December	16	1.7	4.66	1.37	1.58	.885
January	6.6	2.1	2.77	.815	.94	.527
February	4.7	1.9	2.50	.735	.76	.475
March	20	2.4	3.66	1.08	1.24	.698
April	8.0	2.2	2.82	.829	.92	.536
May	7.2	1.9	3.07	.903	1.04	.584
June	2.3	1.1	1.57	.462	.52	.299
July	5.5	.7	1.38	.406	.47	.262
August	4.1	.7	1.46	.429	.50	.277
September	1.7	1.0	1.18	.347	.39	.224
The year	20	.7	2.42	.712	9.66	.460

PATAPSCO RIVER BASIN—*Continued*

Yearly discharge of Cranberry Branch near Westminster

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1950	3.29	.968	13.12	0.626	3.79	1.11	15.11	0.717
1951	4.73	1.39	18.87	.898	4.51	1.33	18.01	.860
1952	6.17	1.81	24.73	1.17	6.54	1.92	26.18	1.24
1953	5.14	1.51	20.50	.976	4.61	1.36	18.41	.879
1954	2.42	.712	9.66	.460				
Highest	6.17	1.81	24.73	1.17	6.54	1.92	26.18	1.24
Average	4.35	1.28	17.38	.827	4.86	1.43	19.41	.924
Lowest	2.42	.712	9.66	.460	3.79	1.11	15.11	.717

25. South Branch Patapsco River at Henryton

Location.—Water-stage recorder and concrete control, lat. 39°21′05″, long. 76°54′50″, on right bank at bridge on State Highway 101 at Henryton, Carroll County, 1.3 miles upstream from Piney Run, 2.3 miles upstream from confluence with North Branch, and 3.2 miles southeast of Sykesville. Datum of gage is 289.15 feet above mean sea level, datum of 1929.

Drainage area.—64.4 square miles.

Records available.—August 1948 to September 1954. Monthly records published to Sept. 30, 1952 in Bulletin 14.

Average discharge.—6 water years (1949–54); 82.6 second-feet.

Extremes.—Maximum discharge, 4,930 second-feet May 26 (gage height, 11.04 feet) from rating curve extended above 1,900 second-feet on basis of slope-area determination at gage height 7.88 feet; minimum, 7.6 second-feet Aug. 1, 1954 (gage height, 1.68 feet); minimum daily 8.5 second-feet Aug. 1, 2, Sept. 28–30, 1954 (gage height, 1.70 feet).

Remarks.—Records excellent except those for periods of doubtful gage-height record, which are fair.

Monthly discharge of South Branch Patapsco River at Henryton

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1952–53						
October	63	36	39.3	0.610	0.70	0.394
November	1,160	34	131	2.03	2.27	1.31
December	294	70	106	1.65	1.90	1.07
January	434	79	139	2.16	2.49	1.40
February	209	92	111	1.72	1.79	1.11
March	463	89	169	2.62	3.02	1.69
April	251	105	144	2.24	2.50	1.45
May	402	76	127	1.97	2.27	1.27
June	292	47	79.6	1.24	1.38	.801
July	120	31	43.1	.669	.77	.432
August	95	20	34.2	.531	.61	.343
September	85	18	29.2	.453	.51	.293
The year	1,160	18	95.8	1.49	20.21	.963
1953–54						
October	86	19	25.6	0.398	0.46	0.257
November	107	24	33.6	.522	.58	.337
December	283	28	68.6	1.07	1.23	.692
January	79	33	45.3	.703	.81	.454
February	73	28	43.8	.680	.71	.439
March	262	47	70.6	1.10	1.26	.711
April	162	40	60.2	.935	1.04	.604
May	298	42	82.0	1.27	1.47	.821
June	42	17	29.8	.463	.52	.299
July	42	9.8	19.9	.309	.36	.200
August	54	8.5	20.6	.320	.37	.207
September	26	8.5	12.2	.189	.21	.122
The year	298	8.5	42.8	.665	9.02	.430

PATAPSCO RIVER BASIN—*Continued*

Yearly discharge of South Branch Patapsco River at Henryton

Year	Year ending Sept. 30				Calendar year			
	Discharge n second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1948	—	—	—	—	—	—	—	—
1949	101	1.57	21.32	1.01	87.7	1.36	18.49	0.879
1950	60.5	.939	12.75	.607	70.3	1.09	14.81	.704
1951	81.2	1.26	17.13	.814	72.9	1.13	15.38	.730
1952	114	1.77	24.04	1.14	125	1.94	26.45	1.25
1953	95.8	1.49	20.21	.963	83.5	1.30	17.61	.840
1954	42.8	.665	9.02	.430				
Highest	114	1.77	24.04	1.14	125	1.94	26.45	1.25
Average	82.6	1.28	17.38	.827	87.9	1.36	18.46	.879
Lowest	42.8	.665	9.02	.430	70.3	1.09	14.81	.704

26. Piney Run near Sykesville

Location.—Water-stage recorder and concrete control, lat. 39°22′55″, long. 76°58′00″, on left bank 75 feet downstream from highway bridge 1¼ miles north of Sykesville, Carroll County, and 5¼ miles upstream from mouth. Altitude of gage is 450 feet (from topographic map).

Drainage area.—11.4 square miles.

Records available.—September 1931 to September 1954. Monthly records published to Sept. 30, 1943 in Bulletin 1, from Oct. 1, 1943 to Sept. 30, 1952 in Bulletin 14.

Average discharge.—23 years (1932–54), 12.9 second-feet.

