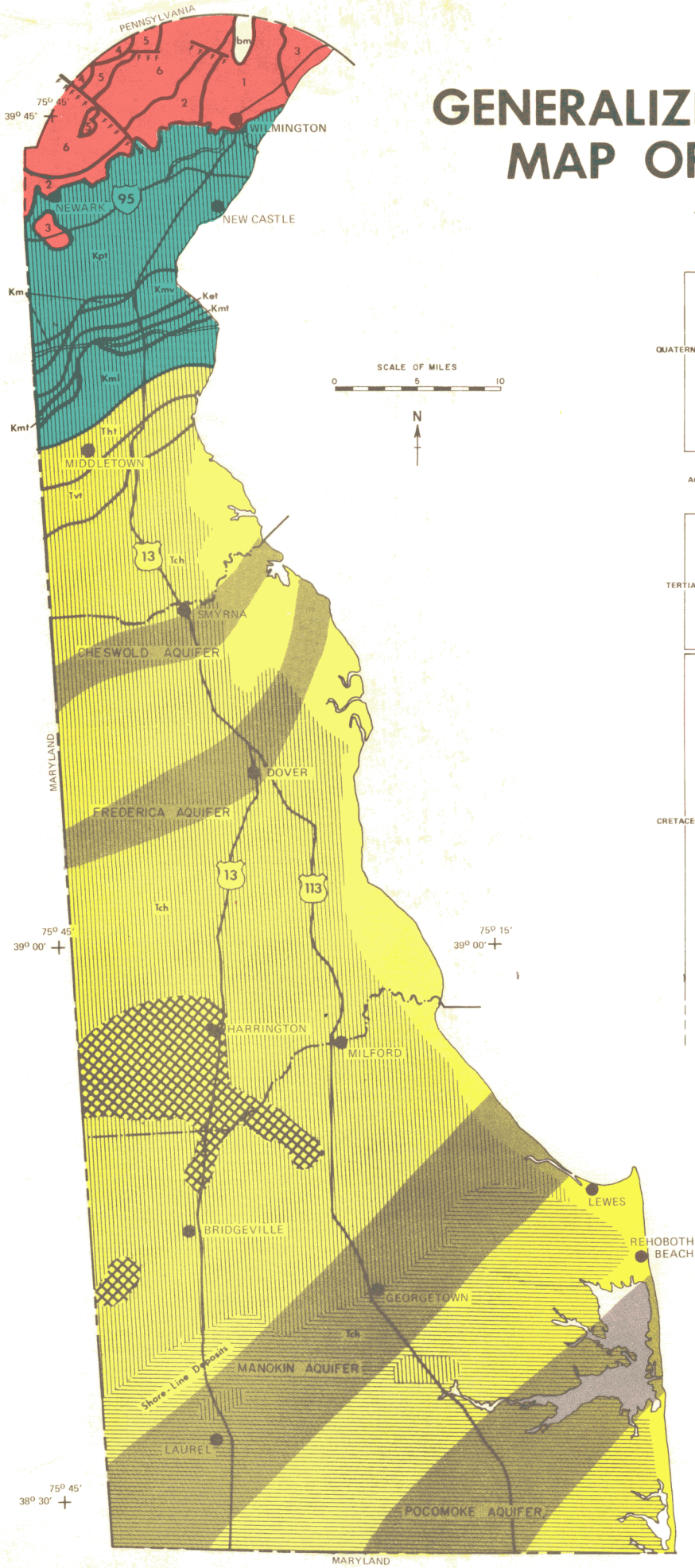
GENERALIZED GEOLOGIC MAP OF DELAWARE

APRIL 1976

Special publication #9



– UNCONFORMITY

QUATERNARY

HOLOCENE
MARSHES
ALONG DELAWARE RIVER, BAYS AND ATLANTIC OCEAN

PLEISTOCENE
COLUMBIA GROUP
STAYTONVILLE UNIT
MOTTLED GRAY AND BROWN SILT AND CLAYEY SAND
OMAR FM.
INTERBEDDED GRAY TO DARK GRAY QUARTZ SAND AND SILTS
BEAVERDAM FM.
(PRESENT IN SOUTHERN SUSSEX COUNTY NOT YET MAPPED)
FAIRLY WELL SORTED MEDIUM SAND, SOME GRAVEL

COLUMBIA FM.
YELLOW AND REDDISH BROWN QUARTZ SAND WITH SOME GRAVEL

FROM JORDAN, 1974

BRYN MAWR FM.
bm
RED AND BROWN QUARTZ SAND WITH SILT, CLAY AND FINE GRAVEL (IN PIEDMONT)

