REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER

FOR THE PERIOD DECEMBER 1,1991-NOVEMBER 30, 1992

By William E. Harkness And Bruce E. Krejmas

With a section on WATER QUALITY

By Kirk E. White

U. S. GEOLOGICAL SURVEY
Open File Report 95-308

Reston, Virginia

1995

U.S. DEPARTMENT OF THE INTERIOR
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U.S. GEOLOGICAL SURVEY
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CONTENTS

Page

Section I - River Master letter of transmittal and special report ---- 1
Section II - Report of Delaware River operations ---- 7
Abstract ---- 9
Introduction ---- 10
Definitions of terms and procedures ---- 10
Precipitation ---- 11
Acknowledgments ---- 12
Operations ---- 12
December through May ---- 12
June through November ---- 19
Summary of operations ---- 21
Supplementary release from Wallenpaupack powerplant ---- 21
Components of flow, Delaware River at Montague, N.J. ---- 21
Time of transit ---- 22
Segregation of flow at Montague ---- 23
Computation of directed releases ---- 23
Analysis of forecasts ---- 24
Diversions to New York City water supply ---- 26
Storage in New York City reservoirs ---- 26
Comparisons of River Master operation data and other streamflow records ---- 27
Releases from New York City reservoirs ---- 27
Releases from Lake Wallenpaupack ---- 29
Delaware River at Montague, N.J. ---- 29
Diversion tunnels ---- 29
Diversions by New Jersey ---- 31
Conformance of operations under Amended Decree ---- 31
Section III - Water quality of the Delaware River estuary ---- 71
Introduction ---- 73
Water-quality monitoring program ---- 73
Estuarine water-quality data during 1991 ---- 73
Streamflow ---- 74
Temperature ---- 74
Specific conductance and chloride ---- 75
Dissolved oxygen ---- 79
Hydrogen-ion concentration (pH) ---- 80
Section IV - Appendices ---- 83
Appendix A - Agreement among the Parties to the Decree dated April 22, 1992 ---- 85
Appendix B - Agreement among the Parties to the Decree dated May 20, 1992 ---- 87

ILLUSTRATIONS

Page

Figure 1. Map of Delaware River basin upstream from Wilmington, Del. ---------- 8
2. Operating curves for New York City reservoirs----------13
3. Hydrograph of uncontrolled runoff component, Delaware River at Montague, N.J., June 1 to October 31, 1992----------67
4. Combined storage in Pepacton, Cannonsville and Neversink Reservoirs ----------68
5. Location of water quality monitoring sites in the Delaware River estuary----------72
6. Mean monthly temperatures of Delaware River at Benjamin Franklin Bridge at Philadelphia, Pa. ----------74
7. Frequency of dissolved-oxygen concentrations in the Delaware River----------79

Plate 1. Hydrograph of components of flow, Delaware River at Montague, N.J., June 1 to October 31, 1992----------69

TABLES

1. Precipitation in Delaware River Basin upstream from Montague, N.J.---------- 11
2. Conservation release rates for New York City Delaware River Basin reservoirs ----------13
3. Listing of the 1992 emergency fishery protection program releases ----------16
4. Payback of 1992 emergency fishery protection program releases ----------17
5. Design rates for the Delaware River at Montague, N.J. gaging station----------19
6. Daily discharge East Branch Delaware River at Downsville, N.Y.----------32
7. Daily discharge West Branch Delaware River at Stilesville, N.Y.----------33
8. Daily discharge Wallenpaupack Creek at Wilsonville,Pa. ----------34
9. Daily discharge Neversink River at Neversink, N.Y.----------35
10. Daily discharge Delaware River at Montague, N.J. ----------36
11. Daily discharge Delaware River at Trenton, N.J. ----------37
12. Storage in Pepacton Reservoir, N.Y ----------38
13. Storage in Cannonsville Reservoir, N.Y.----------39
14. Storage in Neversink Reservoir, N.Y. ----------40
15. Diversions by New Jersey; Delaware and Raritan Canal at Port Mercer, N.J.---------41
16. Diversions to New York City water supply----------42
17. New York City reservoir release design data----------48
18. Controlled releases for reservoirs in the Upper Delaware River Basin and segregation of flow of Montague, N.J.----------54
19. Consumption of water in New York City, 1950 to 1992----------66
20. Chloride Concentrations, Delaware River at Fort Mifflin, Pa. ----------76
21. Chloride concentrations, Delaware River at Chester, Pa.----------77
22. Chloride concentrations, Delaware River at Reedy Island Jetty, Del.----------78
23. Dissolved oxygen, Delaware River at Benjamin Franklin Bridge at Philadelphia, Pa. ----------81
24. Dissolved oxygen, Delaware River at Chester, Pa. ----------82

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To Obtain
	Length	
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
	Area	
square mile (mi^2)	2.590	square kilometer
	Volume	
million gallons (Mgal)	3,785	cubic meter
million gallons (Mgal)	1.547	cubic foot per second-day
billion gallons (Bgal)	3.785	cubic hectometer
cubic foot per second-day	0.002447	cubic hectometer
	Flow	
million gallons per day (Mgal/d)	1.547	cubic foot per second
million gallons per day (Mgal/d)	0.04381	cubic meter per second
billion gallons per day (Bgal/d)	1547	cubic foot per second
cubic foot per second (ft^3/s)	0.02832	cubic meter per second

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 - - a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Section I

RIVER MASTER LETTER OF TRANSMITTAL

and

SPECIAL REPORT

(page 3 follows)

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

March 8, 1995

The Honorable
William H. Rehnquist
Chief Justice of the Supreme Court
of the United States

The Honorable
Thomas R. Carper
Governor of Delaware

The Honorable
Christine Todd Whitman
Governor of New Jersey

The Honorable
George E. Pataki
Governor of New York

The Honorable
Thomas J. Ridge
Governor of Pennsylvania

The Honorable
Rudolph W. Giuliani
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 Supreme Court of the United States entered June 7, 1954, I am transmitting herewith the thirty-ninth Annual Report of the River Master of the Delaware River for the year December 1, 1991, to November 30, 1992.

Monthly precipitation in the upper Delaware River basin during the 1992 River Master report year ranged from 66 percent of the long-term average during February to 137 percent during July (table 1). Total precipitation during the year was 2.96 inches below average. Precipitation during the December to May period, when reservoirs typically refill, was 84 percent of the 51-year average.

On December 1, 1991, when this report year began, combined storage in the New York City reservoirs in the upper Delaware River Basin was 108.567 billion gallons (Bgal), 40.1 percent of the combined storage capacity. Median storage on December 1, based on 24 years of data, is 170.953 Bgal. Operations on December 1, 1991, were being conducted at reduced levels designed to address the water supply shortages caused by the drought-warning conditions in the basin as prescribed by the "Interstate Water Management Recommendatioins of the Parties to the Decree" (DRBC Resolution 83-13) as modified by unanimous agreement of the Parties to the Decree, the Delaware River Basin Commission (DRBC), and the Delaware River Master, on November 15, 1991. Storage in the New York City reservoirs increased throughout the winter and spring, except for a brief period in February, but it remained significantly below normal. By April 20, 1992, storage had increased to 15 billion gallons (Bgal) above the drought-warning level of the operation curves which would have allowed operations in the basin to return to normal levels as prescribed in the Decree on April 25, 1992. However, because storage was still more than 60 Bgal below normal and it was unlikely that it would return to normal by the beginning of the summer drawdown period, pursuant to DRBC Resolution 83-13, the Parties to the Decree and the DRBC requested the River Master to increase the allowable diversions and the Montague flow objective, but that they should not be increased to normal levels. In addition, they unanimously agreed that a special program should be initiated to protect the fishery downstream from the reservoirs. The River Master agreed to these requests and initiated the changes as soon as it was possible to do so. Those programs are described in more detail in section II of this report.

The Delaware River Master Advisory Committee met at Beltzville Dam, Pennsylvania on May 11, 1992 to discuss hydrologic conditions in the basin and operational procedures for the 1992 release season. The River Master informed the committee that, on the basis of information provided by New York City, the excess quantity to be released beginning June 15 was 8.763 Bgal. This water would normally be released at rates designed to maintain the Montague target flow at 110 ft^3/s above the normal 1,750 ft^3/s specifed by the Decree. However, because of the below normal reservoir storage and because hydrologic conditions in the basin had not fully recovered from the drought conditions of the past year, the decision on releasing the excess quantity should be postponed until closer to June 15, 1992, when the releases were to begin. The Parties to the Decree agreed that conditions were below normal and also agreed to monitor the hydrologic conditions in the basin closely and to reconsider releasing the excess quantity at a later date.

On June 9, 1992, the Parties to the Decree, the Delaware River Basin Commission and the River Master met by conference call and unanimously agreed that conditions in the basin had improved sufficiently that operations should be returned to normal levels, as prescribed in the Decree, effective on June 17, 1992.

On November 30, 1992, the end of this report year, the combined storage in the New York City reservoirs was 176.784 Bgal, 65.3 percent of capacity and the operations in the basin were being conducted as prescribed in the Decree.

During the report year, the River Master and staff participated in meetings of the Delaware River Basin Commission to assess water-supply conditions. Upon invitation of the representatives of the Parties to the Decree, the Deputy Delaware River Master met periodically with those representatives as a member of the Flow Management Technical Advisory Committee. Discussions primarily centered on proposals for the management of releases from reservoirs in the basin and other measures designed to cope with streamflow deficiencies whenever they occur.

The U.S. Geological Survey continued the operation of its field office of the Delaware River Master at Milford, Pennsylvania. William E. Harkness, Deputy Delaware River Master, continued in charge of the office, assisted by Bruce E. Krejmas and Beverly A. Roberts.

Mr. Stanley P. Sauer, who served as Delaware River Master since January 1, 1987 retired from Federal service on March 12, 1993. Mr. Sauer very ably guided the operations of the office during the period this report covers. Following Mr. Sauer's retirement, William E. Harkness was designated by the Chief Hydrologist as Acting Delaware River Master until such time as selection of a replacement was made.

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 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 by an "outlook" of the river flow for the forthcoming month, was made available to the representatives on the Advisory Committee.

Section II of this report describes in detail Delaware River operations during the report year. As shown on page 21, the City of New York diverted a total of 242.366 Bgal from the basin during the report year ending November 30, 1992 and released 52.760 Bgal from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River during the same period. The River Master directed releases to the Delaware River from these reservoirs totaling 26.930 Bgal.

Section III of this report describes water quality at various sites in the Delaware River Estuary. It was prepared by Kirk E. White, U.S. Geological Survey, Malvern, Pennsylvania and contains data showing the extent of salinity encroachment and other water-quality characteristics in the estuary.

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

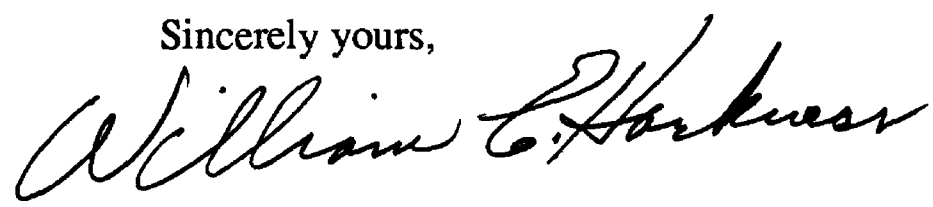
Delaware	Dr. Robert R. Jordan
New Jersey	Steven Nieswand
New York	Russell C. Mt. Pleasant
New York City	Albert F. Appleton
Pennsylvania	John E. McSparran

Throughout the year, diversions to supply water for New York City and releases designed to maintain the flow of the Delaware River at Montague were made as directed by this office. Diversions by New York City from the Delaware River basin reservoirs did not exceed the limit specified by the Decree or the limits in the several agreements among the Parties to the Decree.

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. Also, appreciation is extended to the Pennsylvania Power & Light Company and the Orange and Rockland Utilities, Inc. for their cooperation in keeping us informed of their plans for power generation and resulting releases as requested by this office. As usual, it is gratifying to report that New York City complied willingly with the terms of the Decree and with the directives of the River Master. New Jersey also cooperated fully with the directives of the River Master concerning their diversions from the basin.