Extremes.—Maximum discharge recorded, 2,100 second-feet July 24, 1946 (gage height, 6.95 feet) from rating curve extended above 260 second-feet on basis of slope-area determinations at gage heights 4.16, 4.88, 5.39, 5.76, 6.04 and 6.95 feet; minimum, 0.4 second-foot Jan. 25, 1939; minimum daily, 1.2 second-feet Sept. 17–21, 25, 26, 1932.

Remarks.—Records good except those for periods of ice effect, or doubtful, or fragmentary or no gage-height record, which are fair.

Monthly discharge of Piney Run near Sykesville

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1952–53						
October	11	6.2	6.91	0.606	0.70	0.392
November	298	5.9	24.8	2.18	2.43	1.41
December	64	11	18.5	1.62	1.87	1.05
January	91	13	24.8	2.18	2.51	1.41
February	42	15	19.1	1.68	1.75	1.09
March	100	15	30.8	2.70	3.11	1.75
April	52	20	26.1	2.29	2.55	1.48
May	93	13	23.8	2.09	2.41	1.35
June	45	8.6	13.3	1.17	1.30	.756
July	20	6.2	8.92	.782	.90	.505
August	12	4.1	6.10	.535	.62	.346
September	13	3.9	5.66	.496	.55	.321
The year	298	3.9	17.4	1.53	20.70	.989
1953–54						
October	20	3.7	4.88	0.428	0.49	0.277
November	18	4.5	6.08	.533	.59	.344
December	59	4.9	12.1	1.06	1.22	.685
January	21	5.0	7.88	.691	.80	.447
February	15	4.6	7.26	.637	.66	.412
March	63	8.2	12.5	1.10	1.27	.711
April	20	6.8	8.77	.769	.86	.497
May	53	5.9	13.0	1.14	1.31	.737
June	5.6	3.0	4.33	.380	.42	.246
July	8.6	1.7	3.16	.277	.32	.179
August	9.8	1.5	3.81	.334	.39	.216
September	5.9	2.6	3.20	.281	.31	.182
The year	63	1.5	7.26	.637	8.64	.412

PATAPSCO RIVER BASIN—*Continued*

Yearly discharge of Piney Run near Sykesville

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1932	6.21	0.545	7.41	0.352	8.68	0.761	10.36	0.492
1933	17.9	1.57	21.34	1.01	16.9	1.48	20.08	.957
1934	11.3	.991	13.50	.641	11.9	1.04	14.23	.672
1935	13.5	1.18	16.01	.763	13.0	1.14	15.53	.737
1936	15.4	1.35	18.42	.873	15.0	1.32	17.90	.853
1937	13.8	1.21	16.43	.782	16.7	1.46	19.88	.944
1938	13.4	1.18	15.96	.763	10.7	.939	12.81	.607
1939	12.4	1.09	14.76	.704	12.0	1.05	14.25	.679
1940	10.5	.921	12.49	.595	11.2	.982	13.42	.635
1941	8.80	.772	10.48	.499	7.20	.632	8.57	.408
1942	7.62	.668	9.08	.432	11.0	.965	13.17	.624
1943	12.3	1.08	14.70	.698	10.7	.939	12.77	.607
1944	11.3	.991	13.50	.641	10.5	.921	12.50	.595
1945	11.6	1.02	13.87	.659	13.7	1.20	16.35	.776
1946	16.1	1.41	19.14	.911	14.0	1.23	16.65	.795
1947	10.3	.904	12.22	.584	10.5	.921	12.51	.595
1948	15.0	1.32	17.87	.853	17.6	1.54	20.97	.995
1949	18.0	1.58	21.41	1.02	15.3	1.34	18.27	.866
1950	11.8	1.04	14.02	.672	13.6	1.19	16.24	.769
1951	15.1	1.32	18.00	.853	13.7	1.20	16.29	.776
1952	20.3	1.78	24.27	1.15	22.1	1.94	26.39	1.25
1953	17.4	1.53	20.70	.989	15.1	1.32	18.00	.853
1954	7.26	.637	8.64	.412				
Highest	20.3	1.78	24.27	1.15	22.1	1.94	26.39	1.25
Average	12.9	1.13	15.34	.730	13.2	1.16	15.75	.750
Lowest	6.21	.545	7.41	.352	7.20	.632	8.57	.408

27. Sawmill Creek at Glen Burnie

Location.—Water-stage recorder and concrete control, lat. 39°10′12″, long. 76°37′51″, on left bank 300 feet upstream from bridge on State Highway 301 and 0.5 mile northwest of Glen Burnie, Anne Arundel County. Datum of gage is 26.07 feet above mean sea level, datum of 1929.

Drainage area.—5.1 square miles.

Records available.—May 1944 to September 1952 (discontinued). Monthly records published to Sept. 30, 1943 in Bulletin 1, from Oct. 1, 1943 to Sept. 30, 1948 in Bulletin 5.

Average discharge.—8 water years (1945–52), 8.26 second-feet.

Extremes.—Maximum discharge, 157 second-feet Sept. 1, 1952 (gage height, 4.77 feet), from rating curve extended above 72 second-feet on basis of contracted-opening determination of peak flow; minimum, about 1.1 second-feet sometime during period July 14 to Aug. 5, 1949 result of regulation from unknown source (gage height, 1.72 feet, from recorded range in stage); minimum daily, 3.6 second-feet Sept. 7, 8, 1950.

Flood of August 1933 reached a stage of about 4 feet.

Remarks.—Records good except those for period of doubtful or no gage-height record, which are fair.

