REPORT OF

THE RIVER MASTER

OF THE DELAWARE RIVER

For the period
December 1, 1983 - November 30, 1984

by Francis T. Schaefer, William E. Harkness and Robert W. Baebenroth
with a section on water quality by Deloris W. Speight

U.S. GEOLOGICAL SURVEY

Open-File Report 85-339

Reston, Virginia

1985

UNITED STATES DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

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Factors for Converting Inch-Pound Units to International System Units (SI)

Multiply inch-pound units	By	To obtain SI units
	LENGTH	
inches	25.4	millimeters (mm)
feet	0.3048	meters (m)
miles	1.609	kilometers (km)
	AREA	
square miles	2.590	square kilometers (km^2)
	VOLUME	
million gallons	3,785	cubic meters (m^3)
billion gallons	3.785	cubic hectometers (hm^3)
cfs-days	0.002447	cubic hectometers (hm^3)
	FLOW	
million gallons per day (mgd)	0.04381	cubic meters per second (m^3/s)
cubic feet per second (cfs)	0.02832	cubic meters per second (m^3/s)

Section I

RIVER MASTER LETTER OF TRANSMITTAL

and

SPECIAL REPORT

OFFICE OF THE DELAWARE RIVER MASTER
United States Geological Survey
433 National Center, Reston, Virginia 22092

May 10, 1985

The Honorable
Warren E. Burger
Chief Justice of the Supreme Court
of the United States

The Honorable
Michael N. Castle
Governor of Delaware

The Honorable
Thomas H. Kean
Governor of New Jersey

The Honorable
Mario M. Cuomo
Governor of New York

The Honorable
Richard L. Thornburgh
Governor of Pennsylvania

The Honorable
Edward I. Koch
Mayor of the City of New York

New Jersey v. New York et al
No. 5 Original, October Term 1950

Dear Sirs:

For the record and in compliance with the provisions of the Amended Decree of the United States Supreme Court entered June 7, 1954, I am transmitting herewith the thirtieth Annual Report of the River Master of the Delaware River for the year December 1, 1983, to November 30, 1984.

As the report year began, the total quantity of water in storage in Pepacton, Cannonsville and Neversink Reservoirs of the City of New York in the Delaware River basin totaled 98 billion gallons. This quantity was 12 billion gallons below the drought-warning curve for the reservoirs and 5 billion gallons higher than the situation that existed one year earlier when total contents were 93 billion gallons. Restrictions on diversions and release requirements had been instituted November 9, 1983, in order to conserve water. By letter on October 7, 1983, I had notified the River Master's Advisory Committee that with storage at 121.8 billion gallons and decreasing at a rate of about 1.3 billion gallons per day (bgd), without above-average precipitation and increased runoff, total contents would reach the drought-warning level in early November. I stated that if this situation developed, the Montague flow objective would be reduced to 1,655 cubic feet per second (cfs), and that New York City diversions would be limited to 680 million gallons per day (mgd). New Jersey diversions would be limited to 85 mgd. These measures to conserve the water supply were continued until December 19, 1983.

Reservoir contents increased seasonally in early December but remained below the drought-warning level until December 14, 1983. Storage increased significantly December 14 in response to heavy precipitation December 13-14 so the restrictions on diversions and the reductions in the Montague flow objective were terminated December 20. The augmented conservation release rates for instream-environmental improvement were resumed January 3, 1984.

Storage continued to increase during the winter months, and by June 1 the combined contents were 279 billion gallons, and all reservoirs were spilling. Streamflow at the gaging station on Delaware River at Montague, New Jersey, was above the 1,750 cfs flow specified by the Amended Decree except January 31 and February 1, when the flow dropped to 1700 cfs because of ice conditions in the channel.

The excess-release rate of 1,860 cfs for this year became effective June 15. During July to November, with the daily diversions at customary rates and large releases to maintain the flow objective at Montague, reservoir storage declined rapidly. It was necessary to order directed releases June 23 to July 2 and on an almost daily basis starting July 29. This continued with very few interruptions until the end of the report year. The excess-release quantity was exhausted on November 13 and the Montague flow was again targeted at 1,750 cfs.

By early November, it again became evident that unless favorable precipitation developed, storage in the reservoirs would decline into the drought-warning zone before the end of the month. By letter dated November 14, 1984, I notified the Advisory Committee members and other interested parties that, if this condition occurred, diversions and releases would again be reduced to conserve water.

Storage in the reservoirs declined below the drought-warning level on November 27. However, precipitation averaging almost 2 inches occurred November 29-30 and storage increased above the drought-warning level, averting the need to impose restrictions on diversions and releases.

During regular operations, diversions for water supply for New York City and releases designed to maintain the flow of the Delaware River at Montague were made as directed by this office and as provided in the Decree. Diversions by New York City from the Delaware River basin reservoirs did not exceed the limit specified by the Decree and did not exceed the limits imposed during the period of water-supply deficiency. Diversions by the State of New Jersey did not exceed the limits prescribed in Section V of the Decree and did not exceed the other limitations effected during the year. No water was diverted from the Delaware River River basin by New Jersey after March 16, 1984 because of dredging of the Delaware & Raritan Canal. The dredging project was still ongoing at the end of the report year.

Current-meter measurements of the Neversink Tunnel diversions were made by personnel of this office during October in conjunction with color-velocity measurements by the engineering staff of the New York City Bureau of Water Supply to verify the accuracy of the venturi flow-meter instruments. The results agreed quite closely except at the highest flows. Further investigation is planned to identify the reasons for the difference. In addition, on November 7, personnel from this office participated in a walk-through inspection of the Neversink Tunnel to determine if any structural deterioration had occurred. The inspection was conducted by personnel from New York City Bureau of Water Supply and Central Hudson Gas & Electric Corporation. No significant deterioration was found, but the inside of the tunnel is coated with about 1/4 inch of a material determined to be primarily silt with some imbedded organic matter.

During the report year, the River Master and staff participated in meetings of the Delaware River Basin Commission to assess water supply conditions and to consider measures to ease the growing deficiences. Upon invitation of the representatives of parties to the Decree, the River Master, or his assistants, met frequently with those representatives as a member of the Flow Management Technical Advisory Committee. Discussions primarily centered on proposals for specific releases from reservoirs in the basin and other emergency measures to cope with streamflow deficiencies in the lower basin (downstream from Montague) when the conditions in the upper basin are normal.

The U.S. Geological Survey continued the operation of its field office of the Deputy Delaware River Master at Milford, Pennsylvania. Robert E. Fish, Deputy Delaware River Master, retired from Federal Service on December 30, 1983 and was replaced by William E. Harkness. Robert W. Baebenroth and Beverly A. Roberts continued to assist with the operation of the office throughout the year.

During the report year, the Milford Office continued the weekly distribution of summary river data. These weekly reports contained preliminary data on releases from the New York City reservoirs to the Delaware River, diversions to the New York City water-supply system, reservoir contents, daily segregation of flow of the Delaware River at the Montague gaging station, and diversions by New Jersey. The reports were made available to the State and City representatives on the Delaware River Master Advisory Committee and to other parties interested in the Delaware River operations. A special monthly summary of past hydrologic conditions, supplemented during the low-flow season by an "outlook" of the river flow for the forthcoming month, was made available to the representatives on the Advisory Committee.

Section II of the report describes in detail Delaware River operations during the report year. As shown on page 19 the City of New York diverted a total of 222.252 billion gallons from the basin during the report year ending November 30, 1984, and released 106.685 billion gallons from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River during the same period. During the low-flow period from June 23 to November 30 (Montague dates), the River Master directed releases to the Delaware River from these reservoirs totaling 71.576 billion gallons.

Section III of the report describes water quality of the Delaware River estuary and was prepared by Deloris W. Speight, U.S. Geological Survey, Malvern, Pennsylvania. It contains data showing the extent of salinity invasion and other water-quality characteristics in the Delaware River estuary.

During the report year, the following individuals functioned as members of the River Master Advisory Committee:

Delaware	Dr. Robert R. Jordan
New Jersey	Dirk C. Hofman, P.E.
New York	Edward A. Karath, P.E.
New York City	Joseph T. McGough, Jr.
Pennsylvania	R. Timothy Weston

A meeting with the Advisory Committee and members of their staff was held May 17 in Milford, Pennsylvania to review the hydrologic conditions in the basin, the outlook for the 1984 release season and to discuss the current activities of the River Master's office. It was suggested at this meeting that a plan, including costs, be prepared for modernizing data collection equipment and updating forecast procedures. That plan is in preparation and will be submitted to the Advisory Committee for their consideration.

The appreciation of the River Master and staff is expressed for the continued excellent cooperation of all the representatives of the parties to the Decree. Once again, it is gratifying to report that New York City complied with the terms of the Decree, with the temporary reductions of diversions and releases, and with the directives of the River Master.

A draft of this report was furnished to the Advisory Committee members for comment.

Sincerely yours,

Francis T. Schaefer, P.E.
Delaware River Master

(page 9 follows)

Section II

REPORT OF DELAWARE RIVER OPERATIONS

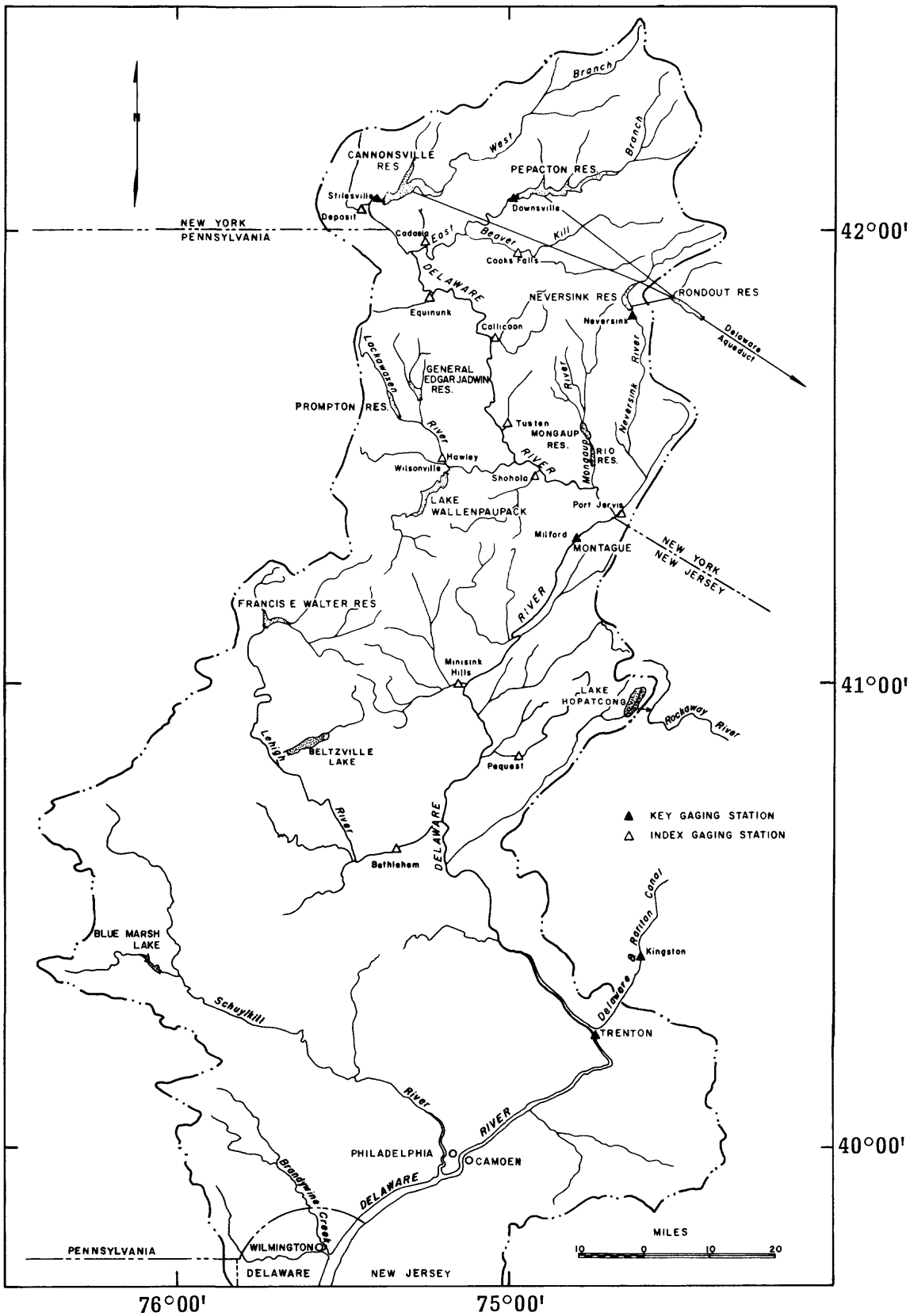


FIGURE 1.--Delaware River Basin Above Wilmington, Delaware.

Section II

REPORT OF DELAWARE RIVER OPERATIONS

by William E. Harkness and Robert W. Baebenroth

Abstract

A Decree of the U.S. Supreme Court in 1954 established the position of Delaware River Master. The Decree authorizes diversions of water from the Delaware River basin and requires compensating releases from certain reservoirs of the City of New York to be made under the supervison and direction of the River Master. Reports to the Court, not less frequently than annually, were stipulated.

During the 1984 report year, December 1, 1983, to November 30, 1984, precipitation and runoff varied from above average to below average in the Delaware River basin. For the year as a whole, precipitation and runoff were near average. Operations were under a status of drought warning December 1, 1983; however, the above normal precipitation the first half of the year increased storage in the reservoirs to record levels by June 1, 1984. Below normal precipitation from August to November coupled with large releases to maintain the Montague flow objective and customary diversions for water supply reduced storage in the reservoirs to the drought-warning level by November 27.

Diversions from the Delaware River basin by New York City and New Jersey conformed to the terms of the Amended Decree throughout the year. Releases were made as directed by the River Master at rates designed to meet the Montague flow objective on 127 days between June 23 and November 30. Releases were made at conservation rates or at rates designed to relieve thermal stress in the streams downstream from the reservoirs at other times.

INTRODUCTION

The Amended Decree of the United States Supreme Court entered June 7, 1954, authorized diversions of water from the Delaware River basin and provided for releases of water from certain reservoirs of the City of New York to the Delaware River to be made under the supervision and direction of the River Master. The Decree also stipulated that reports be made to the Court not less frequently than annually. This report describes the River Master operations December 1, 1983 to November 30, 1984.

Definitions of Terms and Procedures

The following definitions apply to various terms and procedures used in the operations described in this report. A table for converting inch-pound units to International System of Units (SI) is given on page v. The map of the Delaware River basin above Wilmington, Delaware (fig. 1), indicates the location of pertinent streams and reservoirs.

Time of day. - Time of day is expressed in 24-hour eastern standard time, which included a 23-hour day April 29 and a 25-hour day October 28.

Rate of flow. - Mean discharge for any stated 24-hour period, in cubic feet per second (cfs) or million gallons per day (mgd).

Rate of flow at Montague. - Daily mean discharge of the Delaware River at Montague, N.J., on a calendar-day basis.

Reservoir-controlled releases. - Controlled releases from reservoirs passed through outlet valves in the dams or through turbines in powerplants. This does not include spillway overflow at the reservoirs.

Uncontrolled runoff at Montague. - Runoff from the drainage area above Montague exclusive of the drainage area above the Downsville, Cannonsville, Neversink, Wallenpaupack, and Mongaup dams but including spillway overflow at these dams.

Point of maximum reservoir depletion. - Elevation at the top of the highest outlet, sometimes referred to as minimum full-operation level.

Storage or contents. - Usable volume of water in a reservoir. Unless otherwise indicated, volume is computed on the basis of level pool and above the point of maximum depletion.

Capacity. - Total usable volume between the point of maximum depletion and the elevation of the lowest crest of the spillway.

Diversions. - The City of New York diverts water from Pepacton, Cannonsville, and Neversink Reservoirs in the upper Delaware River basin through the East Delaware, West Delaware, and Neversink Tunnels, respectively, to its water-supply system.

The State of New Jersey diverts water from the Delaware River through the Delaware & Raritan Canal.

Excess quantity and seasonal period for its release. - As defined in the Decree, the excess quantity of water equals 83 percent of the amount by which the estimated consumption in New York City during the year is less than the City's estimate of continuous safe yield from all its sources of supply obtainable without pumping, except that the excess quantity should not exceed 70 billion gallons. Each year the "seasonal period" for release of excess quantity begins on June 15. The design rate for that period becomes effective at Montague on that date and continues in effect until the following March 15, or until the cumulative total of excess-release credits becomes equal to the seasonal quantity, whichever occurs first.

Daily excess-release credits. - Daily credits and deficits during the seasonal period are equal to the algebraic difference between the daily mean discharge at Montague and 1,750 cfs; however, the daily credit cannot exceed the 24-hour period releases from Pepacton, Cannonsville and Neversink Reservoirs routed to Montague and made in accordance with direction, with the following exception. During the seasonal period, credits are also made for part or all of other releases from these reservoirs contributing to daily mean discharge at Montague between the excess-release rate and 1,750 cfs.

Precipitation

Precipitation observed on the basin above Montague for the 1984 report year was above normal, totaling 48.89 inches. Precipitation was excessive for December, April, May and July and was deficient for January, September and October. The monthly precipitation during the report year is shown in table 1.

Table 1.-- Precipitation in inches,
Delaware River basin above Montague, N.J.

Month	December 1940 to November 1983 Average	December 1983 to November 1984	
		Amount	Percentage of average
December	3.43	6.18	180
January	2.94	1.69	57
February	2.79	3.37	121
March	3.32	3.48	105
April	3.76	5.32	141
May	4.10	9.14	223
June	3.97	3.27	82
July	4.02	5.91	147
August	3.94	3.10	79
September	3.68	1.67	45
October	3.35	2.49	74
November	3.74	3.27	87
12 months	43.04	48.89	114

These data were computed from records collected by the National Weather Service, New York City Department of Environmental Protection, Bureau of Water Supply and the River Master, at ten stations distributed over the basin area above Montague, December through May, nine stations June through October and eight stations in November.

December to May is generally considered the normal time of year when surface- and ground-water reservoirs fill. During this period in 1983-84, precipitation totalling 29.18 inches was observed, which was 143 percent of the 43-year average. During June to November, 19.71 inches of precipitation was observed, which was 87 percent of the 43-year average. The maximum monthly precipitation listed during the year for any of the ten stations was 10.23 inches in May at Liberty, N.Y.; the minimum monthly precipitation observed was 0.60 inches in September at Milford, Pa.

Acknowledgments

Part of the hydrologic data presented are records of U.S. Geological Survey gaging stations. These records were collected, computed and furnished by the Offices of the U.S. Geological Survey at Albany, New York, Malvern, Pennsylvania, and Trenton, New Jersey, in cooperation with the States of New York and New Jersey, the Commonwealth of Pennsylvania, and the City of New York.

The River Master daily operation records were prepared by the Milford Office of the Delaware River Master from hydrologic data collected principally on a day-to-day basis. Data for these records were collected and computed by the Milford Office or were furnished by agencies, as follows: Data from Pepacton, Cannonsville and Neversink Reservoirs by the New York City Department of Environmental Protection, Bureau of Water Supply; from Lake Wallenpaupack by the Pennsylvania Power & Light Company; and from Mongaup Reservoir by Orange and Rockland Utilities, Inc.

OPERATIONS

December to May

During the first half of the report year, precipitation was 8.84 inches above average and ranged from deficient to excessive. Precipitation during May, 9.14 inches, was the highest May in the period of record. Pepacton, Cannonsville and Neversink Reservoirs reached their highest combined storage since the completion of Cannonsville Reservoir, 281.634 billion gallons, 104 percent of capacity on May 30.

On December 1, 1983, Pepacton Reservoir contained 62.851 billion gallons of water in storage above the point of maximum depletion, or 44.8 percent of the reservoir's storage capacity of 140.190 billion gallons. Cannonsville Reservoir contained 20.790 billion gallons, or 21.7 percent of the reservoir's storage capacity of 95.706 billion gallons and Neversink Reservoir contained 14.643 billion gallons, or 41.9 percent of the reservoir's storage capacity of 34.941 billion gallons. The combined storage in the three reservoirs as of December 1 was 98.284 billion gallons, or 36.3 percent of their combined capacity. Daily storages in Pepacton, Cannonsville and Neversink Reservoirs are shown in tables 10, 11 and 12, respectively.

On November 9, 1983, during the previous report year, the combined storage of Pepacton, Cannonsville and Neversink Reservoirs declined below the drought-warning level of the operation curves recommended by the parties to the Decree. At that time the permissible diversion rate to the New York City Water-Supply system was reduced from 800 to 680 mgd and the design rate of flow of Delaware River at Montague, New Jersey was changed from 1,750 to 1,655 cfs. Those rates were continued until December 19, 1983, when the combined storage had been more than 15 billion gallons above the drought-warning level for 5 consecutive days. On December 20 the allowable diversion rate of 800 mgd, and the Montague minimum basic design rate of 1,750 cfs, were resumed.

Diversions to Rondout Reservoir December 1, 1983 to May 31, 1984, totaled 89.065 billion gallons and averaged 487 mgd.

From December 1 to May 31 the anticipated discharge at Montague, exclusive of water released from the City reservoirs, did not fall below the applicable design rate and no releases were directed to meet the Montague flow objective. During this period, New York City made releases for conservation purposes at rates set forth in the Interstate Water Management Recommendations of the Parties to the Decree. Releases were made at the basic conservation rates December 1 to January 2 and at the augmented conservation rates thereafter. The conservation release rates are shown in table 2.

Table 2.--Conservation release rates for New York City Delaware River Basin reservoirs.

Reservoir	Operative dates	Conservation releases rates	
		Basic (cfs)	Augmented (cfs)
Neversink	April 1-7	5	45
	April 8 to October 31	15	45
	November 1 to March 31	5	25
Pepacton	April 1-7	6	70
	April 8 to October 31	19	70
	November 1 to March 31	6	50
Cannonsville	April 1-15	8	45
	April 16 to June 14	23	45
	June 15 to August 15	23	325
	August 16 to October 31	23	45
	November 1-30	23	33
	December 1 to March 31	8	33

There were two days during the December to May period when the observed discharge at Montague was less than the prevailing design rate. (See table 15.) These deficiencies were caused by ice in the channel during cold weather.

Inflow to the City's reservoirs during the December through May period generally exceeds draft rates and therefore increases storage. The average inflow to Pepacton, Cannonsville, and Neversink Reservoirs for these six months during the 43-year period, December 1940 to May 1983, was 304.8 billion gallons. During the correspondending six months of the current report year, inflow to the three reservoirs totaled 392.8 billion gallons.

Loss chargeable to evaporation was considered to be insignificant and was not included in the computation. Storage in the three reservoirs increased from 97.187 billion gallons on November 30, 1983 to 281.416 billion gallons May 31, 1984.

June to November

Precipitation during the previous six months was almost 9 inches above average, but during the June to November period, precipitation was below average all months except July. From August 1 to November 28, a deficiency of about 4.2 inches below the 43-year average accrued.

Diversions to Rondout Reservoir June 1 to November 30 totaled 133.187 billion gallons. The equivalent diversion rate did not exceed the limit specified by the Decree and was 728 mgd on November 30. Releases were required to satisfy the Montague Formula on 127 days when the anticipated discharge at Montague exclusive of water released from the City reservoirs, fell below the design rate. Releases at augmented conservation rates or at rates designed to relieve thermal stress were made at other times from each reservoir by the City of New York.

During June 1-14, the flow required to be maintained in the Delaware River at Montague was the minimum basic rate of 1,750 cfs. The forecasted discharge, exclusive of releases from Pepacton, Cannonsville and Neversink Reservoirs, was greater than 1,750 cfs each day. During that per- the observed discharge at Montague was always greater than 1,750 cfs.

On June 15, the seasonal period began for release of the excess quantity of water from the reservoirs, and the design rate at Montague was increased to 1,860 cfs. This rate was composed of the basic rate of 1,750 cfs plus 110 cfs of required excess releases.

The New York City Department of Environmental Protection, Bureau of Water Supply, furnished the River Master with the following advance data for the 1984 calendar year:

1. The estimated continuous safe yield, from all the City's sources, obtainable without pumping, is 1,665 mgd, or a total during the calendar year 1984 of 1,665 x 366 days = 609.390 billion gallons.

2. The estimated consumption that the City must provide from all its sources of supply during the calendar year 1984 is 591.582 + 7.250 = 598.832 billion gallons.

On the basis of the provisions of the Decree and the above data, the aggregate quantity of excess-release water (see definition page 13.) was 83 percent of (609.390 - 598.832) or 8.763 billion gallons. The Montague design rate during the excess release period beginning June 15, 1984, was computed as:

$$1{,}750 + \frac{8.763 \text{ billion gallons} \times 1{,}547 \text{ cfs/bgd}}{120 \text{ days}} = 1{,}860 \text{ cfs}$$

Data on consumption of water by the City of New York for each calendar year, beginning in 1940, are shown in table 16.

The design rate of 1,860 cfs at Montague was required June 15 to November 13, when the excess-release quantity was expended. Accordingly, directed releases from the City reservoirs were designed to maintain the rate of 1,860 cfs at Montague June 15 to November 13 and a rate of 1,750 cfs November 14-30.

On the basis of advance estimates, releases from the reservoirs designed to maintain the prevailing rates at Montague were required on 127 days during the period June 23 to November 30 (table 14). During this period, there were 58 days when the observed discharge at Montague was less than the prevailing design rate and 63 days when the observed discharge was above the prevailing design rate (table 15). Deficiencies or excesses in flow on these days were attributed to the uncontrolled flow, weather adjustment, or powerplant releases which were other than those anticipated.

