

DISCUSSION GEOLOGIC HISTORY Miocene and Quaternary rocks are exposed at the surface in the Smyrna-Clayton area. The geologic history is inferred from data derived from a few deep wells within the map area and by interpolation from data outside the map area.

The oldest rocks are the Basement Complex crystalline rocks of Early Paleozoic age. In the Smyrna-Clayton map area they are approximately 1,700 to 3,000 feet below sea level. These rocks are considered to be the down-dip continuation of the Piedmont rocks of northern Delaware. The uppermost part of the basement rocks is believed to have been weathered to a variable thickness when this was the land surface. to a variable thickness when this was the land surface. Above the basement rocks is the nonmarine Potomac Formation, deposited in Early to Late Cretaceous time. The sea then rose over the area and the Magothy Formation was deposited in a shoreline environment. The overlying marine Upper Cretaceous units are the Matawan and Monmouth formations. The Hornerstown transcends the Cretaceous-Tertiary boundary.

Marine sediments accumulated until at least Middle Eocene time. The Vincentown and Nanjemoy formations were deposited probably in an open inner shelf environment. The Piney Point Formation (Eocene) is coarser than the Nanjemoy. Just south of the map area the Piney Point is coarse enough to be a good aquifer, but is not known to be a good aquifer in the map area. No Oligocene rocks are known, therefore the sea probably receded after deposition of the Piney Point.

Fossil radiolarian assemblages indicate that the seas returned during Early to Middle Miocene time when the lower part of the Calvert Formation was deposited in the map area. The Cheswold aquifer is a sandy unit within the Calvert which may represent a nearshore environment. A silica-cemented sandstone containing broken, silicified molluscan shells in the Cheswold is mapped in the Smyrna area at Bannister Hall and south of Lake Como. Cleaves, et al. (1968) describe silica-cemented sandstones within the Plum Point Member of the Calvert Formation in Maryland. The Bannister Hall material may be equivalent. Richards and Harbison (1942) describe and include a photograph of a very similar occurrence on a branch of the Cohansey Creek in New Jersey in the Miocene Kirkwood Formation. The siliceous sandstone may represent a shoreline deposit.

Columbia Formation fluvial sands and gravels of Pleistocene age mantle the map area. The sediments are thought to have been deposited by melt water from continental glaciers in Pennsylvania and New Jersey. Tidal marshes with up to about 60 feet of sediment of Holocene age cover the eastern part of the mapped area. They represent infilling of old stream channels caused by the rise in sea level since the end of the last glacial period approximately 10,000 years ago.

Hard, siliceous molds and casts of pelecypods, mostly the clam Venus mercenaria, have been found in rocks up to 3 feet in diameter found as float in fields near Bannister Hall just west of Smyrna. A few gastropods, bryozoans, and silicified wood have also been found. Similar fossils were reported in place during ditching for water pipes in front of the Delaware Home for the Chronically Ill, south of Lake Como (Rex Gilmore, personal communication). The fossils are believed to be Miocene in age, but no age-diagnostic fossils have been found. A silicified log of cypress, about 50 feet long, was found in the base of a sand and gravel pit in the Columbia Formation, just north of Smyrna.

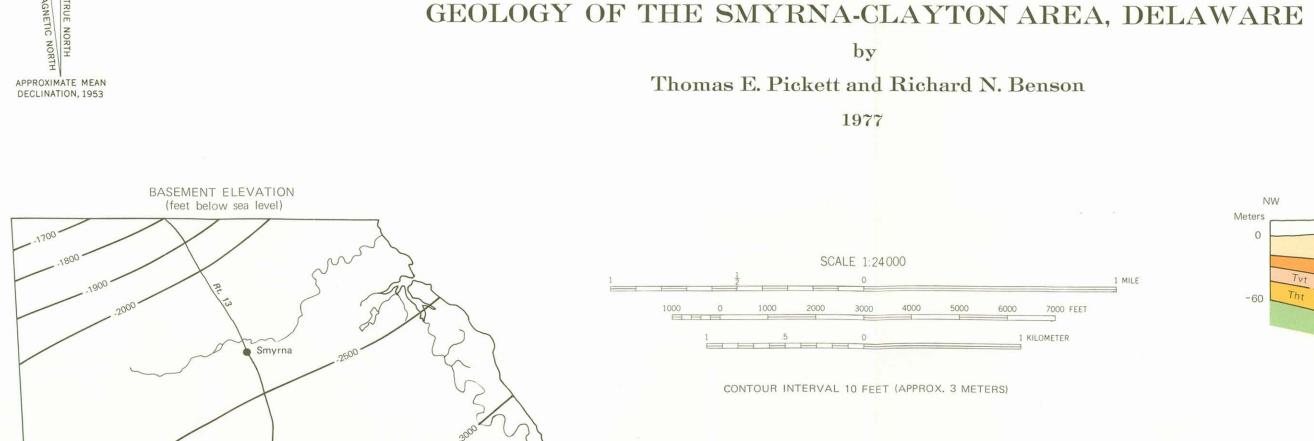
EARTH RESOURCES Sand and gravel are the most important earth resources in the area. Thickness contour lines of the Columbia Formation indicate over 30 feet of these resources, particularly in the center of the mapped area, near Smyrna. ticularly in the center of the mapped area, near Smyrna. Details on sand texture are available in Delaware Geological Survey Bulletin 12 (Jordan, 1964). The western and eastern parts of the map area are generally more clayey because the sediments of Miocene and Holocene age are at or near the surface and are not as promising for sand and gravel extraction. Holocene clay in the wetlands area (Qtm) shows some promise for lightweight aggregate, based on preliminary tests by the U. S. Bureau of Mines (Pickett, 1970). However, the wetlands (tidal-marsh) are a valuable natural habitat which are protected from careless exploitation.

