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SURFICIAL GEOLOGY OF THE WOODBURY QUADRANGLE GLOUCESTER COUNTY, NEW JERSEY OPEN FILE MAP OFM 58

INTRODUCTION

Surficial sediments in the Woodbury quadrangle include artificial fill and fluvial, estuarine, and salt-marsh deposits. They are as much as 90 feet thick but are generally less than 20 feet thick, and are absent over much of the quadrangle. The deposits lie upon a landscape shaped by three main episodes of valley incision. The deposits are described below. The temporal relationships of the deposits and the episodes of valley erosion are shown on the correlation chart. The underlying bedrock formations are mapped by Stanford and Sugarman (2004).

DESCRIPTION OF MAP UNITS

ARTIFICIAL FILL--Sand, silt, gravel, clay; gray to brown; demolition debris (concrete, brick, wood, metal, etc.), cinders, ash, slag, glass. Massive to weakly stratified. As much as 40 feet thick. In highway and railroad embankments, filled marshes and floodplains, and dredge-spoil disposal areas along the Delaware River. Many small areas of fill, particularly along streams in urban areas, are not mapped.

aft — TRASH FILL--Trash mixed and covered with silt, clay, sand, and minor gravel. As much as 80 feet thick. In solid-waste landfills. Small areas of trash fill may be included within artificial fill.

Qal — ALLUVIUM--Sand, silt, minor clay; brown, yellowish-brown, gray; and pebble gravel. Contains variable amounts of organic matter. Sand and silt is massive to weakly stratified. Gravel occurs in massive to weakly stratified beds generally less than 2 feet thick. Sand is chiefly quartz with some glauconite and ironstone. Gravel is chiefly white, gray, and yellow quartz and quartzite, minor reddish-brown ironstone, and a trace of gray chert. Sand and gravel beds may be locally cemented with iron. Beneath the Delaware River (section AA'), alluvium includes late Pleistocene glaciofluvial sand and pebble-to-cobble gravel. The glaciofluvial deposits were laid down between about 20,000 and 15,000 years ago, during the late Wisconsinan glacial maximum. The glaciofluvial gravel, which is exposed in dredge spoils along the river in National Park, includes much gray sandstone and mudstone, and some red sandstone and mudstone, gray gneiss, black chert, and purple-red conglomerate, in addition to white and gray quartz and quartzite. Alluvium is as much as 30 feet thick beneath the Delaware River, and as much as 15 feet thick elsewhere (estimated). Deposited in modern flood plains and stream channels, and in former flood plains and channels beneath estuarine deposits before Holocene sea-level rise.

Qm — SALT-MARSH AND ESTUARINE DEPOSITS--Silt, sand, peat, clay; brown, dark-brown, gray, black; and minor pebble gravel. Contain abundant organic matter. As much as 90 feet thick beneath the Delaware River; 40 feet thick elsewhere. Deposited in modern salt marshes, tidal flats, and tidal channels during Holocene sea-level rise, chiefly within the past 10,000 years. Where covered by artificial fill, the extent of these deposits is based in part on the position of shorelines and salt marshes shown on topographic manuscript map sheets 68 and 69 (N. J. Geological Survey, 1906, scale 1:21,320).

Qtl — LOWER TERRACE DEPOSITS--Fine-to-coarse sand, minor silt; yellow, reddish-yellow, olive-yellow; pebble gravel. Sand is massive to well-stratified. Gravel occurs in thin beds (generally less than 6 inches thick) within and at the base of the deposit. Sand is chiefly quartz and glauconite. Gravel is chiefly white, gray, and yellow quartz and quartzite, minor reddish-brown ironstone, and a trace of gray chert. In deposits beneath the Delaware River, gravel also includes gray and red sandstone and mudstone, gray gneiss, and purple-red conglomerate. As much as 40 feet thick beneath the Delaware River, as much as 15 feet thick (estimated) elsewhere. Glauconite is more abundant than in older surficial deposits because streams had incised into the glauconite-rich Navesink and Hornerstown formations during deposition of this unit. In tributary valleys, forms terraces with surfaces 5 to 15 feet above modern flood plains. Beneath the Delaware River, forms eroded terrace remnants, now covered by estuarine deposits, with top surfaces about -30 feet in elevation.