The hydrographs of plate 1, June 1 to November 30, show the total discharge at Montague; the portion derived from uncontrolled runoff downstream from the reservoirs; the portion contributed by the power reservoirs; and the portion contributed by Pepacton, Cannonsville and Neversink Reservoirs. In analyzing the water budget at Montague, the uncontrolled runoff downstream from the reservoirs was computed as the residual of observed flow less releases from all reservoirs and therefore was subject to all the errors in observations, transit times, and routing of the several components of flow. Because all of these uncertainties are contained in these figures, the computed hydrograph of uncontrolled runoff was somewhat ragged.

The advance estimate of flow of the Delaware River at Montague exclusive of the releases from the New York City reservoirs was less than the design rate on 15 days scattered throughout the period from June 23 to August 10, 1984. From August 11 to November 30, the advance estimate was always less than the design rate and releases were directed every day. The table below compares the advance estimates of the various contributions to the flow at Montague to the observed observations during the August 11 to November 30, 1984 period.

	Advance estimates (cfs-days)	Observed operations (cfs-days)
New York City releases		
Directed	[a] 104,116	[b] 104,385
Other		3,141
Power releases		
Lake Wallenpaupack	16,936	19,962
Mongaup Reservoir	10,448	9,860
Runoff from uncontrolled area	68,098	76,402
Flow at Montague		213,750

[a] Directed release as designed
[b] Actual release in response to direction.

Summary

From December 1, 1983 to November 30, 1984, diversions to Rondout Reservoir totaled 222.252 billion gallons, and all releases from the New York City reservoirs to the Delaware River totaled 165.042 cfs-days (106.685 billion gallons).

During the year, maximum storage in Pepacton Reservoir was 144.249 billion gallons, or 103 percent of capacity, on May 30. Maximum storage in Cannonsville Reservoir was 102.224 billion gallons, or 107 percent of capacity, on May 31. Maximum storage in Neversink Reservoir was 35.563 billion gallons, or 102 percent of capacity, May 30. The maximum combined storage in the three reservoirs during the year was 281.634 billion gallons, or 104 percent of capacity, on May 30.

Minimum storage during the year in Pepacton Reservoir was 62.851 billion gallons, or 45 percent of capacity on December 1 and 6, 1983. The minimum storage in Cannonsville Reservoir was 20.790 billion gallons, or 22 percent of capacity on December 1. Minimum storage in Neversink Reservoir was 12.076 billion gallons, or 35 percent of capacity on November 29, 1984. Minimum combined storage in the three reservoirs was 98.284 billion gallons, or 36 percent of capacity December 1, 1983.

A resume' of the combined storage of the three reservoirs on the first day of the month June 1967 to December 1984 is shown in figure 3. Storage was above the median June 1, below the median all other months and was within the range between the highest and the lowest storage of earlier years, except for a new high on June 1.

On November 30, combined storage in the three reservoirs was 110.248 billion gallons, or 41 percent of their combined capacity. During the year, combined storage increased 13.061 billion gallons, or 5 percent of capacity.

SUPPLEMENTARY RELEASE FROM WALLENPAUPACK POWERPLANT

An agreement between Pennsylvania Power & Light Company and the City of New York provides for supplementary releases from Wallenpaupack hydroelectric powerplant if the Delaware River Basin Commission requests them to compensate for water consumed at the Company's Martins Creek steam-electric generating station. Releases may be requested if the flow of the Delaware River at Trenton, N.J. is expected to be less than 3,000 cfs for more than three consecutive days. No supplementary releases were requested during the year.

WATER BUDGET, DELAWARE RIVER AT MONTAGUE, N.J.

The data and computations of the water budget formed the basic operation records required to carry out the River Master's specific responsibilities with respect to the Montague Formula and the Interstate Water Management Recommendations during the report year. The water budget has two parts: (1) advance estimates of the daily average flow at Montague, exclusive of controlled releases from New York City's reservoirs (table 14) and (2) segregation of the daily average flow at Montague among its various source components (table 15). The time intervals required for water to travel from the various sources to Montague were taken into account.

Discharge of the Delaware River at Montague was composed of the following source components:

1. Controlled releases from Lake Wallenpaupack on Wallenpaupack Creek in the production of hydroelectric power.

2. Controlled releases from Mongaup Reservoir on Mongaup River in the production of hydroelectric power.

3. Runoff from the uncontrolled area upstream from Montague.

4. Controlled releases from Pepacton, Cannonsville and Neversink Reservoirs of the City of New York.

The release from the City's reservoirs necessary to maintain the applicable rate of flow at Montague was computed from the advance estimates of flow at Montague, exclusive of controlled releases from the City's reservoirs.

TIME OF TRANSIT

The average times for the effective transit of water from the various sources of controlled supply to Montague used for discharge routing during the 1984 report year are as follows:

Source	Hours
Pepacton Reservoir	60
Cannonsville Reservoir	48
Neversink Reservoir	33
Lake Wallenpaupack	16
Mongaup Reservoir	12

This schedule was developed from reservoir and powerplant operations and gaging-station records of prior years and was found generally suitable. At times, noticeable exceptions occur, e.g., when a large release from Cannonsville Reservoir follows a small one, a large part of the release is expended in filling the channel en route, and the remainder may appear at Montague as much as 12 hours late. During the winter, the cold weather causes ice to form in the stream, which, together with the low streamflow, gradually increases the resistance to streamflow and lengthens the time of transit.

SEGREGATION OF FLOW AT MONTAGUE

The River Master daily operation record of reservoir releases and daily segregation of flow among the various source components contributing to the flow of the Delaware River at Montague is shown in table 15 on page 54. The arrangement of data conforms with the downstream movement of water from the various sources to Montague. A horizontal summation of data in the table is equivalent to routing the various contributions to Montague, using the schedule for travel time of water discussed previously. The uncontrolled runoff was computed by subtracting the contributions of the several other sources from the observed discharge at Montague.

COMPUTATION OF DIRECTED RELEASES

In the daily operations, it was necessary that the River Master utilize: (1) discharges computed from recorded or reported stream gage heights for various 24-hour periods without current information about changes in stage-discharge relations that might have occurred; (2) daily discharge from New York City's three reservoirs obtained from venturi meters; (3) rainfall reports for the previous 24 hours; (4) actual power-plant operations converted to daily discharge; (5) advance estimates of power demand converted to daily discharge; (6) advance estimates of uncontrolled runoff at Montague; and (7) average times for routing of water from the several sources. Variable errors of estimate occur in projecting data, but these data must be used in the daily design and direction of releases from New York City reservoirs.

The time of transit of water from Pepacton Reservoir to Montague was greater than that from any other reservoir above Montague, therefore, the time of daily directed releases to maintain prescribed rates of flow at Montague was based on time of transit from Pepacton Reservoir. Releases from Cannonsville and Neversink Reservoirs were timed to arrive at Montague concurrently with releases from Pepacton Reservoir. To allow for the actual differences in transit times, daily directed releases began at Pepacton at 1200, at Cannonsville at 2400, and at Neversink Reservoir at 1500 the following day.

The determination of the amount of release required from the City's reservoirs to maintain specified rates of flow at Montague was based on estimates of releases from Lake Wallenpaupack and Mongaup Reservoir and an estimate of the uncontrolled runoff at Montague. Taking into account the time of transit from these sources to Montague, this determination required that advance estimates of the following components be made on the morning of each day: (1) the expected release of water from Lake Wallenpaupack for power production for a 24-hour period, beginning at 0800, two days later; (2) expected release of water from Mongaup Reservoir for power production for a 24-hour period two days later, beginning at 1200; and (3) expected uncontrolled runoff at Montague three days later. The River Master daily operation record for computing daily directed release from the City's reservoirs during the periods of low flow is shown in table 14.

The electric power companies cooperated fully in furnishing advance estimates of powerplant release (table 14). As the hydroelectric plants were used chiefly for meeting peak-power demands of the system, advance estimates were subject to many modifying factors such as the influence of the vagaries of weather upon peak-power demand and unpredictable transmission and mechanical difficulties in electric-system operation. As a result, the actual use of water for power generation was at times at considerable variance with the advance estimates that were used by the River Master's office in design computation. Furthermore, it was impractical for the companies to estimate their probable operation on any period other than 24 hours. In the estimates for the Wallenpaupack plant, the time factor was of little concern, as power operations during periods of low flow were usually between 0800 and 2400, which fell within the 24-hour period beginning at 0800. In routing the Mongaup Reservoir release estimates, some error was introduced at times, as the power operations during periods of low flow were usually between 0700 and 2200 which spanned the 1200 to 1200 routing period.

For computation purposes during periods of low flow, the estimate of uncontrolled runoff at Montague three days in advance was treated as two items: (1) Present runoff and (2) estimated increase in runoff from precipitation. The present runoff was computed for 2,156 square miles of uncontrolled drainage area above Montague based on conditions over the drainage area as of 0800 on the morning the estimate was made. The estimated increase in runoff was computed from precipitation which was forecast to occur on the day the estimate was made and the two following days. Estimated quantities for these items are shown in table 14.

During the winter period, the advance estimate of the uncontrolled runoff (present conditions) was based on nearby gaging stations and on the recession curve of the uncontrolled flow at Montague projected to the date, three days hence, under design.

During open-river conditions, the present runoff portion of the advance estimate of uncontrolled runoff was based on discharges as of 0800 at gaging stations listed below:

Station	Drainage area (square miles)
Beaver Kill at Cooks Falls, N.Y.	241
Cadosia Creek at Cadosia, N.Y.	17.9
Oquaga Creek at Deposit, N.Y.	67.6
Equinunk Creek at Equinunk, Pa.	56.3
Callicoon Creek at Callicoon, N.Y.	110
Tenmile River at Tusten, N.Y.	45.6
Lackawaxen River at Hawley, Pa.	290
Shohola Creek near Shohola, Pa.	83.6
Neversink River at Port Jervis, N.Y.	336

The procedure for computing the advance estimate combined a routing and recession (as applicable) of the 0800 discharges of the Beaver Kill, Oquaga, Equinunk, Callicoon and Shohola Creeks and Tenmile, Lackawaxen, and Neversink Rivers gaging stations to Montague, with a computed yield from the remaining ungaged, uncontrolled drainage area. Releases from Neversink Reservoir were deducted from discharge of the Neversink River site. The yield from the ungaged, uncontrolled drainage area was estimated on the basis of the yield of Cadosia, Oquaga, Equinunk, and Callicoon Creeks, and Tenmile and Lackawaxen Rivers with routing and recession by individual gaging stations.

The advance estimate of increase in runoff from precipitation is shown in table 14 under the heading of "Weather Adjustment." The National Weather Service Office, Philadelphia, Pa., cooperated throughout the low-flow periods by furnishing quantitative forecasts of average precipitation over the drainage area above Montague and air temperatures for each day of the three-day period. During the winter, the probable increase in runoff was estimated from the current state of snow and ice and from forecasted temperature and precipitation for the several days under consideration. During open-river conditions, runoff from the forecasted precipitation was estimated from previously established relationships.

The total anticipated flow at Montague, exclusive of releases from the City's reservoirs (table 14), was the sum of the forecasted releases from the power reservoirs, the estimated uncontrolled runoff under then current conditions, and the weather adjustment. The amount by which this computed flow was less than the prescribed Montague rate indicated the expected deficiency at Montague, which would have to be made up by corresponding releases from New York City reservoirs.

There were times when revised forecasts of weather or powerplant release in substantial amount became available before the completion of the required release from New York City reservoirs. At such times, the release required from New York City reservoirs was recomputed on the basis of the revised information, and the release required was changed to revised indicated deficiency. Usually this procedure resulted in a reduced release requirement from New York City reservoirs and the conservation of water. Only the final figures are shown in table 14.

When the estimates of anticipated flow at Montague, inclusive of New York City releases, were too high, insufficient water was released. When the estimates were too low, more water was released than necessary. Such deviations from the estimates were unavoidable; however, cumulative deviations in the estimating procedure over a period of time were reduced by using an adjustment based on the amount by which the cumulative directed releases were greater or less than the cumulative releases actually required to maintain the prescribed rate of flow at Montague. The cumulative difference between directed and actually required releases was divided by minus 10 to spread the balancing adjustment over 10 days, but was limited to a maximum of $\pm$110 cfs. The mechanics of determining the balancing adjustment are shown in columns 8 to 13 of table 14. As the cumulative difference could be determined only after the actual flow at Montague was computed, the balancing adjustment was entered in column 7 four lines below its computation in columns 13. The balancing adjustment was applied June 25 to November 13 and was helpful in reducing cumulative errors and in conserving water.

DIVERSIONS TO NEW YORK CITY WATER SUPPLY

Table 13 shows diversions from Pepacton, Cannonsville and Neversink Reservoirs to the New York City water-supply system during the report year. The tabulation includes a running account of the average rates of the combined diversions from the reservoirs, computed as prescribed by Interstate Water Management Recommendations of the Parties to the Decree December 1-19 and the equivalent rate as prescribed by the Decree December 20 to November 30. The tabulation shows that the allowable maximum equivalent diversion rates were not exceeded at any time.

STORAGE IN NEW YORK CITY RESERVOIRS

The New York City Board of Water Supply determined the "point of maximum depletion" and other pertinent reservoir levels and contents of Pepacton, Cannonsville and Neversink Reservoirs as follows:

Reservoir level	Pepacton Res.		Cannonsville Res.		Neversink Res.	
	Elev. (feet)	Contents (bg)	Elev. (feet)	Contents (bg)	Elev. (feet)	Contents (bg)
Full pool or spillway crest	1,280.00	*140.190	1,150.00	*95.706	1,440.00	*34.941
Point of maximum depletion	1,152.00	*3.511	1,040.00	*1.020	1,319.00	*0.525
Sill of diversion tunnel	1,143.00	*4.200	+1,035.00	*1.564	1,314.00	
Sill of river outlet tunnel	1,126.50		1,020.5		1,314.00	
Dead storage		1.800		0.328		1.680

*Contents shown are quantities stored between listed elevations.
+Elevation of mouth of inlet channel of diversion works.

Tables 10, 11 and 12 show storage in Pepacton, Cannonsville and Neversink Reservoirs, respectively, above "point of maximum depletion" or minimum full-operating level.

On December 1, 1983 combined storage in the three reservoirs was 98.284 billion gallons, which was below the drought warning level as defined by the Interstate Water Management Recommendations. This was the lowest combined storage during the year. Storage increased gradually but remained below the drought warning level until a significant increase occurred December 14 in response to heavy precipitation throughout the basin. Storage increased above the drought-warning level on December 14 and drought-warning status was lifted December 19 when storage had remained above drought-warning level for five consecutive days.

Storage continued to increase seasonally throughout the winter and spring and reached a combined maximum storage of 281.634 billion gallons on May 30. It remained at fairly high levels throughout the summer months. However, the combination of below-normal precipitation from August through November coupled with large releases to meet the Montague formula and customary diversions for New York City water supply, storage declined to the drought-warning level on November 27. Heavy precipitation occurred November 29 and storage increased above drought-warning level, averting the need to impose conservation measures.

Storage November 30 was 110.248 billion gallons, 0.248 billion gallons above drought-warning level.

ANALYSIS OF FORECASTS

Forecasts of the flow at Montague based on the anticipated flow of the several components (exclusive of the release from the City's reservoirs) vary somewhat with those actually experienced on most days even under the most favorable conditions. The daily variations in the several components are often largely compensating with the resulting forecast being fairly accurate. Forecasts were compared with actual uncontrolled runoff and powerplant releases from August 11 to November 30, which included most of the days for which releases were directed.

A comparison of the hydrographs on figure 2 of forecast uncontrolled runoff and the actual uncontrolled runoff indicate that the forecasting procedures were generally adequate. The forecast included anticipated uncontrolled runoff under then-existing conditions plus the weather adjustment based on forecast precipitation. The total uncontrolled runoff during August 11 to November 30 (Montague dates) was 76,402 cfs-days. (See table on page 18.) The forecast of uncontrolled runoff for those days was 68,098 cfs-days, or 10.9 percent less than actual runoff. However, 4,858 cfs-days of runoff (59 percent of the difference) occurred on November 30 due to almost 2 inches of rain that fell over much of the area that was not forecast.

During this same period, the total actual release from the powerplants was 29,822 cfs-days. The advance estimate of powerplant releases for those days was 27,384 cfs-days, or 8.2 percent less than actual releases.

On the basis of the observed discharges at Montague, exact forecasting of releases required from the City's reservoirs during the release period June 21 to November 30, would have totaled 108,790 cfs-days. The releases, as designed, totaled 110,490 cfs-days, or 1.6 percent more than for exact forecasting.

COMPARISONS OF RIVER MASTER OPERATION DATA AND OTHER STREAMFLOW RECORDS

It has been explained that the River Master operations are, in effect, day-to-day operations, for which it is necessary to use preliminary records of streamflow. The following summaries show comparison of records used in the River Master operations and Geological Survey records. In the comparison of releases approximating conservation rates only, data were used in units of million gallons per day and converted to cubic feet per second in the summaries.

Releases from New York City Reservoirs

The River Master operations data on the controlled releases from Pepacton, Cannonsville and Neversink Reservoirs, to the Delaware River were obtained from calibrated instruments connected to venturi meters installed in the outlet conduits.

The Geological Survey gaging station on the East Branch Delaware River at Downsville, N.Y., is 0.5 mile downstream from Pepacton Reservoir dam. The discharge shown in table 3 includes releases and spillage from Pepacton Reservoir. It also includes a small amount of seepage, which enters the channel between the dam and gage site and, a small amount of runoff, which originates between the dam and gage site. The drainage area at the dam is 372 square miles.

Releases were made at conservation or other rates by New York City during the year. For flows of approximately 6.0, 55, 110 and 600 cfs at the gaging station, the venturi meter instruments indicated +4.0, -8.1, -5.4 and +5.5 percent difference, respectively, in rates of release from the reservoir than those shown by the gaging-station records.

The Geological Survey gaging station on the West Branch Delaware River at Stilesville, N.Y., is 1.4 miles downstream from Cannonsville Dam. The discharge shown in table 4 includes releases and spillage from Cannonsville Reservoir and the runoff from 2 square miles of drainage area between the dam and the gage site. The drainage area at the dam is 454 square miles, and that at the gaging station is 456 square miles.

Releases were made in a range from conservation to high rates during the year. For flows of approximately 13 and 35 cfs at the gaging station, the venturi meter instruments indicated 39 and 4.2 percent less water, respectively, being released from the reservoir than those shown by the gaging-station records. The venturi indicated 9.4 percent more discharge than that shown by the gaging-station records at flows of approximately 340 cfs and 3.6 percent more discharge for flows in the 1,100 cfs range.

The Geological Survey gaging station on the Neversink River at Neversink, N.Y., is 1,650 feet downstream from Neversink Dam. The discharge shown in table 6 includes releases and spillage from Neversink Reservoir and, during storms, a small amount of runoff, which originates between the dam and gage site. The drainage area at the dam is 92.5 square miles and that at the gaging station is 92.6 square miles.

Releases were made at conservation or other low flows by New York City during the year. For flows of approximately 5, 24, 45 and 65 cfs at the USGS gaging station, the venturi meter instrument indicated +2.5, +4.1, -2.5 and +7.6 percent difference, respectively, in rates of release from the reservoir than those shown by the gaging-station records.

The above comparisons indicate good agreement between the data from the venturi meters and U.S. Geological Survey gaging stations at all stations for all ranges of flow except for the very low flows at Cannonsville Reservoir. The gaging station records shown significantly more water at low flows than the venturi meter records for this site.

Releases from Lake Wallenpaupack

In the River Master operations December 1 to November 30, records of daily discharge through the Wallenpaupack powerplant were furnished by the Pennsylvania Power & Light Company. Daily discharges were computed on an 0800 to 0800-time basis to allow for the 16-hour average transit time to Montague.

The records of daily mean discharges for Wallenpaupack Creek at Wilsonville, Pa., published by the Geological Survey, were also furnished by the Company. These discharges, shown in table 5, represent the flow through the turbines of the powerplant and are computed on a midnight to midnight basis. The gates at the dam were opened to allow spillage from May 29 to June 1, 1984. During this period, 7,757 cfs-days, as computed by the Company, was spilled from Lake Wallenpaupack.

During December 1983 through November 1984, the River Master's record based on computations by Pennsylvania Power & Light Company, indicated 0.2 percent more discharge than the Geological Survey record. This difference was due to the difference in the time frame of the computations and a slight difference in the computation of the spillage.

Delaware River at Montague, N.J.

The River Master's operation record indicated 2.2 percent less discharge for the year than the Geological Survey record, and daily records were generally in good agreement.

Diversion Tunnels

Records of diversions through the East Delaware, West Delaware, and Neversink Tunnels were furnished to the River Master's office by the City of New York. These records were obtained from New York City's calibrated instruments connected to venturi meters installed in the tunnel conduits. Current-meter measurements were made by the River Master's office to verify the accuracy of the reported diversions. The current-meter measurements were made in the outlet channels downstream from the tunnels.

Water diverted from Pepacton Reservoir discharges through the East Delaware tunnel into Rondout Reservoir. The elevation of Rondout Reservoir was too high many months of the year to permit access to the outlet channel, which is used for measuring discharge from the tunnel by current meter. The results of two current-meter measurements showed on the average that the venturi-meter instruments gave higher figures by 6.3 percent for the totalizer, 7.6 percent for the manometer and 6.4 percent for the indicator needle.

The powerplant that used the water diverted through the tunnel operated most days of the year. On days when the powerplant was not in operation, there was a small amount of leakage through the wicket gates, which was not recorded on the totalizer. Results of a current-meter measurement March 4, 1982, indicated a rate of 10.9 cfs from cooling water and leakage.

Based upon measurements obtained this year and in previous years, the record of quantity of water diverted through the East Delaware Tunnel should be substantially correct.

The West Delaware tunnel is used to divert water from Cannonsville Reservoir into Rondout reservoir. Due to the high level of Rondout reservoir for much of the year only two current-meter measurements were made to compare with venturi measurements. These two measurements indicated that the venturi gave higher results by 14 percent for the totalizer, 23 percent for the manometer and 11 percent for the indicator needle. Inspections of the channel downstream from the outlet, when valves were closed showed negligible leakage.

The Neversink Tunnel is used to divert water from Neversink reservoir into Rondout reservoir. Results of the comparative data showed that the venturi measurements and 10 current-meter measurements agreed fairly well. The average difference between the two methods showed the venturi higher by 3.6 percent for the totalizer, 6.6 percent for the manometer, and 6.4 percent for the indicator needle.

A series of measurements of flows through the Neversink Tunnel by-pass works was made October 1-3 to check the accuracy of the venturi-meter instruments. Measurements at flows of approximately 180, 280, 390 and 450 mgd were made by the color-velocity method by personnel of New York City and by current-meter method by hydrologists from the River Master office.

There was good agreement between the results of the color velocity tests, venturi-meter totalizer and the current meter measurements except at the highest flow. At 456 mgd by color-velocity method, the venturi-meter totalizer gave 458 mgd but the current meter method only showed 426 mgd (-6.6 percent). The results of these tests and other current meter checks indicate that the reported record of the quantity of water diverted through the Neversink Tunnel was substantially correct.

DIVERSIONS BY NEW JERSEY

According to the terms of the Decree, the State of New Jersey may divert for use outside the Delaware River basin from the Delaware River or its tributaries in New Jersey, without compensating releases, a quantity of water not to exceed 100 mgd (154.7 cfs), as a monthly average, with the diversion on any day not to exceed 120 mgd (185.6 cfs). The diversion through the Delaware & Raritan Canal was recorded at the gaging station at Kingston, N.J. The gaging station is 6.6 miles beyond the Delaware-Raritan divide, and records include a slight amount of inflow from the Raritan River basin. The Interstate Water Management Recommendations of the Parties to the Decree, reduced allowable diversions by New Jersey to an average of 85 mgd (131.5 cfs) December 1-19, 1983 due to the drought warning status in effect since November 9, 1983. Allowable diversions were increased December 20, 1983 to those provided by the Decree.

In order to increase the carrying capacity of the Delaware & Raritan Canal, the New Jersey Water Supply Authority began dredging the canal in March 1984. The canal was closed at about noon on March 16 near Washington Crossing, New Jersey. However, since the gaging station is downstream from the point of closure and no water from the Raritan River Basin was pumped into the canal until later, it was assumed that all flow up to and including March 17 at the Kingston gaging station was from the Delaware River Basin and that all flow thereafter was from the Raritan River Basin.

Summarized below are the records of discharges at the Kingston gaging station from Table 8 that are diversions from the Delaware River basin. The summary table shows that the Decree limitations were not exceeded during the year, December 1 to November 30. The table also shows that the average rates of the Interstate Water Management Recommendations were not exceeded.

Month	Average discharge, cfs	Maximum daily discharge, cfs
December 1-19	104	108
December 20-31	87.6	95
January	82.5	87
February	81.6	87
March 1-17	80.3	85
March 18 to November 30	0	0

CONFORMANCE OF OPERATIONS AS PROVIDED UNDER AMENDED DECREE OF THE U.S. SUPREME COURT, DATED JUNE 7, 1954

At the beginning of the report year, conservation measures including reductions in allowable diversions from the basin and rates of flow of the Delaware River at Montague were in effect due to a drought-warning status having been declared November 9, 1983. With general improvement over drought and the filling of the reservoirs, the restrictions were lifted December 20.

Diversions from the Delaware River basin to the water-supply system of the City of New York were less than the 800 mgd authorized by the Decree. Diversions during the drought-warning period also were less than the 680 mgd permissible level in effect for that period. Allowable and actual diversions are shown in the following table:

Effective dates	Allowable diversions Equivalent rate not to exceed (mgd)	Actual diversions (mgd)
Nov. 9 to Dec. 19, 1983	680	674
Dec. 20, 1983 to May 31, 1984	800	463
June 1 to Nov. 30, 1983	800	728

Under Compensating Releases of the Montague Formula, the City released water from its reservoirs at rates designed by the River Master to maintain the minimum basic rate of flow of 1,750 cfs at Montague December 20 to June 14 and November 14-30; and at the excess-release rate of 1,860 cfs June 15 to November 13. Releases from the reservoirs, under the reduced rates provided in the Interstate Water Management Recommendations and in accordance with the design data of the River Master, were made to provide 1,655 cfs at Montague, N.J. December 1-19.

