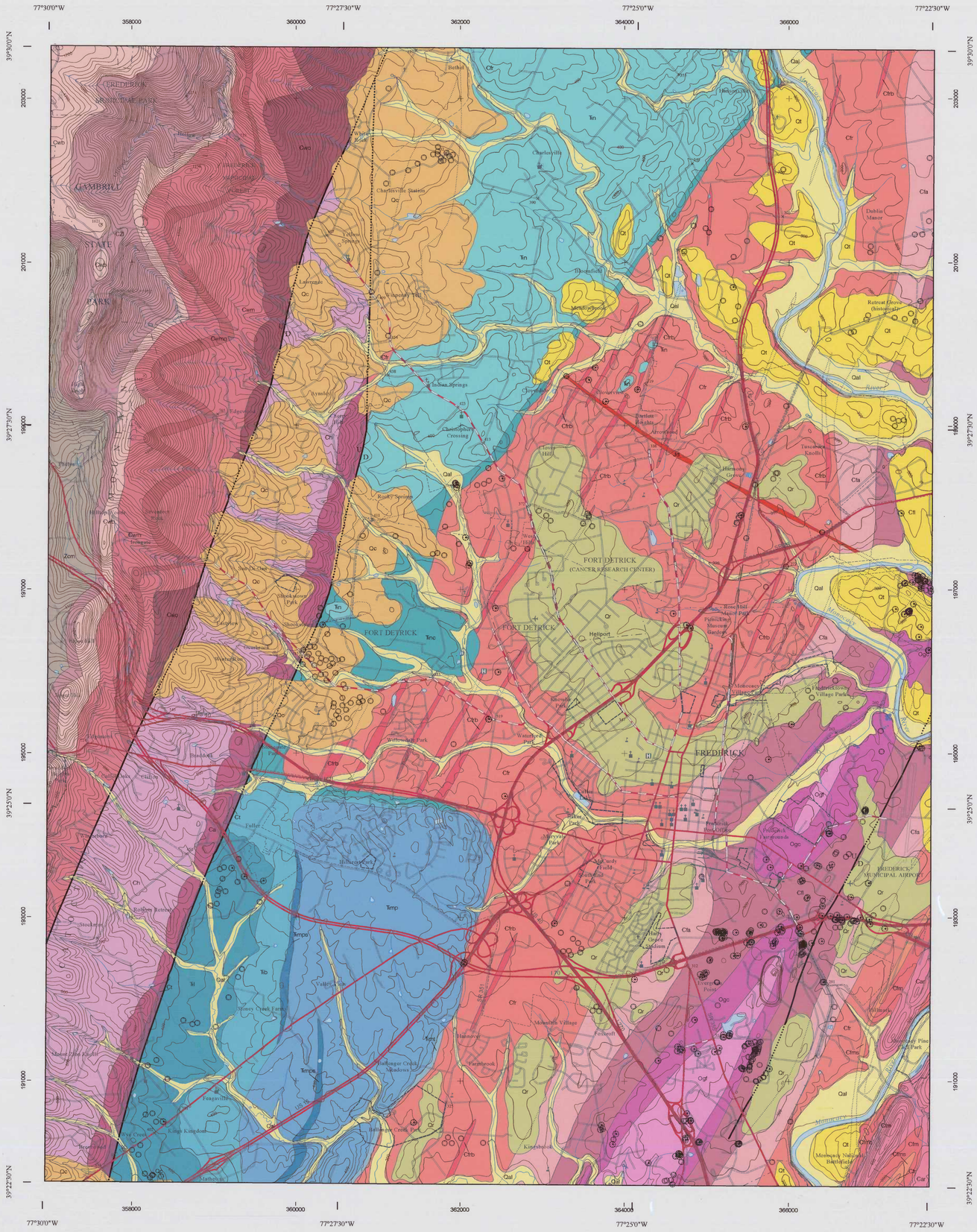

Base layers derived from U.S. Geological Survey (USGS)
7.5-minute Series (Topographic)
Frederick Quadrangle 1953 (photorevised 1993)
Digital line graphs for hydrography, topography, transportation and boundaries (1:24,000)

Cultural features shown from USGS Geographic Names Information System database

(To determine current magnetic declination see: http://www.ngdc.noaa.gov/cgi-bin/seg/gmag/fldsnth1.pl)