Qtu — UPPER TERRACE DEPOSITS--Fine-to-coarse sand, minor silt; yellow, reddish-yellow, brownish-yellow, light-gray, locally olive-yellow; pebble gravel, minor fine cobble gravel. Sand is massive to well-stratified. Gravel occurs in thin beds (generally less than 6 inches thick) within and at the base of the deposit. Sand is chiefly quartz with some glauconite and a trace of feldspar. Gravel is chiefly white, gray, and yellow quartz and quartzite, minor reddish-brown ironstone, and a trace of gray chert. As much as 25 feet thick. Forms terraces with surfaces 15 to 40 feet above modern flood plains. Grades to, or is onlapped by, the Cape May Formation, unit 2 (unit Qcm2), and so is contemporaneous with, or slightly older than, the Cape May 2. Sand in the upper terrace deposits contains significantly less feldspar and fewer rock fragments, and the gravel contains significantly less chert and sandstone, than in units Tp, Tg, and Tb because these deeply weathered materials did not survive reworking from the older deposits.

Qcm2 / Qcm1 — CAPE MAY FORMATION (Salisbury and Knapp, 1917)--Fine-to-coarse sand, minor silt and clay; yellow, brownish-yellow, reddish-yellow, very pale brown, light-gray; minor pebble gravel. Massive to well-stratified. Sand is quartz with a little glauconite and a trace of mica and feldspar. Gravel composition as in unit Qtu. As much as 50 feet thick in the Paulsboro area but generally less than 20 feet thick elsewhere. Unit 2 (Qcm2) (Newell and others, 1995) forms a terrace with a maximum surface elevation of about 30 feet. Fossils, pollen, and amino-acid racemization ratios in shells from this unit elsewhere in the Delaware estuary and Delaware Bay area indicate that it is an estuarine or fluvial-estuarine deposit of Sangamon age (about 125,000 years ago), when sea level was approximately 30 feet higher than at present in this region (Woolman, 1897; Newell and others, 1995; Lacovara, 1997; Wehmiller, 1997). Unit 1 (Qcm1) is an older estuarine or fluvial-estuarine deposit of uncertain age that forms a terrace with a maximum elevation of about 50 feet. It was laid down during a pre-Sangamon interglacial sea-level highstand and is of early or middle Pleistocene age (Lacovara, 1997; O'Neal and McGeary, 2002). Salisbury and Knapp (1917) included fluvial terrace deposits within the Cape May Formation; here they are mapped separately as units Qtl and Qtu.

Tp — PENSAUKEN FORMATION (Salisbury and Knapp, 1917)--Fine-to-coarse sand, minor silt and very coarse sand; reddish-yellow to yellow; pebble gravel. Massive to well-stratified, commonly with tabular, planar cross-beds in sand. Pebble gravel occurs as thin layers (generally less than 3 inches thick) within the sand and as thicker, massive beds in places at the base of the formation, where it may include some cobble gravel. Sand is chiefly quartz with some feldspar, rock fragments (chert and shale), mica, and glauconite (Bowman and Lodding, 1969; Owens and Minard, 1979). The feldspar is generally partially weathered to a white clay. Gravel is chiefly yellow, reddish-yellow (from iron-staining), white, or gray quartz and quartzite; a little brown to gray chert and reddish-brown ironstone; and a trace of brown, reddish-brown, and gray sandstone and shale, and white-to-gray gneiss. The chert, sandstone, shale, and gneiss are generally partially weathered or fully decomposed. As much as 30 feet thick (estimated). Occurs as erosional remnants capping uplands between Mickleton and North Woodbury. Base of the deposit descends from an elevation of about 90 feet east of Mickleton to about 20 feet near Thorofare, reflecting thickening of the deposit towards the main Delaware Valley. This geometry, regional paleoflow data (Owens and Minard, 1979; Martino, 1981), and the provenance of the sand and gravel in the formation, indicate that the Pensauken was deposited by a large river flowing southwesterly from the New York City area to the Delmarva Peninsula. The Woodbury quadrangle is on the southeastern edge of the former river valley.

The age of the Pensauken is not firmly established. Berry and Hawkins (1935) describe plant fossils from the Pensauken near New Brunswick, New Jersey that they consider to be of early Pleistocene age. Owens and Minard (1979) assign a late Miocene age based on correlation to units in the Delmarva Peninsula. Pollen from a black clay bed within the Pensauken near Princeton, New Jersey, includes cool-temperate species and a few pre-Pleistocene taxa. This assemblage suggests a Pliocene age (Stanford and others, 2002). A Pliocene age is also consistent with the geomorphic and stratigraphic relation of the Pensauken to late Pliocene or early Pleistocene till and to middle and late Miocene marine and fluvial deposits in central New Jersey (Stanford, 1993).