Diversions from the Delaware River basin by the State of New Jersey were found to be less than the authorized monthly average of 100 mgd and less than the authorized maximum daily flow of 120 mgd under the Amended Decree. During the drought-warning period, December 1-19, allowable and actual diversions were 85 mgd and 67 mgd respectively.

Table 3. - Daily discharge, in cubic feet per second, of East Branch Delaware River at Downsville, N.Y. (0141700) for the year ending November 30, 1984. Preliminary U.S. Geological Survey record.

Mean values

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	5.3	6.9	59	54	74	220	4,380	75	88	80	79	412
2	5.4	6.9	56	57	76	167	3,000	74	106	74	78	494
3	5.4	31	53	54	78	124	2,200	75	111	77	79	305
4	5.5	54	53	54	79	459	1,650	76	110	75	77	306
5	5.5	54	53	55	79	855	1,010	77	110	70	75	307
6	6.0	58	53	54	81	877	604	84	110	70	74	305
7	6.1	59	54	54	82	784	376	77	109	70	74	305
8	5.6	56	54	54	83	798	230	72	109	71	74	309
9	5.8	56	54	54	76	1,220	136	72	109	73	74	303
10	5.8	56	54	54	77	1,240	97	74	122	72	74	232
11	5.8	55	54	54	79	1,170	100	73	138	72	74	242
12	6.0	55	54	55	81	1,200	105	72	139	74	74	310
13	7.9	54	54	55	81	1,310	105	77	123	75	74	449
14	8.3	52	55	57	81	1,610	105	96	110	74	74	596
15	7.5	59	54	56	81	1,590	104	110	108	74	74	592
16	7.1	57	54	54	83	1,280	103	111	108	74	73	586
17	6.8	51	54	54	83	961	103	111	96	74	72	586
18	6.7	55	56	53	83	700	86	93	83	74	72	586
19	6.3	59	58	54	83	529	72	72	77	75	72	489
20	6.0	57	59	57	214	432	72	74	72	77	72	436
21	5.8	53	60	57	888	523	73	72	72	74	73	585
22	5.8	51	59	56	1,080	415	76	93	72	72	73	586
23	5.6	51	59	55	1,010	366	76	110	73	75	72	586
24	5.5	57	59	54	914	536	73	110	74	72	72	586
25	5.4	58	58	58	812	453	72	96	72	75	139	586
26	5.3	53	56	54	691	374	72	77	73	79	241	586
27	5.3	55	58	57	528	320	79	76	75	78	223	586
28	5.7	61	63	56	406	520	81	73	77	80	129	585
29	6.3	59	57	56	346	5,390	77	72	74	76	186	256
30	7.2	59		56	279	9,340	74	70	90	79	287	55
31	7.2	61		67		7,000		72	93		283	
Total	189.9	1,609.8	1,624	1,719	8,688	42,763	15,391	2,566	2,983	2,235	3,267	13,147
Mean	6.13	51.9	56.0	55.5	290	1,379	513	82.8	96.2	74.5	105	438

Year total 96,182.7 cfs-days

Mean 263 cfs

Table 4. - Daily discharge, in cubic feet per second, of West Branch Delaware River at Stilesville, N.Y. (01425000) for the year ending November 30, 1984. Preliminary U.S. Geological Survey record.

Mean values

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	16	12	36	42	283	1,070	5,140	342	393	1,000	106	603
2	10	12	35	42	244	940	3,920	340	552	1,020	992	753
3	9.9	21	36	42	275	868	2,950	341	661	566	710	942
4	11	35	37	42	327	1,040	2,340	340	656	410	582	780
5	11	35	36	42	727	1,380	1,850	340	656	598	1,350	607
6	12	35	36	42	2,520	1,430	1,420	342	656	659	1,340	888
7	15	36	36	42	3,430	1,390	1,150	342	656	1,030	1,040	890
8	13	35	36	42	3,380	1,330	1,040	339	561	1,050	1,080	898
9	12	34	36	42	2,780	1,520	925	339	448	749	1,030	733
10	11	35	36	42	2,320	1,370	714	340	650	626	818	669
11	11	34	37	45	1,950	1,230	560	339	656	533	825	716
12	12	34	39	55	1,660	1,250	439	339	654	747	1,050	456
13	31	34	42	42	1,440	1,390	387	339	555	817	1,060	429
14	40	34	52	42	1,370	1,840	353	339	442	1,150	1,250	203
15	22	34	71	42	1,660	2,270	336	363	535	1,080	1,100	210
16	17	34	63	42	2,330	2,360	336	435	644	690	1,050	319
17	15	34	50	42	3,910	2,200	338	442	773	1,000	1,040	330
18	15	35	47	42	4,190	1,950	340	397	920	1,080	879	342
19	12	35	46	42	3,870	1,730	339	331	533	1,090	1,040	248
20	14	35	45	42	3,430	1,560	338	334	496	1,100	991	541
21	13	35	44	43	2,920	1,560	338	337	510	1,230	804	398
22	14	34	43	43	2,460	1,450	339	444	491	1,230	698	414
23	13	35	43	42	2,070	1,330	339	449	426	936	255	411
24	13	36	43	88	1,890	1,400	341	450	623	923	183	475
25	13	36	43	375	1,800	1,210	340	396	788	938	371	543
26	13	36	43	590	1,680	865	340	337	526	947	297	541
27	13	36	42	702	1,500	615	453	345	571	843	284	426
28	14	36	43	644	1,340	618	565	340	633	1,250	107	329
29	14	36	43	633	1,260	2,490	555	340	664	1,240	121	206
30	12	36		569	1,160	6,480	348	340	571	538	552	72
31	12	36		383		6,780		340	902		155	
Total	453.9	1,025	1,239	4,968	60,176	54,916	29,173	11,181	18,802	27,070	23,160	15,372
Mean	14.6	33.1	42.7	160	2,006	1,771	972	361	607	902	747	512

Year total 247,535.9 cfs-days Mean 676 cfs

Table 5. - Daily discharge, in cubic feet per second, of Wallenpaupack Creek at Wilsonville, Pa. (01432000) for the year ending November 30, 1984. Record furnished by Pennsylvania Power & Light Company.

Mean values

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	0	618	137	741	0	589	2,790	0	1,000	0	0	0
2	0	592	0	945	364	656	1,860	686	770	0	109	302
3	0	603	0	604	361	586	1,860	736	713	0	445	0
4	0	474	0	590	384	1,200	1,850	0	0	231	449	0
5	469	449	0	960	927	1,820	956	833	0	232	451	0
6	581	444	0	955	1,730	1,820	1,070	912	595	182	0	0
7	807	0	371	956	1,800	1,820	1,190	490	469	98	0	0
8	616	0	358	934	1,820	933	1,200	966	672	0	233	0
9	650	584	358	958	1,820	951	0	950	567	0	227	0
10	0	684	378	620	1,820	967	0	1,170	464	108	324	0
11	0	572	0	589	1,820	971	1,190	639	0	115	593	0
12	714	848	0	989	1,820	0	1,050	1,470	0	108	550	0
13	1,190	626	345	942	1,820	0	1,110	959	247	111	447	0
14	1,680	499	590	954	1,820	0	943	705	291	153	390	0
15	1,700	520	561	943	1,810	0	933	701	284	0	219	0
16	1,740	917	990	959	1,800	0	3	1,120	387	0	220	0
17	1,710	789	809	803	928	15	0	947	242	105	449	0
18	1,700	899	964	594	936	0	568	941	0	103	455	0
19	1,710	1,030	978	710	961	0	426	934	0	100	429	0
20	1,720	1,210	978	708	0	0	0	999	248	109	452	23
21	1,720	898	940	701	0	0	0	0	239	97	388	0
22	1,710	605	939	725	0	0	0	0	224	0	392	0
23	1,820	769	969	697	1,210	289	0	952	226	0	441	0
24	1,820	647	973	0	1,210	0	0	951	231	240	448	0
25	1,690	669	600	0	1,210	0	0	957	0	277	453	0
26	1,460	549	585	600	1,210	0	0	934	0	109	873	0
27	1,450	658	934	614	1,210	0	0	946	239	106	575	0
28	941	0	959	613	0	0	74	0	309	112	580	0
29	928	0	972	626	0	2,010	0	0	231	0	572	0
30	994	0		609	957	4,820	0	719	452	0	577	0
31	582	0		0		4,830		709	308		576	
Total	32,102	17,153	15,688	21,639	31,748	24,277	19,073	22,326	9,408	2,696	12,317	325
Mean	1,036	553	541	698	1,058	783	636	720	303	89.9	397	10.8

Year total 208,752 cfs-days

Mean 570 cfs

Table 6. - Daily discharge, in cubic feet per second, of Neversink River at Neversink, N.Y. (01436000) for the year ending November 30, 1984. Preliminary U.S. Geological Survey record.

Mean values

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	5.5	4.4	24	24	45	42	870	46	56	63	46	41
2	5.2	4.2	24	24	50	44	593	45	68	47	46	24
3	4.6	13	24	24	51	49	447	43	79	46	46	25
4	4.6	24	24	24	48	47	260	44	90	46	46	25
5	4.6	24	24	25	49	42	49	44	89	46	47	25
6	5.0	24	25	24	49	43	45	43	89	46	47	25
7	4.9	24	25	24	46	44	46	42	91	46	48	25
8	4.9	24	25	25	46	45	55	42	84	46	48	25
9	5.0	24	25	25	47	45	64	41	73	46	49	25
10	5.0	24	25	25	48	43	66	42	80	46	49	25
11	5.0	24	25	25	48	42	64	42	92	48	49	25
12	5.0	24	25	24	47	41	66	43	92	46	48	24
13	5.7	24	25	24	46	40	63	51	86	46	47	24
14	5.2	24	25	24	46	41	63	65	73	47	48	23
15	4.8	24	27	24	46	41	63	66	71	48	49	24
16	4.7	24	26	26	46	41	63	66	70	49	47	24
17	4.7	24	25	25	588	41	63	66	70	49	47	24
18	4.7	24	25	25	878	41	49	58	62	47	47	24
19	4.6	24	25	25	557	41	43	49	47	45	48	24
20	4.6	24	26	25	266	41	45	48	47	46	49	23
21	4.7	24	25	25	254	41	45	47	48	49	53	23
22	4.8	24	24	26	50	42	45	56	49	49	51	24
23	4.8	24	25	24	48	43	42	72	47	46	47	24
24	4.8	24	25	24	48	43	42	72	46	47	47	24
25	4.7	24	24	24	56	43	42	58	46	48	46	24
26	4.7	24	23	24	46	43	42	45	48	48	47	24
27	4.7	24	24	24	44	43	43	45	49	47	47	24
28	4.7	24	25	24	43	44	44	45	48	46	47	24
29	4.5	24	24	24	43	242	51	46	47	46	47	24
30	4.5	24		24	43	2,730	46	48	57	46	47	24
31	4.5	24		30		1,560		42	72		47	
Total	149.7	693.6	718	764	3,722	5,728	3,519	1,562	2,066	1,421	1,477	743
Mean	4.83	22.4	24.8	24.6	124	185	117	50.4	66.6	47.4	47.6	24.8

Year total 22,563.3 cfs-days Mean 61.6 cfs

Table 7. - Daily discharge, in cubic feet per second, of the Delaware River at Montague, N.J. (01438500) for the year ending November 30, 1984. Preliminary U.S. Geological Survey record.

Mean values

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	6,950	4,700	1,700	7,370	5,800	7,060	40,200	8,650	2,820	1,890	1,720	1,970
2	5,630	4,000	1,900	6,400	6,570	6,100	26,500	15,700	3,180	1,670	1,480	1,240
3	4,550	3,800	1,900	5,720	7,790	5,590	20,300	9,560	2,990	1,740	1,120	1,830
4	4,080	3,900	2,000	5,080	9,670	11,200	16,400	6,850	3,030	1,940	1,900	1,680
5	4,150	3,600	2,400	5,110	34,100	16,000	12,600	5,290	2,400	2,050	1,910	1,810
6	4,850	3,500	3,200	5,270	64,300	13,400	10,300	5,290	2,410	1,840	1,700	1,950
7	11,400	3,300	3,700	5,570	40,300	11,900	8,930	9,990	3,010	1,790	1,860	2,060
8	13,500	2,600	3,700	4,830	27,600	10,500	7,780	9,460	2,970	1,710	1,710	2,070
9	9,650	2,600	3,100	4,420	20,500	12,000	6,530	7,390	3,080	1,740	1,690	1,950
10	7,690	3,000	3,100	3,870	16,200	12,100	5,020	6,250	2,590	1,700	1,760	1,920
11	6,010	3,100	2,700	3,400	13,700	10,600	4,580	5,630	2,550	1,660	1,780	1,820
12	5,390	3,000	2,600	3,260	12,000	9,150	4,940	5,100	1,990	1,670	1,860	1,920
13	16,400	3,300	3,300	3,860	10,700	9,220	4,430	5,010	2,160	1,700	1,800	1,940
14	57,100	3,200	6,000	4,050	9,660	9,940	4,620	4,520	2,490	1,800	1,890	1,690
15	38,600	2,600	30,000	4,090	10,200	11,400	4,420	3,820	2,250	1,920	1,870	1,870
16	22,900	2,400	50,600	4,820	15,200	10,900	3,940	3,630	2,130	1,930	2,040	1,720
17	15,300	2,900	28,900	5,650	27,600	9,740	2,850	3,830	2,590	1,730	1,920	1,640
18	12,000	2,700	19,500	5,120	25,100	8,810	2,890	4,120	2,290	1,650	2,050	1,760
19	10,200	2,700	15,300	5,470	21,100	7,580	3,640	4,580	1,940	1,810	2,080	1,770
20	8,410	2,700	15,500	5,930	21,100	6,580	3,290	4,310	1,960	1,790	1,910	1,920
21	7,230	2,600	13,800	6,920	18,400	6,940	2,250	3,640	2,060	1,760	1,940	1,780
22	6,300	2,200	11,300	10,400	14,800	7,460	1,930	2,230	2,180	1,790	1,800	1,710
23	6,700	1,900	9,770	10,300	13,100	6,440	1,790	2,260	2,060	1,770	2,100	1,720
24	6,700	2,200	10,200	8,490	12,900	8,010	1,970	3,320	1,970	1,700	2,380	1,710
25	6,000	2,300	10,200	6,900	12,200	7,680	2,210	3,080	2,040	1,850	1,870	1,660
26	5,200	2,700	8,970	6,870	11,300	6,490	2,230	2,730	1,700	1,910	1,640	1,770
27	4,800	2,900	7,970	6,780	10,100	6,250	1,940	2,750	1,720	1,860	1,990	1,740
28	4,500	3,300	7,610	6,590	8,790	5,520	1,690	3,410	1,920	1,640	1,800	1,750
29	5,000	2,400	8,080	7,230	7,040	36,500	1,710	3,300	1,980	1,670	1,820	2,230
30	6,100	1,900		7,170	6,720	82,700	4,400	2,600	1,930	1,710	1,790	6,680
31	5,900	1,800		6,450		61,900		3,070	2,150		1,620	
Total	329,190	89,800	289,000	183,390	514,540	435,660	216,280	161,370	72,540	53,390	56,800	59,280
Mean	10,620	2,897	9,966	5,916	17,150	14,050	7,209	5,205	2,340	1,780	1,832	1,976

Year total 2,461,240 cfs-days Mean 6,725 cfs

Table 8. - Daily discharge, in cubic feet per second, of Delaware & Raritan Canal at Kingston, N.J. (01460500) for the year ending November 30, 1984. Preliminary U.S. Geological Survey record.

Mean values

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	107	87	79	85	61	42	54	0	66	0	0	20
2	107	86	79	83	57	54	54	42	63	0	38	20
3	107	85	79	82	50	53	43	59	63	0	54	0
4	107	85	84	82	47	54	45	60	0	0	37	0
5	108	85	84	82	65	49	50	52	28	22	10	48
6	105	85	84	85	60	46	50	59	78	17	9.5	71
7	106	86	83	83	58	46	52	34	55	17	0	71
8	108	85	82	82	58	49	50	88	66	22	0	70
9	108	85	81	82	56	46	72	65	66	0	0	55
10	107	85	79	82	54	49	61	74	50	0	0	33
11	107	87	79	82	49	48	58	46	60	0	0	18
12	106	84	79	81	43	50	57	66	63	0	0	28
13	106	81	80	82	42	49	9.0	57	62	0	0	33
14	106	81	79	85	40	45	0	57	64	0	0	34
15	97	81	84	82	39	46	0	59	64	28	0	34
16	98	81	85	71	41	48	0	59	67	0	0	34
17	100	81	84	54	42	48	0	61	61	21	0	25
18	98	80	82	33	41	46	28	37	37	33	0	15
19	93	80	81	37	40	48	42	61	26	13	0	24
20	89	82	81	54	40	49	45	68	32	6.8	0	23
21	88	83	80	52	39	47	45	42	23	0	0	22
22	95	82	80	49	38	48	14	64	0	0	0	25
23	88	81	79	45	37	48	0	65	13	0	0	21
24	86	79	82	39	38	51	0	46	21	0	0	21
25	86	78	82	37	40	56	40	64	18	0	0	21
26	86	79	82	36	42	46	86	47	0	0	0	15
27	84	81	81	37	43	47	53	0	0	0	0	11
28	86	81	86	38	45	46	38	78	0	0	0	30
29	90	81	87	51	45	40	0	61	0	0	0	58
30	85	80		63	44	19	0	67	0	0	32	73
31	88	79		60		59		55	0		24	
Total	3,036	2,556	2,367	1,996	1,394	1,472	1,046.0	1,693	1,146	179.8	204.5	953
Mean	97.9	82.5	81.6	64.4	46.5	47.5	34.9	54.6	37.0	5.99	6.60	31.8

Year total 18,043.3 cfs-days Mean 49.3 cfs

Note: December 1, 1984 to March 17, 1985 flow is diversion from the Delaware River. March 18 to November 30, 1985 flow is from Raritan River basin.

Table 9. - Daily discharge, in cubic feet per second, of Delaware River at Trenton, N.J. (01463500) for the year ending November 30, 1984. Preliminary U.S. Geological Survey record.

Mean values

Day	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.
1	20,500	15,300	6,010	18,100	19,800	13,900	96,200	12,700	7,910	4,880	3,260	3,660
2	17,500	13,100	5,270	16,100	18,700	14,000	67,200	23,200	7,340	4,650	3,510	3,400
3	14,800	12,000	5,080	14,000	19,400	12,600	46,800	25,500	7,180	4,030	3,780	3,760
4	16,500	11,200	9,670	12,900	20,400	25,500	37,700	19,100	7,710	4,060	3,410	3,420
5	18,300	10,900	13,200	12,200	53,200	39,700	30,400	15,400	7,580	4,780	2,850	4,190
6	15,400	10,100	9,610	13,000	121,000	34,400	23,700	20,100	7,550	4,570	3,320	4,350
7	18,400	9,570	8,550	13,400	101,000	27,400	20,200	49,300	7,000	4,250	3,390	4,210
8	24,700	8,890	8,610	12,600	69,800	24,100	17,600	34,500	7,500	3,870	3,190	4,130
9	25,200	7,630	8,010	11,800	54,400	25,800	15,600	26,300	7,040	3,710	3,360	4,150
10	19,900	7,200	7,390	10,600	44,500	25,500	14,000	19,900	7,100	3,570	3,260	4,100
11	16,600	8,110	7,330	10,100	36,300	23,500	12,100	16,800	6,840	3,600	3,200	4,220
12	16,200	7,530	9,880	9,270	28,700	20,700	10,700	17,700	6,750	3,550	3,190	3,920
13	45,100	6,830	9,790	8,910	24,300	18,700	10,600	15,700	6,110	3,430	3,190	3,610
14	88,200	6,210	10,200	15,600	21,600	18,100	10,200	14,100	5,860	3,360	3,250	3,560
15	102,000	7,160	26,100	14,200	19,800	18,800	9,750	12,000	5,840	3,450	3,180	3,570
16	69,000	6,480	79,500	13,600	24,200	19,200	9,470	11,000	5,610	3,570	3,270	3,300
17	49,300	5,710	71,500	13,900	33,800	18,000	8,900	11,600	5,150	3,920	3,230	3,330
18	36,800	5,900	48,800	14,400	41,900	16,400	8,510	10,900	5,230	3,600	3,420	3,150
19	28,100	6,360	36,300	13,500	37,900	15,300	9,350	15,500	5,310	3,330	3,320	3,090
20	23,800	6,250	28,600	13,400	34,600	14,100	9,470	13,800	5,010	3,210	3,490	3,150
21	19,300	5,720	27,400	14,300	32,900	16,000	8,640	13,500	4,900	3,310	3,600	3,140
22	20,800	5,210	24,400	17,100	28,300	14,700	7,310	12,000	4,880	3,280	3,640	3,270
23	23,100	5,470	21,200	20,800	24,900	14,600	6,330	9,470	4,930	3,220	5,300	3,140
24	19,200	5,550	22,600	20,100	23,600	15,200	5,970	8,400	5,430	3,220	5,330	2,990
25	16,000	7,000	23,400	17,300	22,400	15,700	13,300	8,550	4,980	3,240	4,540	3,050
26	12,300	8,960	20,800	15,400	21,200	14,900	13,000	8,190	4,750	3,160	4,440	3,020
27	10,900	9,590	18,300	14,600	19,500	14,400	9,270	10,100	4,540	3,240	3,890	3,020
28	12,000	9,280	18,800	15,000	17,800	13,300	7,640	11,400	4,210	3,380	3,600	3,150
29	23,900	8,260	19,400	20,600	16,400	26,000	6,800	9,970	4,080	3,400	4,330	3,440
30	20,900	6,890		20,700	14,700	130,000	6,110	9,180	4,030	3,180	4,250	4,270
31	17,500	6,160		19,500		129,000		8,180	4,270		3,910	
Total	862,200	250,520	605,700	456,980	1,047,000	829,500	552,820	494,040	182,620	110,020	112,900	106,760
Mean	27,810	8,081	20,890	14,740	34,900	26,760	18,430	15,940	5,891	3,667	3,642	3,559

Year total 5,611,060 cfs-days Mean 15,330 cfs

Table 10. - Storage in Pepacton Reservoir, N.Y., for year ending November 30, 1984
(Storage in millions of gallons above elevation 1,152.00 ft. Add 7,711 million gallons for total contents above sill of outlet tunnel, elevation 1,126.50 ft.)
(River Master daily operations record; gage reading at 0900)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	62,851	79,387	75,467	103,058	107,976	140,412	142,789	133,168	123,739	113,387	101,320	87,681
2	62,935	79,250	75,281	103,484	108,395	140,320	142,136	132,988	123,394	112,992	100,854	86,980
3	62,959	79,128	75,123	103,878	108,927	140,246	141,784	132,630	122,946	112,646	100,420	86,394
4	62,959	78,912	75,294	104,193	109,673	140,505	141,506	132,273	122,567	112,349	100,017	85,840
5	62,947	78,884	75,560	104,558	110,762	140,931	141,079	131,916	122,138	111,972	99,583	85,386
6	62,851	78,844	75,971	104,971	116,429	140,968	140,801	131,542	121,728	111,613	99,152	84,947
7	63,954	78,763	76,263	105,288	119,801	140,931	140,542	131,399	121,232	111,171	98,722	84,440
8	64,764	78,668	76,489	105,511	121,916	140,820	140,412	131,345	120,804	110,795	98,261	83,991
9	65,238	78,532	76,703	105,828	123,429	141,154	140,209	131,452	120,344	110,355	97,817	83,457
10	65,580	78,451	76,904	106,020	124,534	141,228	140,061	131,470	119,902	109,965	97,359	83,025
11	65,751	78,329	77,185	106,212	125,437	141,191	139,877	131,167	119,461	109,511	96,917	82,677
12	65,849	78,167	77,722	106,052	126,272	141,116	139,583	130,954	119,172	109,267	96,491	82,246
13	66,757	77,964	78,275	105,924	127,006	141,246	139,289	130,599	118,766	108,830	96,038	81,816
14	71,635	77,816	79,182	105,892	127,688	141,394	139,013	130,227	118,378	108,460	95,630	81,264
15	75,110	77,668	82,162	105,733	128,726	141,450	138,590	129,802	118,479	108,137	95,131	81,795
16	76,998	77,494	87,481	105,638	129,997	141,246	138,333	129,394	118,226	107,750	94,665	80,288
17	78,086	77,279	90,702	105,574	133,671	141,024	138,023	128,972	117,973	107,348	94,246	79,714
18	78,763	77,091	92,784	105,511	136,417	140,857	137,603	128,603	117,636	106,916	93,797	79,155
19	79,250	76,890	94,501	105,447	138,351	140,746	137,329	128,356	117,266	106,500	93,363	78,532
20	79,455	76,716	95,781	105,399	140,116	140,579	137,001	127,952	117,215	106,052	92,918	78,031
21	79,523	76,475	96,994	105,558	140,931	140,690	136,617	127,600	116,931	105,622	92,443	77,440
22	79,619	76,237	97,984	106,036	141,098	140,598	136,236	127,251	116,613	105,193	92,071	76,796
23	79,796	76,024	98,799	106,500	141,042	140,486	135,837	126,936	116,395	104,732	91,835	76,130
24	79,796	75,865	99,552	106,724	141,005	140,709	135,384	126,552	116,144	104,320	91,467	75,493
25	79,632	75,878	100,234	106,964	140,968	140,616	135,312	126,098	115,876	103,909	91,085	74,847
26	79,496	75,998	100,900	107,124	140,839	140,524	134,968	125,714	115,559	103,452	90,614	74,177
27	79,318	75,984	101,414	107,316	140,764	140,505	134,606	125,385	115,210	103,042	90,161	73,511
28	79,155	75,905	101,961	107,428	140,616	140,505	134,175	125,228	114,844	102,602	89,709	72,821
29	79,455	75,812	102,602	107,605	140,542	142,323	133,797	124,899	114,446	102,180	89,301	72,394
30	79,564	75,719		107,799	140,468	144,249	133,509	124,517	114,130	101,742	88,764	73,055
31	79,510	75,600		107,847		143,779		124,135	113,816		88,259	
Change	+16,851	-3,910	+27,002	+5,245	+32,621	+3,311	-10,270	-9,374	-10,319	-12,074	-13,483	-15,204
Equiv. mgd	+543.6	-126.1	+931.1	+169.2	+1,087	+106.8	-342.3	-302.4	-332.9	-402.5	-434.9	-506.8
Equiv. cfs	+841	-195	+1,440	+262	+1,682	+165	-530	-468	-515	-623	-673	-784

