Maryland Geological Survey

Prepared in cooperation with the United States Geological Survey and the Commissioners of Carroll County

HYDROGEOLOGIC ATLAS WINFIELD QUADRANGLE CARROLL COUNTY, MARYLAND

INTRODUCTION AND MAP 1. SLOPE OF LAND SURFACE

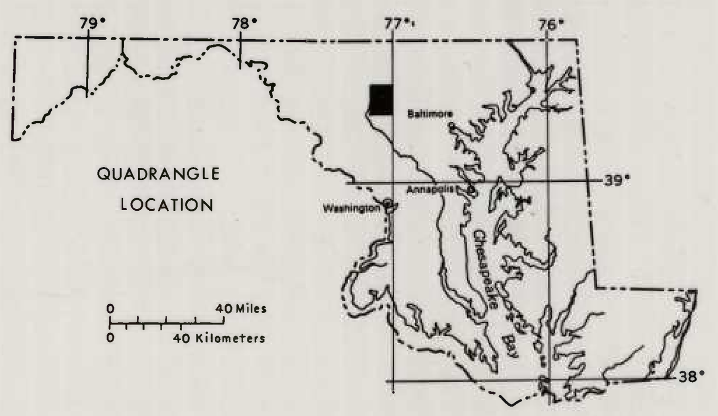
Quadrangle Atlas No. 10

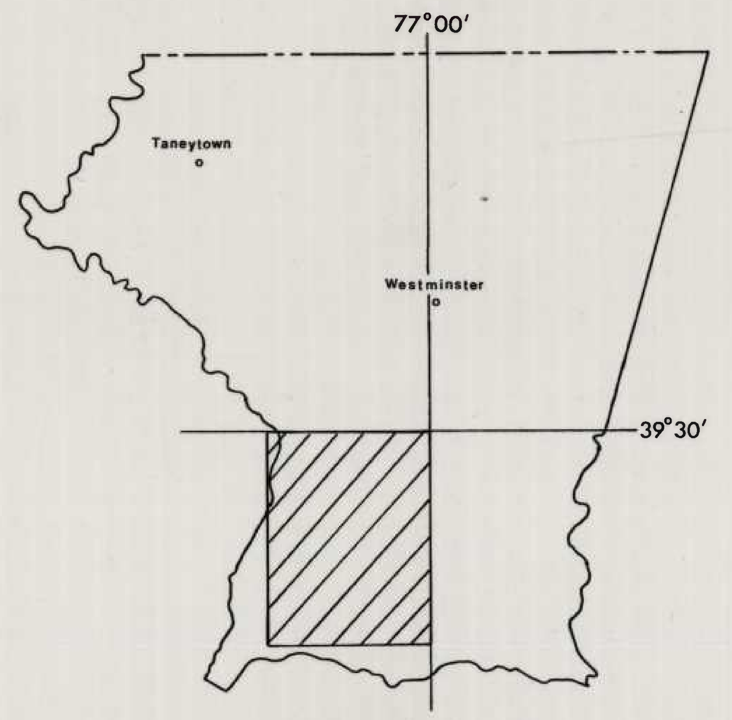
HYDROGEOLOGY

by Edmond G. Otton and others

INTRODUCTION

This atlas describes the hydrology, and geology of the Winfield 7½-minute quadrangle in southern Carroll County, Maryland. It is intended for use by County, State, and Federal officials as well as planners, engineers, health officers, and the general public as a guide to environmental concerns such as water supply, waste disposal, and land-use planning. The quadrangle covers an area of about 57 square miles, of which 55 square miles lie in Carroll County and the remaining 2 square miles are in Frederick County (NW corner of the quadrangle.) The quadrangle is bisected by Maryland Routes 26 and 27 and contains the small communities of Winfield and Taylorsville. Land use in the area is largely agricultural and woodland, although fairly extensive suburban development has occurred during the past decade. The climate is characteristic of the humid Piedmont region of Maryland. The Winfield quadrangle is drained by tributaries of the Patapsco River to the east and south and by tributaries and by tributaries of the Monocacy River to the west of the major drainage divide marked by Maryland Route 27. Topography is undulating to hilly and the maximum relief is about 250 feet.





LOCATION IN CARROLL COUNTY

HYDROLOGY

The source of all ground water in the area is local precipitation, amounting to about 42 inches annually. Hydrologic studies show that approximately 8 to 10 inches of the precipitation becomes ground-water recharge to the aquifers or ground-water reservoirs. These reservoirs consist of the pores and voids in the weathered rock (saprolite) and in the fractures and joints in the unweathered rock. The top of the zone of saturation in these rocks is the water table or the potentiometric surface. Where the rocks in the saturated zone yield water to wells and springs, they are called aquifers. Some of the Piedmont rocks, such as marbles or gneisses, are better aquifers than other rocks, such as schists or phyllites. The yield of individual wells depends on their topographic position (valley sites are more productive), the nature and thickness of the weathered zone, and the extent and degree of fracturing of the rocks penetrated by the well. Most of the water is of suitable chemical quality for domestic use.

GEOLOGY

The Winfield quadrangle lies within the Piedmont physiographic province. It is underlain mainly by metamorphosed sedimentary rocks of early Paleozoic age, chiefly chlorite-muscovite schist with associated quartzite and vein quartz. For additional information on the geology, reference is made to Cleaves, Edwards, and Glaser (1968). Currently (1979), detailed geologic mapping of the scale of 1:24,000 is underway by the Maryland Geological Survey. When available, these maps will form the basis for the revision of the geology.

The crystalline rocks are mantled by soil and weathered rock (saprolite). This material commonly attains its greatest thickness in interfluve areas where it may be as much as 100 feet thick; its average thickness is about 20 to 30 feet. Along stream valleys and in the steep-sided walls, the saprolite is thin or, in places, is absent entirely.

MAPS INCLUDED IN THE ATLAS

Map 1. Slope of land surface, by Photo Science, Inc.

Map 2. Depth to the water table, by Edmond G. Otton.

Map 3. Availability of ground water, by Edmond G. Otton.

Map 4. Constraints on installation of septic systems, by Edmond G. Otton.

Map 5. Location of wells, springs, and test holes, by John T. Hilleary and Edmond G. Otton.

SLOPE OF LAND SURFACE

Prepared by

Photo Science, Inc.

EXPLANATION

Four slope-area categories are shown on this map by three types of shading and by the absence of shading for the terrain category having a slope of 0 to 5 percent. Terrain having the maximum slope (greater than 25 percent) currently (1978) exceeds the maximum land slope permitted for the installation of domestic sewage-disposal systems (septic tanks) by the Carroll County Health Department. Intermediate terrain categories are useful in planning certain construction activities involving local roads and drains.

