

DESCRIPTION OF MAP UNITS (continued)

- Tu Upland Deposits (former Brandywine Formation)**
Sand, pebbly sand, gravel, and sandy loam.
Sand, moderately well sorted, medium- to coarse-grained, with some clayey sand. Pebbles quartzose, maximum about 6 inches in diameter. Color tan to orange-brown. Bedding is chiefly lenticular and massive. Gravel concentrated in the basal beds; upper beds chiefly clayey loam. The South River Quadrangle contains only a tiny erosional remnant of a hilltop in the extreme southwest part of the area.
The unit is fluvial in origin and is thought to have been deposited by the ancestral Potomac River in late Miocene time. Upland Deposits are probably less than about 10 feet thick in the quadrangle.
- Tc Calvert Formation**
Sand, silt, and diatomaceous silt.
Sand, very fine- to fine-grained, silty; silt and minor clay. Unit includes a variable thickness of diatomaceous silt. Color olive-green to greenish-gray where unweathered; pale-gray, tan or brown in weathered sections. The basal portion contains, in places, a thin (< 5 ft.) bed of diatomaceous silt containing as much as 40 percent of diatoms. Most of the unit consists of relatively homogeneous sand and silty sand with obscure bedding and pervasive burrow-mottling. Ghosts of mollusks are common in some strata, but intact shells are absent, having been leached from the sediments of the underlying Nanjemoy. The lower contact is sharp and unconformable on the underlying Nanjemoy. All of the Calvert sediments in the map area belong to the lower Fairhaven Member. The upper member, the Plum Point, was not recognized in the area.
The lower Calvert is a restricted-basin marine unit, deposited in relatively deep water. A maximum thickness of about 30 feet of strata is present in the South River Quadrangle. The Annapolis Quadrangle contains only a tiny hilltop remnant of the unit.
- Tn Nanjemoy Formation**
Glauconitic sand, silty sand, and silt-clay.
Sand, fine- to coarse-grained, variably silty or clayey, containing as much as 50 percent glauconite. Grades to silt-clay in some places. Color medium-gray to dark greenish-gray where unweathered, mottled yellowish and pale-brown in weathered outcrops. Silt-clay is dark gray to chocolate brown. Bedding massive or thick-bedded with prevalent burrow-mottling. Fossiliferous in some beds, chiefly *Venericardina*.
Lower contact sharp marked by sand-filled burrows excavated in the underlying clay of the Marlboro. Indurated beds and concretionary bodies present at some horizons. Sand generally coarsens upward in the section.
The Nanjemoy accumulated on the inner shelf in relatively shallow water. The unit may be as much as 60 feet thick but generally is much less.
- Tm Marlboro Clay**
Clay and minor silt.
Clay, dense and brittle, beds massive and thickly-stratified ranging to finely-laminated. Beds lenticular to hummocky, with sparse partings and thin lenses of micaceous, lignitic, clayey silt, evenly laminated in places. Color pale-red to silvery-gray; silt yellowish-brown. Bedding massive and thick-bedded with abundant burrow-mottling. The upper Marlboro is typically gray, and the remainder red; in places, the lowermost beds are also gray. The lower contact is gradational over a few feet of interbedded glauconitic sand and thin clay beds.
Because it is thin and readily obscured by slumped overlying sandy sediments, good outcrops of the Marlboro are scarce. Nonetheless, the best exposures in Annapolis and outcrops are found in the Central Avenue corridor in the southern portion of the South River Quadrangle. The presence of the unit at the surface is commonly revealed by soils containing abundant small flat clay chips.
The precise depositional environment of the Marlboro is uncertain. The sparse faunal evidence and the sedimentary structures have been interpreted as representing deposition in very shallow water (e.g., intertidal). Recently, however, regional studies of the Marlboro Clay suggest a deeper water depositional environment. Gibson et al. (2000) indicate that the unit probably represents deposits from an inner to middle marine shelf area that received sediments from river drainage systems. Regional microfossil studies indicate that the Marlboro Clay ranges in age from latest Paleocene to earliest Eocene (calcareous nannoplankton upper Zone 9 and lower Zone 10) (e.g., Gibson et al., 2000). The Marlboro is as much as 20 feet thick.
- Qa Aquia and Brightseat Formations (undivided)**
Aquia Formation
Glauconitic sand and calcareous sandstone.
Most of the Aquia consists of well-sorted, medium-grained sand, always glauconitic to some degree, but rarely totaling more than 50 percent of the sediment. The basal beds are fine- to coarse-grained. Color dark gray-green to olive-green in unweathered sand, "salt and pepper" sand where moderately weathered, and rusty-brown with abundant ironstone crusts where deeply-weathered. Bedding massive and thick-bedded with abundant burrow-mottling. Highly fossiliferous in places with large oysters and *Turritella* dominant.
The Aquia is at the surface over most of the northern half of the South River Quadrangle and over nearly all of the Annapolis Quadrangle. Thus, outcrops are numerous, particularly in bluffs facing the lower Severn and South Rivers where as much as 80 feet of Aquia is exposed in continuous section. Much of the unit is deeply weathered (to depths as great as 70 feet) to a limonitic rusty sand in which much of the glauconite has been oxidized and much of the carbonate leached from the sediment. Boulders and blocks of reddish-brown sandstone are common in the soil zone developed on the Aquia and later the surface in places. Below the South River, partial beds or irregular pools of shaly calcareous sandstone as much as 5 feet thick are commonly encountered.
The Aquia probably accumulated in very shallow marine water on the inner shelf and record a regressive cycle during the Paleocene. At its thickest, the Aquia totals nearly 180 feet of beds, but it is generally much thinner over the map area.
Brightseat Formation (not mapped separately from Aquia Formation in this area)
Glauconitic clayey sand.
Most of the Brightseat consists of predominantly fine-grained, poorly sorted sand with as much as 25 percent of glauconite, but generally much less. Color dark-gray to dark greenish-gray where unweathered; pale-gray to tan in weathered exposures. In places, the basal Brightseat contains some medium to coarse sand with granules, small pebbles, phosphatic clasts, and fish teeth; molluscan ghosts are uncommon.
The Brightseat is lithologically similar to the overlying Aquia, and in most areas, the contact is gradational, marked by coarsening sand and increasing glauconite content. In most outcrops and borings, the two units are not readily separable; consequently, they are mapped as one unit. Brightseat sediments probably accumulated on the inner shelf during early Paleocene time. The known thickness is maximally 65 feet, but generally less in many areas.
- Kskm Severn and Matawan Formations (undivided)**
Glauconitic sand and micaceous silt.
Both of these units are thin and lithologically similar, consisting of very fine- to fine-grained, poorly-sorted, variably glauconitic sand and micaceous silt. Color dark-gray to olive-brown in unweathered sections, buff to pinkish-gray where weathered. Both units are thick-bedded to massive with abundant burrow-mottling; molluscan ghosts are common in places.
The units are lithologically convergent (about 50 ft. maximum), and generally pool exposures combine to prevent separate mapping of the Severn and Matawan Formations. In addition, the combined section is limited in the map area to the extreme northeast corner of the South River Quadrangle. The Severn-Matawan sequence is of latest Cretaceous age and is a continental shelf deposit. The combined thickness is maximally 55 feet, but generally less in the map area.

