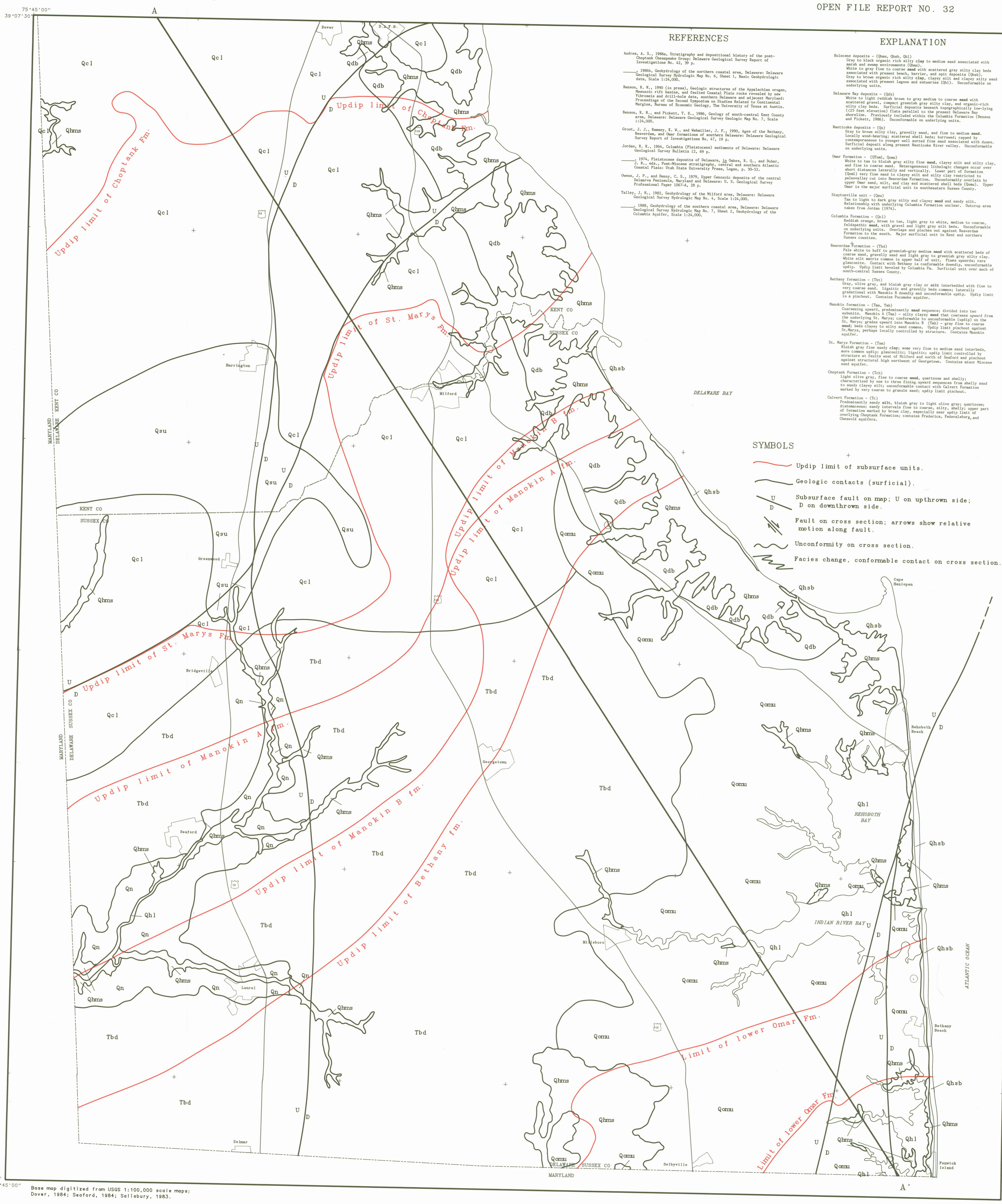
DELAWARE GEOLOGICAL SURVEY
UNIVERSITY OF DELAWARE, NEWARK
Robert R. Jordan, State Geologist



Base map digitized from USGS 1:100,000 scale maps: Dover, 1984; Seaford, 1984; Salisbury, 1983.

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EXPLANATION

Holocene deposits - (Qhms, Qhsb, Qhl)
Gray to black organic rich silty **clay** to medium sand associated with marsh and swamp environments (Qhms).
White to gray fine to coarse **sand** with scattered gray silty clay beds associated with present beach, barrier, and spit deposits (Qhsb).
Gray to brown organic rich silty **clay**, clayey silt and clayey silty sand associated with present lagoon and estuaries (Qhl). Unconformable on underlying units.