This map was prepared using topographic-contour negatives by a process developed by the U.S. Geological Survey, Topographic Division. The process uses a semiautomated photomechanical process, which translates the distance between adjacent contours into slope data. The slope zones on the map are unedited. Proximity of the same contour or absence of adjacent contours may produce false slope information at small tops and depressions, on cuts and fills, in saddles and drains, along shores of open water, and at the edges of the map.

LIMITATIONS OF MAPS

All the maps of this Atlas represent some degree of judgment and interpretation of available data. The boundaries depicted on maps are not to be construed as being final, nor is the information shown intended to supplant a detailed site evaluation by a specialist in these fields.

REFERENCES

Cleaves, E. T., Edwards, Jonathan, Jr., and Glaser, J. D. (compilers and editors), 1968, Geologic map of Maryland: Maryland Geol. Survey.

Ferris, J. G., Knowles, B. B., Brown, R. H., and Stallman, R. W., 1962, Theory of aquifer tests: U.S. Geol. Survey Water-Supply Paper 1536-E, 173 p.

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U.S. Department of Agriculture, Soil Conservation Service, 1971, Soils and septic tanks: 12 p.

U.S. Department of Agriculture, 1971, Soils and septic tanks: 12 p.

U.S. Public Health Service, 1967 rev., Manual of septic-tank practice: 92 p.

1/ The name of this agency was changed to the Maryland Geological Survey in June 1964.

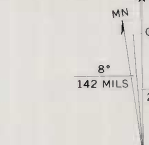
CONVERSION FACTORS

In this Atlas, figures for measurements are given in English units. The following table contains the factors for converting these English units to metric (System International or SI) units:

ENGLISH UNIT	SYMBOL	EQUIVALENT (Multiply by)	METRIC UNIT (unit)	SYMBOL
Inches	(in)	25.4	Millimeters	(mm)
Feet	(ft)	0.3048	Meters	(m)
Miles	(mi)	1.609	Kilometers	(km)
Square miles	(mi^2)	2.590	Square kilometers	(km^2)
U.S. gallons	(gal)	3.785	Liters	(L)
U.S. gallons per minute	(gal/min)	0.06309	Liters per second	(L/s)
U.S. gallons per minute per foot	[(gal/min)/ft]	0.207	Liters per second per meter	(L/s/m)

Topography from aerial photographs by stereophotogrammetric methods
Photographs taken 1943-44 (photo-revised by U.S. Geological Survey 1971).

Prepared by Photo Science, Inc., Gaithersburg Maryland, utilizing contour negatives furnished by United States Geological Survey.



UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

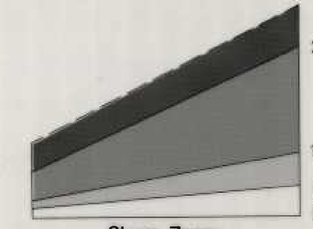
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 100 FEET
DATUM IS MEAN SEA LEVEL

1980

Slope zones photomechanically generated from 20-foot contour lines.

QUADRANGLE LOCATION



Slope Zones

HYDROGEOLOGIC ATLAS WINFIELD QUADRANGLE CARROLL COUNTY, MARYLAND

MAP 2. DEPTH TO THE WATER TABLE

Maryland Geological Survey

Quadrangle Atlas No. 10

DEPTH TO THE WATER TABLE

by Edmond G. Otton

EXPLANATION

This map shows the approximate depth to the top of the permanent zone of saturation (water table), as indicated by published well and spring records (Meyer, 1958), and by additional unpublished records. However, in large part, control for the areas underlain by a shallow water table (0 to 10 feet) was based on an analysis of the drainage network on the topographic quadrangles. Control for areas having depths to the water table of 35 feet or greater was based largely on well records and on an analysis of topographic features as they reflect variations in the position of the water table. In some places, temporary, perched zones of saturation may occur above the levels indicated on the map.

Ground-water levels, as measured in wells, fluctuate both seasonally and over longer periods in response to changes in frequency and amounts of infiltrating precipitation. Ground-water levels also fluctuate in response to withdrawal from wells, but in the Winfield and adjacent quadrangles, the effect of pumping from domestic wells is not widespread, such effects normally being confined to a few tens of feet from each well. The greatest fluctuation in the water table occurs beneath hills and uplands and the smallest in valleys and swales.

In general, ground-water levels are lowest in the fall and early winter and highest in the spring, but in some years, lows and highs may deviate from this pattern. Long-term fluctuations may also occur, related chiefly to the variability of precipitation. The nature of seasonal variations in the fluctuations of the water table are shown by an analysis of the 26-year water-level record of well MO-BE 1, located in Montgomery County near Damacus, Maryland, about 5 miles south of the southern boundary of Carroll County. This well is 58 feet deep and ends in phyllitic rocks. The mean water level in the well is 37.6 feet below land surface (fig. 1), but during the months of September through February the water level is generally below the mean--being at its lowest level in January. From March to or into August, the water level is above the mean--being at the highest level in May. Thus, from March to August is generally a period when ground-water recharge is in excess of discharge, and from September through February is a period when ground-water discharge is in excess of recharge. However, figure 1 is somewhat misleading, as the range in water levels during any one month over the period of 26 years may be substantial. For example, the April range in levels amounted to 29 feet during the period of record. During the entire period of record, the measured water level fluctuated over a range of 30.2 feet.

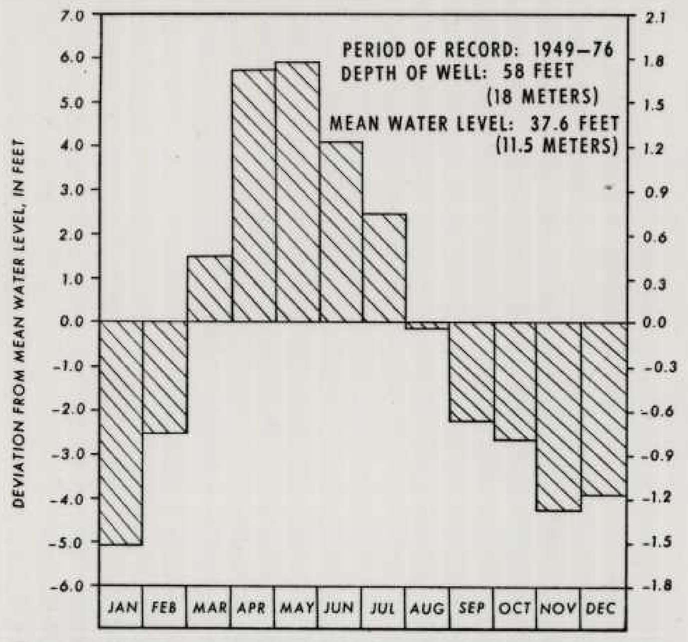


Figure 1.--Average monthly deviation from mean water level in well MO-BE 1 near Damascus, Md.

