DESCRIPTION OF MAP UNITS

Quaternary

Qal — Alluvium

Poorly sorted, unconsolidated, tan, reddish-brown, to dark-gray mud, silt, sand, and pebbles. These deposits form in stream channels, and on the flood plain adjacent to the streams. Thickness estimated at 3 to 10 feet (1 to 3 m).

Qr — Residuum

Brownish-red to reddish-brown soil containing rounded to angular, pebble- to cobble-sized, white to very light gray quartz. Thickness ranges from a thin veneer to 3 feet (1 m).

Qc — Colluvium

Unconsolidated and unsorted sand, cobbles, and boulders that accumulate on the slopes below outcrops of the sandstone and quartzite units, and move slowly downslope under the influence of gravity. Three types were recognized in the Myersville and Smithsburg quadrangles. The first type is composed predominately of angular boulders that overlie outcroppings of quartzites of the Weverton Formation on the flanks of South Mountain. This type of colluvium appears to be the direct result of the mechanical breakdown of the quartzite ledges. The thickness was not determined. The second type of colluvium is composed of reddish brown, rounded pebbles and cobbles of sandstone, quartzite, and vein quartz. This type of colluvium is present both at the western base of South Mountain, and as isolated patches overlying limestone bedrock in the Hagerstown Valley. The latter is far removed from the slopes of South Mountain and tends to be much more heavily weathered. The thickness of this type of colluvium ranges from a thin veneer less 3 feet to more than 300 feet (1 to 100 m). A third type of colluvium is found on steep slopes and valleys underlain by the Catoctin Formation. This colluvium consists of large angular boulders of metabasalt or metarhyolite that have been created by frost action and have moved down steeper slopes and have come to rest in adjacent valley floors. The thickness of this colluvium is typically less than 10 feet (3 m).

Jurassic

Jd — Diabase Dike(s)

Dark-gray to dark-green-gray, medium- to fine-grained diabase. Typically occurs as weathered, spheroidal boulders that exhibit a reddish brown patina. Dikes range in thickness from 6 to 15 feet (2 to 5 m).

Cambrian

Conococheague Formation

Interbedded gray limestone and tan dolomite cycles. Bell (1993) mapped three members of the Conococheague Formation in the adjacent Hagerstown quadrangle. Only two of those members are exposed in the Myersville and Smithsburg quadrangles. Total thickness is ranges from 2,000 to 2,500 feet (600 to 750 m).

Ccm — Middle member

Cyclically bedded, medium- to dark-gray, thrombolitic limestone and gray, ribbony and laminated limestone and tan laminated dolomite. Thrombolites range in thickness from 3 to 6 feet (1 to 2 m) within thrombolitic intervals to less than 1 foot (0.3 m) within the ribbony intervals. Several dark-gray, oolitic intervals present in the upper part of this member. Thickness ranges from 1,500 to 1,800 feet (450 to 600 m).

Ccb — Big Spring Station Member

Tan, massive dolomite interbedded with tan to light-gray, laminated dolomite. Near the top of the member, interbedded light-gray, dolomitic, thrombolite beds are present. This member typically weathers to tan shaly dolomitic chips within the soil. Along the eastern flank of the Hagerstown Valley the quartzarenitic sandstones intervals that characterize this member on the western side of the Hagerstown Valley, are absent. Thickness ranges from 200 to 300 feet (70 to100 m).

Ce — Elbrook Formation

The Elbrook Formation can be subdivided into three informal subunits that are not mapped separately in the Myersville and Smithburg quadrangles. The lower 700 feet (210 m) of the formation is very poorly exposed and contains interbedded very light gray, thin- to thick-bedded limestone and tan platy dolomite, which frequently weather to shale chips. Intervals of medium-bedded, bioturbated, dark-gray limestones are also present. The middle part of the formation contains dark-gray limestone and dolomitic limestone and is up to 200 feet (60 m) thick. The thickest part of the formation is the upper 1,400 feet (425 m) which consists of cyclically bedded, gray thrombolitic limestone and ribbony to laminated limestone and dolomite. Total formation thickness ranges from 2,200 to 2,500 feet (700 to 800 m).

Waynesboro Formation

Interbedded and cyclically bedded carbonates and clastics. Divided into three members by Brezinski (1992). Total thickness approximately 100 feet (300 m).