Change for year +10,396 million gallons Equiv. for year +28.4 mgd Equiv. for year +43.9 cfs

Table 11. - Storage in Cannonsville Reservoir, N.Y., for year ending November 30, 1984
(Storage in millions of gallons above elevation 1,040.00 ft. Add 2,584 million gallons for total contents above sill of outlet tunnel, elevation 1,020.50 ft.)
(River Master daily operations record; gage reading at 0900)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	20,790	52,350	59,279	85,802	96,462	97,363	101,258	92,573	85,412	68,576	50,542	33,893
2	21,478	52,712	59,425	86,352	96,317	97,235	100,260	92,451	85,080	67,702	49,959	33,319
3	21,858	53,027	59,572	86,901	96,301	97,122	99,472	92,131	84,661	66,987	49,200	32,917
4	22,175	53,366	59,816	87,334	96,591	97,202	99,005	91,827	84,212	66,529	48,737	32,379
5	22,500	53,657	60,463	87,869	96,832	97,605	98,362	91,462	83,778	66,070	48,125	32,045
6	22,747	53,996	60,915	88,328	99,247	97,718	97,927	91,096	83,200	65,497	47,124	31,739
7	23,676	54,241	61,065	88,830	100,116	97,734	97,524	90,975	82,709	64,759	46,235	31,313
8	25,102	54,521	61,065	89,195	100,067	97,653	97,058	90,929	82,174	63,892	45,479	30,850
9	26,149	54,708	60,952	89,545	99,649	97,669	96,607	90,883	81,770	63,077	44,678	30,395
10	27,009	54,944	60,903	89,849	99,247	97,653	96,350	90,777	81,206	62,403	43,888	29,932
11	27,766	55,164	60,817	90,123	98,700	97,589	96,028	90,716	80,584	61,779	43,277	29,607
12	28,404	55,225	60,989	90,336	98,329	97,524	95,786	90,518	80,018	61,205	42,605	28,968
13	29,450	55,347	61,549	90,610	98,056	97,653	95,947	90,260	79,424	60,646	41,837	28,643
14	36,043	55,506	62,963	90,838	97,895	97,975	95,931	89,956	78,926	60,048	40,997	28,336
15	40,902	55,689	66,516	91,066	98,168	98,490	95,645	89,591	78,456	59,401	39,989	28,140
16	43,577	55,872	72,443	91,370	98,635	98,635	95,447	89,180	77,973	58,900	39,253	27,826
17	45,356	55,994	75,928	91,751	100,405	98,555	95,174	88,708	77,517	58,595	38,433	27,596
18	46,646	56,165	77,945	92,162	100,405	98,345	94,930	88,343	76,771	57,936	37,609	27,383
19	47,536	56,324	79,548	92,497	100,132	98,136	94,900	88,146	76,094	57,276	36,974	27,187
20	48,203	56,471	80,681	92,877	99,810	97,959	94,869	87,869	75,694	56,654	36,340	26,932
21	48,603	56,593	81,727	93,470	99,408	97,911	94,793	87,565	75,127	55,994	35,815	26,506
22	49,015	56,690	82,464	94,307	99,086	97,830	94,717	87,233	74,658	55,274	35,429	26,183
23	49,504	56,812	83,042	95,250	98,442	97,637	94,596	86,915	74,119	54,638	35,122	25,851
24	49,936	56,947	83,489	95,947	98,281	97,701	94,459	86,438	73,676	54,124	34,964	25,528
25	50,157	57,142	83,880	96,623	98,184	97,605	94,474	86,005	73,106	53,599	34,706	25,102
26	50,262	57,569	84,270	96,961	98,088	97,138	94,398	85,615	72,404	53,050	34,310	24,711
27	50,344	57,997	84,574	97,202	97,911	96,784	94,291	85,499	71,914	52,549	34,191	24,255
28	50,496	58,290	84,791	97,138	97,734	96,543	93,896	85,759	71,318	52,024	34,131	23,938
29	50,869	58,595	85,152	97,170	97,573	98,023	93,303	85,875	70,656	51,243	34,201	23,846
30	51,534	58,803		97,090	97,428	101,822	92,938	85,889	70,059	50,554	34,052	24,804
31	52,024	59,059		96,720		102,224		85,672	69,450		33,844	
Change	+32,060	+7,035	+26,093	+11,568	+708	+4,796	-9,286	-7,266	-16,222	-18,896	-16,710	-9,040
Equiv. mgd	+1,034	+226.9	+899.8	+373.2	+23.6	+154.7	-309.5	-234.4	-523.3	-629.9	-539.0	-301.3
Equiv. cfs	+1,600	+351	+1,392	+577	+36.5	+239	-479	-363	-810	-974	-834	-466

Change for year +4,840 million gallons Equiv. for year +13.2 mgd Equiv. for year +20.4 cfs

Table 12. - Storage in Neversink Reservoir, N.Y. for year ending November 30, 1984
(Storage in millions of gallons above elevation 1,319.00. Add 525 million gallons for total contents above sill of outlet tunnel, elevation 1,314.00 ft.)
(River Master daily operation record; gage reading at 0900)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	14,643	20,294	19,177	26,481	27,974	34,023	35,254	31,044	28,040	23,028	18,668	14,439
2	14,677	20,298	19,109	26,523	28,092	33,857	35,175	31,021	27,896	22,854	18,551	14,337
3	14,706	20,298	19,058	26,562	28,228	33,659	35,140	30,942	27,853	22,685	18,388	14,321
4	14,702	20,294	19,094	26,566	28,381	33,664	35,125	30,883	27,550	22,583	18,261	14,187
5	14,702	20,279	19,195	26,562	28,707	33,862	34,798	30,800	27,378	22,439	18,148	14,083
6	14,696	20,272	19,202	26,633	32,852	33,804	34,635	30,707	27,210	22,283	18,015	14,126
7	15,171	20,253	19,195	26,672	33,911	33,702	34,586	30,703	27,039	22,178	17,907	14,135
8	15,528	20,216	19,163	26,655	34,433	33,877	34,512	30,749	26,868	22,085	17,778	14,144
9	15,655	20,172	19,105	26,667	34,793	33,862	34,414	30,698	26,693	21,837	17,667	14,138
10	15,765	20,131	19,087	26,638	34,803	33,804	34,301	30,615	26,519	21,589	17,553	14,046
11	15,860	20,105	19,066	26,617	34,695	33,702	34,174	30,561	26,359	21,416	17,425	13,942
12	15,906	20,053	19,051	26,566	34,512	33,562	34,023	30,483	26,194	21,264	17,309	13,856
13	16,146	19,983	19,062	26,549	34,331	33,465	33,857	30,437	26,030	21,093	17,172	13,753
14	17,812	19,950	19,102	26,553	34,179	33,384	33,707	30,296	25,900	20,934	17,049	13,635
15	18,828	19,913	19,950	26,540	34,042	33,288	33,557	30,218	25,779	20,765	16,904	13,538
16	19,250	19,854	22,287	26,532	34,018	33,173	33,408	30,132	25,620	20,607	16,776	13,439
17	19,518	19,796	23,349	26,545	35,160	33,009	33,225	29,987	25,491	20,421	16,635	13,331
18	19,664	19,741	23,894	26,549	35,254	32,985	33,062	29,846	25,275	20,272	16,534	13,218
19	19,789	19,697	24,258	26,540	35,229	32,971	32,943	29,751	25,076	20,150	16,504	13,099
20	19,862	19,635	24,731	26,549	35,130	32,957	32,790	29,625	24,936	20,028	16,487	12,989
21	19,880	19,573	25,097	26,680	35,110	32,976	32,619	29,504	24,764	19,909	16,192	12,883
22	19,939	19,500	25,358	26,881	34,936	32,962	32,448	29,383	24,604	19,781	16,014	12,769
23	20,009	19,427	25,520	27,009	34,961	32,928	32,264	29,253	24,466	19,653	15,942	12,658
24	20,076	19,373	25,674	27,069	34,887	32,971	32,080	29,106	24,307	19,536	15,840	12,545
25	20,087	19,398	25,883	27,098	34,862	32,962	31,995	28,941	24,149	19,413	15,723	12,430
26	20,076	19,424	26,060	27,150	34,749	32,938	31,855	28,791	23,999	19,286	15,493	12,309
27	20,076	19,402	26,177	27,279	34,625	32,919	31,681	28,667	23,850	19,159	15,162	12,201
28	20,072	19,362	26,253	27,412	34,468	32,881	31,518	28,575	23,689	19,037	15,012	12,087
29	20,198	19,319	26,414	27,598	34,316	33,533	31,327	28,451	23,521	18,911	14,869	12,076
30	20,290	19,264		27,728	34,208	35,563	31,169	28,315	23,365	18,793	14,646	12,389
31	20,298	19,239		27,857		35,413		28,175	23,206		14,558	
Change	+5,734	-1,059	+7,175	+1,443	+6,351	+1,205	-4,244	-2,994	-4,969	-4,413	-4,235	-2,169
Equiv. mgd	+185.0	-34.2	+247.4	+46.5	+211.7	+38.9	-141.5	-96.6	-160.3	-147.1	-136.6	-72.3
Equiv. cfs	+286	-52.9	+383	+71.9	+327	+60.2	-219	-149	-248	-228	-211	-112

Change for year -2,175 million gallons Equiv. for year - 5.94 mgd Equiv. for year -9.19 cfs

Table 13. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master Daily Operation Record)

Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average to date Nov. 9 to Dec. 19 or Dec. 20-31	Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average Dec. 20, 1983 to date
Dec. 1	451	0	127	658	Jan. 1	450	0	100	678
2	451	161	121	661	2	450	0	95	669
3	451	203	120	665	3	450	0	89	660
4	451	204	120	670	4	298	0	95	643
5	449	204	111	673	5	303	0	99	629
6	448	207	123	677	6	292	0	88	615
7	448	206	89	679	7	292	0	94	603
8	449	52	114	677	8	292	0	103	593
9	451	0	99	673	9	312	0	92	584
10	452	0	70	668	10	308	0	92	576
11	452	0	100	665	11	304	104	98	573
12	450	164	96	666	12	301	0	96	565
13	451	164	95	667	13	293	0	90	558
14	450	164	109	669	14	292	0	98	551
15	450	165	95	670	15	293	0	96	545
16	450	166	90	671	16	312	0	93	540
17	451	166	100	672	17	312	0	99	536
18	451	166	110	673	18	300	0	98	531
19	452	167	92	674	19	298	0	95	527
20	450	167	99	716	20	308	0	93	523
21	451	168	94	714	21	309	0	94	519
22	451	168	102	717	22	309	0	94	516
23	450	169	94	716	23	295	0	93	512
24	451	169	104	717	24	292	0	90	509
25	451	170	89	716	25	298	0	104	506
26	451	170	93	716	26	291	0	89	502
27	450	170	100	716	27	299	0	101	500
28	450	170	96	716	28	300	0	99	497
29	450	169	94	716	29	300	0	100	495
30	451	0	100	701	30	297	0	88	492
31	451	0	106	689	31	318	0	91	490
Total	13,965	4,249	3,152			9,768	104	2,946	

Table 13. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master Daily Operation Record)

Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average Dec. 20, 1983 to date	Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average Dec. 20, 1983 to date
Feb. 1	305	0	89	488	Mar. 1	0	0	94	464
2	299	0	94	486	2	0	0	92	459
3	299	59	91	485	3	0	0	91	455
4	259	0	95	482	4	0	0	92	450
5	0	0	103	475	5	0	0	103	445
6	0	227	95	471	6	0	0	88	441
7	0	289	90	470	7	0	0	93	436
8	0	289	105	468	8	0	0	90	432
9	0	288	98	467	9	0	0	98	428
10	0	372	101	467	10	43	0	96	424
11	0	399	97	467	11	350	0	99	425
12	0	400	100	468	12	350	0	88	425
13	0	400	95	468	13	264	0	84	424
14	0	400	97	469	14	358	0	89	424
15	0	403	92	469	15	347	0	91	424
16	0	401	87	470	16	354	0	105	425
17	0	403	95	470	17	354	0	99	425
18	0	403	97	471	18	353	0	76	425
19	0	404	85	471	19	371	0	93	425
20	0	404	71	471	20	371	0	35	425
21	0	404	89	471	21	368	0	112	426
22	0	404	93	472	22	315	0	105	426
23	0	406	91	472	23	475	0	101	427
24	0	406	94	472	24	375	0	97	428
25	0	407	90	473	25	376	0	97	428
26	0	407	93	473	26	350	0	0	428
27	0	407	91	474	27	348	215	0	429
28	0	408	89	474	28	345	232	0	430
29	0	85	83	470	29	324	232	0	432
					30	387	488	0	436
					31	275	498	0	439
Total	1,162	8,875	2,690			7,453	1,665	2,308	

Table 13. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master Daily Operation Record)

Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average Dec. 20, 1983 to date	Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average Dec. 20, 1983 to date
Apr. 1	0	498	0	440	May 1	400	0	312	437
2	0	494	0	440	2	401	0	330	440
3	0	497	0	441	3	401	0	302	442
4	0	496	0	441	4	400	0	347	444
5	0	45	0	438	5	400	0	342	446
6	0	0	0	434	6	400	0	310	448
7	0	0	0	430	7	400	0	0	447
8	0	0	0	426	8	0	0	333	447
9	0	0	268	424	9	0	0	296	446
10	0	0	302	423	10	0	0	301	445
11	0	0	361	423	11	0	0	324	444
12	0	0	362	422	12	0	0	333	443
13	0	0	358	422	13	0	0	327	442
14	0	0	364	421	14	0	0	320	441
15	0	0	386	421	15	354	0	321	443
16	0	0	244	419	16	444	0	320	445
17	0	0	0	416	17	449	0	159	446
18	0	0	8	413	18	449	0	153	447
19	0	0	306	412	19	449	0	145	448
20	402	0	266	414	20	449	0	159	449
21	402	0	359	417	21	449	0	167	450
22	402	0	197	418	22	450	0	142	451
23	401	0	323	420	23	449	0	149	452
24	400	0	261	422	24	450	139	153	454
25	399	0	329	425	25	448	421	144	458
26	400	0	304	427	26	450	491	159	462
27	400	0	317	429	27	449	493	147	465
28	383	0	310	431	28	450	495	0	468
29	401	0	276	433	29	450	94	0	469
30	400	0	338	435	30	0	0	0	466
					31	0	0	0	463
Total	4,390	2,030	6,239			9,441	2,133	6,495	

Table 13. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master Daily Operation Record)

Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1984 to date	Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1984 to date
June 1	0	0	0	0	July 1	452	232	213	711
2	0	0	0	0	2	451	229	120	714
3	0	0	0	0	3	450	228	123	717
4	411	0	465	219	4	451	228	121	719
5	452	152	316	359	5	447	228	122	722
6	449	182	197	437	6	448	227	122	724
7	449	180	195	493	7	279	67	121	717
8	450	177	207	535	8	0	0	123	701
9	451	177	205	568	9	319	0	123	694
10	451	177	197	594	10	377	0	117	689
11	449	176	203	615	11	443	175	125	691
12	455	175	211	634	12	450	233	116	693
13	451	177	218	650	13	450	233	174	697
14	452	177	196	663	14	449	234	96	699
15	440	176	191	672	15	451	233	97	701
16	449	176	202	682	16	451	230	152	704
17	449	176	198	690	17	451	229	153	706
18	449	33	199	690	18	451	228	149	709
19	450	0	193	687	19	451	228	148	711
20	451	0	196	685	20	452	227	147	714
21	450	0	216	684	21	451	227	149	716
22	450	0	185	682	22	452	227	144	718
23	450	0	207	681	23	452	226	152	720
24	450	0	220	681	24	454	227	150	722
25	450	0	212	680	25	450	225	146	724
26	450	0	205	679	26	449	39	156	722
27	452	193	195	685	27	448	0	151	720
28	453	235	204	692	28	448	0	149	718
29	452	232	203	699	29	449	0	158	716
30	453	232	201	705	30	455	179	148	717
					31	449	179	146	718
Total	12,118	3,203	5,837			13,130	5,218	4,311	

Table 13. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master Daily Operation Record)

Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1984 to date	Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1984 to date
Aug. 1	451	176	155	719	Sept.1	448	275	156	765
2	450	174	24	718	2	448	275	158	767
3	451	174	291	721	3	448	274	156	768
4	451	174	156	722	4	451	274	145	769
5	450	173	149	723	5	451	272	153	770
6	449	173	160	724	6	462	273	99	771
7	451	173	147	725	7	450	275	78	771
8	450	172	153	725	8	452	276	239	773
9	450	275	166	728	9	452	275	241	775
10	450	281	135	730	10	450	276	163	776
11	449	281	152	732	11	450	277	152	777
12	449	281	161	734	12	450	275	159	778
13	450	279	150	736	13	447	0	156	776
14	451	279	133	738	14	447	0	156	775
15	451	279	153	739	15	448	0	162	773
16	449	277	115	741	16	447	0	169	772
17	449	277	202	743	17	454	0	126	770
18	449	277	192	745	18	453	0	107	768
19	448	276	155	747	19	450	0	107	766
20	449	275	149	749	20	449	0	112	764
21	456	279	157	750	21	452	0	104	762
22	450	275	150	752	22	452	0	108	761
23	450	275	165	754	23	452	0	109	759
24	449	275	152	755	24	450	0	107	757
25	449	275	145	756	25	450	0	108	756
26	450	275	142	758	26	449	0	108	754
27	450	275	151	759	27	447	0	106	752
28	451	275	166	760	28	448	0	108	751
29	451	276	153	762	29	448	0	105	749
30	448	276	151	763	30	449	0	109	747
31	448	275	155	764					
Total	13,949	7,757	4,785			13,504	3,297	4,066	

Table 13. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master Daily Operation Record)

Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1984 to date	Date 1984	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1984 to date
Oct. 1	451	273	112	748	Nov. 1	449	0	91	735
2	451	169	161	748	2	448	0	0	734
3	451	167	105	748	3	448	0	125	733
4	451	166	94	748	4	447	0	124	732
5	451	167	96	748	5	451	0	15	730
6	450	168	95	747	6	451	0	0	728
7	450	167	102	747	7	451	0	0	726
8	450	167	97	747	8	452	0	0	725
9	451	167	105	747	9	451	164	130	725
10	451	165	105	746	10	451	210	78	725
11	448	166	105	746	11	451	210	117	725
12	450	165	114	746	12	451	209	128	726
13	450	164	106	746	13	444	208	102	726
14	449	164	121	746	14	265	204	126	725
15	449	164	106	746	15	315	205	113	724
16	449	157	107	745	16	413	204	112	724
17	451	157	105	745	17	451	203	117	725
18	450	160	0	744	18	451	203	136	725
19	450	38	5	742	19	449	202	101	725
20	451	0	270	742	20	449	203	113	725
21	450	0	168	741	21	448	203	115	726
22	449	11	110	740	22	448	202	110	726
23	451	153	104	740	23	448	202	118	726
24	452	168	111	740	24	449	203	117	726
25	448	245	252	741	25	449	202	121	727
26	451	16	330	742	26	455	202	117	727
27	469	0	126	741	27	451	200	113	727
28	451	0	151	740	28	451	199	118	727
29	450	0	220	739	29	449	201	114	728
30	450	0	68	738	30	452	202	118	728
31	450	0	114	737					
Total	13,975	3,704	3,865			13,138	4,441	2,889	

Table 14.-- New York City Reservoir release design data

(River Master daily operation record)

Date of advance estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases: Powerplant release forecasts: Lake Wallenpaupack cfs	Powerplant release forecasts: Mongaup Reservoir cfs	Uncontrolled runoff: Present conditions cfs	Uncontrolled runoff: Weather adjustment cfs	Date	Discharge cfs	Indicated deficiency cfs	Balancing adjustment cfs	Directed release: Daily cfs	Directed release: Cumulative cfs	Actual deficiency: Daily cfs	Actual deficiency: Cumulative cfs	Cumulative difference cfs-days	Balancing adjustment cfs
1983/84	1	2	3	4		5	6	7	8	9	10	11	12	13

MONTAGUE DESIGN RATE = 1,655 CFS DECEMBER 1-19,

1,750 CFS DECEMBER 20, 1983 TO JUNE 14, 1984

AND 1,860 CFS JUNE 15 TO NOVEMBER 13

December 1, 1983 to June 22, 1984 the estimated Montague discharge

was greater than the Montague design rate

June 18	0	259	1,383	256	June 21	1,898	0	-	0	0	125	125	-125	12
19	0	0	1,453	449	22	1,902	0	-	0	0	443	568	-568	57
20	0	130	1,403	0	23	1,533	327	-	327	327	553	1,121	-794	79
21	0	259	1,301	0	24	1,560	300	-	300	627	400	1,521	-894	89
22	0	259	1,092	28	25	1,379	481	12	493	1,120	182	1.703	-583	58
23	0	259	943	346	26	1,548	312	57	369	1,489	156	1,859	-370	37
24	0	259	876	696	27	1,831	29	79	108	1,597	418	2,277	-680	68
25	0	259	1,245	0	28	1,504	356	89	445	2,042	676	2,953	-911	91
26	0	0	1,099	208	29	1,307	553	58	611	2,653	772	3,725	-1,072	107
27	0	0	1,000	181	30	1,181	679	37	716	3,369	0	3,725	-356	36

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on weather forecasts.

Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = Design rate - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 13 (4 days earlier).
Col. 8 = 1,860 - Col. 5 + Col. 7, when positive; otherwise Col. 8 = 0.

Col. 9 = Summation of Col. 8.
Col. 10 = 1,860 - (Col. 9 + Col. 10 from Table 15), when positive; otherwise Col. 10 = 0.
Col. 11 = Summation of Col. 10.
Col. 12 = Col. 9 - Col. 11.
Col. 13 = Col. 12 divided by minus 10, limited to ±110.

Table 14.-- New York City Reservoir release design data - continued

(River Master daily operation record)

Date of advance estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases: Powerplant release forecasts: Lake Wallenpaupack cfs	Powerplant release forecasts: Mongaup Reservoir cfs	Uncontrolled runoff: Present conditions cfs	Uncontrolled runoff: Weather adjustment cfs	Date	Discharge cfs	Indicated deficiency cfs	Balancing adjustment cfs	Directed release: Daily cfs	Directed release: Cumulative cfs	Actual deficiency: Daily cfs	Actual deficiency: Cumulative cfs	Cumulative difference cfs-days	Balancing adjustment cfs
1984	1	2	3	4		5	6	7	8	9	10	11	12	13
June 28	0	0	894	308	July 1	1,202	658	68	726	4,095	0	3,725	370	-37
29	0	0	818	853	2	1,671	189	91	280	4,375	0	3,725	650	-65

JULY 3-21 estimated Montague discharge was greater than 1,860 cfs

July 19	0	0	1,810	0	22	1,810	50	-65	0	4,375	106	3,831	544	-54
20	0	194	1,442	77	23	1,713	147	-65	82	4,457	87	3,918	539	-54
21	943	389	1,400	349	24	3,081	0	-65	0	4,457	0	3,918	539	-54
22	943	389	1,338	68	25	2,738	0	-65	0	4,457	0	3,918	539	-54
23	943	0	1,178	49	26	2,170	0	-54	0	4,457	0	3,918	539	-54
24	943	0	1,089	27	27	2,049	0	-54	0	4,457	0	3,918	539	-54
25	943	0	1,069	86	28	2,098	0	-54	0	4,457	0	3,918	539	-54
26	0	0	839	627	29	1,466	394	-54	340	4,797	0	3,918	879	-88
27	0	259	1,000	114	30	1,373	487	-54	433	5,230	0	3,918	1,312	-110
28	709	454	1,974	241	31	3,378	0	-54	0	5,230	0	3.918	1.312	-110

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on weather forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,860 - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 13 (4 days earlier).
Col. 8 = 1,860 - Col. 5 + Col. 7, when positive; otherwise Col. 8 = 0.
Col. 9 = Summation of Col. 8.
Col. 10 = 1,860 - (Col. 9 + Col. 10 from Table 15), when positive; otherwise Col. 10 = 0.
Col. 11 = Summation of Col. 10.
Col. 12 = Col. 9 - Col. 11.
Col. 13 = Col. 12 divided by minus 10, limited to ±110.