The magnitude of expected fluctuations in the water table at well MO-BE 1 is given in figure 2, which shows the percentage of time the water level was above a given stage. Thus, the figure shows that 60 percent of the time the water level in the well ranged between 32.0 and 43.3 feet below the land surface. This information indicates the possible range in water-table fluctuations which might occur under similar topographic and geologic conditions in the Winfield quadrangle.

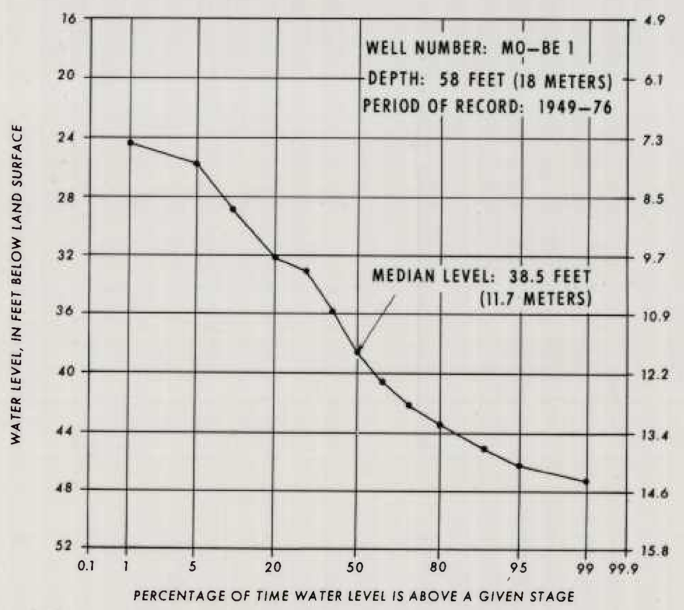


Figure 2.--Stage-duration graph of the water level in well MO-BE 1.

That long-term fluctuations of ground-water levels at places may be somewhat less than shown above is indicated by the 23-year record of observation well CL-DD 2 at Winfield Elementary School. This well is 310 feet deep, located on a hilltop, and ends in crystalline schistose rocks. Nonpumping water levels in this well during 1953-75 fluctuated throughout a range of 12.9 feet. The median water level is this well was 66.8 feet below land surface, and during 60 percent of the time the water level fluctuated throughout a range of 5.9 feet. The following graph (fig. 3) is a stage-duration analysis of 247 water-level measurements made during the period of record.

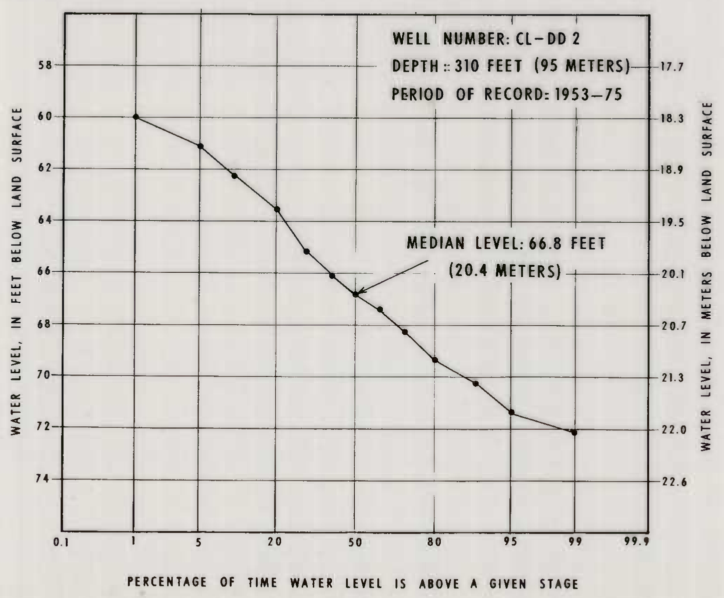


Figure 3.--Stage-duration graph of the water level in well CL-DD 2 at Winfield.

Much smaller fluctuations in ground-water levels occur in valleys and lowlands. Analysis of the record of observation well BA-EC 43 along a stream valley near Pikesville in Baltimore County showed a range of the nonpumping water level of 3.4 feet during 1956-73 (Otton, 1975). Similar ranges in ground-water levels in valley and lowland areas may be expected in the Winfield and adjacent quadrangles.

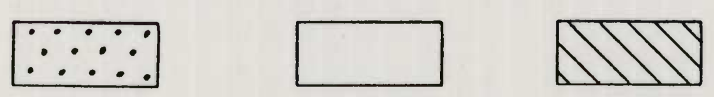
REFERENCES

Meyer, Gerald, 1958, The ground-water resources *in* The water resources of Carroll and Frederick Counties: Maryland Dept. of Geology, Mines and Water Res. 1/ Bull. 22, p. 1-228.

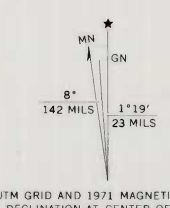
Otton and others, 1975, Cockeysville quadrangle: geology, hdyrology, and mineral resources: Maryland Geol. Survey Quad. Atlas No. 3, 8 maps.

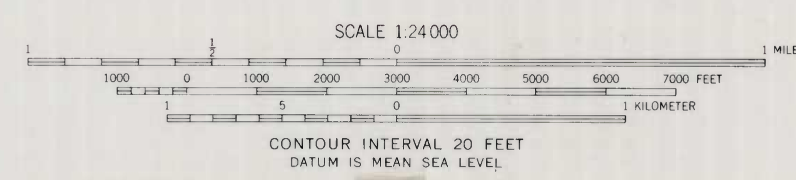
1/ The name of this agency was changed to the Maryland Geological Survey in June 1964.

APPROXIMATE DEPTH TO WATER, IN FEET BELOW LAND SURFACE



Topography from aerial photographs by stereophotogrammetric methods
Photographs taken 1943-44 (photo-revised by U.S. Geological Survey 1971).





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1980

HYDROGEOLOGIC ATLAS   WINFIELD QUADRANGLE   CARROLL COUNTY, MARYLAND

MAP 3. AVAILABILITY OF GROUND WATER

Maryland Geological Survey   Quadrangle Atlas No. 10

AVAILABILITY OF GROUND WATER

by Edmond G. Otton

NATURE OF OCCURRENCE

Ground water in Carroll County occurs chiefly in fractures and other voids in crystalline rocks; some ground water is present also in the residuum (decomposed rock) or saprolite, which forms a mantle of variable thickness over most of the bedrock. The source of all the water in the rocks is local precipitation, amounting to 42 inches per year (46-year mean at Westminster).