Cwac — Chewsville Member

The uppermost member of the Waynesboro Formation consists of reddish-gray to reddish-brown, silty shale, siltstone, and silty fine-grained sandstone, interbedded with white, calcareous, Skolithos-burrowed sandstone beds (2 to 6 cm thick), greenish-gray shale, and tan to buff, fractured, medium-bedded, sandy dolostone. This unit usually is the most diagnostic of the Waynesboro lithologies and typically forms a well-defined topographic ridge, which makes it easily traceable. Thickness estimated at 90 to 125 feet (30 to 45 m).

Cwak — Cavetown Member

The middle member of the Waynesboro Formation consists of cycles of medium- to thick-bedded, medium- to coarse-grained, intraclastic grainstone and tan, laminated dolomite and dolomitic limestone interstratified with medium-gray, oolitic, lime grainstone, ribbony dolomitic limestone and laminated dolomitic carbonates. At the top and base of this member massive dolomitic limestone intervals, up to 45 feet (14 m) are present. Thickness is estimated at 600 to 750 feet (200 to 250 m).

Cwar — Red Run Member

The basal member of the Waynesboro Formation is lithologically similar to the Chewsville Member. This member consists of interbedded, tan-weathering, punky, fine-grained, dolomitic sandstones; green-gray shale; gray sandy limestone; and laminated dolostone. Locally thin (0.25 to 2.0 inches; 0.6 to 5 cm) layers of red siltstone and sandstone are present. Thickness estimated at 150 to 225 feet (60 to 75 m).

Tomstown Formation

Predominately buff-weathering, medium- to dark-gray, dolomite, dolomitic limestone, and limestone. The Tomstown Formation is divided into four members (Brezinski, 1992). In previous mapping of the Smithsburg quadrangle (Brezinski, 1993) the formation was not subdivided, however, in the current map, the members are mapped separately. The total thickness of the formation is 1,200 to 1,300 feet (366 to 396 m).

Ctd — Dargan Member

Interbedded and cyclical dolomite and limestone. Cycles consist of alternations of dark-gray, bioturbated dolomite and medium- to dark-gray, laminated dolomite, or dark-gray dolomite or limestone and tan, laminated, silty dolomite. Cycles of thin-bedded limestone and tan dolomite are more prevalent near the top of the member. Thickness is approximately 700 feet (215 m).

Ctb — Benevola Member

Light-gray to white, massive, highly fractured, sugary dolomite. The Benevola Member varies from white to very light gray, both on fresh and weathered surfaces. It is very chemically pure, containing very little silica or clays. Bedding is rarely evident and is largely confined to the uppermost 30 feet (9 m). In fresh surfaces and within polished slabs faint ghosts of cross-bedding are evident. Thickness is 100 to 150 feet (33 to 50 m).

Ctf — Fort Duncan Member

Medium- to dark-gray, thick-bedded, mottled dolomite with white, void-filling, sparry dolomite. Weathered surface characterized by irregular clotted to anastamosing network of algae. Layers of the white, sparry dolomite, 0.5 to 1.5 inches wide, fill voids that are continuous in beds for up to several yards (several meters). The white, void-filling dolomite contrasts the darker mottled dolomite. Thickness ranges from 200 to 250 feet (60 to 75 m).

Ctbh — Bolivar Heights Member

The Bolivar Heights consists of about 200 feet (60 m) of thin- to medium-bedded, dark-gray, ribbony, burrow-mottled, lime mudstone that weathers light gray in color. The number and density of burrows vary among beds, with very little burrowing in some layers and an anastomosing network of burrows in others. The Keedysville marble bed is present near the base of the member. Thickness is 200 to 250 feet (60 to 75 m).

Cambrian or Late Proterozoic

CHILHOWEE GROUP

Ca — Antietam Formation

The lower part of the formation is greenish-gray, highly cleaved, silty, phyllitic shale and siltstone interbedded with white, *Skolithos*-burrowed, and fine-grained sandstone. These lower strata grade upsection into medium-bedded, white, bioturbated and crossbedded, fine- to medium-grained sandstone in the middle of the formation. The uppermost strata of the formation consist of light- to medium-gray, crossbedded, vuggy, coarse-grained granular sandstone to conglomerate. Thickness ranges from 500 to 800 feet (150 to 245 m).