Monthly discharge of Sawmill Creek at Glen Burnie

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1948–49						
October	18	7.4	9.03	1.77	2.04	1.14
November	24	7.8	9.78	1.92	2.14	1.24
December	25	9.8	13.0	2.55	2.93	1.65
January	23	12	14.4	2.82	3.25	1.82
February	20	13	14.4	2.82	2.94	1.82
March	23	12	13.5	2.65	3.06	1.71
April	16	11	12.3	2.41	2.68	1.56
May	34	10	13.1	2.57	2.97	1.66
June	12	8.6	9.86	1.93	2.16	1.25
July	14	6.0	8.26	1.62	1.87	1.05
August	16	6.0	7.34	1.44	1.66	.931
September	13	6.0	6.85	1.34	1.50	.866
The year	34	6.0	11.0	2.16	29.20	1.40
1949–50						
October	11	6.0	6.60	1.29	1.49	0.834
November	8.2	6.0	6.49	1.27	1.42	.821
December	9.0	5.3	6.42	1.26	1.45	.814
January	8.6	4.7	5.40	1.06	1.22	.685
February	11	5.6	7.13	1.40	1.46	.905
March	17	5.3	7.01	1.37	1.58	.885
April	8.2	6.0	6.55	1.28	1.43	.827
May	12	5.6	7.42	1.45	1.68	.937
June	12	5.3	7.13	1.40	1.56	.905
July	11	5.0	6.97	1.37	1.58	.885
August	34	4.2	6.11	1.20	1.38	.776
September	23	3.6	6.27	1.23	1.37	.795
The year	34	3.6	6.62	1.30	17.62	.840

PATAPSCO RIVER BASIN—*Continued*

Monthly discharge of Sawmill Creek at Glen Burnie—*Continued*

Month	Discharge in second-feet				Runoff in inches	Discharge in million gallons per day per square mile
	Maximum	Minimum	Mean	Per square mile		
1950–51						
October	16	4.7	5.70	1.12	1.29	0.724
November	16	5.0	5.88	1.15	1.29	.743
December	15	5.3	7.44	1.46	1.68	.944
January	9.0	6.2	6.93	1.36	1.57	.879
February	15	6.5	8.34	1.64	1.70	1.06
March	15	7.5	8.51	1.67	1.92	1.08
April	15	8.2	9.48	1.86	2.07	1.20
May	15	7.1	8.44	1.65	1.91	1.07
June	29	7.1	10.7	2.10	2.35	1.36
July	11	7.1	7.90	1.55	1.79	1.00
August	8.6	6.2	6.85	1.34	1.55	.866
September	35	5.6	8.44	1.65	1.85	1.07
The year	35	4.7	7.87	1.54	20.97	.995
1951–52						
October	10	5.3	5.86	1.15	1.33	0.743
November	51	6.2	10.3	2.02	2.25	1.31
December	40	5.9	8.36	1.64	1.89	1.06
January	15	6.6	8.67	1.70	1.96	1.10
February	32	8.2	9.69	1.90	2.05	1.23
March	21	7.8	9.75	1.91	2.21	1.23
April	66	7.8	13.8	2.71	3.01	1.75
May	31	10	13.3	2.61	3.00	1.69
June	22	8.6	10.8	2.12	2.36	1.37
July	52	5.8	9.45	1.85	2.14	1.20
August	21	7.0	10.0	1.96	2.26	1.27
September	84	8.6	13.1	2.57	2.86	1.66
The year	84	5.3	10.2	2.00	27.32	1.29

PATAPSCO RIVER BASIN—*Continued*

Yearly discharge of Sawmill Creek at Glen Burnie

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1944	—	—	—	—	—	—	—	—
1945	7.85	1.54	20.89	0.995	8.10	1.59	21.56	1.03
1946	7.78	1.53	20.72	.989	7.28	1.43	19.40	.924
1947	6.07	1.19	16.16	.769	6.12	1.20	16.29	.776
1948	8.71	1.71	23.25	1.10	9.80	1.92	26.15	1.24
1949	11.0	2.16	29.20	1.40	9.94	1.95	26.45	1.26
1950	6.62	1.30	17.62	.840	6.58	1.29	17.52	.834
1951	7.87	1.54	20.97	.995	8.33	1.63	22.18	1.05
1952	10.2	2.00	27.32	1.29	—	—	—	—
Highest	11.0	2.16	29.20	1.40	9.94	1.95	26.45	1.26
Average	8.26	1.62	21.99	1.05	8.02	1.57	21.31	1.02
Lowest	6.07	1.19	16.16	.769	6.12	1.20	16.29	.776

SUSQUEHANNA RIVER BASIN

Susquehanna River at Marietta, Pa.

Location.—Water-stage recorder, lat. 40°03′15″, long. 76°31′50″, on left bank 420 feet upstream from Chickies Creek and 1 mile downstream from Marietta, Lancaster County. Records include flow of Chickies Creek. Datum of gage is 200.60 feet above mean seal level, datum of 1929.

Drainage area.—25,990 square miles, approximately (includes that of Chickies Creek).

Records available.—October 1931 to September 1954.

Average discharge.—23 years, 36,350 second-feet.

Extremes.—Maximum discharge, 787,000 second-feet Mar. 19, 1936 (gage height, 60.73 feet), from rating curve extended above 460,000 second-feet; minimum, 618 second-feet Sept. 26, 1932 (gage height, 30.89 feet), when York Haven powerplant was shut down in order to obtain current-meter measurements at low water; minimum daily, 1,380 second-feet Sept. 26, 1932.

Maximum stage known prior to 1931, 58.3 feet June 2, 1889, from floodmark (discharge, about 630,000 second-feet).

Remarks.—Records good except those for periods of ice effect or doubtful or no gage-height record, which are fair. Discharge below 8,000 second-feet regulated by Metropolitan Edison Co. plant at York Haven. Accuracy of records for entire period has been verified independently by Pennsylvania Water & Power Co. by comparison with records obtained at Safe Harbor, Holtwood, and Conowingo powerplants below station. Record computed by the Harrisburg Office of U. S. Geological Survey.