Downward-moving water fills the voids and fractures in the rocks and their residuum forming a zone of saturation at variable depths beneath land surface. The upper surface of the zone of saturation is the water table, or potentiometric surface. This irregular surface fluctuates with time in response to changes in the rate of replenishment of the saturated zone and to changes in the rate of removal of water from the zone. Ground water is removed from the saturated zone by gravity flow to nearby streams, by pumping from wells, and by evapotranspiration where the root zone of vegetation is sufficiently close to the saturated zone. Ground water is added to the zone chiefly from infiltrating local precipitation.

Where the rocks in the saturated zone are capable of yielding water to wells and springs, they are termed aquifers. Aquifers differ widely in their ability to yield water. In the Piedmont region, some rocks appear to be better aquifers than others, depending in part on the nature and extent of their interconnected fractures and voids. Figure 1 is a generalized model showing ground-water occurrence and movement in the Piedmont region.

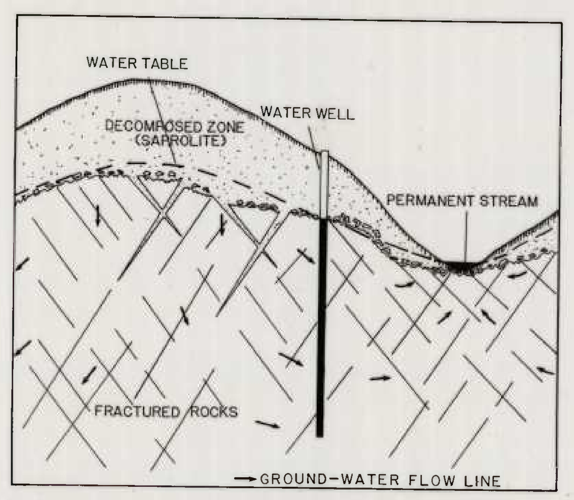

Figure 1.--Occurrence and movement of ground water in Piedmont terrain.

The yields of individual wells in the Winfield quadrangle depend on factors such as topographic position of the well, nature and thickness of the saprolite, and extent and degree of fracturing of the rocks at the well site. In general, the fractures and voids in the rocks disappear with increasing depth. An analysis of the depth of water-yielding fractures, as reported by drillers for 60 wells in the area, indicates that much of the ground water occurs in the uppermost 50 to 75 feet. In fact, 70 percent of the water-bearing fractures occur in the uppermost 100 feet of the rocks. Figure 2 shows the occurrence of water-yielding fractures in depth intervals down to 375 feet, the greatest depth at which any fracture was reported.

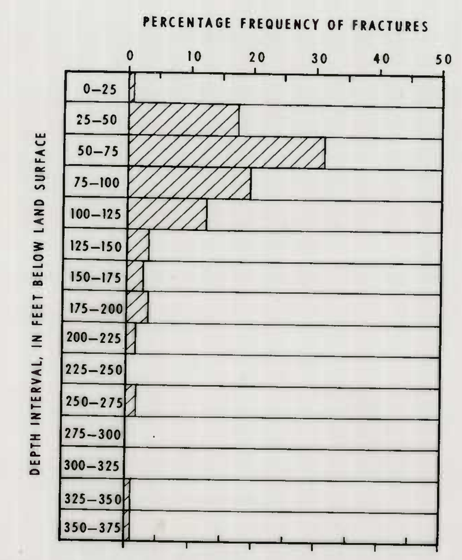

Figure 2. Percentage frequency of water-yielding fractures in wells in Winfield and adjacent quadrangles.

Unfractured and unweathered metamorphic rocks are essentially impermeable. Crystalline rocks containing several intersecting fractures are more permeable and accordingly are more likely to yield larger supplies of water to wells. Therefore, the distribution of fractures is a major factor governing the availability of water in these rocks. An analysis of topography on maps and aerial photographs shows linear features which may identify major zones of rock fracturing. The orientation of many valleys and stream channels seems to be controlled by the zones of rock fracturing. Wells drilled in such zones may be expected to have above-average yields. The presumed existence of such fracture zones, or lineaments, is shown on the accompanying map by the straight lines following the trend of numerous water courses.

SELECTED REFERENCES

Cleaves, E. T., Edwards, Jonathan, Jr., and Glaser, J. D. (compilers and editors), 1968, Geologic map of Maryland: Maryland Geol. Survey.

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Stose, A. J., and Stose, G. W., 1946, Geology of Carroll and Frederick Counties, *in* The physical features of Carroll and Frederick Counties: Maryland Dept. of Geol., Mines and Water Res. 1/

1/ The name of this agency was changed to the Maryland Geological Survey in June 1964.

EXPLANATION

Linear features which may be related to zones of rock fracturing.

The rocks of the Winfield quadrangle are divided into two geohydrologic units according to their water-yielding characteristics. Although these units are part of a larger areawide classification scheme, the well statistics given are based entirely on data from the Winfield and adjacent quadrangles. Because of the small areal extent of Geohydrologic Unit 2 in the Winfield quadrangle, it was necessary to use the well data for this unit from the New Windsor quadrangle immediately to the north. The geohydrologic conditions are probably similar in the two areas.

The mapped geohydrologic units are numbered in the order of their decreasing productivity as a source of water, based on the mean reported specific capacities of drilled wells. Thus, wells in Geohydrologic Unit 2 are more productive than wells in Unit 3. Geohydrologic Unit 1, underlain by Coastal Plain sediments, is absent from the Winfield quadrangle, but is present east of the Fall Line, about 25 miles east of the quadrangle. The stratigraphic nomenclature on this map follows the usage of the Maryland Geological Survey.

2

GEOHYDROLOGIC UNIT 2: Area underlain by the Bachman Valley Formation of Crowley, chiefly white, gray, pink, and dark-blue marble, locally interlayered with phyllite. In places, the formation consists of chloritic greenstone and green schist. Some of the green schists contain vugs resulting from the leaching of calcite. The rocks in unit 2 commonly form valleys resulting from solutional weathering of the marble and associated rocks. The intersection of major fracture zones are especially favorable sites for high-yielding wells. Unit 2 includes rocks mapped as the Wakefield Marble and the Sams Creek Metabasalt on the geologic map of Maryland (Cleaves and others, 1968).

It is possible that some wells drilled in areas mapped as unit 2 may yield more than 100 gallons a minute, although the long-term sustained yield of such wells is dependent on local sources of ground-water recharge and the storage capacity of the rocks during dry periods.

