STATE OF DELAWARE

DELAWARE GEOLOGICAL SURVEY

Johan J. Groot, State Geologist

BULLETIN NO. 8

WATER RESOURCES OF SUSSEX COUNTY, DELAWARE

with a section on

SALT-WATER ENCROACHMENT AT LEWES

by

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Newark, Delaware

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William C. Rasmussen
District Geologist, U. S. Geological Survey,

Richard A. Wilkens
Geologist, U. S. Geological Survey,

Robert M. Beall
Hydraulic Engineer, U. S. Geological Survey

and others

Prepared by the United States Geological Survey

in cooperation with

Delaware Geological Survey

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Plate 5. Aerial photograph of Huckleberry, Savanna, and Sugar Hill, "bays" and smaller basins north of Milton. Huckleberry bay is the large wooded oval near the center of the right margin. Savanna bay is the second largest bay, trees surrounding marsh meadow, due southwest of Huckleberry bay. Sugar Hill bay is the oval in the center near the upper margin, wooded on the west, cultivated on the east, and transected by the W-E road. These features are interpreted as sinkholes in the sandy flatlands formed by removal of material by subterranean drainage.

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WATER RESOURCES OF SUSSEX COUNTY, DELAWARE

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ABSTRACT

Sussex County is in the Atlantic Coastal Plain. Its relatively flat, featureless topography is characterized by two terrace-like surfaces; the lower one rises from sea level to about 40 feet above sea level, and the higher one rises inland from 40 to about 60 feet above sea level. Peculiar landforms of low relief, broad ovals, similar to the "Carolina bays," and to the "New Jersey basins" are common on the sandy flat divides in Sussex County. Hydrologically, they are sites of much ground-water discharge, by evapotranspiration, from meadow and marsh of lush vegetation.

The geology of the county is structurally simple. It is characterized by a sedimentary wedge which thickens southeastward from 3,500 feet to more than 8,000 feet. The strata form a homocline which dips southeastward at rates ranging from 10 to 70 feet per mile. Above the Paleozoic(?) and Precambrian crystalline basement complex, are sediments of the Triassic(?), Cretaceous, Tertiary, and Quaternary systems. Only the uppermost few hundred feet of this column of sediments provide water to wells. The most important aquifer consists of sand and silty sand of the Pleistocene series and the Pliocene(?) series which fill a valley system carved on a now buried surface of Miocene rocks. The Miocene rocks are relatively unconsolidated clays and sands and contain several artesian aquifers which as of 1959 have not been used extensively.

Streamflow records from four gaging stations in the county and two others nearby, and base-flow measurements from eight additional sites in 1955-58 provide the basis for the surface-water analyses presented in this report. From these records it has been possible to construct curves for each of the seven major drainage basins, showing flow duration, low-flow frequency, average discharge, storage requirement, and flood frequency.

In addition, chemical analyses of water from 20 stream sites indicate that the surface waters are low in dissolved solids and soft, but have a slight

to excessive iron content. The pH ranges from 5.2 to 6.7. The average daily use of surface water in Sussex County is estimated at 11 mgd (million gallons per day) based on 1957 data.

Sedimentary and hydrologic analyses of 32 samples taken from outcrops indicate that the surficial sediments are medium-grained sands, having an average porosity about 40 percent and an average coefficient of permeability of 420 gallons per day per square foot. Such material is capable of a high infiltration rate.

Analyses of 142 water samples from 97 wells reveal that the ground waters are, in general, low in dissolved-solids content, soft to slightly hard, low in chloride, and that troublesome amounts of iron are present in some wells, but absent in others. The pH ranged from 3.4 to 9.9.

Nearly all of the ground water used in the county is obtained from four principal aquifers: about 74 percent is obtained from the Beaverdam sand and the Brandywine formation which constitute the shallow water-table aquifers of the Pleistocene-Pliocene(?) series; an additional 20 percent is withdrawn from the Manokin aquifer of the Miocene series; and the remaining 6 percent is withdrawn from the Pocomoke and Frederica aquifers, also of the Miocene series.

Total use of ground water was about 19.1 mgd in 1957. Industrial use accounted for 11.5 mgd; municipal supply about 4.0 mgd; rural domestic uses about 2 mgd; farm-stock uses about 1.1 mgd; and irrigation about 0.4 mgd.

A special investigation of salt-water contamination was made at Lewes. The city well field was contaminated by salt water during World War II, owing to heavy pumping, coincident with the dredging of a canal half a mile away. A new well field was constructed 1.5 miles inland in 1945 and expanded in 1954. Well-field tests made in both those years indicate high potential capacity for the field. At the old well field, in the period 1945 to 1954, pumping was moderate to small and the quality of water returned to normal. This indicated that the salt-water front had retreated due to fresh-water recharge.

It is estimated that at optimum use no more than 1 mgd per square mile could be taken from ground and surface sources. It is very unlikely, however, that such a large quantity, and the requisite network of wells, pipes and check dams, will ever be realized. However, it is concluded that there are large quantities of water readily available for development in many parts of Sussex County.

Sussex County, Del. has adequate, and in places, abundant water resources. During wet seasons water is in excess, both in the lowland areas, and on the broad, swampy divides, so that extensive drainage is necessary. In a few places, malodorous, hard, or iron-containing waters present problems in treatment. Beneath a narrow strip along the shores of the Atlantic Ocean and Delaware Bay, some salt-water encroachment has occurred. In the county-at-large, however, water of quality suitable for most purposes can be developed from streams or from wells in sufficient quantity for agricultural, municipal, or industrial supply.

INTRODUCTION

PURPOSE AND SCOPE

Sussex County is predominantly rural, but in recent years there has been a trend toward manufacturing, and a corresponding growth of the towns. Moreover, the shores facing the Atlantic Ocean have become a beach vacationland. In recent years, too, the farmers of Sussex County have begun to irrigate from wells and ponds, as a supplement to the abundant, yet irregular, rainfall. For many years, the high water table in much of Sussex County has made drainage a continuing concern to farmers, road engineers, and soil scientists.

Interest in irrigation, increased demand for water by the growing towns and developing industry, intrusion of salt water at Lewes, Rehoboth, and other coastal communities, problems of pollution abatement, and the effect of the farm drainage program, have all created a need for the greater understanding of the water resources of Sussex County.

The purpose of this report is to present an evaluation of the water resources of Sussex County with respect to the occurrence, magnitude of supplies, quality, and utilization of both surface and underground waters. Climate is considered in relation to surface runoff and to the recharge and discharge of ground water. The geology of the county is considered in some detail, especially as it pertains to the flow of surface water; the infiltration, retention, and discharge of ground water; and the protective cover which confines some beds containing fresh ground water from pollution by waste products or from contamination by salty marine water.

The surface-water resources have been evaluated by the operation of seven gaging stations in and near Sussex County and by the measurement of base-flow discharge at eight other selected sites. Although they are of relatively short duration, the records for six gaging stations have been analyzed and the results expressed in terms of flow duration, low-flow frequency, storage requirements, and flood frequency. Most of the results have been adjusted to a long-term base period by correlation with records in nearby States. The available fresh-water resources are evaluated by drainage basins and the chemical quality of water is considered briefly.

The ground-water investigation included the systematic inventory of 1,203 water wells used for agricultural, industrial, domestic, and public supply. Data on these wells are summarized in table 26 at the end of this report and the locations of the wells are shown in plates 1, 2, 3, and 4. It is estimated that these comprise about 10 percent of the wells in the county in representative geographic distributions. A greater effort was made to get complete coverage on all high-capacity wells and on all drilled wells for which a well log was obtainable. A total of 149 well logs, compiled from records of well drillers, are listed in table 27 at the end of this report.

The chemical quality of the ground water is considered in relation to the geology, by area and geologic formation. Eleven water samples were taken for complete analysis and 18 for partial analysis as a part of this investigation. In addition, 111 other water analyses were tabulated, some from published sources, but others are published here for the first time.

The ground-water conditions in the vicinity of each town in Sussex County are described with respect to rate of use in the period 1955-57 and to the foreseeable need.

The investigation of the water resources of Sussex County was made by the U. S. Geological Survey, Water Resources Division, in cooperation with the Delaware Geological Survey and the city of Lewes, Del. The investigation of the geology and ground-water resources was made under the direction of A. N. Sayre, former chief, Branch of Ground Water, and H. C. Barksdale, branch area chief. The investigation of the surface-water resources was under the direction of J. V. B. Wells, chief, Branch of Surface Water, and D. S. Wallace, branch area chief. It was under the immediate supervision of J. W. Odell, District Engineer. Johan J. Groot, State Geologist, directed the state cooperation.

O. J. Coskery, engineering aid, Ground Water Branch, collected the data on many of the wells described in this report, and D. H. Boggess, engineering technician, prepared the section on utilization of ground water.

LOCATION AND GENERAL FEATURES OF THE AREA

Sussex County is the southernmost and largest of the three counties in Delaware. It is situated on the flat, almost featureless coastal plain bordering the Atlantic Ocean. Its position relative to the principal surrounding physiographic features is shown on the block diagram of the middle Atlantic area in figure 1. Erosion of the rocks of the Piedmont, the Triassic lowlands, the Blue Ridge, the Appalachian Mountains and Appalachian Plateau, has provided the gravels, sands, silts, and clays which mantle the surface of Sussex County and make up the underground deposits to a depth of several thousand feet. It is estimated that the area which is now Sussex County has been on or near the border of the land and the sea for many millions of years, because the sediments which underlie it are in part continental and in part marine.

Sussex County lies between long. 75° and 75°43' W. and between lat. 38°27' and 38°58' N. on the east-central part of the Delmarva Peninsula. It is bounded on the north by Kent County, Del.; the Mispillion River forming a considerable part of the boundary; on the northeast by Delaware Bay; on the east by the Atlantic Ocean; and on the south and west by the State of Maryland. According to the United States Census of 1940 the land area of the county is approximately 946 square miles or 605,440 acres.

In 1950 the total population of Sussex County was 61,336 persons and the density of population was 64.8 people per square mile. In the 7 years following the 1950 census the population of the county increased approximately 12 percent to an estimated 68,500 persons in 1957. About 19 percent of the population, or approximately 13,000 persons, live in urban communities and the balance live in rural areas. During the summer months vacationists

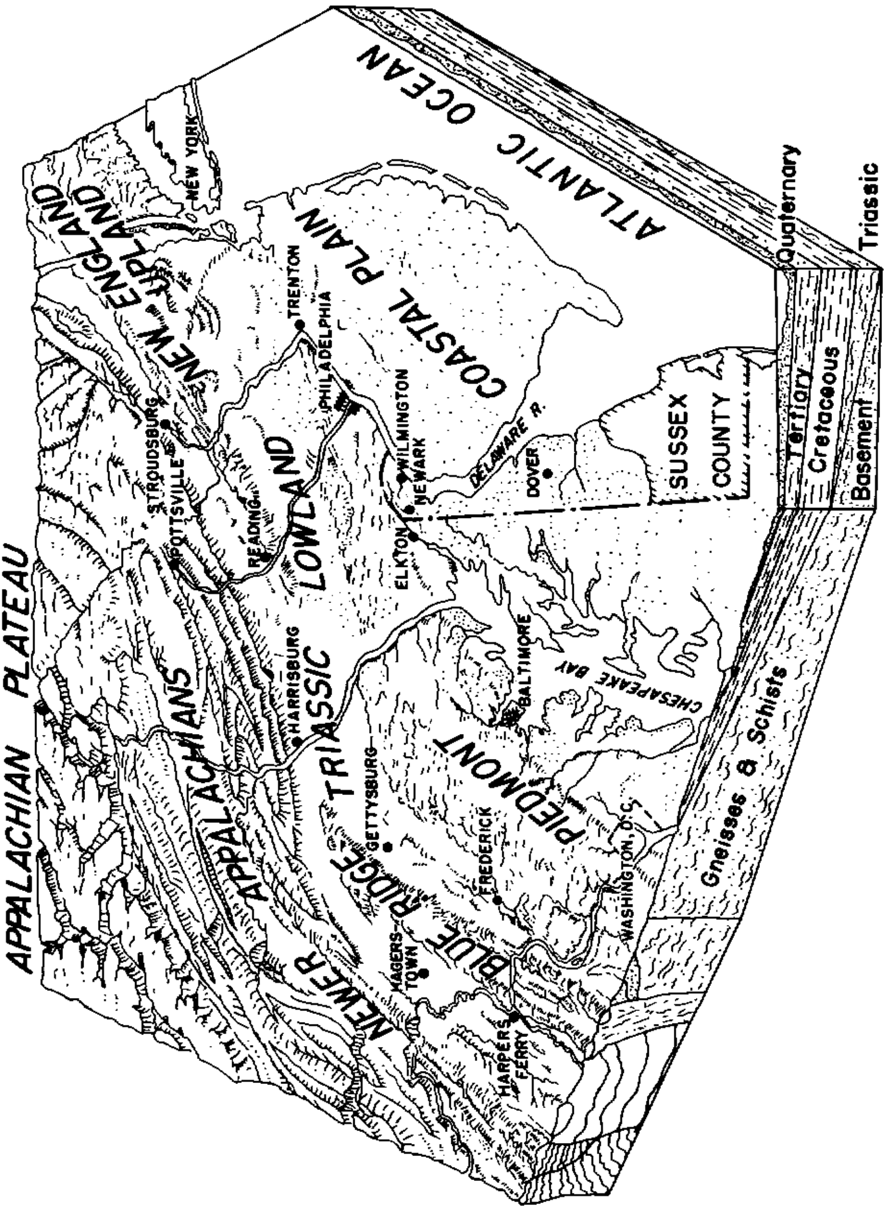

Figure 1. Block diagram showing the regional geomorphology.

(Adapted from Raisz in Stephenson, Cooke, and Mansfield, 1932).

from metropolitan areas outside the county, temporarily increase the population to nearly twice the number of permanent inhabitants.

Approximately 63 percent of the land area of the county is in farms, having an average size of 118 acres. The total value of all farm products sold in the county in 1957 was about 79.2 million dollars (McDaniel, 1958). The sale of livestock products amounted to 65 million dollars, including 59.0 million for poultry products, 4.1 million for dairy products, and 1.9 million for other livestock products. The remainder, or 14.2 million dollars, represents the value of crop sales in 1957. Field crops accounted for about 7.2 million dollars, and vegetables and fruit for 5.1 million dollars. In order of greatest acreage planted, corn, soy beans, and hay were the leading field crops. The leading vegetable in acreage planted was green lima beans.

The major industries of the county include: (1) food processing plants at Georgetown, Rehoboth, Bridgeville, and near Milton, (2) fertilizer plants on the Lewes-Georgetown road, and in and near the town of Laurel, (3) nylon manufacturing plants in the Seaford area, and (4) ice manufacturing and cold storage plants in Georgetown, Dagsboro, Rehoboth, and Bridgeville.

Other commercial enterprises of importance in the county include motels and restaurants located along the major highways of the county and the resort facilities at the Delaware Bay and Atlantic shore area of Lewes, Rehoboth, Dewey Beach, Bethany Beach, and Fenwick Island.

The navigable waterways, principally four bays, but also small streams and fresh-water ponds, provide areas for operation of water-borne commerce and industry. Small shallow-draft boats engaged in commercial fishing and pleasure trips, gain access to points on the Delaware Bay and the entire length of the eastern border of the county through two canals. The longest is the Lewes-Rehoboth canal which is maintained over a distance of about 10 miles and at a depth of about 5 feet. Somewhat larger ocean-going commercial fishing and pleasure craft use the protected bay-harbors as bases for their trips during the fishing periods.

Woodlands totaling 47.5 percent of the total land area of the county (State Forester, 1955), provide raw material for several industries dependent on forest products. Excelsior which is used in packaging is one of the important forest products. Wood pulp is used in the manufacture of paper or paperboard. The timber resources provide lumber for homes, farm buildings, factories, and warehouses.

PREVIOUS WORK

The first published report on the geology of Sussex County was one by Chester (1885), in which he discussed the sands and gravels of southern Delaware. He correlated sand and gravel formations in southern Delaware with sands and gravels of northern Delaware which had been described in a paper published the previous year (Chester, 1884). He described white sands in Sussex County which he called Estuary Sands because he believed they were formed under estuarine conditions, contemporaneous with fluviatile deposition farther north.

Woolman (1894) gave the first description of the subsurface deposits of Sussex County, in a log of an artesian well drilled to a depth of 400 feet at the old quarantine station, now included in the Fort Miles army post. He also studied and described the lithology and paleontology of a well drilled to a depth of 1,080 feet at Lewes in 1898 (Woolman, 1899).

Darton (1896, 1905) described the artesian well prospects of Delaware and presented geologic cross sections which passed through Milford and Lewes. Mathews (Clark, Mathews, and Berry, 1918, p. 485-489) gave a brief description of ground water in Sussex County in relation to geology.

A study of municipal water supplies of the State of Delaware was presented by Weaver (1928) as a thesis at the University of Delaware. Although the paper is primarily concerned with the engineering aspects and the chemical character of the water supplies, it reported the yields and depths of several municipal wells in Sussex County.

Eastman and Beckett, (1931) reporting on 30 public water supplies and a few private supplies, described the supplies of several towns in Sussex County. As in Weaver's thesis, the emphasis is on engineering aspects; however, a table of chemical analyses is included.

A guidebook (Stephenson, Cooke, and Mansfield, 1932), the Chesapeake Bay region, prepared for the Sixteenth International Geological Congress presented a discussion and a geologic map which includes Delaware.

A paper on the fauna of the Pleistocene series of the southern Atlantic Coastal Plain included a study of fossils from four locations in Sussex County (Richards, 1936). In 1945, Richards (1945a, 1945b) described the stratigraphy of the Atlantic Coastal Plain presenting well logs from Lewes and Bridgeville. A geologic study of Delaware by Richards was published in the book "Delaware, a History of the First State" (1947b). In 1948 a revision of Richards' earlier work on the Coastal Plain of Delaware was published with additional logs from Seaford, Milford, and Lewes (Richards, 1948).

The first systematic records of ground-water levels were begun in 1944 by the U. S. Geological Survey (DeBuchananne, 1947) at Lewes, and continued until 1949 (DeBuchananne, 1948, 1949; Birdsall, 1951a, 1951b, 1952). In 1950 the first State-wide network of observation wells was established and six wells in Sussex County were measured at monthly intervals (Andreasen, 1953; Marine and Rasmussen, 1954; Marine, 1955; Boggess and Coskery, 1955; Coskery and Boggess, 1956; Coskery 1956; and Coskery and Rasmussen, 1958). Streamflow records for this area are published annually by the U. S. Geological Survey in the Water-Supply Paper series entitled "Surface-water supply of the United States, Part 1" (Part 1B after 1950).

Spangler and Peterson (1950) in a paper on the Coastal Plain of New Jersey, Delaware, Maryland, and Virginia presented geologic structure and isopachous maps of the principal stratigraphic units.

In 1953 a report (Rasmussen and Haigler) was published concerning the effect of the farm drainage program in Sussex County upon roads and a problem in subdrainage of a road near Laurel. Water analyses from wells at Milford and Seaford were published in 1953 (Lohr, and others, p. 5, 8), and republished, along with analyses from wells at Lewes in 1954 (Lohr and Love, p. 85-87, 89) by the U. S. Geological Survey.

A preliminary report on the geology and ground-water resources of Delaware (Marine and Rasmussen) was published by the Delaware Geological Survey in 1955. In the same year estimates were made of the magnitude of the ground-water supply in Delaware (Rasmussen, 1955) stressing the importance of the Pleistocene and Pliocene(?) aquifer in Sussex County.

In 1958 the Delaware Geological Survey published a report containing a geologic cross-section of the State (Rasmussen, Groot and Depman). A stratigraphic interpretation of two deep wells, one at Milford and one at Bridgeville, was included in the cross-section.

METHODS

Almost 97 percent of the wells in Sussex County are less than 100 feet deep. Therefore, knowledge of the geology of the deeper deposits is derived chiefly from regional considerations, based on six deep wells in the county, and three deep wells in nearby locations on the Eastern Shore of Maryland (Anderson, and others, 1948).

The near-surface formations of the Pleistocene series and Recent series, have been studied in all exposures that could be found in 1955-56. Outcrops shown on the well maps, plates 1 to 5, are designated by the capital letter within each lettered quadrangle; for example, the State gravel pits 4 miles east of Georgetown are designated by the capital letters A and B in the Og quadrangle on plate 1. Grain-size analyses and tests of hydrologic properties of samples from the surface exposures are reported in tables 14, 15, and 16 under the appropriate symbol. Outcrop descriptions are on file at the District office, U. S. Geological Survey, and at the Delaware Geological Survey, both in Newark, Del.

To obtain detailed information on the shallow subsurface materials, 32 test holes, totaling 2, 147 feet in depth, were augered with a mobile power auger.

These and other subsurface data were analyzed by means of 153 graphic strip logs and 54 sand logs (grain materials from each sampled depth cemented to a strip log). Tentative correlations with subdivisions of the Pleistocene and Miocene series adopted for the eastern Shore of Maryland (Rasmussen and Slaughter, 1955), were made on the basis of lithology and stratigraphic position. Because no fossils were found in the Pleistocene series, the lithologic correlation rests upon color, texture, and composition.

In order to understand the petrographic origin of the Pleistocene series, and as a possible additional aid in subdivision and correlation the heavy minerals of the sands of 34 samples from 11 outcrop localities were separated out, mounted in canada balsam on slides, and identified with the petrographic microscope. These data are on file with the Delaware Geological Survey, University of Delaware.

Size analyses were made of a quartered fraction of each of the 34 samples studied petrographically and on 32 more samples from some of the same and six additional localities. The grain size distributions were plotted on arithmetic probability paper, and measures of the average size, dispersion or sorting, and asymmetry of the distribution, were computed. The 32 samples were also tested for porosity and permeability to evaluate storage and infiltration possibilities in the shallow earth materials.

The coefficients of storage and permeability were estimated from a controlled well-field test using nine large-capacity wells of the town of Lewes. The hydraulics of the aquifer of Pleistocene age in the vicinity of Lewes is shown to be favorable for the development of additional large-capacity wells.

The problem of salt-water contamination at Lewes and Rehoboth was reviewed and the extent of salt-water intrusion along the beach and bay shores was estimated in a general way, by means of chemical analyses from specific wells.

ACKNOWLEDGEMENTS

The authors wish to express their appreciation to Cornelius C. Marshall for his efforts on behalf of the cooperative study of the Lewes area in 1943-44, and to Mr. Bayard Coulter, secretary of the Board of Public Works for the city of Lewes, and Gardner and Sterling, consulting engineers, Salisbury, Md., for their help in supplying information on the water facilities of Lewes in 1954-55. Mr. Roy Simpler of the office of the Post Engineer, Fort Miles, Del., provided information on the wells supplying the fort. Assistance has also been rendered by many other individuals and organizations, including water-works superintendents, plant operators, well drillers, and many domestic well owners in providing much of the well data that is basic to this report. Without such help and cooperation, the investigation would have been extremely limited in scope.

WELL-NUMBERING SYSTEM

Wells are identified by a specific letter-number designation. In this system the State of Delaware is divided into 5-minute quadrangles of latitude and longitude, lettered from north to south by capital letters from A to R, and west to east by lowercase letters from a to j. Each quadrangle is thus indicated by two letters, the capital letter being given first. Each 5-minute quadrangle is further subdivided into 25 one-minute quadrangles. These 1-minute quadrangles are numbered from west to east by five consecutive digits from 1 to 5 in the units place, and north to south by five consecutive digits from 1 to 5 in the tens place. This 2-digit quadrangle designation is followed by a hyphen. In each 1-minute quadrangle wells are numbered consecutively in the order that they were scheduled. The well locations are shown on the four quadrant maps, plates 1, 2, 3, and 4, and in insets designated thereon. The explanation on the plates illustrates graphically the number system. For example, well Mf21-2 is shown on plate 1 in the Mf 5-minute quadrangle. It lies in the 1-minute quadrangle No. 21, and was the first well scheduled in this small quadrangle. The descriptive information for each well is summarized in table 26.

GEOGRAPHY

CLIMATE

Sussex County is at the northern edge of a climatic zone which is damp and temperate, and precipitation is equally distributed throughout the year. It has a long, hot summer, of which the warmest month is July, having an average minimum temperature of 69.4°F. Climatological data have been recorded at eight stations located at or near Bridgeville, Georgetown, Lewes, Milford, Selbyville, Millsboro, Laurel, and Seaford, although only the first five were operative in 1957. Information about the specific locations and periods of history is contained in the U. S. Weather Bureau publication "Substation History, Maryland and Delaware" (1956).

Precipitation and temperature have been recorded during 67 years of record at Bridgeville (1891 - 1957), and 73 years of record at Milford (1858, 1869-1878, 1893-1944, 1948-1957). The highest annual precipitation was 66.49 inches recorded at Bridgeville in 1948 (measurements were incomplete at Milford that year). The lowest annual precipitation was 21.06 inches at Milford in 1858 and 25.72 inches at Bridgeville in 1930. The highest temperature recorded was 105°F at both Bridgeville and Milford on July 10, 1936. The lowest temperature recorded was -14°F at Bridgeville, Jan. 11, 1942. Figure 2 shows the relationship between summer and winter temperatures, the periods of high and low water table, and the periods of excessive rainfall and drought. The fluctuations in water level and stream flow are discussed in later sections.

Observations of evaporation and wind movement have been reported by the U. S. Geological Survey at Salisbury, Md., 7 miles south of the Sussex County line, for a period of 2 1/2 years, from January 1952 through July 1954. Wind and evaporation observations were made at the University farm, 5 miles southwest of Georgetown, Del., for several months in the years 1954 to 1957. During the years of continuous record at Salisbury, Md., 1952 to 1954, the maximum monthly evaporation was 9.44 inches in July 1953, and the average monthly evaporation during the hottest months was 8.20 inches. The minimum monthly evaporation was 1.21 inches in January 1954, and the average monthly evaporation during the three coldest winter months was 1.62 inches.

DRAINAGE

Natural drainage in Sussex County is divided by a low, poorly drained, and often swampy ridge, trending generally northwestward from Selbyville to Georgetown and Staytonville. This divide area separates drainage into

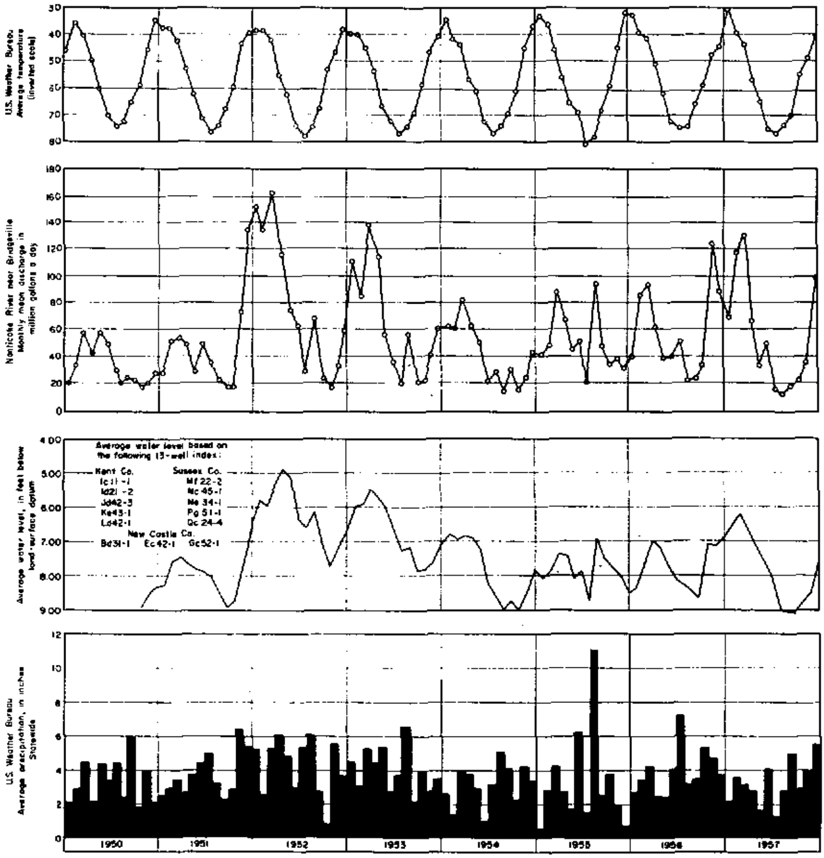

Figure 2. Temperature, precipitation, stream flow, and water levels in Sussex County, 1950 to 1957.

Chesapeake Bay to the southwest from drainage eastward into Delaware Bay and the Atlantic Ocean.

The county can be considered as encompassing at least seven principal drainage areas (pl. 8). The largest of these, the Nanticoke River basin, includes about 40 percent of the area of the county. This river system drains southwestward to Chesapeake Bay; the river is navigable to Seaford and Laurel. Marshy Hope Creek, a principal tributary of the Nanticoke, drains a relatively small and thinly populated area in the northwest portion of the county. Its headwaters are in Kent County and the major part of the basin is in Maryland where it joins the Nanticoke. Two other tributaries of the Nanticoke, Gravelly Branch and Deep Creek, originate in poorly drained areas near Redden and Georgetown. Broad Creek (on some maps shown as Laurel River) drains a large area of southwestern Sussex County and is tributary to the Nanticoke about 2 miles upstream from the State line.

The second largest drainage basin is that of Indian River (including Indian River and Rehoboth Bays) which, above Indian River Inlet, includes almost one quarter of the county area. The principal streams in this basin are the Rehoboth Bay tributaries, Love and Herring Creeks, and the Indian River Bay tributaries, Indian River, and Pepper, Vines, and White Creeks. There are coastal interconnections in the tidal parts of the basin through the Lewes and Rehoboth Canal to the north and through the Assawoman Canal to the south. There are also drainage ditch interconnections in the southern headwater area in which the Pocomoke River also originates.

The several streams of the northeast quarter of Sussex County are somewhat arbitrarily grouped into two basins: Mispillion River and Broadkill River. The major streams of the Mispillion River basin are the Mispillion River and Cedar Creek which are in separate, but parallel, subbasins having a common outlet. To the south of this system lies the more involved Broadkill River basin in which the coastal parts of Primehook Creek, Broadkill River, Old Mill Creek, and Canary Creek are ditched or channeled to Roosevelt inlet.

About 50 square miles in the southeastern corner of the county is drained principally by Miller, Dirickson, Roy, and Greys Creeks, into the Assawoman Bay. In a similar sized area on the south-central border of the county are the headwaters of the Pocomoke River basin which drain southward through Maryland to Chesapeake Bay. A very small part of the southern border area in the vicinity of Delmar is in the Wicomico River basin which drains southwestward to Chesapeake Bay.

A total of 40,204 acres of the county is described as wetland in the inventory of the State designed to accomplish 100-percent coverage of all important wetland areas for use by wildlife. These wetlands are the feeding grounds of the greater snow goose, a tremendous number of willets and rails, and a great variety of shore birds and herons.

In the past 10 years projects of the Soil Conservation Service have done much to drain and clear water-logged land in Sussex County. This activity includes, through 1957, construction of 977 miles of farm drainage ditches and clearing of 2,037 acres of land. Other work includes soil leveling, obstruction removal, improvement of old ditches, installation of culverts, and the dredging of farm ponds to provide water for irrigation. Under the Watershed Protection Program (Public Law 566), an improvement project was approved in June 1956, for 4,523 acres of the Bear Hole "watershed" in the headwaters of Dirickson Creek between Frankford and Selbyville.

GEOMORPHOLOGY

Geomorphology is a study of landforms and of the geologic processes which develop them. The distribution of marshes, swamps, and bays in the west and south sections of Sussex County seems to suggest a control imposed by channels of Pleistocene or earlier age. Basins and "bays" on the surface of these sediments indicate the recent history of interaction of soil, water, and atmosphere, to form sinkholes in the sandy flat lands (Rasmussen, 1958). The occurrence, distribution, and relative age of the bar and dune features suggest the recent modifications of the land surface by the action of ocean water and the wind. A study of stream drainage patterns and gradients indicates the temporary stability of the coastal plain deposits in relation to the underlying rocks. The presence of terraces is evidence of periods of high water stages under fluvial or marine environments.

Marshes, Swamps, and Bays

Low slopes, moderate rainfall, and poor drainage function to maintain marshes, swamps, and bays in many large and small drainage courses. These poorly drained areas provide a habitat for extensive wildlife (U. S. Fish and Wildlife Service, 1953). The distinction between marshes and swamps is made on the basis of the type of vegetation. The marshes contain varieties of grasses and the swamps contain trees or shrubs such as gum, ash, willow, or alder.

Marshes cover large areas along the shores of Delaware Bay and the Atlantic Ocean. Because they are flooded frequently by saline or brackish water the marshes are described as "salt meadows." Although the soil in these areas is water-logged most of the time, it is covered by water only during storms or other higher-than-average tides. The vegetation is predominantly saltmeadow cordgrass but includes also patches of saltgrass, and, in the fresher parts, threesquare and fleabanes. Practically all of the marsh area of Sussex County has been ditched to lower the water table and eliminate ponds of standing water which serve as breeding areas for mosquitoes.

Swamp areas in Sussex County are widely scattered. In the central part of the county a large area is locally called "Ellendale Swamp." Another large swamp in the southern part, west of Selbyville, is called Cypress Swamp, Cedar Swamp, or Burnt Swamp. The swamp areas are often covered with as much as a foot of water. The vegetation consists of trees such as sweet gum, red maple, ash, and willow.

Prominent bays in Sussex County are located on the eastern border along the Atlantic shore. They are Rehoboth Bay, Indian River Bay, and Assawoman Bay. Streams flowing eastward bring fresh surface water into the bays. Sea water enters from the Atlantic Ocean through inlets, and mixing of these waters causes the bay water to be brackish.

"Basins" and "Bays"

In addition to the popular use of the term basins to refer to the drainage area of rivers and creeks, and to the use of the term bays to refer to large bodies of water connected to the sea, there are small irregular undrained depressions or hollows which geologists call "basins," and there are somewhat larger, oval, oriented depressions or hollows, similar to the "Carolina bays," which will be referred to here as "bays" in quotation marks.

"Bays" and "basins" occur in the surficial sediments throughout the county on the broad interstream divides. They have been recognized on topographic maps, aerial photographs, and by observations in the field. Their diameters range from about 150 to 3,500 feet. The relief, from the center of the depression to the rim, appears to vary with the size of the feature, the smaller basins having a relief of about 5 feet and the larger basins 10 to 23 feet. The "bays" and "basins" are found at all altitudes, from those on coastal marshes at sea level, to those on the terraces at 60 or more feet above sea level. Three large "bays" and numerous smaller "bays" and "basins" near Milton are shown in the aerial photograph, plate 5. This group is somewhat better developed and more concentrated than those in most other areas in the county.

Many hypotheses of origin have been applied to "bays" and "basins:" showers of meteors, rotating currents, stranded icebergs, frost-thaw lakes, and others. Studies made in Sussex County, and elsewhere, indicate that the origin of these features is related to the movement of shallow, unconfined ground water. The differential removal of colloidal and fine clay-sized material by slowly percolating ground waters beneath the initial low spots on a newly-formed sedimentary plain is believed to cause the initial development of sinkholes in sandy flatlands. Those sinkholes situated most advantageously with respect to the water-table, as it fluctuates during the wet and dry seasons, enlarge and sometimes capture smaller sinkholes. Presumably, some of the depressions contain water all, or almost all, of the year. These are gradually modified by wind and wave from irregular depressions to well-shaped ovals, approaching perfect ellipses; their long axes oriented in a northwestern direction. Thus, the "basins" become "bays" in a compound origin.

Bars and Dunes

Landforms along the coastline of Sussex County consist principally of sand features, which are prominent on aerial photographs and maps of the county. These features include bay-mouth bars, spits, and shoreline dunes.

Sand bars form the shore of Sussex County along the Atlantic Ocean and Delaware Bay. The bars are land-tied and extend across Rehoboth Bay, Indian River Bay, and Assawoman Bay. The bar at Indian River is pierced by the Indian River Inlet through which the tide moves in its periodic surge. The inlet, the principal connection between the waters of the bay and the ocean, is a popular fishing site and provides a channel for small fishing and pleasure boats.

Cape Henlopen, the prominent point of land protruding into Delaware Bay near Lewes, is a typical feature of bay and ocean environment. It was formed of sand that was deposited by the circulating bay and shore currents in a manner somewhat similar to longshore bars. These land-tied sand bars are called spits. The Cape Henlopen spit forms a natural eastern protection for the harbor at Lewes.

Dunes in Sussex County are known in two locations, along the eastern or Atlantic Ocean border of the county on barrier islands, and along the south bank of the Nanticoke River in the southeastern part of the county near Seaford.

Most of the dunes along the Atlantic coast are typical barrier-beach features of the modern shoreline. They lie at altitudes from sea level to about 25 feet above sea level. Scattered interdune areas near sea level at Ft. Miles were observed to contain thin black sandy deposits in which remnants of tree stumps or roots are found. These areas were formerly swamps on which wind-blown sand has accumulated to form dunes.

Terraces

The surface of Sussex County is beveled by at least two, and perhaps as many as five gently sloping surfaces, designated terraces. The country is so flat that the boundaries of these surfaces are difficult to observe in the field. The boundaries are marked by low scarps, having relief of the order of 5 feet per 100 feet, or by chains of low sand ridges, which are stabilized, and commonly are obscured by vegetation. On topographic maps of a 10-foot interval, the most prominent scarp is indicated only by a gentle gradient between the 20-foot and 30-foot contour lines. On aerial photographs, however, evidence of a terrace a few feet above sea level is apparent in some places.

Question has arisen among geologists as to whether the terraces were formed under marine conditions during higher states of the sea, or by large rivers, debouching from the ice front of the Pleistocene glaciers. In favor of the marine interpretation is the observation, challenged by some, that the similar terraces extend along the Atlantic Coastal Plain from Long Island to the Florida peninsula. Of those terraces that may exist in Sussex County, the following names and range in altitudes above sea level have been given (Cook, 1930): Silver Bluff, 0 to 6 feet; Princess Anne, 6 to 15 feet; Pamlico, 15 to 25 feet; Talbot, 25 to 40 feet; and Penholoway, 40 to 70 feet.

OUTLINE OF GEOLOGY

The geology of Sussex County appears very simple to the casual observer. Loose sand and silt, and peaty clay compose the surficial materials. Only when the subsurface materials are studied by means of well logs and drilling samples does the geologic picture emerge. The facts and possibilities are briefly sketched in the following outline of the geology, as a necessary framework for the discussion of the flow of surface water and the occurrence of ground water.

STRUCTURE AND STRATIGRAPHY

The sedimentary strata that underlie Sussex County lie on a sloping hard rock floor which lies from about 4,000 to more than 8,000 feet below land surface. A vertical cross-section through sedimentary material and the underlying crystalline basement, showing the regional structure, is presented in plate 6. Rocks similar to those composing the basement are exposed in the hills of the Piedmont Plateau around Wilmington, Del., Baltimore, Md., and Washington, D. C. The surface of this basement complex slopes gently southeastward toward the Atlantic Ocean at an average rate of approximately 60 feet per mile. No well in Sussex County has penetrated to a depth great enough to reach the basement, but two oil-test wells on the Eastern Shore of Maryland, a few miles south of the Sussex County line, intersect the basement more than a mile below land surface. Apparently, the basement surface beneath Sussex County lies near the center of a regional depression, the sides of which rise gently northeastward toward New Jersey and southwestward toward the Cape Fear Arch of the Carolinas.

Seismic refraction studies along the Coastal Plain suggest that the basement complex beneath Sussex County consists of crystalline rocks, probably of Precambrian or Paleozoic age. In addition, sediments of presumed Triassic age are believed to form part of the basement complex of Sussex County, owing to the tentative identification of 120 feet of such material in the two oil-test wells on the Eastern Shore of Maryland (Anderson, and others, 1948).

The rocks overlying the basement complex are unconsolidated sediments which lie in layers upon the sloping basement. Generally, the thickness of the unconsolidated layers increases southeastward, in the direction of regional dip, forming a series of wedge-shaped strata. This homoclinal geologic structure predominates throughout the subsurface of Sussex County. Regional structural relationships of the rocks of New Jersey, Pennsylvania, and Maryland, are shown in the block diagram of figure 1.

Sediments which have been identified as Cretaceous in age were encountered near Bridgeville in oil-test wells, Od23-1 and Od23-2, at a depth of about 1,330 feet. It is thought that the depth to the top of the Cretaceous ranges from 1,000 feet below sea level in northwestern Sussex County to 2,100 feet below sea level beneath Fenwick Island in southeastern Sussex County. As shown in the geologic cross-section (plate 6), the Cretaceous system ranges in thickness from about 2,000 feet on the west to almost 6,000 feet on the east. The intake area for water in the sands in the Cretaceous system comprises a strip a few miles wide, extending east from the Fall Line and traversing a belt from Washington, D. C., through Baltimore, Md., Wilmington, Del., and Camden, N. J., lying in general, 40 miles updip from

Sussex County. Additional water enters the sands of the Cretaceous system by leakage from overlying beds.

The Tertiary system unconformably overlies the Cretaceous system. In Delaware, the Paleocene, Eocene, Miocene, and Pliocene(?) series have been identified, and the Oligocene series is regarded as absent.

The Paleocene series has been identified in well Od23-1 on the basis of Foraminifera of Midway age (Richards, 1945a, p. 900). It forms a marine unit believed to be about 200 feet thick, and to underlie the entire county at a depth ranging from about 600 feet below msl on the northwest, to about 1,800 feet below msl on the southeast. It consists of greensand and shale, which are possibly equivalent to the Brightseat formation of Maryland (Bennett and Collins, 1952) and the Hornerstown marl of New Jersey.

The Eocene series overlies the Paleocene series conformably. It has been reached and identified, on the basis of microfossils, in three wells in Sussex County, at Seaford, Milford, and the oil test (Od23-1) near Bridgeville. It was possibly also reached in the old deep well at Lewes (Woolman, 1899) although the science of micropaleontology was not sufficiently advanced at that time for recognition of the upper Eocene. Although the data are meager, on the interpretation of plate 6, Eocene rocks appear to range in thickness from 100 to 400 feet.

Gray sediments of the Miocene series overlie the green sediments of the Eocene series unconformably because during the Oligocene epoch, which intervened between the deposition of the two, there was either nondeposition, or sediments that were deposited were later eroded. In Kent County, Del. the Miocene sediments overlap the Piney Point formation of late Eocene age.

The unconsolidated rocks of the Miocene series in Sussex County have been divided into four formations: the Calvert, Choptank, and St. Marys formations; and the Cohansey sand (Miocene?). The Calvert, Choptank, and St. Marys formations of the Chesapeake group of Maryland (Rasmussen and Slaughter, 1957) are considered on the basis of lithology and stratigraphic position to be equivalent to the Kirkwood formation of New Jersey.

The Cohansey sand was first defined in New Jersey by Kummel and Knapp (1904, p. 32), for exposures of a light-colored medium to coarse quartz sand, containing layers of clay up to 24 feet in thickness. Richards (1956, p. 86) says that the Cohansey sand in New Jersey is as much as 250 feet thick down dip from the outcrop. The absence of marine fossils and the presence of lignite indicate that the Cohansey sand was deposited in a nonmarine environment. The Cohansey sand is regarded by some geologists as the shoreward facies of the marine Yorktown formation of Virginia.

The Pliocene(?) series is represented in Sussex County by deposits of unfossiliferous red or orange gravelly sands as evidenced by wells at Bridgeville, Seaford, Laurel, Lewes, and Millsboro (see plate 10). Following interpretations of Rasmussen and Slaughter (1955, p. 103-108; 1957, p. 78-80) for six counties of the Eastern Shore of Maryland, these deposits are considered to be fluviatile in origin and are correlated on the basis of regional structure and dip, with the Brandywine formation of the western shore of Maryland.

The Pleistocene series in Sussex County has been studied in detail because it forms the major aquifer. During part of the Pleistocene epoch, sea level was much lower than at present, and valleys were excavated in the Pliocene(?) and Miocene sedimentary rocks. The unconsolidated sediments of the Pleistocene series were deposited in these channels. Much of the deposition occurred during the advance and recession of huge ice sheets which covered the northern half of North America during four major stages. The active front of the ice came as far south as Long Island, northern New Jersey, and central Pennsylvania. Large volumes of melt-water came down the Susquehanna and Delaware Rivers, and were carried down to Sussex County.

About 10,000 years ago, the Recent epoch began. The flora resembled that which covers the land today, and the development of soils on the Pleistocene deposits, the filling of the swamps and marshes, the formation of coastal dunes, and the deposition of the modern beach began.

Table 1 summarizes the geologic formations and their water-bearing characteristics.

PALEONTOLOGY

Paleontology is the study of the evidences of the life of the past as preserved in the rocks. These evidences are fossils, a term which includes actual remains or traces of plant or animal life imbedded in successive layers of sand, silt, or clay. By means of these fossils, the sequence of deposition and the environment in which the organisms lived or died may be ascertained.

The paleontologic work done in Sussex County up to 1958 is meager. This is due partially to the fact that the surface exposures are sands and silts of the Pleistocene epoch which are essentially barren fo fossils representative of animal life. Moreover, few holes have been drilled through the Pleistocene series to the underlying fossiliferous Tertiary formations, and of those which have, only a few efforts have been made to collect and study samples. One of the most promising avenues of investigation is the study of fossil pollen in organic layers in the Pleistocene series and the Miocene series. Correlation with glacial and interglacial stages may be established by study of the pollen sequence, aided by measurements of age by the carbon-14 method.

Fossiliferous pebbles have been found in sand pits at Gravel Hill, 2 miles southeast of Lincoln, and at numerous other locations throughout the county. These pebbles represent reworked and redeposited chert, and are a clue to Paleozoic source areas of the gravel, but they are not of correlative value for the deposit itself.

In excavations of the Lewes and Rehoboth Canal, the Assawoman Canal

Table 1.--Geologic formations in Sussex County, and their water-bearing properties.

Era	System	Series	Geologic units	Thickness (feet)	General character	Water-bearing properties
Cenozoic	Quaternary	Recent	Undifferentiated	$0 - 25^{\pm}$	Dune and beach sands; marsh mud; organic silts in poorly drained basins; man-made fill; loam soil.	Chiefly above the zone of saturation; not productive to wells. Small supplies may be available along the beaches.
		Pleistocene	Parsonsburg sand	0 - 90, but only 5 to 15 feet thick over the broad divide area.	A stratified deposit composed predominantly of brown sand. A lower member is gravelly and silty; contains a few erratic cobbles and rare boulders. An upper member is well-sorted fine sand. The interpretation is that river floods of glacial meltwater brought the coarse detritus, and periglacial winds deposited the fine sand.	An average permeability of 330 gpd per square foot, and a specific yield of about 33 percent, make this formation an excellent intake for recharge. Much of the formation is in the zone of aeration, and the saturated part is thin. Yields water to wells only in a few places.
			Pamlico and Talbot formations.	0 - 60, but extends from 25 feet above to 100 feet below sea level.	Irregularly bedded gray silt and clay, with some sand and gravel occupying valleys.	Yields small quantities of water to domestic wells.
			Walston silt (may be part of Penholoway or Wicomico terraces)	0 - 70, but extends from 60 feet above to 20 feet below sea level.	Lenticular beds of fine sand, silt, clay, and peat. More sandy than in Wicomico County, Md.	Yields water to a few domestic wells.
			Beaverdam sand (equivalent to Bridgeton and Pensauken formations of N. J.).	0 - 110, but extends from 45 feet above to 105 feet below sea level.	Tan or buff, fairly well-sorted, coarse to medium-grained sand, and thin layers of gravel and silt. A product of glacial meltwater floods, and of estuarine fill.	The major aquifer of Sussex County, yielding water to roughly 60 percent of the wells. The average coefficient of permeability is 470 gpd per foot, and the specific yield is about 30 percent.

Table 1.--Continued.

Era	System	Series		Geologic unit		Thickness (feet)	General character	Water-bearing properties
Cenozoic	Tertiary	Pliocene(?)		Brandywine formation		0 - 90?	Red and brown, medium to coarse sand, slightly gravelly. Found only in wells in a few localities. Underlies the Pleistocene mantle, resting on old surface of Miocene rocks. Barren of fossils.	Yields water freely to wells where present.
		Miocene(?)	Upper	Cohansey sand	Upper aquiclude	0 - 40?	Gray sandy silt, beneath mantle of the Pleistocene-Pliocene(?) series, found only in southeastern corner of county.	Transmits water slowly, yields little water to wells.
					Pocomoke aquifer	0 - 60?	Gray medium to fine sand, beneath southeastern one-eighth of county.	Probably a fair aquifer. Little used up to 1958.
					Lower aquiclude	0 - 80?	Blue-gray sandy silt underlying younger formations beneath southeastern one-half of county.	Transmits water slowly, yields little water to wells.
					Manokin aquifer	0 - 100?	Brown and gray sands, underlying younger formations beneath southeastern two-thirds of county.	Probably a good aquifer. Little used up to 1958.
		Miocene	Middle	St. Marys formation		30 - 200	Blue silty clay and very fine sand, shells, and Foraminifera.	Yields little or no water to wells.
				Choptank formation "Frederica aquifer"		100 - 250	Gray and brown sand and clay containing shell, marl, and Foraminifera.	An aquifer. Water suitable for most purposes in northern sector. Elsewhere quality doubtful.
				Calvert formation "Cheswold aquifer"		200 - 650	Gray, diatomaceous silts and clays, containing lenses of gray, coarse to fine sand.	Generally yields little water to wells, but does contain one or more aquifers in most places. Water may be high in dissolved-solid content.
		Eocene		Piney Point formation		60 - 160	Olive-green quartz sand, slightly glauconitic; and sandy clay containing Foraminifera of Jackson age. Hard drilling.	A potential aquifer at Milford, and possibly northwestern Sussex County. Water may be fairly high in dissolved-solid content, but not unduly hard.
				Nanjemoy formation		0 - 100	Blackish-green, highly glauconitic, sand, silt, and clay.	Not known to yield water.

Table 1.--Concluded.

Era	System	Series	Geologic unit	Thickness (feet)	General character	Water-bearing properties
Cenozoic	Tertiary	Eocene or Paleocene	Aquia greensand or Vincentown sand	0 - 140	A green, glauconitic, quartz sand, containing lenses of clay, and shell fragments.	An aquifer in central Delaware, and on the central Eastern Shore of Maryland. No records in Sussex County.
		Paleocene	Brightseat formation or Hornerstown marl	100 - 230	Greensand and shale, with Foraminifera of Midway age.	Not used as a source of water in Sussex County. Probably yields little water to wells.
Mesozoic	Cretaceous	Upper Cretaceous	Monmouth group	125 - 150?	Clay and silty fine sand, glauconitic and fossiliferous.	Probably yields little water to wells. Electric log of oil test near Bridgeville indicates low permeability.
			Matawan group	125 - 150?	Black, micaceous glauconitic clay and brown glauconitic sand.	Sands are aquifers in northern Delaware. No wells in Sussex County tap this unit.
			Magothy formation	0 - 150	Predominantly light colored lignitic clay with some sand in northern Delaware. Not identified in Bridgeville or Seaford wells.	Upper part probably not an important water-bearing zone. Lower part may yield as much as 150 gpm.
		Upper and Lower Cretaceous	Raritan, Patapsco, and Patuxent formations, undifferentiated	2000 - 5000	Variegated clay and gray sand. A few Foraminifera and Ostracoda in the Bridgeville oil test indicate that some of the clays are marine, although most of the formation is regarded as continental in origin.	Unused aquifer in Sussex County. Water probably brackish or saline.
	Triassic	Unknown		0 - 300	Hard sandstones, shales, and conglomerates. No wells have penetrated it.	A doubtful aquifer. Waters would be warm and high in dissolved solids.
Paleozoic and Precambrian		Unknown	Basement	Unknown	Hard, crystalline, gneiss and schist, on the basis of seismograph and magnetic records.	Dense rock that neither contains nor transmits ground water. No wells have penetrated to this depth.

near Ocean View, and the Indian River Inlet, shells of Recent or Pleistocene age were collected from elevations about at sea level (Richards, 1936).

Deep wells at Milford, Seaford, Bridgeville, and Lewes provide fossil evidence of correlative value in deposits of the Miocene, Eocene, Paleocene, and Upper Cretaceous series. Wells in Cape May County, N. J., and the Eastern Shore of Maryland provide evidence in the adjacent areas. The kinds of fossils preserved include shark teeth, bryozoa, and shells of pelecypods and gastropods. Remains of diatoms (microscopic algae which secrete siliceous shells) and coccoliths (calcareous secretions of one-celled plants) have been found. Some lignite, or altered vegetal material and pollen is also preserved. A summary of available paleontologic evidence is presented in table 2.

SURFACE WATER

By Robert M. Beall

The waterways and water resources have had a dominant influence on the settlement and development of Sussex County. The tidal estuaries of the Mispillion, Broadkill, Indian, and Nanticoke Rivers provided access to the fertile lands beyond the marshy coast. The principal communities were established near the heads of the tidal rivers where dams were built to harness waterpower for the mills and where shipping could import and export products. As early as 1726, a law was passed forbidding the construction of dams across rivers except for the use of mills. During the century that followed, the utility of the surface waters contributed significantly to the economic growth of the county. Following the mid-1800's there was a general decline in the importance of the rivers and creeks as mills converted to steam power and railroads provided an improved form of transport. Many navigable channels and mill ponds lost their utility because of siltation.

The usually shallow water tables, productive soils, and tempered climate have fostered an extensive agricultural development that has dominated the economy. The principal current role of the streams and their natural or improved channels is that of providing a means for the disposal of municipal and industrial (principally agricultural) wastes, and for the drainage of surplus water from fertile but wet and unworkable areas.

The use of surface waters for recreation, supplemental irrigation, and conservation has been increasing in recent years. The interior areas, in particular, have experienced droughts whereas the lower stream reaches and shallow valleys are subject to flooding when the ground becomes saturated and gradients are too slight to carry off accumulated excess water. Streamflow measuring stations have been established to obtain some quantitative knowledge of the ever-changing supplies of fresh water. Specific information about the magnitude and variability of water resources is essential to their full utilization and effective administration in the interest of all of the potential users.

Table 2. -- Paleontology of samples from wells and dredgings in Sussex County.

Source	Depth (feet)	Series and Formation	Paleontology
Well Me15-11 located near Milford Paleontologist - Richards (1948)	204-223	Miocene series	Mollusca: *Venus mercenaria* Linne *Astarte undulata vaginulata* Dall *Astarte symmetrica* Conrad *Dosinia acetabulum* Conrad *Turritella cumberlandia* Conrad *Pecten madisonius* Say *Melina maxillata* Deshayes
Glenn G. Collins - official communication 1952 (see p. 112)	637.3-777.5	Eocene series Piney Point formation	Foraminifera of Jackson age, rare or in a poor state of preservation
Dredged from Lewes-Rehoboth Canal near Broadkill Creek Paleontologist - Richards (1936)	0-6	Pleistocene series Pamlico formation	Pelecypoda: *Arca campechiensis* Say *Ostrea virginica* Gmelin *Anomia simplex* d'Orbigny *Modiolus demissus* Dillwyn *Venus mercenaria* Linnaeus *Tagelus gibbus* Spengler *Mya arenaria* Linnaeus Gastropoda: *Crepidula fornicata* Linnaeus *Nassa obsoleta* Say

Table 2. -- Continued

Source	Depth (feet)	Series and Formation	Paleontology
Well Ni34-1 located at Lewes, Del.	40-50	Pleistocene series Pamlico formation	Solen americanus, Gould; Mulinia lateralis, Say; Nassa trivittata, Say; Anomia sp. ?
Paleontologist -	50-60	do	Tellina tenera, Say
Woolman (1899)	70-80	do	Natica duplicata, Say; Nassa trivittata, Say
Richards (1945a; 1947)			
Richards and	80-125	do	Some lignite and comminuted shell
Harbison (1942, p. 234)	125-267	Miocene (?) series Cohansey sand	
	267-268	do	Some lignite
	268-294	do	
	294-404	Miocene series	Comminuted molluscan fossils from 396 to 402
	404-772	do	Diatoms 595 to 658, with some comminuted shell and minute Echinus spines
	772-950	do	
	950-990	do	Diatoms, and at 985 ft. a well preserved Olivella mutica
	990-1020	do	Diatoms and coccoliths
	1020-1064	do	Small shells
	1064-1080	do	

Table 2. -- Continued

Source	Depth (feet)	Series and Formation	Paleontology
Composite record of wells Od23-1 and Od24-1	0-180	- -	No samples
	180-200	Miocene (?) series Cohansey sand	
Paleontologist - Richards (1945a)	200-700	Miocene series St. Marys, Choptank, and Calvert formations	
	700-850	Eocene series Piney Point formation	Solidobalanus; Foraminifera, including Bulimina jacksonensis, Cushman
	850-1250	Aquia greensand	Foraminifera, including Ceratobulimina, sp., Textularia sp., Anomalina sp.
	1250-1330	Paleocene series	Foraminifera of Midway age, including Vaginulina longiforma (Plummer), Robulus sp., Nodosaria sp., Hemicristellaria sp.
	1330-1650	Upper Cretaceous series Monmouth and Matawan groups	Foraminifera, including Dorothia bulletta (Carsey), Anomalina taylorensis (Carsey), Bolivinoides decorata (Jones), Cibicides sp.
	1650-3000	Raritan formation	Few Foraminifera and Ostracoda, including Kyphopxa, Fondicularia cf. goldfussi (Reuss), F. archiaciana (d'Orbigny), F. gracilis (Franke) (2,051 - 2,091 ft.)

Table 2. -- Continued

Source	Depth (feet)	Series and Formation	Paleontology
Dredged from Lewes-Rehoboth Canal at Henlopen acres	0-21	Pleistocene series Pamlico formation	Crustacea:
			Balanus sp.
			Pelecypoda:
			Ostrea virginica Gmelin
Paleontologist - Richards (1936)			Modiolus demissus Dillwyn
			Venus mercenaria Linnaeus
			Tagelus gibbus Spengler
			Gastropoda:
			Crepidula fornicata Linnaeus
			Nassa obsoleta Say
Well Pc33-1 located at Seaford	0-75	Pleistocene series	
	75-212	Miocene (?) series Cohansey sand	
	212-251	Miocene series	
Paleontologist - Richards	251-281	do	Pecten sp., and Bryozoa
	281-330	do	
	330-338	do	Pecten madisonius Say; Corbula sp.
	338-364	do	
	364-386	do	Turritella variabilis Conrad
	386-437	do	
	437-452	do	Phacoides crenulatus Conrad; Pecten sp. (probably madisonius Say; Balanus sp.)
	452-488	do	Pecten madisonius Say; Glycymeris sp.
	488-492	do	
	492-611	do	Balanus sp., shark tooth

Table 2. -- Continued

Source	Depth (feet)	Series and Formation	Paleontology
Well Pc33-1 (continued)	611-666	Miocene series	Pecten madisonius Say; Turritella variabilis Conrad; Balanus sp. Phacoides crenulatus Conrad
	666-902	Eocene (?) series	
Dredged at Indian River Inlet Paleontologist - Richards (1936)	Spoil bank	Pleistocene series Pamlico formation	Shells worn and dark Annelida: Eupomotus dianthus Verrill Pelecypoda: Arca campechiensis Say (A. Pexata Say); Ostrea virginica Gmelin; Pecten gibbus irradians Lamarck; Anomia simplex d'Orbigny; Mytilus edulis Linnaeus; Venus mercenaria Linnaeus; Gemma gemma Totten; Petricola pholadiformis Lamarck; Macoma balthica Linnaeus; Tagelus gibbus Spengler; Ensis directus Conrad; Mactra solidissima Dillwyn; Milinia lateralis Say; Pholas costata Linnaeus Gastropoda: Polinices duplicata Say; Crepidula fornicata Linnaeus; Crepidula plana Say; Nassa obsoleta Say; Nassa trivittata Say; Nassa vibex Say; Fulgur canaliculata Linnaeus; Fulgur perversa Linnaeus

Table 2. -- Concluded

Source	Depth (feet)	Series and Formation	Paleontology
Dredged from the Assawoman Canal near Ocean View Paleontologist - Richards (1936)	0-10?	Pleistocene series Pamlico formation	Crustacea: *Balanus* sp. Pelecypoda: *Ostrea virginica* Gmelin

GENERAL PRINCIPLES

Records of stage and measurements of discharge are the base data collected at stream-gaging stations. In addition to these data, observations of factors affecting the stage-discharge relation and weather records are used to supplement base data in determining the daily flow. The records of stage are obtained either from direct readings on a nonrecording gage or from a water-stage recorder that gives a continuous record of fluctuations. Measurements of discharge are made with a current meter by the general methods adopted by the Geological Survey. These methods are described in Water-Supply Paper 888 (Corbett, and others, 1945) and are also outlined in standard textbooks on the measurement of stream discharge. Typical structures in use at gaging stations are shown in plate 7.

Definition of Terms

The units in which hydrologic data are given and some of the terms used in this report are defined as follows:

Cubic foot per second (cfs) is the rate of discharge equivalent to that of a stream whose channel is 1 square foot in cross-sectional area and whose average velocity is 1 foot per second.

Cubic feet per second per square mile (cfsm) is the average number of cubic feet of water per second flowing each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Million gallons per day per square mile (mgdsm) is defined in the same manner as the previous term and conversion between terms may be made with the following constants:

$$1 \text{ cfs} = 448.8 \text{ gpm} = 0.6463 \text{ mgd}$$
$$1 \text{ mgd} = 694.4 \text{ gpm} = 1.547 \text{ cfs}$$

The drainage area of a stream at a specified location is that area, measured in a horizontal plane and usually expressed in square miles (sq mi), which is so enclosed by a topographic divide that direct surface runoff from precipitation normally would drain by gravity into the river above the specified point. This definition is difficult to adhere to in some of the swampy headwater areas where drainage ditches cross the natural divides and in the coastal tidal marshland which is fed by numerous streams whose lower extremities are interconnected by ditches and by navigable canals with ocean outlets.

A water year begins October 1 and ends September 30 and is the annual period for which most streamflow data are reported. Normally, minimum flows occur near the end of the water year. Another annual period, April 1 to March 31, encompassing the low-flow season, is sometimes used in the study of low-flow characteristics.

One part per million (ppm) is a unit weight of a constituent in a million unit weights of water. In the chemical analysis of water samples, it is necessary to determine the presence of various substances usually found in minute amounts; therefore, the results are usually expressed in parts per million rather than in percentages. One part per million equals one ten-thousandth of one percent (0.0001 percent).

Records Available

The major river basins of Sussex County drain eastward to Delaware Bay or the Atlantic Ocean and southwestward to Chesapeake Bay as shown on the block diagram, figure 1. Streamflow records for four gaging stations in the county and two other stations nearby provide the basis for the analyses presented in this report. Two more stations have been established in the area recently -- one in the county and one in Kent County. In addition, periodic or occasional measurements of flow have been made at ten selected sites in the area. The data have been collected by the U. S. Geological Survey in cooperation with the States of Delaware and Maryland and with the Corps of Engineers, U. S. Army.

Streamflow records have been collected for the relatively short period since 1943, and at only two sites in the county for that length of time. Thus, no detailed information is available for the drought of the early thirties or the significant floods of the midthirties. The drought of 1954 ranks fifth in magnitude to the droughts recorded in adjacent States during the period 1896 to 1958.

The length of record available for each of the gaging sites is indicated on the bar graph in figure 3. The sites are shown on the drainage-basin outline map, plate 8, the numbers corresponding to those on the bar graph. Daily discharge records, and a monthly and yearly summary, are published in Part 1 (Part 1-B subsequent to 1950) of the U. S. Geological Survey water-supply paper series entitled "Surface Water Supply of the United States." The observed monthly and yearly data for six gaging stations in the report area have been summarized in table 3 which includes the mean discharge and the monthly maximum and minimum discharges with their years of occurrence. The data for Nanticoke River near Bridgeville is presented graphically in figure 4.

Results of base-flow measurements made during the period 1955-58 at eight sites within the county are summarized in table 4. A summary of monthly data for two partial-record gaging sites in Maryland which reflect conditions in small areas of southwestern Sussex County was published by the Maryland Department of Geology, Mines and Water Resources (Rasmussen and Slaughter, 1955). These data are discussed later in this report.