Cooperation.—Gage-height record furnished by the Pennsylvania Water & Power Co.

SUSQUEHANNA RIVER BASIN—*Continued*

Yearly discharge of Susquehanna River at Marietta, Pa.

Year	Year ending Sept. 30				Calendar year			
	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile	Discharge in second-feet		Runoff in inches	Discharge in million gallons per day per square mile
	Mean	Per square mile			Mean	Per square mile		
1932	25,600	0.985	13.43	0.637	31,250	1.20	16.37	0.776
1933	40,000	1.54	20.91	.995	36,690	1.41	19.16	.911
1934	24,550	.945	12.82	.611	28,280	1.09	14.76	.704
1935	36,250	1.40	14.76	.905	34,640	1.33	18.06	.860
1936	39,650	1.53	20.83	.989	39,910	1.54	20.88	.995
1937	40,170	1.55	20.99	1.00	44,220	1.70	23.09	1.10
1938	35,080	1.35	18.32	.873	30,400	1.17	15.88	.756
1939	31,490	1.21	16.44	.782	28,120	1.08	14.68	.698
1940	34,680	1.33	18.16	.860	38,370	1.48	20.10	.957
1941	25,800	.993	13.48	.642	22,490	.865	11.74	.559
1942	31,200	1.20	16.29	.776	38,870	1.50	20.30	.969
1943	47,500	1.83	24.81	1.18	43,280	1.67	22.62	1.08
1944	32,130	1.24	16.85	.801	29,480	1.13	15.45	.730
1945	41,920	1.61	21.88	1.04	51,300	1.97	26.79	1.27
1946	46,170	1.78	24.13	1.15	37,260	1.43	19.47	.924
1947	38,150	1.47	19.94	.950	37,840	1.46	19.77	.944
1948	36,590	1.41	19.16	.911	38,580	1.48	20.22	.957
1949	32,420	1.25	16.95	.808	31,060	1.20	16.23	.776
1950	38,590	1.48	20.15	.957	49,390	1.90	25.79	1.23
1951	49,210	1.89	25.69	1.22	39,510	1.52	20.63	.982
1952	43,610	1.68	22.83	1.09	45,060	1.73	23.59	1.12
1953	38,810	1.49	20.27	.963	34,840	1.34	18.19	.866
1954	26,430	1.02	13.80	.659				
Highest	49,210	1.89	25.69	1.22	51,300	1.97	26.79	1.27
Average	36,350	1.40	19.00	.905	36,860	1.42	19.28	.918
Lowest	24,550	.945	12.82	.611	22,490	.865	11.74	.559

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Fig. 1. Flood Plain along Broad Creek, Harford County

Fig. 2. Weathering along Sheet Joints in the Woodstock Granodiorite near Granite, Baltimore County

Fig. 1. Differential Weathering in the Cockeysville Marble west of Bare Hills, Baltimore County

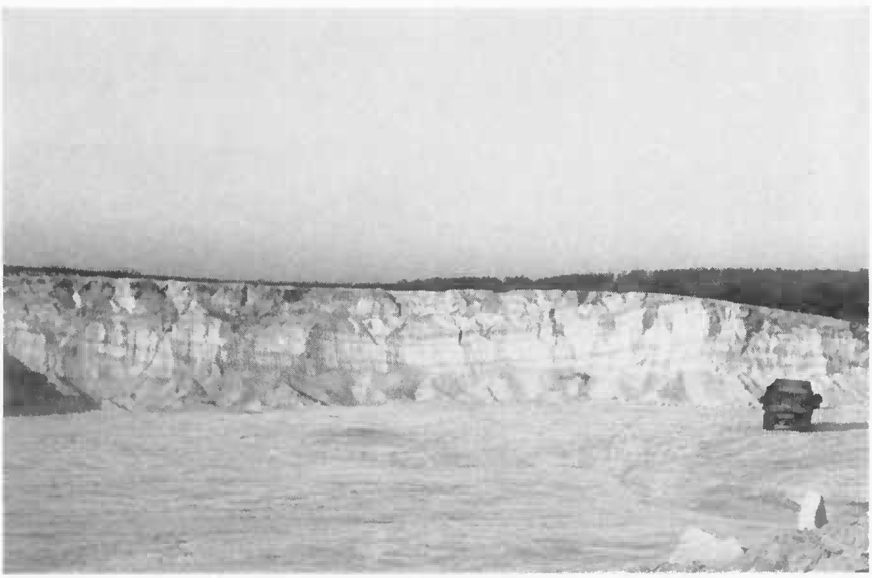

Fig. 2. Sand Quarry in Cockeysville Marble near Texas, Baltimore County

Fig. 1. Closely Folded and Contorted Wissahickon Formation, Wards Chapel Road, Baltimore County

Fig. 2. Folding and Faulting in the Peters Creek Quartzite, The Rocks State Park, Harford County

Fig. 1. Characteristic Topography on the Wissahickon Formation, Harford County

Fig. 2. Rocky Streambed on Little Gunpowder Falls at Laurel Brook near Original Gage House Site