AGE UNDETERMINED

TERTIARY

PLIOCENE ? MIOCENE
CHESAPEAKE GROUP
Tch
BLUISH GRAY SILT WITH QUARTZ SAND AND SOME SHELL BEDS

EOCENE ? PALEOCENE
VINCENTOWN FM.
Tvt
GREEN, GRAY AND REDDISH-BROWN FINE TO COARSE, HIGHLY QUARTZOSE GLAUCONITIC SAND WITH SOME SILT
HORNERSTOWN FM.
Tht
GREEN, GRAY AND REDDISH-BROWN FINE TO MEDIUM, SILTY, HIGHLY GLAUCONITIC SAND AND SANDY SILT

CRETACEOUS

MOUNT LAUREL FM. – MONMOUTH FM.
Kml
GRAY, GREEN AND RED-BROWN, GLAUCONITIC FINE TO MEDIUM, QUARTZ SAND WITH SOME SILT

UPPER CRETACEOUS
MATAWAN GROUP
MARSHALLTOWN FM.
Kmw
DARK GREENISH-GRAY, MASSIVE, VERY GLAUCONITIC SILTY, FINE SAND
ENGLISHTOWN FM.
Ket
LIGHT GRAY AND RUST BROWN, WELL SORTED MICACEOUS SAND WITH THIN INTERBEDDED LAYERS OF DARK GRAY SILTY SAND – ABUNDANT FOSSIL BURROWS
MERCHANTVILLE FM.
Kmv
DARK GRAY TO DARK BLUE, MICACEOUS, GLAUCONITIC SANDY SILT AND SILTY FINE SAND
MAGOTHY FM.
Km
WHITE AND BUFF QUARTZ SAND WITH BEDS OF GRAY AND BLACK CLAYEY SILT

LOWER CRETACEOUS
POTOMAC FM.
Kpt
VARIEGATED SILTS AND CLAYS WITH BEDS OF QUARTZ SAND

PIEDMONT (AFTER WOODRUFF AND THOMPSON) 1972, 1975)

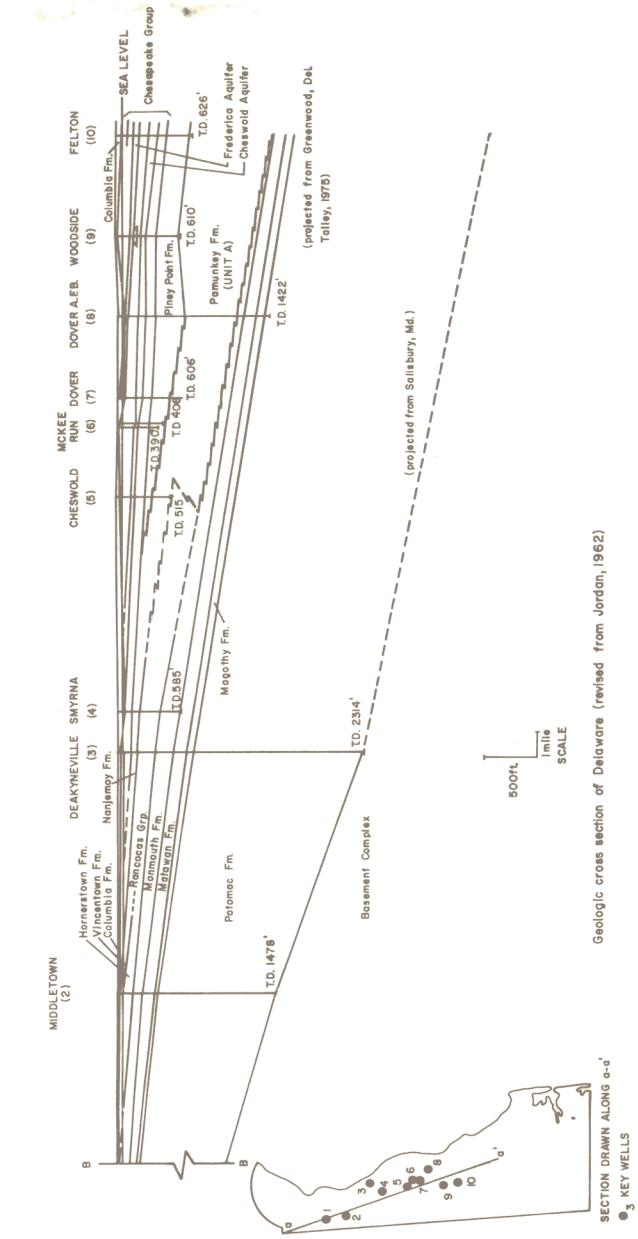
PALEOZOIC?
WISSAHICKON FM.
6
GNEISS, SCHIST, AMPHIBOLITE AND MINOR SERPENTINE
COCKEYSVILLE MARBLE
5
DENSE WHITE CRYSTALLINE MARBLE
BALTIMORE GNEISS
4
FELSPATHIC BIOTITE GNEISS AND MINOR SCHIST
ANORTHOSITE
3
ANDESINE ANORTHOSITE AND ANORTHOSITIC GABBRO

