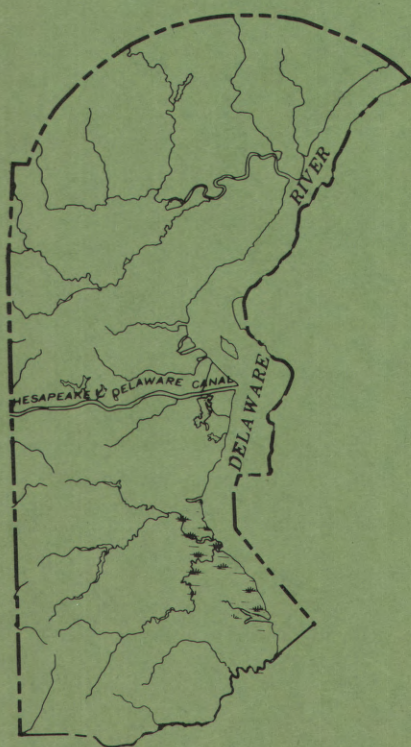


# HYDROLOGIC DATA FOR THE POTOMAC FORMATION IN NEW CASTLE COUNTY, DELAWARE

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U.S. GEOLOGICAL SURVEY  
WATER-RESOURCES INVESTIGATIONS  
OPEN-FILE REPORT 81-916



Prepared in cooperation with the  
U.S. ARMY CORPS OF ENGINEERS  
and the  
DELAWARE DEPARTMENT OF NATURAL RESOURCES  
AND ENVIROMENTAL CONTROL









UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

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IN NEW CASTLE COUNTY, DELAWARE

By M. M. Martin and J. M. Denver

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Dover, Delaware

1982



UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

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Open-File Report

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300 S. New Street  
Dover, Delaware 19901



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# FACTORS FOR CONVERTING INCH-POUND UNITS TO SI METRIC UNITS

<u>Inch-pound unit</u>	<u>Multiply by</u>	<u>Metric unit</u>
cubic foot per second (ft <sup>3</sup> /s)	0.02832	cubic meter per second (m <sup>3</sup> /s)
cubic foot per second per square mile [(ft <sup>3</sup> /s)/mi <sup>2</sup> ]	0.01093	cubic meter per second per square kilometer [(m <sup>3</sup> /s)/km <sup>2</sup> ]
foot (ft)	0.3048	meter (m)
foot per day (ft/d)	0.3048	meter per day (m/d)
foot squared per day (ft <sup>2</sup> /d)	0.0929	meter squared per day (m <sup>2</sup> /d)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
gallon per minute per foot [(gal/min)/ft]	0.207	liter per second per meter [(L/s)/m]
inch (in)	2.54	centimeter (cm)
micromho (μmho)	1.00	microsiemen (μS)
million gallons (Mgal)	3785	cubic meters (m <sup>3</sup> )
million gallons per day (Mgal/d)	3785	cubic meters per day (m <sup>3</sup> /d)
mile (mi)	1.609	kilometer (km)
square mile (mi <sup>2</sup> )	2.590	square kilometer (km <sup>2</sup> )

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## NOTE REGARDING VERTICAL DATUM

The national geodetic vertical datum of 1929, the reference surface to which relief features and altitude data are related, and formerly called mean sea level, is referred to as sea level throughout this report.





# HYDROLOGIC DATA FOR THE POTOMAC FORMATION IN NEW CASTLE COUNTY, DELAWARE

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by Mary M. Martin and Judith M. Denver

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## ABSTRACT

Hydrologic data for the Potomac Formation in New Castle County, Delaware, consist of records of historical ground-water pumpage, water levels, water quality, and surface-water discharge. This report includes records of 405 wells and hydrographs of water levels in 86 wells. Pumpage from 20 well fields is reported. Also included are stream-discharge hydrographs for 6 stations for water years 1979 and 1980 and historical low-flow measurements for 22 stations.

In the analysis of 23 aquifer tests, transmissivity and storage coefficient values for the Potomac Formation range from 454 to 8,480 feet squared per day and  $3.8 \times 10^{-3}$  to  $5.6 \times 10^{-5}$ , respectively. Vertical hydraulic conductivities of the confining bed range from 0.0083 to 3.2 feet per day.

## INTRODUCTION

### Purpose and Scope

The Potomac Formation is a major source of water for the cities and industries of New Castle County, Del. Withdrawal from the Potomac aquifers in 1955 was estimated to be 7.0 Mgal/d (Marine and Rasmussen, 1955, p. 89). A steady increase in Potomac pumpage over the next two decades resulted in pumpage estimated at 10.8 Mgal/d in 1965 and 18.0 Mgal/d in 1975.

Sundstrom and others (1967) documented water-level declines and the development of both regional and local cones of depression in potentiometric surfaces centered about well fields in New Castle County. Resultant changes in ground-water gradients, as well as the proximity of landfills and saltwater estuaries to the recharge areas of the Potomac Formation, have raised concern regarding the future quantity and quality of water from this formation.



The purpose of this report is to present available hydrologic data on the Potomac Formation in New Castle County. Included in this report are a brief summary of the geologic and hydrologic characteristics of the Potomac Formation; records of historical ground-water pumpage, water levels, and water quality; and surface-water discharge hydrographs and low-flow measurements. This report is intended to assist in management decisions on water resources and in developing a digital model of the flow system in the Potomac Formation.

Data were collected from various state agencies, industries, and water companies. Data collected by the U.S. Geological Survey have been identified as such. Typically, each organization collects and reports hydrologic data by their own methods. The lack of standardized collecting and reporting techniques has resulted in several inconsistencies in this report. Wells may be identified by more than one well-numbering system, altitude and water levels are reported to various degrees of accuracy, and pumpage and water-level data are not continuous through time. The well records included in this report were compiled primarily to identify Potomac wells and aid in identifying the location of Potomac sands by use of the wells' screen interval. More detailed well records are maintained by the Delaware Geological Survey and the U.S. Geological Survey in Delaware.

Wells in this report are identified by the number assigned to them by the Delaware Geological Survey (DGS). Wells without an assigned DGS number are identified by a local number. For each well field, wells are listed alpha-numerically by DGS number, then by local number. In each table, wells are listed under their appropriate well-field name. Well-field names are listed alphabetically. Wells shown in figures 3 through 6 were used by Sundstrom and Pickett (1971, p. 14-17) to define New Castle County geology. These wells are not necessarily screened in the Potomac Formation and therefore may not be included in the tabulation of well records.

Additional data from selected areas in nearby Cecil County, Md., are included. Data for selected wells at the Goodrich well field in Cecil County can be found listed under the well-field name in the appropriate sections of this report. Two surface-water stations in Cecil County are identified by their index numbers. These wells and surface-water sites are shown on the appropriate location maps. However, because of the limited documentation of hydrologic data from Maryland in this report, Maryland data are included with data for New Castle County, Del.

#### Acknowledgments

This report is part of a study of the Potomac Formation in New Castle County, Del., by the U.S. Geological Survey in cooperation with the U.S. Army Corps of Engineers and Delaware Department of Natural Resources and Environmental Control. Thanks are given to the staff of the Delaware Geological Survey for their technical assistance in this study.

Special thanks are given the following for their cooperation and assistance in supplying data: B. T. Lakshman, Chief Engineer of the Artesian Water Co.; Amoco Chemicals Corp.; Getty Refining and Marketing Co.; and the Water Department of the city of Newark. Thanks are also given to those municipalities and industries that supplied information through their cooperation with the Delaware Department of Natural Resources and Environmental Control and the Delaware Geological Survey.

## Location and Geographic Setting

The study area shown in figure 1 encompasses that part of the Atlantic Coastal Plain in New Castle County, Del., in which Potomac Formation water is usable. Crystalline rocks of the Appalachian Piedmont form the northern boundary of the area and underlie the Coastal Plain sediments. The southern boundary is a southwest-trending line through the town of Blackbird, which approximates the downdip limit of freshwater in the Potomac Formation proposed by Cushing and others in 1973. Major features are the Delaware River and its estuaries along the eastern boundary and the Chesapeake and Delaware Canal, which bisects the area from east to west.

The Coastal Plain sediments form broad, very gently rolling or flat plains. Relief is slight, as altitudes range from 100 feet above sea level near the Fall Zone, the junction between the Piedmont and Coastal Plain provinces, to sea level along the Delaware River. Precipitation averages 46 inches per year.

## SUMMARY OF NEW CASTLE COUNTY GEOLOGY

The following summary has been adapted from the general descriptions of Delaware and New Castle County geology by Sundstrom, Pickett, and Varrin (1975, p. 10-19) and Sundstrom and Pickett (1971, p. 7-33). More detailed works on the geology of New Castle County are referenced in the bibliography.

Figure 2 is a geologic map of New Castle County. The igneous and metamorphic rocks of the Piedmont are the oldest rocks in the State. These rocks, described by Spoljaric (1972), are probably of late Precambrian or early Paleozoic age. North of the Fall Zone, these crystalline rocks are mantled by a weathered zone. South of the Fall Zone, Coastal Plain sediments overlie the weathered zone, and the Piedmont rocks form the crystalline basement. A structure contour map of the crystalline basement is shown in figure 3. Iron Hill and Chestnut Hill, 2 mi south of Newark, are outliers of crystalline rock surrounded by Coastal Plain sediments.

The Coastal Plain sediments have been divided into the units shown in table 1. These form a wedge of unconsolidated and semiconsolidated sediments that thicken from 0 ft at the Fall Zone to 2,400 ft in southeast New Castle County. A cross section of the Coastal Plain sediments in New Castle County is shown in figure 4.

The oldest of the Coastal Plain sediments in New Castle County form the Potomac Formation. These Early Cretaceous to early Late Cretaceous sediments were deposited by streams on crystalline basement rock. They consist of variegated clay with interbedded sand, which are highly variable in lateral extent. After a period of erosion or nondeposition, the Magothy Formation was deposited in a transitional marine environment during Late Cretaceous time.

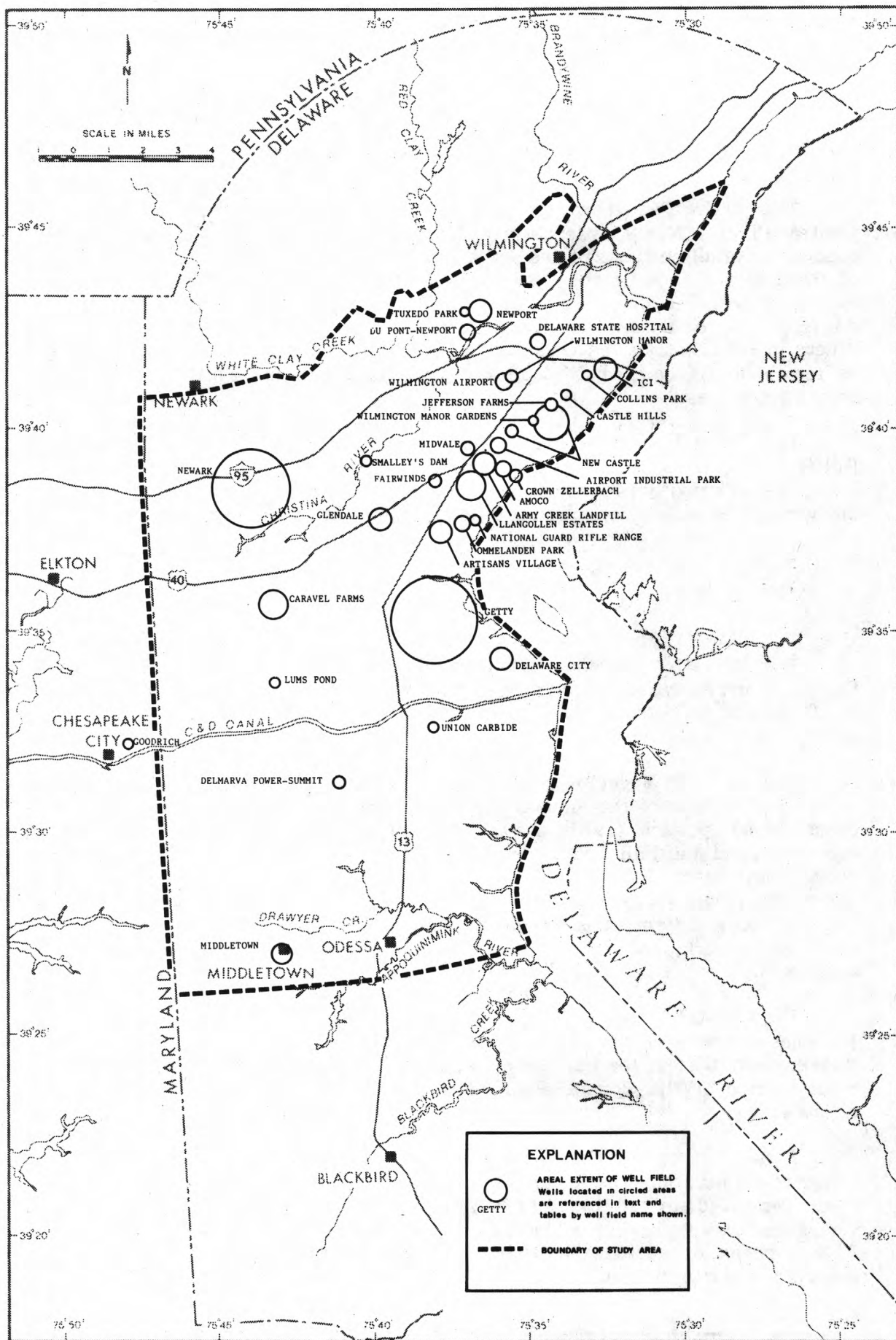


FIGURE 1.--Location of study area and wellfields in the Potomac Formation.



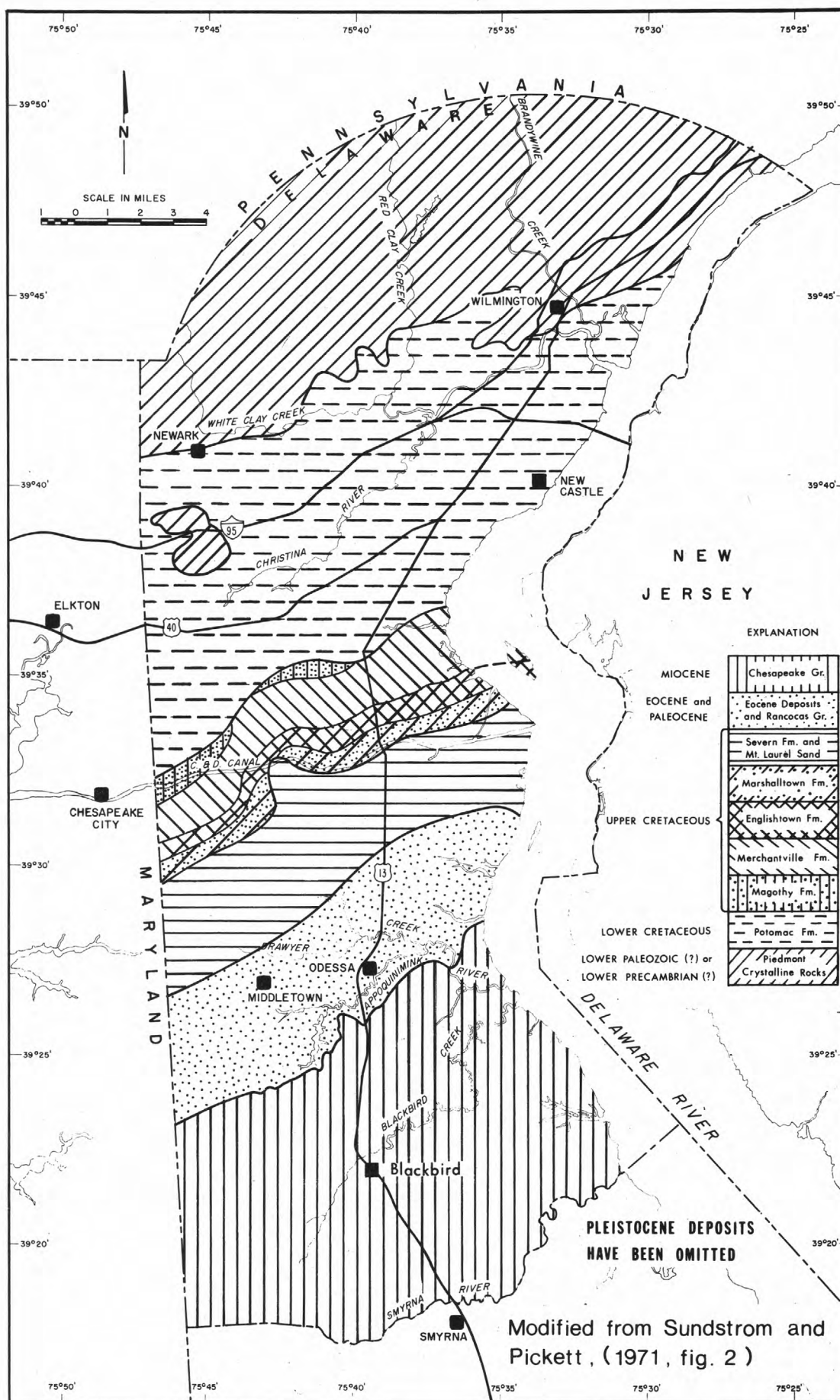


FIGURE 2.--Geology of New Castle County.

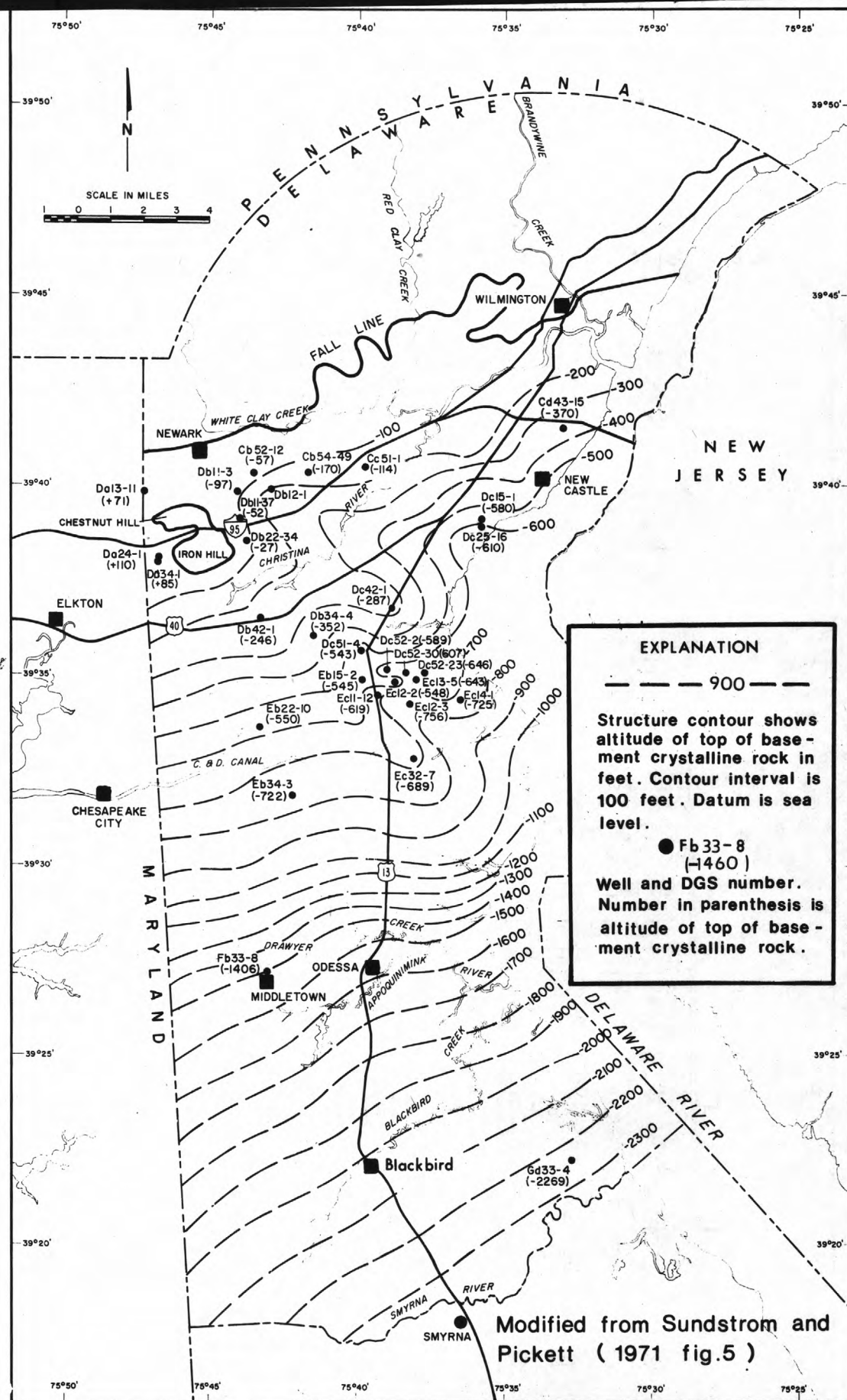



FIGURE 3.--Structure contour map of the top of the basement crystalline rocks.

TABLE 1. Generalized stratigraphic units of the Coastal Plain in Maryland, Delaware, and New Jersey.

System	Series	Stratigraphic Units			
		Maryland		Delaware	New Jersey
Quaternary	Holocene	-----		-----	-----
	Pleistocene	Columbia Group undivided		Columbia Group undivided	Undifferentiated deposits Cape May Formation
Tertiary	Pliocene	Undifferentiated deposits		Undifferentiated deposits	Undifferentiated deposits
	Miocene	Chesapeake Group	Brandywine Formation		Pensauken Formation
			Chesapeake Group undivided	St. Marys Formation	Bridgeton Formation
				Choptank Formation	Cohansey Sand
				Calvert Formation	Kirkwood Formation
	Oligocene				
	Eocene	Piney Point Formation		Piney Point Formation	Piney Point Formation
Nanjemoy Formation		Nanjemoy Formation	Shark River Formation Manasquan Formation		
Paleocene	Aquia Formation Brightseat Formation		Rancocas Group Vincentown Formation Hornerstown Sand	Vincentown Formation Hornerstown Sand	
Cretaceous	Upper Cretaceous	Severn Formation		Severn Formation	Tinton Sand Red Bank Sand Navesink Formation Mount Laurel Sand
		Matawan Formation	Matawan Group	Mount Laurel Sand	Wenonah Formation
				Marshalltown Formation Englishtown Formation Merchantville Formation	Marshalltown Formation Englishtown Formation Woodbury Clay Merchantville Formation
	Lower Cretaceous	Potomac Group	Magothy Formation	Potomac Formation	Magothy Formation  Raritan Formation and Potomac Group undifferentiated

EXPLANATION

-----  
No name assigned

  
Section not present

Modified from Cushing, Owens, and Denny (1979, p. D18), Owens and Denny (1979a, figure 2), and Minard and others, (USGS Bulletin 1435-A, 1977, p. 132).

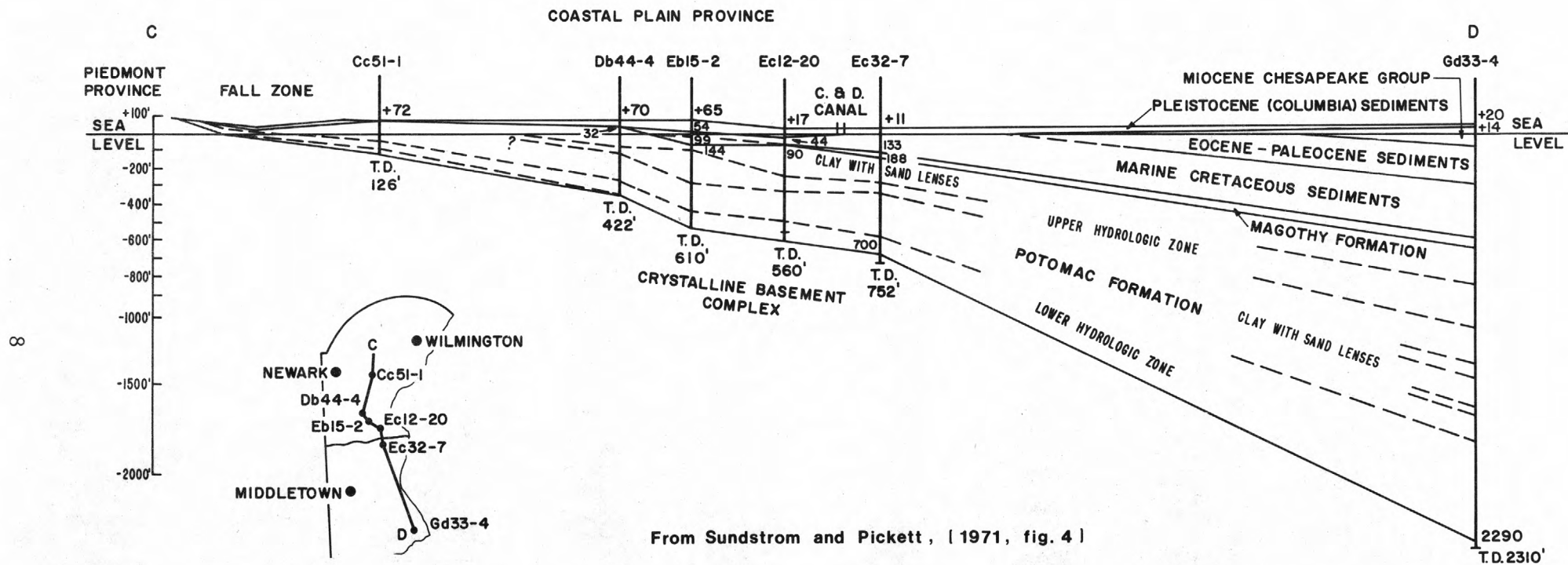


FIGURE 4.--Generalized geologic cross section of New Castle County.



The Magothy consists of light-colored clean quartz sand beds and some clayey silt beds. Although the Magothy Formation is discontinuous along strike, the individual sand layers are less variable in thickness and lateral extent than the Potomac sand beds. The Magothy is a major aquifer in New Castle County.

Above the Magothy, the following marine units were deposited during Late Cretaceous and Paleocene times: Merchantville Formation, Englishtown Formation, Marshalltown Formation, Mount Laurel Sand, Severn Formation, and the Rancocas Group. The Merchantville, Englishtown, and Marshalltown Formations make up the Matawan Group. The Merchantville is a glauconitic sandy silt and is not an aquifer. The Englishtown is a minor aquifer, less than 40 ft thick, composed of fine well-sorted sand with interbedded layers of silty sand. The Marshalltown is a massive very glauconitic silty fine sand that is not used as an aquifer. The undivided Severn Formation and Mount Laurel Sand is glauconitic quartz sand with some silt. It is a minor aquifer and increases in thickness to 140 ft in southern New Castle County. The Rancocas Group consists of the Hornerstown Sand and Vincentown Formation. Both units are composed of glauconitic sands and some silt. The Hornerstown is slightly coarser than the younger Vincentown.

The Nanjemoy Formation, deposited during Eocene time, is a glauconitic silt. Above the Nanjemoy, the Chesapeake Group was deposited during Miocene time. The Eocene sediments are separated from the Miocene sediments by an unconformity of Oligocene age. The Chesapeake Group is gray and tan clays, silts, and fine sands. The Eocene and Miocene units are not used as aquifers in New Castle County.

The Columbia Group or Pleistocene sediments are reddish-brown and tan and yellow medium to coarse sand and gravel beds. These sediments were deposited on the Cretaceous and Tertiary sediments after a period of erosion (Spoljaric and Woodruff, 1970, p. 68). The streams that deposited these sediments generally formed straight channels north of the canal and braided systems south of the canal (Spoljaric, 1967, p. 6).

## HYDROGEOLOGY OF THE POTOMAC FORMATION

### Lithology and Stratigraphy

Jordan (1962, p. 6-8) gives the following summary of work done in Potomac stratigraphy until 1920. The Potomac Formation was first formally named by W. J. McGee in 1886 in the District of Columbia and adjacent parts of Maryland and Virginia. The formation was later traced by McGee through Delaware from North Carolina to New Jersey. The Potomac Formation was then mapped in Maryland and divided into the Patuxent, Arundel, Patapsco, and Raritan Formations, in ascending order. These sediments, with the exception of the Arundel Formation, were subsequently traced into Delaware.

Informal divisions of the Potomac Formation were later developed based on lithologic and hydrologic characteristics. Groot (1955, p. 25) divided the Potomac into two zones on the basis of heavy mineral composition. The lower Patuxent zone was characterized by abundant staurolite, and the upper Patapsco-Raritan zone contained only very stable heavy minerals. Rasmussen and others (1957, p. 111-115) describe three aquifers in the nonmarine Cretaceous sediments. Designated the lower, middle, and upper aquifers, they were not considered to have time significance, but to be separate hydrologic units. Sundstrom and others (1967, p. 21) divided the Potomac Formation in the Chesapeake and Delaware Canal area of Delaware into upper and lower hydrologic zones with an intervening clay layer. These zones represented areas of relatively high sand content within the Potomac. Since Jordan's discussion of stratigraphy, the Potomac Formation in Delaware has had no formal divisions.

The Potomac Formation consists of nonmarine deposits of Early Cretaceous to early Late Cretaceous age, and was described by Jordan (1962, p. 6) as follows:

"White, gray, and rust-brown quartz sands with some gravel; variegated white, yellow, and red silts and clays, and some beds of gray clay containing finely disseminated carbonaceous matter and lignite. These are generally irregularly interbedded.

"The crystalline rocks of the Piedmont are overlain in the Coastal Plain by variegated silts and clays interbedded with sands of varying texture. Individual beds of sand or silt or clay are generally restricted in areal extent and thickness. Thus lithologic variability in both vertical and horizontal directions is a characteristic of the unit."

Sundstrom and others (1967, p. 17) state that the Potomac sediments are predominantly fine grained and were deposited by a stream system of coalescing alluvial fans. The sand layers were deposited mainly in stream channels that were not very large or persistent in location and time. The Potomac Formation typically contains small sand layers interspersed in a clay-silt matrix.

The Potomac Formation increases in thickness and depth to the southeast. A thickness map and a structure contour map of the top of the formation are shown in figures 5 and 6, respectively. In southeastern New Castle County, the Potomac Formation is more than 1,700 ft thick, and the top of the formation is more than 650 ft below sea level.

### Hydraulic Characteristics

The hydrology of the Potomac Formation in the Chesapeake and Delaware Canal area was detailed by Sundstrom and others (1967). This work was updated and extended to include all of New Castle County by Sundstrom and Pickett (1971). The variability of the hydraulic properties of the Potomac is documented in these works.

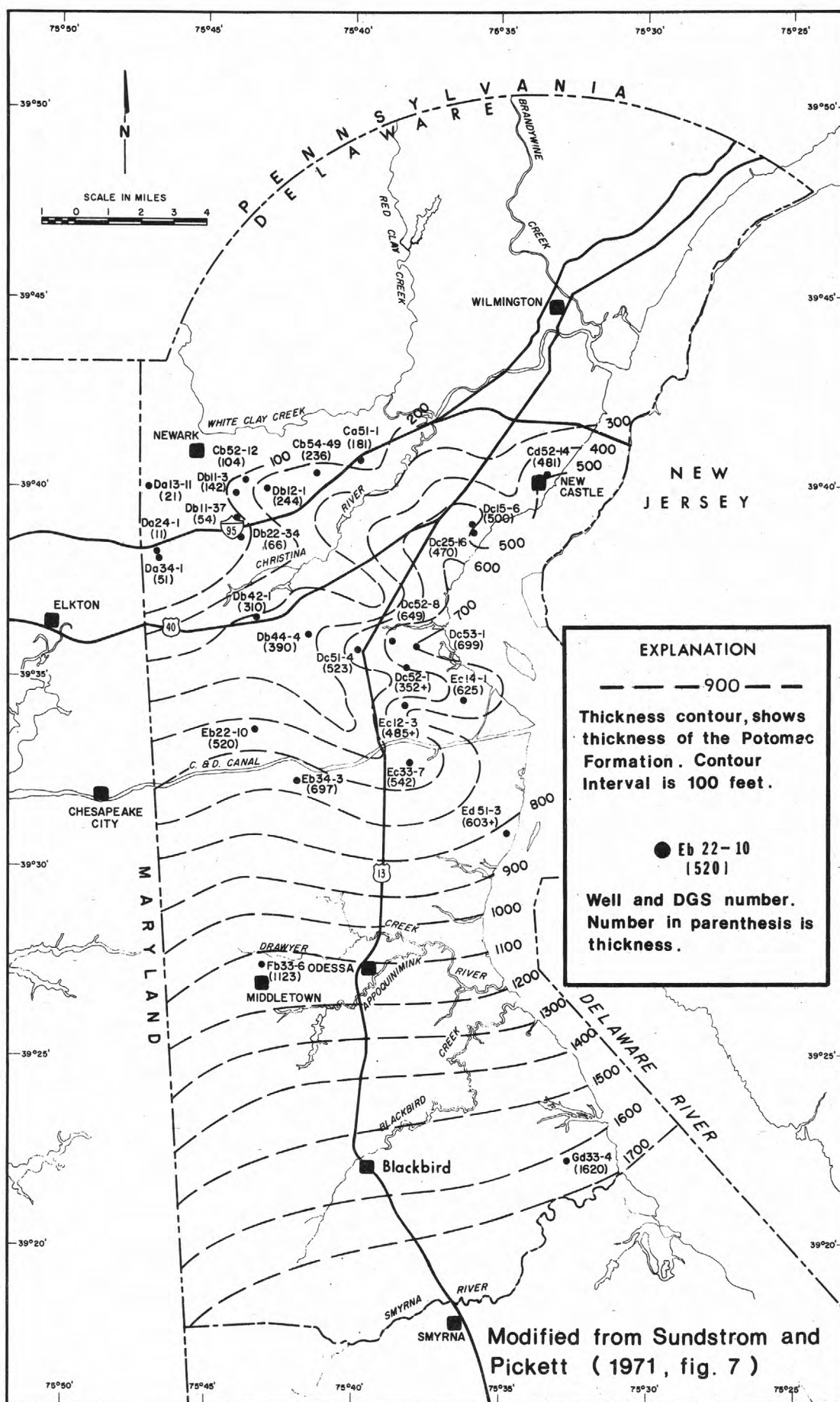


FIGURE 5.--Thickness of the Potomac Formation.

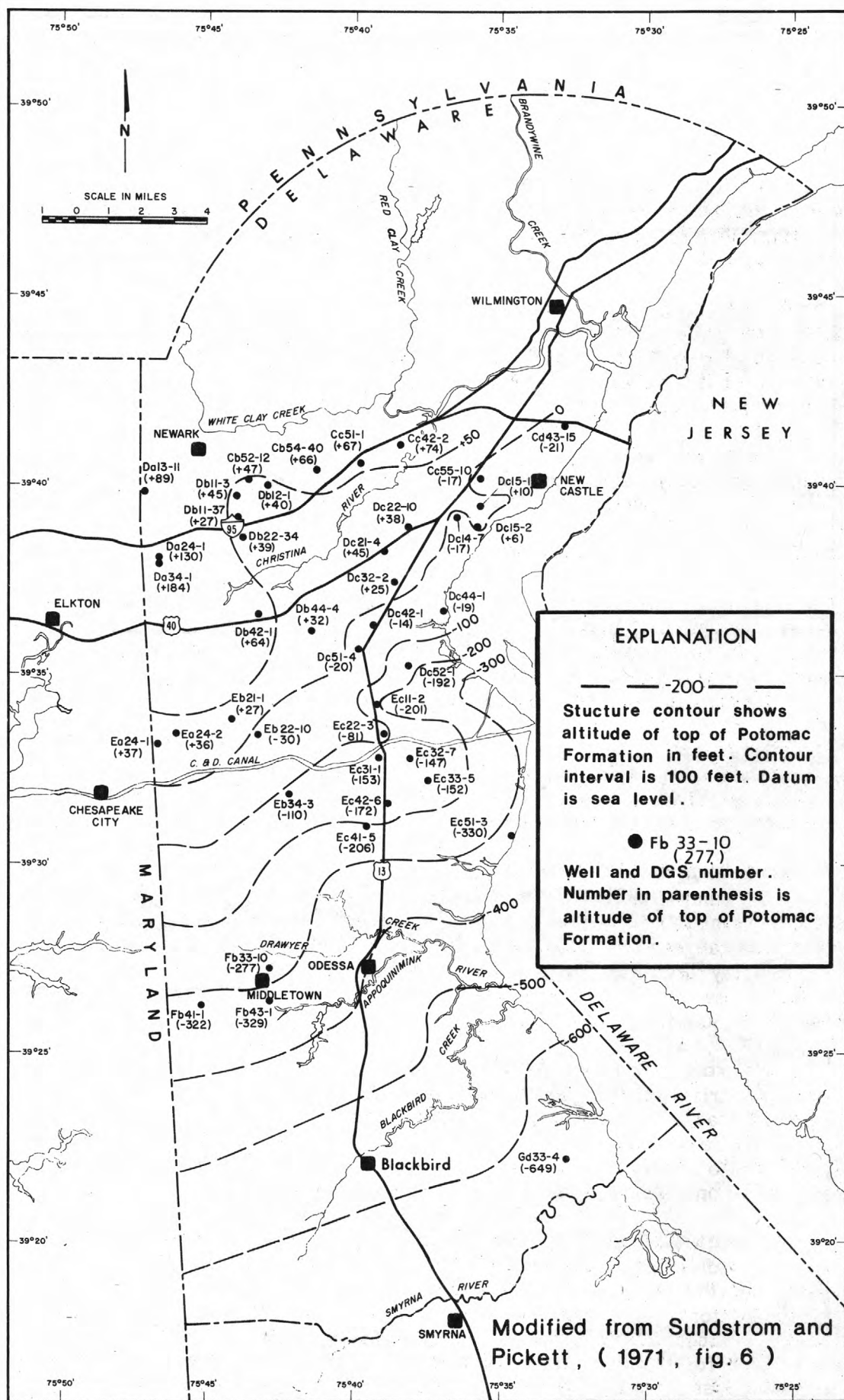


FIGURE 6.--Structure contour map of the top of the Potomac Formation.



The concept that the Potomac Formation contains several aquifers of highly variable transmissivity separated by generally continuous confining beds is consistent with the foregoing discussion of Potomac geology. The individual sand layers that serve as aquifers were deposited within stream channels and are therefore elongate and tabular. The confining beds are finer-grained, overbank stream deposits that surround the sand bodies.

A wide range of transmissivity values are found in the analysis of aquifer tests of the Potomac Formation. Figure 7 is a location map of wells and aquifer-test data. The results of the aquifer tests are given in table 2. Only aquifer tests where one or more observation wells were used have been recorded. Transmissivity values range from 454 to 8,480 ft<sup>2</sup>/d.

Sundstrom and Pickett (1971, p. 69-71) reported transmissivity values from wells at the Getty, Union Carbide, and Goodrich well fields ranging from 548 to 1,640 ft<sup>2</sup>/d. A greater number of aquifer tests are reported here than were reported by Sundstrom and Pickett. This larger sampling of aquifer properties includes transmissivity values significantly higher than those reported earlier.

The wide range of transmissivity in the Potomac sands may be caused by lateral changes in hydraulic characteristics within a sand layer or differences between separate sand layers. Locally, the depth to an aquifer sand is indicated by the depth at which wells are screened. The records of wells given in table 7 at the end of this report include the screened interval of the wells with aquifer-test data.

Storage coefficients reported in table 2 range from  $3.8 \times 10^{-3}$  to  $5.6 \times 10^{-5}$  and average  $5.6 \times 10^{-4}$ . The range of storage values reported here is similar to that reported by Sundstrom and others (1967, p. 43-45). The average value is slightly higher, but of the same order of magnitude.

Vertical hydraulic conductivities of the confining bed range from 0.0083 to 3.2 ft/d. Sundstrom and others (1967, p. 55) reported that the coefficient of vertical permeability (hydraulic conductivity) of the intervening clayey zone in the Getty area ranges from 0.00009 to 0.0003 ft/d. In table 2, the aquifer test results at the Getty area do not include confining bed properties. Vertical hydraulic conductivities of the confining bed in table 2 are significantly higher than those reported by Sundstrom and others.

Sundstrom (1974, p. 48-50) discussed vertical permeability (hydraulic conductivity) variability in relation to confining bed thickness and lateral extent. He suggested that low vertical permeability values are typical of areas such as the Getty well field, where confining beds are thick and areally continuous. He also suggested that vertical permeabilities are high in areas where confining beds are thin and discontinuous, such as Army Creek landfill.

Interpretation of all hydraulic characteristics should take into account local geologic conditions, including identification of separate sand layers, their lateral extent, and the degree of interconnection between the layers. In addition to the geologic factors, interpretation of the aquifer-test results given in table 2 should include consideration of the method of analysis and the degree to which the assumptions for that method have been met. The actual hydrologic conditions at an aquifer-test site rarely match the idealized conditions required by the equations used to analyze the test results.

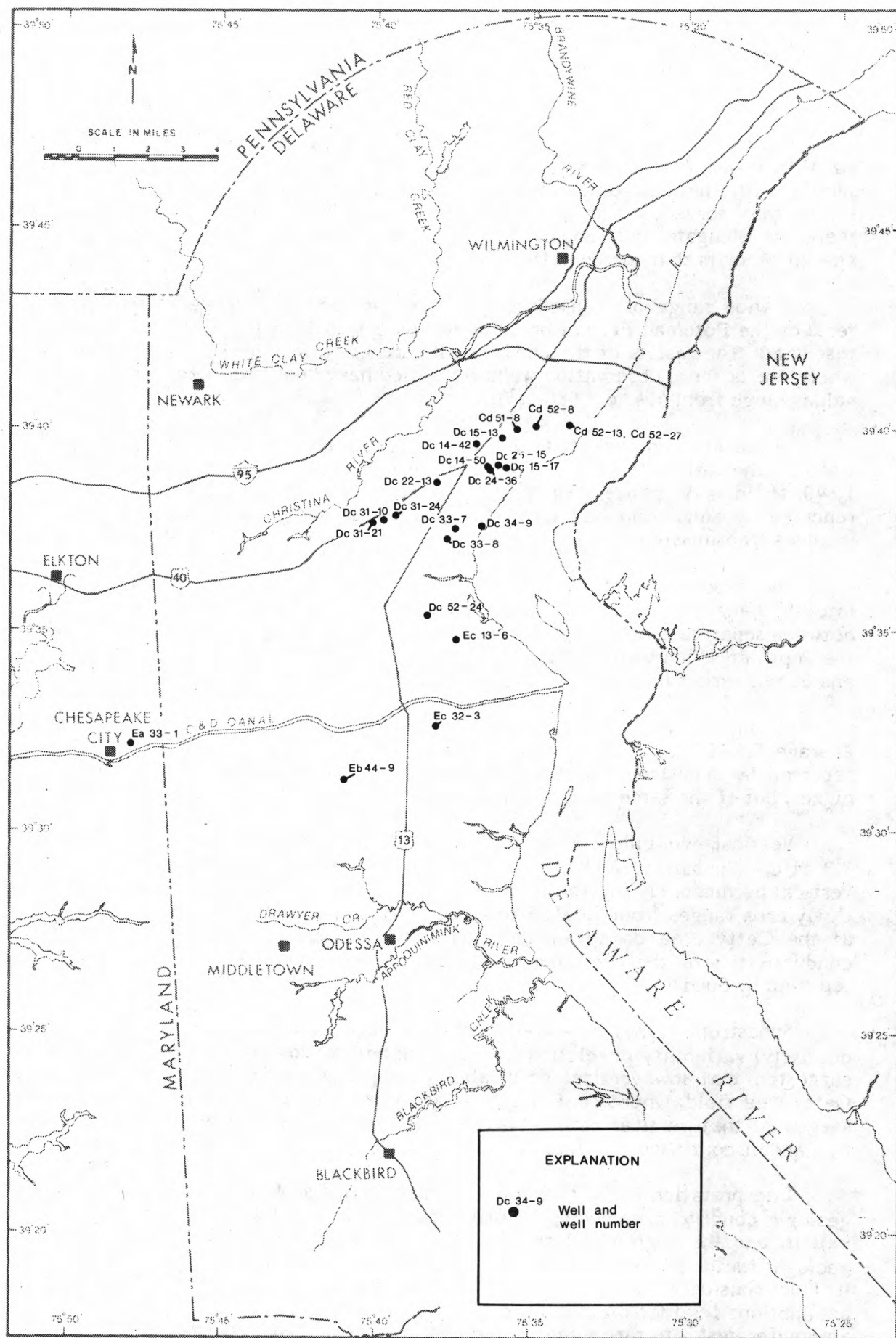


FIGURE 7.--Location of wells with aquifer test data.

TABLE 2.--Transmissivities, coefficients of storage, and confining bed vertical hydraulic conductivities for the Potomac Formation as determined by aquifer tests in New Castle County, Del.

LOCATION AND PUMPING WELL NUMBER	DATE, DURATION OF TEST, AND PUMPING RATE	OBSERVATION WELLS AND DISTANCE FROM PUMPING WELL (ft)	ANALYSIS BY	METHOD OF ANALYSIS	TRANSMISSIVITY (ft <sup>2</sup> /d)	COEFFICIENT OF STORAGE (dimensionless)	CONFINING BED VERTICAL HYDRAULIC CONDUCTIVITY (ft/d)
<u>Airport Industrial Park</u>							
Dc15-13	3-26-75 7 hours 300 gpm	Dc15-14 680	J. M. Denver and M. M. Martin	Stallman single-boundary artesian	676	$1.6 \times 10^{-4}$	
<u>Amoco</u>							
Dc25-17	4-17-61 7 days 1000 gpm	Dc24-6 1200	P. Williams	Hantush-Jacob leaky artesian	6130		
<u>Army Creek Landfill</u>							
15	Dc14-50	11-6-73 30 hours 525 gpm	J. M. Denver and M. M. Martin	Hantush-Jacob leaky artesian	1180	$3.8 \times 10^{-3}$	0.025
		Dc23-19 460			3590	$1.5 \times 10^{-3}$	0.054
	Dc15-15	5-6-75 24 hours 250 gpm	J. M. Denver and M. M. Martin	Hantush-Jacob leaky artesian	3480	$8.1 \times 10^{-5}$	0.013
		Dc25-23 480			3830	$2.4 \times 10^{-4}$	0.0083
	Dc24-36	11-12-73 24 hours 550 gpm	J. M. Denver and M. M. Martin	Hantush leaky artesian	1650	$8.4 \times 10^{-5}$	3.2
<u>Artisans Village</u>							
	Dc33-7	10-1-79 24 hours 1075 gpm	J. M. Denver and M. M. Martin	Theis non-leaky artesian	4390	$1.4 \times 10^{-4}$	
	Dc33-8	3-24-80 24 hours 275 gpm	J. M. Denver and M. M. Martin	Theis non-leaky artesian	1690	$1.9 \times 10^{-4}$	
<u>Delmarva Power, Summit</u>							
	Eb44-9	10-1-75	J. M. Denver and M. M. Martin	Stallman single-boundary artesian	660	$9.6 \times 10^{-5}$	
		47 hours			957	$7.0 \times 10^{-5}$	
		250 gpm			1143	$9.5 \times 10^{-5}$	
		Eb44-10 1400					
		Eb45-9 80					
		Eb45-10 260					

TABLE 2.--Transmissivities, coefficients of storage, and confining bed vertical hydraulic conductivities for the Potomac Formation as determined by aquifer tests in New Castle County--Continued

LOCATION AND PUMPING WELL NUMBER	DATE, DURATION OF TEST, AND PUMPING RATE	OBSERVATION WELLS AND DISTANCE FROM PUMPING WELL (ft)	ANALYSIS BY	METHOD OF ANALYSIS	TRANSMISSIVITY (ft <sup>2</sup> /d)	COEFFICIENT OF STORAGE (dimensionless)	CONFINING BED VERTICAL HYDRAULIC CONDUCTIVITY (ft/d)
<u>Fairwinds</u> Dc22-13	6-30-75 72 hours 350 gpm	Dc22-18 475	P. Williams	Hantush-Jacob leaky artesian	6100	$8.2 \times 10^{-4}$	
<u>Getty</u> Dc52-24	12-8-54 7 days 508 gpm	Dc51-3 5700 Dc51-4 7900 Dc52-6 100 Dc52-32 900 Dc53-6 2000 Dc53-31 <sup>1</sup> 4200 Ec12-15 3800	Leggette and Brashears	Cooper and Jacob semi-log	3610 2410 588 548 949 962 628	$8.7 \times 10^{-4}$ $3 \times 10^{-4}$ $1.5 \times 10^{-3}$ $1.7 \times 10^{-4}$ $5.0 \times 10^{-4}$ $2.5 \times 10^{-4}$ $6 \times 10^{-5}$	
Ec13-6	1-24-55 17 days 500 gpm	Dc52-31 4100 Dc53-23 1900 Ec12-2 5800 Ec12-3 5000 Ec14-1 6100	Leggette and Brashears	Cooper and Jacob semi-log	722 628 856 1280 1540	$1.7 \times 10^{-4}$ $1.9 \times 10^{-4}$ $3 \times 10^{-4}$ $1.1 \times 10^{-4}$ $2.8 \times 10^{-4}$	
<u>Glendale</u> Dc31-10	6-20-73 45 hours 524 gpm	Dc31-13 51	J. M. Denver and M. M. Martin	Hantush-Jacob leaky artesian	912	$2.5 \times 10^{-3}$	0.71
	11-14-73 24 hours 400 gpm	Dc31-13 51 Dc31-25 787	J. M. Denver and M. M. Martin	Hantush-Jacob leaky artesian	454 601	$2.6 \times 10^{-3}$ $6.3 \times 10^{-5}$	1.4 0.017
Dc31-21	4-22-74 48 hours 310 gpm	Dc31-13 1750 Dc31-25 910	J. M. Denver and M. M. Martin	Hantush-Jacob leaky artesian	475 1580	$6.5 \times 10^{-5}$ $1.6 \times 10^{-4}$	0.012 0.012
Dc31-24	2- -76 24 hours 508 gpm	Dc31-10 2200	P. Williams	Stallman single-boundary artesian	2780	$2.1 \times 10^{-4}$	
<u>Goodrich<sup>2</sup></u> Ea33-1	11-18-66 48 hours 200 gpm	Ea33-2 200 Ea33-3 600	Geraghty and Miller		5080	$1 \times 10^{-4}$	

<sup>1</sup> Local well number 5B

<sup>2</sup> Cecil County, Maryland



TABLE 2.--Transmissivities, coefficients of storage, and confining bed vertical hydraulic conductivities for the Potomac Formation as determined by aquifer tests in New Castle County --Continued

LOCATION AND PUMPING WELL NUMBER	DATE, DURATION OF TEST, AND PUMPING RATE	OBSERVATION WELLS AND DISTANCE FROM PUMPING WELL (ft)		ANALYSIS BY	METHOD OF ANALYSIS	TRANSMISSIVITY (ft <sup>2</sup> /d)	COEFFICIENT OF STORAGE (dimensionless)	CONFINING BED VERTICAL HYDRAULIC CONDUCTIVITY (ft/d)
<u>Goodrich</u> Ea33-1	11-18-66 48 hours 200 gpm	Ea33-2	200	R. W. Sundstrom <sup>1</sup>		1650		
		Ea33-3	600					
<u>Midvale</u> Dc14-42	5-1-74 8 hours 70 gpm	Dc14-54	68	J. M. Denver and M. M. Martin	Hantush-Jacob leaky artesian	1020	$5.6 \times 10^{-5}$	0.022
<u>New Castle</u> Cc55-17	2-5-76 96 hours 420 gpm	Dc15-13 <sup>3</sup>	3000	J. M. Denver and M. M. Martin	Hantush-Jacob leaky artesian	7850	$4.5 \times 10^{-4}$	0.10
		Dc15-16	1275			6070	$4.7 \times 10^{-4}$	0.11
Cd51-8	10-4-66 24 hours 207 gpm	Cd51-10	760	K. D. Woodruff	Hantush-Jacob leaky artesian	2940	$2 \times 10^{-4}$	
Cd52-13	6-9-55 9.2 days 376 gpm	Cd52-14	253	W. C. Rasmussen	Cooper and Jacob semi-log	1020	$2.3 \times 10^{-3}$	
Cd52-27	5-5-75 48 hours 305 gpm	Cd52-26	262	P. Williams	Theis non-leaky artesian	994	$1.4 \times 10^{-4}$	
<u>Ommelanden Park</u> Dc34-9	5-17-76 8.5 hours 343 gpm	Dc34-6 <sup>4</sup>	1650	P. P. Leahy	Theis non-leaky artesian	8480	$2.3 \times 10^{-4}$	
<u>Union Carbide</u> Ec32-3	10-12-66 51 hours 300 gpm	Ec32-4	200	Geraghty and Miller		3610	$4 \times 10^{-4}$	
		Ec32-5	600					
		Ec32-4	200	R. W. Sundstrom		869		
		Ec32-5	600					

<sup>3</sup> Airport Industrial Park

<sup>4</sup> National Guard Rifle Range

## Regional Flow System

A generalized flow pattern of ground water for the Cretaceous sediments of Delaware, Maryland, New Jersey, and Virginia is shown in figure 8. The flow pattern, proposed by Back (1966, p. A9-A11) was developed by an electric analog model and both measured and historic water-level data. The flow pattern shown in figure 8 shows the direction of ground-water movement in two directions and does not take into account vertical leakage. Although ground water discharges upward through overlying sediments, the two-dimensional flow pattern is adequate to demonstrate important general features of ground-water movement (Back, 1966, p. A11).

Water in the Cretaceous sediments in Delaware is shown to flow from recharge areas of high head near the Fall Zone down dip to discharge areas of lower head. These discharge areas are in southern New Castle County along the saltwater interface and in Maryland and New Jersey along the interface and the Fall Zone.

The saltwater interface in figure 8 represents an estimated boundary between freshwater and saltwater with a chloride concentration of 350 mg/L. In analyzing the pattern of ground-water flow, Back (1966, p. A11) considered the interface an impermeable boundary. According to Back (1966, p. A11), ground water discharges upward through overlying sediments at the interface. The limitations imposed by these assumptions must be considered when applying Back's generalized flow pattern to flow within the Potomac Formation of New Castle County.

## HYDROLOGIC DATA

### Ground-Water Pumpage

Before 1955, pumpage from the Potomac Formation was insignificant. During 1980, 19.9 Mgal (estimated) was withdrawn each day from Potomac aquifers in New Castle County. The greatest proportion of this pumpage is for industrial, municipal, and public water supply. Less than 10 percent of current pumpage is for irrigation or domestic use.

Table 3 shows the total yearly pumpage from the Potomac Formation for the principal well fields in New Castle County. Pumpage information was compiled from previous publications, records at the Delaware Department of Natural Resources and Environmental Control and the Delaware Geological Survey, and from information supplied by the municipalities, industries, and public water supply companies. Although some of the values given in table 3 are not exact, they are the best estimate of pumpage for the years shown. No information is available for the years not listed in table 3. Pumpage for years before those shown is not necessarily zero, but is generally insignificant.

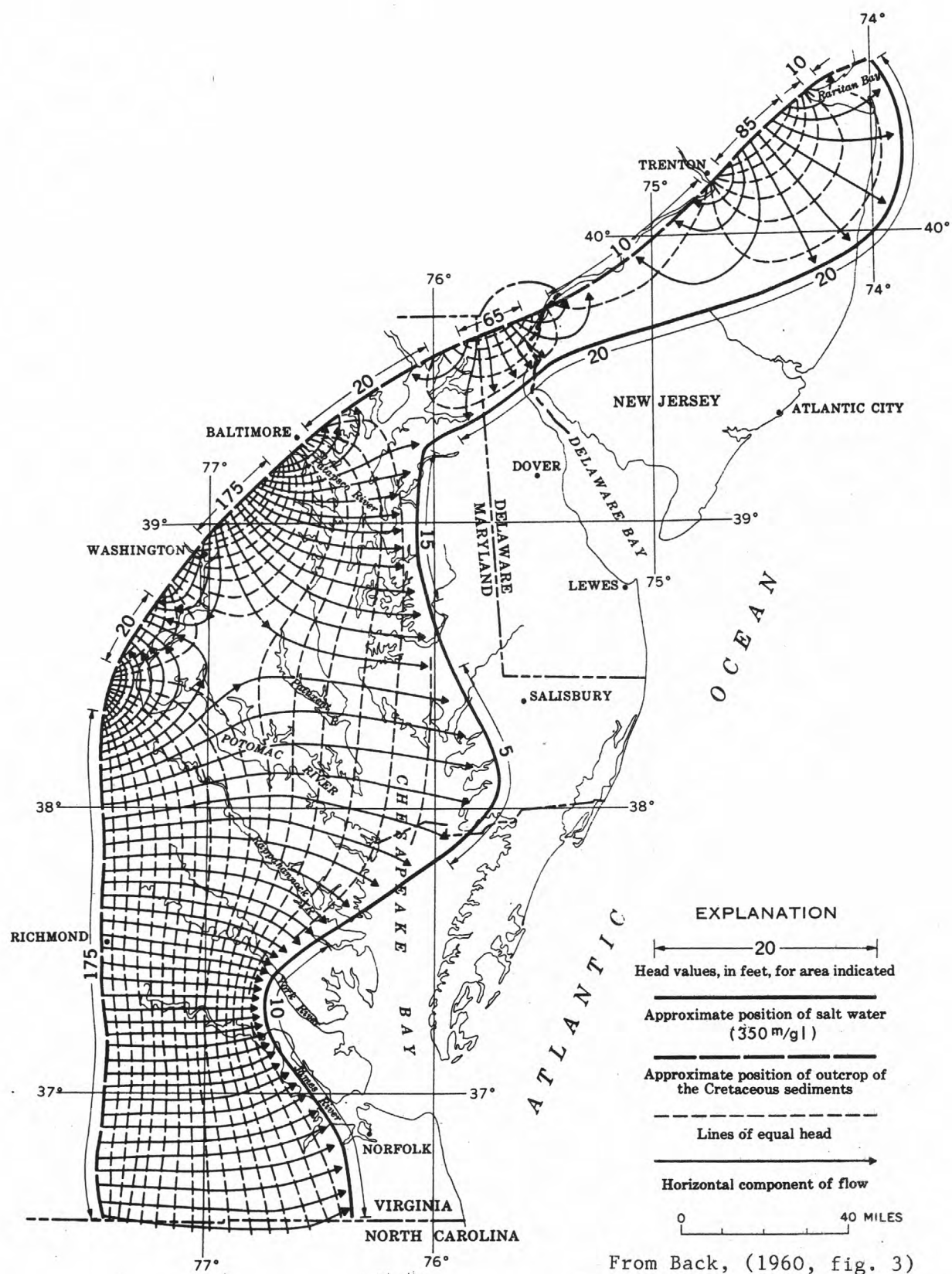


Figure 8.--General water flow in the Cretaceous sediments in the northern part of the Atlantic Coastal Plain.

TABLE 3.--Pumpage from the Potomac Formation in New Castle County, Del.