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

Sincerely yours,



William E. Harkness P.E.
Acting Delaware River Master

Section II

REPORT OF DELAWARE RIVER OPERATIONS

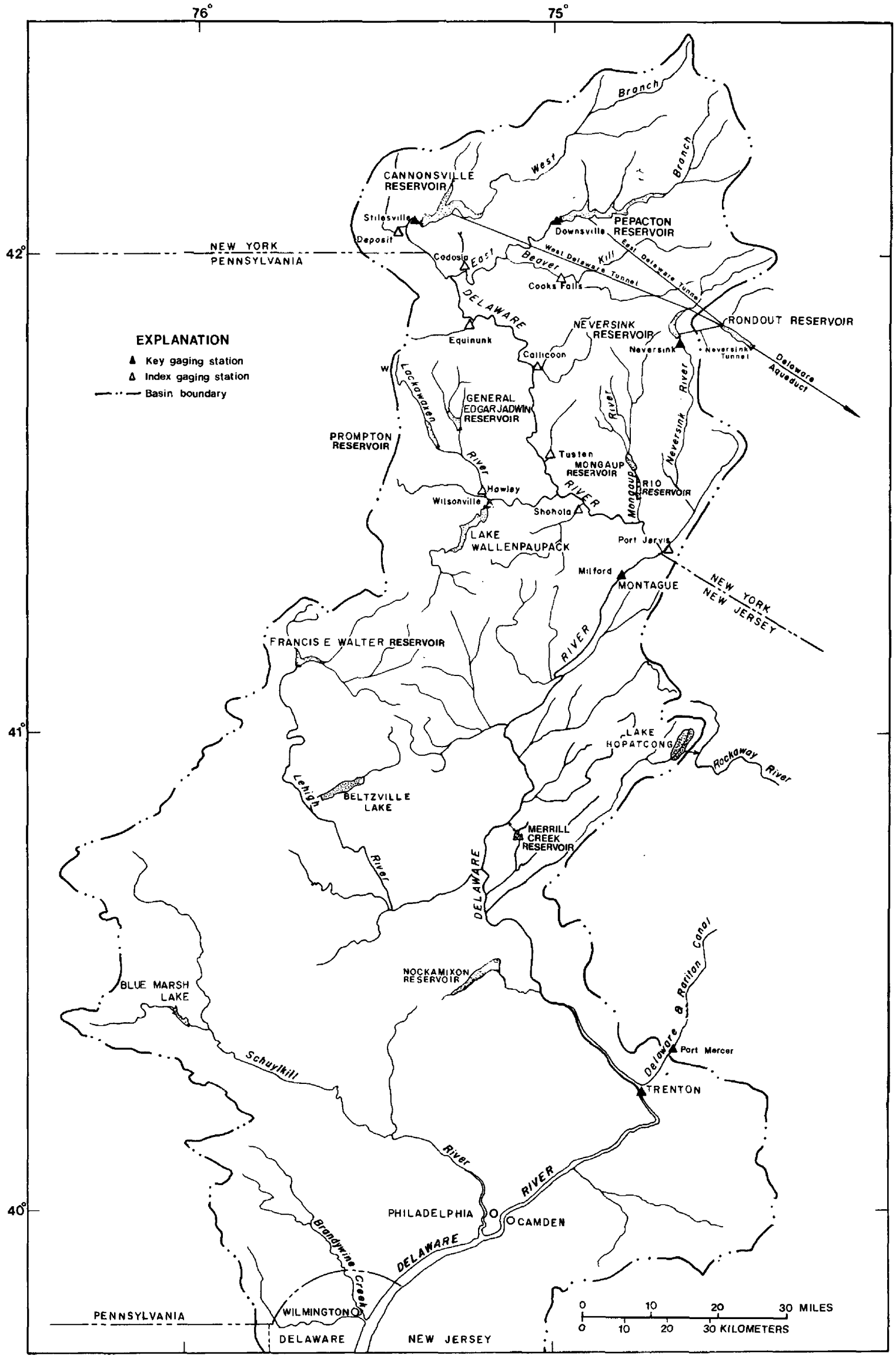


Figure 1. - Delaware River Basin upstream from Wilmington, Delaware.

Section II

REPORT OF DELAWARE RIVER OPERATIONS

by William E. Harkness and Bruce E. Krejmas

ABSTRACT

A Decree of the Supreme Court of the United States in 1954 established the position of Delaware River Master. The Decree authorizes diversions of water from the Delaware River Basin (fig. 1) and requires compensating releases from certain New York City owned reservoirs to be made under the supervision and direction of the River Master. Reports to the Court, not less frequently than annually, were stipulated.

During the 1992 report year, December 1, 1991, to November 30, 1992, the monthly precipitation and runoff ranged from below average to above average in the Delaware River Basin. For the year as a whole, precipitation was 2.96 inches below average. Reservoir storage in the basin increased steadily December 1, 1991, to May 15, 1992, except for a brief period from February 6-16. Operations were conducted at reduced levels designed to conserve the short water supplies caused by the drought-warning conditions in the basin from December 1, 1991, to June 16, 1992, in response to the unanimous request of the Parties to the Decree, as authorized by DRBC Resolution 83-13. Hydrologic conditions in the basin improved steadily during the first half of the year and operations were returned to normal on June 17, 1992, and remained there for the remainder of the year.

Diversions from the Delaware River basin by New York City and New Jersey did not exceed those authorized by the terms of the Amended Decree, or the reduced limits imposed because of the drought. Releases were made as directed by the River Master at rates designed to meet the Montague flow objective on 76 days during the year. Releases were made at the augmented conservation rates, at rates designed to relieve thermal stress and protect the fishery in the streams downstream from the reservoirs, or at other times at the basic conservation rates.

New York City and New Jersey complied fully with the terms of the Decree, the agreements reached to conserve water in the basin during the drought, and with the directives of the River Master during the year.

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 New York City reservoirs 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 from December 1, 1991 to November 30, 1992.

Part of the hydrologic data presented are records of flow and water quality at 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 West Trenton, New Jersey, in cooperation with the States of New York and New Jersey, the Commonwealth of Pennsylvania, and the City of New York.

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 (fig. 1) indicates the location of pertinent streams, reservoirs, and gaging stations.

Time of day. - Time of day is expressed in 24-hour eastern standard time, which included a 23-hour day April 5 and a 25-hour day October 5.

Rate of flow. - Mean discharge for any stated 24-hour period, in cubic feet per second (ft^3/s) or million gallons per day(Mgal/d).

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.

Conservation releases. - Controlled releases from reservoirs designed to maintain flow in the channels downstream from the reservoirs.

Directed releases. - Controlled releases from the New York City Reservoirs in the upper Delaware River Basin designed by the Delaware River Master to meet the Montague flow objective.

Uncontrolled runoff at Montague. - Runoff from the drainage area upstream from Montague exclusive of the drainage area upstream from the Downsville, Cannonsville, Neversink, Wallenpaupack, and Rio 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 transfer of water by New York City 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. Also, the transfer of water by New Jersey from the Delaware River through the Delaware and 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 (1,665 Mgal/d stipulated by 1954 Decree) 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 the 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 ft^3/s; 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 ft^3/s.

Precipitation

Precipitation measured in the basin above Montague totaled 40.15 inches for the 1992 report year and was 2.96 inches below the long-term average. Monthly precipitation ranged from 66 percent of the long-term average in February, 1992 to 137 percent of the average in July, 1992. Table 1 compares the monthly precipitation during the report year with the long-term average.

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

Month	December 1940 to November 1991 Monthly Average	December 1991 to November 1992			
		Amount	Percentage of average	Excess (+) or deficit (-)	
				Month	Cumulative
December	3.38	3.05	90	-.33	-.33
January	2.88	1.95	68	-.93	-1.26
February	2.73	1.80	66	-.93	-2.19
March	3.23	3.31	102	+.08	-2.11
April	3.71	3.73	101	+.02	-2.09
May	4.30	3.23	75	-1.07	-3.16
June	3.89	4.59	118	+.70	-2.46
July	4.10	5.60	137	+1.50	-.96
August	3.96	3.16	80	-.80	-1.76
September	3.72	2.74	74	-.98	-2.74
October	3.39	2.61	77	-.78	-3.52
November	3.82	4.38	115	+.56	-2.96
12 months	43.11	40.15	93	-2.96	

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 10 stations distributed over the basin area upstream from Montague.

December to May is generally considered the normal time of year when surface- and ground-water reservoirs fill. During this period in 1991-92, average precipitation at the 10 stations was 17.07 inches, which was 84 percent of the 51-year average. During June to November, average precipitation at the 10 stations was 23.08 inches, which was 101 percent of the long-term average. The maximum monthly precipitation measured at any of the 10 stations was 8.03 inches in June at Rock Hill, New York; the minimum monthly precipitation was 1.29 inches in January at Cannonsville Dam, New York.

Acknowledgements

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 Delaware and Raritan Canal by the New Jersey Water Supply Authority; from Lake Wallenpaupack by the Pennsylvania Power & Light Company; and from Rio Reservoir by Orange and Rockland Utilities, Inc. Precipitation data and quantitative precipitation forecasts were provided by the National Oceanic and Atmospheric Administration, National Weather Service.

OPERATIONS

December through May

Hydrologic conditions in the Delaware River Basin had entered drought warning on September 13, 1991 and remained in drought warning at the beginning of this report year. Operations on December 1, 1991 were being conducted as prescribed by the "Interstate Water Management Recommendations of the Parties to the Decree" (DRBC Resolution 83-13), as modified on November 15, 1991 by unanimous agreement of the Parties to the Decree, the Delaware River Basin Commission and the River Master. The Montague flow objective was 1,100 ft^3/s and the allowable diversions to New York City and New Jersey were 560 Mgal/d and 70 Mgal/d respectively. Conservation releases from New York City reservoirs were being made at the basic levels shown in table 2.

During the first half of the report year, total precipitation was 3.16 inches below average and monthly precipitation ranged from 66 percent of the long-term average in February to 102 percent in March (table 1.) Runoff in the upper basin was below normal during February but was within the normal range during the rest of the period.

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

Reservoir	Operative dates	Conservation release rates	
		Basic (ft^3/s)	Augmented (ft^3/s)
Neversink	April 1-7	5	45
	April 8 to October 31	15	45
	November 1 toMarch 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

