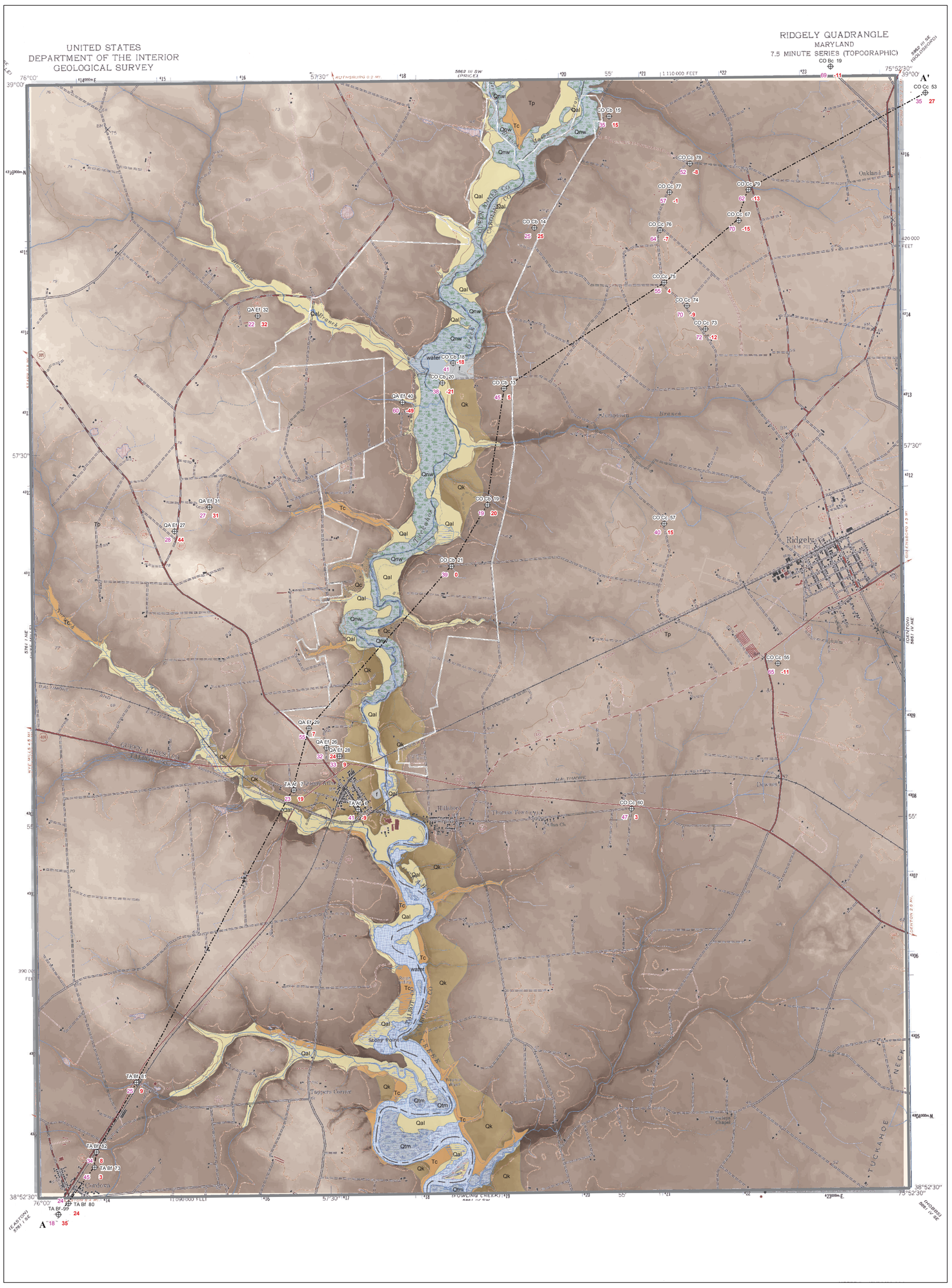

Description of Map Units

QUATERNARY

f — **Graded area/fill**

Shown where extensive amount of mapped geologic unit has been disturbed, removed or covered by other earth materials not necessarily naturally occurring at the site.