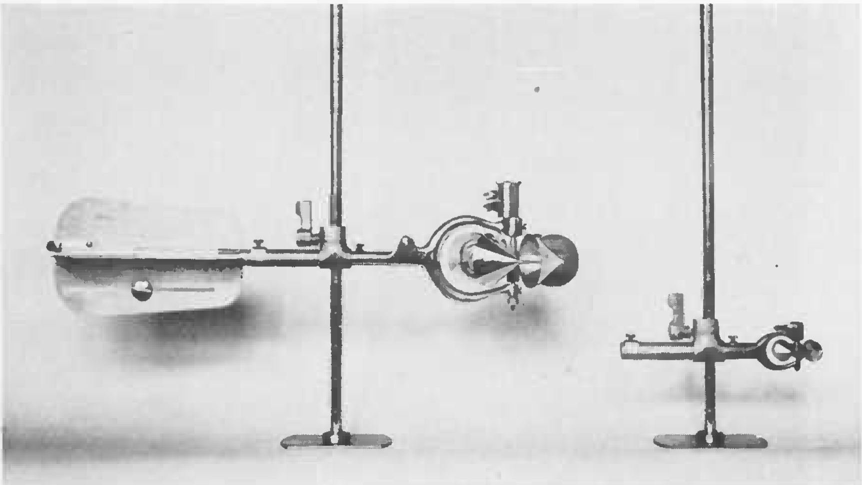

Fig. 1. Price Standard Current Meter and Pygmy Meter, Suspended on Wading Rods, Used to Measure Discharge

Fig. 2. Highway Bridge Equipment Used to Measure Discharge at Stages Higher than Wading

Fig. 1. Gunpowder Falls below Loch Raven Dam

Fig. 2. Downstream from Gaging Station on Deer Creek at Rocks

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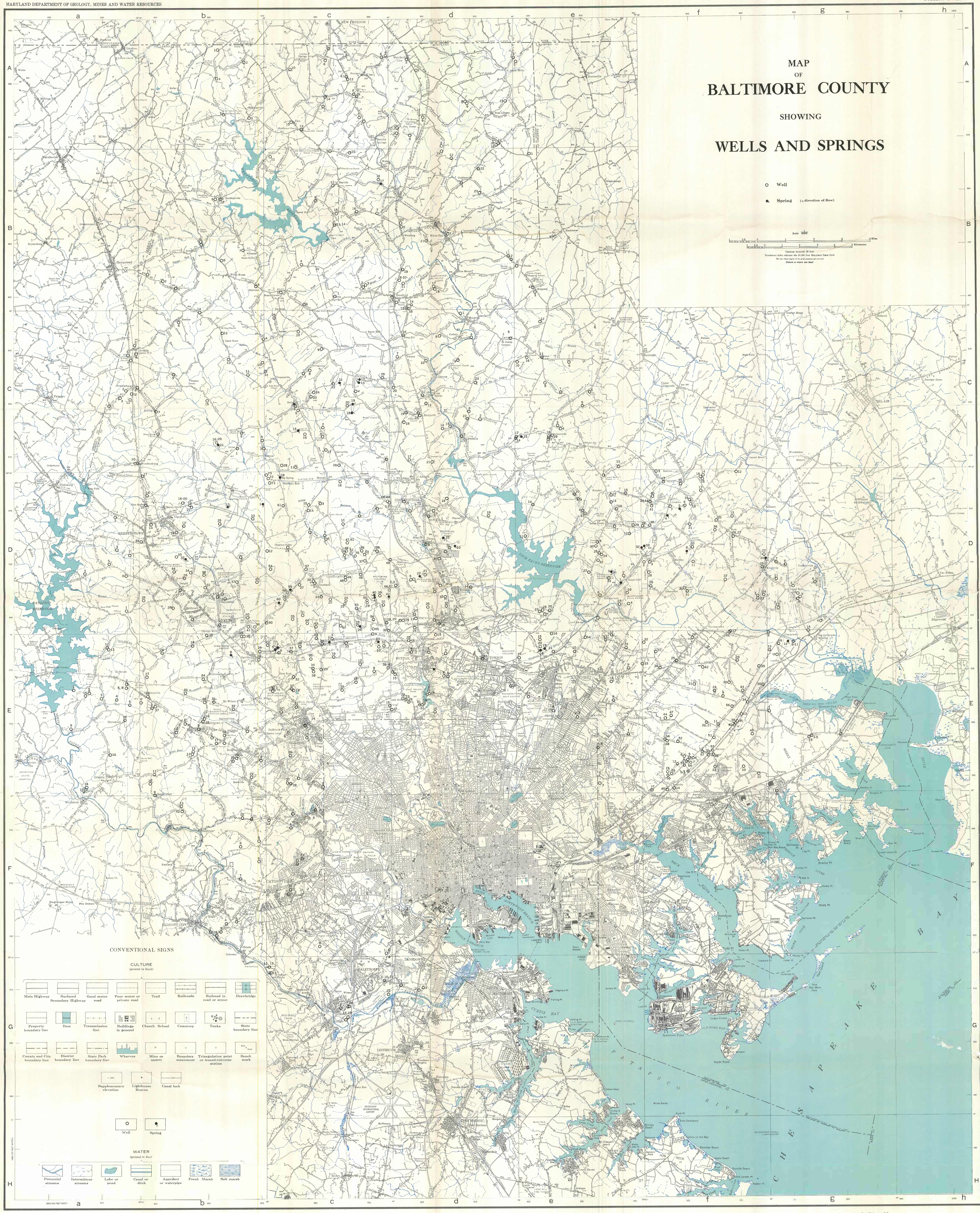
* Page numbers in *italics* indicate detailed descriptions