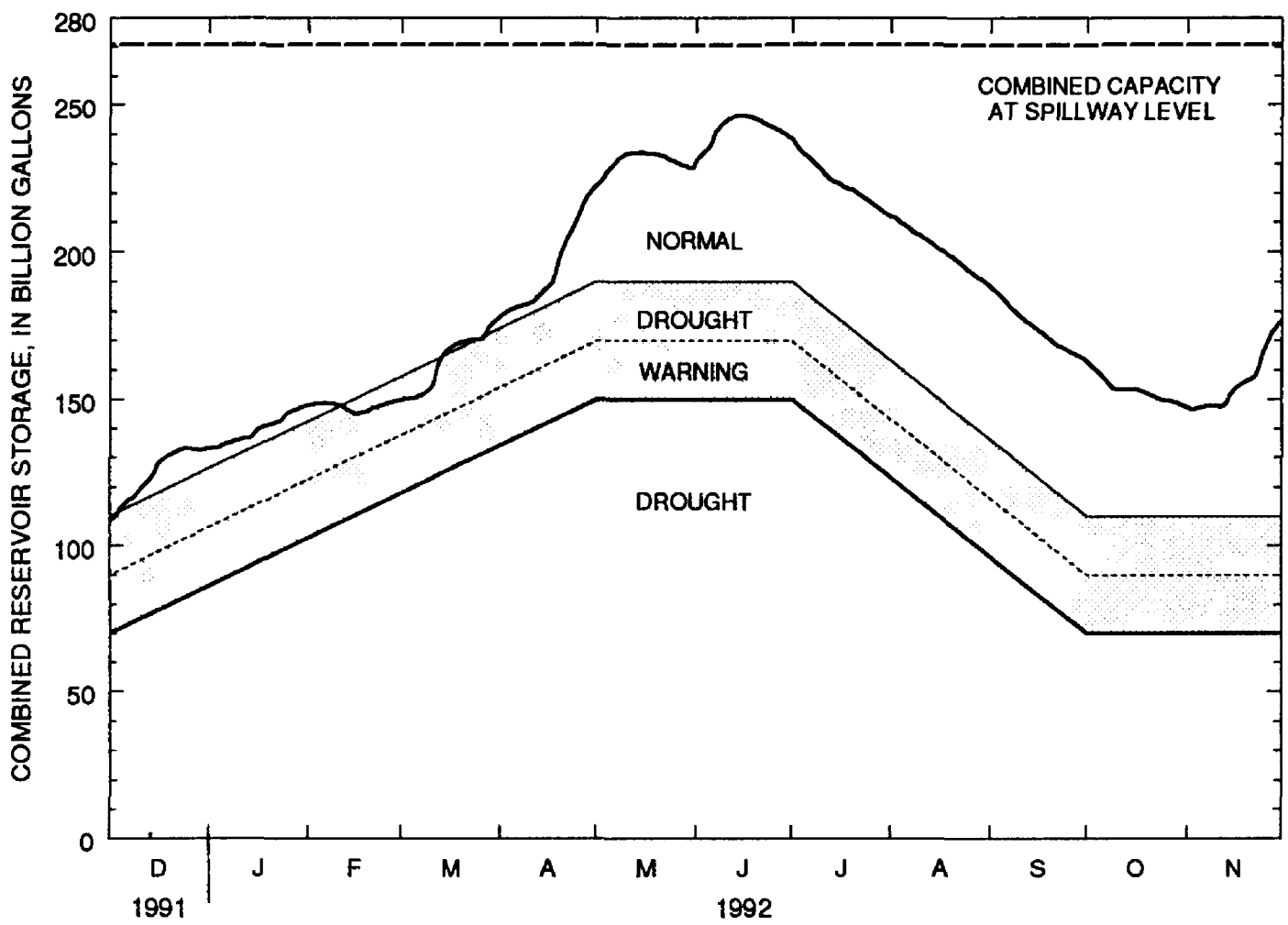


Figure 2.-Operating curves for New York City reservoirs in the Delaware River basin compared with the actual contents of the reservoirs, December 1, 1991 to November 30, 1992 (Sources: Operating curves from Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree of 1954-DRBC Resolution 83-13, reservoir contents from New York City Bureau of Water Supply data.)

On December 1, 1991, Pepacton Reservoir contained 60.873 Bgal of water in storage above the point of maximum depletion, or 43.4 percent of the reservoir's storage capacity of 140.190 Bgal. Cannonsville Reservoir contained 40.440 Bgal, or 42.3 percent of the reservoir's storage capacity of 95.706 Bgal and Neversink Reservoir contained 7.254 Bgal, or 20.8 percent of the reservoir's storage capacity of 34.941 Bgal. The combined storage in the three reservoirs as of December 1 was 108.567 Bgal, or 40.1 percent of their combined capacity. Daily storages in Pepacton, Cannonsville, and Neversink Reservoirs are shown in tables 12, 13, and 14, respectively, and the combined storage is shown graphically in figure 2.

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 51-year period, December 1940 to May 1991, was 300.1 Bgal. During the corresponding six months of the current report year, inflow to the three reservoirs totaled 244.4 Bgal. Evaporation loss was not included in the computation.

Combined storage increased seasonally throughout the period from December 1, 1991 to May 15, 1992, except for a brief period from February 6-16. Although storage increased, it remained less than 15 billion gallons above the drought-warning zone until April 20, 1992. On April 20, the storage increased to greater than 15 billion gallons above the drought-warning level of the operation curves and remained above that level for 5 consecutive days (fig. 2), which would have allowed the drought-warning operations to be terminated on April 25, 1992. However, the Parties to the Decree and the DRBC, in consultation with the River Master unanimously agreed on April 22, that since storage was still more than 60 Bgal below normal and that since it was unlikely that the reservoirs would fill before the normal summer drawdown would begin, allowable diversions and releases should not be returned to the levels prescribed by the Decree, but that they could be increased somewhat. The allowable diversions by New York City and New Jersey were increased to 750 Mgal/d and 95 Mgal/d respectively and the Montague and Trenton target flows were increased to 1,700 ft^3/s and 2,800 ft^3/s respectively. In addition, an emergency fishery protection program was established to allow special releases to protect the fishery in the streams downstream from the New York City reservoirs beginning May 1, 1992. The provisions of the emergency fishery protection program are listed below:

a. No net loss of storage.
b. Maximum use of 6000 $ft^3/s \cdot d$ to be paid back by reductions in releases required for Montague.
c. Credits from releases required for Montague targets may occur at the following rates:

When design target flow equals or exceeds	Allowed credit reduction in directed releases
1700 ft^3/s	150 ft^3/s
1600 ft/s	100 ft^3/s
1500 ft^3/s	50 ft^3/s

d. This emergency program begins May 1, 1992 and usage ends October 31, 1992 but reductions to Montague directed releases will continue until total storage is paid back or until reservoirs spill.

e. This emergency fisheries program will continue during drought warning and automatically terminate upon the Basin being in drought emergency as determined by DRBC Resolution No. 83-13. While continuing in this drought warning, conservation releases will remain at the basic release level.

f. The operation of this emergency program will be directed by NYDEC and will be coordinated with the River Master and New York City. DRBC will be informed of the River Master's directed releases each day when it is computed and NYDEC will report each request for augmented release.

On May 20, 1992, the Parties to the Decree and the DRBC reached agreement to make available an additional 2,000 $ft^3/s \cdot d$ of storage in the New York City reservoirs for fishery protection with the provision that it could not be used for releases above the augmented conservation rates that would have been effective if normal operations had been resumed. After reviewing the agreement the River Master agreed to administer it in addition to the previous agreement, effective at Montague on May 24, 1992. Tables 3 summarizes the releases made based on the two agreements. Table 4 summarizes the payback of storage used to make the releases in order to meet the "No net loss of storage," provision included in both agreements. The two agreements are included in the appendix of this report.

Total storage in the three reservoirs was 107.766 Bgal on November 30, 1991 and 228.615 Bgal on May 31, 1992. The maximum storage was 233.988 Bgal on May 15 (fig. 2). Normally, maximum storage in the individual reservoirs occurs on different days. The maximum storage in Pepacton Reservoir was 118.647 Bgal on April 18, 1992, the maximum storage in Cannonsville Reservoir was 86.929 Bgal on May 12, 1992, and the maximum storage in Neversink Reservoir was 28.973 Bgal on May 10, 1992 During the same period, diversions to Rondout Reservoir by New York City totaled 115.993 Bgal (634 Mgal/d). The forecast discharge at Montague, exclusive of water released from the City reservoirs, fell below the design rate on three days, May 25, 26 and 31. Because of the forecast low flow, releases were directed to meet the Montague flow objective and the observed discharge at Montague did not fall below the design rate.

On 13 days, releases were made from the emergency fishery protection bank (table 3). A total of 1,316 $(ft^3/s) \cdot d$ (851 Mgal) of water was released from the bank during May. New York City made releases for conservation purposes at the basic conservation rates shown in table 2 on all other days during the period.

Table 3 - Listing of the 1992 Emergency Fishery Protection Program Releases, in $ft^3/s \cdot d$

Montague Date	Directed release	Pepacton					Cannonsville					Neversink					Debits			
																	2,000 $ft^3/s \cdot d$		6,000 $ft^3/s \cdot d$	
		Conservation	Directed	2,000 $ft^3/s \cdot d$	6,000 $ft^3/s \cdot d$	Total	Conservation	Directed	2,000 $ft^3/s \cdot d$	6,000 $ft^3/s \cdot d$	Total	Conservation	Directed	2,000 $ft^3/s \cdot d$	6,000 $ft^3/s \cdot d$	Total	Daily	Total	Daily	Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
May 15	0	19	0		0	19	25	0		0	25	15	0		10	25			10	10
16	0	19	0		0	19	25	0		0	25	15	0		10	25			10	20
17	0	19	0		0	19	25	0		0	25	15	0		0	15			0	20
18	0	19	0		0	19	25	0		0	25	15	0		0	15			0	20
19	0	19	0		0	19	25	0		0	25	15	0		0	15			0	20
20	0	19	0		0	19	25	0		0	25	15	0		2	17			2	22
21	0	19	0		0	19	25	0		0	25	15	0		8	23			8	30
22	0	19	0	Began	0	19	25	0	Began	0	25	15	0	Began	10	25			10	40
23	0	19	0	May 24	0	19	25	0	May 24	63	88	15	0	May 24	16	31	Began May 24		79	119
24	0	19	0	26	0	45	25	0	20	269	314	15	0	30	0	45	76	76	269	388
25	282	0	19	52	0	71	0	248	0	119	367	0	15	30	0	45	82	158	119	507
26	175	0	19	54	0	73	0	141	0	90	231	0	15	30	0	45	84	242	90	597
27	0	19	0	51	0	70	25	0	20	105	150	15	0	14	0	29	85	327	105	702
28	0	19	0	27	0	46	25	0	20	108	153	15	0	14	0	29	61	388	108	810
29	0	19	0	27	0	46	25	0	18	0	43	15	0	14	0	29	59	447	0	810
30	0	19	0	27	0	46	25	0	18	0	43	15	0	14	0	29	59	506	0	810
31	146	0	54	0	0	54	0	43	0	0	43	0	43	0	0	43	0	506	0	810
June 1	214	0	50	0	0	50	0	135	0	0	135	0	31	0	0	31	0	506	0	810
2	0	19	0	26	0	45	25	0	18	0	43	15	0	14	0	29	58	564	0	810
3	0	19	0	26	0	45	25	0	9	0	34	14	0	0	0	14	35	599	0	810
4	0	19	0	0	0	19	25	0	0	0	25	15	0	0	0	15	0	599	0	810
5	0	19	0	0	0	19	25	0	0	0	25	15	0	2	0	17	2	601	0	810
6	0	19	0	0	0	19	25	0	0	0	25	15	0	19	0	34	19	620	0	810
7	0	19	0	0	0	19	25	0	0	0	25	12	0	0	0	12	0	620	0	810
8	0	19	0	0	0	19	25	0	0	0	25	15	0	0	0	15	0	620	0	810
9	0	19	0	0	0	19	29	0	0	0	29	15	0	0	0	15	0	620	0	810
10	0	19	0	0	0	19	25	0	0	0	25	15	0	0	0	15	0	620	0	810
11	0	19	0	0	0	19	25	0	11	0	36	15	0	14	0	29	25	645	0	810
12	0	19	0	21	0	40	25	0	20	0	45	15	0	14	0	29	55	700	0	810
13	0	19	0	21	0	40	25	0	20	0	45	15	0	19	0	34	60	760	0	810
14	0	19	0	24	0	43	25	0	20	105	150	15	0	36	0	51	80	840	105	915
15	0	19	0	52	0	71	25	0	20	325	370	15	0	31	0	46	103	943	325	1240
16	0	19	0	52	0	71	25	0	20	145	190	15	0	31	0	46	103	1046	145	1385
17	0	19	0	52	0	71	25	0	154	0	179	15	0	14	0	29	220	1266	0	1385
18	0	19	0	27	0	46	25	0	127	0	152	23	0	11	0	34	165	1431	0	1385
19	0	24	0	24	0	48	Program releases ended reservoir date June 16, 1992 (Montague date June 19, 1992)										24	1455	0	1385

Column = Release directed by River Master

Columns 2,7,12 = Releases at basic conservation rates (Table 2).