Table 14.-- New York City Reservoir release design data - continued

(River Master daily operation record)

Date of advance estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases: Powerplant release forecasts: Lake Wallenpaupack	Powerplant release forecasts: Mongaup Reservoir	Uncontrolled runoff: Present conditions	Uncontrolled runoff: Weather adjustment	Date	Discharge	Indicated deficiency	Balancing adjustment	Directed release: Daily	Directed release: Cumulative	Actual deficiency: Daily	Actual deficiency: Cumulative	Cumulative difference	Balancing adjustment
	cfs	cfs	cfs	cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs-days	cfs
1984	1	2	3	4		5	6	7	8	9	10	11	12	13
July 29	709	518	1,736	68	Aug. 1	3,031	0	-54	0	5,230	0	3,918	1,312	-110
30	709	259	1,422	0	2	2,390	0	-88	0	5,230	0	3,918	1,312	-110
31	709	259	1,193	23	3	2,184	0	-110	0	5,230	0	3,918	1,312	-110
Aug. 1	709	130	1,059	0	4	1,898	0	-110	0	5,230	0	3,918	1,312	-110
2	0	0	1,117	49	5	1,166	694	-110	584	5,814	349	4,267	1,547	-110
3	0	54	1,102	34	6	1,190	670	-110	560	6,374	349	4,616	1,758	-110
4	473	259	1,323	84	7	2,139	0	-110	0	6,374	0	4,616	1,758	-110
5	473	259	1,546	68	8	2,346	0	-110	0	6,374	0	4,616	1,758	-110
6	473	259	1,254	50	9	2,036	0	-110	0	6,374	0	4,616	1,758	-110
7	473	259	1,103	0	10	1,835	25	-110	0	6,374	10	4,626	1,748	-110
8	473	205	985	23	11	1,686	174	-110	64	6,438	0	4,626	1,812	-110
9	0	0	858	98	12	956	904	-110	794	7,232	762	5,388	1,844	-110
10	0	54	830	20	13	904	956	-110	846	8,078	620	6,008	2,070	-110
11	237	259	918	214	14	1,628	232	-110	122	8,200	245	6,253	1,947	-110
12	237	259	863	94	15	1,453	407	-110	297	8,497	373	6,626	1,871	-110
13	237	194	877	106	16	1,414	446	-110	336	8,833	357	6,983	1,850	-110
14	237	194	804	44	17	1,279	581	-110	471	9,304	3	6,986	2,318	-110
15	237	194	796	28	18	1,255	605	-110	495	9,799	410	7,396	2,403	-110
16	0	0	751	25	19	776	1,084	-110	974	10,773	882	8,278	2,495	-110
17	0	0	694	0	20	694	1,166	-110	1,056	11,829	945	9,223	2,606	-110
18	237	184	625	40	21	1,086	774	-110	664	12,493	454	9,677	2,816	-110
19	237	184	603	81	22	1,105	755	-110	645	13,138	314	9,991	3,147	-110
20	237	184	683	0	23	1,104	756	-110	646	13,784	474	10,465	3,319	-110
21	237	194	654	26	24	1,111	749	-110	639	14,423	539	11,004	3,419	-110
22	237	194	638	330	25	1,399	461	-110	351	14,774	355	11,359	3,415	-110
23	0	0	768	200	26	968	892	-110	782	15,556	913	12,272	3,284	-110
24	0	0	805	0	27	805	1,055	-110	945	16,501	1,056	13,328	3,173	-110
25	237	194	669	0	28	1,100	760	-110	650	17,151	600	13,928	3,223	-110
26	237	194	601	0	29	1,032	828	-110	718	17,869	571	14,499	3,370	-110
27	237	194	539	0	30	970	890	-110	780	18,649	658	15,157	3,492	-110
28	237	194	515	0	31	946	914	-110	804	19,453	511	15,668	3,785	-110

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on weather forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,860 - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 13 (4 days earlier).
Col. 8 = 1,860 - Col. 5 + Col. 7 when positive; otherwise Col. 8 = 0.
Col. 9 = Summation of Col. 8.
Col. 10 = 1,860 - (Col. 9 + Col. 10 from Table 15), when positive; otherwise Col. 10 = 0.
Col. 11 = Summation of Col. 10.
Col. 12 = Col. 9 - Col. 11.
Col. 13 = Col. 12 divided by minus 10, limited to ±110.

Table 14.-- New York City Reservoir release design data - continued

(River Master daily operation record)

Date of advance estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases: Powerplant release forecasts: Lake Wallenpaupack cfs	Powerplant release forecasts: Mongaup Reservoir cfs	Uncontrolled runoff: Present conditions cfs	Uncontrolled runoff: Weather adjustment cfs	Date	Discharge cfs	Indicated deficiency cfs	Balancing adjustment cfs	Directed release: Daily cfs	Directed release: Cumulative cfs	Actual deficiency: Daily cfs	Actual deficiency: Cumulative cfs	Cumulative difference cfs-days	Balancing adjustment cfs
1984	1	2	3	4		5	6	7	8	9	10	11	12	13
Aug.29	237	194	503	88	Sept.1	1,022	838	-110	728	20,181	677	16,345	3,836	-110
30	0	0	520	111	2	631	1,229	-110	1,119	21,300	1,320	17,665	3,635	-110
31	0	0	553	50	3	603	1,257	-110	1,147	22,447	1,238	18,903	3,544	-110
Sept.1	0	0	510	67	4	577	1,283	-110	1,173	23,620	1,086	19,989	3,631	-110
2	237	194	486	152	5	1,069	791	-110	681	24,301	518	20,507	3,794	-110
3	237	194	518	261	6	1,210	650	-110	540	24,841	580	21,087	3,754	-110
4	110	194	670	29	7	1,003	857	-110	747	25,588	846	21,933	3,655	-110
5	110	194	639	11	8	954	906	-110	796	26,384	955	22,888	3,496	-110
6	0	0	570	0	9	570	1,290	-110	1,180	27,564	1,316	24,204	3,360	-110
7	0	0	556	0	10	556	1,304	-110	1,194	28,758	1,337	25,541	3,217	-110
8	110	194	580	0	11	884	976	-110	866	29,624	1,052	26,593	3,031	-110
9	110	194	452	238	12	994	866	-110	756	30,380	922	27,515	2,865	-110
10	110	194	428	365	13	1,097	763	-110	653	31,033	789	28,304	2,729	-110
11	110	194	436	109	14	849	1,011	-110	901	31,934	948	29,252	2,682	-110
12	110	194	503	0	15	807	1,053	-110	943	32,877	857	30,109	2,768	-110
13	0	0	440	0	16	440	1,420	-110	1,310	34,187	1,219	31,328	2,859	-110
14	0	0	462	73	17	535	1,325	-110	1,215	35,402	1,298	32,626	2,776	-110
15	111	194	568	55	18	928	932	-110	822	36,224	998	33,624	2,600	-110
16	111	0	474	0	19	585	1,275	-110	1,165	37,389	1,178	34,802	2,587	-110
17	111	0	419	0	20	530	1,330	-110	1,220	38,609	1,254	36,056	2,553	-110
18	111	0	411	0	21	522	1,338	-110	1,228	39,837	1,295	37,351	2,486	-110
19	111	0	387	0	22	498	1,362	-110	1,252	41,089	1,290	38,641	2,448	-110
20	0	0	378	0	23	378	1,482	-110	1,372	42,461	1,429	40,070	2,391	-110
21	0	0	376	0	24	376	1,484	-110	1,374	43,835	1,482	41,552	2,283	-110
22	111	194	369	0	25	674	1,186	-110	1,076	44,911	1,097	42,649	2,262	-110
23	111	194	367	8	26	680	1,180	-110	1,070	45,981	1,038	43,687	2,294	-110
24	111	194	361	0	27	666	1,194	-110	1,084	47,065	1,101	44,788	2,277	-110
25	111	194	355	0	28	660	1,200	-110	1,090	48,155	1,318	46,106	2,049	-110
26	111	194	363	101	29	769	1,091	-110	981	49,136	1,183	47,289	1,847	-110
27	0	0	359	0	30	359	1,501	-110	1,391	50,527	1,578	48,867	1,660	-110

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on weather forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,860 - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 13 (4 days earlier).
Col. 8 = 1,860 - Col. 5 + Col. 7 when positive; otherwise Col. 8 = 0.
Col. 9 = Summation of Col. 8.
Col. 10 = 1,860 - (Col. 9 + Col. 10 from Table 15), when positive; otherwise Col. 10 = 0.
Col. 11 = Summation of Col. 10.
Col. 12 = Col. 9 - Col. 11.
Col. 13 = Col. 12 divided by minus 10, limited to ±110.

Table 14.-- New York City Reservoir release design data - continued

(River Master daily operation record)

Date of advance estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases: Powerplant release forecasts: Lake Wallenpaupack	Powerplant release forecasts: Mongaup Reservoir	Uncontrolled runoff: Present conditions	Uncontrolled runoff: Weather adjustment	Date	Discharge	Indicated deficiency	Balancing adjustment	Directed release: Daily	Directed release: Cumulative	Actual deficiency: Daily	Actual deficiency: Cumulative	Cumulative difference	Balancing adjustment
	cfs	cfs	cfs	cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs-days	cfs
1984	1	2	3	4		5	6	7	8	9	10	11	12	13
Sept.28	0	0	352	30	Oct.1	382	1,478	-110	1,368	51,895	1,516	50,383	1,512	-110
29	0	194	392	588	2	1,174	686	-110	576	52,471	946	51,329	1,142	-110
30	0	194	361	963	3	1,518	342	-110	232	52,703	976	52,305	398	-40
Oct. 1	0	194	324	61	4	579	1,281	-110	1,171	53,874	1,103	53,408	466	-47
2	443	194	313	0	5	950	910	-110	800	54,674	752	54,160	514	-51
3	443	194	392	0	6	1,029	831	-110	721	55,395	885	55,045	350	-35
4	0	0	299	0	7	299	1,561	-40	1,521	56,916	1,519	56,564	352	-35
5	0	0	339	0	8	339	1,521	-47	1,474	58,390	1,590	58,154	236	-24
6	249	0	366	21	9	636	1,224	-51	1,173	59,563	1,341	59,495	68	-7
7	249	0	353	0	10	602	1,258	-35	1,223	60,786	1,334	60,829	-43	+4
8	318	0	347	0	11	665	1,195	-35	1,160	61,946	1,269	62,098	-152	+15
9	565	0	311	0	12	876	984	-24	960	62,906	985	63,083	-177	+18
10	565	0	309	0	13	874	986	-7	979	63,885	1,035	64,118	-233	+23
11	424	0	230	0	14	654	1,206	4	1,210	65,095	1,242	65,360	-265	+26
12	424	0	238	0	15	662	1,198	15	1,213	66,308	1,252	66,612	-304	+30
13	212	0	237	0	16	449	1,411	18	1,429	67,737	1,288	67,900	-163	+16
14	213	194	239	0	17	646	1,214	23	1,237	68,974	1,213	69,113	-139	+14
15	213	194	256	0	18	663	1,197	26	1,223	70,197	1,053	70,166	31	-3
16	213	216	253	0	19	682	1,178	30	1,208	71,405	995	71,161	244	-24
17	425	194	234	0	20	853	1,007	16	1,023	72,428	972	72,133	295	-30
18	425	0	237	0	21	662	1,198	14	1,212	73,640	1,145	73,278	362	-36
19	425	0	219	71	22	715	1,145	-3	1,142	74,782	1,228	74,506	276	-28
20	425	194	271	0	23	890	970	-24	946	75,728	734	75,240	488	-49
21	425	194	276	94	24	989	871	-30	841	76,569	447	75,687	882	-88
22	425	194	343	542	25	1,504	356	-36	320	76,889	320	76,007	882	-88
23	425	194	735	150	26	1,504	356	-28	328	77,217	591	76,598	619	-62
24	213	194	646	226	27	1,279	581	-49	532	77,749	402	77,000	749	-75
25	567	0	588	60	28	1,215	645	-88	557	78,306	674	77,674	632	-63
26	567	0	578	0	29	1,145	715	-88	627	78,933	714	78,388	545	-54
27	567	194	645	118	30	1,524	336	-62	274	79,207	342	78,730	477	-46
28	567	194	625	96	31	1,482	378	-75	303	79,510	568	79,298	212	-21

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on weather forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,860 - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 13 (4 days earlier).
Col. 8 = 1,860 - Col. 5 + Col. 7 when positive; otherwise Col. 8 = 0.
Col. 9 = Summation of Col. 8.
Col. 10 = 1,860 - (Col. 9 + Col. 10 from Table 15), when positive; otherwise Col. 10 = 0.
Col. 11 = Summation of Col. 10.
Col. 12 = Col. 9 - Col. 11.
Col. 13 = Col. 12 divided by minus 10, limited to ±110.

Table 14.-- New York City Reservoir release design data - continued

(River Master daily operation record)

Date of advance estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases: Powerplant release forecasts: Lake Wallenpaupack	Powerplant release forecasts: Mongaup Reservoir	Uncontrolled runoff: Present conditions	Uncontrolled runoff: Weather adjustment	Date	Discharge	Indicated deficiency	Balancing adjustment	Directed release: Daily	Directed release: Cumulative	Actual deficiency: Daily	Actual deficiency: Cumulative	Cumulative difference	Balancing adjustment
	cfs	cfs	cfs	cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs-days	cfs
1984	1	2	3	4		5	6	7	8	9	10	11	12	13
Oct.29	0	194	580	56	Nov.1	830	1,030	-63	967	80,477	844	80,142	335	-34
30	567	194	617	40	2	1,418	442	-54	388	80,865	994	81,136	-271	+27
31	0	194	513	39	3	746	1,114	-48	1,006	81,931	1,119	82,255	-324	+32
Nov. 1	0	0	415	61	4	476	1,384	-21	1,363	83,294	1,499	83,754	-460	+46
2	0	0	475	11	5	486	1,374	-34	1,340	84,634	1,373	85,127	-493	+49
3	0	194	459	115	6	768	1,092	27	1,119	85,753	1,052	86,179	-426	+43
4	0	194	450	287	7	931	929	32	961	86,714	769	86,948	-234	+23
5	0	0	549	82	8	631	1,229	46	1,275	87,989	1,059	88,007	-18	+2
6	0	0	655	0	9	655	1,205	49	1,254	89,243	1,161	89,168	75	-8
7	0	0	646	0	10	646	1,214	43	1,257	90,500	1,177	90,345	155	-16
8	0	0	723	80	11	803	1,057	23	1,080	91,580	1,113	91,458	122	-12
9	0	0	659	174	12	833	1,027	2	1,029	92,609	949	92,407	202	-20
10	0	0	783	116	13	899	961	8	953	93,562	863	93,270	292	-29
					MONTAGUE DESIGN RATE = 1,750 CFS NOVEMBER 14 - 30									
11	0	0	950	29	14	979	771		771					
12	0	0	961	0	15	961	789		789					
13	0	0	955	0	16	955	795		795					
14	0	0	855	0	17	855	895		895					
15	0	0	769	0	18	769	981		981					
16	0	0	769	0	19	769	981		981					
17	0	0	758	0	20	758	992		992					
18	0	173	754	0	21	927	823		823					
19	0	0	739	0	22	739	1,011		1,011					
20	0	0	697	0	23	697	1,053		1,053					
21	0	0	669	0	24	669	1,081		1,081					
22	0	0	669	0	25	669	1,081		1,081					
23	0	0	581	0	26	581	1,169		1,169					
24	0	0	538	0	27	538	1,212		1,212					
25	0	0	520	0	28	520	1,230		1,230					
26	0	0	524	142	29	666	1,084		1,084					
27	0	0	526	244	30	770	980		980					

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on weather forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,860 - Col. 5, Nov. 1-13.
1,750 - Col. 5, Nov. 14-30.
Col. 7 = Col. 13 (4 days earlier); balancing adjustment (Cols. 7 and 9-13) not applicable after Nov. 13.
Col. 8 = Col. 6 + Col. 7, Nov. 1-13.
Col. 8 = Col. 6, Nov. 14-30.
Col. 9 = Summation of Col. 8.
Col. 10 = 1,860 - (Col. 9 + Col. 10 from Table 13) when positive; otherwise Col. 11 = 0.
Col. 11 = Summation of Col. 10.
Col. 12 = Col. 9 - Col. 11.
Col. 13 = Col. 12 divided by minus 10, limited to ±110.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow							
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallen-paupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncon-trolled	Total	Excess release credits	
Date	Amount								Directed	Other				Daily	Cumulative
1983	1	2	3	4		5	6		7	8	9	10	11	12	13
Nov. 28	0	6	25	6	Nov. 30	459	86	Dec. 1	0	37	545	6,368	6,950		
29	0	6	26	6	Dec. 1	0	286	2	0	38	286	5,336	5,660		
30	0	6	8	6	2	0	0	3	0	20	0	4,560	4,580		
Dec. 1	0	6	8	6	3	0	0	4	0	20	0	4,070	4,090		
2	0	6	8	6	4	0	0	5	0	20	0	4,150	4,170		
3	0	6	8	6	5	469	0	6	0	20	469	4,291	4,780		
4	0	6	8	5	6	581	0	7	0	19	581	10,900	11,500		
5	0	6	8	5	7	807	65	8	0	19	872	12,509	13,400		
6	0	6	8	5	8	621	518	9	0	19	1,139	8,472	9,630		
7	0	6	8	5	9	645	502	10	0	19	1,147	6,484	7,650		
8	0	6	8	5	10	0	259	11	0	19	259	5,692	5,970		
9	0	6	8	5	11	0	108	12	0	19	108	5,233	5,360		
10	0	6	8	5	12	736	518	13	0	19	1,254	15,027	16,300		
11	0	6	8	5	13	1,678	459	14	0	19	2,137	52,844	55,000		
12	0	6	8	5	14	1,676	518	15	0	19	2,194	36,087	38,300		
13	0	6	8	5	15	1,724	502	16	0	19	2,226	20,555	22,800		
14	0	6	8	5	16	1,717	502	17	0	19	2,219	13,062	15,300		
15	0	6	8	5	17	1,687	518	18	0	19	2,205	9,876	12,100		
16	0	6	8	5	18	1,708	518	19	0	19	2,226	7,955	10,200		
17	0	6	8	5	19	1,723	518	20	0	19	2,241	6,100	8,360		
18	0	6	8	5	20	1,727	518	21	0	19	2,245	4,926	7,190		
19	0	6	8	5	21	1,706	518	22	0	19	2,224	4,057	6,300		
20	0	6	8	5	22	1,825	486	23	0	19	2,311	4,370	6,700		
21	0	6	8	5	23	1,814	459	24	0	19	2,273	4,408	6,700		
22	0	6	8	5	24	1,740	356	25	0	19	2,096	3,885	6,000		
23	0	6	8	5	25	1,654	324	26	0	19	1,978	3,203	5,200		
24	0	6	8	5	26	1,458	389	27	0	19	1,847	2,934	4,800		
25	0	6	8	5	27	965	491	28	0	19	1,456	3,025	4,500		
26	0	6	8	5	28	941	367	29	0	19	1,308	3,673	5,000		
27	0	6	8	5	29	961	362	30	0	19	1,323	4,758	6,100		
28	0	6	8	5	30	961	378	31	0	19	1,339	4,542	5,900		
Total	0	186	283	161		31,983	10,525		0	630	42,508	283,352	326,490		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.

Col. 8 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J. - continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow						
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total	Excess release credits
Date	Amount								Directed	Other				Daily / Cumulative
1983/84	1	2	3	4		5	6		7	8	9	10	11	12 / 13
Dec. 29	0	6	8	5	Dec. 31	582	421	Jan. 1	0	19	1,003	3,678	4,700	
30	0	6	8	5	Jan. 1	618	319	2	0	19	937	3,044	4,000	
31	0	6	8	5	2	592	378	3	0	19	970	2,811	3,800	
Jan. 1	0	6	8	8	3	603	389	4	0	22	992	2,886	3,900	
2	0	8	20	26	4	474	265	5	0	54	739	2,807	3,600	
3	0	50	29	26	5	449	286	6	0	105	735	2,660	3,500	
4	0	50	29	26	6	444	238	7	0	105	682	2,513	3,300	
5	0	50	29	25	7	0	216	8	0	104	216	2,280	2,600	
6	0	56	29	25	8	0	243	9	0	110	243	2,247	2,600	
7	0	51	29	26	9	584	189	10	0	106	773	2,121	3,000	
8	0	50	29	26	10	684	259	11	0	105	943	2,052	3,100	
9	0	50	29	26	11	595	259	12	0	105	854	2,041	3,000	
10	0	53	29	25	12	825	270	13	0	107	1,095	2,098	3,300	
11	0	48	29	25	13	626	178	14	0	102	804	2,294	3,200	
12	0	51	29	26	14	499	0	15	0	106	499	1,995	2,600	
13	0	45	29	25	15	612	0	16	0	99	612	1,689	2,400	
14	0	50	29	25	16	825	0	17	0	104	825	1,971	2,900	
15	0	53	31	25	17	883	0	18	0	109	883	1,708	2,700	
16	0	50	32	25	18	907	0	19	0	107	907	1,686	2,700	
17	0	46	32	25	19	1,106	0	20	0	103	1,106	1,491	2,700	
18	0	48	32	25	20	1,031	0	21	0	105	1,031	1,464	2,600	
19	0	54	32	25	21	898	0	22	0	111	898	1,191	2,200	
20	0	50	32	25	22	697	0	23	0	107	697	1,096	1,900	
21	0	45	32	25	23	679	81	24	0	102	760	1,338	2,200	
22	0	50	32	25	24	726	92	25	0	107	818	1,375	2,300	
23	0	50	32	25	25	590	0	26	0	107	590	2,003	2,700	
24	0	54	32	25	26	609	0	27	0	111	609	2,180	2,900	
25	0	51	32	25	27	599	0	28	0	108	599	2,593	3,300	
26	0	43	32	25	28	0	0	29	0	100	0	2,300	2,400	
27	0	57	34	25	29	0	0	30	0	116	0	1,784	1,900	
28	0	53	34	25	30	0	0	31	0	112	0	1,588	1,700	
Total	0	1,340	851	705		17,737	4,083		0	2,896	21,820	64,984	89,700	

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.

Col. 8 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague							
								Segregation of flow						Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total		
Date	Amount								Directed	Other				Daily	Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
Jan. 29	0	54	34	25	Jan. 31	38	270	Feb. 1	0	113	308	1,279	1,700		
30	0	54	32	25	Feb. 1	100	308	2	0	111	408	1,381	1,900		
31	0	54	34	25	2	0	394	3	0	113	394	1,393	1,900		
Feb. 1	0	53	34	25	3	0	205	4	0	112	205	1,683	2,000		
2	0	50	34	25	4	0	81	5	0	109	81	2,210	2,400		
3	0	51	34	25	5	0	146	6	0	110	146	2,944	3,200		
4	0	51	34	25	6	0	389	7	0	110	389	3,201	3,700		
5	0	51	34	26	7	432	373	8	0	111	805	2,784	3,700		
6	0	51	34	26	8	360	259	9	0	111	619	2,370	3,100		
7	0	51	34	26	9	361	373	10	0	111	734	2,255	3,100		
8	0	51	34	26	10	312	227	11	0	111	539	2,050	2,700		
9	0	50	34	26	11	0	243	12	0	110	243	2,247	2,600		
10	0	50	34	26	12	61	11	13	0	110	72	3,118	3,300		
11	0	50	34	26	13	345	22	14	0	110	367	5,523	6,000		
12	0	50	34	26	14	544	146	15	0	110	690	29,200	30,000		
13	0	50	34	26	15	604	410	16	0	110	1,014	45,176	46,300		
14	0	50	34	26	16	932	389	17	0	110	1,321	25,169	26,600		
15	0	50	34	26	17	809	497	18	0	110	1,306	16,684	18,100		
16	0	48	34	26	18	964	491	19	0	108	1,455	12,837	14,400		
17	0	50	34	26	19	978	518	20	0	110	1,496	12,994	14,600		
18	0	54	34	26	20	978	508	21	0	114	1,486	11,600	13,200		
19	0	54	34	26	21	940	448	22	0	114	1,388	9,498	11,000		
20	0	53	32	26	22	939	508	23	0	111	1,447	8,072	9,630		
21	0	56	34	26	23	972	497	24	0	116	1,469	8,415	10,000		
22	0	54	34	26	24	970	502	25	0	114	1,472	8,414	10,000		
23	0	53	34	26	25	600	416	26	0	113	1,016	7,741	8,870		
24	0	53	34	26	26	585	464	27	0	113	1,049	6,728	7,890		
25	0	53	34	26	27	934	464	28	0	113	1,398	6,049	7,560		
26	0	51	34	26	28	959	529	29	0	111	1,488	6,391	7,990		
Total	0	1,500	982	747		14,717	10,088		0	3,229	24,805	249,406	277,440		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.

Col. 8 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague							
								Segregation of flow						Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total		
									N.Y.C. reservoirs		Powerplants				
Date	Amount								Directed	Other				Daily	Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
Feb. 27	0	60	36	26	Feb. 29	972	529	Mar. 1	0	122	1,501	5,727	7,350		
28	0	54	36	26	Mar. 1	741	448	2	0	116	1,189	5,145	6,450		
29	0	51	36	26	2	945	475	3	0	113	1,420	4,207	5,740		
Mar. 1	0	51	36	26	3	604	475	4	0	113	1,079	3,928	5,120		
2	0	53	36	26	4	590	470	5	0	115	1,060	3,945	5,120		
3	0	50	36	26	5	970	421	6	0	112	1,391	3,827	5,330		
4	0	51	36	26	6	945	443	7	0	113	1,388	4,109	5,610		
5	0	48	36	26	7	956	232	8	0	110	1,188	3,552	4,850		
6	0	50	36	26	8	934	324	9	0	112	1,258	3,110	4,480		
7	0	51	36	26	9	958	259	10	0	113	1,217	2,620	3,950		
8	0	48	36	26	10	620	0	11	0	110	620	2,690	3,420		
9	0	50	36	26	11	595	108	12	0	112	703	2,475	3,290		
10	0	50	36	26	12	991	367	13	0	112	1,358	2,450	3,920		
11	0	50	36	26	13	934	508	14	0	112	1,442	2,496	4,050		
12	0	53	36	26	14	954	497	15	0	115	1,451	2,534	4,100		
13	0	53	36	26	15	943	491	16	0	115	1,434	3,281	4,830		
14	0	54	36	26	16	1,297	470	17	0	116	1,767	3,807	5,690		
15	0	51	36	26	17	465	508	18	0	113	973	4,064	5,150		
16	0	51	36	26	18	594	497	19	0	113	1,091	4,266	5,470		
17	0	48	36	26	19	710	389	20	0	110	1,099	4,671	5,880		
18	0	50	36	26	20	708	356	21	0	112	1,064	5,714	6,890		
19	0	51	36	26	21	701	497	22	0	113	1,198	8,789	10,100		
20	0	53	36	26	22	725	340	23	0	115	1,065	8,820	10,000		
21	0	53	37	25	23	697	373	24	0	115	1,070	7,145	8,330		
22	0	51	37	25	24	0	378	25	0	113	378	6,399	6,890		
23	0	50	37	25	25	2	486	26	0	112	488	6,290	6,890		
24	0	53	27	25	26	598	383	27	0	115	981	5,674	6,770		
25	0	51	37	25	27	614	367	28	0	113	981	5,476	6,570		
26	0	53	37	25	28	613	508	29	0	115	1,121	5,924	7,160		
27	0	53	37	25	29	626	518	30	0	115	1,144	5,871	7,130		
28	0	53	37	25	30	609	508	31	0	115	1,117	5,158	6,390		
Total	0	1,598	1,124	798		22,611	12,625		0	3,520	35,236	144,164	182,920		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.