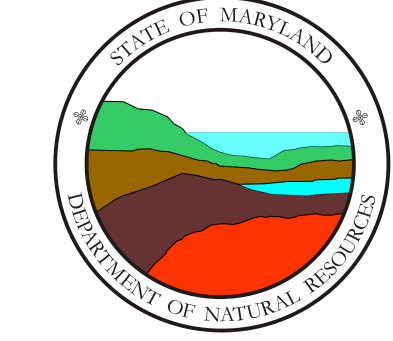
DESCRIPTION OF MAP UNITS

- af Artificial fill**
Heterogeneous unstratified materials including sand, gravel, clay, slag, construction debris, and dredge spoil. Only major fill areas have been mapped, most of these adjacent to the shoreline.
- Qal Alluvium**
Interbedded sand, gravel, and silt-clay.
Sand, very fine to coarse, interbedded with pebbly sand and fine to very coarse gravel. Unit contains beds and lenses of silt-clay, massive to laminated, bearing in places organic matter such as leaves, twigs, and logs. Rare thin peat beds occur. Color tan, brown, and gray.
Alluvium includes typically heterogeneous, generally poorly sorted sediments, which range from well-sorted to massive. Sandy lithologies are mostly quartzose where derived from the Calvert Formation, but contain variable amounts of glauconite where source materials are Nanjemoy or Aquia sediments. Alluvium underlies stream channels, floodplains, and adjacent low areas. The most extensive traces of alluvium in the two-quadrangle area underlie the beds and floodplains of Flat, Beards, and Muddy Creeks as well as Bacon Ridge Branch and the North River.
Alluvium is largely the product of channel and overbank deposition within the last 10,000 years. The unit is as thick as 20 feet in places.
- Qz Lowland Deposits (former Talbot Formation)**
Interbedded sand, pebbly sand, gravel, and silt-clay.
Sand, generally silty or clayey and poorly-sorted. Contains variable amounts of glauconite in deposits along the southeastern flank of the Broad Neck peninsula and below the Severn River. Gravel and pebbly sand is concentrated in the lower part of the unit. In places, thin peats are interbedded in the section, as are black, highly organic clays rich in plant debris. Color mostly pale-gray, tan, or buff, varying to dark-gray.
This unit underlies low flats bordering the Chesapeake Bay and the lower reaches of the South River. Most of the flats lie at 20 feet or less in elevation but some rise to 80 feet in places along their inner margins. The most extensive Qz flats in the two-quadrangle area flank the mouths of the Severn and South Rivers as well as extend along the South River from Boyd Point to Turkey Point.
Much of the Qz unit is a graded sequence with gravel and pebbly sand concentrated in the lower portion and silt-clay strata capping the section. The silt-clay unit provides the surficial materials over most of the Qz lowlands bordering the Bay. In places, drainage is poor and swampy tracts prevail. Outcrops are scarce due to low relief and widespread shoreline protection.
Radiocarbon dating of organic materials in the Qz unit (former Talbot) elsewhere along the Bay indicate a minimum age of 35,000 years. The paleoflora suggests interglacial conditions; thus the Qz unit is probably Sangamonian or older, perhaps mid-Pleistocene. Qz strata are as thick as 40 feet in places.
Note: The informal unit name of Qz is used on this map for deposits previously mapped as the Talbot Formation, a name currently in disuse. The relationships between Qz and the Kent Island Formation of McCarty, 1989a, 1989b; Owens and Denny, 1979) as well as some Quaternary terrace deposits are not unequivocally defined. Until further study reveals the correlation of these units, the informal name of Qz is applied to identify the former Talbot sediments in this map area.
- Qs Terrace Deposits**
Interbedded sand, gravel, and silt-clay.
Heterogeneous sediments comprising fine to coarse gravel, poorly-sorted sand containing glauconite where source materials include Aquia or Nanjemoy beds, clayey sand, and thin lenses of silt-clay. Bedding chiefly lenticular or massive. Color tan, buff, grayish-brown, or reddish-brown.
Terrace deposits have a very limited distribution in the map area. Remnant patches of Qs can be found flanking the shallow valleys of Beards Creek and the Muddy Creek-Mill Swamp drainage in the southwestern part of the South River Quadrangle. The deposits are as thick as 25 feet, but are generally much thinner.