Pumpage: In million gallons.

Status of production wells is given in Table 7.

Amoco

PRODUCTION WELLS: Dc15-9, Dc15-10, and Dc25-17.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1964	590	1970	580	1976	424.2
1965	500	1971	500	1977	381.2
1966	465	1972	580	1978	401.6
1967	500	1973	660	1979	348.3
1968	526	1974	620	1980	287.2
1969	650	1975	433.3		

Army Creek Landfill

PRODUCTION WELLS: Dc14-33, Dc14-34, Dc14-35, Dc14-36, Dc14-47, Dc14-48, Dc14-49, Dc14-50, Dc14-51, Dc24-36, and Dc24-38.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1974	946.7	1977	598.0	1979	572.9
1975	533.6	1978	456.2	1980	431.5 <sup>1</sup>
1976	635.3				

Caravel Farms

PRODUCTION WELL: Db52-27.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1978	86.6	1979	95.1	1980	100.3

Castle Hills

PRODUCTION WELLS: Cd42-18, Cd52-15, and Cd52-28.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1955	25.7	1964	306.1	1973	444.5
1956	-	1965	391.5	1974	464.1
1957	200.9	1966	410.4	1975	445.3
1958	248.5	1967	388.8	1976	446.8
1959	354.7	1968	404.1	1977	372.6
1960	515.6	1969	441.6	1978	410.0
1961	603.4	1970	482.2	1979	405.4
1962	525.2	1971	434.7	1980	373.9
1963	377.7	1972	466.6		

<sup>1</sup> Pumpage for January through September.



TABLE 3.--Pumpage from the Potomac Formation in New Castle County--Continued

Collins Park

PRODUCTION WELLS: Cd42-1, Cd42-3, Cd42-4, Cd42-5, Cd42-9, Cd42-13, Cd42-14, Cd42-15, and Cd42-17.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1955	37.9	1964	32.4	1973	96.5
1956	-	1965	25.5	1974	66.5
1957	-	1966	36.1	1975	100.1
1958	61.5	1967	21.2	1976	106.8
1959	80.9	1968	45.7	1977	117.4
1960	66.0	1969	102.1	1978	78.1
1961	119.5	1970	92.5	1979	154.9
1962	72.1	1971	112.8	1980	132.2
1963	29.6	1972	86.5		

Crown Zellerbach

PRODUCTION WELLS: Dc25-1, Dc25-2, Dc25-3, Dc25-4, Dc25-5, Dc25-6, Dc25-7, and Dc25-27.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1949	465.0	1954	-	1977	82.9
1950	464.9	1955	225	1978	106.9
1951	432.7			1979	186.3
1952	45.4	1975	140.0	1980	122.0 <sup>2</sup>
1953	213.84	1976	140.0		

du Pont - Newport

PRODUCTION WELLS: Cc34-14, Cc34-15, and Cc34-19.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1975	26.28	1977	31.20	1979	15.83
1976	24.34	1978	22.04	1980	14.98 <sup>2</sup>

Fairwinds

PRODUCTION WELLS: Dc22-13, Dc22-14, Dc22-22, Dc22-23, Dc22-24, Dc23-11, and Dc23-17.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1964	126.2	1970	762.6	1976	813.6
1965	362.3	1971	698.3	1977	739.3
1966	694.7	1972	773.0	1978	686.1
1967	806.8	1973	817.7	1979	590.0
1968	856.3	1974	773.6	1980	740.2
1969	865.1	1975	730.5		

<sup>2</sup> Pumpage for January through September.

TABLE 3.--Pumpage from the Potomac Formation in New Castle County--Continued

Getty

PRODUCTION WELLS: Dc41-4, Dc42-6, Dc51-7, Dc52-24, Eb15-4, Eb15-5, Ec12-20, Ec13-6, Ec14-7, and Ec22-3.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1955	110.0	1964	903.6	1973	1430.6
1956	644.3	1965	798.4	1974	1216.9
1957	1203.7	1966	913.0	1975	1341.9
1958	1307.7	1967	778.0	1976	1434.9
1959	1345.5	1968	841.6	1977	1499.5
1960	1256.9	1969	933.4	1978	1280.6
1961	1247.4	1970	1067.3	1979	1413.9
1962	1210.1	1971	1028.6	1980	1468.9
1963	1028.6	1972	1058.7		

Glendale

PRODUCTION WELLS: Dc31-10, Dc31-21, Dc31-24, and Pleistocene wells.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1973	433.7	1976	669.1	1979	630.9
1974	776.1	1977	600.6	1980	696.2
1975	647.4	1978	560.0		

ICI

PRODUCTION WELL: Cd44-14.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1973	119.4	1976	147.6	1979	147.2
1974	147.5	1977	136.8	1980	120.7
1975	156.2	1978	151.3		

Jefferson Farms

PRODUCTION WELLS: Cd51-13, Cd51-14, and Cd51-15.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1962	191.4	1969	191.0	1976	164.7
1963	178.0	1970	265.0	1977	277.0
1964	314.7	1971	240.0	1978	261.8
1965	326.4	1972	257.2	1979	245.2
1966	179.8	1973	238.0	1980	272.2
1967	165.7	1974	345.1		
1968	183.4	1975	275.2		

TABLE 3.--Pumpage from the Potomac Formation in New Castle County--Continued

Llangollen Estates

PRODUCTION WELLS: Dc23-2, Dc23-9, Dc23-10, Dc23-12, Dc24-1, Dc24-14,  
Dc24-15, Dc24-17, Dc24-18, Dc24-19, Dc24-40, and Dc24-41.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1955	406.8	1964	578.4	1973	923.5
1956	-	1965	565.1	1974	543.7
1957	523.0	1966	591.8	1975	579.8
1958	476.5	1967	495.2	1976	626.9
1959	566.4	1968	601.1	1977	679.2
1960	603.4	1969	634.6	1978	699.0
1961	516.9	1970	925.9	1979	648.5
1962	606.9	1971	950.5	1980	670.6
1963	524.1	1972	1205.9		

Midvale

PRODUCTION WELLS: Dc14-3, Dc14-53, and Dc14-54.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1955	172.3	1964	180.5	1973	73.9
1956	-	1965	207.3	1974	158.0
1957	189.0	1966	151.0	1975	162.1
1958	179.8	1967	159.0	1976	136.1
1959	127.2	1968	149.2	1977	148.3
1960	95.0	1969	170.3	1978	146.9
1961	282.3	1970	140.2	1979	144.1
1962	216.6	1971	125.2	1980	137.5
1963	152.9	1972	34.5		

Newark

PRODUCTION WELLS: Ca55-3, Ca55-4, Ca55-5, Ca55-7, Db11-49, Db12-27,  
Db22-42, and Db32-16.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1975	388.1	1977	434.9	1979	466.7
1976	446.5	1978	446.1	1980	348.1 <sup>3</sup>

New Castle

PRODUCTION WELLS: Cc55-17, Cd51-8, Cd52-13, Cd52-27, and Dc15-16.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1952	15.0	1962	167.2	1972	166.2
1953	24.1	1963	169.3	1973	164.7
1954	-	1964	173.3	1974	173.1
1955	104.3	1965	174.9	1975	150.3
1956	70.2	1966	164.6	1976	261.1
1957	93.9	1967	171.2	1977	192.1
1958	71.9	1968	173.6	1978	225.9
1959	58.5	1969	184.9	1979	226.1
1960	52.2	1970	197.9	1980	213.3
1961	141.5	1971	164.8		

<sup>3</sup> Pumpage for January through September.

TABLE 3.--Pumpage from the Potomac Formation in New Castle County--Continued

Tuxedo ParkPRODUCTION WELLS: Various.<sup>a</sup>

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1955	93.3	1962	214.0	1969	134.3
1956	-	1963	209.3	1970	134.4
1957	103.8	1964	174.6	1971	13.0
1958	121.1	1965	130.9	1972	6.83
1959	203.5	1966	120.4	1973	5.44
1960	240.4	1967	124.1	1974	2.78
1961	210.7	1968	132.3	1975	2.42

Wilmington Airport

PRODUCTION WELLS: Cc45-1, Cc45-2, and Cc55-1.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1946	18.5	1952	95.0	1976	122.3
1947	49.6	1953	102.3	1977	69.1
1948	63.7	1954	100.8	1978	115.1
1949	48.5	1955	99.7	1979	90.7
1950	40.3	1956	-	1980	91.3
1951	73.7	1957	112.2		

Wilmington Manor

PRODUCTION WELLS: Cc55-6 and Cc55-7.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1955	5.83	1961	6.92	1967	3.49
1956	-	1962	7.29	1968	7.90
1957	7.98	1963	4.93	1969	1.07
1958	8.58	1964	5.63	1970	2.60
1959	2.38	1965	3.69	1971	11.63
1960	3.56	1966	6.88		

Wilmington Manor Gardens

PRODUCTION WELLS: Cd51-1, Cd51-11, and Cd51-12.

YEAR	PUMPAGE	YEAR	PUMPAGE	YEAR	PUMPAGE
1955	171.2	1964	204.1	1973	205.5
1956	-	1965	181.8	1974	155.2
1957	291.4	1966	199.6	1975	251.5
1958	352.2	1967	188.9	1976	215.8
1959	307.3	1968	213.9	1977	234.5
1960	290.2	1969	193.6	1978	231.8
1961	263.5	1970	215.1	1979	235.4
1962	250.5	1971	197.4	1980	220.7
1963	216.4	1972	139.5		

<sup>a</sup> Incomplete well records.



Areas not included in table 3, because of insufficient data, include Delaware City, Delaware State Hospital, and the towns of Middletown and Newport. Pumpage in these areas is considered minor. Pumpage at Artisans Village began in November 1980 at an average rate of 37 Mgal per month.

Many well fields are in subcrop areas of Potomac sands. In the subcrop area, Pleistocene sediments directly overlie Potomac sands, or the intervening confining bed is relatively thin or discontinuous. Production wells screened in Potomac sands in these areas may withdraw water from Pleistocene sediments, and production wells screened in Pleistocene sediments may withdraw water from the Potomac Formation. Areas included in table 3 with Potomac production wells that may be hydraulically connected with the Pleistocene sediments, include: Army Creek landfill, Castle Hills, du Pont-Newport, Glendale, Midvale, Newark, New Castle, Newport, Tuxedo Park, Wilmington Manor, and Wilmington Manor Gardens.

Also, the following subcrop areas have or have had Pleistocene production wells: Glendale, ICI (ICI Americas, Inc.), Newark, Midvale, Newport, and Tuxedo Park. In table 3, pumpage values for only two areas, Glendale and Tuxedo Park, are known to include pumpage from both Pleistocene and Potomac wells.

Records of Potomac Formation wells in table 7 list the screened interval and date drilled. However, because of incomplete well records and questionable thickness of Pleistocene sediments in some areas, both table 3 and the well records may include some Pleistocene wells or exclude some Potomac wells in certain areas. These areas include: Castle Hills, Delaware State Hospital, ICI, Newark, Newport, Tuxedo Park, Wilmington Manor, and Wilmington Manor Gardens. In all the subcrop areas referred to above, the direct hydraulic connection between Potomac and Pleistocene sediments creates a complex problem in determining the amount of pumpage attributable to each formation. Analysis of the local groundwater flow must necessarily include determination of the thickness, extent, and hydraulic conductivity of the confining bed.

Figure 9 is a map showing the location of selected wells in the Potomac Formation, including those production wells for which monthly pumpage data are available. Graphs of monthly pumpage from these wells and total monthly pumpage from entire well fields are shown in figures 10 through 67. Hydrographs of water-level fluctuations in wells at each well field are shown for comparison. Pumpage data are shown in millions of gallons per month. Horizontal dashed lines represent average monthly pumpage from wells for which only yearly pumpage data were available. Well-field names are indicated in the upper right corner of each page, and well numbers are indicated in the upper left corner of each graph. Graphs for total monthly pumpage for a well field are indicated by the word "Total" in the upper left corner of the graph. Periods of no record are indicated by a question mark on the graph. Pumpage records for some wells are incomplete for the last 3 months of 1980. This is shown by a vertical dashed line at the end of the bar graph.

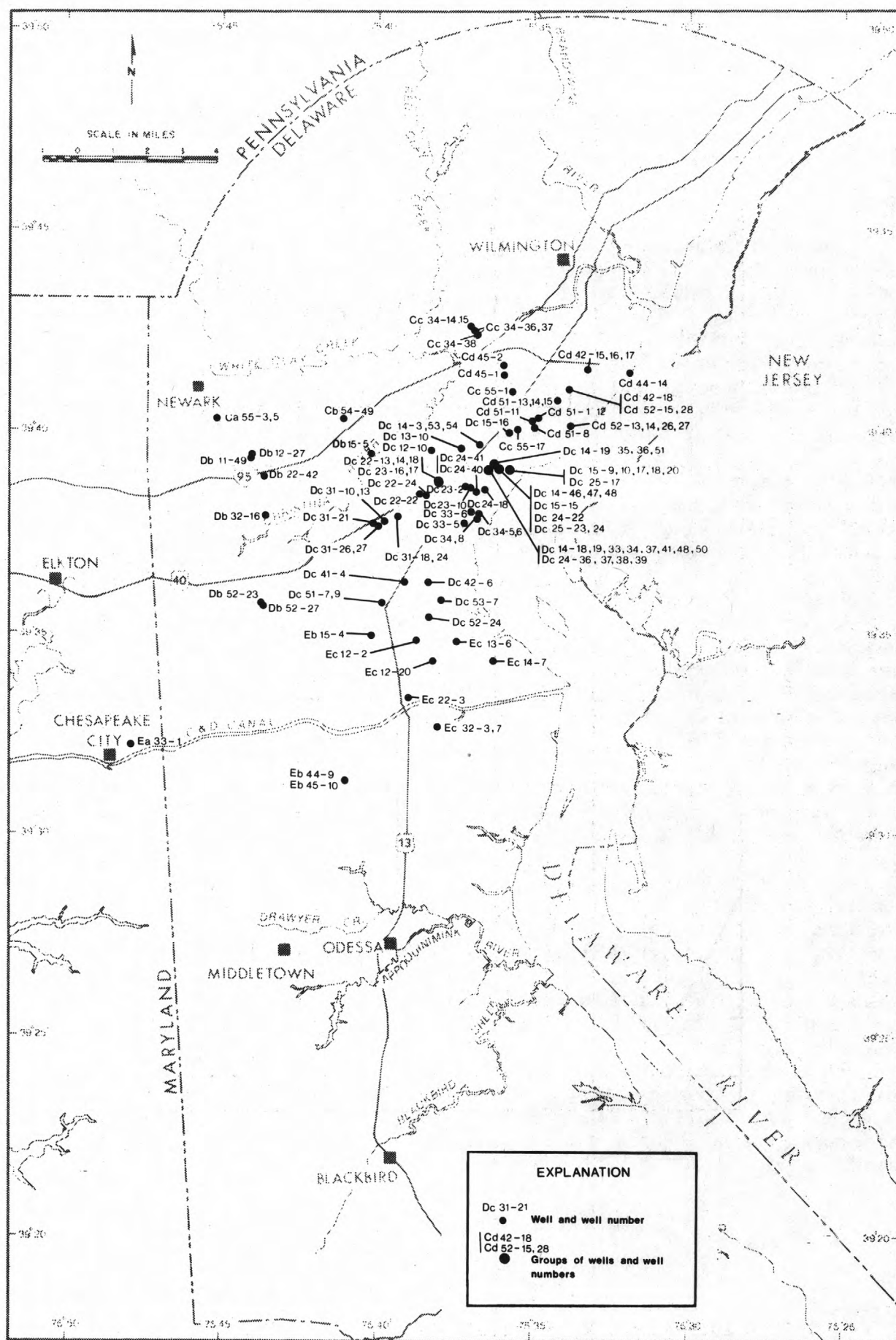


Figure 9.-- Map showing location of selected wells in the Potomac Formation.

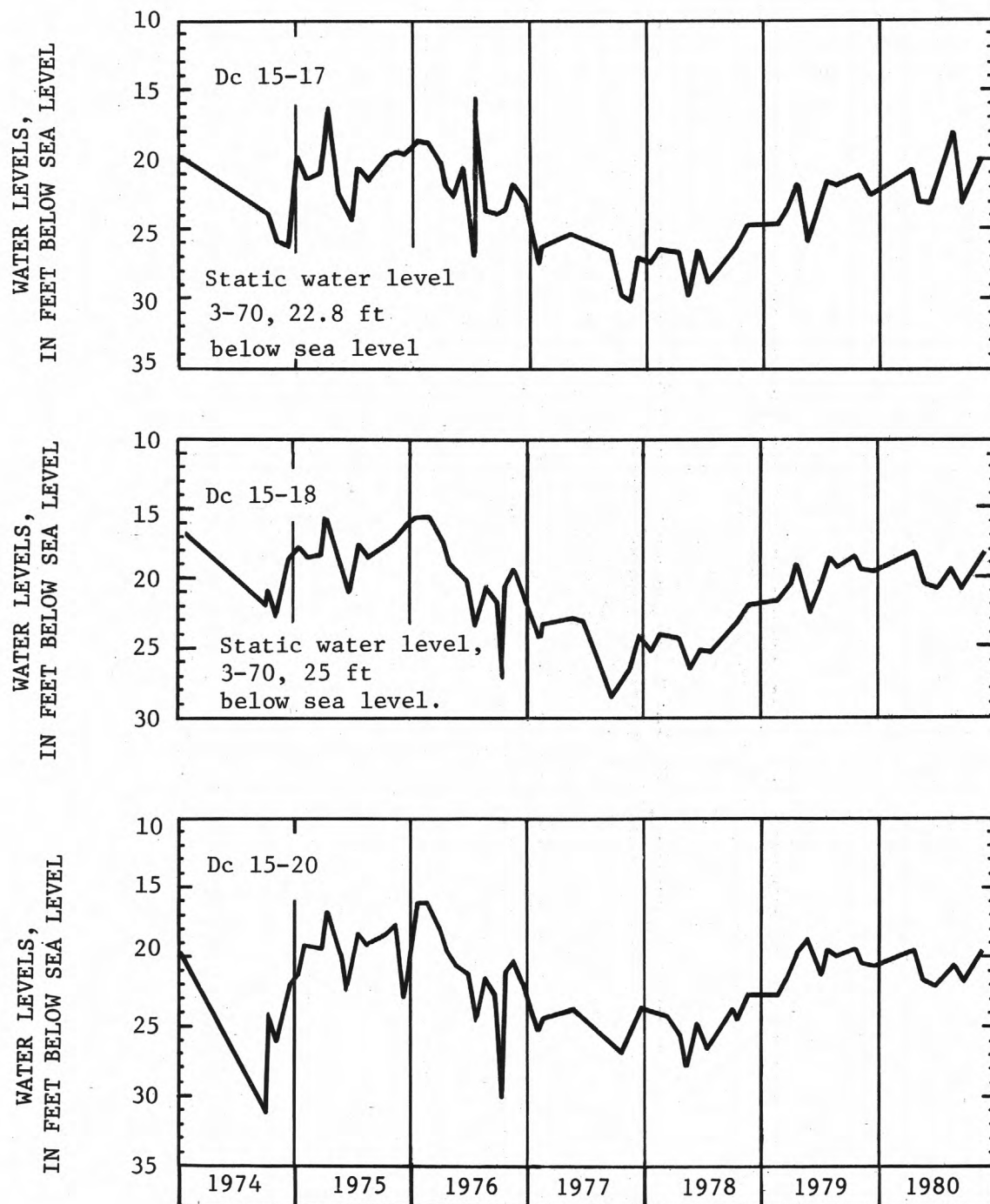


FIGURE 10.--Amoco. Water levels in wells Dc15-17, Dc15-18, and Dc15-20, 1974-80.

# AMOCO

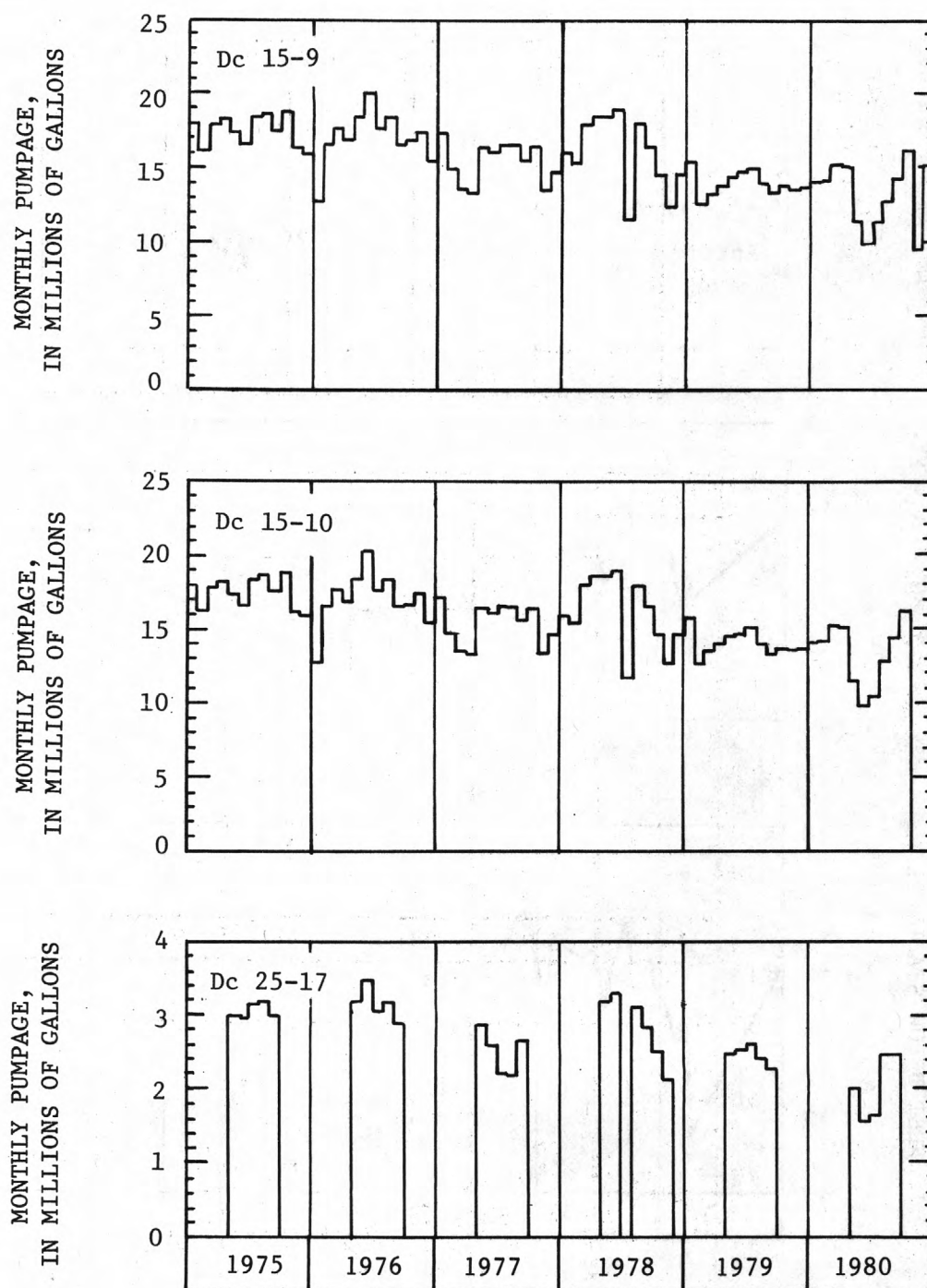


FIGURE 11.--Amoco. Monthly pumpage from Dc15-9, Dc15-10, and Dc25-17, 1975- 80.



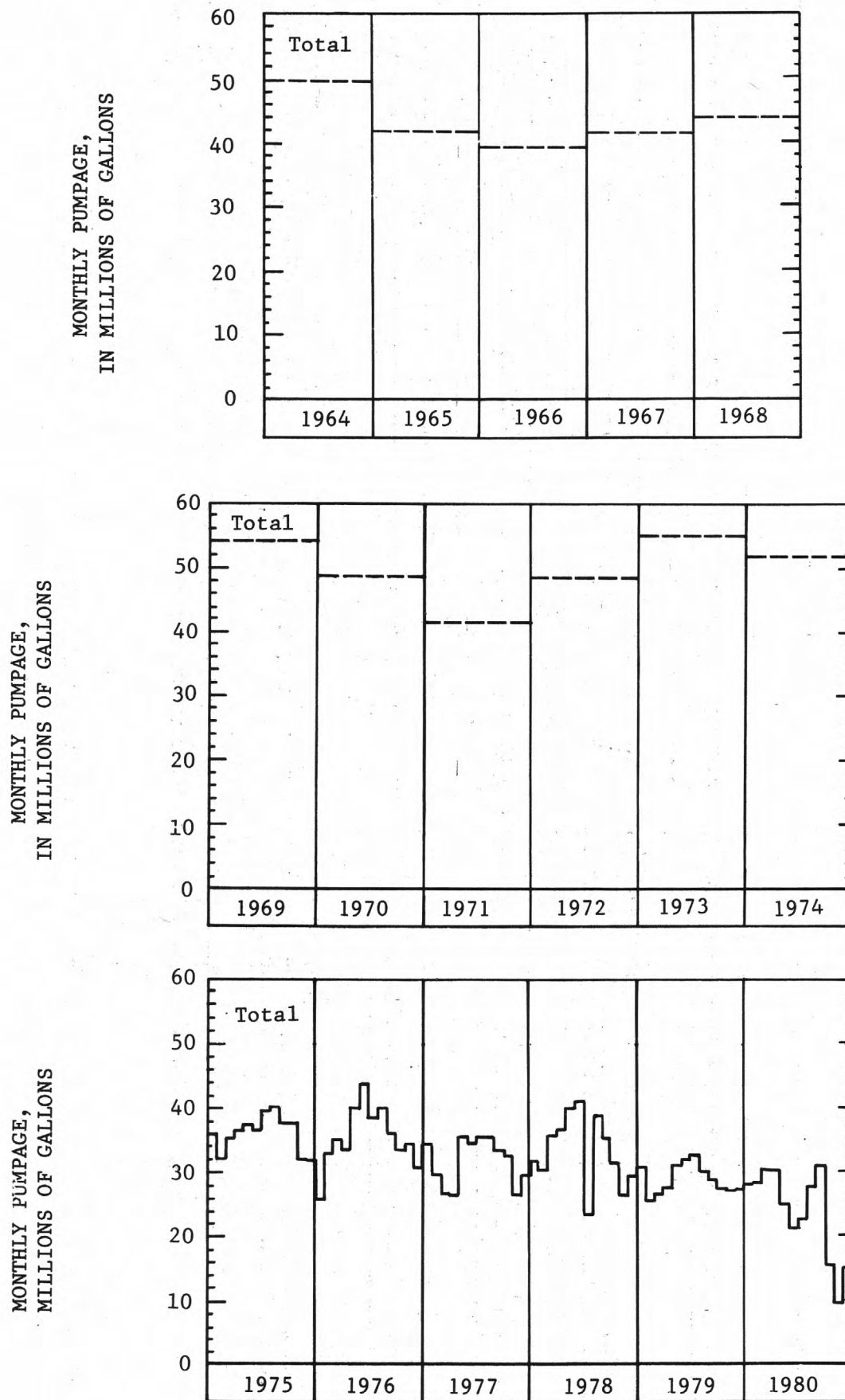


FIGURE 12.--Amoco. Total monthly pumpage from well field, 1964- 80.

# ARMY CREEK LANDFILL

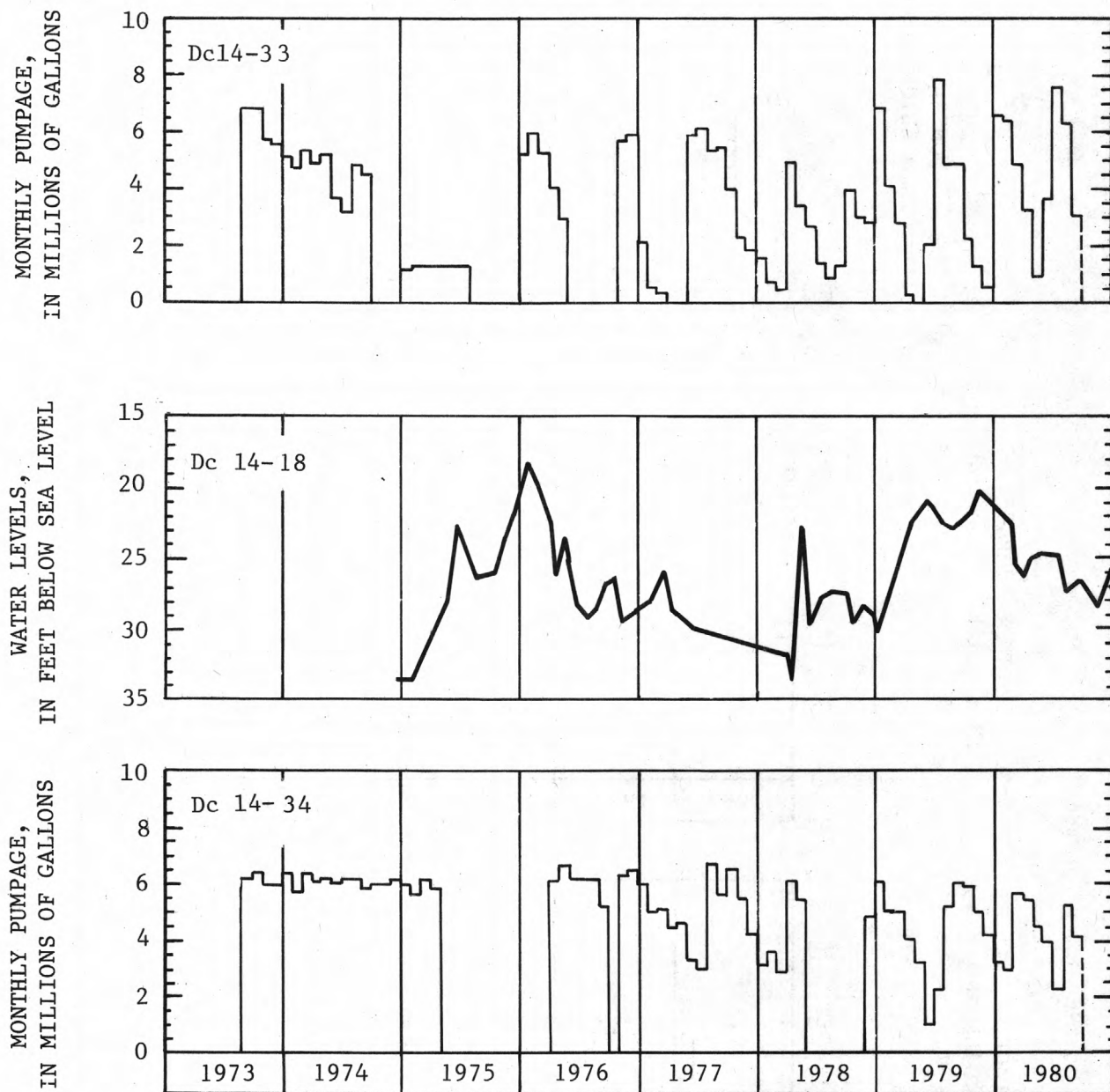


FIGURE 13.--Army creek landfill. Monthly pumpage from Dc14-33 and Dc14-34, 1973- 80. Water levels in Dc14-18, 1974- 80.

# ARMY CREEK LANDFILL

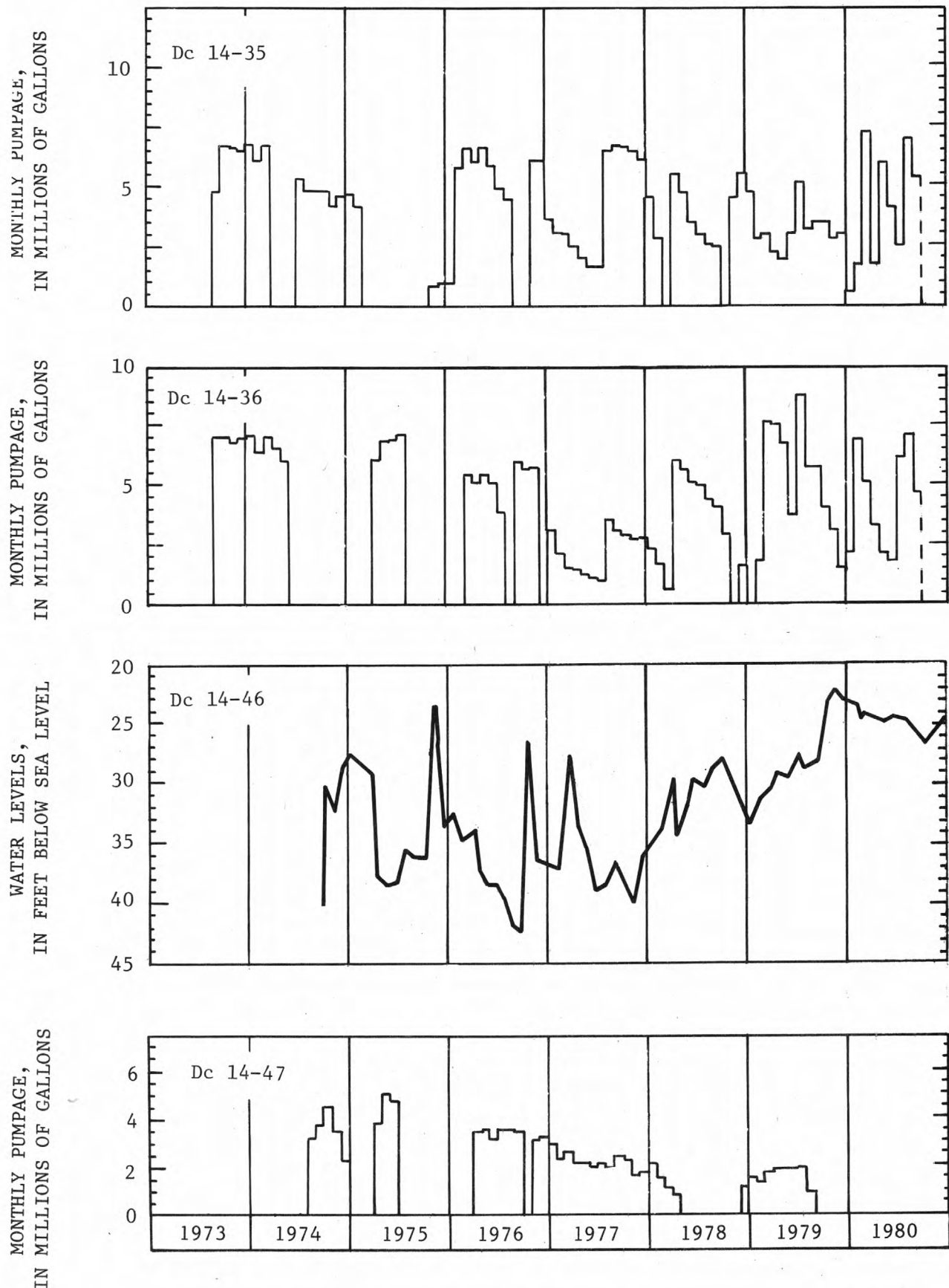


FIGURE 14.--Army Creek landfill. Monthly pumpage from Dc14-35 and Dc14-36, 1973- 80, and Dc14-47, 1974- 79 . Water levels in Dc14-46, 1974- 80.

# ARMY CREEK LANDFILL

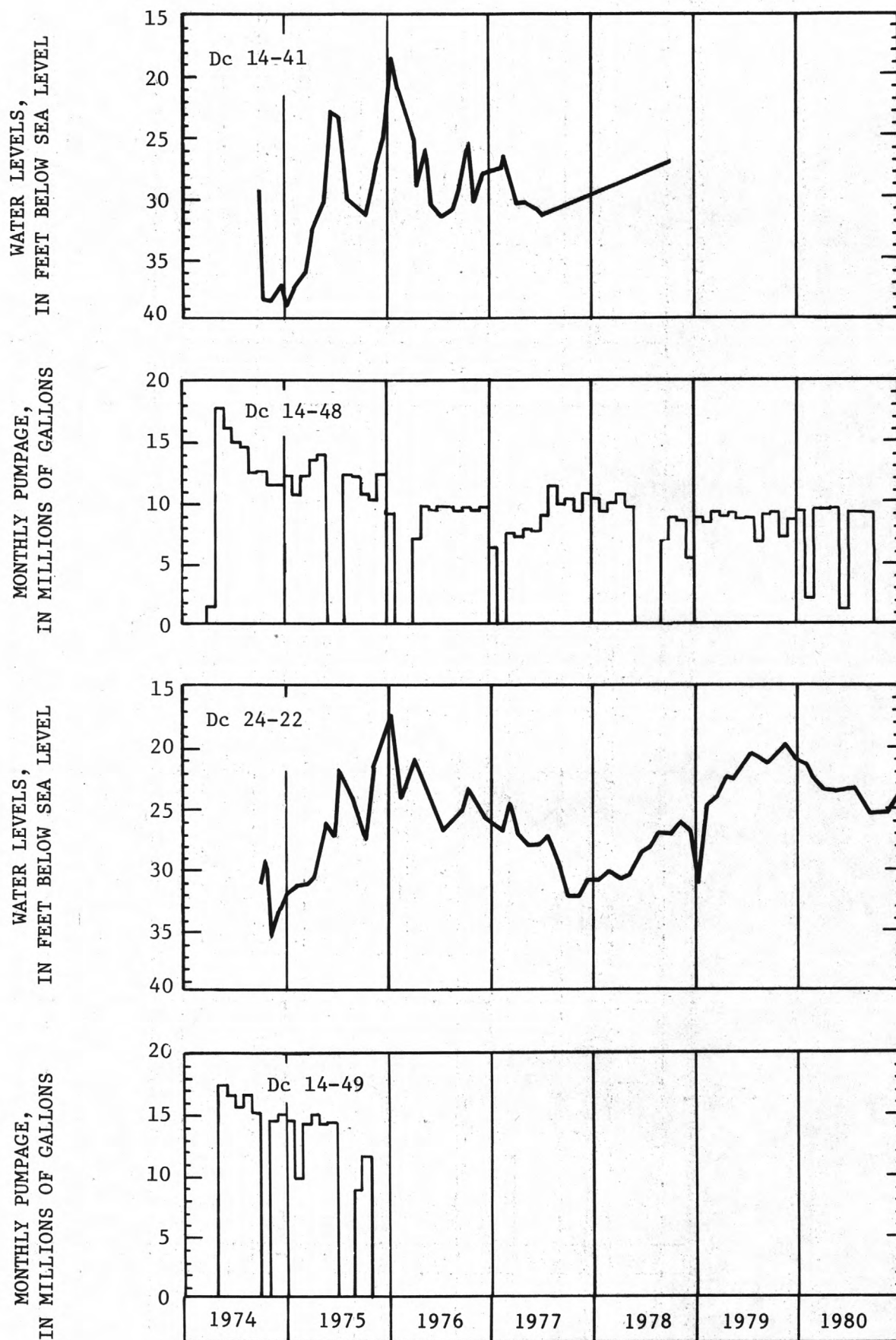


Figure 15.--Army Creek landfill. Monthly pumpage from Dc14-48, 1974-80, and Dc14-49, 1974-75. Water levels in Dc14-41, 1974-78 and Dc24-22, 1974-80.



# ARMY CREEK LANDFILL

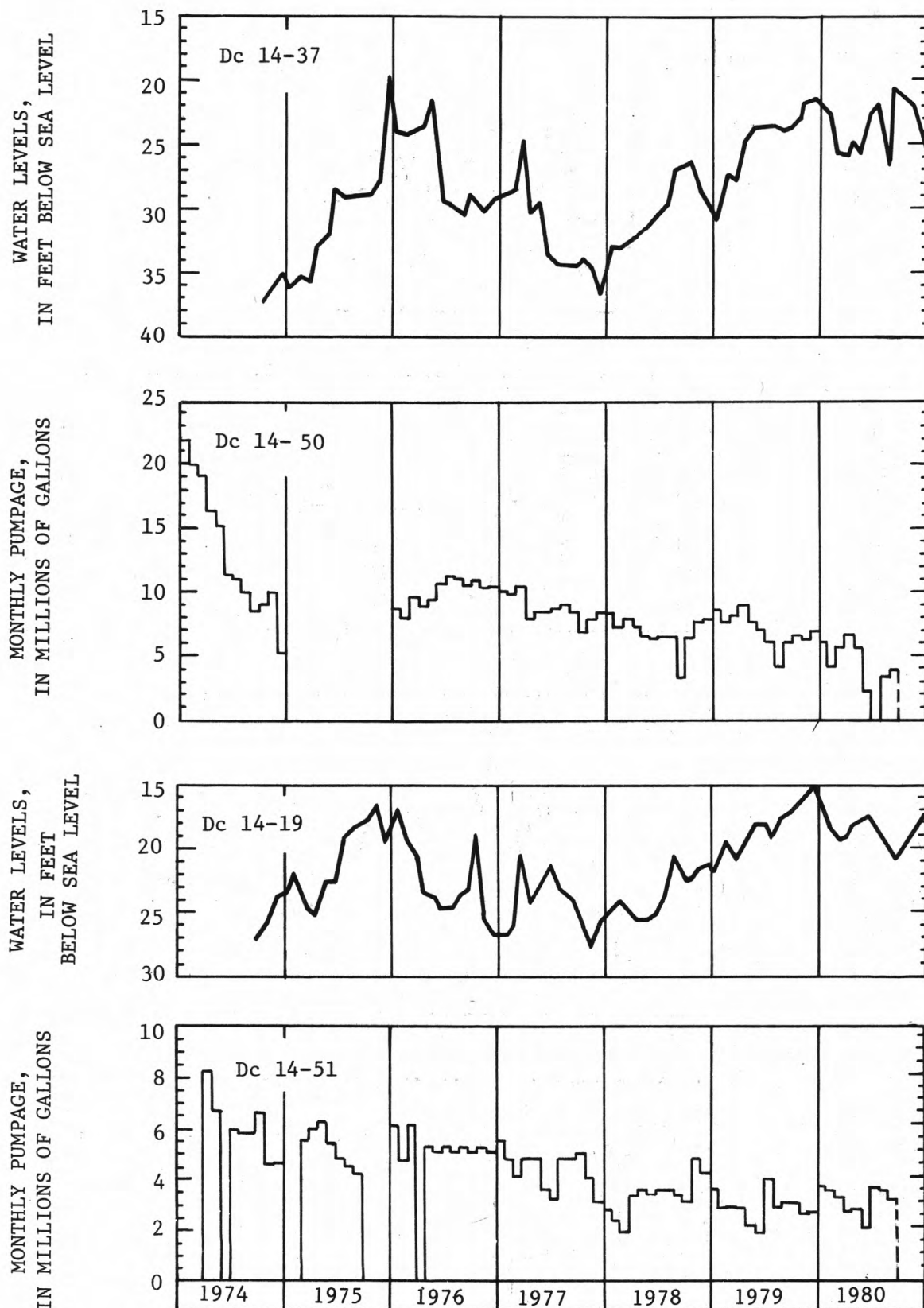
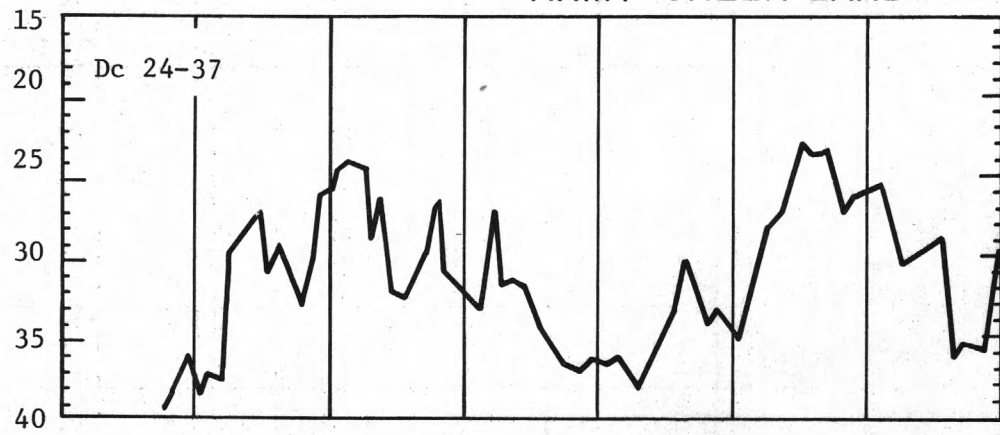


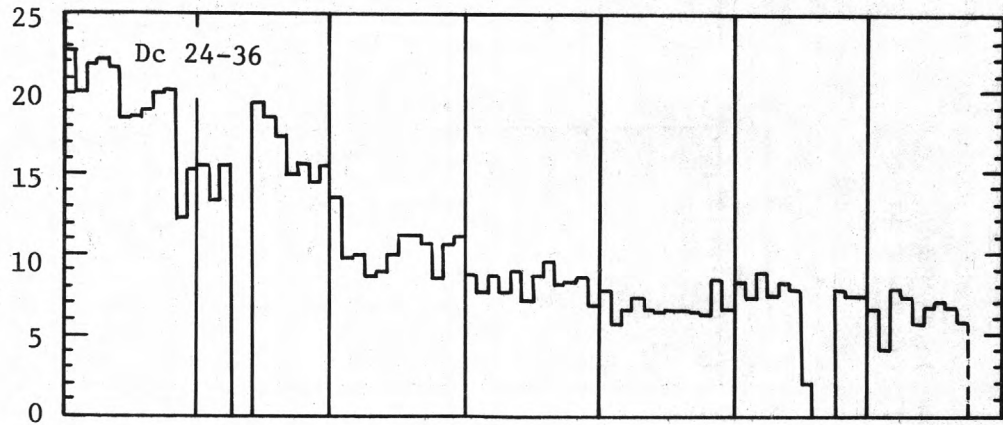
FIGURE 16.--Army Creek landfill. Monthly pumpage in Dc14-50 and Dc14-51, 1974- 80. Water levels in Dc14-37 and Dc14-19, 1974- 80.

# ARMY CREEK LANDFILL

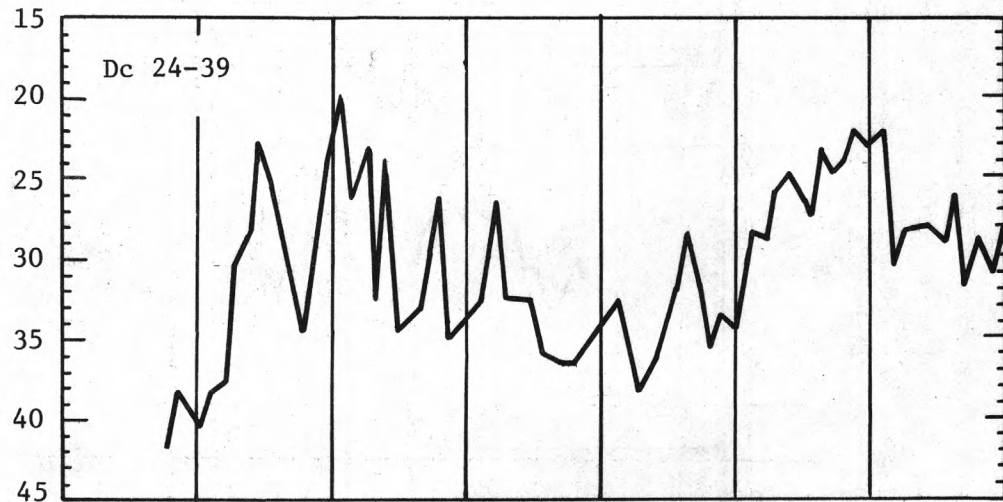
WATER LEVELS,  
IN FEET BELOW SEA LEVEL



MONTHLY PUMPAGE,  
IN MILLIONS OF GALLONS



WATER LEVELS,  
IN FEET BELOW SEA LEVEL



MONTHLY PUMPAGE,  
IN MILLIONS OF GALLONS

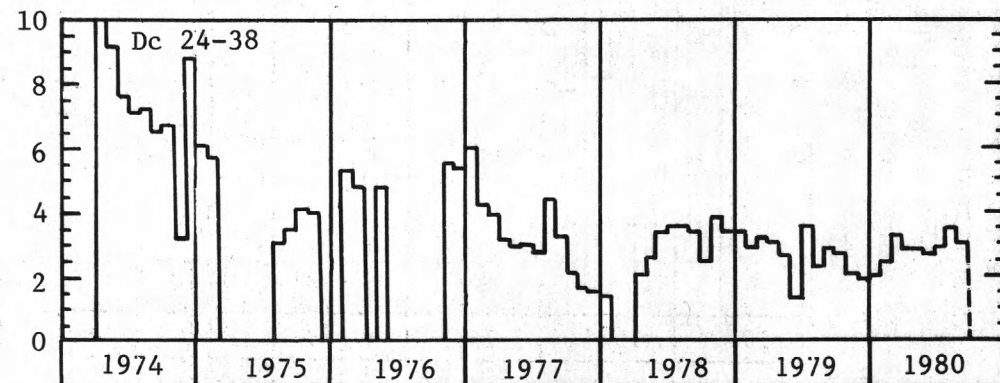


FIGURE 17.--Army Creek landfill. Monthly pumpage in Dc24-36 and Dc24-38, 1974- 80. Water levels in Dc24-37 and Dc24-39, 1974- 80.

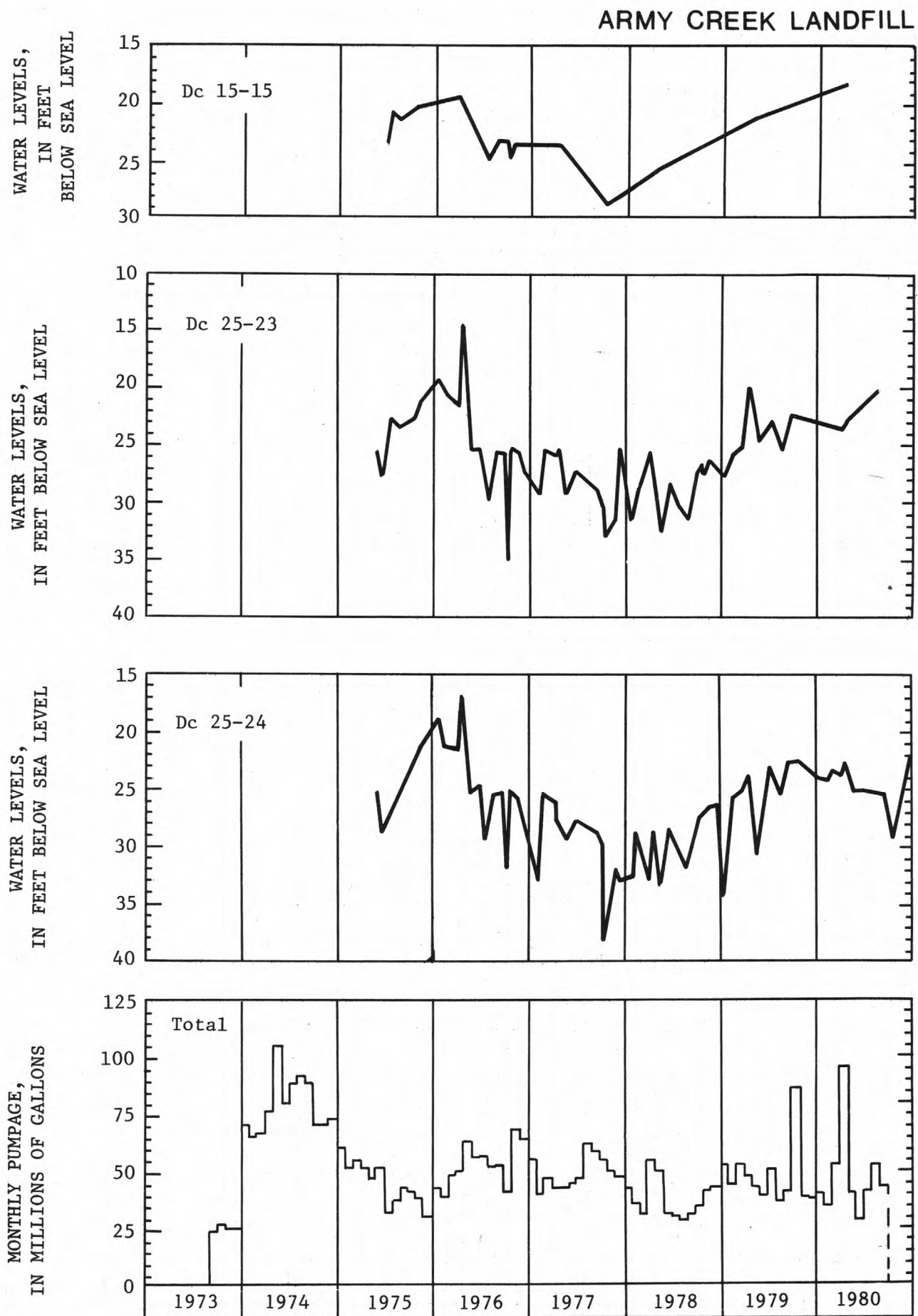


FIGURE 18.--Army Creek landfill. Total monthly pumpage from well field, 1973-80. Water levels in Dc15-15, Dc25-23, and Dc25-24, 1975- 80.

# CARAVEL FARMS

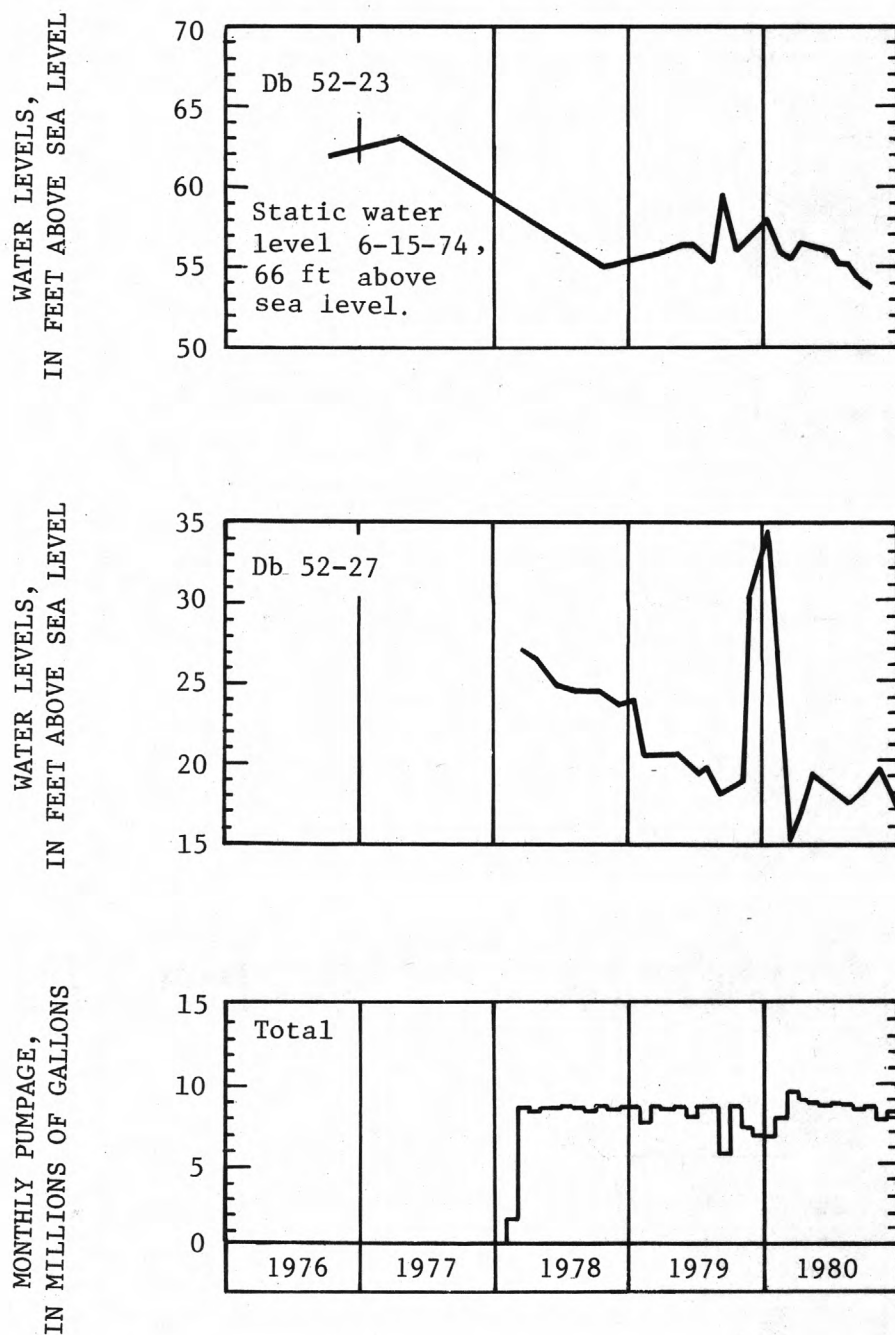


FIGURE 19.--Caravel Farms. Total monthly pumpage from well field, 1978- 80. Water levels in Db52-23, 1976- 80, and Db52-27, 1978-80.