The drainage areas of some of the principal streams and at the gaging sites within each major basin are listed in table 5. The figures of drainage area are provisional and subject to considerable modification when time will permit their determination from the latest map series. Because of the poor topographic definition, these determinations should be supplemented by field surveys and investigations and by the information contained in files of drainage and highway engineers and others. Some areas in the headwaters and

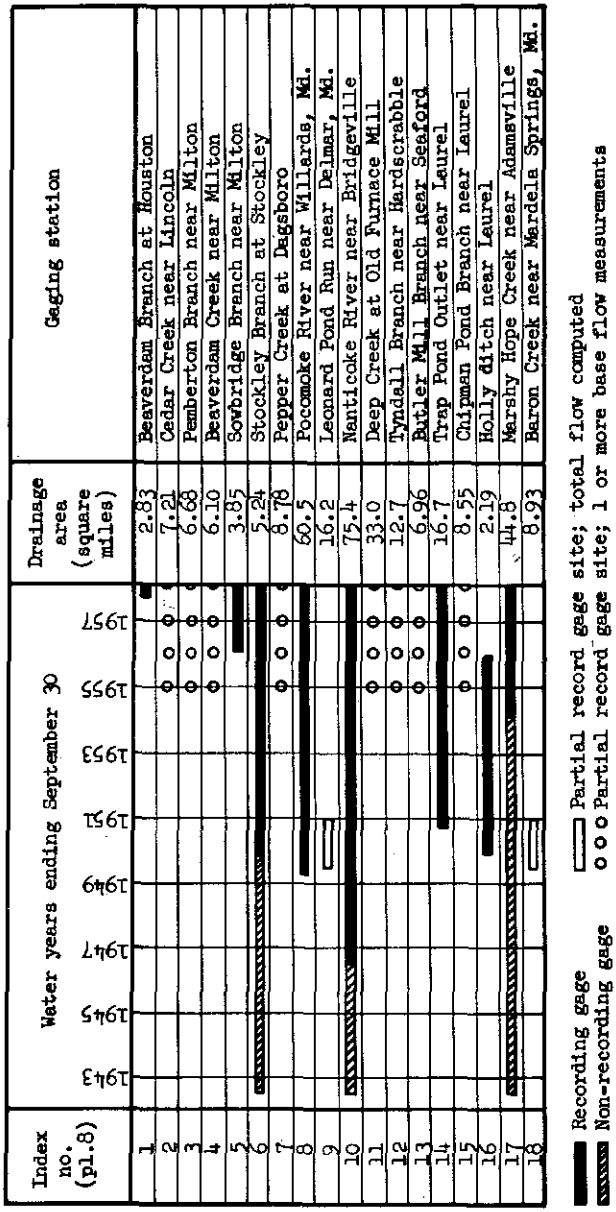

Figure 3. Bar graph of duration of records at gaging stations in the Sussex County area.

Table 3. -- Summary of observed monthly and yearly discharge at stream-gaging stations in the Sussex County area.

Index no. (pl. 8)	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Water year
						Mean monthly and yearly discharge in million gallons per day							
6	2.05	3.49	4.98	6.53	6.46	7.76	5.90	4.65	3.84	3.34	3.26	1.87	4.55
8	18.6	29.1	41.1	52.0	57.7	75.6	51.6	30.7	32.1	15.0	28.1	11.3	36.8
10	21.3	36.8	64.6	80.8	77.6	95.0	76.3	54.2	46.4	34.6	36.8	22.3	54.4
14	3.71	7.69	11.6	16.0	17.1	22.4	16.0	8.34	7.76	2.90	5.76	3.10	10.3
16	.023	.016	.034	.198	.413	.711	.575	.229	.918	.005	.127	.028	.204
17	6.98	22.1	43.1	56.4	46.1	60.8	43.0	28.1	22.8	24.9	21.7	8.01	32.4
						Maximum monthly and yearly discharge in million gallons per day							
6	3.72	7.37	14.7	11.4	11.6	13.4	9.11	12.7	16.4	11.3	10.3	3.24	7.17
8	78.9	47.4	66.6	96.3	91.8	128	82.7	52.0	70.4	27.0	69.2	24.2	52.2
10	40.5	80.8	190	154	153	163	117	127	193	82.7	95.0	48.0	87.3
14	12.4	12.3	18.9	28.2	28.2	37.9	22.2	11.1	15.0	5.49	11.2	8.47	15.3
16	.140	.087	.098	.591	1.22	2.02	1.49	.679	.393	.028	.376	.158	.554
17	13.7	67.2	127	112	94.4	101	70.4	107	101	112	72.4	27.8	56.9
						Calendar year (last two digits) of maximum of record							
6	48	48	45	52	49	52	53	48	48	45	48	55	48
8	55	55	51	52	56	52	53	54	55	56	53	55	52
10	48	48	48	49	49	52	52	48	48	46	55	55	52
14	55	51	51	52	52	52	53	54	55	56	53	55	52
16	55	55	52	53	52	52	52	52	52	52	55	55	52
17	48	48	48	49	49	44	44, 52	48	48	46	52	50	52
						Minimum monthly and yearly discharge in million gallons per day							
6	0.737	1.16	1.16	2.26	3.16	3.95	3.48	2.76	1.64	0.853	0.418	0.513	2.80
8	5.66	11.7	22.7	20.2	33.5	35.0	30.9	17.8	12.5	6.41	4.76	6.46	23.8
10	11.6	18.0	15.4	19.8	32.9	52.4	42.0	29.6	20.1	11.3	8.79	6.53	32.6
14	1.22	3.30	8.14	6.05	9.18	15.0	8.92	5.86	4.18	1.31	.357	.885	7.11
16	0	0	0	0	0	.090	.005	0	0	0	0	0	.034
17	3.23	7.37	5.38	6.79	20.4	31.2	20.1	11.9	5.73	2.96	2.58	2.12	14.7
						Calendar year (last two digits) of minimum of record							
6	47	50	43	51	44	51	45	55	44	44	44	43	51
8	52,53	53	49	50	54	51	55	55	53	53	54	51	51
10	43	46	43	50	50	51	50	51	44	44	43	43	50
14	54	54	55	55	54	54	55	55	53	53	54	56	54
16	50-54	53, 54	50, 54	55, 56	55	55	55	55	55, 56	51,53-56	51,54,56	51,54,56	51

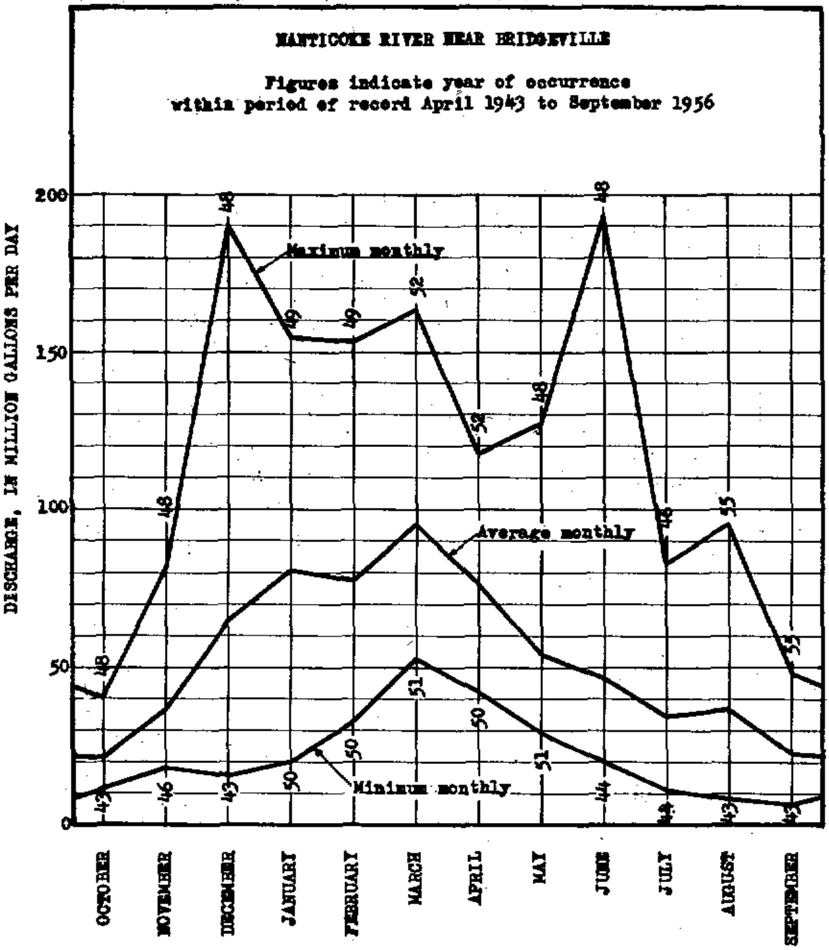

Figure 4. Monthly discharge, Nanticoke River near Bridgeville.

Table 4. -- Results of base-flow discharge measurements at sites other than gaging stations

Index no. (pl. 8)	Site	Drainage area (sq mi)	Date	Discharge (cfs)
2	Cedar Creek	7.21	June 29, 1955	12.9
	near Lincoln		Oct. 5, 1955	11.6
	(at bridge 1.2		Nov. 15, 1955	10.4
	mi south)		June 13, 1956	11.4
			Aug. 13, 1956	9.40
			Nov. 30, 1956	15.3
			Apr. 1, 1957	18.5
			June 25, 1957	7.89
			Apr. 22, 1958*	23.5
3	Pemberton Branch	6.68	June 29, 1955	7.30
	near Milton		Oct. 5, 1955	5.47
	(at bridge 1.5		Nov. 15, 1955	4.59
	mi west)		June 13, 1956	10.4
			Aug. 13, 1956	7.22
			Nov. 30, 1956	9.41
			Apr. 1, 1957	14.6
			June 25, 1957	5.83
			Apr. 22, 1958*	29.1
4	Beaverdam Creek	6.10	June 29, 1955	7.76
	near Milton		Oct. 5, 1955	7.78
	(at bridge 2.5		Nov. 15, 1955	7.68
	mi east)		June 13, 1956	9.32
			Aug. 13, 1956	10.4
			Nov. 30, 1956	11.9
			Apr. 1, 1957	18.5
			June 25, 1957	9.82
			Apr. 22, 1958*	27.0
7	Pepper Creek	8.78	June 29, 1955	4.35
	at Dagsboro		Oct. 5, 1955	6.49
	(at Del. Hwy. 26)		Nov. 15, 1955	9.35
			June 13, 1956	2.93
			Aug. 13, 1956	2.94
			Nov. 29, 1956	8.37
			Apr. 16, 1957	8.32
			June 24, 1957	1.94
			Apr. 22, 1958*	11.0

Table 4. -- Continued

Index no. (pl. 8)	Site	Drainage area (sq mi)	Date	Discharge (cfs)
11	Deep Creek	33.0	June 30, 1955	13.8
	at Old Furnace		Oct. 5, 1955	19.6
	(at bridge 5.6		Nov. 15, 1955	30.7
	mi northeast		June 13, 1956	21.0
	of Seaford)		Aug. 13, 1956	13.6
			Nov. 29, 1956	44.2
			Apr. 16, 1957	36.6
			June 24, 1957	12.9
			Apr. 21, 1958*	41.6
12	Tyndall Branch	12.7	June 29, 1955	7.56
	near Hardscrabble		Oct. 5, 1955	9.66
	(at bridge 1.4		Nov. 15, 1955	13.2
	mi northeast)		June 13, 1956	8.73
			Aug. 13, 1956	6.02
			Nov. 29, 1956	19.1
			Apr. 16, 1957	14.7
			June 24, 1957	6.72
			Apr. 21, 1958*	23.7
13	Butler Mill Branch	6.96	June 30, 1955	3.53
	near Woodland		Oct. 6, 1955	7.60
	(at bridge 2.2		Nov. 17, 1955	5.82
	mi north)		June 13, 1956	4.64
			Aug. 13, 1956	3.65
			Nov. 29, 1956	9.80
			Apr. 16, 1957	9.27
			June 24, 1957	7.14
			Apr. 21, 1958*	16.1
15	Chipman Pond Branch	8.55	June 29, 1955	4.60
	near Laurel		Oct. 5, 1955	5.83
	(at bridge 2.9		Nov. 15, 1955	8.49
	mi northeast)		June 13, 1956	5.04
			Aug. 13, 1956	2.56
			Nov. 29, 1956	10.2
			Apr. 16, 1957	9.52
			June 24, 1957	3.94
			Apr. 21, 1958*	17.5

* Results of chemical analysis shown in table 13.

Table 5. -- Drainage areas of streams in the Sussex County area

Index no. (pl. 8)	Name of stream in downstream order		Drainage area (square miles) Total	In Md.
	DELAWARE BAY			
	MISPILLION RIVER BASIN			
1	Beaverdam Branch (head of Mispillion River) at Houston (0.8 mi south)	a	2.83	-
	Mispillion River "West of Milford"		29.5*	-
	Mispillion River "West of Herring Branch"		42.3*	-
2	Cedar Creek near Lincoln (1.2 mi south)	b	7.21	-
	Slaughter Creek		+	-
	Mispillion River at mouth		126*	
	BROADKILL RIVER BASIN			
3	Pemberton Branch (head of Broadkill River) near Milton (1.5 mi west)	b	6.68	-
4	Beaverdam Creek near Milton (2.5 mi east)	b	6.10	-
5	Sowbridge Branch (head of Primehook Creek) near Milton (2.5 mi north)	a	3.85	-
	Old Mill Creek		+	-
	Canary Creek		+	-
	Broadkill River at Roosevelt Inlet		110*	-
	Lewis and Rehoboth Canal drainage (to bay or ocean)		(15)	-
	ATLANTIC OCEAN			
	INDIAN RIVER BASIN			
	Cow Bridge Branch (head of Indian River)		+	-
6	Stockley Branch at Stockley	a	5.24	-
	Mirey Branch		+	-
	Sheeppen Ditch		+	-
	Long Drain Ditch		+	-
	Indian River at Millsboro (State Hwy. 24)		(60)	-
	Iron Branch		+	-
	Swan Creek		+	-
7	Pepper Creek at Dagsboro (State Hwy. 26)	b	8.78	-
	Vines Creek		+	-
	Blackwater Creek		+	-
	White Creek		+	-
	Rehoboth Bay		(70)	-
	Love Creek		+	-
	Herring Creek		+	-
	Indian River Inlet		(250)	-
	LITTLE ASSAWOMAN BAY		(40)	-
	Miller Creek		+	-
	Dirickson Creek		+	-
	ASSAWOMAN BAY			
	Roy Creek		+	-
	Greys Creek		+	+
	St. Martin River		+	+

Table 5. -- Continued

Index no. (pl. 8)	Name of stream in downstream order		Drainage area (square miles) Total	In Md.
	CHESAPEAKE BAY			
	POCOMOKE RIVER BASIN			
	Pocomoke River at Delaware State line		26.8	-
8	Pocomoke River near Willards, Md. (1.3 mi east)	a	60.5	22.3
	WICOMICO RIVER BASIN			
9	Leonard Pond Run near Delmar (2 mi south)	b	16.2	14.1
	Wicomico River above Beaverdam Creek, Md.		42.1	38.5
	NANTICOKE RIVER BASIN			
	Nanticoke River at Greenwood		+	-
	Gum Branch		+	-
10	Nanticoke River near Bridgeville (2.5 mi southeast)	a	75.4	-
	Gravelly Branch		+	-
11	Deep Creek at Old Furnace Mill	b	33.0	-
12	Tyndall Branch near Hardscrabble (1.4 mi northeast)	b	12.7	-
	Clear Brook		+	-
	Nanticoke River at Seaford		214	-
13	Butler Mill Branch near Seaford (2.6 mi west)	b	6.96	-
	James Branch (head of Broad Creek)		+	-
14	Trap Pond Outlet near Laurel (5 mi southwest)	a	16.7	0.9
15	Chipman Pond Branch near Laurel (2.9 mi northeast)	b	8.55	-
	Broad Creek at Records Pond Outlet, Laurel		+	3.5
	Little Creek		+	-
16	Holly Ditch near Laurel (1.5 mi southwest)	a	2.19	-
	Tussocky Branch		+	-
	Broad Creek at mouth		(120)	3.5
	Nanticoke River at Delaware State line		393	7
17	Marshy Hope Creek near Adamsville (1.5 mi northeast)	a	44.8	-
	Marshy Hope Creek at Delaware State line		84.6	4.0
	Marshy Hope Creek at mouth		214**	123
18	Baron Creek near Mardela Spring, Md. (3 mi east)	b	8.9	6.0
	Baron Creek at mouth		30.0	20.3

* From publications of Delaware Water Pollution Commission.
** About 30 sq mi in Sussex County.
\+ Not determined.
a Complete-record gaging station site.
b Partial-record gaging site.
Drainage area figures in parentheses are approximations.

coastal marshes can be classed only as approximate because of the interconnections between basins. An index to topographic mapping in Sussex County is shown in figure 5 in which are designated the 7 1/2' and 15' quadrangle sheets distributed by the U. S. Geological Survey. Except for the southern border area south of lat. 38°30' N., the county was mapped in 1954-55 at a scale of 1:24,000 with a contour interval of 10 feet. No further mapping in this series is currently in progress.

FLOW CHARACTERISTICS

Streamflow varies greatly from day to day, from season to season, from year to year, and frequently, from basin to basin. This variability creates the problem of too little water at times and too much at other times. Thus, any complete analysis of the data should include three principal objectives, namely, (1) to determine the frequency of occurrence of the various rates of flow throughout the regimen of a stream, (2) to evaluate the probable magnitude and frequency of minimum flows, and (3) to appraise the flood characteristics.

In considering the adequacy of a specific source for water supply, the requirements are known for water consumption or for waste disposal. The percent of time the flow is sufficient to meet the needs must be determined. Information is also required on how frequently the flow will be insufficient and the amount of storage required to meet the deficiency. The "lowest flow on record" is often considered as the "safe yield," particularly in the design of a small facility that is to take water directly from a stream with little or no storage provided. Local variations in climatic and geological conditions affect the occurrence of this lowest flow to such an extent that it is not feasible to make reliable estimates of the lowest flow in totally ungaged areas or for some particular period outside of the period of record.

It should be realized that the data presented in this report represents a sampling of a relatively small number of streams within the county. Care should be exercised in using the "per-square-mile" runoff, even at other points on the same streams because all parts of most drainage basins do not have similar runoff characteristics or equal yields per unit of area. In general, the possible error increases with an increase in distance between the gaging station and the place where streamflow information is desired. To conserve space, many of the data are given in tabular form. However, sample graphs of the results of the several analyses are given to indicate how the tabular data might be plotted.

Streamflow records in Sussex County are short, but by statistical methods and regional analysis it is possible to adjust short-term records to a long-term base period by using the records for nearby streams. Streamflow records collected on the Delmarva coastal plain are all short-term, but a fair correlation was obtained with records for Brandywine Creek at Chadds Ford, Pa., and Maurice River near Norma, N. J., for which regionalized and adjusted data on flow duration and low-flow frequency had been prepared.

In general, the observed data for Nanticoke River near Bridgeville were adjusted on the basis of correlations with the aforementioned records, fol-

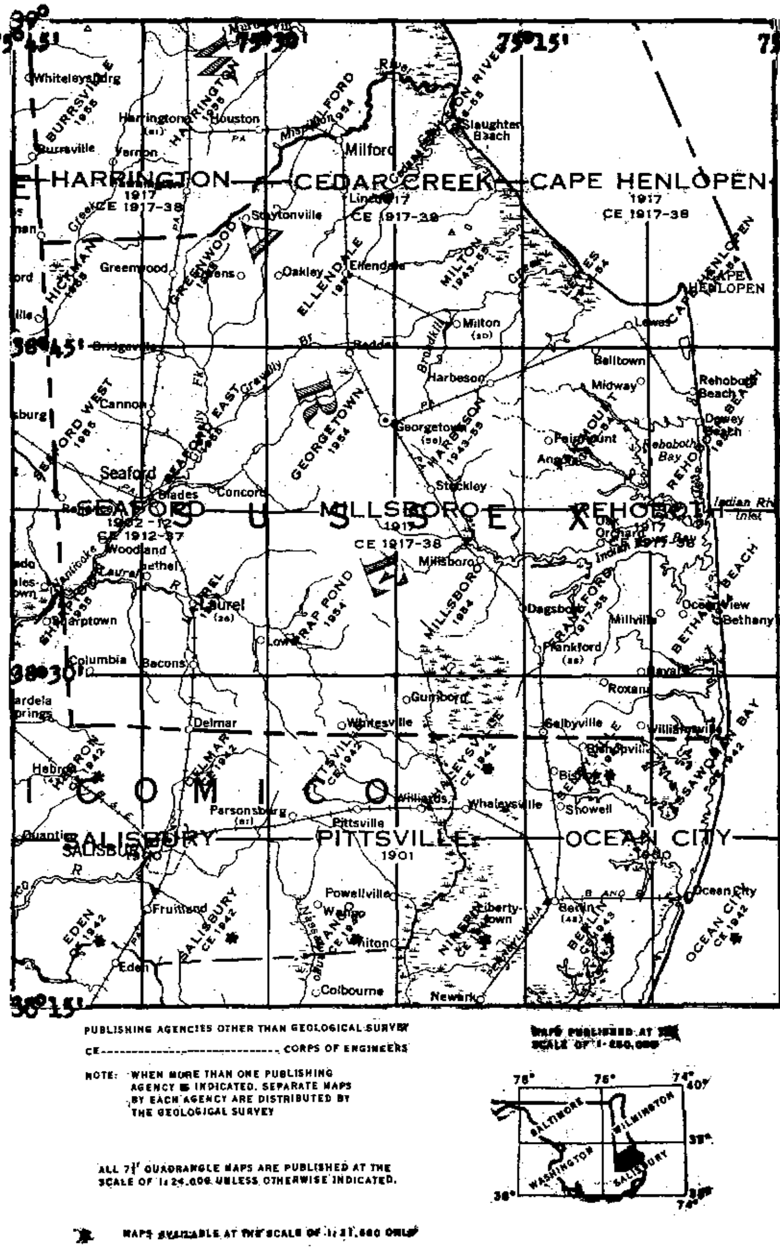

Figure 5. Index to topographic mapping in Sussex County.

lowing which the observed data for the remaining stations were adjusted on the basis of the new Nanticoke River data. It is not practicable to transpose flood-flow information by these methods.

Flow Duration

A duration curve of daily flow (figure 6) shows the percentage of time that a specified daily flow was equaled or exceeded. It shows the cumulative frequency of occurrence of different rates of flow at a given point. The slope of a duration curve is an index of the natural storage within a basin, including ground-water storage, in that the flatter the general slope of the curve the more uniform the flow.

The duration curves of daily flow for six gaging-station records in the report area have been adjusted from their individual short-term records to a 42-year (April 1913 to March 1955) base period and are given in table 6. Plots of these data are shown in figure 7, as a means of comparing the characteristics of the streams. It will be noted that the lower part of the curve for Nanticoke River near Bridgeville is the highest of the six and indicates the best sustained flow.

The importance of adjustment to a common long-term period, when comparing characteristics of two or more streams, is illustrated in figure 6. The discharge for Stockley Branch at Stockley adjusted to the 42-year period has been plotted with curves of 12-year (April 1943 to March 1955) and 5-year (April 1951 to March 1956) periods, both based on actual records. The marked difference between the curves for greater than 80 percent of time is due to the inclusion of progressively more low-flow experiences as the period increases. The extreme low end of the 12-year period curve indicates a disproportionate number of very low flows during that period.

The flow duration curve does not provide information on the chronological sequence of flows; for example, it does not indicate whether the lowest 30 days of record occurred in one rare drought year or as a few days nearly every year. Additional information is therefore required to describe adequately the low-flow characteristics of the stream.

Average Discharge

The average discharge at a gaging station is usually computed as the average of the yearly mean discharges for five or more complete years of record. Because of the year-to-year variation in precipitation and runoff, comparisons between stations should be made for identical time periods. To facilitate such comparisons, table 7 presents the average discharge in million gallons per day per square mile for several periods corresponding to the length of record at each of the gaging stations.

Because the ordinate of a flow-duration curve represents rates of discharge and the abscissa represents the time duration of these rates, the average discharge can be obtained by a step integration of the curve. These computations were made, using the data in table 6, to obtain an average dis-

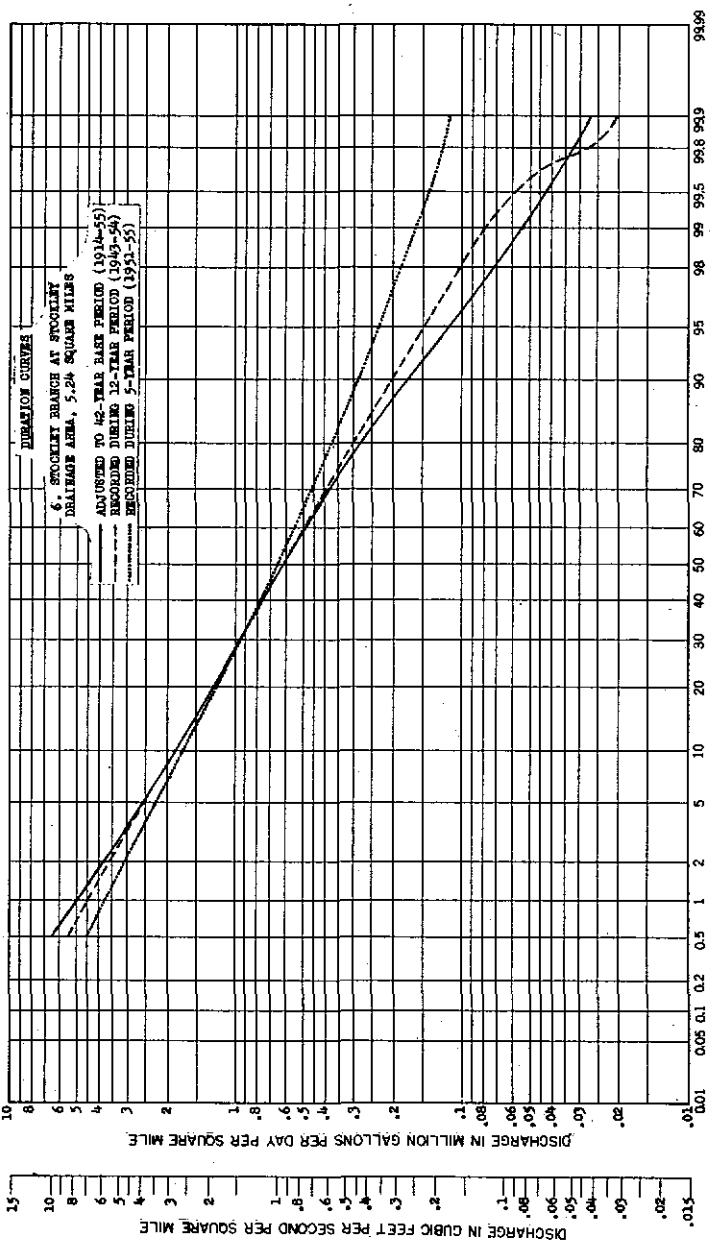

Figure 6. Duration curves of daily flow, Stockley Branch at Stockley.

Table 6. -- Duration of daily flow at stream-gaging stations in the Sussex County area
(Adjusted to the 42-year period, 1914-55, on basis of long-term streamflow records in adjacent states).

	Flow in cubic feet per second and millions of gallons per day per square mile, which was equaled or exceeded for indicated percent of time											
Drainage area sq mi	6. Stockley Branch at Stockley 5.24		8. Pocomoke River near Willards 60.5		10. Nanticoke River near Bridgeville 75.4		14. Trap Pond Outlet near Laurel 16.7		16. Holly Ditch near Laurel 2.19		17. Marshy Hope Creek near Adamsville 44.8	
Percent of time	cfs	mgdsm	cfs	mgdsm	cfs	mgdsm	cfs	mgdsm	cfs	mgdsm	cfs	mgdsm
0.5	52.5	6.48	608	6.50	562	4.82	132	5.11	7.05	2.08	630	9.09
1	40.6	5.01	481	5.14	479	4.11	104	4.03	5.50	1.62	515	7.43
2	31.0	3.82	364	3.89	385	3.30	81.8	3.17	4.12	1.22	385	5.55
5	21.0	2.59	223	2.38	258	2.21	53.1	2.06	2.54	.750	216	3.12
10	15.1	1.86	143	1.53	179	1.53	34.4	1.33	1.47	.434	121	1.75
20	10.2	1.26	86.0	.919	118	1.01	21.8	.844	.57	.168	63.6	.918
30	7.75	.956	59.9	.640	89.0	.763	16.0	.619	.23	.068	42.5	.613
50	4.98	.614	31.8	.340	53.5	.459	8.38	.324	0	0	22.4	.323
70	3.12	.385	16.2	.173	34.5	.296	3.71	.144			11.8	.170
80	2.28	.281	11.1	.119	27.6	.237	2.07	.080			8.3	.120
90	1.41	.174	6.85	.073	20.8	.178	.60	.023			5.2	.075
95	.92	.113	4.79	.051	16.9	.145	.01	.0004			4.0	.058
98	.59	.073	3.30	.035	13.6	.117	0	0			3.2	.046
99	.44	.054	2.63	.028	11.9	.102					2.8	.040
99.5	.34	.042	2.15	.023	10.6	.091					2.5	.036
99.9	.22	.027	1.48	.016	8.5	.073					2.0	.029

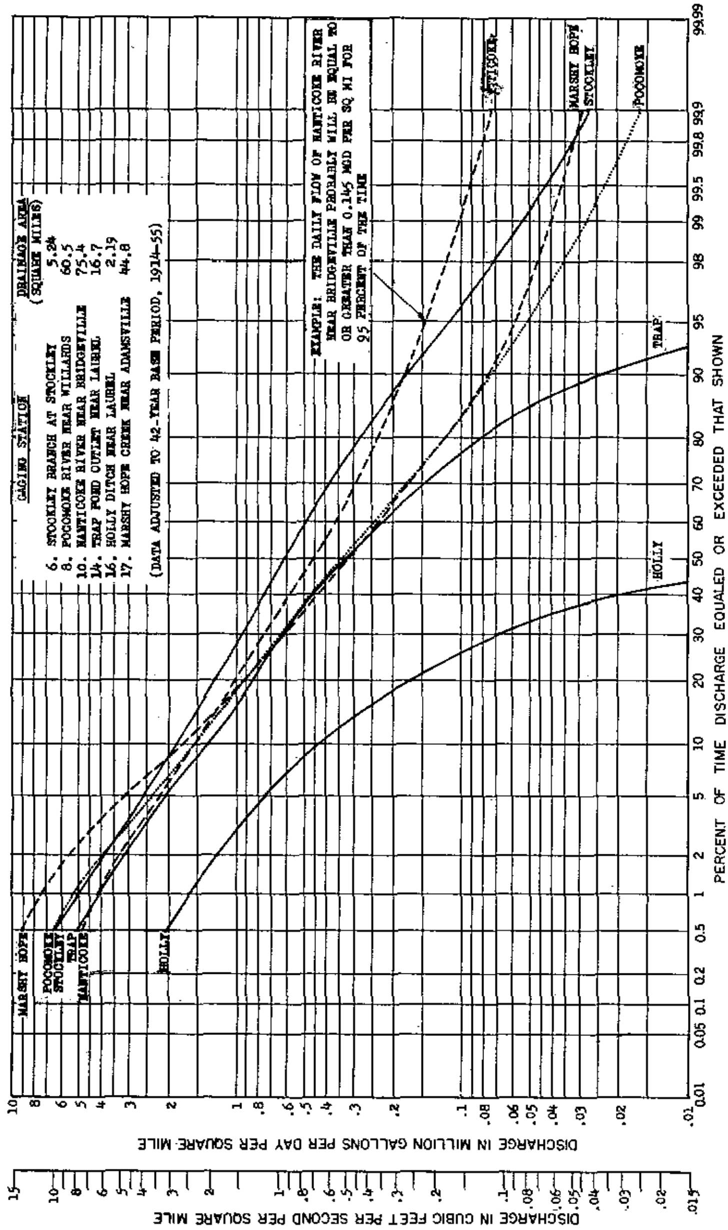

Figure 7. Duration curves of daily flow for gaged streams in the Sussex County area.

Table 7. -- Average discharge at stream-gaging stations in the Sussex County area

Gaging station Drainage area	Average discharge in million gallons per day per square mile for period shown in column headings				
	5 years 1952-56	6 years 1951-56	7 years 1950-56	13 years 1944-56	42 years 1914-55
6. Stockley Branch at Stockley: 5.24 sq mi	0.844	0.792	0.776	0.868	0.911
8. Pocomoke River near Willards: 60.5 sq mi	.683	.635	.609	-	.684
10. Nanticoke River near Bridgeville: 75.4 sq mi	.766	.711	.672	.722	.737
14. Trap Pond Outlet near Laurel: 16.7 sq mi	.615	-	-	-	.593
16. Holly Ditch near Laurel: 2.19 sq mi	.109	.093	-	-	.143
17. Marshy Hope Creek near Adamsville: 44.8 sq mi	.742	.700	.646	.724	.792

charge adjusted to the 42-year period. These figures are also shown in table 7.

The low average discharge of Holly Ditch near Laurel (table 7, no. 16), of only 0.143 mgdsm, indicates that this small area is discharging chiefly by subterranean drainage to Broad Creek and by evapotranspiration to the atmosphere. There is little reason to suppose that this area is physically much different from any other area in Sussex County. This discharge of 0.143 mgdsm, compared with the average discharge of the five other stations, 0.743 mgdsm, or a ratio of 1 to 5, indicates the effectiveness of a recent man-made shallow drain as compared with the old established deeper natural drainageways.

Low-Flow Frequency

The low-flow frequency curve gives the average interval at which a specific discharge may be expected to recur as the lowest flow in an annual period beginning April 1 and ending March 31. Low-flow frequency curves for the average minimum flow during period of 1, 7, 15, 30, 60, 120, 183 consecutive days and for 9 and 12 consecutive months are shown in figure 8 for Pocomoke River near Willards, about 4 miles south of the Sussex County line. These curves do not imply a regularity of occurrence, but rather the probable average interval between specified low flows. Low-flow frequency data for six gaged sites in the report area are summarized in table 8. The data may be used to predict future streamflow, assuming that the flow during the base period was normal and that the flow will follow the pattern of the past. For example, the lowest 7-day flow of Nanticoke River near Bridgeville in a year may be expected to be equal to or less than 0.115 mgdsm at an average interval of 5 years, or, stated another way, that a minimum 7-day flow as low as 0.115 mgdsm has a probability of 20 percent of occurring in any particular year. Low-flow characteristics at a site on a stream are modified when storage or diversion facilities are installed, and when such facilities are installed after the base period the effects need to be evaluated.

Analyses to indicate the maximum number of consecutive days during which the flow remained equal to or less than a specified discharge, have not been made for this report. Research is in progress to define methods whereby this deficient discharge might be computed from the low-flow frequency data described above.

Storage Requirements

The need for storage becomes apparent when the flow of a stream in its natural state cannot meet the requirements of a water development. The amounts of storage required to maintain selected drafts have been determined by mass-curve analyses of streamflow records in which the accumulated (monthly) flow is plotted against the time of accumulation. Storage volume required is determined as the maximum ordinate between the mass curve and a specified "use line" drawn tangent to the mass curve at some critical period of deficient discharge.

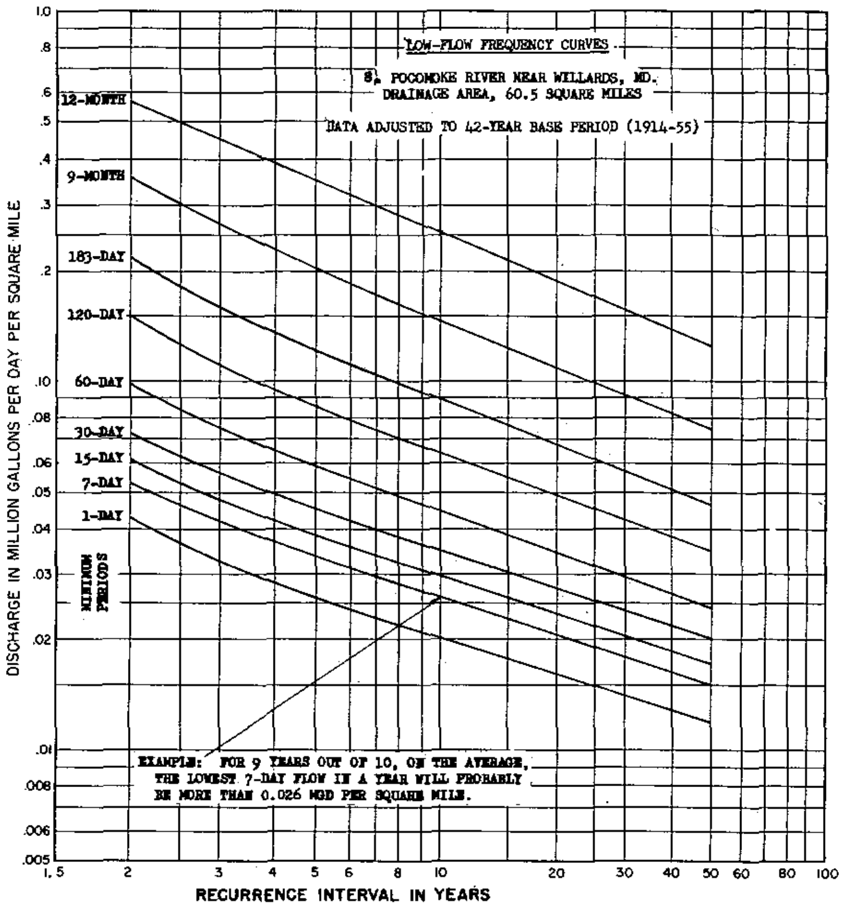

Figure 8. Magnitude and frequency of low-flows, Pocomoke River near Willards, Md.

Table 8. -- Magnitude and frequency of annual low flow at stream-gaging stations in the Sussex County area (Adjusted to the 42-year period, 1914-55, on basis of long-term streamflow records in adjacent states).

Gaging Station	Drainage area sq mi	Recurrence interval years	Average discharge, in millions of gallons per day per square mile, for length of minimum period indicated in column headings								
			1-day	7-day	15-day	30-day	60-day	120-day	183-day	9-month	12-month
6. Stockley	5.24	2	0.094	0.125	0.144	0.179	0.247	0.358	0.469	0.636	0.829
Branch at		5	.049	.070	.080	.099	.139	.213	.296	.434	.611
Stockley		10	.035	.052	.059	.072	.098	.154	.220	.340	.500
		25	.023	.034	.040	.049	.064	.101	.150	.249	.387
		50	.017	.025	.030	.036	.046	.073	.113	.197	.321
8. Pocomoke	60.5	2	0.043	0.054	0.061	0.073	0.098	0.150	0.217	0.358	0.570
River near		5	.026	.034	.038	.045	.059	.086	.121	.204	.353
Willards		10	.020	.026	.030	.035	.045	.064	.090	.144	.254
		25	.015	.019	.022	.026	.032	.045	.062	.099	.169
		50	.012	.015	.017	.020	.024	.035	.046	.075	.125
10. Nanticoke	75.4	2	0.132	0.151	0.163	0.181	0.217	0.280	0.351	0.476	0.647
River near		5	.098	.115	.122	.135	.159	.200	.247	.337	.470
Bridgeville		10	.084	.099	.105	.117	.135	.168	.206	.274	.384
		25	.069	.082	.088	.097	.110	.136	.165	.218	.297
		50	.059	.071	.077	.084	.094	.117	.139	.184	.251
14. Trap Pond	16.7	2	--	0.0006	0.0050	0.025	0.059	0.124	0.207	0.352	0.542
Outlet near		5	--	--	--	--	.0023	.043	.089	.179	.333
Laurel		10	--	--	--	--	--	.010	.049	.113	.232
16. Holly	2.19	2	--	--	--	--	--	--	0.0053	0.030	0.086
Ditch near		5	--	--	--	--	--	--	--	.0019	.025
Laurel		10	--	--	--	--	--	--	--	--	.0083
17. Marshy Hope	44.8	2	0.052	0.060	0.066	0.079	0.110	0.176	0.273	0.443	0.674
Creek near		5	.039	.045	.048	.056	.071	.105	.156	.264	.428
Adamsville		10	.033	.039	.042	.047	.058	.082	.117	.196	.319
		25	.027	.032	.035	.039	.046	.062	.084	.136	.221
		50	.023	.028	.030	.033	.039	.052	.069	.105	.170

When economic considerations alone govern the design of a development, the frequency with which the natural flow must be augmented to supply selected rates of regulated flow becomes even more important than the flow during a single critical period. By using data on storage-required frequency, the cost of providing storage can be weighed against the loss of revenue due to deficient flow.

In this report the analyses of storage requirements are based on frequency-mass curves such as the one shown in figure 9. These mass curves differ from those described above in that they represent the discharge for a particular recurrence interval rather than that observed during some particular drought period. Thus, to develop data for a range of values, individual mass curves were drawn for recurrence intervals of 2, 5, 10, and 25 years. The circles on the curve of total discharge available in figure 9 represent discharge from table 8 multiplied by the number of days in the minimum period, plotted against the number of days. Draft rates are determined by the slope of the draft line and corresponding storage is determined by the maximum vertical distance to the line of total discharge available. The values of storage required are original assumptions and values of less than 5 mgsm have been omitted from figure 9 for clarity. Data on allowable draft and on storage required, computed as shown on figure 9, were used to develop curves of storage requirements as shown in figure 10, which were then summarized in table 9 for gaged streams in the report area. These data might also be plotted with allowable draft as the ordinate, storage required as the abscissa, and selected recurrence intervals as the third parameter.

These analyses of storage requirements make no allowance for dead storage or for reservoir losses such as evaporation or seepage. These factors must be considered before the tables can be used for design purposes. Use of these data are illustrated by specific examples in the section of this report entitled, "Evaluation by Basins."

Flood-Frequency Relations

The safe, economic, and practical design of dams, bridges, highways, and a variety of structures located on flood plains is partly dependent on the magnitude and frequency of occurrence of flood peaks. Studies of flood-frequency should provide a means of predicting, for any site in a given area, the flood height and discharge which might be expected to occur within some specified period of time. Because of inadequacies in areal coverage and in duration of records, it is not possible at this time to develop relationships which could be considered reliable for any stream site within the county. The curves that have been developed should be used with caution beyond the limits of stream location and area from which they were developed.

In this analysis, annual (water year) flood peaks were tabulated for the 15-year period, 1944-58, for Stockley Branch, Nanticoke River, and Marshy Hope Creek. Flood peaks for the stations with shorter periods of record (Pocomoke River, Holly Ditch, and Trap Pond Outlet) were also tabulated and estimates were made of the annual peaks outside of the period of record in order that all of the computations might have the same, 1944-58, time base.

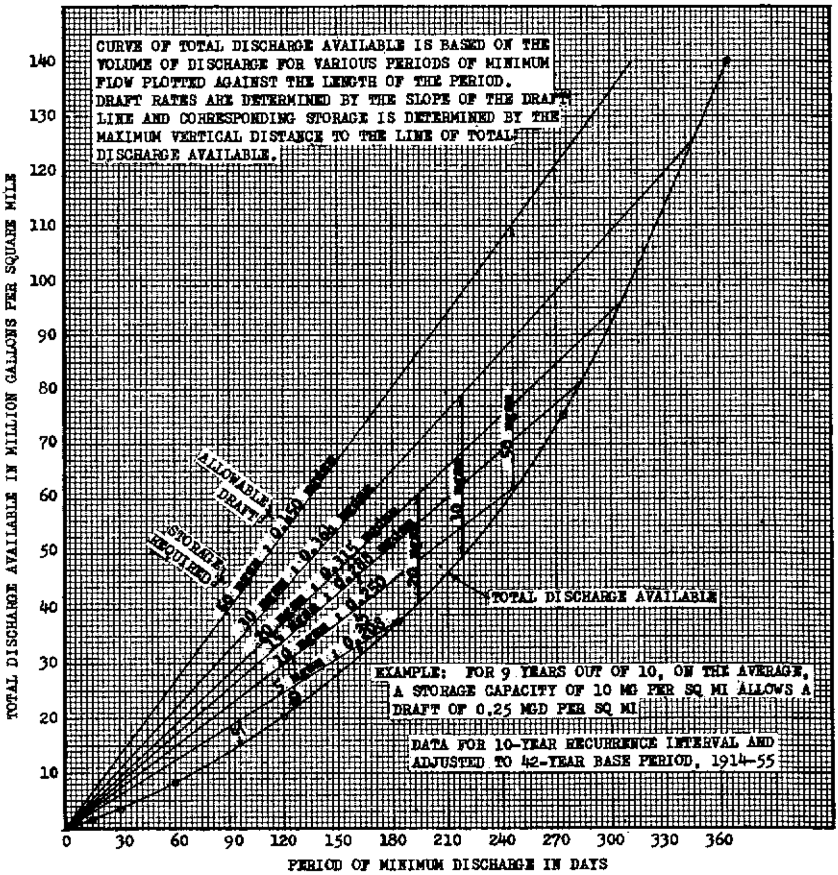

Figure 9. Frequency mass curves and storage-draft rates, Nanticoke River near Bridgeville.

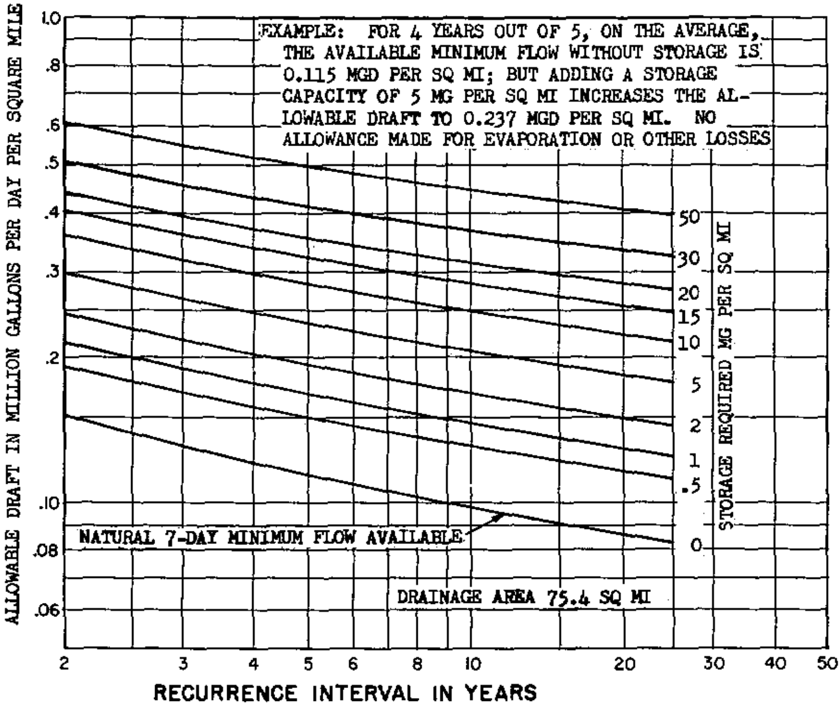

Figure 10. Storage requirements, Nanticoke River near Bridgeville, adjusted to 42-year (1914-55) base period.

Table 9. -- Storage requirements at stream-gaging stations in the Sussex County area
(Adjusted to the 42-year period, 1915-55, on basis of long-term streamflow records in adjacent states).

Gaging Station	Drainage area sq mi	Recurrence interval years	Natural 7-day flow mgdsm	Net amount of reservoir storage, in millions of gallons per square mile, uncorrected for evaporation or other losses. 0.5	1	2	3	5	10	15	20	30	50
				Allowable draft, in millions of gallons per day per square mile, for net storage indicated above.									
6. Stockley Branch at Stockley	5.24	2	0.125	0.179	0.205	0.244	0.278	0.329	0.410	0.471	0.522	0.607	0.742
		5	.070	.114	.133	.163	.189	.223	.286	.333	.381	.455	.566
		10	.052	.089	.105	.130	.146	.176	.233	.277	.320	.384	.488
		25	.034	.067	.079	.097	.111	.136	.184	.222	.256	.314	.409
8. Pocomoke River near Willards	60.5	2	0.054	0.089	0.107	0.130	0.147	0.173	0.228	0.273	0.314	0.378	0.488
		5	.034	.062	.075	.092	.106	.127	.167	.200	.230	.283	.373
		10	.026	.050	.062	.075	.087	.105	.143	.171	.196	.242	.324
		25	.019	.039	.048	.060	.070	.085	.116	.142	.164	.206	.281
10. Nanticoke River near Bridgeville	75.4	2	0.151	0.190	0.214	0.244	0.266	0.299	0.360	0.404	0.441	0.510	0.615
		5	.115	.150	.167	.192	.210	.237	.283	.322	.355	.409	.500
		10	.099	.132	.148	.169	.184	.208	.250	.288	.315	.364	.450
		25	.082	.111	.125	.143	.156	.177	.217	.247	.272	.317	.398
14. Trap Pond Outlet near Laurel	16.7	2	0.001	0.036	0.056	0.086	0.107	0.142	0.203	0.247	0.289	0.364	0.477
		5	0	.009	.019	.035	.052	.080	.125	.164	.198	.252	.347
		10	0	.007	.013	.024	.034	.056	.094	.129	.157	.204	.289
16. Holly Ditch near Laurel	2.19	2	0	0.004	0.008	0.014	0.021	0.032	0.058	0.080	0.101	0.140	--
17. Marshy Hope Creek near Adamsville	44.8	2	0.060	0.096	0.114	0.140	0.160	0.190	0.250	0.300	0.343	0.420	0.545
		5	.045	.074	.086	.103	.117	.141	.186	.227	.260	.319	.417
		10	.039	.065	.074	.090	.102	.123	.162	.195	.225	.278	.368
		25	.032	.054	.064	.076	.087	.103	.137	.166	.191	.237	.318

The 15 peaks were then ranked in order of magnitude and the recurrence interval T in years computed by the formula $T = (n + 1)/m$ where n is the number of years of record (15), and m is the order number of each flood, the greatest being numbered 1. These computations are illustrated in table 10 which summarizes the data for Nanticoke River. Preliminary individual flood-frequency curves were then drawn for each of the six stations on a graph of discharge versus recurrence interval, similar to that of figure 11. The graphical mean-annual flood was picked from each curve at its intersection with the 2.33-year line on the basis of one theory of the probability of occurrence of extreme values (Gumbel, 1945).

From a statistical consideration of the relation between the mean annual flood, the 10-year flood, and the effective length of record (Mitchell, 1954), it was determined that the six stations were homogeneous to the extent that their individual frequency curves could be combined into one composite frequency curve. Accordingly, the ratios of annual floods to the mean annual flood were computed as shown in table 10. Median values of a ranked tabulation of these ratios were plotted and the curve shown in figure 11 was drawn. This curve is dashed beyond 20 years to emphasize its limited time definition. Actually, the scatter of the plotted points is such that curves differing by as much as 20 percent in ratio, at the 10-year interval, might be drawn.

Assuming that, for design purposes, a recurrence interval has been selected, the ratio of the magnitude of that flood to the mean annual flood may be picked from the curve of figure 11. For example, the 20-year flood will be 3.3 times as large as the mean annual flood. It should be borne in mind that the 20-year flood is one which is expected to recur once in 20 years, on the average. It would also be thought of as a flood of such magnitude that the odds are 1 in 20 that it will be equaled or exceeded within any given year (Mitchell, 1954).

The remaining problem is the determination of the magnitude of the mean annual flood. Many studies have confirmed the natural assumption that magnitude of flood increases with size of drainage area in a region of relatively homogeneous physiography and climatology. Other factors such as land and stream slopes; geology; floodwater storage in stream channels, swamp, and ponds; and type of vegetal cover and land use have also been found important. Of the six streams in the Sussex County area, four, Stockley Branch, Pocomoke River, Nanticoke River, and Trap Pond Outlet, may be grouped together as expressed by the central curve of figure 12 in which the mean annual flood is shown as a direct function of drainage area. The four points are not precisely on the curve; however, statistical considerations indicate that they plot within an allowable range. The relation for Marshy Hope Creek is shown as the upper curve of figure 12, which possibly demonstrates that extensive ditching has increased the mean annual flood. The erratic plotting of Holly Ditch (represented by the lower curve segment) may be related to the fact that the ditch was dry a considerable part of the time. It must be reemphasized that, because of the small number of stations available for analysis and their relatively short periods of record, the curves should be considered only as approximations of the flood-frequency relations for the county.

Table 10. -- Annual flood peaks, Nanticoke River near Bridgeville
Drainage area, 75.4 square miles. Period of record, April 11, 1943 to September 30, 1958

Water year	Date	Gage height (feet)	Discharge (cfs)	Ratio to $Q_{2.33}$	Order	Recurrence interval (T years)*
1933	August	+	-	-	-	-
1935	September	11.0±	-	-	-	-
1943	Apr. 21, 1943	5.00	400	‡	‡	‡
1944	Mar. 14, Apr. 26	5.13	420	0.75	10	1.60
1945	July 24, 1945	5.24	435	.78	9	1.78
1946	Dec. 30, 1945	6.20	730	1.30	4	4.00
1947	May 27, 1947	4.98	386	.69	11	1.45
1948	June 5, 1948	6.40	830	1.48	2	8.00
1949	Dec. 5, 1948	5.81	590	1.05	7	2.29
1950	Mar. 24, 1950	3.91	216	.39	15	1.07
1951	June 12, 1951	4.15	240	.43	14	1.14
1952	Dec. 22, 1951	6.21	776	1.39	3	5.33
1953	Mar. 17, 1953	5.39	468	.84	8	2.00
1954	Mar. 5, 1954	4.53	248	.44	13	1.23
1955	Aug. 15, 1955	6.12	680	1.21	5	3.20
1956	Mar. 17, 1956	4.84	270	.48	12	1.33
1957	Nov. 3, 1956	6.03	680	1.21	6	2.67
1958	Aug. 26, 1958	8.84	2300	4.11	1	16.00

Graphical mean annual flood ($Q_{2.33}$): 560 cfs for period 1944-58.

* T = (n+1)/m = (15+1)/m.

\+ Water an unspecified depth over bridge floor which is at 8 feet, gage datum.

‡ Year incomplete.

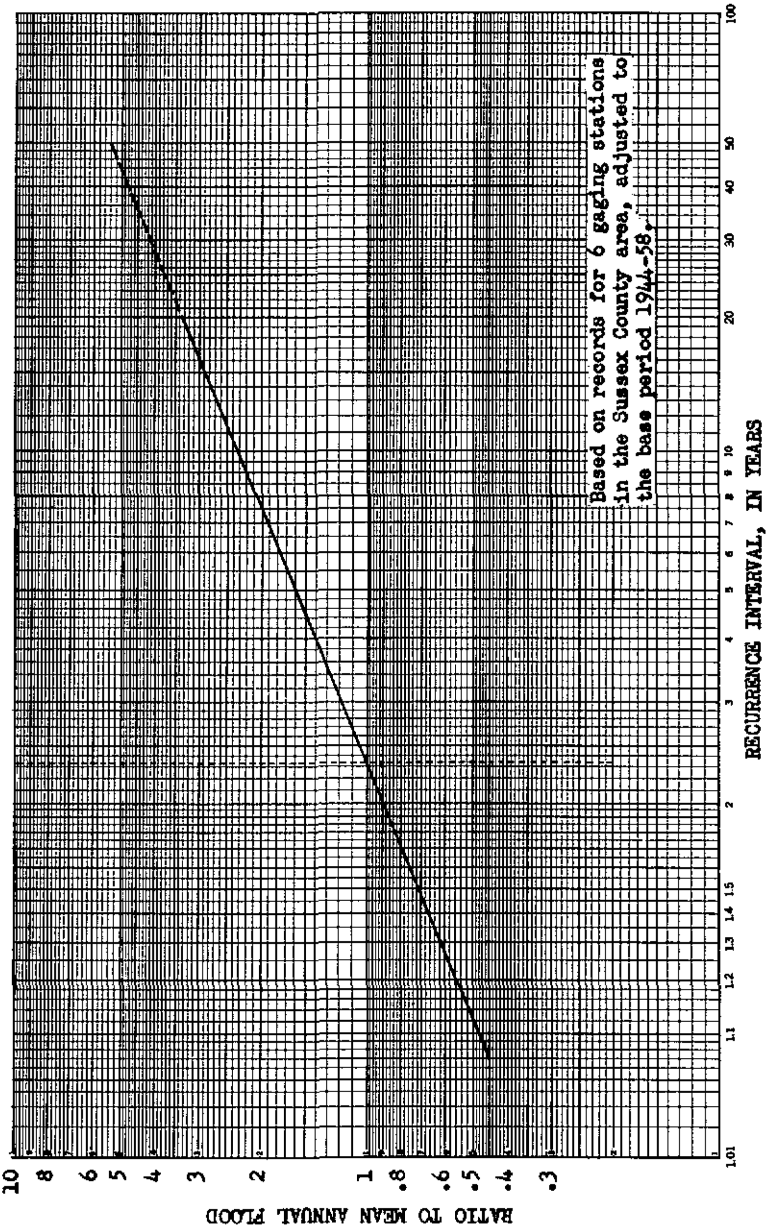

Figure 11. Frequency of annual floods for streams in Sussex County.

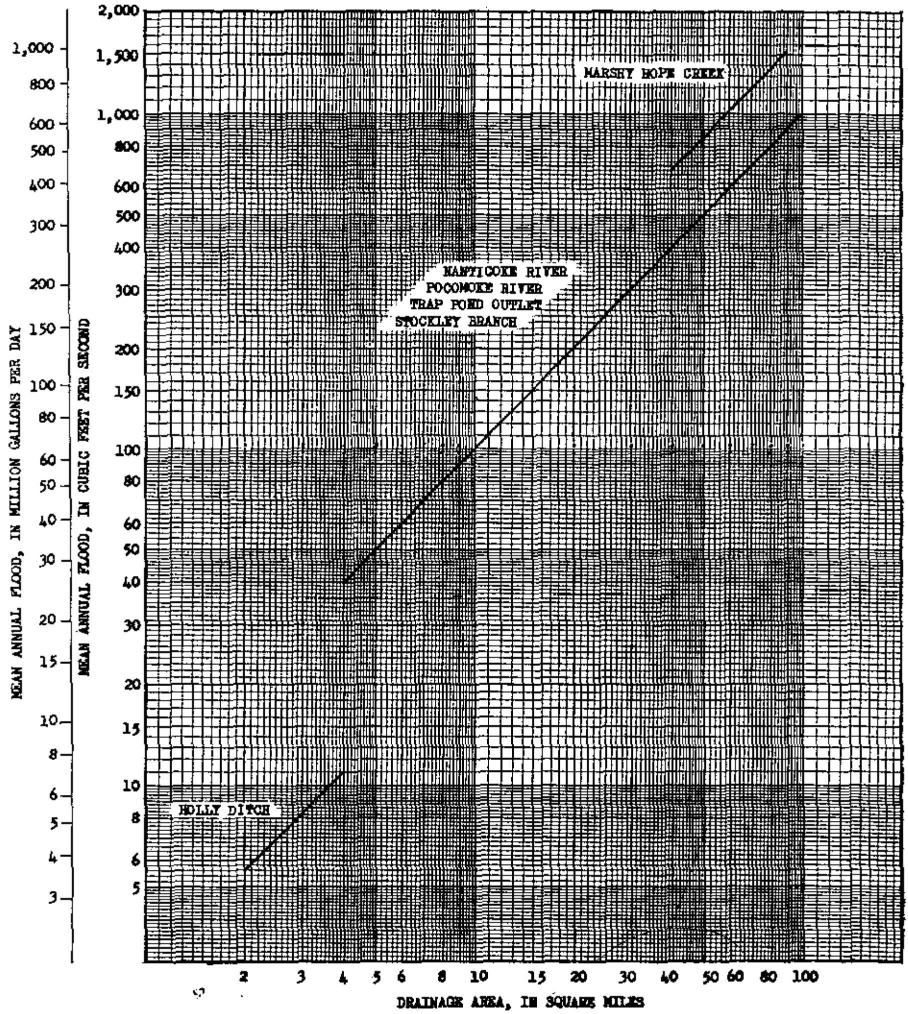

Figure 12. Variation of the mean annual flood with drainage area for streams in Sussex County.

QUALITY OF THE SURFACE WATERS

By Peter W. Anderson

The surface waters of Sussex County, Del., are used principally for navigation; industrial cooling and cleaning processes; irrigation, dairying, poultry farming and other agricultural uses; waste disposal; recreation and fishing; the culture of shellfish; and the generation of power for woolen and feed mills. In selecting a site for a water-using facility, the chemical quality of the water is an important consideration, and may be the determining factor, in conjunction with the quantity available. Chemical analyses are often desirable to determine whether the water is suitable for a particular purpose or, if not, to determine the type and cost of treatment or other remedial action needed to make it satisfactory.

In 1950 the Water Pollution Commission of the State of Delaware initiated comprehensive studies of pollution in the principal basins within the county. These studies (Kaplovsky, 1950, 1951a, and 1951b, 1952, 1958; Kaplovsky and Aulenbach, 1956) are concerned principally with sanitation problems and give only partial information about the mineral content of the surface waters. For many industrial and agricultural purposes, it is important to know the mineral content and its seasonal variations during periods of high and low flow. Accordingly, the Geological Survey in November 1957 and April 1958 analyzed a few spot samples from streams in Sussex County. These streams were sampled above the head of tide, where the quantity of water available for use is limited. The results of the chemical analyses together with several analyses made by the Water Pollution Commission of the State of Delaware (1958) in May and June 1955, are presented in table 11.

All natural waters contain varying amounts of dissolved mineral matter, which originate primarily in the solution of materials found in the rocks and soils, or in the decomposition of organic material in the swamps and lowlands. The following paragraphs are descriptions of five selected constituents or properties of surface waters.

Dissolved Solids

Dissolved solids are a measurement of the amount of dissolved mineral matter in the water. The maximum concentration, prior to treatment, recommended for most industrial and domestic uses is 500 ppm. Waters containing dissolved solids less than 1,500 ppm are satisfactory for most irrigation purposes.

Concentrations of dissolved solids in the analyses presented in table 11 were relatively low, ranging from 49 to 110 ppm. However, the table contains no analyses showing the high mineral content of the brackish and saline waters below the head of tide. In hydrographic surveys of the Brandywine and Cape May Channels of the Delaware Bay, opposite the mouths of the Mispillion and Broadkill Rivers, Cronin (1953) found a salinity concentration range of 10,560 to 32,000 ppm.

Table 11.--Chemical analyses of water from streams in Sussex County

(Chemical constituents in parts per million)

Date of collection	Mean discharge (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe) *	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$: Calcium, Magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color
MISPILLION RIVER BASIN																			
**2. Cedar Creek near Lincoln																			
April 22, 1958	24	64					7.1		13	2.4	6.0		2.4		8	0	52	6.2	20
BROADKILL RIVER BASIN																			
3. Pemberton Branch near Milton																			
April 22, 1958	29	61					5.5		12	4.0	6.0		2.1		12	2	53	6.1	35
4. Beaverdam Creek near Milton																			
April 22, 1958	27	61					7.6		18	4.0	9.0		5.9		20	5	85	6.1	30
5. Sowbridge Branch near Milton																			
Nov. 1, 1957	4.7	55		0.32			7.8		10	5.4	7.9		3.2		10	2	57	6.1	20
INDIAN RIVER BASIN																			
6. Stockley Branch at Stockley																			
Nov. 1, 1957	1.9			0.58			7.8		10	3.1	9.8		6.3		13	5	72	6.0	8
Long Drain Ditch below Betts Pond near Millsboro																			
≠ June 8, 1955				6.0					10						24			5.2	
Indian River at Millsboro																			
≠ April 25, 1956		54		0.25											34			6.3	
7. Pepper Creek at Dagsboro																			
April 22, 1958	11	60					9.2		18	23	10		6.3	110	38	23	127	6.7	37
Vines Creek at Frankford																			
≠ June 8, 1955				6.0					10						24			5.2	
NANTICOKE RIVER BASIN																			
10. Nanticoke River near Bridgeville																			
≠ May 24, 1955	51	68	9.4	1.3	3.2	0.3			15				1.1	64	18			6.1	
Nov. 1, 1957	43	55		.53			8.0		10	3.6	7.4		9.0		12	4	69	5.8	10

Table 11.--Continued

(Chemical constituents in parts per million)

9-268j

Date of collection	Mean discharge (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe) *	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
															Calcium, Magnesium	Non-carbonate			
Gravelly Branch at Collins Mill Pond near Redden																			
/ May 24, 1955		82	6.7	2.4	1.3	0.3			12				0.2	49	14			6.7	
11. Deep Creek at Old Furnace Mill																			
April 21, 1958	42	68					5.3		9	4.8	6.0		0.9		10	3	48	6.0	37
12. Tyndall Branch near Hardscrabble																			
April 21, 1958	24						13		26	2.8	7.0		3.3	55	8	0	83	6.4	35
Deep Creek at Concord Pond at Concord																			
/ May 24, 1955		73	8.3	1.7	2.3	0.5			16				0.4	51	26			6.3	
Clear Brook at Williams Pond at Seaford																			
/ May 24, 1955		76	8.4	1.8	5.6	0.5			22				0.4	62	20			6.5	
13. Butler Mill Branch near Woodland																			
April 21, 1958	16	62					5.8		14	4.4	6.0		5.2		16	5	65	6.1	28
14. Trap Pond Outlet near Laurel																			
Nov. 1, 1957	0.4	55		.2			6.7		12	3.8	7.0		0.9		10	0	52	6.0	7
15. Chipman pond Branch near Laurel																			
April 21, 1958	18	64					9.4		22	3.6	7.0		6.1	65	16	0	80	6.3	25
James Branch at Records Pond at Laurel																			
/ May 24, 1955		76	5.6	1.9	2.7	0.8			17				0.4	51	24			6.3	
17. Marshy Hope Creek near Adamsville (1.65 miles upstream from Sussex County line)																			
Sept. 24, 1958		61					7.1		18	7.3	7.0		2.5	67	19	4	78	6.3	40

* Iron in solution at time of analysis by U.S.G.S. or at time of sampling by Water Pollution Commission.
** Index number of site shown on 8.
/ Analysis by Water Pollution Commission of the State of Delaware.