Columns 3,8,13 = Releases in response to direction by River Master

Columns 4,9,14,17,18 = Releases per para. 5.f of agreement dated May 20,1992

Columns 5,10,15,19,20 = Releases per para. 4 of agreement dated Apr. 22, 1992

Columns 6,11,16 = Total release from each reservoir

Table 4 - Payback of 1992 Emergency Fishery Protection Program Releases, in ft3/s·d

Montague	Releases		Credits		Montague	Releases		Credits		Montague	Releases		Credits	
Date	Design	Direct	Cutback	Total	Date	Design	Direct	Cutback	Total	Date	Design	Direct	Cutback	Total
May 1					June 1	364	214	150	300	July 1	0	0	0	436
2					2	0	0	0	300	2	0	0	0	436
3					3	0	0	0	300	3	180	180	0	436
4					4	0	0	0	300	4	1,020	910	110	546
5					5	0	0	0	300	5	1,042	932	110	656
6					6	0	0	0	300	6	657	547	110	766
7					7	0	0	0	300	7	0	0	0	766
8					8	0	0	0	300	8	0	0	0	766
9					9	0	0	0	300	9	0	0	0	766
10					10	0	0	0	300	10	0	0	0	766
11					11	0	0	0	300	11	0	0	0	766
12					12	0	0	0	300	12	515	515	0	766
13					13	0	0	0	300	13	473	473	0	766
14					14	0	0	0	300	14	0	0	0	766
15					15	0	0	0	300	15	0	0	0	766
16					16	0	0	0	300	16	0	0	0	766
17					17	0	0	0	300	17	0	0	0	766
18					18	0	0	0	300	18	0	0	0	766
19					19	0	0	0	300	19	0	0	0	766
20					20	0	0	0	300	20	0	0	0	766
21					21	320	320	0	300	21	0	0	0	766
22					22	0	0	0	300	22	0	0	0	766
23					23	0	0	0	300	23	0	0	0	766
24					24	0	0	0	300	24	0	0	0	766
25					25	0	0	0	300	25	124	124	0	766
26					26	0	0	0	300	26	636	526	110	876
27					27	0	0	0	300	27	516	516	0	876
28					28	690	580	110	410	28	247	247	0	876
29					29	513	487	26	436	29	0	0	0	876
30	0	0	0	0	30	0	0	0	436	30	0	0	0	876
31	296	146	150	150						31	0	0	0	876

Releases = Portion of Montague flow from NYC res. except conservation releases
Design = Directed release absent this program
Direct = Amount directed after deducting the allowable cutback

Credits = Amount credited to the payback of releases per this program
Cutback = Amount deducted daily from the design
Total = Cumulative cutback; limited to total released or 8,000 ft3/s·d

Table 4 - Payback of 1992 Emergency Fishery Protection Program Releases, in $ft^3/s{\cdot}d$ - Continued

Montague	Releases		Credits		Montague	Releases		Credits	
Date	Design	Direct	Cutback	Total	Date	Design	Direct	Cutback	Total
Aug. 1	118	118	0	876	Sept. 1	141	141	0	1,794
2	0	0	0	876	2	531	421	110	1,904
3	0	0	0	876	3	644	534	110	2,014
4	0	0	0	876	4	772	662	110	2,124
5	0	0	0	876	5	876	766	110	2,234
6	0	0	0	876	6	1,105	1,095	110	2,344
7	0	0	0	876	7	1,202	1,092	110	2,454
8	0	0	0	876	8	1.087	977	110	2,564
9	0	0	0	876	9	435	325	110	2,674
10	0	0	0	876	10	772	662	110	2,784
11	0	0	0	876	11	807	751	56	2,840
12	0	0	0	876	12				
13	0	0	0	876	13	Payback complete, program terminated			
14	0	0	0	876	14				
15	0	0	0	876	15				
16	0	0	0	876	16				
17	0	0	0	876	17				
18	0	0	0	876	18				
19	211	160	51	927	19				
20	379	269	110	1,037	20				
21	408	298	110	1,147	21				
22	365	255	110	1,257	22				
23	692	582	110	1,367	23				
24	526	517	9	1,376	24				
25	314	314	0	1,376	25				
26	434	434	0	1,376	26				
27	768	658	110	1,486	27				
28	831	721	110	1,596	28				
29	601	513	88	1,684	29				
30	328	328	0	1,684	30				
31	780	670	110	1,794					

Releases = Portion of Montague flow from NYC res. except conservation releases
Design = Directed release absent this program
Direct = Amount directed after deducting the allowable cutback

Credits = Amount credited to the payback of releases per this program
Cutback = Amount deducted daily from the design
Total = Cumulative cutback; limited to total released or 8,000 $ft^3/s{\cdot}d$

June through November

Monthly precipitation during the June through November period was above average in June, July and November and was below average in August, September and October. Total precipitation during the period was 23.08 inches or 0.20 inches above the 51-year average of 22.88 inches (table 1).

The New York City Department of Environmental Protection, Bureau of Water Supply, furnished the River Master with the following advance data for the 1992 calendar year:

1. The estimated continuous safe yield from all the City's sources, obtainable without pumping, is 1,665 Mgal/d, or a total during the calendar year 1992 of 1.665 Bgal/d x 366 days = 609.390 Bgal.

2. The estimated consumption that the City must provide from all its sources of supply during calendar year 1992 is 591.582 + 7.250 = 598.832 Bgal.

On the basis of the provisions of the Decree and the above data, the aggregate quantity of excess-release water was 83 percent of (609.390 - 598.832) or 8.763 Bgal. The Montague design rate during the excess release period beginning June 17, 1992, was computed as:

$$1{,}750\ \text{ft}^3/\text{s} + \frac{8.763\ \text{Bgal} \times 1{,}547\ (\text{ft}^3/\text{s})/(\text{Bgal/d})}{120\ \text{days}} = 1{,}860\ \text{ft}^3/\text{s}$$

Data on consumption of water by the City of New York for each calendar year, since 1950, are shown in table 19.

Releases were directed to satisfy the Montague design rate on 73 days when the forecasted discharge at Montague, exclusive of water released from the City reservoirs, fell below the applicable design rate (table 5). Releases at basic conservation rates or at rates designed to protect the fishery were made at other times from each reservoir from June 1 to June 16 and at the augmented conservation rates or rates designed to relieve thermal stresses from June 17 to November 30. A total of 1,280 $(\text{ft}^3/\text{s})\cdot\text{d}$ (0.827 Bgal) was released for the relief of thermal stress from June 17 through September 15.

Table 5. - Design rates for the Delaware River at Montague, N.J. gaging station, December 1, 1991 to November 30, 1992

Effective dates	Montague Design Rate (ft^3/s)
December 1, 1991 to April 25, 1992	1,100
April 26 to June 16	1,700
June 17 to November 30	1,860

From June 1 to June 16, the level of flow required to be maintained in the Delaware River at Montague was 1,700 ft^3/s. The forecasted flow, exclusive of releases from Pepacton, Cannonsville, and Neversink Reservoirs, was less than the design rate on one day during the period and releases were directed. Releases designed to protect the fishery were made on 10 additional days.

On June 9, 1992 the Parties to the Decree, the DRBC and the River Master met by conference call and unanimously agreed that hydrologic conditions had improved sufficiently to allow a return to normal operations. It was agreed that:

1. The Delaware River Basin will return to normal operations as established in Resolution No. 83-13, except that credits due under the emergency fisheries protection program will occur in accordance with the following schedule:

When design target at Montague equals or exceeds	Allowed credit reduction in directed release
1700 cfs	110 cfs
1600 cfs	100 cfs
1500 cfs	50 cfs

2. The excess release shall be incorporated into the design for Montague, in accordance with the Decree.

3. These modifications will take effect June 17, 1992.

Accordingly the Montague target was increased to 1,860 ft^3/s and the allowable diversions by New York City and New Jersey were increased to 800 Mgal/d and 100 Mgal/d, respectively on June 17, 1992. Releases based on the emergency fishery protection program were terminated on June 17, 1992, but the payback of the amount used for the program continued until it was completed on September 11, 1992 (table 4).

Between June 17, when normal operations in the basin resumed, and November 30, 1992, the forecasted flow at Montague, exclusive of releases from the New York City reservoirs was below the design rate on 72 days and releases were directed. On 28 of the days that releases were directed, the directed release was less than the deficiency because of the payback of the emergency fishery protection releases (table 4).

On 39 days during the June 17 to November 30 period, the observed flow fell below the design rate. Of those 39 days, 21 were within 10 percent of the design rate (9 were affected by the payback) and 18 were more than 10 percent below the design rate (3 were affected by the payback).

The hydrographs of plate 1, 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. All of these uncertainties are contained in the computed hydrograph of uncontrolled runoff.

Diversions to Rondout Reservoir June 1 to November 30 totaled 126.373 Bgal.

Summary of Operations

From December 1, 1991, to November 30, 1992, diversions to Rondout Reservoir totaled 242.366 Bgal, and all releases from the New York City reservoirs to the Delaware River totaled 52.760 Bgal.

During the year, maximum storage in Pepacton Reservoir was 123.876 Bgal, on June 15, 1992. Maximum storage in Cannonsville Reservoir was 89.271 Bgal, on June 16-17. Maximum storage in Neversink Reservoir was 33.398 Bgal, on June 12. The maximum combined storage in the three reservoirs during the year was 246.355 Bgal, on June 15.

Minimum combined storage in the reservoirs during the year was 108.567 Bgal on December 1, 1991. Minimum storage in Pepacton Reservoir was 60.850 Bgal (43.4 percent of capacity) on December 2, 1991. Minimum storage in Cannonsville Reservoir was 40.440 Bgal (42.3 percent of capacity) on December 1, 1991 and minimum storage in Neversink Reservoir was 7.254 Bgal (20.8 percent of capacity) on December 1, 1991.

On November 30, 1992, combined storage in the three reservoirs was 176.784 Bgal, or 65.3 percent of their combined capacity. During the year, combined storage increased 69.018 Bgal, or 25.5 percent of capacity.

The combined storage of the three reservoirs on the first day of the month June 1967 to November 1992 is shown in figure 4. Storage was below the median all months except November and was below the 25th percentile December through July.

SUPPLEMENTARY RELEASE FROM WALLENPAUPACK POWERPLANT

An agreement between Pennsylvania Power & Light Company and New York City provides for supplementary releases from Wallenpaupack hydroelectric powerplant if the Delaware River Basin Commission requests compensation 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 ft^3/s for more than three consecutive days. No supplementary releases were requested during the year.

COMPONENTS OF FLOW, DELAWARE RIVER AT MONTAGUE, N.J.

The data and computations of the various components of flow formed the basic operational records required to carry out the River Master's specific responsibilities with respect to the Montague Formula during the report year. The operational record has two parts: the forecasted flow at Montague, exclusive of controlled releases from New York City's reservoirs (table 17) and the segregation of the daily average flow at Montague among its various source components (table 18).

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 Rio 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 New York City.

The releases from the City's reservoirs necessary to maintain the applicable rate of flow at Montague was computed from the forecasted 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 1992 report year are as follows:

Source	Hours
Pepacton Reservoir	60
Cannonsville Reservoir	48
Neversink Reservoir	33
Lake Wallenpaupack	16
Rio Reservoir	8

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, for example, 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 18 hours late. During the winter, ice cover, together with the low streamflow, gradually increases the resistance to streamflow and lengthens the time of transit. On several occasions, when large releases were directed following small ones, these releases were directed to begin from 9 to 15 hours earlier than normal to compensate for the expected increase in travel time. Although the adjustments were helpful, the observed flow at Montague tended to be low on the first day that these releases were expected to arrive and to be high on the second or third day. The average of the observed flow for approximately three days when this procedure was used was usually close to the design rate.

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 18. 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 powerplant releases 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 the reservoirs.

The time of transit of water from Pepacton Reservoir to Montague (60 hours) was greater than the transit time of water from any other 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 from Pepacton were scheduled to begin at 1200 hours, releases from Cannonsville were scheduled to begin at 2400 hours, and releases from Neversink were scheduled to begin at 1500 hours the following day.

Releases from the City's reservoirs required to maintain the specified flow at Montague were calculated after estimates of releases from Lake Wallenpaupack and Rio Reservoir were obtained and after a forecast was made of the uncontrolled runoff at Montague. Taking into account the time of transit from these sources to Montague, the calculation required that estimates of the following components be made two or more days in advance: (1) release of water from Lake Wallenpaupack, (2) release of water from Rio Reservoir, and (3) uncontrolled runoff at Montague. 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 17.

The electric power companies cooperated fully in furnishing advance estimates of powerplant releases. 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. In addition, the power companies are members of wide area power pools which may present unforeseen demands for power generation. 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.

For computation purposes during periods of low flow, the estimate of uncontrolled runoff at Montague was treated as two items: (1) present runoff and (2) estimated increase in runoff from precipitation. Estimated quantities for these items are shown in table 17.

During the winter period, the advance estimate of the uncontrolled runoff (present conditions) was based on flows at nearby gaging stations and on the recession curve of the computed uncontrolled flow at Montague.