Qnw — **Non-tidal wetlands** (Holocene)

Areas along Tuckahoe Creek and its tributaries, where sediments are continually or frequently inundated with water, vegetation is fairly dense and emergent (e.g., trees, shrubs, soft-stemmed vegetation), and sites are located upstream of the approximate head of tide (slightly north of Queen Anne on Tuckahoe Creek per NOAA, 1985). These are freshwater wetland areas and tend to be continually or seasonally flooded. Near the dammed lake at Tuckahoe State Park, there are areas dominated by low scrub-shrub, saplings and herbaceous plants; upstream, areas appear to be largely flooded woodlands. Non-tidal wetland deposits are generally dominated by decaying organic matter, roots, and alluvial silt, clay, and sand; small bivalve shells (modern) and gravel occur in places. Sediments range from being subaqueous to intermittently saturated to the land surface; deposits are often loose and "soupy" where inundated and in many areas are mainly organic matter (roots, leaves, etc). Color is typically dark brown to dark gray-brown due to organic matter but sediment may be tan to brown. Deposit thicknesses are not known.

Qtm — **Tidal marsh deposits** (Holocene)

Largely based upon mapping of tidal marsh deposits of Glaser (1998), Owens and Denny (1986) and recent aerial photography. The upstream limit to tidal marshes, as previously mapped, was apparently based upon the head of tide (NOAA, 1985); therefore in the quadrangle, tidal marsh deposits are limited to low lying areas along Tuckahoe Creek from Queen Anne south toward the creek's junction with the Choptank River. These are freshwater wetland areas (salinities less than 0.5 parts per thousand from an oceanic source) that are flooded by freshwater tides either during extended periods of the year or throughout the year. Areas mapped here as "tidal marsh deposits" tend to have emergent herbaceous plants (grasses, lily pads, etc.) and generally do not tend to be flooded woodlands that appear to be common in nontidal wetlands upstream.

Tidal marsh deposits are generally silt, clay and sand with abundant decaying organic matter and plant roots. Sediments are typically saturated and generally "soupy." Color is typically dark brown to dark gray-brown due to organic matter. Sediment thicknesses are not known but are reported to be commonly less than 3 m (10 ft) (Glaser, 1998) but may range up to 6 m (20 ft) (Owens and Denny, 1986).

Qc — **Colluvium** (Holocene)

Sands, gravels, silty, clayey sands, and soils. Variable in lithology depending upon eroding source material from higher elevations.

Along steep stream banks, there appears to be eroding material from surrounding coastal plain deposits, mainly Pensauken Formation. Shown only where it is fairly extensive and obscures outcrop of older underlying unit(s).

Qal — **Alluvium** (Holocene)

Sand, gravel, silt and clay.

Unlike some previous regional mapping, alluvium does not encompass all nontidal wetland areas (present-day nontidal wetlands, especially flooded woodlands, have been mapped separately; see above); however, alluvium may include some older wetland deposits. Alluvium is generally limited to a narrow band along and in the stream channels of Tuckahoe Creek and some of its tributaries. Alluvium presumably underlies most areas currently covered by wetlands.

Where alluvium is predominantly sandy, deposits tend to be white, tan, or pale gray in color; fine-grained deposits tend to be gray or brown. In some locations, iron cementation seems to be in progress with dark orange-brown to red intervals of semi-cemented sands, silty sands and gravelly sands. The Tuckahoe Creek channel bed tends to be sandy but is punctuated with several distinct gravel-cobble bars; one semi-emergent sand bar contained abundant bivalve shells (apparently recent in age) as well as gravel. Gravels vary in color from white to tan to dark brown/black and tend to be rounded to subrounded though may include shards and blocks of iron-cemented sands. Size varies from fine gravel to cobbles. In many areas of the river channel where the water is clear enough to see the riverbed, the surface of the sand is rippled. Owens and Denny (1986) reported that near Queen Anne the alluvium is relatively thick (up to 6 m / 20 ft) and consists of white, moderately sorted, cross-bedded gravelly sands. Limited information from drilling and local well logs suggest that Tuckahoe Creek may have varied in its course over time resulting in several periods of down-cutting and channel fill near and along the present channel.

