Base from Maryland Geological Survey, 1973

SOME ENVIRONMENTAL GEOLOGY CONSIDERATIONS IN MONTGOMERY COUNTY, MARYLAND

The Montgomery County folio is intended for use by planners, engineers, hydrologists, and citizens interested in evaluating geologic and hydrologic conditions that may be limiting factors to certain types of land use. The scale of the maps, 1:62,500 (1 inch = approx. 1 mile, contour interval 20 ft), permits only a regional overview, or guide, on a county basis. The maps and accompanying tables and texts provide source and supplementary information to facilitate preliminary area evaluations for some uses, but the data are considered to be reliable only at the published scale. The maps are not intended for enlargement, nor are they, or the engineering data, intended to replace site investigations by qualified technical personnel. Local details at any given site may be quite different from the generalities portrayed on these county maps. These local details must also be considered in planning for a specific land use, although remedial actions and treatments can commonly be engineered at reasonable cost so that otherwise limiting factors can be overcome.

The folio consists of a series of derivative maps that provide a perspective of the surface and shallow subsurface of Montgomery County from readily available published geologic, soils, and ground-water studies on which they are primarily based. Engineering properties of rock and overburden are provided in generalized tabular summaries. The maps are designed as multipurpose products to be used independently and in combination with other maps or data published or available elsewhere, such as soils, ground-water, flood-prone areas, slope, vegetation, population, zoning, land use, or geophysical maps. By combining the maps in a variety of ways depending on the relevant limiting factors for any given land use, a series of maps can be derived by the user that focuses on specific problems. For example, the user will be able to evaluate several given areas for a sanitary landfill considering a group of factors using certain map combinations, then be able to assess the limitations or advantages of the same areas for park land or urban development by using other factors and other map combinations. By selecting criteria or guidelines, unique single-purpose derivative maps can be made. Once the essential guidelines to a specific problem are established, other secondary criteria can be modified by trading off or moderating conflicting uses. Current problems, such as evaluating sites for sanitary landfills, sewage-treatment and disposal plants, evaluating areas with limitations for heavy construction, locating transportation or utility corridors, siting septic-tank leaching fields, extracting mineral resources, assessing ground-water resources, determining limitations for surface disposal of treated waste water, selecting areas for park land or rural open space, and many other urban area problems can be more rationally assessed from these maps, at least on a regional basis. Potential uses and possible derivative products from other combinations are discussed in the texts accompanying each map.

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MINERAL RESOURCES OF MONTGOMERY COUNTY, MARYLAND

INTRODUCTION

The rock and mineral resources of Montgomery County are used as sources for construction materials, highway fill, and building stone. The principal quarries, mines, and prospects are shown on the map and keyed to a locality list. Deposits worked in 1973 include serpentinite quarried for crushed stone, schist and gneiss quarried for building stone, and sand and gravel. Some of the resources necessary for future construction are adequate quantities of crushed stone and sand and gravel located close to the area of use. Large reserves of some industrial materials remain, but new sources may be required to fulfill future construction requirements as urbanization expands. As the metropolitan area enlarges, the surrounding land, including potential mineral deposits, may be preempted by suburban development unless such deposits are recognized and preserved by the public in the land use planning process (Edwards, 1969, p. 26). Extraction of rock or sand and gravel resources may be only a temporary stage in the efficient use of land. After extraction, the land can be restored to agriculture, used for recreational areas, building sites, or even waste disposal.

Minor deposits of metallic and nonmetallic minerals are distributed across the county, but the occurrences are mainly of historical or geological interest; their locations are shown by symbols designating abandoned mines or prospects accompanied by letter symbols indicating the type of deposit.

CRUSHED STONE

Several large deposits of rock—serpentinite and diabase—suitable for crushed stone are present in west-central Montgomery County. These rocks make aggregate of excellent quality because of their toughness, uniformity of texture, and inert chemical nature (Edwards, 1969, p. 15). Large tonnage of crushed stone was produced in 1971 from a quarry (locality 1) in the serpentinite deposit west of Rockville in central Montgomery County. This material is used principally as binder-filler for asphalt paving, as base course for highways, for road metal, and for concrete aggregate (Larrabee, 1969, p. 29). Large reserves remain in an area of about 3.5 square miles; however, the periphery of the serpentinite body is currently being developed for detached homes and public buildings. As shown on the map, smaller serpentinite bodies occur in a northeast-trending belt centered roughly at Gaithersburg. None of these deposits has been worked; however, surface exposures of several bodies are now being preempted by urbanization.