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)

GN
(State Plane Grid North)

Adjoining 7.5' Quadrangle Names
Frederick Quadrangle, shaded

1	2	3
4		5
6	7	8

1. Myersville
2. Catoctin Furnace
3. Woodsboro
4. Middletown
5. Walkersville
6. Point of Rocks
7. Buckeystown
8. Urbana

Copies of this map are available
in hard copy (paper) and digital form from:
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2300 Saint Paul Street
Baltimore, MD 21218
Ph: 410-554-5500
Fax: 410-554-5502
http://www.mgs.md.gov/

Karst Features of the Frederick Quadrangle, Frederick County, Maryland

By
David K. Brezinski
2004

Scale 1:24 000

1 0.5 0 1 Miles
1.000 0 1.000 2.000 3.000 4.000 5.000 6.000 7.000 Feet
1 0.5 0 1 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)

Explanation of Map Symbols

Geologic Symbols

Contacts
- Geologic contact; approximately located dotted where concealed

Faults
- U Upthrown side
- D Downthrown side
- Fault; concealed

Karst Features
- Active Sinkhole
- Depression
- Spring

Folds
- Minor syncline bearing and degree of plunge shown
- Minor anticline bearing and degree of plunge shown

Base Map Symbols

Transportation
- Primary route, class 1 (divided, lanes separated)
- Primary route, class 1 (undivided)
- Secondary route, class 2
- Light duty road or street, class 3
- Unimproved road or street, class 4
- Trail
- Railroad, railroad siding or spur
- Power transmission line
- Substation

Topography
- Topographic index contour (100-ft interval)
- Topographic intermediate contour (20-ft interval)

Hydrography
- Stream
- Water body (eg. lakes, ponds, rivers)

Culture
- Boundary, incorporated city, village, or town
- Park or reservation boundary
- Small park boundary
- Cemetery
- Church
- School
- Airport
- Hospital

Description of Map Units

Quaternary

Qal — Alluvium
Reddish brown, poorly sorted mixture of rounded pebbles to boulders with sand, silt, and clay, as interbeds and interstitial matrix. Layers of moderately well sorted, rounded cobbles or sandy pebbles are also present. Thickness estimated at 1.0 foot to more than 15 feet (0.3 to more than 4 m) especially along the Monocacy River.

Qc — Colluvium
Unsorted, light gray to reddish gray, angular boulders to cobbles of quartzite and vein quartz with a reddish silty, clay matrix. Present near base of the eastern foot of Catoctin Mountain. Appears to have originated by the slow down-slope movement of weathered material from the Weverton and Loudoun Formations on Catoctin Mountain. Thickness ranges from a thin veneer to more than 100 feet (30 m).

Qr — Weathering residuum
Mixture of moderate reddish brown soil and pebbles to blocks of grayish pink to white angular, locally euhedral, quartz. Thickness ranges from a thin veneer to 10 feet (3 m).

Qt — Terrace deposits
Reddish brown to brown, sandy and clayey mixture of rounded pebbles to cobbles of sandstone, vein quartz and quartzite. Present along elevated low relief areas above the Monocacy River. Several separate levels of terrace deposits can be observed, but are not separately mapped here. Thickness ranges from a thin veneer to more than 10 feet (3 m).

Jurassic

Jd — Diabase dike(s)
Dark gray to black, fine-grained diabase weathering to rusty, red-brown, spheroidal boulders and cobbles. Dikes are exposed in the Frederick Quadrangle at several locations along the Monocacy River.

CULPEPER BASIN

Jl — Leesburg Formation
Light gray to light reddish gray, very thickly bedded, boulder conglomerate. Clasts are mainly subangular to subrounded limestone and dolostone of Cambrian and Ordovician age, but locally Triassic age siltstone and sandstone are prevalent. Thickness ranges from 100 to 3000 feet (30 to 910 m) (Lee, 1979).

Triassic

Trb — Balls Bluff Siltstone
Brownish red to reddish brown, argillaceous, massive siltstone with thin fine-grained sandstone interbeds. Thickness is estimated at 200 to 4500 feet (60 to 1400 m) (Lee, 1979).