Alluvium appears to be largely eroded and re-deposited material from the Pensauken Formation of surrounding upland areas. Presumed to be entirely or largely Holocene (10,000 years or less) in age.

Qud (not mapped) — **Undrained depression deposits/"Delmarva bays"/Parsonsburg Sand?** (late Pleistocene to Holocene?)

Not shown on the map but suggested by surficial topographic pattern shown on shaded digital elevation model (DEM) from the U.S Geological Survey (USGS), National Elevation Dataset (Gesch, 2007; Gesch et al., 2002).

Previous studies, especially recent investigations using LIDAR (Light Detection And Ranging) imagery, have suggested that in many areas of the Delmarva Peninsula there are shallow geomorphic features sometimes referred to as Delmarva Bays, Maryland Bays, or Carolina Bays (e.g., Rasmussen and Slaughter, 1955; Ramsey, 2005, 2007; Newell and Dejong, 2011). These are shallow undrained depressions that are typically elliptical to circular in pattern often with raised sandy rims and flat interiors. They have been interpreted as periglacial deposits formed via one or more processes reflecting freeze-thaw effects and/or wind-blown, and wind- and snow-blown features (e.g., Ramsey, 2005, 2007; Newell and Dejong, 2011; Andres and Howard, 1998).

A review of the LIDAR and DEM imagery covering the Ridgely area at approximately 1.0- and 1.5-m (approximately 3.3 to 4.9 ft) vertical intervals suggests the possibility that such features may exist across much of the upland areas of the quadrangle. The geologic map includes a DEM shaded by 1 m gradations.

The stratigraphic nomenclature and relationship between the Parsonsburg Sand and these surficial periglacial deposits have not been fully defined and these deposits have been mapped and/or named separately by some workers (e.g., Ramsey, 2005, 2007). The Parsonsburg Sand, as identified by Rasmussen and Slaughter (1955), included both a surficial veneer of sand as well as sandy rims, and occasionally sandy interiors, of shallow basins. Denny et al., (1979) studied the Parsonsburg Sand in southeastern Maryland where it is relatively thick (1.25-6.00 m / 4-20 ft in the area east and south of Salisbury) and it is present as discontinuous sheets, dunes, ridges and sand-rimmed basins. The Parsonsburg is described as mainly medium-grained sand but poorly sorted and it includes clay-silt, laminated fine sand and clay-silt, and occasional gravel and basal peaty beds; the sand is typically light-colored (tan, yellowish-brown, gray) though colors like orange and brown are also reported (e.g., Rasmussen and Slaughter, 1955, 1957; Denny et al., 1979; Newell, and Dejong, 2011).

Glaser (1998) indicated that the Parsonsburg Sand was limited to an area in Caroline County southeast of the Ridgely quadrangle, although recent and on-going work by the U.S. Geological Survey in areas west and south of the Ridgely quadrangle suggest it is likely to be present albeit discontinuous or thin in many places (Newell, and Dejong, 2011; D. Powars, U.S. Geological Survey, 2011, unpublished data). Further detailed study and field work would be needed to determine if the apparent surficial morphology as shown on the DEM imagery for the Ridgely area is accurate and if there are areas where the unit is of mappable thickness.

The unit has been interpreted as late Pleistocene in age (~16,000-35,000 yrs B.P. radiocarbon dates of related peaty beds) (Owens and Denny, 1986). Ramsey (2005) cites potential age of 11,000 yrs B.P. for surficial undrained depression deposits based on radiocarbon dates by Webb (1990).

Qk — **Kent Island Formation** (late Pleistocene)

Sand, clayey sand, clay-silt, and in places abundant organic matter; and minor gravel. Sands are often light colored and occur above the clay-silt, which is typically dark colored.