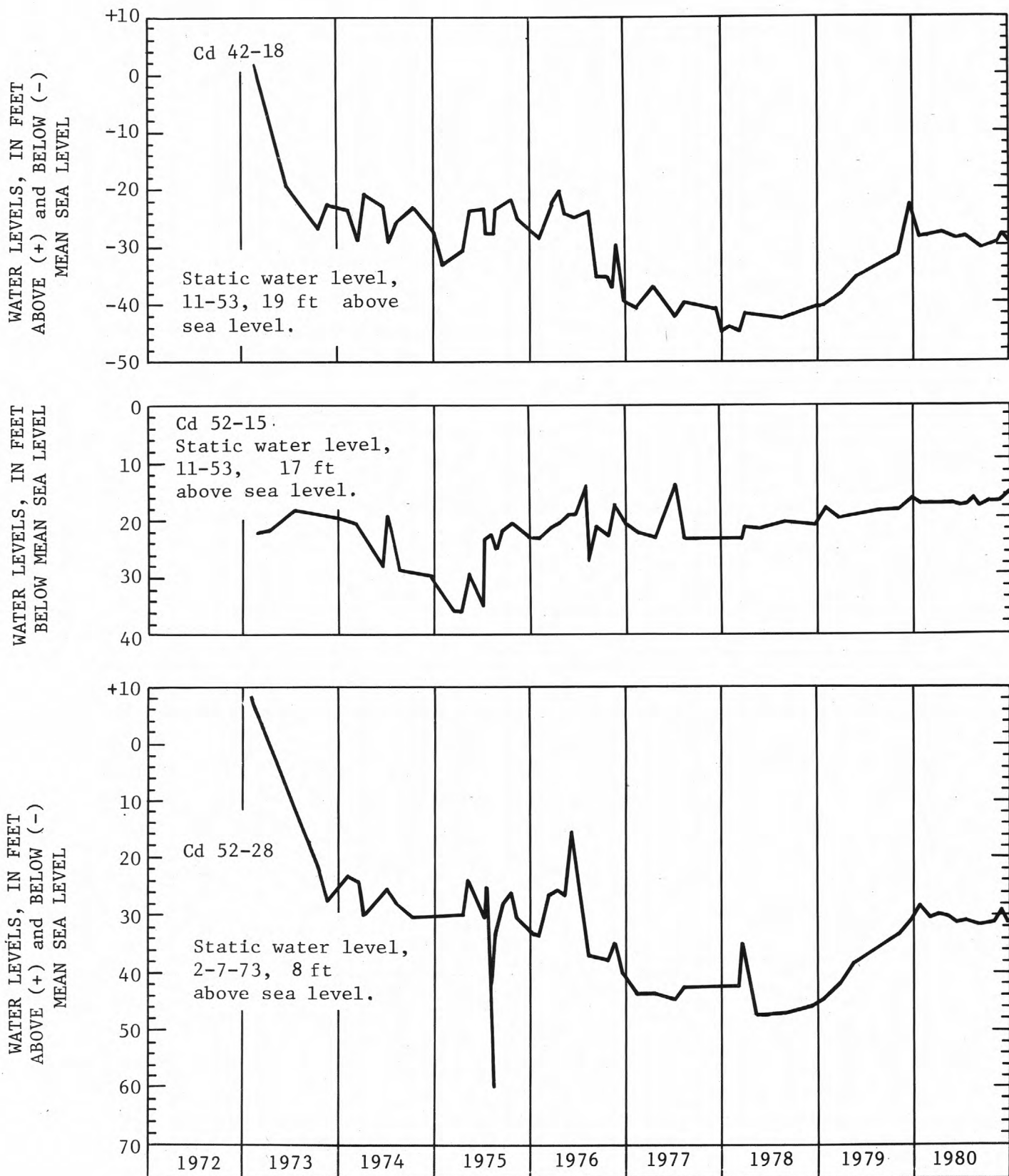


FIGURE 20--Castle Hills. Water levels in Cd42-18, Cd52-15, and, Cd52-28, 1973- 80.

# CASTLE HILLS

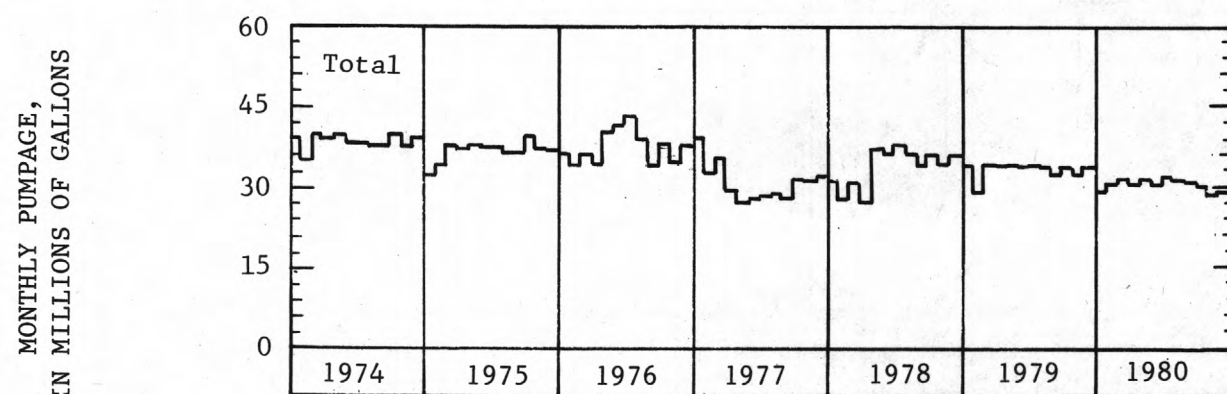
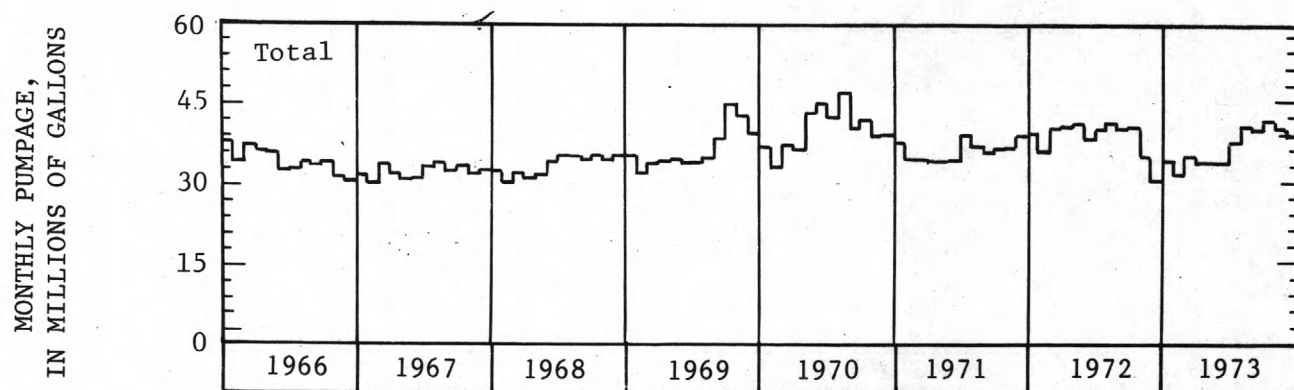
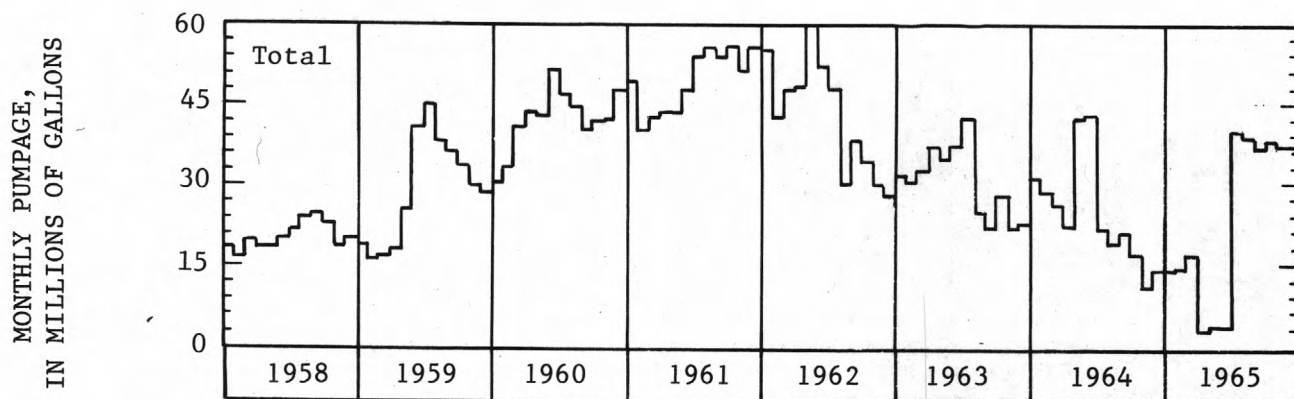


FIGURE 21.--Castle Hills. Total monthly pumpage from well field, 1958- 80.

# COLLINS PARK

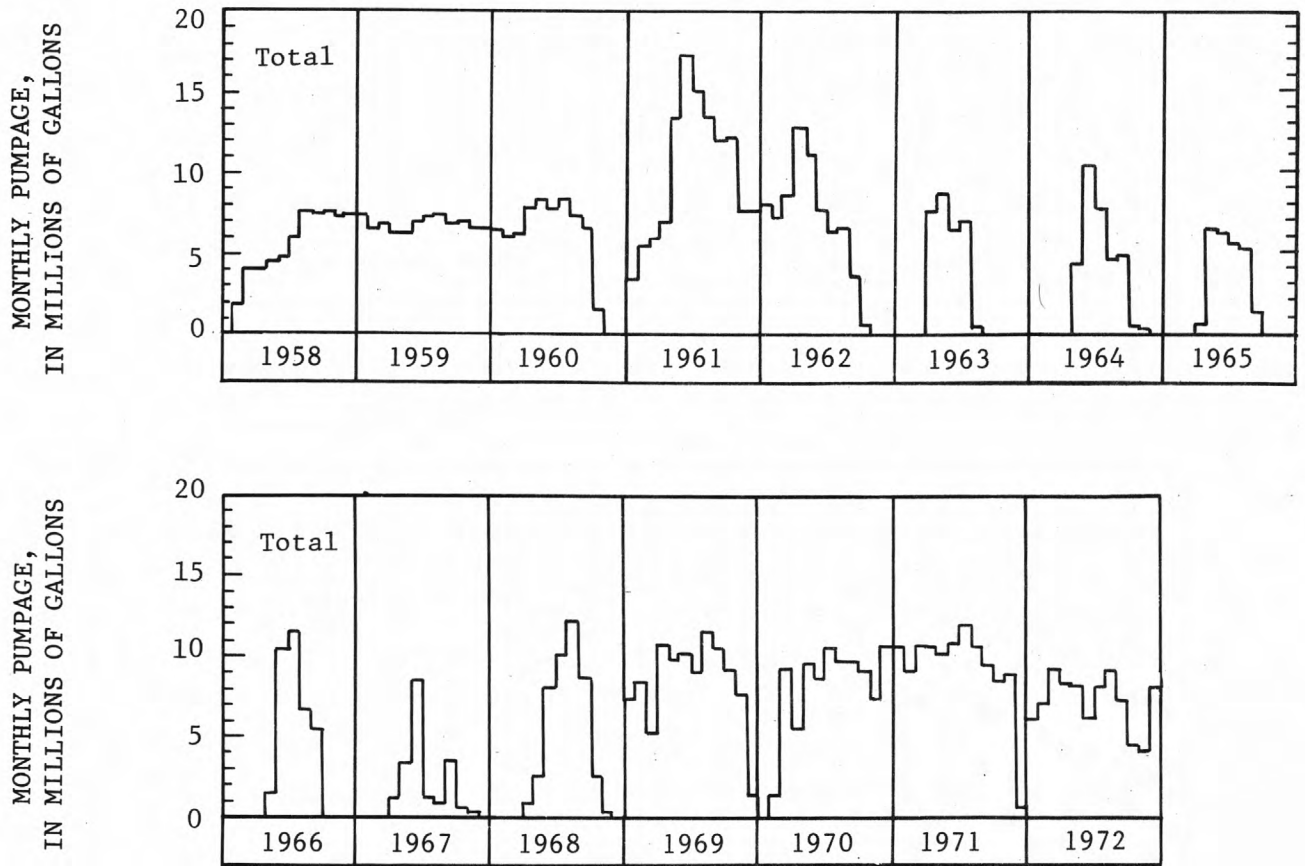


FIGURE 22.--Collins Park. Total monthly pumpage from well field, 1958- 72.

# COLLINS PARK

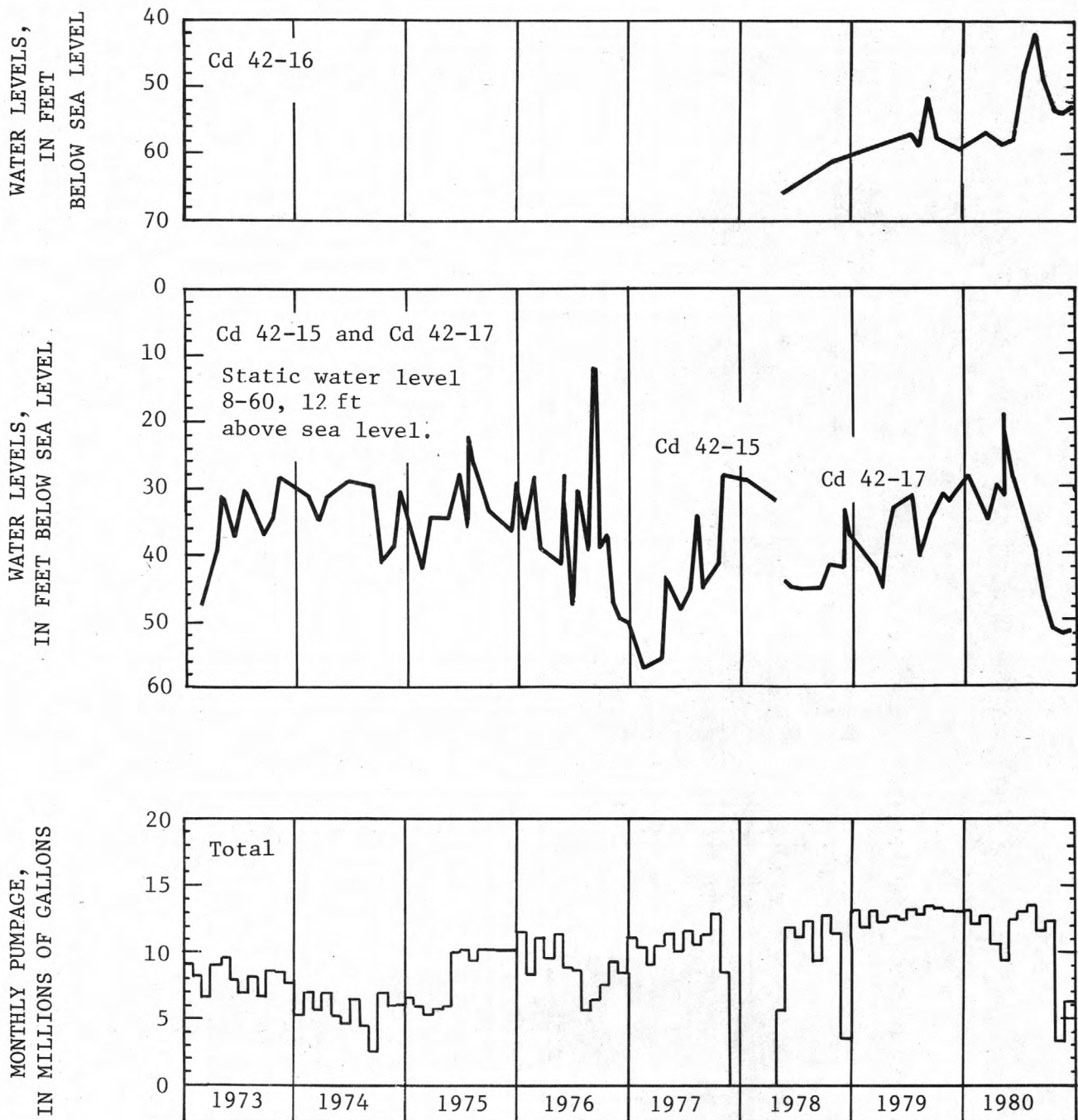


FIGURE 23.--Collins Park. Total monthly pumpage from well field, 1973- 80. Water levels in Cd42-16 and Cd42-17, 1978- 80, and Cd42-15, 1973-78.



# DELMARVA POWER - SUMMIT

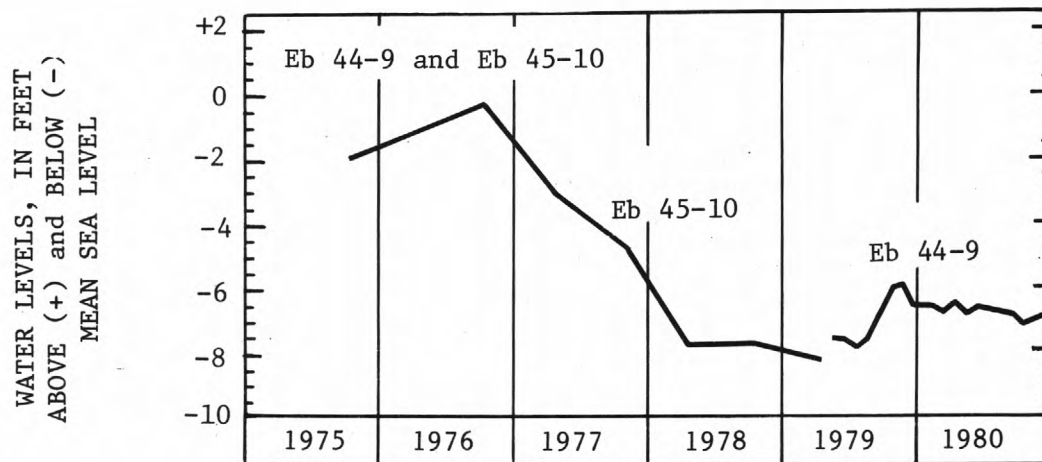


FIGURE 24.--Delmarva Power - Summit. Water levels in Eb45-10, 1975- 79, and Eb44-9, 1979 - 80 .

# DU PONT - NEWPORT

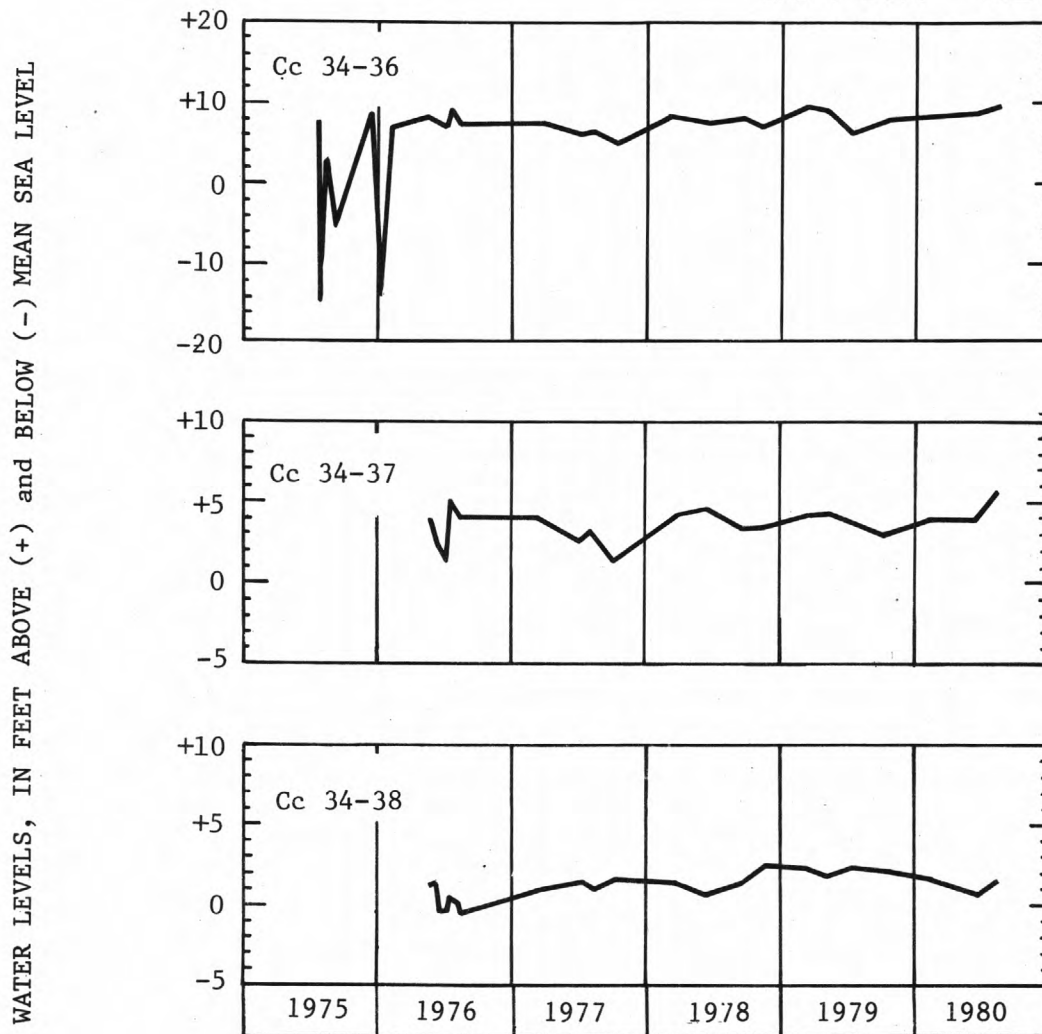


FIGURE 25.--Du Pont - Newport. Water levels in Cc34-36, 1975- 80, and Cc34-37 and Cc34-38, 1976- 80.

# DU PONT - NEWPORT

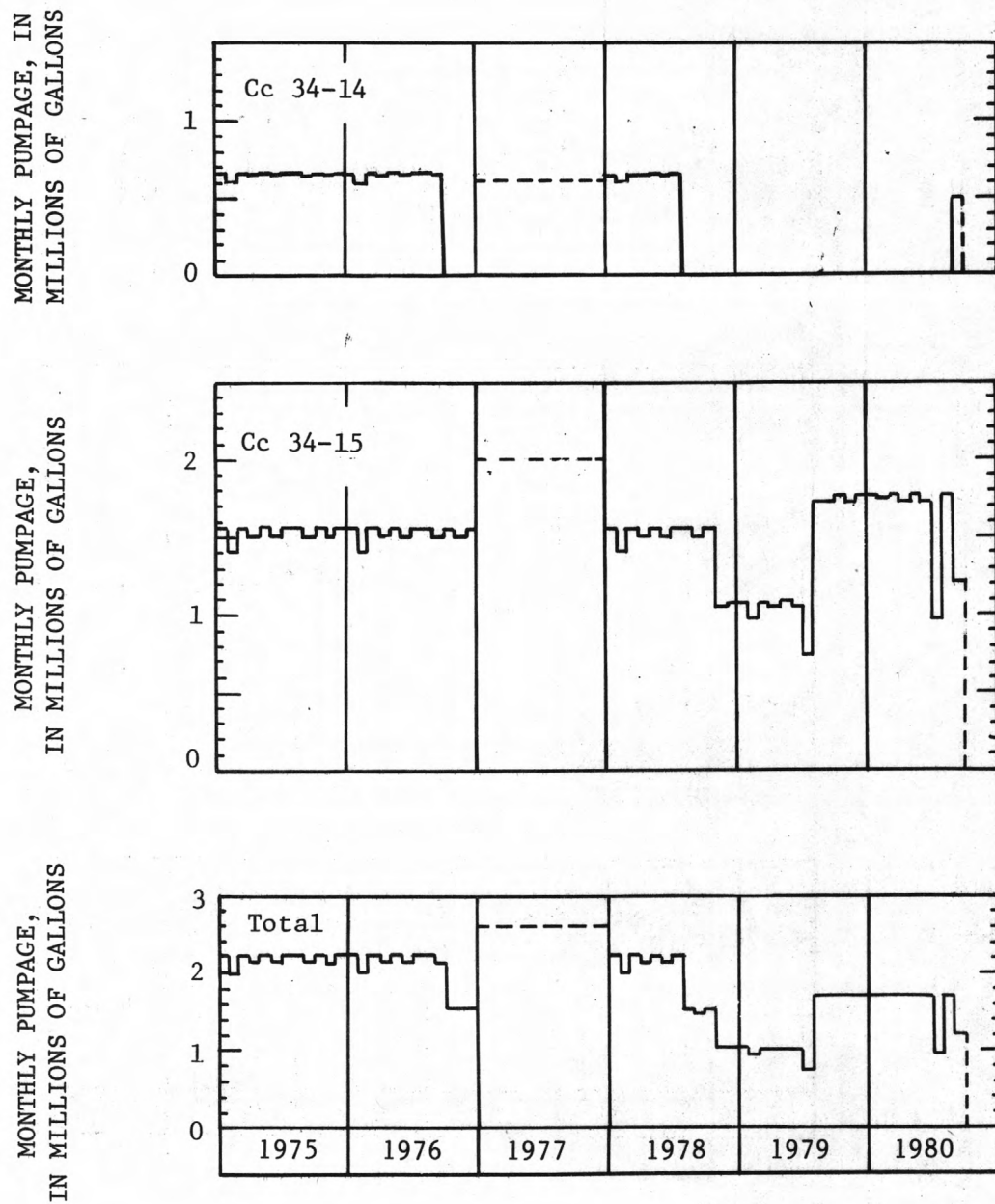


FIGURE 26.--Du Pont - Newport. Monthly pumpage from Cc34-14 and Cc34-15 and total monthly pumpage from well field, 1975- 80.

# FAIRWINDS

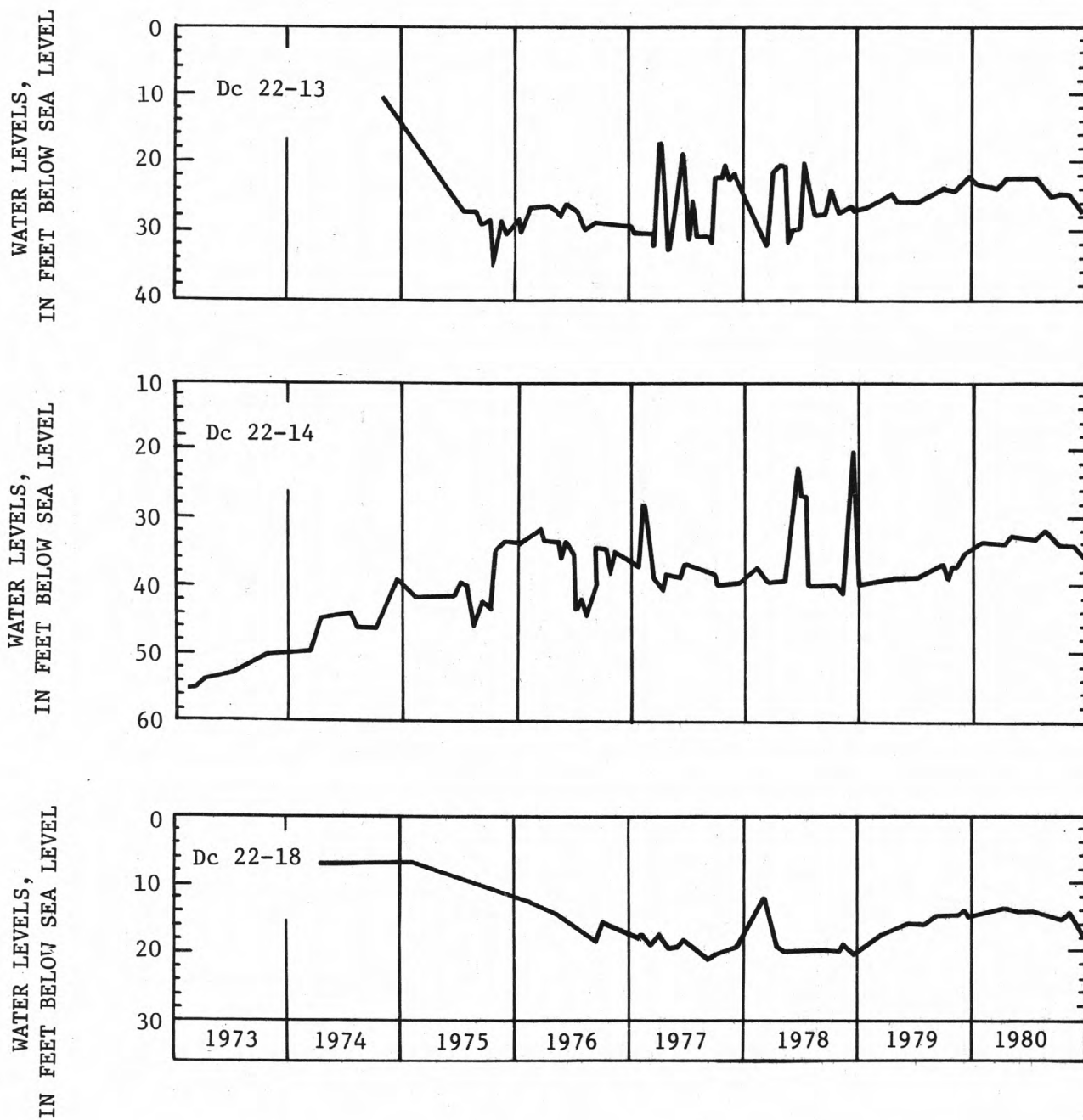


FIGURE 27.--Fairwinds. Water levels in Dc22-13 and Dc22-18, 1974- 80, and Dc22-14, 1973- 80.

# FAIRWINDS

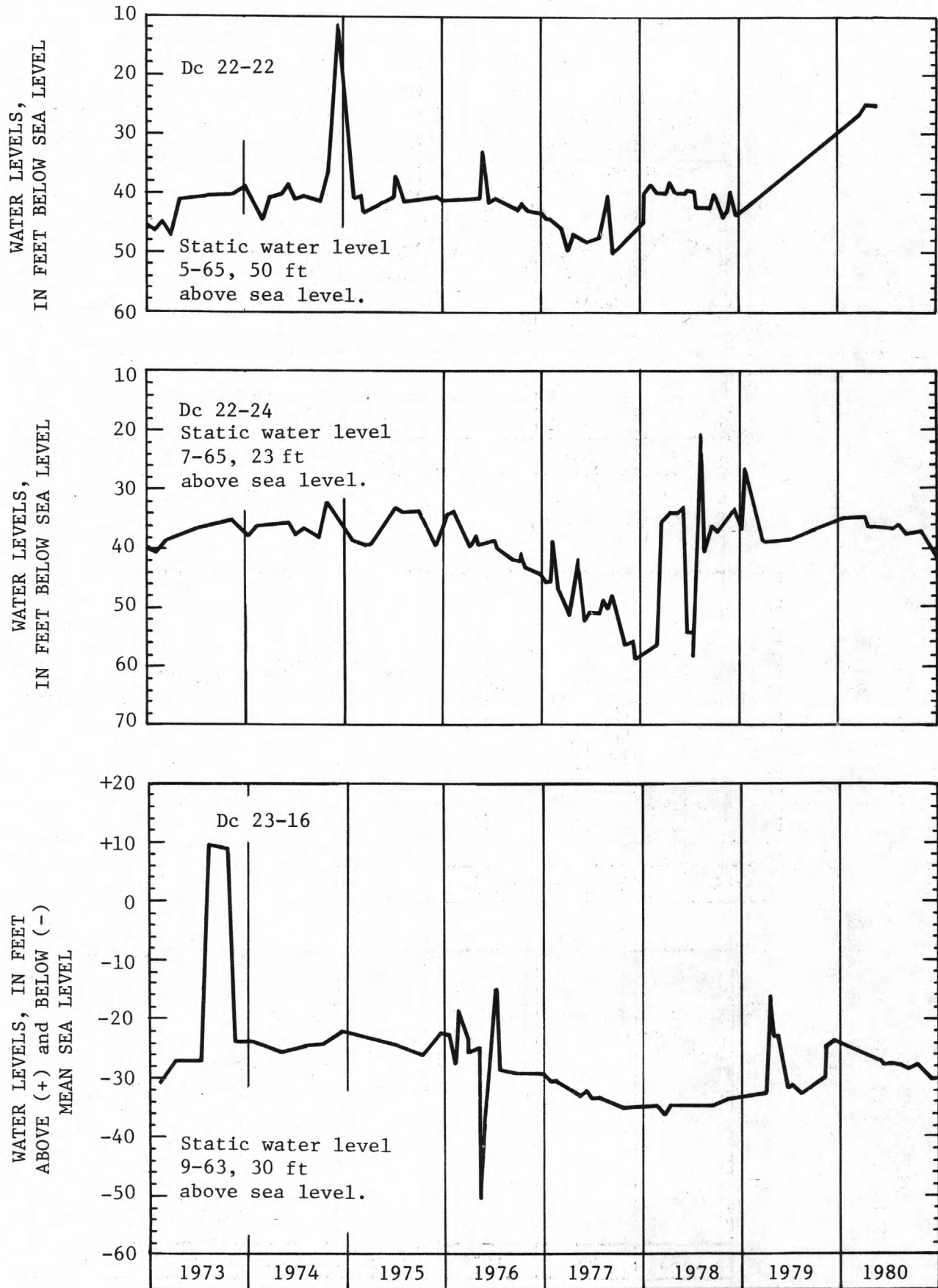


FIGURE 28.--Fairwinds. Water levels in Dc22-22, Dc22-24, and Dc23-16, 1973- 80.



# FAIRWINDS

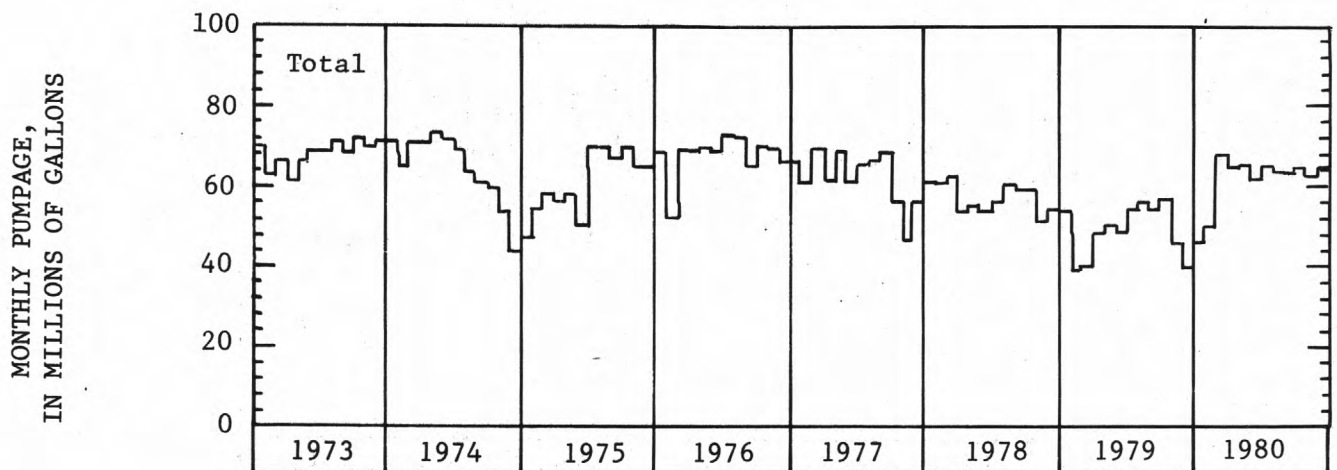
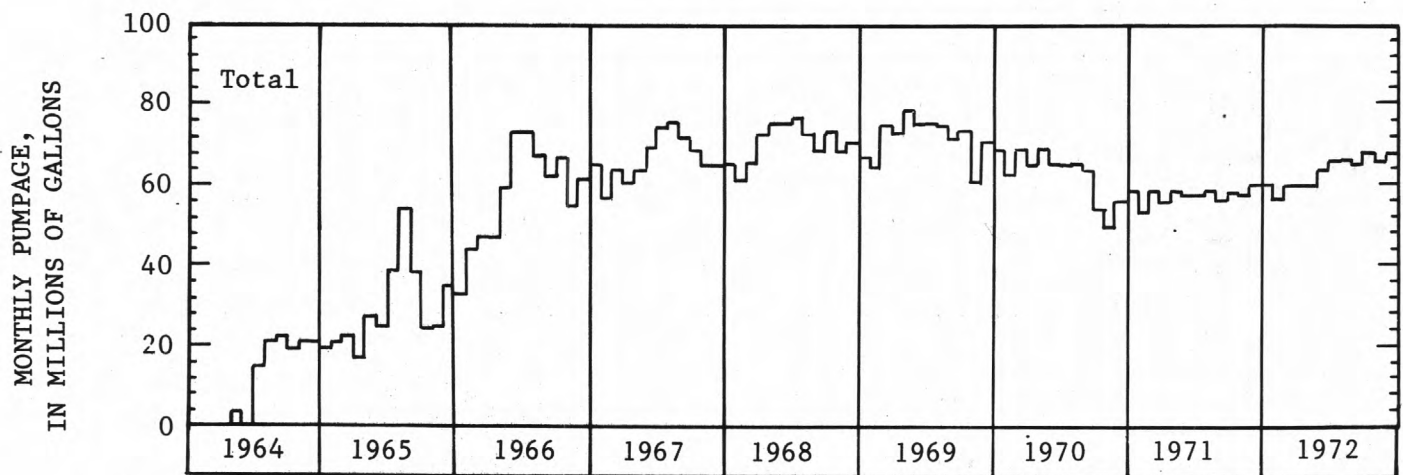
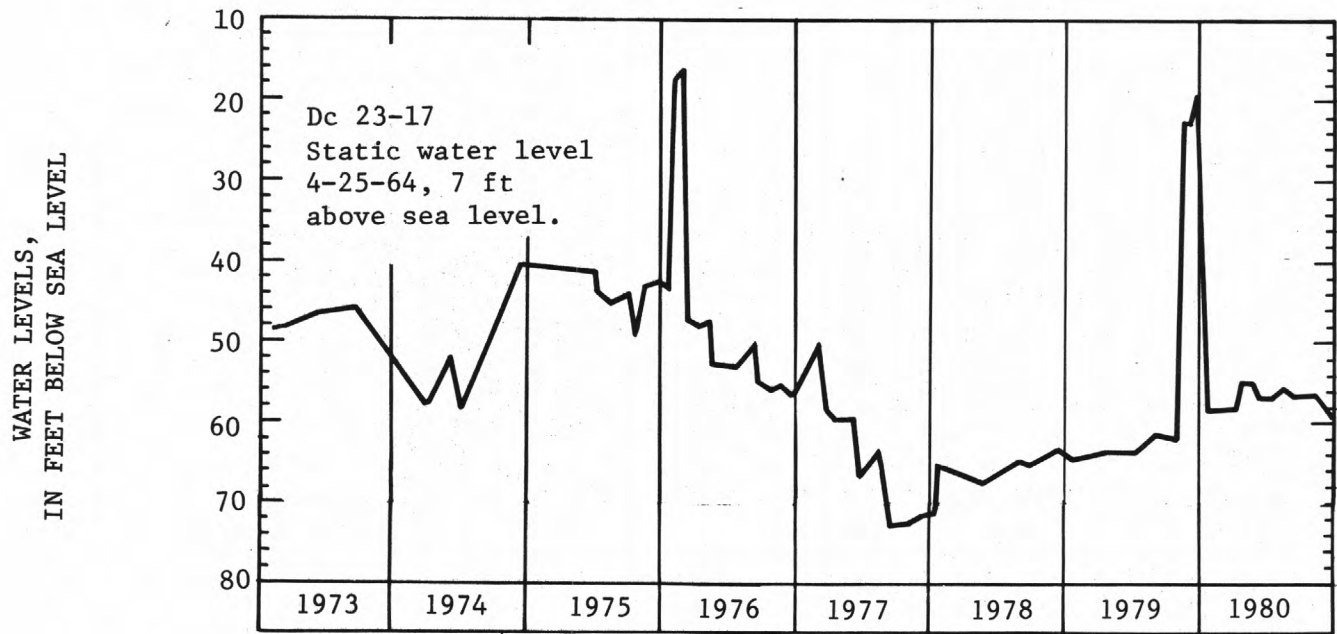


FIGURE 29.--Fairwinds. Total monthly pumpage from well field, 1964- 80. Water levels in Dc23-17, 1973- 80.

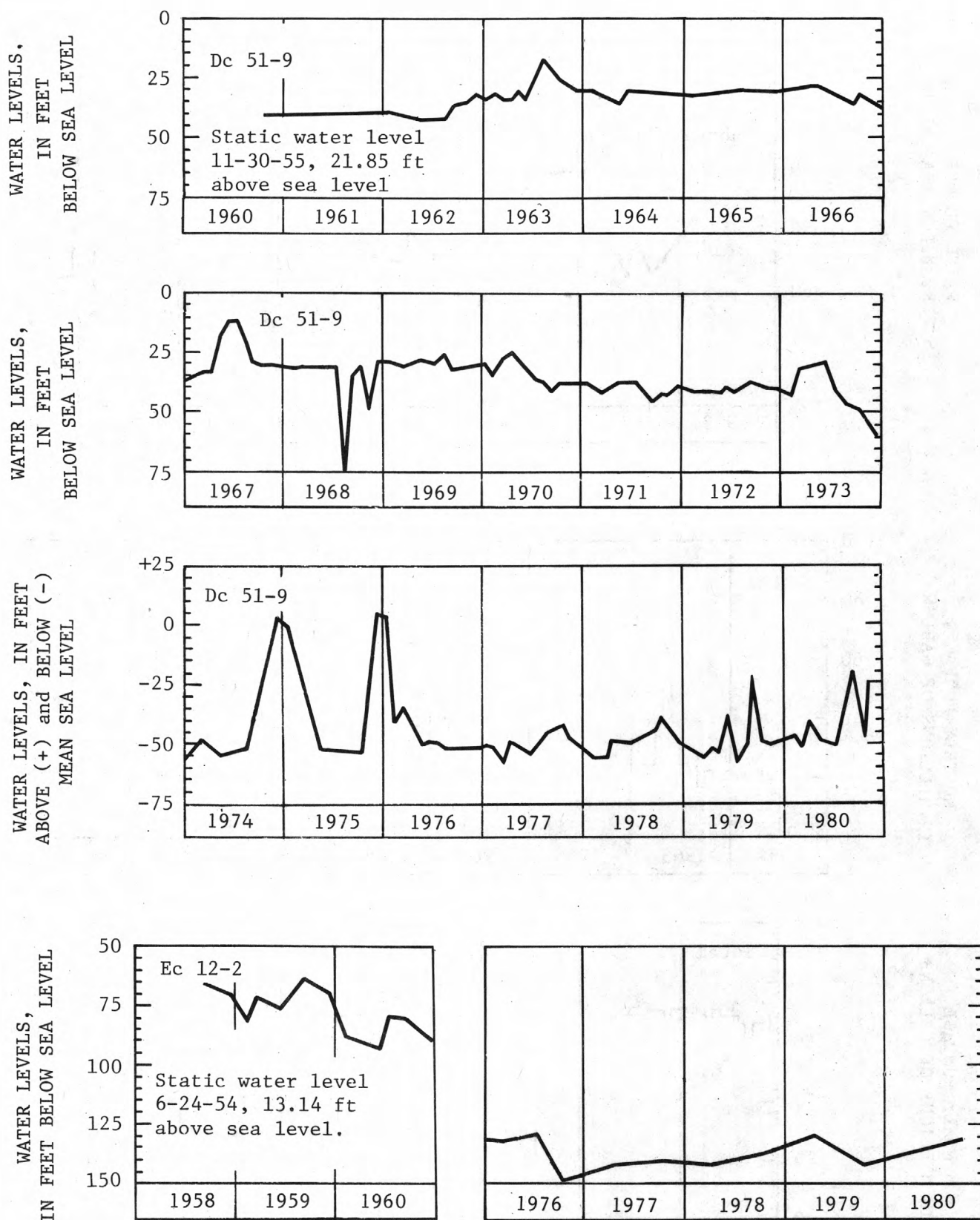


FIGURE 30.--Getty. Water levels in Dc51-9, 1960-80, and Ec12-2, 1958-60, and 1976-80.

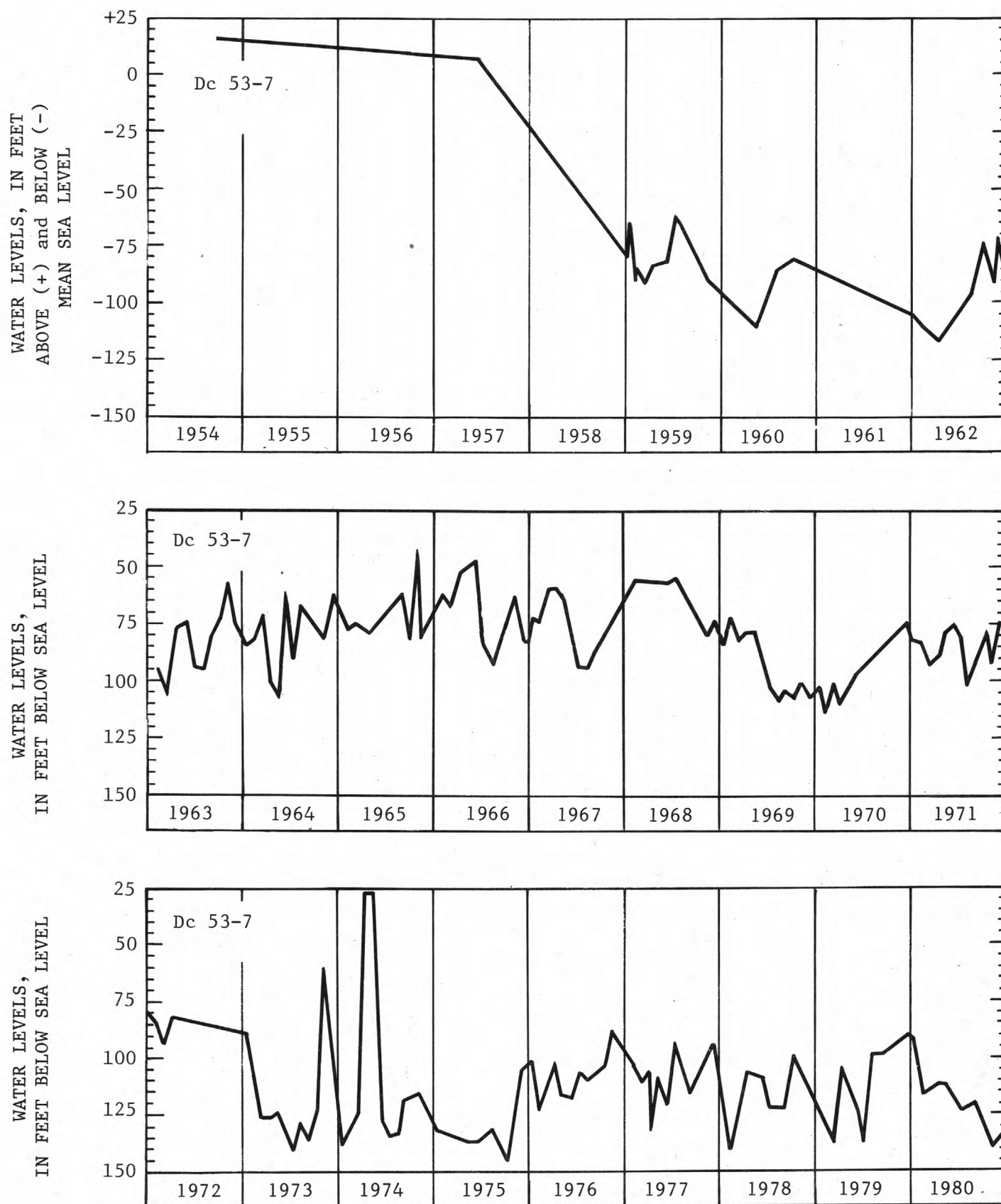


FIGURE 31.--Getty. Water levels in Dc53-7, 1954- 80.

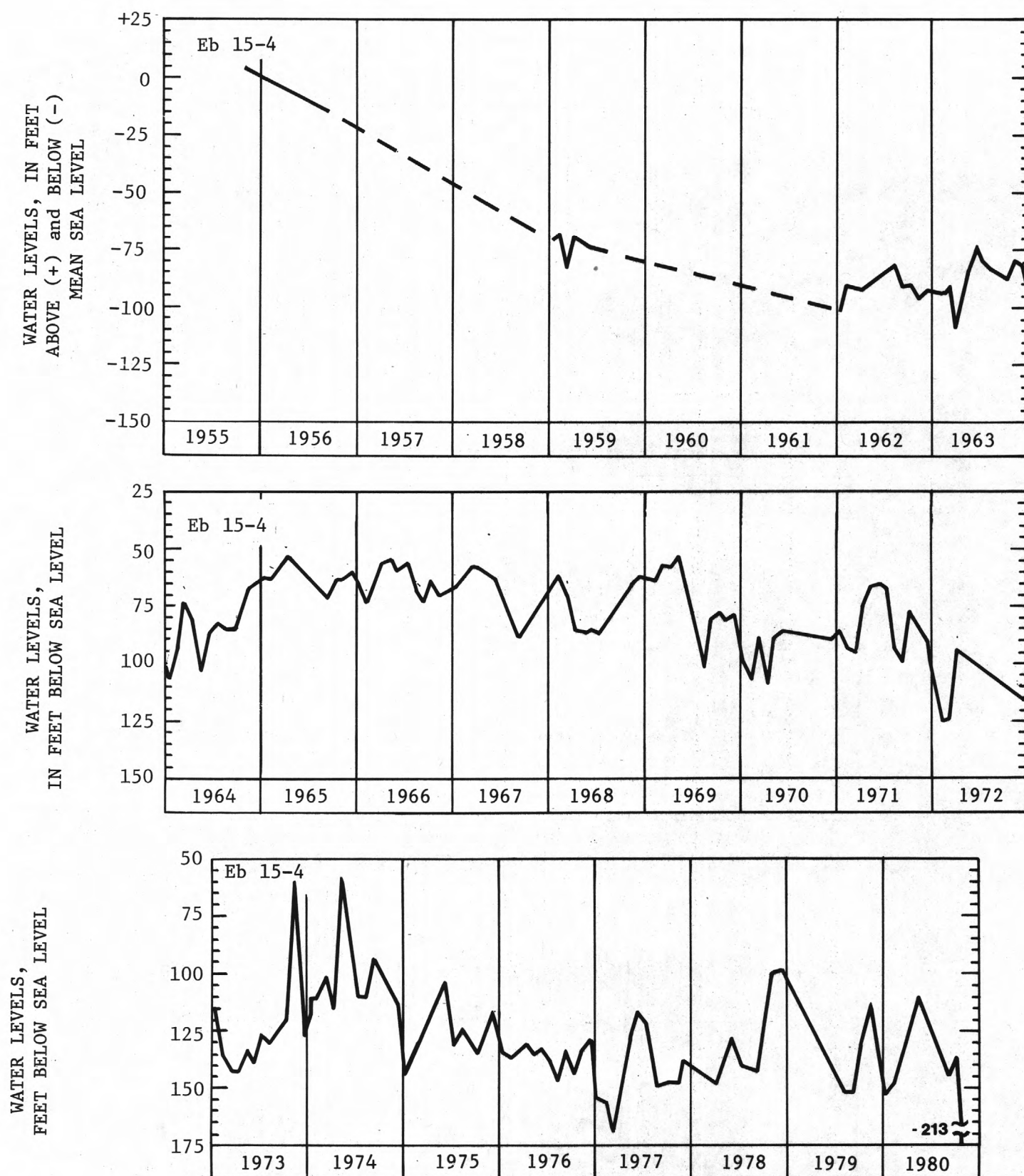


FIGURE 32.--Getty. Water levels in Eb15-4, 1955- 80.



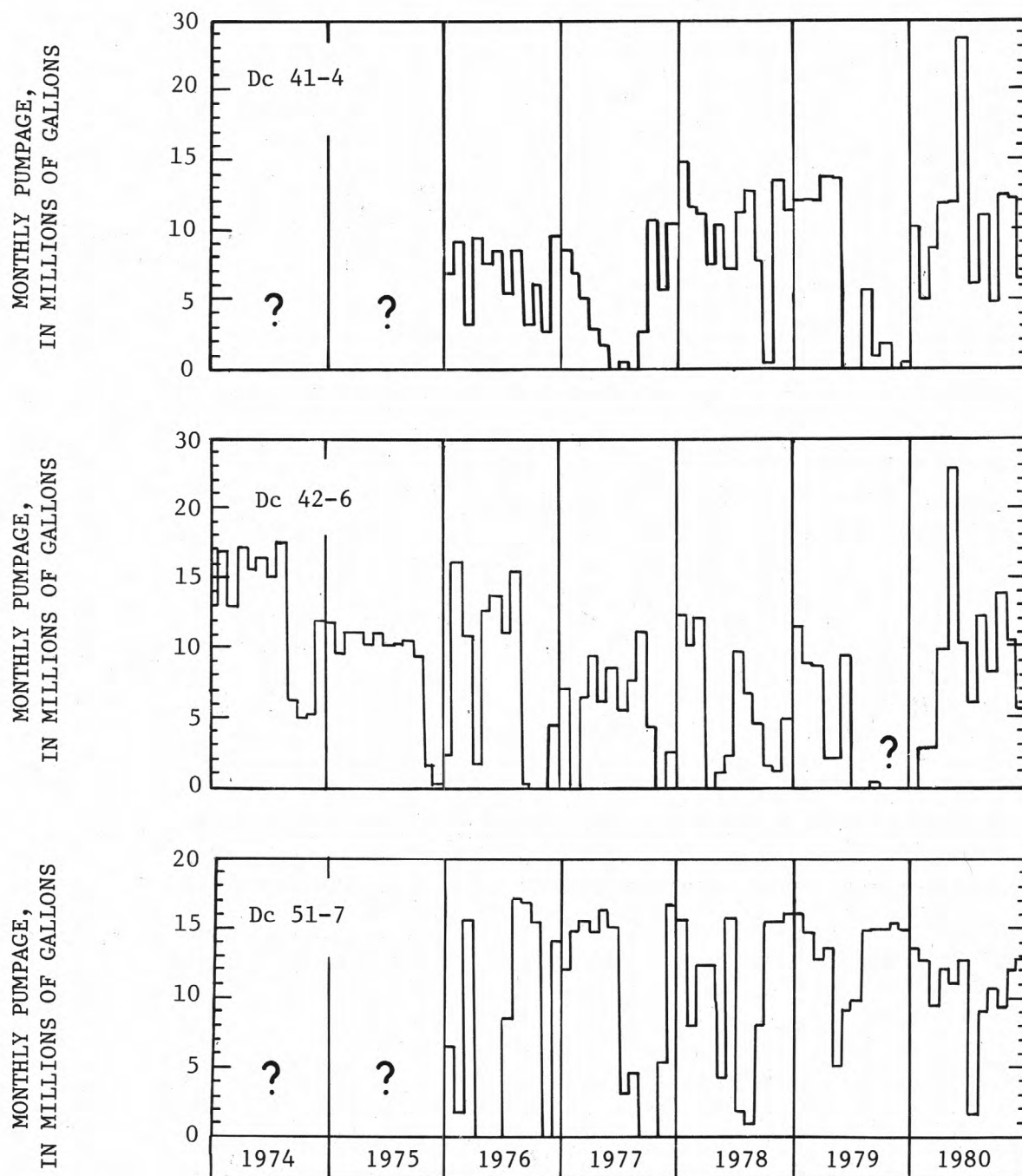


FIGURE 33.--Getty. Monthly pumpage from Dc41-4 and Dc51-7 1976-80, and Dc42-6, 1974-80.

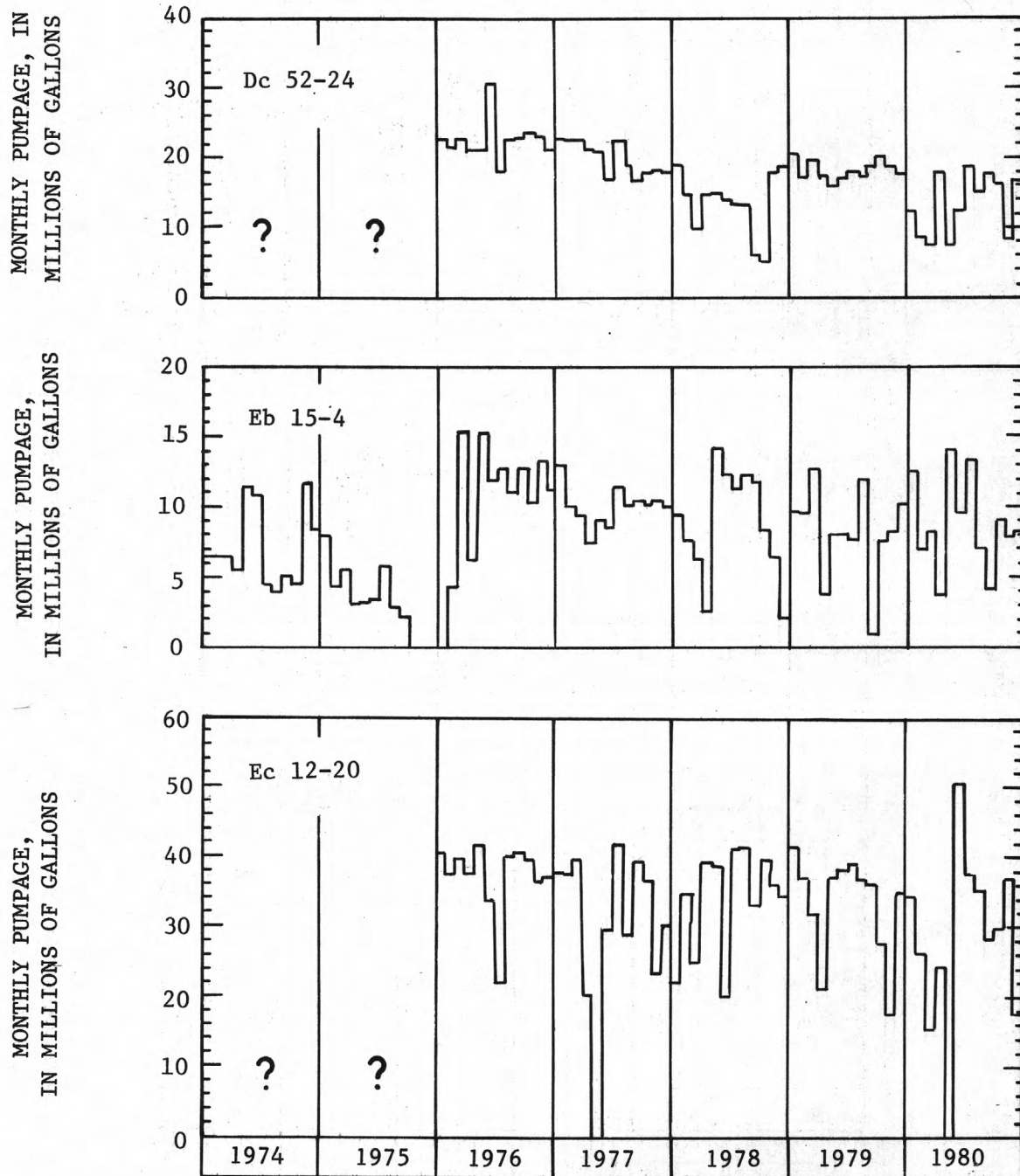


FIGURE 34.--Getty. Monthly pumpage from Dc52-24 and Ec12-20, 1976- 80, and Eb15-4, 1974- 80.