WELL YIELDS AND DEPTHS: The rocks in unit 2 are the most productive aquifer in the area. The reported yields 1/ of 54 wells range from 0 to 100 gal/min; the mean yield is 22 gal/min. At least four wells are known to yield 100 gal/min each at sites in the Wakefield Valley a few miles north of the Winfield quadrangle. Figure 3 shows the distribution of wells by yield classes and adequacy categories.

The depths of 111 wells range from 46 to 1,033 feet and average 133 feet. Only one of the wells included in the above range, CL-DC 16, is in the Winfield quadrangle. The deepest well, CL-CC 14, was drilled in 1939 for the town of New Windsor at a site 2.4 miles north of the Winfield quadrangle.

WELL SPECIFIC CAPACITIES: Reported specific capacities 2/ of 54 wells, mainly in the New Windsor quadrangle immediately north of the Winfield quadrangle, range from 0.0 to 12.5 (gal/min)ft and average 0.7 (gal/min)ft.

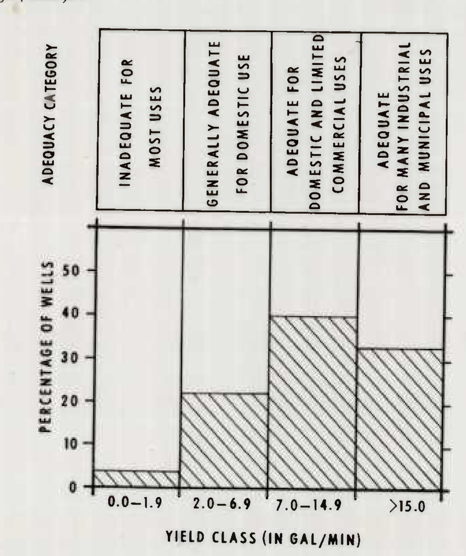


Figure 3. Yield class graph for Geohydrologic Unit 2.

1/ Only wells for which the driller reported a yield test of 2 hours duration, or longer, were used in this analysis.

2/ Specific capacity of a well is the yield per foot of drawdown of the water level in the well. No time period is, however, specified for the measurement of this variable, which is commonly expressed in gallons per minute per foot of drawdown [(gal/min)/ft]. For many domestic wells, the period of measurement ranges from 2 to 6 hours. Analysis includes only wells having a yield test of 2 hours duration, or longer.

3

GEOHYDROLOGIC UNIT 3: Area underlain by the Prettyboy Schist, consisting of grren to gray and blue-gray, muscovite-chlorite quartzose schist, commonly with laminae and stringers of quartzite and veins of milky-white to gray quartz. Locally, this unit is underlain by greenish chloritic phyllite and purple-gray phyllite. Unit 3 includes a part of the area shown on the geologic map of Maryland (Cleaves and others, 1968) as the Wissahickon Formation (undivided). Thickness of the weathered zone is variable, ranging from zero to more than 100 feet.

The most productive wells occur where major fractures, faults, or joint planes occur, or where two or more of these features intersect. Indirect evidence suggests that these features occur along the sites of major and minor stream valleys. Some streams, Gillis Falls for example, flow along straight fracture-oriented valleys for distances of nearly 2 miles. Wells drilled on or near these presumed fractures may be expected to have yields two to three times above the average.

WELL YIELDS AND DEPTHS: These rocks are only moderately productive aquifers, but are capable of furnishing domestic water supplies in most areas. The reported yields 1/ of 102 wells in the Winfield quadrangle range from 0 to 40 gal/min; the mean yield of these wells is about 8 gal/min. The well having the highest yield is about 2 miles south of Taylorsville. However, a well (CL-EC 17) reportedly yielding 110 gal/min was drilled along Route 27 about 1 mile west of the Winfield quadrangle in the vicinity of Mt. Airy.

Figure 4 shows that 18 percent of the wells are inadequate for most uses (yield less than 2 gal/min), and 20 percent of the wells yield 15 gal/min or more. The remaining 62 percent of the wells are in the two intermediate yield classes.

The depths of 138 wells range from 49 to 422 feet; the mean depth of these wells is 164 feet.

WELL SPECIFIC CAPACITIES: Reported specific capacities of 102 wells range from 0.0 to 1.1 (gal/min)/ft of drawdown and average 0.2 (gal/min)/ft 2/. The maximum specific capacity (1.1 (gal/min)/ft) was for well CL-DC 12 located along Gillis Road, 1.5 miles south of Taylorsville.

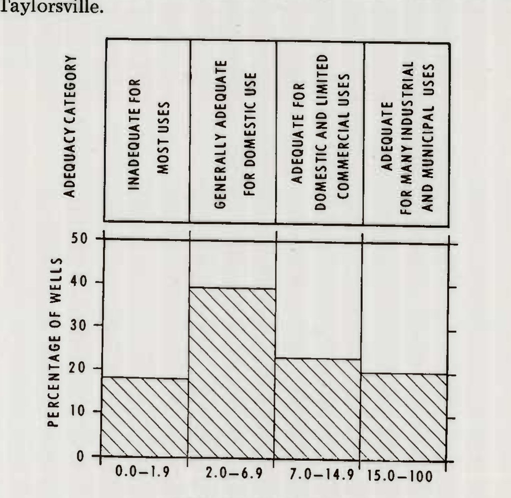


Figure 4. Yield class graph for Geohydrologic Unit 3.

SUMMARY OF GEOHYDROLOGY

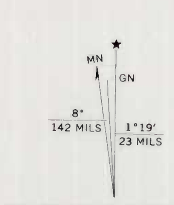
In summary, the reported yields of 102 wells in the Winfield quadrangle range from 0 to 40 gal/min and average 8 gal/min. All of these wells are in Geohydrologic Unit 3, which includes approximately 95 percent of the area of the quadrangle. Yield data for wells in unit 2 in the adjacent New Windsor quadrangle suggest that well yields in the Winfield quadrangle from unit 2 could be more than 100 gal/min.

Specific capacities of wells in unit 2 range up to 12.5 (gal/min)/ft and average 0.7 (gal/min)/ft, based on data from the adjoining New Windsor quadrangle. Specific capacities of 102 wells in unit 3 range from 0.0 to 1.1 (gal/min)/ft and average 0.2 (gal/min)/ft.

Depths of 139 wells in both units range from 49 to 422 feet and average 164 feet.

Although the above information on well yields and specific capacities is statistically valid, the data have an inherent sampling bias because a high proportion of the wells are for domestic use only. These wells are commonly located on uplands and hilltops where conditions are less favorable for more productive wells than they are in valleys and lowlands. Furthermore, not all domestic wells are tested for their maximum capacity, as public supply and industrial wells commonly are. An earlier study of ground-water conditions in Carroll County (Meyer, 1958, p. 44) indicates that the average yield of valley wells is more than twice as great as that of hilltop and hillside wells.