Col. 8 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow							
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total	Excess release credits	
Date	Amount								Directed	Other				Daily	Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
Mar. 29	0	53	37	26	Mar. 31	0	459	Apr. 1	0	116	459	5,255	5,830		
30	0	54	40	53	Apr. 1	10	491	2	0	147	501	5,892	6,540		
31	0	71	45	50	2	355	373	3	0	166	728	6,846	7,740		
Apr. 1	0	70	45	51	3	359	518	4	0	166	877	8,467	9,510		
2	0	73	70	50	4	384	502	5	0	193	886	31,421	32,500		
3	0	73	45	45	5	1,479	518	6	0	163	1,997	56,740	58,900		
4	0	70	45	50	6	1,777	421	7	0	165	2,198	34,537	36,900		
5	0	70	45	45	7	1,804	481	8	0	160	2,285	22,955	25,400		
6	0	71	46	46	8	1,815	459	9	0	163	2,274	16,563	19,000		
7	0	73	46	46	9	1,820	497	10	0	165	2,317	12,718	15,200		
8	0	73	46	48	10	1,820	475	11	0	167	2,295	10,538	13,000		
9	0	67	45	48	11	1,828	464	12	0	160	2,292	8,948	11,400		
10	0	71	45	48	12	1,817	448	13	0	164	2,265	7,871	10,300		
11	0	71	45	46	13	1,819	281	14	0	162	2,100	7,128	9,390		
12	0	71	45	46	14	1,812	481	15	0	162	2,293	7,505	9,960		
13	0	71	45	46	15	1,807	416	16	0	162	2,223	12,215	14,600		
14	0	71	45	46	16	1,198	502	17	0	162	1,700	23,638	25,500		
15	0	71	45	46	17	928	416	18	0	162	1,344	21,494	23,000		
16	0	71	45	48	18	936	486	19	0	164	1,422	17,914	19,500		
17	0	71	45	48	19	961	432	20	0	164	1,393	17,943	19,500		
18	0	71	71	48	20	0	475	21	0	190	475	16,335	17,000		
19	0	71	43	48	21	0	464	22	0	162	464	13,274	13,900		
20	0	73	45	48	22	0	464	23	0	166	464	11,870	12,500		
21	0	71	45	48	23	1,208	443	24	0	164	1,651	10,385	12,200		
22	0	74	45	48	24	1,212	448	25	0	167	1,660	9,673	11,500		
23	0	68	45	48	25	1,210	448	26	0	161	1,658	8,881	10,700		
24	0	73	45	48	26	1,208	421	27	0	166	1,629	7,985	9,780		
25	0	73	45	48	27	1,212	448	28	0	166	1,660	6,694	8,520		
26	0	73	45	45	28	0	443	29	0	163	443	6,404	7,010		
27	0	70	45	45	29	0	448	30	0	160	448	6,112	6,720		
Total	0	2,103	1,389	1,406		30,779	13,622		0	4,898	44,401	434,201	483,500		

Col. 2 - 24 hours beginning 1200 of date shown, except 23 hours Apr. 28.
Col. 3 - 24 hours ending 2400 one day later, except 23 hours Apr. 28.
Col. 4 - 24 hours beginning 1500 one day later, except 23 hours Apr. 27.
Col. 5 - 24 hours beginning 0800 of date shown, except 23 hours Apr. 28.
Col. 6 - 24 hours beginning 1200 of date shown, except 23 hours Apr. 28.

Col. 8 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown, except 23 hours Apr. 29.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague							
								Segregation of flow						Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total		
Date	Amount								N.Y.C. reservoirs		Powerplants			Daily	Cumulative
									Directed	Other					
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
Apr. 28	0	69	45	45	Apr. 30	957	416	May 1	0	159	1,373	5,388	6,920		
29	0	70	45	43	May 1	589	421	2	0	158	1,010	4,882	6,050		
30	0	70	45	45	2	658	346	3	0	160	1,004	4,386	5,550		
May 1	0	70	45	50	3	585	130	4	0	165	715	9,820	10,700		
2	0	71	45	51	4	1,806	265	5	0	167	2,071	12,762	15,000		
3	0	70	45	46	5	1,823	292	6	0	161	2,115	10,424	12,700		
4	0	70	46	46	6	1,828	491	7	0	162	2,319	9,019	11,500		
5	0	70	46	48	7	1,263	481	8	0	164	1,744	8,292	10,200		
6	0	70	45	50	8	940	432	9	0	165	1,372	10,063	11,600		
7	0	70	45	50	9	953	475	10	0	165	1,428	10,107	11,700		
8	0	68	217	48	10	962	491	11	0	333	1,453	8,614	10,400		
9	0	70	110	46	11	908	286	12	0	226	1,194	7,640	9,060		
10	0	70	46	46	12	0	254	13	0	162	254	8,744	9,160		
11	0	70	45	45	13	0	454	14	0	160	454	9,136	9,750		
12	0	70	46	45	14	0	486	15	0	161	486	10,453	11,100		
13	0	70	45	45	15	0	389	16	0	160	389	10,151	10,700		
14	0	70	45	45	16	10	146	17	0	160	156	9,314	9,630		
15	0	70	46	45	17	5	448	18	0	161	453	8,156	8,770		
16	0	68	46	45	18	0	238	19	0	159	238	7,253	7,650		
17	0	70	45	45	19	0	0	20	0	160	0	6,520	6,680		
18	0	70	45	45	20	0	70	21	0	160	70	6,750	6,980		
19	0	70	46	45	21	0	292	22	0	161	292	7,017	7,470		
20	0	70	46	45	22	0	194	23	0	161	194	6,185	6,540		
21	0	70	45	45	23	289	248	24	0	160	537	7,223	7,920		
22	0	68	45	46	24	0	302	25	0	159	302	7,159	7,620		
23	0	70	45	46	25	0	243	26	0	161	243	6,136	6,540		
24	0	71	45	46	26	0	302	27	0	162	302	5,846	6,310		
25	0	70	45	46	27	0	0	28	0	161	0	5,419	5,580		
26	0	71	45	46	28	0	400	29	0	162	400	35,638	36,200		
27	0	73	45	48	29	1,803	518	30	0	166	2,321	80,013	82,500		
28	0	67	45	48	30	1,823	524	31	0	160	2,347	58,993	61,500		
Total	0	2,166	1,640	1,435		17,202	10,034		0	5,241	27,236	397,503	429,980		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.

Col. 8 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague							
								Segregation of flow						Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total		
									N.Y.C. reservoirs		Powerplants				
Date	Amount								Directed	Other				Daily	Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
May 29	0	70	45	48	May 31	1,830	481	June 1	0	163	2,311	37,326	39,800		
30	0	70	45	48	June 1	1,861	491	2	0	163	2,352	23,885	26,400		
31	0	70	45	45	2	1,859	513	3	0	160	2,372	17,668	20,200		
June 1	0	70	45	45	3	1,859	497	4	0	160	2,356	13,784	16,300		
2	0	70	45	45	4	1,231	470	5	0	160	1,701	10,639	12,500		
3	0	68	45	46	5	958	481	6	0	159	1,439	8,502	10,100		
4	0	68	45	48	6	1,069	464	7	0	161	1,533	7,046	8,740		
5	0	68	45	48	7	1,192	481	8	0	161	1,673	5,786	7,620		
6	0	70	45	50	8	1,200	464	9	0	165	1,664	4,561	6,390		
7	0	73	209	70	9	0	459	10	0	352	459	4,129	4,940		
8	0	96	377	71	10	16	481	11	0	544	497	3,489	4,530		
9	0	96	377	70	11	1,214	518	12	0	543	1,732	2,535	4,810		
10	0	94	377	71	12	1,008	486	13	0	542	1,494	2,254	4,290		
11	0	105	367	70	13	1,111	470	14	0	542	1,581	2,387	4,510		
12	0	105	370	71	14	943	475	15	0	546	1,418	2,346	4,310		
13	0	102	374	70	15	937	481	16	0	546	1,418	1,846	3,810		
14	0	104	374	68	16	0	443	17	0	546	443	1,841	2,830		
15	0	102	374	68	17	0	464	18	0	544	464	1,842	2,850		
16	0	104	374	62	18	568	410	19	0	540	978	2,042	3,560		
17	0	101	374	45	19	426	243	20	0	520	669	2,091	3,280		
18	0	71	374	50	20	0	0	21	0	495	0	1,735	2,230	110	110
19	0	71	374	48	21	0	0	22	0	493	0	1,417	1,910	110	220
20	327	71	374	48	22	0	70	23	327	166	70	1,237	1,800	50	270
21	300	71	373	46	23	0	313	24	300	190	313	1,147	1,950	110	380
22	493	74	373	45	24	0	248	25	492	0	248	1,430	2,170	420	800
23	369	68	373	45	25	0	167	26	369	117	167	1,537	2,190	323	1,123
24	108	70	373	45	26	0	11	27	108	380	11	1,431	1,930	110	1,233
25	445	68	373	45	27	0	0	28	445	41	0	1,184	1,670	-80	1,153
26	611	71	493	48	28	74	0	29	612	0	74	1,014	1,700	-50	1,103
27	716	74	605	54	29	0	0	30	716	17	0	3,627	4,360	716	1,819
Total	3,369	2,415	8,437	1,633		19,356	10,081		3,369	9,116	29,437	171,758	213,680		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 June 1-22.
= Col. 2 + Col. 3 + Col. 4 - Col. 1 June 23-24, 26-28, 30.

Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.
Col. 12 = Col. 11 - Col. 8 - 1,750 cfs, computed algebraically, but not greater than Col. 7; except that part of Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit June 15, 1984 to Mar. 14, 1985 = 13,556 cfs-days.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow							
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs			Computed uncontrolled	Total	Excess release credits	
Date	Amount								Directed	Other	Powerplants			Daily	Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
June 28	726	76	569	50	June 30	0	0	July 1	695	0	0	7,905	8,600	695	2,514
29	280	70	373	51	July 1	0	275	2	280	214	275	14,731	15,500	280	2,794
30	0	70	373	50	2	694	248	3	0	493	942	8,075	9,510	0	2,794
July 1	0	70	371	48	3	728	173	4	0	489	901	5,380	6,770	0	2,794
2	0	70	371	48	4	0	454	5	0	489	454	4,307	5,250	0	2,794
3	0	70	371	48	5	833	518	6	0	489	1,351	3,410	5,250	0	2,794
4	0	70	371	48	6	912	491	7	0	489	1,403	8,088	9,980	0	2,794
5	0	73	371	45	7	549	464	8	0	489	1,013	7,948	9,450	0	2,794
6	0	74	371	46	8	909	508	9	0	491	1,417	5,412	7,320	0	2,794
7	0	68	371	45	9	1,156	518	10	0	484	1,674	4,062	6,220	0	2,794
8	0	68	371	45	10	1,353	518	11	0	484	1,871	3,255	5,610	0	2,794
9	0	70	371	45	11	728	475	12	0	486	1,203	3,331	5,020	0	2,794
10	0	68	373	45	12	991	464	13	0	486	1,455	2,999	4,940	0	2,794
11	0	68	374	46	13	956	486	14	0	488	1,442	2,500	4,430	0	2,794
12	0	68	373	71	14	705	518	15	0	512	1,223	2,035	3,770	0	2,794
13	0	76	373	70	15	713	518	16	0	519	1,231	1,810	3,560	0	2,794
14	0	101	410	71	16	1,114	497	17	0	582	1,611	1,687	3,880	0	2,794
15	0	101	489	71	17	947	486	18	0	661	1,433	2,046	4,140	0	2,794
16	0	101	487	70	18	941	464	19	0	658	1,405	2,537	4,600	0	2,794
17	0	101	425	53	19	934	464	20	0	579	1,398	2,283	4,260	0	2,794
18	0	68	368	46	20	999	232	21	0	482	1,231	1,967	3,680	0	2,794
19	0	70	368	48	21	0	0	22	0	486	0	1,754	2,240	106	2,900
20	82	70	367	50	22	0	130	23	82	405	130	1,643	2,260	87	2,987
21	0	67	483	70	23	952	346	24	0	620	1,298	1,382	3,300	0	2,987
22	0	105	484	76	24	951	238	25	0	665	1,189	1,236	3,090	0	2,987
23	0	96	484	68	25	957	0	26	0	648	957	1,115	2,720	0	2,987
24	0	104	419	46	26	934	0	27	0	569	934	1,247	2,750	0	2,987
25	0	71	365	45	27	946	0	28	0	481	946	2,043	3,470	0	2,987
26	340	71	367	46	28	0	0	29	340	144	0	2,856	3,340	340	3,327
27	433	71	365	46	29	0	81	30	433	49	81	2,147	2,710	433	3,760
28	0	70	367	50	30	719	243	31	0	487	962	1,651	3,100	0	3,760
Total	1,861	2,396	12,395	1,657		21,621	9,809		1,830	14,618	31,430	112,842	160,720		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 July 3-22, 24-28, 31.
= Col. 2 + Col. 3 + Col. 4 - Col. 1 July 2, 23, 29-30.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col.9
Col. 11 - 24 hours of calendar day shown.
Col. 12 = Col. 11 - Col. 8 - 1,750 cfs, computed algebraically, but not greater than Col. 7; except that part of Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 15, 1984 = 13,556 cfs-days.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow							
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total	Excess release credits	
Date	Amount								Directed	Other				Daily	Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
July 29	0	68	367	45	July 31	709	211	Aug. 1	0	480	920	1,420	2,820	0	3,760
30	0	68	365	48	Aug. 1	1,003	259	2	0	481	1,262	1,437	3,180	0	3,760
31	0	70	421	67	2	770	248	3	0	558	1,018	1,484	3,060	0	3,760
Aug. 1	0	97	580	71	3	713	194	4	0	748	907	1,325	2,980	0	3,760
2	584	104	685	90	4	0	0	5	584	295	0	1,511	2,390	345	4,105
3	560	104	684	91	5	0	32	6	560	319	32	1,479	2,390	321	4,426
4	0	104	684	88	6	595	297	7	0	876	892	1,232	3,000	0	4,426
5	0	104	684	90	7	469	486	8	0	878	955	1,147	2,980	0	4,426
6	0	104	682	90	8	672	448	9	0	876	1,120	1,084	3,080	0	4,426
7	0	104	575	71	9	567	173	10	0	750	740	1,110	2,600	10	4,436
8	64	104	475	71	10	464	173	11	64	586	637	1,283	2,570	64	4,500
9	794	104	684	94	11	0	0	12	794	88	0	1,098	1,980	142	4,642
10	846	128	682	90	12	0	59	13	846	54	59	1,181	2,140	336	4,978
11	122	131	681	93	13	247	227	14	122	783	474	1,141	2,520	110	5,088
12	297	131	572	70	14	291	130	15	297	476	421	1,066	2,260	110	5,198
13	336	102	475	70	15	284	173	16	336	311	457	1,046	2,150	110	5,308
14	471	102	571	70	16	387	162	17	471	272	549	1,308	2,600	471	5,779
15	495	102	678	70	17	242	184	18	495	355	426	1,024	2,300	195	5,974
16	974	102	800	70	18	0	0	19	972	0	0	978	1,950	200	6,174
17	1,056	77	942	46	19	0	0	20	1,065	0	0	915	1,980	230	6,404
18	664	76	543	45	20	248	27	21	664	0	275	1,131	2,070	320	6,724
19	645	70	529	45	21	239	200	22	644	0	439	1,107	2,190	440	7,164
20	646	70	528	46	22	224	162	23	644	0	386	1,000	2,030	280	7,444
21	639	70	524	45	23	226	43	24	639	0	269	1,052	1,960	210	7,654
22	351	70	430	45	24	231	151	25	351	194	382	1,123	2,050	110	7,764
23	782	70	668	45	25	0	0	26	783	0	0	947	1,730	-20	7,744
24	945	70	831	45	26	0	22	27	946	0	22	782	1,750	0	7,744
25	650	68	537	45	27	239	216	28	650	0	455	805	1,910	160	7,904
26	718	70	606	45	28	309	173	29	721	0	482	807	2,010	260	8,164
27	780	71	662	45	29	231	211	30	778	0	442	760	1,980	230	8,394
28	804	71	685	45	30	473	146	31	801	0	619	730	2,150	400	8,794
Total	14,223	2,786	18,830	1,991		9,833	4,807		14,227	9,380	14,640	34,513	72,760		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 Aug. 1-4, 7-10.
= Col. 2 + Col. 3 + Col. 4 - Col. 1 Aug. 5-6, 11-18, 25.

Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 12 = Col. 11 - Col. 8 - 1,750 cfs, computed algebraically, but not greater than Col. 7; except that part of Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 15, 1984 = 13,556 cfs-days.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow						
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallen-paupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncon-trolled	Total	Excess release credits
Date	Amount								Directed	Other				Daily / Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12 / 13
Aug. 29	728	68	589	70	Aug. 31	287	157	Sept.1	727	0	444	739	1,910	160 / 8,954
30	1,119	102	958	70	Sept. 1	0	0	2	1,119	11	0	540	1,670	-80 / 8,874
31	1,147	74	1,038	46	2	0	0	3	1,147	11	0	622	1,780	30 / 8,904
Sept. 1	1,173	74	1,057	45	3	0	16	4	1,176	0	16	758	1,950	200 / 9,104
2	681	68	565	45	4	231	167	5	678	0	398	944	2,020	270 / 9,374
3	540	74	421	45	5	232	184	6	540	0	416	864	1,820	70 / 9,444
4	747	68	633	45	6	182	243	7	746	0	425	589	1,760	10 / 9,454
5	796	68	682	45	7	98	130	8	795	0	228	677	1,700	-50 / 9,404
6	1,180	68	1,063	45	8	0	0	9	1,176	0	0	544	1,720	-30 / 9,374
7	1,194	68	1,064	45	9	0	0	10	1,177	0	0	523	1,700	-50 / 9,324
8	866	68	749	45	10	108	140	11	862	0	248	560	1,670	-80 / 9,244
9	756	70	647	45	11	115	189	12	762	0	304	634	1,700	-50 / 9,194
10	653	67	537	45	12	108	194	13	649	0	302	769	1,720	-30 / 9,164
11	901	71	791	46	13	111	216	14	908	0	327	585	1,820	70 / 9,234
12	943	71	831	45	14	153	167	15	947	0	320	683	1,950	200 / 9,434
13	1,310	71	1,200	48	15	0	0	16	1,319	0	0	641	1,960	210 / 9,644
14	1,215	71	1,101	46	16	0	0	17	1,218	0	0	562	1,780	30 / 9,674
15	822	71	709	48	17	105	211	18	828	0	316	546	1,690	-60 / 9,614
16	1,165	71	1,049	48	18	103	0	19	1,168	0	103	579	1,850	100 / 9,714
17	1,220	71	1,108	45	19	100	0	20	1,224	0	100	506	1,830	80 / 9,794
18	1,228	70	1,120	45	20	109	0	21	1,235	0	109	456	1,800	50 / 9,844
19	1,252	73	1,139	48	21	97	0	22	1,260	0	97	473	1,830	80 / 9,924
20	1,372	73	1,258	48	22	0	0	23	1,379	0	0	431	1,810	60 / 9,984
21	1,374	68	1,259	45	23	0	0	24	1,372	0	0	378	1,750	0 / 9,984
22	1,076	70	962	45	24	240	167	25	1,077	0	407	356	1,840	90 / 10,074
23	1,070	73	959	46	25	277	205	26	1,078	0	482	340	1,900	150 / 10,224
24	1,084	68	975	48	26	109	329	27	1,091	0	438	321	1,850	100 / 10,324
25	1,090	73	979	46	27	106	43	28	1,098	0	149	393	1,640	-110 / 10,214
26	981	73	865	45	28	112	162	29	983	0	274	403	1,660	-90 / 10,124
27	1,391	74	1,279	45	29	0	0	30	1,398	0	0	282	1,680	-70 / 10,054
Total	31,074	2,149	27,587	1,423		2,983	2,920		31,137	22	5,903	16,698	53,760	

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4, in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 1 Sept. 2-3.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.
Col. 12 = Col. 11 - Col. 8 - 1,750 cfs, computed algebraically, but not greater than Col. 7; except that part of Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 15, 1984 = 13,556 cfs-days.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague							
								Segregation of flow						Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total		
									N.Y.C. reservoirs		Powerplants				
Date	Amount								Directed	Other				Daily	Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
Sept.28	1,368	73	1,258	45	Sept.30	0	54	Oct. 1	1,376	0	54	290	1,720	-30	10,024
29	576	73	458	45	Oct. 1	0	194	2	576	0	194	720	1,490	-260	9,764
30	232	73	118	45	2	109	200	3	236	0	309	575	1,120	-630	9,134
Oct. 1	1,171	73	1,055	45	3	445	194	4	1,173	0	639	118	1,930	180	9,314
2	800	73	684	45	4	449	184	5	802	0	633	475	1,910	160	9,474
3	721	73	616	46	5	451	173	6	735	0	624	351	1,710	-40	9,434
4	1,521	71	1,402	46	6	0	0	7	1,519	0	0	341	1,860	110	9,544
5	1,474	71	1,361	48	7	0	0	8	1,480	0	0	270	1,750	0	9,544
6	1,173	71	1,054	46	8	233	0	9	1,171	0	233	286	1,690	-60	9,484
7	1,223	71	1,115	48	9	227	0	10	1,234	0	227	299	1,760	10	9,494
8	1,160	71	1,060	48	10	324	0	11	1,179	0	324	267	1,770	20	9,514
9	960	71	838	46	11	593	0	12	955	0	593	282	1,830	80	9,594
10	979	71	866	48	12	550	0	13	985	0	550	275	1,810	60	9,654
11	1,210	71	1,106	45	13	447	0	14	1,222	0	447	171	1,840	90	9,744
12	1,213	71	1,105	46	14	390	38	15	1,222	0	428	180	1,830	80	9,824
13	1,429	71	1,309	48	15	219	205	16	1,428	0	424	148	2,000	250	10,074
14	1,237	71	1,126	46	16	440	157	17	1,243	0	597	50	1,890	140	10,214
15	1,223	71	1,106	46	17	446	151	18	1,223	0	597	210	2,030	280	10,494
16	1,208	71	1,088	46	18	452	221	19	1,205	0	673	192	2,070	320	10,814
17	1,023	71	885	46	19	433	124	20	1,002	0	557	331	1,890	140	10,954
18	1,212	71	1,078	46	20	456	0	21	1,195	0	456	259	1,910	160	11,114
19	1,142	71	1,046	51	21	386	11	22	1,168	0	397	235	1,800	50	11,164
20	946	71	832	51	22	395	194	23	954	0	589	537	2,080	330	11,494
21	841	71	730	46	23	437	286	24	847	0	723	690	2,260	510	12,004
22	320	71	203	46	24	433	173	25	320	0	606	934	1,860	110	12,114
23	328	71	224	46	25	545	162	26	341	0	707	562	1,610	-140	11,974
24	532	71	415	46	26	579	167	27	532	0	746	712	1,990	240	12,214
25	557	210	308	46	27	577	0	28	564	0	577	609	1,750	0	12,214
26	627	280	308	46	28	578	16	29	634	0	594	552	1,780	30	12,244
27	274	171	45	46	29	572	189	30	262	0	761	757	1,780	30	12,274
28	303	87	175	46	30	577	167	31	308	0	744	548	1,600	-150	12,124
Total	28,983	2,677	24,974	1,440		11,743	3,260		29,091	0	15,003	12,226	56,320		

Col. 2 - 24 hours beginning 1200 of date shown, except 25 hours Oct. 27
Col. 3 - 24 hours ending 2400 one day later, except 25 hours Oct. 27.
Col. 4 - 24 hours beginning 1500 one day later, except 25 hours Oct. 26.
Col. 5 - 24 hours beginning 0800 of date shown, except 25 hours Oct. 27.
Col. 6 - 24 hours beginning 1200 of date shown, except 25 hours Oct. 27.
Col. 7 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown, except 25 hours Oct. 28.
Col. 12 = Col. 11 - 1,750 cfs, computed algebraically, but not greater than Col. 7.
Col. 13 - Season limit of cumulative credit beginning June 15, 1984 = 13,556 cfs-days.