Chlorides

The chloride content of surface waters may be attributed to natural mineral origin or to contamination by industrial and domestic wastes and sewage. When used for irrigation, waters containing excessive amounts of chloride are toxic to most plants. Chloride concentrations as low as 100 ppm may be noticeable. The taste threshold for different solutions of compounds may differ according to the type of salt in the water, as shown in the table below:

	Approx. taste threshold in parts per million
calcium chloride	150-500
magnesium chloride	168-750
potassium chloride	350-600
sodium chloride	200-550

(from "Water Quality Criteria", California State Water Pollution Control Board, 1952)

Taste tolerances can be developed by continuous use of unsatisfactory waters or they may be an individual psychological reaction. The U. S. Public Health Service Drinking Water Standards recommend that the chloride content of water used for public supplies should not exceed 250 ppm. The few samples analyzed from the streams of Sussex County all contained 10 ppm of chloride or less. Kaplovsky and Aulenbach (1956) found chloride concentration approaching the concentration of sea water in the Lewes and Rehoboth Canal and in the Indian River Bay. Chloride is a critical factor in the large shellfish industry of the State, as most shellfish require a salt content of from 5, 000 to 35, 000 ppm for proper growth.

Hardness

The term "hardness" is applied as a measure of the ability of water to form an insoluable curd with soap. The curd shows up on fabric as a gray coloring. Hard water is responsible for scale in boilers, pipes, and hot water heaters. The analyses presented in table 11 contained from 8 ppm to 38 ppm of calcium, magnesium hardness as $CaCO_3$. Such water can be considered soft, suitable for most purposes without treatment.

pH

The term "pH" is used as a measure of the intensity or degree of acidity or alkalinity of water. Water having a pH of 7. 0 is neutral, above 7. 0 alkaline, and below 7. 0 acid. With the exception of two streams in the Indian River Basin, Vines Creek (pH 5. 2), which drains the Cedar Swamp, and Shoals Branch (pH 5. 2), the streams showed a pH between 5. 8 and 6. 7 when analyzed. The pH of waters below the head of tide would probably be closer to that of sea water (pH 7. 5 - 8. 4).

In the use of water for irrigation, it is necessary to know the physical and chemical properties of the soil, because in an alkaline soil it is best to use water with a low pH. Shellfish growth is favored by a slightly alkaline water.

Iron

Iron is dissolved from soil and rocks. It is of little importance in irrigation, but in washing and cleaning processes it causes a reddish stain in quantities as low as 0.30 ppm. Some surface waters of the county have a high concentration of iron, mostly around 1.0 ppm. Kaplovsky and Aulenbach (1956) report that some streams in the Indian River basin contain as much as 6.0 ppm of iron.

In summary, the few analyses of the fresh waters in Sussex County presented are low in dissolved-solids content, chloride and hardness, are high in iron concentration, and have a pH of 5.2 to 6.7. The analyses presented in table 11 are mostly of water samples taken during the months of April, May, and June 1957-58, and quite possibly are not representative of other months or years.

EVALUATION BY BASINS

The foregoing surface-water sections of this report have been concerned with the analyses of the several flow characteristics at the six principal gaging stations in or near Sussex County. The seven basins of the county are discussed briefly in regard to physiography, streamflow information available, and application of the analyses previously presented in tabular form. As mentioned earlier, records of daily discharge are published annually in U.S. Geological Survey Water-Supply Papers, wherein also are given the details of location, drainage area, records available, gage type and datum, average discharge, momentary extremes, and remarks pertaining to the accuracy of the records and conditions which affect the natural flow at the gaging station. For information of this nature it is suggested that pages 282 to 291 of Water-Supply Paper 1432 (1956) be consulted.

This discussion follows the "downstream order" of the tabulation of streams and drainage areas of table 7. Many of the ponds and smaller streams mentioned in the following text have not been identified by name on plate 8. These features can be located on the quadrangle maps indexed in figure 5.

Delaware Bay and Atlantic Ocean Drainage

Mispillion River Basin

Northeastern Sussex County, about 80 square miles in area, is drained by the Mispillion River and its principal headwaters, Beaverdam and Tantrough Branches. These branches terminate at Blairs Pond, below which a series of artificial lakes extend to Milford. A navigable tidewater channel is maintained from Milford to Delaware Bay at Mispillion Light (U. S. Army Engineer Division, 1957). A complete-record gaging station was established in May 1958 on Beaverdam Branch, 0.8 miles south of Houston. In time this record will provide an estimate of the available fresh-water supply at Milford although the drainage area above the station is only about one-tenth of the drainage area above Milford.

Cedar Creek, roughly parallel to the Mispillion River, 5 miles to the south, is considered a tributary of the Mispillion because its lower reach is ditched to the river mouth at Mispillion Light. The drainage area of Cedar Creek and its principal tributary, Slaughter Creek, is almost as large as that of the Mispillion River; however, a greater proportion of the area drains marshlands. Although no gaging-station records have been collected on Cedar Creek, a series of base-flow measurements (table 4) have been made 1.2 miles south of Lincoln. After several years of concurrent operation, the Cedar Creek measurements can be correlated with the records for Beaverdam Branch at Houston, or for Sowbridge Branch near Milton, to obtain a limited but useful amount of information about the flow-duration and low-flow frequency characteristics of the creek.

Broadkill River Basin

The Broadkill River basin occupies about 110 square miles of eastern Sussex County and drains to Delaware Bay at Roosevelt Inlet through the Lewes and Rehoboth Canal. The river is formed by the confluence of Pemberton and Ingram Branches at Wagamons Pond in West Milton, below which it is navigable to Delaware Bay. As the Broadkill flows eastward from Milton, Beaverdam Creek joins it from the south and Primehook Creek joins it from the north through a drainage ditch that was part of a mosquito control project. The former Delaware Bay outlets of Primehook Creek and Broadkill River have been blocked for some time. Old Mill and Canary Creeks are the principal tributaries to the lower tidal reach of the Broadkill. At one time the generally marshy area landward from Cape Henlopen was drained by Lewes Creek northward to Delaware Bay. The Lewes and Rehoboth Canal was constructed partly along this stream course, however, and the flow from the adjacent marshes and glades now may be transported north to Delaware Bay or south to Rehoboth Bay depending upon tide, tide differential, and channel condition. After considerable study, Kaplovsky and Aulenbach (1956, p. 99) found that, although there was definite cyclic flow in both directions, the net movement of the water was from Lewes towards Rehoboth.

A gaging station has been operated since October 1956 in the headwaters of Primehook Creek on Sowbridge Branch, 2.5 miles north of Milton (no. 5, pl. 8). When the Sowbridge Branch station has been operated for a length of time sufficient to establish its flow characteristics, the base-flow measurements that have been made on Pemberton Branch and Beaverdam Creek (table 4) can be correlated with the Sowbridge records. This will provide significant information on the fresh-water yield of the Broadkill basin.

Considerable use of the surface waters of the basin formerly was made in the milling and shipping of grain. In recent years, however, the growing and processing of poultry and vegetables has dominated the economy of the area, along with the development of oystering in the lower reaches of the Broadkill.

Chemical analysis of water samples at several gage sites (table 11) indicates a soft water that is slightly acid and low in chloride content, which is perhaps characteristic of the unpolluted headwaters of the streams. A variation in sodium chloride content of zero to 5,220 ppm in Broadkill River half a mile below the mouth of Beaverdam Creek was reported by Kaplovsky and others (1950).

Indian River Basin

An area of about 250 square miles of southeastern Sussex County, composed of the basins of Rehoboth and Indian River Bays and their tributary streams, drains to the Atlantic Ocean through Indian River Inlet. In the usual concept of a drainage basin pattern, Rehoboth Bay could be considered a principal tributary of the Indian River. The drainage area of the basin cannot be precisely defined because of its man-made interconnections to adjoining basins through canals and drainage ditches and because of the indeterminate nature of the drainage in some of the swampy headwaters. As these headwater areas are reclaimed by drainage projects the basins assume definite limits. An extensive system of ditches has been constructed in the southern part of the basin. As described on p. 99, the area north and west of Rehoboth Beach which drains into the Lewes and Rehoboth Canal can be tributary to either Delaware Bay or Rehoboth Bay depending on an involved relationship centered on the tidal variation. Although the shallow Assawoman Canal nominally connects the southeastern part of Indian River Bay (in the White Creek estuary) to the northern extension of Little Assawoman Bay, it is believed that there is little interbasin flow through the canal.

The main stem of Indian River originates at the outlet of Millsboro Pond into which Cow Bridge and Mirey Branches and Sheeppen and Long Drain Ditches flow. The outflow from Millsboro Dam is the largest source of fresh-water supply in the basin. East of Millsboro Pond the principal river and bay tributaries are Iron Branch and Pepper, Vines, Blackwater and White Creeks from the south, and Swan Creek and Rehoboth Bay from the north. Love and Herring Creeks are the principal tributaries to Rehoboth Bay and yield perhaps 15 percent of the total fresh-water flow in the Indian River basin. The basin area north and west of the mouth of Rehoboth Bay is approximately 70 square miles.

Streamflow records have been collected since April 1943 on Stockley Branch (no. 6, pl. 8), which is tributary to Cow Bridge Branch. The drainage area above the gage is 5.24 square miles, but as an example of the use of flow-duration curves, assume that it is desired to locate a facility using surface water at a site adjacent to Stockley Branch where the drainage area is 5 sq mi and that construction of a storage dam is not planned. Further assume that a flow of 500,000 gpd (0.1 mgd per sq mi from 5 sq mi) is required for plant operation. From the 42-year curve (figure 6) or from table 6, it can be seen that such a flow would be available for 96 percent of the time, assuming that the flow in the future will be similar to that of the base period. Thus, over a long period of time there would be sufficient water 96 percent of the days and a shortage for the remaining 4 percent of the days. The advantages of the proposed site where such a shortage would occur could be weighed against those of alternate sites farther downstream where drainage areas are larger or against sites on other streams where the required flow would be available a greater portion of the time. The low-flow frequency data of table 8 indicate that the average flow for a 7-day period would be less than that required for plant operation at average intervals of about 3 years. The long-term economic disadvantage of a weeklong shortage can thus be calculated. If it was considered desirable to construct a dam at this point to assure the required flow, the data in table 9 indicate that, with 10 mg (million gallons) storage (2 mgsm per sq mi), the required flow would be insufficient for a 7-day period at average intervals of 25 years. Additional storage would have to be provided to compensate for evaporation, seepage, and other losses, and future reduction of reservoir volume through siltation.

Further, an examination of the daily discharge data for the 14 individual years (1943-57) discloses the fact that during 4 of the years the minimum 7-day period commenced in August; during 6 years, in September; and during the remaining 4, in October. The seasonal disadvantages of a water shortage can thus also be considered.

It is likely that in locations where the drainage areas are small, water supplies could be developed also from ground-water sources. However, if the rates of withdrawal from ground water were such that the water table was lowered appreciably during periods when the ground-water reserves could not be assured of replenishment from precipitation, it might prove feasible under favorable conditions to develop well fields adjacent to surface-water impoundments from which the ground water would be continuously replenished. One advantage of this type of development would be that a natural filtration of the surface water would be obtained.

Duration, low-flow frequency, and storage-requirement data may also be used in the calculation of the probable effect of the disposal of municipal or industrial wastes on a natural water course and the determination of the degree of effectiveness of a proposed treatment system. The possible magnitude of a flood that might be expected to occur within some specified period of time can be determined from the graphs of figures 11 and 12. For example, at the aforementioned stream site with a 5 sq mi drainage area, it can be computed from figure 12 that the mean annual flood would be 50 cfs. From figure 11, it can be seen that a flood that would be expected to occur once in 10 years on the average, would be 2.3 times as large as the mean annual flood or 115 cfs.

The data on streamflow characteristics have been developed from such a small number of gaging-station records that they should only be used for those gaged streams. A series of base-flow measurements have been obtained on Pepper Creek at Dagsboro (table 4) from which a limited amount of information canbe developed by correlation with the records for Stockley Branch.

The principal surface-water uses in the basin are those of recreation and seafood production in the tidal waters. Domestic and industrial wastes are discharged into several of the fresh-water streams and tidal areas. These sources of pollution and their effect on the waters of the basin were studied by Kaplovsky and Aulenbach (1956) who recommended measures to restore and maintain a high quality of water consistent with the economically predominant recreational uses of the water. The Water Pollution Commission (1958) has reported on the status of these remedial measures, which are being actively undertaken.

The several chemical analyses shown in table 11 and others made during the pollution study of Kaplovsky and Aulenbach (1956) indicate that the waters are slightly acid (low pH), soft, high in iron content, highly colored, and low in chloride content. Concentrations of sodium chloride content of as much as 7,100 ppm were found at Millsboro Dam, indicative of the effect of tide to that point; concentrations of 20,000 to 30,000 ppm were found in the Lewes and Rehoboth Canal and in Rehoboth and Indian River Bays.

Assawoman Bay

Several minor streams in the 60 square miles of the southeastern part of the county drain to Little Assawoman Bay through Miller and Dirickson Creeks, and to Assawoman Bay through Roy and Greys Creeks and Buntings Branch. Buntings Branch becomes Bishopville Prong in the tidal reach below Bishopville and changes further to St. Martin River below the confluence with Shingle Landing Prong.

No gaging stations have been maintained in the Assawoman Bay drainage area. The Delaware State Board of Health (1952) made an intensive study of a pollution problem in Buntings Branch below Selbyville which has since been corrected (Water Pollution Commission, 1958, p. 9). During the course of the field investigation, October to December 1951, several measurements were made in which the discharge ranged from 0.6 to 4.7 mgd from an area of about 10 sq mi, but the data were insufficient to establish a relationship between Buntings Branch and Pocomoke River. Another pollution problem at Bunting in the headwaters of Greys Creek was investigated by Kaplovsky and Aulenbach (1956, p. 128), but little runoff data are available.

Chesapeake Bay Drainage

Pocomoke River Basin

The discharge from about 38 sq mi of south-central Sussex County is measured at the Pocomoke River gaging station 1.3 miles east of Willards, Md. (no. 8, pl. 8), where the total drainage area is 60.5 sq mi. A large part of the basin in Delaware is occupied by Burnt Swamp, sometimes called Cypress Swamp or Cedar Swamp. In spite of this swampy area, the duration curves of daily flow (figure 7) indicate that the low flows of the river are not as well sustained as those in the upper Nanticoke River basin. This may be due to the effectiveness of the drainage works that have been constructed in the northern part of the Pocomoke basin.

Low-flow frequency data of table 8 and figure 8 indicate that at a point near the State line, where the drainage area is about 26 sq mi, the average discharge for a 7-day period could drop below 0.68 mgd (26 sq mi x 0.026 mgdsm) in 1 year out of 10. Reference to the storage-requirement data on table 9 shows that, for example, with a net storage capacity of 52 mg (26 sq mi x 2 mgsm) this 7-day flow could be increased to at least 1.95 mgd for 9 years out of 10, on the average. This type of appraisal is of interest in the consideration of pollution abatement measures. For instance, the cost of dilution of an industrial waste by increasing minimum flows can be compared with the cost of treatment processes to achieve the same results. Some advantageous combination of the two methods can also be considered.

The magnitude and frequency of flooding by the Pocomoke River can be estimated from figures 11 and 12. The 10-year recurrence-interval flood is 2.3 times the mean annual flood (figure 11) and, for a site near the State line, the mean annual flood is estimated to be 260 cfs (figure 12). The flood to be expected 1 year out of 10 on the average is therefore about 600 cfs.

Wicomico River Basin

A very small part of the county, occupying about 3.5 sq mi near Delmar, is in the headwater drainage area of the Wicomico River. The several streams originating in Delaware and flowing south converge about 3 miles south of Delmar. A series of discharge measurements was made during the period February 1950 to September 1951 on one of these tributaries, Leonard Pond Run (no. 9, pl. 8), and monthly discharges were computed and published (Rasmussen and Slaughter, 1955). Because this site is immediately downstream from a pond and has a drainage area of 16.2 sq mi, the results obtained may not be representative of any one of the small headwater streams in Sussex County. However, the yield from this area appears to be similar to that determined at the gaging station at Trap Pond near Laurel. No information is available on surface water use or on the chemical and physical quality of the water in this part of the Wicomico basin. Values of monthly discharge during the 20-month period of operation of the gaging station are given in the following table:

Leonard Pond Run 2 miles south of Delmar

Drainage area, 16.2 sq mi

Month 1950	Discharge in mgdsm	Month 1950-51	Discharge in mgdsm	Month 1951	Discharge in mgdsm
February	0.499	September	0.129	March	0.503
March	.898	October	.050	April	.459
April	.511	November	.100	May	.302
May	.507	December	.159	June	.711
June	.230	1951		July	.221
July	.249	January	.283	August	.120
August	.175	February	.511	September	.073
		The 1950-51 water year			.289

Nanticoke River Basin

The Nanticoke River basin occupies the western half of Sussex County and is the largest single drainage system in the county. From a 10-sq mi headwater area in Kent County, the river flows south past Greenwood to Bridgeville below which Gum Branch enters from the northeast as the first tributary of substantial size. A gaging station was established in April 1943 on the Nanticoke, 0.3 mile downstream from Gum Branch (no. 10, pl. 8). The drainage area above this site is about 75 sq mi.

After correlation with long-term records for stations in Pennsylvania and New Jersey, the duration and low-flow analyses based on records collected at the Nanticoke station were adjusted to the 42-year base period, 1914-55. The remainder of the stations in the Sussex County area were then correlated with those of the Nanticoke to develop duration, low-flow frequency, and storage requirement data for all of the stations, adjusted to the common base period. The Nanticoke records have been used to illustrate the interrelation of precipitation, water level, and streamflow (figure 2). Monthly averages and extremes for the period of record have been summarized graphically in figure 4. It will be noted from the duration-curve comparisons in figure 7 that the discharge per square mile occurring 90 percent or more of the time is higher than that of any other gaged stream in the area. The low-flow frequency data (table 8) indicate that at a hypothetical Nanticoke River plant site where the drainage area is 80 sq mi, if a withdrawal of 10 mgd was required (0.125 mgdsm), the natural daily flow would be insufficient to satisfy that requirement at average intervals of about 3 years. The average flow for a period of a week would be insufficient at average intervals of about 4 years. With net reservoir storage of 80 mg (1 mgsm x 80 sq mi), the required flow would be assured for 24 years out of 25 on the average (table 9).

As the Nanticoke continues south from Bridgeville, Gravelly Branch joins it from the northeast. This stream has its headwaters in the vicinity of Ellendale. Deep Creek, which heads near Georgetown, is the next major tributary. A series of base-flow measurements has been obtained on Deep Creek (no. 11, pl. 8) and on Tyndall Branch (no. 12, pl. 8), one of its tributaries (table 4). In time these measurements may be correlated with discharges of Stockley Branch or Nanticoke River to develop a relationship from which some characteristics of the flow in this sub-basin can be determined.

Clear Brook and Butler Mill Branch are tributary to the Nanticoke from the northwest. Base-flow measurements, not yet correlated, have also been obtained on Butler Mill Branch (no. 13, pl. 8), (table 4). A navigable channel 12 feet deep is maintained in the Nanticoke from Tangier Sound to the highway bridge in Seaford.

Broad Creek drains about 115 sq mi of southwestern Sussex County from a small headwater area near Nelson, Md., to its confluence with the Nanticoke River, 2 miles upstream from the State line. The creek is navigable below Laurel. James Branch, the head of Broad Creek, flows northward from Wicomico County, Md., and is joined by Hitch Pond Branch from the east and Chipman Pond Branch from the northeast. James Branch flows into

Records Pond at Laurel, below which the stream is named Broad Creek (shown on some maps as Laurel River). Rossakatum Branch, Little Creek, and Tussocky Branch are the principal tributaries of lower Broad Creek. A gaging station was established in June 1951 at the outlet of Trap Pond (no. 14, pl. 8) which drains a major part of the headwater area of Hitch Pond Branch. The duration and low-flow frequency characteristics are no doubt influenced by the regulatory effects of the storage immediately upstream from the gage and should not be considered as representative of ungaged areas in the vicinity.

A series of base-flow measurements has been obtained at an 8.5 sq mi drainage area site above Chipman Pond (no. 15, pl. 8). These determinations will be correlated with records for Trap Pond Outlet or Stockley Branch. A gaging station was maintained on Holly ditch (no. 16, pl. 8) 1.5 miles southwest of Laurel from August 1950 to September 1956. Analyses indicated that the ditch would be dry about 50 percent of the time and that it would not be practicable to maintain sustained flow with storage. Perhaps because of the intermittent nature of the stream, a lower than usual mean annual flood was computed for this site (figure 12). Peak discharges were no doubt often reduced by infiltration and storage of the initial runoff in the practically dry channel.

Marshy Hope Creek is tributary to the Nanticoke River 4 miles southwest of the Delaware State line, but has its headwaters in Kent County. About 45 sq mi of this headwater area is gaged at a station 1.5 miles northeast of Adamsville (no. 17, pl. 8). The creek, sometimes called Northwest Fork (of the Nanticoke River), flows south from Kent County and drains about 30 sq mi of the northwest part of Sussex County. A substantial amount of fresh water is available in Marshy Hope Creek although the flow is not as well sustained as that in the Nanticoke River near Bridgeville. At a hypothetical plant site (89 sq mi drainage area) similar to that discussed for the Nanticoke River, if a withdrawal of 10 mgd was required (0.125 mgdsm), the average river flow during some 7-day period would be insufficient every year. From table 9 it will be seen that 8 times as much net reservoir storage (8 mgsm or 640 mg) would be required on Marshy Hope Creek as on Nanticoke River to sustain the required flow for 24 years out of 25, on the average. The relative difference in the flow characteristics of these adjacent areas might be attributed to the effectiveness of the drainage works completed in Kent County. Similarly, the mean annual flood on Marshy Hope Creek appears to be higher than that of the Nanticoke or Pocomoke Rivers (figure 12). For a 50 sq mi drainage area, a 10-year recurrence interval flood of 1,950 cfs might be expected (850 cfs x 2.3 ratio).

Another one of the lower tributaries of the Nanticoke River, Baron Creek, drains 30 sq mi of which about 10 sq mi is in the southwest corner of Sussex County. Monthly discharges for a gage site near the State Corner (no. 18, pl. 8), for the period January 1950 to September 1951, were computed from a series of discharge measurements correlated with other gaging-station records in Maryland. The yield from this area, which is about half in Delaware and half in Maryland, is significantly higher than that at the partial-record gage site in the upper Wicomico River basin immediately to the east (no. 9, pl. 8). Values of estimated monthly discharge for the 21-month period of operation are given in the following table:

Baron Creek 3 miles east of Mardela Springs

Drainage area, 8.9 sq mi

Month 1950	Discharge in mgdsm	Month 1950-51	Discharge in mgdsm	Month 1951	Discharge in mgdsm
January	0.452	August	0.280	March	0.685
February	.730	September	.282	April	.692
March	1.01	October	.266	May	.403
April	.763	November	.265	June	.505
May	.873	December	.349	July	.316
June	.501	January ('51)	.429	August	.289
July	.335	February	.542	September	.249
		The 1950-51 water year			.414

In former years a considerable number of grist and sawmills were powered by water stored in small ponds throughout the basin. Although few mills continue in use, the ponds are now generally maintained for sport fishing and recreation. The DuPont Nylon plant and municipal powerplant at Seaford and the powerplant at Laurel are the largest water-using facilities. Together, they use a maximum of about 135 cfs (60,300 gpm) for cooling purposes. The water is obtained from Nanticoke River and Broad Creek at locations which are affected by tides but have not as yet been contaminated by salt-water encroachment. The use of surface water and ground water for supplemental irrigation has increased rapidly in recent years because the dominance of agriculture in the economy has spurred adoption of newly-developed equipment and techniques. The sizeable investments in farm equipment and canning plants militate against suspension of operations because of drought conditions.

The several chemical analyses shown in table 11 and determinations reported by Aulenbach and Kaplovsky (1958) indicate that the chemical quality of the surface water of the Nanticoke River basin is, in general, very good. The water is soft, slightly acid, and low in chloride. The undesirable features are a relatively high iron content and a tendency to be somewhat corrosive. Although there are no facilities for the treatment of domestic or industrial wastes except at the DuPont Nylon plant in Seaford, the pollution problems were found to be localized in nature. Treatment plants have been planned by the municipalities of Seaford and Laurel.

GROUND WATER

Ground water is water that occurs beneath the land surface and is free to move by gravity to wells, seeps, and springs. It is stored in the zone of saturation; a zone in which all of the interconnected openings or voids in the rocks of the earth's crust are filled with water. The top of the zone of saturation is called the "water table." Above the water table three other zones are identified, each of which has some water in retention and some water in transit, but none of these yield water to wells or springs.

The uppermost zone is called the soil zone or belt of soil moisture. Water in the soil zone, called "soil water," is retained by molecular and capillary forces and is the principal supply for plants.

Between the soil zone and the water table, the rocks of the earth's crust are only partly saturated. This zone is called the "zone of aeration," the "zone of suspended water," or the "vadose zone" (Meinzer, 1923). The bottom of the zone of aeration is marked by the "capillary fringe" in which water is held by capillary tension against the force of gravity, but the water in the capillary fringe is continuous with that in the subjacent zone of saturation.

In the soil zone, the zone of aeration, and the capillary fringe, the principal direction of water movement is vertical: there is little lateral movement. However, within the zone of saturation, water moves readily --- downward, sideward, and even upward --- in response to changes in the hydraulic gradient. Rock materials that are sufficiently permeable to transmit water are called aquifers, those that are relatively impermeable are called aquicludes.

Ground water occurs either under water-table (unconfined) conditions or under artesian (confined) conditions. Water-table conditions prevail where the upper surface of an aquifer is exposed to atmospheric pressure, whereas artesian conditions exist wherever an aquifer is completely saturated and the water therein is confined under pressure by an impermeable layer or aquiclude. A well pumping from a body of unconfined water actually dewaters the aquifer, obtaining most of the water from storage in the immediate vicinity of the well. A well pumping at the same rate from an artesian aquifer, lowers the pressure over a wide area, and the water taken from storage becomes available as a result of the slight compression of the aquifer skeleton over the entire area of influence or as a result of dewatering of deposits beyond the limit of confinement.

PROPERTIES OF WATER-BEARING MATERIALS

The mass properties of the water-bearing materials that chiefly affect their water-bearing character are the grain-size distribution, or sorting, and the grain arrangement, or packing. The permeability, porosity, specific retention, specific yield, and moisture equivalent, are bulk and fluid properties that are dependent upon the granular properties. All of these properties except grain arrangement or packing can be expressed quantitatively, based on measurements made either in the field or in the laboratory.

Grain-Size Distribution

The grain-size distribution of a rock or soil is determined in the laboratory by mechanical analysis, using standard sieve and hydrometer methods (Krumbein and Pettijohn, 1938). If the grade-size percentages are plotted as cumulative frequency curves on semi-logarithmic graph paper, the graphs can be used to determine the median grain diameter (Md) and the coefficient of sorting (So) as defined by Trask (1932). The median or average grain diameter can be read directly from the cumulative frequency graph by noting the grain diameter of the middlemost grain as indicated by the second quartile or 50 percent line. The sorting coefficient, So, is defined as the square root of the ratio of the first quartile (25 percent line, Q_1) to the third quartile (75 percent line, Q_3) as follows:

$$So = \sqrt{Q_1/Q_3}$$

According to Trask (1932) well sorted sediments have values of So less than 2.5, moderately sorted sediments range from 2.5 to 4.0, and poorly sorted sediments have values larger than 4.0.

Permeability and Porosity

The permeability of a rock is a measure of its ability to transmit fluid under pressure (Meinzer, 1923, p. 44). The porosity of a rock is its property of containing interstices and commonly is expressed as the ratio of aggregate volume of interstices to its total volume. This ratio is usually stated as a percentage. Porosity and permeability are not directly related properties: a clay may have a high porosity, but a very small permeability; conversely, a crystalline rock, having only a few widely separated fissures, may have a low porosity, yet owing to fluid movement through the fissures it may be highly permeable.

Quantitative measurements of permeability are generally expressed as the coefficient of permeability (P) which is defined as the rate of flow of water through a unit cross-sectional area of a rock material at right angles to the direction of flow if the hydraulic gradient is unity (Meinzer, 1923, p. 44). Laboratory determinations of the coefficient of permeability are made using either a constant or variable head apparatus described by Wenzel (1942). Values for permeability coefficients depend upon the size and arrangement of the particles, being low for clay and other fine-grained materials, and high for well-sorted gravel. Coefficients of permeability for water-bearing materials are usually greater than 10 gpd per square foot.

The porosity of a rock is determined by measuring the bulk density and particle density of the material. Porosity is then computed from the ratio of (1) the difference between bulk density and particle density, to (2) the bulk density, and is stated as a percentage. Unconsolidated sands usually have porosities ranging from about 25 to 50 percent. Soft clays have porosities usually between 30 and 60 percent, although values as high as 90 percent have been reported.

Specific Retention and Specific Yield

The specific retention of a rock is the percentage of its volume occupied by water that will be retained in the rock against the pull of gravity. The specific yield of a rock represents the percentage volume of water that will drain out of the rock by the force of gravity. Thus, by definition, the specific yield equals the porosity of the rock minus its specific retention.

Measurements of specific retention and specific yield are made by indirect laboratory methods involving the moisture equivalent. The centrifuge moisture equivalent of a rock is the amount of water, expressed as a percentage of the dry weight, retained by the material which has been first saturated with water and then subjected to a force equal to 1,000 times the force of gravity for one hour. The centrifuge moisture equivalent is multiplied by the bulk density of the sample to obtain the moisture equivalent by volume. The centrifuge moisture equivalent by volume is then adjusted to specific retention by a correction factor proposed by Piper (1933). The specific yield can then be calculated by subtracting the specific retention from the porosity of the sample.

Experience in the Beaverdam Creek area (Rasmussen and Andreasen, 1959, p. 83) indicates that in normal water-level fluctuations, the actual drainage, called "gravity yield" is only one-third to one-half of the specific yield computed by the moisture equivalent method. The "gravity yield" is approximately equal to the coefficient of storage determined by pumping test methods.

Laboratory Tests

During the course of this investigation the hydrologic properties of surficial sediments in Sussex County were determined by laboratory tests made on 32 samples. The results are summarized in tables 12, 13, and 14.

Table 12 summarizes the properties of a dune sand, beach sand, and alluvial sand, and of a basin silt, all of Recent age. The three sands are well-sorted, medium-grained sands. The silt is from the basin of Savanna "bay," and is representative of nine other analyses taken there. A pollen sample from the basin silt of Savanna "bay" was identified by Dr. John Penny, of LaSalle College, Philadelphia (personal communication) as containing a flora of Recent age.

Table 13 summarizes the properties of the Parsonsburg sand, the surficial material deposited during the Pleistocene epoch. The wide range in median grain diameters and sorting coefficients indicates the variable conditions that prevailed. The median grain diameters of the samples tested range from 0.01 mm to 0.99 mm and the sorting coefficient ranges from 1.2 to 10.7.

Table 14 summarizes characteristics of the more uniform Beaverdam sand. Well-sorted sediments predominate, and the median grain diameter of 0.52 mm, although in the coarse sand range, verges on the medium-grained sand range. The Beaverdam sand probably represents shoreline estuarine conditions during an early glacial stage and subsequent interglacial state of the Pleistocene epoch.

Table 12.--Hydrologic properties of typical samples of the Recent series, Sussex County

(Analyzed in the Hydrologic Laboratory, U. S. Geol. Survey, Denver, Colo.)

Sample	Depth (ft.)	Mechanical analysis (size in millimeters)								Median grain diameter (mm)	Coefficient of sorting (So)	Porosity (percent)	Specific yield (percent)	Coefficient of permeability (P)
		Gravel (larger than 2.0)	Very coarse sand (2.0-1.0)	Coarse sand (1.0 - 0.50)	Medium sand (0.50-0.25)	Fine sand (0.25-0.125)	Very fine sand (0.125-0.062)	Silt (0.062 -0.004)	Clay (less than 0.004)					
Dune sand	0.1	- -	0.4	9.5	58.2	30.2	1.3	0.4		0.28	1.2	41.9	41.4	1030
Beach sand	.1	0.2	3.0	35.4	56.7	4.4	0.1	0.2		.48	1.1	44.2		1530
Alluvial sand	.1	0.4	1.2	8.0	54.8	28.2	1.4	6.0		.28	1.2	34.7	16.9	220
Basin silt	3	- -	- -	0.6	4.8	49.8	10.6	11.2	23.0	.13		39.6	27.7	0.2

Table 13. -- Hydrologic properties of the Parsonsburg sand, Sussex County

(Analyzed in the Hydrologic Laboratory, U. S. Geol. Survey, Denver, Colo.)

Sample		Depth (ft.)	Mechanical analysis (size in millimeters)								Median grain diameter (mm)	Coefficient of sorting (So)	Porosity (percent	Specific yield (percent)	Coefficient of permeability (P)
Symbol 1/	Location		Gravel (larger than 2.0)	Very coarse sand (2.0-1.0)	Coarse sand (1.0-0.50)	Medium sand (0.50-0.25)	Fine sand (0.25-0.125)	Very fine sand (0.125 - 0.062)	Silt (0.062-0.004)	Clay (less than 0.004)					
Me A	Lincoln pit	4.3		1.1	4.5	49.9	35.3	3.1	6.1		0.25	1.2	41.9		850
Me B	Wilson's pit	1.5	21.6	10.5	17.7	24.1	5.6	1.6	5.4	13.5	0.47	2.5	33.2		910
Me B	Do	5.0	1.9	13.5	53.0	17.5	5.1	1.6	7.4		0.61	1.4	44.2		660
Mf A	Cedar Creek	2.0	6.6	17.2	7.6	7.0	15.8	10.6	21.2	14.0	0.15	5.8	40.4		120
Mf B	Do	4.0		2.3	15.1	38.6	30.1	4.3	9.6		0.27	1.5	41.9		410
Mg52-17	Savanna "bay"	3.0		1.5	12.4	41.9	14.3	9.4	20.5		0.28		35.1	32.1	60
Mg A	Sugar Hill "bay"	3.3	0.2	0.2	1.6	33.8	29.4	6.8	13.0	15.0	0.20	2.6	38.9	33.1	70
Mg A	Do	6.3	0.2	1.6	17.2	30.0	28.8	6.8	6.4	9.0	0.25	1.6	40.7	36.8	180
Ng B	Primehook Creek	3.4	0.6	3.7	16.8	45.6	16.0	2.7	14.6		0.36	1.5	43.3		480
Og A	Gravel Hill			18.0	7.9	7.6	18.3	13.3	13.1	21.8	0.14	5.6	64.5		1
Oh A	Al Reed pit	3.0	11.4	31.6	33.2	13.4	4.3	0.8	5.8		0.88	1.6	33.2		1430
Pb A	Alexander pit	3.2	7.4	8.3	18.2	34.9	12.2	3.4	15.6		0.36	1.8	38.1		190
Pc A	Webb pit	4.0	0.4	0.4	0.4	0.2	13.2	11.0	33.4	41.0	0.01	10.4	35.5		.0004
Pc A	Do	6.0	0.4	0.4	0.4	1.8	41.0	34.9	11.3	9.8	0.12	1.3	43.2		180
Pd B	S. Middleford	5.0	3.2	0.8	12.8	56.7	22.5	1.6	2.4		0.32	1.4	38.9	36.6	470
Pd B	Do	9.9	0.4	1.2	9.8	20.2	20.0	7.4	19.0	22.0	0.13	6.1	29.8		2
Qc B	Vicker's pit	7.5	0.3	3.8	16.3	13.7	8.9	18.5	38.5		0.10	10.7	36.6		7
Qc B	Do	9.5	4.8	10.8	25.8	22.8	9.6	2.4	6.8	17.0	0.40	2.9	40.0	31.6	370
Qg C	Hunters millpond	10.0	0.4	1.9	10.8	36.1	29.4	7.2	14.2		0.25	1.6	32.5		110

1/ Symbol refers to location of exposure or well shown on well-location map, plates 2, 3, 4, and 5.

Table 14.-- Hydrologic properties of the Beaverdam sand, Sussex County

(Analyzed in the Hydrologic Laboratory, U. S. Geol. Survey, Denver, Colo.)

Sample		Depth (ft.)	Mechanical analysis (size in millimeters)								Median grain diameter (mm)	Coefficient of sorting (So)	Porosity (percent)	Specific yield (percent)	Coefficient of permeability (P)
Symbol 1/	Location		Gravel (larger than 2.0)	Very coarse sand (2.0-1.0)	Coarse sand (1.0-0.50)	Medium sand (0.50-0.25)	Fine sand (0.25-0.125)	Very fine sand (0.125-0.062)	Silt (0.062-0.004)	Clay (less than 0.004)					
Me A	Lincoln pit	14.5	1.3	4.7	39.5	41.5	5.4	1.1	6.5		0.46	1.2	46.4		450
Me B	Wilson's pond	7.8		0.6	81.2	13.3	1.7	0.4	2.8		0.54	1.1	46.4		480
Mf A	Cedar Creek	9.5	4.1	13.1	28.0	17.4	19.2	5.4	12.8		0.43	2.3	39.2		170
Mf B	Millpond pit	7.4	0.2	1.2	13.8	50.8	30.0	2.5	1.5		0.29	1.3	41.2		720
Mf B	Do	10.0	44.0	9.5	12.6	24.8	6.9	0.5	1.7		1.3	3.9	40.0		220
Ng B	Primehook Creek	6.4	0.8	3.1	11.2	69.7	6.1	0.3	8.8		0.40	1.2	43.0		250
Og A	Gravel Hill	5.3	2.4	4.9	15.1	45.0	21.0	3.2	8.4		0.30	1.5	43.4		210
Pb A	Alexander pit	7.5		0.2	7.8	34.2	32.2	4.6	6.7	14.3	0.24	1.7	30.6		70
Pd B	S. Middleford	15.8	19.2	20.5	27.1	13.8	7.4	1.6	10.1		0.74	2.1	38.1	29.1	1620

1/ Symbol refers to location of exposure or well shown on well-location map, plates 2, 3, 4, and 5.

FLUCTUATIONS OF WATER LEVELS

The water table in Sussex County is the principal water-level surface. There are piezometric surfaces for each of the artesian aquifers -- in the Miocene series -- however, these surfaces have not been defined in this study.

The only record of fluctuation of the water level in the artesian aquifers is the decline in water level at Milford in the "shallower Miocene sand" described in the preliminary Statewide report (Marine and Rasmussen, 1955, p. 134-136). Early reports indicated that flowing wells were obtained in this aquifer in the Milford area where water levels are now more than 60 feet below land surface. This decline in water level represents the cone of depression caused by municipal and industrial pumping.

The fluctuations in the water table in Sussex County are shown in figure 2, a graph comparing average ground-water level with temperature, precipitation, and streamflow for a period from 1950 through 1957. The average water level is derived from the monthly or bimonthly measurement of four observation wells: Mf22-2 near Milford (formerly Mf 3); Ne34-1 near Ellendale (formerly Ne 1); Pg51-1 near Millsboro (formerly Pg 4); and Qc24-4 near Laurel (formerly Qc 4). In addition to the four wells used to compute the average water level, periodic measurements have been made in a well near Greenwood, Nc45-1 (formerly Nc 6), and one at Lewes, Ni51-3 (formerly Ni 3).

The water table is relatively shallow throughout Sussex County, the greatest depth to water being about 25 feet below land surface, and in many of the basin-like depressions the water table is at the surface during much of the year. The average water level fluctuated between 7.5 and 11.3 feet below land surface, a range of 3.8 feet in 7 1/2 years. These average depths are representative of ground-water conditions in the county as a whole.

There is a fair correlation between the average ground-water stage and streamflow, because as much as 70 percent of the streamflow is derived from ground-water discharge. This correlation is illustrated by the graph of discharge of the Nanticoke River near Bridgeville (fig. 2).

There also is a correlation between average ground-water level and precipitation, but, the correlation is much poorer than might be expected. In the winter the precipitation recharges the ground water readily, because the demands of the soil zone are at a minimum. But during the growing season, demands for water by plants, and high rates of evaporation, prevent much of the rainfall from passing through the soil zone. Only the more persistent and larger rainfalls provide sufficient moisture for infiltration to the water table. Therefore, only in those summer months in which 6 or more inches are recorded is the normal seasonal water-table recession appreciably altered.

Both the ground-water levels and the streamflow reflect the inverted average temperature curve, reaching higher stage and higher flow in the winter, when the water loss by evapotranspiration is at a minimum, and reaching low stage and low flow in summer or early autumn when the cumulative effect of evapotranspiration is greatest. There is a lag of about 2 months between higher average temperature, in late July, and lowest water level and flow, in late September. The hours and intensity of sunlight diminish late in the summer, so that evaporation opportunity decreases; however, the plants are larger and their water demand greater, hence, their transpiration continues to increase until harvest, or until the first killing frost.

It is obvious that the demand for irrigation water will be greatest during the season when the ground-water levels and streamflow are lowest. Nevertheless, in most places in Sussex County, there are plentiful reserves of shallow ground water in storage, even at times of lowest natural water level, that could supply large quantities of water to irrigation wells. Streams and shallow dug ponds are likely to dry up, or prove inadequate for irrigation supply during the dry season.

AQUIFER HYDRAULICS

Each aquifer has specific characteristics which govern the rate of yield of water: two of these are the formation constants, the coefficients of transmissibility and storage. The coefficient of transmissibility, T, is the product of the saturated thickness and the coefficient of permeability. It is expressed as the rate of flow, at the prevailing water temperature in gallons per day, through a vertical strip of the aquifer 1 foot wide extending the full saturated height of the aquifer under unit hydraulic gradient. The coefficient of storage of an aquifer, S, is defined as the volume of water it releases or takes into storage per unit surface area of the aquifer per unit change in the component of head normal to that surface.

In addition to the formation constants, the finite boundaries of an aquifer may influence the performance of wells, particularly nearby wells, quite significantly. The overlying and underlying confining beds of artesian aquifers may be relatively impermeable and virtually prevent vertical movement from above or below. Commonly, the confining beds are leaky, and allow vertical flow of water into or out of the aquifer.

Most of the aquifers in Sussex County are brimful and discharge to streams throughout the year. Some of the artesian aquifers lose water by upward leakage through the confining beds and discharge at altitudes near sea level, along bays, estuaries, and streams.

For the water-table aquifers near the sea or bay shore, the presence of a salt-water interface beneath the land places an important limitation on the rate of withdrawal of fresh water. This latter situation is discussed in the special section on Lewes (p. 103).

The coefficients of transmissibility and storage can be determined by means of aquifer tests developed and employed by the U. S. Geological Survey over the past 20 years and now widely used by hydraulic engineers and geologists (Brown, 1953). From such tests, inferences on future water-level changes at specified rates of pumping from proposed wells can be made.

QUALITY OF GROUND WATER

In this discussion of the quality of ground water, emphasis is placed upon the chemical and physical character of the water. The problem of bacterial or radiological pollution of ground water fortunately is rare in Sussex County and, therefore, is not considered here.

The chemical and physical character of ground water is generally expressed by means of an analytical statement of the composition and properties of a water solution. The ionic form of statement is used for substances known to be dissociated into positive ions, or cations, and negative ions, or anions. Other substances, including dissolved gases and colloids which are not known to occur in dissociated form, are reported either as an oxide or as an uncombined element. The principal ionized constituents in the ground waters of Sussex County include the cations, calcium, magnesium, sodium, and potassium, and the anions, carbonate, bicarbonate, sulphate, chloride, fluoride, and nitrate. Other substances that are present include silica, iron, manganese, aluminum, phosphate, and carbon dioxide.

The properties commonly reported in analyses of ground water include color, turbidity, dissolved solids, specific conductance, hardness, acidity, and temperature. The source and significance of all these constituents and properties are discussed in detail by Hem (1959).

General Chemical Character

Analyses of ground water obtained during this investigation are presented in tables 15 and 16. Table 15 contains the results of analyses made by the U. S. Geological Survey, Branch of Quality of Water, and table 16 contains analyses obtained from other sources. The analyses are reported in parts per million (ppm) by weight. Some of the analyses are incomplete, in that quantitative tests or standard calculations were not made for all of the dissolved and suspended material present.

Included in the analytical data are the results of analyses of 142 samples from 97 wells ranging in depth from 6 to 242 feet below land surface. A total of 120 samples were obtained from shallow aquifers of Pleistocene and Pliocene(?) age, and the remaining samples were taken from aquifers of Miocene age. It should be noted that for sizeable areas in Sussex County, no water analyses are available.

Ground water in most sections of Sussex County, based on the data contained in tables 15 and 16, is soft, is low in iron and chloride content, is relatively low in dissolved solids content, and may be used for most purposes without further treatment. Nevertheless, shallow ground water, from marsh areas, is often malodorous and distasteful. Moreover, in some places, the water is high in iron content (more than 2.0 ppm) and in a few localities near the coastline, it is saline. These characteristics are shown graphically on the map, figure 13, which is based chiefly on analyses of water from municipal and industrial wells.

Table 15.--Chemical analyses by U. S. Geological Survey of ground water in Sussex County

Aquifer: Qp, Pleistocene series; Tp(?), Pliocene(?) series; Tm, Miocene series undifferentiated; Tf, Frederica aquifer; Tma, Manokin aquifer; Tpo, Pocomoke aquifer.

[Analytical results in parts per million except as indicated]

Well number	Depth (feet)	Aquifer	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Sum	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH	Color
Me15-3 and 9	242	Tf	2-20-56	58	-				7.5		185	0	2.5	1.5	-	0.1			175	140	0		292	7.7	
Me15-10	224	Tf	4-13-31		54	.01	46	4.0	11	2.8	194	-	3.0	2.5	-	.1			220	131	0		-	-	-
Me15-13	236	Tf	12-28-51		55	.13	48	6.9	6.4	2.5	192	0	2.0	3.4	.1	.0			219	148	0		296	7.9	2
Me15-13	236	Tf	6-18-54	59			49	5.3	9.1		188	0	5.4	2.4	.1				181	144	0		301	7.6	
Mg52-4	9	Qp	9-20-57	65										14					61	24	0		102	6.5	10
Mg52-5	6.5	Qp	9-20-57	67		.20								12					92	16	0		153	6.4	-
Mg52-6	10	Qp	9-20-57	66										16					52	12	0		87	6.6	5
Mg52-7	18.5	Qp	9-20-57	62		.08								9.5					83	47	0		139	6.2	5
Mg52-9	12.5	Qp	9-20-57	64										9.0					106	60	0		176	6.5	10
Mg52-10	8	Qp	9-20-57	65										8.0					67	22	0		111	6.3	-
Mg53-1	7.3	Qp	9-20-57	71										8.0					94	62	0		157	7.1	15
Mg53-2	8.8	Qp	9-20-57	63										12					92	76	0		153	6.7	15
Mg53-3	9.2	Qp	9-20-57	64										51					199	72	0		332	6.2	25
Mg53-4	18.5	Qp	9-20-57	-										10					149	75	0		248	6.5	50
Nc25-2	61	Qp	2-16-56	58		.12	-	-	6.5		58	0	.9	9.5	-	4.1				51	3		141	7.2	-
Ng42-2	68	Qp	2-17-56	56		.29	-	-	5.5		6	0	4.9	6.5	-	12				17	12		79	5.8	-
Nh35-1	62	Qp	11-4-53								0	0		6300	-	.0				2320	0		14800	3.4	-
Ni31-1	100	Tma(?)									44			4000		3.4			6300	1500			10500	6.3	
Ni31-2	39	Qp	11-4-53								174			31		.2			279	248			465	7.4	
Ni42-2	60-65	Qp	6-16-44		11	.45	10	5.3	12		22	0	18	18	.0	14			105	47				6.2	
Ni42-8	60-65	Qp	11-4-53								42	0		31		3.0			179	100			298	6.7	
Ni42-9	60-65	Qp	6-16-44		13	.70	9.2	8.5	19		32	0	24	25	.0	15			134	58				6.2	
Ni42-10	60-65	Qp	6-16-44		14	.01	16	13	14		38	0	28	28	.0	31			175	93				6.2	
Ni51-3	64-84	Qp	10-31-44		17	.05	1.6	1.2	9.4	.8	9		3.5	12	.0	3.2			54	9				6.4	
Ni51-3	102-112	Qp	10-24-44		17	.12	1.9	1.0	11		12		2.7	13	.0	.9			54	9				7.1	
Ni51-3	137-147	Qp	10-25-44		16	.05	1.7	1.0	10		11		2.2	13	.0	.8			51	8				6.8	
Ni51-15	30	Qp	5-16-44			.62					31		44	37		120				129				6.6	
Ni51-16	97.3	Qp	2-23-56						10		12	0	5.4	15		12			67	24	14		116	6.0	
Ni51-17	157	Qp	2-23-56						5.4		8	0	1.3	9.0		1.5			36	10	3		60	5.8	
Ni52-1	80	Qp	5-15-44			.19					9.0		3.0	13		12				21				6.7	
Ni52-3	7	Qp	5-16-54			.31					18		2.0	14		15				30				6.5	
Ni52-4	65	Qp	5-16-54			.13					19		11	22		37				69				6.2	
Ni52-5	65	Qp	5-16-54			.15					20		26	15		28				72				6.2	
Ni52-6	70	Qp	5-16-54			1.4					8.0		36	12		22				78				5.6	
Ni52-8	72	Qp	5-15-44			.03					10		7.0	12		22				50				5.5	
Ni53-3	90-100	Tp(?)	9-22-44								12		3	12		7.5				20				6.0	
Ni53-3	90-100	Tp(?)	8-26-47		9.8	.25	3.7	4.9	8.6		12		11	9.8	.0	16			68	29			111	5.9	0
Ni53-4	85	Tp(?)	2-28-44			.82					12			15						21				6.0	
Ni53-4	90	Tp(?)	3-3-44			.40								15						19				6.0	
Ni53-4	110	Tm	9-22-44								14		2	13		2.1				15				6.0	
Oc14-8	119	Tp(?)	2-16-56	56		.09			11		16	0	7.8	11		17			76	27	14		127	6.0	
Of42-1	113	Tma	2-13-56	59	20	.00	13	3.8	23		5	0	17	38	.0	29			162	48	44		289	5.6	1
Oi11-1	80	Tp(?)	5-16-44			1.0					12		26	18		29				45				5.7	
Oi11-2	20	Qp	5-16-44			.80					13		14	11		17				32				6.1	
Oi11-5	90	Tp(?)	5-15-44			.37					18		1.0	11		2.6				16				5.9	

Table 15.--Continued

[Analytical results in parts per million except as indicated]

Well number	Depth (feet)	Aquifer	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Sum	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH	Color
Oi34-1	131	Qp	2-13-56	57		.08			10		10	0	4.0	14		12			67	19	11		112	5.8	
Oi34-4	35	Qp	5-12-44			.20					81		14	15		28				102				6.8	
Oi35-1	110	Qp	12-19-44			4.8					46		1.0	13		.0				33				6.7	
Oi35-2	110	Qp	12-15-44			3.2					36		1.0	13		.0				32				6.5	
Oi35-15	136	Qp	9-22-44								37		1.0	16		.4				27				6.8	
Oj31-1, 31-2	110	Qp	9-23-44		25	.14	17	5.3	37	3.3	23	0	9.8	86		.0			204	64				6.0	
Oj31-1, 31-2	110	Qp	11-5-53								18	0		95		.15				138			356	7.5	
Oj31-3	136	Qp	7-4-44			32					55			736						171				6.6	
Oj31-3	136	Qp	10-24-44			28								215											
Oj31-3	136	Qp	8-1-45			12.3								910											
Pc23-3	85	Qp	2-21-56		15	.00	4.1	0.4	3.7		4	0	1.6	4.0	.0	11			50	12	8		58	5.4	3
Pc33-4	87	Qp	3-7-45			2.1					9		3.0	7.5		4.8				20				5.6	
Pc33-6	76	Qp	3-7-45			.41					5		3.0	8.4		1.5				9				5.4	
Pg53-9	85	Tp(?)	2-14-56	59	20	.00	5.7	1.5	12		10	0	6.5	9.0	.0	23			87	20	12		106	6.0	1
Qd21-3	91	Tma	2-21-56						7.4		13	0	12	6.5		5.9			59	21	10		94	6.6	
Qh31-2 to 31-6	16	Qp	2-14-56			.20			24		33		30	40		36			235	91	64		392	5.8	
Qh51-7	102	Tpo	2-14-56	59	25	.00	4.1	0.8	12		10	0	12	14	.0	.0			83	14	5		99	5.8	4
Qj32-8	70	Tpo	2-23-56						13		127	0	0	63		.0			267	164	60		445	6.7	
Rd31-8	126	Qp	2-14-56			.14			11		14	0	9.2	12		6.2			67	18	7		111	7.1	

Table 16.--Chemical analyses by commercial laboratories of ground water in Sussex County

Analyst: A, American Water Softener Co.; AC, Allis-Chalmers Mfg. Co.; B, W. H. & L. D. Betz; Ca, Calgon; G, Gilbert Assoc. Inc.; H, Hall Laboratory; H&T, Hungerford & Terry, Inc.; M, Metropolitan Refining Co.; P, Permutit Co.; P&B, Penniman & Browne; SPW, Sydnor Pump & Well Co.

[Analytical results in parts per million except as indicated]

Well number	Analyst	Depth (feet)	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Sum	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH	Color	Turbidity
Ni41-1	--	80-110	8-26-47		15	.07	1.6	2.1		9.5	12	0	3.1	13	.0	2.4			55	13			78	6.1	0	
Ni53-3	P&B	110	-44			.012		1.66					2.80	11.04					70					6.5		
	--	110	8-26-47		15	.14	6.2	3.6		2.2	31		7.1	19	.2	23			111	30			175	6.5	7	
	--	110	9-28-49	70	14	.11	10	2.6		9.3	33	0	5.9	12	.4	5.9			84	36			128	7.4	3	
Oi35-3	--	40	12-2-43			.2					14			54						46				6.0		
Oi35-5	--	130	6-4-53			.4								33					70					6.0		
Oi35-24	H	29	--		20	0.5					16.3		0	22.2					107	42				6.0		
Oi35-25	H	17	--	.56		1.0					12.2			18.8					134	27	14			6.0		
Oj21-3	Ca	93	1-15-52		27	7.2			22		51	0		70						80				7.0		
Oj31-5	H	113	--		20	2.6					65		0	15					126	46				6.8		
Oj31-6	H	38	--		20	0.5					6.1		5	22					125	58				6.0		
Oj31-7	H	27	7-3-52		20	0.2								23.9					80	18				6.0		
Oj31-10	H	25	5-8-52			0.6	4.8	7.3			14.2			39.3						42				6.0		
Oj31-11	H	17	-53			0.5					16.3		25	53						70				6.0		
Pc23-1	SPW	87	2-27-53		3.8	.03	3.2	2.48		0.34	6.1	0	0.49	12					62.8	22				5.5		
	P	87	10-9-53		9.8	0.1	10	14	9		2	0	6	11	.05	14				24				5.5	3	3
Pc23-3	P	85	10-9-53		13.6	0.1	6	2	12		3	0	1	6	.05	8				8				5.6	10	10
Pc24-1	P	80	10-9-53		15.0	0.1	6	12	9		3	0	5	10	.05	10				18				5.6	5	5
Pc24-8	P	90	10-9-53		12.2	0.15	16	10	18		6	0	6.5	14	.05	15				26				5.8	3	3
Pc33-2 to 33-5	AC	83-98	8-15-44		8		3	6	4		5		5	6					34	9				5.2		
	AC	83-98	9-15-44		9		4	2	2		10		4	6					32	16				5.4		
Pc33-11	--	101	--		10.9	.03							2	4.3						13.8						
Pc55-1	P	114	7- -51			.03	4	2.6	11		5	0	6	7						6.6				6.0	3	8
Pg45-3	B	50	--		20.8	0.1	3	1					20	5.5						10				6.0		
Pg53-1 and 54-1	M	70-105	9-21-50								15.4		18.8	28					195	1.7				9.9		
Pg53-1	H&T	83	6-15-51		30	3.2	2.0	2.2					16	11						14				5.8	5	11
Pg54-1	H&T	104	6-15-51		30	8.0	2.0	2.2					16	12						14				5.8	5	40
Pg54-2	H&T	33	6-11-51		15	0.8	4.0	3.92					12	14						26	20			5.3	4	9
Pg54-3	H&T	83	6-15-51		30	3.6	2.0	2.2					16	11						14				5.8	5	30
Ph51-1	G	71	--		25.5	2.5	5.5	8.6	63.6				2.6	71.1		.03			278	49				6.4	20	145
Qd21-2	Ca	91	10-10-50			.2	13	2			30			13						41				6.5		
Qd21-4	Ca	94	10-10-50			.5	8	3			26			10						32				6.3		
Qh51-11	P	121	6-12-51			42.5			15											14				6.2		90
Qi55-1	H&T	117	8-23-53		25	5.0	3.6	5.8	16				12	16						114				6.7	1	100
Qj32-7	H&T	71	9-14-54		40	7.5	31	10	11				0	58						120				6.5	1	90
Rh32-1	A	95	11-24-52		10	5.0	4.8	3.9	5.1		4.3		12	10.6						28				5.6		
Rh32-2	A	110	11-24-52		10	6.0	2.4	2.6	2.3		1.2		4.8	7.1						17				4.9		

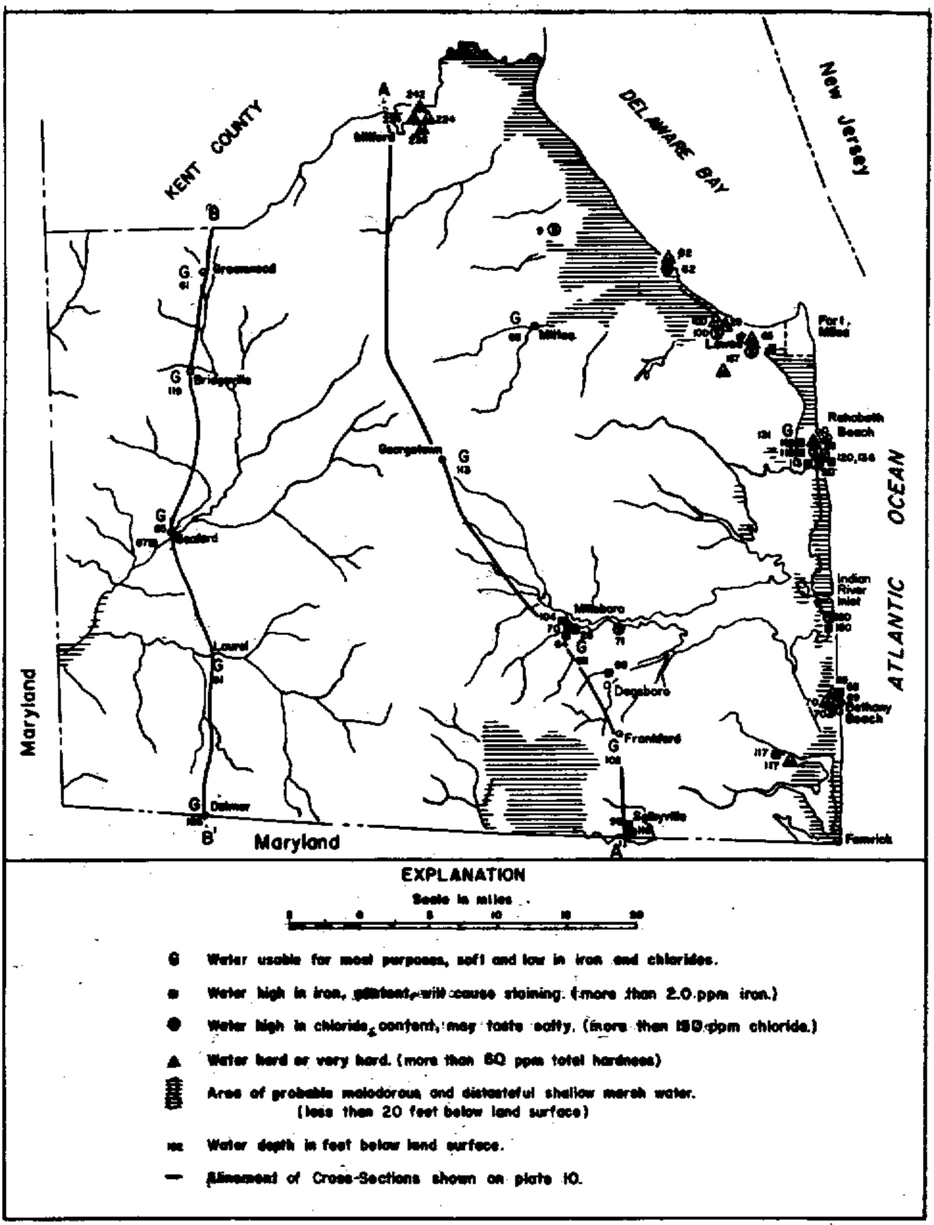

Figure 13. Map of quality of the well waters of Sussex County.

Relation to Use

Excessive concentrations of various constituents in water make it unuseable for certain purposes. Limits of iron, dissolved solids, and hardness are tabulated below for various uses.

	Maximum content in parts per million		
Industrial Use	Iron	Dissolved solids	Hardness as $CaCO_3$
Cooling water	0.5	-	50
Food equipment washing	0.2	850	10
Food processing, general	0.2 to 0.3	850	10-250
Ice, raw water	0.03 to 0.2	170-350 a/	70-72
Laundering	0.2	-	0-50
Rayon and textiles manufacture	0.0 to 1.0	-	0-55
Boiler feed water	-	50-3,000 b/	2-80 c/

Adapted from: Water Quality Criteria - California, Water Pollution Control Board, 1952.

a/ Water with concentrations as much as 1,300 ppm has been used successfully.

b/ Varies according to pressure of boiler.

c/ Varies according to pressure of boiler,

at 0-150 psi	80 ppm
at 150-250 psi . . .	40 ppm
at 250-400 psi . . .	10 ppm
over 400 psi	2 ppm

Tentative standards for irrigation waters were established by Magistad and Christiansen (1944) and are given in the table below:

Water class	Specific conductance (micromhos at 25°)	Salt content ppm 1/	Sodium percent	Boron ppm
1. Excellent to good	Below 1,000	Below 700	Below 60	Below 0.5
2. Good to injurious	1,000 to 3,000	700 to 2,000	60 to 75	0.5 to 2.0
3. Unsatisfactory to injurious	Above 3,000	Above 2,000	Above 75	Above 2.0

1/ Equivalent to "total dissolved solids."

According to Magistad and Christiansen (1944), the salt content in each class canbe raised 50 percent if the salts present are largely sulfates. They add "If a water falls in class 3 on any basis, i.e., conductance, salt content, percentage of sodium, or boron, it should be classed as unsuitable under most conditions." This latter view has been modified somewhat following studies by the U. S. Salinity laboratory staff (1954). A brief summary of papers on irrigation waters has been prepared by the U. S. Geological Survey (1954, p. 9-14). Hem (1959, p. 229-230, 242-251) gives a general discussion of the problems.

Treatment

Water of inferior quality frequently can be improved at reasonable cost by treatment, if the water is malodorous, corrosive, hard, or has troublesome iron and manganese content. However, little can be done to reduce the total dissolved solids content: the processes of distillation and ion-exchange are expensive and there is no foreseeable need for them in Sussex County.

One of the commonest methods of water treatment is the lime-soda process which consists of adding calcium oxide (quicklime) and sodium carbonate (soda ash) to the water to be treated. The lime absorbs free carbon dioxide and changes the soluble bicarbonates of calcium and magnesium, the hardness forming constituents, into insoluble calcium carbonate and magnesium hydroxide. Similarly, the addition of the soda ash changes the sulfates of calcium and magnesium into calcium carbonate and magnesium hydroxide, which are insoluble salts and, thus, form a sludge which can be removed. This process is used at three locations at Bethany Beach: the municipal plant, the U. S. Army camp, and a private water company just north of the town.

A common method of treatment of water for domestic use in the eastern part of Sussex County, where hardness associated with saline water locally is a problem, is the zeolite softening process, which involves the use of complex compounds of sodium, aluminum, and silica, called zeolites. Zeolites have the faculty of exchanging bases and when water containing calcium and magnesium passes over zeolite filters, the alkaline earth elements are exchanged for sodium in the zeolite compounds. The exchange softens the water, but increases its sodium content. The zeolite is regenerated by backwashing with brine, which replaces the sodium in the zeolite and withdraws the calcium and magnesium in a chloride solution. The process is not always successful with water of high turbidity or high iron content.

Aeration is the process of exposing water to the air. It is accomplished by spraying water into the air, passing air under pressure into the water, or allowing water to cascade over slats or flow through beds of coke or other material. The process adds oxygen to the water and reduces tastes and odors caused by decomposition of vegetation by the liberation of dissolved gases such as hydrogen sulfide. Also, undesirable amounts of iron and manganese in water can be oxidized to the insoluble ferric and manganic oxides. However, iron in combination with organic matter in water is more difficult to remove. Aeration equipment has been employed in municipal supply systems at Lewes, Rehoboth, Bethany Beach, Georgetown, and at the Army camps at Bethany Beach.

Many small water supplies that are troubled with excessive iron have been treated successfully with a sequestering agent such as sodium hexametaphosphate, sold commercially for use in a container which is attached to the suction side of a pump. The crystals of hexametaphosphate dissolve at a rate proportional to the pumping. The iron is not removed, it is "sequestered," that is, it forms a protected compound with the hexametaphosphate, and passes on through the water system without precipitating as a stain. The hexametaphosphate is reported successful on concentrations of iron up to about 5 ppm, but above that concentration it is not a reliable deterrent to staining.

WATER-BEARING CHARACTERISTICS OF THE GEOLOGIC FORMATIONS

The geologic formations occurring in Sussex County are discussed in this section in order of geologic age from oldest to youngest. This arrangement is opposite to the order in which the formations would be encountered in drilling a well.