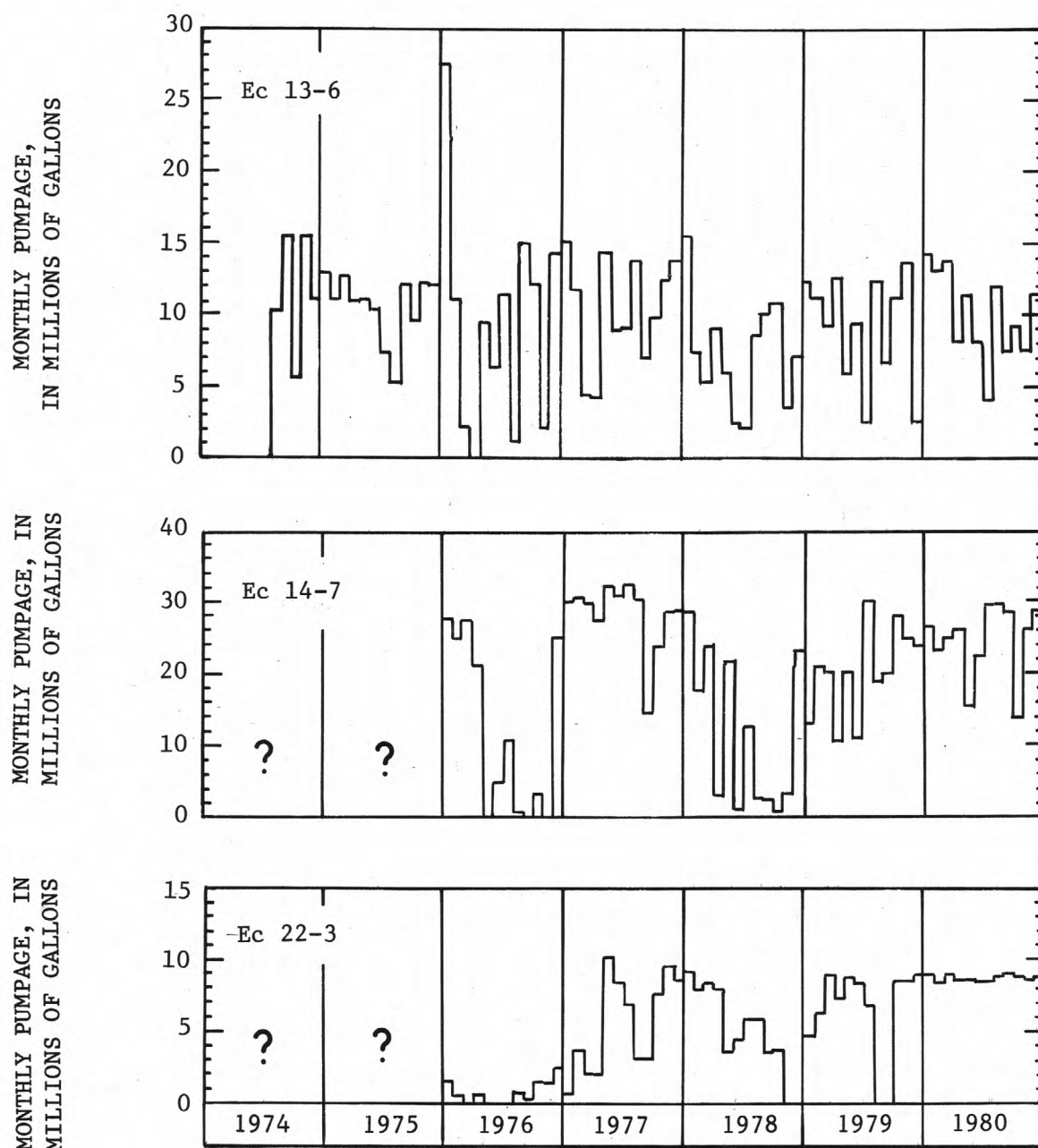


FIGURE 35.--Getty. Monthly pumpage from Ec13-6, 1974- 80 and Ec14-7 and Ec22-3, 1976-80.

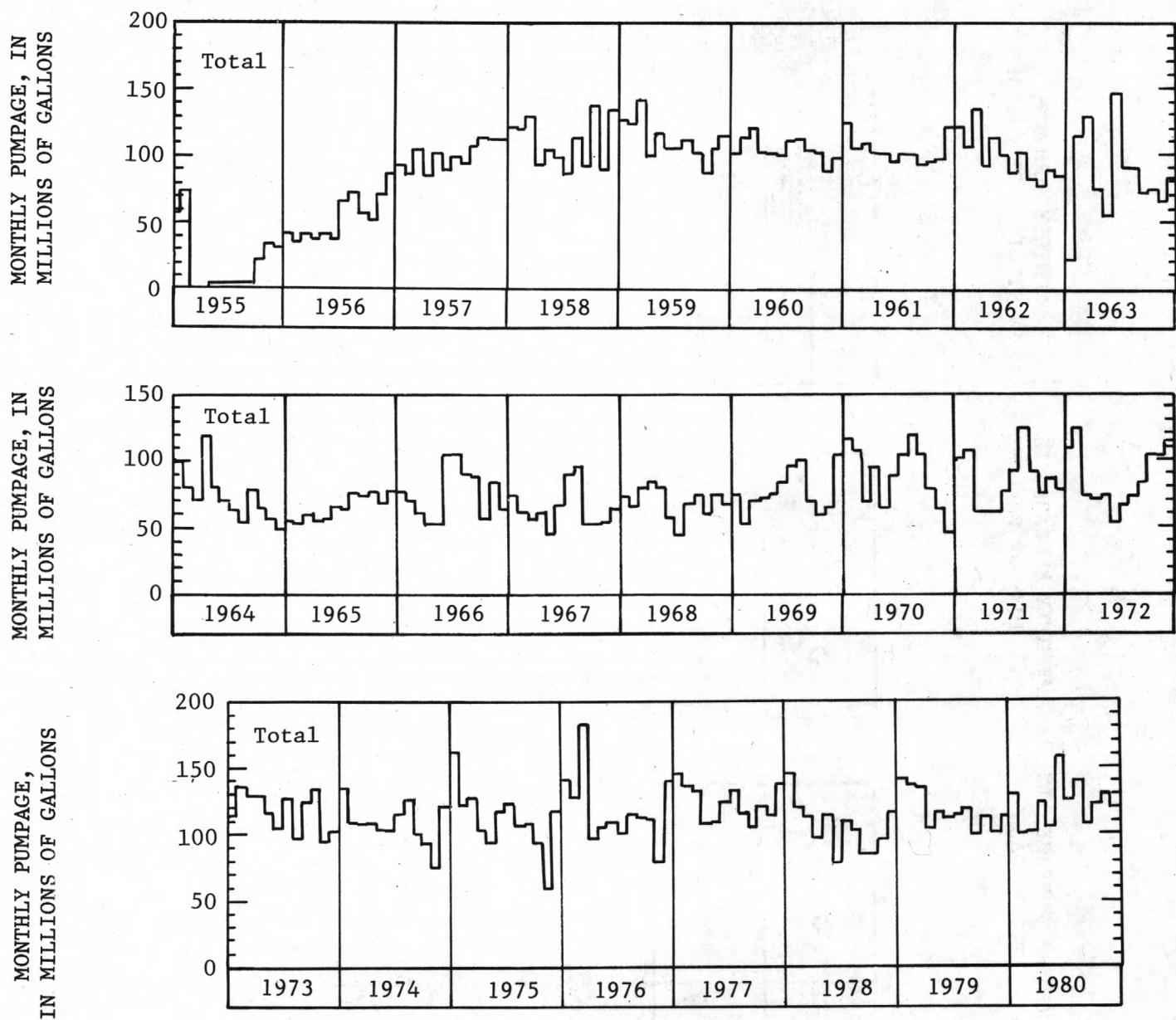


FIGURE 36.--Getty. Total monthly pumpage from well field,  
1955- 80.

# GLENDALE

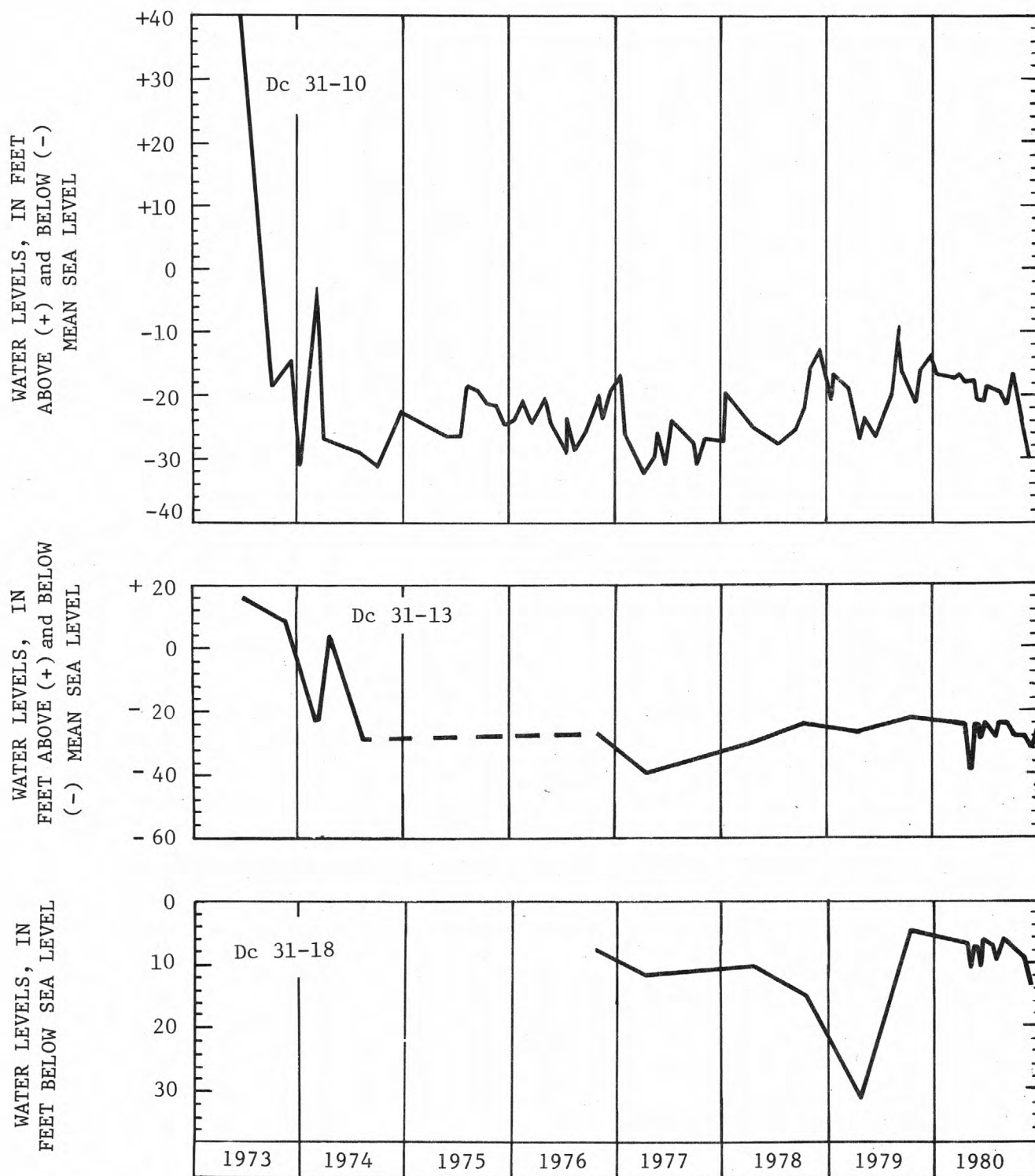


FIGURE 37.--Glendale. Water levels in Dc31-10 and Dc31-13, 1973- 80, and Dc31-18, 1976- 80.



# GLENDALE

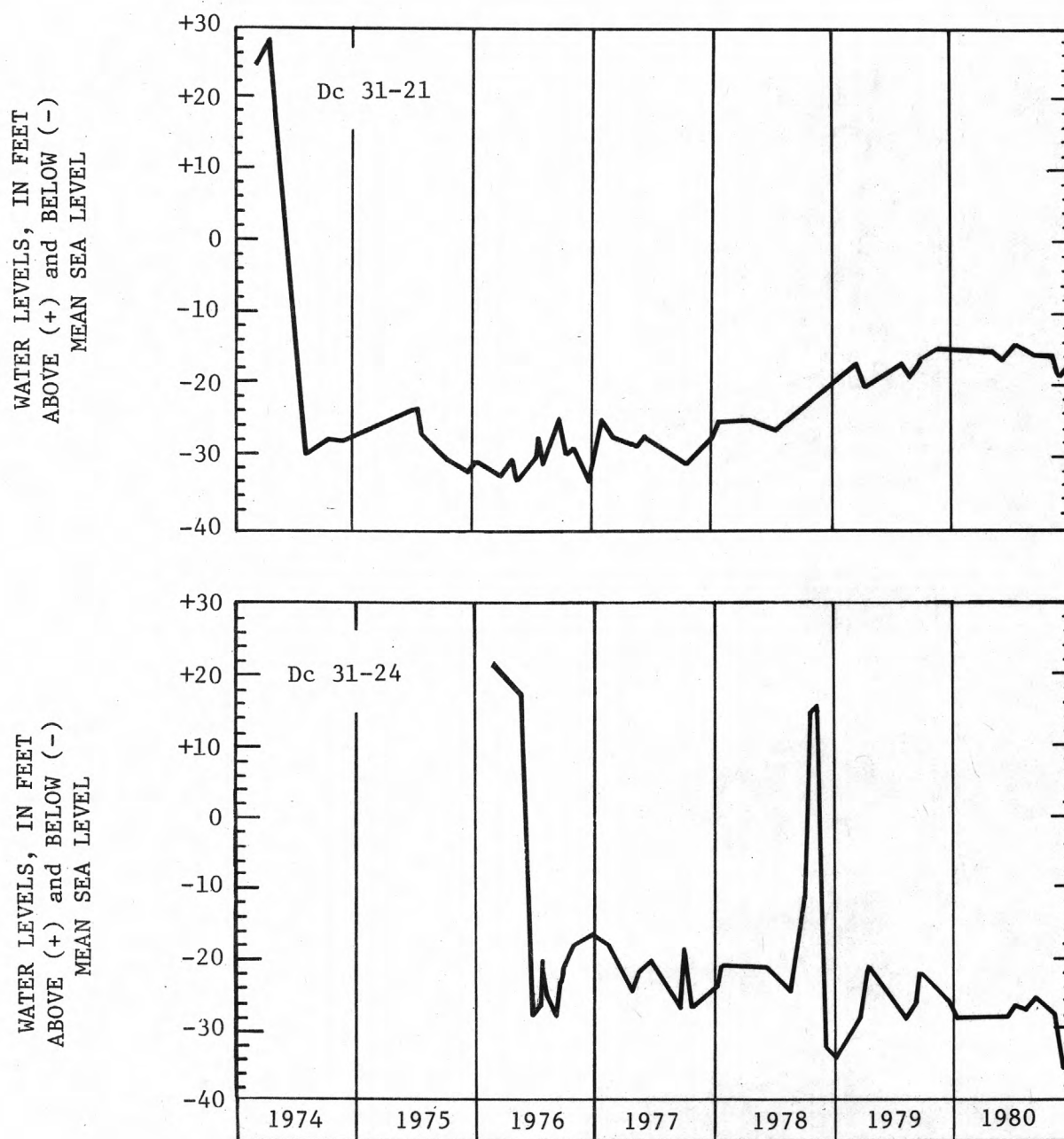


FIGURE 38.--Glendale. Water levels in Dc31-21, 1974- 80, and Dc31-24, 1976- 80.

# GLENDALE

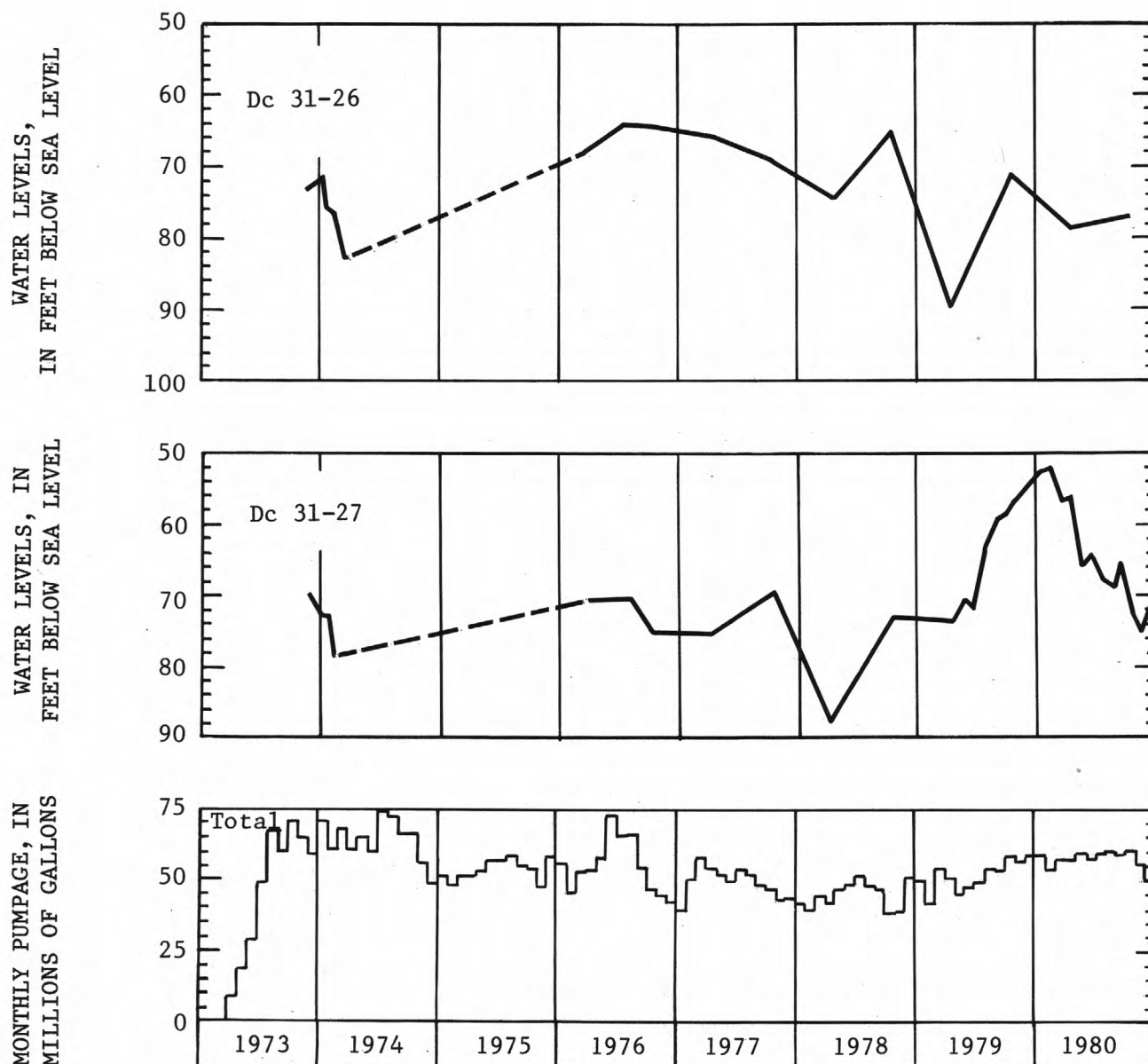


FIGURE 39.--Glendale. Total monthly pumpage from well field, 1973- 80. Water levels in Dc31-26 and Dc31-27, 1973- 80.

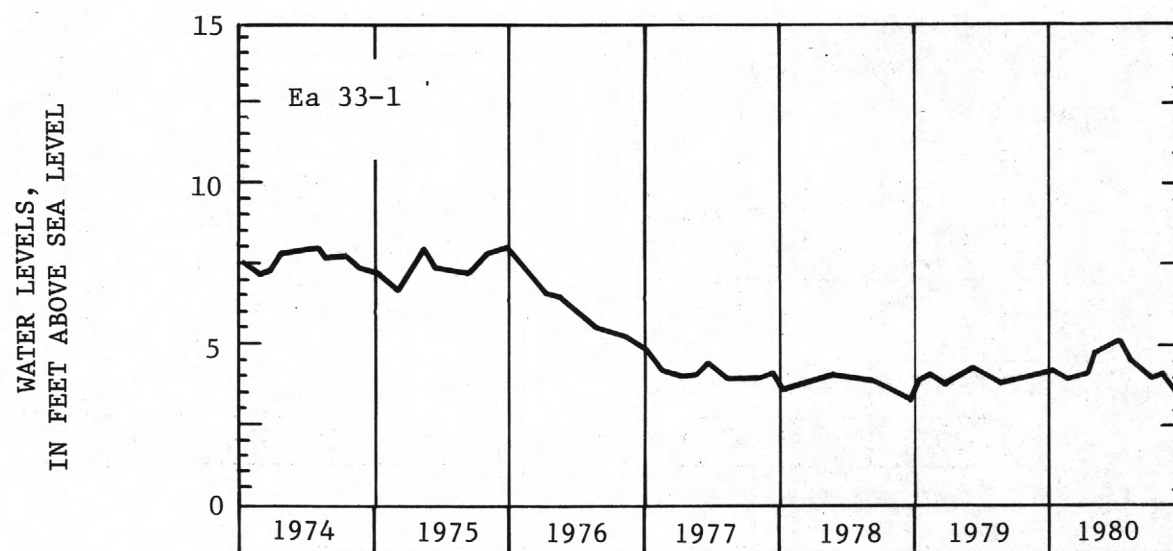
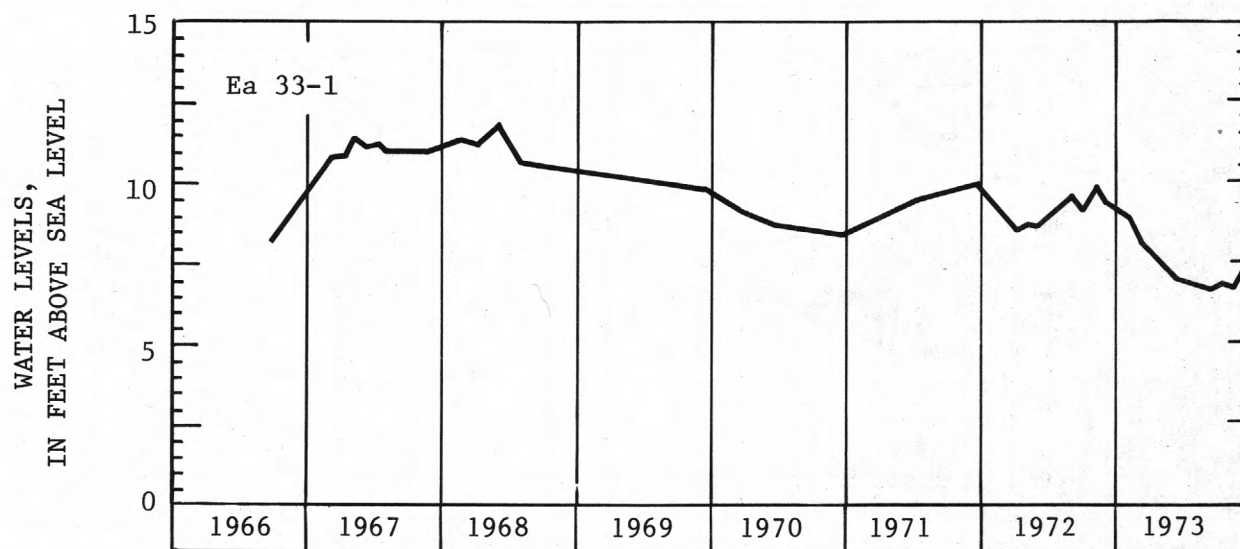


FIGURE 40.--Goodrich. Water levels in Ea33-1, 1966- 80.

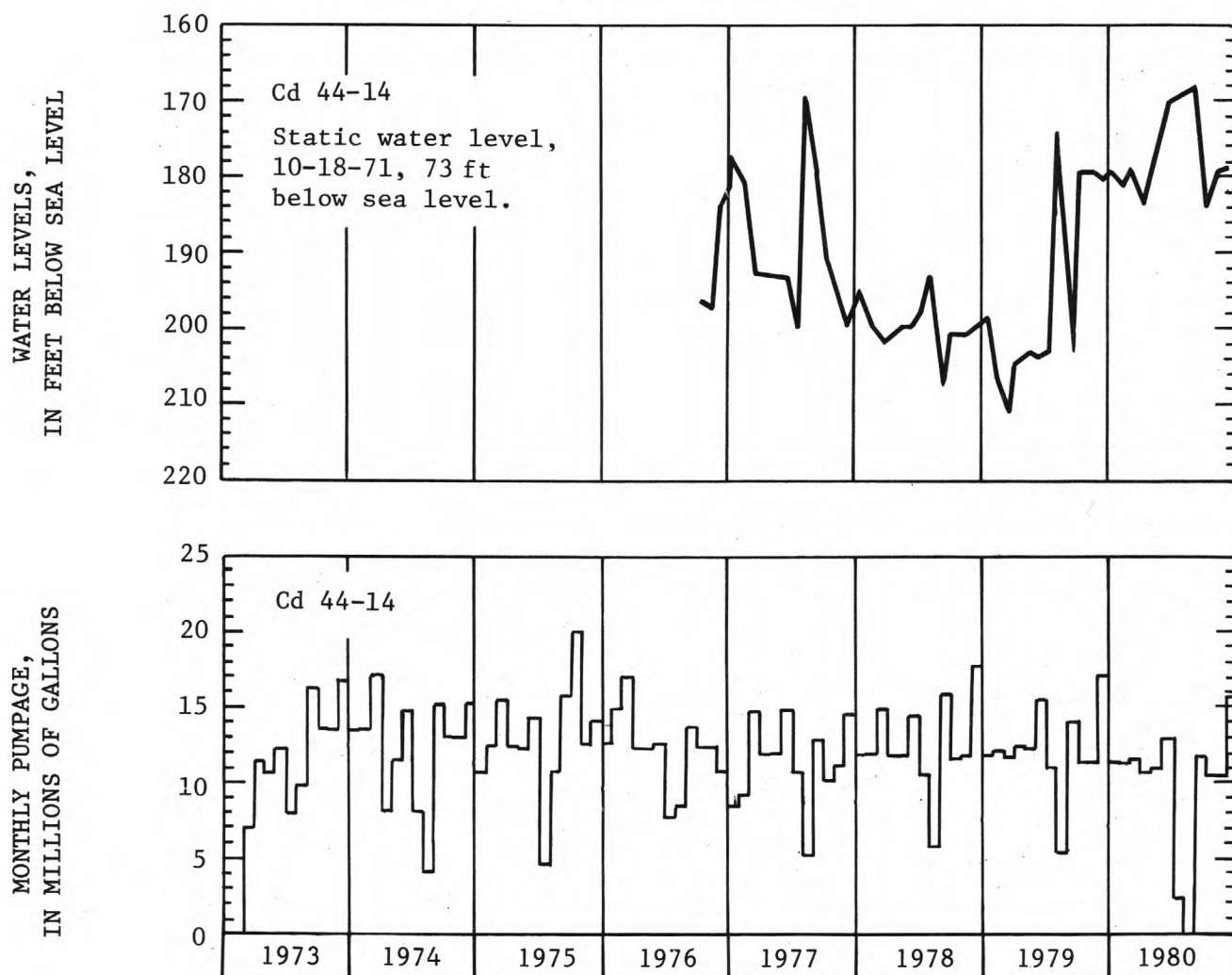


FIGURE 41.--ICI. Monthly pumpage from Cd44-14, 1973-80.  
Water levels in Cd44-14, 1976-80.

# JEFFERSON FARMS

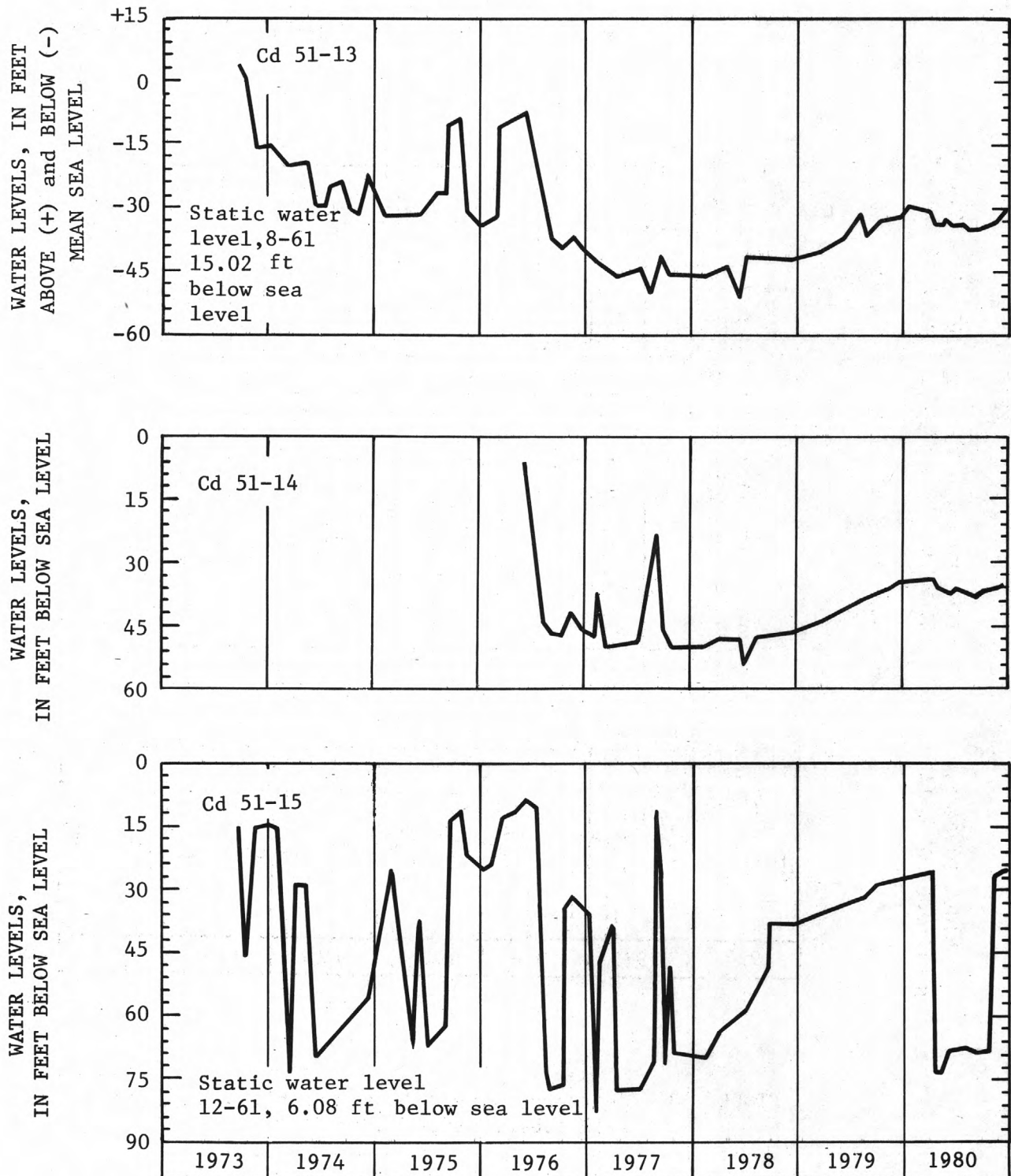
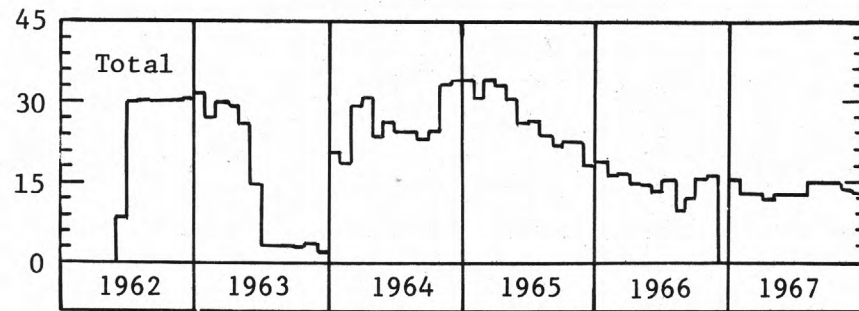


FIGURE 42.--Jefferson Farms. Water levels in Cd51-13 and Cd51-15, 1973- 80, and Cd51-14, 1976-80.

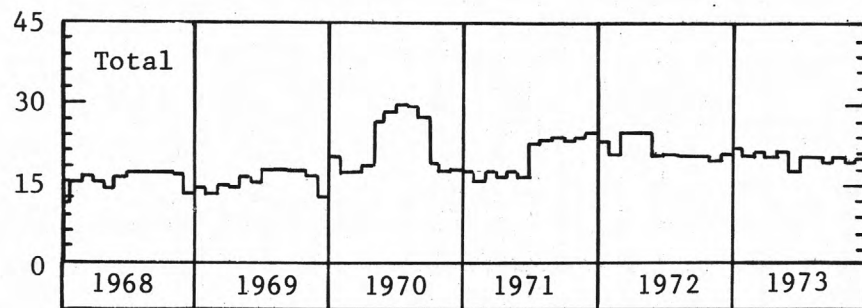


# JEFFERSON FARMS

MONTHLY PUMPAGE, IN  
MILLIONS OF GALLONS



MONTHLY PUMPAGE, IN  
MILLIONS OF GALLONS



MONTHLY PUMPAGE,  
IN MILLIONS OF GALLONS

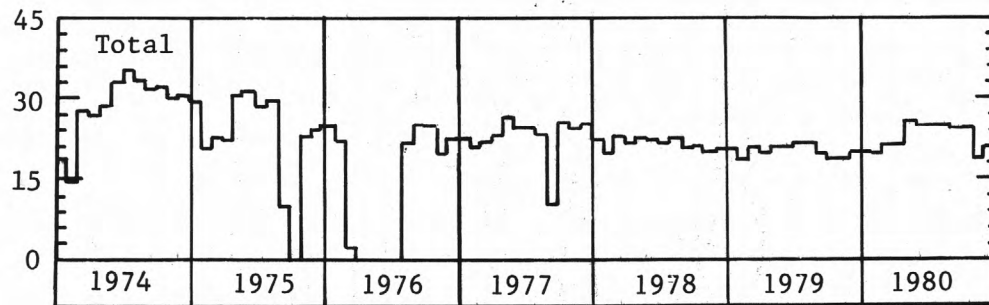


FIGURE 43.--Jefferson Farms. Total monthly pumpage from well field, 1962-80.

# LLANGOLLEN ESTATES

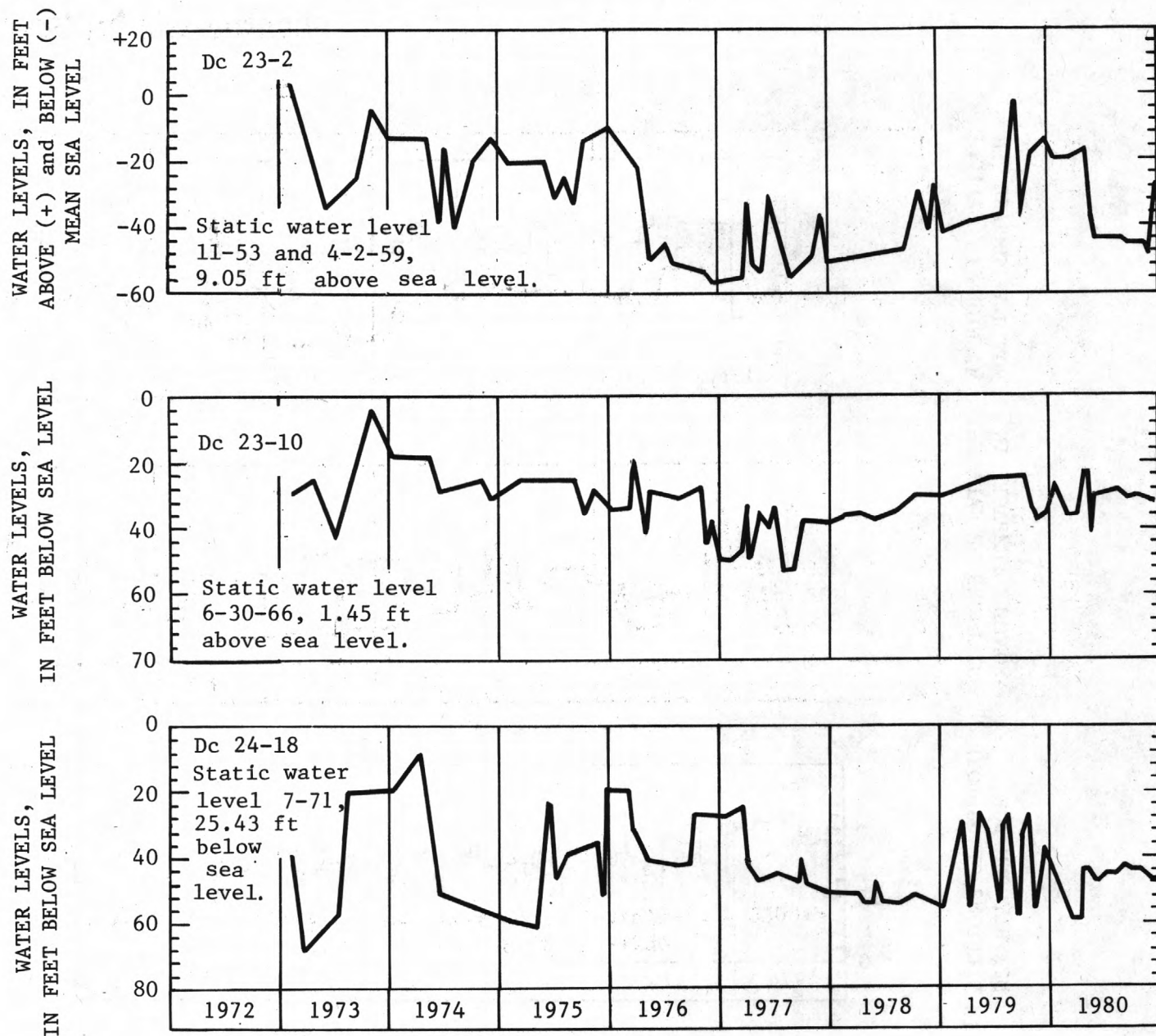


FIGURE 44.--Llangollen Estates. Water levels in Dc23-2, Dc23-10, and Dc24-18, 1973- 80.

# LLANGOLLEN ESTATES

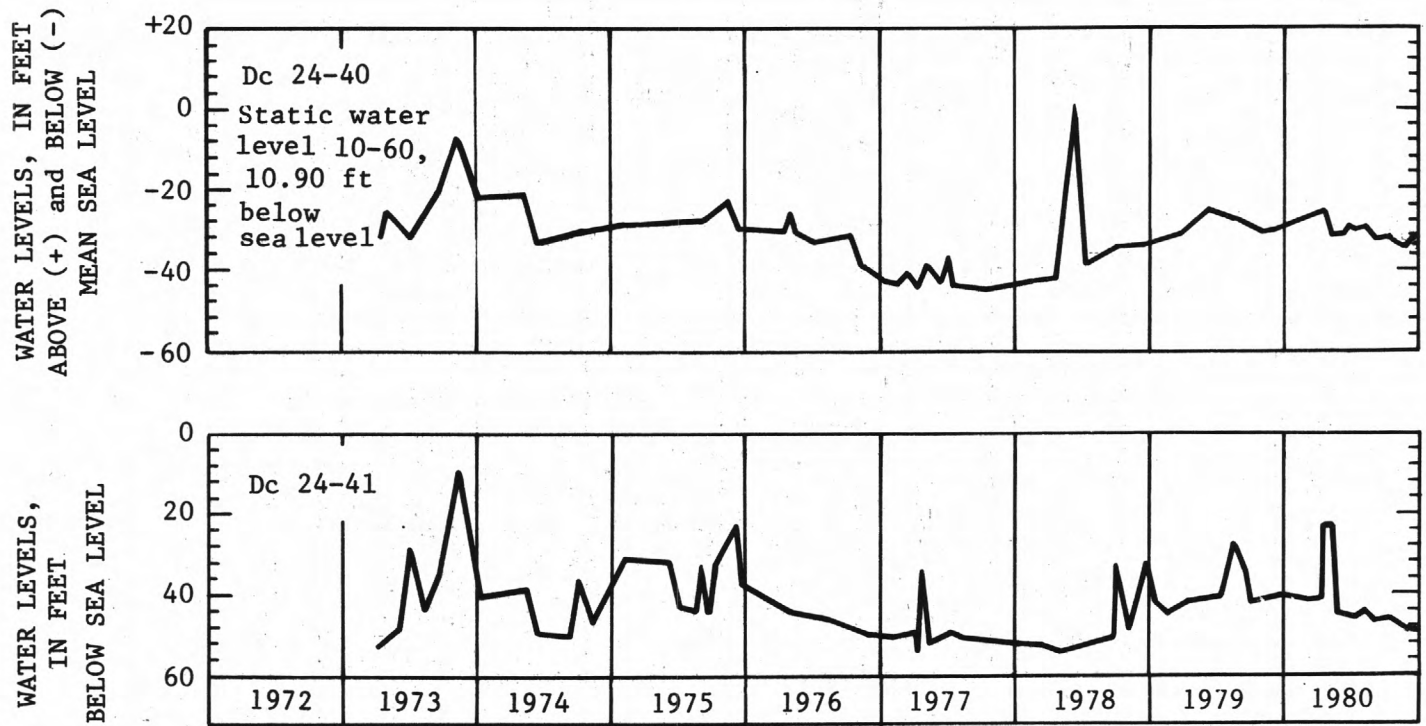


FIGURE 45.--Llangollen Estates. Water levels in Dc24-40 and Dc24-41, 1973-80.

# LLANGOLLEN ESTATES

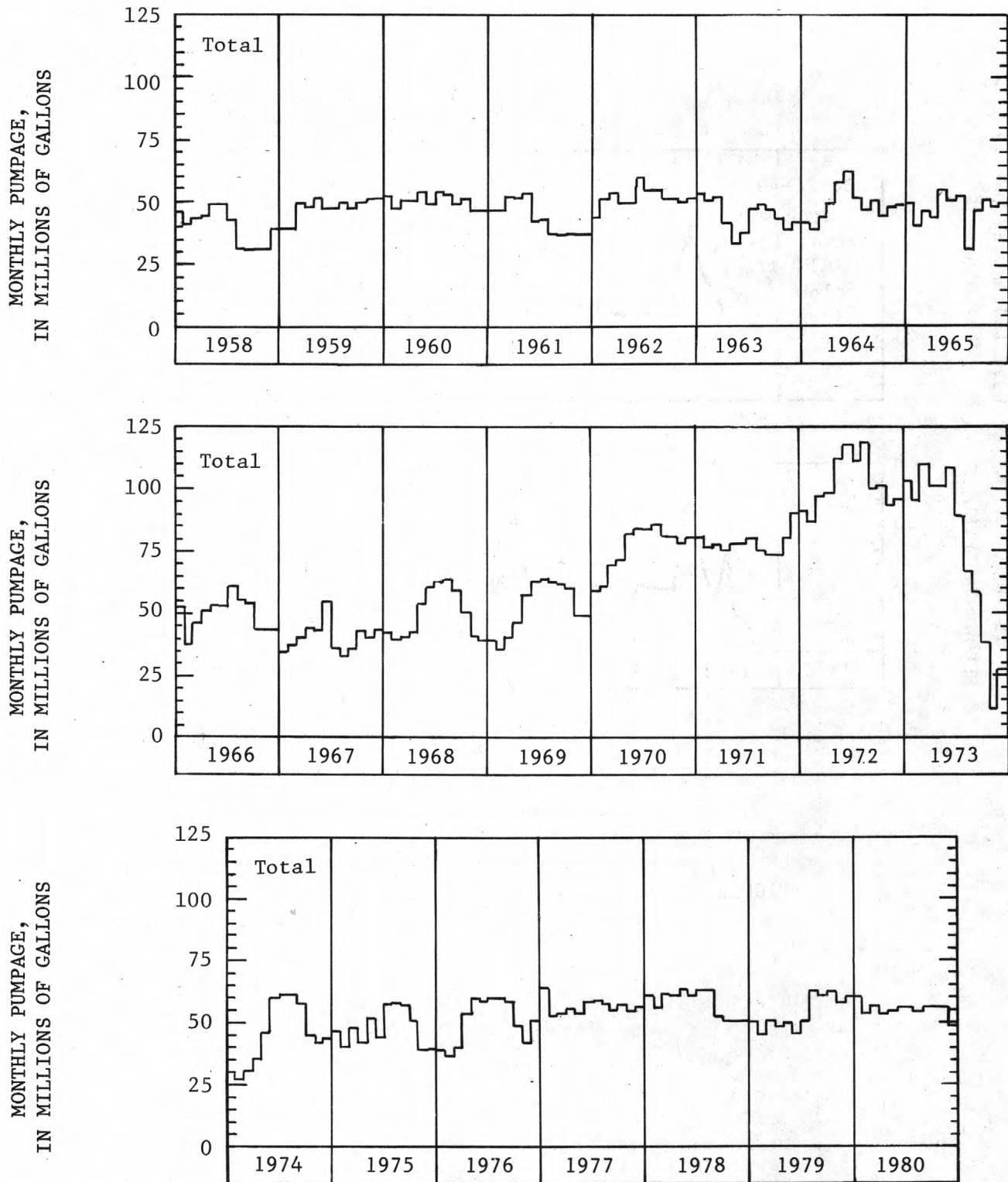


FIGURE 46.--Llangollen Estates. Total monthly pumpage from well field, 1958-80.

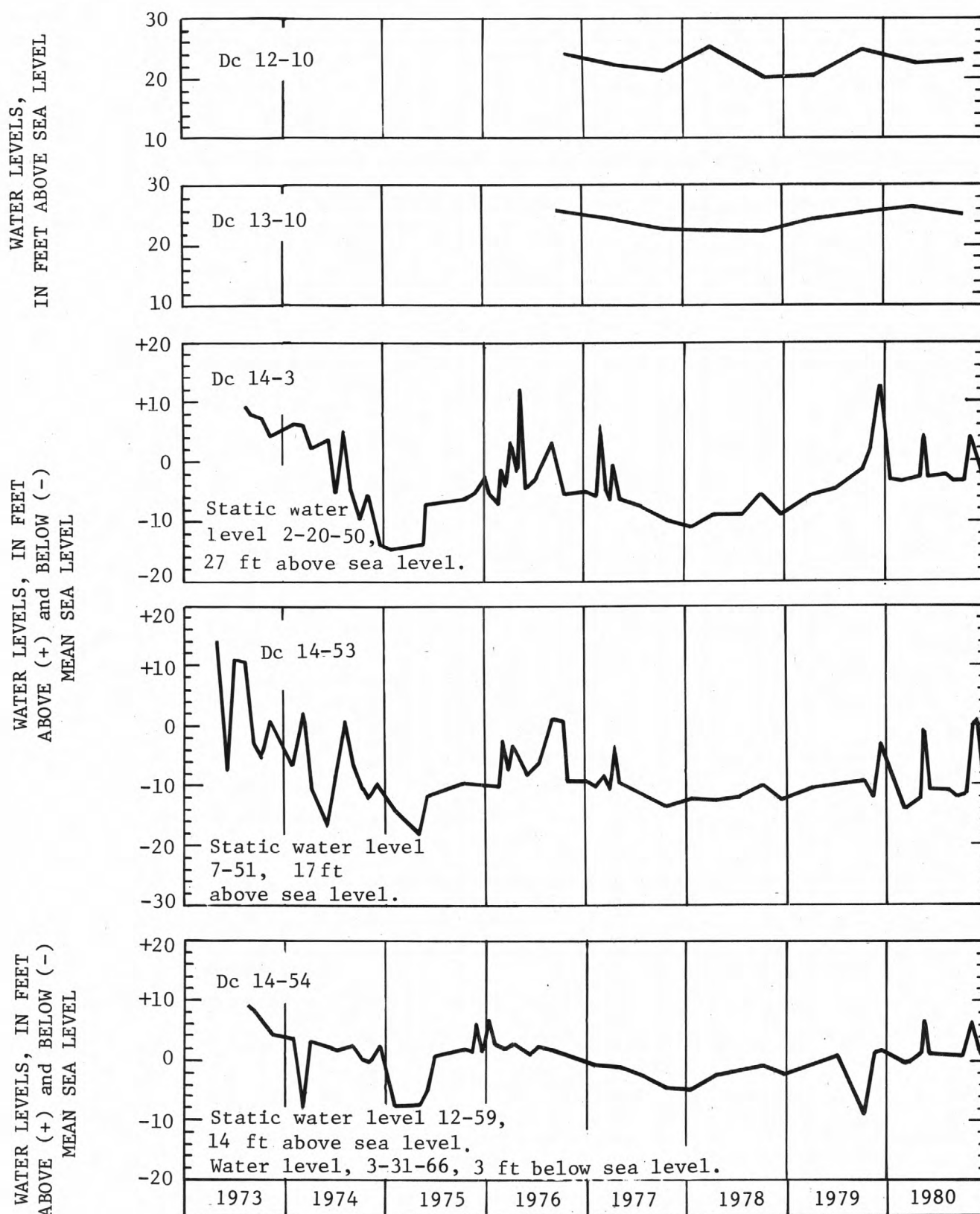


FIGURE 47.--Midvale. Water levels in Dc12-10 and Dc13-10, 1976-80,  
and Dc14-3, Dc14-53, and Dc14-54, 1973-80.



# MIDVALE

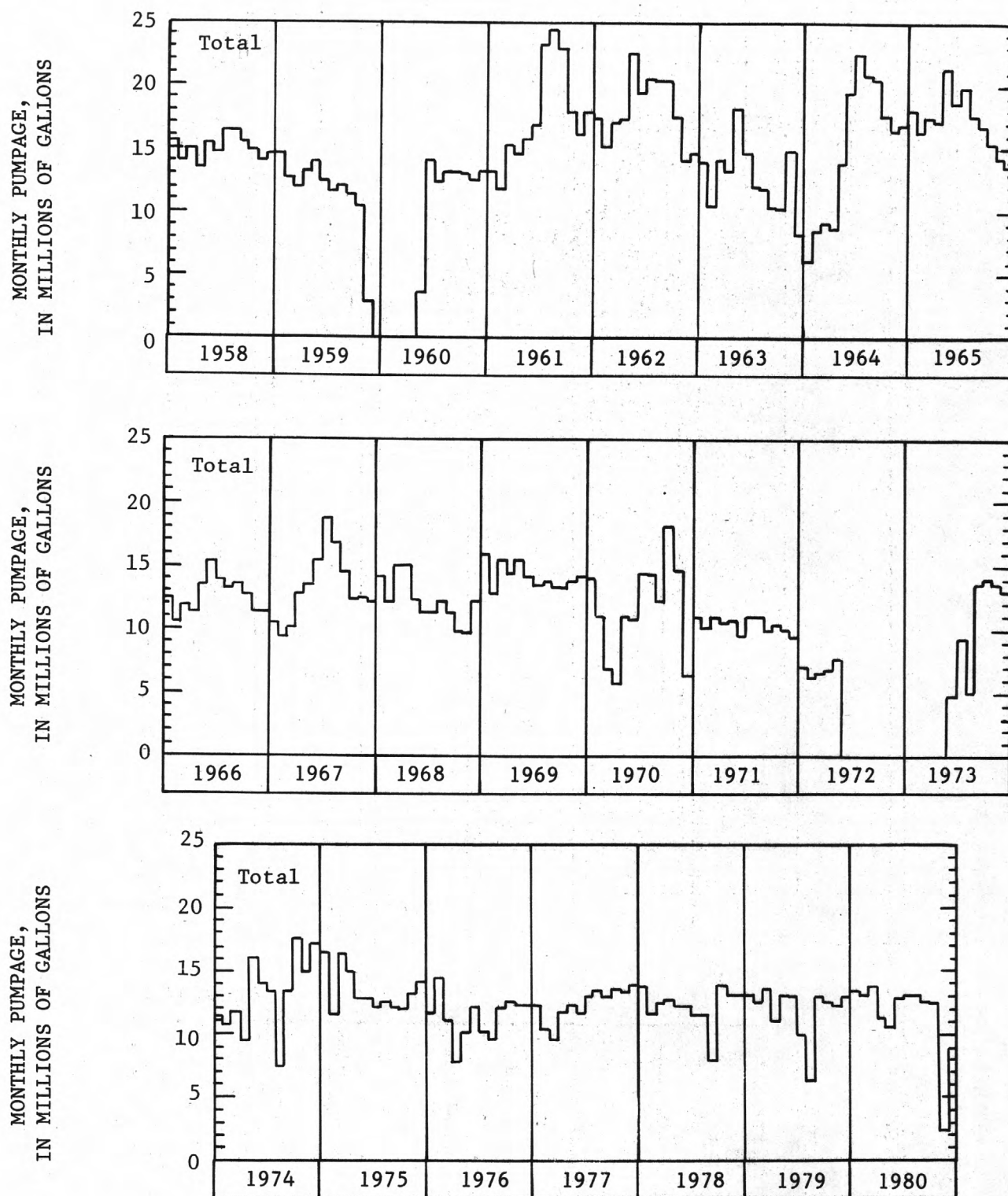


FIGURE 48.--Midvale. Total monthly pumpage from well field, 1958- 80.

# NATIONAL GUARD RIFLE RANGE

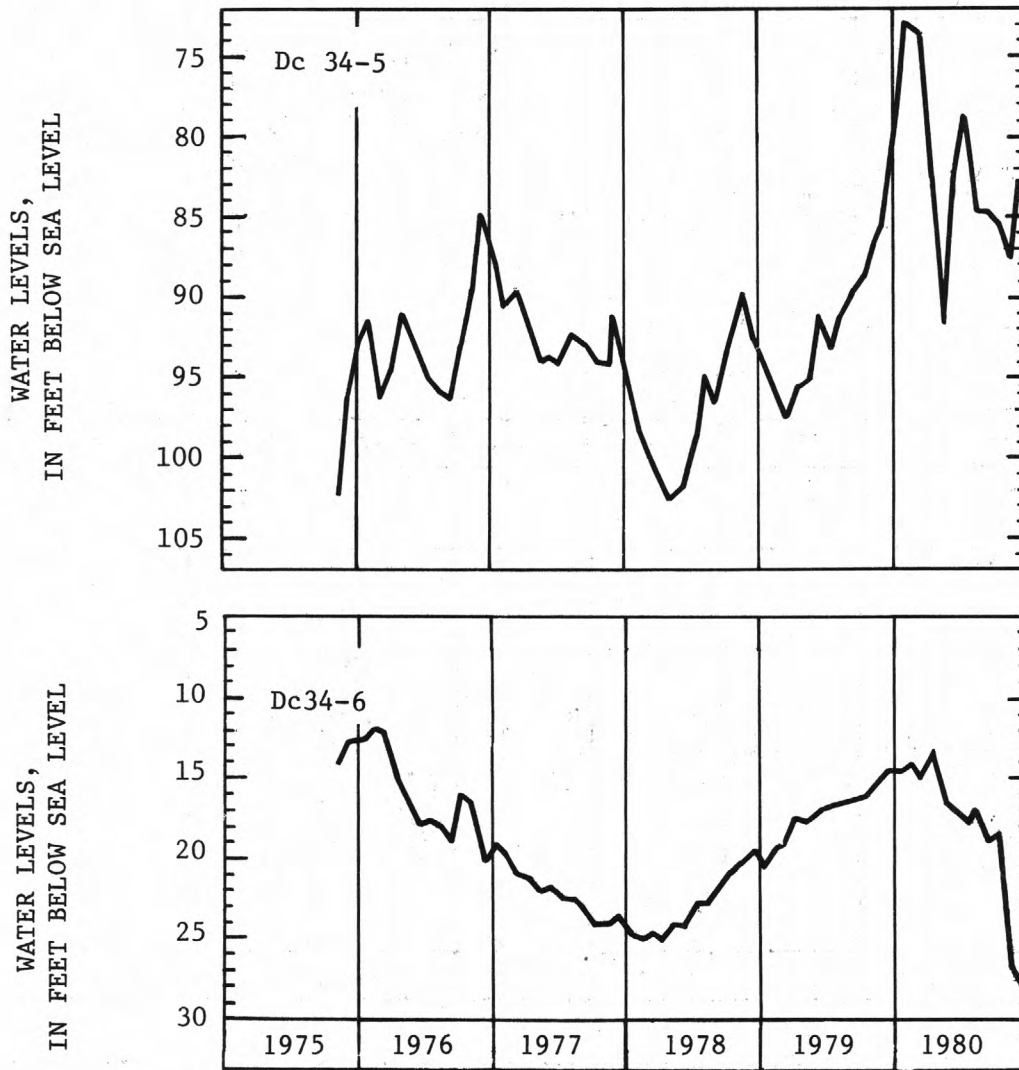


FIGURE 49.-- National Guard rifle range. Water levels in Dc34-5 and Dc34-6, 1975-1980.

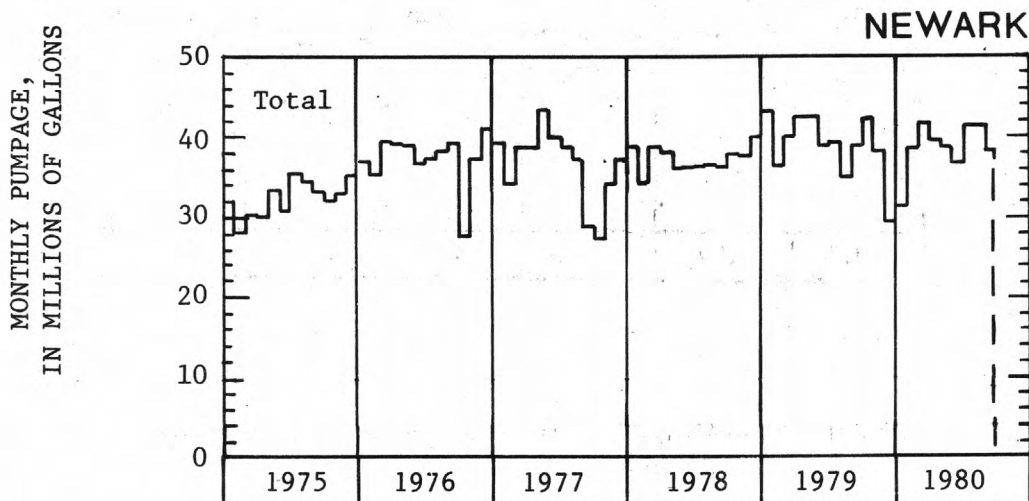
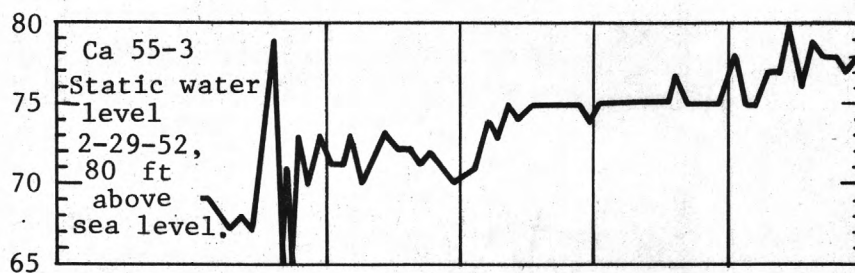
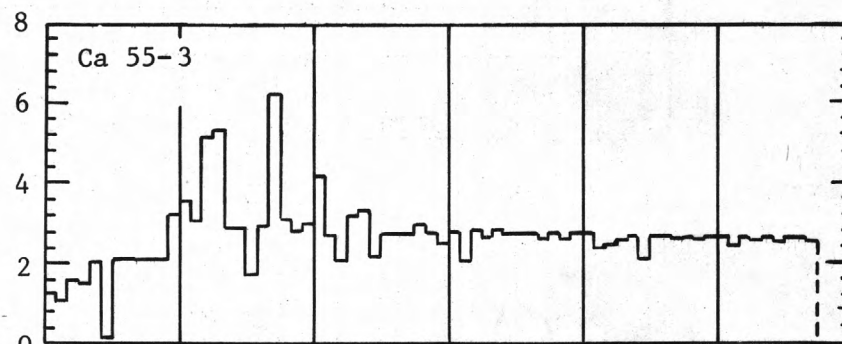


FIGURE 50.--Newark. Total monthly pumpage from well field, 1975- 80.