Manassas Formation

Trmp / Trmps — Poolesville Member
Reddish brown to reddish gray, locally greenish gray, medium-grained sandstone and reddish, variegated claystone. Sandstone beds (Trmps) exhibit sharp convex-down bases, shale pebble lag conglomerates, and fining upsection character. Claystone intervals are thoroughly root mottled and contain light gray caliche carbonate nodules. The thickness of this member is estimated at 500 to 3000 feet (150 to 910 m) (Lee, 1979).

Trnt — Tuscarora Creek Member
Light gray to light reddish gray, subangular to subrounded, limestone and dolomite conglomerate. Clasts are predominately tan dolostone, but locally reddish siltstone and sandstone and some limestone clasts are prevalent. Matrix is a reddish brown calcareous mudstone to reddish clayey carbonate. Thickness ranges from a feather edge to 100 feet (30 m) (Lee, 1979).

GETTYSBURG BASIN

Tgc — Gettysburg Conglomerate
Medium red to reddish gray, limestone conglomerate, with reddish brown, calcareous, claystone matrix. Present along the base of Catoctin Mountain at the Triassic border fault. Marks the western edge of the Gettysburg Basin in Maryland, and is not exposed in outcrop in the Frederick Quadrangle. Thickness is in question, but may be as much as 1000 feet (305 m).

New Oxford Formation

Trn / Trnc — New Oxford Formation
Brownish red to reddish gray, locally light greenish gray, medium- to coarse-grained sandstone interbedded with red, variegated claystone. Sandstone units exhibit sharp bases with shale pebble lag conglomerates and fine upsection. Claystone intervals are thoroughly root mottled and contain light gray caliche carbonate nodules. Poorly exposed and thickness is in question. Limestone and quartz-pebble conglomerate (Trnc) at base.

Ordovician

Ogf — Grove Formation
Thick-bedded to massive, medium to light gray limestone with interbedded tan to medium gray dolomite. Three members are recognized and mapped in the Frederick Valley, but only the lower two are present in the Frederick Quadrangle (Brezinski, 2004a, b).

Fountain Rock Member

Ogf — Fountain Rock Member
Very thickly bedded, medium light gray, locally sandy, thrombolitic and stromatolitic algal limestone and medium gray, laminated dolomitic limestone and olive gray dolomite. Thickness is probably greater than 450 feet (140 m).

Ogc — Ceresville Member
Medium light gray to medium gray, thick-bedded and crossbedded, arenaceous limestone and sandy dolomitic limestone with thin interbeds (1 foot; 0.3 m) of medium light gray, sandy dolomite. Thickness is approximately 150 to 200 feet (45 to 60 m).

Cambrian

Frederick Formation
The Frederick Limestone is a thick interval of thin- to medium-bedded limestone, dolomite and thin intervals of shale and sandstone. Because of the numerous lithologies present in this unit, it is herein recommended that the term formation be used when discussing the Frederick. Three members are recognized and mapped within the Frederick Formation and were named by Reinhardt (1974). Brezinski (2004a) redefined the diagnoses of each member and added the Monocacy Member to the base of the formation. This member was informally termed the "Unnamed Member" by Brezinski and Southworth (2001).

Cfl — Lime Kiln Member
Interbedded, thinly laminated to thinly bedded, dark gray, fine-grained limestone, calcareous shale, and medium-bedded, fine-grained limestone near the base, becoming more thickly interbedded toward the top with medium dark gray, fine-grained limestone with wavy bedding and locally stromatolitic algal beds. Near the top, the member becomes interbedded with crossbedded, sandy, medium light gray limestone. Thickness is approximately 600 feet (180 to 200 m).

Cfa — Adamstown Member
Thinly interbedded, medium dark gray to dark gray, argillaceous, fine-grained limestone and dusky yellow to medium dark gray, silty dolomite. Limestone beds range from 0.2 to 4.0 cm in thickness. Several thin (6.6 to 16 feet; 2.0 to 5.0 m), dark greenish gray to greenish black, light olive-brown weathering, silty, calcareous shale intervals are present throughout the member. The top of the member is mapped at the base of the lowest medium to thick bed of sandy or algal limestone. Thickness is approximated at 1000 feet (300 m).