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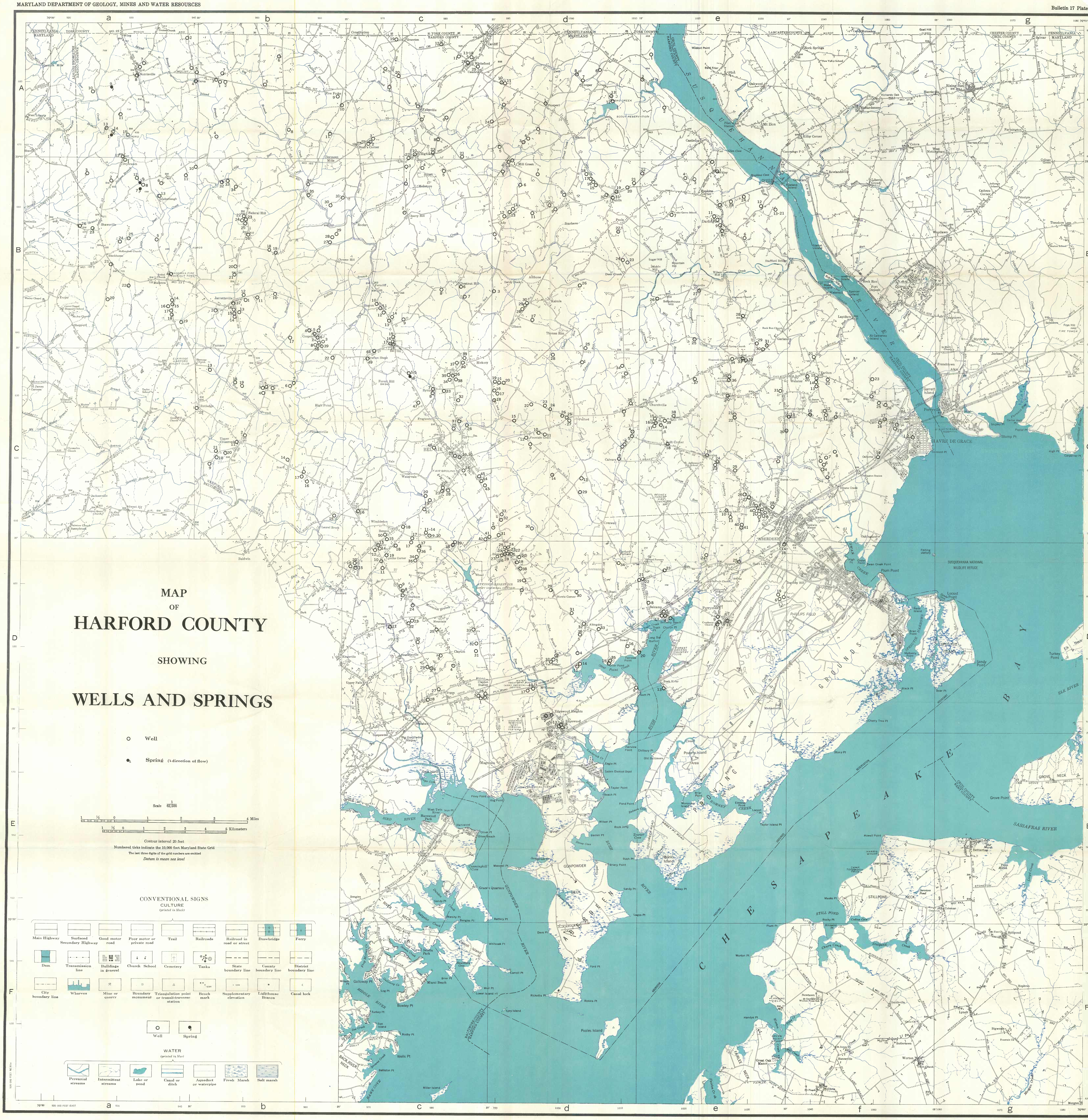