Pre-Tertiary Systems

The rocks of the Precambrian, Paleozoic, Triassic, and Cretaceous systems are not used as sources of ground water in Sussex County, and hence are little known. For the purposes of this report, they are summarized in table 1 and on the geologic cross section, plate 6. It should be noted however, that waters from aquifers in these formations probably would be warm and highly mineralized.

Tertiary System

Information on the character of the Tertiary deposits in Sussex County has been obtained chiefly from two deep oil-test wells, Od23-1 and Od23-2, about 4 1/2 miles southeast of Bridgeville (plate 3). Well Od23-2 was drilled in 1935 to a depth of 3,012 feet, and logged lithologically. Well Od23-1 drilled nearby, was logged both lithologically and electrically, from 520 feet to 2,585 feet. A composite log of both wells is given in plate 9.

The electrical log of well Od23-1 (plate 9) shows a self-potential (SP) curve on the left, and a normal resistivity (R) curve on the right. The deflections of the SP curve correspond to the drop of potential created by the circulation of an electrical current through the formations and the fluid which fills the borehole. The deflections are measurable in millivolts (mv), positive to the right and negative to the left. The SP curve is used to relate the character of the fluid in the well bore to that in the formations penetrated by the well. Formations containing interstitial water that is more conductive than the borehole fluids are marked by negative deflections, whereas the formations containing interstitial water that is less conductive than the borehole fluid are identified by positive deflections.

The resistivity curve shown on plate 9 records the changes in the apparent resistance offered by individual strata to the passage of an electric current. Resistivity is commonly measured in ohm-meters squared per meter (ohm m2/m) and expressed as ohm-meters. The apparent resistivity of individual strata as measured by electric logging devices is strongly influenced by the presence of and conductivity of the interstitial fluids. Low resistivities are generally associated with deposits of clay or silt, and, likewise, beds of sand containing highly mineralized interstitial solutions. It follows that the highest resistivities are recorded for clean sands containing relatively fresh ground water.

On the basis of paleontological data obtained from a study of the materials penetrated by well Od23-1 (table 2), the Tertiary sediments in Sussex County have been subdivided into four parts: the Paleocene, Eocene, Miocene, and Pliocene(?) series.

Paleocene Series

The Paleocene series in Sussex County has been recognized in the Bridgeville oil-test well on the basis of Foraminifera of Midway age (see table 2, well Od23-1). The interval, illustrated on plate 9, is about 200 feet thick, and consists of fine greensand and clay. It is unimportant as a source of water because the sand is saturated with highly mineralized water and the clay functions as an aquiclude.

Eocene Series

The Eocene series has been identified on the basis of microfossils in wells at Milford and Seaford, in addition to the oil-test well near Bridgeville (see Me15-11, Pc33-1, and Od23-1, in table 2). In the Bridgeville oil test, the Eocene series is logged as being 382 feet thick (pl. 9). It is composed of glauconitic sand, sandy shale, and indurated rock, which may be limestone, and it extends from 738 to 1,120 feet below land surface. In the geologic cross section (pl. 6) the Eocene series is interpreted as dipping toward the southeast at a rate of 30 feet to the mile. It decreases to a thickness of about 100 feet in the southeastern part of the county.

Following the terminology used in Maryland, the Eocene series has been divided into three formations: the Aquia greensand (equivalent to the Vincentown sand of New Jersey), the Nanjemoy formation, and the Piney Point formation. Interpretation of the log (pl. 9) indicates that the lower part of the Eocene series, which includes the Aquia greensand and the Nanjemoy formation, would yield little water to wells and therefore is unimportant as a source of ground water in Sussex County.

The upper part of the Eocene series, the Piney Point formation, is a medium-to-fine-grained, somewhat glauconitic sand. It occurs in well Od23-1 (pl. 9) at a depth of 740 feet to 850 feet. Inasmuch as a high-capacity city test well has been developed in the Piney Point formation at the Air Force Base at Dover (Rasmussen, Groot, and Depman, 1958), it is a possibility that a productive well could be developed in this formation at Milford, where it has been identified in Me15-11 as medium to fine sand at 637 to 777 feet below land surface. It is a productive aquifer in southern Maryland and a potential aquifer for the northern and western part of Sussex County.

No chemical analyses are available to provide information on the character of the water in the Piney Point formation, but the electric log (pl. 9), indicates that the water in the formation in northwestern Sussex County is only slightly mineralized. However, on the Isle of Wight, Worcester County, Md., 4 miles south of the Sussex County line, a well flowing from a depth of 1,706 feet yield water having a chloride content of 2,550 ppm (Rasmussen and Slaughter, 1955, p. 78). Therefore, it appears likely that the Piney Point formation contains highly mineralized water in southeastern Sussex County.

The Eocene series crops out in a belt about 40 miles northwesterly from Sussex County, extending from Annapolis, Md., through Middletown, Del., and Salem, N. J. For the most part this belt is mantled by Pleistocene sand, through which it receives some recharge water by infiltration.

Miocene Series

The Miocene series forms a relatively thick wedge of sedimentary strata underlying all of Sussex County. It is composed in large part of clay, but contains several useable aquifers. The Miocene series presumably rests on the eroded surface of the Eocene series, for the intervening Oligocene epoch was a time of erosion or nondeposition in this area. Wells at only three sites in the county (Milford, the oil tests near Bridgeville, and Seaford) have been drilled through the entire Miocene section. The geologic cross section, plate 6, shows the overall structure relations, the prevailing southeasterly dip, and thickening toward the southeast. The Miocene series ranges in thickness from about 500 feet in northwestern Sussex County to 1,550 feet beneath Fenwick Island in the southeastern corner of the County.

Two detailed cross sections, plate 10, show the generally conformable relations and southeasterly dip of the formations of the Miocene series in contrast to the highly unconformable channel-fill deposits of the Pliocene(?) and Pleistocene series, which overlie it. The Miocene series is composed of four formations in Delaware: the Calvert, Choptank, and St. Marys formations, and the Cohansey sand (Miocene?).

Calvert formation

The Calvert formation of middle Miocene age is the lowest unit of the Miocene section in Delaware, overlying the Eocene series unconformably. It consists of gray diatomaceous silt and clay, and sparsely glauconitic gray sand. In Ni34-1 at Lewes, an old test well, the Calvert formation was found to extend from 407 to 1,020 feet below land surface, a thickness of 613 feet. Water was encountered at 625, 750, and 911 feet below land surface, but the water at 911 feet was of unsatisfactory quality (Clark, Mathews, and Berry, 1918, p. 489). In the log of well Od23-1 (pl. 9) the boundaries of the Calvert formation have not been delimited, but on the basis of lithology, the section between 357 and 738 feet below land surface may be the Calvert. The electric log indicates a fresh water-bearing sand in the interval 520 to 610 feet.

At Oak Grove, in well Pb13-1, a sand aquifer extending from 240 to 300 feet below land surface is found in the Calvert formation. This sand has been correlated with the Nanticoke aquifer of the adjacent area in Maryland (Rasmussen and Slaughter, 1955, p. 80, 81; 1957, p. 72). Well Pb13-1 is pumped at 150 gpm and has a specific gravity of 1.6 gpm per foot of drawdown. At Seaford, well Pc33-1 penetrated the Calvert formation. The top is difficult to distinguish, but may be at 336 feet below land surface. The bottom contact with the Eocene series appears to be at 666 feet. The Nanticoke aquifer may be productive in southwestern Delaware over an area of a few square miles, in the interval ranging from 200 to 400 feet below sea level.

In well Me15-11 at Milford, the interval 298 to 637 feet below land surface has been identified as Calvert formation. The uppermost sand, sandstone, and gravel has tentatively been correlated with the Cheswold aquifer of Kent County (Rasmussen, 1955, p. 60). This aquifer is tapped by a municipal supply well in the northern part of Milford.

Choptank formation

The Choptank formation presumably underlies all of Sussex County at depths ranging from about 100 feet below land surface in the northwestern part of the county (see plate 10) to 700 feet below land surface beneath Fenwick Island (Rasmussen and Slaughter, 1955, pl. 2). The formation is generally an aquifer in nearby Maryland, providing water to an estimated 1,500 wells in Caroline, Dorchester, and Talbot Counties (Rasmussen and Slaughter, 1957, p. 73). The formation includes the Frederica aquifer of Delaware (Rasmussen, 1955, p. 60) which provides water in southern Kent County and in Sussex County at Milford. Two wells at Milford (Me15-13 and Me15-5) are reported to yield 373 gpm and 400 gpm respectively.

The quality of water of the Frederica aquifer at Milford is given in table 15 for wells Me15-3, -9, -10, and -13. The water is high in calcium bicarbonate and the hardness is about 140 ppm as $CaCO_3$. The water contains about 200 ppm total dissolved solids. It is low in iron and in all constituents except silica, of which it contains about 55 ppm. The pH is 7.7, slightly alkaline.

The Choptank formation has been logged in wells at Milford (Me15-11, 150 feet thick), near Bridgeville (Od23-1, where it is indistinct), at Oak Grove (Pb13-1, 65 feet thick), at Seaford (Pc33-1, 132 feet thick), and at Fenwick Island (Rasmussen and Slaughter, 1955, pl. 2). It is described as a quartz sand containing shells and blue-gray clay and many hard beds.

In summary, the Choptank formation may be regarded as a potential aquifer at moderate depths beneath western and northern Sussex County, yielding a hard water suitable for most purposes. The intake area for this aquifer lies about 15 miles northwest of the northern boundary of Sussex County (see Rasmussen and Slaughter, 1957, p. 68).

St. Marys formation

The St. Marys formation is a significant aquiclude throughout Sussex County. It comprises a relatively impermeable sheaf of beds of gray fine sand, silt, and clay. As illustrated in the two geologic cross sections, (pl. 10), the St. Marys formation is in conformable contact with the Choptank formation below, and the Cohansey sand above. The Cohansey sand directly overlies the St. Marys formation only in the southeastern two-thirds of the county. Elsewhere, the St. Marys formation is unconformably overlain by channel deposits of the Pliocene(?) series and the Pleistocene series.

The St. Marys formation is not known to yield water in Sussex County, although it may prove possible to develop small domestic wells locally in some of the fine sand layers.

Miocene(?) Series

Cohansey sand

The Cohansey sand underlies the mantle of Pleistocene and Pliocene(?) channel deposits throughout the southeastern two-thirds of Sussex County, and includes at least two productive aquifers beneath the area. The two geologic cross sections in plate 10 illustrate the interpretation adopted in this report, which is an extension of the interpretation of Rasmussen and Slaughter (1955, p. 93-103).

According to this interpretation, the Cohansey sand is divisible into four units. The basal part is a unit which consists of gray sand with some silt, called the Manokin aquifer. It ranges from 0 up to perhaps 100 feet in thickness (Bethany Beach area). The Manokin aquifer is overlain by a unit of silt, fine sand, and highly lenticular clay, called the lower aquiclude, which reaches a thickness of 74 feet in well Qj32-9. The lower aquiclude in turn, is overlain by a unit of sand and intercalated silt and clay, called the Pocomoke aquifer, which is as much as 60 feet thick in the vicinity of well Rh22-1. In the southeastern corner of the State, the Pocomoke aquifer is overlain by a less permeable deposit of very fine sand, silt, and clay called the upper aquiclude. The thickness of the upper aquiclude in well Qj32-9 is about 40 feet.

This fourfold division, which is shown in table 1, must be taken with caution, however, as a provisional working hypothesis. Few wells penetrate more than a few tens of feet into the formation, and fewer still have logs that have received careful study. The subdivision and study of the Cohansey sand in Delaware is a project worthy of detailed geologic investigation.

On the basis of subsurface data, the buried surface of the Cohansey sand is believed to have considerable relief. According to this interpretation, shown on plate 10, the Manokin and Pocomoke aquifers form at least two low-lying ridges, or cuestas, and the lower and upper aquicludes occupy adjacent swales. By projection the ridge formed by the Manokin aquifer supposedly underlies a belt about 7 miles wide that crosses the county from the southwest corner, through Delmar, Laurel, Georgetown, and Milton, to Delaware Bay. As shown on the cross section (pl. 10), an outline of the Manokin aquifer, near Milford, may be tapped by well Me45-1. In somewhat similar manner, a belt about 6 miles wide passing beneath Selbyville, Frankford, Dagsboro, and Indian River Inlet, would represent the subsurface outcrop area of the Pocomoke aquifer.

The position of the sub-outcrop areas of the Manokin and Pocomoke aquifers is an important feature from a hydrologic standpoint, for it is in these areas that the Manokin and Pocomoke aquifers are hydraulically connected to the overlying channel deposits of Pliocene(?) and Pleistocene age. The combined thickness of permeable deposits contributes significantly to the yield and specific capacity of individual wells as evidenced by table 17 which summarizes the available data on the yields and specific capacities of wells that top the Cohansey sand.

The quality of water in the Manokin aquifer is represented by seven analyses in tables 15 and 16 (Ni31-1 at Lewes; Of42-1 at Georgetown; Pc24-8 at Seaford; Pc55-1 at Broad Creek; and Qd21-2, -3, and -4 at Laurel). With the exception of Ni31-1, the analyses indicate that the waters are slightly acidic, low in dissolved solids, soft, and low in iron content. The exceptional analysis, Ni31-1 at Lewes, indicates salt-water contamination near where the outcrop area of the Manokin aquifer crosses Delaware Bay.

The quality of water in the Pocomoke aquifer shows considerable variation, as might be expected owing to its proximity to estuaring and ocean waters, and to its dissection by channels now filled with deposits of Pleistocene and Pliocene(?) age. Six analyses are given in tables 15 and 16 (Qh51 -7, -11, at Frankford; Qi55-2 at Camp Barnes, Qh32-7, -8 at Bethany Beach; and Rh32-1 at Selbyville). With one exception, Qh51-7, the waters are high in iron content which is characteristic of the Pocomoke aquifer in Somerset and Worcester Counties, Md. (Rasmussen and Slaughter, 1955, p. 163). Chloride is low except at Bethany Beach, where well Qj32-7 and -8 contained 58 and 63 ppm chloride respectively, indicating some contamination. The waters ranged from soft to hard, and the pH ranged from 5.6 to 6.7. Three sam-

Table 17. -- Yields and specific capacities of wells in the Cohansey sand

Well	Depth feet	Yield gpm	Specific capacity gpm per ft	
		Pocomoke aquifer		
Qh31-7	74	85	2.1	
Qh33-12	63	70	3.9	
Qh41-1	111	400	14.4	
Qh51-9	98	120	4.4	
Qh51-10	105	240	24	
Qh51-11	98	240	14.5	
Qh51-12	99	70	3.9	
Qi34-1	85	120	2.3	
Qj32-6	60	97	6.4	
Qj32-7	69	202	16.8	
Rg35-1	118	220	14.1	
Rh12-1	102	-	10	
Rh15-1	125	70	2.5	
Rh32-2	110	500		
Rh32-6	185	100	10	
		Manokin aquifer		Conjunction with
Ng42-3	79	250	21	Pleistocene-Pliocene(?)
Ng42-6	78	250	14	Do
Ng42-7	79	250	19	Do
Ng53-1	52	6	0.4	--
Nh42-1	87	100	5.7	--
Of42-1	116	1,100	17.8	Pleistocene(?)
Of42-17	110	500	8	Do
Of42-23	110	1,005	34.5	Do
Of43-2	110	575	44.2	--
Og32-1	88	65	2.8	--
Of52-1	106	80	3.1	--
Pc24-8	68	420	15.5	Pleistocene
Pc55-1	114	130	1.9	--
Pe23-2	84	80	12.4	Pliocene(?)
Pj42-1	250	20	0.5	--
Qd21-2	91	500	12.9	Pliocene(?)
Qd21-3	91	540	12.9	Do
Qd21-4	94	730	12.8	Do
Qd21-5	103	700	16.7	Do
Rh32-6	185	100	10	--
Rj32-5	287	40	1.5	Do

ples from wells Qh51-11, Qi55-1, and Qj32-7, showed turbidities of 90, 100, and 90, respectively, remarkably high for ground water and possibly related to their high iron content.

Pliocene(?) series

The Pliocene(?) series is composed of orange, red, or brown sand, containing a few layers of clay and some gravel. It is not known to crop out in Delaware, but is found in wells at depths ranging from 35 to 95 feet below land surface. These sediments are identified as the Brandywine formation in table 1 and plate 10. They occur at altitudes as high as 10 feet above sea level, and as a fill material in channels carved in the Miocene sediments to depths as much as 100 feet below sea level.

The maximum thickness of the Brandywine formation shown in plate 10 is 59 feet at well Rd31-8. Generally, the thickness of the Brandywine formation is much less than 59 feet, but it is so variable that an average is meaningless.

The contact of the red gravelly sand characteristic of the Brandywine formation with the underlying gray, blue, or greenish sands, silts, and clays of the Miocene series is sharp, and generally unmistakable in well samples. The contact with the overlying white, gray, tan, buff, or light-brown gravelly sands and silts of the Pleistocene series is in places distinct, but in some sample suites it is gradational and is difficult to define accurately. Consequently, the combined term, Pleistocene-Pliocene(?) series has been used in the well tables to indicate these units where they have not been differentiated.

The red gravelly sand is not encountered in all wells. Plate 10 shows that of the wells drilled deep enough to reach the Brandywine formation, 21 penetrated this unit and 16 did not. More specifically, along the western cross-section, B-B (plate 10), about 80 percent of the wells penetrated this unit, but along the eastern cross-section A-A, it was found in only 35 percent of the wells.

The red gravelly sand is unfossiliferous, so far as is known, and its oxidized character makes it unlikely that fossil pollen will be found, although thin stringers of varicolored clay have been encountered at a few places. It appears to be a continental deposit, occupying channels cut in the late Miocene surface. The predominantly sandy character and presence of a few small stones, suggests that the formation may be an alluvial-fan deposit, although less coarse than those of the alluvial fans of the basin-and-range province of the western States. The highly-colored nature of the deposit is probably caused by the presence of small amounts of hematite, which is red ferric oxide, and limonite, which is yellow-brown hydrous ferric oxide. This suggests that the materials accumulated in an oxidizing environment.

Although the red gravelly sand could have been formed in late Miocene(?) time, the long time interval of the Pliocene epoch is perhaps the most likely time of formation of the Brandywine. Regional considerations indicate this was an epoch in which the continental land mass was rising, the streams were rejuvenated, and weathered soils of the Appalachian Mountains and the Piedmont were removed by erosion and carried to the Coastal Plain.

The red gravelly sand is correlated by the writers with the Pliocene(?) Brandywine formation of Maryland, on the basis of lithology and stratigraphic position. This interpretation follows that made by Rasmussen and Slaughter (1955, p. 103-108; 1957, p. 78-80), and Rasmussen and Andreasen (1959) on the adjacent middle and lower counties of the Eastern Shore of Maryland, an interpretation based on two peg models prepared from well samples for those areas. Campbell (1931) described the Brandywine as an alluvial fan, a "sand and gravel brought down by the Potomac River during the period of downcutting." The sand and gravel spread out from a central point located near what is now Washington, D. C. and was deposited on a surface which sloped from an altitude of 300 feet to below 100 feet. Hack (1955) considers the Brandywine formation to be a channel deposit of a degrading and laterally cutting stream such as the ancestral Potomac River.

Regardless of age the red gravelly sand is one of the important aquifers of Sussex County, providing water to about 17 percent of the wells. Together with overlying deposits of the Pleistocene series, it yields large quantities of water at Lewes, Bridgeville, Seaford, Laurel, and Delmar. It is potentially an important aquifer in areas south of Milford and Georgetown. Table 18 gives reported yields and reported specific capacities of wells tapping the Pliocene(?) series and the Pliocene(?)-Pleistocene series. The yields range from 15 to 1,050 gpm. The specific capacities range from 1.1 to 25.9 and average about 10 gpm per foot of drawdown for 29 wells.

The quality of water from the Pliocene(?) series is suitable for most purposes; it is generally soft, low in chloride content, and generally does not contain excessive iron. The highest concentration of iron from the Pliocene(?) series, listed in table 15 was 1.0 ppm in well Oi11-1. As was found for the Pliocene(?) series on the Eastern Shore of Maryland (Rasmussen and Slaughter, 1955, p. 107), in spite of the redness of the sand, the water obtained from it is only occasionally high in iron content. One well driller reports that he gets less "irony" water from the "red gravelly sand" than does from the overlying light-colored sands.

Quaternary System

Pleistocene Series

The Pleistocene series has been subdivided on plate 10, and in the well logs appended to this report, into four formations: the Beaverdam sand, the Walston silt, the Pamlico formation, and the Parsonsburg sand. The characteristics of these formations are defined in table 1. All of these formations yield water to some wells; nevertheless, the yields from the sand layers in the Walston silt, the Pamlico formation, and the Parsonsburg sand are small. The principal aquifer of the Pleistocene series is the Beaverdam sand.

Table 18. -- Yields and specific capacities of wells tapping the Pliocene(?) series

L indicates well log listed in table 22.

Pleistocene and Pliocene(?) series					Pliocene(?) series				
Well	Depth feet	Yield gpm	Specific capacity gpm per ft		Well	Depth feet	Yield gpm	Specific capacity gpm per ft	
Me33-2	88	20	1.1	L	Me14-6	21	15	-	L
Mf23-3	82	20	2.2	L	Mf21-1	63	180	15	L
Mg51-1	62	80	-	L	Ng24-2	85	40	4	L
Nc25-1	70	100	-	L	Ng52-2	70	20	-	L
Nc25-2	61	690	-		Oc14-1	108	300	-	
Nc53-1	68	220	-		Oc14-2	94	200	-	
Nd41-1	91	70	4.4	L	Oc14-4	109	600	21.4	
Ne25-1	67	100	-	L	Oc14-5	116	800	21.1	
Ng42-4	60	250	-		Oc14-6	98	500	15.1	
Ng42-8	60	250	-		Oc14-7	111	90	4.2	L
Ni41-1	110	339	-		Oh11-1	72	50	-	L
Ni42-10	64	300	-	L	Oh11-2	84	75	8.8	L
Ni51-16	97	480	16		Oj41-22	120	100	9.8	L
		510	12.5		Pc23-1	87	307	8.4	L
Ni51-17	157	500	11.3	L	Pc33-3	83	1050	-	
Ni51-18	89	400	11.1		Pc33-11	101	625	13.1	
Ni52-1	94	100	20.0	L	Pc23-4	100	650	18.8	
Ni51-13	87	35	3.5	L	Pd21-1	92	60	6.0	L
Ni51-14	87	30	2.5	L	Pe23-5	115	100	6.7	L
Ni51-21	105	75	4.2	L	Pg54-1	105	400	12.5	
Ni51-19	151	975	-		Pg53-8	87	350	-	L
Ni51-20	146	895	25.9		Rj32-6	95	60	-	
Og23-1	64	150	3.7						
Og23-3	78	336	7.8						
Oi12-2	71	40	4	L					
Pc33-7	82	1000	-						
Ph55-1	80	85	-						
Qd21-6	63	50	-	L					

The grain size, permeability, and porosity of samples from surface exposures of the Pleistocene series are shown in tables 13 and 14. Coefficients of permeability of samples obtained from well Qd21-2, believed to be representative of unweathered deposits of Pleistocene age, were also determined in the Hydrologic laboratory of the U. S. Geological Survey. The results are given in the following table:

Depth feet	Coefficient of permeability gpd per square foot
21 - 26	1,847
31 - 36	978
67 - 75	4,011
75 - 80	939

The coefficient of transmissibility of the Pleistocene series, or of the Pleistocene-Pliocene(?) series undifferentiated, is in the vicinity of 100,000 gpd per foot, as computed from aquifer tests at Lewes, Del. and Salisbury, Md. Most of the Pleistocene aquifers are unconfined and their coefficients of storage range from 0.05 to 0.20.

The Pleistocene series contains the principal aquifers of Sussex County, as shown by the number of municipalities that obtain water supplies from formations of this series. Public-supply wells at Greenwood, Rehoboth, Millsboro, Dagsboro, Frankford, and Selbyville obtain water from formations of the Pleistocene series and at Bridgeville, Seaford, Laurel, Delmar, and Lewes public-supply wells obtain water from formations of the Pleistocene and Pliocene(?) series. Moreover, 67 percent of the scheduled wells tap only the Pleistocene series, indicating that it is the chief aquifer in the rural areas of Sussex County as well.

Table 19 summarizes the yield and specific capacity reported for 67 wells in the Pleistocene series. Many of these wells are of modest yield, not because of incapacity of the aquifer, but because the capacity of the pumps is low and the wells were not constructed to obtain maximum yields. Yields up to 1,000 gpm are listed. The Pleistocene series together with the Cohansey sand and the Brandywine formation, supplies large capacity wells, as shown in tables 17 and 18. The average specific capacity of 24 wells in the Pleistocene series is 8.9 gpm per foot, although the range is from 1.0 to 31.

The quality of water from the Pleistocene series is, in general, suitable for most purposes (see tables 15 and 16). Except for a few analyses from wells contaminated with salt water along the coast, the water is generally very low in dissolved-solid content, that is, less than 100 ppm. The water is usually soft or only moderately hard, and contains no troublesome constituents except iron. The content of iron is sporadic: in some wells it is very low, in others it reaches a maximum of as much as 8.0 ppm. Millsboro, in particular, is troubled by excessive iron content (see wells Pg53-1, 54-3, table 16). The pH of the water from the Pleistocene series commonly is low, and in some systems treatment is needed to avoid corrosion of pipes. For example, the water from wells at Seaford has a pH of about 5.5 (table 16).

Table 19.-- Yields and specific capacities of wells in the Pleistocene series

L indicates well log listed in table 24.

Well	Depth feet	Yield gpm	Specific capacity gpm per ft		Well	Depth feet	Yield gpm	Specific capacity gpm per ft	
Me14-5	35	12	1.0	L	Oj41-8	94	110	-	L
Me15-12	40	100	-		Oj41-9	98	100	5.6	L
Me15-17	73	25	2.3	L	Oj41-10	100	60	2.6	L
Me15-27	38	50	4.3	L	Oj41-11	103	105	-	L
Mf11-1	47	65	-	L	Oj41-12	110	80	-	L
Mf11-2	42.5	50	-	L	Oj41-13	107	90	3.8	L
Nc15-1	38	45	2.1	L	Oj41-14	109	90	-	L
Nc25-8	50.8	100	2.5	L	Oj41-15	111	100	-	L
Ng12-1	61	300	16.7	L	Oj41-16	111	100	6.6	L
Ng35-2	47	40	-	L	Oj41-17	105	50	-	
Ng42-1	68	200	31	L	Oj41-18	105	60	4.0	L
Ng42-2	68	200	31	L	Oj41-19	100	40	-	L
Ng42-9	32	40	1.4	L	Oj41-23	115	80	-	L
Ng52-1	56	15	-	L	Oj41-25	100	100	-	L
Ng55-1	75	100	-	L	Oj31-5	113	90	-	L
Ni31-3	60	100	14		Oj31-6	38	50	-	L
Oi34-1	131	725	22.7	L	Oj41-26	110	100	5.6	L
Oi24-1	102	378	5.8	L	Oj31-9	40	20	-	
Oi34-3	116.6	500	-	L	Pc24-1	80	300	-	
Oi25-1	118	60	12	L	Pc24-2	80	300	-	
Oi34-5	104	85	10	L	Pc24-3	80	350	-	
Oi35-18	119	80	16	L	Pc13-1	41	15	1	L
Oi35-19	110	40	-	L	Pc33-2	87	1000	-	
Oi35-20	77	37	-	L	Pc33-5	98	540	11.7	
Oi35-21	134	-	7.5	L	Pc33-9	82.9	640	23.7	
Oi12-1	73	25	2.5	L	Pc33-10	78	600	23.6	
Oi34-2	123	750	-		Pc25-1	45	60	5.5	L
Oj31-4	120	60	-	L	Pc23-3	95	800	28	L
Oj41-2	108	80	-	L	Pc23-7	84	37	5.3	L
Oj41-3	101	100	-	L	Pe23-3	40	20	-	
Oj41-4	102	50	-	L	Pg31-1	80	120	-	
Oj41-5	112	40	1.6	L	Pg31-2	86	90	-	L
Oj41-6	102	85	-	L	Rd31-8	126	290	10	L
Oj41-7	117	100	-	L					

Recent Series

Sediments of the Recent series consist of the soil, the coastal dunes, marsh muds, swamp and bog peat, alluvium, and man-made fill. A significant portion of the land area of the county is covered by these materials.

Areas of dune and beach sand are favorable to recharge of underground water because the specific retention is low and the permeability is high (see table 12). A sample of Recent dune sand was collected about 1 mile north of Rehoboth in the dune area along the Atlantic shore. The sample had a coefficient of permeability of 1,030 gpd per square foot, a porosity of 41.9 percent, a specific retention of 0.5 percent, and a specific yield of 41.4 percent. A sample of beach sand collected 1 mile north of Rehoboth along the Atlantic shore at the strand line had a porosity of 44.2 percent and a coefficient of permeability of 1,530 gpd per square foot (table 12). The dunes of Delaware supply small quantities of water to small diameter wells where the quality of water is suitable for domestic use.

A sample of alluvium was collected near Lewes, south of the new municipal well field, where a small road crosses Ebenezer creek. The sample, taken at stream level in the creek bed, was found to have a porosity of 34.7 percent, a coefficient of permeability of 220 gpd per square foot, a specific retention of 17.8 percent, and a specific yield of 16.9 percent.

In several gravel pits in the county, a remarkably uniform black sandy soil about 6 inches thick, is found at the surface. The analyses of "basin silt" from Savanna "bay" are given in table 12 as representative of this swamp-type soil, which occurs in many undrained depressions in the county.

UTILIZATION OF GROUND WATER

By Durward H. Boggess

The average use of ground water in Sussex County was about 19 million gallons per day (mgd) in 1957, the latest year for which pumpage data have been compiled. Pumpage for industrial and commercial uses accounted for about 61 percent of the total ground water used, or approximately 11.6 mgd. In addition, 21 percent or 4.0 mgd, was withdrawn by public water-supply systems for municipal and institutional purposes. The remaining 18 percent, or 3.4 mgd, was withdrawn for rural uses. It should be noted however, that peak demands on the ground-water resources, representing 3 to 4 times the daily average, occur during the summer months when resorts are in greatest use, canneries are in full operation, and irrigation is at a maximum. The magnitude and distribution of the principal centers of pumping are shown schematically on figure 14.

Public Supplies

Ground-water supplies have been developed for public use in Sussex County by 14 municipalities and 3 institutions. These systems serve 36 percent of the population of the county, and furnish water for nearly all residential

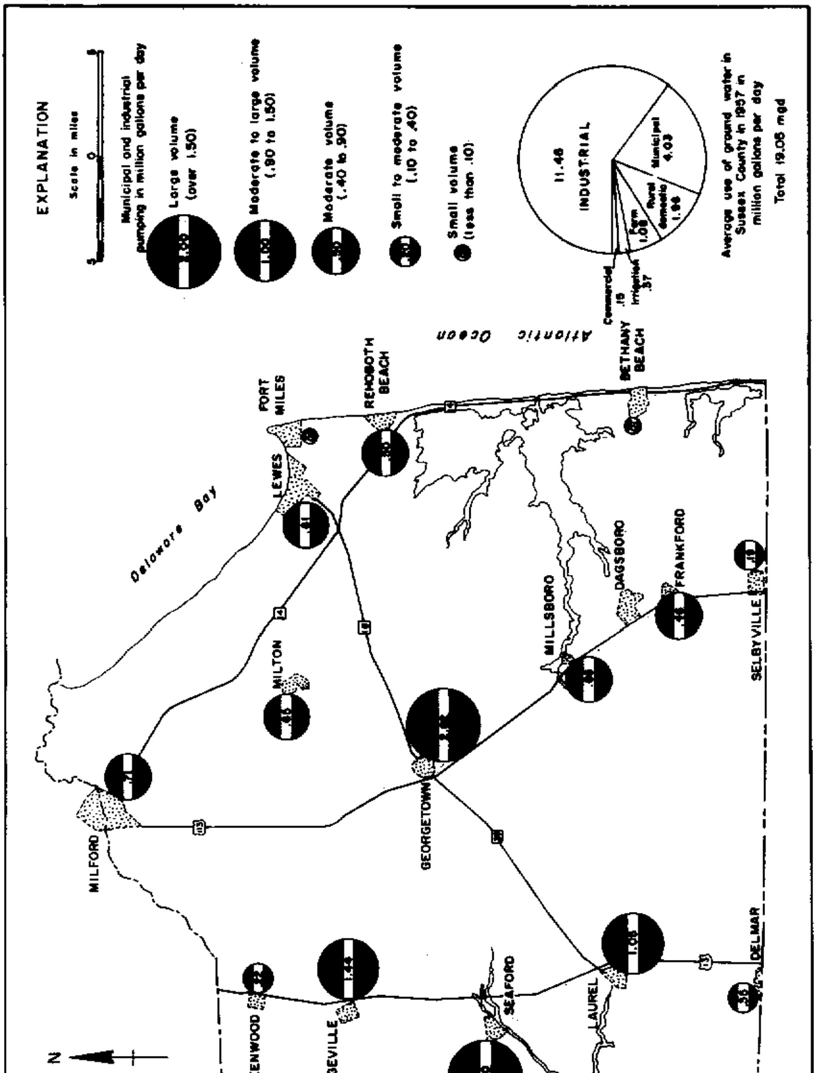

Figure 14. Map and diagram of utilization of ground water in Sussex County.

Table 20.--Average daily pumpage of ground water for public use in Sussex County in 1957, by geologic source

Pumpage (thousand gallons per day)

	Pleistocene-Pliocene(?) series Beaverdam sand and Brandywine formation	Miocene(?) series Pocomoke aquifer	Miocene(?) series Manokin aquifer	Miocene series Frederica aquifer	Total
Municipalities					
Bethany Beach		40			40
Bridgeville	150				150
Delmar	330				330
Frankford		60			60
Georgetown			350		350
Greenwood	35				35
Laurel			600		600
Lewes	685				685
Milford				250	250
Millsboro	30				30
Milton	150				150
Rehoboth	450				450
Seaford	607				607
Selbyville	45	45			90
Institutions					
Bethany Beach Army Camp		25			25
Delaware State Colony	100				100
Fort Miles	80				80
Total	2,662	170	950	250	4,032

and commercial needs, and for part of the industrial uses within their respective service areas. Table 23 shows the average daily use of ground water by each of these systems and identifies the geologic source from which the supplies are obtained.

Industrial Supplies

The amount of ground water used by industries in Sussex County exceeds the combined amounts used for all other purposes. Much of the industry within the county is concerned with the processing of agricultural products, mainly fruits, vegetables, and poultry. Listed on table 24 are all industries using significant quantities of ground water and the source, or aquifer from which it is withdrawn. The industries are grouped according to area, as some companies operate in several areas.

Rural Water Supplies

Rural water supplies include water used for domestic purposes, for farm stock use, and for irrigation of crops. In 1957 an average of 3.4 million gallons daily was withdrawn from ground-water sources in Sussex County for these purposes. Most of this water is obtained from wells less than 100 feet deep, tapping aquifers in the Pleistocene or Pleistocene-Pliocene(?) series.

Domestic

The rural domestic use of ground water in Sussex County was about 2 mgd in 1957. Domestic use includes mainly household use for drinking, sanitation, cooking, washing, and lawn watering, representing the primary use by man. Individually, the amount of water used per house or per person is relatively small, but collectively the amount is significant. The estimated population of Sussex County was about 69,000 in 1957 of which about 25,000 persons were served by municipal water supplies. The remaining 44,000 persons represent the rural population (including small towns without municipal supplies) which obtains water from individual home wells. The per capita use of water for houses with running water (equipped with electric pumps) averaged 60 gpd, while the per capita use for those without running water averages only about one-sixth of this amount, or 10 gpd. Rural domestic water use may then be calculated by multiplying the per capita use by the population served in each category.

Farm Stock

An estimated 1.1 mgd was used for watering farm stock in 1957. The greatest amount, about 64 percent, was used for chicken broiler production. The total daily use by farm stock was computed by multiplying the total number of each type of farm animal by their estimated daily requirements and summing up to the total amounts used by each type. Estimated daily water requirements include 20 gpd for milk cows, 10 gpd for other cattle, 10 gpd for horses and mules, 3 gpd for hogs, 2 gpd for sheep, 0.04 gpd for chickens, and 0.06 gpd for other poultry. Data on chicken broiler production in 1957

Table 21.--Average daily pumpage of ground water for industrial use in Sussex County in 1957, by geologic source

Pumpage (thousand gallons per day)

Area and Company	Pleistocene-Pliocene(?) series Beaverdam sand and Brandywine formation	Miocene(?) series Pocomoke aquifer	Miocene(?) series Manokin aquifer	Miocene series Frederica aquifer	Total
Bridgeville area					
Atlantic Ice Mfg. Co.	844				844
H. P. Cannon & Son, Inc.	308				308
Dulany Frosted Foods Co.	130				130
O. A. Newton & Son Co.	10				10
Delmar area					
Ralston Purina Co.	20				20
Frankford area					
Atlantic Ice Mfg. Co.	10	14			24
Delmarva Poultry Co.		280			280
Hypro Associates		50			50
Smith-Roland Co.		50			50
Georgetown area					
Atlantic Ice Mfg. Co.			860		860
J. S. Isaacs & Sons Cold Storage, Inc.			400		400
Paramount Poultry Co.	200				200
Swift & Co.			595		595
J. G. Townsend, Jr. & Co.			310		310

Table 21.--Continued.

Area and Company	Pleistocene-Pliocene(?) series Beaverdam sand and Brandywine formation	Miocene(?) series Pocomoke aquifer	Miocene(?) series Manokin aquifer	Miocene series Frederica aquifer	Total
Greenwood area					
Eastern Shore Products Co.	180				180
Laurel area					
Beacon Feed Co.			50		50
Buntings Nurseries			110		110
Kosters Frozen Foods	290				290
Lewes area					
Doxsee Co.			19		19
Fish Products Co.	50				50
Lewes Dairy	57				57
Milford area					
Delmarva Poultry Co.	30		135	140	305
Draper Canning Co.				40	40
Milford Ice Co.	65				65
Torsch Canning Co.				50	50
Millsboro area					
Delaware Power & Light Co.	80				80
Millsboro Poultry Co.	400				400
Townsends, Inc.	140				140

Table 21.--Concluded.

Area and Company	Pleistocene-Pliocene(?) series Beaverdam sand and Brandywine formation	Miocene(?) series Pocomoke aquifer	Miocene(?) series Manokin aquifer	Miocene series Frederica aquifer	Total
Milton area					
Draper Frozen Products, Inc.	126		190		316
J. H. Dulany & Sons, Inc.	85				85
E. F. Isaacs & Sons	39				39
Milton Poultry Co.	58				58
Rehoboth					
Stokely Van Camp Co.	45				45
Seaford area					
E. I. duPont de Nemours Co., Inc.	4,900				4,900
Selbyville area					
H & H Poultry Co.		100			100

was furnished by the Department of Agricultural Economics, University of Delaware. Other stock totals were obtained from the 1954 Census of Agriculture (U. S. Dept. Commerce, 1956).

Irrigation

Irrigated land in Delaware has increased rapidly in the past 8 years, from 390 acres in 1949 to 14,269 acres in 1957. Data supplied by the Department of Agricultural Economics, University of Delaware, indicates that nearly 341 million gallons of water were applied to crops in Sussex County in 1957. About 40 percent (136 million gallons) was pumped from ground-water sources, including dug ponds, natural ponds fed by springs, and wells. The remaining 205 million gallons was pumped from surface-water sources, such as streams, lakes, and impounded ponds.

Water used for irrigation supplements water received from precipitation during periods when precipitation is inadequate or unevenly distributed. The amount of water used and the period of use will vary considerably from year to year or from month to month depending on the rainfall pattern. Precipitation data presented in table 1 indicate that 1957 was a relatively dry year, with below normal precipitation occurring at the peak of the growing season in July and August. It is also noted in table 1 that below normal precipitation (based on the 7-year average) occurred in at least one month of the growing season each year from 1951 through 1957.

Although the average combined use of ground and surface water for irrigation amounts to about 930, 000 gpd when averaged over the year, as much as 6 mgd or more may be used during some periods. One well, Pg51-2, used for irrigation from June to August is reported to yield as much as 972, 000 gpd. Should the present trend in irrigation continue, water use in this category may well exceed many other present uses.

SALT-WATER ENCROACHMENT

All along the eastern shore of Sussex County, the shallow aquifer of Pleistocene and Recent age is exposed to one or more large bodies of salty or brackish water (figure 1). Thus, an opportunity exists for the encroachment of salty or brackish water into the shallow aquifer wherever the natural seaward hydraulic gradient is reversed by pumping from wells adjacent to the shoreline. This has apparently occurred at only two localities in Sussex County, namely, at Lewes and at Rehoboth. Although information relative to the nature and extent of salt-water contamination at Rehoboth is scant, considerable data is available on the incidence of contamination at Lewes.

The encroachment of salt water into the shallow aquifer in the Lewes area was first recognized in 1943 following the dredging of the Lewes-Rehoboth Canal. The first indication of the presence of salty or brackish water in the shallow aquifer which supplies the city of Lewes was the discovery that the chloride concentration of water from the municipal-supply well located nearest the newly dredged canal was abnormally high. This observation was followed by a study of the chloride content of water from other wells in the area to determine the extent of the contamination and, if possible, to identify the source of the highly contaminated water. The investigation of salt-water encroachment at Lewes was made by the U. S. Geological Survey in cooperation with the city of Lewes.

Periodic water sampling of the four public supply wells in Lewes started in March 1944. The results are given in table 25. Analyses of the first series of samples showed that 3 wells (Ni42-2, Ni42-9, and Ni42-10) were yielding water having a near-normal chloride concentration for the area, but that one well (Ni42-8) was producing water having a chloride concentration of 422 ppm. Analysis of samples collected during the early part of April indicated that the chloride concentration of water from the uncontaminated wells (Ni42-2, Ni42-9, and Ni42-10) had increased slightly or not at all, but that the chloride concentration of water from Ni42-8 had increased from 422 ppm to 452 ppm.

In May 1944 a 1-1/2 inch well (Ni42-11) was driven into the water-bearing sands along the south side of Third Street, half way between Ni42-8 and the Lewes-Rehoboth Canal, the suspected source of the salt-water contamination. The chloride concentration of the first sample of water taken from this well was 855 ppm, nearly double the chloride content of the water from well Ni42-8. This confirmed the suspicion that the Lewes-Rehoboth Canal was the source of the contaminant. Until September, analyses from wells Ni42-2, Ni42-9, and Ni42-10 showed essentially no increase in chloride concentration; meanwhile, the chloride concentration increased steadily in the water from wells Ni42-8 and Ni42-11. In September the chloride concentration of water from wells Ni42-2 and Ni42-10 had not changed appreciably, while it had increased in water samples from wells Ni42-8 and Ni42-9.

The Board of Public Works was informed by the Geological Survey of the threat to the existing well field due to salt-water contamination. It was pointed out that fresh-water recharge in the winter months would probably reverse the trend of increasing chloride concentration in the well water, but that this is generally a temporary situation, and that unless it were possible to decrease the rate of pumping materially, the chloride concentrations would rise again during the next summer.

As a result, a survey was made of conditions farther inland and the site of the new well field was chosen as a new source of supply. By not delaying the selection of a new source of supply until water in the present supply became too contaminated to use, the town met the threat of salt-water contamination before it became critical. During the time of transition the water delivered to consumers did not generally taste salty because the water of high chloride concentration was mixed with fresher water from the other wells.

With almost complete cessation of pumping in the old municipal well field, the chloride content of the ground water beneath the well field began to diminish. Well Ni42-8 showed a chloride concentration of 1,190 ppm in September 1944. In November 1953, this well had a chloride concentration of 31 ppm, indicating that the salt water had been flushed out of the aquifer in the vicinity of the well.

Table 22. -- Chloride content of water samples collected from wells in Lewes, Del. between March 1944 and October 1945

Chloride in parts per million

Well	1944						1945		
number	Mar.	Apr.	May	June	Sept.	Dec.	Jan.	Feb.	Oct.
Ni42-2	18	18	--	18	18	18	19	18	17
Ni42-9	23	30	--	25	72	147	139	--	184
Ni42-10	18	18	--	28	30	30	28	26	31
Ni42-8	422	452	465	660	1,190	1,040	1,160	738	605
Ni42-11	--	--	855	825	1,400	1,420	1,280	1,170	1,060
Ni51-17	--	--	--	--	--	--	--	--	10

FUTURE INVESTIGATION AND DEVELOPMENT OF WATER RESOURCES

The future investigation of the water resources should be determined by the intensity, or importance, of use. Where large investment is involved, detailed investigation is warranted. Where national security is involved, detailed investigation is strongly urged. Nevertheless, if investigation merely kept pace with development, adequate appraisal would be available only after-the-fact, and each step forward would be taken either on inadequate bases, or following delay necessary to make an adequate appraisal.

PRECIPITATION

Rainfall is generally adequate in Sussex County, and the tremendous storage of infiltrating rainfall in the ground is enough to tide over the industries or municipalities through the most protracted dry spell yet recorded. Wells may fail, and streams go dry, but adequate water is at hand if the proper development works are constructed.

The haphazard distribution of rainfall has led to increased interest in irrigation from dug-out ponds and from wells. The storage available in the soil, except in the lowland areas, is not adequate for optimum growth during some period of almost every year. However, there is no foreseeable need for cloud-seeding, or other forms of rain-making, such as are being developed in the arid and semi-arid western plains because the storage available below the soil zone in the zone of saturation, is, in most places, adequate to supply wells and ponds, which can be used for man-made rainfall sprinkler irrigation. Ditch irrigation is not feasible in most places in Sussex County, because the ditch banks and beds are too leaky. Sprinkler irrigation, although somewhat wasteful of water, owing to greater losses by interception and evaporation, has proved to be the most economic method.

The five rain gages in Sussex County in operation at the end of 1957 provide a fairly good areal distribution for the purpose of hydrologic analysis, not only at the present intensity of water use but at any foreseeable intensity for the next few years. However, areal coverage would be improved by the establishment of rain and temperature gages in the vicinity of Bethel, Trap Pond, Millsboro, and Milton. Present measurements are on a daily basis, and at no place in the county are hourly readings recorded, such as is done at some airports.

SURFACE WATER

Investigation

In fulfilling the broad objective of appraising the surface-water resources of an area it is immediately apparent that full-time gaging of every stream is neither physically possible nor economically justifiable. Recent studies on the development of an effective stream-gaging program have led to the concept of a hydrologic network composed of (1) long-term primary stations continuously sampling the time variation in streamflow within a given hydrologic area, (2) secondary stations operated for limited periods of time which will define the areal variations in streamflow and which can be correlated with primary stations to adjust the short-term streamflow records to a longer-term base period, and (3) partial-record stations at which specific portions of the streamflow regimen will be measured for a length of time sufficient to relate the particular information to that collected at one of the complete-record stations. The density of the network is related to the hydrologic complexity of the area and to the present and anticipated degree of water-resources development. To adequately interpret streamflow records, concurrent information must be obtained on water use within the basins gaged. Some network stations, or others specifically established, may be considered in a water-management category in which they would be maintained for operational, administrative, legal, design, research, or other purposes.

The seven complete-record and eight partial-record gaging stations now being operated in the Sussex County area provide a relatively good hydrologic coverage in light of the present level of surface-water use, although detailed interpretative studies will require supplemental data on physiography, ditching, diversions, pondage, and other factors. A few Rehoboth Bay and Indian River tributaries, Gravelly Branch, and Clear Brook are the principal streams as yet ungaged. The streamflow characteristics in these and other sub-basins can be appraised by operation of partial-record stations when the data from the current group have been analyzed satisfactorily. It is important that most of the present group of complete-record stations be continued in operation to provide a basis for correlation.

It may be found that the areal variation in streamflow regimen is such that, to obtain satisfactory correlations, one or more primary or secondary stations should be established. Many of the problems inherent in the gaging of small drainage areas may be resolved if current research in tidal hydraulics and estuarine instrumentation leads to development of simpler methods of operation of gaging stations in the estuaries. It is hoped that, by systematic gaging and investigation, the climatic and physiographic factors which produce the areal variations in streamflow may be defined to such a degree that reliable estimates of yield, flood frequency, and other characteristics may be determined by reconnaissance-type investigations of the ungaged areas.

Development

The recent trend of population growth in the Washington, Baltimore, Wilmington, and Philadelphia areas has focused attention on the agricultural and recreational potentialities of Sussex County although these activities have been economically predominant for many years.

While an abundance of ground water has been a vital factor in sustaining high crop yields, extensive drainage works have been constructed to reclaim excessively wet and unworkable areas. Paradoxically, it has been found necessary in recent years to provide supplemental irrigation from both ground and surface sources. The effect of these drainage and irrigation practices has not been adequately defined in the streamflow records and related data thus far collected.

When water tables are lowered by ditching, reducing the sustained low flows, and surface-water withdrawals are made for irrigation, conflicts will develop with downstream interests concerned with the dilution of municipal or industrial wastes and with the prevention of salt-water encroachment in estuaries not provided with tidal dams. Adequate streamflow and related information can provide the basis for economic and equitable resolution of differences which will arise if the legal definitions of interest are specific and adequate time is available to collect the basic data.

It is not possible at this time to make a reliable estimate of the limit of potential development of fresh-water supplies. Although surface-storage possibilities are restricted by the topography, large quantities of fresh water are available at Seaford, Laurel, Millsboro, and on Marshy Hope Creek near Woodenhawk. It may be found that surface waters will find their greatest utility in the recharging of ground-water aquifers by spreading or by development of well fields adjacent to small surface impoundments.

The average discharge determined at five gaging stations on natural channels (6, 8, 10, 14, and 17) in or near Sussex County, shown in table 7, is 743,000 gpd per square mile. If this is rounded to 0.7 mgd per square mile, and taken as representative of the county as a whole, the land area, 946 square miles, discharges about 670 million gallons a day on the average as surface-water runoff. Much of this water serves a useful purpose, as dilution of wastes, and preservation of natural habitat for water plants and animals. The consumptive use, mainly by irrigation, reached an estimated 205 mgd during the summer of 1957. During most of the year, however, the consumptive use of surface water is only a few million gallons a day. Thus, on the average, there is available about 500 mgd of surface water, which is currently being used for low-value purposes. Under an intensive-use plan, perhaps as much as 200 mgd of this water could be converted to high-value purposes although only an additional 100 mgd might be available during the crop season.

Anticipated agricultural utilization must be tempered by the fact that the mean discharge during the 4-month period, June through September, is only 400 mgd. This figure is derived from an extrapolation of observed data in table 28 and partly reflects recent irrigation usage. When it is considered that only about 700 square miles of the county might effectively contribute surface-water runoff in the agriculturally usable area, the available discharge is reduced to about 300 mgd.

GROUND WATER

Investigation

At the date of writing this progress report (1959), the investigation of the ground-water resources of Sussex County compares favorably, in the intensity of study, with other rural areas in the United States of comparable size (1, 000 square miles). Nevertheless, the data on ground water leave much to be desired, both geologically and hydrologically.

Geologically, the understanding of the stratigraphy of the Pleistocene series, the Pliocene(?) series, and the Miocene series, is still incomplete. Much more precise data on the lithology, mineralogy, and paleontology must be collected before the strata of the uppermost 500 feet beneath Sussex County can be adequately described and correlated. Such a detailed geologic investigation would have significant economic implications: development of the large-capacity wells is generally limited to areas of Pleistocene and Pliocene(?) channel deposits, and the proper mapping of these deposits is necessary to derive optimum yield and to limit the number of inadequate wells; the protection of coastal aquifers from salt-water intrusion depends upon detailed knowledge of the aquicludes, or confining beds.

Hydrologically, much more quantitative data on the coefficients of transmissibility and storage, and much more geochemical data on the quality of waters, is needed for adequate planning of new supplies. The hydraulic phase involves more controlled well-field tests and aquifer analysis. The quality of water phase involves more water sampling at critical sites, and chemical analyses.

A detailed investigation of the geology and hydrology of the coastal area along Delaware Bay and the Atlantic shore is the most pressing need -- particularly with a view to evaluating the relationships of fresh and salty water in aquifers of the coastal zone and to locating by means of test drilling the positions of the fresh-water-salt-water interfaces in these aquifers.

Development

A rough approximation of the total amount of ground water available from an optimum number of properly spaced wells in Sussex County may be obtained by considering the hydrologic factors involved (Rasmussen, 1955).

A hydrologic study of the Beaverdam Creek drainage basin (Rasmussen and Andreasen, 1959), about 7 miles south of the Sussex County line, showed that 10 percent of the precipitation was lost immediately by overland runoff, about 50 percent filtered into the ground and reached the water table, and about 40 percent was evaporated or transpired from the surface soils and ponds. Sussex County has soils, topography, and climate that are similar in almost all respects to those of the Beaverdam Creek drainage basin. The average annual rainfall, 45 inches a year, taken on an areal basis indicates an average precipitation of 2.1 mgd per square mile. From the hydrologic study (Rasmussen and Andreasen, 1959, p. 98) it was demonstrated that infiltration was 51.5 percent of precipitation. Thus, the average recharge to the ground water was about 1 mgd per square mile. Considering the land area of Sussex County, 946 sq. mi.; this means that the average available recharge is about 950 mgd.

The ultimate long-term rate of withdrawal of ground water cannot exceed the average recharge, without dewatering the reservoirs, although some withdrawal from storage is unavoidable, and even desirable, to induce water to move toward points of withdrawal. This perennial yield will be competitive with the discharge of 670 mgd calculated for the average surface-water runoff. In fact the two must be considered a single hydrologic system, except that through the process of dewatering the ground-water reservoirs, some small additional increment may be added to temporary storage that would normally have escaped by flash runoff, and some water may be salvaged that otherwise would have been lost to transpiration.

Therefore the perennial yield of both ground and surface water in Sussex County is of the order of magnitude of 950 mgd, or nearly 1 billion gallons a day. It is, of course, highly unlikely that this quantity of water ever will be utilized, but in some localities in Sussex County such as Seaford, the rate of 1 mgd per sq. mi. has already been achieved without adverse effects.

The total use of water for high value purposes in 1957, 19.1 mgd from ground-water sources and about 10 mgd from surface-water sources, was only about 3 percent of the estimated safe withdrawal of 950 mgd. It may be concluded, therefore, that large quantities of water are available for development in many parts of Sussex County, but efficient development of these supplies will require considerable expansion of our present knowledge of local ground-water conditions.

QUALITY OF WATER

The quality of water now in use in Sussex County is, in general, suitable for most purposes. The quality of water from the same sources is not expected to change materially throughout the county-at-large. However, there are four important limitations to be considered.

The first of these is the rather extensive margin bordered by saline waters along the Atlantic Ocean, Delaware Bay, Indian River Bay, and the many smaller bays and brackish marshes. As pumping increases, the threat of salt-water intrusion in these areas becomes increasingly important. It is for this reason that further investigation of the coastal area is recommended.

The second limitation concerns pollution. As the activities of man increase, the waste products will also increase and must be disposed of. With continued vigilance and adequate protective measures for sewage treatment and pollution abatement, this problem is being solved by the State Board of Health and the Water Pollution Commission.

The third limitation involves the development of new sources, untapped reservoirs of ground water lying at greater depths than those in use. Although some of this water will be suitable for most purposes, and much of it may be suitable for washing, irrigation, cooling, or other specified limited purposes, experience has indicated that in general, deeper ground waters are higher in dissolved-solid content, and may require more treatment than the shallower waters.

Finally, the surface and the shallow ground waters of Sussex County are vulnerable to radioactive fallout. Any extensive fallout would render most water supplies unusable for almost all purposes. Almost every city and town would have to prospect for deeper sources immediately, in the event of such a catastrophe.

In summary: the waters of Sussex County are usable for most purposes. Such local problems as occur are the result of human activities and can be solved by treatment, or by wise management. Should a fallout catastrophe occur, deeper sources must be sought at once.

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Table 23.--Record of wells

Well number:	See text, p. 9, for description of well-numbering system.
Driller:	AP, Artesian Well Drilling Co., Phila.; B, G. Bradshaw; CO, Continental Oil Co.; D, Delaware Geological Survey; E, Ennis Bros.; HH, Harris-Harmon Well Co.; Ke, Kelly Well Co., Inc.; L, Layne-New York Co., Inc.; La, C. W. Lauman & Co.; Ld, Local well diggers and drivers; M&P, McDaniels and Pentz; MWD, Middletown Well Drilling Co.; PC, C. Pentz; P&JC, P. H. & J. Conlan; PM, M. A. Pentz; Po, Porter; R, J. H. Rulon; RCP, Raymond Concrete Pile Co.; S, Sydnor Pump & Well Co.; SAW, Shannahan Artesian Well Co.; SCS, Soil Conservation Service; Sh, A. C. Schultes & Son; SO, Sun Oil Co.; S&R, Slater & Rogers; SWD, Shannahan Well Drilling Co.; UEC, United Engineers & Constructors, Inc.; W, P. E. White; WD, Well Drillers, Inc.; USGS, indicates test hole drilled under supervision of the U. S. Geological Survey.
Method of construction:	B, bored; Ct, cable tool-drilled; Dg, dug; DgP, dug pond; Dv, driven; Hr, hydraulic rotary-drilled; J, jetted; P, pit; St, stream storage area.
Total depth:	The depth given is the producing depth except for screened wells where screen setting is given.
Aquifer name:	Qr, Recent series; Qp, Pleistocene series; Tp(?), Pliocene(?) series; Tm, Miocene series; Tpo, Pocomoke aquifer; Tma, Manokin aquifer; Tsm, St. Marys formation; Tch, Choptank formation; Tf, Frederica aquifer; Tca, Calvert formation; Tcw, Cheswold aquifer; Te, Eocene series; Kr, Raritan formation. A combination of these symbols, such as Qp-Tp(?), is used to indicate aquifers comprising more than one geologic unit.
Use:	A, abandoned; C, commercial; D, domestic; E, emergency; F, farm and stock; I, industrial; Ir, irrigation; N, not used; O, observation; P, public supply; R, recreation; Sh, school; T, test hole; W, national defense.
Remarks:	C. A., chemical analysis; D. D., drilled depth if different from finished depth reported in table.

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Lf32-1	J. L. Davis	Ld	1951	20	Dv	1.5	65	- -	Qp	Sand	--	--	--	--	--	F	
Lf43-1	G. Read	Ld	1950	25	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	D	
Lf44-1	F. D. Watson	Ld	1947	12	Dv	1.5	48	- -	Qp	Sand	--	--	--	--	--	F	
Lf52-1	J. Hayes	Ld	1950	15	Dv	1.5	34	- -	Qp	Sand	1950	9	--	--	--	D	
Lf52-2	W. Brereton	Ld	--	22	Dv	--	30	- -	Qp	Sand	11-6-51	17.4	--	--	--	N	
Lf53-1	G. W. Shockley	Ld	1941	15	Dv	1.5	40	- -	Qp	Sand	--	--	--	--	--	D	
Lg41-1	Zigmund Kendzierski	E	1941	5	J	8	244	- -	Tf	Sand	--	--	--	--	--	D	See log.
Lg41-2	J. C. Watson	PM ?	1949	5	J	3	165	- -	Tm	Sand	1949	Flow	--	--	--	F	
Lg42-1	R. Pailley	W	1948	2	J	3	269	- -	Tf	Sand	11-5-51	0.5	12-1-48	10	--	D	D. D. = 292 ft.
Lg52-1	E. Bennett	Ld	1939	5	Dv	1.25	14	- -	Qp	Sand	10-5-51	4.7	--	--	--	D	
Md44-2	J. H. Annett	SCS	1953	57	DgP	--	15	- -	Qp	Sand	--	--	--	--	--	Ir	Area 16,000 sq. ft.
Md54-1	Do	SCS	1953	55	DgP	--	15	- -	Qp	Sand	--	--	--	--	--	Ir	Area 16,250 sq. ft.
Md55-1	Do	SCS	1953	55	DgP	--	15	- -	Qp	Sand	--	--	--	--	--	Ir	Area 6,000 sq. ft.
Me13-1	S. W. Hammond	Ld	1947	30	Dv	1.5	55	- -	Qp	Sand	11- -51	18	--	--	--	D	
Me14-1	L. D. Caulk Co.	PC	1924	25	J	6	35	- -	Qp	Sand	--	--	Summer 1951	80	--	I	C. A.
Me14-2	Do	PC	1924	25	J	6	35	- -	Qp	Sand	--	--	--	--	--	I	
Me14-3	Do	PC	1924	25	J	6	35	- -	Qp	Sand	--	--	--	--	--	I	
Me14-4	J. K. Lambert	Ld	--	30	Dv	1.5	38	- -	Qp	Sand	--	--	--	--	--	F	
Me14-5	M. Wilkens	W	1949	30	J	3	35	- -	Qp	Sand	11-16-49	19	11-16-49	12	--	D	
Me14-6	Milford Memorial Hospital	W	1954	25	J	3	21	- -	Tp(?)	Coarse sand	8-1-54	11	8-1-54	15	--	C	D. D. = 50 ft.
Me15-1	Mullholland Co.	--	About 1920	10	--	2	154	- -	Tm	Sand	5-15-50 1-1-52	7.2 6.7	--	--	--	N	
Me15-2	Draper Canning Co.	PC	1935	10	J	6	232	- -	Tf	Sand	5-15-50 9-7-51	40 85	--	--	--	I	
Me15-3	Town of Milford	--	Before 1896	10	--	8	242	- -	Tf	Sand	3-10-39	92	--	--	--	P	C. A.
Me15-4	Torsch Canning Co.	WD	1949	15	Ct	6	310	- -	Tcw(?)	Sand	--	--	5-17-50	55	--	A	
Me15-5	Schine-Milford Theatre	La	--	20	--	10	225	- -	Tf	Sand	--	48.5	--	400	90	C	C. A.; D. D. = 300 ft.