Diabase was formerly quarried for road metal and railroad fill near Dickerson in the western part of the county (loc. 6). The abandoned quarries are in part of a narrow dike system extending more than 6 miles (10 km) across the county but covering an area of only 0.7 sq. mi. The diabase that is exposed at land surface near Boyds (loc. 7) covers about 2.7 sq. mi. It contains rock of quality similar to that quarried near Leesburg, Va., and probably will meet the materials specifications of the Maryland State Roads Commission. It is a major potential source of crushed stone. A square mile area excavated to a depth of 50 feet contains about 130 million tons.

Quartz diorite gneiss, quartz diorite, and related rocks in east-central Montgomery County have been considered to be a potential source of crushed stone (Edwards, 1969, p. 16). These rocks, however, are coarsely crystalline, contain abundant mica and minerals which cleave readily, and are not as satisfactory for crushed stone as diabase or serpentinite.

Although not within the county proper, Cockeysville marble is quarried at the Howard-Montgomery Crushed Stone Company, about one-half mile east of Brighton Dam; it is used extensively in road construction in northwestern Montgomery County.

BUILDING STONE

Several rock quarries in gneiss and schist were operating in 1972 west of Bethesda in southeastern Montgomery County (locs. 8, 10-12). The jointed rock is used locally for flagstone, building stone, veneer, "slate," fill, and riprap. Many abandoned rock quarries in the area where fresh jointed bedrock occurs at land surface along the Potomac River and Cabin John Creek (locs. 9, 13-15) produced rock used in construction of the Chesapeake and Ohio Canal and for local dams, bridges, aqueducts, and buildings. Extensive reserves of similar rock remain at shallow depth in this area, but the surface areas of many of the accessible sites are now used as streamside parks and for residential development. Other accessible deposits are widespread along the same outcrop belt in central and northern Montgomery County (see bedrock and thickness of overburden maps of Montgomery County, Froelich, 1975a, b). Granite east of Cabin John (loc. 15) and quartz diorite south of Norbeck were quarried for building stone in areas now completely urbanized.

Red and gray sandstone was formerly quarried west of Seneca (loc. 16) for use in the Chesapeake and Ohio (C & O) Canal locks, for the Cabin John bridge, for building stone used in the Smithsonian Institution, and other large buildings in Washington, D.C. Immense deposits of rock underlie much of the area northwest of Seneca (see bedrock map, Froelich, 1975a). "Potomac or Calico marble," a limestone conglomerate, was reportedly quarried along the bold cliffs flanking the C & O Canal west of Martinsburg (loc. 17).

Hard gray quartzite occurs at land surface extensively west of Little Monocacy River, but it has not been quarried; similar quartzite was formerly quarried for the C & O Canal locks at White quarry at the base of nearby Sugarloaf Mountain in adjacent Frederick County.

SAND AND GRAVEL

Sand and gravel were extracted from numerous pits along the east border of the county (loc. 18) (Cleaves, 1964, p. 262). A few pits were still operating in 1973, but available reserves were nearly depleted and this area was undergoing intense urbanization. Large deposits remain nearby in Prince Georges County.

Another potential source of sand and gravel occurs west of Martinsburg in western Montgomery County, the largest of which covers an area of 3.1 sq. mi. (loc. 19). Here pebble and cobble gravel is generally poorly sorted and contains abundant red clay. The gravel is only locally more than 30 feet (9 m) thick. Gravel from a small pit north of Poolesville was used for construction of Highway 28. Thick parts of this deposit may contain more than 500,000 cubic yards of usable material, but would require washing and screening.

Sand and gravel deposits also occur along the Potomac River south and west of Poolesville. The alluvial deposits probably average 20 feet (6 m) thick and contain much clay and silt. Any plan to extract these deposits would have to be weighed against the scenic values and recreational uses of the Potomac River valley.

MINOR DEPOSITS OF HISTORIC INTEREST

Gold.—Although gold was first reported in Montgomery County in 1849, it was not commercially exploited until 1867 when mines in the vicinity of Great Falls were opened (locs. 20-28) (Cleaves, 1964, p. 264). The mines operated intermittently until 1951 and about $164,000 worth of gold was produced. The gold occurs in quartz veins which cut schist and gneiss. Most of the old workings are caved in or destroyed, but ruined workings are accessible at the Maryland (loc. 20) and Ford mines (loc. 22) near Great Falls (Reed and Reed, 1969).