Cfr / Cfrb — Rocky Springs Station Member
Interbedded dark gray, thinly bedded, lime mudstone and black dolomitic shale, massive, medium gray, polymictic breccias, medium gray, sandy limestone, and dark gray flaggy lime mudstone. Thicker, massive breccia beds (Cfrb) are mapped on the western flank of the synclinorium but are not evident on the east flank. Top of the member is mapped at the top of the stratigraphically highest polymictic breccia or sandstone interval. Thickness is approximated at 1,200 feet (425 m) on the eastern flank, but is likely much thicker on the western flank.

Cfm / Cfms — Monocacy Member
Predominately black, shaly, lime mudstone with thick intervals of black platy shale at the base and top. Dark gray, dolomitic polymictic breccia bed characterizes the middle of the member (Cfms). Thickness is approximately 400 feet (120 m).

Ct — Tomstown Formation
Medium light gray to medium gray, sugary dolomite with thin (< 0.1 cm) layers of mica. Thickness measured at 150 feet (about 45 m) by Hoy and Schumacher (1956).

Car — Araby Formation
Thickly bedded, greenish black to grayish black, very fine grained to fine-grained, burrow-mottled silty sandstone, interbedded with medium gray to grayish black, phyllitic shales 1 to 3 m thick. Top of the formation consists of grayish black phyllitic shale 50 to 66 feet (15 to 20 m) thick. The Araby Formation is present on the eastern side of the Frederick Valley synclinorium. Thickness of the Araby Formation is estimated at 300 feet (100 m).

Ca — Antictam Formation
Interbedded, light olive gray to olive gray, medium- to coarse-grained, medium-bedded, locally ferruginous, micaceous, silty sandstone and very fine grained, silty sandstone to sandy siltstone. Thickness is estimated at 300 feet (100 m).

Ch — Harpers Formation
Brownish gray to dark greenish gray, silty phyllitic shale to highly sheared phyllitic siltstone with intervals of brownish gray, medium-grained, silty sandstone. Thickness is estimated at greater than 900 feet (300 m).

Weverton Formation
Primarily light gray to gray quartzite, conglomerate, and graywacke. Three members make up the Weverton Formation on Catoctin Mountain. These are in ascending order: the Buzzard Knob, Maryland Heights, and Owens Creek Members (Brezinski, 1992). Owing to truncation by Triassic faulting, only the Buzzard Knob Member is present in the south of Interstate 70.

Cwo — Owens Creek Member
Medium to dark gray, medium-bedded, pebbly, ferruginous conglomerate, and conglomeratic, crossbedded, coarse-grained sandstone to quartzite. Member occurs on the dip slope of Catoctin Mountain, and rarely is a ridge-forming unit within the Weverton Formation. Thickness is 150 to 200 feet (45 to 60 m).

Cwm / Cwmq — Maryland Heights Member
Interbedded, dark greenish gray, phyllitic, highly cleaved, sandy siltstone, and silty sandstone, medium gray, pebbly, coarse-grained sandstone to conglomerate, with a massive, light gray quartzite near top of member (Cwmq). The massive quartzite near the top of the member is a major ridge-forming quartzite within the formation, but rarely exceeds 50 feet (15 m). Thickness of the member is estimated at 200 to 300 feet (60 to 90 m).

Cwb — Buzzard Knob Member
Light gray 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. The Buzzard Knob Member has an estimated thickness of 50 to 150 feet (15 to 45 m).

Late Proterozoic? - Cambrian?

CZl — Loudoun Formation
Medium to dark gray, medium-bedded conglomerate and black, tufaceous 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 of this formation may be the result of the original deposition or omission by faulting; however, owing to the colluvial apron of the Weverton, this relationship remains obscure. The Loudoun Formation ranges in thickness from 30 to 200 feet (9 to 60 m) in the Frederick Quadrangle.

Late Proterozoic

Catoctin Formation
Predominately greenish-gray, highly cleaved, metabasalt, with gray phyllites and metarhyolites mapped separately.

Zam — Metabasalt
Medium to dark greenish gray, chloritic, locally amydaloidal, epidote-rich metabasalt. Some areas are composed of highly sheared chlorite schist. Epidote occurs as light green veins and nodules. Thickness estimated at greater than 1000 feet (300 m) by Fauth (1977).

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Supplemental Information

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