Topography from aerial photographs by stereophotogrammetric methods Photographs taken 1943-44 (photo-revised by U.S. Geological Survey 1971).



SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

Prepared in cooperation with the United States Geological Survey and the Commissioners of Carroll County

1980

MAP 4. CONSTRAINTS ON INSTALLATION OF SEPTIC SYSTEMS

Maryland Geological Survey — Quadrangle Atlas No. 10

CONSTRAINTS ON INSTALLATION OF SEPTIC SYSTEMS

by Edmond G. Otton

EVALUATION OF UNITS

The areas, or units, shown on this map differ in their degree of limitation for domestic liquid-waste disposal systems because of differences in soil and subsoil infiltration characteristics, land slope, depth to the water table, flood hazard, and the existence of a thin or rocky soil mantle over bedrock at various places.

The following graph shows the range in constraints of the various units for use as a disposal medium:

MAXIMUM CONSTRAINTS	MARGINAL TO VARIABLE CONSTRAINTS		MINIMUM CONSTRAINTS
I	II	III	IV

FACTORS GOVERNING THE EVALUATION

1. Soil and subsoil infiltration rates were determined chiefly on the basis of several hundred percolation tests 1/ conducted by sanitarians of Carroll County, under standardized procedures established by the Maryland Department of Health, and by more than 100 tests conducted by the U.S. Geological Survey using modified test procedures.

2. Land slopes were obtained from a machine-generated slope map, prepared by Photo Science, Inc. Maryland Department of Health regulations (July 1964, Section 1, definitions, part 1.9) do not permit, as of 1978, the installation of underground domestic sewage disposal systems where the slope of the land surface is in excess of 25 percent. Steep slopes are considered to be a major contributing cause of failure of underground disposal systems (U.S. Public Health Service, 1967, p. 18 and U.S. Department of Agriculture, Soil Conservation Service, 1971, p. 8).

3. The 10-foot depth to the water table used as a constraint in this report is the sum of three component factors. These are: (a) The recommended depth of drain tile fields is 3 feet below the land surface (U.S. Department of Agriculture, Soil Conservation Service, 1971, p. 3); (b) a minimum depth of 4 feet between the base of the tile field (absorption trench) and the underlying water table is recommended (U.S. Public Health service, 1967, p. 11); and (c) a 3-foot additional depth is suggested to allow for seasonal variations in position of the water table, which commonly fluctuates through at least a 3-foot range in Piedmont valleys.

4. Most valleys in the Winfield quadrangle are subject to periodic flooding. Floods would cause uncontrollable dispersal of sewage effluent and possible physical damage to the disposal system.

5. Where bedrock crops out or occurs near the land surface, the construction of underground disposal systems is not feasible. Hence, the presence of rock is an obvious terrain constraint.

MAP UNITS

I — UNIT I. Includes low-lying valley-bottom areas, where the depth to the permanent water table ranges from 0-10 feet, and areas where the slope of the land surface exceeds 25 percent. Unit I is underlain by stream alluvium, colluvium, and rocky land consisting of the various crystalline rock formations present in the quadrangle, chiefly the Prettyboy Schist, a gray to green msucovite-chlorite schist. Near the surface the rocks oxidize to a tan to brown color. The depth of overburden on the steep slopes generally ranges from 0 to 5 feet.

The terrain in unit I is characterized by steep-sided valley slopes, commonly rocky, and by flat, poorly drained, valley bottoms, subject to periodic flooding.

Relatively few percolation tests have been made in unit I, but the soil and subsoil along the valley bottoms appear to be relatively impermeable. The valley bottoms are underlain mainly be Hatboro, Codorus, and Baile soils (U.S. Department of Agriculture, 1969), consisting chiefly of silt loam. The steep hillsides are underlain by Mt. Airy and Glenelg soils. Figure 1 shows the approximate mean percolation rates fro three depth categories in unit I, based on 33 tests in valley alluvium in several areas in central Carroll County. In only two tests were measured percolation rates less than 30 minutes per inch. Both tests were in the depth interval from 6 to 9 feet. However, the number of tests run in unit I is not sufficient for a valid rating of the unit.

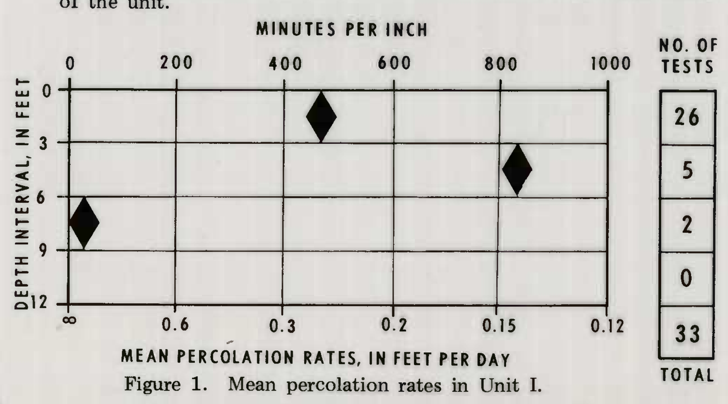


Figure 1. Mean percolation rates in Unit I.

II — UNIT II. Includes areas underlain by maroon to reddish-brown shale and siltstone with some sandstone, comprising the New Oxford Formation. This unit has relatively thin soil and subsoil having low percolation rates. Unit II is not present in the Winfield quadrangle, but is present in the Union Bridge and New Windsor quadrangles immediately to the northwest and north.

III — UNIT III. Includes two separate areas totalling about 2 square miles in the extreme northwest part of the quadrangle. Most of unit III in the quadrangle lies in Frederick County. It includes a few valleys underlain by white to reddish impure marble and bands of green to bluish-gray phyllite and phyllitic greenstone. These rocks are part of the Bachman Valley Formation of Crowley, extending northward to and beyond the towns of New Windsor and Westminster. Solutional features are common in some areas underlain by marble, but none were observed in the Winfield quadrangle.

The marble commonly weathers to a dark-red clayey loam. Depths of weathering range from a few to several tens of feet. Depth to the water table is generally between 10 and 35 feet. Slopes of the land surface are commonly less than 15 percent.