Chromium.—Chromite has been reported from serpentinite bodies at two localities near Etchison (locs. 31 and 32) and at "Tysons chrome pits" west of Rockville (loc. 33), but was apparently never mined extensively in the county. Magnetite, limonite, and talc are associated minerals.

Manganese.—Manganese was reportedly once mined west of Brookville (loc. 37).

Mica and feldspar.—Mica and feldspar were mined on a small scale from pegmatite dikes locally exposed along Northwest Branch of the Anacostia River (loc. 39) and about 1½ miles (2.5 km) northeast of Burtonsville (loc. 38) at a site now inundated by Rocky Gorge Reservoir.

Talc.—Talc (soapstone) was prospected or mined locally north of Spencerville, south of Middlebrook, near Etchison, and northeast and southeast of Darnestown (loc. 34), where it is reportedly associated with amphibole asbestos.

Copper.—Copper carbonate occurs with carbonized plant fragments in sandstone at the quarry along the Potomac River 1½ miles (2.5 km) west of Seneca (loc. 16). A similar deposit reportedly associated with chalcocite and native copper was mined near Sugarland Road (loc. 41). Native copper, chalcocite, and malachite also occur east of Darnestown in diorite breccia associated with the serpentinite deposit.

Quartz.—Quartz veinlets, veins, dikes, and lenticular pods as much as 45 feet (14 m) wide (locs. 35 and 36) occur discontinuously throughout the metamorphic rocks of the county. They commonly form hillocks rising above the more easily weathered Piedmont country rock. A small quartz dike was quarried for road metal for construction of Highway 28 east of Darnestown, and a large quartz mass was formerly quarried for pottery manufacture, abrasives, and filler at Annapolis Rock in adjoining Howard County.

Slate.—Slate was quarried for local use as roofing material north of Dickerson (loc. 40). It occurs as a 50-foot (15-m) thick vertical bed of slate interbedded with quartzitic sandstone.

Shale.—Fresh and weathered red shale which may be suitable for light-weight aggregate or in the manufacture of terra cotta pipe and tile products (Edwards, 1969, p. 24) is common northwest of Seneca (see bedrock map, Froelich, 1975a); however, the shale is commonly silty, locally calcareous, and interbedded with siltstone and sandstone.

USE OF THE MAP

The chief use of the map is to enable a rapid evaluation of the mineral resources in Montgomery County. When used in conjunction with the bedrock map (Froelich, 1975a), the distribution and extent of a rock unit currently or formerly quarried in the county can be readily ascertained. When used with the thickness of overburden map (Froelich, 1975b), areas most accessible and economically suitable for establishing new quarries in similar rock units can be determined. Specific quarry site selection would require detailed investigations, including evaluation of local terrain, accessibility, zoning ordinances, and rock quality.

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E X P L A N A T I O N

Rock units that are widespread are not mapped separately; in these areas, only prospects, pits, and quarries are shown. For the boundaries of these units see the bedrock map of Montgomery County (Froelich, 1975a)

UNCONSOLIDATED AND PARTLY CONSOLIDATED MATERIALS

A — ALLUVIUM—Sand, gravel, silt, and clay; in stream valleys; coarse fraction mainly quartz and quartzite, locally contains limestone and chert; poorly sorted; only extensive areas shown

Gv — GRAVEL
West part of map area, upland gravel—Cobbles, pebbles, boulders, silt, clay; capping ridges and hills; coarse fraction predominantly quartz, quartzite, and chert; poorly sorted
East part of map area, upland gravel and Coastal Plain sediments—Gravel, sand, silt, clay; coarse fraction mainly quartz, quartzite, and chert; moderately well sorted

BEDROCK (GENERALLY FIRM AND CONSOLIDATED WHERE UNALTERED AND FRESH)

Sp — SERPENTINITE—Tough, massive to foliated; crushed for road metal; includes gabbro

Db — DIABASE—Tough, crystalline, massive; potential source of road metal when crushed

q — QUARTZ VEINS

qt — QUARTZITE—Hard, massive, tough

ss — SANDSTONE—Arkosic; quarried for building stone, as in C & O Canal locks, Smithsonian Institution buildings, etc.

g — GNEISS—Includes minor amounts of schist; quarried for flagstone, riprap, and building stone

gr — GRANITE—Quarried for building stone

qd — QUARTZ DIORITE—Locally quarried for building stone

s — SCHIST—Includes minor amounts of gneiss; quarried for flagstone, riprap, and building stone

SITES OF PITS AND QUARRIES

Letter symbol indicates commodity: au, gold; cr, chromite; cu, copper; f, feldspar; ls, limestone conglomerate; m, magnetite; mi, mica; mn, manganese; mbl, marble; sl, slate; ta, talc (soapstone). Queried where commodity and/or location uncertain.