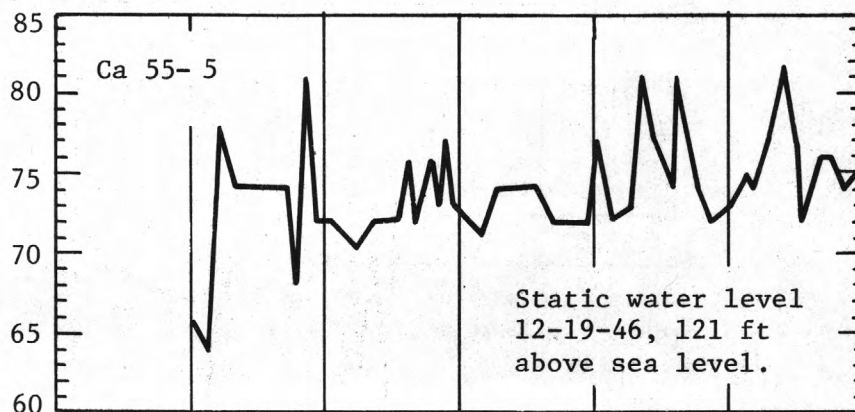
WATER LEVELS,  
IN FEET  
ABOVE SEA LEVEL



MONTHLY PUMPAGE,  
IN MILLIONS OF GALLONS



WATER LEVELS,  
IN FEET ABOVE SEA LEVEL



MONTHLY PUMPAGE,  
IN MILLIONS OF GALLONS

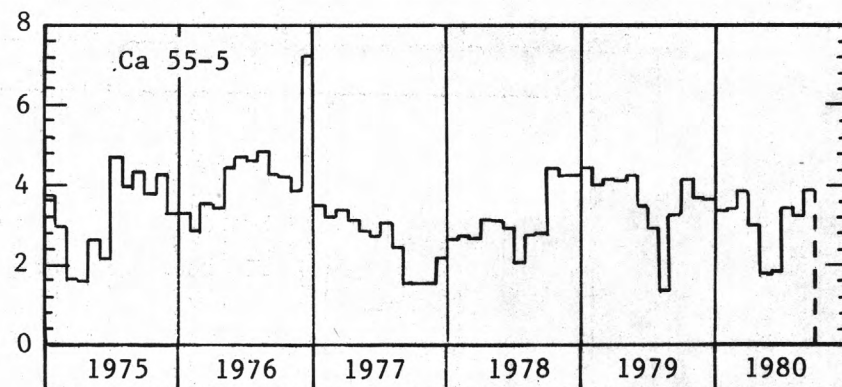


FIGURE 51.--Newark. Monthly pumpage from Ca55-3 and Ca55-5, 1975-80. Water levels in Ca55-3 and Ca55-5, 1976-80.

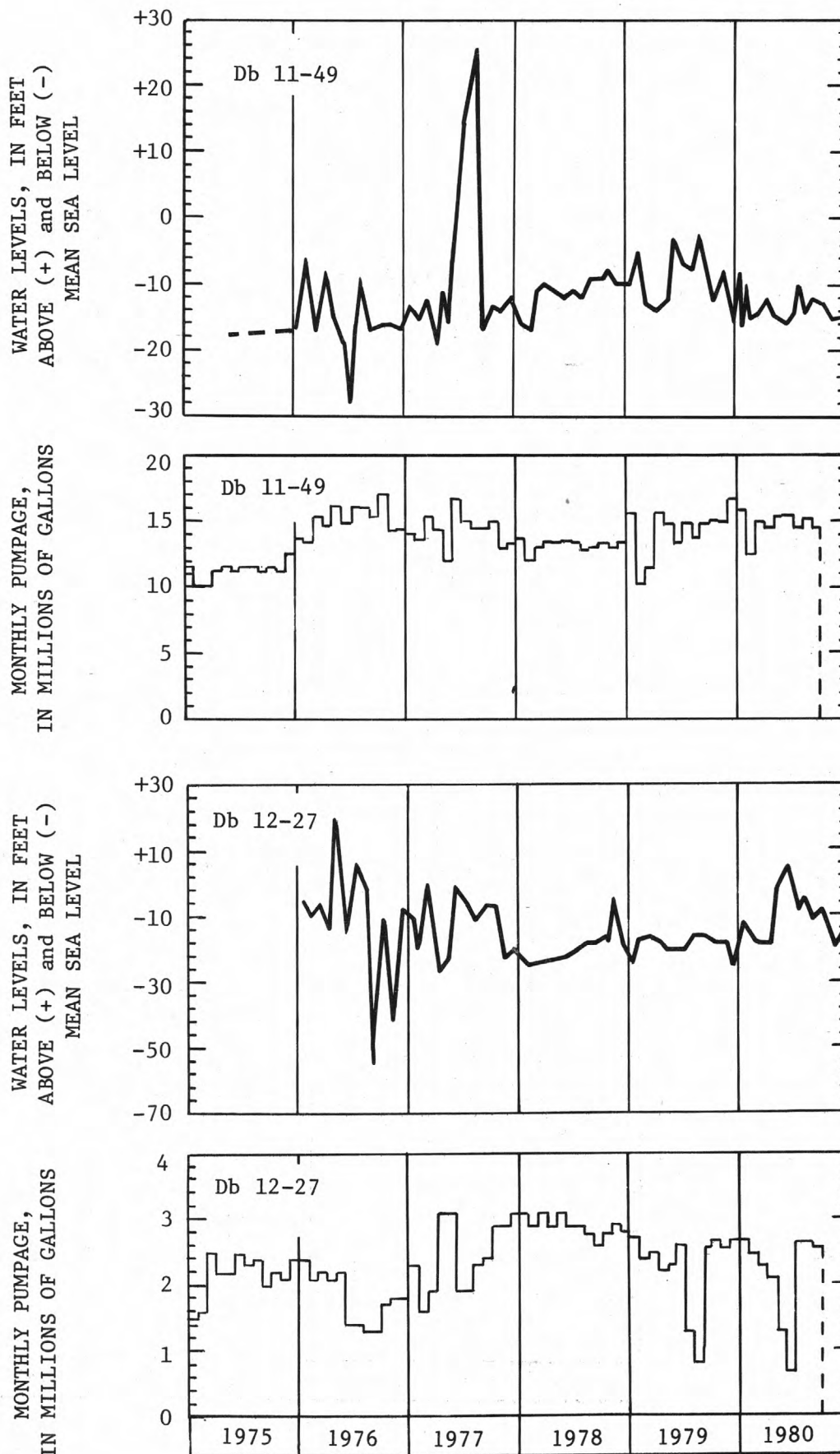


FIGURE 52.--Newark. Monthly pumpage from Db11-49 and Db12-27, 1975-80. Water levels in Db11-49, 1975-80. and Db12-27, 1976-80.

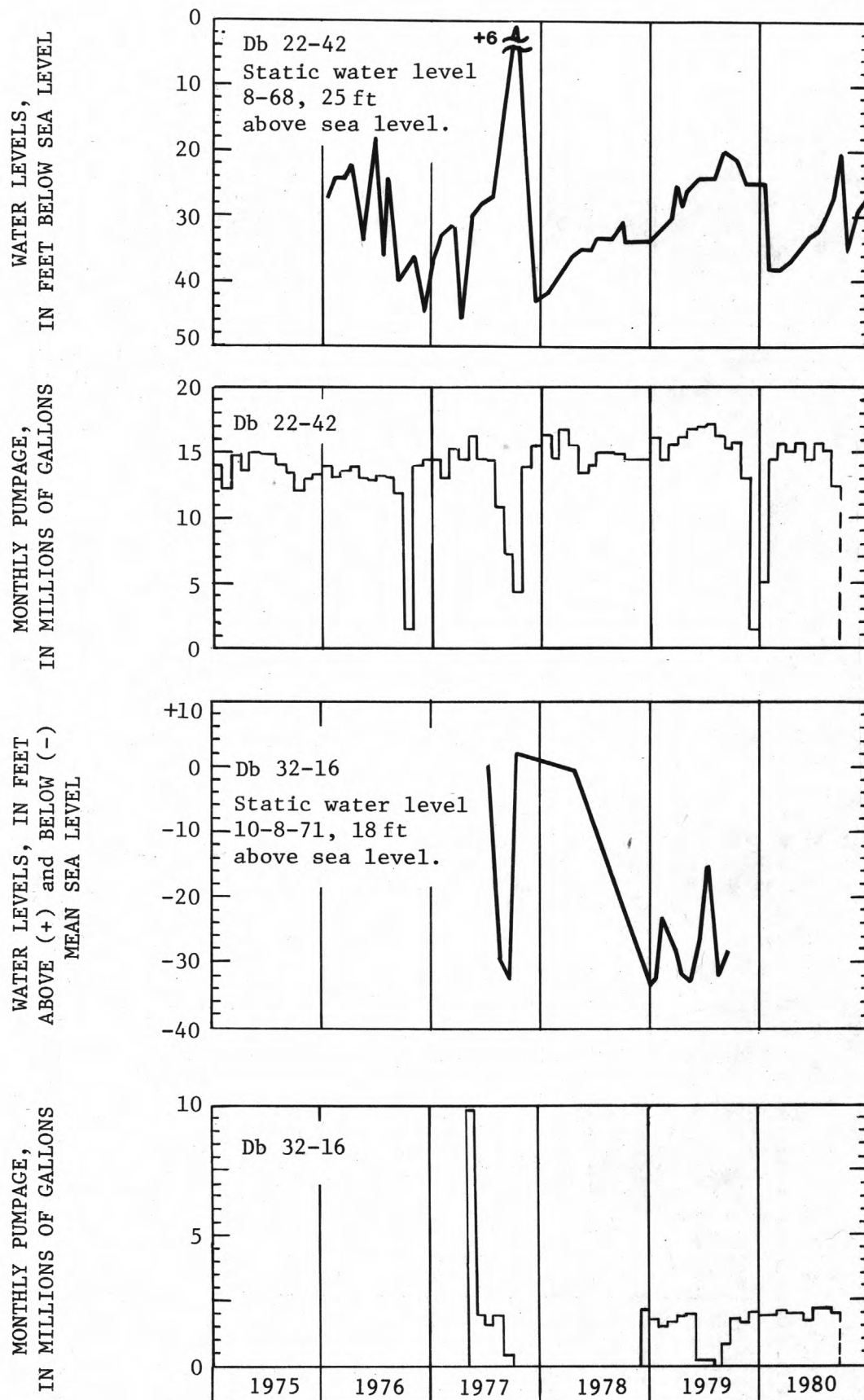


FIGURE 53.--Newark. Monthly pumpage from Db22-42, 1975-80, and Db32-16, 1977-80. Water levels in Db22-42, 1976-80, and Db32-16, 1977-79.



# NEW CASTLE

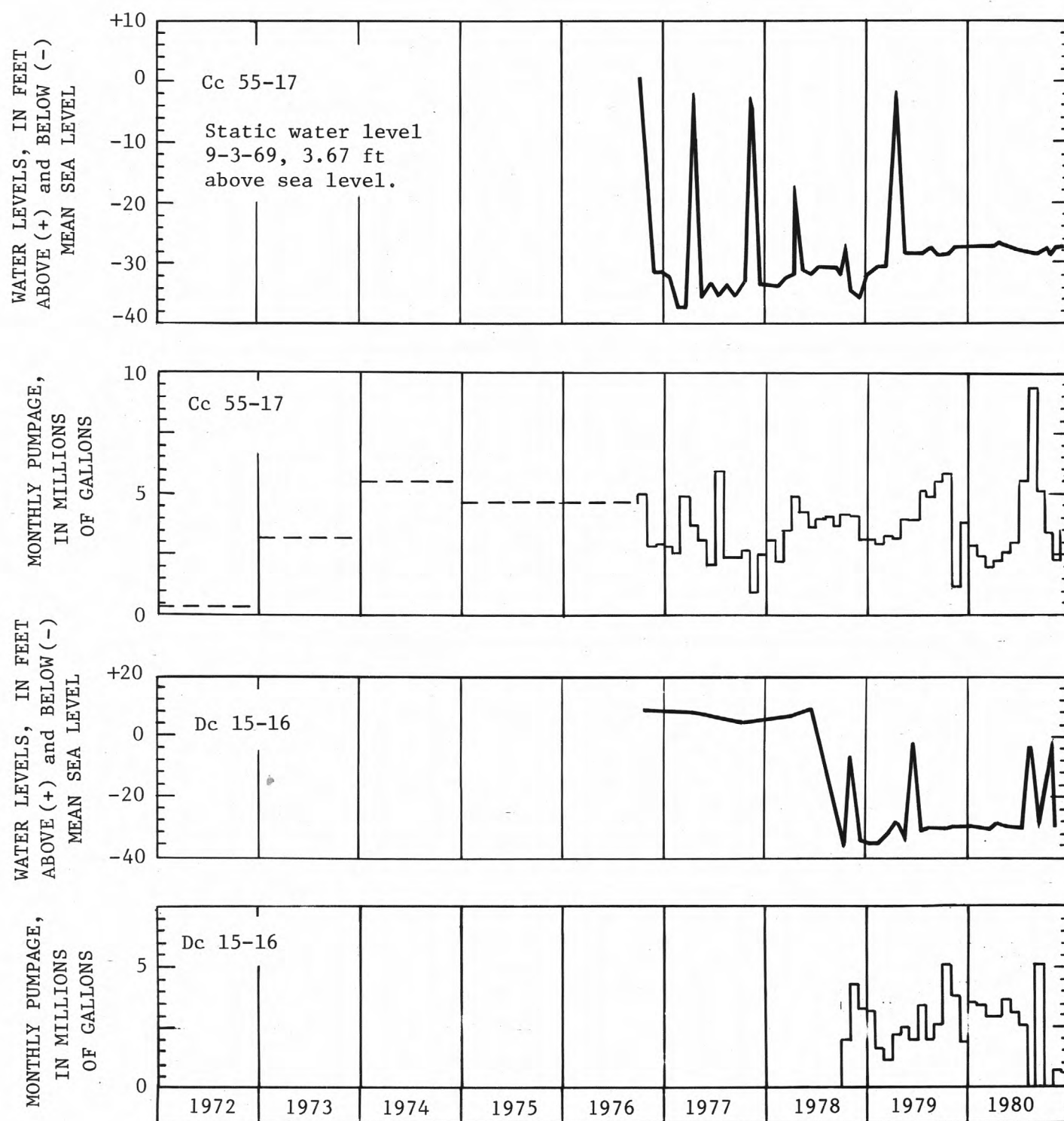


FIGURE 54.--New Castle. Monthly pumpage from Cc55-17, 1972- 80, and Dc15-16, 1978- 80. Water levels in Cc55-17 and Dc15-16, 1976- 80.

# NEW CASTLE

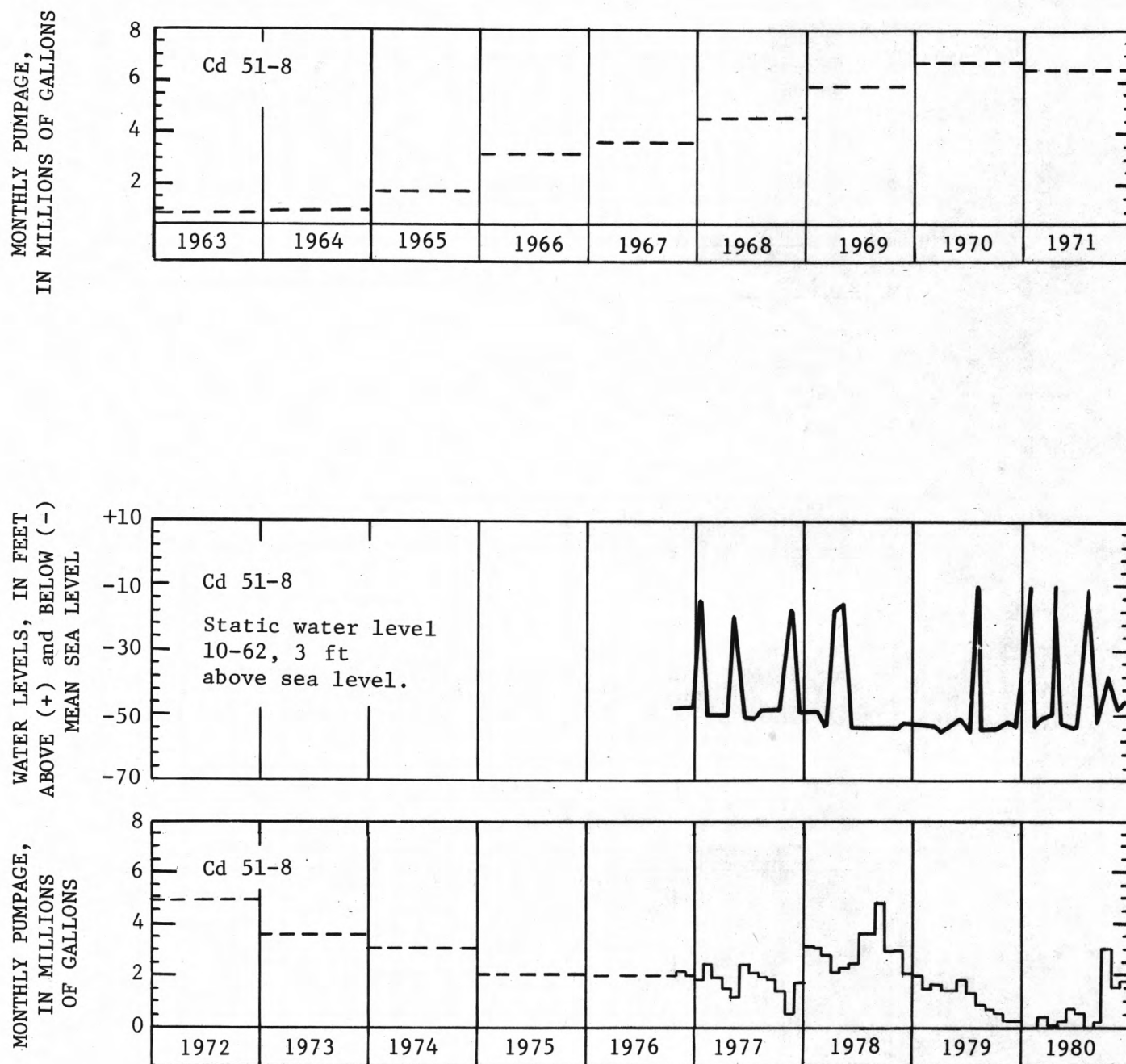


FIGURE 55.--New Castle. Monthly pumpage from Cd51-8, 1963-80.  
Water levels in Cd51-8, 1976-80.

# NEW CASTLE

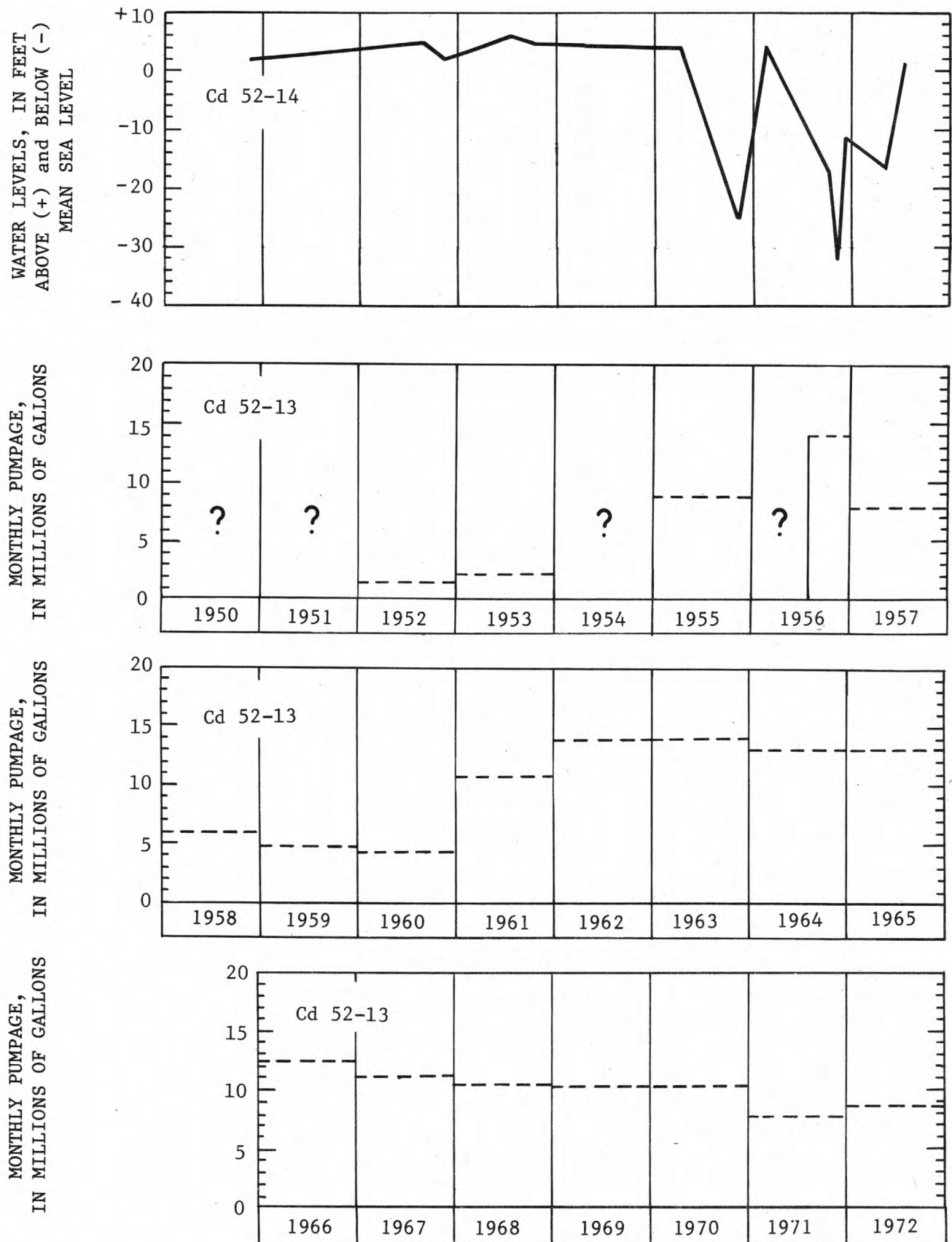


FIGURE 56.--New Castle. Monthly pumpage from Cd52-13, 1952- 72.  
Water levels in Cd52-14, 1950- 57.

# NEW CASTLE

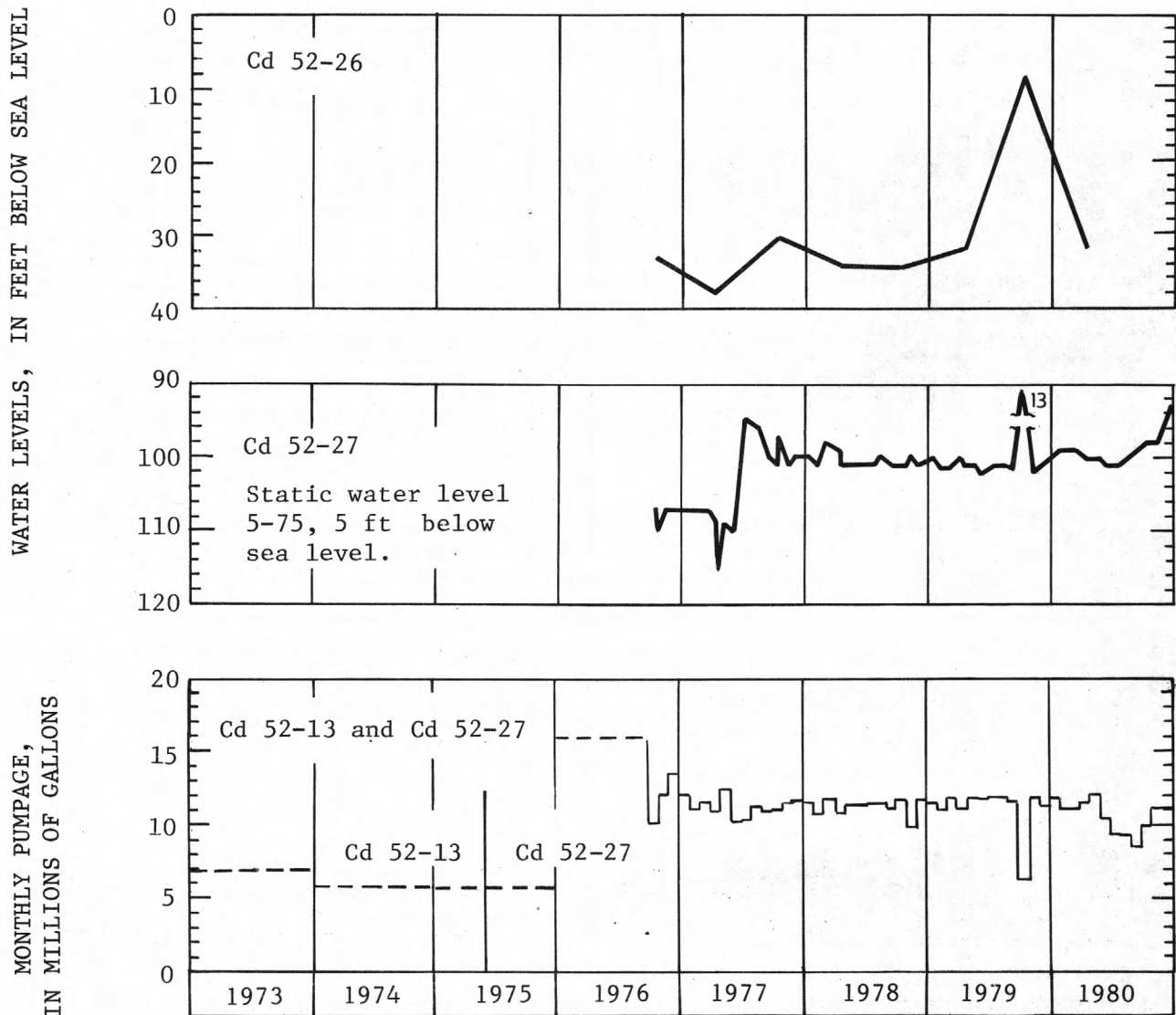


FIGURE 57.--New Castle. Monthly pumpage from Cd52-13, 1973- 75, and Cd52-27, 1975- 80. Water levels in Cd52-26 and Cd52-27, 1976- 80.

# NEW CASTLE

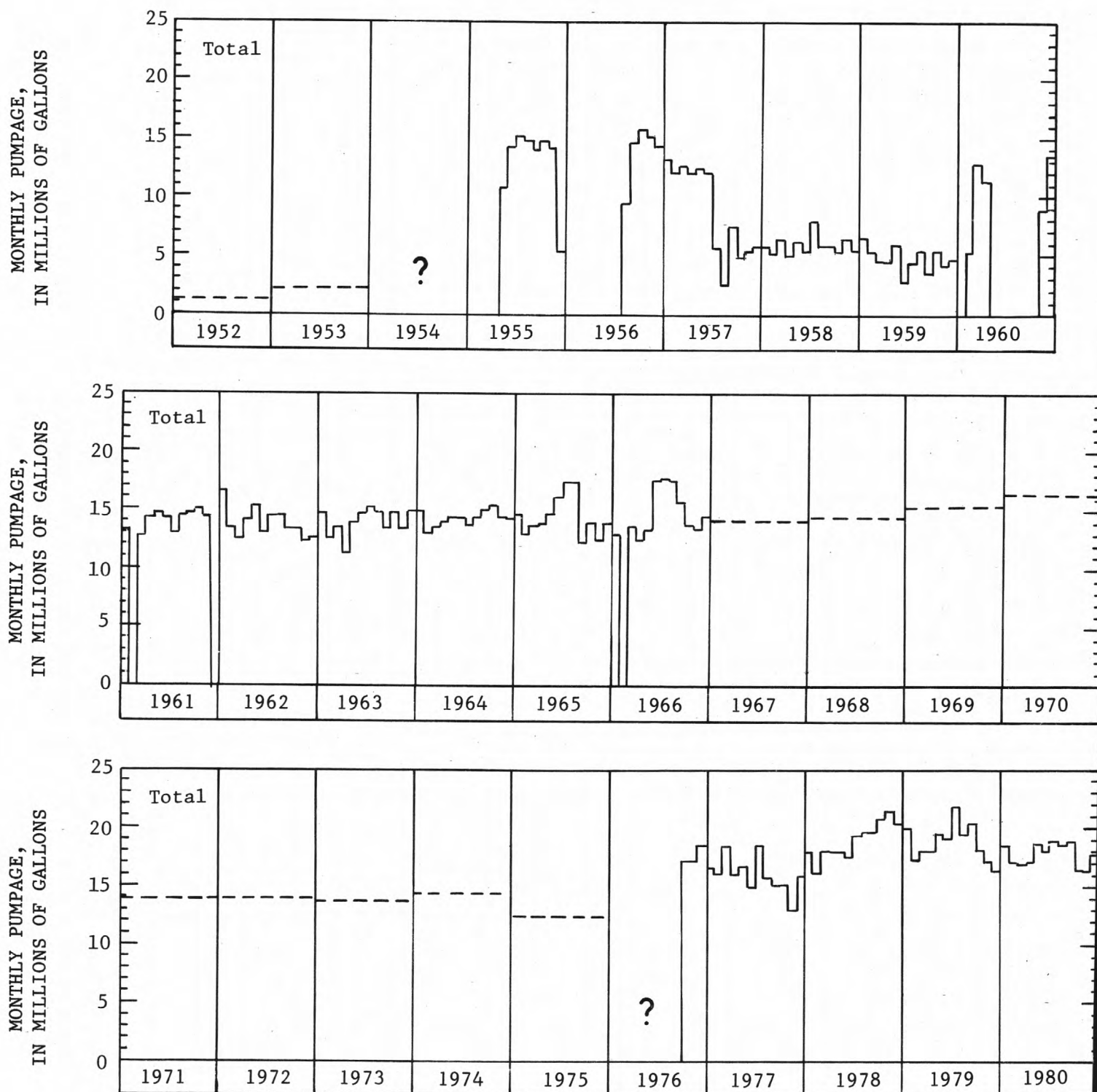


FIGURE 58.--New Castle. Total monthly pumpage from well field, 1952-80.



# OMMELANDEN PARK

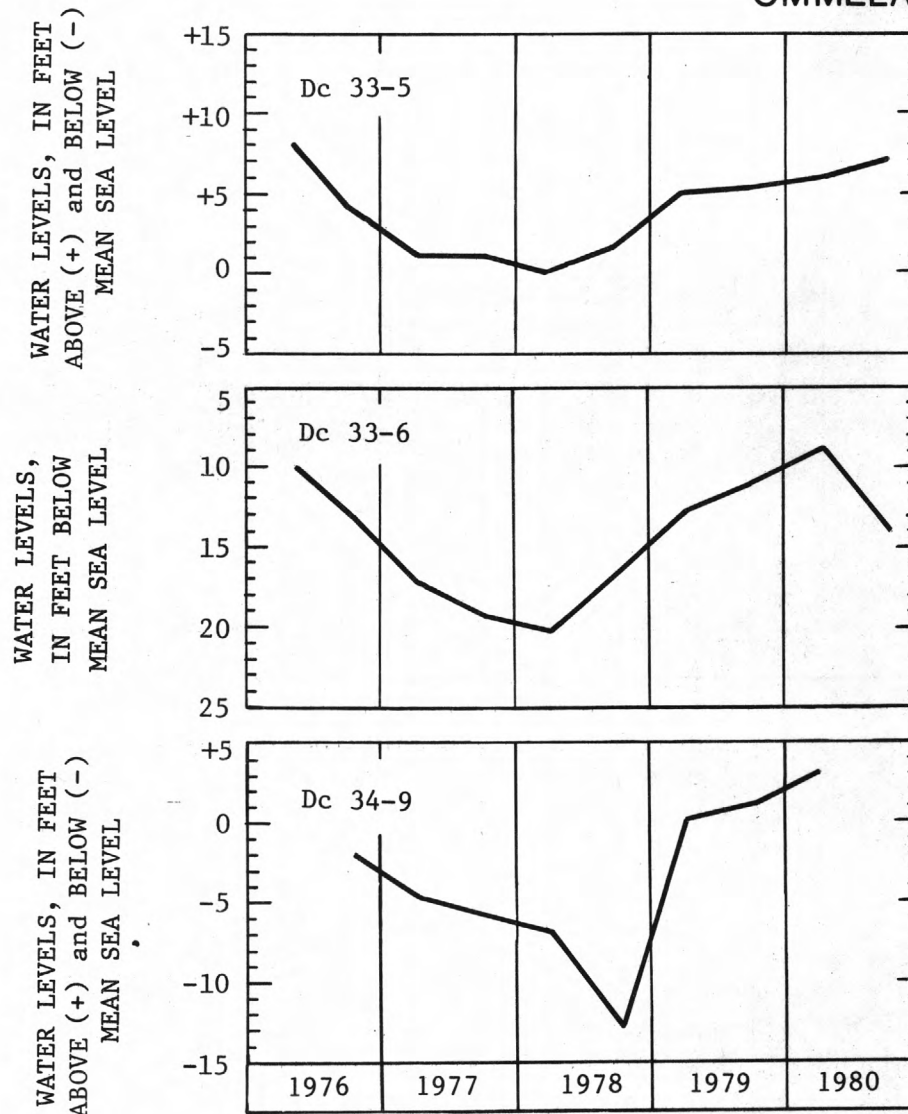


FIGURE 59.--Ommelanden Park. Water levels in Dc33-5, Dc33-6, and Dc34-9, 1976-80.

# SMALLEY'S DAM

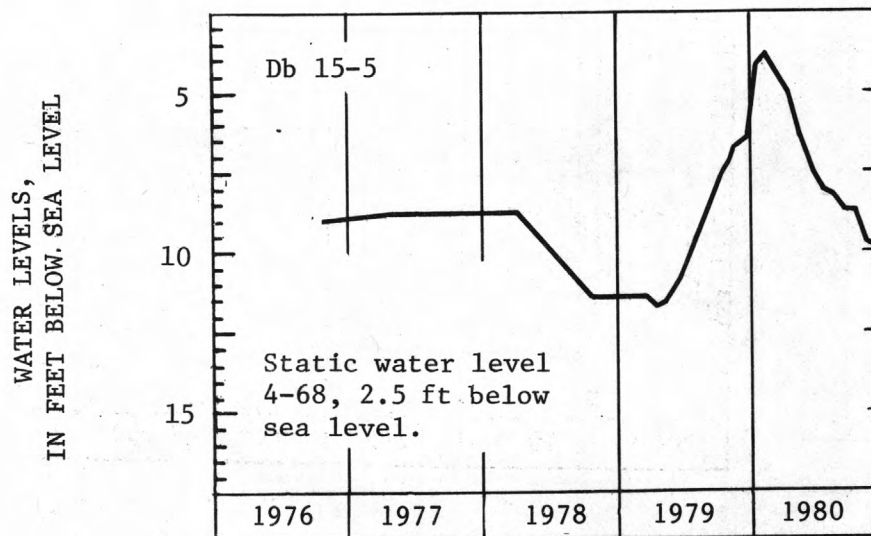


FIGURE 60.--Smalley's Dam. Water levels in Db15-5, 1976-80.

# TUXEDO PARK

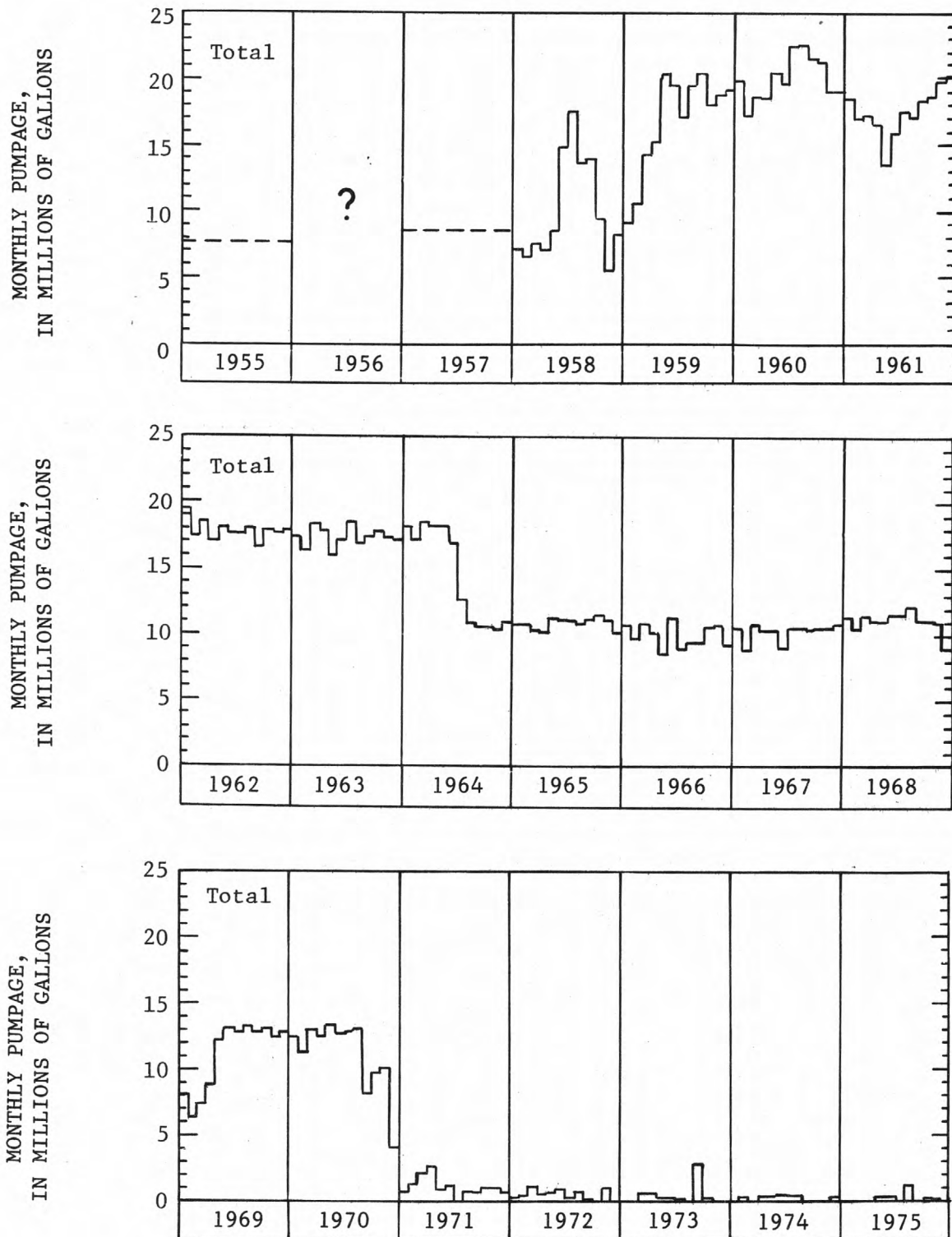


FIGURE 61.--Tuxedo Park. Total monthly pumpage from well field, 1955-75.

# UNION CARBIDE

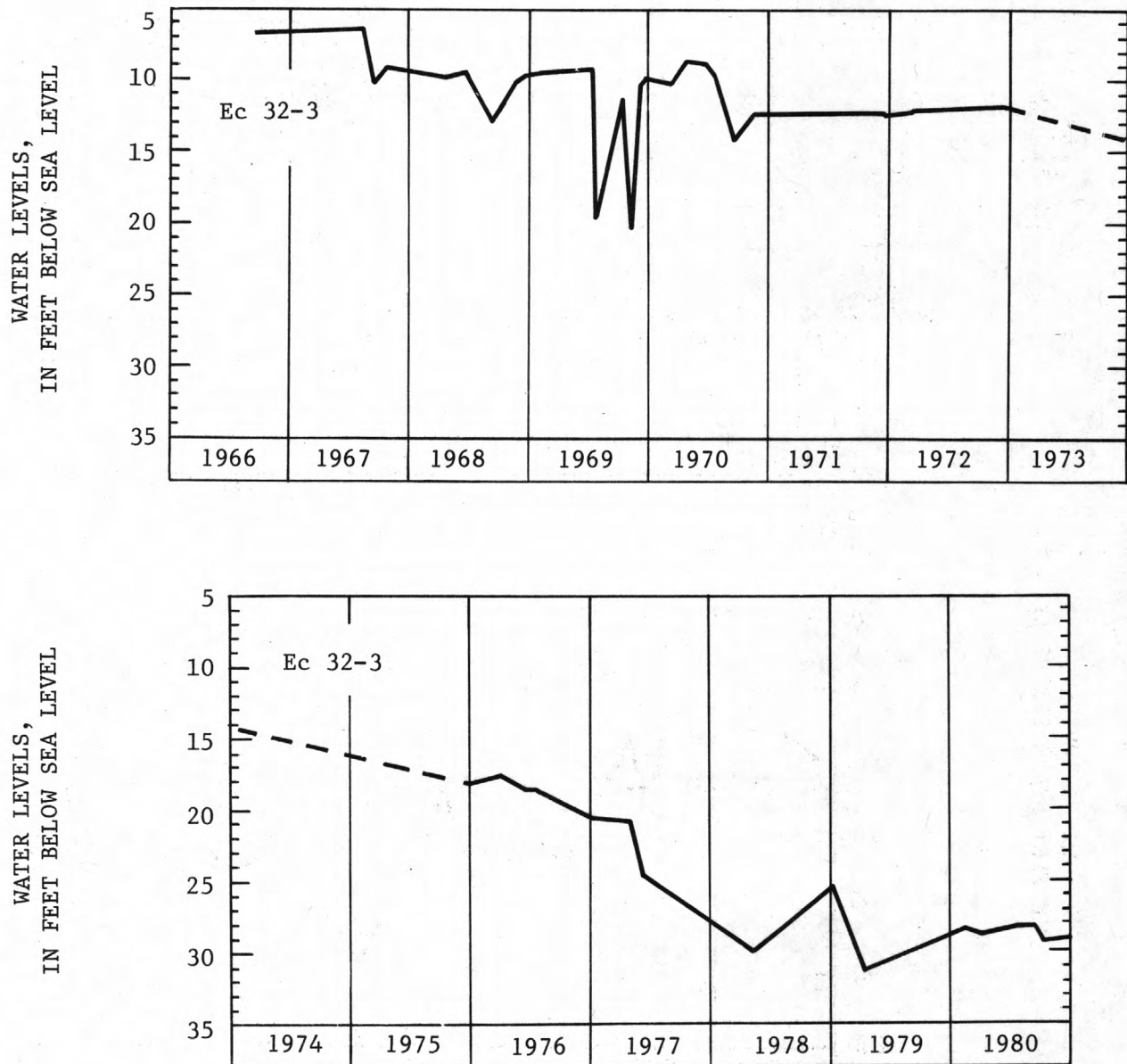


FIGURE 62.--Union Carbide. Water levels in Ec32-3, 1966-80.

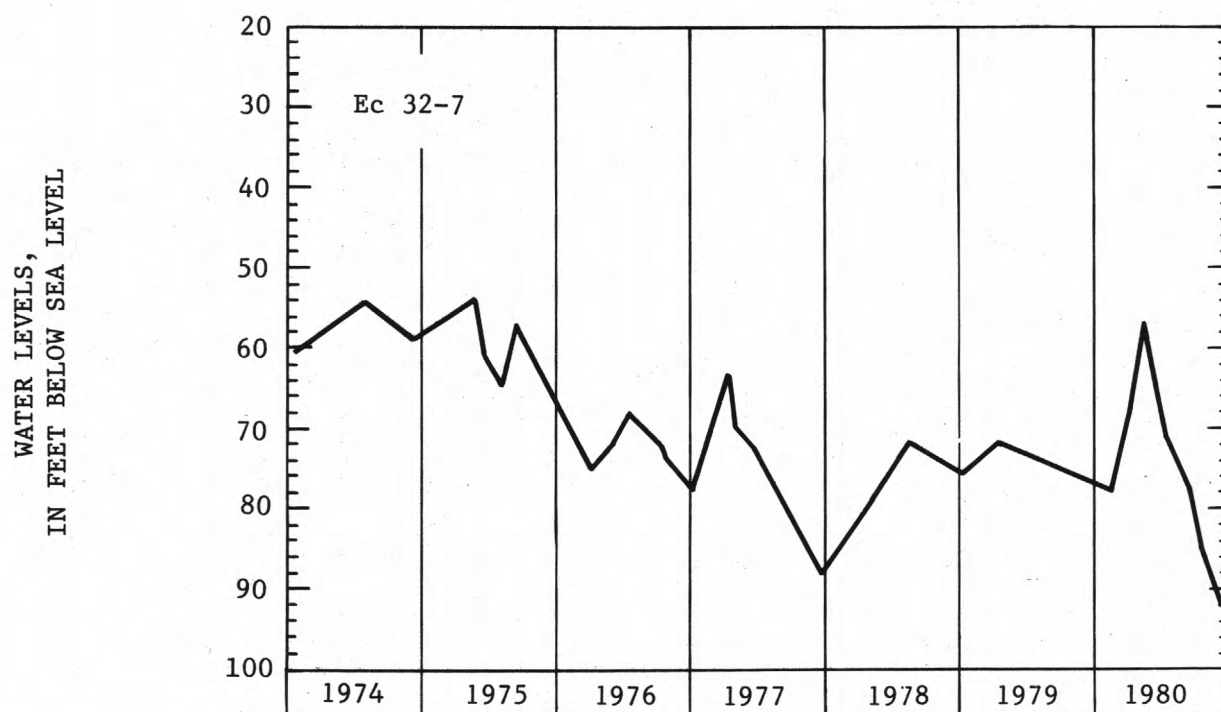
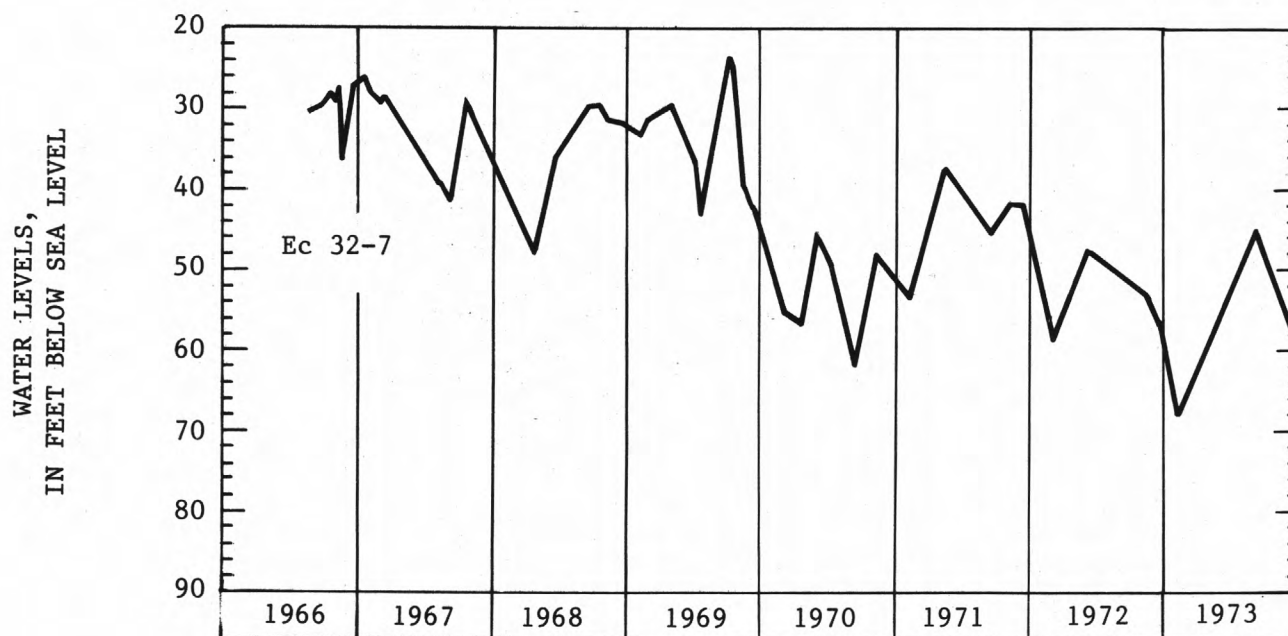
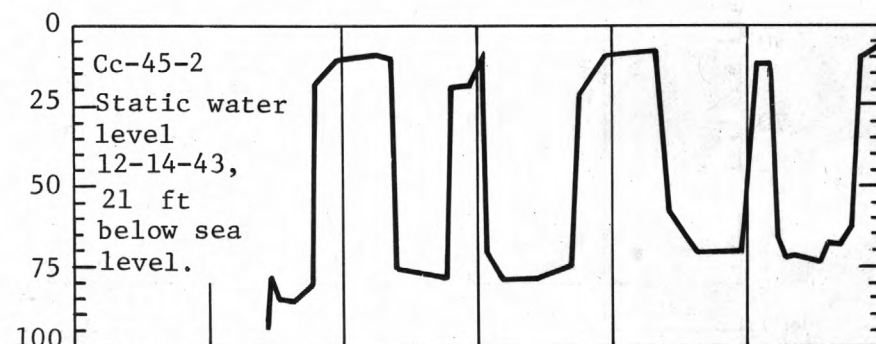
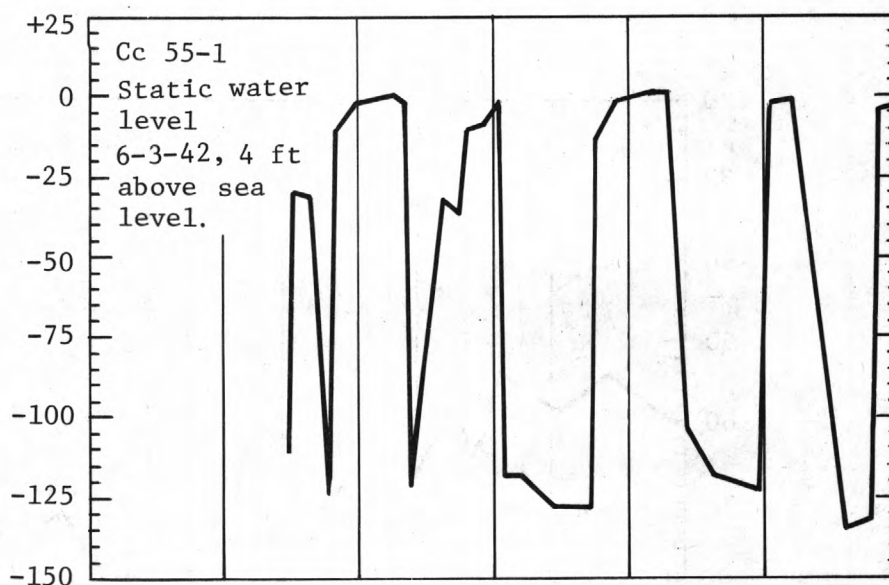


FIGURE 63.--Union Carbide. Water levels in Ec32-7, 1966- 80.

## WATER LEVELS, IN FEET BELOW SEA LEVEL



WATER LEVELS, IN FEET  
ABOVE (+) and BELOW (-)  
MEAN SEA LEVEL



MONTHLY PUMPAGE,  
IN MILLIONS OF GALLONS

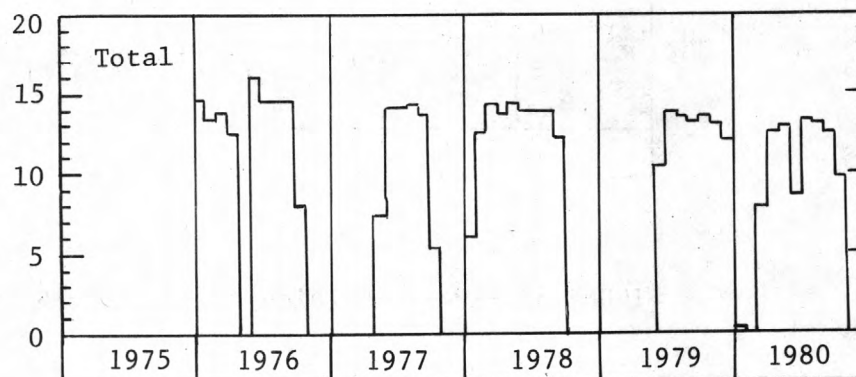


FIGURE 64.--Wilmington Airport. Total monthly pumpage from well field, 1976-80. Water levels in Cc45-1, Cc45-2, and Cc55-1, 1976-80.



# WILMINGTON MANOR

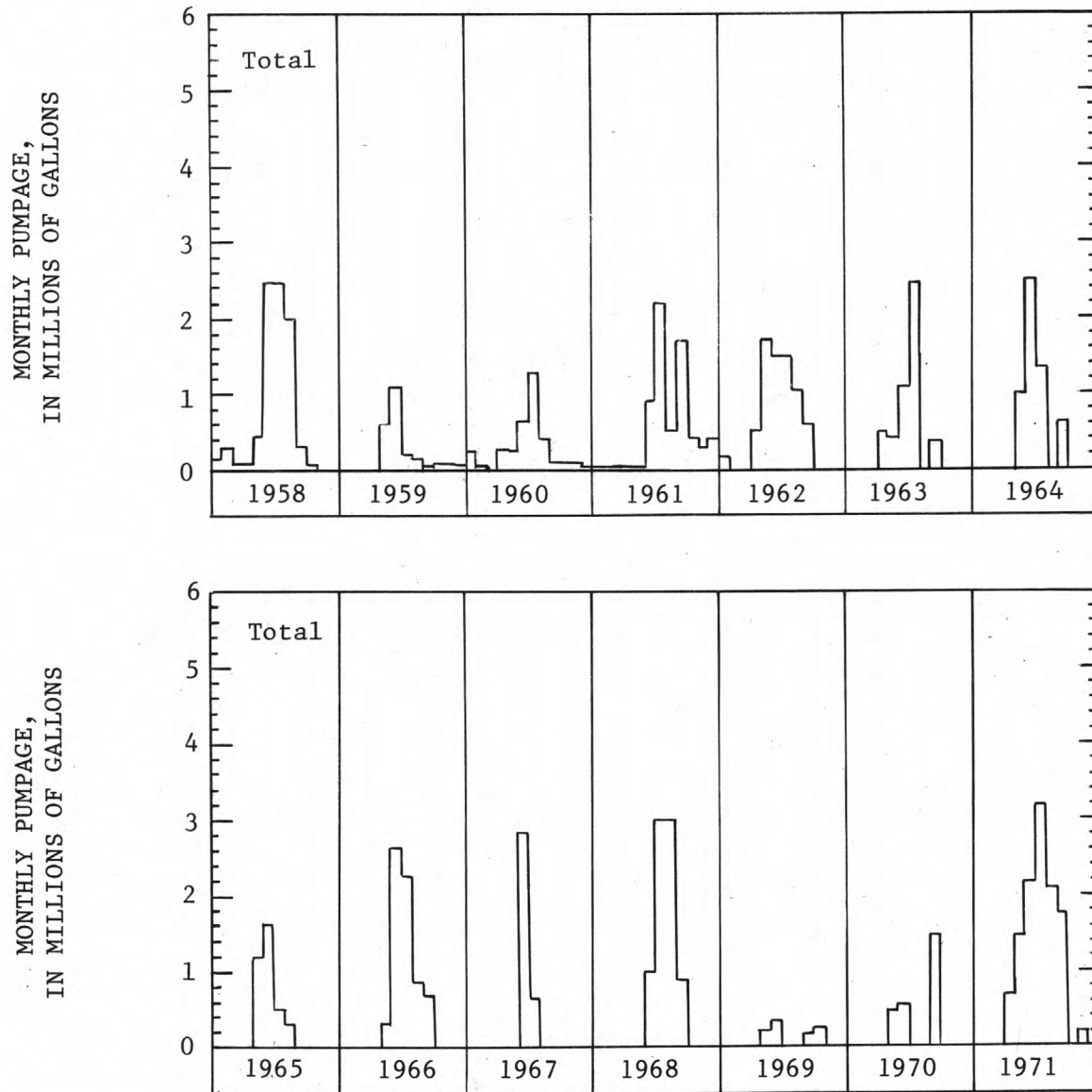


FIGURE 65.--Wilmington Manor. Total monthly pumpage from well field, 1958- 71.

# WILMINGTON MANOR GARDENS

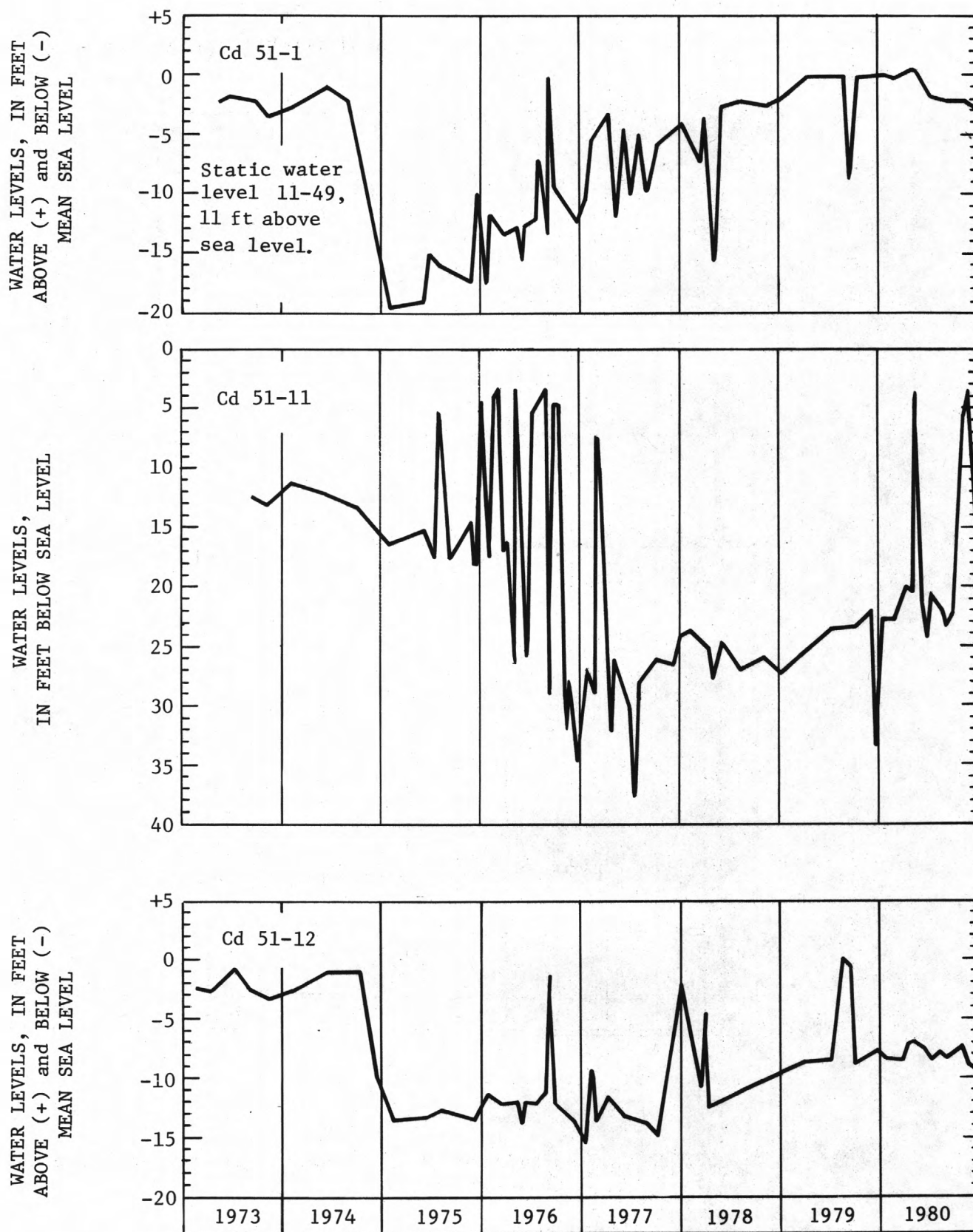


FIGURE 66.--Wilmington Manor Gardens. Water levels in Cd51-1, Cd51-11, and Cd51-12, 1973-80.