Soils in the unit include Mt. Airy channery loam, Glenelg and Chester silt loam, and Lindside silt loam (U.S. Department of Agriculture, 1969). Within the soil and subsoil of unit III a moderate range of infiltration characteristics occurs. Figure 2 shows the mean infiltration rates for four depth intervals from 0 to 12+ feet. The data given are based on 145 tests in areas of Carroll County north and northeast of the Winfield quadrangle. Figure 2 shows that the earth materials having the lowest rates (longest times) are in the depth interval from 0 to 6 feet, and the materials having the highest rates (shortest times) are in the permeable, phyllitic, channery zones in the depth interval from 6 to 12+ feet. Based on mean values, earth materials above a depth of 6 feet are too poorly permeable to be used for the disposal of liquid sewage.

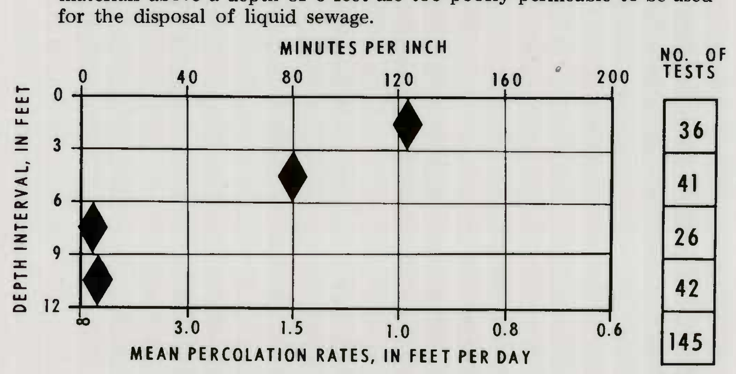


Figure 2. Mean percolation rates in Unit III.

IV — UNIT IV. Includes most of the upland areas of the quadrangle and is underlain by gray to bluish-gray phyllitic schist of the Prettyboy Schist. White veins and lenses of quartz and quartzite are common. At some places, purple-gray to green phyllite, in bands, is the predominant rock type. Thickness of the weathered zone (saprolite) is variable, but in a few places it is as great as 100 feet. The mean thickness of saprolite in the upland areas of the quadrangle is 40 feet.

Soils in unit IV include the Glenelg channery loam, Mt. Airy channery loam, Glenville silt loam, Manor gravelly loam, and Linganore channery silt loam. The Soil Conservation Service (U.S. Department of Agriculture, 1969, table 7) indicates that certain categories of Mt. Airy and Glenville soils present in the unit have severe limitations for use with underground sewage disposal systems. In some of the Mt. Airy and Linganore soils, the depth to bedrock ranges from 1 to about 3 feet, and in these localities underground disposal systems are not feasible.

Figure 3 shows the infiltration rates by depth intervals of the soils and subsoils in unit IV. The mean rates are similar to those of unit III, except for the slower rates (longer times) for the depth interval 3-6 feet. However, the mean rates of 7.7 and 6.0 minutes per inch in the depth intervals, 6-9 feet and 9-12 feet indicate the rapid rates of infiltration permit rapid passage of liquid effluent down into the underlying crystalline rock aquifers. Thus, the effectiveness of the subsoil below depths of 6 feet in renovating the effluent before it enters the aquifers is subject to serious doubt.

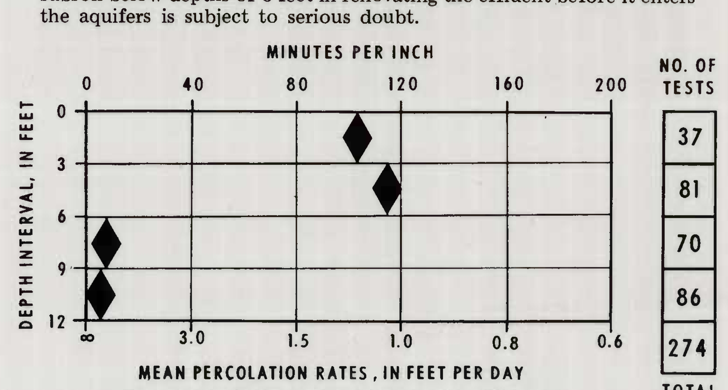


Figure 3. Mean percolation rates in Unit IV.

REFERENCES

Cleaves, E. T., Edwards, Jonathan, Jr., and Glaser, J. D. (compilers and editors), 1968, Geologic map of Maryland: Maryland Geol. Survey.

Meyer, Gerald, 1958, The ground-water resources *in* The water resources of Carroll and Frederick Counties: Maryland Dept. Geology, Mines and Water Res. 2/ Bull. 22, p. 1-228.

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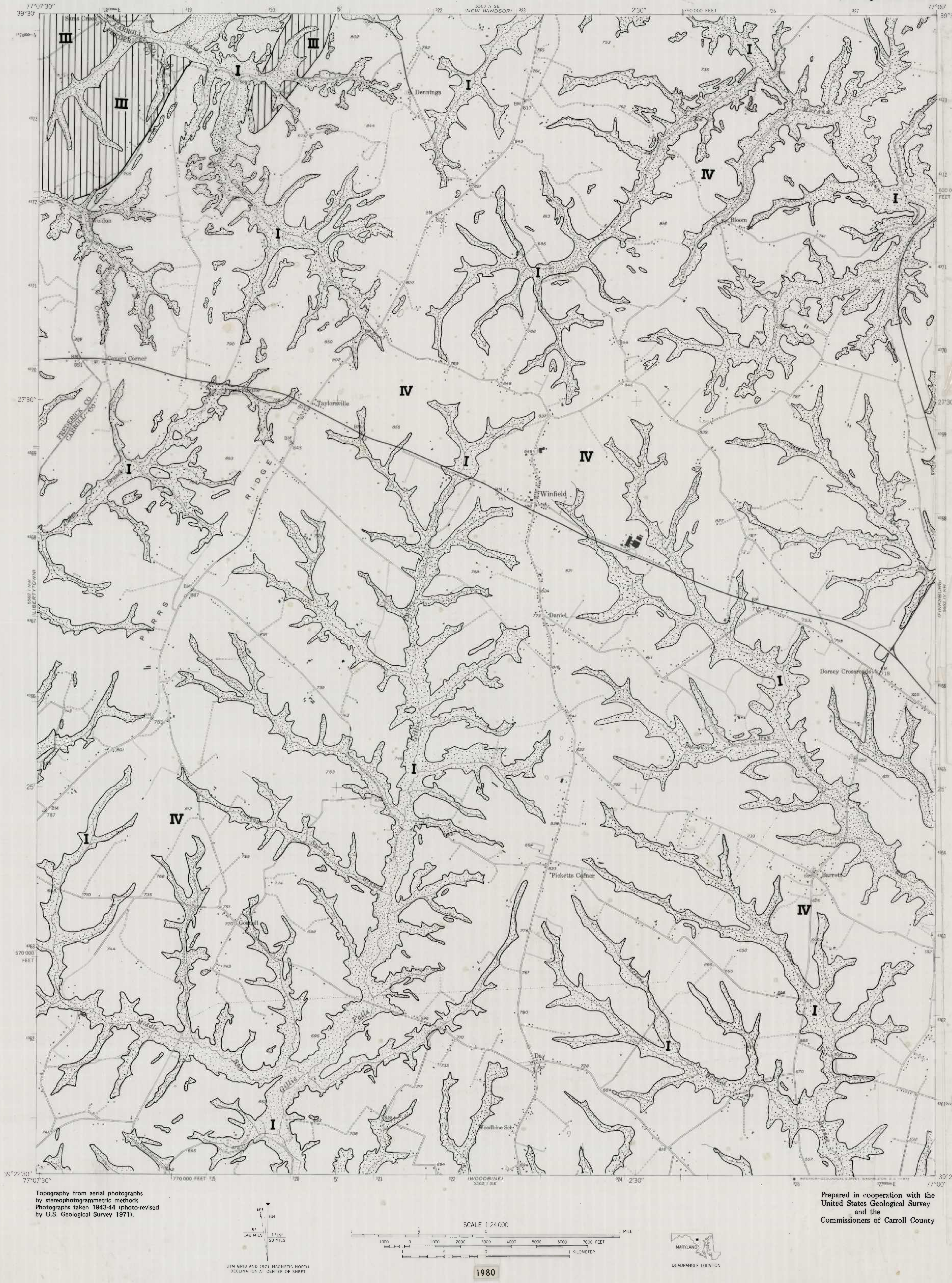
U.S. Department of Agriculture, Soil Conservation Service, 1969, Soil survey, Carroll County, Maryland, 92 pages, 55 photomaps, 1 index.

