



Base maps — USGS Topographic Division, Wilmington, ME, 1963; Clayton, Del., 1956; Smyrna, Del., 1956; Boney Hook, 1956

**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 interpretation from data outside the map area.

The oldest rocks in the basement complex crystalline rocks of Early Paleozoic age. In the Smyrna-Clayton area they are approximately 1,700 to 3,000 feet below the surface. 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.

Above the basement rocks is the summative Potomac Formation, deposited in Early to Late Cretaceous time. The sea then rose over the area and the Magnolia Formation was deposited in a shallow environment. The overlying marine Upper Cretaceous units are the Malvern and Monmouth formations. The Honesdale, transmits the Cretaceous-Tertiary boundary.

Marine sediments accumulated until at least Middle Eocene time. The Vincennes and Nanjemoy formations were deposited probably in an open near-shore environment. The Piney Point, Fort Point, and Nanjemoy formations are considered to be a good aquifer, but it is not known to be a good aquifer in the map area.

No Cretaceous rocks are known, therefore the sea probably receded after deposition of the Piney Point.

**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. 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 favorable for sand and gravel extraction. Holocene clay in the wetlands area (Qm) shows some promise for lightweight aggregate, based on preliminary tests by R. E. Benson and M. Pickett, 1970. However, the wetlands (tidal marsh) are a valuable natural habitat which are protected from erosion excavation.

**USEFUL REFERENCES**

Boggs, D. H., et al., 1964. Hydrologic investigation atlas, HA-81, Smyrna Area, Delaware. U. S. Geol. Survey in cooperation with Delaware Geol. Survey. Scale: 1:34,000.

Cleves, R. T., Edwards, J. Jr., Glass, J. D., 1969. Geologic map of Maryland. Maryland Geol. Survey. Scale: 1:60,000.

Jordan, R. R., 1962. Stratigraphy of the sedimentary rocks of Delaware. Delaware Geol. Survey, Bull. No. 9, 51 p.

Jordan, R. R., 1964. Columbia (Pleistocene) sediments of Delaware. Delaware Geol. Survey, Bull. No. 12, 89 p.

Kraft, J. C., and John, C. J., 1976. The geologic structure of the shorelines of Delaware. College of Marine Studies, University of Delaware, Sea Grant Tech. Rept. DLS-80-147, 136 p.

Sundstrom, R. W. and Pickett, T. E., 1966. The availability of ground water in Kent County, Delaware. Water Res. Center, University of Delaware, 122 p.

Sundstrom, R. W. and Pickett, T. E., 1971. The availability of ground water in New Castle County, Delaware. Water Res. Center, University of Delaware, 146 p.

Well, C. R., 1977. Sediments, structural framework, and evolution of Delaware Bay, a tectonogeomorphic delta. College of Marine Studies, University of Delaware, Sea Grant Tech. Rept. DLS-80-147, 136 p.

**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 interpretation from data outside the map area.

The oldest rocks in the basement complex crystalline rocks of Early Paleozoic age. In the Smyrna-Clayton area they are approximately 1,700 to 3,000 feet below the surface. 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.

Above the basement rocks is the summative Potomac Formation, deposited in Early to Late Cretaceous time. The sea then rose over the area and the Magnolia Formation was deposited in a shallow environment. The overlying marine Upper Cretaceous units are the Malvern and Monmouth formations. The Honesdale, transmits the Cretaceous-Tertiary boundary.

Marine sediments accumulated until at least Middle Eocene time. The Vincennes and Nanjemoy formations were deposited probably in an open near-shore environment. The Piney Point, Fort Point, and Nanjemoy formations are considered to be a good aquifer, but it is not known to be a good aquifer in the map area.

No Cretaceous rocks are known, therefore the sea probably receded after deposition of the Piney Point.

**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 interpretation from data outside the map area.

The oldest rocks in the basement complex crystalline rocks of Early Paleozoic age. In the Smyrna-Clayton area they are approximately 1,700 to 3,000 feet below the surface. 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.

Above the basement rocks is the summative Potomac Formation, deposited in Early to Late Cretaceous time. The sea then rose over the area and the Magnolia Formation was deposited in a shallow environment. The overlying marine Upper Cretaceous units are the Malvern and Monmouth formations. The Honesdale, transmits the Cretaceous-Tertiary boundary.

Marine sediments accumulated until at least Middle Eocene time. The Vincennes and Nanjemoy formations were deposited probably in an open near-shore environment. The Piney Point, Fort Point, and Nanjemoy formations are considered to be a good aquifer, but it is not known to be a good aquifer in the map area.

No Cretaceous rocks are known, therefore the sea probably receded after deposition of the Piney Point.

Basement Elevation (feet below sea level)

SCALE 1:24,000

CONTOUR INTERVAL 10 FEET (APPROX. 3 METERS)

QUADRANGLE LOCATION

**EXPLANATION**

**TIDAL MARSH** (thickness contour)

**COLUMBIA FORMATION** (thickness contour)

**CALVERT FORMATION** (thickness contour)

**CHESWOLD AQUIFER**

**INDURATED FOSSILIFEROUS SILICEOUS SANDSTONE** (Smyrna Area)

**MONMOUTH FORMATION**

**SYMBOLS**

Sand or gravel Pit, active and inactive

Approximate geologic contact (dashed where comitted)

**OLDER FORMATIONS ONLY ON CROSS SECTION:**

**PINEY POINT FORMATION** (Top)

**NANJEMOY FORMATION** (Top)

**VINCENNOT FORMATION** (Top)

**HORNSTOWN FORMATION** (Top)

**MONMOUTH FORMATION** (Top)