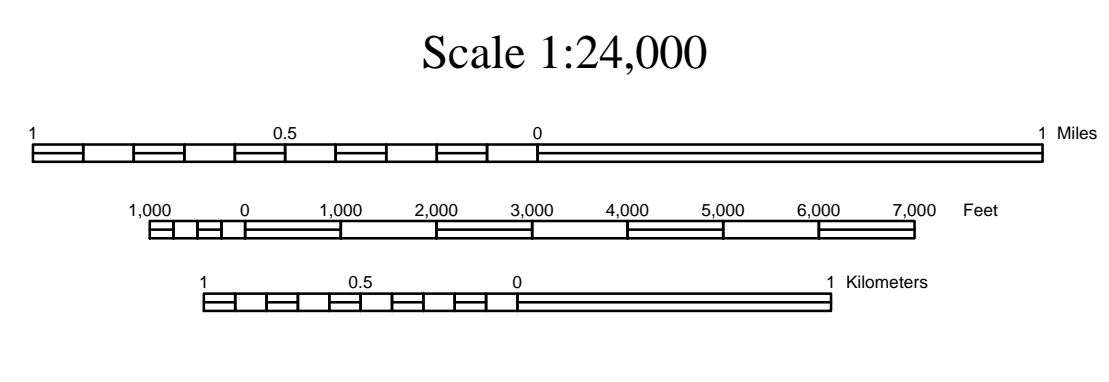
Geologic Map of the South River Quadrangle, and Portions of the Annapolis Quadrangle, Anne Arundel County, Maryland

By
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2002

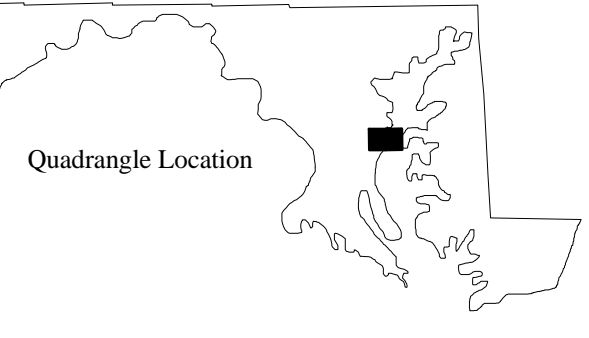
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Secretary
Karen M. White
Deputy Secretary
MARYLAND GEOLOGICAL SURVEY
Emery T. Cleaves
Director



Contour Interval 20 Feet
National Geodetic Vertical Datum of 1929
Shoreline shown represents the approximate line of mean high water
(The mean range of the tide is approximately 0.9 feet
To convert from feet to meters, multiply by 0.3048)



Adjoining 7.5' quadrangle names (This map is a composite of the South River and western part of Annapolis quadrangles, shaded)		
1	2	3
4	5	6
7	8	9

1. Odenton
2. Round Bay
3. Gibson Island
4. Bowles River
5. South River
6. Annapolis
7. Broad
8. Deal
9. Herring Point

Copies of this map are available in hard copy (paper) and digital form from: MARYLAND GEOLOGICAL SURVEY, 2200 Saint Paul Street, Baltimore, MD 21218, Ph. 410-554-5500, Fax: 410-554-5502, http://www.mgs.md.gov/

Supplemental Information

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CROSS SECTION A-A' AND B-B'
Vertical Exaggeration 10x