PRECAMBRIAN?
JAMES RUN FM.
2
AMPHIBOLITE, HYPERSTHENE GNEISS AND MINOR PELITIC GNEISS
WILMINGTON COMPLEX
1
HYPERSTHENE GNEISS WITH MINOR AMPHIBOLITE

PIEDMONT FAULT
F F F F F F F

PREPARED BY: DELAWARE GEOLOGICAL SURVEY, UNIVERSITY OF DELAWARE, NEWARK, IN CO-OPERATION WITH THE DELAWARE STATE PLANNING OFFICE, DOVER.

REVISED BY THOMAS E. PICKETT, APRIL 1976 FROM NENAD SPOLJARIC AND ROBERT R. JORDAN AUGUST 1966.



FOR FURTHER INFORMATION
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GEOLOGIC HISTORY OF DELAWARE

Severe metamorphism has obscured the exact age relationships of the rocks of the Piedmont. This regional metamorphism is a product of crustal upheavals which built the Appalachian Mountain System. The major events in the evolution of these rocks occurred between 500 and 200 million years ago.

A great period of time, of which there is no record in Delaware, passed before the deposition of the oldest sediments of the Coastal Plain, the Potomac Formation, during the latter part of Early Cretaceous time, about 120 million years ago. Streams transported clays with interbedded sands from the Appalachians which lay to the northwest. This process continued into Late Cretaceous time and built a wedge with a thickness of about 4,000 feet in southern Delaware. A small unconformity, or period of nondeposition, separates the Potomac from the overlying Magothy Formation. The white sands and lignitic black silts of the Magothy form a distinctive marker indicating the transition from the older sediments to the later marine deposits.

The sea now encroached deeply upon the land and remained over most of Delaware until at least Middle Eocene time; a sequence of varied marine sedimentary rocks was deposited essentially continuously during this interval. The oldest of these sediments form the Matawan Group, consisting of the Merchantville, Englishtown and Marshalltown Formations. None of these persist as distinct entities far into the subsurface, and so the Matawan is relegated to formational status at depth, as is shown on the cross-section. Above the Matawan is the Monmouth Formation, called Mt. Laurel at the surface. These Cretaceous formations are exposed in the Chesapeake and Delaware Canal and are fossiliferous.

In the northern half of the Delaware Coastal Plain the time boundary between the Cretaceous and Tertiary (ca. 63 million years) is located within the Hornerstown Formation. Farther south, in the subsurface, the upper part of the Monmouth Formation, the Cretaceous to Eocene Rancocas Group, and the Nanjemoy Formation (subsurface only), grade into a thick clay-silt mass called the Pamunkey Formation (Unit A). The interrelationships of these rocks in the subsurface may be seen on the cross-section. The subsurface Piney Point Formation, a quartz-glauconite sand, which is the youngest of the Eocene units is, in part, the time equivalent of the Pamunkey and Nanjemoy Formations, and is, in part, younger. All of these marine sediments are truncated by a major unconformity; no Oligocene deposits are present.

During the Miocene, the sea returned to cover the State, and deposition of sediment resumed. A sequence of three silts separated by two sand intervals forms most of the Chesapeake Group. Additional sands and silts are added toward the southeast where the Chesapeake attains its maximum thickness in Delaware of over 1,000 feet. Sands within the Chesapeake supply important amounts of water and are named from oldest to youngest, the Cheswold, Frederica, Manokin and Pocomoke aquifers. No sediments of proven Pliocene age are known from the Coastal Plain and the Chesapeake sediments are beveled by another major erosional unconformity.

During Pleistocene time, the advance and retreat of the continental glaciers brought about profound changes in sea level and in the streams which drained into Delaware. The Columbia Formation, consisting mostly of coarse sand with gravel, was deposited on the stream-channeled surface formed by the truncated edges of the Cretaceous and Tertiary beds and thus is a sheet or irregular thickness covering much of the Coastal Plain. During a later period of higher-than-present sea level, the sea reworked these continental deposits in the southern part of the State where they may be subdivided into the Staytonville unit, Omar and Beaverdam (and probably other) Formations (Jordan, 1974). Holocene (Recent) sea level rise has resulted in marsh filling adjacent to the coast. Total maximum thickness of all coastal plain units is about 8,000 feet (at Fenwick Island)

According to the U.S. Bureau of Mines Minerals Yearbook, Delaware produces over 3.5 million dollars worth of sand, gravel, and brick clay annually. Greensand (Hornerstown Fm.) has the potential for use in waste water treatment.