Locally described by Glaser (1998) as fluvial terraces along river and stream valleys with sediments that reflect reworking of nearby coastal plain deposits, mainly Pensauken. Generally interpreted as estuarine and fluvial deposits during higher sea level stands that were subsequently dissected by down-cutting channels during periods of lower sea level stands thus leaving the Kent Island deposits flanking many present day estuaries/river channels along the Eastern Shore of the Chesapeake Bay (e.g., Owens and Denny; 1979)

It is likely that the deposits here mapped as the Kent Island Formation may consist of more than one sequence of deposition, as has been proposed elsewhere on the Delmarva Peninsula (e.g., Owens and Denny, 1979; Ramsey, 2010). This unit may include some terrace deposits in addition to the Kent Island Formation.

There is limited data to age-date the Kent Island Formation. Ramsey (2010) interpreted the Kent Island deposits (as mapped in Delaware) to represent deposition of approximately 120,000 yrs B.P. and 80,000 yrs B.P. (late Pleistocene) based on geomorphic evidence and limited amino-acid racemization data of mollusk shell material. Owens and Denny (1986) note a peaty sample attributed to the Kent Island Formation in Talbot County, Maryland, (outside of the quadrangle area) was radiocarbon dated as approximately 30,000 +/- 1,000 yrs B.P. and was overlain by sands believed to be the Parsonsburg Sand, but pollen in some areas indicates two periods of deposition that suggest a range of dates, possibly Late Sangamon to Middle Wisconsin in age which is similar to ages of Ramsey (2010).

TERTIARY

Tp — **Pensauken Formation** (late Miocene?)

Sand, pebbly sand, silty, clayey sand, gravel and clay-silt lenses. Mainly orange, red, and reddish brown, variably feldspathic quartz sand, fine to coarse-grained and variably gravelly. Sands are iron-cemented in places.

The Pensauken Formation underlies most of the map area except where Quaternary stream valleys of Tuckahoe Creek and Choptank River cut down into the underlying Chesapeake Group. The elevation data suggest a change in topography in the southwest corner of the quadrangle, suggestive of a scarp. On-going work by the U.S. Geological Survey in adjacent areas suggests that there may be a northwest-southeast-trending scarp in the Cordova area and its relation to possible ancient channel development is being investigated (D. Powars, U. S. Geological Survey, 2011, unpublished data).

In general the Pensauken Formation has been interpreted as ancient river deposits of the ancestral Delaware System that flowed across the Delmarva Peninsula in the late Tertiary (e.g., Owens and Denny, 1979; Owens and Minard 1979). Glaser (1998) indicated there may be two facies of the Pensauken in Caroline County – a fluvial facies in the Ridgely quadrangle area and an estuarine facies (or possibly another stratigraphic unit) to the southeast where sediments are finer in texture and contain evidence of burrows.

Over much of the upland areas, the thickness of sediments that are interpreted as Pensauken and the elevation of the base of the unit vary but commonly are 20 to 55 ft thick with elevations of the base of the unit between about +5 and +40 ft (+2 and +12 m) above mean sea level.

Previous workers have recognized that in the region there appear to be numerous paleochannels of various ages with younger channels cutting into and through older ones so that several channel-fill deposits may be superimposed upon one another (e.g., Rasmussen and Slaughter, 1957). Bachman and Wilson (1984) and Glaser (1998) suggest there may be a paleochannel or paleochannel deposits running approximately north-south through the Ridgely area. Information from driller's logs suggests that a relatively thick and deep sequence of sands occurs in that area although it is not clear from these records if these sands represent one or more periods of channel fill.

The base of the Pensauken Formation is often distinguished by a gravelly layer interpreted as a channel lag deposit that overlies fine-grained sediments of the Chesapeake Group. The contact, however, does not seem to be universally so distinct. In some locations, both units appear to be similar approaching the contact – both relatively clayey or both relatively sandy. It is possible that some of the difficulty in identifying the contact may be, in part, a function of the data collection process (composited cuttings versus core samples and/or limited focus on this interval during well drilling to deeper productive sands).

