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

DELAWARE GEOLOGICAL SURVEY
GEOHYDROLOGY OF THE CHESAPEAKE AND DELAWARE CANAL AREA
HYDROLOGIC MAP SERIES, NO. 6
SHEET 2

Geohydrology of the Newark Area, Delaware

Geohydrology of the Wilmington Area, Delaware

DISCUSSION

The Hydrologic Map Series provides information on both the ground and surface water resources of the State and emphasizes the relationship of the local geology to the occurrence of ground water. Sheet 1 of any given area should be consulted first in order to understand the geologic framework and its relationship to adjacent areas. The total number of sheets necessary to characterize a particular area and the type of information portrayed depends on differences in complexity of the geology, the needs and interests of the users, and the amount of data available. Existing or pending federal, state, or local regulations often determine the subject of a particular sheet. These maps are designed to show the major geologic elements that may affect or control the water resources and to guide, not replace, site specific studies.

This sheet shows the total thickness of confining beds between the water-table aquifer and the uppermost artesian sand capable of consistently supplying water to wells. In the northern one-third of the map area sands of the Potomac Formation comprise the artesian aquifer system. Elsewhere, the uppermost artesian aquifer is the sand of the Magothy Formation (see schematic cross-section). The capability of a sand to supply water is inferred from historical records, pump tests, and from drilling and geophysical logs. The Englishtown Formation (see Sheet 1) and other thin sands (less than 3 feet thick) interbedded with silts or clays are not considered to have consistent water supply potential even though they may occasionally yield enough water for a domestic well. The thickness of these thin sands is therefore included in the total thickness of the confining unit. In a few places the Magothy sand is too thin or fine-grained to be considered as a source of ground water. Nevertheless it was still mapped as a useable aquifer because of its probable hydrologic connection with more productive parts of the formation.

Sands of the Columbia Formation generally comprise the water-table aquifer in the northern half of the map area whereas the major confining layer is a silt or clay of the underlying Potomac Formation. In the northeastern corner of the map area the Merchantville Formation may directly underlie the Columbia Formation and act as a confining layer along with clays and silts of the Potomac Formation. Beneath the Delaware River, silts of Holocene age and fine-grained sediments of the Potomac Formation are included in the total thickness of the confining unit.

South of the north bank of the Chesapeake and Delaware Canal the water-table aquifer may include sands of the Columbia, Mt. Laurel, and possibly the Englishtown formations depending on location. The confining layers in the southern part of the map area include fine-grained marine sediments of the Marshalltown, Merchantville, and Magothy formations (youngest to oldest).

Note that the schematic cross-section indicates that sands of the Magothy Formation underlie the Chesapeake and Delaware Canal. The exact depth of the Magothy Formation in the vicinity of the Canal varies with location but at the western end of the Canal the potential exists for salt-water intrusion into Magothy sands. Rasmussen and others (1958) indicated that, at the time of their study, ground-water discharge was from the Magothy into the Canal. This is probably also true today. However, extensive development of ground-water supplies near the Canal, either in the Magothy or overlying sands could reverse the prevailing flow direction in this important aquifer.

Sheets 3 and 4 of the Wilmington Area Hydrologic Map Series, No. 3, (Woodruff, 1984, 1985) to the north show the configuration of the uppermost Potomac sand rather than the overlying confining unit. Mapping the confining unit in the Chesapeake and Delaware Canal area appeared to be a more reasonable approach. The Potomac Formation is thicker, contains more sand bodies, and does not have a single, mappable upper sand. Although the Magothy sand is generally persistent it is not mappable in detail because of lack of control.

Information presented here can be used to qualitatively judge the relative vulnerability of the uppermost artesian aquifer to surface pollution and, conversely, to show where a deeper sand is most easily recharged. If an average hydraulic conductivity of the confining unit is assumed and head differences between the water-table and deeper artesian aquifers are known, then estimates of the vertical travel rate and time between the two aquifers might be made. Some limited hydraulic conductivity data are given on Sheet 1. The recharge potential of the area has been mapped in detail by Petty and others (1985). The map may also be used to approximate drilling depths to the uppermost artesian aquifer, taking into account the additional thickness of the water-table aquifer. Contour patterns on the map are not necessarily a reflection of geologic structure and caution should be exercised when making strictly geological interpretations.