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Me15-6	Delmarva Poultry Corp.	PM	1944	30	J	6	240	- -	Tf	Sand	--	--	--	200	--	I	
Me15-7	Do	PM	1948	25	J	6	97	- -	Tm	Sand	1950	16	1950	150	--	I	
Me15-8	Draper Canning Co.	--	Before 1925	10	--	--	--	- -	Tf(?)	Sand	--	--	--	--	--	E	
Me15-9	Town of Milford	M&P	1914	10	J	4.5	224	- -	Tf	Sand	3-23-50	46.4	--	--	--	A	C. A.; reported to flow 40 gpm when drilled.
Me15-10	Do	M&P	1914	10	J	6	224	- -	Tf	Sand	10-10-51	56	--	--	--	A	D. D. = 240 ft.
Me15-11	Do	L	1948	10	Hr	8	778	- -	Te	Sand	2- -38	Flows	--	--	--	T	See table 2.
Me15-12	Do	R	1939	15	J	44	40	- -	Qp	Sand	--	--	1939	100	67	N	
Me15-13	Do	L	1939	25	Hr	10	236	- -	Tf	Sand	3-10-39	92	11- -54	373	--	C	See log. D. D. = 250 ft.
Me15-14	Delmarva Poultry Corp.	PM	1948	25	J	6	85	- -	Tm	Sand	1949 7-29-55	16 14.2	--	--	--	N	
Me15-5	Do	PM	1949	20	J	6	85	- -	Tm	Sand	1949	16	--	--	--	I	
Me15-16	Do	W	1949	25	Ct	--	298	- -	Tf	Sand	--	--	--	--	--	A	See log.
Me15-17	Do	W	1946	30	J	6	73	- -	Qp	Sand	11- -49	19	11- -49	25	11	I	See log.
Me15-18	Torsch Canning Co.	W	1949	15	Ct	--	218	- -	Tm	Sand	5-13-49	5	--	--	--	A	See log.
Me15-19	Do	PM	--	15	J	4	239	- -	Tf	Sand	--	--	--	--	--	I	
Me15-20	Do	WD ?	--	15	J	--	--	- -	Tf	Sand	--	--	--	--	--	I	
Me15-21	Do	PM	1937	15	J	6	239	- -	Tf	Sand	--	--	--	--	--	I	
Me15-22	J. H. Prettyman	PC	1913	20	J	6	206	- -	Tf	Sand	10-28-55 3-31-56	20.9 16.4	--	--	--	O	
Me15-23	Milford Ice Co.	PM	1951	25	J	2	40	- -	Qp	Sand	--	--	--	--	--	I	
Me15-24	Do	PM	1942	25	J	2	40	- -	Qp	Sand	--	--	--	--	--	A	
Me15-25	Do	--	Before 1917	25	--	6	250	- -	Tf	Sand	--	--	--	--	--	N	
Me15-26	Do	PM	1942	25	J	2	40	- -	Qp	Sand	--	--	--	--	--	I	
Me15-27	Do	W	1955	25	J	4	38	- -	Qp	Sand	7-22-55	16.5	7-22-55	50	11.6	I	See log.
Me15-28	Draper Canning Co.	Ld	1900?	15	Dv	1.25	30	- -	Qp or Tm	Sand	--	--	--	--	--	--	
Me22-1	W. Savage	Ld	1951	52	Dv	1.5	52	- -	Qp-Tp(?)	Coarse sand	11-28-51	23.3	--	--	--	D	
Me22-2	Do	Ld	--	52	Dv	1.5	30	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Me23-1	W. A. Zencak	Ld	--	40	Dv	1.5	35	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Me23-2	A. D. Dickerson	Ld	--	42	Dv	1.5	49	- -	Qp-Tp(?)	Coarse sand	11-28-51	8.4	--	--	--	D	
Me24-1	T. Rodgers	Ld	1951	40	Dv	1.5	40	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Me24-2	W. E. Bennett	Ld	--	40	Dv	1.5	50	- -	Qp-Tp(?)	Coarse sand	5- -50	13	--	--	--	D	
Me25-1	W. D. Williams	W	1948	28	Dv	1.25	36	- -	Qp	Sand	--	--	--	--	--	F	
Me25-2	O. D. Houston	Ld	1949	35	Dv	-	37	- -	Qp-Tp(?)	Coarse sand	11-27-51	11.2	--	--	--	N	
Me25-3	Do	Ld	--	35	Dv	-	32	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Me31-1	G. E. Sharp	Ld	1948	50	Dv	1.5	21	- -	Qp	Sand	11- -51	15	--	--	--	F	
Me32-1	C. Jester	Ld	1951	45	Dv	1	44	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Me33-1	H. E. Ringgold	Ld	--	45	Dv	1.5	30	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Me33-2	T. Collett	W	1949	48	J	3	88	- -	Qp-Tp(?)	Coarse sand	10-24-49	11	10-24-49	20	18	D	
Me34-1	J. Morgan	Ld	1946	50	Dv	1.25	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Me34-2	W. M. Robinson	Ld	1951	45	Dv	1.5	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Me35-1	W. H. Davidson	Ld	--	40	Dv	1.5	33	- -	Qp	Sand	11-9-51	12.6	--	--	--	N	Temp. 62°F.
Me41-1	E. F. Isaacs & Sons	Ld	1951	50	Dv	1.5	35	- -	Qp-Tp(?)	Coarse sand	12- -51	10	--	--	--	F	
Me42-1	A. Postles	Ld	1951	50	Dv	1.5	50	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Me42-2	Do	Ld	--	50	Dv	1.5	30	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Me42-3	E. F. Isaacs & Sons	Ld	1953	45	Dv	2	32	- -	Qp	Sand	--	--	--	--	--	I	
Me42-4	Do	Ld	--	45	Dv	2	32	- -	Qp	Sand	--	--	--	--	--	I	
Me42-5	Do	Ld	--	45	Dv	2	33	- -	Qp	Sand	11-23-55	4.4	--	--	--	I	
Me44-1	H. Melvin	Ld	1936	50	Dv	1.25	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Me44-2	Do	Ld	--	50	Dv	1.25	45	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Me45-1	Delmarva Poultry Corp.	W	--	38	J	4	92	- -	Tm	Sand	1949	17	--	100	--	D	
Me45-2	Joe May	Ld	1949	50	Dv	1.25	65	- -	Qp-Tp(?)	Coarse sand	11-27-51	11.2	--	--	--	N	
Me45-3	M. C. Whitehead	Ld	1949	50	Dv	1.25	65	- -	Qp-Tp)?)	Coarse sand	--	--	--	--	--	D	
Me53-1	J. Deputy	Ld	1949	50	Dv	1.25	30	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Me54-1	Del-Mar-Va Nurseries	Ld	1948	40	Dv	1.5	45	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	C	
Me54-2	E. L. Lynch	Ld	--	40	Dv	1.5	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Me54-3	Del-Mar-Va Nurseries	SCS	1955	-	DgP	-	7	- -	Qp	Sand	--	--	--	--	--	Ir	Area 4,000 sq. ft.
Me55-1	A. King	Ld	1948	50	Dv	1.25	16	- -	Qp	Sand	--	--	--	--	--	F	
Mf11-1	Modern Services Inc.	E	1945	25	J	4	47	- -	Qp	Sand	8-4-45	18.8	8-4-45	65	--	C	
Mf11-2	Do	E	1947	25	J	6	43	- -	Qp	Sand	3-24-47	20.8	3-24-47	50	--	C	
Mf11-3	E. Morris	W	1947	30	Dv	1.5	42	- -	Qp	Sand	--	--	--	--	--	D	
Mf11-4	City of Milford	L	1952	15	Hr	-	302	- -	Tm	Sand	--	--	6-2-52	100	--	T, A	
Mf13-1	Lynn and Jacobs	Ld	1951	23	Dv	1.5	57	- -	Qp-Tp(?)	Coarse sand	10- -51	15	--	--	--	D	
Mf13-2	T. Mills	Ld	1948	20	Dv	-	26	- -	Qp	Sand	11-6-51	8.8	--	--	--	F	Temp. 60°F.
Mf13-3	W. Higman	PM	1949	31	J	3	68	- -	Tp(?) Tm	Coarse sand	1949	22	--	--	--	F	
Mf21-1	Diamond State Nurseries	W	1949	28	Ct	8	63	- -	Tp(?)	Coarse sand	12- -49	13.5	1949	180	12	Ir	
Mf21-2	Do	Ld	--	28	Dv	1.5	50	- -	Tp(?)	Coarse sand	--	--	--	--	--	D	
Mf21-3	Do	Ld	--	28	Dv	1.5	31	- -	Tp(?)	Coarse sand	11-7-51	12.5	--	--	--	Ir	Temp. 62°F.
Mf21-4	L. C. Lovett	Ld	--	35	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	D	
Mf22-1	B. P. Thawley	-	--	-	Dv	-	35?	- -	Qp	Sand	--	--	--	--	--	D	
Mf22-2	State Highway Dept.	USGS	1950	40	B, Dv	1	27	- -	Qp	Sand	8-3-56 6-2-52	22.6 13.5	--	--	--	O	
Mf22-3	Do	USGS	1958	38	B	1	23	- -	Qp	Sand	9-8-58	13.1	9-8-58	1	--	O	
Mf23-1	H. Short	W	1949	30	Dv	2	45	- -	Qp	Sand	--	--	--	--	--	F	
Mf23-2	L. Bennett	Ld	--	30	Dv	1.5	45	- -	Qp	Sand	--	--	--	--	--	F	
Mf23-3	R. Sharp	W	1948	35	Ct	3	82	- -	Qp-Tp(?)	Coarse sand	9- -48	21	9- -48	20	9	F	

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Mf31-1	H. A. Macklin	W	1946	45	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	D	
Mf32-1	W. C. Banning	Ld	1949	25	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	F	
Mf32-2	H. S. Vreeland	Ld	--	37	Dv	1.25	38	- -	Qp	Sand	11-8-51	15.7	--	--	--	F	Temp. 60°F.
Mf33-1	- - Isaacs	Ld	--	20	Dv	1.25	36	- -	Qp	Sand	11-7-51	17.3	--	--	--	D	Temp. 61°F.
Mf41-1	A. Behles	Ld	--	40	Dv	1.5	36	- -	Qp	Sand	--	--	--	--	--	D	
Mf42-1	M. Brenman	W	--	36	Dv	1.25	-	- -	Qp	Sand	--	--	--	--	--	D	
Mf43-1	O. Neal	W	1947	30	Dv	1.5	45	- -	Qp	Sand	--	--	--	--	--	D	
Mf45-1	T. Hicks	W	1948	32	Dv	1.5	50	- -	Qp	Sand	--	--	--	--	--	D	Temp. 56°F.
Mf51-1	W. Fitzgerald	Ld	1947	42	Dv	1.5	60	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Mf52-1	H. Wilson	-	--	30	St	-	-	- -	Qp	Sand	--	--	--	--	--	Ir	
Mf54-1	J. Millman	Ld	1947	35	Dv	1.5	50	- -	Qp	Sand	--	--	--	--	--	D	
Mg12-1	G. Draper	PC	--	7	J	6	180	- -	Tm	Sand	--	8	--	--	--	R	
Mg41-1	S. Draper	USGS	1955	14	B	3.5	79	- -	Qp and Tm	Sand	9-27-55	5	--	--	--	T, A	
Mg41-2	Do	USGS	1955	19	B	3.5	79	- -	Qp-Tp(?)	Coarse sand	9-23-55	9	--	--	--	T, A	
Mg41-3	F. L. Bennett	USGS	1955	19	B	3.5	49	- -	Qp	Sand	10-4-55	19	--	--	--	T, A	
Mg41-4	V. Carey	USGS	1957	14	B	4	9	- -	Qp	Sand	8-26-57	5.2	--	--	--	O	
											9-12-57	4.9	--	--	--		
Mg42-1	Do	USGS	1955	17	B	3.5	74	- -	Tm	Sand	9-22-44	12.5	--	--	--	T, A	See log.
Mg42-2	S. Draper	USGS	1955	23	B	3.5	44	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Mg42-3	Do	USGS	1955	19	B	3.5	19	- -	Qp	Sand	11-22-55	9	--	--	--	T, A	See log.
Mg42-4	Do	USGS	1955	20	B	3.5	19	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Mg42-5	Do	USGS	1955	17	B	3.5	24	- -	Qp	Sand	11-22-55	9	--	--	--	T, A	See log.
Mg42-6	C. Elwanger	USGS	1955	15	B	3.5	19	- -	Qp	Sand	11-22-55	10	--	--	--	T, A	See log.
Mg42-7	Do	USGS	1955	12	B	3.5	14	- -	Qp	Sand	11-22-55	11	--	--	--	T, A	See log.
Mg42-8	Draper Foods, Inc.	PM	1949	5	J	6	80	- -	Qp-Tp(?)	Coarse sand	11- -51	3.5	1955	84	--	I, M	Pumping affects water level of Mg42-10.
Mg42-9	Do	Ld	1953	10	Dv	1.5	60	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Mg42-10	Do	-	--	5	J ?	-	175	- -	Tm	Sand	--	--	--	--	--	N	Water level affected by pumping Mg42-8.
Mg42-11	Do	Ld	--	5	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	N	
Mg42-12	Do	Ld	--	5	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	N	

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Mg43-1	C. Clifton	W	1949	8	Ct	3	117	- -	Tm	Sand	9-19-49	11	9- -49	60	19	F	
Mg51-1	Do	W	--	18	Ct	3	62	- -	Qp-Tp(?)	Coarse sand	--	6	--	80	--	F	
Mg52-1	W. H. Draper	USGS	1957	16	B	3.5	38	- -	Qp	Sand	--	--	--	--	--	T, A	
Mg52-2	T. R. Wilson	USGS	1957	7.2	B	3.5	102	- -	Qp-Tp(?)	Coarse sand	10-8-57	0.2	--	--	--	T, A	See log.
Mg52-3	W. H. Draper	USGS	1957	13.6	B	3.5	101	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	T, A	
Mg52-4	T. R. Wilson	USGS	1957	7.5	B	4	9	- -	Qr-Qp	Sand	8-28-57	2.4	--	--	--	O	C. A.; Temp. 65°F.
Mg52-5	Do	USGS	1957	7.2	B	4	7	- -	Qr-Qp	Sand	8-28-57	2.9	--	--	--	O	C. A.; Temp. 67°F.
Mg52-6	R. Jones	USGS	1957	7.6	B	4	10	- -	Qr-Qp	Sand	8-29-57	2.3	--	--	--	O	C. A.; Temp. 66°F.
Mg52-7	W. H. Draper	USGS	1957	13.4	B	4	19	- -	Qp	Sand	8-29-57	8.2	--	--	--	O	C. A.; Temp. 62°F.
Mg52-8	T. R. Wilson	USGS	1957	7	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg52-9	W. H. Draper	USGS	1957	16.1	B	4	13	- -	Qp	Sand	8-29-57	10.4	--	--	--	O	C. A.; Temp. 64°F.
Mg52-10	T. R. Wilson	USGS	1957	7.5	B	4	8	- -	Qr-Qp	Sand	8-29-57	2.6	--	--	--	O	C. A.; Temp. 65°F.
Mg52-11	Do	USGS	1957	8	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg52-12	Do	USGS	1957	8	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg52-13	Do	USGS	1957	8.9	P	30	3	- -	Qp	Sand	--	--	--	--	--	T, A	
Mg52-14	Do	USGS	1957	7.5	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg52-15	Do	USGS	1957	7.2	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg52-16	R. Jones	USGS	1957	7.6	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg52-17	W. H. Draper	USGS	1957	13.4	P	30	3	- -	Qp	Sand	--	--	--	--	--	T, A	
Mg52-18	T. R. Wilson	USGS	1957	8	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg52-19	W. H. Draper	USGS	1957	16.1	P	30	3	- -	Qp	Sand	--	--	--	--	--	T, A	
Mg52-20	T. R. Wilson	USGS	1957	7.5	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg53-1	Do	USGS	1957	6.9	B	4	7	- -	Qp	Sand	7-17-57	1.3	--	--	--	O	C. A.; Temp. 71°F.
Mg53-2	Do	USGS	1957	11.7	B	4	9	- -	Qp	Sand	8-28-57	7	--	--	--	O	Temp. 63°F.
Mg53-3	Do	USGS	1957	8.9	B	4	9	- -	Qp	Sand	8-28-57	3.7	--	--	--	O	C. A.; Temp. 64°F.

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Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer		Static water level		Well capacity			Use	Remarks
									Name	Composition	Date measured	Depth below land surface (feet)	Date measured	Yield (gpm)	Draw-down (feet)		
Mg53-4	T. R. Wilson	Ld	1948	20	Dv	1.25	70	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Mg53-5	Do	USGS	1957	21	B	3.5	43	- -	Qr-Qp	Sand	10-10-57	14.5	--	--	--	T, A	See log.
Mg53-6	Do	USGS	1957	20.5	B	3.5	38	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Mg53-7	Do	USGS	1957	23	B	3.5	103	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	T, A	See log.
Mg53-8	Do	USGS	1957	20.5	B	4	19	- -	Qp	Sand	8-29-57	14.9	--	--	--	O	C. A.; See log.
Mg53-9	Do	USGS	1957	20	P	30	3	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Mg53-10	Do	USGS	1957	6.9	P	30	3	- -	Qr	Sand	--	--	--	--	--	T, A	
Mg53-11	Do	USGS	1957	11.7	P	30	3	- -	Qp	Sand	--	--	--	--	--	T, A	
Mg53-12	Do	USGS	1957	20.5	P	30	3	- -	Qp	Sand	--	--	--	--	--	T, A	
Mh41-1	J. D. Short	W	1950	5	Ct	5	335	- -	Tm	Sand	4-1-50	Flow	4-1-50	15	28	D	See log.
Nb15-1	T. A. Johnson	Ld	1950	51	Dv	1.5	20	- -	Qp	Sand	--	--	--	--	--	F	
Nb23-1	J. E. Bailey	Ld	1954	45	Dv	1.25	19	- -	Qp	Sand	11-4-55	3.0	--	--	--	F	
Nb24-1	Unknown	Ld	--	40	Dv	1.25	19	- -	Qp	Sand	11-4-55	2.5	--	--	--	N	
Nb33-1	C. W. Adams	Ld	1915	40	Dv	1.25	22	- -	Qp	Sand	--	--	--	--	--	D	
Nb34-1	H. Short	Ld	1954	35	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	D	
Nb44-1	R. Arner	Ld	--	45	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	D	
Nb53-1	W. Steward	Ld	1948	45	Dv	1.25	48	- -	Qp	Sand	--	--	--	--	--	D	
Nb55-1	Matilda Hastings	Ld	1955	55	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Nc11-1	G. S. Brown	Ld	1920	51	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Nc13-1	L. L. Swartzentruber	Ld	1953	62	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	D	
Nc15-1	Standard Bithulithic Co.	E	1941	55	J	2.5	38	- -	Qp	Sand	1- -41	2	1941	45	21	I	See log.
Nc22-1	R. Howlett	Ld	1953	63	Dv	1.5	32	- -	Qp	Sand	--	--	--	--	--	F	
Nc25-1	Town of Greenwood	SAW	1924	50	J	8	70	- -	Qp-Tp(?)	Coarse sand	1929	6	1924	100	--	P	
Nc25-2	Do	SAW	1950	50	J	8	61	- -	Qp-Tp(?)	Coarse sand	5-2-50	5	1950	690	--	P	C. A.; Temp. 58°F.
Nc25-3	The J. L. Strickland Co.	E	1941	45	J	4	38	- -	Qp	Sand	12-4-51 6-13-55	4.0 3.5	--	--	--	N	See log.
Nc25-4	Do	PC	1918	45	J	3	125	- -	Tp(?)	Coarse sand	--	--	--	--	--	A	
Nc25-5	Do	PC	1918	45	J	8	125	- -	Tp(?)	Coarse sand	--	--	--	--	--	A	
Nc25-6	Do	PC	1918	45	J	3	125	- -	Tp(?)	Coarse sand	--	--	--	--	--	A	
Nc25-7	Do	PC	1918	45	J	8	125	- -	Tm	Sand	--	--	--	--	--	A	
Nc25-8	Do	E	1943	45	J	6	51	- -	Qp	Sand	6-13-55	5.0	8-1-43	--	40	A	See log. D.D.=54 ft.

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Nc25-9	Eastern Shore Products Co.	-	1950	45	J	6	45	- -	Qp	Sand	--	--	--	--	--	I	
Nc25-10	Do	E	1952	45	J	6	45	- -	Qp	Sand	--	--	--	--	--	I	
Nc31-1	J. Vannicola	Ld	1917	52	Dv	1.25	32	- -	Qp	Sand	11-9-55	2.5	--	--	--	F	
Nc32-1	L. W. Richards	PC	1925	60	J	4	75	- -	Tp(?)	Coarse sand	--	--	--	--	--	F	
Nc41-1	J. Melson	Ld	--	54	Dv	1.25	23	- -	Qp	Sand	11-9-55	4.3	--	--	--	F	
Nc43-1	R. Zehr	Ld	1955	49	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	F	
Nc44-1	H. P. Cannon & Son	SCS	1953	40	DgP	-	12	- -	Qp	Sand	--	--	1955	400	--	Ir	Area 12,000 sq. ft.
Nc45-1	P. H. Cannon	USGS	1950	43	Dv	1	16	- -	Qp	Sand	1-30-52 8-31-54	6.7 9.7	--	--	--	O	
Nc45-2	O. A. Newton & Son Co.	SCS	1950	35	DgP	-	8	- -	Qp	Sand	--	--	1955	400	--	Ir	Area 22,500 sq. ft.
Nc45-3	H. Lyons	S&R	1955	48	DgP	-	7	- -	Qp	Sand	11-16-55	1.1	--	--	--	Ir	Area 6,000 sq. ft.
Nc53-1	O. A. Newton & Son Co.	SAW	1949	50	J	8	68	- -	Qp-Tp(?)	Coarse sand	5-2-50	32	1949	220	--	C,F	pH 4.3.
Nc53-2	Do	SAW	1950	50	J	4	60	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	E	
Nc54-1	G. B. Ruos & Son	PM	1949	50	J	4	87	- -	Tp(?)	Coarse sand	--	--	--	--	--	F	
Nc54-2	Do	PM	1949	50	J	4	87?	- -	Tp(?)	Coarse sand	--	--	--	--	--	F	
Nc54-3	Do	SCS	1954	40	DgP	-	7	- -	Qp	Sand	--	--	1955	600	--	Ir	Area 30,000 sq. ft.
Nc54-4	Do	SCS	1950	45	DgP	-	8-9	- -	Qp	Sand	--	--	1955	600	--	Ir	Area 38,700 sq. ft.
Nc55-1	State Highway Dept.	USGS	1955	40	B	3.5	64	- -	Qp-Tp(?)	Coarse sand	5-25-55	9	--	--	--	T,A	See log.
Nd12-1	N. Bender	Ld	Before 1945	58	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Nd13-1	Miss L. V. Clark	Ld	1940	50	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	D	
Nd22-1	R. Howlett	Ld	1953	63	Dv	1.5	32	- -	Qp	Sand	--	--	--	--	--	F	
Nd24-1	F. Schlabach	SCS	1955	55	DgP	-	8	- -	Qp	Sand	--	--	--	--	--	Ir	Area 5,500 sq. ft.
Nd25-1	C. H. Banning	Ld	1950	50	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	F	
Nd25-2	O. R. Tatman	Ld	1928	53	Dv	1.5	24	- -	Qp	Sand	11-17-55	4.6	--	--	--	N	

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Nd34-1	Mrs. H. E. Willy	Ld	Before 1930	50	Dv	1.5	18	- -	Qp	Sand	11-16-55	5.8	--	--	--	F	
Nd41-1	H. & L. Lyons	W	1951	45	Ct	3	91	- -	Qp-Tp(?)	Coarse sand	2-13-51	14	2-13-51	70	16	F	See log.
Nd41-2	L. Richards	Ld	1954	44	Dv	1.25	52	- -	Qp	Sand	--	--	--	--	--	D	
Nd41-3	Do	Ld	Before 1936	44	Dv	1.25	16	- -	Qp	Sand	11-16-55	7.8	--	--	--	F	
Nd43-1	S. B. McIlvaine	Ld	--	43	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	D	
Nd44-1	F. H. Webb	Ld	Before 1944	50	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	D	
Nd51-1	F. Swain	Ld	1950	41	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Nd51-2	Do	Ld	--	41	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	A	
Nd55-1	A. Kosegi	Ld	1947	46	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Nd55-2	Do	Ld	Before 1945	46	Dv	-	60	- -	Qp	Sand	--	--	--	--	--	A	Low yield.
Ne11-1	B. B. Mullett	Ld	--	55	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	F	
Ne11-2	Do	Ld	--	55	Dv	1.25	32	- -	Qp	Sand	11-23-55	3.6	--	--	--	A	
Ne13-1	R. Morgan	Ld	--	51	Dv	1.25	38	- -	Qp	Sand	11-23-55	5.6	--	--	--	N	
Ne14-1	State Highway Dept.	USGS	1955	50	B	3.25	89	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	T, A	See log.
Ne24-1	H. Coleman	Ld	1938	50	Dv	1.25	56	- -	Qp	Sand	--	--	--	--	--	F	
Ne25-1	Ellendale Excelsior Corp.	W	1954	52	Ct	3	67	- -	Qp-Tp(?)	Coarse sand	8-17-54	5	8-17-54	100	--	D	See log.
Ne32-1	W. Coverdale	Ld	1949	48	Dv	1.25	42	- -	Qp	Sand	--	--	--	--	--	F	
Ne33-1	C. Wilson	Ld	1930	51	Dv	1.25	65	- -	Qp	Sand	--	--	--	--	--	F	
Ne34-1	State Highway Dept.	USGS	1950	48	B, Dv	1	14	- -	Qp	Sand	10-31-50 11-2-56	6.2 1.0	--	--	--	O	See log.
Ne34-2	Do	USGS	1955	45	B	3.5	94	- -	Qp-Tp(?)	Coarse sand	8-9-55	8	--	--	--	T, A	See log.
Ne44-1	C. Abbott, Jr.	Ld	--	48	Dv	1.25	26	- -	Qp	Sand	11-22-55	2.2	--	--	--	F	
Ne51-1	Mrs. A. Williams	Ld	--	45	Dv	1.25	26	- -	Qp	Sand	11-22-55	6.6	--	--	--	F	
Ne52-1	J. Merrider	Ld	--	45	Dv	1.25	9	- -	Qp	Sand	11-22-55	5.5	--	--	--	N	
Ne52-2	Do	Ld	--	45	Dv	1.25	42	- -	Qp	Sand	11-22-55	4.9	--	--	--	N	
Ne53-1	R. Smith	Ld	--	45	Dv	1.25	16	- -	Qp	Sand	11-22-55	6.8	--	--	--	F	
Ne54-1	State Highway Dept.	USGS	1955	45	B	3.5	94	- -	Qp-Tp(?)	Coarse sand	8-9-55	10	--	--	--	T, A	See log.
Ne55-1	J. Millman	Ld	1944	47	Dv	1.25	42	- -	Qp	Sand	--	--	--	--	--	D	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Nf12-1	E. Parker	--	1954	40	St	--	4	- -	Qp	Sand	--	--	1955	1720	--	Ir	Area 50,000 sq. ft.
Nf15-1	Isaacs Canning Co.	PM	1945	30	J	8	100	- -	Tp(?) -Tm	Coarse sand	--	--	--	--	--	I	
Nf15-2	Do	PM ?	1945?	30	J	8	100	- -	Tp(?) -Tm	Coarse sand	--	--	--	--	--	I	
Nf15-3	Do	Ld	--	30	Dv	1.5	-	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	N	
Nf22-1	C. R. Appel	W	1949	43	Dv	1.5	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Nf22-2	Do	Ld	1923	43	Dv	1.5	23	- -	Qp	Sand	10-27-54	10.3	--	--	--	A	
Nf23-1	R. E. Tucker	Ld	Before 1930	38	Dv	1.5	-	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Nf23-2	Do	Ld	--	38	Dv	1.5	-	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Nf25-1	F. Rust	W	1947	33	Dv	1.5	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Nf25-2	R. Holmes	Ld	1947	35	Dv	1.5	90	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Nf25-3	Do	Ld	1947	35	Dv	1.25	60	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Nf31-1	J. G. Wilson	Ld	1905	50	Dv	1.25	36	- -	Qp	Sand	--	--	--	--	--	F	D. D. = 100 ft.
Nf33-1	E. J. Clendaniel	Ld	1930	45	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	F	
Nf41-1	T. H. Cordrey	Ld	1950	50	Dv	1.25	32	- -	Qp	Sand	--	--	--	--	--	D	
Nf43-1	Unknown	--	--	42	Dv	1.25	20	- -	Qp	Sand	12-7-55	5.8	--	--	--	F	
Nf43-2	J. Parsons	Ld	1950?	42	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	F	
Nf43-3	Do	Ld	Before 1945	42	Dv	1.25	44	- -	Qp	Sand	12-8-55	10.1	--	--	--	F	
Nf45-1	Brookman Lumber Co.	Ld	1953	38	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	I	
Nf45-2	Do	Ld	1953	38	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	D	
Nf51-1	H. V. Donovan	Ld	Before 1935	48	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	F	
Nf54-1	C. Donovan	Ld	1953	40	Dv	1.25	61	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Ng12-1	C. Clifton	W	1949	10	Ct	6	61	- -	Qp	Sand	4-20-49	7	4-20-49	300	18	I	See log.
Ng12-2	Do	--	--	10	J	3	48	- -	Qp	Sand	--	--	--	--	--	I	
Ng24-1	R. Lank	Ld	1948	20	Dv	1.25	63	- -	Qp	Sand	--	--	--	--	--	F	

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Ng24-2	C. Betts	W	1952	17	Ct	6	85	- -	Tp(?)	Coarse sand	7-17-52	20	7-17-52	40	10	Ir	See log. D. D. = 130 ft.
Ng35-1	R. Lank	W	1949	12	Ct	3	80	- -	Tma	Sand	9-2-49	16	8-2-49	15	--	F	See log. D. D. = 122 ft.
Ng35-2	W. Lank	W	1951	10	Ct	4	47	- -	Qp	Sand	9-26-51	12	9-26-51	40	--	F	
Ng41-1	C. Draper	W	1949	30	Ct	3	94	- -	Tma	Sand	6-29-49	20	6-29-49	75	--	D	
Ng42-1	Town of Milton	PM	1945	10	J	6	68	- -	Qp	Sand	3-23-50	3.0	1945	200	--	P	Sp. cap. 31. Driller reported low pH.
Ng42-2	Do	PM	1945	10	J	6	68	- -	Qp	Sand	3-23-50	3.0	1945	200	6.5	P	C. A., Temp. 56°F.
Ng42-3	Draper Frozen Products, Inc.	PM	1953	26	J	6	79	- -	Tma	Sand	5-4-55	18	1955	250	12	I	
Ng42-4	Do	PM	1947	26	J	6	60	- -	Qp-Tp(?)	Coarse sand	--	--	1955	250	--	I	
Ng42-5	Do	PM ?	1943	25	J	6	60	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	A	
Ng42-6	Do	PM	1952	25	J	6	78	- -	Tma	Sand	--	--	1955	250	18	I	
Ng42-7	Do	PM	1952	25	J	6	79	- -	Tma	Sand	5-4-55	17	1955	250	19	I	
Ng42-8	Do	PM ?	1943	25	J	6	60	- -	Qp-Tp(?)	Coarse sand	--	--	1955	250	--	I	
Ng42-9	Milton Poultry Co.	W	1952	10	Ct	4	32	- -	Qp	Sand	6- -52	6	6- -52	40	--	I	
Ng42-10	Do	W	1952	10	Ct	4	165	- -	Tm	Sand	--	--	6- -52	50	--	A	
Ng42-11	J.H. Dulaney & Son, Inc.	SWD	1955	9	J	10	60	- -	Qp	Sand	--	--	--	--	--	I	
Ng42-12	Do	SAW	1950	9	J	8	70	- -	Qp	Sand	--	--	--	--	--	I	
Ng42-13	Do	Ld	1955	9	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	D	
Ng42-14	Do	Ld	1953	9	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	N	
Ng43-1	F. Leithmann	W	1952	35	Ct	3	41	- -	Tma	Sand	8-15-52	30	--	--	--	F	
Ng52-1	C. Draper	W	1949	35	Ct	4	56	- -	Qp	Sand	4-28-49	20	4-28-49	15	--	D	
Ng52-2	H. Draper	W	1949	35	Ct	3	70	- -	Tp(?)	Coarse sand	7-22-49	23	7-22-49	20	--	D	
Ng53-1	C. Stucklik, Jr.	W	1949	32	Ct	4	52	- -	Tma	Sand	8-11-49	32	8-11-49	6	15	F	See log.
Ng55-1	C. Draper	W	1949	28	Ct	3	75	- -	Qp	Sand	7-14-49	19	7-14-49	100	--	F	See log.
Nh13-1	H. P. Layton	PM	1940?	10	J	5.5	387	- -	Tf(?)	Sand	2- -54	0	--	--	--	N	
Nh13-2	Dr. W. P. Hearn	Ld	1946	8	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Nh13-3	Do	Ld	1946	8	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Nh13-4	R. Hughes	Ld	1953	8	Dv	3	6	- -	Qr-Qp	Sand	--	--	--	--	--	D	

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Nh35-1	Doxsee Company	PM	1952	7	J	4	62	- -	Qp	Sand	8- -52	17	--	--	--	C, P	C. A.
Nh42-1	R. White	W	1948	24	Ct	3	87	- -	Tma	Sand	9-27-48	17.5	9-27-48	100	17.5	I	See log.
Nh52-1	J. Spevak	W	1948	21	Ct	4	115	- -	Tma	Sand	1948	14	1948	105	--	G	See log. T. D. = 142 ft.
Ni31-1	Lewes Dairy	PM	1938	18	J	4	100	- -	Tma (?)	Sand	6- -53	14	--	--	--	C, B	C. A.
Ni31-2	Do	SAW	1946	18	J	6	29	- -	Qp	Sand	8-5-55	14.5	--	--	--	N	C. A.
Ni31-3	Do	SAW	1949	18	J	6	60	- -	Qp	Sand	1- -55	16	--	100	7	I	
Ni31-4	Lewes Yacht Club	D	1953	8	B	3.5	84	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Ni34-1	Sea Coast Products, Inc.	SAW	1898	5	J	-	1,080	- -	Tca or Te(?)	Sand	1898	Flow	1898	10	--	N	See log.
Ni35-1	U. S. Quarantine Sta.	P&JC	1892	7	-	6	400	- -	Tm	Sand	--	--	--	15	--	W	See log.
Ni41-1	U.S. Army, Ft. Miles	SAW	1944	15	J	8	110	- -	Qp-Tp(?)	Coarse sand	5-5-55	11	6-14-44	339	--	W	C. A.
Ni42-1	Town of Lewes	Ke	1934	15	Dg	16 ?	65	- -	Qp-Tp(?)	Coarse sand	3-25-55	6.4	--	--	--	A	
Ni42-2	Do	SAW	1936	15	J	6	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	P, E	C. A.
Ni42-3	Do	PM	Before 1934	15	J	6	--	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	N	No screen.
Ni42-4	Do	--	Before 1934	15	J	3	70	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	N	
Ni42-5	Do	--	Before 1934	13	J	3	70	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	A	
Ni42-6	Do	SAW	1942	12	J	6	67	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	P	
Ni42-7	Do	SAW	1936	15	J	6	--	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	A	
Ni42-8	Do	SAW	1942	17	J	10	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	A	C. A.
Ni42-9	Do	SAW	1942	15	J	8	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	P, E	C. A.
Ni42-10	Do	SAW	1942	14	J	10	64	- -	Qp - Tp(?)	Coarse sand	3-28-55	11.6	1942	300	--	A	C. A.
Ni42-11	Do	Ld	1944	15	Dv	1.25	--	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	A	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Ni51-1	Town of Lewes	SAW	1944	22	J	2	84	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	T;O	
Ni51-2	Do	SAW	1944	22	J	2	66	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	T,O	
Ni51-3	Do	SAW ?	1944	22	J	6	84	- -	Tp(?)	Coarse sand	9-25-47 5-1-53	21.7 13.9	--	--	--	O	C.A.
Ni51-4	Do	SAW	1944	22	J	2	21	- -	Qp	Sand	8-5-48	5.7	--	--	--	T,O	
Ni51-5	Do	SAW	1945	22	J	2	83	- -	Tp(?)	Coarse sand	3-24-55	16.6	--	--	--	T,O	
Ni51-6	Do	SAW	1945	20	J	2	164	- -	Tp(?)-Tm	Coarse sand	4-10-48	13.4	--	--	--	T,O	See log. D.D. = 188 ft.
Ni51-7	Do	SAW	1945	19	J	2	80	- -	Qp-Tp(?)	Coarse sand	6-5-48	12.5	--	--	--	T,O	T.D. = 87 ft.
Ni51-8	Do	SAW	1945	19	J	2	71	- -	Qp-Tp(?)	Coarse sand	6-5-48	11.3	--	--	--	T,O	T.D. = 89 ft.
Ni51-9	Do	S	1954	17	Hr	4	160	- -	Tp(?)-Tm	Coarse sand	11-18-54	6.0	11-18-54	30	30	T,O	See log. D.D. = 170 ft. Temp. 57°F.
Ni51-10	Do	S	1954	11	Hr	4	144	- -	Tp(?)-Tm	Coarse sand	11-30-54	5.4	11-30-54	157	--	T,O	T.D. = 170 ft.
Ni51-11	Do	S	1954	11	Hr	1.25	69	- -	Qp	Sand	11-30-54	5.5	--	--	--	O	
Ni51-12	E. L. Wescoat	W	--	26	Ct	--	92	- -	Qp	Sand	--	--	--	--	--	D	
Ni51-13	F. Thorpe	W	1950	26	Ct	3	87	- -	Qp-Tp(?)	Coarse sand	8-29-50	22	8-29-50	35	10	F	
Ni51-14	J. W. Webb	W	1950	26	Ct	4	87	- -	Qp-Tp(?)	Coarse sand	5-12-50	17	5-12-50	30	12	F	
Ni51-15	R. Martin	Ld	--	23	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	C.A.
Ni51-16	Town of Lewes	SAW	1945	23	J	10	97	- -	Qp-Tp(?)	Coarse sand	11-29-54 1946	15.3 14	11-29-54 1- -45	510 480	41 30	P	C.A.; Temp. 57°F.
Ni51-17	Do	SAW	1945	22	J	10	157	- -	Qp-Tp(?)	Coarse sand	2- -45 1954	16 17.3	1945	500	44	P	C.A.; D.D. = 188 ft.
Ni51-18	Do	SAW	1945	19	J	10	89	- -	Qp-Tp(?)	Coarse sand	1946 1954	13 15	1945	400	36	P	Temp. 57°F.
Ni51-19	Do	S	1955	12	Hr	10	151	- -	Qp-Tp(?)	Coarse sand	3-29-55	12	11-29-55	975	--	P	
Ni51-20	Do	S	1955	12	Hr	10	146	- -	Qp-Tp(?)	Coarse sand	4-2-55	12	4-2-55	895	35	P	
Ni51-21	R. Martin, Jr.	W	1952	19	Ct	3	105	- -	Qp-Tp(?)	Coarse sand	1-3152	12	1-3-52	75	18	F	T.D. = 120 ft.

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Ni51-22	W. A. Beauchamp	--	1952	10	J	--	--	- -	Qp	Sand	--	--	--	--	--	D	
Ni52-1	Diamond State Poultry Co.	SAW	1950	20	Hr	8	94	- -	Qp-Tp(?)	Coarse sand	12-28-50	10.5	12-28-50	100	5	I	C. A.; D. D. = 160 ft.
Ni52-2	Do	--	1949?	15	Ct	4	80	- -	Qp-Tp(?)	Coarse sand	2- -53	10	--	--	--	I	
Ni52-3	V. L. Dennis	Ld	1939	19	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	C. A.
Ni52-4	F. C. Marshall	Ld	1948	19	Dv	1.25	65	- -	Qp	Sand	4-18-52	15	--	--	--	D	C. A.
Ni52-5	E. H. Maul	Ld	1949	19	Dv	1.25	65	- -	Qp	Sand	4-18-52	15	--	--	--	D	C. A.
Ni52-6	L. Mitchell	Ld	1946	19	Dv	1.25	70	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	C. A.
Ni52-7	Do	Ld	--	20	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	F	
Ni52-8	O. H. Warrington	Ld	1950	19	Dv	1.25	72	- -	Qp-Tp(?)	Coarse sand	4-18-52	20	--	--	--	F	C. A.
Ni52-9	Do	Ld	--	19	Dv	1.25	72	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Ni53-1	U.S. Army, Ft. Miles	SAW	1944	12	J	6	85	- -	Qp-Tp(?)	Coarse sand	4-18-52	18.2	--	--	--	T, O	
Ni53-2	Do	SAW	1943?	12	J	3	34	- -	Qp	Sand	4-18-52	17.7	--	--	--	N	
Ni53-3	Do	SAW	1944	10	J	8	110	- -	Tp(?)-Tm	Coarse sand	6-13-44	43	6-13-44	461	--	W	C. A.
Ni53-4	Do	SAW	1944	10	J	8	103	- -	Tp(?)-Tm	Coarse sand	6-12-44 1-31-52	10.5 27	6-12-44	320	30	W	C. A.
Ob13-1	Mrs. M. Jones	Ld	1925	45	Dv	1.25	13	- -	Qp	Sand	11-4-55	3.3	--	--	--	D	Temp. 60°F.
Ob14-1	S. E. Melson	Ld	Before 1940	50	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	D	Temp. 58°F.
Ob23-1	C. Johnson	Ld	1950	45	Dv	1.5	75	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Ob25-1	G. Hartzel	Ld	Before 1944	50	Dv	1.25	39	- -	Qp	Sand	11-4-55	4.2	--	--	--	F	
Ob33-1	D. Calloway	Ld	Before 1943	48	Dv	1.5	80	- -	Qp-Tp(?)	Sand	--	--	--	--	--	F	
Ob43-1	C. Coulbourn	Ld	1954	52	Dv	1.5	45	- -	Qp	Sand	--	--	--	--	--	F	
Ob45-1	E. Jester	Ld	Before 1930	48	Dv	1.25	25	- -	Qp	Sand	11-3-55	1.0	--	--	--	N	
Ob54-1	L. O'Bier	Ld	Before 1907	48	Dv	1.25	39	- -	Qp	Sand	11-3-55	4.8	--	--	--	E	
Ob55-1	L. Ward	Ld	1947	40	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	D	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Ob55-2	L. Ward	Ld	1942	40	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	F	
Oc12-1	C. Walston	Ld	1951	51	Dv	1.25	36	- -	Qp	Sand	--	--	--	--	--	F	
Oc14-1	Atlantic Ice Mfg. Co.	AP	1940	48	J	8	108	- -	Tp(?)	Coarse sand	--	--	1950	300	--	N	
Oc14-2	J.H. Dulaney & Son, Inc.	SAW	1949	45	J	4	94	- -	Tp(?)	Coarse sand	1949	24	1949	200	--	I	
Oc14-3	Atlantic Ice Mfg. Co.	PM	1951	45	J	8	110	- -	Tp(?)	Coarse sand	4-21-53	12	--	--	--	I	
Oc14-4	H.P. Cannon & Son, Inc.	AP	1943	47	Ct	8	109	- -	Tp(?)	Coarse sand	9- -43	11	9- -43	600	28	I	
Oc14-5	Do	AP	1940	47	Ct	10	116	- -	Tp(?)	Coarse sand	4- -40	9	4- -40	800	38	I	
Oc14-6	Do	PM	1943	47	J	8	98	- -	Tp(?)	Coarse sand	2-3-43	12	2-3-43	500	33	I	
Oc14-7	Sidney Theatre	W	1947	45	Ct	4	111	- -	Tp(?)	Coarse sand	1947	6.5	1947	90	22	C	
Oc14-8	Town of Bridgeville	--	1930	45	J	12	119	- -	Tp(?) -Tm	Coarse sand	1930	16	1930	470	--	P	C.A.; temp. 56°F.
Oc14-9	Do	PC	1910	45	J	4	--	- -	Tp(?) -Tm	Coarse sand	--	--	--	--	--	P, E	
Oc14-10	Do	SWD	1955	45	J	8	96	- -	Tp(?) -Tm	Coarse sand	--	--	11- -55	850	--	P	
Oc14-11	Atlantic Ice Mfg. Co.	SWD	1954	45	J	8	110	- -	Tp(?)	Coarse sand	--	--	--	--	--	I	
Oc21-1	C. Wright	Ld	Before 1935	52	Dv	1.25	16	- -	Qp	Sand	11-7-55	5.4	--	--	--	N	
Oc23-1	S. W. Allen	Ld	1950	50	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Oc25-1	M. Adams	PM	1953	44	J	--	--	- -	Tp(?) -Tm	Coarse sand	--	--	--	--	--	D	
Oc25-2	Do	PM	--	44	J	4	--	- -	Tp(?) -Tm	Coarse sand	--	--	--	--	--	F	
Oc32-1	C. Messick	Ld	1946	48	Dv	1.25	29	- -	Qp	Sand	--	--	--	--	--	F	
Oc34-1	L. W. Noble Cannery	PM	1945	41	J	3	70	- -	Qp-Tp(?)	Coarse sand	4- -52	3	--	--	--	I	D. D. = 120 ft.
Oc34-2	Do	Ld	--	41	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	I	
Oc35-1	State Highway Dept.	USGS	1955	40	B	3.5	54	- -	Tp(?)	Coarse sand	5-24-55	14	--	--	--	T, A	See log.
Oc35-2	Do	USGS	1955	45	B	3.5	84	- -	Tp(?)	Coarse sand	5-26-55	12	--	--	--	T, A	See log.
Oc41-1	R. V. Stallard	Ld	1943	46	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	D	
Oc42-1	Wesley Methodist Church	Ld	--	43	Dv	1.25	30	- -	Qp	Sand	11-7-55	4.3	--	--	--	P	
Oc42-2	C. C. Allen, Jr.	--	--	31	St	--	--	- -	Qp	Sand	--	--	1955	400	--	Ir	
Oc52-1	W. Miller	Ld	1952	42	Dv	1.25	28	- -	Qp	Sand	11-7-55	7.1	--	--	--	N	
Oc53-1	C. H. Isaacs	Ld	1951	34	Dv	1.25	19	- -	Qp	Sand	--	--	--	--	--	D	

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Oc55-1	State Highway Dept.	USGS	1955	30	B	3.5	54	- -	Tp(?)	Coarse sand	5-23-55	8	--	--	--	T, A	See log.
Od11-1	T.S. Smith & Son	SCS	--	30	St	--	8?	- -	Qp	Sand	--	--	1955	1,000	--	Ir	Area 5,250 sq. ft.
Od12-1	Do	SCS	1955	20	St	--	8?	- -	Qp	Sand	--	--	1955	1,000	--	Ir	Area 10,000 sq. ft.
Od14-1	Mrs. M. Moore	Ld	1954	42	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	F	
Od15-1	R. Macklin	Ld	--	40	Dv	1.25	70	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Od21-1	A. Corey	Ld	1928	35	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	F	
Od23-1	Townsend, Inc.	SO	1939	43	Hr?	4	2,600	- -	Kr	Sand	--	--	--	--	--	T, A	Oil exploration. See log.
Od23-2	Do	CO	1935?	42	Ct, Hr	8?	3,012	- -	Kr	Sand	--	--	--	--	--	T, A	Oil exploration. See log.
Od23-3	Do	SAW	1942	50	J	6	90	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Od24-1	R. Russell	SO	1939	36	Hr?	4	2,674	- -	Kr	Sand	--	--	--	--	--	T, A	Oil exploration. See log.
Od32-1	State Highway Dept.	USGS	1952	25	B	3.5	114	- -	Qp-Tp(?)	Coarse sand	5-19-52	14	--	--	--	T, A	See log.
Od32-2	Do	USGS	1952	30	B	3.5	69	- -	Qp-Tp(?)	Coarse sand	5-20-52	6.5	--	--	--	T, A	See log.
Od32-3	Do	USGS	1952	28	B	3.5	114	- -	Qp	Sand	5-21-52	14	--	--	--	T, A	See log.
Od33-1	O. A. Newton & Son Co.	Ld	--	38	Dv	1.5	14	- -	Qp	Sand	11-11-55	11.5	--	--	--	N	
Od35-1	A. Givens	Ld	1948	35	Dv	2	48	- -	Qp	Sand	--	--	--	--	--	F	
Od35-2	H. I. Short, Sr.	SO	1935	40	Hr?	--	550	- -	Tf(?)	Sand	--	--	--	--	--	T, A	Oil exploration. See log.
Od42-1	State Highway Dept.	USGS	1952	28	B	3.5	89	- -	Qp	Sand	5- -52	15	--	--	--	T, A	See log.
Od42-2	Do	USGS	1952	30	B	3.5	99	- -	Qp	Sand	5- -52	36	--	--	--	T, A	See log.
Od44-1	W. C. Fleetwood	Ld	1925	32	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Od53-1	E. Richard	Ld	1950	32	Dv	1.25	32	- -	Qp	Sand	--	--	--	--	--	F	
Od55-1	Mrs. I. Hudson	Ld	--	32	Dv	1.5	21	- -	Qp	Sand	10-10-55	12.6	--	--	--	N	
Oe11-1	L. J. Isaacs	Ld	Before 1915	38	Dv	1.25	12	- -	Qp	Sand	11-21-55	5.1	--	--	--	N	
Oe14-1	W. B. Vink	Ld	Before 1935	47	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Oe15-1	State Highway Dept.	USGS	1955	47	B	3.5	94	- -	Tma	Sand	8- -55	7	--	--	--	T, A	See log.
Oe23-1	S. R. Wilson	Ld	--	38	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	F	

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Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Oe25-1	Unknown	Ld	--	40	Dv	1.25	40	- -	Qp	Sand	11-21-55	1.9	--	--	--	N	
Oe31-1	H. I. Short, Sr.	Ld	1949	40	Dv	2	73	- -	Qp	Sand	--	--	--	--	--	F	
Oe41-1	R. Lambdon	Ld	1952	35	Dv	1.25	21	- -	Qp	Sand	1952	15	--	--	--	D	
Oe43-1	A. Blake	Ld	Before 1914	36	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	D	
Oe45-1	C. Morris	Ld	1949	45	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Oe52-1	Unknown	Ld	--	40	Dv	1.25	9	- -	Qp	Sand	11-21-55	5.4	--	--	--	N	
Of14-1	I. Williams	Ld	1954	47	Dv	1.25	16	- -	Qp	Sand	--	--	--	--	--	D	
Of15-1	Mrs. I. M. Blizzard	Ld	1945	40	Dv	1.5	79	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Of22-1	A. Short	Ld	1952	52	Dv	1.25	14	- -	Qp	Sand	--	--	--	--	--	F	
Of24-1	H. R. Wilson	Ld	1951	40	Dv	1.25	42	- -	Qp	Sand	--	--	--	--	--	F	
Of25-1	E. A. Metz	Ld	1953	40	Dv	1.25	42	- -	Qp	Sand	--	--	--	--	--	F	
Of31-1	State Highway Dept.	USGS	1955	47	B	3.5	94	- -	Qp	Sand	6-22-55	4	--	--	--	T, A	See log.
Of35-1	Mrs. E. W. Reynolds	Ld	1925	42	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	F	
Of42-1	Water & Supply Co.	SAW	1951	55	Hr	10	116	- -	Tma	Sand	11-16-53	11	1951	1100	--	P	C. A.; Temp. 59°F.
Of42-2	Do	PM	1928	55	J	3	116	- -	Tma	Sand	--	--	--	--	--	P, E	
Of42-3	Do	PM	1928	55	J	3	116	- -	Tma	Sand	5-22-50	5.5	--	--	--	P, E	
Of42-4	Do	PM	1928	55	J	3	116	- -	Tma	Sand	--	--	--	--	--	P, E	
Of42-5	Do	PM	1928	55	J	3	116	- -	Tma	Sand	--	--	--	--	--	P, E	
Of42-6	Do	PM	1928	55	J	3	116	- -	Tma	Sand	--	--	--	--	--	P, E	
Of42-7	Do	PM	1928	55	J	3	116	- -	Tma	Sand	--	--	--	--	--	P, E	
Of42-8	Do	PM	1928	55	J	3	116	- -	Tma	Sand	--	--	--	--	--	P, E	
Of42-9	Do	PM	1928	55	J	3	116	- -	Tma	Sand	--	--	--	--	--	P, E	
Of42-10	Do	PC ?	Before 1928	55	J	3	113	- -	Tma	Sand	--	--	--	--	--	A	
Of42-11	Do	PC ?	Before 1928	55	J	3	113	- -	Tma	Sand	--	--	--	--	--	A	
Of42-2	Do	PC ?	Before 1928	55	J	3	113	- -	Tma	Sand	--	--	--	--	--	A	
Of42-13	Do	PC ?	Before 1928	55	J	3	113	- -	Tma	Sand	--	--	--	--	--	A	
Of42-14	Do	PC ?	Before 1928	55	J	3	113	- -	Tma	Sand	--	--	--	--	--	A	
Of42-15	Do	Pc ?	Before 1928	55	J	3	113	- -	Tma	Sand	--	--	--	--	--	A	
Of42-16	Do	SAW	1955	55	J	10	120	- -	Tma	Sand	--	--	--	--	--	P	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer		Static water level		Well capacity			Use	Remarks
									Name	Composition	Date measured	Depth below land surface (feet)	Date measured	Yield (gpm)	Drawdown (feet)		
Of42-17	Isaacs & Sons Cold Storage Co.	PM	1946	55	J	6	112	- -	Tma	Sand	--	8	--	300	--	O	High in CO_2.
Of42-18	Do	PM	1946	55	J	10	90	- -	Tma	Sand	--	--	--	--	--	I	
Of42-19	Atlantic Ice Mfg. Co.	PM	1947	55	J	8	110	- -	Tma	Sand	1947	9	--	500	62	I	Temp. 56°F.
Of42-20	Do	PM	1951	55	J	8	110	- -	Tma	Sand	--	--	--	--	--	I	
Of42-21	Do	PM	1953	55	J	8	110	- -	Tma	Sand	--	--	--	--	--	I	
Of42-22	Do	PM	1953	55	J	8	110	- -	Tma	Sand	--	--	--	--	--	I	
Of42-23	Townsend Canning Co.	L	1946	55	Hr	16	110	- -	Tma	Sand	1948	8.5	10- -46	1,005	29	I	D. D. = 130 ft.
Of43-1	Swift & Co.	PM	1952	55	J	8	110	- -	Tma	Sand	--	--	--	--	--	I, E	pH 7.8.
Of43-2	Do	L	1946	55	Hr	10	110	- -	Tma	Sand	--	5	1946	575	--	I	D. D. = 125 ft.
Of43-3	Do	PM	1946	50	J	4	110	- -	Tma	Sand	--	--	--	--	--	I, E	
Of44-1	All American Engineering Co.	Ld	1944	55	Dv	1.5	55	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	I	
Of44-2	Do	Ld	1954	50	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	I	
Of44-3	Do	Ld	1955	53	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	I	
Of45-1	J. L. Briggs	Ld	--	45	Dv	1.25	17	- -	Qp	Sand	12-5-55	6.4	--	--	--	F	
Of51-1	C. Phelps	Ld	--	52	Dv	1.25	23	- -	Qp	Sand	12-5-55	9.3	--	--	--	D	
Of51-2	W. D. Reynolds	Ld	--	50	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	D	
Of52-1	Arrow Safety Device Co.	W	1953	50	Ct	6	106	- -	Tma	Sand	4- -53	4	1953	80	--	I	
Of54-1	F. Wells & Son	Ld	Before 1948	45	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	D	
Og12-1	H. Prettyjohn	Ld	1920	35	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Og13-1	F. Mitchell	Ld	1951	36	Dv	1.5	50	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Og15-1	C. T. Pepper	Ld	1928	32	Dv	1.25	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Og23-1	Paramount Poultry Co.	PM	Before 1946	45	J	6	64	- -	Qp-Tp(?)	Coarse sand	1953	8	1949	150	40	I	D. D. = 79 ft.
Og23-2	Do	PM	--	45	J	--	--	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	I	
Og23-3	Do	PM	--	45	J	8	78	- -	Qp-Tp(?)	Coarse sand	--	10.7	9-2-49	336	45	I	
Og32-1	H. G. Graves & Sons, Inc.	W	1947	45	Ct	3	88	- -	Tma	Sand	10-6-48	6	10-6-48	65	23	I	
Og41-1	J. West	Ld	Before 1930	44	Dv	1.25	24	- -	Qp	Sand	--	--	--	--	--	F	

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Drawdown (feet)	Use	Remarks
Og43-1	Mrs. M. E. Dodd	Ld	1925	44	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	D	
Og44-1	Mrs. M. Hellens	Ld	1940	40	Dv	1.25	19	- -	Qp	Sand	12-14-55	7.5	--	--	--	N	
Og51-5	C. Thompson	Ld	Before 1912	40	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	D	
Og53-1	R. R. Johnson	Ld	1905	37	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Og55-1	G. Johnson	Ld	--	42	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Og55-2	O. Smith	Ld	--	42	Dv	1.25	5	- -	Qp	Sand	12-14-55	3.9	--	--	--	A	
Oh11-1	A. S. Hanby	W	1950	40	Ct	3	72	- -	Tp(?)	Coarse sand	10-11-50	29	10-11-50	50	--	F	
Oh11-2	M. C. Vaughn	W	1950	40	Ct	4	84	- -	Tp(?)	Coarse sand	1950	26.5	1950	75	8.5	F	
Oh12-1	A.S. Hopkins, Sr.	Ld	1953	22	Dv	1.25	69	- -	Tp(?)	Coarse sand	--	--	--	--	--	F	
Oh13-1	R. Jones	Ld	1954	25	Dv	1.25	24	- -	Qp	Sand	11-5-54	16.7	--	--	--	F	
Oh13-2	R. S. Swisher	Ld	1955	26	Dv	1.25	45	- -	Qp	Sand	11-21-55	16.9	--	--	--	D	
Oh15-1	Graves Block Co.	Ld	1947	25	Dv	1.5	75	- -	Qp	Sand	--	--	--	--	--	I	
Oh21-1	Johnson Bros.	Ld	--	28	Dv	1.5	45	- -	Qp	Sand	--	--	--	--	--	D, C	
Oh22-1	A. S. Hopkins, Sr.	Ld	Before 1940	26	Dv	1.25	--	- -	Tp(?)	Coarse sand	--	--	--	--	--	F	
Oh22-2	Do	Ld	1954	35	Dv	1.25	79	- -	Tp(?)	Coarse sand	10-26-54	19.4	--	--	--	F	
Oh22-3	Do	Ld	1942	35	Dv	1.25	79	- -	Tp(?)	Coarse sand	10-26-54	19.4	--	--	--	N	
Oh22-4	Do	Ld	1946	38	Dv	1.25	77	- -	Tp(?)	Coarse sand	10-26-54	21.0	--	--	--	N	
Oh24-1	J. Hall	Ld	1942	20	Dv	1.25	18	- -	Qp	Sand	11-9-54	10.6	--	--	--	N	
Oh24-2	Do	Ld	1953	20	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Oh31-1	H. C. Smith	Ld	1948	35	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	D	
Oh33-1	G. Johnson	Ld	1953	31	Dv	1.25	34	- -	Qp	Sand	--	--	--	--	--	A	
Oh41-1	N. Burton	Ld	1944	35	Dv	1.25	33	- -	Qp	Sand	11-10-54	13.9	--	--	--	N	
Oh43-1	G. W. Bennum	Ld	--	30	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	N	Well reported dry.
Oh43-2	Do	Ld	--	30	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	A	
Oh44-1	J. McIlvain	PM	About 1940	23	J	3	72	- -	Tp(?)	Coarse sand	--	--	--	--	--	F	
Oh45-1	Unknown	Ld															
Oh45-1	Unknown	Ld	--	27	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	N	
Oh51-1	W. Hurdle	Ld	--	36	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Oh51-2	Do	Ld	--	36	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	F	
Oi11-1	C. Baker	Ld	--	20	Dv	1.25	80	- -	Tp(?)	Coarse sand	--	--	--	--	--	D	C. A.
Oi11-2	G. Bloth	Ld	1951	20	Dv	1.25	--	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Oi11-3	Do	Ld	Before 1951	20	Dv	1.25	--	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	N	C. A.