Ch / Chm — Harpers Formation

Predominately dark-greenish-gray, highly cleaved, phyllitic shale and siltstone with lesser amounts of metasandstones that may be quartzitic, locally. Shale and siltstone are dark-green-gray, dark-brown-gray to medium-gray in color and commonly containing thin 2- to 6-inch, fine-grained sandstone layers. The greenish-gray intervals weathers tan to light gray. Cleavage typically obscures bedding. Mappable metasandstone intervals [Chm] are up to 30 feet (9 m) thick and contain *Skolithos* burrows. In the Smithsburg quadrangle these metasandstone layers may be southern extensions of the Mont Alto Member of the Harpers Formation of southern Pennsylvania. Owing to intense intraformational folding, determining the thickness of the formation was impossible. Estimates range from 1,500 to 3,000 feet (450 to 1,000 m).

Weverton Formation

Primarily light-gray to gray quartzite, conglomerate, and medium- to dark-gray metagraywacke with intervals of dark-gray to black phyllite. Three members are recognized and mapped in the Myersville and Smithsburg quadrangles (Brezinski, 1992).

Cwo — Owens Creek Member

Dark-gray to very dark gray, very coarse grained to conglomeratic, crossbedded metagraywacke. Commonly crossbedded, but the very coarse grained nature makes recognition of crossbedding difficult. Large (1 to 3 cm) white and pink quartz pebbles are characteristic of this member, although they are only locally common. Thickness ranges from 150 to 180 feet (50 to 60 m).

Cwm — Maryland Heights Member

Interbedded, thin (less than 30 feet; 9 m), medium- to dark-gray quartzite and metagraywacke and very dark gray, highly cleaved siltstone and phyllitic shale. Shales and siltstones are very poorly exposed and individual quartzites and graywackes are only locally traceable. Thickness ranges from 150 to 350 feet (50 to 115 m).

Cwb — Buzzard Knob Member

The lowest member of the formation consists of two ledge-forming quartzites, which are often difficult to discern between. The lower ledge consists of light- to medium-gray, medium-bedded quartzite with dark-gray argillaceous layers up to 4 cm thick, separating the quartzite beds. Crossbedding within individual quartzite strata is pervasive and is commonly accentuated by purplish or yellow-gold bands demarcating the individual crossbed foresets. The upper ledge-forming quartzite is composed of medium- to thick-bedded, very light green-gray, shaly quartzite. Crossbedding is much less common than in the lower ledge. This member is the main ridge-forming unit of the Maryland Blue Ridge. Thickness ranges from 125 to 175 feet (40 to 50 m).

CZl — Loudoun Formation

Medium- to dark-gray, medium-bedded conglomerate and black, tuffaceous phyllite. Lithology is very variable, ranging from a crossbedded quartz-pebble conglomerate to a highly cleaved polymictic conglomerate with a matrix of flattened phyllite pebbles. The localized distribution and rapid thickness variations of this formation may be the result of the original deposition patterns. The Loudoun Formation ranges in thickness from 20 to 150 feet (6 to 45 m) in the Myersville and Smithsburg quadrangles.

Catoctin Formation

The Catoctin Formation is a suite of volcanigenic rocks that consists principally of metabasalt, metarhyolite, and tuffaceous phyllites. Although these major rock types are mappable lithologic units, their stratigraphic relationships are not known.

Zcm — Massive metabasalt

Characteristically a dark-green, dark-greenish-gray, or dark-bluish-green, medium-grained, metabasalt (Fauth, 1981). Textures vary greatly between exposures. Most commonly rock consists of massive to highly cleaved aphanitic metabasalt. Locally metabasalt is amygdaloidal, porphyoblasitic, porphyritic, or banded. Porphyroclasts commonly are epidote, plagioclase feldspar, or chlorite. Amygdules are commonly oval-shaped vesicles filled with epidote. Porphyroblastic rock contains flattened and elongated grains or aggregates of chlorite, actinolite (?), or epidote, ranging between 10 and 25 mm (0.4 to 1 inch) in length. Primary layering is present in many exposures. Prominent veins and nodular masses of epidote and quartz are widely distributed throughout the unit. Thickness of the entire metabasalt unit is estimated at approximately 1,000 to 2000 feet (300 to 700 m).