Pollen from the clay-silts in the Pensauken Formation suggest deposition in more than one paleoclimate and a Tertiary age (Owens and Denny, 1979). Based on apparent stratigraphic position and interfingering with the Yorktown-Cohansey Formation, Owens and Denny (1979, 1986) further interpreted the unit as late Miocene in age.

Tc — **Chesapeake Group** (Choptank/Calvert Formations undifferentiated) (early to middle Miocene)

Sand, silt-clay, shells; typically grayish brown, greenish brown, grayish green, gray, bluish gray. Glaser (1998) notes that lignitized wood is common.

Outcrops are very limited in the Ridgely quadrangle. Some small exposures occur mainly along Tuckahoe Creek and its tributaries. One distinctive exposure of dark brown silt with thin laminae of fine white sand occurs along the steep western bank of the Tuckahoe Creek nearly due west of borehole CO Cb 21.

The Choptank and Calvert Formations are typically undivided by most workers in the area due to relatively poor exposures. Rasmussen and Slaughter (1957) indicated the updip edge (pinchout) of the Choptank Formation occurs slightly west of Tuckahoe Creek, trending southwest to northeast, at an elevation likely to be slightly above mean sea level. Bachman and Wilson (1984) also showed the Choptank pinching out across the map area. Glaser (1998), however, suggested that it is principally the Calvert Formation that underlies most of the map area.

The Choptank Formation is characterized as brown or gray, variably muddy, fine sands, silt-clays, shell beds. The type section of the Boston Cliffs member of the Choptank Formation is in southern Talbot County (Gernant 1970). At Martinak State Park, approximately 2.2 miles southeast of the map area the Choptank appears to be approximately 53.6 ft (16.3 m) thick extending from approximately 22.8 to 76.4 ft (6.95 to 23.3 m) below land surface (estimated elevation of 19 ft [5.8m]above mean sea level). The interval assigned to the Choptank in a corehole (CO Dc 152) was confirmed and identified as middle Miocene via an initial analysis of dinoflagellate cysts and acritarchs from core samples conducted by the U.S. Geological Survey (L.E. Edwards, U.S. Geological Survey, 2011, unpublished data).

The Calvert Formation includes variably micaceous, silty, fine sands, silt-clays, shell layers, muddy shelly sands, and diatom-bearing silts; glauconite is present in places. Colors are typically brown, grayish brown, light gray, grayish green, bluish gray. In borehole CO Dc 152 southeast of the Ridgely quadrangle, the Calvert Formation is approximately 250 ft (76.2 m) thick and dinocysts and calcareous nannofossil analyses conducted by the U.S. Geological Survey suggested that the Calvert Formation had a relatively thick lower Miocene interval and relatively thin uppermost lower to middle Miocene interval (L.E. Edwards and J.M. Self-Trail, U.S. Geological Survey, 2011, unpublished data).

A deep well drilled at Tuckahoe State Park (QA Ef 29) indicates the Chesapeake Group sediments are approximately 230 to 260 ft (70 to 79 m) thick in the center of the quadrangle area (Andreasen and Hansen, 1987). The top of the unit, however, could not be clearly determined from the driller's log or cuttings at this location.

Based on fossils, the Chesapeake units present in the quadrangle are considered early to middle Miocene-age marine units (e.g., Lucy E. Edwards, Jean M. Self-Trail, U.S. Geological Survey, 2011, unpublished data; Shattuck, 1904; Gernant, 1970; Kidwell, 1984).

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Base Map Credits:

U.S. Geological Survey (USGS) 7.5-minute Series (Topographic)
Ridgely quadrangle 1944 (photorevised 1973)
Select topographic, cultural and transportation features from raster graphic (1:24000)
Digital line graphs (DLGs) for select hydrography (1:24,000)
(Original topography by photogrammetric methods from aerial photographs taken 1942.
Photorevisions from aerial photographs taken 1973 and other sources; this information not field checked.)

Digital Elevation Model (DEM) 1/3 arc-second resolution
from the National Elevation Dataset http://seamless.usgs.gov/about_elevation.php

GN
(State Plane Grid North)

Estimated 2011 magnetic north declination
(center of Ridgely quadrangle): 11 degrees, 29 minutes west
To determine cur rent magnetic declination see:
http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp

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

Geographic coordinates (latitude-longitude) shown near corners and 2.5' intervals also shown in black with larger font

Original topographic map in Polyconic Projection NAD1927;
10,000-ft grid tics based on the 1927 MD State Plane coordinate system.