Tg — UPLAND GRAVEL--Fine-to-coarse sand, minor silt; yellow, reddish-yellow, very pale brown; and pebble gravel, minor fine cobble gravel. Sand is massive to weakly stratified. Gravel occurs as thin beds (generally less than 1 foot thick) within the sand, and at the base of the deposit. Sand is chiefly quartz, with some glauconite, and a trace of weathered feldspar and chert. Gravel is chiefly yellow, reddish-yellow (from iron-staining), white, and gray quartz and quartzite, with a little ironstone and a trace of weathered chert. As much as 15 feet thick. The chert content of the upland gravel is significantly lower than in unit Tb because the weathered material did not survive reworking from the older deposit. Occurs as erosional remnants capping uplands or interfluves in the southern half of the quadrangle. The base of the deposits descends from an elevation of about 110 feet near Jefferson and Barnsboro to about 60 feet at their northwestern limit, where the deposits grade into the Pensauken Formation. This relationship, and the northwest-southeast trend of many of the deposits, suggests that the upland gravels were laid down by northwesterly flowing local streams that were tributaries to the Pensauken river. Post-Pensauken stream erosion resulted in a topographic inversion, with the former valley-bottom deposits now forming interfluves.

Tb — BRIDGETON FORMATION (Salisbury and Knapp, 1917)--Medium-to-very coarse sand, minor fine sand, clay, and silt; reddish-yellow, red, yellow, white, very pale brown; pebble gravel, and minor cobble gravel. Massive in upper 5-10 feet, where bioturbation, cryoturbation, and soil processes have destroyed the stratification. Generally well-stratified below the soil zone, commonly with tabular, planar cross-beds in sand. Pebble gravel occurs as thin layers (generally less than 3 inches thick) within the sand, and as thicker, massive beds (as much as 2 feet thick) in places at the base of the deposit, where it may include some cobble gravel. The gravel and coarse sand beds may be locally iron-cemented. Sand is chiefly quartz with some feldspar and rock fragments (chiefly chert and shale). The feldspar and chert are generally weathered to white clay, which has been translocated by ground water to form coatings on the quartz grains and to fill voids in the coarser sand beds. Glauconite is rare to absent because glauconitic Coastal Plain formations were not exposed during deposition of the Bridgeton. Gravel is chiefly yellow, reddish-yellow, and reddish-brown (from iron-staining) to white and gray quartz and quartzite with some gray and brown chert, and a trace of weathered reddish-brown to gray sandstone and shale and weathered white-to-gray gneiss. Many of the chert pebbles are weathered to white and yellow clay. As much as 40 feet thick. Occurs as erosional remnants on the highest uplands. Base of deposit ranges from 110 to 130 feet. Paleoflow measured at numerous locations regionally (Owens and Minard, 1979; Martino, 1981), is southeasterly. The Bridgeton was deposited by a river that flowed southeasterly to easterly across the southern New Jersey Coastal Plain. Stratigraphic position and petrologic correlations to marine deposits in the Delmarva Peninsula suggest a late Miocene age (Owens and Minard, 1979; Pazzaglia, 1993).

Qwcp — OUTCROP OF COASTAL PLAIN FORMATIONS--Exposed formations of Cretaceous through Miocene age. Soil zone generally includes some lag pebbles from eroded surficial deposits. May include thin, patchy colluvial or alluvial sediments less than 3 feet thick.

MAP SYMBOLS

Contact--Solid where well-defined by landforms; dashed where approximate, featheredged, or gradational; dotted to show original position within excavated areas where material is now removed or disturbed.

30-1047 / 25 — **Thickness of surficial material in well or boring--**Location accurate to within 200 feet. Upper or first number is identifier; lower or following number is thickness in feet of surficial material, inferred from driller's log. Identifiers of the form 31-xxxx or 30-xxxx are well permits issued by the N. J. Department of Environmental Protection, Bureau of Water Allocation. Identifiers B1-B6 and 1X-12X are test borings on file at the N. J. Geological Survey, made in 1935 for a proposed tunnel. Identifiers prefixed by WW, CSW, CNW, CSE, 107, 109, 101, and TB are from Jengo (1999). Identifiers of the form 31-xx-xxx are N. J. Atlas Sheet coordinates of records of wells in the Bureau of Water Allocation files that do not have permit numbers.

31-1047 / 25 — **Thickness of surficial material in well or boring--**Location accurate to within 500 feet. Identifiers and thickness values as above.

Material observed in hand-auger hole, exposure, or excavation

Excavation perimeter--Marks extent of sand pits. Topography within these areas may differ from that on the base map.

Sand and gravel pit--Inactive in 1999.

Glauconite pit--Active in 1999. Excavated in the Hornerstown Formation of Paleocene age.

Dune field--Low, small wind-shaped dunes. Sand in dunes derived from underlying map unit.

Shallow topographic basin--Line at rim, pattern in basin. Depth generally less than 5 feet. Basins were likely formed by thawing of permafrost between 15,000 and 18,000 years ago. Drawn from air photos taken in 1979.