Zcrr — Red metarhyolite

Grayish-red to dusky reddish-purple, porphyritic metarhyolite. Phenocrysts make up 3 to 5 percent of the rock and are predominantly euhedral pink to light-gray feldspar and reddish quartz. Estimated thickness 200 to 300 feet (20 to 90 m).

Blue to bluish-gray metarhyolite

Blue to gray, aphanitic metarhyolite that weathers to medium-dark-gray to light-grayish-blue. Five separate units differentiated and mapped on the basis of texture. These metarhyolite subunits were identified as Units A through E by Fauth (1981) and are here identified (and coded) by textural name following the protocol on the adjacent quadrangle map (Brezinski and Fauth, 2005). Minimum aggregate thickness is estimated at 500 to 800 feet (150 to 240 m).

Late Proterozoic

Bluish-gray metarhyolite, undifferentiated

Undifferentiated bluish-gray metaryholite in which no single variety is dominant.

Zcrf — *Flow-banded bluish-gray metarhyolite*

Flow-banded, bluish-gray metarhyolite containing nearly planar, locally convoluted flow bands 0.12 to 0.4 inch (3 to 10 mm) thick. Laminae are discontinuous and most prominent on weathered surfaces. Phenocrysts constitute less than 2 percent of the rock.

Zcrp — *Porphyritic bluish-gray metarhyolite*

Porphyritic, bluish-gray metarhyolite with conspicuous very light gray to very pale orange or pinkish-gray feldspar laths. Phenocrysts are up to 0.2 inches (6 mm) long and make up 2 to 5 percent of the rock.

Zcra — *Aphanitic metarhyolite*

Aphanitic, bluish-gray metarhyolite that is massive and dense, and exhibits a concoidal fracture. Rare phenocrysts, were present, comprise less than 1 percent of the rock. Weathers bone white to very light gray.

Zcrb — *Metarhyolite breccia*

Dusky blue-gray, metarhyolite breccia with angular to subrounded clasts that weather to a lighter color than the felsic matrix.

Zcpl — Lavender phyllite

Pale purple to grayish red-purple or very light gray phyllite. Locally color mottled with red quartz grains and light gray to yellowish gray porphyoblasts of feldspar. Estimated thickness of 30 to 50 feet (9 to 15 m).

Zcp1 — Phyllite, unit 1

Medium-light-gray to dark-gray phyllite with very light gray elongate feldspathic porphyoblasts. Locally exhibits fine banding or laminations which appear to be a shear fabric. This unit is equivalent to the gray phyllite (Zcpg) of Fauth (1981) Estimated thickness 50 to 100 feet (15 to 30 m).

References

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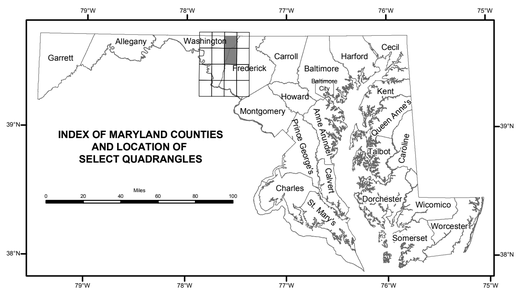
Index to 7.5 - Minute Topographic Quadrangles



Mason and Dixon	Hagerstown	Smithsburg	Blue Ridge Summit
Williamsport	Funkstown	Myersville	Catoctin Furnace
Shepherdstown	Keedysville	Middletown	Frederick
Charles Town	Harpers Ferry	Point of Rocks	Buckeystown

Explanation of Map Symbols

Geologic and Karst Symbols

Contacts

Geologic contact
Location certainty is indicated by line pattern: solid where accurate, long dash where approximate; short dash where inferred; dotted where concealed.

Karst Features

Active sinkhole

Depression

Spring

Faults

Location certainty is indicated by line pattern: solid where accurate, long dash where approximate; short dash where inferred; dotted where concealed. Queries (?) added where identity or existence may be questionable.