# WILMINGTON MANOR GARDENS

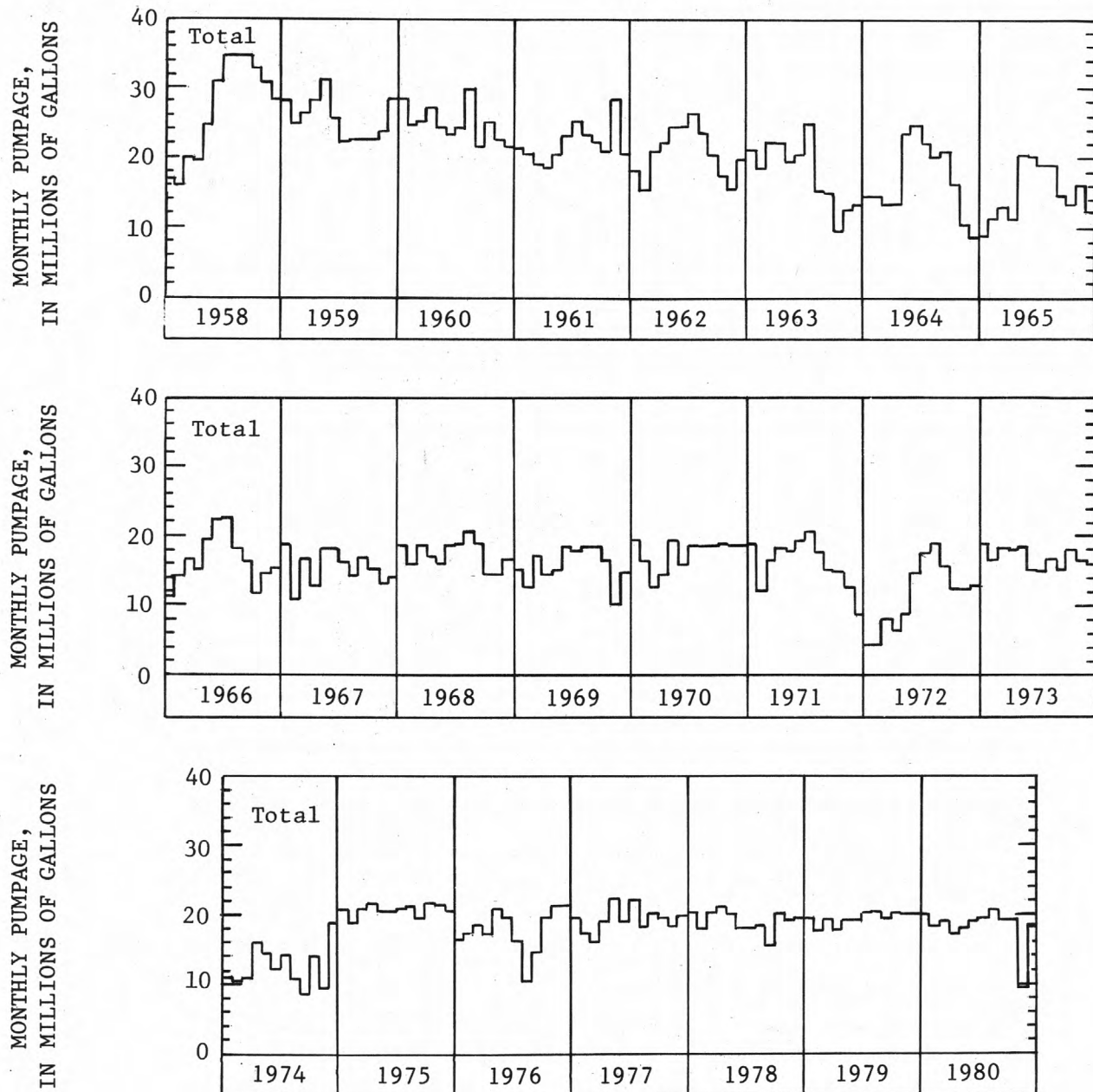


FIGURE 67.--Wilmington Manor Gardens. Total monthly pumpage from well field, 1958-80.

## Ground-Water Levels

Table 4 lists water levels in wells in the Potomac Formation. Hydrographs for wells with several years of water-level data have been included in figures 10 through 67. The data were compiled from previous publications; records from the Delaware Department of Natural Resources and Environmental Control, Delaware Geological Survey, and the U.S. Geological Survey; and from information supplied by the municipalities, industries, and public water supply companies.

Graphs of water levels appear with monthly pumpage graphs for that well field in figures 10 through 67. The name of the well field appears in the upper right corner of the page, and the well number appears in the upper left corner of the hydrograph. Where possible, graphs of water levels for a particular well have been placed directly above graphs of pumpage from that well or a nearby well with a similar screened interval. Locations of those wells with hydrographs are shown in figure 9.

All water levels listed in table 4 or shown in figures 10 through 67 are in feet above or below sea level. These levels are calculated by subtracting the depth to water from the measuring point altitude listed in table 7. In wells with unknown measuring point altitudes, absolute water-level altitudes cannot be determined. In such wells, water-level altitudes are estimated from land-surface altitudes. Although these water-level data cannot be considered exact, the data provide approximate water levels and indicate relative changes in the potentiometric surface through time.

Water levels for production wells or for wells near production wells are affected by short-term changes in pumpage and can fluctuate greatly in short periods of time. Hydrographs for these wells may show extreme water-level changes that primarily reflect the production rate at the time of measurement and appear unrelated to monthly pumpage. In such wells, several years of monthly water-level measurements are needed to analyze changes in the potentiometric surface. However, these hydrographs aid in providing a range of local water levels during periods of pumping and nonpumping. Water levels measured before 1955 are indicative of the potentiometric surface before significant pumping.

Depth-to-water measurements made by U.S. Geological Survey personnel are noted as such in table 4 and are accurate to within several hundredths of a foot. Other water-level data, collected from various sources, may be in error from 0.1 to 10 ft, depending on the method of measurement and type of equipment used. The accuracy of measurements before 1950 is particularly hard to verify. Although an attempt was made to eliminate errors and inconsistencies in all water levels reported here, the lack of standardized measuring methods limits the use of these data. However, these data can provide useful water-level altitudes and indicate changes in the potentiometric surface if these limitations are considered.

TABLE 4.--Water Levels in the Potomac Formation in New Castle County, Del.

Water Level: feet above (+) or below (-) sea level. H, hydrograph of water levels appears in preceding section. Figures are rounded to same significant digit as in depth to water.

Depth to Water: distance in feet from measuring point to water surface. Distance is assumed to be measured from land surface to water surface if measuring point is unknown.

Well	Date	Water Level	Depth to Water	Well	Date	Water Level	Depth to Water
<u>Airport Industrial Park</u>				<u>Amoco</u>			
Dc14-14 <sup>1</sup>	4- -78	- 5	22	Dc15-10	4-27-66	- 46.9	69.9
	11-15-78	- 4.19	20.99		3-11-69	-297	320
	12-15-78	- 4.05	20.85		3-15-73	-111	134
	1-15-79	- 4.05	20.85		1-24-74	-286.9	309.9
	2-15-79	- 3.37	20.17		10-15-76	-320	343
	3-15-79	- 2.31	19.11	Dc15-17		H	
	4-15-79	- 1.56	18.36			H	
	5-20-79	- 0.95	17.75	Dc15-18		H	
	6-15-79	- 0.74	17.54			H	
	7-15-79	- 0.62	17.42	Dc15-19	3- -70	- 25	43
	8-17-79	- 0.41	17.21		1-29-74	- 16.7	34.8
	9-15-79	- 0.74	17.54	Dc15-20		H	
	10-15-79	- 0.37	17.17			H	
	11-15-79	- 0.35	17.15	Dc24-6	4- -61	+ 1.2	39.7
	12-15-79	- 0.37	17.17		4- -65	- 22	63
	1-15-80	- 0.53	17.33		6-3-66	- 16	57
	2-15-80	- 1.10	17.90		3-13-68	- 15	56
	3-15-80	- 1.20	18.00		3-18-68	- 14.5	55.4
	4-15-80	- 0.27	17.07		3-21-68	- 14.19	55.07
	6-15-80	+ 0.03	16.77		11-25-69	- 17.11	57.99
	7-15-80	- 0.45	17.25		1-16-74	- 19.54	60.42
	8-15-80	- 0.46	17.26		1-24-74	- 19.42	60.30
	9-15-80	- 1.51	18.31	Dc25-16	1-24-74	-178.04	208.04
	10-15-80	- 2.03	18.83				
	11-15-80	- 1.65	18.45	Dc25-17	4-17-61	- 0.3	25.8
	12-15-80	- 1.77	18.57		2-28-68	- 20	45
Dc15-13	3- -75	+ 3.1	19.4		3-11-68	- 27	52
	10-15-76	+ 2.70	19.79		3-11-69	- 23	48
	4-15-77	+ 1.39	21.10		9- -72	- 48	73
	10-21-77	- 1.01	23.50		1-24-74	- 55	80
	4-18-78	- 4.18	26.67	<u>Army Creek</u>			
	10-17-78	+ 0.30	22.19	Dc14-13		H	
Dc15-14	1-17-75	+ 2	20			H	
	10-15-76	- 1.08	22.88	Dc14-19		H	
	4-15-77	- 2.53	24.33			H	
<u>Amoco</u>				Dc14-37		H	
Dc14-13	11- -66	- 4	20			H	
	3-1-74	- 8.41	24.16	Dc14-41		H	
Dc15-9	5-9-61	+ 2.15	19.95			H	
	5-31-61	+ 2.59	19.51	Dc14-46		H	
	1-24-66	- 21	43			H	
	3-11-69	- 81	103	Dc15-15		H	
	1-24-74	- 72	94			H	
	10-15-76	- 76.01	98.11			H	
	4-15-77	- 73.01	95.11				

<sup>1</sup> Continuous record collected by U.S. Geological Survey since 10-30-78.



TABLE 4.--Water levels in the Potomac Formation in New Castle County--Continued

Well	Date	Water Level	Depth to Water	Well	Date	Water Level	Depth to Water
<u>Army Creek</u>				<u>Collins Park</u>			
Dc24-22		H		Cd42-16 <sup>3</sup>		H	
Dc24-37		H		Cd42-17		H	
Dc24-39		H		<u>Crown Zellerbach</u>			
Dc25-23		H		Dc25-2	-55	- 2.5	19.4
Dc25-24		H			8-7-67	- 12	29
					4-9-69	- 94	111
					7-6-72	- 24.2	41.1
					7-28-72	- 26.6	43.5
<u>Caravel Farms</u>				Dc25-3	4- -28	+ 7	4
Db42-12	3-13-74		9.63		10-15-76	- 45	56
Db52-21	6-3-74	+ 48.5	1.5		4- -77	- 54	65
Db52-23		H		Dc25-4	3-17-50	+ 5.36	4.54
Db52-24	2- -74	+ 63	2	Dc25-5	-42	- 17	32
Db52-25	1-30-74	+ 68.29	1.71	Dc25-6	3- -49	- 21	46
Db52-26	2-14-74		10		3-30-66	- 35.58	60.58
					4-4-66	- 38.33	63.33
Db52-27 <sup>2</sup>		H		Dc25-7	3-17-50	+ 0.34	11.23
Db52-28	10-15-76	+ 64	6	Dc25-27	9-22-77	- 28	43
	4-15-77	+ 60.65	9.35	<u>Delaware City</u>			
	4-18-78	+ 45.55	24.45	Ec15-26	4-12-61	- 44	54
	10-17-78	+ 42.81	27.19	Ec15-27	12-1-76	-112.5	122.5
	10-18-79	+ 39.05	30.95	<u>Delaware State Hospital</u>			
Db52-29	10-15-76	+ 64	11	Cd41-7	7- -55	0	65
	4-15-77	+ 66.05	8.95	Cd41-11	3-2-76	+ 25.2	34.8
<u>Castle Hills</u>					7-14-76	+ 19.27	40.73
Cd42-18		H			10-15-76	+ 25	35
Cd52-15		H			4-15-77	+ 24.7	35.3
Cd52-28		H			10-21-77	+ 23.90	36.10
<u>Collins Park</u>					4-18-78	+ 27.04	32.96
Cd42-1	1- -47	- 10.5	50.5		10-18-78	+ 27.38	32.62
Cd42-3	2- -47	- 9	49		4-25-79	+ 28.08	31.92
Cd42-4	9- -48	- 24	64		10-15-80	+ 26.61	33.39
Cd42-9	5-14-53	- 43.5	83.5	Cd41-18	3-18-61	+ 43	26
Cd42-13	5-14-53	- 43.5	83.5	<u>Delmarva Power-Summit</u>			
	11- -53	+ 19	21	Eb44-9 <sup>4</sup>		H	
Cd42-14	10-20-56	- 35	75	Eb45-10		H	
Cd42-15		H		<u>du Pont-Newport</u>			
				Cc34-14	1-8-30	+ 17	5

<sup>2</sup> Continuous record collected by U.S. Geological Survey since 5-29-79.

<sup>3</sup> Continuous record collected by U.S. Geological Survey since 6-6-79.

<sup>4</sup> Continuous record collected by U.S. Geological Survey since 5-11-79.

TABLE 4.--Water levels in the Potomac Formation in New Castle County--Continued

Well	Date	Water Level	Depth to Water	Well	Date	Water Level	Depth to Water
<u>du Pont - Newport</u>				<u>Fairwinds</u>			
Cc34-15	12-7-53	+ 7	27	Dc22-23	3-22-79	--	74.45
Cc34-19	-30	+ 11	14		4-9-79	--	73.25
Cc34-34	7-1-77	+ 1.5	6.0		7-11-79	--	71.10
	8-10-77	+ 1.0	6.5		10-18-79	--	69.08
	10-14-77	+ 1.5	6.0		12-6-79	--	69.00
	3-30-78	+ 2.3	5.2		1-28-80	--	69.00
	6-15-78	+ 1.1	6.4		3-30-80	--	97.50
	9-27-78	+ 2.0	5.5		4-10-80	--	97.26
	11-15-78	+ 2.7	4.8		4-24-80	--	95.50
	3-21-79	+ 2.1	5.4		5-21-80	--	95.49
	5-2-79	+ 2.1	5.4		6-5-80	--	96.81
	7-19-79	+ 2.1	5.4		7-10-80	--	96.38
	10-17-79	+ 2.2	5.3		8-21-80	--	95.56
	2-3-80	+ 2.4	5.1		9-18-80	--	96.53
	6-19-80	+ 0.8	6.7		10-30-80	--	96.19
	8-18-80	+ 1.7	5.8		12-1-80	--	98.00
					12-29-80	--	98.50
Cc34-36		H		Dc22-24		H	
Cc34-37		H		Dc23-11	4-20-65	--	28
Cc34-38		H		Dc23-16		H	
Cc34-39	7-1-77	- 0.2	2.1	Dc23-17		H	
	8-10-77	- 0.4	2.3	<u>Getty</u>			
	10-14-77	- 0.2	2.1	Dc42-6	2-3-56	+ 4	30
	3-30-78	+ 1.7	0.2	Dc51-3	10-5-54	+ 20.20	53.38
	6-15-78	+ 1.8	0.1		12- -54	+ 18.44	55.14
	9-27-78	+ 1.1	0.8		9- -56	- 0.44	74.02
	11-15-78	+ 1.5	0.4	Dc51-4	10-15-54	+ 21.38	21.16
	3-21-79	+ 1.7	0.2		12- -54	+ 19.01	23.53
	5-2-79	+ 1.3	0.6		9-5-56	- 2.56	45.10
	7-18-79	+ 1.9	0.0		2- -57	- 10.60	53.14
	10-16-79	+ 0.8	1.1		3- -57	- 12.71	55.25
	2-13-80	+ 1.3	0.6		6- -57	- 19.29	61.83
	6-19-80	+ 1.8	0.1	Dc51-7	10-7-55	+ 9	30
	8-18-80	+ 0.7	1.2	Dc51-8	1-12-56	+ 20	50
<u>Fairwinds</u>				Dc51-9		H	
Dc22-12	12-14-73	- 50.5	101.5	Dc52-2	6-14-54	+ 36.79	28.62
	12- -73	-138.71	189.71	Dc52-6	8-31-54	+ 13.28	59.84
	3-15-76	- 42.3	93.3	Dc52-8	9-15-54	+ 10.66	53.83
	10-15-76	- 43.85	94.85		9- -56	+ 9.59	54.90
	4-15-77	- 43.35	94.35		2- -57	+ 8.34	56.15
	10-21-77	- 43.52	94.52		3- -57	+ 8.49	56.00
	4-18-78	- 55.05	106.05		6- -57	+ 7.57	56.92
	10-17-78	- 46.44	97.44	Dc52-24	12-3-54	+ 4.7	64.0
	4-25-79	- 49.00	100.00	Dc52-30	5-24-54	+ 10.40	68.87
	10-18-79	- 42.45	93.45	Dc52-31	7-21-54	+ 12.07	67.35
	4-24-80	- 41.50	92.50	Dc52-32	8-3-54	+ 14.25	64.85
	10-15-80	- 42.72	93.72				
Dc22-13		H					
Dc22-14		H					
Dc22-18		H					
Dc22-19	1-16-74	--	61.5				
Dc22-22		H					

TABLE 4.--Water levels in the Potomac Formation in New Castle County--Continued

Well	Date	Water Level	Depth to Water	Well	Date	Water Level	Depth to Water
<u>Getty</u>				<u>Getty</u>			
Dc53-6	10-11-54	+ 12.37	47.69	Ec22-3	3-15-78	+ 5.4	4.6
Dc53-7		H			4-15-78	+ 4.2	5.8
Dc53-23	9-16-54	+ 7.09	27.20		5-14-78	+ 4.2	5.8
Dc53-31 <sup>5</sup>	7-19-54	+ 11.82	22.94		6-15-78	+ 2.5	7.5
Dc53-31 <sup>6</sup>	7-19-54	+ 9.74	25.10		7-15-78	+ 1.4	8.6
Eb15-2	10-13-54	+ 26.41	41.79		8-15-78	+ 2.0	8.0
	12- -54	+ 26.37	41.83		9-15-78	+ 1.8	8.2
	9- -56	+ 20.55	47.65	<u>Glendale</u>			
	2- -57	+ 22.59	45.61	Db35-3	-55	+ 56	24
	3- -57	+ 24.51	43.69	Db35-4	11-2-53	+ 54.5	25.5
	6- -57	+ 19.87	48.33	Db35-6	9-16-57	+ 48	22
Eb15-4		H		Dc31-10		H	
Eb15-5	1-6-56	+ 26.41	39.59	Dc31-13		H	
	10-15-76	- 23	89	Dc31-18		H	
	4-15-77	- 15.6	81.6	Dc31-21		H	
	10-21-77	- 15.2	81.2	Dc31-24		H	
	4-18-78	- 20.85	86.85	Dc31-25	11-12-73	--	39
	10-17-78	- 15.03	81.03		12-4-73	--	48.85
	4-25-79	- 20.12	86.12		1-8-74	--	55.24
	10-18-79	- 14.00	80.00		1-18-74	--	51
	4-23-80	- 18.17	84.17		3-19-74	--	53.36
	10-15-80	- 20.77	86.77		4-22-74	--	39.68
Ec11-2	9-17-54	+ 19.64	24.43		8-2-74	--	62.24
	9- -56	+ 7.32	36.75	Dc31-26		H	
	2- -57	- 0.03	44.10	Dc31-27 <sup>7</sup>		H	
	3- -57	- 2.64	46.71	<u>Goodrich</u> <sup>8</sup>			
	6- -57	- 11.35	55.42	Ea33-1		H	
Ec12-2		H		Ea33-2	11-18-66	0	60
Ec12-3	10-1-54	+ 12.34	3.31		11-20-66	- 11	71
	12- -54	+ 9.35	6.30		11-25-66	+ 0.69	59.31
	9- -56	- 3.20	18.85		11-28-66	+ 1.1	58.9
Ec12-15	9-9-54	+ 10.29	49.91		12-4-66	+ 0.55	59.45
	9- -56	- 14.15	74.35		12-20-66	+ 1.0	59.0
Ec12-20	3-14-56	- 10	24		1-5-67	+ 0.95	59.05
	4- -56	- 14	28		1-24-67	+ 0.72	59.28
Ec13-5	7-6-54	- 4.17	66.38		2-5-67	+ 1.1	58.9
Ec13-6	1-5-55	+ 7.98	28.28		2-20-67	+ 1.25	58.75
Ec14-1	9-20-54	+ 6.24	0.40		3-5-67	+ 1.25	58.75
	9- -56	- 3.32	9.96		3-18-67	+ 1.2	58.8
	7-28-60	- 60	67		3-15-67	+ 1.4	58.6
Ec22-3	2-16-53	- 13	23	Ea33-3	11-18-66	+ 2	58
	10-15-77	- 1.2	11.2		11-20-66	- 7	67
	11-15-77	+ 2.2	7.8				
	12-15-77	+ 2.7	7.3				
	1-15-78	+ 4.5	5.5				
	2-15-78	+ 6.2	3.8				

<sup>5</sup> Local well number 5A.<sup>6</sup> Local well number 5B.<sup>7</sup> Continuous record collected by U.S. Geological Survey since 5-29-79.<sup>8</sup> Cecil County, Maryland.

TABLE 4.--Water levels in the Potomac Formation in New Castle County--Continued

Well	Date	Water Level	Depth to Water	Well	Date	Water Level	Depth to Water
<u>ICI</u>				<u>Llangollen Estates</u>			
Cd44-1	10-18-71	- 73	87	Dc24-14	4-19-76	- 21.01	60.12
Cd44-2	5-6-72	- 77	87		5-4-76	- 29.56	68.67
	10-21-77	-138.30	148.30		2-24-78	- 35.89	75.00
Cd44-14		H			6-9-78	- 36.39	75.50
<u>Jefferson Farms</u>					8-21-78	- 30.69	69.80
Cd51-13		H		Dc24-15	4- -71	- 27	55
Cd51-14		H			2-8-73	- 73	101
Cd51-15		H			3-22-73	- 80.41	108.66
<u>Llangollen Estates</u>					6-6-73	- 75.33	103.58
Dc23-2		H			7-6-73	- 21.75	50.00
Dc23-9	8- -58	+ 15	42		10-17-73	- 16.92	45.17
	9-1-59	+ 5.5	51.5		1-8-74	- 19.50	47.75
	5-23-63	- 3.5	60.5		5-14-74	- 21.75	50.00
	8-12-74	- 38.04	95.00		6-17-74	- 31.67	59.92
	10-7-74	- 28.71	85.67		9-10-74	- 21.83	50.08
	12-12-74	- 38.97	95.93		11-7-74	- 30.00	58.25
	2-10-75	- 28.04	85.00		2-10-75	- 21.41	49.66
	8-26-75	- 32.51	89.47		7-9-75	- 23.46	51.71
	10-14-75	- 27.96	84.92		10-14-75	- 26.75	55.00
	11-21-75	- 23.02	79.98		12-22-75	- 19.60	47.85
	1-23-76	- 25.09	82.05		3-29-76	- 22.14	50.39
	3-12-76	- 24.90	81.86		5-4-76	- 34.06	62.31
	2-18-77	- 45.59	102.55		5-14-76	- 26.76	55.01
					2-24-78	- 32.75	61.00
					4-25-79	- 26.15	54.40
Dc23-10		H			10-18-79	- 23.49	51.74
Dc23-12	3-6-59	- 2.4	67.5		4-24-80	- 22.76	51.01
	3-9-73	- 20.55	85.62	Dc24-17	3- -71	- 24	62
	5-1-73	- 24.86	89.93		9- -72	- 71.8	110.0
	6-5-73	- 15.85	80.92		2-9-73	- 69.32	107.50
	8-17-73	+ 25.49	39.58		4-3-73	- 69.33	107.51
	9-21-73	- 10.93	76.00		5-1-73	- 31.90	70.08
	11-15-73	- 3.26	68.33		8-17-73	- 13.90	52.08
	2-5-74	- 12.01	77.08		2-5-74	- 14.57	52.75
	6-17-74	- 18.10	83.17		5-14-74	- 14.90	53.08
	12-12-74	- 13.05	78.12		12-12-74	- 16.99	55.17
	7-9-75	- 22.91	87.98		5-12-75	- 14.07	52.25
	9-24-75	- 20.02	85.09		7-9-75	- 20.57	58.75
	4-19-76	- 19.54	84.61		10-14-75	- 23.37	61.55
	5-14-76	- 25.08	90.15		12-5-75	- 18.70	56.88
					3-12-76	- 14.65	52.83
Dc24-14	3- -71	- 29	68		5-4-76	- 25.57	63.75
	2-8-73	- 40.64	79.75		2-4-78	- 29.82	68.00
	4-3-73	- 44.70	83.81		4-21-78	- 30.92	69.10
	8-17-73	- 19.14	58.25		9-20-78	- 28.24	66.42
	11-14-73	- 11.72	50.83	Dc24-18		H	
	1-8-74	- 20.81	59.92	Dc24-19	9- -71	- 30	42
	5-14-74	- 21.30	60.41		3-22-73	- 42.50	54.08
	6-18-74	- 33.06	72.17		4-3-73	- 41.67	53.25
	10-7-74	- 31.22	70.33		5-10-73	- 81.34	92.92
	12-12-74	- 20.59	59.70		9-21-73	- 16.92	28.50
	4-8-75	- 22.14	61.25		10-17-73	- 24.36	35.94
	9-24-75	- 28.98	68.09		1-17-74	- 17.25	28.83
	12-5-75	- 23.31	62.42		6-18-74	- 30.25	41.83
	1-23-76	- 20.60	59.71		9-10-74	- 31.59	43.17
					12-12-74	- 33.50	45.08
					3-17-75	- 32.25	43.83
					7-9-75	- 23.15	34.73
					10-31-75	- 24.27	35.85
					12-22-75	- 18.01	29.59

TABLE 4.--Water levels in the Potomac Formation in New Castle County--Continued

Well	Date	Water Level	Depth to Water	Well	Date	Water Level	Depth to Water
<u>Llangollen Estates</u>				<u>Newark</u>			
Dc24-19	3-12-76	- 18.23	29.81	Ca55-2	7-15-58	+ 75.28	32.37
	5-14-76	- 26.83	38.41		10-5-58	+ 72.97	34.68
	2-24-78	- 32.42	44.00		12-20-58	+ 71.24	36.41
Dc24-40		H		Ca55-3		H	
Dc24-41		H		Ca55-5		H	
<u>Midvale</u>				Ca55-7	2-24-51	+ 77.9	27.1
Dcl2-10		H			4-22-75	+ 84.6	20.4
Dcl3-10		H		Ca55-8	1-12-51	+ 77.21	27.79
Dcl4-3		H			7-12-53	+ 82.41	22.59
Dcl4-42	5-1-74	+ 1	49		10-15-53	+ 79.70	25.30
Dcl4-53		H			1-15-54	+ 78.91	26.09
Dcl4-54		H			4-15-54	+ 78.79	26.21
<u>National Guard Rifle Range</u>					7-15-54	+ 77.81	27.19
Dc34-5 <sup>9</sup>		H			10-15-54	+ 76.38	28.62
Dc34-6 <sup>10</sup>		H			4-1-55	+ 75.79	29.21
<u>Newark</u>					7-1-55	+ 75.14	29.86
Ca55-2	2-24-50	+ 73.75	33.90		10-6-55	+ 75.71	29.29
	4-28-50	+ 87.30	20.35		3-31-56	+ 75.49	29.51
	1-15-51	+ 74.33	33.32		6-1-56	+ 75.63	29.37
	4-15-51	+ 76.42	31.23	Db11-49		H	
	7-15-51	+ 76.07	31.58	Db12-27		H	
	10-15-51	+ 77.14	30.51	Db12-39	4-25-75	+ 38.54	31.46
	1-15-52	+ 77.79	29.86	Db12-40	3-7-70	--	12.2
	4-15-52	+ 82.73	24.92	Db12-41	3-6-70	+ 53.08	11.92
	7-15-52	+ 79.29	28.36	Db21-40	6- -69	--	8
	10-15-52	+ 77.01	30.64	Db22-41	9-28-67	--	10.17
	1-16-53	+ 76.11	31.54	Db22-42		H	
	4-15-53	+ 78.94	28.71	Db22-46	10- -71	--	45.2
	7-15-53	+ 78.85	28.80	Db22-48	10- -71	+ 15.5	44.5
	10-15-53	+ 74.94	32.71	Db22-49	8- -68	+ 31	29
	1-15-54	+ 73.88	33.77		10-15-76	+ 24	36
	4-15-54	+ 74.00	33.65	Db32-16		H	
	7-15-54	+ 73.53	34.12	<u>New Castle</u>			
	10-15-54	+ 72.73	34.92	Cc55-10	8-10-65	--	37
	1-10-55	+ 72.46	35.19	Cc55-17		H	
	4-15-55	+ 72.09	35.56	Cc55-18	-68	+ 10	40
	7-16-55	+ 71.71	35.94	Cc55-21	12-6-66		32
	10-14-55	+ 71.86	35.79	Cc55-22	12-6-66		31.9
	1-16-56	+ 71.33	36.32	Cc55-23	12-6-66		35.6
	4-16-56	+ 73.07	34.58				
	7-12-56	+ 73.83	33.82				
	9-6-56	+ 75.04	32.61				
	1-23-57	+ 75.12	32.53				
	4-16-57	+ 74.65	33.00				
	7-1-57	+ 73.96	33.69				
	10-18-57	+ 72.13	35.52				
	1-31-58	+ 71.87	35.78				
	4-10-58	+ 73.68	33.97				

<sup>9</sup> Monthly record collected by U.S. Geological Survey since 11-11-75.<sup>10</sup> Continuous record collected by U.S. Geological Survey since 11-11-75.



TABLE 4.--Water levels in the Potomac Formation in New Castle County--Continued

Well	Date	Water Level	Depth to Water	Well	Date	Water Level	Depth to Water
<u>New Castle</u>				<u>Tuxedo Park</u>			
Cd51-8		H		Cc23-1	3- -56	- 10	80
Cd51-9	10- -63	--	22	Cc24-3	9- -41	+ 32	48
Cd51-10	5- -64	--	15	Cc24-5	3-22-50	- 12.09	87.09
Cd52-13	8-20-52	+ 5	7	Cc24-7	3-24-50	+ 0.38	75.62
Cd52-14		H		Cc24-8	3-24-50	- 21.91	91.91
Cd52-26		H		<u>Union Carbide</u>			
Cd52-27		H		Ec32-3		H	
Dc15-16		H		Ec32-4	10-12-66	- 6	25
Dd12-3	4- -56	+ 2	10		11-5-66	- 5.0	24.5
	10-15-76	+ 11	1		11-20-66	- 4.8	24.3
	4-15-77	- 14.3	26.3		11-28-66	- 4.0	23.5
<u>Newport</u>					12-4-66	- 4.5	24.0
Cc34-2	5- -45	+ 17	18		12-20-66	- 3.9	23.4
	10-15-76	+ 16	19		1-5-67	- 4.8	24.3
	4-15-77	+ 24.85	10.15		1-20-67	- 4.7	24.2
	10-21-77	+ 25.86	9.14		2-5-67	- 4.0	23.5
Cc34-3	10- -39	+11 - +8	14-17		2-20-67	- 3.9	23.4
Cc34-4	10- -39	+11 - +8	14-17		3-5-67	- 3.8	23.3
Cc34-5	10- -39	+11 - +8	14-17		3-16-67	- 3.5	23.0
Cc34-6	10- -39	+11 - +8	14-17	Ec32-5	10-12-66		58
Cc34-7	10- -39	+11 - +8	14-17	Ec32-7		H	
Cc34-8	1-26-44	+ 1	29	<u>Wilmington Airport</u>			
	10-15-76	+ 22	8	Cc45-1		H	
	4-15-77	+ 26.80	3.20	Cc45-2		H	
	10-21-77	+ 27.25	2.75	Cc55-1		H	
Cc34-9	7-11-50	- 1.67	22.22	<u>Wilmington Manor Gardens</u>			
Cc34-10	8- -52	- 10	25	Cd51-1		H	
Cc34-11	8-27-52	- 4	19	Cd51-11		H	
Cc34-12	9- -52	- 3	18	Cd51-12		H	
Cc34-31	9- -63	- 23	48	<u>Miscellaneous</u>			
Cc34-35	12-15-77	--	26.7	Cb44-14	6- -42	+ 64	26
<u>Ommelanden Park</u>				Cb53-14	-47	+ 41	19
Dc33-5		H		Cb54-18	3-23-51	+ 65	18
Dc33-6		H		Cb54-49	5- -57	+ 56	17
Dc34-8		H			7- -58	+ 53.11	19.89
<u>Smalley's Dam</u>				Cb41-1	7- -44	+ 35	50
Dbl5-5 <sup>11</sup>		H		Cc45-5	7- -51	- 14	79
				Cc55-2	12- -50	+ 20	50

<sup>11</sup> Continuous record collected by U.S. Geological Survey since 3-8-79.

TABLE 4.--Water levels in the Potomac Formation in New Castle County--Continued

Well	Date	Water Level	Depth to Water	Well	Date	Water Level	Depth to Water
<u>Miscellaneous</u>				<u>Miscellaneous</u>			
Cd31-2	12- -48	+ 47	35	Ec21-4	3- -50	- 6	61
Cd32-5	5- -42	+ 30	44	Ec44-1	3- -50	+ 6	19
Cd32-6	12- -44	+ 5	70	Ed51-1	1-20-46	+ 6	5
Cd33-1	12- -50	- 0.5	10.5		1-20-56	- 6	17
Cd42-6	5- -42	+ 14	61				
Cd42-7	5- -42	+ 30	45				
Db14-14	4-6-42	+ 18	52				
Db15-1	-51	+ 27	3				
Db15-4	4-8-50	- 1	51				
Db33-8	5- -54	+ 1	39				
Db41-5	8- -61	+ 39	35				
Dc11-3	-42	+ 43.5	63.5				
Dc12-3	9- -53	+ 15	60				
Dc12-4	7- -53	+ 30	30				
Dc13-1	2- -42	+ 1	65				
Dc13-2	9- -42	+ 33.5	21.5				
Dc14-1	7- -44	- 15	50				
Dc22-1	9-11-46	+ 36	26				
Dc22-2	9-18-46	+ 40	23				
Dc22-3	9-18-46	+ 37.5	26.5				
Dc22-8	5-16-55	+ 56	19				
Dc23-1	3- -49	+ 11.3	5.7				
Dc25-8	7- -44	- 25	50				
Dc25-9	4-15-50	- 4	36				
Dc25-14	7- -40	- 5.5	30.5				
Dc32-2	2-4-54	- 35	95				
Dc32-3	10-5-53	- 48	118				
Eb24-1	10-19-43	+ 19.92	51.08				
Eb24-2	8- -52	+ 21	24				
Eb34-3	4-20-67	+ 1.92	56.28				

## Ground-Water Quality

Table 5 shows chemical analyses for wells in the Potomac Formation. Water-quality data were compiled from previous publications and from records at the Delaware Department of Natural Resources and Environmental Control and the Delaware Geological Survey. The data included in table 5 are generally historical. Many of the analyses reported in table 5 are the earliest water-quality data available for the wells listed.

The Delaware Department of Natural Resources and Environmental Control regularly receives or collects water-quality analyses of samples from monitor wells near several waste disposal sites including: Army Creek landfill, du Pont-Newport, Cherry Island (1.5 mi southeast of Wilmington), and Pigeon Point (directly north of the ICI well field). At these sites, additional water-quality data are available for monitor wells in the Potomac Formation or the Pleistocene sediments above the Potomac subcrop. However, because of the large volume of repetitive data, analyses from these sites are not included in this report.

## Surface-Water Discharge

The locations of selected low-flow, continuous water-stage, and miscellaneous measuring stations are shown in figure 68. Data at these stations were collected by the U.S. Geological Survey. Low-flow discharge measurements and descriptions of the stations are given in table 6.

Hydrographs of daily discharge computed from water-stage records for the 1979 and 1980 water years are shown in figures 69 through 80. Additional long-term discharge records for Blackbird Creek at Blackbird have been published yearly by the U.S. Geological Survey since 1957.

Some basins with surface-water discharge stations are partly or entirely in the Potomac subcrop area. Other basins are in the subcrop area of overlying formations. Low-flow measurements were made after extended periods of no rainfall when streamflow is primarily from ground-water storage.

## APPLICATION OF FINDINGS

Hydrologic data on the Potomac Formation in New Castle County were compiled. Enough data are available to document changes in the potentiometric surface of the Potomac aquifers, to make a detailed analysis of ground-water runoff, and to determine the effects of pumpage on ground-water levels. For these types of analyses to be more meaningful, investigation of the local geohydrologic properties of the aquifers and confining beds, their thickness, and areal extent is necessary.

A three-dimensional finite-difference model of the flow system in the Potomac Formation is planned by the U.S. Geological Survey from these data. This model would be useful in evaluating and predicting effects of increased ground-water development on future ground-water levels.

TABLE 5.--Chemical analyses of water from the Potomac Formation in New Castle County, Del

[Results in milligrams per liter except as indicated; &lt;10, less than 10]

Specific conductance in micromhos per centimeter at 25°C.

Other: BOD, biochemical oxygen demand; COD, chemical oxygen demand;  
Cu, copper; H<sub>2</sub>S, hydrogen sulfide; K, potassium; PO<sub>4</sub>, phosphate; Zn, zinc.

Well	Date sam- pled	PH	Spe- cific con- duc- tance	Total dis- solved solids	Iron (Fe)	Man- ga- nese (Mn)	Sodi- um (Na)	Chlo- ride (Cl)	Flo- ride (F)	Cal- cium (Ca)	Mag- ne- sium (Mg)
<u>Airport Industrial Park</u>											
Dc15-13	10-25-77	6.0	110	--	4.72	<0.10	--	5	--	--	--
<u>Amoco</u>											
Dc14-3	10-31-66	5.6	--	--	0.22	0.0	--	2	--	--	--
Dc15-7	5-4-67	--	--	--	--	--	--	9	--	--	--
Dc15-9	6-1-61	5.9	--	--	0.1	--	--	8	--	--	--
	4-12-66	5.8	--	--	0.02	0.0	--	5	--	--	--
	9-22-72	--	110	--	--	--	--	21.3	--	--	--
	3-7-74	6.3	121	108	4.66	0.47	10.7	23	--	4.5	--
	11-6-74	6.0	--	91	1.68	0.25	9.4	<15	--	2.2	--
Dc15-10	10-25-60	7.8	--	--	0.2	0	--	8	--	--	--
	9-22-72	--	170	--	--	--	--	13.4	--	--	--
	3-7-74	8.0	186	143	0.45	<.1	20	<10	--	2.0	--
	10-1-74	7.6	--	100	0.34	<.1	42.0	18	--	3.7	--
Dc15-20	10-2-74	6.7	--	64	0.15	<.1	6.7	15	--	4.1	--
Dc24-6	3-5-74	6.9	--	201	6.74	0.11	--	49	--	--	--
	10-1-74	7.2	--	193	10.0	0.12	--	68	--	18.5	--
Dc25-16	5-4-67	--	--	--	--	--	--	9	--	--	--
Dc25-17	4-18-61	6.0	--	0.1	--	--	--	4	--	--	--
	9-22-72	--	160	--	--	--	--	45.0	--	--	--
	3-7-74	6.0	156	113	0.28	<.1	20	31	--	3.5	--
	10-1-74	6.9	--	74	0.23	0.10	20.8	23	--	8.1	--
<u>Caravel Farms</u>											
Db52-25	1-30-74	6.0	--	--	0.05	0	--	4	0.0	--	--
<u>Collins Park</u>											
Cd42-1	1-18-54	--	--	--	--	--	--	25	--	--	--
Cd42-3	5-19-78	7.2	--	--	0.84	0.03	21	1	0.0	--	--
Cd42-5	1-18-54	--	--	--	--	--	--	7	--	--	--
Cd42-15	3-7-78	5.8	--	--	0.07	0.02	15	35	0.0	--	--
<u>Crown Zellerbach</u>											
Dc25-1	8-11-48	7.3	--	--	4.5	--	--	5.0	--	22	6
	6- -77	--	--	104	0.18	<0.02	00	48.5	<.1	--	--

Source: BA, analysis by Brant Associates; BGB, analysis by Booth, Garrett, and Blair; DGS, Delaware Geological Survey; DNREC, Delaware Department of Natural Resources and Environmental Control; G, Groot and Rasmussen, 1954; GM, Geraghty and Miller; LBG, Leggett, Brashears, and Graham; M, Marine and Rasmussen, 1955; PB, analysis by Penniman and Browne; R, Rasmussen and Others, 1957; RW, Roy F. Westop; S, Sundstrom and Others, 1967; W, Woodruff, 1969.

Silica (SiO <sub>2</sub> )	Ni- trate Ni- trogen (NO <sub>3</sub> -N)	Sul- fate (SO <sub>4</sub> )	Total hard- ness as CaCO <sub>3</sub>	Non- car- bon- ate hard- ness	Bi- car- bon- ate (HCO <sub>3</sub> )	Free car- bonic acid (CO <sub>2</sub> )	Tur- bid- ity	Alka- lin- ity	Other	Source
--	1.64	--	0	--	--	--	--	--	COD: 74	DNREC
--	--	--	10	4	--	28	3	6	--	DNREC
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	--	DNREC
--	--	--	22	12	--	29	0	10	--	BGB
--	--	--	--	--	--	--	--	--	COD: < 5	RW
--	--	--	--	--	--	--	--	27	BOD: < 2.4, COD: 0	RW
--	--	--	--	--	--	--	--	18	BOD: < 2.4, COD: 4	RW
--	--	--	16	--	83	11	20	--	--	LBG
--	--	--	--	--	--	--	--	--	COD: 19	DNREC
--	--	--	--	--	--	--	--	87	BOD: < 2.4, COD: 0	RW
--	--	--	--	--	--	--	--	84	BOD: < 2.4, COD: 20	RW
--	--	--	--	--	--	--	--	--	BOD: 2.4, COD: 4	DNREC
--	--	--	--	--	--	--	--	40	BOD: < 2.4, COD: 8	RW
--	--	--	--	--	--	--	--	57	BOD: 2.0, COD: 41	RW
--	--	--	--	--	--	--	--	--	--	S, W
--	12	--	14	--	6	13	5	--	--	LBG
--	--	--	--	--	--	--	--	--	COD: 29	DNREC
--	--	--	--	--	--	--	--	15	BOD: < 2.3, COD: 0	RW
--	--	--	--	--	--	--	--	37	BOD: < 2.4, COD: 32	RW
--	4.97	1	20	8	--	53	4	--	--	BGB
--	--	--	--	--	--	--	--	--	--	W
--	0.05	21	40	0	--	15	37	82	--	BGB
--	--	--	--	--	--	--	--	--	--	W
--	2.0	16	62	45	--	46	0.8	17	--	BGB
0	0.90	2.0	28	--	50	5.0	15	40	--	R, M
--	1.29	4.8	--	--	--	--	2.4	< 1	Heavy Metals	DNREC



TABLE 5.--Chemical analyses of water from the Potomac Formation in New Castle County--  
Continued

Well	Date sam- pled	PH	Spe- cific con- duc- tance	Total dis- solved solids	Iron (Fe)	Man- ga- nese (Mn)	Sodi- um (Na)	Chlo- ride (Cl)	Flo- ride (F)	Cal- cium (Ca)	Mag- ne- sium (Mg)
<u>Crown Zellerbach</u>											
Dc25-2	2-16-37	--	--	--	--	--	--	2	--	--	--
	8-11-48	7.2	--	--	2.5	--	--	4	--	31	9
	8-20-51	--	--	--	--	--	--	2	--	--	--
	6-8-55	--	--	--	--	--	--	4	--	--	--
	6-29-55	6.0	56.8	--	--	--	--	5.0	--	--	--
	9-22-72	--	100	--	--	--	--	38.1	--	--	--
Dc25-3	2-16-37	--	--	--	--	--	--	4	--	--	--
	8-11-48	6.6	--	--	0.2	--	--	6	--	7	3
	8-20-51	--	--	--	--	--	--	4	--	--	--
	9-22-72	--	33	--	--	--	--	15.9	--	--	--
Dc25-4	8-11-48	7.6	--	--	1.2	--	--	5	--	30	4
	9-22-72	--	120	--	--	--	--	13.3	--	--	--
Dc25-5	8-11-48	6.6	--	--	0.2	--	--	7.0	--	9	5
	1- -66	5.6	--	46	0.22	0.0	--	2	--	--	--
Dc25-6	2-16-37	6.2	--	--	0.1	--	--	8	--	5	5
	8-11-48	6.5	--	--	0.1	--	8	4.0	--	2.8	1.0
	4-15-74	5.7	70	56	0.13	< .1	4.3	<15	--	1.42	--
Dc25-10	8-15-51	--	--	--	--	--	--	4	--	--	--
<u>Delaware City</u>											
Ecl5-26	12-2-76	7.2	--	--	0.62	0.0	44	14	0.0	--	--
<u>Delmarva Power-Summit</u>											
Eb44-9	10-2-75	7.3	--	--	5.24	0.05	5	1	0.0	--	--
	10-3-75	7.2	--	112	5.24	0.05	5	1	0.0	--	--
<u>Fairwinds</u>											
Dc22-18	4-1-74	5.8	--	--	0.50	0.02	--	13	0.0	--	--
Dc22-20	1- -74	6.9	--	--	6.3	0.03	--	2	0.0	--	--
<u>Getty</u>											
Dc41-4	10-12-55	6.5	--	154	--	0.1	--	4.5	--	--	--
	1-29-59	6.8	--	--	4.7	--	--	7.5	--	<sup>1</sup> 30	--
	5-4-67	--	--	--	--	--	--	8	--	--	--
	7-25-75	6.7	--	96	6.0	0.06	--	4	0.0	--	--
	7-16-76	6.8	--	94	5.3	0.07	--	4	0.0	--	--
	4-20-77	6.8	--	138	11.3	0.07	--	6	0.0	--	--
Dc42-6	2-3-56	7.3	--	0	0.33	0.0	--	10	--	--	--
	3-2-59	7.5	--	--	0.4	--	--	9.0	--	<sup>1</sup> 14	--
	5-4-67	--	--	--	--	--	--	9	--	--	--
	7-28-75	7.6	--	126	0.64	0.00	--	9	0.0	--	--
	7-22-76	7.5	--	167	0.52	0.00	--	10	0.0	--	--
	4-20-77	7.5	--	142	1.98	0.01	--	11	0.0	--	--

<sup>1</sup> as CaCO<sub>3</sub>.

Silica (SiO <sub>2</sub> )	Ni- trate Ni- trogen (NO <sub>3</sub> -N)	Sul- fate (SO <sub>4</sub> )	Total hard- ness as CaCO <sub>3</sub>	Non- car- bon- ate hard- ness	Bi- car- bon- ate (HCO <sub>3</sub> )	Free car- bonic acid (CO <sub>2</sub> )	Tur- bid- ity	Alka- lin- ity	Other	Source
--	--	--	--	--	--	--	--	--	--	W
--	0.0	3	40	--	69	10	20	5	--	M
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	--	W
--	1.83	4.2	13	0	23	--	--	--	--	R
--	--	--	--	--	--	--	--	--	COD:19	DNREC
--	--	--	--	--	--	--	--	--	--	W
--	0.90	0	10	--	9	5	3	3	--	M
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	COD:10	DNREC
--	0.0	2	34	--	69	3	5	30	--	M
--	--	--	--	--	--	--	--	--	COD:<5	DNREC
--	0.90	6.0	14	--	9	5.0	5	3	--	R,M
--	--	--	10	4	--	28	3	6	--	BGB
--	--	--	13	--	--	20	--	--	--	M
--	2.26	0	11	--	--	4.0	5	5	K:7	S
--	2.6	<5.0	22	--	--	--	--	--	BOD:<2.4, COD:0	DNREC
--	--	--	--	--	--	--	--	--	--	W
--	0.0	13	14	0	--	9	1.5	85	--	BGB
--	0.03	8	60	0	--	35 iron rust	80	--	--	BGB
--	0.15	8	60	0	--	40 iron rust	80	--	--	BGB
--	2.71	18	26	11	--	47	20	15	--	BGB
--	0.05	12	54	0	--	65 iron rust	75	--	--	BGB
--	--	--	38	0	--	--	--	70	--	DNREC
5.8	--	2.1	40	--	<sup>1</sup> 10	23	5	62	--	DNREC
--	--	--	--	--	--	--	--	--	--	DNREC
--	6.2	7.0	40	0	--	--	--	70	--	DNREC
--	0.0	5.0	36	0	--	--	--	70	--	DNREC
--	1.0	34.0	40	0	--	--	--	62	--	DNREC
--	1.0	0	12	0	--	8.8 iron rust	62	--	--	DNREC
7.3	--	4.0	26	--	<sup>1</sup> 12	15	5	78	--	DNREC
--	--	--	12	--	85	8.8	10	--	--	R
--	0.4	10	16	0	--	7	2.5	90	--	DNREC
--	0.0	14	20	0	--	7	3.2	74	--	DNREC
--	0.4	19	16	0	--	7	9	80	--	DNREC

TABLE 5.--Chemical analyses of water from the Potomac Formation in New Castle County-  
Continued

Well	Date sam- pled	PH	Spe- cific con- duc- tance	Total dis- solved solids	Iron (Fe)	Man- ga- nese (Mn)	Sodi- um (Na)	Chlo- ride (Cl)	Flo- ride (F)	Cal- cium (Ca)	Mag- ne- sium (Mg)
<u>Getty</u>											
Dc43-1	7-6-55	6.9	144	--	--	--	26	3.5	--	--	--
	6-8-55	--	--	--	--	--	--	3.5	--	--	--
Dc44-1	7-6-55	6.4	53.3	--	--	--	5	2.5	--	--	--
Dc51-3	3-11-66	--	--	--	--	--	--	11	--	--	--
	4-7-66	--	--	--	--	--	--	21	--	--	--
Dc51-7	10-6-55	6.6	--	148	3.2	0.1	--	19	--	--	--
	10-7-55	6.7	--	--	2.8	0.1	--	19	--	--	--
	5-11-59	6.85	--	--	3.4	--	--	9.0	--	<sup>2</sup> 36	--
	5-4-67	--	--	--	--	--	--	17	--	--	--
	7-25-75	6.7	--	117	5.5	0.0	--	14	0.0	--	--
	7-15-76	6.8	--	92	6.1	0.07	--	4	0.0	--	--
	4-22-77	7.0	--	115	5.6	0.1	--	14	0.0	--	--
Dc51-8	2-16-56	6.8	--	--	4.0	0.1	--	3.4	--	--	--
	3-7-56	6.4	--	--	4.8	0.1	--	2.0	--	--	--
	5-5-67	--	--	--	--	--	--	9	--	--	--
Dc52-1	7-6-54	<sup>3</sup> 6.7	--	88	6.0	0.8	--	5.5	.1	--	--
	7-21-54	<sup>4</sup> 7.1	--	--	.24	.1	--	16	--	--	--
	8-2-54	<sup>3</sup> 6.7	--	--	4.5	.1	--	4.0	--	--	--
Dc52-2	7-12-54	6.6	--	118	5.3	0.1	--	6.5	--	--	--
	7-28-75	6.9	--	98	15.5	0	--	2	0	--	--
Dc52-24	12-9-54	6.6	--	78	3.0	0	--	4.0	--	13	2.5
	12-12-54	6.7	--	82	3.3	0	--	4.0	--	14	1.6
	12-15-54	6.6	--	88	2.8	0	--	4.0	--	13	2.1
	- -56	6.6	--	96	2.8	0	--	4	--	--	<sup>2</sup> 12.6
	3-2-59	7.3	--	--	0.9	--	--	9.0	--	--	<sup>2</sup> 16
	3-11-66	--	--	--	--	--	--	5	--	--	--
	1-6-67	--	--	--	--	--	--	1	--	--	--
	7-25-75	6.7	--	80	10.0	0.02	--	1	0	--	--
	7-16-76	6.8	--	99	8.34	0.05	--	2	0	--	--
	4-20-77	6.8	--	97	16.1	0.06	--	1	0	--	--
	1-3-79	8.0	--	--	2.2	--	--	14	--	--	<sup>2</sup> 16
Dc53-7	10-1-54	7.3	--	--	--	0.2	--	12	--	--	--
Dc53-23	8-3-54	7.1	--	110	1.4	0	--	4.0	--	--	--
	8-25-54	6.5	--	--	5.5	0.1	--	4.0	--	--	--
Eb15-2	12-6-55	6.5	--	--	7.5	0.1	--	2.5	--	--	--
	1-5-56	6.5	--	--	8.2	0.1	--	5.0	--	--	--
Eb15-4	10-21-55	6.7	--	116	2.0	.0	--	10.0	--	--	--
	1-29-59	6.8	--	--	7.0	--	--	16	--	--	<sup>2</sup> 16
	3-2-59	6.9	--	--	0.7	--	--	9.0	--	--	<sup>2</sup> 6
	5-4-67	--	--	--	--	--	--	12.0	--	--	--
	7-25-75	6.9	--	102	4.8	0.0	--	9.0	0.0	--	--
	7-16-76	6.8	--	107	6.46	0.05	--	7	0.0	--	--
	4-20-77	6.8	--	119	9.76	0.05	--	9	0.0	--	--
Ec12-2	4-7-66	--	--	--	--	--	--	9	--	--	--
	1-6-67	--	--	--	--	--	--	7	--	--	--
Ec12-3	11-1-54	7.0	--	126	2.8	0.1	--	11.0	--	--	--
	1-6-67	--	--	--	--	--	--	3	--	--	--

<sup>2</sup> as CaCO<sub>3</sub>.

<sup>3</sup> Screen Interval 320-340 ft below land surface.

<sup>4</sup> Screen Interval 520-540 ft below land surface.

Silica (SiO <sub>2</sub> )	Ni- trate Ni- trogen (NO <sub>3</sub> -N)	Sul- fate (SO <sub>4</sub> )	Total hard- ness as CaCO <sub>3</sub>	Non- car- bon- ate hard- ness	Bi- car- bon- ate (HCO <sub>3</sub> )	Free car- bonic acid (CO <sub>2</sub> )	Tur- bid- ity	Alka- lin- ity	Other	Source
--	0	5.0	22	0	83	--	--	--	--	R
--	0	4.0	14	0	--	--	--	--	--	W
--	0	4.0	14	0	21	--	--	--	--	R
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	--	W
--	--	--	52	0	82	35 iron rust	80	--	--	DNREC
--	--	--	52	--	80	31	--	--	--	R
5.8	--	1.6	50	--	14	36	10	72	--	DNREC
--	--	--	--	--	--	--	--	--	--	S,W
--	0.6	9.0	56	0	--	35 iron rust	80	--	--	DNREC
--	0.0	5.0	50	0	--	37 iron rust	75	--	--	DNREC
--	0.2	14	54	0	--	15 iron rust	73	--	--	DNREC
--	--	--	44	--	62	22	--	--	--	R
--	--	--	42	--	62	44	--	--	--	R
--	--	--	--	--	--	--	--	--	--	S
6.0	--	--	34	--	68	30.8	--	--	--	R
5.6	--	--	28	0	--	15.4	--	100	--	R
7.0	--	--	40	--	82	35.2	25	--	--	R
6.0	--	--	44	0	80	28.6	--	80	--	R
--	1.0	12.0	48	0	--	15 iron rust	55	--	--	DNREC
6.0	--	4.9	42	--	65	31	--	--	--	R
6.0	--	4.3	40	--	68	29	35	--	--	R
6.0	--	4.9	40	--	70	33	35	--	--	R
6.0	--	4.9	40	0	2.1	33 iron rust	70	--	--	DNREC
7.4	2.1	--	22	--	6	16	3	86	--	DNREC
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	--	W
--	2	--	44	0	--	31 iron rust	60	--	--	DNREC
--	3	--	44	0	--	27 iron rust	70	--	--	DNREC
--	8	--	44	0	--	29 iron rust	60	--	--	DNREC
--	--	--	30	--	--	--	--	82	PO <sup>4</sup> :0.1	DNREC
--	--	--	22.0	0	--	8.8	muddy	85	--	W
7.0	--	56	0	84	13.2	55	84	--	--	R
7.0	--	38	0	70	44	10	--	--	--	R
--	--	--	34	--	60	40	--	--	--	R
--	--	--	34	--	63	44	150	--	--	R
--	--	--	44	0	82	31 iron rust	--	--	--	R
2.0	--	7.0	58	--	--	22	5	66	--	DNREC
5.3	--	1.6	40	--	--	30	5	74	--	DNREC
--	--	--	--	--	--	--	--	82.5	--	S,W
--	0.4	4	44	0	--	26 iron rust	75	--	--	DNREC
--	0.0	8.0	40	--	--	26 iron rust	73	--	--	DNREC
--	0.1	12.0	40	--	--	35	16	70	--	DNREC
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	--	W
7.0	--	5.3	22	--	90	18	30	--	--	R
--	--	--	--	--	--	--	--	--	--	W

TABLE 5.--Chemical analyses of water from the Potomac Formation in New Castle County--  
Continued

Well	Date sam- pled	PH	Spe- cific con- duc- tance	Total dis- solved solids	Iron (Fe)	Man- ga- nese (Mn)	Sodi- um (Na)	Chlo- ride (Cl)	Flo- ride (F)	Cal- cium (Ca)	Mag- ne- sium (Mg)
<u>Getty</u>											
Ec12-15	8-19-54	6.6	--	84	5.2	0.1	--	5.5	--	--	--
	9-2-54	6.9	--	116	4.15	0.0	--	11.5	--	--	--
Ec12-20	- -55	7.0	--	122	1.44	0.0	--	8	--	--	--
	1-29-59	6.7	--	--	2.1	--	--	12	--	<sup>5</sup> 20	<sup>5</sup> 8
	5-4-67	--	--	--	--	--	--	13	--	--	--
	7-28-75	7.0	--	--	4.3	0.05	--	11	0.0	--	--
	9-27-76	7.0	--	105	3.73	0.08	--	14	0.0	<sup>5</sup> 13	<sup>5</sup> 9
	1-3-79	7.7	181	--	2.2	--	--	13	--	--	--
Ec13-5	1-6-67	--	--	--	--	--	--	2	--	--	--
Ec13-6	8-25-54	6.5	--	98	5.5	0.1	--	4.0	--	--	--
	1-24-55	7.1	--	--	1.3	0.0	--	9.0	--	4.3	2.3
	1-26-55	7.1	--	--	1.2	0.0	--	8.0	--	3.7	2.1
	1-31-55	7.1	--	--	1.2	0.0	--	8.5	--	4.3	1.8
	2-10-55	7.3	--	--	1.1	0.0	--	9.0	--	5.7	1.4
	- -56	7.3	--	132	--	0.0	--	9	--	5.7	--
	3-2-59	7.3	--	--	0.9	--	--	9	--	<sup>5</sup> 16	--
	6-3-66	--	--	--	--	--	--	4	--	--	--
	1-6-67	--	--	--	--	--	--	4	--	--	--
	5-4-67	--	--	--	--	--	--	9	--	--	--
	7-25-75	7.2	--	144	5.94	0.03	--	6	0.0	--	--
	7-15-76	7.2	--	111	1.65	0.00	--	7	0.0	--	--
	1-3-79	8.0	179	--	8.0	--	--	15	--	<sup>5</sup> 17	--
Ec14-1	9-24-54	7.4	--	186	2.5	0.0	--	39.5	--	--	--
	10-8-54	7.1	--	--	2.0	0.0	--	43	--	--	--
	10-26-54	--	--	--	--	--	--	39	--	--	--
Ec14-7	- -55	7.0	--	158	1.16	0.0	--	22	--	--	--
	1-29-59	7.0	--	--	1.6	--	--	22	--	<sup>5</sup> 14	<sup>5</sup> 6
	5-9-67	--	--	--	--	--	--	21	--	--	--
	7-25-75	7.5	--	132	1.28	0.01	--	19	0.0	--	--
	7-14-76	7.3	--	155	1.56	0.00	--	17	0.0	--	--
	4-18-77	7.5	--	158	1.9	0.02	--	17	0.0	--	--
	1-3-79	7.8	156	--	42	--	--	15	--	<sup>5</sup> 11	<sup>5</sup> 8
<u>Glendale</u>											
Dc31-10	6- -73	5.8	--	--	0.03	0.11	4	4	0.0	--	--
Dc31-24	2-19-76	5.45	47.5	--	0.02	--	--	5.0	<.1	--	--
Dc31-26	11-30-73	6.8	--	--	5.7	0.05	--	4	0.0	--	--
Dc31-27	12-11-73	6.6	--	--	1.5	0.03	--	3	0.0	--	--
<u>Goodrich<sup>6</sup></u>											
Ea33-1	11-20-66	6.3	--	61	9.2	0.15	--	1	--	--	--
Ea33-4	9-30-66	6.1	--	158	9.2	0.1	--	1	--	--	--
<u>Lums Pond</u>											
Eb22-11	11-1-74	6.6	--	--	3.3	0.0	--	2	0.0	--	--

<sup>5</sup> as CaCO<sub>3</sub>.