During ice-free conditions, the present runoff was calculated using a routing and recession procedure based on discharges as of 0800 hours at the gaging stations listed below:

Station	Drainage area (mi^2)
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 forecasted increase in runoff from precipitation is shown in table 17 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 threeday design period. During the winter, runoff was estimated from the current state of snow and ice and from forecasted temperature and precipitation. During other periods, the forecasted precipitation was used to calculate runoff.

The forcasted flow at Montague, exclusive of releases from the City's reservoirs (table 17), was the sum of the forecasted releases from the power reservoirs, the estimated uncontrolled runoff under then current conditions, and the weather adjustment. If the computed flow was less than the desired flow at Montague, the expected deficiency was made up by corresponding releases from New York City reservoirs.

When revised forecasts of precipitation or powerplant releases became available, the releases required from the reservoirs were recomputed. Usually this procedure resulted in a reduced release requirement from New York City reservoirs for that day and therefore conserved water. Only the final figures are shown in table 17.

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) varied somewhat from the observed flow on most days. At times, variations in the several components are partially compensating and the resulting observed flows were fairly close to the estimated flows.

The forecasted flow of the Delaware River at Montague, exclusive of the releases from the New York City reservoirs, was less than the applicable design rate on 52 days from August 19 to October 12, 1992. The table below compares the advance estimates of the various contributions to the flow at Montague to the observed operations during this period.

	Advance estimates [$(ft^3/s)\cdot d$]	Observed operations [$(ft^3/s)\cdot d$]
Directed releases from		
New York City reservoirs	[a] 32,715	[b] 32,790
Power releases		
Lake Wallenpaupack	9,517	9,962
Rio Reservoir	2,041	6,053
Runoff from uncontrolled area	[c] 49,508	[c] 48,731

[a] Directed release as designed.
[b] Actual release in response to direction.
[c] August 19 to October 9.

During the period, New York City released slightly more water (0.23 percent) than was directed, the power companies released 4.7 percent more water from Lake Wallenpaupack and 197 percent more water from Rio Reservoir than was forecast, and the observed runoff from the uncontrolled area was 1.6 percent less than the forecasted runoff. October 10-12 was removed from the comparison for the uncontrolled runoff because the flow was affected by a very high runoff event from precipitation that was much higher than was forecasted and would have greatly distorted the comparison (+8.2 percent v. -1.6 percent).

On the basis of the observed discharges at Montague, exact forecasting of releases required from the City's reservoirs during the report year would have totaled 40,535 $(ft^3/s)\cdot d$. Directed releases totaled 41,661 $(ft^3/s)\cdot d$, or 2.8 percent more than for exact forecasting.

A comparison of the hydrographs of forecasted runoff and the actual runoff (fig. 3) from the uncontrolled area, indicate that the forecasting procedures tended to underestimate runoff during high precipitation events but the forecasts were generally adequate. Adjustments were made when needed to compensate for errors in the forecast, but because of the travel time, the effect of the adjustments at Montague are not seen for several days.

Analysis of the precipitation forecasts indicate that the total precipitation forecasted for the three-day design period is often fairly accurate but the storm may occur either earlier or later in the period. The accuracy of the runoff forecasts are significantly affected by the timing of the precipitation events. In addition, if the storm track is somewhat different than was anticipated, the amount and timing of the runoff is significantly affected.

DIVERSIONS TO NEW YORK CITY WATER SUPPLY

The 1954 Amended Decree allows New York City to divert water from the Delaware River Basin at a rate not to exceed 800 Mgal/d. The Decree also specifies that the rate of diversions will be computed as the aggregate total diversion beginning on June 1 of each year divided by the number of days elapsed since the previous May 31.

Table 16 shows diversions from Pepacton, Cannonsville, and Neversink Reservoirs to the New York City water-supply system (Rondout Reservoir) 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 the Decree or the "Interstate Water Management Recommendations of the Parties to the Decree (DRBC Resolution 83-13)." The tabulation below shows the allowable maximum diversion rates and the actual diversions during those periods.

Effective dates	Allowable diversions (Mgal/d)	Actual diversions (Mgal/d)
Oct. 11, 1991 to Feb. 26, 1992	560	556
Feb. 27 to Apr. 22, 1992	680	672
Apr. 23 to June 16, 1992	750	596
June 17 to Nov. 30, 1992	800	735

During the year, a total of 242.366 Bgal of water was diverted to the New York City water supply system. The allowable diversion during the year was 262.771 Bgal.

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:

Level	Pepacton Reservoir		Cannonsville Reservoir		Neversink Reservoir	
	Elevation (ft.)	Contents (Bgal)	Elevation (ft.)	Contents (Bgal)	Elevation (ft.)	Contents (Bgal)
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 12, 13, and 14 show storage in Pepacton, Cannonsville, and Neversink Reservoirs, respectively, above the "point of maximum depletion" or minimum full-operating level.

On December 1, 1991 combined storage in the three reservoirs was 108.567 Bgal, 1.433 Bgal below the drought-warning level of the operating curves for the reservoirs. As discussed earlier, storage increased seasonally throughout the period from December 1, to May 15, except for a brief period from February 6-16, 1992. The seasonal decline in storage began in mid-May and continued until early November, except for June 1-15, when storage increased significantly in response to precipitation, reaching the maximum storage for the year on June 15, 1992 (fig. 2).

Precipitation averaging slightly more than 1.1 inches over the upper basin occurred during the November 2-3 period. The resulting runoff helped to increase storage from a seasonal low of 146.839 Bgal on November 3, 1992, to 176.784 Bgal on November 30, 1992 (fig. 2). The rate of decline in storage throughout the seasonal period was slightly less than normal, but the storage remained below median levels until late October because it was significantly below normal when the seasonal drawdown began.

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 U.S. Geological Survey records. In the comparison of releases, the data used were reported in units of Mgal/d and converted to ft^3/s 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 U.S. Geological Survey gaging station on the East Branch Delaware River at Downsville, N.Y., is 0.5 mile downstream from Pepacton Reservoir dam (fig. 1). The discharge shown in table 6 includes releases from Pepacton Reservoir and also includes a small amount of seepage and any runoff, which enters the channel between the dam and the gage site. The drainage area at the dam is 371 mi^2 and at the gaging station is 372 mi^2.

The table below lists the comparison of the releases from Pepacton Reservoir reported by New York City to the final records from the USGS gage (table 6).

Approximate rate of flow reported by NYC (ft^3/s)	6	19	50	70	100
Percent difference from gaging-station record a/	-11.8	-1.1	-17.5	b/	+7.3

a/ (-) indicates reported release was lower than gaging station record
b/ +10.2 June 18-28, 1992; +0.4 Sept. 20 to Nov. 1, 1992

The differences are similar to the differences observed in previous years. The comparison indicates that the venturi meters tended to under register the flows at the low end of their range and to over register at the high end of the range. The meters were adjusted to periodically to improve the accuracy of the readings, as evidenced in the differences between the comparison shown for the 70 ft^3/s rate.

The U.S. Geological Survey gaging station on the West Branch Delaware River at Stilesville, N.Y. is 1.4 miles downstream from Cannonsville Dam (fig. 1). The discharge shown in table 7 includes releases from Cannonsville Reservoir and the runoff from 2 mi^2 of drainage area between the dam and the gage site. The drainage area at the dam is 454 mi^2, and that at the gaging station is 456 mi^2.

The following table compares the releases from Cannonsville Reservoir reported by New York City to the final records from the USGS gage (table 7).

Approximate rate of flow reported by NYC (ft^3/s)	8.2	8.8	24	33	360	640	1030
Percent difference from gaging-station record a/	-35.3	-52.1	-26.7	-16.8	+10.4	+5.5	+3.2

a/ (-) indicates reported release was lower than gaging station record

The gaging-station records are considered good above 100 ft^3/s and fair below. The agreement between the data reported by New York City and the gaging station records is also good at high flows, but is poor at low flows. The gaging-station records include the runoff from precipitation on the area between the dam and the gaging station and includes seepage that occurs near the base of the dam. On January 29, 1992, the seepage was measured and found to be 2.4 ft^3/s. This value agrees with estimates made in previous years. If the gaging-station record is adjusted for seepage, the agreement at 8.2 ft^3/s , 8.8ft^3/s , 24 ft^3/s and 33 ft^3/s from the above table becomes -20.1, -38.7, -20.9 and -11.5 percent respectively. We are continuing to monitor the differences and are working with New York City and the USGS field office to improve the agreement.

The U.S. Geological Survey gaging station on the Neversink River at Neversink, N.Y. is 1,650 feet downstream from Neversink Dam (fig. 1). The discharge shown in table 9 includes releases from Neversink Reservoir and, during storms, a small amount of runoff which originates between the dam and the gage site. The drainage area at the dam is 92.5 mi^2 and that at the gaging station is 92.6 mi^2.

The following table compares the releases from Neversink Reservoir to the U.S. Geological Survey final gaging-station records shown in table 9.

Approximate rate of flow reported by NYC (ft^3/s)	4.7	15	25	45	70	102
Percent difference from gaging-station record a/	-23.4	+2.0	-8.8	+.2	+1.0	+3.0

a/ (-) indicates reported release was lower than gaging station record

The above comparisons indicate very good agreement between the data from the venturi meters and U.S. Geological Survey gaging stations at Neversink Reservoir, except for very low flows.

Additional studies will be done during 1993 to improve the agreement at all release rates, at all three reservoirs.

Releases from Lake Wallenpaupack

Records of daily discharge through the Wallenpaupack powerplant were furnished by the Pennsylvania Power & Light Company and published by the U.S. Geological Survey as Wallenpaupack Creek at Wilsonville, Pa. These discharges, shown in table 8, represent the flow through the turbines of the powerplant and were computed on a midnight-to-midnight basis. For River Master operations, flows were computed on an 0800 hour to 0800 hour basis to compensate for the travel time to Montague.

From December 1991 through November 1992, the River Master's record agrees with the U.S. Geological Survey record except for a slight variation due to the difference in the time frame and rounding of the computations.

Delaware River at Montague, N.J.

The River Master's operation record shown in table 18 indicated 0.4 percent less discharge for the year than the U.S. Geological Survey record (table 10), and daily records were in good agreement.

Diversion Tunnels

Records of diversions through the East Delaware, West Delaware, and Neversink Tunnels (fig. 1) 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. These instruments include a differential pressure transmitter which is connected to a numerical totalizer that records the volume of water discharged and a rate-of-flow indicator that records on a Bristol-type chart. The totalizer readings are transmitted electronically to the New York City Bureau of Water Supply and are reported to the River Master office daily. Current-meter measurements were made by the River Master's office to verify the accuracy of the reported diversions. The measurements were made in the outlet channels downstream from the tunnels.

The East Delaware Tunnel is used to divert water from Pepacton Reservoir to Rondout Reservoir. Conditions in the outlet channel of the East Delaware Tunnel were unfavorable for the measurement of flows from May 1 to September 30, 1992, because of high water levels in Rondout Reservoir. The results of two current-meter measurements made at other times during the report year and two measurements, one made just before the beginning of the year and one just after the end of the year showed that on the average, the venturi-meter instruments gave higher figures by 4.1 percent for the totalizer and 3.6 percent higher for the rate-of-flow indicator.

Comparison of the data provided by New York City with discharges obtained from recorded gage-heights and the rating curve for the weir on the outlet channel from the East Delaware Tunnel indicate that the data provided by New York City were within acceptable limits.

The hydroelectric plant at the downstream end of the East Delaware Tunnel operated most days of the year. 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. The results of current-meter measurements made in previous years and observations made in 1992 indicate that the leakage has not changed substantially with time and is approximately 8.0 Mgal/d. Since the powerplant was not in operation for the equivalent of 119 days during the 1992 report year, the unmeasured leakage was approximately 1.0 Bgal. Based upon the measurements obtained this year and in previous years, the record of diversions through the East Delaware Tunnel was substantially correct.

The West Delaware Tunnel is used to divert water from Cannonsville Reservoir into Rondout Reservoir. Four current-meter measurements of flow in the West Delaware Tunnel were made during the year. Those measurements and one measurement made just after the end of the year indicated that on the average the venturi instruments gave higher results, 4.6 percent for the totalizer and 4.8 percent for the rate-of-flow indicator. Inspections of the channel downstream from the outlet, when valves were closed, showed negligible leakage.