Delaware Bay deposits - (Qdb)
White to light reddish brown to gray medium to coarse **sand** with scattered gravel, compact greenish gray silty clay, and organic-rich silty clay beds. Surficial deposits beneath topographically low-lying (<25 feet elevation) flats parallel to the present Delaware Bay shoreline. Previously included within the Columbia Formation (Benson and Pickett, 1986). Unconformable on underlying units.

Nanticoke deposits - (Qn)
Gray to brown silty clay, gravelly sand, and fine to medium **sand**. Locally wood-bearing; scattered shell beds; burrowed; capped by contemporaneous to younger well sorted fine sand associated with dunes. Surficial deposit along present Nanticoke River valley. Unconformable on underlying units.

Omar Formation - (QToml, Qomu)
White to tan to bluish gray silty fine **sand**, clayey silt and silty clay, and fine to coarse sand. Heterogeneous; lithologic changes occur over short distances laterally and vertically. Lower part of formation (Qoml) very fine sand to clayey silt and silty clay restricted to paleovalley cut into Beaverdam Formation. Unconformably overlain by upper Omar sand, silt, and clay and scattered shell beds (Qomu). Upper Omar is the major surficial unit in southeastern Sussex County.

Staytonville unit - (Qsu)
Tan to light to dark gray silty and clayey **sand** and sandy silt. Relationship with underlying Columbia Formation unclear. Outcrop area taken from Jordan (1974).

Columbia Formation - (Qcl)
Reddish orange, brown to tan, light gray to white, medium to coarse, feldspathic **sand**, with gravel and light gray silt beds. Unconformable on underlying units. Overlaps and pinches out against Beaverdam Formation to the south. Major surficial unit in Kent and northern Sussex counties.

Beaverdam Formation - (Tbd)
Pale white to buff to greenish-gray medium **sand** with scattered beds of coarse sand, gravelly sand and light gray to greenish gray silty clay. White silt matrix common in upper half of unit. Fines upwards; rare glauconite. Contact with Bethany is conformable downdip, unconformable updip. Updip limit beveled by Columbia Fm. Surficial unit over much of south-central Sussex County.

Bethany formation - (Tbt)
Gray, olive gray, and bluish gray clay or **silt** interbedded with fine to very coarse sand. Lignitic and gravelly beds common; laterally gradational with Manokin B downdip and unconformable updip. Updip limit is a pinchout. Contains Pocomoke aquifer.

Manokin formation - (Tma, Tmb)
Coarsening upward, predominantly **sand** sequence; divided into two subunits. Manokin A (Tma) - silty clayey **sand** that coarsens upward from the underlying St. Marys; conformable to unconformable (updip) on the St. Marys; grades upward into Manokin B (Tmb) - gray fine to coarse **sand**; beds clayey to silty sand common. Updip limit pinchout against St.Marys, perhaps locally controlled by structure. Contains Manokin aquifer.

St. Marys Formation - (Tsm)
Bluish gray fine sandy **clay**; some very fine to medium sand interbeds, more common updip; glauconitic; lignitic; updip limit controlled by structure at faults west of Milford and north of Seaford and pinchout against structural high northwest of Georgetown. Contains minor Miocene sand aquifer.

Choptank Formation - (Tch)
Light olive gray, fine to coarse **sand**, quartzose and shelly; characterized by one to three fining upward sequences from shelly sand to sandy clayey silt; unconformable contact with Calvert Formation marked by very coarse to granule sand; updip limit pinchout.

Calvert Formation - (Tc)
Predominantly sandy **silt**, bluish gray to light olive gray; quartzose; diatomaceous; sandy intervals fine to coarse, silty, shelly; upper part of formation marked by brown clay, especially near updip limit of overlying Choptank Formation; contains Frederica, Federalsburg, and Cheswold aquifers.

SYMBOLS

Updip limit of subsurface units.

Geologic contacts (surficial).

U / D Subsurface fault on map; U on upthrown side; D on downthrown side.

Fault on cross section; arrows show relative motion along fault.

Unconformity on cross section.

Facies change, conformable contact on cross section.