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer		Static water level		Well capacity			Use	Remarks
									Name	Composition	Date measured	Depth below land surface (feet)	Date measured	Yield (gpm)	Draw-down (feet)		
Oi11-4	W. Carpenter	PM	1948	20	J	3	90	- -	Tp(?)	Coarse sand	--	--	--	--	--	F	
Oi11-5	Do	Ld	Before 1944	20	Dv	--	90	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	N	C.A.
Oi12-1	C. Nelson, Jr.	W	1953	29	Ct	3	73	- -	Qp	Sand	3-28-53	18	3-28-53	25	10	C	D.D. = 80 ft.
Oi12-2	C. Hill	W	1954	20	Ct	3	71	- -	Qp-Tp(?)	Coarse sand	5- -54	20	5- -54	40	--	C	
Oi13-1	E. F. Wolfe	Ld	1940	30	Dv	1.25	31	- -	Qp	Sand	11-8-54	22.1	--	--	--	F	
Oi23-1	Aircrafters, Inc.	Ld	1950	27	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	C	
Oi24-1	Town of Rehoboth	SAW	1952	24	Hr	12	102	- -	Qp	Sand	1-29-52	19.3	1-29-52	378	65	N	D.D. = 120 ft.
Oi24-2	A. Waples	Ld	1943	20	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	D	
Oi24-3	L. Waples	Ld	1944	20	Dv	1.25	18	- -	Qp	Sand	11-8-54	13.7	--	--	--	N	
Oi25-1	A.P. Richardson	W	1948	25	Ct	4	118	- -	Qp	Sand	10-28-48	25	10-28-48	60	5	F	See log.
Oi25-2	Corkran	Ld	--	20	Dg	--	19	- -	Qp	Sand	4-17-53	17.9	--	--	--	N	
Oi25-3	Do	PM	1939	20	J	2.5	100	- -	Qp	Sand	--	--	--	--	--	D	
Oi34-1	Town of Rehoboth	SAW	1952	24	Hr	12	131	69-74 86-96 102-112 126-131	Qp	Sand	1-29-52	18.8	1-29-52	725	32	P	See log.
Oi34-2	Do	SAW	1952	24	J	12	123	- -	Qp	Sand	--	--	--	750	--	P	
Oi34-3	State Highway Dept.	PM	1946	24	J	6	117	- -	Qp	Sand	1-29-52	18.8	3-1-46	500	--	T, N	See log. D.D. = 150 ft.
Oi34-4	Mrs. J. S. Boyd	Ld	1948	25	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	A	C.A.
Oi34-5	J. Wolfe	W	1950	25	Ct	4	104	- -	Qp	Sand	1950	20.5	1950	85	8.5	D	See log.
Oi35-1	Town of Rehoboth	PM	1943	18	J	10	110	- -	Qp	Sand	--	--	--	--	--	P, E	C.A.
Oi35-2	Do	PM	1948	18	J	10	110	- -	Qp	Sand	--	20	--	--	--	P, E	
Oi35-3	Rehoboth Beach	Ld	1938	15	Dv	2	40	- -	Qp	Sand	--	--	--	--	--	N	C.A.
Oi35-4	Do	Ld	1938	15	Dv	2	40	- -	Qp	Sand	--	--	--	--	--	N	C.A.
Oi35-5	Stokely Van Camp, Inc.	PM	1939	20	J	3	128	- -	Qp	Sand	--	--	--	--	--	I	C.A.
Oi35-6	Do	PM	1950	20	J	8	128	- -	Qp	Sand	--	--	--	--	--	I	
Oi35-7	Do	PM	1922	20	J	3	100	- -	Qp	Sand	--	--	--	--	--	N	
Oi35-8	Do	PM	1922	20	J	3	100	- -	Qp	Sand	--	--	--	--	--	N	
Oi35-9	Do	PM	1922	20	J	3	100	- -	Qp	Sand	--	--	--	--	--	N	
Oi35-10	Do	PM	1922	20	J	3	100	- -	Qp	Sand	--	--	--	--	--	N	
Oi35-11	Do	PM	1922	20	J	3	100	- -	Qp	Sand	--	--	--	--	--	N	
Oi35-12	Do	PM	1922	20	J	3	100	- -	Qp	Sand	--	--	--	--	--	N	
Oi35-13	Do	PM	1922	20	J	3	100	- -	Qp	Sand	--	--	--	--	--	N	
Oi35-14	Do	PM	1922	20	J	3	100	- -	Qp	Sand	--	--	--	--	--	N	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Oi35-15	Atlantic Ice Mfg. Co.	--	--	25	--	3	136	- -	Qp	Sand	--	--	--	--	--	I	C. A.
Oi35-16	Pennsylvania Railroad Co.	--	--	25	J	--	--	- -	Qp	Sand	--	--	--	--	--	I	
Oi35-17	Do	Ld	--	25	Dv	1.25	18	- -	Qp	Sand	8-18-52	11.8	--	--	--	N	
Oi35-18	H. R. Watson	W	1949	25	Ct	3	119	- -	Qp	Sand	12-26-49	25	12-26-49	80	5	D	
Oi35-19	W. M. Melvin	W	--	16	Ct	3	110	- -	Qp	Sand	--	19	--	40	--	D	
Oi35-20	J. D. Johnson	W	--	20	Ct	3	77	- -	Qp	Sand	--	8	--	37	5	D	
Oi35-21	Town of Rehoboth	PM	1946	25	J	6	134	- -	Qp	Sand	--	--	--	--	--	T, A	
Oi35-22	A. Kirkpatrick Co. Inc.	SAW	1951	5	Dv	1.5	109	- -	Qp	Sand	--	--	--	--	--	I	
Oi35-23	J. Dick	Ld	1954	15	Dv	1.5	32	- -	Qp	Sand	--	--	--	--	--	D	
Oi35-24	J. S. Truitt	Ld	Before 1947	15	Dv	1.25	29	- -	Qp	Sand	--	--	--	--	--	D	C. A.
Oi35-25	Dr. R. E. Hall	Ld	--	12	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	D	C. A.
Oj21-1	G. Butz	Ld	--	20	Dv	1.25	19	- -	Qp	Sand	--	--	--	--	--	D	
Oj21-2	Do	Ld	1954	20	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	Ir	
Oj21-3	R. Dodge	Ld	1951	5	Dv	1.5	93	- -	Qp	Sand	--	--	--	--	--	D	C. A.
Oj21-4	Way	Ld	1951	5	Dv	1.5	79	- -	Qp	Sand	--	--	--	--	--	D	
Oj31-1	Town of Rehoboth	PC	1930	18	J	10	110	- -	Qp	Sand	--	--	--	--	--	P, E	Composite analysis wells Oj31-1 and 2.
Oj31-2	Do	PC	1930	18	J	10	110	- -	Qp	Sand	--	--	--	--	--	P, E	C. A
Oj31-3	Blue Hen Theatre	PC	--	15	J	6	136	- -	Qp	Sand	4- -52	12	--	--	--	C	C. A.; Fe 78 ppm, Cl 860.
Oj31-4	R. C. Barnard	W	1951	10	Ct	3	120	- -	Qp	Sand	6-2-51	16	6-2-51	60	--	D	
Oj31-5	L. Miller	W	1953	15	Ct	3	113	- -	Qp	Sand	3- -53	15	3- -53	90	--	A	C. A.
Oj31-6	Do	W	1953	15	Ct	3	38	- -	Qp	Sand	5- -53	9	3- -53	50	--	C	C. A.
Oj31-7	R. Lingenfelter	Ld	1950	17	Dv	1.5	27	- -	Qp	Sand	--	--	--	--	--	D	C. A.
Oj31-8	S. Cohan	Ld	--	10	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	A	
Oj31-9	Do	W	1955	10	Ct	3	40	- -	Qp	Sand	--	--	1- -55	20	--	D	
Oj31-10	J. Hemmerich	Ld	1916	20	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	E, N	C. A.
Oj31-11	R. E. Hall	Ld	1952	20	Dv	1.25	17	- -	Qp	Sand	--	--	--	--	--	D	C. A.
Oj41-1	R. Seimes	W	1948	7	Ct	3	110	- -	Qp	Sand	1948	3	--	--	--	D	See log.
Oj41-2	H. Shaud	W	1947	7	Ct	3	108	- -	Qp	Sand	12- -47	2	12- -47	80	--	C	See log.
Oj41-3	J. Dillon	W	1951	7	Ct	3	101	- -	Qp	Sand	6-17-51	2.5	6-17-51	100	--	D	See log.
Oj41-4	Mc Carty	W	1948	7	Ct	3	102	- -	Qp	Sand	9- -48	1.5	9- -48	50	--	D	See log.
Oj41-5	F. Denmead	W	1951	7	Ct	3	112	- -	Qp	Sand	4-18-51	3	4-18-51	40	25	C	See log.
Oj41-6	R. Palmer	W	1948	7	Ct	3	102	- -	Qp	Sand	6- -48	3.5	6- -48	85	--	C	

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Oj41-7	McDonald & Conway	W	1948	5	Ct	3	117	- -	Qp	Sand	6- -48	4	6- -48	100	--	D	
Oj41-8	Wilson Boat Co.	W	--	5	Ct	3	94	- -	Qp	Sand	--	1.5	--	110	--	C	
Oj41-9	J. Pierce	W	1951	5	Ct	4	98	- -	Qp	Sand	7-27-51	5	7-27-51	100	18	D	
Oj41-10	Do	W	--	5	Ct	3	100	- -	Qp	Sand	--	6	--	60	23	D	
Oj41-11	Megginson	W	1948	5	Ct	3	103	- -	Qp	Sand	7- -48	8	7- -48	105	--	D	
Oj41-12	J. Gosley	W	--	5	Ct	3	110	- -	Qp	Sand	--	8	--	80	--	D	
Oj41-13	J. Rawlins	W	1950	10	Ct	3	107	- -	Qp	Sand	1950	8.3	1950	80	21	D	
Oj41-14	Chapman	W	--	5	Ct	3	109	- -	Qp	Sand	--	2	--	90	--	D	
Oj41-15	H. Hough	W	1951	10	Ct	3	111	- -	Qp	Sand	6-30-51	6.5	6-30-51	100	--	D	
Oj41-16	Mrs. T. B. O'Toole	W	1948	10	Ct	3	111	- -	Qp	Sand	10-13-48	4	10-13-48	100	15	D	
Oj41-17	Do	W	1947	10	Ct	3	105	- -	Qp	Sand	12- -47	8	12- -47	50	--	N	
Oj41-8	C. Riggs	W	1951	10	J	2	105	- -	Qp	Sand	10-3-51	9	10-3-51	60	15	C	
Oj41-19	Do	W	1951	10	J	2	100	- -	Qp	Sand	10-9-51	9	10-8-51	40	--	D	
Oj41-20	C. Draper	W	--	7	Ct	3	107	- -	Qp	Sand	--	8	--	--	--	D	
Oj41-21	Walsh	W	1952	7	Ct	4	122	- -	Qp	Sand	--	--	--	--	--	D	
Oj41-22	H. Legates	W	1954	6	J	3	120	- -	Tp(?)	Coarse sand	11-12-54	3	11- -54	100	10	D	
Oj41-23	G. Mc Mahon	W	1954	8	Ct	3	115	- -	Qp	Sand	9- -54	6.5	8- -54	80	--	C	
Oj41-24	Do	Ld	1945	8	Dv	1.5	28	- -	Qp	Sand	--	--	--	--	--	C	
Oj41-25	R. C. Clark	W	1954	6	Ct	3	100	- -	Qp	Sand	8- -54	2.5	8- -54	100	--	D	See log.
Oj41-26	F. Denmead	W	1953	5	Ct	4	110	- -	Qp	Sand	5- -53	6	5- -53	100	18	C	See log.
Oj41-27	W. Scarlett	Ld	--	10	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Pb13-1	Phillips Canning Co.	SAW	1951	46	J	6	303	- -	Tca	Sand	11- -51	29	11- -51	150	94	I	See log.
Pb13-2	Do	B	1935	46	J	2.5	463	- -	Tca	Sand	--	--	--	--	--	A	
Pb13-3	Do	Ld	--	47	Dv	1.5	20	- -	Qp	Sand	--	--	--	--	--	A	
Pb13-4	Do	Ld	--	47	Dv	1.25	13	- -	Qp	Sand	--	--	--	--	--	A	
Pb13-5	Do	Ld	--	47	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	A	
Pb13-6	Dp	--	--	47	--	--	150	- -	Tsm	Fine sand	--	--	--	--	--	A	
Pb14-1	P. E. Williamson	Ld	1950	41	Dv	1.25	50	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Pb14-2	Do	Ld	1955	41	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Pb15-1	R. Allen	Ld	1930	45	Dv	1.25	32	- -	Qp	Sand	9-2-55	6.2	--	--	--	N	
Pb15-2	Do	Ld	1918	45	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	F	
Pb23-1	W. T. Handy	Ld	1938	45	Dv	1.25	52	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Pb24-1	J. Massey	Ld	1946	45	Dv	1.25	27	- -	Qp	Sand	--	--	--	--	--	D	
Pb25-1	J. Kennedy	Ld	1950	29	Dv	1.25	14	- -	Qp	Sand	--	--	--	--	--	D	
Pb34-1	E. W. West	Ld	1955	38	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	

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Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Pb35-1	W. Riddle	Ld	Before 1949	40	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	D	
Pb45-1	M. R. Spicer	Ld	Before 1927	35	Dv	1.25	32	- -	Qp	Sand	--	--	--	--	--	F	
Pb45-2	C. Ellis	Ld	--	30	Dv	1.25	11	- -	Qp	Sand	9-2-55	2.9	--	--	--	D	
Pc11-1	F. Banning	Ld	1954	38	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	F	
Pc13-1	Delaware National Guard (Seaford Armory)	W	1949	35	Ct	6	41	- -	Qp	Sand	10- -49	14	10- -49	15	15	W	
Pc21-1	R. O. Shaffer	Ld	1953	35	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	C	
Pc22-1	E. I. duPont & Co., Inc	Sh	--	25	--	6 ?	60 ?	- -	Qp	Sand	--	--	--	--	--	A	
Pc22-2	Do	Sh	--	25	--	6 ?	60 ?	- -	Qp	Sand	--	--	--	--	--	A	
Pc23-1	Town of Seaford	S	1952	20	Hr	10	87	- -	Tp(?)	Coarse sand	2- -53	18.5	3- -53	307	37	P	C. A.; See log. D. D. = 130 ft.
Pc23-2	Allens Hatchery	SAW	1955	25	J	4	55	- -	Qp	Sand	--	--	--	--	--	I	See log. D. D. = 110 ft.
Pc23-3	Town of Seaford	SAW	1953	31	J	10	95	- -	Qp	Sand	--	--	4-23-53	800	29	P	C. A.; See log. D. D. = 103 ft.
Pc23-4	E. I. duPont & Co., Inc.	Sh	1955	25	Hr	8	100	- -	Tp(?)	Coarse sand	11- -55	25	1955	650	32	I	
Pc23-5	Do	Sh	1955	25	--	6	60	- -	Qp	Sand	--	--	--	--	--	O	
Pc23-6	Do	Sh	--	25	--	6 ?	60 ?	- -	Qp	Sand	--	--	--	--	--	A	
Pc23-7	Nylon Capital Shopping Center	SAW	1955	32	J	6	84	- -	Qp	Sand	11-28-55	16	1955	37	7	C	See log.
Pc23-8	Parsons Bros. & Co.	Ld	1954	20	Dv	1.5	68	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	I	
Pc23-9	Do	PM	1953	20	J	3	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	I	
Pc23-10	Town of Seaford	Sh	1958	29	--	6	--	- -	Qp	Sand	--	--	--	--	--	O	See log. D.D. = 120 ft.
Pc23-11	Do	Sh	1958	31	--	6	--	- -	Qp	Sand	--	--	--	--	--	O	See log. D. D. = 120 ft.
Pc24-1	Do	Ke	1901	10	Dg	18	80	- -	Qp	Sand	9-4-52	3.9	--	300	--	N	C. A.
Pc24-2	Do	Ke	1901	12	Dg	18	80	- -	Qp	Sand	9-4-52	6.8	--	300	--	N	
Pc24-3	Do	PM ?	1938	7	J	3	80	- -	Qp	Sand	1948	Flow	1950	350	--	A	
Pc24-4	Do	PC ?	1938 ?	7	J	3	80	- -	Qp	Sand	1948	Flow	--	--	--	A	
Pc24-5	Do	PC ?	1938 ?	7	J	3	80	- -	Qp	Sand	--	--	--	--	--	A	
Pc24-6	Do	PC ?	1938 ?	7	J	3	80	- -	Qp	Sand	--	--	--	--	--	A	

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Pc24-7	Town of Seaford	PC ?	1938?	7	J	3	80	- -	Qp	Sand	--	--	--	--	--	A	
Pc24-8	Do	L	1946	30	Hr	24	68	- -	Tma	Sand	1946	19	1946	420	27	P	C. A.; see log. D. D. = 90 ft.
Pc24-9	Causeway Motors	Ld	--	5	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	C	
Pc24-10	Nanticoke Cleaners	Ld	--	5	Dv	2	50	- -	Qp	Sand	--	--	--	--	--	C	
Pc24-11	Do	PM	1957	5	J	4	83	- -	Qp	Sand	--	--	--	--	--	C	
Pc24-12	Nanticoke Memorial Hospital	PM	1953	20	J	3	89	- -	Qp	Sand	--	--	--	--	--	P	
Pc24-13	Seaford Ice & Cold Storage	Ld	1955	10	Dv	2	60	- -	Qp	Sand	--	--	--	--	--	I	
Pc24-14	Do	PM	1956	10	J	4	65	- -	Qp	Sand	1956	25	--	--	--	I	
Pc24-15	Do	PM	1954	10	J	4	70	- -	Qp	Sand	--	--	--	--	--	I	
Pc14-16	Town of Seaford	Sh	1958	12	Dv	6	--	- -	Qp	Sand	--	--	--	--	--	O	D. D. = 140 ft.
Pc25-1	F. Bennett	W	1954	20	Ct	4	45	- -	Qp	Sand	6-8-54	17	6-8-54	60	11	R	
Pc32-1	E. I. duPont & Co., Inc.	HH	1939	18	--	--	95	- -	Qp-Tp(?)	Coarse sand	1939	12	--	--	--	O	
Pc32-2	Do	L	1939	25	--	--	263	- -	Tma	Sand	--	--	--	--	--	N	
Pc32-3	Do	Sh	--	25	--	6 ?	60	- -	Qp	Sand	--	--	--	--	--	A	
Pc32-4	Do	Sh	--	25	--	6	60	- -	Qp	Sand	--	--	--	--	--	N	
Pc33-1	Do	L	1939	23	Hr	--	902	- -	Te	Sand	--	--	--	--	--	A	
Pc33-2	Do	HH	1939	8	Hr ?	18	87	- -	Qp	Sand	10- -39	5.8	10- -39	1,000	--	A	C. A.
Pc33-3	Do	HH	1939	9	Hr ?	18	83	- -	Tp(?)	Coarse sand	10- -39	3.7	10- -39	1,050	--	A	C. A.
Pc33-4	Do	HH	1939	10	Hr ?	18	87	- -	Qp	Sand	12- -39	3.7	--	--	--	A	C. A.
Pc33-5	Do	Sh	1952	25	Hr	10	98	- -	Qp	Sand	8- -52	26	8- -52	540	--	I	C. A
Pc33-6	Do	HH	1939	9	Hr ?	18	76	- -	Qp-Tp(?)	Coarse sand	12- -39	5.9	--	--	--	A	C. A., D. D. = 95 ft.
Pc33-7	Do	L	1946	8	Hr	16 ?	82	- -	Qp-Tp(?)	Coarse sand	4- -46	10.2	Apr. 1946	1,000	--	I	
Pc33-8	Do	L	1947	8	Hr	16	90	- -	Tp(?)	Coarse sand	10- -47	14.1	--	--	--	I	
Pc33-9	Do	Sh	1949	27	Hr	10	83	- -	Qp	Sand	12- -49	1	Dec. 1949	640	27	I	
Pc33-10	Do	Sh	1950	25	Hr	10	78	- -	Qp	Sand	1- -50	32	Jan. 1950	600	25	I	
Pc33-11	Do	Sh	1951	27	Hr	10	101	- -	Tp(?)	Coarse sand	4- -51	28.5	Apr. 1951	625	--	I	C. A.
Pc33-12	Do	HH	1939	8	--	--	90	- -	Qp-Tp(?)	Coarse sand	1939	3.5	--	--	--	N	
Pc33-13	Do	HH	1939	10	--	--	110	- -	Qp-Tp(?)	Coarse sand	1939	6	--	--	--	N	

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Pc33-14	E. I. duPont & Co., Inc	HH	1939	25	--	--	125	- -	Qp-Tp(?)	Coarse sand	1939	14	--	--	--	N	
Pc33-15	Do	HH	1939	7	--	--	90	- -	Qp-Tp(?)	Coarse sand	1939	4.5	--	--	--	A	See log.
Pc33-16	Do	HH	1939	8	--	--	94	- -	Qp-Tp(?)	Coarse sand	1939	6	--	--	--	A	See log.
Pc33-17	Do	HH	1939	7	--	2 ?	95	- -	Qp-Tp(?)	Coarse sand	1939	4	--	--	--	N	See log.
Pc33-18	Do	HH	1939	7	--	--	90	- -	Qp	Sand	1939	4	--	--	--	N	See log.
Pc33-19	Do	HH	1939	5	--	--	90	- -	Qp-Tp(?)	Coarse sand	1939	6	--	--	--	N	See log.
Pc33-20	Do	HH	1939	3	--	--	102	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	N	
Pc33-21	Do	L	1939	23	--	--	200	- -	Tm	Sand	--	--	--	--	--	N	
Pc33-22	Do	L	1939	5	--	6	88	- -	Qp-Tp(?)	Coarse sand	1956	10.1	--	--	--	O	
Pc33-23	Do	L	1939	24	--	--	93	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	N	
Pc33-24	Do	L	1939	23	--	--	93	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	E	
Pc33-25	Do	--	--	25	--	6	60	- -	Qp	Sand	5-15-56	29.9	--	--	--	O	
Pc33-26	Do	--	--	25	--	6	60	- -	Qp	Sand	--	--	--	--	--	O	
Pc33-27	Do	--	--	25	--	6	60	- -	Qp	Sand	--	--	--	--	--	O	
Pc33-28	Do	--	--	25	--	6	60	- -	Qp	Sand	--	--	--	--	--	O	
Pc33-29	Do	--	--	25	--	6	60	- -	Qp	Sand	--	--	--	--	--	O	
Pc33-30	Do	--	--	25	--	6	60	- -	Qp	Sand	5-15-56	29.3	--	--	--	O	
Pc33-31	Do	Sh	--	25	--	6 ?	60?	- -	Qp	Sand	--	--	--	--	--	A	
Pc33-32	Do	Sh	--	25	--	6 ?	60?	- -	Qp	Sand	--	--	--	--	--	A	
Pc33-33	Do	Sh	--	9	--	6	80	- -	Tp(?)	Coarse sand	--	--	--	--	--	O	
Pc33-34	Do	Sh	--	25	--	6 ?	60?	- -	Qp	Sand	--	--	--	--	--	N	
Pc33-35	Do	HH	1939	7	--	--	100	- -	Tp(?)	Coarse sand	1939	6	--	--	--	A	
Pc33-36	Do	HH	1939	9	--	--	95	- -	Tp(?)	Coarse sand	1939	4	--	--	--	A	
Pc33-37	Do	--	--	8	--	6	80	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	O	
Pc33-38	Do	HH	1939	9	--	--	91	- -	Qp-Tp(?)	Coarse sand	1939	4	--	--	--	A	

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Pc33-39	E.I. duPont & Co., Inc.	HH	1939	8	--	--	95	- -	Qp-Tp(?)	Coarse sand	1939	6	--	--	--	A	See log.
Pc34-1	State Highway Dept.	USGS	1955	13	B	3.5	84	- -	Tp(?)	Coarse sand	9- -55	6	--	--	--	T, A	See log.
Pc34-2	Del. Bd. of Education (Blades School)	Ld	1952	20	Dv	1.5	30	- -	Qp	Sand	--	--	--	--	--	Sh	
Pc44-1	Seaford-Laurel Auto. Laundry	Ld	1950	34	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	C	
Pc44-2	Do	Ld	1950	34	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	C	
Pc44-3	R. Gordy	Ld	1954	32	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	F	
Pc45-1	State Highway Dept.	USGS	1955	43	B	3.5	99	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Pc52-1	Unknown	Ld	--	15	Dv	1.25	19	- -	Qp	Sand	5-11-55	8.9	--	--	--	N	
Pc55-1	Heckman Products Co.	E	1951	39	J	8	114	- -	Tma	Sand	6- -51	10.3	1951	130	68	I	C.A.; see log.
Pd11-1	C. J. Kensey	SAW	1956	15	Hr	4	71	- -	Qp	Sand	--	--	--	--	--	D	See log.
Pd11-2	H. D. Musser	Ld	1952	25	Dv	1.25	24	- -	Qp	Sand	--	--	--	--	--	D	
Pd12-1	S. L. Mellin	Ld	1941	27	Dv	1.25	43	- -	Qp	Sand	--	--	--	--	--	F	
Pd13-1	F. Savage	Ld	1955	38	Dv	1.25	38	- -	Qp	Sand	--	--	--	--	--	D	
Pd13-2	J. E. West	Ld	1929	30	Dv	1.25	14	- -	Qp	Sand	--	--	--	--	--	D	
Pd15-1	J. L. King	Ld	1951	31	Dv	1.25	50	- -	Qp	Sand	--	--	--	--	--	D	
Pd15-2	Do	Ld	1951	31	Dv	1.25	49	- -	Qp	Sand	8-4-55	12.7	--	--	--	N	
Pd21-1	Dr. D. L. Bice	W	1954	30	Ct	4	92	- -	Tp(?)	Coarse sand	5-16-54	20	6-16-54	60	10	D, R	See log.
Pd21-2	M. Hill	Ld	Before 1935	12	Dv	1.25	50	- -	Qp	Sand	--	--	--	--	--	F	
Pd22-1	L. Calhoun	Ld	Before 1925	32	Dv	1.25	24	- -	Qp	Sand	--	--	--	--	--	D	
Pd24-1	P. Tyndall	Ld	1954	33	Dv	1.25	46	- -	Qp	Sand	--	--	--	--	--	F	
Pd24-2	Do	Ld	Before 1949	33	Dv	1.25	38	- -	Qp	Sand	8-3-55	13.0	--	--	--	F	
Pd25-1	H. Fleetwood	Ld	Before 1949	36	Dv	1.25	10	- -	Qp	Sand	8-3-55	9.5	--	--	--	N	
Pd25-2	A. Kenney	Ld	1948	36	Dv	1.25	18	- -	Qp	Sand	--	--	--	--	--	D	
Pd31-1	J. E. Lambden	Ld	1945	32	Dv	1.25	65	- -	Qp	Sand	--	--	--	--	--	D	
Pd31-2	Do	Ld	--	32	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	F	
Pd32-1	W. Grayston	Ld	1948	35	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	D	
Pd33-1	U. S. Hitchens	Ld	1925	38	Dv	1.25	24	- -	Qp	Sand	--	--	--	--	--	D	
Pd33-2	Do	Ld	1925	38	Dv	1.25	26	- -	Qp	Sand	--	--	--	--	--	F	
Pd35-1	R. Mumford	Ld	1950	40	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Pd35-2	A. Messick	Ld	1950	38	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Pd42-1	E. Hitch	Ld	--	44	Dv	1.5	60	- -	Qp	Sand	--	--	--	--	--	F	

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Pd42-2	H. Waller	Ld	1945	42	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Pd43-1	H. Messick	Ld	1945	47	Dv	1.25	50	- -	Qp	Sand	--	--	--	--	--	D	
Pd44-1	D. H. Lecates	Ld	Before 1937	43	Dv	1.25	37	- -	Qp	Sand	--	--	--	--	--	F	
Pd45-1	A. James	Ld	1954	44	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	D	
Pd51-1	M. O'Neal	Ld	--	42	Dv	1.5	27	- -	Qp	Sand	8-2-55	9.9	--	--	--	D	
Pd52-1	L. Tyndall	Ld	1952	45	Dv	1.25	33	- -	Qp	Sand	--	--	--	--	--	F	
Pd53-1	H. Mills	Ld	--	36	Dv	1.25	41	- -	Qp	Sand	8-2-55	6.9	--	--	--	N	
Pd54-1	H. T. O'Neal	Ld	1933	36	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Pd55-1	G. M. Waller	Ld	Before 1945	43	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	D	
Pe11-1	J. A. Ingram	Ld	1953	42	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	D	
Pe12-1	C. Simmons	Ld	1910	45	Dv	1.25	48	- -	Qp	Sand	--	--	--	--	--	D	
Pe12-2	Do	Ld	1945	45	Dv	1.5	22	- -	Qp	Sand	9-7-55	7.9	--	--	--	F	
Pe14-1	W. Brasure	Ld	1945	50	Dv	1.25	24	- -	Qp	Sand	--	--	--	--	--	D	
Pe14-2	Do	Ld	--	50	Dv	1.25	31	- -	Qp	Sand	9-7-55	6.5	--	--	--	F	
Pe14-3	E. Scarborough	Ld	Before 1938	51	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	D	
Pe15-1	Lederle Drug Co.	W	1953	50	Ct	3	95	- -	Tma	Sand	2-19-53	3	2-19-53	100	--	F	See log.
Pe22-1	A. Waller	Ld	1910	45	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	F	
Pe22-2	Do	Ld	1910	45	Dv	1.25	33	- -	Qp	Sand	9-7-55	5.8	--	--	--	F	
Pe23-1	State Highway Dept.	D	1952	48	B	3.5	59	- -	Tp(?)	Coarse sand	6-16-52	8	--	--	--	T, A	See log.
Pe23-2	Univ. of Del. Exp. Poultry Farm	W	1951	48	Ct	3	84	- -	Tma	Sand	10-21-51	10.5	10-21-51	80	6.5	F	See log.
Pe23-3	Univ. of Del. Agri. Exp. Station	Ld	1947	50	Dv	1.25	40	- -	Qp	Sand	--	--	1955	20	--	F	
Pe23-4	Do	Ld	1947	50	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	D	
Pe23-5	Do	W	1953	50	Ct	4	115	- -	Tp(?)	Coarse sand	6-15-53	10	6-15-53	100	15	Ir	See log.
Pe32-1	State Highway Dept.	D	1952	40	B	3.5	94	- -	Tp(?)	Coarse sand	6-18-52	14	--	--	--	T, A	See log.
Pe32-2	Do	D	1952	40	B	3.5	84	- -	Tp(?)	Coarse sand	6-19-52	6	--	--	--	T, A	See log.
Pe32-3	E. Adams	Ld	1950	39	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	F	
Pe32-4	Do	Ld	--	39	Dv	1.25	39	- -	Qp	Sand	9-7-55	4.4	9-7-55	--	--	N	
Pe33-1	State Highway Dept.	D	1952	42	B	3.5	94	- -	Tp(?)	Coarse sand	6-17-52	6	--	--	--	T, A	See log.
Pe33-2	W. Tyndall	Ld	1940	42	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Pe35-1	R. Short	Ld	1950	50	Dv	1.25	60	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	

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Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Pe41-1	E. Dukes	Ld	1920	50	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	D	
Pe41-2	A. Conway	Ld	Before 1953	44	Dv	1.25	66	- -	Qp-Tp(?)	Coarse sand	9-7-55	5.3	--	--	--	D	
Pe43-1	Mrs. E. James	Ld	1943	50	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Pe45-1	E. A. Short	Ld	1940	51	Dv	1.25	65	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	E	
Pe45-2	Do	Ld	1928	51	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	D, F	
Pe45-3	Do	Ld	--	50	Dv	1.25	47	- -	Qp	Sand	9-6-55	2.5	--	--	--	N	
Pe51-1	R. Bryan	Ld	--	45	Dv	1.25	16	- -	Qp	Sand	9-7-55	3.4	--	--	--	F	
Pe53-1	L. B. Brittingham & Son	Ld	Before 1940	50	Dv	1.25	50	- -	Qp	Sand	--	--	--	--	--	F	
Pe54-1	King & Carmine	Ld	--	50	Dv	1.25	24	- -	Qp	Sand	9-6-55	2.5	--	--	--	F	
Pe55-1	E. W. Phillips	Ld	1945	52	Dv	1.25	47	- -	Qp	Sand	--	--	--	--	--	F	
Pf13-1	Soil Conservation Service	PM	1944	48	J	2	64	- -	Qp	Sand	6- -44	8	--	--	--	N	See log.
Pf13-2	Do	Ld	--	48	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	F	
Pf13-3	Do	Ld	--	48	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Pf13-4	Sussex County Jail	PM	1940	49	J	--	--	- -	Qp	Sand	--	--	--	--	--	P	
Pf14-1	G. Marvel	Ld	1933	45	Dv	1.25	23	- -	Qp	Sand	--	--	--	--	--	F	
Pf22-1	J. G. Townsend, Inc.	Ld	1939	50	Dv	1.5	67	- -	Qp-Tp(?)	Coarse sand	10-12-55	5.5	--	--	--	F	Temp. 61°F.
Pf23-1	Unknown	Ld	--	46	Dv	1.25	19	- -	Qp	Sand	10-12-55	6.1	--	--	--	-	
Pf25-1	Unknown	Ld	--	41	Dv	1.25	26	- -	Qp	Sand	10-17-55	9.7	--	--	--	N	
Pf25-2	D. Short	Ld	1905	45	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	F	
Pf32-1	Unknown	Ld	--	45	Dv	1.25	18	- -	Qp	Sand	10-12-55	7.0	--	--	--	N	
Pf33-1	I. R. Green	Ld	--	46	Dv	1.25	34	- -	Qp	Sand	10-12-55	5.1	--	--	--	N	
Pf33-2	Do	Ld	1955	46	Dv	1.25	18	- -	Qp	Sand	--	--	--	--	--	F	
Pf34-1	State Highway Dept.	USGS	1955	42	B	3.5	89	- -	Tp(?)	Coarse sand	9-29-55	10.5	--	--	--	T, A	See log.
Pf34-2	P. E. Short	Ld	Before 1917	42	Dv	1.25	29	- -	Qp	Sand	10-17-55	7.9	--	--	--	E, N	
Pf42-1	H. B. Davis, Jr.	Ld	1950	48	Dv	1.5	20	- -	Qp	Sand	--	--	--	--	--	F	
Pf51-1	St. Thomas M. E. Church	Ld	--	50	Dv	1.25	21	- -	Qp	Sand	9-6-55	6.0	--	--	--	P	
Pf51-2	W. Betts	Ld	1950	52	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	F	
Pf51-3	Do	Ld	--	52	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	D	
Pf54-1	Dr. W. B. Adkins	Ld	1940	42	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	E, N	
Pf54-2	W. E. Timmons	Ld	1953	40	Dv	1.25	42	- -	Qp	Sand	--	--	--	--	--	F	
Pf55-1	J. E. Brasure	Ld	--	40	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Pg11-1	Allen Hatchery	Ld	1955	35	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	F	
Pg11-2	Do	Ld	1954	35	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Pg13-1	J. N. Blizzard	Ld	1935	38	Dv	1.25	52	- -	Qp	Sand	10-17-55	7.2	--	--	--	F	Temp. 59°F.
Pg21-1	J. W. Smith	Ld	1951	39	Dv	1.25	26	- -	Qp	Sand	--	--	--	--	--	D, F	
Pg24-1	Unknown	Ld	--	35	Dv	1.25	22	- -	Qp	Sand	10-18-55	8.1	--	--	--	N	
Pg31-1	Del. State Colony	E	1942	33	J	6	80	- -	Qp	Sand	2- -42	12.6	4- -42	120	--	P	
Pg31-2	Do	E	1944	33	J	6	86	- -	Qp	Sand	7- -44	12	7- -44	90	--	P	See log.
Pg31-3	Do	Ld	--	36	Dv	1.25	44	- -	Qp	Sand	10-18-55	13.4	--	--	--	F	
Pg33-1	N. King	Ld	1954	34	Dv	1.5	80	- -	Qp	Sand	--	--	--	--	--	F	
Pg34-1	Mrs. E. Lawson	Ld	Before 1915	30	Dv	1.25	46	- -	Qp	Sand	10-18-55	9.8	--	--	--	E, N	
Pg35-1	C. J. Miller	Ld	1953	25	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	F	
Pg45-1	Townsend's Inc.	SAW	1945	22	J	6	150	- -	Tm	Sand	--	--	--	--	--	N	
Pg45-2	Do	SAW	1945	22	J	6	60	- -	Qp	Sand	--	--	--	--	--	I	
Pg45-3	Do	SAW	1951	22	J	--	50	- -	Qp	Sand	--	--	--	--	--	I	C.A.
Pg51-1	State Highway Dept.	USGS	1950	30	B, Dv	1	22	- -	Qp	Sand	11-30-50 5-1-53	16.7 13.4	--	--	--	O	See log.
Pg51-2	Bunting Nurseries	SAW	1953	33	J	10-4	90	- -	Qp	Sand	--	--	1953	1800	--	Ir	
Pg53-1	Millsboro Poultry Co.	PM	1947	25	J	6	70	- -	Qp	Sand	--	--	--	--	--	A	C.A.
Pg53-2	Houston-White Lumber Co.	PM	1948	25	J	3	70	- -	Qp	Sand	5-4-50	15	--	--	--	I	
Pg53-3	Millsboro Poultry Co.	PM	--	25	J	4	64	- -	Qp	Sand	--	--	--	--	--	A	
Pg53-4	Do	SAW	1952	25	J	6	35	- -	Qp	Sand	--	--	--	--	--	I	
Pg53-5	Do	PM	1953	25	J	6	35	- -	Qp	Sand	--	--	--	--	--	I	
Pg53-6	Do	PM	1953	25	J	6	35	- -	Qp	Sand	--	--	--	--	--	I	
Pg53-7	Do	PM	1953	25	J	6	35	- -	Qp	Sand	1954	22	--	--	--	I	
Pg53-8	Town of Millsboro	PM	1948	30	J	8	87	- -	Tp(?)	Coarse sand	1948	18	1948	350	35	P	See log.
Pg53-9	Do	PM	1953	30	J	8	85	- -	Tp(?)	Coarse sand	--	--	--	--	--	I	See log.
Pg54-1	Millsboro Poultry Co.	SAW	1950	25	J	8	105	- -	Tp(?)	Coarse sand	5-3-50	25.3	5-3-50	400	32	A	C.A.
Pg54-2	Do	SAW	1940	25	J	3	34	- -	Qp	Sand	1940	18	--	--	--	A	
Pg54-3	Do	PM	1940	25	J	3	28	- -	Qp	Sand	1940	14	--	--	--	I	
Ph11-1	D. W. Harmon	Ld	1955	35	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	D	Temp. 60°F.
Ph12-1	L. M. Drain	Ld	1951	28	Dv	1.5	55	- -	Qp	Sand	--	--	--	--	--	F	
Ph22-1	W. D. Burton	Ld	--	25	Dv	1.25	34	- -	Qp	Sand	11-1-55	4.7	--	--	--	D	
Ph23-1	Friendship M. E. Church	Ld	--	19	Dv	1.25	18	- -	Qp	Sand	11-1-55	5.6	--	--	--	P	
Ph25-1	M. E. Stevenson	Ld	Before 1947	18	Dv	1.5	60	- -	Qp	Sand	--	--	--	--	--	F	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Ph31-1	I. Harmon	Ld	--	28	Dv	1.25	13	- -	Qp	Sand	11-1-55	8.7	--	--	--	N	
Ph32-1	R. Cordrey	Ld	--	22	Dv	1.25	19	- -	Qp	Sand	11-2-55	12.0	--	--	--	A	
Ph34-1	Townsend's, Inc.	Ld	1953	23	Dv	1.25	21	- -	Qp	Sand	--	--	--	--	--	F	
Ph35-1	C. E. Lingo	Ld	1938	15	Dv	1.5	90	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	F	
Ph41-1	L. Street	Ld	Before 1945	28	Dv	1.25	44	- -	Qp	Sand	11-1-55	14.5	--	--	--	F	Temp. 61°F.
Ph44-1	B. Phillips	Ld	Before 1940	13	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	D	Temp. 59°F.
Ph44-2	Do	Ld	--	13	Dv	1.25	23	- -	Qp	Sand	11-2-55	5.9	--	--	--	N	
Ph51-1	Del. Power & Light Co.	PM	1953	8	J	6	71	- -	Tp(?)	Coarse sand	--	--	--	--	--	I	C. A.; See log.
Ph51-2	Do	RCP	1952	10	B	-	90	- -	Tpo	Sand	--	--	--	--	--	T, A	See log.
Ph51-3	Do	RCP	1952	8	B	-	60	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Ph51-4	Do	RCP	1952	8	B	-	60	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Ph51-5	Do	RCP	1952	8	B	-	90	- -	Tpo	Sand	--	--	--	--	--	T, A	See log.
Ph51-6	Do	UEC	1955	8	B	-	90	- -	Tpo	Sand	1955	5.4	--	--	--	T, A	See log.
Ph51-7	Do	UEC	1955	8	B	-	60	- -	Qp	Sand	1955	7.4	--	--	--	T, A	See log.
Ph51-8	Do	UEC	1955	8	B	-	60	- -	Qp	Sand	1955	2.4	--	--	--	T, A	See log.
Ph51-9	Do	UEC	1955	8	B	-	90	- -	Tpo	Sand	1955	8	--	--	--	T, A	See log.
Ph51-10	Do	UEC	1955	8	B	-	90	- -	Tpo	Sand	1955	5	--	--	--	T, A	See log.
Ph51-11	Do	UEC	1955	3	B	-	93	- -	Tpo	Sand	1955	1	--	--	--	T, A	See log.
Ph51-12	Do	UEC	1955	3	B	-	60	- -	Qp	Sand	1955	1.5	--	--	--	T, A	See log.
Ph51-13	Do	UEC	1955	7	B	-	90	- -	Qp	Sand	1955	.5	--	--	--	T, A	See log.
Ph51-14	Do	UEC	1955	8	B	-	123	- -	Tpo	Sand	1955	5.8	--	--	--	T, A	See log.
Ph51-15	Do	UEC	1955	9	B	-	90	- -	Tpo	Sand	1955	6.5	--	--	--	T, A	See log.
Ph51-16	Do	UEC	1955	7	B	-	60	- -	Qp	Sand	1955	6	--	--	--	T, A	See log.
Ph51-17	Do	UEC	1955	9	B	-	60	- -	Qp	Sand	1955	7.5	--	--	--	T, A	See log.
Ph51-18	Do	UEC	1955	9	B	-	60	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Ph52-1	H. S. Okie Corp.	Ld	1915	23	Dv	1.25	23	- -	Qp	Sand	11-1-55	15.2	--	--	--	F	
Ph53-1	Rosedale Beach Hotel, Inc.	Ld	1946	15	Dv	1.5	30	- -	Qp	Sand	--	--	--	--	--	C	
Ph53-2	Do	Ld	1946	15	Dv	1.5	30	- -	Qp	Sand	--	--	--	--	--	C	
Ph53-3	Do	Ld	1946	15	Dv	1.5	30	- -	Qp	Sand	--	--	--	--	--	C	
Ph53-4	Do	Ld	1946	15	Dv	1.5	30	- -	Qp	Sand	--	--	--	--	--	C	
Ph55-1	C. Fagan	PM	1950	6	J	3	80	- -	Qp-Tp(?)	Coarse sand	--	--	--	85	--	I	
Pj31-1	U. S. Coast Guard Station	W	1953	5	Ct	3	505	- -	Tch(?)	Fine sand	6-24-55	3.0	--	--	--	N	See log.
Pj31-2	Do	W	1953	5	Ct	3	152	- -	Tp(?)	Coarse sand	--	--	--	--	--	A	See log.

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Pj31-3	U. S. Coast Guard Station	--	1949	5	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	W	
Pj31-4	Do	--	--	5	--	1.25	--	- -	Qp	Sand	6-24-55	2.1	--	--	--	N	
Pj41-1	Inlet Marina Hotel	Po	1955	5	J	2	200	- -	Tma	Sand	--	--	--	--	--	C	
Pj41-2	J. Marsh	Po	--	6	J	1.25	--	- -	Qp	Sand	--	--	--	--	--	C	
Pj42-1	State Highway Dept.	E	1947	6	J	4	250	- -	Tma	Sand	11- -47	18	11- -47	20	41	C	See log.
Pj52-1	Sportsman's Motel	Po	1955	5	J	2	180	- -	Tma	Sand	6-24-55	Flow	--	--	--	C	
Qb14-1	W. M. Loker	Ld	--	18	Dv	1.25	20	- -	Qp	Sand	8-4-55	5.5	--	--	--	A	
Qb14-2	Do	Ld	1925	18	Dv	1.25	21	- -	Qp	Sand	--	--	--	--	--	F	
Qb25-1	I. Hill	Ld	1951	20	Dv	1.25	37	- -	Qp	Sand	5-11-55	3.4	--	--	--	D	
Qb25-2	Unknown	Ld	--	5	Dv	1.25	11	- -	Qp	Sand	5-11-55	4.7	--	--	--	D	
Qb34-1	L. Waller	Ld	--	8	Dv	1.25	15	- -	Qp	Sand	8-10-49	12.5	--	--	--	D	
Qb35-1	C. Brassure	--	Before 1951	32	J	2	--	- -	Qp	Sand	--	--	--	--	--	F	
Qb35-2	Do	Ld	--	32	Dv	1.5	42	- -	Qp	Sand	10-6-54	15.2	--	--	--	F	
Qb35-3	E. Dickerson	Ld	--	30	Dv	1.5	26	- -	Qp	Sand	4-26-55	8.0	--	--	--	A	
Qb44-1	E. Jones, Sr.	Ld	Before 1937	40	Dv	1.5	20	- -	Qp	Sand	--	--	--	--	--	C	
Qb44-2	G. Rider	Ld	--	40	Dv	1.5	13	- -	Qp	Sand	10-6-54	9.2	--	--	--	D	
Qb44-3	C. Shockley	Ld	1946	39	Dv	1.5	40	- -	Qp	Sand	--	--	--	--	--	D	
Qb44-4	Do	Ld	Before 1946	39	Dv	1.5	31	- -	Qp	Sand	4-26-55	5.2	--	--	--	F	
Qb55-1	J. W. Smith	Ld	--	44	Dv	1.5	17	- -	Qp	Sand	--	--	--	--	--	A	
Qb55-2	Do	Ld	Before 1938	44	Dv	1.5	17	- -	Qp	Sand	4-26-55	3.4	--	--	--	D	
Qb55-3	Do	Ld	--	44	Dv	1.5	17	- -	Qp	Sand	--	--	--	--	--	D	
Qc13-1	H. M. Spicer	Ld	1949	15	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	D	
Qc14-1	Unknown	Ld	--	30	Dv	1.25	19	- -	Qp	Sand	5-23-55	16.9	--	--	--	N	
Qc14-2	Eskridge	Ld	--	29	Dv	1.5	25	- -	Qp	Sand	--	--	--	--	--	D	
Qc14-3	Do	Ld	1953	29	Dv	1.5	25	- -	Qp	Sand	--	--	--	--	--	F	
Qc15-1	R. Jones	Ld	--	30	J	2	160	- -	Tm	Sand	--	--	--	--	--	F	
Qc22-1	H. Vickers	Ld	1946	26	Dv	1.5	50	- -	Qp	Sand	--	--	--	--	--	F	
Qc22-2	Do	Ld	Before 1930	26	Dv	1.25	24	- -	Qp	Sand	5-12-55	13.3	--	--	--	A	
Qc22-3	Unknown	Ld	--	20	Dv	1.5	16	- -	Qp	Sand	5-12-55	8.6	--	--	--	P	
Oc24-1	State Highway Dept.	USGS	1950	15	Dv	1	6	- -	Qp	Sand	6-7-50 9-5-50	5.0 5.6	--	--	--	T, A	

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Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer		Static water level		Well capacity			Use	Remarks
									Name	Composition	Date measured	Depth below land surface (feet)	Date measured	Yield (gpm)	Drawdown (feet)		
Qc24-2	State Highway Dept.	USGS	1950	14	B	1	4	- -	Qp	Sand	6-7-50	1.0	--	--	--	T,A	
											9-5-50	1.8					
Qc24-3	Do	USGS	1950	17	B	1	4	- -	Qp	Sand	6-7-50	2.1	--	--	--	T,A	
											9-5-50	2.2					
Qc24-4	Do	USGS	1950	15	Dv	1	8	- -	Qp	Sand	10-2-51	3.0	--	--	--	O	
											4-1-52						
Qc24-5	J. Spicer	Ld	--	28	Dv	1.25	18	- -	Qp	Sand	5-12-55	14	--	--	--	A	
Qc25-1	J. M. Evans	Ld	1953	20	Dv	1.5	70	- -	Qp	Coarse sand	--	--	--	--	--	D	
									Tp(?)								
Qc25-2	Do	Ld	--	20	Dv	1.25	16	- -	Qp	Sand	5-12-55	Dry	--	--	--	N	
Qc25-3	Do	Ld	--	20	Dv	1.25	18	- -	Qp	Sand	5-12-55	Dry	--	--	--	N	
Qc25-4	W. J. Stoakley	Ld	1947	20	Dv	1.5	24	- -	Qp	Sand	--	--	--	--	--	F	
Qc25-5	Do	Ld	1942	20	Dv	1.5	24	- -	Qp	Sand	--	--	--	--	--	F	
Qc31-1	J. N. Ellis	Ld	Before 1935	30	Dv	1.5	42	- -	Qp	Sand	--	--	--	--	--	D	
Qc32-1	Paramount Poultry Co.	Ld	1954	31	Dv	1.5	40	- -	Qp	Sand	--	--	--	--	--	F	
Qc32-2	Unknown	Ld	--	25	Dv	1.5	36	- -	Qp	Sand	5-4-55	11.7	--	--	--	N	
Qc33-1	L. Hastings	Ld	1949	35	Dv	1.5	43	- -	Qp	Sand	--	--	--	--	--	D	
Qc35-1	H. H. Dickerson	Ld	1952	30	Dv	1.5	45	- -	Qp	Sand	--	--	--	--	--	C	D.D. = 75 ft.
Qc41-1	R. Phillips	Ld	1951	39	Dv	1.5	50	- -	Qp	Sand	--	--	--	--	--	F	
Qc41-2	Do	Ld	1955	38	Dv	1.5	37	- -	Qp	Sand	5-4-55	8.2	--	--	--	N	
Qc42-1	V. Hastings	Ld	Before 1954	40	Dv	1.5	50	- -	Qp	Sand	--	--	--	--	--	D	
Qc42-2	Do	Ld	--	48	Dv	1.5	37	- -	Qp	Sand	4-28-55	9.6	--	--	--	A	Pumps sand.
Qc43-1	L. Cordrey	Ld	1925	43	Dv	1.5	56	- -	Qp	Sand	4-29-55	6.1	--	--	--	A	
Qc43-2	M. Ellis	Ld	1949	38	Dv	1.5	30	- -	Qp	Sand	--	--	--	--	--	F	
Qc44-1	C. Hill	Ld	1951	40	Dv	1.5	60	- -	Qp	Sand	--	--	--	--	--	F	
Qc44-2	Do	Ld	1935	40	Dv	1.5	21	- -	Qp	Sand	4-28-55	6.3	--	--	--	A	Inadequate.
Qc44-3	W. N. Horsey	Ld	1954	35	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	D	
Qc45-1	E. Messick	Ld	1954	38	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	F	
Qc45-2	F. Messick	Ld	1937	38	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	F	
Qc45-3	E. Messick	Ld	1938	38	Dv	1.5	31	- -	Qp	Sand	4-27-55	6.2	--	--	--	A	
Qc51-1	E. Phillips	Ld	1953	45	Dv	1.5	25	- -	Qp	Sand	--	--	--	--	--	D	
Qc52-1	P. F. Henry	Ld	1952	48	Dv	2	40	- -	Qp	Sand	--	--	--	--	--	F	
Qc52-2	Do	Ld	1930	48	Dv	2	40	- -	Qp	Sand	--	--	--	--	--	F	
Qc52-3	Mrs. R. Calloway	Ld	--	45	Dv	1.5	32	- -	Qp	Sand	4-29-55	4.8	--	--	--	N	D.D. = 80 ft.
Qc52-4	Do	Ld	--	45	Dv	1.5	40	- -	Qp	Sand	--	--	--	--	--	F	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Qc53-1	J. Dickerson	Ld	1953	47	Dv	1.5	37	- -	Qp	Sand	--	--	--	--	--	D	
Qc53-2	Do	Ld	1930	47	Dv	1.5	47	- -	Qp	Sand	--	--	--	--	--	F	
Qc53-3	E. B. Ralph	Ld	--	50	Dv	1.5	33	- -	Qp	Sand	4-29-55	5.7	--	--	--	--	
Qc54-1	E. Hastings	Ld	1952	47	Dv	1.5	70	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	D	
Qc54-2	Do	Ld	1954	47	Dv	1.5	50	- -	Qp	Sand	--	--	--	--	--	F	
Qd12-1	L. Givens	Ld	1943	45	Dv	1.5	24	- -	Qp	Sand	5-23-50	7.1	--	--	--	A	
Qd21-1	Valiant Fertilizer Co.	PC	1924	10	J	4.5	70	- -	Tp(?)	Coarse sand	1924	Flow	--	--	--	A	
Qd21-2	Town of Laurel	Ke	1925	25	Dg	18	91	- -	Tma	Sand	1925	20	1925	500	39	A	C. A.
Qd21-3	Do	Ke	1934	25	Dg	25	91	- -	Tma	Sand	1934	20	1934	540	42	P	C. A.; temp. 58°F
Qd21-4	Do	Ke	1937	25	Dg	24	94	- -	Tma	Sand	1937	20	1937	730	57	P	C. A.
Qd21-5	Do	L	1952	25	Hr	16	103	- -	Tma	Sand	7- -52	20	8-22-53	700	42	P	See log.
Qd21-6	Koster's Frozen Food & Locker Plant	SAW	1946	25	J	1.5	63	- -	Qp-Tp(?)	Coarse sand	10- -46	18	10- -46	50	--	C	See log.
Qd21-7	Atlas Plywood Co.	Ld	1955	15	Dv	1.5	30	- -	Qp	Sand	--	--	--	--	--	I	
Qd23-1	C. Lowe	--	1947	25	J	4	90	- -	Qp-Tp(?)	Coarse sand	1947	6	--	--	--	A	
Qd23-2	Do	--	1947	29	J	4	90	- -	Qp-Tp(?)	Coarse sand	1947	6	--	--	--	A	
Qd25-1	Buntings Nurseries	SWD	1955	35	J	10	100	- -	Tma (?)	Sand	1955	7	1955	800	--	Ir	
Qd31-1	State Highway Dept.	USGS	1955	32	B	3.5	94	- -	Qp	Sand	--	--	--	--	--	T, A	See log.
Qd33-1	L. Smith	Ld	1940	35	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Qd33-2	E. Workman	Ld	1935	32	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	D	
Qd41-1	Beacon Feed Co.	PM	1952	37	J	8	100	- -	Tma	Sand	8- -52	8	8- -52	500	--	C	
Qd43-1	G. E. Gordy	Ld	1952	40	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	D	
Qd43-2	Mrs. F. LeCates	Ld	Before 1950	40	Dv	1.25	24	- -	Qp	Sand	--	--	--	--	--	F	
Qd44-1	Brittingham Feed Service	Ld	--	38	Dv	1.5	39	- -	Qp	Sand	5-24-55	6.2	--	--	--	N	
Qd51-1	P. Powell	Ld	1940	40	Dv	1.5	52	- -	Qp	Sand	--	--	--	--	--	F	See log.
Qd51-2	Do	Ld	1940	40	Dv	1.5	52	- -	Qp	Sand	--	--	--	--	--	F	
Qd51-3	Do	Ld	Before 1935	38	Dv	1.5	48	- -	Qp	Sand	5-16-55	8.4	--	--	--	N	
Qd51-4	State Highway Dept.	USGS	1955	41	B	3.5	83	- -	Qp	Sand	--	--	--	--	--	T, A	
Qd51-5	P. Powell	Ld	1940	40	Dv	1.25	35	- -	Qp	Sand	5-16-55	7.7	--	--	--	D	
Qd52-1	C. W. Jones	Ld	1952	45	Dv	1.5	65	- -	Qp	Sand	--	--	--	--	--	D	

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Qd53-1	C. Oliphant	Ld	Before 1945	43	Dv	1.25	17	- -	Qp	Sand	--	--	--	--	--	A	Filled with oil seepage from discarded motor oil.
Qd53-2	Do	Ld	1953	43	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Qd55-1	M. Cannon	Ld	1953	45	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	R, E	
Qd55-2	R. D. Joseph	Ld	1952	39	Dv	1.25	18	- -	Qp	Sand	--	--	--	--	--	F	
Qe14-1	H. Williams	Ld	1947	50	Dv	1.25	75	- -	Qp	Sand	--	--	--	--	--	D	
Qe14-2	Do	Ld	--	50	Dv	1.5	70	- -	Qp	Sand	--	--	--	--	--	F	
Qe14-3	Do	Ld	--	50	Dv	1.5	75	- -	Qp	Sand	--	--	--	--	--	F	
Qe14-4	H. W. Lecates	Ld	1949	51	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Qe14-5	Do	Ld	Before 1945	51	Dv	1.25	21	- -	Qp	Sand	7-27-55	7.1	--	--	--	F	
Qe23-1	St. John's A. M. E. Church	Ld	Before 1946	42	Dv	1.25	29	- -	Qp	Sand	7-13-55	5.1	--	--	--	P	
Qe25-1	Rodney Feed Co.	Ld	1949	50	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	D	
Qe31-1	R. Givens	Ld	1953	32	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	F	
Qe32-1	L. B. Brittingham	Ld	1955	38	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Qe32-2	Mrs. W. M. Truitt	Ld	1948	43	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	D	
Qe32-3	Do	Ld	--	43	Dv	1.25	18	- -	Qp	Sand	--	--	--	--	--	F	
Qe32-4	Do	Ld	1945	40	Dv	1.25	40	- -	Qp	Sand	7-12-55	9.7	--	--	--	N	
Qe33-1	L. B. Whaley	Ld	1923	43	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	F	
Qe35-1	E. Jones	Ld	1954	50	Dv	1.25	24	- -	Qp	Sand	--	--	--	--	--	D	
Qe35-2	Do	Ld	1945	50	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	F	
Qe35-3	J. J. Williams	Ld	1953	58	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	F	
Qe35-4	Do	Ld	1953	58	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	F	
Qe35-5	Do	Ld	1953	58	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	F	
Qe35-6	Do	Ld	--	58	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	A	
Qe41-1	Mrs. G. L. Wright	Ld	1955	37	Dv	1.25	21	- -	Qp	Sand	7-12-55	7.1	--	--	--	D	
Qe41-2	H. W. Culver	Ld	1953	38	Dv	1.25	24	- -	Qp	Sand	--	--	--	--	--	D	
Qe42-1	Laurel Sportsmen & Beagle Club, Inc.	Ld	--	43	Dv	1.25	13	- -	Qp	Sand	7-12-55	5.7	--	--	--	D	
Qe43-1	Mrs. S. E. Hudson	Ld	1955	42	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	F	
Qe53-1	L. Hickman	Ld	--	42	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Qe54-1	O. Baker	Ld	1952	50	Dv	1.25	36	- -	Qp	Sand	--	--	--	--	--	F	
Qe55-1	N. B. Baker	Ld	1945	48	Dv	1.25	32	- -	Qp	Sand	7-12-55	4.5	--	--	--	E	
Qe55-2	Do	Ld	1953 ?	48	Dv	1.25	40	- -	Qp	Sand	--	--	--	--	--	D	
Qf12-1	E. Workman	Ld	1953	47	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	D	

Table 23 --RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Qf14-1	H. Williams	Ld	1950	43	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Qf14-2	W. E. Timmons	Ld	--	40	Dv	1.25	25	- -	Qp	Sand	9-12-55	10.6	--	--	--	A	
Qf21-1	Mrs. G. West	Ld	Before 1920	53	Dv	1.25	90	- -	Qp-Tp(?)	Coarse sand	--	--	--	--	--	A	
Qf21-2	Do	Ld	1940	53	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Qf22-1	Mrs. C. Brittingham	Ld	--	52	Dv	1.25	26	- -	Qp	Sand	9-9-55	3.3	--	--	--	A	
Qf22-2	Do	Ld	1954	52	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	D	
Qf23-1	M. Mitchell	Ld	1955	50	Dv	1.25	39	- -	Qp	Sand	--	--	--	--	--	D	
Qf23-2	Do	Ld	--	50	Dv	1.25	27	- -	Qp	Sand	9-12-55	4.3	--	--	--	A	
Qf23-3	W. H. Hudson	Ld	1943	50	Dv	1.25	18	- -	Qp	Sand	--	--	--	--	--	D	
Qf25-1	G. Dorey	Ld	1954	45	Dv	1.25	19	- -	Qp	Sand	--	--	--	--	--	D	Temp. 61°F.
Qf31-1	J. Williams	Ld	Before 1953	52	Dv	1.25	29	- -	Qp	Sand	9-9-55	7.0	--	--	--	F	
Qf32-1	I. Pusey	Ld	1930	48	Dv	1.25	19	- -	Qp	Sand	--	--	--	--	--	D	
Qf34-1	J. Tunnel	Ld	Before 1952	44	Dv	1.25	21	- -	Qp	Sand	9-9-55	3.9	--	--	--	N	Temp. 62.5°F.
Qf34-2	B. Mitchell	Ld	--	45	Dv	1.25	9	- -	Qp	Sand	9-12-55	3.0	--	--	--	A	
Qf35-1	Sen. J. J. Williams	Ld	About 1945	45	Dv	1.25	57	- -	Qp	Sand	--	--	--	--	--	F	
Qf41-1	W. R. West	Ld	1945	50	Dv	1.25	30	- -	Qp	Sand	--	-	--	--	--	D	
Qf41-2	Do	Ld	Before 1947	50	Dv	1.25	32	- -	Qp	Sand	9-9-55	3.7	--	--	--	F	Temp. 61°F.
Qf43-1	F. Brittingham	Ld	Before 1945	47	Dv	1.25	22	- -	Qp	Sand	9-9-55	4.9	--	--	--	E, N	
Qf43-2	Do	Ld	--	47	Dv	1.25	9	- -	Qp	Sand	9-9-55	7.0	--	--	--	A	
Qf45-1	J. F. Hitchens	Ld	1954	44	Dv	1.25	9	- -	Qp	Sand	--	--	--	--	--	D	
Qf45-2	Do	Ld	1954	44	Dv	1.25	9	- -	Qp	Sand	--	--	--	--	--	D	
Qf45-3	Do	Ld	1951	44	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	F	
Qf52-1	R. Jones	Ld	Before 1952	50	Dv	1.25	39	- -	Qp	Sand	9-9-55	3.8	--	--	--	F	Temp. 60°F.
Qf53-1	Westwood Methodist Church	Ld	--	45	Dv	1.25	58	- -	Qp	Sand	9-8-55	5.2	--	--	--	P	
Qf54-1	W. Revel	Ld	About 1940	42	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	D	
Qf54-2	Do	Ld	Before 1917	42	Dv	1.25	13	- -	Qp	Sand	9-8-55	3.5	--	--	--	F	Water has odor.

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Qf54-3	W. Revel	Ld	1940	42	Dv	1.25	51	- -	Qp	Sand	9-8-55	5.4	--	--	--	N	
Qg11-1	Williams Hatchery Co.	Ld	1955	37	Dv	1.25	70	- -	Qp	Sand	--	--	--	--	--	I	Slight turbidity.
Qg11-2	R. N. Lewis	Ld	1941	37	Dv	1.25	42	- -	Qp	Sand	--	--	--	--	--	F	
Qg11-3	Do	Ld	1930	37	Dv	1.25	43	- -	Qp	Sand	9-14-55	9.2	--	--	--	N	
Qg12-1	O. R. Fisher	Ld	1952	35	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	D	
Qg13-1	L. Mitchell	Ld	1949	30	Dv	1.25	30	- -	Qp	Sand	--	--	--	--	--	F	
Qg13-2	T. R. Taylor	Ld	1950	20	Dv	1.25	39	- -	Qp	Sand	--	--	--	--	--	F	
Qg15-1	G. H. Timmons	Ld	1949	21	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Qg15-2	A. Daisey	Ld	1953	25	Dv	1.25	65	- -	Qp	Sand	--	--	--	--	--	D	
Qg15-3	Do	Ld	1955	25	Dv	1.25	59	- -	Qp	Sand	--	--	--	--	--	F	
Qg21-1	L. Mumford	Ld	1947	36	Dv	1.25	23	- -	Qp	Sand	9-12-55	5.1	--	--	--	N	
Qg22-1	J. Mumford	Ld	1936	35	Dv	1.25	36	- -	Qp	Sand	9-13-55	6.3	--	--	--	F	
Qg22-2	Do	Ld	1910	35	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	D	
Qg24-1	Esham's Nurseries	Ld	1938	28	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	Ir	
Qg25-1	E. C. Timmons	Ld	1915	28	Dv	1.25	12	- -	Qp	Sand	--	--	--	--	--	F	Temp. 68.5°F.
Qg33-1	J. Hitchens	--	1910	41	Dg	20	11	- -	Qp	Sand	9-13-55	2.9	--	--	--	E	Turbid after rain.
Qg34-1	W. E. Gray	Ld	--	38	Dv	1.25	50	- -	Qp	Sand	--	--	--	--	--	D	Temp. 58°F.
Qg34-2	Do	--	--	38	Dg	20	7	- -	Qp	Sand	9-13-55	4.1	--	--	--	D	Turbid.
Qg35-1	O. Brumbley	Ld	--	33	Dv	1.25	38	- -	Qp	Sand	9-13-55	10.5	--	--	--	N	
Qg35-2	H. Vickers	Ld	1940	33	Dv	1.25	17	- -	Qp	Sand	--	--	--	--	--	D, F	
Qg35-3	H. Bunting	Ld	--	33	Dv	1.25	62	- -	Qp	Sand	--	--	--	--	--	D	
Qg35-4	B. E. Timmons	Ld	--	35	Dv	1.25	32	- -	Qp	Sand	--	--	--	--	--	E	
Qg35-5	Do	Ld	1946	35	Dg	24	7	- -	Qp	Sand	9-14-55	3.7	--	--	--	D	
Qg41-1	G. Holloway	Ld	--	42	Dv	1.25	13	- -	Qp	Sand	--	--	--	--	--	F	Turbid after rain.
Qg45-1	E. Bunting	Ld	1951	36	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Qg53-1	J. W. Vickers	Ld	About 1932	40	Dv	1.25	52	- -	Qp	Sand	9-13-55	7.9	--	--	--	F, E	Temp. 60°F.
Qg53-2	Do	Ld	About 1935	40	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Qg55-1	B. Cannon	--	Before 1952	38	Dg	24	12	- -	Qp	Sand	9-12-55	5.9	--	--	--	D	Turbid after rain.
Qg55-2	Do	Ld	Before 1952	38	Dv	1.25	18	- -	Qp	Sand	9-12-55	6.0	--	--	--	A	
Qh11-1	R. Baker	Ld	1952	20	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	D	
Qh13-1	L. Hickman	Ld	1935	12	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	F	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Qh13-2	W. Timmons	Ld	1937	13	Dv	1.25	36	- -	Qp	Sand	10-6-55	13.2	--	--	--	D	
Qh14-1	Mrs. A. Timmons	Ld	1941	12	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	D	
Qh15-1	C. Townsend	Ld	--	10	Dv	1.25	21	- -	Qp	Sand	10-6-55	7.0	--	--	--	P	
Qh22-1	O. Massey	Ld	1945	20	Dv	1.25	39	- -	Qp	Sand	--	--	--	--	--	F	
Qh22-2	I. T. Cannon	Ld	1950	24	Dv	1.25	67	- -	Qp	Sand	--	--	--	--	--	D	
Qh25-1	Mrs. C. Murphy	Ld	1953	15	Dv	1.25	39	- -	Qp	Sand	--	--	--	--	--	F	
Qh31-1	Atlantic Ice Mfg. Co.	PM	1948	18	J	4	88	- -	Tpo	Sand	1948	4	--	--	--	I	
Qh31-2	Do	Ld	1952	20	Dv	1.25	16	- -	Qp	Sand	--	--	--	--	--	I	C. A.
Qh31-3	Do	Ld	1952	20	Dv	1.25	16	- -	Qp	Sand	--	--	--	--	--	I	C. A.
Qh31-4	Do	Ld	1952	20	Dv	1.25	16	- -	Qp	Sand	--	--	--	--	--	I	C. A.
Qh31-5	Do	Ld	1952	20	Dv	1.25	16	- -	Qp	Sand	--	--	--	--	--	I	C. A.
Qh31-6	Do	Ld	1952	20	Dv	1.25	16	- -	Qp	Sand	--	--	--	--	--	I	C. A.
Qh31-7	Dagsboro Vol. Fire Co.	E	1951	25	J	3	74	- -	Tpo	Sand	7-31-51	16	7-31-51	85	40	E	See log.
Qh33-1	R. Townsend	Ld	1943	25	Dv	1.25	42	- -	Qp	Sand	--	--	--	--	--	F	
Qh33-2	H. Bennett	W	1953	22	J	4	63	- -	Tpo	Sand	9-15-53	12	9-15-53	70	18	F	See log.
Qh34-1	W. Scott	Ld	1940	22	Dv	1.5	60	- -	Qp	Sand	--	--	--	--	--	F	
Qh41-1	Delmarva Poultry Co.	W	1951	35	Ct	8	111	- -	Tpo	Sand	5-22-51	13.3	5-22-51	400	49	I	See log.
Qh43-1	G. W. Wilson	Ld	--	15	Dv	1.25	48	- -	Qp	Sand	--	--	--	--	--	F	
Qh44-1	State Highway Dept.	MWD	1958	22	Hr	6	208	- -	Tpo	Sand	--	--	--	--	--	T, A	See log.
Qh51-1	Town of Frankford	PM	1934	35	J	3	81	- -	Tpo	Sand	1934	10	--	--	--	E, P	See log.
Qh51-2	Do	PC	1934	35	J	3	81	- -	Tpo	Sand	--	--	--	--	--	E, P	
Qh51-3	Do	PC	1934	35	J	3	81	- -	Tpo	Sand	--	--	--	--	--	E, P	
Qh51-4	Do	PC	1934	35	J	3	91	- -	Tpo	Sand	--	--	--	--	--	E, P	
Qh51-5	Do	PC	1934	35	J	3	81	- -	Tpo	Sand	--	--	--	--	--	E, P	
Qh51-6	Do	PC	1934	35	J	3	81	- -	Tpo	Sand	--	--	--	--	--	E, P	
Qh51-7	Do	W	1954	35	J	8	100	- -	Tpo	Sand	5-3-54	16	--	--	--	P	C. A.; see log. Temp. 59°F.
Qh51-8	Delmarva Poultry Co.	E	1940	35	J	3	92	- -	Tpo	Sand	--	--	12- -40	65	--	A	
Qh51-9	Do	E	1940	35	J	8	98	- -	Tpo	Sand	1940	12	1940	120	27	A	Pumped sand.
Qh51-10	Do	W	1948	35	Ct	8	105	- -	Tpo	Sand	5- -48	12	5- -48	240	10	I	See log.
Qh51-11	Hipro Associates	W	1949	35	Ct	8	121	- -	Tpo	Sand	2- -49	10.5	2- -49	240	16.5	D, I	See log.
Qh51-12	A. Banks	W	1950	35	J	4	99	- -	Tpo	Sand	1950	10	1950	70	--	D	See log.
Qh52-1	C. Mitchell	Ld	1953	35	Dv	1.5	87	- -	Tpo	Sand	--	--	--	--	--	F	
Qh52-2	Do	Ld	1915	35	Dg	24	18	- -	Qp	Sand	9-15-55	7.3	--	--	--	E	
Qh53-1	E. McGee	Ld	1945	33	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	F	
Qh53-2	F. M. Gum, Jr.	Ld	1930	36	Dv	1.5	80	- -	Tpo(?)	Sand	--	--	--	--	--	F	
Qh54-1	A. Phillips	Ld	1925	34	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	F	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Qh54-2	H. M. Tingle	Ld	1915	32	Dv	1.5	70	- -	Qp	Sand	--	--	--	--	--	F	
Qh54-3	Do	Ld	1940	32	Dv	1.25	39	- -	Qp	Sand	9-15-55	13.2	--	--	--	E	
Qh55-1	E. Lynch, Jr.	Ld	1954	23	Dv	2.5	60	- -	Qp	Sand	1954	14	--	--	--	F	
Qi12-1	A. Calhoun	Ld	1953	17	Dv	1.5	32	- -	Qp	Sand	--	--	--	--	--	D	
Qi13-1	E. Hudson	Ld	1935	12	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Qi13-2	Do	Ld	1908	12	Dg	18	13	- -	Qp	Sand	10-11-55	8.6	--	--	--	E	
Qi21-1	K. Marvel	Ld	1955	11	Dv	1.25	25	- -	Qp	Sand	--	--	--	--	--	F	Temp. 60°F.
Qi21-2	Do	Ld	--	11	Dg	24	14	- -	Qp	Sand	10-11-55	8.3	--	--	--	E, F	
Qi21-3	Mrs. A. Carey	Ld	1906	10	Dg	20	8	- -	Qp	Sand	10-11-55	6.7	--	--	--	D	
Qi31-1	Mrs. E. W. Lynch	Ld	Before 1939	18	Dv	1.25	26	- -	Qp	Sand	10-10-55	7.8	--	--	--	F	
Qi31-2	B. L. McGann	Ld	1953	20	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	Ir	
Qi34-1	Millville Fire Co.	E	1943	12	J	6	85	- -	Tpo(?)	Sand	1953	8	8-18-43	120	52	E	
Qi34-2	Do	Ld	1945	12	Dv	1.25	51	- -	Qp	Sand	--	--	--	--	--	D	
Qi43-1	F. Rogers	Ld	--	17	Dv	1.25	15	- -	Qp	Sand	10-10-55		5.2	--	--	A	
Qi51-1	A. Daisey	Ld	1954	23	Dv	1.5	96	- -	Tpo(?)	Sand	--	--	--	--	--	D	
Qi51-2	S. Layton	Ld	--	23	Dv	1.25	126	- -	Tpo(?)	Sand	--	--	--	--	--	F	
Qi51-3	C. M. Tingle	PC	1937	24	J	3	90	- -	Tpo(?)	Sand	1937	3	--	--	--	F	
Qi53-1	Mrs. L. Evans	Ld	Before 1930	20	Dg	18	6	- -	Qp	Sand	10-10-55		4.0	--	--	A	
Qi54-1	G. Pitts	Ld	1934	17	Dv	1.25	13	- -	Qp	Sand	--	--	--	--	--	D	
Qi55-1	Del. Police Chiefs' Assn	W	1953	5	J	4	117	- -	Tpo	Sand	6-27-53	4.5	6-27-53	100	--	R	C. A.; see log.
Qi55-2	Do	Ld	1947	5	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	P	
Qj22-1	Sussex Shores Real Estate	SAW	1957	10	Hr	4	188	- -	Tma	Sand	--	--	1957	200	--	T, A	See log.
Qj32-1	Del. State Nat'l. Guard	E	1943	7	J	4	64	- -	Tpo	Sand	6-17-43	2.3	6-17-43	160	--	W	See log.
Qj32-2	Do	Ld	1951	7	Dv	1.5	15	- -	Qp	Sand	--	--	--	--	--	W	
Qj32-3	Do	Ld	1951	7	Dv	1.5	15	- -	Qp	Sand	--	--	--	--	--	W	
Qj32-4	Town of Bethany Beach	PM ?	1950	7	J	4	66	- -	Tpo	Sand	--	--	--	--	--	P	
Qj32-5	Do	E	1951	7	J	4	65	- -	Tpo	Sand	--	--	1951	40	--	P	
Qj32-6	Do	E	1943	7	J	4	60	- -	Tpo	Sand	8-30-43	4.9	8-30-43	97	15	E	See log.
Qj32-7	W. P. Short, Jr.	SAW	1954	5	J	6	69	- -	Tpo	Sand	2-17-56	30	2-17-56	202	12	P	C. A.; see log.
Qj32-8	Town of Bethany Beach	PM	1954	7	J	4	70	- -	Tpo	Sand	--	--	1954	90	--	P	C. A.; temp. 57°F.
Qj32-9	Sussex Shores Real Estate	--	Before 1931	7	J	4.5	267	- -	Tma	Sand	6-29-55	2.9	--	--	--	N	See log.
Qj52-1	R. Norman	Ld	1958	10	Dv	1.25	11	- -	Qp	Sand	8-18-58	6.0	--	--	--	D	