A hydroelectric plant uses water diverted through the West Delaware Tunnel. However, it operates only when diversions are less than 300 Mgal/d. When the powerplant is not operating, the valves on the pipelines to the powerplant are closed, and there is no leakage through the system. The results of the measurements and inspections made this year and during past years indicate that the reported record of the quantity of water diverted through the West Delaware Tunnel was substantially correct.

The Neversink Tunnel is used to divert water from Neversink Reservoir into Rondout Reservoir. One measurement of flow from the Neversink Tunnel was made during the year. The results of comparative data from venturi and the current-meter measurement showed that the venturi instruments were 4.2 percent higher for the totalizer and 3.6 percent higher for the rate-of-flow indicator.

A hydroelectric plant uses water diverted through the Neversink Tunnel. When the powerplant is not operating and the main valve on the diversion tunnel is open, leakage occurs that is not recorded on the venturi instruments. Based on measurements made during the previous years, the average rate of leakage was 14.0 ft^3/s (9.0 Mgal/d). When the powerplant was operating, the leakage was included in the recorded flow. When the main valve on the tunnel is closed there is no leakage.

During the 1992 report year, the power plant was not used from December 29, 1991 to April 15, 1992. The valve on the diversion tunnel was closed from January 2 to April 14, 1992 and no leakage occurred. Based on the above rate and on records of power plant operation, approximately 1.3 Bgal of water was diverted but unrecorded.

DIVERSIONS BY NEW JERSEY

The Amended Decree allows New Jersey to divert water from the Delaware River (or its tributaries in New Jersey) to areas outside the Delaware River Basin without compensating releases. These diversions may not exceed 100 Mgal/d (154.7 ft^3/s) as a monthly average, with the diversion on any day not to exceed 120 Mgal/d (185.6 ft^3/s). The U.S. Geological Survey gaging station, Delaware and Raritan Canal at Port Mercer, New Jersey (fig. 1) is used as the official location for measuring the diversions by New Jersey (table 15).

The following table lists the allowable diversions by New Jersey, the periods that they were in effect, and the maximum diversion during each period for the report year.

Effective dates	Allowable diversion Mgal/d	Maximum monthly average diversion (Mgal/d)
Oct. 11, 1991 to Apr. 22, 1992	70	66.4
Apr. 23 to June 16, 1992	95	91.9
June 17 to Nov. 30, 1992	100	100

The 30-day average diversion was computed weekly throughout the year to monitor compliance with the terms of the Decree and with the reduced diversions allowed during the period of drought warning. The maximum 30-day average diversion was 100 Mgal/d during September, 1992. The maximum daily diversion was 111 Mgal on May 28, 29, 1992. These computations show that the diversions by New Jersey did not exceed the limits allowed by the Decree or the reduced limits in effect during the drought-warning period.

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

Operations were conducted as prescribed by unanimous agreements by the Parties to the Decree based on the "Interstate Water Management Recommendations of the Parties to the Decree (DRBC Resolution 83-13)," which were designed to alleviate the drought-warning conditions in the basin from December 1, 1991 to June 16, 1992. Effective June 17, 1992, the Parties to the Decree unanimously agreed that conditions in the basin had improved sufficiently to allow a return to operations as prescribed in the Decree. From June 17 to November 30, 1992 operations were conducted as prescribed in Decree.

Diversions from the Delaware River Basin to the New York City water-supply system were less than those authorized by the Decree, the Interstate Water Management Recommendations of the Parties to the Decree and the agreements among the Parties to the Decree.

Under Compensating Releases of the Montague Formula, New York City released water from its reservoirs at rates designed by the River Master to maintain the applicable Montague flow objectives and complied fully with the directives of the River Master during the year.

Diversions from the Delaware River Basin by New Jersey were within the limits prescribed by the Decree, et al. New Jersey also complied fully with the requests of the River Master.

Table 6. - Daily Mean discharge, in cubic feet per second, of East Branch Delaware River at Downsville, N.Y. (01417000) for the year ending November 30, 1992.
U.S. Geological Survey record.

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	7.6	7.1	6.6	6.7	7.3	20	46	76	67	67	70	70
2	7.6	7.1	6.6	6.7	7.3	20	38	65	67	67	70	64
3	8.4	7.2	6.6	6.7	7.3	20	38	76	67	68	70	60
4	7.8	7.3	6.6	6.7	7.3	20	38	77	67	80	70	60
5	7.6	7.2	6.6	6.8	7.3	20	38	66	67	91	70	60
6	7.6	7.2	6.6	6.8	7.1	19	35	65	67	80	70	60
7	7.5	7.1	6.6	6.9	10	18	20	66	79	81	70	60
8	7.5	6.9	6.6	6.8	18	18	20	66	92	93	70	60
9	7.4	6.9	6.6	6.8	18	18	35	71	92	81	72	60
10	7.3	6.9	6.6	6.9	18	18	52	83	93	68	71	59
11	7.3	6.9	6.5	7.5	18	18	52	89	84	68	71	59
12	7.3	6.8	6.4	7.1	19	18	59	78	67	68	71	59
13	7.4	6.8	6.4	7.1	18	18	64	66	67	68	72	59
14	7.6	7.3	6.4	7.1	18	18	64	66	67	68	72	59
15	7.5	7.1	6.5	7.1	18	18	59	66	67	68	72	59
16	7.4	7.1	6.8	7.0	19	19	55	66	68	69	71	59
17	7.4	7.1	6.6	7.0	19	18	61	66	68	83	71	59
18	7.4	7.1	6.6	7.0	19	18	64	66	68	95	70	59
19	7.3	7.1	6.8	6.9	19	18	65	66	69	82	71	59
20	7.3	7.1	6.7	6.9	19	18	66	82	67	68	70	59
21	7.4	7.1	6.7	6.9	19	36	66	92	78	68	70	59
22	7.4	7.1	6.7	6.9	19	57	65	77	90	69	70	59
23	7.3	7.5	6.6	6.8	19	63	66	67	90	68	70	60
24	7.3	7.4	6.7	6.8	20	62	66	74	90	68	71	60
25	7.3	7.3	6.7	6.8	20	58	66	75	102	68	70	60
26	7.2	7.3	6.7	7.2	20	53	66	66	114	69	70	60
27	7.2	7.3	6.7	7.5	20	53	66	66	91	69	70	60
28	7.1	7.3	6.7	7.1	20	55	66	66	66	69	70	60
29	7.3	6.9	6.8	7.1	20	56	65	67	67	69	70	60
30	7.4	6.6		7.1	20	53	78	67	67	70	70	60
31	7.1	6.6		7.3		54		67	68		70	
	230.2	219.7	192.0	216.0	490.6	972	1639	2206	2373	2200	2185	1801
	7.43	7.09	6.62	6.97	16.4	31.4	54.6	71.2	76.5	73.3	70.5	60.0

Year total 14,724.5 $(ft^3/s)\cdot d$ Mean 40.2 ft^3/s

Table 7. - Daily mean discharge, in cubic feet per second, of West Branch Delaware River at Stilesville, N.Y. (01425000) for the year ending November 30, 1992.
U.S. Geological Survey record.

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	15	16	10	11	14	31	65	326	326	360	625	77
2	14	16	11	11	13	31	41	750	325	512	780	45
3	26	16	10	34	13	33	39	773	322	599	860	42
4	20	18	10	13	12	32	32	354	322	831	897	39
5	18	17	10	12	12	34	32	327	322	895	959	39
6	18	17	10	12	12	34	32	326	322	778	1010	40
7	17	17	10	14	12	33	31	326	321	246	1090	39
8	17	17	10	14	12	33	31	328	321	408	1130	38
9	17	17	10	14	12	33	36	330	323	548	1070	38
10	16	17	10	14	13	32	50	330	318	666	561	37
11	16	16	10	34	13	32	51	330	317	508	58	37
12	16	16	10	23	18	31	138	330	317	151	46	38
13	17	17	10	17	15	31	283	330	318	134	44	41
14	18	19	10	14	14	31	215	331	318	130	44	39
15	18	17	10	14	13	31	168	336	317	256	45	38
16	17	17	12	13	29	31	146	331	101	210	45	38
17	17	17	11	13	38	31	286	332	50	329	44	38
18	17	16	11	15	39	31	327	334	95	767	44	38
19	17	18	12	12	41	30	328	331	212	783	44	38
20	17	17	11	12	37	30	327	330	99	475	44	37
21	16	17	11	12	35	66	326	330	407	393	44	38
22	16	17	11	12	35	252	326	329	315	302	124	40
23	16	17	11	12	34	331	326	331	309	213	134	46
24	16	17	11	11	34	251	328	375	309	56	158	43
25	16	17	11	11	34	155	327	333	408	458	52	44
26	16	16	11	13	34	154	419	329	444	435	45	43
27	16	16	11	20	33	71	326	326	323	177	44	42
28	16	16	11	15	32	56	326	326	310	54	44	42
29	17	15	13	17	31	56	326	327	495	107	44	41
30	17	16		14	31	131	326	326	194	499	263	40
31	16	11		14		77		332	254		276	
Total	526	513	309	467	715	2235	6014	11149	9134	12280	10668	1235
Mean	17.0	16.5	10.7	15.1	23.8	72.1	200	360	295	409	344	41.2

Year total 55,245 (ft^3/s)·d

Mean 151 ft^3/s

Table 8. - Daily mean discharge, in cubic feet per second, at Wallenpaupack Creek at Wilsonville, Pa. (01432000) for the year ending November 30, 1992. Record furnished by Pennsylvania Power & Light Company.

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	0	0	0	0	167	170	1010	630	0	0	0	0
2	0	354	0	290	171	0	530	641	0	435	0	466
3	0	191	816	231	170	0	538	0	232	233	0	712
4	0	0	808	232	0	170	1500	0	234	233	0	464
5	0	0	836	233	0	0	1420	0	217	0	0	507
6	0	347	837	228	255	0	1440	636	229	0	0	706
7	0	359	836	0	166	0	1440	645	234	0	0	0
8	0	356	0	0	183	710	1450	627	0	231	0	0
9	0	350	0	210	162	0	1450	802	0	226	0	209
10	0	392	832	232	168	0	1450	809	235	232	0	0
11	0	0	828	421	0	165	1270	809	232	226	0	0
12	0	0	822	230	0	0	521	0	233	0	0	0
13	0	352	834	220	169	0	0	788	229	0	0	0
14	0	344	845	0	173	0	0	972	231	233	0	0
15	0	340	0	0	144	163	511	889	0	233	0	0
16	0	346	0	230	350	0	514	814	0	430	0	208
17	162	344	835	234	0	0	524	646	231	473	0	12
18	0	0	841	293	0	172	523	0	227	466	0	0
19	0	66	829	413	0	0	521	0	233	0	228	173
20	132	339	628	233	191	0	0	646	224	0	0	0
21	0	348	817	0	164	0	0	640	227	469	0	0
22	0	344	0	0	169	166	520	644	0	541	0	0
23	0	348	0	228	173	0	524	643	0	469	32	0
24	0	346	710	231	161	0	524	647	230	467	0	0
25	0	0	221	230	0	0	512	0	219	476	0	0
26	0	0	727	230	0	828	530	0	455	0	474	0
27	0	348	708	652	347	820	0	230	229	0	469	0
28	0	703	703	0	170	817	0	234	227	472	470	0
29	0	701	0	0	169	820	536	233	0	471	458	0
30	0	697		172	167	0	525	225	0	449	466	0
31	0	712		111		1,130		214	236		0	
Total	294	9027	15313	5784	3989	6131	20283	14064	5044	7465	2597	3457
Mean	9.48	291	528	187	133	198	676	454	163	249	83.8	115

Year total 93,448 $(ft^3/s)\cdot d$ Mean 255 ft^3/s

Table 9. - Daily mean discharge, in cubic feet per second, of Neversink River at Neversink, N.Y. (01436000) for the year ending November 30, 1992. U.S. Geological Survey record.