<sup>6</sup> Cecil County, Maryland.



Silica (SiO <sub>2</sub> )	Ni- trate Ni- trogen (NO <sub>3</sub> -N)	Sul- fate (SO <sub>4</sub> )	Total hard- ness as CaCO <sub>3</sub>	Non- car- bon- ate hard- ness	Bi- car- bon- ate (HCO <sub>3</sub> )	Free car- bonic acid (CO <sub>2</sub> )	Tur- bid- ity	Alka- lin- ity	Other	Source
6.0	--	--	44	--	61.5	30.8	50	--	--	R
7.0	--	--	32	0	88	22	200	--	--	R
--	--	--	24	--	--	22	5	90	--	DNREC
7.1	--	4.0	28	--	--	28	5	70	--	DNREC
--	--	--	--	--	--	--	--	--	--	S
--	0.2	7.0	32	0	--	18 iron rust	--	85	--	DNREC
--	0.0	9	28	0	--	18	25	85	--	DNREC
8.0	--	--	22	--	--	--	--	81	--	DNREC
--	--	--	--	--	--	--	--	--	--	S
7.0	--	--	38.0	0	--	44.0	10	70.0	--	BGB
6.0	--	10	20	--	90	13	0	--	--	R
6.0	--	9.5	18	--	92	13	0	--	--	R
6.0	--	7.3	18	--	90	13	0	--	--	R
6.0	--	4.9	20	--	92	10	0	--	--	R
6.0	--	4.9	20	0	1.4	10.1	0	92.5	--	DNREC
7.4	--	2.1	22	--	5.6	16	3	86	--	DNREC
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	--	S
--	0.3	12	24	0	--	18 iron rust	--	95	--	DNREC
--	0.0	12	24	0	--	18	10	88	--	DNREC
8.3	--	--	26	--	5.9	--	--	81	--	DNREC
7.0	--	20.6	28	--	85	7.0	70	--	--	R
7.0	--	21	24	--	85	13	--	--	--	R
--	--	--	--	--	--	--	--	--	--	BGB
--	--	--	20	0	--	17.0	--	90	--	DNREC
7.5	--	9.4	20	--	--	15	--	74	H <sub>2</sub> S:0	DNREC
--	--	--	--	--	--	--	--	--	--	S
--	--	10	20	0	--	7	--	90	--	DNREC
--	0.2	5	24	0	--	13	--	90	--	DNREC
--	0.0	17	18	0	--	7	--	87	--	DNREC
3.7	0.1	--	19	--	--	--	--	71	PO <sub>4</sub> :0.1	DNREC
--	0.90	1	10	0	--	30	0	12	--	BGB
--	4.1	0.90	12.0	--	--	31.2	--	5.5	Other metals	DNREC
--	0.22	5	47	0	--	47 iron rust	--	68	--	BGB
--	0.03	3	16	0	--	45	20	50	--	BGB
--	--	--	20	0	0	57 iron rust	--	48	COD:1.4, PO <sub>4</sub> :0.04	GM
--	--	--	14	0	--	66	80	21	--	GM
--	0.0	9	34	0	--	24	20	56	--	BGB

TABLE 5.--Chemical analyses of water from the Potomac Formation in New Castle County--  
Continued

Well	Date sam- pled	PH	Spe- cific con- duc- tance	Total dis- solved solids	Iron (Fe)	Man- ga- nese (Mn)	Sodi- um (Na)	Chlo- ride (Cl)	Flo- ride (F)	Cal- cium (Ca)	Mag- ne- sium (Mg)
<u>Middletown</u>											
Fb33-2	9-19-60	6.8	--	--	0.1	0.0	30	6	--	32	12
	11-1-60	7.1	174	110	4.9	.01	16	.5	.1	14	3.3
	9-8-69	--	--	--	0.2	--	--	10	--	--	--
<u>Newark</u>											
Ca55-3	4-26-51	6.5	111	--	--	--	--	12	--	--	--
Ca55-5	4-26-51	6.0	144	--	--	--	--	16	--	--	--
	12-18-51	5.6	142	88	0	--	9.7	16	.1	6.0	5.1
	10-1-66	6.8	--	120	0	0	--	0	0	10	6.8
Ca55-7	9-22-53	5.6	83.2	--	.03	--	--	9	--	--	--
Cb51-2	4-26-51	5.8	113	--	--	--	--	12	--	--	--
Db11-49	10-13-66	6.8	--	60	0.1	0	--	2	0	3.2	7.3
Db12-41	2-13-70	5.7	--	--	0.72	0.02	--	4	--	--	--
Db22-42	8-19-68	5.7	--	--	0.42	0	--	4	--	--	--
Db22-49	5-23-68	6.4	--	--	0.63	0	--	6	--	--	--
Db31-50	5-26-29	6.5	--	--	0.37	0	--	6	--	--	--
Db32-16	10-13-71	6.0	--	188	3.85	0.08	--	4	--	--	--
	6-13-72	6.2	--	38.3	5.5	0.10	3.5	2.0	<0.1	--	--
	12-9-76	6.5	--	--	3.6	0.14	4.0	5.79	0.1	79.5	79.5
<u>New Castle</u>											
Cc55-17	9-4-69	6.1	--	--	0.04	0.01	--	8	--	--	--
Cc55-18	7-17-68	5.9	--	56	0.15	0.00	--	9	--	--	--
	7-18-68	5.7	--	--	0.04	0.00	--	7	--	--	--
Cd52-13	10-28-55	6.0	46.7	33	2.1	--	3.0	2.4	--	3.9	1.5
Dc15-16	6-14-78	6.2	--	--	0.15	0.01	7	12	0.0	--	--
<u>Newport</u>											
Cc34-8	9-20-55	7.0	134	89	.12	--	11	13	.1	--	--
<u>Ommelanden Park</u>											
Dc33-5	5-28-76	6.1	--	--	0.05	0.0	--	9	0.0	--	--
Dc33-6	5-26-76	6.0	--	--	0.15	0.0	--	4	0.0	--	--
Dc34-9	5-18-76	5.8	--	--	0.01	0.0	--	1	0.0	--	--

<sup>7</sup> as CaCO<sub>3</sub>.

Silica (SiO <sub>2</sub> )	Ni- trate Ni- trogen (NO <sub>3</sub> -N)	Sul- fate (SO <sub>4</sub> )	Total hard- ness as CaCO <sub>3</sub>	Non- car- bon- ate hard- ness	Bi- car- bon- ate (HCO <sub>3</sub> )	Free car- bonic acid (CO <sub>2</sub> )	Tur- bid- ity	Alka- lin- ity	Other	Source
10.8	--	10	44	--	--	17	25	60	--	DNREC
9.8	0.20	9.0	49	0	102	--	--	--	K:6.3	DGS
--	--	25	90	--	--	5	2	100	--	DGS
--	2.94	7.8	31	20	14	--	--	--	--	G,M
--	4.52	10	34	23	13	--	--	--	Other Metals	G,R
11	5.42	9	36	--	10	--	--	--	K:1.8	G,R,M
0	--	7	54	--	--	10	0	28	PO <sub>4</sub> :0, Cu:0	GM
--	1.76	1	16	8	10	--	--	--	K:5.6	G,R,M
--	4.52	5.9	32	24	10	--	--	--	--	G,M
0	--	0	38	--	--	5.0	0	16	PO <sub>4</sub> :1.5, Cu:0	GM
--	0.25	12	8	1	27	18	--	7	--	BGB
--	0.36	11.2	6	0	--	21	10	6	--	BGB
--	0.32	14.8	12	7	--	9	50	5	--	BGB
--	2.71	8	44	7	--	20	40	37	--	BGB
--	0.00	11	16	8	--	30 iron rust	8	--	--	BGB
--	<0.02	20.6	18.4	0.5	--	43.0	23	17.9	--	BA
--	0.25	6	20	19	--	--	42	14	--	BA
--	1.35	1	14	4	--	23	3	10	--	BGB
--	2.89	2.5	14	5	--	28	0	9	--	BGB
--	1.72	2.5	14	5	--	26	0	9	--	BGB
9.4	.41	.6	16	1	19	--	--	--	Other Metals	R
--	1.0	5	22	7	--	31	0.3	15	--	BGB
8.8	4.74	9.9	35	23	15	--	--	--	--	R
--	1.08	7	24	9	--	40	3.3	15	--	BGB
--	1.35	10	14	4	--	35	0.8	10	--	BGB
--	1.81	3.0	10	2	--	37	--	8	--	BGB

TABLE 5.--Chemical analyses of water from the Potomac Formation in New Castle County--  
Continued

Well	Date sam- pled	PH	Spe- cific con- duc- tance	Total dis- solved solids	Iron (Fe)	Man- ga- nese (Mn)	Sodi- um (Na)	Chlo- ride (Cl)	Flo- ride (F)	Cal- cium (Ca)	Mag- ne- sium (Mg)
<u>Union Carbide</u>											
Ec32-5	10-14-66	6.8	--	96	5.8	0.05	--	1	--	--	--
Ec32-7	8-19-66	7.0	--	116	1.90	0.02	--	12	--	--	--
	8-30-66	--	--	--	--	--	--	10	--	--	--
<u>Wilmington Airport</u>											
Cc45-1	9-3-57	--	--	--	--	--	--	5.3	--	--	--
	1-31-75	7.0	138	80	4.25	--	--	2.3	0.06	--	--
Cc55-1	9-20-55	--	--	--	2.3	--	--	--	--	--	--
	4-3-57	--	--	--	--	--	--	2.5	--	--	--
	9-3-57	--	--	--	--	--	--	5.0	--	--	--
<u>Miscellaneous</u>											
Cc45-5	5-24-74	7.0	141.0	--	4.15	--	--	3.9	--	--	--
Cd15-1	7- -53	7.2	--	--	11	--	--	16	--	139	11
	6- -53	--	--	--	--	--	--	3.5	--	--	--
	6-28-55	7.6	659	--	--	--	49	3.5	--	--	--
Cd33-2	7-22-56	6.4	--	--	>0.5	--	--	23	--	--	--
	1-18-54	--	--	--	--	--	--	515	--	--	--
	6-28-55	5.4	1060	--	--	--	136	218	--	--	--
	4-18-57	--	--	--	--	--	--	174	--	--	--
Ec23-9	8- -68	6.8	--	--	10.9	0.08	--	4	--	--	--

Silica (SiO <sub>2</sub> )	Ni- trate Ni- trogen (NO <sub>3</sub> -N)	Sul- fate (SO <sub>4</sub> )	Total hard- ness as CaCO <sub>3</sub>	Non- car- bon- ate hard- ness	Bi- car- bon- ate (HCO <sub>3</sub> )	Free car- bonic acid (CO <sub>2</sub> )	Tur- bid- ity	Alka- lin- ity	Other	Source
--	--	--	40	0	--	24	iron rust	59	--	GM
--	--	--	24	0	--	13	5	75	--	GM
--	--	--	--	--	--	--	--	--	--	GM
--	--	--	--	--	--	--	--	--	--	W
--	0.60	8.5	44.0	--	--	20.0	5.1	--	Other Metals	DNREC
--	--	--	--	--	--	--	--	--	Zn: 14	R
--	--	--	--	--	--	--	--	--	--	W
--	--	--	--	--	--	--	--	--	--	W
--	--	--	48.0	--	--	--	2.3	70	--	DNREC
.6	--	120	231	--	--	--	--	--	--	M, R
--	--	--	--	--	--	--	--	--	--	W
--	0.14	141	245	90	189	--	--	--	--	R
--	--	--	42	--	--	--	--	--	--	R
--	--	--	--	--	--	--	--	--	--	W
--	.05	139	165	157	10	--	--	--	--	R
--	--	--	--	--	--	--	--	--	--	W
--	0.0	6.4	38	0	--	31	iron rust	50	--	BGB



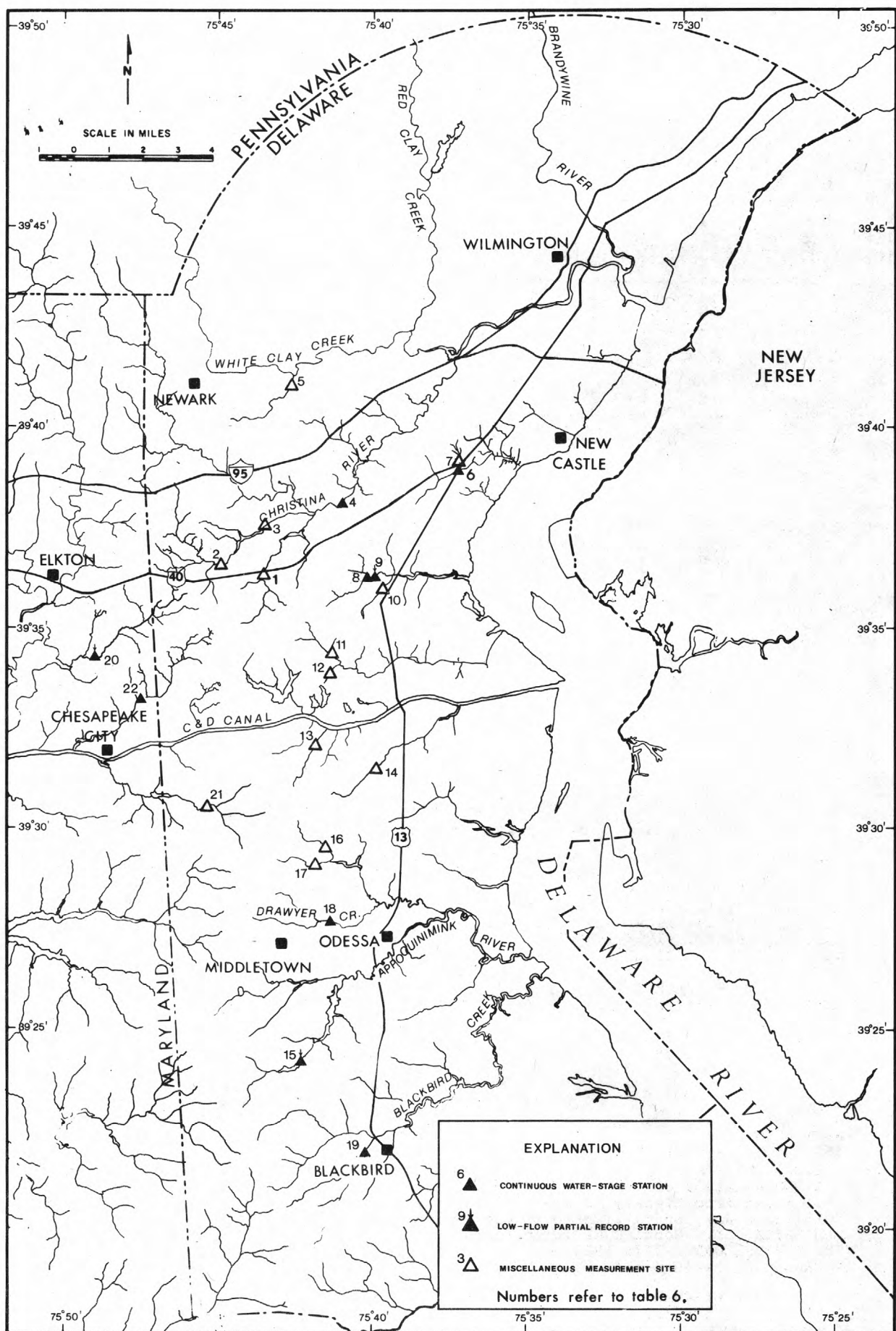


FIGURE 68.--Location of selected stream flow measuring sites.

TABLE 6.--Low-flow discharge at selected surface-water stations in New Castle County, Del.

Index numbers refer to station locations shown in Figure 69.

## INDEX NUMBER.--1.

STATION NAME.--Belltown Run near Glasgow, DE.

LOCATION.--Lat 39°36'27", long 75°43'26", New Castle County, at culvert on U.S. Highway 40, and 1.2 mi east of Glasgow.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--3.35 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-7-78	0.84	5-10-79	1.22	2-13-80	1.40
10-12-78	0.44	11-1-79	2.61	7-17-80	0.71

## INDEX NUMBER.--2.

STATION NAME.--Muddy Run at Glasgow, DE.

LOCATION.--Lat 39°36'36", long 75°44'48", New Castle County, at bridge on State Highway 896, 0.3 mi north of Glasgow, 3.4 mi upstream from mouth, and 5 mi south of Newark.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1968-1970, 1978-1979.

DRAINAGE AREA.--5.43 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-10-68	0.32	9-24-69	0.44	9-7-78	1.10
4-15-69	1.62	6-2-70	1.16	10-12-78	0.55
7-3-69	0.28	9-3-70	0.45	5-10-79	1.91

## INDEX NUMBER.--3.

STATION NAME.--Muddy Run near Coochs Bridge, DE.

LOCATION.--Lat 39°37'34", long 75°43'28", New Castle County, at bridge on State Highway 72, 1.9 mi northeast of Glasgow, and 0.9 mi southeast of Coochs Bridge.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--8.21 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
10-12-78	0.73	2-13-80	2.00	7-17-80	1.06
11-1-79	2.08				

## INDEX NUMBER.--4.

STATION NUMBER.--01478040.

STATION NAME.--Christina River near Bear, DE.

LOCATION.--Lat 39°38'12", long 75°40'53", New Castle County, on right bank 500 ft upstream from highway bridge, 1.3 mi northwest of Bear, 1.6 mi downstream from Belltown Run, and 17.7 mi upstream from mouth.

CLASSIFICATION.--Continuous water-stage station.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--40.6 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-29-78	7.61	5-10-79	22.50	2-13-80	14.10
10-12-78	6.28				

TABLE 6.--Low-flow discharge at selected surface-water stations in New Castle County--Continued

INDEX NUMBER.--5.  
 STATION NAME.--White Clay Creek Tributary near Ogletown, DE.  
 LOCATION.--Lat 39°40'58", long 75°42'36", New Castle County, at culvert on State Highway 273, 100 ft east of Penn Central Railroad and 0.7 mi northwest of Ogletown.  
 CLASSIFICATION.--Miscellaneous measuring site.  
 PERIOD OF RECORD.--1978-1980.  
 DRAINAGE AREA.--3.68 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-7-78	0.67	5-10-79	1.01	7-17-80	0.79
10-12-78	0.95	2-13-80	0.80		

INDEX NUMBER.--6.  
 STATION NUMBER.--01482200.  
 STATION NAME.--Army Creek at State Road, DE.  
 LOCATION.--Lat 39°38'56", long 75°37'18", New Castle County, on left bank at downstream end of culvert on U.S. Highway 13, 0.2 mi south of State Road, and 2.3 mi upstream from mouth.  
 CLASSIFICATION.--Continuous water-stage station.  
 PERIOD OF RECORD.--1978-1980.  
 DRAINAGE AREA.--2.42 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
7-21-78	0.08	9-12-78	0.09	2-13-80	0.19
9-7-78	0.10	5-10-79	0.49	7-17-80	0.13
9-11-78	0.10	11-1-79	0.18		

INDEX NUMBER.--7.  
 STATION NAME.--Army Creek Tributary at State Road, DE.  
 LOCATION.--Lat 39°39'17", long 75°37'12", New Castle County, 850 ft upstream from U.S. Highway 40, at State Road, and 2700 ft upstream from mouth. Prior to July 1980, site was 1900 ft upstream from mouth at lat 39°39'12" and long 75°37'08".  
 CLASSIFICATION.--Miscellaneous measuring site.  
 PERIOD OF RECORD.--1978-1980.  
 DRAINAGE AREA.--0.32 mi<sup>2</sup>. Prior to July 1980 drainage area was 0.38 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
10-5-78	0.05	11-1-79	0.05	7-17-80	0.02
5-10-79	0.09				

INDEX NUMBER.--8.  
 STATION NUMBER.--01482298.  
 STATION NAME.--Red Lion Creek near Red Lion, DE.  
 LOCATION.--Lat 39°36'16", long 75°40'06", New Castle County, on left bank at downstream side of culvert on U.S. Highway 301S, 0.2 mi southwest of Red Lion, and 3.4 mi upstream from mouth.  
 CLASSIFICATION.--Continuous water-stage station.  
 PERIOD OF RECORD.--1978-1980.  
 DRAINAGE AREA.--3.08 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
10-12-78	0.41	11-1-79	1.98	7-17-80	0.55
5-10-79	1.56	2-13-80	1.74		

TABLE 6.--Low-flow discharge at selected surface-water stations in New Castle County--Continued

INDEX NUMBER.--9.

STATION NUMBER.--01482300.

STATION NAME.--Red Lion Creek at Red Lion, DE.

LOCATION.--Lat 39°36'20", long 75°39'55", New Castle County, at bridge on State Highway 7, 0.2 mi south of Red Lion.

CLASSIFICATION.--Low-flow partial record station.

PERIOD OF RECORD.--1955-1960, 1962-1971.

DRAINAGE AREA.--3.20 mi<sup>2</sup>.

DATE	DISCHARGE (ft /s)	DATE	DISCHARGE (ft /s)	DATE	DISCHARGE (ft /s)
6-28-55	0.96	6-1-59	0.76	9-13-66	0.03
10-6-55	1.40	6-9-60	0.96	5-2-67	1.89
11-17-55	0.90	9-24-62	0.28	7-25-68	0.41
6-14-56	0.44	5-6-63	1.02	9-10-68	0.33
8-13-56	0.58	7-17-63	0.25	4-15-69	0.97
11-27-56	5.92	8-27-64	0.05e	9-26-69	0.17
4-16-57	2.34	9-1-65	0.00e	6-2-70	0.67
7-3-57	0.43	10-5-65	0.11	9-3-70	0.26
4-21-58	2.80	7-21-66	0.08	4-27-71	1.13
3-3-59	2.09				

INDEX NUMBER.--10.

STATION NAME.--Doll Run at Red Lion, DE.

LOCATION.--Lat 39°35'53", long 75°39'43", New Castle County, 10 ft above culvert on secondary road, 0.7 mi south of Red Lion.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1967-1969, 1974-1979.

DRAINAGE AREA.--1.2 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
12-4-67	0.86	3-18-75	0.79	9-6-77	0.49
5-31-68	1.92	4-15-76	0.84	3-30-78	1.38
4-28-69	0.41	9-7-76	0.38	9-11-78	1.07
4-17-74	1.26	3-1-77	0.68	4-2-79	1.29
7-26-74	0.60				

INDEX NUMBER.--11.

STATION NAME.--Dragon Creek at Kirkwood, DE.

LOCATION.--Lat 39°34'23", long 75°41'20", New Castle County, at culvert in trailer park 1500 ft downstream from U.S. Highway 301S, 6.8 mi upstream from mouth, and 0.5 mi northeast of Kirkwood.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--1.93 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-8-78	0.21	5-10-79	0.85	2-13-80	0.94
10-12-78	0.15	11-1-79	1.21	7-17-80	0.27

e estimated.

TABLE 6.--Low-flow discharge at selected surface-water stations in New Castle County--Continued

INDEX NUMBER.--12.

STATION NAME.--Dragon Creek Tributary at Kirkwood, DE.

LOCATION.--Lat 39°33'52", long 75°41'16", New Castle County, at culvert on Road No. 409, 0.4 mi upstream from mouth, and 0.7 mi east of Kirkwood.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--0.16 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-8-78	0.07	5-10-79	0.17	2-13-80	0.12
10-12-78	0.03	11-1-79	0.18	7-17-80	0.05

INDEX NUMBER.--13.

STATION NAME.--Joy Run near Summit Bridge, DE.

LOCATION.--Lat 39°32'02", long 75°41'48", New Castle County, at culvert on Road No. 412, 0.6 mi upstream from mouth at Chesapeake and Delaware Canal, and 1.6 mi east of Summit Bridge.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--1.26 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
10-15-78	1.48	2-13-80	1.87	7-17-80	1.68
5-10-79	1.77				

INDEX NUMBER.--14.

STATION NAME.--Scott Run near Boyds Corner, DE.

LOCATION.--Lat 39°31'30", long 75°39'54", New Castle County, at culvert on Road No. 413, 3.7 mi upstream from mouth at Chesapeake and Delaware Canal, and 1.9 mi northwest of Boyds Corner.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--2.18 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
10-5-78	0.60	11-1-79	1.00	7-17-80	1.06
5-10-79	1.25	2-13-80	0.93		

INDEX NUMBER.--15.

STATION NUMBER.--01483150.

STATION NAME.--Wiggins Millpond Outlet at Townsend, DE.

LOCATION.--Lat 39°24'12", long 75°42'16", New Castle County, at bridge on State Highway 446, 0.8 mi northwest of Townsend.

CLASSIFICATION.--Low-flow partial-record station.

PERIOD OF RECORD.--1957-1960, 1962-1966, 1968-1971, 1978-1980.

DRAINAGE AREA.--3.82 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
4-16-57	3.86	5-6-63	3.25	4-15-69	2.41
7-3-57	0.89	7-17-63	2.13	9-18-69	1.58
4-21-58	7.90	8-27-64	2.38	6-2-70	2.79
3-3-59	4.75	8-9-65	1.43	4-26-71	2.68
6-1-59	3.20	10-5-65	1.49	9-11-78	2.26
6-9-60	3.10	7-21-66	0.31	5-10-79	4.02
9-24-62	2.85	7-25-68	1.77	2-13-80	4.19
4-12-63	3.65	9-9-68	1.65		



TABLE 6.--Low-flow discharge at selected surface-water stations in New Castle County--Continued

INDEX NUMBER.--16.

STATION NAME.--Drawyer Creek near Mt. Pleasant, DE.

LOCATION.--Lat 39°29'34", long 75°41'24", New Castle County, at culvert on Road No. 427, 0.5 mi upstream from Shallcross Lake, and 1.7 mi southeast of Mt. Pleasant.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--1.54 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-8-78	0.43	5-10-79	0.69	2-13-80	0.64
10-13-78	0.34	11-1-79	0.65	7-17-80	0.45

INDEX NUMBER.--17.

STATION NAME.--Drawyer Creek Tributary near Armstrong, DE.

LOCATION.--Lat 39°29'05", long 75°41'48", New Castle County, at culvert on Road No. 427, 0.7 mi upstream from Shallcross Lake, and 1.2 mi northeast of Armstrong.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--1.79 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-8-78	1.04	5-10-79	1.42	2-13-80	1.45
10-13-78	0.75	11-1-79	1.09		

INDEX NUMBER.--18.

STATION NUMBER.--01483170.

STATION NAME.--Drawyer Creek Tributary near Odessa, DE.

LOCATION.--Lat 39°27'45", long 75°41'17", New Castle County, on right bank at downstream side of highway bridge, 1.5 mi northwest of Odessa, and 2.4 mi upstream from mouth.

CLASSIFICATION.--Continuous water-stage station.

PERIOD OF RECORD.--1968-1969, 1974, 1976-1980.

DRAINAGE AREA.--4.68 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-9-68	1.73	4-15-76	3.77	9-19-79	2.46
6-2-69	2.29	9-9-76	2.18	11-1-79	3.34
7-2-69	0.44	3-2-77	1.69	2-13-80	3.53
4-17-74	4.91	9-7-77	1.80	4-17-80	5.83
7-26-74	2.78	3-30-78	2.90	7-17-80	2.26

INDEX NUMBER.--19.

STATION NUMBER.--01483200.

STATION NAME.--Blackbird Creek at Blackbird, DE.

LOCATION.--Lat 39°21'58", long 75°40'10", New Castle County, on right bank 15 ft downstream from highway bridge, 0.5 mi upstream from Barlow Branch, 0.6 mi southwest of Blackbird, 5.6 mi northwest of Smyrna, and 13.8 mi upstream from mouth.

CLASSIFICATION.--Continuous water-stage station.

PERIOD OF RECORD.--1957-1958, 1964-1966, 1968, 1973-1974, 1976, 1978-1980.

DRAINAGE AREA.--3.85 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
7-22-57	0.183	8-31-66	0.00	2-27-78	4.86
11-17-58	3.93	4-15-68	3.98	8-25-78	0.79
10-14-64	0.60	7-18-73	0.61	5-10-79	3.23
3-17-65	3.07	11-11-74	2.04	2-13-80	2.33
3-17-66	1.35	12-30-74	4.05	7-17-80	1.25
7-21-66	0.00	11-15-76	1.54		

TABLE 6.--Low-flow discharge at selected surface-water stations in New Castle County--Continued

INDEX NUMBER.--20.

STATION NUMBER.--01495550.

STATION NAME.--Perch Creek near Elkton, MD.

LOCATION.--Lat 39°34'16", long 75°48'53", Cecil County, at bridge on U.S. Highway 213, 2.5 mi south of Elkton.

CLASSIFICATION.--Low-flow partial-record station.

PERIOD OF RECORD.--1964-1975, 1978-1980.

DRAINAGE AREA.--5.44 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-8-64	0.48	9-10-68	0.94	4-25-74	5.13
8-31-65	0.34	5-28-69	1.21	9-12-75	1.56
9-29-65	0.47	9-26-69	0.94	10-5-78	1.29
7-18-66	0.37	6-1-70	1.78	10-12-78	1.23
9-13-66	0.27	7-7-71	1.00	5-10-79	1.37
5-2-67	3.81	9-27-72	1.08	2-13-80	3.27
7-26-68	1.08	9-10-73	1.38		

INDEX NUMBER.--21.

STATION NAME.--Back Creek near Mt. Pleasant, DE.

LOCATION.--Lat 39°30'36", long 75°45'10", New Castle County, at bridge on County Road 435, 1.7 mi upstream from Maryland state line, 2.3 mi west of Mt. Pleasant, DE, and 3.5 mi southeast of Chesapeake City, Maryland.

CLASSIFICATION.--Miscellaneous measuring site.

PERIOD OF RECORD.--1968-1970, 1978-1980.

DRAINAGE AREA.--4.40 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-9-68	1.34	5-6-70	3.21	10-5-78	1.89
4-15-69	2.00	6-2-70	2.50	5-10-79	3.35
7-2-69	0.92	9-3-70	1.31	2-13-80	2.90
9-24-69	1.16				

INDEX NUMBER.--22.

STATION NUMBER.--01495800.

STATION NAME.--Long Creek near Chesapeake City, MD.

LOCATION.--Lat 39°33'15", long 75°47'18", Cecil County, at culvert on private road, 2.0 mi northeast of Chesapeake City.

CLASSIFICATION.--Continuous water-stage station.

PERIOD OF RECORD.--1978-1980.

DRAINAGE AREA.--4.36 mi<sup>2</sup>.

DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)	DATE	DISCHARGE (ft <sup>3</sup> /s)
9-7-78	0.50	5-10-79	1.51	7-17-80	0.66
10-12-78	0.34	2-13-80	2.29		

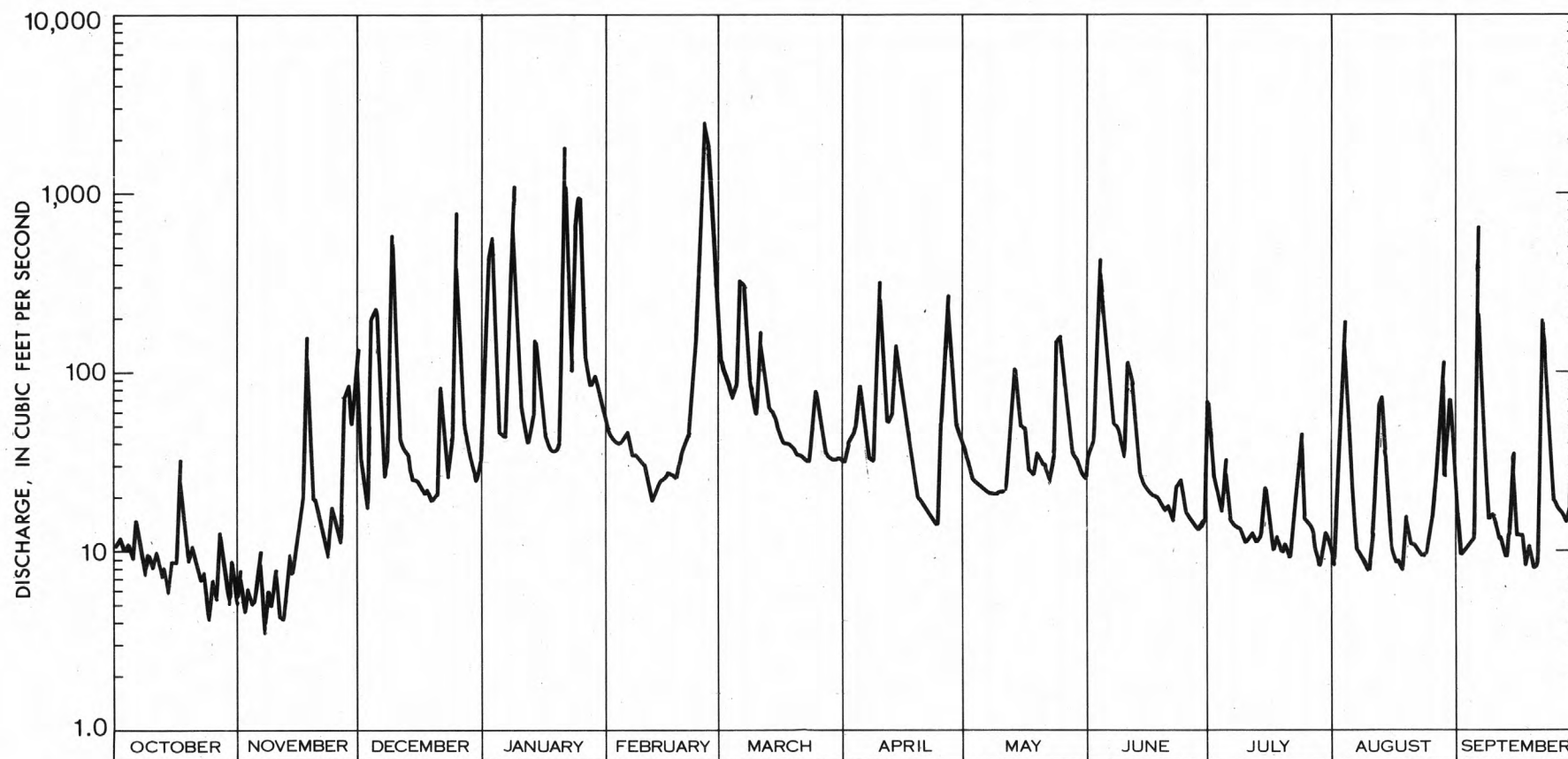


Figure 69.--Stream discharge at station 01478040, Christina River near Bear, Del., water year 1979.

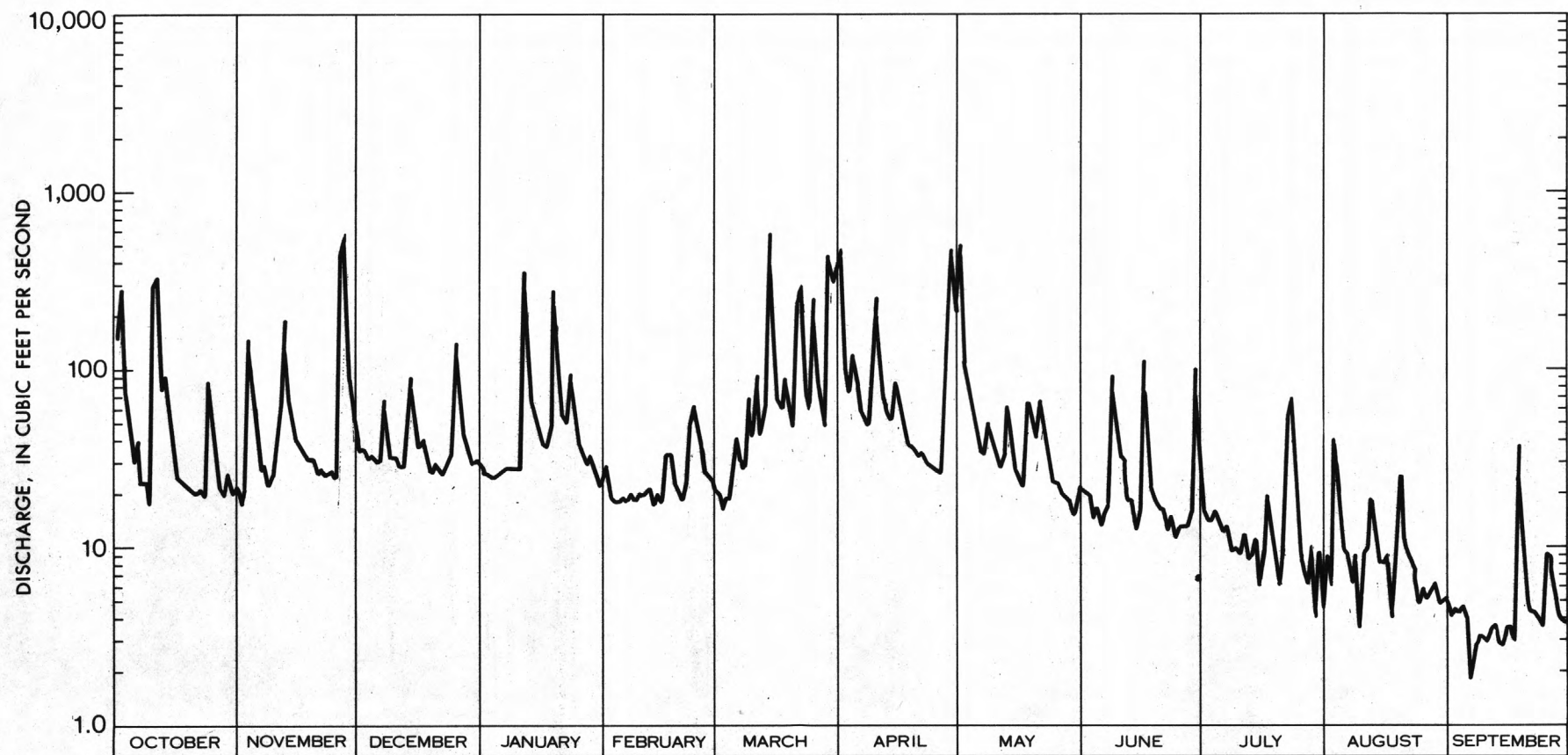


Figure 70.--Stream discharge at station 01478040, Christina River near Bear, Del., water year 1980.

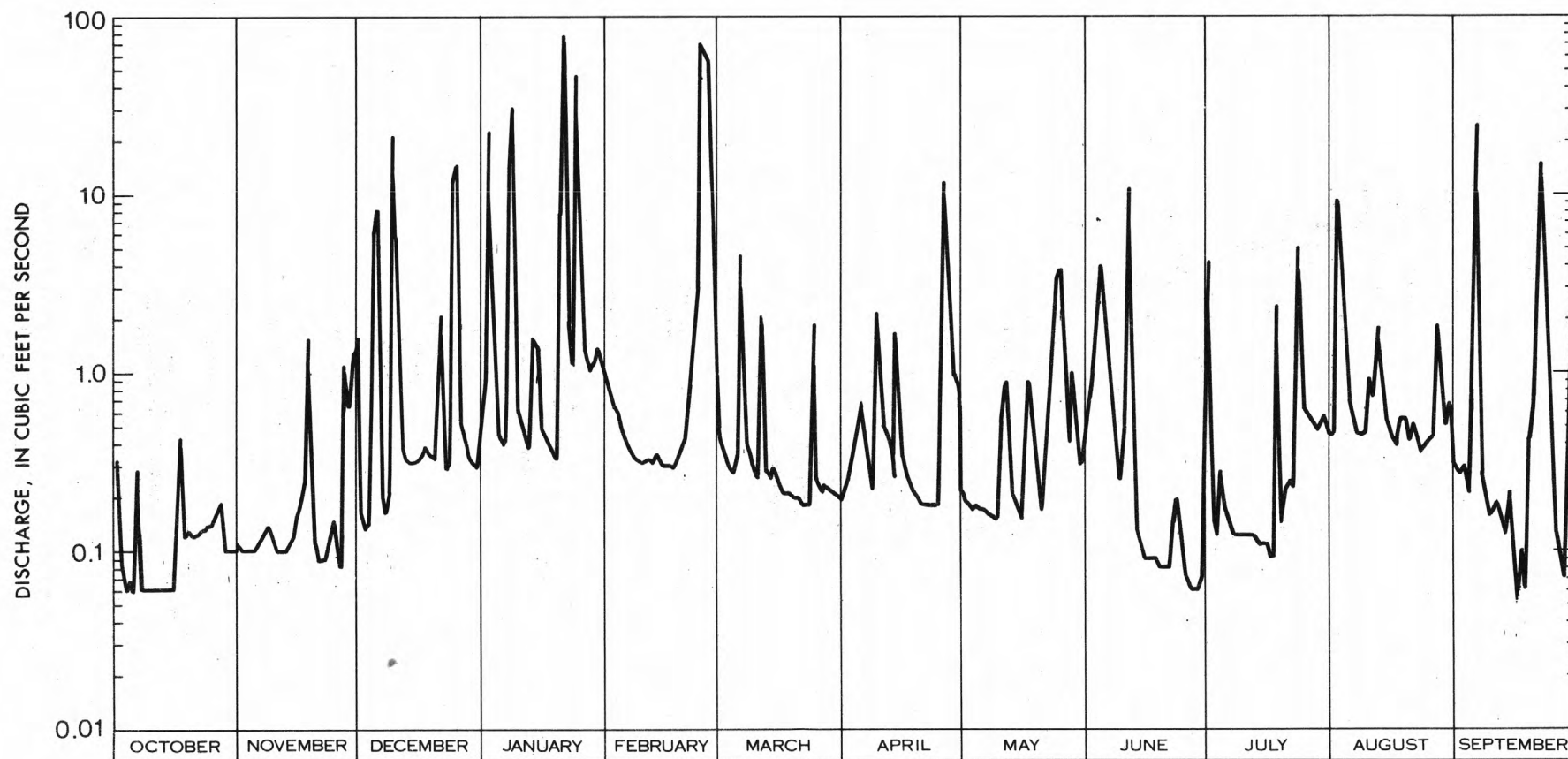


Figure 71.--Stream discharge at station 01482200, Army Creek at State Road, Del., water year 1979.



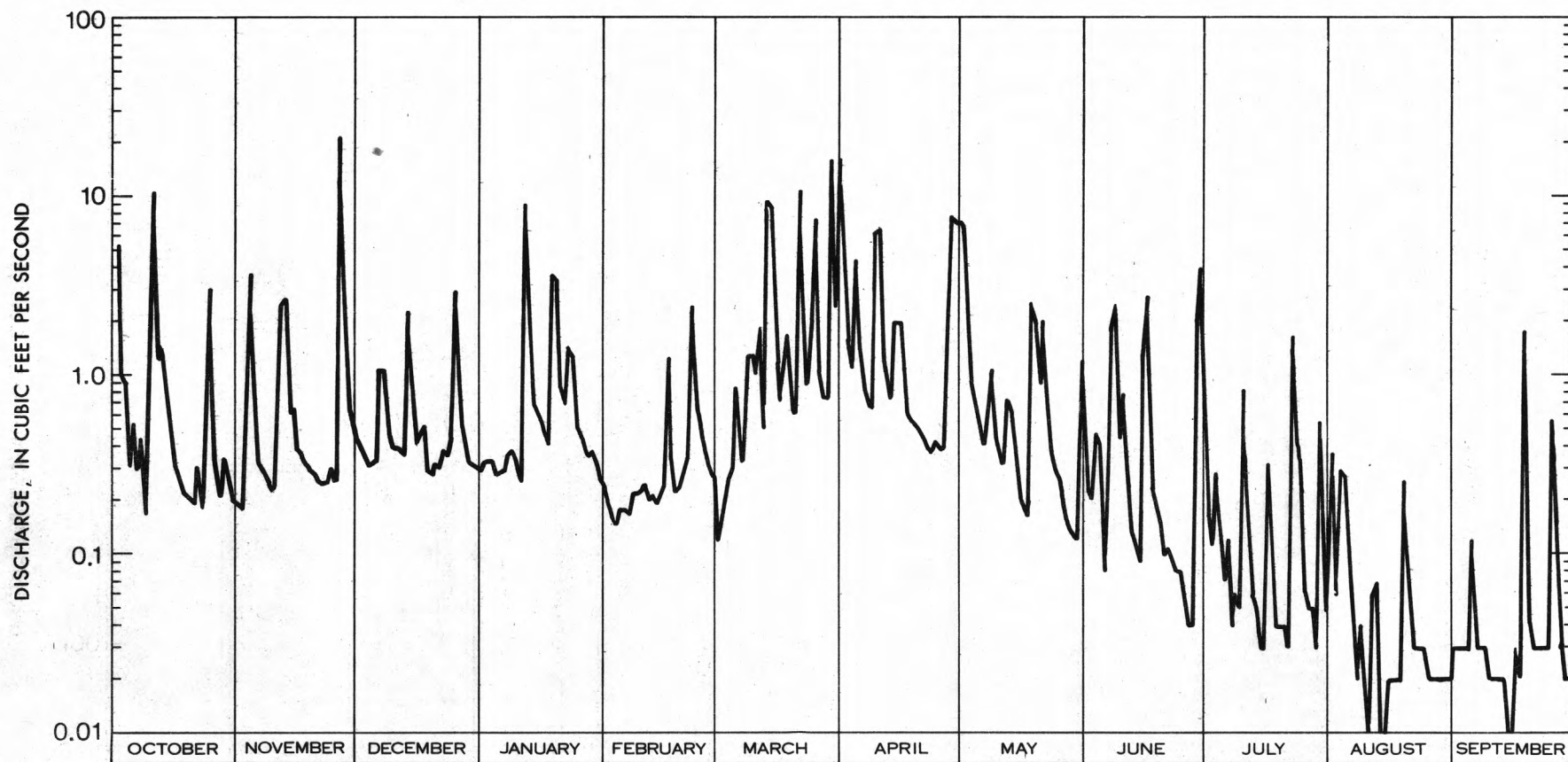


Figure 72.--Stream discharge at station 01482200, Army Creek at State Road, Del., water year 1980.

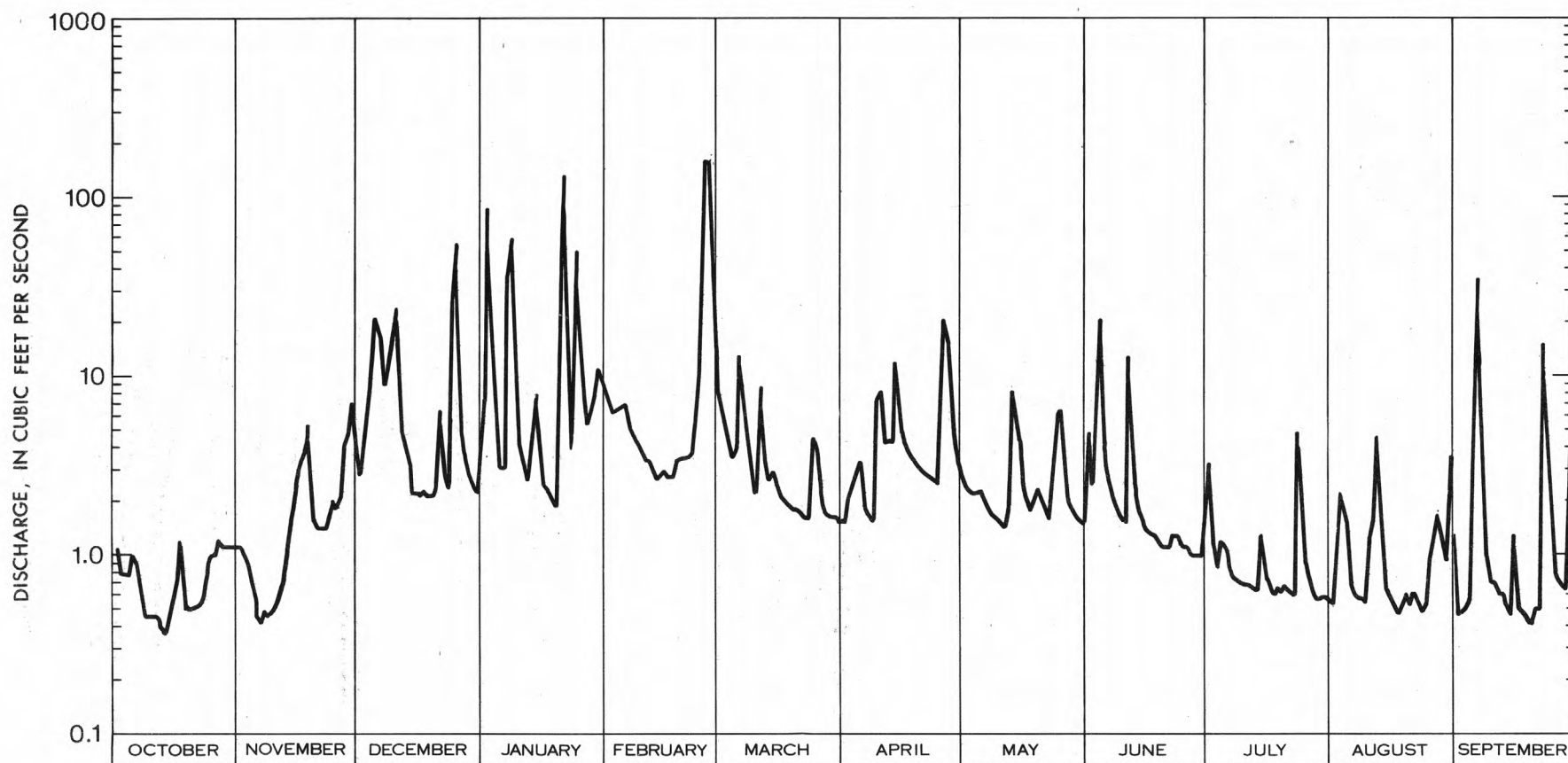


Figure 73.--Stream discharge at station 01482298, Red Lion Creek near Red Lion, Del., water year 1979.

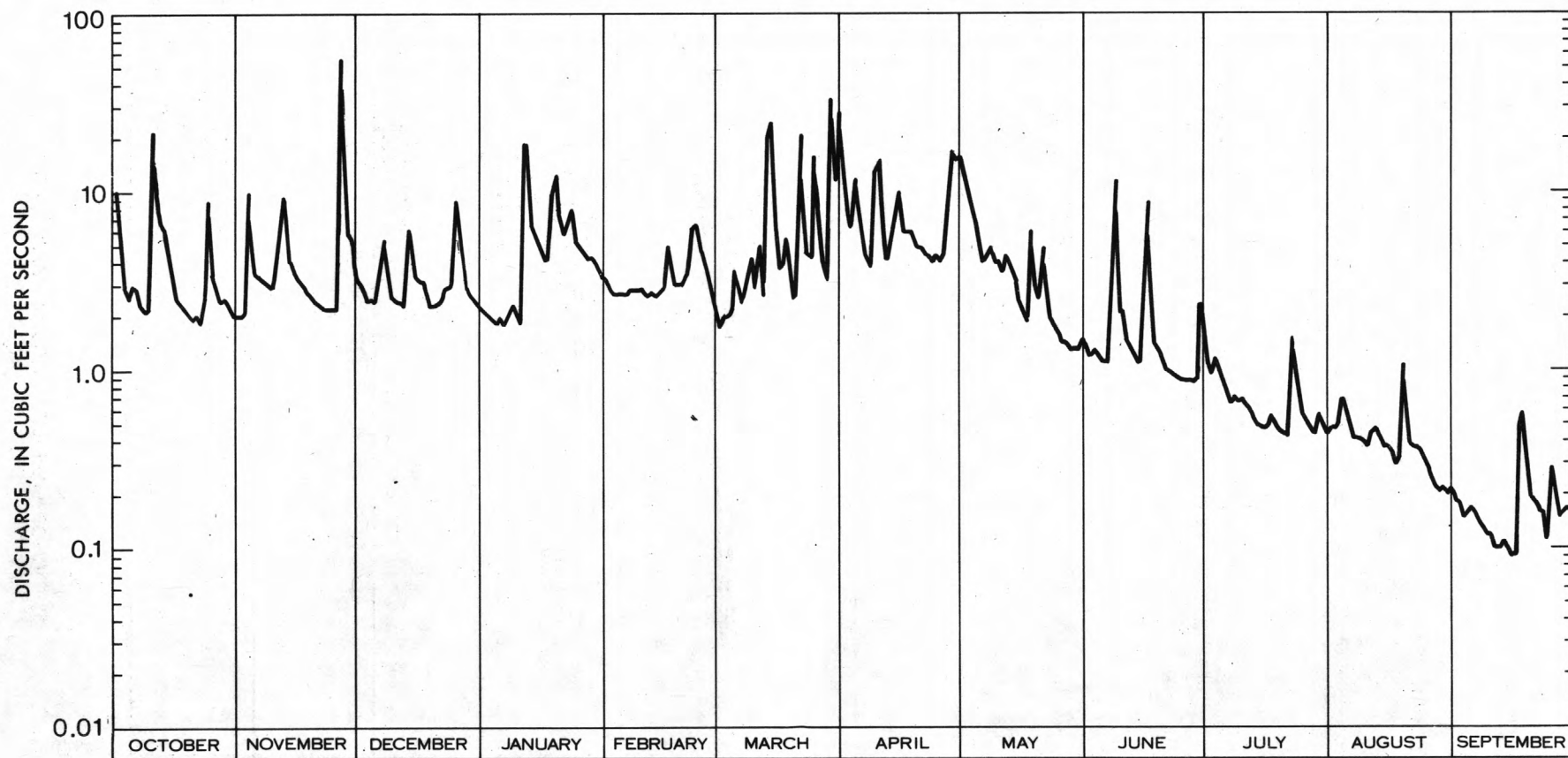


Figure 74.--Stream discharge at station 01482298, Red Lion Creek near Red Lion, Del., water year 1980.

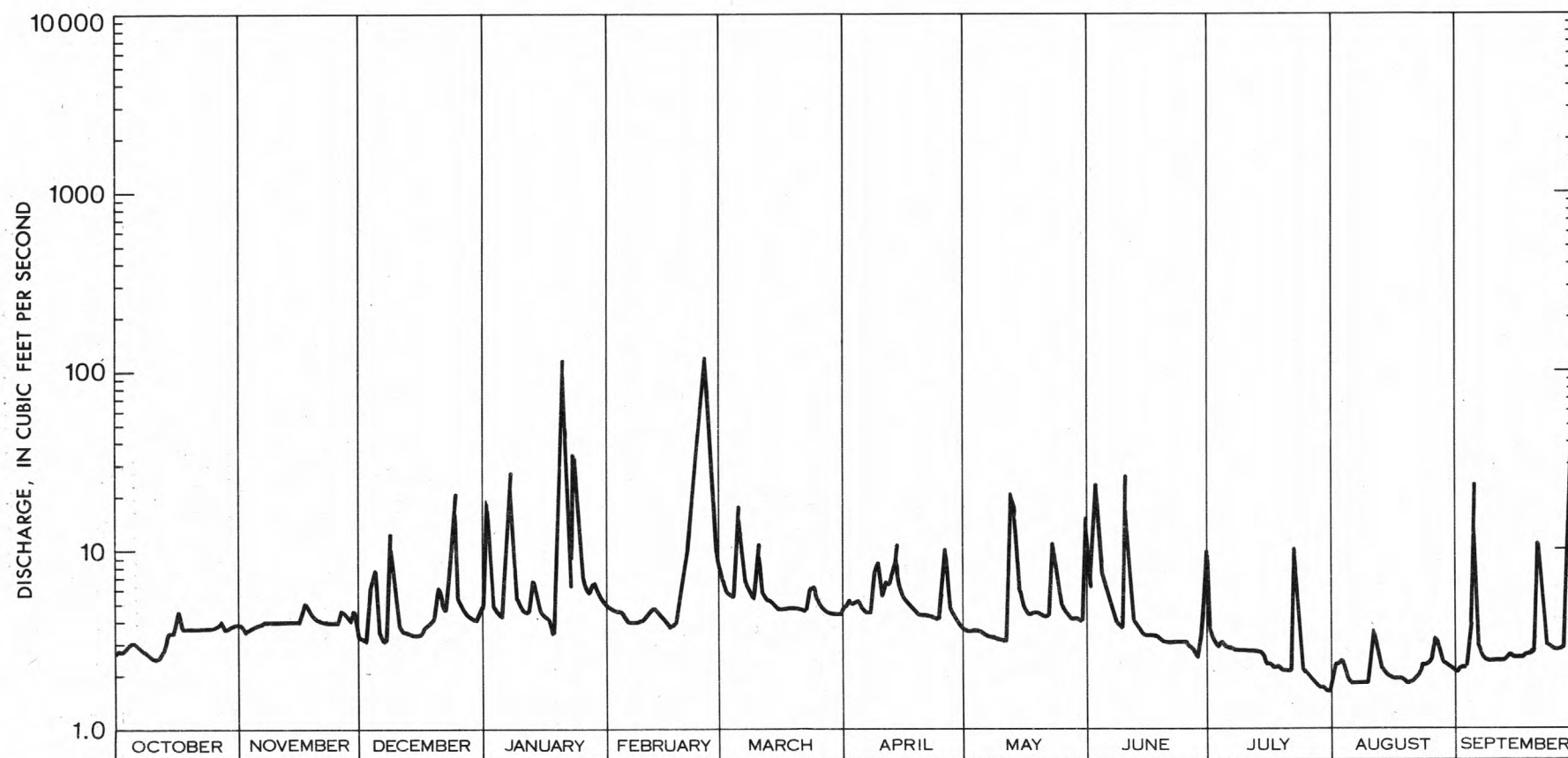


Figure 75.--Stream discharge at station 01483170, Drawyer Creek Tributary near Odessa, Del., water year 1979.