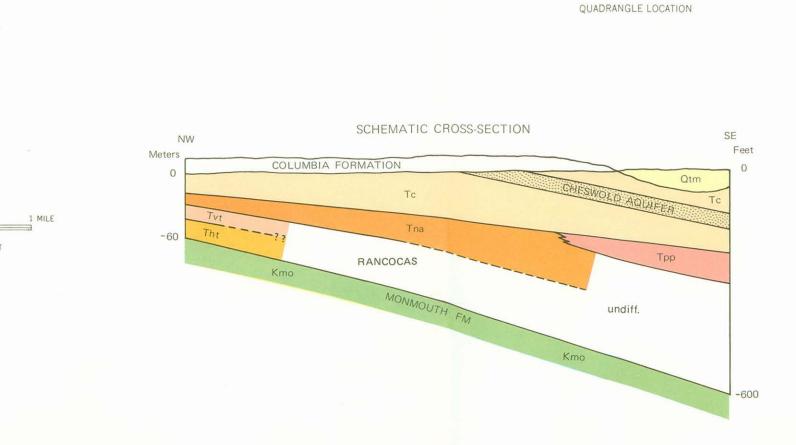
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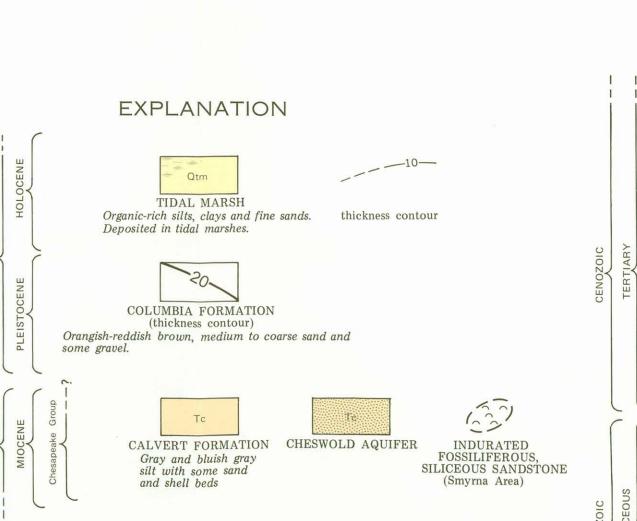
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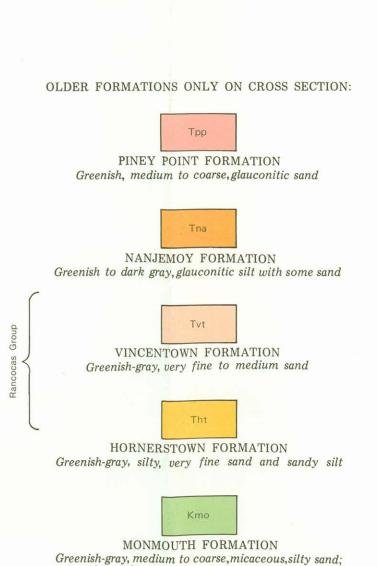
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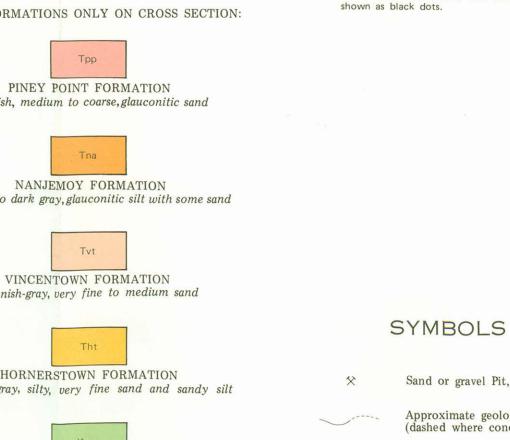








some glauconite



Sand or gravel Pit, active and inactive Approximate geologic contact (dashed where concealed)