Table 15. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.- continued
(River Master daily operation record)
Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow							
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total	Excess release credits	
Date	Amount								Directed	Other				Daily	Cumulative
1984	1	2	3	4		5	6		7	8	9	10	11	12	13
Oct. 29	967	308	610	46	Oct. 31	576	205	Nov. 1	964	0	781	235	1,980	230	12,354
30	388	271	67	46	Nov. 1	0	103	2	384	0	103	763	1,250	-500	11,854
31	1,066	308	755	26	2	302	157	3	1,089	0	459	282	1,830	80	11,934
Nov. 1	1,363	628	716	25	3	0	0	4	1,369	0	0	361	1,730	-20	11,914
2	1,340	308	1,010	25	4	0	0	5	1,343	0	0	487	1,830	80	11,994
3	1,119	311	786	25	5	0	0	6	1,122	0	0	808	1,930	180	12,174
4	961	309	625	25	6	0	0	7	959	0	0	1,091	2,050	300	12,474
5	1,275	309	945	25	7	0	0	8	1,279	0	0	801	2,080	330	12,804
6	1,254	309	927	25	8	0	0	9	1,261	0	0	699	1,960	210	13,014
7	1,257	308	934	25	9	0	0	10	1,267	0	0	683	1,950	200	13,214
8	1,080	308	750	25	10	0	0	11	1,083	0	0	747	1,830	80	13,294
9	1,029	306	688	25	11	0	0	12	1,019	0	0	911	1,930	180	13,474
10	953	172	756	25	12	0	0	13	953	0	0	997	1,950	82	13,556
11	771	312	435	25	13	0	38	14	772	0	38	890	1,700		
12	789	314	452	25	14	0	194	15	791	0	194	875	1,860		
13	795	630	152	25	15	0	22	16	807	0	22	921	1,750		
14	895	630	255	25	16	0	0	17	910	0	0	740	1,650		
15	981	623	343	25	17	0	0	18	991	0	0	789	1,780		
16	981	622	339	25	18	0	65	19	986	0	65	729	1,780		
17	992	620	354	25	19	0	259	20	999	0	259	652	1,910		
18	823	619	209	25	20	23	178	21	853	0	201	736	1,790		
19	1,011	348	627	25	21	0	0	22	1,000	0	0	700	1,700		
20	1,053	614	415	25	22	0	0	23	1,054	0	0	676	1,730		
21	1,081	620	446	25	23	0	0	24	1,091	0	0	629	1,720		
22	1,081	619	442	25	24	0	0	25	1,086	0	0	584	1,670		
23	1,169	616	514	25	25	0	0	26	1,155	0	0	595	1,750		
24	1,212	616	563	25	26	0	0	27	1,204	0	0	546	1,750		
25	1,230	616	586	25	27	0	0	28	1,227	0	0	523	1,750		
26	1,084	617	442	25	28	0	0	29	1,084	0	0	1,116	2,200		
27	980	617	330	25	29	0	0	30	972	0	0	5,628	6,600		
Total	30,980	13,808	16,473	793		901	1,221		31,074	0	2,122	26,194	59,390		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.
Col. 12 = Col. 11 - 1,750 cfs, computed algebraically, but not greater than Col. 7.
Col. 13 - Season limit of cumulative credit beginning June 15, 1984 = 13,556 cfs-days; expired Nov. 13, 1984.

Table 16. - Consumption of Water by New York City - 1940 to 1984.
Data furnished by New York City, Department of
Environmental Protection, Bureau of Water Supply

Year	Consumption in City proper (mgd)	Consumption in City proper (gpcd) 1/	Furnished to outside communities (mgd)	Total (mgd)	Annual (bg)
1940	922.7	124	21.6	944.3	345.614
41	964.2	130	24.8	989.0	360.985
42	906.7	124	21.5	928.2	338.793
43	942.7	133	21.5	964.2	351.933
44	1,004.9	144	26.5	1,031.4	377.492
1945	1,056.2	146	22.0	1,078.2	393.543
46	1,117.1	146	24.1	1,141.2	416.538
47	1,159.0	149	30.4	1,189.4	434.131
48	1,172.3	150	31.5	1,203.8	440.591
49	1,166.9	149	36.2	1,203.1	439.132
1950	953.3	121	29.1	982.4	358.576
51	1,041.9	131	28.1	1,070.0	390.550
52	1,087.0	136	32.7	1,119.7	409.810
53	1,093.9	135	44.6	1,138.5	415.552
54	1,063.4	131	46.3	1,109.7	405.040
1955	1,109.9	136	45.3	1,155.2	421.648
56	1,111.3	136.2	48.9	1,160.2	424.633
57	1,169.0	143	57.2	1,226.2	447.563
58	1,152.9	140.8	49.6	1,202.5	438.912
59	1,204.3	146.8	60.3	1,264.6	461.579
1960	1,199.4	153.9	58.9	1,258.3	460.529
61	1,221.0	156.0	64.0	1,285.0	469.022
62	1,207.6	153.5	68.8	1,276.4	465.896
63	1,218.0	154.1	76.7	1,294.7	472.582
64	1,189.2	149.8	79.4	1,268.6	464.295
1965	1,052.1	131.9	71.2	1,123.3	409.995
66	1,044.9	130.4	73.2	1,118.1	408.128
67	1,135.3	141.0	71.0	1,206.3	440.302
68	1,242.0	153.6	78.2	1,320.2	483.175
69	1,328.7	163.5	80.1	1,408.8	514.229
1970	1,400.3	177.9	90.4	1,490.7	544.116
71	1,423.6	180.0	87.9	1,511.5	551.695
72	1,412.4	178.3	83.0	1,495.4	547.340
73	1,448.9	182.7	95.4	1,544.3	563.681
74	1,441.8	181.5	96.3	1,538.1	561.409
1975	1,415.0	177.9	92.1	1,507.1	550.093
76	1,435.0	180.1	95.8	1,530.8	560.264
77	1,483.0	185.9	104.7	1,587.7	579.510
78	1,479.4	185.1	103.0	1.582.4	577.566
79	1,513.0	189.0	104.6	1,617.6	590.426
1980	1,506.3	187.9	110.0	1,616.3	591.582
81	1,309.5	185.2*	100.0	1,409.5	514.475
82	1,383.0	195.6*	104.8	1,487.8	543.060
83	1,424.2	201.4*	112.6	1,536.8	561.010
84	1,465.2	207.2*	113.9	1,579.1	577.963

1/ Gallons per Capita per day.
*Provisional

PLATE I.— COMPONENTS OF FLOW, DELAWARE RIVER AT MONTAGUE, N.J. 1984

JUNE | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER

	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
N.Y.C.	8.07 BG	10.63 BG	15.26 BG	20.14 BG	18.81 BG	20.09 BG
POWER	19.03 BG	20.32 BG	9.46 BG	3.82 BG	9.70 BG	1.37 BG
UNCONT.	111.03 BG	72.94 BG	22.31 BG	10.79 BG	7.90 BG	16.93 BG
TOTAL	138.13 BG	103.89 BG	47.03 BG	34.75 BG	36.41 BG	38.39 BG

N.Y.C. RESERVOIRS
POWER RESERVOIRS
UNCONTROLLED RUNOFF

EXCESS RELEASE RATE 1,860 CFS

MINIMUM BASIC RATE 1,750 CFS

DISCHARGE, IN THOUSAND CUBIC FEET PER SECOND

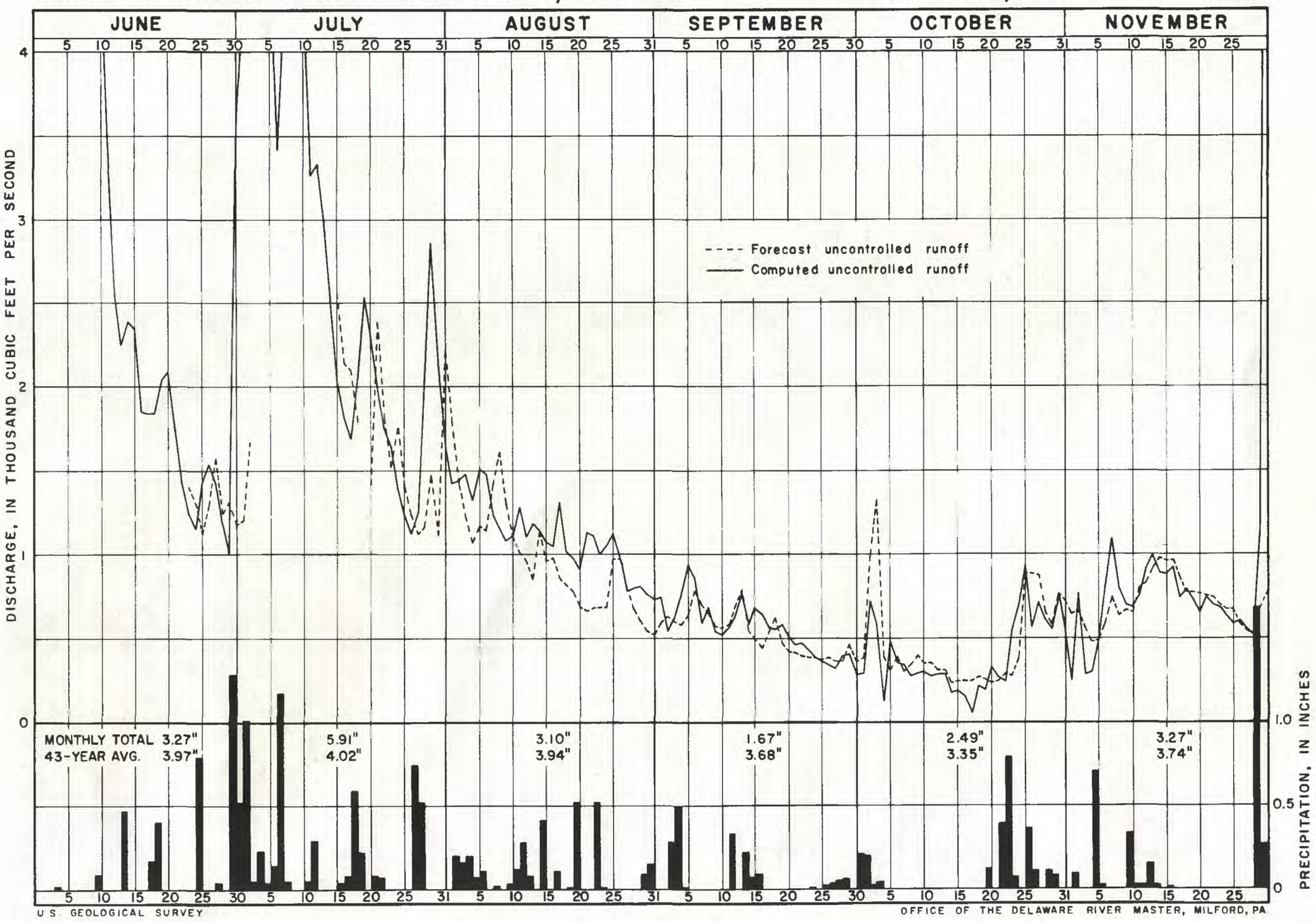
PRECIPITATION, IN INCHES

	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
MONTHLY TOTAL	3.27"	5.91"	3.10"	1.67"	2.49"	3.27"
43-YEAR AVG.	3.97"	4.02"	3.94"	3.68"	3.35"	3.74"

U.S. GEOLOGICAL SURVEY

OFFICE OF THE DELAWARE RIVER MASTER, MILFORD, PA.

FIGURE 2 – UNCONTROLLED COMPONENT, DELAWARE RIVER AT MONTAGUE, N.J. 1984



U.S. GEOLOGICAL SURVEY

OFFICE OF THE DELAWARE RIVER MASTER, MILFORD, PA

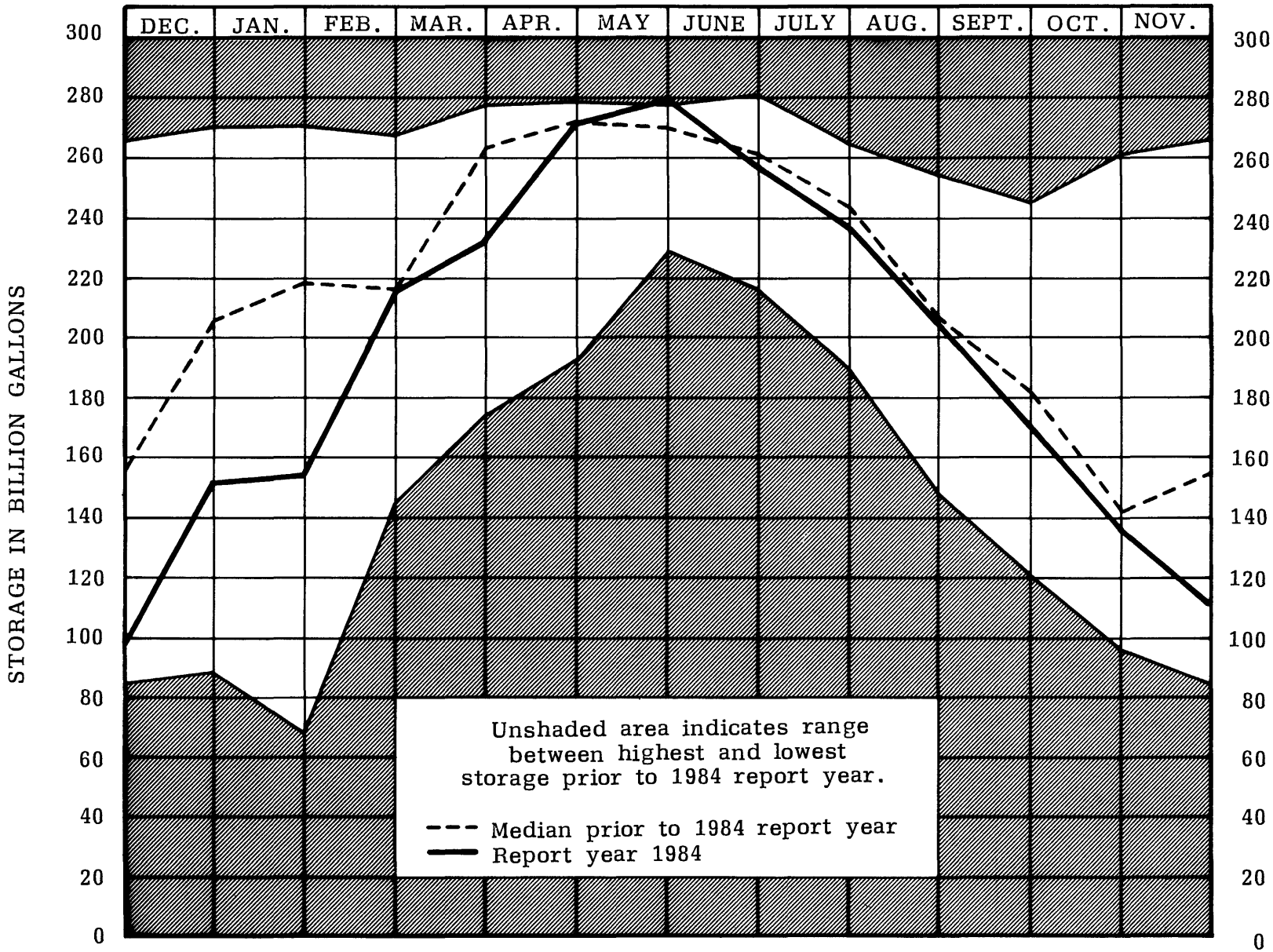


Figure 3. - Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs on first day of month, June 1967 to December 1984

Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

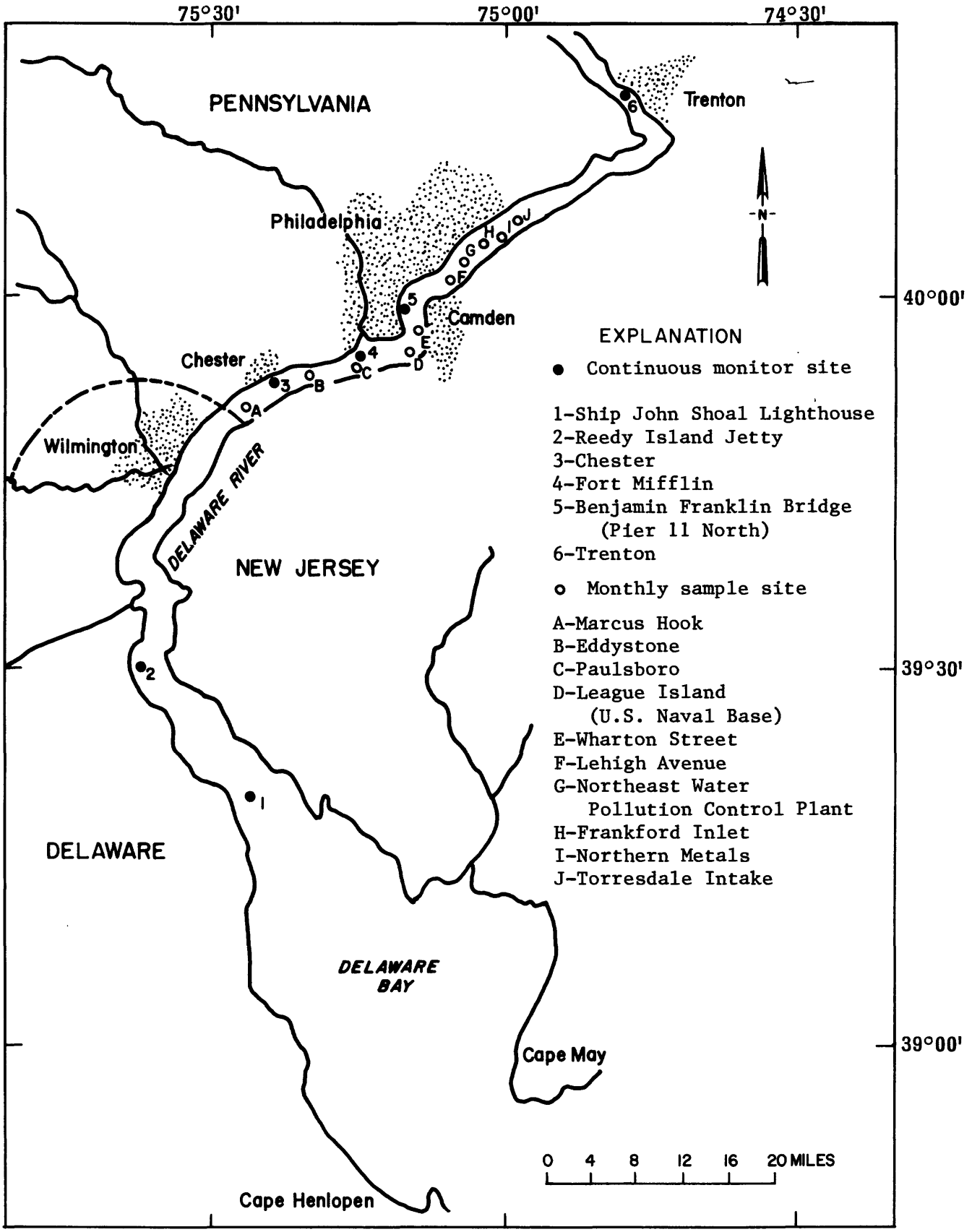


FIGURE 4.--Delaware River Estuary.

Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

By Deloris W. Speight

INTRODUCTION

This section describes the water-quality monitoring program carried out by the U.S. Geological Survey in the Delaware Estuary during the 1984 report year. Also presented here are some of the data that were obtained by this program and a brief discussion of the significance of the data.

WATER-QUALITY MONITORING PROGRAM

Water quality of the Delaware River and Estuary was monitored at sites between Trenton, N.J., and Ship John Shoal Lighthouse, N.J. Data were acquired continuously by electronic instruments at six sites, one at Trenton, just upstream of the head of tidewater and at five sites in the estuary (fig. 4). The monitors at Chester, Pa., Fort Mifflin, Pa. and Benjamin Franklin Bridge were not operated from early December 1983 through the end of March 1984. At Ship John Shoal Lighthouse and Fort Mifflin the water was monitored for two parameters: temperature and specific conductance. At the remaining sites, the water was monitored for four parameters: temperature, specific conductance, dissolved oxygen, and pH.

Additional data were obtained monthly at ten sites between Torresdale and Marcus Hook, Pa. At each of these sites, water samples were collected at three points of the cross-section. These samples were analyzed for temperature, chloride, alkalinity, biochemical oxygen demand, specific conductance, dissolved oxygen, and pH.

Data obtained from the continuous monitoring sites were processed and stored for future reference by the U.S. Geological Survey. They were also distributed regularly to cooperators and published annually by the U.S. Geological Survey in "Water Resources Data for Pennslyvania, Volume 1, Delaware River Basin". Data from the monthly sites were processed and stored by the City of Philadelphia Water Department.

The above-described programs were carried out in cooperation with the City of Philadelphia Water Department, Delaware River Basin Commission, Delaware River Master, and other agencies of federal, state, and county governments.

ESTUARINE WATER-QUALITY DATA DURING 1984

The following is a summary and discussion of the data that were collected during the 1984 report year. Additional information can be found in the tables at the end of this section.

Streamflow

Streamflow is a vital factor in controlling the water quality of the estuary. Increased streamflow usually results in limiting salt-water intrusion and diluting the concentration of dissolved minerals, both of which contribute to a lower specific conductance and chloride level. Increased flow also aids in maintaining lower water temperature during warm weather and supporting higher dissolved-oxygen levels.

Based on streamflow records for the Delaware River at Trenton, N.J., mean monthly streamflow was lowest for the year during November (3,559 cfs) and highest for the year during April (34,900 cfs) (see table 9). The mean monthly streamflow was above the respective median for the period of record in December, February, and April through August, and below the median for January, March and September through November.

Temperature

The significance of water temperature in regard to water quality in the estuary lies in its profound influence on various physical, chemical, and biological properties of the water. In general, increases in water temperature have deleterious effects on water quality by lowering the saturation level of dissolved oxygen and increasing biological activities.

The primary factors involved in controlling water temperature in the estuary are climatic; however, various uses of the water by man can also have significant effects.

Based on records from Benjamin Franklin Bridge (Pier 11 North), Philadelphia, Pa., mean monthly temperatures April to November 1984 were below normal (based on the period 1962 to 1983) in April through September and above normal in October and November (see fig. 5).

Specific Conductance and Chloride

Specific conductance is the ability of a solution to conduct electricity. Basically, it can be used to measure the amount of ionized material in solution and relates approximately to dissolved-solids concentration.

Specific conductance values in bodies of water usually reflect the geochemistry of the drainage basin; however, pollution and the intrusion of oceanic salts can also have considerable effects. Increasing streamflows reduce the concentration of dissolved solids, thus lowering specific conductance and chloride concentrations. Conversely, decreasing flows have the opposite effects.

In the Delaware Estuary, the intrusion of oceanic salts is important to those who must use the estuary as a water supply. For this reason, chloride concentration is of great interest. Water with chloride concentrations in excess of 250 mg/L (milligrams per liter) is usually considered undesirable for domestic use and water with concentrations in excess of 50 mg/L is unsatisfactory for some industrial uses.

As sea water has a chloride concentration of approximately 19,000 mg/L the location of a body of water in relation to the sea can influence chloride concentrations in that body of water. For this reason, chloride concentrations in the Delaware Estuary generally increase with distance downstream toward the Delaware Bay and Atlantic Ocean.

Chloride concentration was not measured directly at Fort Mifflin, Pa. and Reedy Island Jetty, Del., but a correlation between specific conductance and chloride concentration has been developed based on analyses of water samples taken in the estuary. Chloride concentrations at those sites presented in tables 17 and 19 were derived from that relationship. The relationship is less reliable when chloride concentrations are lower than 30 mg/L because other ionized materials may be present in amounts large enough to affect the conductance-chloride relation. Therefore, chloride concentrations derived from specific conductance are not given when the relationship indicates chloride concentrations of less than 30 mg/L. Chloride concentrations at Chester, Pa. were furnished by Scott Paper Company.

At Fort Mifflin, the maximum daily chloride concentration equaled or exceeded 50 mg/L 33 percent of the time (see table 17). The maximum was 111 mg/L on October 21. At Chester, the chloride concentrations equaled or exceeded 50 mg/L January 26 to February 16, March 13, August 31, and September 2 to November 30 and exceeded 250 mg/L September 26 to October 2, October 5 to November 13, November 15, and November 19 to November 30 with a maximum concentration of 640 mg/L on October 14 (see table 18). The maximum daily chloride concentration in the estuary at Chester was greater than 50 mg/L 31 percent of the time and greater than 250 mg/L 16 percent of the time (see table 18). Chloride concentrations in excess of 250 mg/L were recorded on all but 9 days at Reedy Island Jetty (see table 19) with concentrations in the range of 2,000 to 9,000 mg/L being common. The maximum concentration at this site was 9,280 mg/L on November 23.

Dissolved Oxygen

Dissolved oxygen is necessary in water for the respiration of aquatic organisms. It also plays a significant role in chemical reactions in aquatic environments. The major sources of dissolved oxygen in water are diffusion from the air and photosynthesis in aquatic plants. Dissolved-oxygen levels are limited by temperature, salinity, and the partial pressure of atmospheric oxygen.

Dissolved-oxygen levels in the estuary tend to be highest near Trenton and to decrease with distance downstream to a point near or somewhat downstream from the Benjamin Franklin Bridge where minimum values are usually reached.

During the past year, mean dissolved-oxygen concentration at the Benjamin Franklin Bridge was below 5 mg/L most days between May 7 and July 6, and continued below 5 mg/L for the period July 11 to November 30 (see table 20). The minimum daily mean was 0.5 on June 22. At Chester, the mean dissolved-oxygen concentration was below 5 mg/L on many days from June 9 through November 13 (see table 21). The lowest daily mean was 0.9 mg/L on July 2. The minimum hourly value was 0.2 mg/L on July 2. At Reedy Island Jetty, the minimum hourly value was 3.2 mg/L on July 5.