GEOLOGIC MAP OF SOUTHERN DELAWARE

by

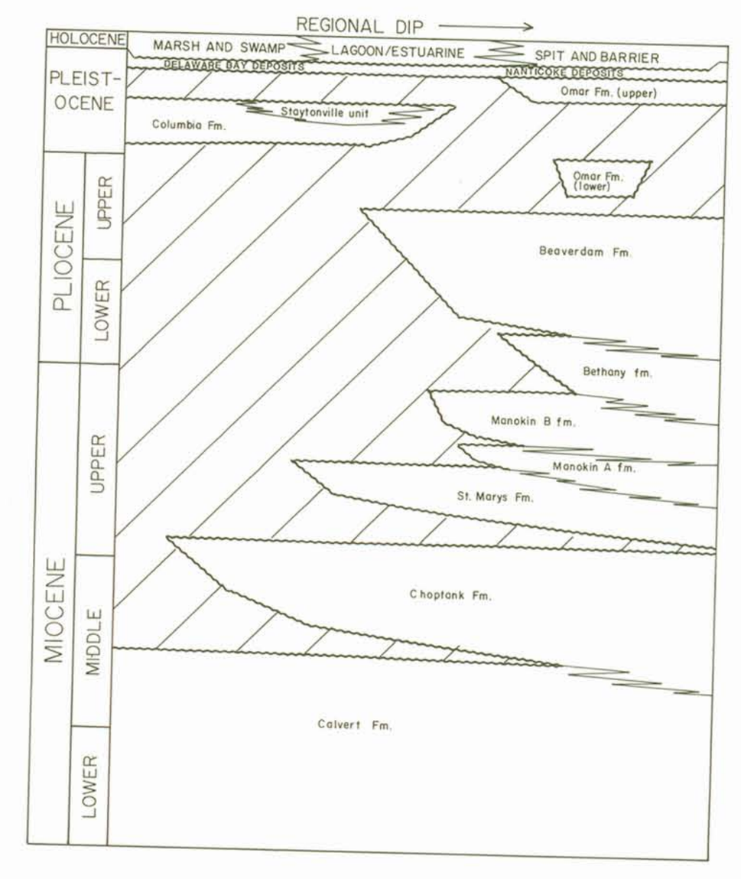
Kelvin W. Ramsey and William S. Schenck

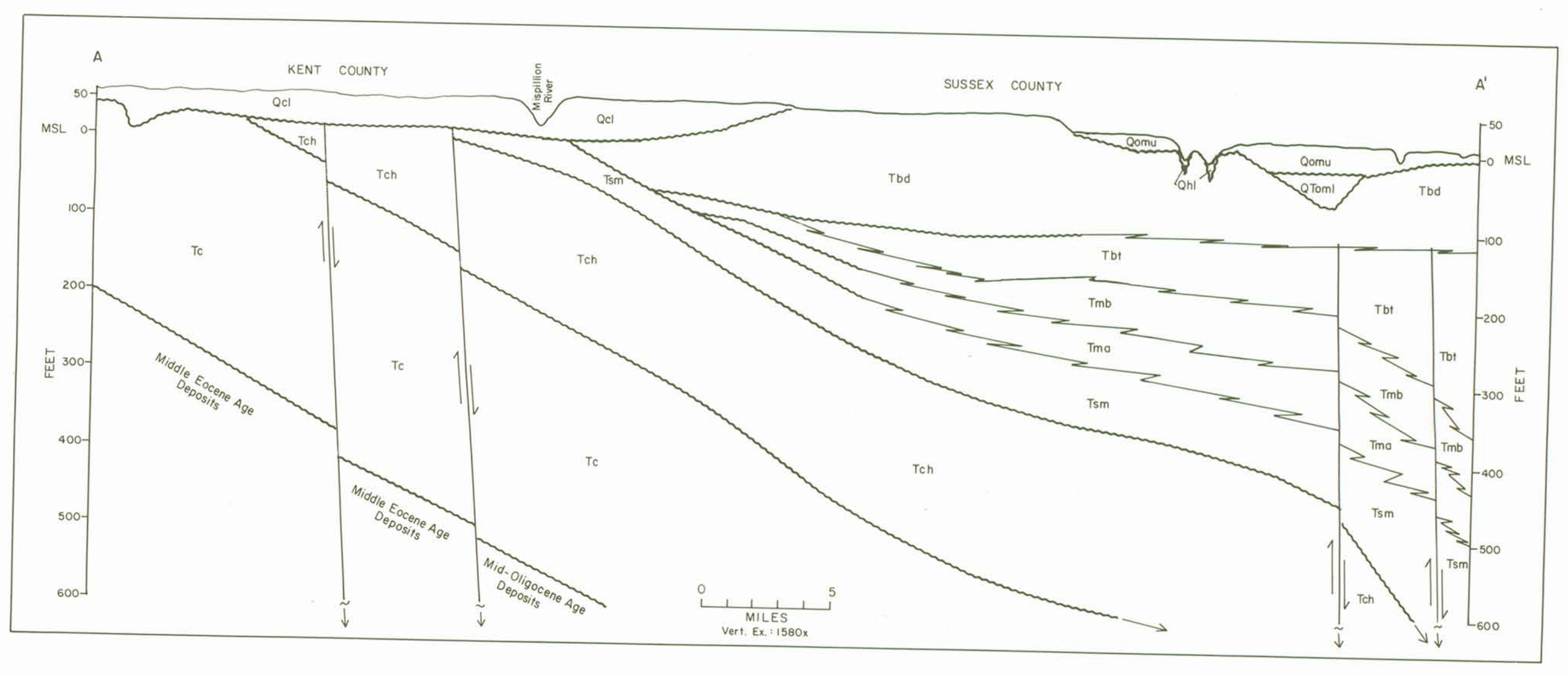
June 1990

Scale 1:100,000

Miles
0 1 2 3 4 5 6 7 8 9 10

Kilometers
0 1 2 3 4 5 6 7 8 9 10





DISCUSSION

This geologic map shows: (1) distribution of geologic units found at the land surface; (2) updip limit (generally the northern extent) of Miocene and Pliocene geologic units found in the subsurface; and (3) locations of major subsurface faults that affected deposition of the Miocene and Pliocene geologic units. The geologic units shown are defined on their dominant lithologies (i.e., sand, silt, clay) and other characteristics such as presence or absence of shells or other fossils and range of colors. This map is a compilation and interpretation of data collected from southern Delaware over the last fifteen to twenty years and builds upon the work of Jordan (1964, 1974). Contributions by Andres (1986a, 1986b), Talley (1982, 1988), and Groot, et al. (1990) have provided the basic data and stratigraphic framework used for this map.

The distribution of surficial units is based on previous mapping (Benson and Pickett, 1986; Jordan, 1964, 1974; Owens and Denny, 1979) and geologic and hydrogeologic mapping currently underway in southern Kent and Sussex counties. Updip limits and faults are based on interpretation of geophysical logs, primarily gamma-ray, supplemented by driller and geologist logs and geologic samples as well as interpretion of seismic (Benson, 1990) and palynoflora (Groot, et al., 1990) data. These data reside in the data base and the core and sample repository of the Delaware Geological Survey.