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	5.9	5.9	6.0	6.3	6.3	15	26	58	46	46	45	48
2	6.0	5.9	6.1	6.3	6.2	15	20	46	46	46	45	35
3	6.5	5.9	6.1	6.3	6.2	15	20	53	46	46	44	27
4	6.0	6.0	6.1	6.3	6.3	15	27	67	47	46	45	27
5	6.0	5.9	6.1	6.3	6.2	15	27	59	46	54	45	27
6	6.0	5.9	6.1	6.3	6.3	15	15	44	46	68	45	27
7	5.9	6.0	6.1	6.3	8.7	15	14	44	58	61	45	27
8	5.9	6.1	6.1	6.2	15	15	14	44	70	56	46	27
9	6.0	6.1	6.1	6.1	15	15	18	44	68	68	47	27
10	6.0	6.0	6.1	6.3	15	15	28	50	68	60	46	27
11	6.0	6.1	6.2	6.7	15	15	28	64	61	45	46	27
12	5.9	6.1	6.1	6.4	15	15	39	61	46	45	46	27
13	6.2	6.1	6.1	6.3	15	18	46	45	46	45	46	27
14	6.2	6.4	6.1	6.3	15	23	44	45	46	45	46	27
15	6.0	6.3	6.2	6.3	15	21	39	45	46	45	46	27
16	6.2	6.4	6.4	6.4	15	15	29	45	46	53	46	27
17	6.1	6.2	6.1	6.2	16	15	39	45	46	68	46	27
18	6.0	5.9	6.2	5.9	16	15	45	45	46	68	46	27
19	5.9	5.9	6.3	6.0	16	19	45	45	46	59	46	27
20	5.8	5.9	6.3	5.9	16	22	45	60	46	45	46	27
21	5.8	5.9	6.3	5.9	15	26	45	71	46	45	46	27
22	5.8	5.9	6.3	6.0	15	35	44	58	55	44	46	28
23	5.8	6.2	6.3	6.0	15	45	45	45	70	44	46	28
24	5.8	6.1	6.3	5.9	15	45	45	45	70	45	46	28
25	5.8	6.0	6.3	5.9	16	40	45	52	81	44	46	28
26	5.8	6.1	6.4	6.4	16	30	45	65	99	44	47	28
27	5.8	6.1	6.3	6.9	16	29	45	57	80	45	47	28
28	5.8	6.1	6.4	6.1	16	29	45	46	46	45	47	28
29	6.0	6.1	6.4	6.0	15	33	45	46	46	44	47	28
30	5.9	6.1		6.2	15	38	60	46	46	44	47	27
31	5.9	6.1		6.2		31		46	46		48	
Total	184.7	187.7	179.9	192.6	399.2	709	1072	1586	1701	1513	1426	847
Mean	5.96	6.05	6.20	6.21	13.3	22.9	35.7	51.2	54.9	50.4	46.0	28.2

Year total 9,998.1 $(ft^3/s)\cdot d$ Mean 27.3 ft^3/s

Table 10. - Daily mean discharge, in cubic feet per second, of the Delaware River at Montague, N.J. (01438500) for the year ending November 30, 1992. U.S. Geological Survey record.

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	2940	2830	3100	3700	7140	5860	17100	2460	4680	1630	1710	1930
2	2990	2720	2400	3790	6740	5520	16200	2280	4500	1080	1350	1860
3	4840	3180	2500	3800	6170	5710	10600	2020	3640	1720	1580	3090
4	10300	3390	3500	3490	5480	6400	9230	1800	3370	1880	1600	6570
5	8410	3180	3000	3490	5060	5730	7720	2020	3370	1880	1620	5330
6	6640	4200	3100	3910	4630	5250	13700	2110	3340	1710	1630	5090
7	5220	4140	2900	4020	4410	5180	14900	2570	2820	1720	1650	4880
8	4490	3770	2600	4880	4210	4980	11400	2420	2390	1690	1670	3690
9	4620	3440	1600	6200	4110	5120	9420	2540	2110	1760	1860	3580
10	5100	3310	1500	6140	4110	4600	7960	2780	3120	1690	2590	3280
11	5000	3120	2900	8170	4090	4500	6640	2620	3650	2540	4970	2890
12	4380	2480	2400	16600	4750	4120	5120	2330	3210	2560	3240	2970
13	4460	2470	2200	11800	7350	3700	4280	1530	2680	2050	3410	4410
14	4870	3250	2300	8630	6350	3160	3340	2530	2490	1590	2780	8380
15	6310	5670	2400	6970	5670	3110	3370	2810	2160	1700	2450	6540
16	6010	6100	1400	5950	5170	3100	3360	3430	1890	1580	2200	5520
17	5200	4400	2000	5330	5950	3130	3140	3750	1850	1770	2190	5050
18	4570	4000	3200	4870	11400	3180	2690	3340	2050	1960	2150	4400
19	3950	3400	3300	4970	15700	3020	2790	2760	2200	1730	1900	4090
20	3500	3000	3400	4630	14400	2710	2810	2820	1990	1590	1940	3920
21	3400	3500	3810	4050	11300	2320	2220	3160	1970	1570	1700	3390
22	3570	3400	3760	3450	9860	2200	2260	2670	1660	2010	1620	3410
23	3330	3500	2660	3420	10300	2140	2640	2460	1520	2340	1590	7880
24	2880	4800	2860	3530	9550	1970	2850	2570	1500	2120	1640	12200
25	2580	5800	3720	3300	9860	2340	3250	2640	1810	2160	1590	10300
26	2630	4400	3880	3300	11400	2580	2920	1980	2280	1960	2210	9920
27	2400	3700	4150	8420	10300	3240	2790	2780	2490	1590	2870	9450
28	2070	4000	4090	13700	8810	3120	2190	3560	2360	1640	2790	8730
29	2030	4100	4060	10000	7540	2920	2080	2870	1950	2040	2540	7190
30	2520	3900		8000	6690	2590	2540	2690	1490	1860	2530	6210
31	3390	3700		7310		3230		3280	1720		2280	
Total	134600	116850	84690	189820	228500	116730	181510	81580	78260	55120	67850	166150
Mean	4342	3769	2920	6123	7617	3765	6050	2632	2525	1837	2189	5538

Year total 1,501,660 (ft^3/s)·d

Mean 4,103 ft^3/s

Table 11. - Daily mean discharge, in cubic feet per second, of Delaware River at Trenton, N.J. (01463500) for the year ending November 30, 1992. U.S. Geological Survey record.

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	7710	6380	8040	9580	17200	12000	21700	5940	6500	3230	4910	4210
2	6990	6260	7260	8660	15900	11000	35300	5320	7640	3230	4450	3860
3	10600	5760	5840	8510	14700	10500	30200	4930	8650	3300	4040	5730
4	19400	6150	5450	8570	13600	10300	21900	4680	7120	3010	3390	13000
5	20700	6690	5830	8220	12400	10800	21000	4230	6660	4000	3870	13500
6	16900	6820	6130	7640	11400	10700	35600	4290	6030	4140	3630	13400
7	14200	6850	5420	7950	10400	9530	33600	4850	5660	3960	3410	12300
8	11900	7540	5540	9640	9850	9370	29600	5100	5490	4070	3330	11400
9	10600	7070	5630	10000	9370	13400	24700	5790	4910	4200	3450	9390
10	11200	6870	4560	11000	9150	15300	21200	7960	5300	3930	4370	7850
11	11800	6420	3370	15000	9110	13600	17900	6710	5250	4040	6570	7740
12	10800	6270	3960	20000	9380	11900	15000	5760	6770	4720	9050	7000
13	9820	5560	4520	27300	9320	10900	12500	5010	6720	6020	9510	9610
14	9950	5390	3930	20500	11500	9730	10900	4720	6000	5730	8140	15800
15	10300	7710	4320	16000	11300	8740	9470	4880	5090	4910	7560	17100
16	11000	9730	5710	13400	10100	8160	8090	6340	4700	4140	6460	15000
17	10900	10700	6320	11800	9520	10000	8040	7320	4320	3850	5510	13300
18	9890	8350	5410	10800	10600	9020	7070	8390	4610	3300	5460	12600
19	8750	7230	6260	10500	16400	8990	7250	8060	5060	3510	5320	10900
20	7230	5860	7230	10400	21700	9220	7750	6270	5550	3790	4960	9790
21	6540	5960	7190	10100	20200	7880	7160	5780	5270	4060	4470	9270
22	6800	6060	7160	9000	17700	7160	5910	5940	4630	3310	4040	8990
23	6840	6760	7280	8310	17200	6180	5370	5580	4390	3340	3830	27000
24	6750	9910	6280	7710	17800	6100	5560	5790	3740	4370	3790	32300
25	6480	12100	5860	7880	17300	5580	5990	5710	3350	4710	3850	29700
26	6000	10900	8010	8350	17500	5890	6650	5610	3300	4670	3880	25100
27	5320	9610	10600	16400	18600	6230	6320	5640	3610	5500	3760	22500
28	5190	8270	10400	29200	17100	6850	7990	5870	4040	5990	4800	20100
29	5120	8420	9960	29300	15400	6620	6560	6900	4490	5190	4980	17800
30	5710	8380		22200	13300	6240	5720	6980	4520	4750	4600	15600
31	5970	8130		18400		6950		5910	4090		4380	
Total	297360	234110	183470	412320	415000	284840	442000	182260	163460	126970	153770	421840
Mean	9592	7552	6327	13300	13830	9188	14730	5879	5273	4232	4960	14060

Year total 3,317,400 (ft^3/s).d

Mean 9,064 ft^3/s

Table 12. - Storage in Pepacton Reservoir, N.Y. for year ending November 30, 1992
(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.) Storage at spillway level is 140,190 million gallons.
(River Master daily operations record; gage reading at 0800)

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	60,873	66,093	75,837	79,291	90,967	112,547	116,478	119,444	108,959	100,776	89,374	80,220
2	60,850	66,093	76,117	79,428	91,438	113,156	116,830	119,002	109,170	100,342	88,980	79,933
3	60,956	66,154	76,368	79,550	91,777	114,064	117,501	118,529	108,717	100,326	88,547	79,741
4	61,817	66,179	76,622	79,550	92,042	114,911	118,073	118,158	108,266	99,986	88,201	79,754
5	61,947	66,387	76,636	79,727	92,338	115,409	118,377	117,770	107,991	99,614	87,696	79,632
6	62,136	66,522	77,051	79,919	92,605	115,926	118,799	117,417	107,766	99,151	87,266	79,564
7	62,244	66,633	77,253	80,056	92,828	116,428	120,225	117,014	107,525	98,721	86,766	79,496
8	62,315	66,745	77,347	80,302	93,066	116,780	121,026	116,612	107,172	98,260	86,294	79,305
9	62,564	66,855	77,347	80,671	93,229	117,064	121,780	116,211	106,964	97,862	85,867	79,155
10	62,934	66,966	77,185	81,044	93,481	117,434	122,190	115,876	106,758	97,434	85,938	78,938
11	63,222	67,064	77,507	81,774	93,647	117,686	122,722	115,028	106,532	97,343	85,725	78,776
12	63,545	67,077	77,226	83,234	94,186	117,939	123,084	114,611	106,212	96,932	85,470	78,681
13	63,761	67,175	76,877	84,117	94,875	118,141	123,411	114,197	105,908	96,658	85,186	79,114
14	64,099	67,509	76,622	84,819	95,418	118,276	123,635	113,815	105,653	96,385	84,834	79,864
15	64,413	68,307	76,382	85,414	95,963	118,411	123,876	113,486	105,383	95,978	84,834	80,205
16	65,848	68,819	76,184	85,739	96,234	118,529	123,807	113,288	105,241	95,569	84,566	80,424
17	66,118	69,222	76,143	86,109	96,902	118,613	123,704	112,975	104,939	95,146	84,229	80,644
18	66,399	69,688	76,435	86,365	98,306	118,647	123,549	112,712	104,669	94,620	83,822	80,671
19	66,522	70,142	76,676	86,665	99,955	118,512	123,359	112,431	104,447	94,336	83,443	80,685
20	66,633	70,459	76,984	86,894	101,336	118,411	123,136	112,266	104,098	93,901	83,053	80,671
21	66,745	70,829	77,333	87,066	102,570	118,208	122,929	111,971	103,735	93,422	82,677	80,561
22	66,757	71,287	77,507	87,152	103,641	118,006	122,601	111,677	103,531	92,976	82,398	80,920
23	66,843	71,519	77,842	87,281	104,764	117,871	122,275	111,431	103,215	92,754	81,995	81,540
24	66,745	72,355	78,126	87,423	105,701	117,635	121,951	111,186	102,932	92,323	81,926	82,677
25	66,695	73,042	78,329	87,538	106,820	117,383	121,694	110,925	102,632	91,865	81,843	83,415
26	66,547	73,510	78,573	87,710	108,072	117,098	121,317	110,647	102,383	91,511	81,678	84,074
27	66,436	73,967	78,735	88,287	109,251	116,780	121,009	110,371	102,210	91,217	81,540	84,665
28	66,289	74,347	78,911	89,111	110,306	116,428	120,616	110,192	101,961	90,819	81,292	85,101
29	66,179	74,820	79,155	89,636	111,203	116,144	120,276	109,819	101,820	90,306	81,044	85,414
30	66,179	75,175		90,117	111,922	115,809	119,818	109,494	101,554	89,840	80,795	85,625
31	66,179	75,466		90,569		115,575		109,218	101,164		80,547	
Change	+5,329	+9,287	+3,689	+11,414	+21,353	+3,653	+4,243	-10,600	-8,054	-11,324	-9,293	-5,078
Equiv. Mgal/d	+171.9	+299.6	+127.2	+368.2	+711.8	+117.8	+141.4	-341.9	-259.8	-377.5	-299.8	-169.3
Equiv. ft^3/s	+266	+463	+197	+570	+1,101	+182	+219	-529	-402	-584	-464	-262