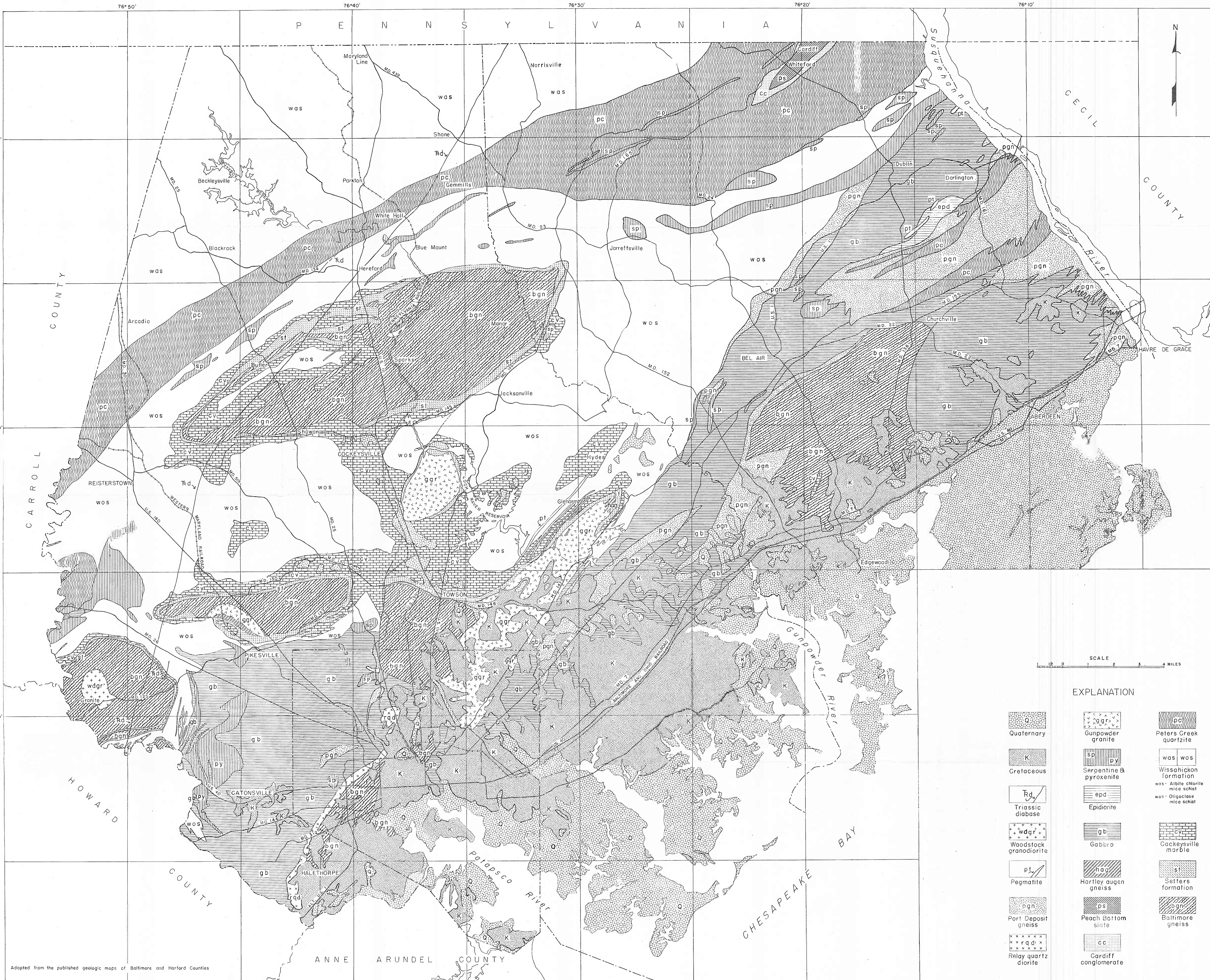
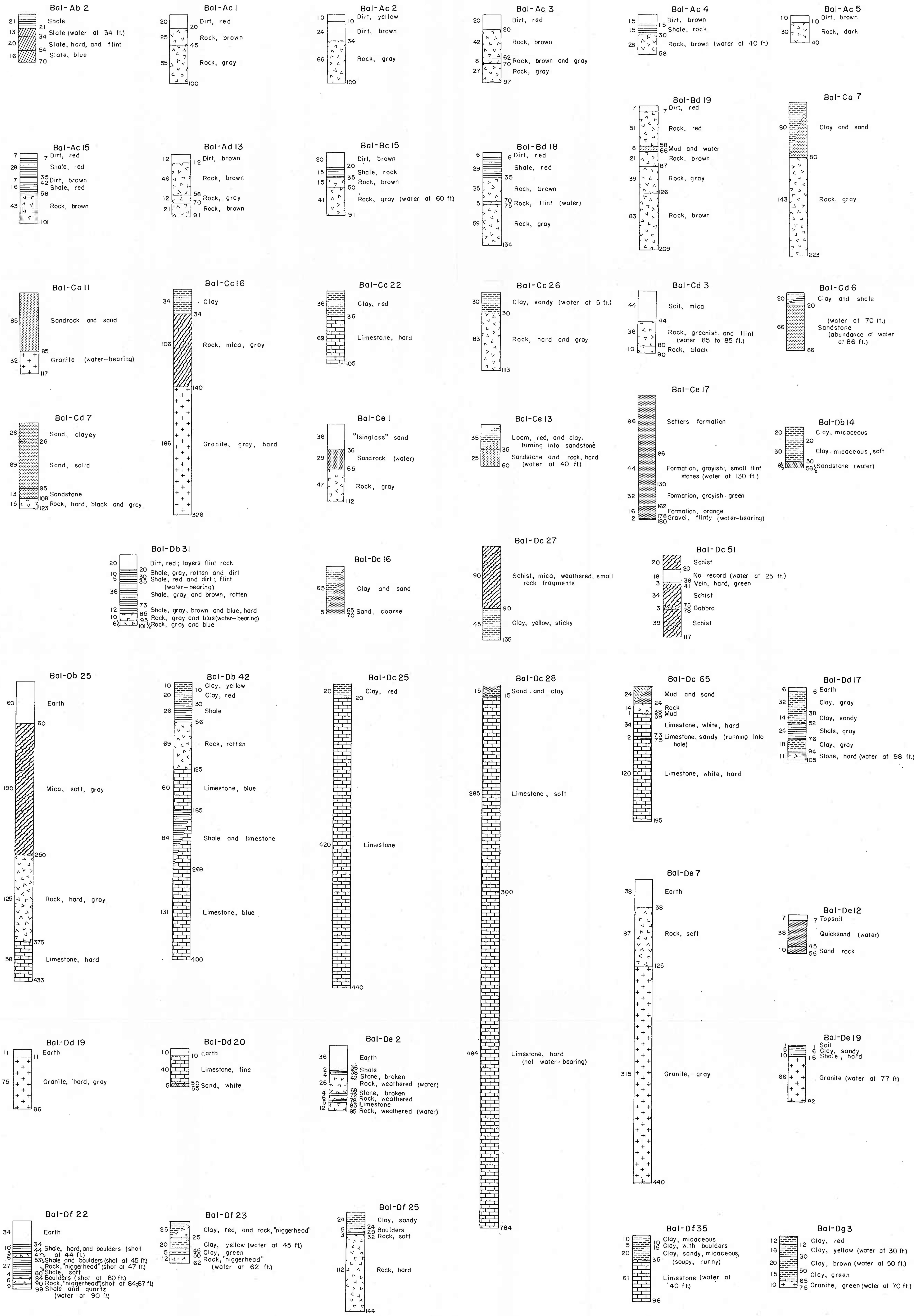
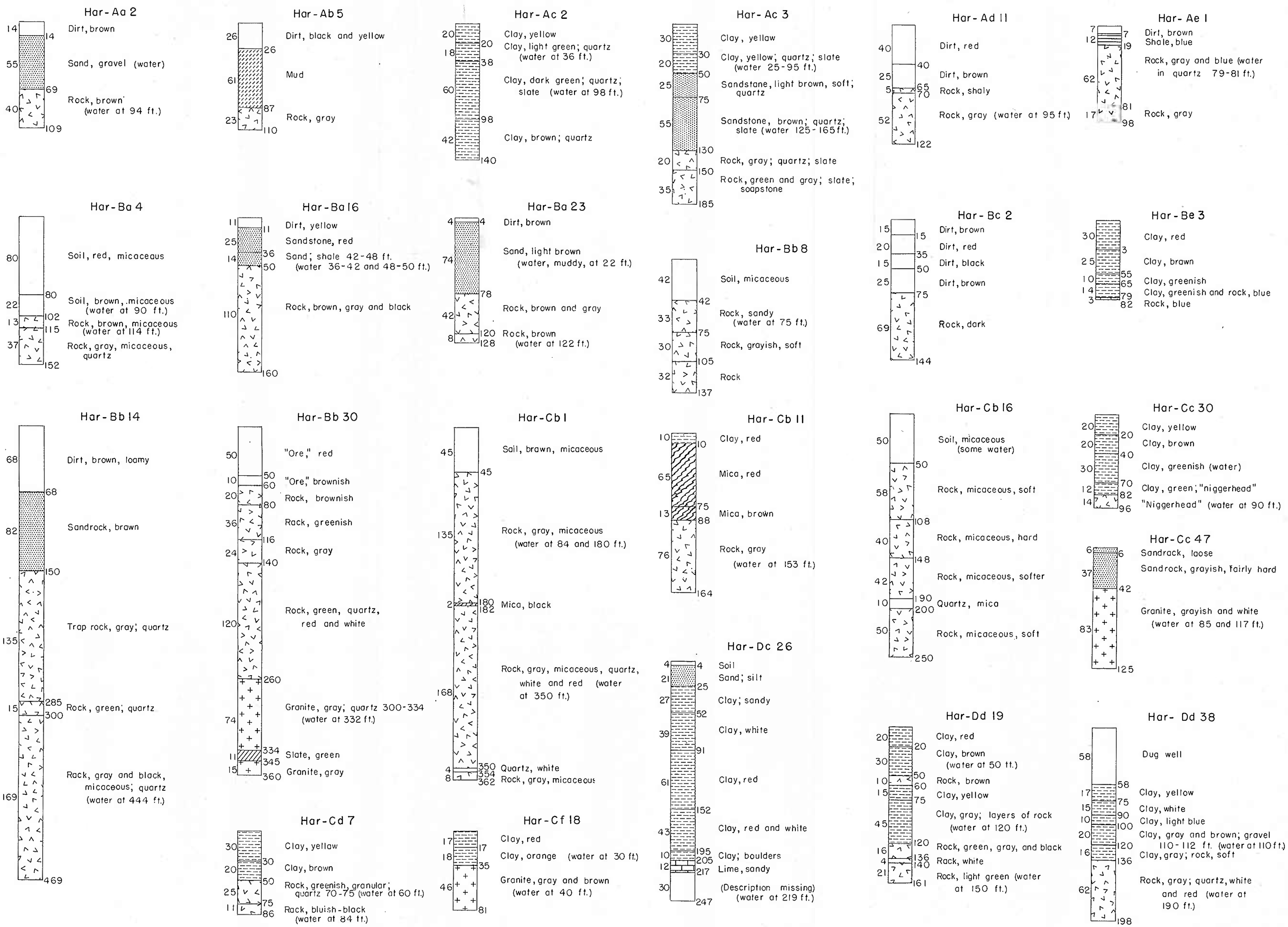