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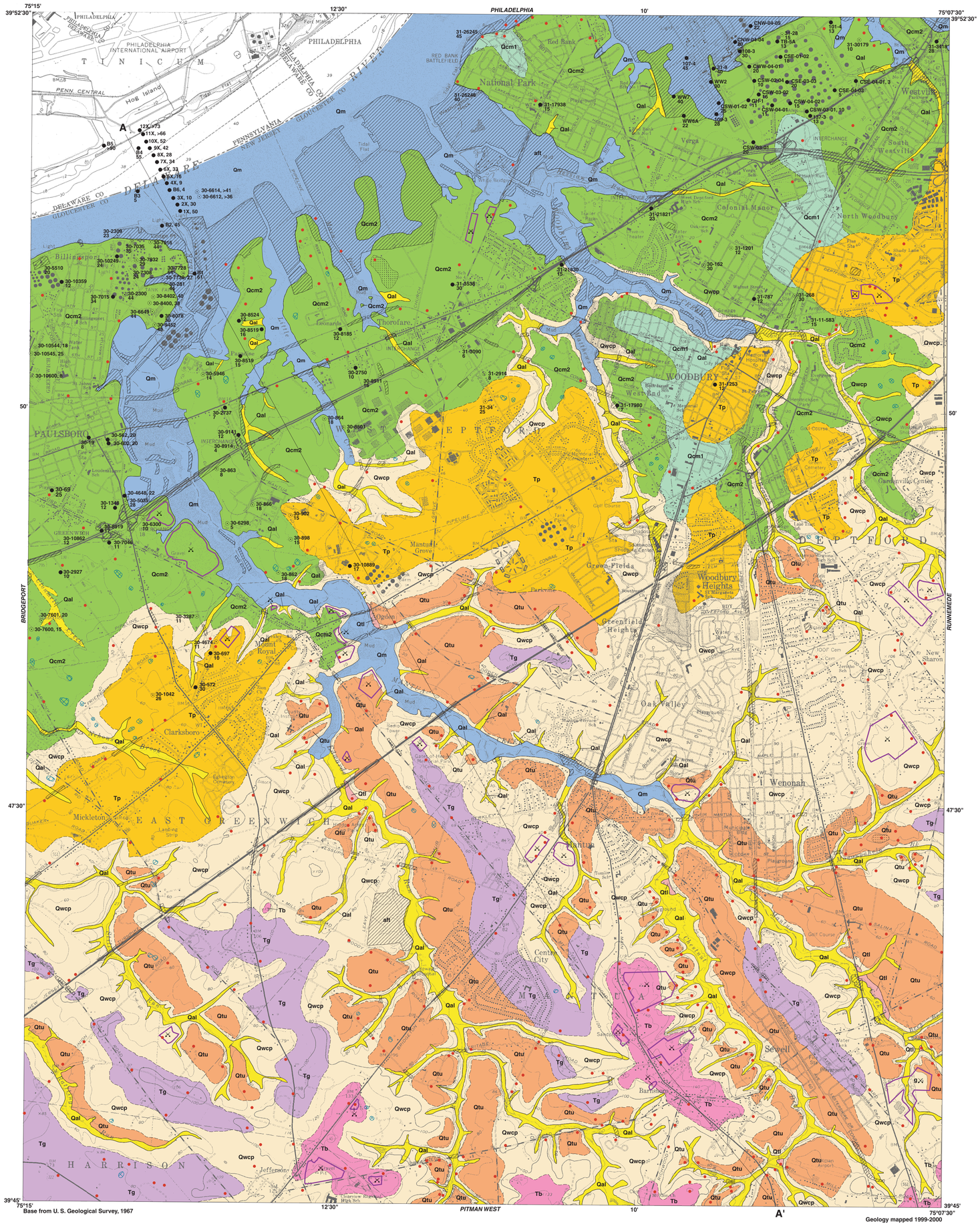
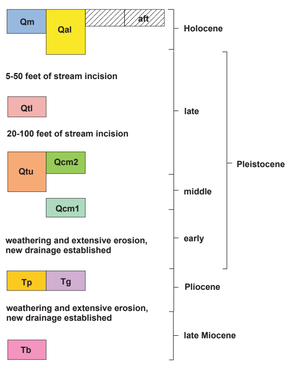
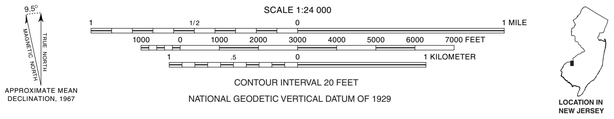


Base from U. S. Geological Survey, 1967

Geology mapped 1999-2000

CORRELATION OF MAP UNITS





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by
Scott D. Stanford
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