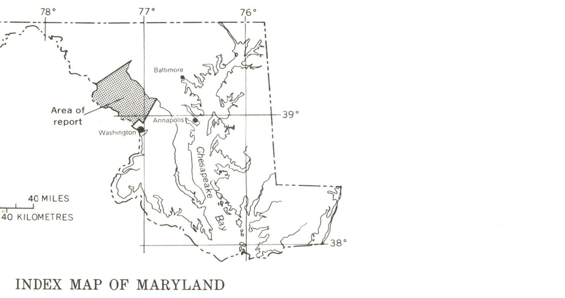
GRAVEL PIT, ACTIVE OR ABANDONED
QUARRY OR MINE, ABANDONED OR INACTIVE
QUARRY, ACTIVE
PROSPECT, BORROW PIT, REPORTED LOCALITY OR MINE
▲ PEGMATITE—quartz, feldspar, mica, etc.
18 LOCALITY NUMBER—Keyed to locality list

LOCALITY LIST

1.* Rockville crushed-serpentine quarry (Pearre and Heyl, 1960; Larrabee, 1969).
2.† Washington Grove serpentinite body (Cloos and Cooke, 1953; Hopson, 1964, p. 151).
3.† Rocky Road serpentinite body (Cloos and Cooke, 1953; Hopson, 1964, p. 151).
4.† Quince Orchard serpentinite body (Cloos and Cooke, 1953; Hopson, 1964, p. 151).
5.† Middlebrook serpentinite body (Cloos and Cooke, 1953; Hopson, 1964, p. 151).
6.† Dickerson diabase quarries (Ostrander and Price, 1940, p. 40).
7.† Boyds diabase sill (Cloos and Cooke, 1953; Fisher, 1964, p. 14).
8.* Congressional and Stoneyhurst schist quarries (Pearre, 1961).
9.† Schist quarry (Pearre, 1961).
10.* B. Giancola, Inc., schist quarry—flagstone, riprap, building stone.
11.* Tri-state flagstone schist and gneiss quarry—riprap, building stone.
12. Schist quarry (Pearre, 1961).
13. Halpine crushed-schist quarry (Pearre, 1961).
14.† Gneiss quarry.
15.† Granite quarry.
16.† Seneca red sandstone quarries (Mathews, 1898, p. 199-206; Martenet, 1865).
17.† Potomac "marble" quarry; limestone conglomerate (Hahn, 1971; Martenet, 1865).
18.† Fairland gravels and sands (upland and Coastal Plain deposits, Cleaves, 1964).
19.† Martinsburg gravels (upland) (Cloos and Cooke, 1953; Cloos, 1964, p. 25).
20.† Maryland gold mine (Weed, 1905; Reed and Reed, 1969).
21. Bogley gold mine (Ulke, 1939, map; Reed and Reed, 1969).
22.† Allerton-Ream gold mines and prospects, including Ford (Cool Spring Branch) mine (Emmons, 1890, p. 400-401; Ulke, 1939, p. 299; Reed and Reed, 1969).
23. Anderson (Potomac) gold mine (Weed, 1905).
24. Huddleston gold mine (Emmons, 1890, p. 404; Reed and Reed, 1969).
25. Montgomery (Alton) gold mine (Ostrander, 1938; Ulke, 1939, p. 299).
26. Harrison (Sawyer) and Eagle gold mines (Emmons, 1890, p. 399, 401-404).
27.† Rock Run gold placers (Pearre, 1961).
28. Irma and Lynch gold mines (Emmons, 1890, p. 401, 403-404; Reed and Reed, 1969).
29.† Ellicott gold mine (Justice, 1849; Martenet, 1865).
30. Bethesda gold mine (Nitze and Wilkens, 1895, p. 689).
31. Etchison chromite mine (Singewald, 1928, p. 191; Pearre and Heyl, 1960).
32. Griffith chromite mine (Ducatel, 1838, p. 33-34; Pearre and Heyl, 1960).
33. Tysons chrome pits (Martenet, 1865).
34.† Muddy Branch talc prospect (Cloos and Cooke, 1953).
35.† Glen Hills quartz vein.
36.† Hawlings Branch quartz vein (Cloos and Cooke, 1953).
37.† Brookeville manganese prospect (Singewald, 1928, p. 192; Clark and Mathews, 1909, p. 156).
38. Earth Products Company feldspar quarries and mica prospects (Singewald, 1928, p. 130, pl. 3).
39.† Kensington (Gilmore) mica mine (Ostrander and Price, 1940, p. 39).
40.† Mount Ephraim slate quarry (Dale and others, 1914, p. 86).
41. Sugarland copper mine.