REFERENCES

Petty, S., Miller, W. D., and Lunan, B. A., 1985, Potential for groundwater recharge in the Coastal Plain of northern New Castle County; Sheet 2-Chesapeake and Delaware Canal area: Delaware Geological Survey Open File Report No. 28.

Pickett, T. E., 1970, Geology of the Chesapeake and Delaware Canal area: Delaware Geological Survey Geologic Map Series No. 1.

Rasmussen, W. C., Groot, J. J., Reamer, N. H., 1958, Wells for the observation of chloride and water-levels in aquifers that cross the Chesapeake and Delaware Canal: Delaware Geological Survey Report of Investigations No. 3.

Rima, D. R., Cookerly, O. J., and Anderson, P. W., 1964, Ground-water resources of southern New Castle County, Delaware: Delaware Geological Survey Bulletin No. 11, 54 p.

Talley, J. H., 1985, Geologic cross-section of Delaware River Red Lion Creek to Killcohook National Wildlife Refuge: Delaware Geological Survey Miscellaneous Map No. 3.

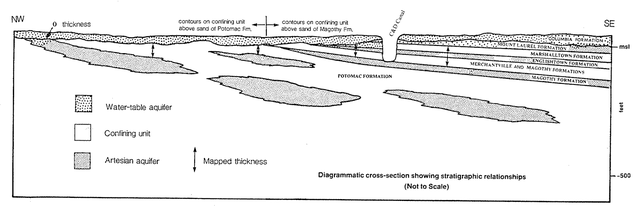
Woodruff, K. D., 1984, Geohydrology of the Wilmington Area, Delaware: Delaware Geological Survey Hydrologic Map Series, No. 3, Sheet 3 - Structural Geology (Elevation of base of sand in the upper part of the Potomac Formation).

——— 1985, Geohydrology of the Wilmington Area, Delaware: Delaware Geological Survey Hydrologic Map Series No. 3, Sheet 4 -Structural Geology (Elevation of top and isopach map of upper sandy zone, Potomac Formation).

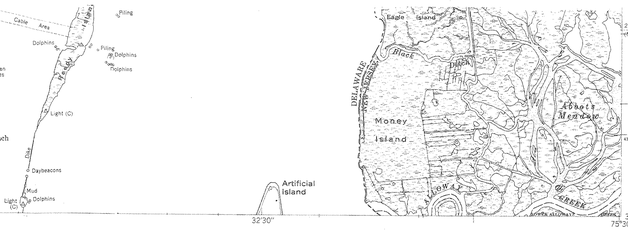
——— 1986, Geohydrology of the Chesapeake and Delaware Canal Area, Delaware: Delaware Geological Survey Hydrologic Map Series No. 6, Sheet 1 - Basic Geology.

EXPLANATION

Da44-6 — Control point
90 — Da44-6 : Well or test hole number
90 : Thickness (feet)
100 — Thickness contour (feet)
Photorevised area on base map



Diagrammatic cross-section showing stratigraphic relationships (Not to Scale)



Base Maps — USGS Topographic Division; Delaware City, Elkton, Saint Georges Quadrangles

UTM GRID AND 1970 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

THICKNESS OF CONFINING UNIT BENEATH THE WATER-TABLE AQUIFER

by

Kenneth D. Woodruff

1988

SCALE 1:24000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

TOPOGRAPHIC CONTOUR INTERVAL
East of longitude 75°45': 10 feet
West of longitude 75°45': 20 feet
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Projection and 1000-meter grid, zone 18: Universal Transverse Mercator
10,000-foot grid ticks based on Delaware coordinate system
1927 North American Datum

MAP LOCATION