MAP
OF
HARFORD COUNTY
SHOWING
WELLS AND SPRINGS
Well
Spring (direction of flow)
Scale 1/62,500
4 Miles
5 Kilometers
Contour interval 20 feet
Numbered ticks indicate the 10,000 foot Maryland State Grid
The last three digits of the grid numbers are omitted
Datum is mean sea level
CONVENTIONAL SIGNS
CULTURE
(printed in black)
Main Highway
Surfaced Secondary Highway
Good motor road
Poor motor or private road
Trail
Railroads
Railroad in road or street
Drawbridge
Ferry
Dam
Transmission line
Buildings in general
Church School
Cemetery
Tanks
State boundary line
County boundary line
District boundary line
City boundary line
Wharves
Mine or quarry
Boundary monument
Triangulation point or transit-traverse station
Bench mark
Supplementary elevation
Lighthouse Beacon
Canal lock
Well
Spring
WATER
(printed in blue)
Perennial streams
Intermittent streams
Lake or pond
Canal or ditch
Aqueduct or waterpipe
Fresh Marsh
Salt marsh
PENNSYLVANIA
MARYLAND
YORK COUNTY
HARFORD COUNTY
LANCASTER COUNTY
CHESTER COUNTY
CECIL COUNTY
SUSQUEHANNA RIVER
HAVRE DE GRACE
ABERDEEN
BEL AIR
PHILLIPS FIELD
SUSQUEHANNA NATIONAL WILDLIFE REFUGE
GROUNDS
CHESAPEAKE BAY
ELK RIVER
SASSAFRAS RIVER
GROVE NECK
STILLPOND NECK
GUNPOWDER RIVER
BUSH RIVER
MIDDLE RIVER
Pooles Island
Rising Sun
Conowingo
Darlington
Edgewood
Magnolia
Betterton
Compiled & Lithographed by Williams & Heintz Co. Washington, D.C.



GENERALIZED GEOLOGIC MAP OF BALTIMORE AND HARFORD COUNTIES



LOGS OF WELLS IN BALTIMORE COUNTY



LOGS OF WELLS IN HARFORD COUNTY