The map area is located in the Atlantic Coastal Plain Province and covers a portion of the Delmarva Peninsula. The map and cross-section emphasize the distribution and relationships of Miocene and younger geologic units of the map area. Several thousand feet of Coastal Plain rocks lie beneath those shown on the cross section. The Calvert and Choptank formations were deposited in predominately marine environments. Beginning with the St. Marys Formation, deltas formed consisting of the muds and sands of the St. Marys, Manokin, and Bethany formations. Deposition of this deltaic system ended with the fluvial to estuarine deposits of the Beaverdam Formation in the late Pliocene. Changes in global sea level, and local and regional tectonic movements influenced deposition and produced erosion surfaces (unconformities), especially in the northern part of the map area. In the late Pliocene and Pleistocene, the surficial geologic units were deposited either by rivers as the result of large volumes of water from melting glaciers to the north and inland (Columbia Formation) or during rising sea levels associated with the transition from glacial to interglacial periods (Omar Formation and Delaware Bay and Nanticoke River deposits). These units were deposited in river, bay, lagoon, marsh and swamp environments much like those found along the present Delaware River and Bay and along the Atlantic Coast.

The map is a statement of knowledge at the time of production. The data from which it was derived are from unevenly distributed localities across the map area. Any individual line may be based on a large number of data points in one area and only a few points in an adjacent area. The lines on the map, then, must be considered on the basis of the scale at which they are shown and the data from which they were derived. Precise location of any individual feature requires detailed investigation at an appropriate scale. Some known features such as dunes or elongate mounds (Jordan, 1974) are not shown because they can not be accurately represented at a 1:100,000 scale. Current and future mapping at a scale of 1:24,000 by the Delaware Geological Survey will refine and in some instances may change the interpretations presented herein.