U.S. Department of Agriculture, Soil Conservation Service, 1971, Soils and septic tanks: 12 p.

U.S. Public Health Service, 1967 rev., Manual of septic-tank practice: 92 p.

1/ The standard percolation test conducted in the Maryland Piedmont counties (1978) is performed as follows: a 2- to 3-foot wide pit is dug to the depth to be tested, and a 1-foot square hole is hand-excavated on the floor of the pit. The 1-foot hole is filled with water, and the time required for the water to drop the second inch of a 2-inch decline is measured. To be rated as "passing" or successful, the rate of drop of the water level must be between 2 and 30 minutes per inch. Declines of the water level at rates too fast or too slow are the basis for rejection of the unit of land sampled by the test. Also, the presence of shallow ground water or rock ledges is an additional basis for rejection of the test site. Where clayey or other nearly impervious materials are encountered in a test pit, the actual test may not be performed, based on the judgment of the sanitarian cnducting the test.

2/ The name of this agency was changed to the Maryland Geological Survey in June 1964.



Topography from aerial photographs by stereophotogrammetric methods Photographs taken 1943-44 (photo-revised by U.S. Geological Survey 1971).

Prepared in cooperation with the United States Geological Survey and the Commissioners of Carroll County

1980

HYDROGEOLOGIC ATLAS WINFIELD QUADRANGLE CARROLL COUNTY, MARYLAND

Maryland Geological Survey

MAP 5. LOCATION OF WELLS, SPRINGS, AND TEST HOLES

Quadrangle Atlas No. 10

Topography from aerial photographs by stereophotogrammetric methods Photographs taken 1943-44 (photo-revised by U.S. Geological Survey 1971).

UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

1980

Prepared in cooperation with the United States Geological Survey and the Commissioners of Carroll County

LOCATION OF WELLS, SPRINGS, AND TEST HOLES

by John T. Hilleary and Edmond G. Otton

EXPLANATION

Information for wells and test holes shown on the map is on file with the U.S. Geological Survey, Towson, Maryland, and the Maryland Geological Survey, Baltimore, Maryland. Logs and well-construction records are available for most wells and test holes shown.

Well-numbering system: The wells and springs shown on the map are numbered according to a coordinate system in which Maryland counties are divided into 5-minute quadrangles of latitude and longitude. The first letter of the well number designates a 5-minute segment of latitude; the second letter designates a 5-minute segment of longitude. These letter designations are followed by a number assigned to wells chronologically. This letter-number sequence is the quadrangle designation, which is preceded by an abbreviation of the county name. Thus, well CL-CE 20 is the 20th well inventoried in quadrangle CE in Carroll County. In reports describing wells in only one county, the county prefix letters are frequently omitted from the well number. However, the numbering system currently in use (1978) differs slightly from that used in earlier published reports, such as Meyer (1958). In the 1958 report, well CL-CE 20 was designated as Car-Ce 20. The discontinuance of the use of lower-case letters in the well designation was necessitated by the change in 1970 to a computer storage and retrieval system for well information.

Miscellaneous shallow boreholes or auger test holes are designated by a number preceded by a "T". These holes are numbered chronologically within each 7½-minute quadrangle. Geologic and hydrologic records for them were obtained from various local concerns and agencies, chiefly county and State highway departments.

Water wells drilled in Maryland since 1945 also have a number (not shown on this map) assigned by the Maryland Water Resources Administration. This number consists of a two-letter county prefix (for example, CL for Carroll County) followed by a two-digit number indicating the State fiscal year in which the permit was issued (for example, -72 for the 1972 fiscal year). A four-digit chronologic sequence number follows the State fiscal year in which the permit was issued (for example, -72 for the fiscal year designation. Thus, well CL-72-0010 is the 10th well permit issued for Carroll County during the 1972 fiscal year. Since 1973, metal well tags showing the Water Resources Administration permit number are required to be affixed to the well casing. Beginning in 1973 the wells in Carroll County have been numbered chronologically through number CL-73-9999, regardless of the actual fiscal year.

Records of wells, springs, and boreholes shown on the map are in the Selected References, or are in the files of the District office of the U.S. Geological Survey at Towson, Maryland.

o 10
WATER WELL AND LOCATION NUMBER

o~ 3
SPRING AND LOCATION NUMBER

● T7
AUGER OR TEST HOLE AND NUMBER

SELECTED REFERENCES

Cleaves, E. T., Edwards, Jonathan, Jr., and Glaser, J. D. (compilers and editors), 1968, Geologic Map of Maryland: Maryland Geol. Survey, scale 1:250,000.

Meyer, Gerald, 1958, The ground-water resources *in* The water resources of Carroll and Frederick Counties: Maryland Dept. of Geology, Mines and Water Resources 1/ Bull. 22, p. 1-228.

Stose, A. J., and Stose, G. W., 1944, Geology of the Hanover-York district Pennsylvania: U.S. Geol. Survey Prof. Paper 204, 84 p.

1/ Name of this agency changed to Maryland Geological Survey in 1964.