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Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Rb14-1	E. M. Abbott	Ld	--	43	Dv	1.5	50?	- -	Qp	Sand	--	--	--	--	--	F	
Rb14-2	Do	Ld	--	43	Dv	1.25	30	- -	Qp	Sand	7-8-54	4.6	--	--	--	D	
Rb15-1	C. Smiley	Ld	1951	49	Dv	1.5	23	- -	Qp	Sand	7-8-54	4.9	--	--	--	N	
Rb15-2	Mt. Nebo M. E. Church	Ld	--	45	Dv	1.25	22	- -	Qp	Sand	7-8-54	7.3	--	--	--	D	
Rb24-1	Marvin C. Bradley	Ld	1950	44	Dv	1.5	77	- -	Qp	Sand	7-8-54	35	--	--	--	F	
Rb25-1	Do	Ld	1935	44	Dv	1.5	72	- -	Qp	Sand	7-8-54	6.6	--	--	--	N	
Rb25-2	Do	Ld	--	44	Dv	1.5	85	- -	Qp	Sand	7-8-54	5.3	--	--	--	N	
Rb34-1	J. L. Phillips	Ld	1950	36	Dv	1.5	60	- -	Qp	Sand	--	--	--	--	--	D	
Rb34-2	Do	Ld	--	36	Dv	1.25	45	- -	Qp	Sand	7-7-54	10.9	--	--	--	E	
Rc12-1	St. Marks Episcopal Church	Ld	--	50	Dv	1.25	29	- -	Qp	Sand	7-9-54	6.8	--	--	--	D	
Rc13-1	T. E. Ellis	Ld	1950	51	Dv	1.25	14	- -	Qp	Sand	7-9-54	6.8	--	--	--	F	
Rc13-2	Do	Ld	1949	51	Dv	1.25	67	- -	Qp	Sand	--	--	--	--	--	D	
Rc14-1	A. Patilla	Ld	--	48	Dv	1.5	60	- -	Qp	Sand	7-9-54	5.8	--	--	--	N	
Rc14-2	Do	Ld	--	48	Dv	1.5	--	- -	Qp	Sand	--	--	--	--	--	F	
Rc14-3	J. Elliott	Ld	1945	45	Dv	1.5	24	- -	Qp	Sand	7-9-54	8.2	--	--	--	F	
Rc15-1	Mrs. I. German	Ld	1952	48	Dv	1.5	45	- -	Qp	Sand	7-9-54	5.0	--	--	--	F	
Rc21-1	M. Jones	Ld	--	45	Dv	1.25	29	- -	Qp	Sand	7-9-54	5.7	--	--	--	N	
Rc21-2	Do	Ld	1952	45	Dv	1.25	29	- -	Qp	Sand	7-9-54	6.3	--	--	--	D	
Rc22-1	Mrs. E. Ellis	Ld	1934	50	Dv	1.5	75	- -	Qp	Sand	7-9-54	3.0	--	--	--	F	
Rc22-2	Do	Ld	1925	50	Dv	1.5	110	- -	Qp	Sand	--	--	--	--	--	F	
Rc25-1	W. Hastings	Ld	1951	48	Dv	1.5	50	- -	Qp	Sand	7-9-54	7.0	--	--	--	F	
Rc25-2	Do	Ld	1934	48	Dv	1.5	30	- -	Qp	Sand	7-9-54	6.0	--	--	--	F	
Rc33-1	F. M. Wright	Ld	1953	48	Dv	1.5	?	- -	Qp	Sand	7-9-54	8.1	--	--	--	F	
Rc35-1	W. Yeadt	Ld	1951	47	Dv	1.5	45	- -	Qp	Sand	7-12-54	8.3	--	--	--	E	
Rd11-1	C. Culver	Ld	1938	45	Dv	1.25	43	- -	Qp	Sand	7-12-54	8.4	--	--	--	F	
Rd11-2	E. McCutchon	Ld	1948	45	Dv	1.25	50	- -	Qp	Sand	--	--	--	--	--	F	
Rd11-3	Do	Ld	1945	45	Dv	1.25	33	- -	Qp	Sand	--	--	--	--	--	F	
Rd11-4	State Highway Dept.	USGS	1955	45	B	3.5	83	- -	Tp(?)	Coarse sand	5-17-55	10	--	--	--	T, A	See log.
Rd14-1	P. J. Elliott	Ld	1944	46	Dv	1.5	--	- -	Qp	Sand	7-12-54	6.4	--	--	--	F	
Rd14-2	J. T. Elliott	Ld	1954	49	Dv	1.5	35	- -	Qp	Sand	7-14-54	6.2	--	--	--	F	
Rd15-1	Smith Mills Baptist Church	--	--	40	Dv	1.5	--	- -	Qp	Sand	7-14-54	5.0	--	--	--	D	
Rd15-2	H. J. Brumbley	Ld	1950	45	Dv	1.5	40	- -	Qp	Sand	--	--	--	--	--	F	
Rd15-3	Do	Ld	1920	45	Dv	1.5	--	- -	Qp	Sand	7-14-54	7.5	--	--	--	N	
Rd21-1	Ralston-Purina Co.	AP	1952	50	J	6	104	- -	Tp(?)	Coarse sand	1952	Flow	--	--	--	I	
Rd21-2	Mrs. M. Hearn	Ld	1953	51	Dv	1.25	22	- -	Qp	Sand	7-12-54	8	--	--	--	D	

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Rd22-1	F. Ward	Ld	--	53	Dv	1.25	53	- -	Qp	Sand	7-12-54	5.0	--	--	--	F	
Rd22-2	Do	Ld	--	53	Dv	1.25	45	- -	Qp	Sand	--	--	--	--	--	D	
Rd23-1	E. Hovatter	Ld	1942	50	Dv	1.25	43	- -	Qp	Sand	7-12-54	9.4	--	--	--	E	
Rd24-1	Mrs. C. Driscoll	Ld	--	52	Dv	1.25	45	- -	Qp	Sand	7-12-54	8.4	--	--	--	D	
Rd24-2	J. T. Elliott	Ld	1941	49	Dv	1.5	65	- -	Qp	Sand	--	--	--	--	--	F	
Rd31-1	Town of Delmar	--	--	57	--	4	95	- -	Tp(?)	Coarse sand	--	--	--	--	--	A	
Rd31-2	Do	--	--	57	--	4	95	- -	Tp(?)	Coarse sand	--	--	--	--	--	A	
Rd31-3	Do	--	1937	57	--	3	100	- -	Tp(?)	Coarse sand	--	--	--	--	--	A	
Rd31-4	Do	PM ?	1946	57	J	4	103	- -	Tp(?)	Coarse sand	--	--	--	--	--	A	
Rd31-5	Do	R	1937	57	J	12	130	- -	Tp(?)	Coarse sand	--	--	--	--	--	P	
Rd31-6	Do	PM ?	1946	57	J	3	115	- -	Tp(?)	Coarse sand	--	--	--	--	--	N	
Rd31-7	Do	PM ?	1946	57	J	4	109	- -	Tp(?)	Coarse sand	3-31-48	7.5	--	--	--	N	
Rd31-8	Do	PM	1952	57	J	8	126	- -	Tp(?)	Coarse sand	1-9-52	6.1	7-15-55	290	29	P	C.A.; see log.
Rd31-9	Dp	--	--	57	J	3	50	- -	Qp	Sand	--	--	--	--	--	A	
Rd32-1	Mrs. C. Hovatter	Ld	1930	50	Dv	1.25	49	- -	Qp	Sand	7-12-54	7.7	--	--	--	D	
Rd33-1	G. W. Hearn	Ld	--	51	Dv	1.25	61	- -	Qp	Sand	7-12-54	6.8	--	--	--	F	
Rd33-2	Do	Ld	1948	51	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Rd35-1	E. S. Hearn	Ld	1945	57	Dv	1.5	45	- -	Qp	Sand	7-14-54	7.0	--	--	--	F	
Rd35-2	Do	Ld	1946	57	Dv	1.5	45	- -	Qp	Sand	--	--	--	--	--	D	
Rd35-3	R. Burton	Ld	1954	54	Dv	1.5	45	- -	Qp	Sand	7-14-54	6.4	--	--	--	D	
Re12-1	L. Brittingham	Ld	--	53	Dv	1.25	30	- -	Qp	Sand	7-16-54	6.3	--	--	--	N	
Re14-1	F. Warrington	Ld	Before 1933	50	Dv	1.25	55	- -	Qp	Sand	7-16-54	8.0	--	--	--	E	
Re14-2	Do	Ld	1951	50	Dv	1.25	35	- -	Qp	Sand	--	--	--	--	--	F	
Re15-1	H. Pak	Ld	--	55	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Re21-1	E. Workman	Ld	1953	56	Dv	1.25	32	- -	Qp	Sand	7-16-54	15	--	--	--	F	
Re22-1	R. Christopherson	Ld	1941	50	Dv	1.25	18	- -	Qp	Sand	7-16-54	5.8	--	--	--	F	
Re23-1	R. J. Gordy	Ld	1953	55	Dv	1.25	--	- -	Qp	Sand	7-16-54	7.8	--	--	--	D	
Re24-1	A. Nero	Ld	--	56	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Re31-1	F. Adkins	Ld	--	57	Dv	1.5	53	- -	Qp	Sand	7-16-54	10.3	--	--	--	N	
Re31-2	Do	Ld	1946	57	Dv	1.5	50	- -	Qp	Sand	--	--	--	--	--	F	
Re32-1	P. Ring	Ld	--	64	Dv	1.25	40	- -	Qp	Sand	7-16-54	14.1	--	--	--	F	
Re32-2	Do	Ld	1954	64	Dv	1.5	35	- -	Qp	Sand	--	--	--	--	--	F	
Re35-1	M. Wootten	Ld	--	63	Dv	1.25	4	- -	Qp	Sand	7-16-54	0.4	--	--	--	N	
Re35-2	Line Church	Ld	--	60	Dv	1.25	49	- -	Qp	Sand	7-18-54	13.9	--	--	--	D	
Rf12-1	Jones M.E. Church	Ld	--	48	Dv	1.25	23	- -	Qp	Sand	7-18-54	8.4	--	--	--	N	
Rf12-2	P. Stephens	Ld	1937	50	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	D	
Rf13-1	D. M. Collins	Ld	--	45	Dv	1.25	25	- -	Qp	Sand	7-18-54	6.8	--	--	--	F	

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Rf14-1	W. T. Short	Ld	--	42	Dv	1.25	--	- -	Qp	Sand	7-18-54	6.6	--	--	--	N	
Rf15-1	E. Toomey	Ld	1950	40	Dv	1.25	62	- -	Qp	Sand	7-18-54	6.9	--	--	--	D	
Rf21-1	K. West	Ld	--	54	Dv	1.25	--	- -	Qp	Sand	7-18-54	10.2	--	--	--	F	
Rf21-2	L. Daisey	Ld	--	52	Dv	1.25	48	- -	Qp	Sand	7-18-54	11.0	--	--	--	N	
Rf23-1	C. Collins	Ld	1946	45	Dv	1.25	15	- -	Qp	Sand	7-18-54	5	--	--	--	N	
Rf24-1	H. Collins	Ld	--	43	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	E	
Rf24-2	Do	Ld	--	43	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	F	
Rf24-3	Do	Ld	--	43	Dv	1.25	18	- -	Qp	Sand	7-18-54	4.4	--	--	--	F	
Rf24-4	R. C. Wootten	Ld	1951	45	Dv	1.25	65	- -	Qp	Sand	--	--	--	--	--	D	
Rf25-1	H. Collins	SCS	1946	39	Dv	12	6	- -	Qp	Sand	8-4-48	0.1	--	--	--	O, A	
Rf25-2	Do	SCS	1946	37	Dv	12	9	- -	Qp	Sand	3-8-48 10-30-52	0.0 5.9	--	--	--	O, A	
Rf25-3	Do	Ld	1940	36	Dv	1.5	96	- -	Tp(?)	Coarse sand	--	--	--	--	--	F	
Rf31-1	H. Pease	Ld	1948	61	Dv	1.25	50	- -	Qp	Sand	7-16-54	16.6	--	--	--	N	
Rf31-2	Do	Ld	1943	61	Dv	1.25	55	- -	Qp	Sand	--	--	--	--	--	F	
Rf32-1	D. E. Parker	Ld	1952	46	Dv	1.25	14	- -	Qp	Sand	--	--	--	--	--	D	
Rf32-2	Do	Ld	--	46	Dv	1.25	--	- -	Qp	Sand	--	--	--	--	--	F	
Rf32-3	J. W. Brittingham	Ld	--	46	Dv	1.25	33	- -	Qp	Sand	7-18-54	3.5	--	--	--	--	
Rf33-1	T. H. Moore	Ld	1949	42	Dv	1.25	13	- -	Qp	Sand	--	--	--	--	--	F	
Rf35-1	A. Baker	Ld	1940	34	Dv	1.25	15	- -	Qp	Sand	--	--	--	--	--	D	
Rf35-2	Do	--	Before 1900	34	Dg	20	8	- -	Qp	Sand	7-22-54	5.9	--	--	--	F	
Rg15-1	N. Mitchell	Ld	1944	37	Dv	1.25	45	- -	Qp	Sand	7-22-54	9.9	--	--	--	F	
Rg21-1	W. Bunting	Ld	1948	39	Dv	1.25	20	- -	Qp	Sand	--	--	--	--	--	F	
Rg21-2	Standard Feed Co.	Ld	1950	40	Dv	1.5	--	- -	Qp	Sand	--	--	--	--	--	F	
Rg22-1	State Highway Dept.	MWD	1958	40	Hr	6	277	- -	Trna	Sand	--	--	--	--	--	T, A	See log.
Rg23-1	Do	MWD	1958	39	Hr	6	188	- -	Trna (?)	Sand	--	--	--	--	--	T, A	See log.
Rg24-1	A. R. Hudson	Ld	1950	38	Dv	1.5	20	- -	Qp	Sand	--	--	--	--	--	F	
Rg24-2	G. V. Wood	Ld	--	38	Dv	1.5	--	- -	Qp	Sand	--	--	--	--	--	E	
Rg25-1	S. H. Long	Ld	1920	41	Dg	20	10	- -	Qp	Sand	7-22-54	5.1	--	--	--	F	
Rg31-1	T. H. Hall	Ld	Before 1900	38	Dg	20	8	- -	Qp	Sand	--	--	--	--	--	F	
Rg35-1	E. S. McCabe & Son	W	1954	35	J	4	118	- -	Tpo	Sand	10-13-54	12	10-13-54	220	15	Ir	See log. Sp. cap. 14.1.
Rh12-1	Smith-Roland Co.	PM	1951	37	J	6	102	- -	Tpo(?)	Sand	1951	14.5	--	--	--	I	

Table 23.--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Drawdown (feet)	Use	Remarks
Rh12-2	Smith-Roland Co.	PM	1951	37	J	6	103	- -	Tpo(?)	Sand	1951	14.5	--	--	--	I	
Rh14-1	F. Gum	Ld	1954	34	Dg	20	8	- -	Qp	Sand	10-6-55	4.7	--	--	--	D	
Rh14-2	Do	Ld	--	34	Dv	1.5	47	- -	Qp	Sand	10-6-55	15.2	--	--	--	N	
Rh15-1	H. F. Wilgus	E (?)	1943	30	J	4	125	- -	Tpo	Sand	8-30-43	22	8-30-43	70	28	N	See log.
Rh15-2	Do	Ld	1954	30	Dv	1.25	12	- -	Qp	Sand	--	--	--	--	--	D	
Rh21-1	E. Hudson	Ld	1930	38	Dg	20	14	- -	Qp	Sand	10-7-55	7.4	--	--	--	D	
Rh22-1	H. H. Simpler	USGS	1955	39	B	3.5	89	- -	Tpo	Sand	--	--	--	--	--	T, A	See log.
Rh24-1	W. Godfrey	Ld	1942	37	Dv	1.5	38	- -	Qp	Sand	10-7-55	8.6	--	--	--	N	
Rh32-1	Town of Selbyville	PM	1948	35	J	8	96	- -	Qp	Sand	1948	30	5-2-50	500	--	P	C, A.; see log.
Rh32-2	Do	PM	1951	35	J	8	110	- -	Tpo	Sand	--	--	1951	500	--	P	
Rh32-3	H & H Poultry Co.	PM	1948	36	J	6	110	- -	Tpo	Sand	--	--	--	--	--	I	
Rh32-4	Do	PM	1945	36	J	6	90	- -	Qp	Sand	--	--	--	--	--	A	Marshy odor.
Rh32-5	Do	PM	1952	36	J	6	118	- -	Tpo	Sand	--	--	--	--	--	I	
Rh32-6	Town of Selbyville	PM	1957	35	J	4	185	- -	Tma	Sand	8-6-58	12.7	1957	100	10	N	Marshy odor.
Rh33-1	J. Beauchamp	Ld	--	35	Dv	2	14	- -	Qp	Sand	--	--	--	--	--	I	
Rh35-1	White Oak Hatchery	Ld	1947	21	Dv	1.5	12	- -	Qp	Sand	12-6-51	1.5	--	--	--	C, D	
Ri11-1	K. Wharton	Ld	--	25	Dg	18	7	- -	Qp	Sand	10-7-55	5.3	--	--	--	N	
Ri13-1	I. C. Hudson	Ld	--	11	Dv	1.5	38	- -	Qp	Sand	--	--	--	--	--	D	
Ri14-1	G. W. Shockley	Ld	1950	8	Dv	1.25	18	- -	Qp	Sand	--	--	--	--	--	F	
Ri22-1	Mrs. J. B. Evans	Ld	1949	11	Dv	1.25	23	- -	Qp	Sand	--	--	--	--	--	F	
Ri22-2	Do	Ld	Before 1920	11	Dv	1.25	28	- -	Qp	Sand	10-7-55	6.4	--	--	--	F	
Ri24-1	S. Murray	Ld	Before 1953	7	Dv	1.25	14	- -	Qp	Sand	--	--	--	--	--	F	
Ri24-2	Do	Ld	--	7	Dv	1.25	8	- -	Qp	Sand	10-7-55	3.5	--	--	--	E	
Ri31-1	M. Gray Hatchery	Ld	1944	17	Dv	2	90	- -	Tpo(?)	Sand	--	--	--	--	--	C	
Ri32-1	A. Kites	Ld	1936	26	Dv	1.25	65	- -	Qp	Sand	--	--	--	--	--	D	
Ri34-1	E. Cooper	Ld	1952	7	Dv	1.25	28	- -	Qp	Sand	--	--	--	--	--	D	
Rj31-1	M. Bunting	Ld	1939	4	Dv	1.25	26	- -	Qp	Sand	12-6-51	0.5	--	--	--	D	
Rj32-1	E. B. McCabe	Ld	1952	10	Dv	1.25	8	- -	Qp	Sand	--	--	--	--	--	A	Marshy odor.
Rj32-2	Do	Ld	1952	10	Dv	1.25	5	- -	Qr	Sand	5-24-52	2.0	--	--	--	A	Marshy odor.
Rj32-3	N. Bunting	Ld	1953	5	Dv	1.25	5	- -	Qp	Sand	5- -53	3	--	--	--	C	
Rj32-4	E. B. McCabe	Ld	1952	10	Dv	1.25	8	- -	Qp	Sand	--	--	--	--	--	A	
Rj32-5	Do	W	1951	10	J	4	287	- -	Tma	Sand	12-12-51	2.5	12-12-51	40	27	T, A	See log. Water at 169.5 and 194 ft.
Rj32-6	Do	W	1946	10	J	4	95	- -	Tp(?)	Coarse sand	--	--	1946	60	--	D	

Table 23--RECORD OF WELLS

Well number	Owner or name	Driller	Year completed	Altitude above sea level (feet)	Method of construction	Diameter of casing (inches)	Total depth (feet)	Screen setting (feet)	Aquifer: Name	Aquifer: Composition	Static water level: Date measured	Static water level: Depth below land surface (feet)	Well capacity: Date measured	Well capacity: Yield (gpm)	Well capacity: Draw-down (feet)	Use	Remarks
Rj32-7	E. B. McCabe	W	--	10	J	--	66	- -	Qp	Sand	--	--	--	--	--	A	
Rh32-8	Do	W	--	10	J	4	60	- -	Qp	Sand	--	--	--	--	--	A	
Rj32-9	Do	Ld	1955	10	Dv	1.25	8	- -	Qp	Sand	--	--	--	--	--	D	
Rj32-10	Do	Ld	1955	10	Dv	1.25	8	- -	Qp	Sand	--	--	--	--	--	D	
Rj32-11	Do	Ld	1955	10	Dv	1.25	8	- -	Qp	Sand	--	--	--	--	--	D	
Rj32-12	Do	Ld	--	10	Dv	1.25	60	- -	Qp	Sand	--	--	--	--	--	A	

Table 24. -- Log of wells

The altitude, in feet above sea level, of the land surface at each well is given in parentheses. The descriptions of rock material are from observation by the geologist, or driller, whose name is given after the altitude. The geologic formations are designated by the writers on the bases of texture, color, and mineralogy. Numerous instances where the descriptions were not apt, or the properties not diagnostic, so that the writers were in doubt, are treated with a "(?)" or an alternative interpretation is introduced by the conjunction "or".

	Thickness (feet)	Depth (feet)
Lg41-1 (Alt. 5 ft.) Ennis		
Recent series		
Clay, yellow	5	5
Pleistocene series		
Pamlico formation or Parsonsburg sand		
Sand, white	38	43
Beaverdam sand		
Sand, yellow	12	55
Sand, white and yellow	31	86
Miocene (?) series		
Cohansey (?) sand		
Sand, fine, gray	19	105
Sand, coarse, gray	35	140
Sand, coarse, gray, yellow, and white	33	173
Miocene series		
St. Marys formation		
Sand, gray and black	11	184
Mud	30	214
Choptank formation		
Frederica (?) aquifer		
Sand, gray and white; shell	30	244
Me15-13 (Alt. 25 ft.) Layne		
Pleistocene series		
Pamlico formation or Parsonsburg sand		
Clay, sandy	28	28
Sand, brown	4	32
Clay, sandy, brown	10	42
Miocene (?) series		
Cohansey (?) sand		
Clay, sandy, blue	22	64
Miocene series		
St. Marys formation		
Sand, muddy	11	75
Clay, sandy, blue; shells	143	218
Choptank formation		
Frederica aquifer		
Sand, dark-gray; gravel; shells	19	237
Clay, brown	13	250

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Me15-16 (Alt. 25 ft.) White		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Pamlico formation or Parsonsburg sand		
Clay, sandy	4.5	5
Clay	3	8
Clay, sandy	6	14
Beaverdam (?) sand		
Sand, clayey	8	22
Sand and gravel	6	28
Sand, clayey, cemented	9	37
Pliocene (?) or Pleistocene series		
Sand, very fine, red	36	73
Miocene (?) series		
Cohansey (?) sand		
Sand, fine, cemented, gray-green	13	86
Sand, loose, black	2	88
Miocene series		
St. Marys formation		
Clay, sandy, gray	35	123
Clay, gray	7	130
Clay, gray; shells	10	140
Choptank (?) formation		
Frederica (?) aquifer		
Sand, gray; clay; shells	90	230
Clay and shells, hard	6	236
Clay, sandy; shells	9	245
Missing	53	298
Me15-17 (Alt. 30 ft.) White		
Recent series		
Fill	0.3	0.3
Pleistocene series		
Parsonsburg (?) sand		
Sand, clayey, reddish	9.7	10
Beaverdam sand		
Clay, white	8	18
Sand, very fine; gravel; silt	10	28
Sand, very fine, yellow	32	60
Pliocene (?) series		
Sand, very fine, medium, coarse	13	73
Me15-18 (Alt. 15 ft.) White		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Pamlico formation or Parsonsburg sand		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Me15-18 (continued)		
Sand, clayey, dry	4.5	5
Water table	-	5
Sand, silty	10	15
Beaverdam sand		
Sand and gravel, layered	2	17
Sand, fine and medium, silty, clayey	3	20
Sand, coarse; gravel; water-bearing	9	29
Clay, gumbo, gray	11	40
Clay, sandy, gray	15	55
Sand, fine and very fine, gray-white, some coarse sand and small gravel from 61 to 63 ft.	8	63
Miocene series		
St. Marys formation		
Clay, gumbo, gray	13	76
Sand, fine, gray, dirty; wood	12	88
Clay, gumbo, gray	2	90
Sand, very fine, dirty, black	5	95
Sand, dirty, muddy	15	110
Clay, gumbo, sandy, gray; shells	40	150
Sand, very fine, muddy; shells	18	168
Clay, gumbo, sandy, gray; shells	30	198
Gumbo, sandy, gray; shells	6	204
Clay, gray, with a lot of shells	8	212
Choptank (?) formation		
Missing	6	218
Me15-27 (Alt. 25 ft.) White		
Recent series		
Fill	1	1
Pleistocene series		
Pamlico formation or Parsonsburg sand		
Clay, sandy; gravel	12	13
Sand and gravel, dirty	4	17
Clay, white and yellow; some gravel	4	21
Beaverdam sand		
Sand, medium, brown	2	23
Sand, very fine to very coarse, mostly fine, orange-yellow	13	36
Pliocene (?) series		
Sand, coarse, orange-red	2	38
Clay, sandy, orange	-	38
Me33-2 (Alt. 48 ft.) White		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Walston silt		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Me33-2 (continued)		
Clay, sandy	17.5	18
Beaverdam sand		
Sand, fine, water-bearing	6	24
Sand, fine, dirty	57	81
Sand, fine to coarse, silty	9	90
Sand, fine to very coarse, clayey; gravel	4	94
Miocene (?) series		
Cohansey sand		
Shale, sandy; soft, gray, fine, sand	3.5	97.5
Miocene series		
St. Marys (?) formation		
Sand, fine, silty, gray-black	10.5	108
Mg42-1 (Alt. 17 ft.) Coskery		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Parsonsburg sand		
Sand, medium, reddish-brown	3	3.5
Sand, fine to medium, brown, with pellets of gray clay	2.5	6
Sand, medium, gray-brown	2	8
Sand, clayey, dark gray-brown	2	10
Sand, coarse, silty, tan; granules and gravel; some ilmenite	2	12
Pamlico formation		
Sand, medium to coarse, silty, white; granules, water-bearing	7	19
Clay, red-brown, stiff	7	26
Clay, sandy, red-brown, and gravel	5	31
Beaverdam sand		
Sand, medium, silty, white	2	33
Sand, medium to coarse, gray-white; gravel and pebbles	1	34
Sand, coarse, white; gravel; pebbles	9	43
Sand, coarse; pebbles; pellets of white clay	1	44
Sand, coarse, white; gravel; pebbles	5	49
Sand, medium, tan; gravel	1	50
Pliocene (?) series		
Clay, sandy, orange-red to brown	2	52
Sand, medium, clayey, tan to reddish; pebbles	5	57
Clay, sandy, reddish; pebbles	2	59
Miocene (?) series		
Cohansey sand		
Sand, medium to coarse; gravel; pebbles; gravel and pebbles; white particles	15	74

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Mg42-2 (Alt. 23 ft.) Wilkens and Coskery		
Recent series		
Top soil; sand, fine to medium, brown	1	1
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, silty, light-brown; woody material	3	4
Sand, fine to medium, clayey, light-brown	2	6
Silt; sand, fine	1	7
Sand, fine to medium, silty, tan	3.5	10.5
Sand, medium, very silty	2.5	13
Clay, sandy (fine), gray with trace of brown	1	14
Pamlico formation or Beaverdam sand		
Sand, coarse and granules, silty, tan	3	17
Sand, medium to very coarse, silty, white	2	19
Sand, coarse, tan, water-bearing	2	21
Sand, fine to coarse, silty, white; gravel	5	26
Beaverdam (?) sand		
Sand, coarse, brown; large pebbles	2	28
Sand, coarse to very coarse, white; gravel	6	34
Sand, medium to very coarse, grayish-white; gravel; black particles	10	44
Mg42-3 (Alt. 19 ft.) Wilkens		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium, clayey, brown	2	3
Clay, sandy, brown	1	4
Sand, medium, silty, brown	1	5
Clay, gray	1	6
Sand, medium, silty, gray and brown	1	7
Clay, sandy, dark-gray	1.5	8.5
Sand, medium, dark-gray	1.5	10
Sand, medium to coarse, buff	5	15
Clay, sandy, orange-brown	1	16
Silt, clayey, dark-gray	3	19
Mg42-4 (Alt. 20 ft.) Wilkens		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium, silty, brown	3	4
Silt, sandy, clayey, brown	2	6
Sand, fine, gray	3	9
Sand, medium to very coarse, brown; gravel	4	13

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Mg42-4 (continued)		
Pamlico formation or Beaverdam sand		
Sand, medium, silty, light-gray to white	2	15
Silt, light-gray to white; sand, very fine	4	19
Mg42-5 (Alt. 17 ft.) Wilkens		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium, silty, brown	3	4
Clay, sandy, brown to gray	2	6
Sand, medium to coarse, yellow-brown	2.5	8.5
Gravel, sandy (tan), water-bearing	2	10.5
Pamlico formation or Beaverdam sand		
Sand, very coarse, white and tan mixed	2.5	13
Sand, very fine to medium, very silty, white to light-gray; fine particles of black minerals	9	22
Beaverdam (?) sand		
Silt, red-brown, some gray; sand, coarse, brown; gravel	2	24
Mg52-2 (Alt. 7.2 ft.) Hopkins and Rasmussen		
Recent series		
Loam, sandy	1	1
Sand, coarse to fine, silty, light-gray	2	3
Pleistocene series		
Pamlico formation or Beaverdam sand		
Sand, coarse to fine, silty, buff	5	8
Sand, medium to coarse, gray	1	9
Sand, medium to fine, silty, buff-gray; (layer of gravel at 12 ft.)	4	13
Sand, medium to coarse, buff-gray; (layer of silt at 16 ft.)	5	18
Sand, medium, gray	3.5	21.5
Gravel, and sand	7.5	29
Sand, medium to coarse; gravel, fine	5	34
Sand	5	39
Beaverdam (?) sand		
Grit and sand, coarse, tan-orange; some gravel, fine	14	53
Pliocene (?) series		
Sand, orange and gravel	14	67
Grit and sand, orange	9	76
Sand, medium to coarse, silty, orange	13.5	89.5
Clay, sandy (fine), gray	3.5	93
Sand	1	94
Clay	0.5	94.5
Sand, medium, silty, orange	7.5	102

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Mg53-5 (Alt. 21 ft.) Hopkins and Coskery		
Recent series		
Top soil; loam, sandy, brown	0.7	0.7
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, silty, brown	3.1	3.8
Sand, medium, silty, dark-brown; granules	1.2	5
Sand, fine, very silty, brown; lumps of gray and red silt	4	9
Silt, brown and gray mixed	3	12
Sand, medium to coarse, very silty, gravelly, gray-brown, water-bearing	2.2	14.2
Pamlico formation or Beaverdam sand		
Sand, medium, some coarse, silty, tan; some granules	2.3	16.5
Sand, fine, and silt, tan	2.5	19
Clay, silty, brown	6	25
Sand, coarse, silty, white	17	42
Mg53-6 (Alt. 20.5 ft.) Hopkins and Coskery		
Recent series		
Top soil; loam, sandy, silty, black-brown	0.8	0.8
Pleistocene series		
Parsonsburg sand		
Silt, sandy (fine), brown	2	2.8
Sand, fine to medium, silty, brown; some granules	3.2	6
Silt, brown; granules; some gravel	2	8
Sand, fine to medium, silty, brown	2.5	10.5
Silt, gray; some sand and granules	2.5	13
Sand, medium to coarse, silty, brown; gravel	1.8	14.8
Pamlico formation		
Clay, silty, brown	2	16.8
Sand, fine to medium, silty, clayey, brown	1.2	18
Clay, blue-gray	7	25
Clay, brown	3	28
Beaverdam sand		
Sand, medium (soupy), silty, brown	6	34
Sand, coarse, silty, white; granules; small gravel	4	38
Mg53-7 (Alt. 23 ft.) Hopkins and Coskery		
Recent series		
Top soil; loam, sandy, medium, brown	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, brown; granules	1.5	2.5
Sand, fine to medium, red-brown; granules	3.5	6
Sand, fine, silty, brown; granules; some small gravel	5.5	11.5

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Mg53-7 (continued)		
Sand, fine, silty, brown; granules	3.5	16
Sand, fine to coarse, silty, buff; granules; gravel	2	18
Sand, medium to coarse, silty, gray-brown	3	21
Pamlico formation		
Sand, fine to coarse, very silty, light-gray; granules; gravel	2	23
Sand, coarse to medium, light-brown	10	33
Sand, medium, silty, light-brown	4	37
Gravel	0.5	37.5
Beaverdam sand		
Sand, coarse to fine, brown	5.5	43
Sand, quartz, fine to coarse, silty, brown	5	48
Pliocene (?) series		
Sand, coarse, silty, orange-brown; gravel; pebbles	15	63
Sand, medium to coarse, silty, orange-brown; gravel and pebbles	10	73
Sand, fine to coarse, silty, orange-brown; gravel and pebbles	10	83
Sand, medium to coarse, silty, light-brown; granules; some gravel	20	103
Mg53-8 (Alt. 20.5 ft.) Coskery		
Recent series		
Top soil; sand, medium, dark-brown; roots	1	1
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, silty, red-brown	4.5	5.5
Sand, medium, silty, brown	1.7	7.2
Silt, gray; sand, medium, brown	0.8	8
Sand, medium, silty, orange-brown	2	10
Silt, orange-brown and gray; some root fibres	2	12
Clay, stiff, gray	0.5	12.5
Silt, orange-brown	0.5	13
Sand, medium, silty, rust-brown to orange-brown	0.5	13.5
Sand, medium to very coarse, brown; gravel; water-bearing	2	15.5
Beaverdam sand		
Sand, medium to coarse, silty, gray; some gravel	1.3	16.8
Sand, fine, silty, gray	1.7	18.5
Mg53-9 (Alt. 20 ft.) Coskery		
Recent series		
Top soil, sandy, dark-brown	0.3	0.3
Pleistocene series		
Sand, fine to coarse, silty, red-brown to brown	2.7	3

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Mh41-1 (Alt. 5 ft.) White		
Recent series		
Beach sand, dry	2	2
Sand; gravel	2	4
Mud, sandy, gravelly, with decayed vegetation	16	20
Pleistocene series		
Parsonsburg sand		
Sand, grayish-white; gravel; silt	16	36
Pamlico formation		
Sand, very fine, white; silt; some clay balls; brackish water	14	50
Beaverdam (?) sand		
Sand, very fine, buff and white	28	78
Sand, buff, dirty	60	138
Miocene (?) series		
Cohansey sand		
Sand, medium to very coarse, buff, water-bearing (brackish)	12	150
Miocene series		
St. Marys formation		
Shale, sandy, dark-gray	16	168
Clay, gray, tough	62	230
Clay, sandy, gray; shell	15	245
Rock	1.5	246.5
Clay, gray; shell	12.5	259
Clay, light-lavender; shell	11	270
Choptank (?) formation		
Clay, sandy, gray; shell	20	290
Shale, sandy (fine), hard; shell	40	330
Shale, sandy, soft	2	332
Rock	1	333
Clay, gray; shell	2	335
Nc15-1 (Alt. 55 ft.) Ennis		
Pleistocene series		
Walston silt		
Clay	3	3
Sand, white	26	29
Beaverdam sand		
Sand, coarse, yellow	9	38
Nc25-1 (Alt. 50 ft.) Shannahan		
Pleistocene-Pliocene (?) series		
Missing	71	71
Miocene series		
Clay, black; shell	55	126
Nc25-3 (Alt. 45 ft.) Ennis		
Pleistocene series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Nc25-3 (continued)		
Walston silt		
Clay, blue and yellow	20	20
Sand, yellow; streaks of clay, blue	20	40
Beaverdam sand		
Sand, yellow; gravel	12	52
Nc25-8 (Alt. 45 ft.) Ennis		
Pleistocene series		
Walston silt		
Sand and clay	20	20
Beaverdam sand		
Sand and gravel	34	54
Nc55-1 (Alt. 40 ft.) Wilkens and Coskery		
Recent series		
Fill	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium, red-brown; some gravel	2	3
Sand, fine to medium, tan to red-brown	3	6
Sand, medium, reddish-brown; small clay balls	2	8
Sand, medium, clayey, reddish-brown	1	9
Sand, medium to coarse, silty, buff; small gravel; water-bearing	2	11
Beaverdam sand		
Sand, medium to coarse, clayey, brown	1	12
Sand, fine to coarse, silty, tan to buff	2	14
Sand, medium to coarse, silty, dark-brown	5	19
Sand, clayey, light-brown, soft	1	20
Silt, sandy, brown	4	24
Sand, medium, clayey, brown; some gravel	5	29
Sand, medium to coarse, clayey, brown; gravel	6	35
Pliocene(?) series		
Silt, sandy, purple-red	5	40
Sand, coarse to granule, orange-brown; gravel	14	54
Sand, fine to coarse, light-gray, orange-brown	10	64
Nd41-1 (Alt. 45 ft.) White		
Recent series		
Top soil and clay	3	3
Pleistocene series		
Parsonsburg sand		
Sand and clay	11	14
Sand and gravel	8	22
Walston silt		
Clay	10	32
Beaverdam sand		
Sand, clayey; gravel	3	35

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Nd41-1 (continued)		
Sand, orange, water-bearing	3	38
Silt, sand, fine; gravel	12	50
Sand, fine, and silt in layers	15	65
Clay, sandy	12	77
Sand, white; gravel	2	79
Pliocene (?) series		
Brandywine formation		
Sand, medium to coarse; gravel, large; water-bearing	12	91
Ne14-1 (Alt. 50 ft.) Wilkens and Coskery		
Recent series		
Fill	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium, gray-black	1.5	2.5
Sand and clay, gray to yellow	3.5	6
Walston silt		
Clay, sandy, light gray	8	14
Sand, fine to medium, clayey, light-buff; black particles	4	18
Sand, medium to coarse, silty, buff to reddish-brown	3	21
Clay, sandy (medium), orange-brown	3	24
Sand, medium to coarse, silty, clayey, buff to orange-brown	7	31
Beaverdam sand		
Sand, medium to coarse, with granules, silty, buff to orange-brown	6	37
Sand, medium to coarse with large granules, silty, buff; clay, white	4	41
Sand, coarse, with granules, silty, orange-brown, water-bearing	8	49
Sand, fine to medium, silty, dark orange-brown	5	54
Sand, medium to coarse, with granules, silty, buff with orange-red streaks	10	64
Sand, fine to medium, silty, clayey, white to buff	10	74
Sand, medium to coarse, silty, buff to orange-brown	7	81
Pliocene (?) series		
Clay, sandy, red-orange-brown	3	84
Sand, fine to medium, silty, brown	5	89
Ne25-1 (Alt. 51 ft.) White		
Recent series		
Cinder fill	1	1
Pleistocene series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ne25-1 (continued)		
Walston silt		
Sand, clayey, cream-colored	24	25
Sand, clayey, grayish-white	14	39
Pliocene (?) series		
Sand, fine, medium, and coarse, orange-red, dirty, water-bearing	4	43
Silt, orange, yellow; sand; gravel	16	59
Sand, fine to very coarse, mostly very coarse, silty, orange; gravel, large; water-bearing	8	67
Clay, yellow	-	67
Ne34-1 (Alt. 48 ft.) Haigler		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Clay, sandy, red and gray	5	6
Sand, medium, clayey, red	3	9
Beaverdam sand		
Sand, coarse, gray	-	9
Missing	4.8	13.8
Ne34-2 (Alt. 49 ft.) Wilkens		
Recent series		
Fill	1	1
Pleistocene series		
Parsonsburg sand		
Sand, fine, silty, brown to white	5	6
Sand, medium, silty, yellow-brown	3	9
Sand, medium to coarse, orange-brown, loose	6	15
Walston silt		
Sand, fine to coarse, silty, grayish-tan to white	7	22
Beaverdam sand		
Sand, medium to coarse, brown to greenish-gray	7	29
Sand, fine to medium, silty, grayish-brown	17	46
Pliocene (?) series		
Sand, medium to coarse, rusty orange-brown; gravel	12	58
Sand, medium, coarse, and granules, orange-brown	15	73
Sand, fine to medium, silty, orange-brown	20	93
Ne54-1 (Alt. 45 ft.) Wilkens		
Recent series		
Fill	1	1
Pleistocene series		
Parsonsburg sand		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ne54-1 (continued)		
Sand, fine, clayey, tan	3	4
Sand, fine, silty, tan and gray	2	6
Walston silt		
Sand, very silty, gray; a little gravel	3	9
Beaverdam sand		
Sand, medium, cream-colored, water-bearing	8	17
Sand, cream-colored and orange-brown	5	22
Sand, medium, orange-brown; layers of gravel	14	36
Sand, medium, tan to brown	13	49
Sand, greenish-gray; gravel; clay, gray	13	62
Sand, very silty, white; gravel	2	64
Pliocene (?) series		
Sand, medium to coarse, orange-brown	4	68
Gravel	-	68
Sand, medium, coarse, and granules, orange-brown	26	94
Ng12-1 (Alt. 10 ft.) White		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Parsonsburg sand		
Clay, sandy, brown	4.5	5
Water table	-	5
Sand, fine, white	9	14
Pamlico (?) formation		
Sand, clayey, white; gravel	24	38
Beaverdam sand		
Sand and gravel, water-bearing	24	62
Ng24-2 (Alt. 17 ft.) White		
Recent series		
Top soil	0.7	0.7
Pleistocene series		
Parsonsburg sand		
Clay, sandy, yellow	2.3	3
Sand, yellow	8	11
Clay, sandy, yellow	7	18
Clay, red	6	24
Pamlico formation		
Clay, light-gray, dark-gray, brown	11	35
Clay, sandy, gray-brown	10	45
Iron ore	-	45
Clay, sandy, gray-brown	5	50
Clay, sandy, yellow; sand, clayey	18	68
Pliocene (?) series		
Sand, coarse to very coarse, clayey; gravel	13	81

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ng24-2 (continued)		
Sand, fine to coarse, brownish-red, dirty	5	86
Sand, clayey; gravel	8	94
Clay, white and red; sand; gravel	11	105
Miocene series		
St. Marys formation		
Sand and clay	7	112
Sand, very fine, clayey; silt	18	130
Sand, very fine; silt	-	130
Ng35-1 (Alt. 12 ft.) White		
Recent series		
Top soil	0.5	0.5
Clay, sandy, dry	3	3.5
Pleistocene series		
Parsonsburg sand		
Sand, very fine, white	1	4.5
Sand, clayey	18.5	23
Pamlico formation		
Sand, fine; silt	7	30
Clay, slightly sandy, soft	8	38
Beaverdam(?) sand		
Sand, clayey, silty, yellow; gravel	12	50
Sand, clayey; silt; some gravel	13	63
Miocene(?) series		
Cohansey sand		
Sand, fine to medium	18	81
Miocene series		
St. Marys(?) formation		
Sand, very fine; silt	41	122
Ng53-1 (Alt. 32 ft.) White		
Missing	10	10
Pleistocene series		
Pamlico formation		
Clay, blue	14	24
Sand, very fine, cemented	4	28
Pliocene(?) series		
Sand, very fine to coarse, reddish-brown	15	43
Sand, fine, white; gravel, coarse	2	45
Sand, very fine, brown	3	48
Miocene(?) series		
Cohansey sand		
Manokin aquifer		
Sand, white; gravel	6	54
Sand, very fine, white	-	54
Ng55-1 (Alt. 28 ft.) White		
Recent series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ng55-1 (continued)		
Fill and top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, fine, light-yellow	3	4
Clay	1	5
Sand, reddish-yellow	4	9
Pamlico formation		
Clay; clay, sandy	22	31
Sand, fine, cemented	3	34
Clay, sandy, soft	7	41
Beaverdam sand		
Sand, yellow, dirty	19	60
Sand, silty, white; gravel	7	67
Sand and gravel	8	75
Nh42-1 (Alt. 24 ft.) White		
Recent series		
Top soil	0.7	0.7
Clay	1.3	2
Pleistocene series		
Parsonsburg sand		
Sand, fine to coarse, clayey	2	4
Sand, fine, white; sand, clayey, white	16	20
Sand, fine to medium, white	4	24
Pamlico formation		
Clay, sandy, white, stiff	6	30
Beaverdam sand		
Sand, very fine, silty, white	20	50
Sand, very fine to coarse, silty, white; gravel	7	57
Pliocene (?) series		
Sand, very fine to coarse, clayey, yellow-orange; gravel	5	62
Miocene (?) series		
Cohansey sand		
Manokin aquifer		
Sand, very fine; silt; pebbles; gravel	16	78
Sand, medium to coarse; gravel; water-bearing	9	87
Nh52-1 (Alt. 21 ft.) White		
Recent series		
Top soil	0.5	0.5
Clay and sand	4.5	5
Pleistocene series		
Parsonsburg sand		
Sand, dry	9	14
Sand, very fine, water-filled	12	26
Pamlico formation		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Nh52-1 (continued)		
Clay, light-gray	4	30
Clay, white	2	32
Beaverdam sand		
Sand, fine, white; pebbles	2	34
Sand, fine to coarse, white, water-bearing	5	39
Sand, fine	17	56
Pliocene (?) series		
Clay	2	58
Sand, fine to coarse	22	80
Miocene (?) series		
Cohansey sand		
Manokin aquifer		
Sand, fine, white	26	106
Sand, fine to medium, clean	7	113
Sand, coarse; gravel	3	116
Sand, fine; silt	26	142
Ni31-4 (Alt. 8 ft.) Del. Geol. Survey (Vlangas?)		
Recent series		
Sand, medium to coarse, white	4	4
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, subangular to subrounded, light-brown; clay, gray and brown	5	9
Missing	5	14
Sand, medium to coarse, clayey, blue-gray; bands of clay, blue	5	19
Sand, fine to coarse, silty, poorly sorted, blue-gray	5	24
Sand, fine to coarse, poorly sorted, blue-gray; clay	10	34
Pamlico (?) formation		
Missing	20	54
Beaverdam sand		
Sand, fine to coarse, mostly coarse, gray	15	69
Sand, fine to coarse, subangular to subrounded, gray	5	74
Missing	5	79
Sand, fine to coarse, gray; grit; gravel	5	84
Ni34-1 (Alt. 5 ft.) Woolman, 1899, p. 85-86; paleontologic names may be outmoded.		
Pleistocene series		
Pamlico formation		
Sand and sandy clay, with mollusc shell fragments	40	40
Gravel, medium to coarse, gray with shells *Solen americanus* Gould		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ni34-1 (continued)		
Mulinea lateralis Say		
Nassa trivittata Say		
Anomia sp. ?	10	50
Beaverdam sand		
Gravel, orange-yellow with shells, as above, plus		
Tellina tenera Say	10	60
Clay, orange-yellow	10	70
Gravel, yellowish-white, with shells		
Nassa trivittata Say		
Natica duplicata Say	10	80
Pliocene (?) series		
Clay, sandy, dark		
(lignite at 100 ft.)		
(comminuted shells at 109 ft.)	45	125
Miocene (?) series		
Cohansey sand		
Sand, fine, gray	24	149
Sand, coarse, brown	11	160
Sand, clayey, greenish	5	165
Clay, brownish	20	185
Sand, coarse, brown	15	200
Sand, gray	94	294
(lignite at 268 ft.)		
(clay streaks at 277 ft.)		
Miocene series		
St. Marys formation		
Clay (not diatomaceous)	91	385
Choptank (?) formation		
Rock	2	387
Sand, clayey and clay, sand	6	393
Rock	3	396
(water at 400 ft.)		
Sand, clayey, with shells	6	402
Rock	5	407
Calvert formation		
Clay, diatomaceous, sometimes sandy	161	568
No record, probably clay	27	595
Clay, probably diatomaceous	37	632
(sand seam with water at 625 ft.)		
Sand, diatomaceous, greenish, with broken shells and Echinus spines	22	654
Sand, diatomaceous, brown	4	658
Sand, gray and clay	72	730
Rock	1	731
No record (water-bearing sand at 750 ft.)	29	760
Sand, gray, Diatoms	7	767
No record	5	772

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ni34-1 (continued)		
Rock	1	773
Clay, lead-colored	16	789
Rock	1	790
Clay, sand, dark-green	60	850
Clay, light-green	20	870
Clay, sandy(?)	13	883
Rock	1	884
Clay	7	891
Sand, with water	59	950
Clay, diatomaceous	50	1,000
Marl, greensand and clay, Diatoms and Coccoliths	20	1,020
Eocene series		
Piney Point formation		
Rock	1	1,021
Sand and small shells	43	1,064
Sand, white, water-bearing	16	1,080
Clay, diatomaceous(?)	-	1,080+
Ni35-1 (Alt. 7 ft.) Woolman, 1894, p. 404		
Pleistocene series		
Sand, beach	90	90
Pliocene(?) series		
Gravel, medium-coarse, yellow	10	100
Miocene(?) series		
Cohansey sand		
Sand and sandy clays, gray	200	300
At 200 ft. a "cedar branch" was found. A little lower fragments of wood were found.		
Miocene series		
St. Marys formation		
Clay, blue, tenaceous, pebbly	30	330
Clay, blue and sand, alternating	62	392
Choptank(?) formation		
Frederica(?) aquifer		
Sand and water	8	400
Rock	-	400
Ni51-6 (Alt. 20 ft.) Shannahan Art. Well Co.		
Recent series		
Soil, dark	1	1
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, light	17	18
Pamlico formation		
Clay, blue, tough; some small streaks of sand	17	35
Beaverdam sand		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ni51-6 (continued)		
Sand, fine to medium, brown; clay streaks	25	60
Hard	0.2	60.2
Pliocene (?) series		
Brandywine formation		
Sand, coarse, brown; some gravel	24.8	85
Gravel, coarse; sand, coarse, brown	10	95
Sand, medium to coarse, brown; clay streaks about 2 in. thick	10	105
Sand, medium, brown, streaks of clay, white, tough	14	119
Clay, blue; sand streaks	5	124
Gravel	0.2	124.2
Miocene (?) series		
Cohansey sand		
Manokin aquifer		
Sand, fine to medium	38.8	163
Iron ore, hard	0.6	163.6
Lower (?) aquiclude		
Clay, dark-blue	16.4	188
Ni51-9 (Alt. 16.5 ft.) Mitchell		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, light-brown	9	10
Sand, yellow-brown; gravel	6	16
Pamlico formation		
Clay, blue-gray	4	20
Sand and gravel, with streaks of clay, blue-gray	10	30
Beaverdam sand		
Sand, fine, light-gray to brown	20	50
Gravel	10	60
Pliocene (?) series		
Brandywine formation		
Sand, coarse to granule, yellow-brown	30	90
Gravel	20	110
Sand, fine; gravel	10	120
Sand, coarse; gravel	10	130
Sand and gravel	10	140
Sand, medium; gravel	10	150
Miocene (?) series		
Cohansey sand		
Sand, fine to medium	9	159
Clay	1	160
Clay, blue	10	170

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Oc35-1 (Alt. 40 ft.) Wilkens and Coskery		
Recent series		
Fill	1	1
Loam, black and brown	2	3
Pleistocene series		
Parsonsburg sand		
Clay, sandy, friable, gray and yellow-brown	4	7
Sand, clayey, buff	2	9
Beaverdam sand		
Sand, medium to coarse, clayey, yellowish-brown; black particles	5	14
Sand, fine to medium, yellow-brown; gravel	29	43
Pliocene(?) series		
Sand, medium to coarse, gray-brown; gravel	6	49
Miocene series		
St. Marys formation		
Sand, very fine and silt, light-gray, semi-soft	5.5	54.5
Oc35-2 (Alt. 45 ft.) Coskery		
Recent series		
Fill	0.5	0.5
Pleistocene series		
Parsonsburg sand		
Sand, medium, brown	1	1.5
Sand, clayey, red-brown	2.5	4
Silt, sandy, yellow-brown	7	11
Beaverdam sand		
Sand, medium to coarse, silty, tan	7	18
Sand, coarse, silty, yellow-brown; gravel	8	26
Silt, sandy, yellow-brown	3	29
Sand, medium to coarse, silty, yellow-brown; gravel	15	44
Sand, medium to coarse, silty, yellow-brown	10	54
Pliocene(?) series		
Brandywine formation		
Sand, medium to coarse, red	30	84
Oc55-1 (Alt. 30 ft.) Wilkens		
Recent series		
Top soil	2	2
Pleistocene series		
Pamlico formation		
Clay, sandy, gray	6	8
Beaverdam sand		
Sand, medium to very coarse, light-gray; granules	15	23
Sand, medium to very coarse, buff	17	40
Pliocene(?) series		
Brandywine formation		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Oc55-1 (continued)		
Sand, gravelly, orange	14	54
Od23-1 (Alt. 43 ft.) Sun Oil Co. (Electric log available)		
Pleistocene series		
Beaverdam sand		
Sand; gravel	20	20
Sand	25	45
Hard; shells	0.5	45.5
Pliocene (?) series		
Sand; gravel	17.5	63
Miocene (?) series		
Cohansey sand		
Sand	100	163
Sand; shale	20	183
Sand, hard	1	184
Miocene series		
Kirkwood formation		
Shale	23	207
Shale, sandy; shale	17	224
Rock	19	243
Rock; thin streaks sand, soft	26	269
Shale, sandy; shells	88	357
Rock	5	362
Shale, sandy, with hard sand breaks	18	380
Rock	6	386
Shale, sandy, with hard sand breaks	35	421
Shale	4	425
Shale, sandy, with hard breaks	35	460
Rock	5.5	465.5
Shale, sandy; sand, hard	31.5	497
Rock, hard	3	500
Shale, sandy; sand, hard	10	510
Rock	12	522
(Cheswold aquifer ?)		
Sand with hard breaks	18	540
Sand	53	593
Sandstone	3	596
Sand with hard breaks	36	632
Shale, sandy, with shale breaks	30	662
Shale	20	682
Shale, sandy	18	700
Sand	5	705
Sand, hard; shale, sandy	17	722
Shale	16	738
Eocene series		
Sand, hard	22	760

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od23-1 (continued)		
Sand, with breaks of hard sand	42	802
Shale, sandy	218	1020
Shale	20	1040
Hard	80	1120
Paleocene (?) series		
Sand with hard breaks	60	1180
Shale, sandy	60	1240
Shale, sticky	60	1300
Shale, sandy	14	1314
Hard	6	1320
Upper Cretaceous series		
Sand, with hard breaks	28	1348
Shale, sticky	21	1369
Hard	13	1382
Shale, sandy with hard breaks	18	1400
Chalk; shale	119	1419
Shale with hard breaks	36	1455
Sand, hard	10	1465
Shale	58	1523
Shale, sandy, glauconitic (10 ft. core at 1523-1533 and 5 ft. core at 1564-1569)	83	1606
Magothy (?) formation		
Sand	45	1651
Raritan formation		
Shale, sticky	34	1685
Clay, red- and gray-mottled (core)	9	1694
Clay, lignitic, gray (core)	1	1695
Shale	65	1760
Sand, hard	5	1765
Shale	113	1878
Sand	42	1920
Shale	20	1940
Shale with breaks of hard sand; sand with breaks of sandy shale	38	1978
Shale	52	2030
Shale, sandy	10	2040
Shale	45	2085
Shale, sandy, with hard breaks	12	2097
Shale	9	2106
Shale, sandy	41	2147
Shale, sticky	57	2204
Shale, sandy	4	2208
Shale	23	2231
Sand with hard breaks	5	2236
Shale	54	2290
Shale, sticky	10	2300
Shale	17	2317

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od23-1 (continued)		
Shale with hard breaks	9	2326
Shale	17	2343
Shale, sandy, with hard breaks	19	2362
Shale with lime breaks	29	2391
Shale, glauconitic, green (core)	6	2397
Shale	43	2440
Shale, sandy	20	2460
Shale	24	2484
Shale, sandy	14	2498
Sand, hard	3	2501
Shale	6	2507
Sand	13	2520
Shale, sticky	17	2537
Shale, sandy	10	2547
Shale	13	2560
Sand, hard, with breaks of shale, sandy	8	2568
Shale, sticky	32	2600
Od23-2 (Alt. 42 ft.) Cleveland Oil Co.		
Pleistocene, Pliocene (?), and Miocene series		
Sand, yellow; gravel	180	180
Miocene series		
Kirkwood formation		
Shale, sticky, blue	60	240
Hard	4	244
Shale, sandy	16	260
Sand	120	380
Shale, sticky	40	420
Rock (sand?), hard	7	427
Sand	28	455
Rock (sand?), hard	10	465
Shell; sand	56	521
Rock (sand?), hard	9	530
Shale, sandy	50	580
Shale, sticky	10	590
Sand	39	629
Shale, sticky, blue	54	683
Eocene series		
Sand, dark, soft	19	702
Rock, hard	18	720
Shale, sandy; clay, sticky, hard	29	749
Clay, sandy, yellow, hard	31	780
Sand, dark	60	840
Clay, dark yellow, streaked with dark sand	25	865
Shale; gravel	5	870
Clay, sticky, hard	15	885
Sand, soft, dark	85	970
Clay, sticky, hard	23	993

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od23-2 (continued)		
Shale, sandy, dark, with streaks of clay, sticky	102	1095
Paleocene (?) series		
Shale, gray, streaked with lime-shale	135	1230
Clay, sticky, dark, streaked with sand	20	1250
Shale, sticky, dark	73	1323
Upper Cretaceous series		
Shale, sandy, dark, streaked with sand	562	1885
Raritan formation (top may be above this depth)		
Shale, sticky, red, hard, streaked with sand	165	2050
Sand, iron-cemented (core)	2	2052
Sand; shale	58	2110
Shale, sticky, red, hard	60	2170
Sand, streaked with shale	170	2340
Sand	5	2345
Sand, hard; shale, sticky	160	2505
Sand	20	2525
Shale, sticky, hard	42	2567
Sand, hard	30	2597
Shale, sticky	9	2606
Sand	11	2617
Hard (driller said limestone)	2	2619
Sand	6	2625
Shale, sticky, hard	30	2655
Sand	7	2662
Shale, sticky, hard	27	2689
Sand, hard, streaked with shale	142	2831
Shale, sandy	19	2850
Clay, sticky	11	2861
Lime-shell, hard	2	2863
Sand; shale	90	2953
Lime-shell, hard	2	2955
Shale, sticky	15	2970
Sand, hard	14	2984
Missing	8	2992
Sand	4	2996
Shale, sticky, hard	14	3010
Shale, sticky, red (core)	1.5	3011.5
Lime-shell (core)	0.5	3012
Od24-1 (Alt. 36 ft.) Sun Oil Co.		
Pleistocene and Pliocene (?) series		
Sand and gravel	120	120
Miocene (?) series		
Cohansey sand		
Sand with hard breaks	40	160
Shale, sandy	48	208
Sand with hard breaks	15	223
Rock, hard	3	226

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od24-1 (continued)		
Sand with hard breaks	4	230
Rock, hard	3.5	233.5
Sand; shells	8.5	242
Miocene series		
Kirkwood formation		
Shale, sandy, with sand	41	283
Rock, hard	1	284
Shale, sandy; sand	17	301
Rock, hard	2	303
Shale, sandy, and hard breaks	97	400
Shell	23	423
Sand	47	470
Rock, hard; shell	2	472
Sand	8	480
Rock, hard	12.5	492.5
Sand; shell	9.5	502
Rock, hard, with sand streaks	13	515
Rock, hard	4	519
Sand; shale, sandy	44	563
Shale	29	592
Sand, hard, or shell	6	598
Rock and sand, hard	6	604
Rock	6	610
Shale, sandy	92	702
Rock	1	703
Eocene(?) series		
Sand	45	748
Rock	9	757
Sand	133	890
Shale, sandy	140	1030
Hard	1	1031
Shale, sandy	109	1140
Paleocene(?) series		
Sand	50	1190
Shale, sandy	30	1220
Shale, sticky	60	1280
Shale, sandy	57	1337
Upper Cretaceous(?) series		
Rock	4	1341
Shale, sandy	42	1383
Shale	3	1386
Chalk, hard	19	1405
Shale, limey, gray (chalk)	58	1463
Shale	17	1480
Shale, sticky	63	1543
Shale, sandy, dark	20	1563
Sand, black, with hard streaks	20	1583

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od24-1 (continued)		
Magothy (?) formation		
Sand, gray	20	1603
Sand, gray and black	40	1643
Raritan formation		
Shale, sandy	77	1720
Sand and shale, sandy	43	1763
Shale	20	1783
Shale, sandy; shale breaks	40	1823
Shale, sticky, red	17	1840
Shale, sticky	50	1890
Sand, soft, or lime	3	1893
Shale, sticky, red	30	1923
Shale, sandy, red	20	1943
Shale, sandy, with hard breaks	20	1963
Shale, sticky	37	2000
Shale, sticky, yellow and gray	6	2006
Shale, sticky, gray	21	2027
Shale, sticky, gray-green	12	2039
Clay, sandy, gray-white	7	2036
Clay, gray; lignite	5	2051
Shale, sticky, pinkish	4	2055
Shale, sticky, red- and gray-mottled	26	2081
Sand, coarse, shaley, gray-white	5	2086
No core recovery	24	2110
Clay, ashy, gray-white	3	2113
Clay, brown-red and gray	2	2115
Clay, gray	1	2116
Shale, sandy, dark-gray; lignite	6	2122
Clay, lignitic, gray-white	4	2126
Shale, sticky, red- and pink-mottled	14	2140
Shale, sandy, gray- and buff-mottled	6	2146
Shale, sandy, soft	12	2158
Shale, dark-gray; lignite	12	2170
Shale, sticky, gray	12	2182
Clay, ashy, red-gray mottled	17	2199
Sand, shaley, dark-gray	7	2206
Sand, gray, soft	12	2218
Clay, gray- and red-mottled	36	2254
Sand, clayey, gray; lignite	12	2266
Sand, gray; lignite	12	2278
Shale, sandy, gray; lignite	12	2290
Shale, lignitic, black	6	2296
Shale, sticky, gray	6	2302
Clay, ashy, gray-white	4	2306
Sand, clayey, soft	1	2307
Sandstone, tan	6	2313
Shale, gray	1	2314
Clay, sticky, gray	12	2326