Geologic Map of the Ridgely Quadrangle, Queen Anne's, Caroline and Talbot Counties, Maryland

By John M. Wilson and Heather A. Quinn
2011

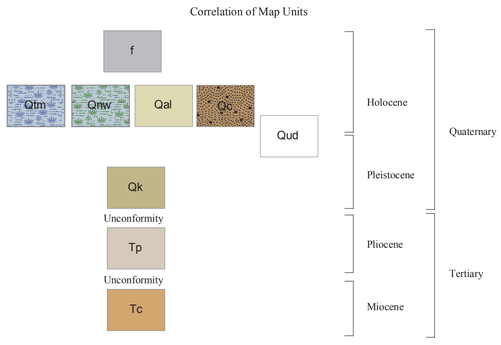
STATE OF MARYLAND
Martin O'Malley
Governor

DEPARTMENT OF NATURAL RESOURCES
John R. Griffin
Secretary

MARYLAND GEOLOGICAL SURVEY
Jeffrey P. Halka
Director

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

Correlation of Map Units



Supplemental Information

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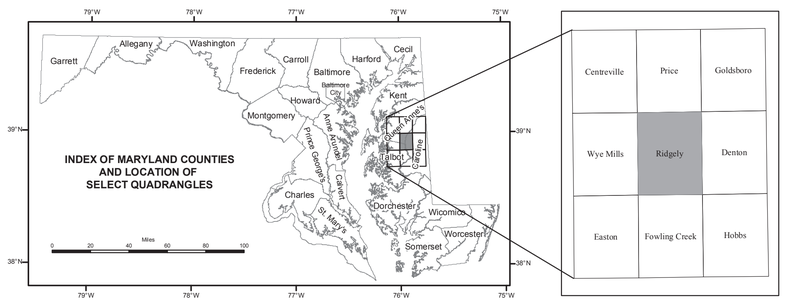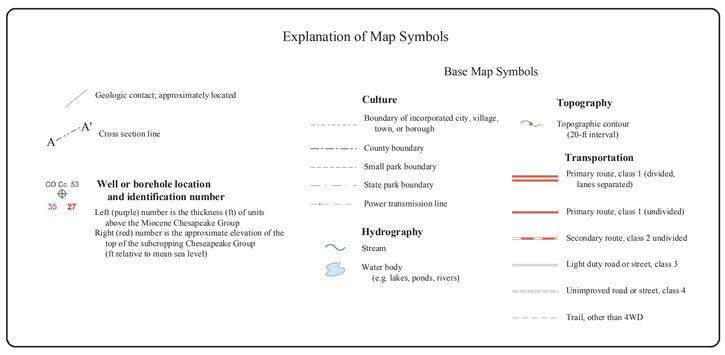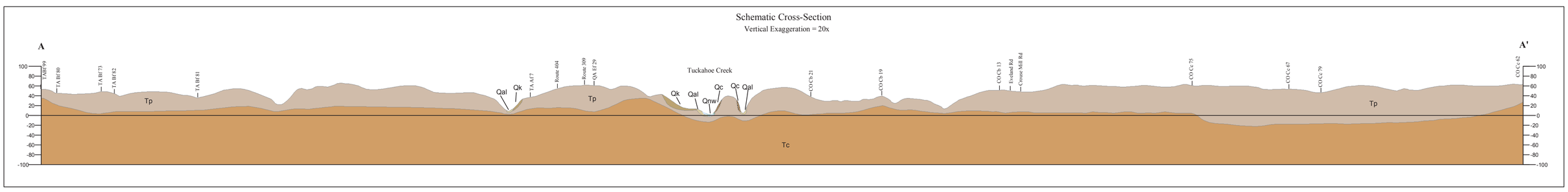
Version: RIDGE2011.0 (Preliminary – subject to review)