Figure 6 shows the frequency of hourly dissolved-oxygen concentration at Benjamin Franklin Bridge (Pier 11 North) and Chester during the critical summer period, July through September. During this period, the dissolved-oxygen concentration was below 4 mg/L 85 percent of the time at the Benjamin Franklin Bridge. Dissolved-oxygen concentrations were similar at the Benjamin Franklin Bridge in the 1983 and 1984 report years. Dissolved-oxygen concentration was below 4 mg/L only 16 percent of the time at Chester in 1983 as compared with 92 percent of the time in 1984.

Hydrogen-Ion Concentration (pH)

Hydrogen-ion concentration (pH) is fundamentally a measure of acidity or alkalinity. Values of pH below 7 indicate acidity, whereas values above 7 indicate alkalinity. In natural waters, pH generally ranges from 6.0 to 8.5. The main factors controlling the pH of a body of water are usually the geochemistry of the drainage basin and external influences such as pollution. Photosynthetic activity can also have a considerable influence on pH values. Increased photosynthetic activity (algal bloom) produces higher pH values. All pH values at Benjamin Franklin Bridge, Chester, and Reedy Island Jetty were within the range of 6.2 to 8.2. pH in the estuary tends to be lowest near Trenton, N.J., and to increase downstream.

Table 17.- Chloride concentrations, Delaware River at Fort Mifflin, Pa.
Daily maximum and minimum chloride concentrations in milligrams per liter
December 1, 1983 to November 30, 1984

Day	December		January		February		March		April		May		June		July		August		September		October		November	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	*	*							-	-	*	*	*	*	31	*	*	*	43	30	82	43	59	47
2	*	*							-	-	*	*	*	*	*	*	*	*	42	*	94	43	57	48
3									-	-	*	*	*	*	*	*	*	*	38	30	108	45	57	48
4									-	-	*	*	*	*	*	*	30	*	50	31	97	43	59	48
5									-	-	*	*	*	*	*	*	40	*	53	31	88	43	55	47
6									-	-	*	*	*	*	*	*	43	*	52	33	53	42	77	47
7									-	-	*	*	*	*	*	*	40	*	47	31	48	42	52	40
8									-	-	*	*	*	*	-	-	38	*	42	31	47	38	50	40
9									-	-	*	*	*	*	-	-	40	*	40	31	82	42	53	38
10									-	-	*	*	*	*	-	-	40	*	40	31	85	42	50	38
11									-	-	*	*	*	*	-	-	-	-	43	31	85	42	50	40
12									-	-	*	*	*	*	-	-	-	-	42	31	85	43	50	38
13									*	*	*	*	*	*	-	-	-	-	38	33	82	43	47	38
14									31	*	*	*	*	*	-	-	-	-	40	33	74	43	43	38
15									*	*	*	*	*	*	-	-	-	-	42	33	60	48	52	37
16									*	*	-	-	42	*	-	-	-	-	43	33	59	45	47	37
17									*	*	*	*	*	*	-	-	-	-	48	33	57	45	45	35
18									*	*	*	*	31	*	-	-	-	-	52	33	105	47	47	38
19									*	*	*	*	37	*	-	-	-	-	50	37	80	48	47	37
20									*	*	*	*	*	*	-	-	45	*	52	37	60	48	48	38
21									30	*	*	*	33	*	-	-	43	*	60	37	111	48	50	40
22									33	*	30	*	*	*	-	-	40	*	74	37	105	50	48	40
23									*	*	*	*	*	*	-	-	40	*	82	37	77	53	50	40
24									*	*	*	*	*	*	*	*	43	*	74	38	102	55	52	42
25									*	*	*	*	38	*	*	*	40	*	80	40	80	53	53	43
26									*	*	-	-	33	*	*	*	37	*	82	42	82	47	53	42
27									*	*	-	-	*	*	38	*	35	*	77	40	74	30	53	43
28									*	*	-	-	*	*	35	*	33	*	85	42	77	48	59	43
29									*	*	-	-	*	*	*	*	33	*	82	42	85	50	53	43
30									*	*	-	-	*	*	*	*	37	*	82	43	80	48	-	-
31									-	-	-	-	-	-	*	*	40	*	-	-	60	48	-	-

* Less than 30 mg/L

Table 18.-Chloride concentrations, Delaware River at Chester, Pa.1/
Daily maximum and minimum chloride concentrations in milligrams per liter
December 1, 1983 to November 30, 1984

Day	December		January		February		March		April		May		June		July		August		September		October		November	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	30	*	35	30	55	48	*	*	*	*	*	*	*	*	*	*	30	*	48	37	445	130	480	174
2	30	*	34	*	56	48	*	*	30	*	*	*	*	*	*	*	31	*	60	38	272	108	372	173
3	*	*	32	*	58	52	*	*	30	*	*	*	*	*	*	*	30	*	68	39	230	125	400	170
4	*	*	35	*	57	50	*	*	30	*	*	*	*	*	*	*	30	*	80	35	237	90	496	190
5	40	*	32	*	56	52	*	*	*	*	*	*	*	*	*	*	30	*	68	40	257	95	490	180
6	38	*	35	30	66	50	*	*	*	*	*	*	*	*	*	*	30	*	80	40	300	100	315	150
7	30	*	37	*	57	49	*	*	*	*	*	*	*	*	*	*	30	*	85	38	256	110	330	152
8	30	*	34	30	54	48	*	*	*	*	*	*	*	*	*	*	*	*	91	39	300	110	390	150
9	31	*	35	*	53	48	32	*	*	*	*	*	*	*	*	*	30	*	97	35	255	109	432	155
10	*	*	34	*	54	48	32	*	*	*	*	*	*	*	*	*	30	*	88	44	287	120	330	156
11	30	*	34	*	53	48	30	*	*	*	*	*	*	*	*	*	30	*	100	40	324	128	360	145
12	35	*	34	30	52	46	36	*	30	*	*	*	*	*	*	*	32	*	110	52	310	120	266	130
13	*	*	35	30	54	46	50	*	*	*	*	*	*	*	*	*	32	*	110	60	500	148	310	110
14	*	*	36	31	52	48	48	37	*	*	*	*	*	*	*	*	36	*	101	63	640	220	--	--
15	*	*	37	34	52	40	44	37	*	*	*	*	*	*	*	*	35	30	110	60	627	230	400	130
16	*	*	37	31	50	35	44	38	*	*	*	*	*	*	*	*	38	30	124	54	632	225	210	110
17	*	*	38	35	36	31	45	35	*	*	*	*	*	*	*	*	33	*	99	50	550	235	205	105
18	*	*	43	35	32	*	42	35	*	*	*	*	*	*	*	*	40	30	115	50	575	220	230	115
19	*	*	42	35	31	*	38	35	*	*	*	*	*	*	30	*	34	30	115	42	606	240	260	95
20	*	*	43	37	*	*	37	33	*	*	*	*	*	*	32	*	36	30	135	58	550	275	280	120
21	*	*	44	39	*	*	37	35	*	*	*	*	*	*	30	*	33	30	145	54	600	238	294	101
22	*	*	42	38	*	*	36	33	*	*	*	*	*	*	30	*	34	30	185	60	550	252	342	105
23	*	*	42	38	*	*	36	34	*	*	*	*	*	*	*	*	33	32	168	65	580	235	444	135
24	*	*	43	40	*	*	34	30	*	*	*	*	*	*	*	*	34	32	185	60	490	200	364	130
25	*	*	46	39	*	*	31	*	*	*	*	*	*	*	*	*	35	32	225	74	470	210	400	140
26	*	*	52	43	*	*	32	*	*	*	*	*	*	*	*	*	35	32	180	73	410	210	440	170
27	*	*	58	47	*	*	*	*	*	*	*	*	*	*	30	*	45	33	310	79	500	215	425	175
28	34	*	54	49	*	*	*	*	*	*	*	*	*	*	31	*	43	32	320	85	600	235	490	176
29	32	*	54	48	*	*	*	*	*	*	*	*	*	*	30	*	42	34	400	97	500	240	455	200
30	32	*	55	45	--	--	*	*	30	*	*	*	*	*	32	*	43	35	370	140	452	190	360	155
31	37	*	54	48	--	--	*	*	--	--	*	*	--	--	30	*	57	38	--	--	520	170	--	--

1/ Collection and analysis by Scott Paper Company
* Less than 30 mg/L

Table 19.- Chloride concentrations, Delaware River at Reedy Island Jetty, Del.
Daily maximum and minimum chloride concentrations in milligrams per liter
December 1, 1983 to November 30, 1984

Day	December		January		February		March		April		May		June		July		August		September		October		November	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	--	--					--	--	2660	501	1790	296	*	*	2910	479	3700	940	5750	2810	8310	4380	--	--
2	--	--					--	--	2520	445	1190	217	*	*	2210	389	3150	952	5820	2880	7530	5000	--	--
3	2170	569					--	--	2350	377	1470	217	614	*	1890	285	3690	974	5910	2910	7700	4170	--	--
4	4120	636					--	--	1970	389	2150	285	760	*	1660	285	3580	1030	5920	3010	6990	4140	--	--
5	3600	614					--	--	2780	182	524	102	636	*	1480	239	3670	1170	6250	2980	7430	3980	--	--
6	3220	648					--	--	1040	38	445	52	377	*	749	205	4120	1170	5920	3090	7650	4170	--	--
7	--	--					--	--	389	31	366	38	456	*	389	102	4350	1270	5960	2950	6800	4320	--	--
8	--	--					--	--	262	91	366	38	524	*	321	*	5160	1340	6300	2980	6880	4140	--	--
9	--	--					--	--	681	52	102	31	715	*	648	*	--	--	5930	3130	6800	4090	--	--
10	--	--					2620	434	985	38	274	31	816	*	1030	*	--	--	5900	3180	6920	4060	--	--
11	--	--					3650	760	1400	45	400	31	985	*	1050	*	--	--	5370	3010	6780	4520	--	--
12	--	--					1640	434	1580	80	102	*	1220	31	1450	52	--	--	5820	3090	--	--	--	--
13	--	--					2920	501	985	102	591	*	1340	52	--	--	--	--	5930	3010	--	--	--	--
14	--	--					--	--	805	80	228	*	1150	59	--	--	3600	1640	5550	3190	--	--	--	--
15	--	--					--	--	1260	125	445	*	1270	102	--	--	4090	1520	5550	3090	9000	5500	--	--
16	--	--					--	--	952	91	344	31	--	--	704	125	4090	1590	6600	3110	8310	5600	7500	5030
17	--	--					--	--	873	59	693	31	--	--	1500	125	4320	1570	6000	3600	8310	5340	7000	3980
18	--	--					--	--	411	38	1360	45	1150	310	1850	840	4750	1750	6280	3510	7920	5280	8040	3880
19	--	--					1440	445	194	31	1500	91	1970	251	1470	125	5090	1920	6780	3360	8500	5160	5400	4060
20	--	--					2240	434	205	*	1400	102	1850	274	1920	125	5310	2290	6850	3360	7920	5090	8310	4480
21	--	--					2410	479	59	*	861	102	2340	296	1830	194	5940	2340	6970	3020	8220	4800	8450	4480
22	--	--					1800	816	332	*	1170	148	3080	422	1850	274	6380	2490	6970	3060	7560	5030	8450	4520
23	--	--					--	--	952	31	1270	148	--	--	2280	251	5990	2340	6380	3580	--	--	9280	5030
24	--	--					--	--	1430	38	929	102	--	--	2200	296	6350	2280	6600	3050	--	--	8570	5030
25	--	--					--	--	1590	102	1820	125	--	--	3620	296	6850	2480	6750	3180	--	--	8730	5000
26	--	--					2200	445	2290	228	1680	148	3130	434	4200	535	6880	2590	6850	3440	--	--	8400	4650
27	--	--					2140	411	2910	445	1800	159	3090	501	4000	861	6500	2850	6950	3620	--	--	7830	4750
28	--	--					2780	479	2270	569	2030	182	2980	344	3620	670	6380	2970	6990	3850	--	--	8400	5000
29	--	--					4170	1120	1900	490	1970	228	2800	377	3920	738	5960	2830	7530	4000	--	--	7890	5120
30	--	--					3220	648	1570	411	952	*	2940	456	3880	828	5750	2760	7890	4140	7470	6000	7270	4380
31	--	--					3148	557	--	--	125	*	--	--	3700	884	5500	2810	--	--	--	--	--	--

* Less than 30 mg/L

Table 20.-Dissolved oxygen, Delaware River at Benjamin Franklin Bridge at Philadelphia, Pa.
Daily mean dissolved oxygen in milligrams per liter
December 1, 1983 to November 30, 1984

Day	December	January	February	March	April	May	June	July	August	September	October	November
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
1	8.8			---	11.7	8.4	---	1.9	2.0	1.4	2.1	1.7
2	9.0			---	11.7	8.0	---	2.3	1.9	1.5	2.1	1.7
3	---			---	11.9	7.6	---	3.4	1.9	1.6	2.3	2.5
4	---			---	11.7	7.3	---	4.1	1.9	1.2	2.7	2.6
5	---			---	11.5	7.7	---	4.8	2.1	.9	2.4	2.5
6	---			---	11.1	6.1	---	4.9	2.3	1.0	2.5	2.7
7	---			---	11.3	2.5	---	5.8	2.5	1.2	2.4	2.9
8	---			---	11.6	3.9	6.3	6.3	2.5	1.4	2.2	3.0
9	---			---	11.8	4.9	5.9	5.7	2.5	1.6	1.9	2.8
10	---			---	11.6	5.6	5.8	5.0	2.2	1.6	1.6	2.7
11	---			---	11.3	5.0	---	4.7	2.1	1.2	1.3	2.7
12	---			---	10.9	4.8	---	4.7	2.4	1.0	1.2	3.0
13	---			---	10.4	5.0	---	4.7	2.2	.8	1.4	3.5
14	---			---	10.2	5.0	---	4.5	2.0	.8	1.7	4.3
15	---			---	9.9	4.0	3.2	4.4	1.6	.7	1.9	4.1
16	---			---	9.6	5.1	---	---	1.5	1.1	1.6	4.1
17	---			---	9.3	3.5	---	---	1.4	1.4	1.6	4.7
18	---			---	9.4	3.6	---	---	1.4	1.4	1.6	4.6
19	---			---	9.6	4.5	---	2.7	1.3	1.2	1.5	4.4
20	---			---	9.8	4.8	---	3.0	1.4	1.3	1.4	4.5
21	---			---	9.7	4.7	---	3.1	1.8	1.3	1.6	4.6
22	---			---	9.7	4.9	.5	3.2	2.0	1.4	1.8	4.6
23	---			---	9.4	4.6	.7	3.1	2.1	1.7	1.8	4.5
24	---			---	9.4	4.1	1.1	2.7	1.9	1.9	1.8	4.6
25	---			---	9.4	4.2	1.4	2.3	---	1.6	1.7	4.5
26	---			---	9.2	4.6	2.6	2.0	---	1.4	1.8	4.4
27	---			---	9.3	3.3	2.7	2.3	---	1.8	1.9	4.4
28	---			---	9.2	2.7	3.0	2.3	---	1.8	1.7	4.3
29	---			---	9.0	3.2	2.6	2.4	---	1.8	1.7	4.4
30	---			---	8.9	---	2.3	2.4	---	2.0	1.7	4.5
31	---			12.1	---	---	---	2.1	1.4	---	1.5	---

Table 21.-Dissolved oxygen, Delaware River at Chester, Pa.
Daily mean dissolved oxygen in milligrams per liter
December 1, 1983 to November 30, 1984

Day	December Mean	January Mean	February Mean	March Mean	April Mean	May Mean	June Mean	July Mean	August Mean	September Mean	October Mean	November Mean
1	7.2				---	9.8	---	1.5	2.8	2.5	4.8	2.7
2	7.2				---	9.5	7.7	.9	2.7	2.5	4.8	3.1
3	---				---	9.8	7.5	1.4	2.6	2.5	5.0	3.4
4	---				---	9.2	7.1	1.2	2.7	2.6	5.2	4.1
5	---				---	8.6	6.7	1.7	3.0	2.3	5.1	4.4
6	---				---	8.5	6.4	2.6	3.5	2.5	5.1	3.9
7	---				---	8.1	6.0	3.3	4.1	2.8	5.1	3.8
8	---				---	8.1	5.1	3.5	4.7	3.1	5.0	4.1
9	---				---	7.9	4.6	3.6	4.7	3.3	4.6	4.2
10	---				---	7.9	4.4	3.6	4.3	3.2	4.2	4.3
11	---				---	8.0	4.2	3.4	3.8	3.1	4.0	4.3
12	---				---	8.1	4.1	3.3	3.6	3.0	3.7	4.3
13	---				---	8.0	4.1	2.9	3.5	3.0	4.1	4.5
14	---				11.0	7.5	3.9	2.7	3.3	3.1	4.9	---
15	---				11.3	7.0	3.6	2.6	3.2	2.9	5.0	---
16	---				10.7	6.8	2.2	2.6	3.3	3.1	4.7	---
17	---				10.8	6.9	3.4	2.6	3.4	3.3	4.4	---
18	---				10.7	6.9	2.9	2.5	3.5	3.5	4.0	---
19	---				10.6	6.7	2.4	2.5	3.4	3.5	3.8	---
20	---				11.2	7.2	1.7	2.4	3.4	3.6	3.5	---
21	---				10.3	7.0	1.3	2.5	3.5	3.5	3.3	---
22	---				8.8	7.0	1.2	2.3	3.5	3.5	3.3	---
23	---				8.4	7.0	1.5	2.2	3.4	3.6	3.0	---
24	---				8.7	6.8	2.0	2.3	3.2	3.3	2.8	---
25	---				8.9	7.1	2.5	2.5	3.3	2.4	2.7	---
26	---				9.6	---	2.0	2.7	3.3	2.6	2.8	---
27	---				9.9	---	2.1	3.2	3.1	3.1	2.7	---
28	---				10.0	---	2.4	3.0	3.0	3.7	2.6	---
29	---				10.0	---	2.2	2.8	3.0	4.0	2.2	---
30	---				10.0	---	1.8	2.7	2.7	4.3	2.2	---
31	---				---	---	---	2.6	2.4	---	2.4	---

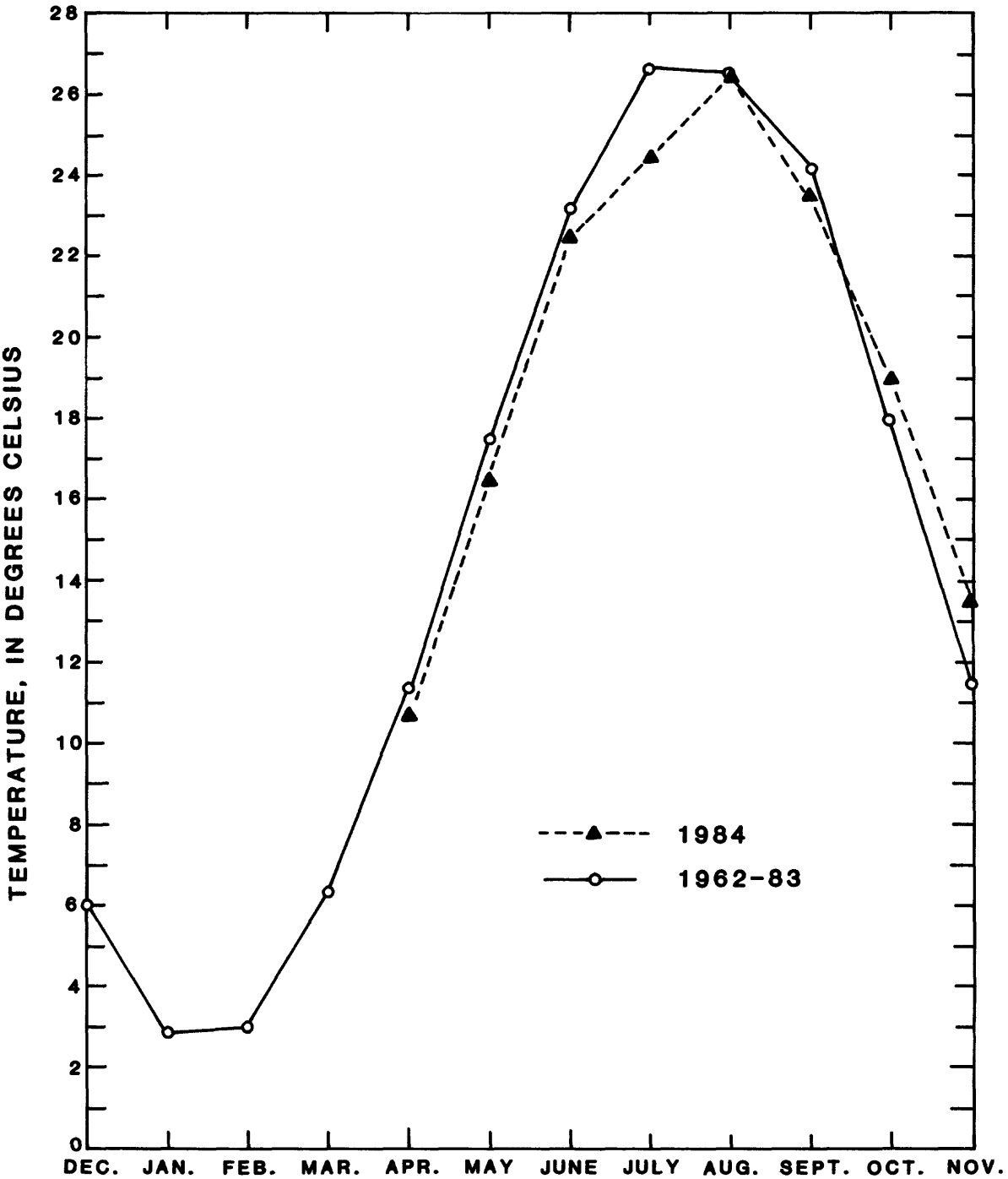


FIGURE 5.--Mean monthly temperatures of Delaware River at Benjamin Franklin Bridge, Philadelphia, Pennsylvania.

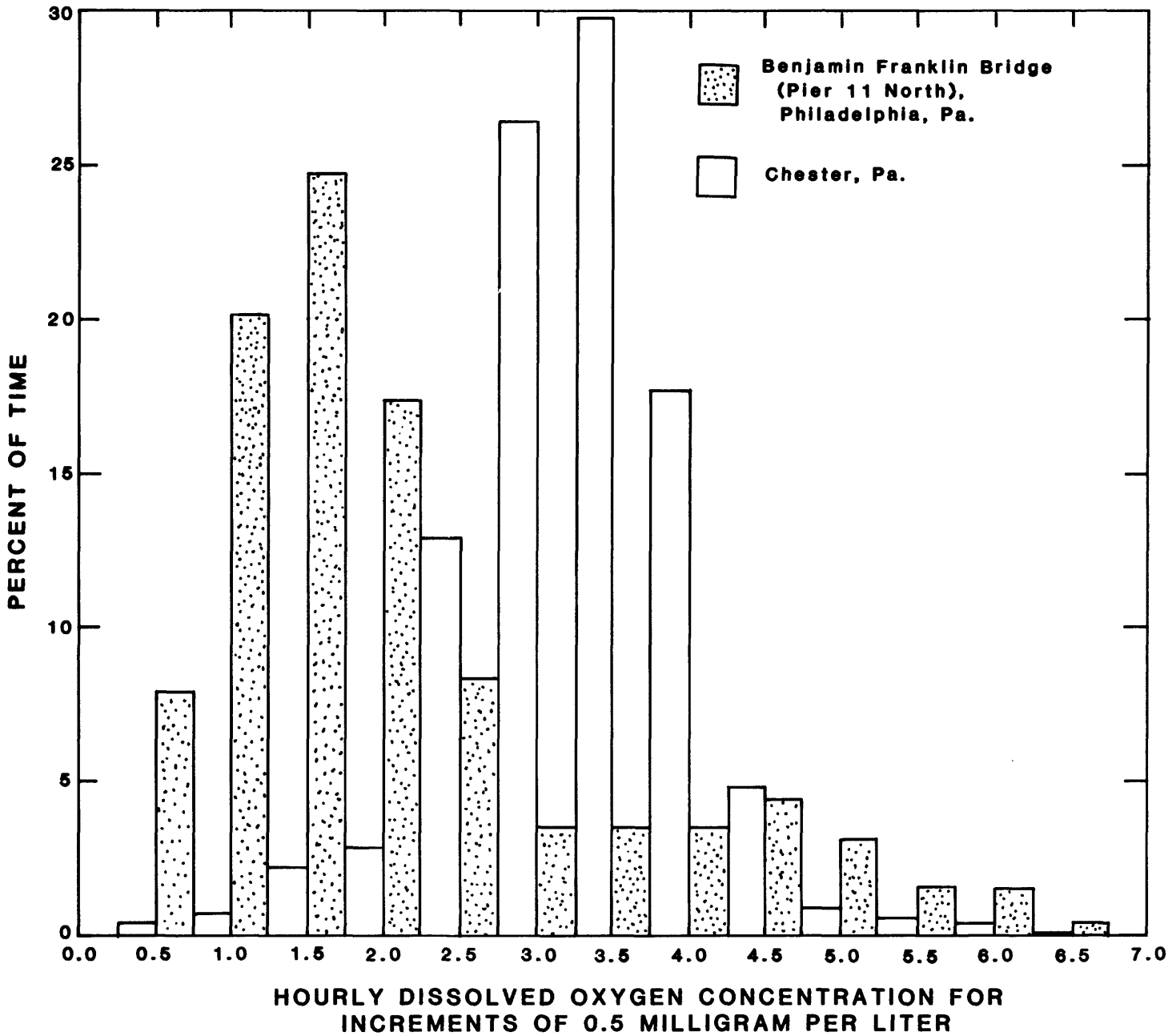


FIGURE 6.--Frequency of dissolved oxygen concentrations at two stations in the Delaware River July, August, and September 1984.

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