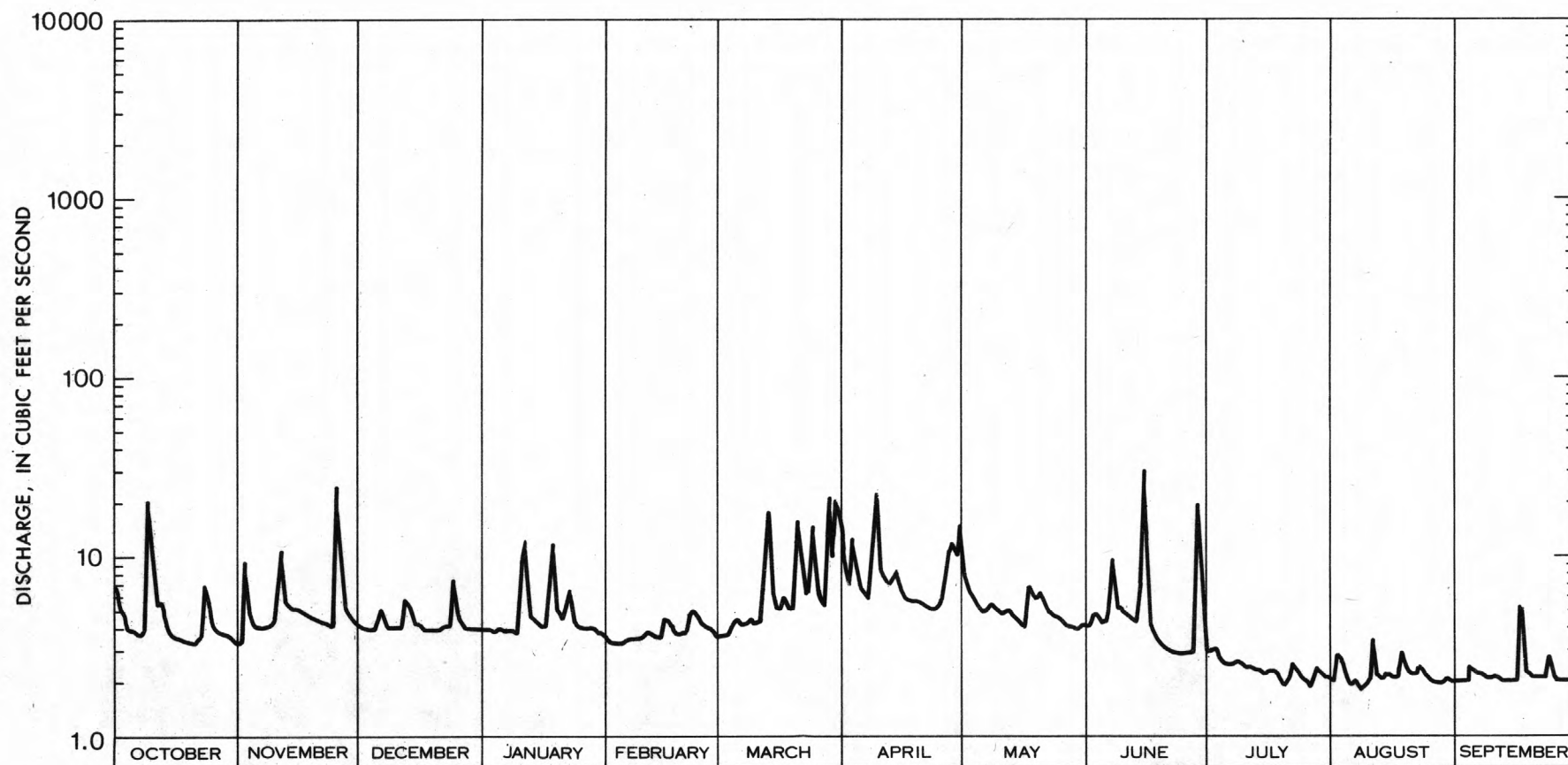


Figure 76.--Stream discharge at station 01483170, Drawyer Creek Tributary near Odessa, Del., water year 1980.



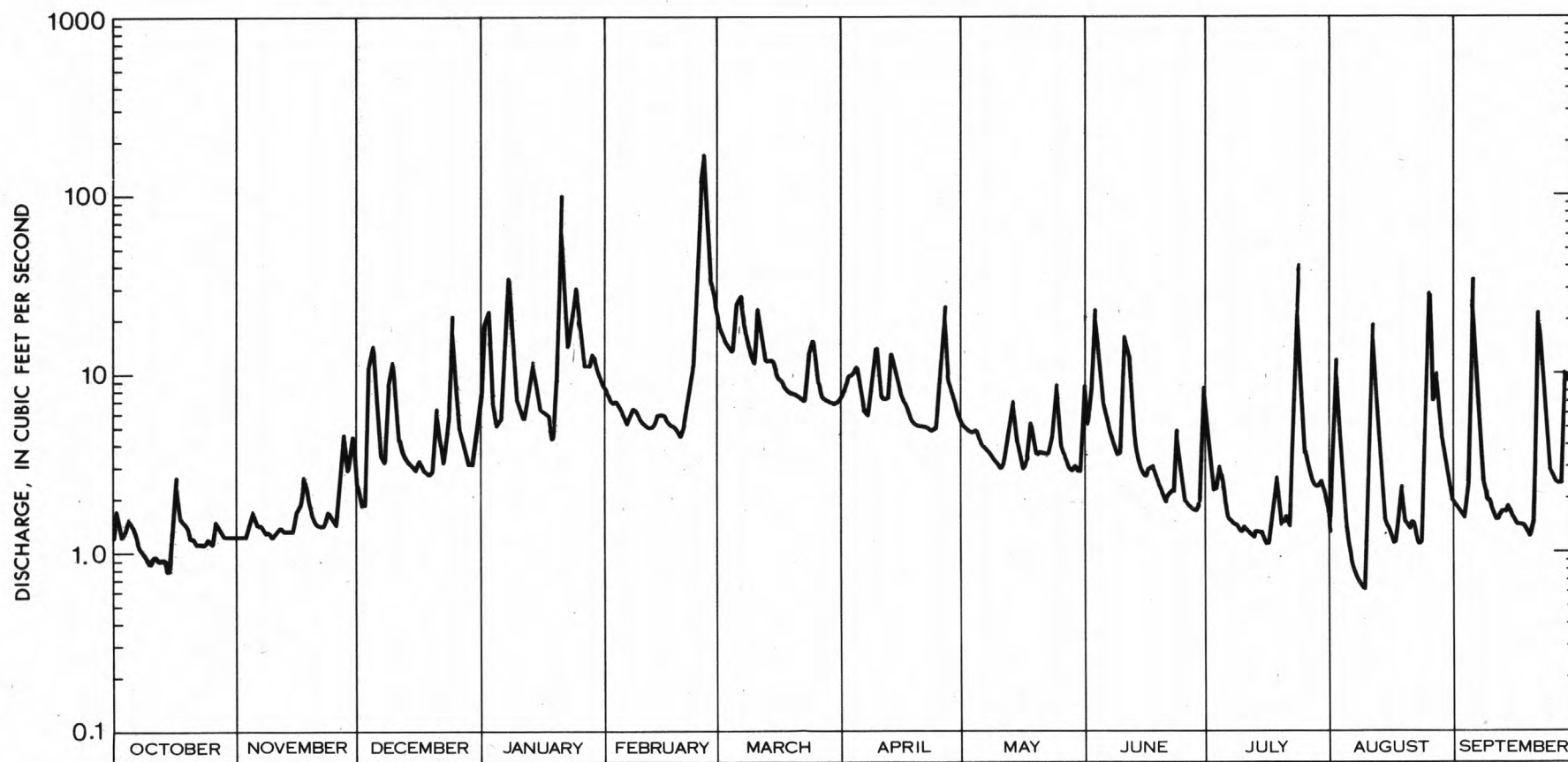


Figure 77.--Stream discharge at station 01483200, Blackbird Creek at Blackbird, Del., water year 1979.

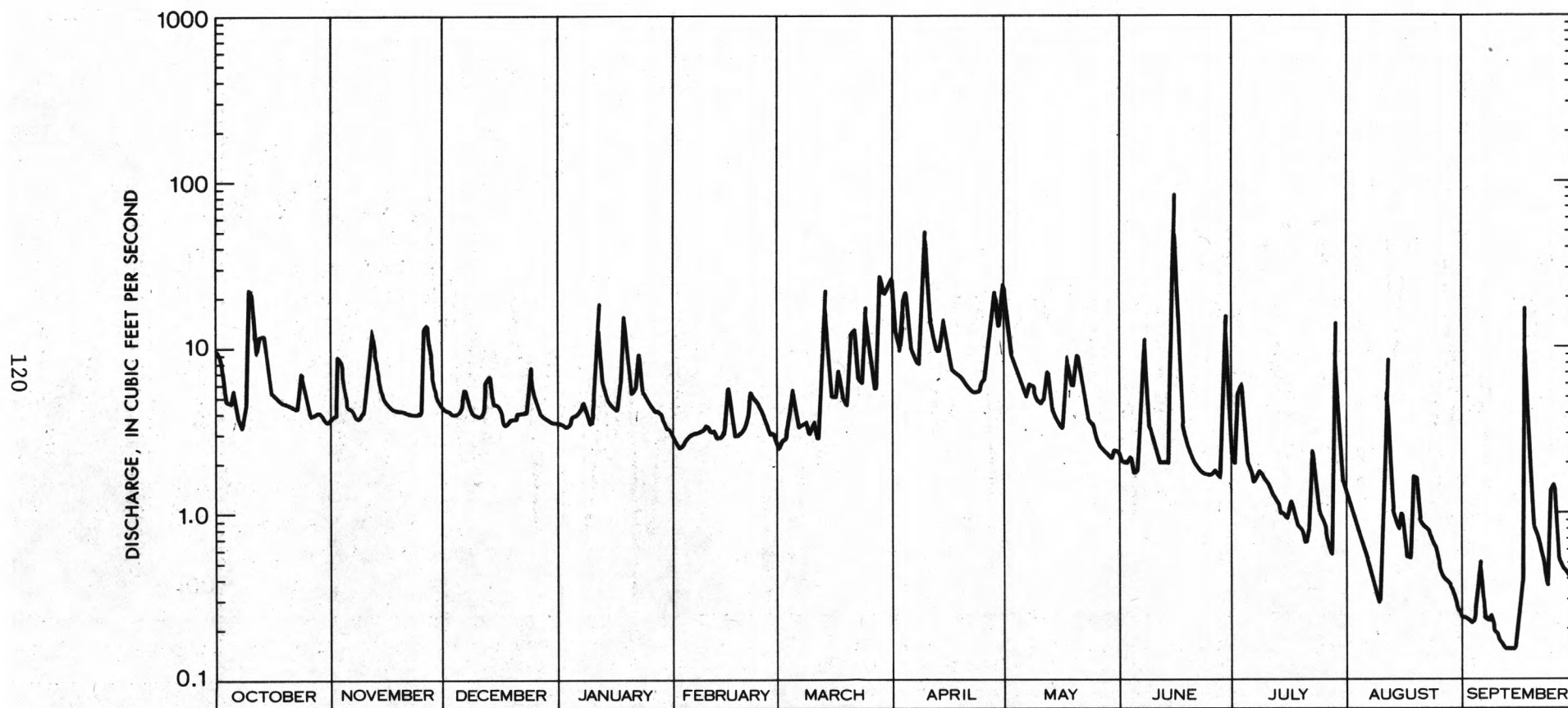


Figure 78.--Stream discharge at station 01483200, Blackbird Creek at Blackbird, Del., water year 1980.

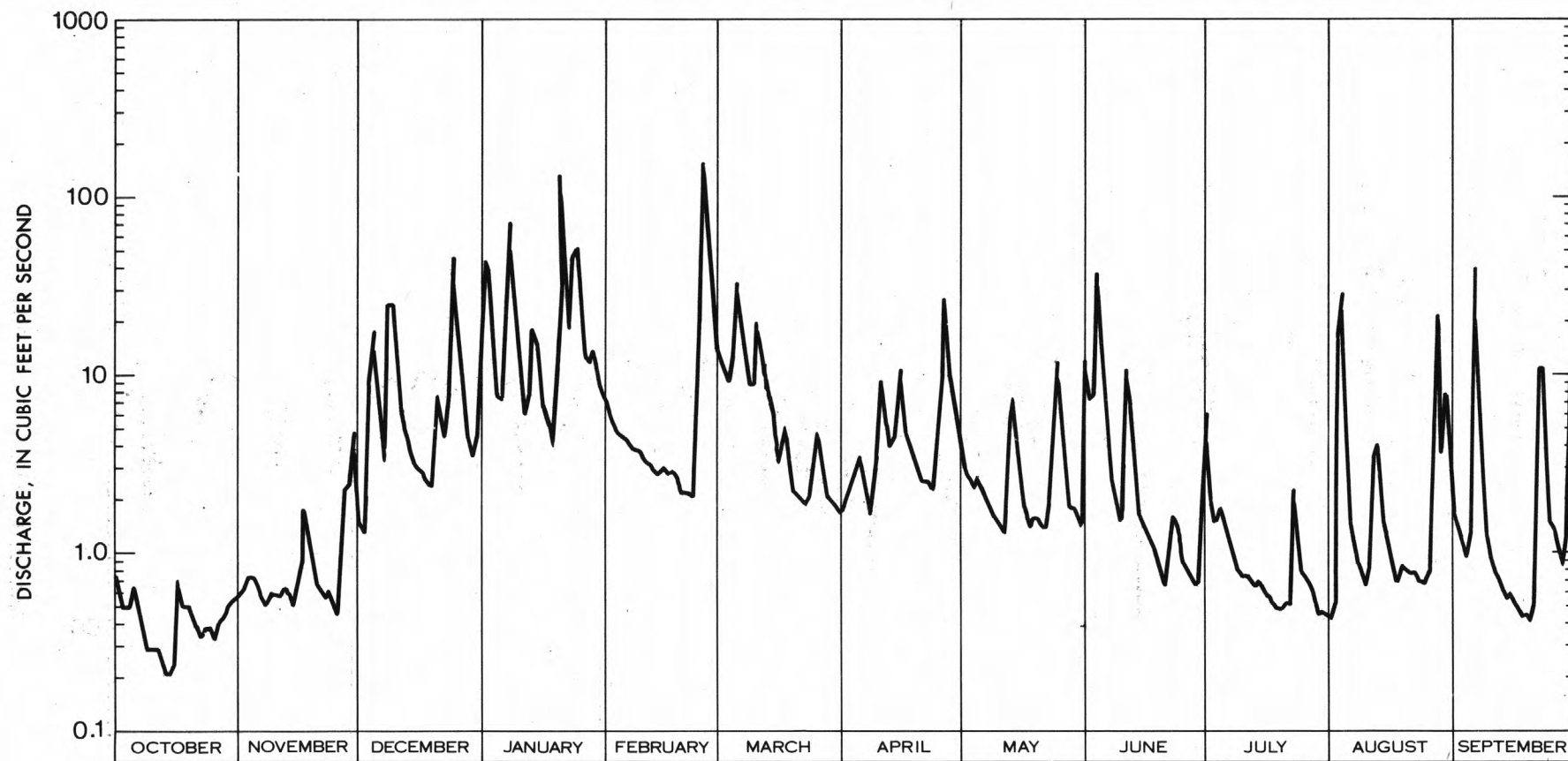


Figure 79.--Stream discharge at station 01495800, Long Creek near Chesapeake City, Md., water year 1979.

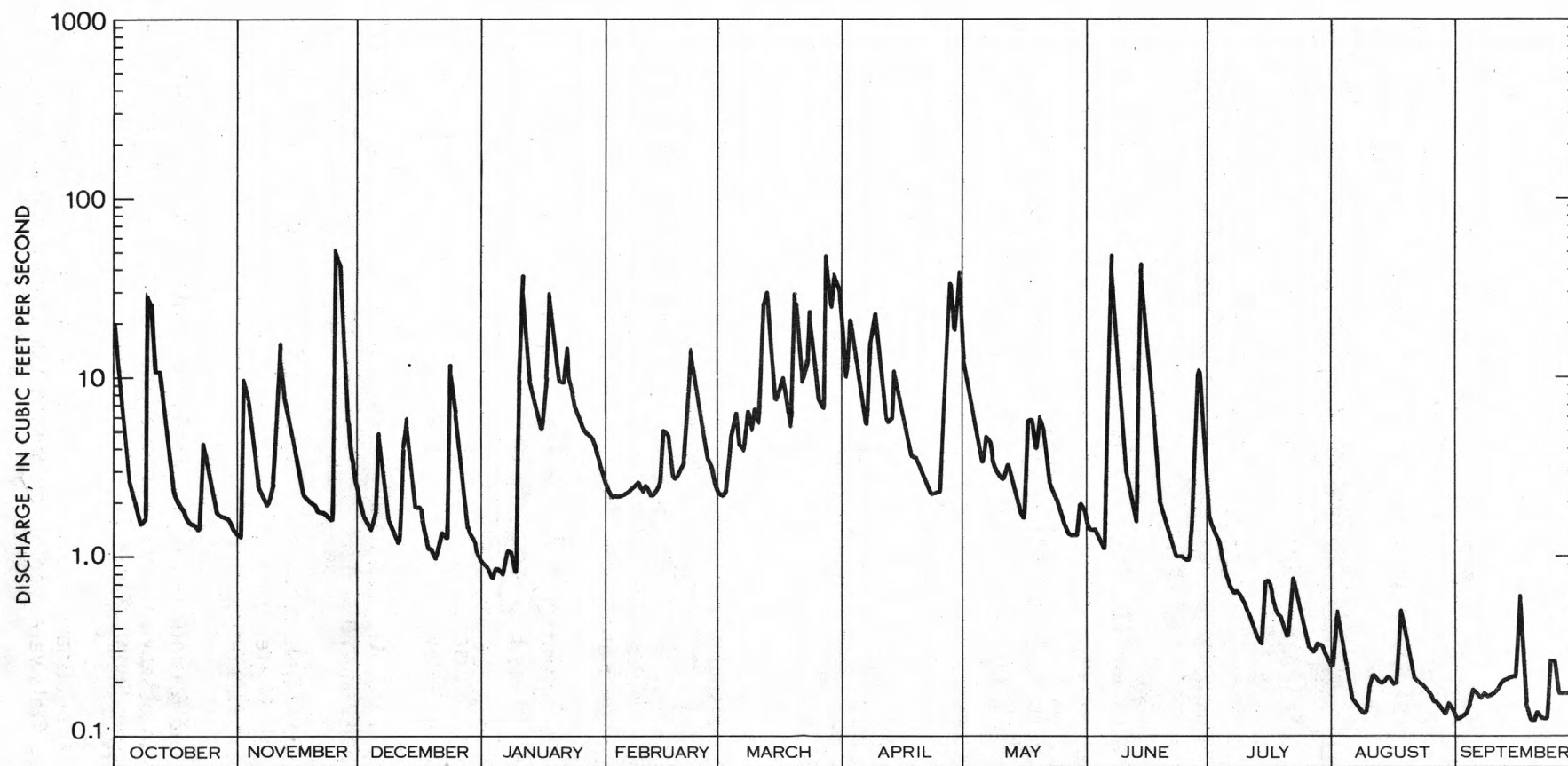


Figure 80.--Stream discharge at station 01495800, Long Creek near Chesapeake City, Md., water year 1980.

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TABLE 7. Partial record of wells in the Potomac Formation in New Castle County

DGS Well Number: Well number assigned by the Delaware Geological Survey; N.A., no DGS well number assigned.

Local Well Number: Well number assigned by owner; ( ), two or more wells with individual local well numbers but one DGS well number.

Type: C, commercial; D, domestic; G, county, state or federal government; I, industrial; M, municipal; S, public water supply.

Use: O, observation; P, production; R, recovery; T, test; U, unknown.

Status: A, abandoned; E, emergency or stand-by; N, not in use; Op, operating; W, water-level observation; U, unknown.

Screen Interval: In feet below land surface.

Depth Drilled: In feet below land surface.

Elevation, Land Surface and Measuring Point: In feet above sea level.

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
Airport Industrial Park								
City of New Castle	Dcl4-14	13	M, O, W	97-107	140	1978	15	16.8
Artesian Water Co.	Dcl4-43	1	S, U, U	95-125	200	1975	--	--
Do	Dcl5-13	6	S, U, U	82-112	114	1975	--	22.49
Do	Dcl5-14	5	S, U, U	--	146	1975	--	21.80
Do	N. A.	3	S, P, U	--	120	--	--	--
Do	N. A.	4	S, U, U	--	154	1975	--	--
Amoco <sup>1</sup>								
Amoco Chemical Corp.	Dcl4-13	OW5	I, O, W	132-142.5	175	1966	15	15.75
Do	Dcl5-7	OW3	I, T, N	513-518 543-548	608	1960	20	--
Do	Dcl5-9	PW3	I, P, Op	120-149	153	1961	22	22.10
Do	Dcl5-10	PW1	I, P, Op	500-520 530-550 556-566	600	1960	23	23.05
Do	Dcl5-17	TW1	I, O, W	113-118	125	1970	20	20.32
Do	Dcl5-18	TW3	I, O, W	113-118.5	139	1970	15	17.66
Do	Dcl5-19	TW4	I, O, W	125-130	139	1970	10	18.15
Do	Dcl5-20	Layne	I, O, W	--	--	--	15	16.71

<sup>1</sup> Formerly AviSun Corporation

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Amoco</u>								
Amoco Chemical Corp.	Dc24-6	OW4	I, O, W	139-144	187	1960	40	40.88
Do	Dc25-16	OW2	I, T, N	525-530 552-557	664	1960	30	--
Do	Dc25-17	PW2	I, P, Op	129-169	174	1961	25	25.46
<u>Army Creek Landfill<sup>2</sup></u>								
New Castle County Dept. of Public Works	Dc13-9	5A	G, O, W	70-80	124	1972	11.5	11.76
Do	Dc14-18	{2A 2B	G, O, W G, O, W	80-88 45-55	99 55	1972 1972	17.3 17.3	17.58 17.19
Do	Dc14-16	1B	G, O, W	56-66	66	1972	7.0	8.21
Do	Dc14-17	1A	G, O, W	94.5-104.5	112	1972	7.0	7.94
Do	Dc14-19	3A	G, O, W	74.5-84.5	85	1972	13.0	13.15
Do	Dc14-20	{4A 4B	G, O, U G, O, U	120-130 72-82	136 89	1972 1972	51.0 51.0	52.95 52.63
Do	Dc14-22	6	G, O, U	70-79	124	1972	13.7	14.05
Do	Dc14-23	7	G, O, U	105-110	124	1972	16.0	16.11
Do	Dc14-24	8	G, O, U	80-90	124	1972	12.0	12.24
Do	Dc14-25	9	G, O, U	100-110	124	1972	5.3	5.58
Do	Dc14-26	10	G, O, U	74-84	124	1972	18.9	19.21
Do	Dc14-27	11	G, O, W	60-70	124	1972	9.0	9.93
Do	Dc14-28	12	G, O, U	50-58	124	1972	7.0	7.15
Do	Dc14-29	13	G, O, U	50-60	124	1972	5.0	6.0

<sup>2</sup> Formerly Llangollen Landfill

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Army Creek</u>								
New Castle County Dept. of Public Works	Dc14-30	16	G, O, W	65-75	145	1972	22.1	22.12
Do	Dc14-31	17	G, O, W	100-110	145	1972	21.3	21.39
Do	Dc14-32	19	G, O, U	90-95	145	1972	23.7	23.83
Do	Dc14-33	27	G, R, Op	40-110	120	1973	10.3	12.10
Do	Dc14-34	28	G, R, Op	40-120	140	1973	18.9	21.89
Do	Dc14-35	29	G, R, Op	34-113	130	1973	15.2	17.91
Do	Dc14-36	31	G, R, Op	57-105	116	1973	13.4	14.3
Do	Dc14-37	41	G, O, W	73-113	120	1973	10.4	12.48
Do	Dc14-38	39	G, O, W	78-118	132	1973	6.4	6.74
Do	Dc14-39	32	G, O, W	120-155	160	1973	16.0	19.91
Do	Dc14-40	34	G, O, W	60-96	140	1973	5.6	7.70
Do	Dc14-41	35	G, O, W	62-130	141	1973	7.4	10.15
Do	Dc14-44	44	G, O, W	83-98	120	1973	12.2	14.25
Do	Dc14-45	45	G, O, W	110-115 135-145	156	1973	24.1	24.21
Do	Dc14-46	46	G, O, W	110-135	160	1973	23.0	25.21
Do	Dc14-47	53	G, R, Op	77-92	95	1973	24.8	27.88
Do	Dc14-48	RW-1	G, R, Op	80-110	110	1973	--	9.64
Do	Dc14-49	RW-2	G, R, N	106-135	137	1973	--	8.10
Do	Dc14-50	RW-4	G, R, Op	85-110	120	1973	--	12.38
Do	Dc14-51	RW-6	G, R, Op	59-69	79	1973	--	15.43



TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	ELEVATION MEASURING POINT
Army Creek								
New Castle County Dept. of Public Works	Dc14-52	RW-7	G, R, N	--	--	--	--	6.74
Do	Dc15-12	61	G, O, W	120-155	176	1974	--	35.85
Do	Dc15-15	RW-8	G, O, W	120-157	175	1975	--	33.64
Do	Dc23-14	63	G, O, W	135-150	200	1974	--	23.78
Do	Dc23-15	64	G, O, W	110-170	217	1974	--	61.75
Do	Dc23-18	RW-9	G, R, N	109-134	165	1973	--	17.91
Do	Dc23-19	42	G, O, W	106-130	147	1973	46.6	47.69
Do	Dc24-21	15	G, O, U	95-105	145	1972	0.7	1.05
Do	Dc24-22	18	G, O, W	80-90	145	1972	5.1	5.61
Do	Dc24-23	20	G, O, U	120-130	145	1972	46.3	46.33
Do	Dc24-26	21	G, O, U	80-110	171	1973	45.4	47.78
Do	Dc24-27	22	G, O, W	74-154	159	1973	52.4	54.83
Do	Dc24-28	23	G, O, W	82-105 118-165	181	1973	41.1	42.96
Do	Dc24-29	24	G, O, W	83-163	167	1973	49.2	51.99
Do	Dc24-30	25	G, O, W	108-156	171	1973	46.1	48.11
Do	Dc24-31	26	G, O, W	100-166	175	1973	39.9	42.95
Do	Dc24-32	30	G, O, W	85-163	170	1973	56.9	58.19
Do	Dc24-33	33	G, O, W	35-60	140	1973	1.6	5.09
Do	Dc24-34	37	G, O, W	10-21	132	1973	0.6	3.33

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Army Creek</u>								
New Castle County Dept. of Public Works	Dc24-36	RW-3	G, R, Op	103-118	142	1973	--	35.52
Do	Dc24-37	38	G, O, W	131-151	160	1973	33.7	34.18
Do	Dc24-38	RW-5	G, R, Op	108-123	124	1973	--	33.72
Do	Dc24-39	40	G, O, W	110-140	152	1973	33.1	34.10
Do	Dc25-23	60	G, O, W	90-100	160	1974	--	39.83
Do	Dc25-24	62	G, O, W	95-115 150-160	180	1974	--	36.31
Do	N.A.	14	G, O, U	120-130	145	1972	48.5	48.91
Do	N.A.	36	G, O, W	70-110	136	1973	1.4	3.88
Do	N.A.	43	G, O, U	95-115	150	1973	11.0	12.95
Do	N.A.	44A	G, O, W	40-50	55	1973	12.1	14.15
Do	N.A.	47	G, O, W	120-150	160	1973	45.1	48.14
Do	N.A.	48	G, O, U	90-110	120	1973	4.6	5.94
Do	N.A.	49	G, O, W	105-155	160	1973	55.9	57.15
Do	N.A.	50	G, O, U	100-130 142-150	170	1973	49.1	50.77
Do	N.A.	51	G, O, W	43-63	65	1973	14.9	17.10
Do	N.A.	52	G, O, W	113-158	170	1973	31.0	31.14
Do	N.A.	54	G, O, W	40-50	131	1973	24.7	26.33
Do	N.A.	55	G, O, W	95-115	130	1973	41.8	42.77
Do	N.A.	56	G, O, U	75-100	122	1973	21.2	23.21
Do	N.A.	57	G, O, W	75-95	121	1973	14.3	15.50

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Army Creek</u>								
New Castle County Dept. of Public Works	N.A.	57A	G, O, U	36-56	60	1973	14.6	16.08
Do	N.A.	58	G, O, W	95-110	135	1973	10.0	10.62
Do	N.A.	59	G, O, U	70-90	120	1973	10.0	12.92
<u>Artisans Village</u>								
Artesian Water Co.	Dc32-7	Site 6	S, T, U	140-210	210	--	--	--
Do	Dc33-7	1-Site 3	S, P, Op	155-215	225	1979	--	--
Do	Dc33-8	2-Site 5	S, P, Op	116-125 130-135 150-160 165-205 210-225	227	1979	--	--
Do	Dc33-9	Obs. 1-Site 3	S, O, U	165-185	188	1979	--	--
<u>Caravel Farms</u>								
Artesian Water Co.	Db42-12	D-28	S, T, U	40-55	150	1974	--	--
Do	Db52-21	PD43	S, T, U	129-144	159	1974	50	--
Do	Db52-23	D-46	S, O, W	137-167	390	1974	<sup>3</sup> 71	<sup>3</sup> 72.3
Do	Db52-24	D-19	S, T, U	104-124	201	1974	65	--
Do	Db52-25	D-12	S, T, U	71-91	195	1974	70	--
Do	Db52-26	D-17	S, T, U	84-94	--	1974	--	--
Do	Db52-27	1	S, P, Op	70-90	--	--	70	--
Do	Db52-28	D-44 <sup>4</sup>	S, O, W	--	--	--	--	70
Do	Db52-29	D-47 <sup>5</sup>	S, T, U	--	--	--	--	75

<sup>3</sup> Land surface and measuring point elevations prior to 3-18-81 were 74 and 75 ft, respectively.<sup>4</sup> No information available.<sup>5</sup> No information available, casing blocked.

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Castle Hills</u>								
Artesian Water Co.	Cd42-18	2	S, P, Op	--	106	1958	--	38
Do	Cd52-15	1	S, P, Op	58-74	73	1953	--	38
Do	Cd52-28	3	S, P, Op	--	110	1959	--	38
<u>Collins Park</u>								
Artesian Water Co.	Cd42-1	2	S, P, A	60-72	72	1947	40	--
Do	Cd42-3	Old 3	S, P, A	117-122 250-255	278	1947	40	--
Do	Cd42-4	4	S, P, A	84-95	95.3	1948	40	--
Do	Cd42-5	5	S, P, A	104-113	113	1949	40	--
Do	Cd42-9	6	S, P, A	113-123	123.5	1953	40	--
Do	Cd42-13		S, P, A	58-74 90-106	124	1953	40	--
Do	Cd42-14	7	S, P, A	86-98 110-123	437	1940	40	--
Do	Cd42-15	Old 1	S, P, W	--	124	1960	45	--
Do	Cd42-16	6 in. Obs., 3	S, T, W	228-248	383	1978	45	46
Do	Cd42-17	1	S, P, Op	100-125	145	1978	45	--
<u>Crown Zellerbach<sup>6</sup></u>								
Crown Zellerbach Corp.	Dc25-1	1	I, P, A	215-235 410-420	--	1915	15	--
Do	Dc25-2	New 2	I, P, A	123-155	199	1948	15	16.9
Do	Dc25-3	3	I, P, E	200-220 430-440	--	1915	11	--

<sup>6</sup> Formerly Amoco Film Plant, which was formerly Delaware Rayon Company.

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Crown Zellerbach</u>								
Crown Zellerbach Corp.	Dc25-4	4	I, P, U	--	400	--	7	9.9
Do	Dc25-5	5	I, P, A	80-100	105	1942	15	--
Do	Dc25-6	6	I, P, U	--	190	1949	25	--
Do	Dc25-7	Old 2	I, P, A	200-220	500	1915	10	11.57
Do	Dc25-10	OW6	I, O, A	--	162	1951	--	--
Do	Dc25-13	--	I, A, U	--	137	1951	--	--
Do	Dc25-15	OW2	I, T, A	--	440	1951	20	--
Do	Dc25-27	7	I, P, Op	129-183	245	1977	15	--
Do	N.A.	TW2	I, T, U	142-149	168	1970	20	--
<u>Delaware City</u>								
Delaware City	Ec15-26	3	M, P, Op	631-636 675-695	701	1961	10	--
Do	Ec15-27	4	M, P, Op	692-722	720	1976	10	--
Do	Ec15-28	5	M, P, Op	707-737	--	1977	10	--
<u>Delaware State Hospital</u>								
Delaware State Hospital	Cd31-17	--	C, P, Op	100-115	142	1973	--	--
Do	Cd31-18	--	C, P, Op	100-120	162	1973	--	--
Do	Cd41-1	Old 1	C, P, U	41-80	92	1938	69	--
Do	Cd41-7	--	C, T, N	189-199	200	1955	65	--
Do	Cd41-11	1	C, P, W	43-52	150	1947	60	60



TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Delaware State Hospital</u>								
Delaware State Hospital	Cd41-18	--	C, P, U	--	80	1961	69	--
Do	Cd41-20	--	C, U, U	60-80	82	1970	69	--
<u>Delmarva Power - Summit</u>								
Delmarva Power & Light Co.	Eb44-9	TW1	I, T, N	325-375	403	1975	80	81
Do	Eb44-10	603	I, T, U	355-370	--	--	79.3	81.06
Do	Eb45-9	801	I, O, W	344-384	403	1975	80	81
Do	Eb45-10	802	I, O, W	330-380	403	1975	80	81
<u>du Pont - Newport</u>								
E. I. du Pont de Nemours & Co., Inc.	Cc34-14	11	I, P, Op	--	65	1930	22.0	--
Do	Cc34-15	13	I, P, Op	88.5-99	112	1953	34.0	--
Do	Cc34-19	12	I, P, N	87-100	116	1930	25	--
Do	Cc34-34	DM5	I, O, W	53-63	81	1977	7.5	--
Do	Cc34-36	DM1	I, O, W	27-31	56	1975	16.2	--
Do	Cc34-37	DM3	I, O, W	53-62	63	1976	23.6	--
Do	Cc34-38	DM4	I, O, W	--	51	1976	7.5	--
Do	Cc34-39	DM6	I, O, W	60-70	70	1977	1.9	--
<u>Fairwinds</u>								
Artesian Water Co.	Dc22-12	D-6	S, O, W	232-240 254-264 278-283	509	1973	51	--
Do	Dc22-13	7	S, P, Op	81-113	117	1974	--	51

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Fairwinds</u>								
Artesian Water Co.	Dc22-14	6	S, P, Op	--	145	1962	--	60
Do	Dc22-18	D-27	S, O, W	71-86 93-108	155	1974	50	--
Do	Dc22-19	D-8	S, T, U	69-89 104-114	120	1974	--	--
Do	Dc22-22	4	S, P, W	--	129	1965	--	60
Do	Dc22-23	R4	S, P, Op	--	--	1979	--	--
Do	Dc22-24	5	S, P, Op	--	162	1965	--	50
Do	Dc23-11	3	S, P, A	--	148	1965	--	--
Do	Dc23-16	Obs. 1	S, O, W	--	156	1963	--	50
Do	Dc23-17	2	S, P, Op	--	145	1964	--	50
<u>Getty<sup>7</sup></u>								
Getty Refining and Marketing Co.	Dc41-4	P-5A	I, P, Op	366-396 519-539	603	1955	3.8	--
Do	Dc42-6	P-6A	I, P, Op	602-626 639-656 668-678	713	1956	34	--
Do	Dc43-1	Wilson #1	I, U, U	144-150	151	1949	8	--
Do	Dc44-1	Wilson #2	I, U, U	96-108	108	1949	21	--
Do	Dc51-3	9	I, O, U	245-250	588	1954	70.6	73.58
Do	Dc51-4	10	I, O, U	260-265	606	1954	40.1	42.54
Do	Dc51-7	P-4	I, P, Op	416-439 454-474 534-544	566	1955	38.5	38.88

<sup>7</sup> Formerly Tidewater Associated Oil Co.

TABLE 1.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Getty</u>								
Getty Refining and Marketing Co.	Dc51-8	R-8	I, O, U	229-255	340	1956	70	--
Do	Dc51-9	R-4	I, O, A	252-270 286-313	340	1955	40.3	39.85
Do	Dc52-1	TW1	I, O, U	Various <sup>a</sup>	621	1954	76.0	--
Do	Dc52-2	2	I, O, U	476-481	815	1954	62.9	65.41
Do	Dc52-6	1H	I, O, U	337-342	363	1954	70.2	73.12
Do	Dc52-8	11	I, O, U	434-439	723	1954	61.6	64.49
Do	Dc52-24	15	I, P, Op	302-333	364	1954	67.8	68.71
Do	Dc52-30	1B	I, T, A	600-606	606	1954	76.4	79.27
Do	Dc52-31	1C	I, T, A	517-539	620	1954	76.4	79.42
Do	Dc52-32	1D	I, T, A	315-335	349	1954	76.6	79.10
Do	Dc52-34	2A	I, T, A	465-485	695	1954	63	--
Do	Dc53-6	14A	I, T, N	312-317	360	1954	56.9	60.06
Do	Dc53-7	12	I, O, W	534-539	781	1954	54.9	57.69
Do	Dc53-23	5C	I, T, N	538-543	712	1954	32.2	34.29
Do	Dc53-31	5A	I, O, U	400-406	406	1954	32	34.76
		5B	I, O, U	201-207	406	1954	32	34.84
Do	Eb15-2	8	I, O, U	240-245	635	1954	65.5	68.20
Do	Eb15-4	P-3	I, P, Op	510-544	556	1955	--	57.1
Do	Eb15-5	R-2	I, P, A	230-258 270-286 391-401 410-422	422	1956	66	--

<sup>a</sup> Screen interval varied from 320-340 to 520-540 for water quality sampling.  
Present screen interval unknown.

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Getty</u>								
Getty Refining and Marketing Co.	Ec11-2	7	I, O, U	560-565	758	1954	41.5	44.07
Do	Ec12-2	3	I, O, W	549-553	605	1954	57.1	60.40
Do	Ec12-3	P-6	I, O, U	548-553	828	1954	13.1	15.65
Do	Ec12-15	3B	I, O, U	340-345	734	1954	57.5	60.20
Do	Ec12-20	P-9	I, P, Op	525-558	574	1956	13	14.34
Do	Ec13-5	4	I, O, U	543-547	694	1954	59.1	62.21
Do	Ec13-6	16	I, P, Op	523-563 581-592	705	1955	35.5	36.26
Do	Ec14-1	13	I, O, U	678-685	751	1954	4.4	6.64
Do	Ec14-7	P-10	I, P, Op	642-668 692-702	764	1956	9	--
Do	Ec22-3	P-1	I, P, Op	235-260	261	1952	10	--
<u>Glendale and Moores Farm</u>								
Artesian Water Co.	Db35-3	--	S, P, N	77-87	120	1956	80	--
Do	Db35-4	--	S, P, N	88-100	100	1953	80	--
Do	Db35-6	--	S, P, N	92-102	107	1957	70	--
Do	Dc21-10	Site 6- Moores Farm	S, T, U	115-139	154	1975	--	--
Do	Dc31-10	5	S, P, Op	108-138	138.5	1973	69	--
Do	Dc31-12	TW 1	S, O, U	460-510	549	1973	--	--
Do	Dc31-13	5A	S, O, W	--	--	--	69	--
Do	Dc31-18	1, Site 4- Moores Farm	S, T, W	125-155	163	1975	71	--
Do	Dc31-21	6	S, P, Op	115-138	138	1974	65	--
Do	Dc31-24	7-Moores Farm	S, P, Op	123-153	156	1976	--	--
Do	Dc31-25	D-2	S, O, U	125-135	147	1973	--	--

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Glendale and Moores Farm</u>								
Artesian Water Co.	Dc31-26	D-4	S, O, W	261.5-270.5 304-327 347-357	358	1973	66	66.8
Do	Dc31-27	D-5	S, O, W	431-454 468-476 482-495	510	1973	66	66.5
<u>Goodrich</u> <sup>9</sup>								
B. F. Goodrich Co.	Ea33-1	TW2	I, T, W	390-410	427	1966	60	--
Do	Ea33-2	Obs. 1	I, O, U	408-418	431	1966	60	--
Do	Ea33-3	Obs. 2	I, O, U	398-408	431	1966	60	--
Do	Ea33-4 <sup>10</sup>	TW1	I, T, U	580-585 598-608	695	1966	60	60
<u>ICI</u> <sup>11</sup>								
ICI Americas, Inc.	Cd44-1	28	I, T, U	250-270	332	1971	10	13.6
Do	Cd44-2	29	I, O, U	249-259	402	1972	10	--
Do	Cd44-14	12	I, P, Op	249-289	289	1972	10	--
<u>Jefferson Farms</u>								
Artesian Water Co.	Cd51-13	Obs. 1	S, P, W	--	170	1961	--	42.98
Do	Cd51-14	1	S, P, Op	--	--	1976	--	41.57
Do	Cd51-15	2	S, P, Op	127.5-137.5	150	1961	--	41.42
<u>Llangollen Estates</u>								
Artesian Water Co.	Dc23-2	2	S, P, Op	129-154	172	1953	63	65.05

<sup>9</sup> Cecil County, Maryland.<sup>10</sup> Casing broken.<sup>11</sup> Formerly Atlas Chemical Co.



TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION	
							LAND SURFACE	MEASURING POINT
<u>Llangollen Estates</u>								
Artesian Water Co.	Dc23-9	3	S, P, N	--	161	1959	56	56.96
Do	Dc23-10	6	S, P, Op	--	165	1966	55	57.03
Do	Dc23-12	4	S, P, N	--	163.5	1959	60	65.07
Do	Dc24-1	1	S, P, A	--	167	1952	52	66.18
Do	Dc24-14	E-1	S, P, Op	122-142	182	1971	40.5	39.11
Do	Dc24-15	K-1	S, P, Op	135-173	220	1971	27.3	28.25
Do	Dc24-17	E-2	S, P, Op	131-173	200	1971	34	38.18
Do	Dc24-18	G-3	S, P, Op	115-155	200	1971	19.9	20.57
Do	Dc24-19	J-1	S, P, N	122-162	200	1971	15.9	11.58
Do	Dc24-40	5	S, P, W	--	163	1960	52	54.85
Do	Dc24-41	7	S, P, Op	115-170	195	1969	--	48.09
Do	Dc24-42	D-2	S, O, U	--	--	--	--	59.68
<u>Lums Pond State Park</u>								
Delaware Division of Parks and Recreation	Eb22-10	--	G, T, A	526-546	610	1971	50	--
Do	Eb22-11	--	G, P, Op	514-539	560	1974	--	--
U.S. Geological Survey	Eb23-22	{ B C D	G, O, W	288-292	732	1980	60	--
			G, O, W	432-436	732	1980	60	--
			G, O, W	600-604	732	1980	60	--
<u>Middletown</u>								
Town of Middletown	Fb33-2	2	M, P, A	407-493	525	1914	64	--
Do	Fb33-22	8	M, P, Op	800-846	--	1978	78	--
Do	Fb33-23	4 in. test well	M, T, U	825-845	866.6	1976	60	--
Do	Fb33-24	9	M, P, Op	460-490 526-536	540	1978	--	--

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Midvale</u>								
Artesian Water Co.	Dc12-10	WD42	S, T, W	49-59 76-81	145	1974	--	85
Do	Dc13-10	WD41	S, T, W	30-45	195	1974	--	46
Do	Dc14-3	1	S, P, Op	54-87	87	1950	--	61
Do	Dc14-42	MD40	S, T, U	93-108	196	1974	50	--
Do	Dc14-53	2	S, P, Op	--	77	1951	--	50
Do	Dc14-54	3	S, P, W	--	99	1959	--	50
<u>National Guard Rifle Range</u>								
U.S. Geological Survey	Dc34-5	Lower	G, O, W	574-579	599	1975	28	30.1
Do	Dc34-6	Upper	G, O, W	183-188	200	1975	28	30
Do	Dc34-7	--	G, P, Op	163-168	168	--	--	--
<u>Newark</u>								
City of Newark	Ca55-2	--	M, U, U	60-65	66	1951	107	107.65
Do	Ca55-3	NWF 5	M, P, Op	55-60	64	1920	109	--
Do	Ca55-4	NWF 7	M, P, A	55-60	63	1931	102	--
Do	Ca55-5	NWF 8	M, P, Op	55-60	64	1931	102	--
Do	Ca55-7	NWF 9	M, P, N <sup>12</sup>	--	79	1936	105	--
Do	Ca55-8	--	M, O, U	35-40	42	1953	105	--
Do	Cb51-2	--	M, U, A	--	62	1920	102.5	--
Do	Db11-49	14	M, P, Op	106-129	129	--	70	--
Do	Db12-27	12	M, P, Op	<sup>13</sup> 145-170	188	1956	--	75
Do	Db12-39	--	M, O, U	120-140	178	1969	70	--

<sup>12</sup> Collapsed in 1978.<sup>13</sup> Rescreened in 1970; formerly well screen was shallower.

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Newark</u>								
City of Newark	Db12-40	52A	M, T, U	63-73.5	206	1970	--	--
Do	Db12-41	52B	M, T, U	50.5-71	190	1970	65	--
Do	Db21-40	50	M, T, N	46.5-52	74	1969	--	--
Do	Db22-41	24	M, T, N	79-89	105	1967	--	--
Do	Db22-42	16	M, P, Op	130-145 149-164	169	1968	--	60
Delmarva Power and Light Co.	Db22-44	--	I, U, U	113-123	123	1971	60	--
City of Newark	Db22-46	57	M, T, A	137-159	159	1971	--	--
Do	Db22-48	57A	M, T, U	125-135	140	1971	60	--
Do	Db22-49	Obs. 16	M, O, U	118.5-138.5 148.5-158.5	185	1968	60	--
Do	Db31-50	TH46	M, T, U	67.5-72.5	102	1969	--	--
Do	Db32-16	19, TH55	M, P, Op	120-135	170	1971	70	--
<u>New Castle</u>								
City of New Castle	Cc55-10	School House Lane Obs. 1	M, T, U	61.5-72	100	1965	--	--
Do	Cc55-17	School House Lane, 6B	M, P, Op	89-115	128	1967	--	46.61
Do	Cc55-18	School House Lane, 6A	M, T, U	96-116	161	1968	50	--
Do	Cc55-21	Obs. 6	M, O, U	53-58	61	1966	--	--

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>New Castle</u>								
City of New Castle	Cc55-22	Obs. 7	M, O, U	53-58	59	1966	--	--
Do	Cc55-23	Obs. 8	M, O, U	53-58	131	1966	--	--
Do	Cd51-8	Basin Road	M, P, Op	65-82	150	1962	20	22
Do	Cd51-9	Obs. 1	M, O, U	--	84	1963	--	--
Do	Cd51-10	Obs. 2	M, O, U	--	85	1964	--	--
Do	Cd52-13	Old 11	M, P, A	115-130.5	132	1951	12	--
Do	Cd52-14	Old 2 in. Obs.	M, O, W	122-125	515	1951	11.0	12.21
Do	Cd52-26	2 in. Obs.	M, O, W	--	--	--	8	--
Do	Cd52-27	Water Plant 11	M, P, Op	128-141	161	1975	9	--
Do	Dc15-16	Frenchtown Road <sup>14</sup>	M, P, Op	99-109 115-125	154	1978	48	--
Do	Dd12-3	4th Street	M, O, A	132-148	154	1956	12	--
<u>Newport</u>								
City of Newport	Cc34-2	Old 7, 2	M, P, Op	40.5-47.5	63	1944	25	35
Do	Cc34-3	Old 1	M, P, A	--	110	1919	25	--
Do	Cc34-4	Old 2	M, P, A	--	50	1919	25	--
Do	Cc34-5	Old 3	M, P, A	--	57	1919	25	--
Do	Cc34-6	Old 4	M, P, A	48- --	--	1919	25	--
Do	Cc34-7	Old 5	M, U, A	--	58	1919	25	--

<sup>14</sup> Previously TW10, converted to production well in 1978.

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Newport</u>								
City of Newport	Cc34-8	Old 6, 1	M, P, Op	--	72	1943	25	30
Do	Cc34-9	4	M, P, Op	--	72	1950	20	20.55
Do	Cc34-10	3	M, P, A	46-56	58	1952	15	--
Do	Cc34-11	4	M, P, A	--	58	1952	15	--
Do	Cc34-12	5	M, O, U	46-56	58	1952	15	--
Do	Cc34-31	New 3	M, P, Op	67-87	98	1963	25	--
Do	Cc34-35	--	M, P, U	--	98	--	--	--
<u>Ommelanden Park</u>								
New Castle County	Dc33-5	1	S, T, W	62-82	91	1976	--	23
Do	Dc33-6	2	S, T, W	161-201	231	1976	--	39
Do	Dc34-8	3	S, T, W	155-215	--	--	--	--
Do	Dc34-9	4	S, T, U	156-196	241	1976	--	20
<u>Smalley's Dam</u>								
Delaware Water Co.	Db15-5	--	S, P, W	215.5-238.5 273.5-306	317	1968	20	21.5
<u>Tuxedo Park</u>								
Artesian Water Co.	Cc23-1	1	S, P, N	40-100	150	1925	70	--
Do	Cc24-2	10	S, P, A	78-105	200	--	68	--
Do	Cc24-3	12	S, P, N	85-95	150	1941	80	--
Do	Cc24-5	17	S, A, U	--	160	--	75	--
Do	Cc24-7	20	S, A, U	--	163	--	76	--
Do	Cc24-8	21	S, A, U	--	140	--	70	--

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Union Carbide</u>								
Union Carbide Corp.	Ec32-3	TW2-Site 1	I, T, W	318-328 338-348	420	1966	11.2	13.15
Do	Ec32-4	Obs. 1	I, O, U	332-352	406	1966	18.0	19.47
Do	Ec32-5	Obs. 2	I, O, U	380-400	427	1966		
Do	Ec32-7	TW1-Site 1	I, T, W	586-596	752	1966	11.2	13.15
Do	Ec42-12	6	I, T, U	340-350	--	--	30	--
<u>Wilmington Airport</u>								
Artesian Water Co.	Cc45-1	1	S, P, Op	187-197	272	1942	70	--
Do	Cc45-2	3	S, P, Op	134-154	174	1943	40	--
Do	Cc55-1	2	S, P, Op	211-221	245	1942	70	--
<u>Wilmington Manor</u>								
Artesian Water Co.	Cc45-4	27	S, T, U	--	68	--	60	--
Do	Cc45-6	28	S, T, U	--	55	--	30	--
Do	Cc55-6	--	S, P, U	132- --	--	1935	70	--
Do	Cc55-7	--	S, P, U	132- --	--	1935	72	--
<u>Wilmington Manor Gardens</u>								
Artesian Water Co.	Cd51-1	2	S, P, Op	20-47	47	1949	20	--
Do	Cd51-11	3	S, P, Op	--	72	1956	20	--
Do	Cd51-12	1	S, P, Op	--	85	1949	20	--



TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Miscellaneous</u>								
--	Cb44-14	--	D, U, U	51- 60	60	1942	90	--
--	Cb53-14	--	D, U, U	40-60	60	1947	60	--
--	Cb54-18	--	D, U, U	--	60	1945	83	--
Wilmington Suburban Water Co.	Cb54-49	3	S, P, U	78-88 101-111	238	1957	73	--
--	Cc41-1	--	D, A, U	55-60	66	1941	85	--
Interstate Inns	Cc41-7	--	C, P, Op	45-65	160	1965	52.6	--
Cavaliers Country Club	Cc42-2	--	C, P, Op	112-122 138-146 184-200	210	1959	80	--
Touring Court Motel	Cc45-5	--	C, P, E	292-302	302	1951	65	--
U.S. Geological Survey	Cc52-1	B	G, O, W	200-204	265	1980	12	--
--	Cc55-2	--	C, P, U	--	86	1949	70	--
Airport Inn	Cc55-5	--	C, P, Op	76-86	86	1946	70	--
Ludlow Mfg.	Cd15-1	--	I, U, U	--	98	--	--	--
Brandywine Drive-In	Cd31-1	--	C, P, Op	121-129	129	1949	70	--
--	Cd31-2	--	D, U, U	78-82	82	1948	82	--
--	Cd32-5	--	D, A, U	73-83	83	1942	74	--
--	Cd32-6	--	D, U, U	105-115	115	1944	75	--
Cork Insulation Co. Inc.	Cd33-1	--	I, P, N	38-56	126	1948	10	--
Do	Cd33-2	--	I, U, U	--	120	--	--	--
Standard Bitulithic Co.	Cd41-4	--	I, P, Op	166-186	190	1943	35	--
--	Cd42-6	--	D, U, U	117-122	127	1942	75	--

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Miscellaneous</u>								
--	Cd42-7	--	D, U, U	74-86	86	1942	75	--
--	Da15-3	--	D, U, U	93-102	102	1950	210	--
--	Db12-1	--	D, U, U	211-288	288	1946	70	--
Wilmington Suburban Water Co.	Db12-25	Layne Co.	S, O, U	58-63	63	1956	82	--
--	Db14-14	--	D, U, U	152-167	168.5	1942	70	--
--	Db15-1	--	D, U, U	124-130	136	1951	30	--
--	Db15-4	--	D, U, U	201-213	213	1950	50	--
Artesian Water Co.	Db25-5	D-13	S, T, A	--	145	1974	--	--
Do	Db25-6	D-15	S, T, A	--	245	1974	--	--
--	Db31-16	--	D, U, U	118-133	--	1960	60	--
--	Db33-8	--	D, U, U	192-197	200	1954	40	--
--	Db33-9	--	D, U, U	134-139	139	1954	60	--
U.S. Geological Survey	Db33-17	(B C	G, O, W G, O, W	139-143 185-189	243 243	1980 1980	48 48	-- --
--	Db34-6	--	D, U, U	270-275	276	1955	55	--
--	Db34-10	--	D, U, U	98-102	102	1968	65	--
--	Db41-5	--	D, A, U	226-256	256	1961	74	--
--	Db43-3	--	D, U, U	295-305	316	1954	75	--
Warner Cement Co.	Db44-5	--	C, P, Op	332-358	360	1956	70	--
--	Db45-4	--	D, U, U	389-399	401	1955	75	--
--	Dc11-1	--	D, A, U	274- --	306	1944	30	--
--	Dc11-3	--	D, U, U	89-99	99	1942	20	--

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE, AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Miscellaneous</u>								
--	Dc11-4	--	D, U, U	259-269	269	1946	15	--
--	Dc12-3	--	D, U, U	203-213	213	1953	75	--
--	Dc12-4	--	D, U, U	51-56	57	1953	60	--
--	Dc13-1	--	D, U, U	242-252	252	1942	66	--
--	Dc13-2	--	D, U, U	105-112	118.5	1942	55	--
Delaware Sand and Gravel Co.	Dc14-1	2	C, P, Op	115-132	132	1944	35	--
M & M Restaurant	Dc14-5	--	C, P, U	73-78	78.5	1949	64	--
--	Dc14-15	--	D, U, U	123-131	131	1965	50	--
Artesian Water Co.	Dc21-9	D-14	S, T, A	--	195	1974	--	--
--	Dc22-1	--	D, U, U	85-95	95.5	1946	62	--
--	Dc22-2	--	D, U, U	75-85	85	1946	63	--
--	Dc22-3	--	D, U, U	78-88	88	1946	64	--
--	Dc22-4	--	D, U, U	78-85	85	1946	64	--
--	Dc22-8	--	D, U, U	--	91	1955	75	--
--	Dc23-1	--	D, U, U	173-183	183	1949	17	--
Delaware Sand and Gravel Co.	Dc25-8	1	C, P, U	122-132	132	1944	25	--
--	Dc25-9	--	D, U, U	121-126	128	1949	32	--
--	Dc25-14	--	D, U, U	110-115	116	1940	25	--
--	Dc32-2	--	D, N, U	126-131	132	1953	60	--
--	Dc32-3	--	D, U, U	131-141	143	1953	70	--

TABLE 7.--Partial record of wells in the Potomac Formation in New Castle County--Continued

WELL FIELD OWNER	DGS WELL NUMBER	LOCAL WELL NUMBER	TYPE, USE AND STATUS	SCREENED INTERVAL	DEPTH DRILLED	DATE DRILLED	ELEVATION LAND SURFACE	MEASURING POINT
<u>Miscellaneous</u>								
--	Eb24-1	--	D, U, U	203-208	208	1950	71	--
--	Eb24-2	--	D, U, U	169-177	177	1952	45	--
Canal Realty	Eb34-3	--	C, T, U	442-462	845	--	58.2	--
Diamond Ice & Coal Co. Service Station	Ec21-4	--	C, P, U	265-275	282	1941	55	--
--	Ec21-6	--	D, S, N	208-293	294	1954	30	--
--	Ec21-24	--	D, U, U	267-275	275	1969	50	--
--	Ec21-25	--	D, U, U	270-278	278	1969	50	--
Gunning Bedford School	Ec23-9	2	C, P, Op	320-340	360	1968	55	--
--	Ec44-1	--	D, U, U	--	350	1950	25	--
--	Ed51-1	--	D, U, U	447-472	473	1946	11	--