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od24-1 (continued)		
Shale, sticky, gray	3	2329
Shale, sticky, gray- and pink-mottled	4	2333
Shale, dark-gray	4	2337
Shale, gray; lignite	2	2339
Shale, sticky, gray- and red-mottled	12	2351
Shale, dark-gray	2	2353
Sandstone	6	2359
Clay, ashy, white	6	2365
Shale, gray- and red-mottled	8	2373
Clay, ashy, white	6	2379
Clay, gray- and red-mottled	14	2393
Shale, black; thin brown streaks	7	2400
Clay, gray-white	5	2405
Shale	10	2415
Sand	2	2417
Clay, gray-white	3	2420
Shale, dark-gray; sand, soft, dry	12	2432
Shale, gray-black; some sand; shell fragments; pyrite	28	2460
Shale, black	12	2472
Lignite, soft	1	2473
Shale, gray	11	2484
Sand, micaceous, gray with hard streaks and shale inclusions	14	2498
Shale	12	2510
Missing	10	2520
Shale, sandy, gray	1	2521
Clay, ashy, gray	4	2525
Clay, red	2	2527
Missing	7	2534
Clay, ashy, gray	3	2537
Clay, red- and gray-mottled	21	2558
Missing	2	2560
Shale, tough	20	2580
Clay, red-gray-mottled	3	2583
Clay, gray-white	2	2585
Missing	7	2592
Clay, brick-red- and gray mottled	23	2615
Shale, sandy, dark-gray	1	2616
Missing	4	2620
Sand, soft, laminated, dark-gray	3	2623
Shale, black	1	2624
Shale, sandy, black	1	2625
Sandstone, hard, cross-bedded	0.5	2625.5
Sand, shaley, laminated, black	1.5	2627
Missing	7	2634
Clay, red and gray mottled	40	2674

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od32-1 (Alt. 25 ft.) Vlangas		
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, brown and gray; grit	2	2
Sand, fine, silty, yellow	0.5	2.5
Clay, sandy, gray-black, tough	3.5	6
Sand, fine, silty, clayey, gray-brown	3	9
Beaverdam sand		
Sand, fine to medium, silty, well-sorted, light-brown	12	21
Gravel; cobbles	1.5	22.5
Sand, fine to medium, silty, light-brown; some grit	6.5	29
Sand, fine to medium, silty, light-brown; grit; lignite	5	34
Sand, mostly fine, some medium to coarse; light-brown; grit; lignite	10	44
Sand, fine to medium, silty, tan	35	79
Pliocene (?) series		
Sand, fine to medium, silty, tan-brown; dark minerals	20	99
Sand, fine, yellow-brown; grit; gravel	15	114
Od32-2 (Alt. 30 ft.) Vlangas		
Recent series		
Top soil; sand, medium, gray	1.5	1.5
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, gray-tan	1.5	3
Sand, fine to medium, silty, light-gray	6	9
Sand, fine to medium, silty, yellow-orange; white and black grains	10	19
Beaverdam sand		
Sand, fine to coarse, light-brown; grit	5	24
Sand, fine to medium, some coarse, tan; grit; lignite	3.5	27.5
Gravel	-	27.5
Sand, fine to medium, some coarse, tan; grit; lignite	1.5	29
Sand, fine to medium, some coarse, silty, tan	2	31
Gravel	-	31
Sand, fine to medium, some coarse, silty, tan; lignite	13	44
Pliocene (?) series		
Sand, fine to medium, some coarse, silty, rust-brown	10	54
Sand, fine to medium, some coarse, silty, light-brown	15	69

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od32-3 (Alt. 28 ft.) Vlangas		
Pleistocene series		
Parsonsburg sand		
Sand, fine, tan-gray; some lignite	2	2
Sand, fine to medium, light-brown; grit; pebbles; black minerals	4.5	6.5
Sand, fine, well-sorted, tan; white specks; black minerals	3	9.5
Sand, fine to medium, silty, clayey, gray, light-brown	3	12.5
Sand, fine to medium, silty, clay, brown and gray; white specks	1.5	14
Beaverdam sand		
Sand, medium, well-sorted, light-tan	2	16
Sand, medium to coarse, light-tan; gravel	8	24
Sand, fine to coarse, mostly medium, tan; grit	25	49
Sand, fine to coarse, mostly coarse, tan	55	104
Od35-2 (Alt. 40 ft.) Sun Oil Co.		
Missing	208	208
Miocene series		
St. Marys formation(?)		
Sand and clay, green	6	214
Sand and pebbles, green-gray	6	220
Silt and sand	12	232
Clay and shell fragments	24	256
Choptank formation(?)		
Shells	12	268
Sand, silty	24	292
Frederica aquifer(?)		
Sand and shell fragments	218	510
Od42-1 (Alt. 28 ft.) Vlangas		
Pleistocene series		
Parsonsburg sand		
Sand, fine, silty, gray-tan; clay	6	6
Sand, fine, silty, clayey; grit	3	9
Beaverdam sand		
Sand, fine to medium, well-sorted, light-tan	10	19
Sand, fine to medium, light-tan	15	34
Sand, fine to medium, some coarse, tan; grit	5	39
Sand, fine to medium, some coarse, brown	10	49
Sand, fine to coarse, light-brown	10	59
Sand, fine to medium, light-brown	30	89
Od42-2 (Alt. 30 ft.) Vlangas		
Recent series		
Top soil, sandy (fine), silty, gray	1.5	1.5
Pleistocene series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Od42-2 (continued)		
Parsonsburg sand		
Sand, fine, silty, tan	1	2.5
Sand, fine to medium, silty, light-brown	2	4.5
Sand, fine to medium, tan; silt	1.5	6
Water table	-	6
Sand, fine to medium, silty, tan	3	9
Sand, fine to medium, well-sorted, tan; thin layer of clay, gritty, gray	5	14
Beaverdam sand		
Sand, fine to medium some coarse, tan; grit	5	19
Sand, fine to medium, silty, light-tan	15	34
Sand, fine to medium, some coarse, light-tan; grit; black minerals	5	39
Sand, fine to medium, buff	11	50
Gravel	-	50
Sand, fine to medium, buff	4	54
Sand, fine to medium, silty, clayey, light-tan	10	64
Sand, fine to medium, tan	10	74
Sand, fine to medium, silty, light-brown	25	99
Oe15-1 (Alt. 47 ft.) Wilkens		
Recent series		
Fill	1	1
Pleistocene series		
Parsonsburg sand		
Sand, silty, tan	3	4
Sand, fine, silty, reddish-brown	1	5
Sand, fine, silty, yellow-brown	4	9
Sand, fine, tan	4	13
Walston silt		
Sand, silty, yellowish-brown, tan and gray; clay	6	19
Beaverdam sand		
Missing	15	34
Sand, medium, yellow-brown	5	39
Miocene(?) series		
Cohansey sand		
Manokin aquifer		
Sand, medium, white	10	49
Sand, medium, gray	45	94
Of31-1 (Alt. 47 ft.) Wilkens		
Recent series		
Fill	1	1
Pleistocene series		
Parsonsburg sand		
Clay, sandy, black	1	2
Clay, sandy, gray	1	3
Sand, brown to light-brown	1	4

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Of31-1 (continued)		
Water table	-	4
Sand, light-brown	3	7
Walston (?) silt		
Clay, gray	2	9
Sand, medium to coarse, silty, gray	15	24
Sand, medium, silty, gray to brown	5	29
Sand, coarse, silty, gray to yellow	10	39
Beaverdam sand		
Sand, fine to medium, brown-yellow; pebbles	5	44
Sand, coarse, brown-orange; pebbles	5	49
Sand, medium to coarse, orange-brown; gravel	10	59
Sand, medium, yellowish-brown; gravel	35	94
Oi25-1 (Alt. 24 ft.) White		
Recent series		
Top soil	0.7	0.7
Clay	3.3	4
Pleistocene series		
Parsonsburg sand		
Sand, coarse, dry	8	12
Sand, very fine to fine; gravel	10	22
Clay, sandy	9	31
Sand, fine; pebbles	12	43
Pamlico formation		
Clay, blue-gray	29	72
Sand, very fine, white	8	80
Sand, fine, black; sand, clayey	5	85
Clay, gray, soft	20	105
Beaverdam sand		
Sand; gravel	13	118
Oi34-1 (Alt. 24 ft.) N. Shannahan		
Pleistocene series		
Missing	43	43
Pamlico formation		
Clay	20	63
Pamlico (?) formation or Beaverdam sand		
Sand, coarse, yellow	10	73
Sand, fine, white	10	83
Beaverdam sand		
Sand, coarse, white and gray	31	114
Clay, sandy, gray	2	116
Sand, fine, yellow	5	121
Sand, coarse, yellow	16	137
Oi34-3 (Alt. 24 ft.) Pentz		
Pleistocene series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Oi34-3 (continued)		
Parsonsburg sand		
Sand, yellow	20	20
Sand, coarse, yellow	12	32
Sand, gray-blue	12	44
Sand, gray	6	50
Pamlico formation		
Clay, blue	12	62
Pamlico formation or Beaverdam sand		
Sand, water-bearing (Test #1: 72-82 ft. 800 gpm)	20	82
Beaverdam sand		
Sand	13	95
Sand, water-bearing (Test #2: 102-112 ft. 1000 gpm)	17	112
Clay, blue	6	118
Sand, fine, yellow	4	122
Sand, yellow, water-bearing (Test #3: 126-136 ft. 500 gpm)	14	136
Miocene (?) series		
Cohansey sand		
Sand, fine, gray-blue; clay	14	150
Oi34-5 (Alt. 25 ft.) White		
Recent series		
Top soil	0.7	0.7
Clay	1.8	2.5
Clay, sandy, red	3	5.5
Pleistocene series		
Parsonsburg sand		
Sand, very fine, white	2.5	8
Sand, fine to medium, yellow	18	26
Sand, very fine, white	4	30
Sand, fine; pebbles	8	38
Sand, fine, gray-black; pebbles	2	40
Pamlico formation		
Clay, gumbo, gray	18	58
Beaverdam sand		
Sand, very fine, white	19	77
Clay, sandy, black	8	85
Clay, gray	2	87
Sand, fine to coarse; gravel	3	90
Clay, sandy, lavender	2	92
Sand, coarse, white; gravel	10	102
Sand, coarse, yellow-red	0.5	102.5
Sand, coarse, white; gravel	1.5	104
Oj41-1 (Alt. 7 ft.) White		
Recent series		
Fill and sand	2.5	2.5

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Oj41-1 (continued)		
Pleistocene series		
Parsonsburg sand		
Sand, water-bearing	33.5	36
Pamlico formation		
Clay, blue-gray	56	92
Beaverdam sand		
Rock; pebbles	1	93
Sand, fine	5	98
Sand, medium, water-bearing	18	116
Oj41-2 (Alt. 7 ft.) White		
Recent series		
Sand, dry	1.5	1.5
Pleistocene series		
Parsonsburg sand		
Sand, water-bearing	28.5	30
Pamlico formation		
Clay, blue-gray	34	64
Sand, fine	4	68
Clay, sandy, blue-gray	28	96
Clay, sandy, gray, soft	4	100
Beaverdam sand		
Sand, fine to coarse; gravel	8	108
Oj41-3 (Alt. 7 ft.) White		
Recent series		
Fill	1	1
Pleistocene series		
Pamlico formation		
Sand, containing brackish water	34	35
Clay, gray; shell	39	74
Clay, sandy, gray; shale	17	91
Beaverdam sand		
Sand, coarse; gravel; water-bearing	3	94
Clay or clay balls, white and yellow	-	94
Sand, fine to coarse, light-amber	7	101
Oj41-4 (Alt. 7 ft.) White		
Pleistocene series		
Parsonsburg sand		
Sand	35	35
Pamlico formation		
Clay, blue-black, hard	45	80
Clay, sandy, blue-black	10	90
Beaverdam sand		
Sand; gravel, pebbly	12	102
Clay, white	-	102+

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Oj41-5 (Alt. 7 ft.) White		
Recent series		
Fill and sand	2	2
Pleistocene series		
Parsonsburg sand		
Sand, containing brackish water; decayed vegetation	27	29
Pamlico formation		
Clay, gray; shells	61	90
Sand; clay, gray	14	104
Beaverdam sand		
Sand, gray	1	105
Sand, orange-red; gravel	7	112
Oj41-25 (Alt. 6 ft.) White		
Recent series		
Fill; sand; marsh	3	3
Pleistocene series		
Parsonsburg sand		
Sand	12	15
Pamlico formation		
Clay, gray	4	19
Sand, containing brackish water	11	30
Clay, dark-gray; shell	43	73
Sand	3	76
Clay, gray	13	89
Beaverdam sand		
Sand, fine to coarse, light-gray; gravel; water-bearing	11	100
Oj41-26 (Alt. 5 ft.) White		
Recent series		
Fill; sand	2.5	2.5
Sand	9.5	12
Sand; marsh	4	16
Pleistocene series		
Parsonsburg sand		
Sand	14	30
Pamlico formation		
Clay, gray	62	92
Missing	10	102
Beaverdam sand		
Sand, fine to coarse, mostly coarse, white; gravel	8	110
Sand, fine to coarse, mostly coarse, yellow; gravel	-	110
Pb13-1 (Alt. 46 ft.) Shannahan Art. Well Co.		
Recent series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pb13-1 (continued)		
Sand	7	7
Pleistocene series		
Sand; gravel	63	70
Pliocene (?) series		
Brandywine formation		
Sand, red	20	90
Miocene series		
St. Marys formation		
Clay, sandy	30	120
Clay, tough	55	175
Choptank formation		
Rock	1	176
Sand; shells	10	186
Rock	1	187
Sand; hard; shell	23	210
Clay	30	240
Calvert formation		
Sand and shell, hard	60	300
Clay, sandy	3	303
Pc13-1 (Alt. 35 ft.) White		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Parsonsburg sand		
Sand, clayey, brown	4.5	5
Sand, clayey, yellow	10	15
Sand, clayey, orange-red	5	20
Sand, fine to coarse, dark-yellow, silt; gravel	9	29
Pamlico (?) formation		
Clay, sandy, yellow	6	35
Beaverdam sand		
Sand, fine to very coarse, dirty	6	41
Pc23-1 (Alt. 20 ft.) Sydnor		
Recent series		
Top soil	2	2
Pleistocene series		
Parsonsburg sand		
Sand, yellow	28	30
Pamlico (?) formation		
Sand, fine, yellow	10	40
Sand, dark-yellow	10	50
Beaverdam sand		
Sand, medium to coarse, dark-yellow	14	64
Sand, medium to coarse, dark-yellow, clay streaks	2	66

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pc23-1 (continued)		
Sand, medium to coarse, yellow	21	87
Miocene series		
St. Marys (?) formation		
Marl, dark	43	130
Pc23-2 (Alt. 25 ft.) N. Shannahan		
Pleistocene series		
Parsonsburg sand		
Sand and clay	14	14
Gravel, large	1	15
Pamlico formation and Beaverdam sand		
Sand	35	50
Pliocene (?) series		
Sand, coarse, brown	19	69
Miocene series		
St. Marys formation		
Rock	1	70
Clay, gray	33	103
Sand, gray and clay	10	113
Pc23-3 (Alt. 31 ft.) Wilkens and N. Shannahan		
Pleistocene series		
Parsonsburg (?) sand		
Silt, sandy, buff	8	8
Sand, coarse, silty, gray; granules	8	16
Gravel, gray, clean	2	18
Sand, medium, silty, gray; gravel	12	30
Pamlico formation		
Silt, white and yellow	10	40
Sand, fine, gray	10	50
Silt, white; some sand, coarse	10	60
Beaverdam (?) sand		
Sand, fine, grayish-white	10	70
Sand, medium, grayish-white	25	95
Pliocene (?) series		
Brandywine formation		
Sand, fine, silty, yellow-brown; sand, coarse; granules	8	103
Pc23-7 (Alt. 32 ft.) N. K. Shannahan		
Pleistocene series		
Parsonsburg sand		
Sand, loose	10	10
Clay, white	8	18
Sand, coarse, white; gravel	17	35
Sand	5	40
Beaverdam sand or Pliocene (?) series		
Sand, coarse, white and brown	18	58

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pc23-7 (continued)		
Sand, medium, white and brown	21	79
Miocene series		
St. Marys formation		
Clay, white	5	84
Clay, brown	-	84
Pc23-10 (Alt. 29 ft.) Wilkens		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, brown	2	3
Sand, brown, clayey, pebbles, stony	5	8
Sand, white, pebbles, clayey, no water	3	11
Sand, white, pebbles, stony, with silt or clay, brown	4	15
Sand, yellow-brown, silty, with pebbles	3	18
Sand, white, medium to coarse, with pebbles	6	24
Pamlico formation		
Sand, fine, silty, white	2	26
Sand, fine, with clay lumps, and streaks, red and gray	2	28
Clay, red, brown and gray	6	34
Clay, red, brown, with sand, fine	2	36
Clay, gray, with black streaks	2	38
Beaverdam sand		
Sand, fine to medium, well-sorted, yellow-brown; water-bearing	10	48
Sand, fine to medium, yellow-brown, water-bearing	10	58
Sand, fine to medium, yellow-brown, water-bearing, with clay streaks and lumps, brown and gray	6	64
(hard pan at 63 ft.)		
Sand, medium to coarse, silty, yellow-brown	2	66
Sand, coarse, yellow-brown, (well-sorted)	10	76
Sand, medium and coarse, yellow-brown (cored 80 to 81 ft. 50% recovery)	8	84
Sand, medium and coarse, tan	2	86
Sand, coarse, yellow-brown, water-bearing; clay, red, at 96 ft.	10	96
Pliocene (?) series		
Clay, blue-gray, stiff, very little fine sand (cored 98 1/2 to 100 ft. 100% recovery)	7	103
Brandywine formation		
Sand, medium to coarse, brown, silty, hard pan fragments, rust, water-bearing, some silt, gray and grayish-white	4	107

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pc23-10 (continued)		
Sand, grayish-white and brown, coarse to medium, (cored)	3	110
Sand, medium to coarse, pale-orange, well-sorted	1	111
Sand, medium to coarse, red or deep-orange, well-sorted, brown at bottom	3	114
Sand, coarse, orange-brown, water-bearing, clay lumps, finely laminated yellow and gray, with fine orange fragments	2	116
Miocene series		
St. Marys formation		
Clay, gray, with fine sand	4	120
Pc23-11 (Alt. 31 ft.) Rasmussen		
Recent series		
Loamy sand	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium-fine, orange-brown	4	5
Gravel, medium to fine, and silt, sandy, gray	1	6
Sand, coarse to fine, gritty, light-gray	2	8
Sand, very fine, silty, gray, compact (called clay by driller)	6	14
Sand, medium to coarse, light-gray, with gravel, fine to medium	6	20
Sand, coarse to medium, gritty	3	23
Sand stone, medium to fine, white, friable, some muscovite, (called hardpan by driller)	2	25
Gravel and grit, angular and sand, coarse, orange	1	26
Gravel, angular, and sand, coarse	2	28
Sand, medium, brown	1	29
Pamlico formation		
Silt, and sand, fine, yellow	4	33
Silt, sand, fine, yellow, clay "pebbles"	4	37
Beaverdam sand		
Gravel and sand with a cobble of white sandstone	2	39
Sand, fine, brown, silty with small pieces of orange-ocher	8	47
Silt, and clay, gray, small black and red specks	2	49
Sand, medium to fine, brown, water-bearing	9	58
Sand, medium to fine, brown, with a stringer of gray silt	10	68
Sand, coarse to fine, brown with a little silt	10	78
Miocene(?) series (or Pliocene(?) series to 107 ft.)		
Manokin(?) aquifer		
Silt, gray, and peat, black	1	79

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pc23-11 (continued)		
Sand, and silt, gray, slightly organic (cored 100% recovery)	0.9	79.9
Peat, and silt	0.1	80
Sand, very fine, brownish with layers of peat and silt, gray, thixotropic	5	85
Silt, gray, sand, brown and peat	3	88
Clay, and silt, blue	0.5	88.5
Sand, medium to fine, brown	5.0	93.5
Clay, silty, blue	0.5	94.0
Sand, medium, orange-brown (cored - 70% recovery)	1.0	95.0
Sand, fine to medium, brown with stringer of clay at 96 ft.	5	100
Sand, fine to medium	5	105
Clay and silt, blue	0.5	105.5
Sand, fine to coarse, brown	1.5	107
Miocene series		
St. Marys formation		
Clay and silt, blue-gray	1	108
Clay, blue and sand, fine, gray	11	119
Sand, medium-fine, gray with black speckles, (cored - 100% recovery)	1	120
Pc24-8 (Alt. 30 ft.) Chandler		
Recent series		
Top soil	2	2
Pleistocene series		
Parsonsburg sand		
Sand, white and gray	8	10
Sand, with clay streaks	10	20
Sand, coarse; boulders	10	30
Pamlico formation		
Sand; clay streaks	10	40
Miocene (?) series (or Pleistocene series to 73 ft.)		
Manokin aquifer (or Beaverdam sand)		
Sand, coarse, gray and white	33	73
Miocene series		
St. Marys formation		
Clay, soft	17	90
Pc33-15 (Alt. 7 ft.) Harris - Harmon		
Pleistocene series		
Top soil and clay	13	13
Pamlico formation		
Clay, black	2	15
Clay, gray	6	21
Sand, gray, muddy	5	26

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pc33-15 (continued)		
Sand, fine, gray	30	56
Pleistocene or Pliocene(?) series		
Sand, coarse, and gravel, fine	9	65
Miocene series		
St. Marys formation		
Sand, yellow and black, muddy, and clay	25	90
Pc33-16 (Alt. 8 ft.) Harris - Harmon		
Recent series		
Clay, soft; some sand	15	15
Pleistocene series		
Parsonsburg sand		
Sand, coarse	5	20
Sand, coarse; gravel	5	25
Beaverdam(?) sand		
Sand, medium	5	30
Sand, coarse	7	37
Sand, coarse; gravel	6	43
Sand, medium	7	50
Sand, coarse	6	56
Pleistocene or Pliocene(?) series		
Sand, coarse, with traces of clay	14	70
Sand, coarse	12	82
Miocene series		
St. Marys formation		
Clay, dark, with some fine sand	12	94
Pc33-17 (Alt. 7 ft.) Harris - Harmon		
Recent and Pleistocene series		
Sand, coarse; some clay	15	15
Pleistocene series		
Sand, fine, and clay	12	27
Sand, coarse	33	60
Sand, medium	3	63
Sand, coarse	7	70
Pleistocene or Miocene series		
Sand, coarse, black	2	72
Sand, fine, black	11	83
Miocene series		
St. Marys formation		
Sand, fine, black; clay	12	95
Pc33-18 (Alt. 7 ft.) Harris - Harmon		
Recent series		
Clay	15	15
Pleistocene series		
Sand, medium	7	22

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pc33-18 (continued)		
Sand, fine	6	28
Sand, coarse	6	34
Sand, medium	12	46
Sand, fine, and clay	9	55
Sand, coarse	14	69
Miocene series		
St. Marys formation		
Sand, coarse, and clay, black	1	70
Clay, black; some sand, fine	6	76
Clay, black	14	90
Pc33-39 (Alt. 8 ft.) Harris - Harmon		
Pleistocene series		
Parsonsburg sand		
Sand, coarse; some clay	25	25
Sand, coarse; gravel	5	30
Sand, medium	18	48
Pamlico formation		
Clay	3	51
Sand, coarse; traces of clay	4	55
Pleistocene or Pliocene (?) series		
Sand, coarse	12	67
Sand, medium	6	73
Sand, coarse	4	77
Miocene series		
Sand, fine, dark; clay	18	95
Pc34-1 (Alt. 13 ft.) Wilkens		
Recent series		
Fill	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium, dark-brown to tan	3	4
Sand, medium to coarse, reddish-brown; with gravel and some silt	2	6
Clay, red-brown and gray, variegated	3	9
Sand, fine, brown	2	11
Silt, variegated; gravel	2	13
Sand and gravel, very clayey	1	14
Pamlico formation		
Clay, red, gray, brown, yellow	5	19
Clay, brown, gray; sand, brown	7	26
Clay, sandy, white	3	29
Beaverdam sand		
Sand, medium, buff	15	44
Clay; gravel	1	45
Sand, medium to coarse; yellow-brown	19	64
Pliocene (?) series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pc34-1 (continued)		
Brandywine formation		
Sand, medium to coarse, red-brown	5	69
Missing	5	74
Sand, medium, light-brown	4	78
Clay, gray to tan	1	79
Sand, clayey, yellow-brown	5	84
Pc45-1 (Alt. 43 ft.) Wilkens		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium, light-yellow-brown	7	8
Sand, coarse, light-brown	3	11
Sand, coarse, clayey, gray; some granules	7	18
Beaverdam sand		
Sand, coarse, yellowish-brown	12	30
Sand, medium to coarse, white and yellow-brown	5	35
Sand, fine to coarse, yellow-brown	7	42
Sand, medium to coarse, clayey, yellow-brown with streaks of white sand and yellowish clay	12	54
Missing	5	59
Sand, medium to coarse, yellow-brown	21	80
Sand, medium to coarse, yellow-brown; clay, yellow	2	82
Sand, medium to coarse, yellow-brown	17	99
Pc55-1 (Alt. 39 ft.) Ennis		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Gravel; sand	44	45
Pamlico formation		
Clay, white and gray	20	65
Miocene(?) series (or Pleistocene series)		
Cohansey sand (or Beaverdam sand)		
Manokin aquifer		
Sand, fine; clay; wood	32	97
Sand, fine	11	108
St. Marys(?) formation		
Sand, fine, and clay	6.3	114.3
Pd11-1 (Alt. 15 ft.) N. K. Shannahan		
Pleistocene series		
Parsonsburg sand		
Sand and gravel	29	29

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pd11-1 (continued)		
Sand	24	53
Pamlico formation		
Clay and wood	2	55
Sand and clay	6	61
Beaverdam sand		
Sand, white	10	71
Pd21-1 (Alt. 30 ft.) White		
Recent series		
Fill and top soil	2	2
Pleistocene series		
Parsonsburg sand		
Sand, fine, yellowish-brown	16	18
Pamlico formation		
Clay, white; sand; gravel	5	23
Sand, clayey, yellow; silt	12	35
Clay, sandy, yellow	10	45
Sand, clayey, yellow; silt	5	50
Clay, sandy, purplish-gray	7	57
Silt, clayey, yellow	8	65
Clay, white	6	71
Beaverdam(?) sand		
Sand, very fine, white; silt	3	74
Pliocene(?) series		
Brandywine formation		
Sand, very fine, orange; silt	7	81
Sand, fine to coarse	6	87
Sand, medium to very coarse; gravel	5	92
Pe15-1 (Alt. 50 ft.) White		
Recent series		
Fill and top soil	0.8	0.8
Pleistocene series		
Walston silt		
Sand, clayey, yellow	1.2	2
Sand, white, hard	1.5	3.5
Sand, fine, white; water	1	4.5
Clay, sandy, white; clay	13.5	18
Beaverdam sand		
Sand, coarse, clayey, white; gravel	12	30
Sand, clayey, buff; gravel	10	40
Miocene(?) series		
Manokin aquifer		
Sand, clayey, light-gray; gravel	15	55
Sand, silty, white; gravel	30	85
Sand, fine to very coarse, white; gravel, small to large; water-bearing	10	95

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pe23-1 (Alt. 48 ft.) Vlangas		
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, brown	3	3
Sand, fine to medium, orange-brown; gravel	1	4
Sand, fine to medium, clayey, grayish-brown	0.2	4.2
Walston silt		
Sand, fine, clayey, cream-gray; silt	1.8	6
Sand, fine, brown; silt	2	8
Water table	-	8
Sand, fine to medium, light-brown	6	14
Sand, fine to medium, silty, tan	10	24
Pliocene (?) series		
Brandywine formation		
Clay, orange-brown to brick-color; sand; grit; gravel	16	40
Gravel	3	43
Sand, fine to medium, silty, clayey; grit; gravel	16	59
Pe23-2 (Alt. 48 ft.) White		
Recent series		
Fill and top soil	1.5	1.5
Pleistocene series		
Walston silt		
Sand and clay	3.5	5
Clay and gravel	2	7
Sand, dry	5	12
Sand, clayey	12	24
Beaverdam (?) sand		
Sand, water-bearing	4	28
Sand, clayey	13	41
Sand, clayey; gravel	5	46
Sand, clayey	10	56
Sand, clayey, white	13	69
Pliocene (?) series		
Brandywine formation		
Sand, yellow, dirty; gravel	7	76
Miocene (?) series		
Cohansey sand		
Manokin aquifer		
Sand, coarse, clean; gravel; water-bearing	8	84
Pe23-5 (Alt. 50 ft.) White		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Walston silt		
Clay, sandy	1	1.5
Sand, clayey	1.5	3

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pe23-5 (continued)		
Sand	14	17
Sand, clayey, silty	23	40
Silt; sand; gravel	10	50
Pliocene (?) series		
Sand, fine to very coarse, silty; gravel, orange; water-bearing	7	57
Sand, and gravel, very silty	22	79
Sand, and gravel, iron-cemented	1	80
Sand, finè to coarse, silty; gravel, small to large, yellow; water-bearing	22	102
Sand, fine to coarse, white; gravel	6	108
Sand, fine to coarse, yellow; gravel	4	112
Miocene series		
Silt, white; clay balls	3	115
Pe32-1 (Alt. 40 ft.) Vlangas		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, brown	4	5
Walston silt		
Clay, sandy, gray	5	10
Silt and sand, fine, gray	4	14
Water table	-	14
Sand, fine to medium, gray	5	19
Beaverdam sand		
Sand, fine to coarse, gray-brown	10	29
Sand, fine to medium, brown; lenses of clay, gray, gravel	5	34
Pliocene (?) series		
Brandywine formation		
Sand, fine to medium, orange-brown	30	64
Sand, fine, clayey, orange; gravel	5	69
Sand, fine to medium, clayey, orange-brown	25	94
Pe32-2 (Alt. 40 ft.) Vlangas		
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, silty, tan	0.5	0.5
Sand, fine to medium, black	1	1.5
Sand, fine to medium, clayey, tan to light-gray	7.5	9
Walston silt		
Sand, fine, buff; silt; clay	5	14
Beaverdam sand		
Sand, fine, some medium, tan; silt; clay lenses	20	34
Pliocene (?) series		
Brandywine formation		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pe32-2 (continued)		
Sand, fine to medium, orange; cobbles	10	44
Sand, fine to medium, rusty to gray; scattered clay lenses	20	64
Sand, fine, clayey, rusty to gray	5	69
Gravel; sand, fine to medium, rusty	10	79
Sand, fine to medium, rusty	5	84
Pe33-1 (Alt. 42 ft.) Vlangas		
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, gray-brown	1	1
Sand, fine to medium, brown to buff; some clay and gravel	5	6
Water table	-	6
Sand, clayey, buff and gray	1	7
Walston silt		
Clay, gray- and orange-streaked, tough; grit	2	9
Sand, fine, clayey, light-brown	3	12
Clay, gray; grit	2	14
Beaverdam sand		
Sand, fine, clayey, orange and gray	5	19
Sand, fine, buff; some clay and gravel	10	29
Pliocene (?) series		
Brandywine formation		
Sand, fine to medium, clayey, orange and buff	16	45
Sand, fine to coarse; silt; clay, orange; some gravel	5	50
Sand, medium, clayey, gray and orange; some gravel	10	60
Sand, fine to very coarse, brown to buff; silt	20	80
Sand, fine to coarse, brown; grit; gravel	13.8	93.8
Clay, red	0.2	94
Pf13-1 (Alt. 48 ft.) Pentz		
Pleistocene series		
Walston silt		
Sand, clayey, white		
Beaverdam sand		
Sand, coarse, white and yellow	34	64
Pf34-1 (Alt. 42 ft.) Coskery		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Parsonsburg formation		
Sand, medium, gray-brown	2.5	3
Sand, medium, clayey, rich, brown to gray	2.5	5.5
Clay, sandy, gray	0.5	6

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pf34-1 (continued)		
Sand, medium to coarse, brown to gray; granules; gravel	4.5	9.5
Sand, fine to medium, silty, clayey, tan	1.5	12
Clay, sandy, gray to orange-brown	0.5	12.5
Beaverdam sand		
Sand, medium to coarse, silty, buff; granules; some pebbles	9.5	22
Sand, medium, silty, buff to brown	14	36
Sand, medium to coarse, brown to orange-brown	7	43
Sand, medium to coarse, silty, yellow-brown	6	49
Sand, medium to coarse, silty, gray-white to orange-brown; granules; pebbles	10	59
Pliocene (?) series		
Brandywine formation		
Sand, medium to coarse, brown to orange-brown; granules; gravel	9	68
Sand, medium to coarse, tan to orange-brown	4	72
Sand, fine to medium, silty, tan and gray-brown; black particles	7	79
Sand, medium to coarse, orange-brown to tan; granules; gravel	6	85
Miocene (?) series		
Cohansey sand		
Lower aquiclude		
Clay, sandy, black	4	89
Pg31-2 (Alt. 33 ft.) Ennis		
Pleistocene series		
Parsonsburg sand		
Sand, white, with streak of yellow	25	25
Sand, coarse, white	33	58
Pamlico (?) formation		
Clay and sand	7	65
Beaverdam sand		
Sand, yellow	21	86
Pg51-1 (Alt. 30 ft.) Haigler		
Recent series		
Top soil	1	1
Pleistocene series		
Parsonsburg sand		
Sand, medium, clayey, tan	3	4
Clay, sandy, reddish-tan	2	6
Sand, fine, clayey, reddish-tan	1	7
Sand, very fine, clayey, tan to gray	0.5	7.5
Clay, gray	1	8.5
Sand, very fine, gray	2.5	11

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pg51-1 (continued)		
Sand, medium, gray, with iron streaks	-	11
Missing	11.2	22.2
Pg53-8 (Alt. 30 ft.) M. Pentz		
Pleistocene series		
Clay and sand, interbedded	77	77
Pliocene (?) series		
Brandywine formation		
Sand	10	87
Pg53-9 (Alt. 30 ft.) M. Pentz		
Recent and Pleistocene series		
Top soil; sand, fine	19	19
Pleistocene series		
Pamlico formation		
Clay, sandy	16	35
Sand, water-bearing	10	45
Clay, white	15	60
Beaverdam sand		
Sand, coarse; gravel; water-bearing	25	85
Ph51-1 (Alt. 8 ft.) Pentz		
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, white	20	20
Beaverdam sand		
Sand, medium and coarse, tan, a few granules	10	30
Sand, medium and coarse, grayish-white	20	50
Pliocene (?) series		
Brandywine formation		
Sand, medium, yellow-brown	21	71
Ph51-2 (Alt. 10 ft.) Lee		
Recent series		
Loam; sand, medium, brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, brown	10	12
Sand, coarse, brown; gravel	61	73
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, fine to medium, gray	17	90
Ph51-3 (Alt. 8 ft.) Lee		
Pleistocene series		
Parsonsburg sand		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ph51-3 (continued)		
Sand, coarse, brown	7	7
Sand, coarse, brown; gravel	45	52
Sand, coarse, brown; some gravel	8	60
Ph51-4 (Alt. 8 ft.) Lee		
Pleistocene series		
Parsonsburg sand		
Sand, coarse, brown	9	9
Sand, coarse, brown; gravel	45	54
Sand, coarse, brown	6	60
Ph51-5 (Alt. 8 ft.) Lee		
Recent and Pleistocene series		
Loam; sand, medium, brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, brown	7	9
Sand, coarse, brown; some clay; traces of gravel	9	18
Sand, coarse, white and brown; traces of gravel	14	32
Sand, coarse, gray; traces of gravel	20	52
Pliocene (?) series		
Brandywine formation		
Sand, coarse, brown; gravel	17	69
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, coarse, gray; gravel	11	80
Sand, fine, silty, gray	3	83
Sand, fine, gray	7	90
Ph51-6 (Alt. 8 ft.) United Engrs. & Constructors		
Recent series		
Loam; sand, medium, brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, brown	10	12
Sand, coarse, brown; gravel	35	47
Sand, coarse, brown; traces of gravel	26	73
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, fine to medium, gray	17	90
Ph51-7 (Alt. 8 ft.) United Engrs. & Constructors		
Pleistocene series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ph51-7 (continued)		
Sand, coarse, brown	7	7
Sand, coarse, brown; gravel	45	52
Sand, coarse, brown; traces of gravel	8	60
Ph51-8 (Alt. 8 ft.) United Engrs. & Constructors		
Pleistocene series		
Parsonsburg sand		
Sand, coarse, brown	9	9
Sand, coarse, brown; traces of gravel	12	21
Sand, coarse, brown; gravel	33	54
Sand, coarse, brown	6	60
Ph51-9 (Alt. 8 ft.) United Engrs. & Constructors		
Recent series		
Loam; sand, medium, brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, brown	7	9
Sand, coarse, brown; some clay; traces of gravel	9	18
Sand, coarse, brown and white; traces of gravel	14	32
Sand, coarse, gray; traces of gravel	20	52
Sand, coarse, brown; gravel	23	75
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, coarse, gray; gravel	5	80
Sand, fine, silty, gray	3	83
Sand, fine, gray	7	90
Ph51-10 (Alt. 7.5 ft.) United Engrs. & Constructors		
Recent series		
Loam; sand, fine, brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, coarse, brown; gravel	25	27
Sand, coarse, brown; traces of gravel	41	68
Sand, coarse, brown and gray; gravel; some clay	9	77
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Silt, brownish-gray, with some fine sand	7	84
Sand, fine, gray; traces of silt	4	88
Sand, medium, gray	2	90
Ph51-11 (Alt. 2.5 ft.) United Engrs. & Constructors		
Pleistocene series		
Parsonsburg sand		
Sand, coarse, brown; traces of gravel	13	13

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ph51-11 (continued)		
Sand, fine to medium, gray	9	22
Sand, coarse, brown; gravel; some clay	7	29
Sand, coarse, brown; traces of gravel	19	48
Sand, coarse, gray; traces of gravel	21	69
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Silt, brownish-gray, with some fine sand	8	77
Sand, silty, brownish-gray	6	83
Sand, fine, gray	7	90
Ph51-12 (Alt. 2.5 ft.) United Engrs. & Constructors		
Pleistocene series		
Parsonsburg sand		
Sand, fine to medium, brown	2	2
Sand, medium, gray	6	8
Sand, fine, gray	4	12
Sand, coarse, gray and brown; gravel	10	22
Sand, coarse, brown; gravel	26	48
Beaverdam (?) sand		
Sand, fine, white	12	60
Ph51-13 (Alt. 7 ft.) United Engrs. & Constructors		
Pleistocene series		
Parsonsburg sand		
Sand, fine, medium	9	9
Sand, medium to coarse, brown and gray; gravel	56	65
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, medium, gray; gravel	10	75
Sand, fine, gray; some small gravel	15	90
Ph51-14 (Alt. 7.8 ft.) United Engrs. & Constructors		
Pleistocene series		
Parsonsburg sand		
Sand, fine, brown	4	4
Sand, medium to coarse, brown and gray; gravel	58	62
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, medium gray; gravel	12	74
Sand, silty, gray	18	92
Lower aquiclude		
Sand, fine gray	17	109
Sand, silty, gray	8	117
Sand, fine, gray	6	123

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Ph51-15 (Alt. 8.5 ft.) United Engrs. & Constructors		
Pleistocene series		
Parsonsburg sand		
Sand, fine, brown	3.5	3.5
Sand, medium to coarse, brown and gray; gravel	64	67.5
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, medium, gray; seams of silt; gravel	6	73.5
Sand, fine, silty, gray	15	88.5
Sand, fine, gray	1	89.5
Ph51-16 (Alt. 6.5 ft.) United Engrs. & Constructors		
Recent series		
Loam; sand, fine, brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, brown	6	8
Sand, coarse, brown; traces of gravel	13	21
Sand, coarse, brown; gravel	32	53
Sand, coarse, brown	7	60
Ph51-17 (Alt. 9 ft.) United Engrs. & Constructors		
Recent series		
Loam; sand, coarse, brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium to coarse, brown	5	7
Sand, coarse, brown; traces of gravel	10	17
Sand, medium to coarse, brown; traces of clay	6	23
Sand, coarse, brown	4	27
Sand, coarse, brown; gravel	33	60
Ph51-18 (Alt. 9 ft.) United Engrs. & Constructors		
Recent series		
Loam; sand, coarse, brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium, brown	6	8
Sand, coarse, brown	9	17
Sand, coarse, brown; gravel	43	60
Pj31-1 (Alt. 5 ft.) White		
Recent series		
Fill; sand, dry	2	2
Sand, water-bearing	6	8
Pleistocene series		
Parsonsburg sand		
Sand, marshy formation	9	17

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pj31-1 (continued)		
Sand, muddy, white	64	81
Sand, yellow; gravel	8	89
Pamlico formation		
Clay; sand; clay, sandy	16	105
Beaverdam (?) sand		
Silt; sand, fine; gravel, small	35	140
Sand, and gravel, muddy, dark-gray	12	152
Miocene (?) series		
Cohansey sand		
Lower aquiclude		
Clay, dark-gray; clay, sandy; marl	35	187
Manokin aquifer		
Sand, very fine to fine, silty, gray	15	202
Sand, fine, silty, gray	10	212
Miocene series		
St. Marys formation		
Silt, gray; clay balls	8	220
Silt, gray; sand, very fine	30	250
Silt, brown; sand, very fine; clay, brown	14	264
Choptank (?) formation		
Sand, very fine, gray; silt	96	360
Calvert (?) formation		
Silt; clay; sand, very fine, silty, layered; shell in layers	143	503
Hard layer	2	505
Hard layers of less than one foot in thickness at 440, 445, and 490 feet.		
Pj31-2 (Alt. 5 ft.) White		
Recent series		
Fill; sand, dry	2	2
Sand, water-bearing	6	8
Pleistocene series		
Parsonsburg sand		
Sand, and marshy formation	9	17
Sand, muddy, white	64	81
Sand, yellow; gravel	8	89
Pamlico formation		
Clay, sandy; clay, yellow, white, and gray	16	105
Beaverdam sand		
Sand, fine, silty; gravel, small, white; water, yellow	35	140
Sand, muddy, dark-gray; gravel	12	152
Pj42-1 (Alt. 6 ft.) Ennis		
Pleistocene series		
Parsonsburg sand		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Pj42-1 (continued)		
Sand and gravel	36	36
Pamlico formation		
Clay, gray	26	62
Sand, coarse; gravel	28	90
Mud; gravel	2	92
Beaverdam sand		
Sand, white and yellow	52	144
Miocene (?) series		
Cohansey sand		
Lower aquiclude		
Clay, green; sand, white and yellow	7	151
Sand, green, yellow, and white; gravel	4	155
Sand, green, yellow, and white	8	163
Sand, green and white; clay	16	179
Clay, gray and green; sand, white and green	5	184
Manokin aquifer		
Sand, gray and white; wood	66	250
Qd21-5 (Alt. 25 ft.) Hatton		
Pleistocene series		
Parsonsburg sand		
Sand, white	4	4
Sand, brown	1	5
Pamlico formation		
Clay, sandy, white	28	33
Clay, sandy, red	11	44
Beaverdam (?) sand		
Clay and gravel	10	54
Pliocene (?) series		
Brandywine formation		
Sand, coarse, red; gravel	22	76
Sand, fine, red	4	80
Miocene series		
Sand, coarse; gravel	18	98
Sand, gray	4	102
Clay, gray, soft	0.6	102.6
Qd21-6 (Alt. 25 ft.) Shannahan Art. Well Co.		
Pleistocene series		
Parsonsburg sand		
Sand, gray	17	17
Pamlico (?) formation		
Sand and gravel with clay streaks	18	35
Beaverdam sand		
Sand, white	5	40
Sand, hard; gravel	16	56
Iron ore	-	56

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Qd21-6 (continued)		
Pleistocene or Pliocene (?) series		
Sand; gravel; iron ore	7	63
Qd31-1 (Alt. 32 ft.) Wilkens		
Recent series		
Top soil, sandy (medium), dark-brown	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium, light-brown	2	4
Pamlico formation		
Clay, sandy, brown and gray	5	9
Sand, medium to coarse, clayey, gray	5	14
Beaverdam sand		
Sand, medium to coarse, clayey, buff	4	18
Sand, coarse, silty, yellow to orange	7	25
Sand, fine to coarse, clayey, yellow; pebbles	4	29
Sand, medium to coarse, silty, yellow to orange; pebbles	19	48
Sand, medium to coarse, white and brown; pebbles	21	69
Pliocene (?) series		
Brandywine formation		
Sand, coarse, silty, brown	25	94
Qd51-1 (Alt. 41 ft.) Wilkens		
Recent series		
Top soil	2	2
Pleistocene series		
Parsonsburg sand		
Sand, medium, brown	3	5
Sand, medium, clayey, light-brown and gray	5	10
Beaverdam sand		
Sand, medium to very coarse, buff	9	19
Sand, medium to coarse, cream-colored	20	39
Sand, medium to coarse, silty, white	25	64
Sand, medium to coarse, clayey, buff	19	83
Qh31-7 (Alt. 25 ft.) Ennis		
Pleistocene series		
Pamlico formation		
Sand; clay; gravel	21	21
Beaverdam sand		
Sand, white and yellow; gravel	7	28
Sand, white; gravel	27	55
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, white; gravel; clay	5	60

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Qh31-7 (continued)		
Sand, coarse, white and yellow	14	74
Qh33-2 (Alt. 22 ft.) White		
Recent series		
Top soil	0.7	0.7
Pleistocene series		
Parsonsburg sand		
Sand, very fine, orange	3.3	4
Sand, fine, white, with brown irony streaks	10	14
Pamlico formation		
Clay, sandy, light-gray	9	23
Sand, clay, buff; some gravel and wood	7	30
Clay, sandy, white; sand, clayey	9	39
Beaverdam sand		
Sand, very fine to very coarse, silty, yellow	4	43
Sand, fine, white; silt, gravel	5	48
Sand, coarse, silty; orange	2	50
Sand, fine, white; silt	3	53
Sand, fine to coarse, silty, white; gravel	10	63
Qh41-1 (Alt. 35 ft.) White		
Recent series		
Fill and top soil	2	2
Pleistocene series		
Parsonsburg sand		
Clay, sandy	2	4
Sand	3	7
Pamlico formation		
Clay, sandy, brown	5	12
Clay, light-gray; clay, sandy; sand, clayey	43	55
Beaverdam sand		
Sand and gravel, dirty, light-gray	15	70
Sand, fine, and silt, light-gray	11	81
Sand, fine to coarse, mostly coarse, white; gravel, fine to coarse	7	88
Sand, fine to medium, silty, white	8	96
Sand, fine to gravel, small	15	111
Miocene series		
Clay, gray	-	111
Qh44-1 (Alt. 22 ft.) Jordan		
Recent series		
Loam, sandy	2.5	2.5
Pleistocene series		
Parsonsburg(?) sand		
Sand, poorly-sorted, yellow	1.5	4
Pamlico formation		
Silt and clay, gray	8.5	12.5

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Qh44-1 (continued)		
Sand, fine to coarse, gray, some silt and wood	9.5	22
Clay, sandy, gray	2	24
Sand, fine, silty, gray	3	27
Clay, woody, gray	6	33
Sand, fine to medium, gray	6	39
Clay, woody, gray-blue, and a little fine sand	10	49
Beaverdam sand		
Gravel and sand, light-gray	4	53
Sand, medium to coarse, some fine gravel, greenish-gray	28.5	81.5
Gravel	1	82.5
Sand, medium, greenish-gray	7.5	90
Gravel	4	94
(Possibly Cohansey sand with gravel follow-down)		
Sand, coarse, and gravel, fine, greenish-gray	28	122
Miocene (?) series		
Cohansey sand		
Upper (?) aquiclude		
Clay, gray	4	126
Pocomoke aquifer		
Sand, coarse to medium	23	149
Lower aquiclude		
Sand, fine, silty, clayey, blue-gray	25	174
Clay, blue and sand	16	190
Sand, fine, gray	18	208
Qh51-1 (Alt. 35 ft.) M. Pentz		
Pleistocene series		
Clay and sand, interbedded	70	70
Sand, coarse, water-bearing	10	80
Qh51-7 (Alt. 35 ft.) White		
Recent series		
Fill; top soil	2	2
Pleistocene series		
Parsonsburg sand		
Sand, clayey, yellow, brown, and white	9	11
Pamlico formation		
Clay, sandy, dark-gray	7	18
Clay, sandy, light-gray	15	33
Beaverdam sand		
Sand, silty, white; gravel, large	27	60
Clay, sandy, light-gray	13	73
Sand, clayey; gravel; silt	7	80
Sand, very fine to very coarse, white; gravel; some silt	20	100

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Qh51-7 (continued)		
Miocene(?) series		
Cohansey sand		
Sand, fine; silt	-	100
Qh51-10 (Alt. 35 ft.) White		
Recent series		
Fill; top soil	0.8	0.8
Pleistocene series		
Parsonsburg sand		
Clay	1.2	2
Sand, white	4	6
Pamlico formation		
Clay, gray	5	11
Clay, sandy (fine, white	17	28
Sand, very fine, clayey, white	5	33
Beaverdam sand		
Sand, fine to medium, silty	23	56
Sand, fine to coarse; gravel; silt	18	74
Sand, fine to coarse; some silt	6	80
Sand, fine to coarse; some gravel; and sandstone, gray-green	15	95
Sand, fine to coarse; some gravel; clay balls	10	105
Qh51-11 (Alt. 35 ft.) White		
Recent series		
Sand, loamy, black	0.2	0.2
Pleistocene series		
Parsonsburg sand		
Sand, iron-cemented, hard	4.8	5
Sand, fine, white	5	10
Pamlico formation		
Clay, gray	4	14
Clay, sandy, gray	8	22
Clay, white	3	25
Sand, clayey, cemented	26	51
Beaverdam sand		
Sand, fine; silt; gravel	34	85
Sand, fine to coarse; gravel	2	87
Miocene(?) series		
Cohansey sand		
Sand, very fine	3	90
Pocomoke aquifer		
Sand, fine to very coarse, water-bearing	32	122
Lower(?) aquiclude		
Clay, gray, hard	-	122
Qh51-12 (Alt. 35 ft.) White		
Recent series		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Qh51-12 (continued)		
Fill; top soil; clay	1.5	1.5
Pleistocene series		
Parsonsburg sand		
Sand	17.5	19
Pamlico formation		
Clay, soft	10	29
Beaverdam sand		
Sand, very fine to coarse; silt; gravel, small to large	59	88
Sand, water-bearing	12	100
Miocene (?) series		
Sand, very fine	-	100
Qi34-1 (Alt. 12 ft.) Ennis		
Pleistocene series		
Clay and sand	20	20
Pleistocene and Pliocene (?) series		
Sand and clay, white and red	43	63
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand	21	84
Qi55-1 (Alt. 5 ft.) White		
Recent series		
Fill; top soil	2	2
Pleistocene series		
Parsonsburg sand		
Clay, sandy, red	2	4
Sand, clayey, yellow	3	7
Sand, fine, white; silt	7	14
Sand, light-gray; silt	6	20
Pamlico formation		
Silt, brown; pyrites	6	26
Clay, blue-gray	26	52
Sand, muddy, gray; gravel	3	55
Sand, dirty, light-gray; silt	17	72
Beaverdam sand		
Sand, coarse, buff; gravel; some silt and clay	7	79
Clay, sandy, light-gray; sand, coarse	8	87
Silt; clay balls, gray; sand; gravel	6	93
Sand, silty, buff	7	100
Sand, fine, white; silt	6	106
Sand, coarse; gravel; some silt	2	108
Miocene (?) series		
Cohansey sand		
Upper aquiclude		
Clay, sandy, light-gray	3	111

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Qi55-1 (continued)		
Pocomoke aquifer		
Sand, fine to coarse, white; gravel; some silt	6	117
Qj22-1 (Alt. 10 ft.) N. K. Shannahan		
Pleistocene series		
Parsonsburg sand		
Sand, brown and small gravel	24	24
Pamlico formation		
Clay, green, and wood	19	43
Beaverdam sand		
Sand, coarse, and gravel, fine	22	65
Miocene(?) series		
Cohansey sand		
Upper aquiclude		
Sand, fine, gray	8	73
Pocomoke aquifer		
Sand, coarse, and gravel, fine	33	106
Sand, medium, gray and white	10	116
Lower aquiclude		
Clay, sandy, gray	47	163
Manokin aquifer		
Sand, medium, gray-white	5	168
Sand, coarse, gray and white	12	180
Clay, green, some sand and shell	8	188
Qj32-1 (Alt. 7 ft.) Ennis		
Recent and Pleistocene series		
Parsonsburg sand		
Sand, white and yellow	10	10
Clay, blue	1	11
Sand, white and yellow	8	19
Pamlico formation		
Sand, green; clay	16	35
Clay, blue; sand, green	12	47
Clay, gray; some sand	9	56
Miocene(?) series		
Cohansey sand		
Upper aquiclude		
Clay, dark	4	60
Pocomoke aquifer		
Sand, fine and coarse, mostly coarse, gray	20	80
Qj32-6 (Alt. 7 ft.) Ennis		
Recent series		
Clay and sand	5	5
Pleistocene series		
Parsonsburg sand		
Sand	19	24

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Qj32-6 (continued)		
Pamlico formation		
Clay, blue	13	37
Beaverdam (?) sand		
Sand	23	60
Qj32-7 (Alt. 5 ft.) N. Shannahan		
Recent and Pleistocene series		
Sand	10	10
Pleistocene series		
Parsonsburg sand		
Sand, coarse	12	22
Pamlico formation		
Marl	8	30
Miocene (?) series		
Cohansey sand		
Upper aquiclude		
Clay, gray, tough	29	59
Pocomoke aquifer		
Sand, medium, gray	12	71
Qj32-9 (Alt. 7 ft.) ?		
Recent and Pleistocene series		
Parsonsburg sand		
Sand, beach	30	30
Pamlico formation		
Clay	23	53
Beaverdam sand		
Sand, fine	7	60
Miocene (?) formation		
Cohansey sand		
Upper aquiclude		
Clay	38	98
Pocomoke aquifer		
Gravel*, gives flow of 50 gpm	38	136
Lower aquiclude		
Clay	5	141
Sand, fine	12	153
Clay, blue	3	156
Sand, clay, and gravel	36	192
Sand and clay	18	210
Manokin aquifer		
Sand, fine	44	254
Gravel*, flint, very coarse	5	259
Gravel*, water-bearing	8	267

(*Use of the term "gravel" by this driller is open to some question. He does not use the term "coarse sand".)

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Rd11-4 (Alt. 45 ft.) Wilkens		
Recent series		
Top soil	1.5	1.5
Pleistocene series		
Parsonsburg sand		
Clay, sandy, brown and gray	1.5	3
Sand, fine, clayey, light-gray to white	5	8
Sand, fine, clayey, buff	4	12
Sand, medium, clayey, buff	9	21
Beaverdam sand		
Sand, medium, some coarse, orange-brown, some pinkish-brown	13	34
Sand, coarse, orange-brown	24	58
Sand, medium, clayey, buff	5	63
Pliocene (?) series		
Brandywine formation		
Sand, medium to coarse, orange-brown	5	68
Sand, coarse to very coarse, rusty-brown	15	83
Rd31-8 (Alt. 57 ft.) Slaughter		
Pleistocene series		
Parsonsburg sand		
Clay, sandy, buff, sticky	10	10
Beaverdam sand		
Sand, coarse, light-brown	10	20
Sand, medium to coarse, buff	20	40
Sand, coarse, buff to light-brown; some granules	10	50
Sand, medium to coarse, buff; some granules	10	60
Sand, medium to coarse, light rust-brown	10	70
Pliocene (?) series		
Sand, medium to coarse, dark iron-brown; granules	15	85
Sand, medium to very coarse, buff-brown and light iron-brown; granules	10	95
Sand, very coarse, buff-brown; granules	10	105
Sand, medium, well-sorted, light-brown	20	125
Sand, medium to very coarse, light-iron-red	4	129
Rg22-1 (Alt. 40 ft.)		
Recent series		
Road fill	2	2
Pleistocene series		
Parsonsburg sand		
Sand, quartz, fine, rounded, poorly sorted, very silty and clayey, brown. (cored 3 to 5 ft.)	3	5
Sand, quartz, fine, subrounded, well-sorted, light-gray; containing some bands of dark-		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Rg22-1 (continued)		
brown clay with organic matter. (cored 7 to 9 ft.)	7	12
Sand, quartz, fine to medium, subrounded to rounded, fairly sorted, light-gray; occasional thin bands of blue clay. (cored 12 to 14 ft.)	2	14
Clay, silty, black; some sand, fine, rounded. (cored 16 to 18 ft.)	4	18
Sand, fine, subrounded to rounded, clayey, fairly sorted, dark-brown; some mafic minerals. (cored 18 1/2 to 21 ft.)	4	22
Sand, quartz, fine, subrounded to rounded, well-sorted, gray; some mafic minerals. (cored 22 to 24 ft.)	4	26
Pamlico formation		
Clay, silty, blue-gray; quartz sand, fine, subrounded to rounded; some muscovite. (cored 28 to 30 ft.)	10	36
Sand, quartz, fine, very silty and clayey, poorly sorted, dark gray-blue; some muscovite and mafic minerals. (cored 42 to 44 ft.)	18	54
Sand, quartz, coarse to medium, rounded to well-rounded, fairly sorted, brown; some granules, chert and muscovite. (cored 54 to 55 ft.)	16	70
Clay, green; sand, quartz, fine to medium, subrounded, fairly sorted; some muscovite and biotite. (cored 73 to 74 ft.)	4 1/2	74 1/2
Beaverdam sand		
Sand, quartz, medium, subrounded to rounded, poorly sorted, blue-green; some granules and pebbles; some muscovite and mafic minerals. (cored 74 to 75 ft.)	7 1/2	82
Sand, quartz, medium, subrounded, poorly sorted, light-gray; some muscovite, biotite, and mafic minerals. (cored 104 to 106 ft.)	36	118
Sand, quartz, medium, subrounded, fairly sorted, gray; some mafic minerals and chert; some very thin bands of clay, green. (cored 124 to 126 ft.)	17	135
Miocene (?) series		
Cohansey sand		
Clay, gray; some fine quartz sand. (cored)	1	136
Pocomoke aquifer		
Sand, quartz, fine to medium, subrounded, fairly sorted, gray; some mafic minerals and muscovite. (cored 136 to 137 ft.)	14	150
Sand, quartz, fine to medium, subrounded to rounded, very silty and clayey, poorly sorted, blue-gray; some muscovite, chlorite, and mafic minerals. (ditch 155 ft.)	10	160

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Rg22-1 (continued)		
Lower aquiclude		
Clay, blue; with a little sand, fine, quartz. (cored 165 to 167 ft.) Some lignite (ditch 163 ft.)	17	177
Sand, fine	8	185
Clay	4	189
Sand, fine	10	199
Clay	3	202
Manokin aquifer		
Sand, quartz, fine to medium, subrounded to rounded, poorly sorted, gray; some muscovite and mafic minerals. (Ditch 227, 248, 267, 277 ft.)	75	277
Rg23-1 (Alt. 39 ft.)		
Recent series		
Sand, quartz, fine to medium, rounded, clayey, fairly sorted, black	2	2
Sand, quartz, fine to medium, rounded, clayey, fairly sorted, light-gray; some muscovite	0.5	2.5
Sand, quartz, fine to medium, rounded, clean, well-sorted, gray; some mafic minerals. (cored 2.5 to 3 ft.)	4.5	7
Silt, brown; some quartz sand, fine, subrounded, well-sorted; much plant matter. (core)	0.5	7.5
Pleistocene series		
Parsonsburg sand		
Sand, quartz, fine, rounded, fairly sorted, light-gray; some mafic minerals and muscovite. (cored 7.5 to 8 ft.)	5.5	13
Pamlico formation		
Clay, gray; some plant matter (cored 13 to 15 ft.)	3	16
Clay, sandy, gray. (cored)	1	17
Sand, quartz, fine to medium, subrounded to rounded, well-sorted, light-gray; some mafic minerals. (cored)	1	18
Sand, quartz, very fine, subrounded to rounded, very silty, and clayey, fairly sorted; some mafic minerals. (cored 21 to 23 ft.)	8	26
Sand, with clay lenses	5	31
Silt, clayey, sandy, fine, blue-gray. (cored)	1	32
Beaverdam sand		
Sand, quartz, fine to medium, rounded, fairly sorted, light-gray; some mafic grains. (cored)	1	33
Sand, quartz, coarse, greenish-white, with thin lenses of clay, blue-gray	5	38
Sand, quartz, coarse to medium, rounded, fairly sorted, greenish-gray; some granules, muscovite,		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Rg23-1 (continued)		
and mafic minerals. (cored 41 to 43 ft.)	12	50
Gravel, and granules, quartz with some chert; matrix of clay, sandy, gray. (cored 51 to 52 ft.)	2	52
Sand, quartz, medium, poorly sorted, greenish-gray; some granules, pebbles, thin clay bands, muscovite and ferromagnesian. (cored 52 to 53 ft.)	10	62
Gravel, granules, quartz with some chert; matrix of gray clay with some fine sand	1	63
Sand, quartz, medium to coarse, subrounded to rounded, poorly sorted, greenish-gray, some mafic minerals. (cored 63 to 64 ft.)	21	84
Gravel, pebble, quartz, chert, and sandstone; some clay, gray. (cored)	2	86
Sand, medium to coarse, quartz, greenish-gray	18	104
Gravel, pebble, quartz, chert, and quartzite. (cored)	2	106
Sand, medium to coarse, quartz, greenish-gray, some pebbles	14	120
Clay	4	124
Sand, quartz, medium, some granules, subrounded, poorly sorted, light-gray; some muscovite, dust and mafic minerals. (cored 124 to 126 ft.)	19	143
Sand, quartz, coarse to medium, some granules, subrounded to rounded, poorly sorted, gray; some chert and muscovite. (cored 145 to 147 ft.)	6	149
Miocene (?) series		
Cohansey sand		
Lower (?) aquiclude		
Sand, quartz, fine, subrounded, well-sorted, gray; some mafic minerals. (cored 165 to 167 ft.)	27	176
Manokin (?) aquifer		
Sand, quartz, medium, subangular to subrounded, poorly sorted, gray; some mafic minerals. (cored 186 to 188 ft.)	12	188
Rg35-1 (Alt. 35 ft.) White		
Recent series		
Fill; top soil	1.5	1.5
Pleistocene series		
Parsonsburg sand		
Sand, brown and yellow	1.5	3
Sand, fine, white, and clay, light-gray, in streaks	4	7
Sand, clayey, brown	6	13
Sand, clayey, gray	5	18
Sand, quick, dark-gray	5	23
Pamlico formation		
Clay, sandy, gray	14	37

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Rg35-1 (continued)		
Silt and sand, clayey, light-gray	7	44
Beaverdam sand		
Sand, fine, white; silt, some gravel	18	62
Sand, fine to coarse; silt	8	70
Sand, silty, yellow; gravel	8	78
Sand, fine to coarse, cream-colored; gravel; pebbles	7	85
Sand, fine, clayey, gray-white	11	96
Sand, fine to very coarse, white; gravel, small to large; some silt; water-bearing	22	118
Miocene (?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, very fine, white; silt; clay balls	5	123
Rh15-1 (Alt. 30 ft.) Ennis ?		
Pleistocene series		
Parsonsburg sand and Pamlico formation		
Clay	6	6
Sand	24	30
Miocene (?) series		
Cohansey sand		
Upper aquiclude		
Sand, blue	30	60
Clay, black	30	90
Clay, black; sand	6	96
Pocomoke aquifer		
Sand, white and gray	29	125
Rh22-1 (Alt. 39 ft.) Wilkens		
Recent series		
Top soil	0.5	0.5
Pleistocene series		
Parsonsburg sand		
Sand, medium, brown	1.5	2
Sand, medium, silty, gray	4	6
Sand, fine, silty, gray-brown; black particles	6.5	12.5
Pamlico formation		
Clay, sandy (fine), gray	1	13.5
Sand, fine to medium, silty, bluish-gray	4	17.5
Clay, sandy, bluish-gray	1.5	19
Sand, medium, clayey, light-gray	5	24
Sand, fine to medium, silty, light-gray	10	34
Silt, sandy (fine), light-gray	1	35
Clay, gray, stiff	7	42
Sand, medium, silty, gray	1.5	43.5
Clay, gravelly, stiff; sand, coarse, gray	3	46.5
Beaverdam sand		

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Rh22-1 (continued)		
Sand, medium to coarse, silty, light-gray	20.5	67
Gravel	2	69
Miocene(?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, medium to coarse, silty, light gray	5	74
Sand, fine to medium, light-gray; white and black particles	5	79
Sand, medium to coarse, light-gray; white and black particles	10	89
Rh32-1 (Alt. 35 ft.) M. Pentz		
Recent series		
Sand and loam	40	40
Pleistocene series		
Sand	10	50
Sand, clayey	35	85
Sand and gravel	10	95
Rj32-5 (Alt. 10 ft.) White		
Recent series		
Fill; sand, dry	2.5	2.5
Sand; decayed vegetation	1.5	4
Recent or Pleistocene series		
Parsonsburg sand		
Sand, medium, water-bearing	6	10
Sand, fine, gray	10	20
Sand, yellow; pyrites	20	40
Pamlico formation		
Sand, gray, containing salty water	4	44
Clay, gray	4	48
Beaverdam sand		
Sand, fine to very coarse; gravel; water-bearing	32	80
Sand and clay balls	4	84
Sand, water-bearing	8	92
Sand, and gravel, water-bearing	10	102
Miocene(?) series		
Cohansey sand		
Pocomoke aquifer		
Sand, very fine, silty, mushy	5	107
Sand, medium to coarse, white; gravel; containing water of poor quality	9	116
Sand, dark-gray; gravel	5	121
Lower aquiclude		
Clay, sandy, light-gray	5	126
Sand, very fine, compacted	23	149
Sand, very fine, dirty	21	170

Table 24. -- Continued

	Thickness (feet)	Depth (feet)
Rj32-5 (continued)		
Clay, sandy	5	175
Clay, gray	12	187
Manokin aquifer		
Sand, very fine, cemented	53	240
Sand, fine, loose	5	245
Sand, fine; bits of wood	2	247
Sand, very fine, cemented	30	277
Sand, very fine, loose; silt	10	287