Fault – generic, high-angle, normal or multigenerational
Relative (most recent) motion shown, if known
U Upthrown side
D Downthrown side

Thrust fault, teeth on upper plate; (sawteeth in direction of dip)

Overturned thrust fault, bars on tectonically higher plate (footwall); sawteeth in direction of dip

Base Map Symbols

Topographic Symbols

Topographic contour - Index (100-ft interval)

Topographic contour - Intermediate (20-interval)

Hydrographic Symbols

Stream, perennial

Water body (e.g., lake, pond, river)

Wetland, marsh

Reservoir

Sewage disposal pond or settling basin

Cultural Symbols

State boundary

County boundary

Municipal boundary

Park/reservation boundaries:

National or state park, forest, wildlife refuge or military reservation boundary

Other local or small park boundary

Transportation Symbols

Primary highway (Class 1)

Secondary highway (Class 2)

Light duty road (Class 3)

Urban light duty road (Class 3)

Railroad

Power transmission line

Karst Features of the Myersville Quadrangle and Maryland portion of the Smithsburg Quadrangle, Washington and Frederick Counties, Maryland

by
David K. Brezinski
2009

Scale 1:24,000

1 0.5 0 1 2 3 Miles

5,000 0 5,000 10,000 15,000 Feet

1 0.5 0 1 2 3 4 Kilometers

Contour Interval 20 Feet
National Geodetic Vertical Datum of 1929
(To convert elevations to the North American Vertical Datum of 1988, subtract 1 foot)
(To convert from feet to meters, multiply by 0.3048)

GN
(State Plane Grid North)

Current map projection:
Maryland State Plane Coordinate System 1987
(Projection: Lambert Conformal Conic, 1980 geodetic reference system)
(Horizontal Datum: North American Datum 1983)

MD State Plane 2000-meter grid tics and coordinates shown in black
Geographic coordinates (latitude-longitude)
shown near corners and 2.5' intervals (in black)

Karst features shown over a modified version of the digital compilation of the Geologic Map of Myersville and part of the Smithsburg Quadrangles, Washington and Frederick Counties, Maryland (Brezinski and Fauth, 2009), published by the Maryland Geological Survey (digital version MYSMGEO2009.1)

Topographic and cultural components of geologic map compiled and extracted from:

U.S. Geological Survey (USGS) 7.5-minute Series (Topographic)
Myersville quadrangle 1953 (photorevised 1985, photoinspected 1994)
Digital line graphs (DLGs) for hydrography, topography, select transportation and boundaries (1:24,000)
(Topography by photogrammetric methods from aerial photographs taken 1943. revised 1953
Photorevisions from aerial photographs taken 1981 and other sources; this information not field checked.
Map edited in 1985.
Smithsburg/Funkstown quadrangle 1953 (photorevised 1985; photoinspected 1994)
Digital line graphs (DLGs) for hydrography, topography, select transportation and boundaries (1:24,000)
(Topography by photogrammetric methods from aerial photographs taken 1943. culture revised 1953
Photorevisions from aerial photographs taken 1982 and other sources; this information not field checked.
Map edited in 1985.

Cultural features shown from USGS Geographic Names Information System (GNIS) database

Maryland State Highway Administration (MD_SHA)
MD Cooperative Centerline Program, select quadrangle excerpt (200?) for roads
Original dataset developed at 1:12,000 scale

Estimated 2009 magnetic north declination at center of Myersville quadrangle: 10 degrees, 33 minutes west
(To determine current magnetic declination see:
http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp)

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DEPARTMENT OF NATURAL RESOURCES
John R. Griffin
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MARYLAND GEOLOGICAL SURVEY
Jeffrey P. Halka
Director

Supplemental Information

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Acknowledgements: Karst mapping was funded in part by the Maryland State Highway Administration. Portions of the base geologic map (non-karst areas) were funded in part by the USGS National Cooperative Mapping Program. The views and conclusion contained in this document are those of the author(s) and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government. Mapping of karst areas was funded in part by the Maryland State Highway Administration.

Field mapping of karst features was conducted in 2008 and 2009 by D. K. Brezinski. Field mapping of the geology was conducted in 1974-1976 (J. L. Fauth) and 2007 (D. K. Brezinski) in the Myersville quadrangle and 1986-1989 and 2006-2008 (D. K. Brezinski) in the Smithsburg quadrangle. This karst map was compiled in digital form by Heather Quinn and Robert Conkwright of the Maryland Geological Survey.

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Version: MY_SMKST2009.1
Released September 2009

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