* Active quarry (1973).

† Accessible mine, pit, prospect, or quarry (1973).



INDEX MAP OF MARYLAND

Table 1.—*Summary of mineral resources, Montgomery County, Maryland*

Commodity	Map locality no.	Selected physical properties and factors affecting use: Specific gravity (gm/cm^3)	Selected physical properties and factors affecting use: Other	Principal use and remarks
CRUSHED STONE Serpentinite	1-5	2.59-2.77	Area surrounding active major quarry currently being urbanized.	Binder-filler for asphalt paving; base course for highways, road metal, concrete aggregate.
Diabase	6, 7	2.86-3.04	Los Angeles loss (500 revolutions) 22.5-30.7; absorption 0.1-0.67 (from physical test data in active diabase quarries near Leesburg, Va., Gooch and others, 1960, p. 47)[1].	Road metal, railroad fill; potentially suitable as aggregate, base course, and binder-filler.
BUILDING STONE Gneiss, granite, quartz diorite	11, 14, 15	2.59-2.87	Accessible areas overlain by shallow overburden along Potomac River largely preempted by urbanization. Extensive areas of gneiss with shallow overburden along Patuxent River north of Unity.	Chesapeake and Ohio Canal locks, bridges, dams, buildings, and riprap.
Schist	8-10, 12, 13	2.63-2.74		Flagstone, building stone, veneer, slate, riprap.
Sandstone	16	2.5-2.65	Extensive deposits west of Seneca; crushing strength 18,625 lb/in^2.	Chesapeake and Ohio Canal locks, bridges, dams, aqueducts, Smithsonian Institution.
Limestone conglomerate	17	2.74	One bed about 50 ft (16 m) thick northwest of Martinsburg. Chemical analysis shows composition, by weight, of 70.5% lime (as carbonate); 15.0% magnesia; 12.25% quartz sand; 1.25% iron, clays, etc.	Building and ornamental stone; potential local source of lime.
Quartzite	Mt. Ephraim foothills	2.53-2.61	Extensive occurrences at Sugarloaf Mountain in Frederick County.	Quarried in nearby Frederick County for aqueduct and bridges; possibly useful in glass industry and for refractory products.
Slate	40	2.52-2.79	Occurs in 50-ft (16-m) thick beds interbedded with quartzite.	Roofing and flagstones.
SAND AND GRAVEL Upland gravel and sand (in west part of county)	19	No data.	Poorly sorted, interstitial red clay; pebbles mainly quartz, quartzite, and chert. Requires washing and grading.	Construction material, fill, base course for highways.
Upland gravel and sand, and Coastal Plain strata (in east part of county)	18	do.	Moderately well sorted; pebbles mainly quartz and quartzite; area being urbanized; reserves nearly depleted.	Construction material, fill, base course for highways, concrete.
Alluvial gravel	Potomac River	do.	Scenic and recreational value of Potomac River valley may preclude use.	

[1] The Los Angeles abrasion test is used to determine the abrasive resistance of crushed rock, crushed slag, uncrushed gravel, and crushed gravel. For details see American Association of State Highway Officials, 1938, Standard specifications for highway materials and methods of sampling and testing: Washington, D. C., Am. Assoc. State Highway Officials, p. 149.

Common equivalents and conversions
1 inch — 25 millimetres (2.54 cm)
1 foot — 0.3 metre
1 sq ft — 0.09 sq metre
1 ton (avdp) — 900 kilograms

SCALE 1:62 500

1 MILES ... 5 MILES
1 ... 7 KILOMETRES

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL
NUMBERED TICKS INDICATE THE 10,000 FOOT MARYLAND STATE GRID
THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1975

MAP SHOWING MINERAL RESOURCES OF MONTGOMERY COUNTY, MARYLAND

By
Albert J. Froelich
1975

For sale by U.S. Geological Survey, price $1.00