Change for year +24,775 Mgal Equiv. for year +67.7 Mgal/d Equiv. for year +105 ft^3/s

Table 13. - Storage in Cannonsville Reservoir, N.Y. for year ending November 30, 1992
(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.) Storage at spillway level is 95,706 million gallons.
(River Master daily operations record; gage reading at 0800)

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	40,440	57,472	58,827	54,969	64,313	81,539	85,311	87,652	74,961	62,505	51,931	48,648
2	40,976	57,484	58,705	54,895	64,555	81,987	85,759	86,583	74,616	61,868	51,464	48,592
3	41,627	57,301	58,485	54,908	64,746	82,579	86,091	85,831	74,285	61,243	50,963	48,703
4	42,794	57,533	58,265	54,871	64,886	83,461	86,511	85,123	73,821	60,683	50,437	49,072
5	43,800	57,838	57,985	54,813	64,975	84,126	86,843	84,718	73,477	59,902	49,936	49,317
6	44,667	58,058	57,862	54,848	65,103	84,689	87,204	84,256	73,040	59,120	49,270	49,621
7	45,445	58,192	57,533	54,932	65,090	85,513	87,710	83,822	72,589	58,485	48,637	49,924
8	46,157	58,314	57,264	55,164	65,052	86,149	88,086	83,330	72,192	58,070	47,992	50,204
9	46,891	58,461	57,020	55,482	65,115	86,525	88,435	82,912	71,834	57,472	47,402	50,321
10	47,780	58,497	56,666	55,848	65,115	86,756	88,602	82,478	71,530	56,861	46,935	50,402
11	48,570	58,632	56,287	56,654	65,141	86,857	88,921	82,016	71,013	56,239	47,269	50,531
12	49,294	58,742	55,701	59,035	65,383	86,929	89,119	81,495	70,669	55,811	47,647	50,717
13	50,041	58,778	55,335	60,280	65,790	86,901	89,195	81,004	70,232	55,457	47,970	51,196
14	50,834	58,595	55,018	61,142	66,006	86,799	89,256	80,682	69,768	55,115	48,158	52,455
15	51,919	59,071	54,719	61,702	66,643	86,742	89,210	80,668	69,318	54,789	48,348	53,354
16	52,899	59,340	54,439	62,059	67,025	86,482	89,271	80,336	68,960	54,346	48,592	54,136
17	53,692	59,303	54,533	62,352	67,596	86,337	89,271	80,018	68,722	54,311	48,859	54,789
18	54,428	59,291	54,638	62,441	68,920	86,265	89,226	79,714	68,470	53,926	48,992	55,457
19	54,920	59,254	54,509	62,568	70,602	86,236	89,058	79,686	68,126	53,576	49,015	56,092
20	55,372	59,157	54,673	62,581	72,060	86,236	89,028	79,645	67,914	53,179	49,060	56,568
21	55,848	59,096	54,801	62,606	73,199	86,120	88,876	79,161	67,437	52,945	48,959	57,081
22	56,251	59,010	54,719	62,556	74,243	86,048	88,663	78,857	66,923	52,700	48,837	57,704
23	56,690	58,974	54,743	62,492	75,320	85,644	88,526	78,374	66,541	52,642	48,781	59,132
24	56,996	59,108	54,743	62,352	76,246	85,326	88,374	78,014	66,070	52,654	48,570	61,358
25	57,142	59,401	54,824	62,212	76,965	85,181	88,283	77,614	65,599	52,630	48,648	63,154
26	57,203	59,352	54,789	62,008	78,360	85,123	88,206	77,158	65,052	52,502	48,826	64,797
27	57,166	59,303	54,848	62,224	79,189	84,950	88,042	76,813	64,580	52,292	48,948	66,274
28	57,203	59,157	54,754	63,090	80,156	84,993	87,854	76,371	64,071	52,327	48,948	67,318
29	57,191	59,108	54,920	63,485	80,613	84,849	87,710	75,915	63,803	52,362	49,015	68,179
30	57,252	59,059		63,816	81,076	84,791	87,681	75,514	63,243	52,234	49,015	68,841
31	57,411	58,998		63,969		84,820		75,141	62,937		48,815	
Change	+17,622	+1,587	-4,078	+9,049	+17,107	+3,744	+2,861	-12,540	-12,204	-10,703	-3,419	+20,026
Equiv. Mgal/d	+568.5	+51.2	-140.6	+291.9	+570.2	+120.8	+95.4	-404.5	-393.7	-356.8	-110.3	+667.5
Equiv. ft^3/s	+879	+79.2	-218	+452	+882	+187	+148	-626	-609	-552	-171	+103.3

Change for year +29,052 Mgal — Equiv.for year +79.4 Mgal/d — Equiv. for year +122.8 ft^3/s

Table 14. - Storage in Neversink Reservoir, N.Y. for year ending November 30, 1992
(Storage in millions of gallons above elevation 1,319.00 ft. Add 525 million gallons for total contents above sill of outlet tunnel, elevation 1,314.00 ft.) Storage at spillway level is 34,941 million gallons.
(River Master daily operations record; gage reading at 0800)

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	7,254	9,546	13,677	15,893	23,008	28,574	29,423	31,485	28,040	25,027	21,565	18,540
2	7,365	9,663	13,749	15,942	23,187	28,583	29,823	31,341	27,953	24,899	21,443	18,419
3	7,484	9,767	13,816	16,030	23,354	28,628	30,032	31,174	27,866	24,780	21,317	18,395
4	7,693	9,868	13,911	16,109	23,501	28,795	30,150	31,012	27,745	24,707	21,192	18,444
5	7,866	10,046	13,994	16,182	23,633	28,866	30,200	30,887	27,710	24,612	21,074	18,530
6	7,878	10,182	14,056	16,284	23,757	28,929	31,438	30,758	27,584	24,494	20,930	18,565
7	7,885	10,317	14,117	16,378	23,878	28,950	32,486	30,602	27,498	24,385	20,791	18,555
8	7,887	10,427	14,173	16,561	24,015	28,955	32,914	30,438	27,348	24,259	20,660	18,544
9	7,921	10,531	14,240	16,776	24,149	28,964	33,259	30,259	27,262	24,153	20,510	18,547
10	8,026	10,630	14,286	16,958	24,271	28,973	33,341	30,114	27,283	24,027	20,588	18,469
11	8,078	10,737	14,377	17,401	24,368	28,959	33,379	29,941	27,240	23,963	20,600	18,466
12	8,140	10,826	14,421	18,625	24,556	28,941	33,398	29,760	27,172	23,850	20,548	18,480
13	8,190	10,911	14,436	19,036	24,863	28,915	33,360	29,584	27,056	23,729	20,488	18,682
14	8,352	11,003	14,523	19,311	25,018	28,879	33,341	29,504	26,945	23,625	20,439	19,129
15	8,650	11,369	14,583	19,518	25,184	28,835	33,269	29,473	26,778	23,485	20,320	19,307
16	8,896	11,542	14,665	19,694	25,221	28,795	33,230	29,473	26,701	23,362	20,253	19,409
17	8,990	11,653	14,788	19,821	25,329	28,756	33,134	29,495	26,600	23,238	20,168	19,467
18	9,085	11,773	14,844	19,979	25,674	28,712	33,062	29,464	26,528	23,107	20,064	19,518
19	9,132	11,854	14,958	20,116	26,148	28,668	32,991	29,410	26,418	22,984	19,972	19,537
20	9,143	11,932	15,094	20,235	26,494	28,663	32,900	29,347	26,299	22,818	19,869	19,576
21	9,198	12,034	15,190	20,342	26,727	28,605	32,819	29,235	26,202	22,694	19,792	19,587
22	9,220	12,147	15,241	20,447	26,923	28,583	32,752	29,106	26,072	22,552	19,763	19,817
23	9,220	12,263	15,335	20,533	27,184	28,574	32,615	28,959	25,938	22,486	19,580	20,339
24	9,269	12,577	15,406	20,625	27,412	28,486	32,472	28,857	25,792	22,462	19,475	21,006
25	9,274	12,833	15,525	20,742	27,653	28,455	32,386	28,760	25,654	22,252	19,394	21,313
26	9,254	12,968	15,603	20,825	28,001	28,416	32,241	28,632	25,553	22,147	19,285	21,577
27	9,238	13,081	15,690	21,321	28,233	28,351	32,127	28,513	25,445	22,031	19,133	21,873
28	9,238	13,221	15,759	22,093	28,351	28,271	31,962	28,407	25,325	21,942	19,014	22,081
29	9,228	13,352	15,834	22,377	28,438	28,245	31,818	28,298	25,238	21,841	18,895	22,228
30	9,316	13,466		22,599	28,526	28,193	31,677	28,176	25,234	21,730	18,782	22,318
31	9,464	13,562		22,803		28,220		28,097	25,130		18,660	
Change	+2,337	+4,098	+2,272	+6,969	+5,723	-306	+3,457	-3,580	-2,967	-3,400	-3,070	+3,658
Equiv. Mgal/d	+75.4	+132.2	+78.3	+224.8	+190.8	-9.87	+115.2	-115.5	-95.7	-113.3	-99.0	+121.9
Equv. ft^3/s	+117	+205	+121	+348	+295	-15.3	+178	-179	-148	-175	-153	+189

Change for year +15,191 Mgal Equiv. for year +41.5 Mgal/d Equiv. for year +64.2 ft^3/s

Table 15. - Diversions by New Jersey; Daily mean discharge, in million gallons per day, of Delaware and Raritan Canal at Port Mercer, N.J. (01460440) for the year ending November 30, 1992.

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	83	65	62	58	61	67	100	98	98	101	95	100
2	78	67	63	63	61	66	100	100	100	100	98	100
3	58	70	63	69	61	70	99	99	103	100	98	69
4	47	70	64	65	61	71	95	101	101	101	101	94
5	54	67	63	64	61	72	72	99	103	104	102	100
6	64	63	67	65	59	76	28	100	101	106	100	99
7	67	60	67	67	59	75	82	101	101	103	97	98
8	67	63	65	64	59	74	77	99	99	102	99	98
9	70	68	64	62	59	67	78	101	101	102	92	97
10	68	68	67	57	59	72	79	100	100	102	100	96
11	63	67	67	50	60	74	86	98	96	103	96	93
12	65	66	71	52	59	74	89	97	90	102	92	93
13	69	64	72	56	61	74	85	100	94	101	94	93
14	65	65	70	57	62	71	85	99	98	102	98	94
15	65	63	69	61	67	78	90	98	94	101	100	94
16	67	63	61	63	67	90	96	97	92	101	95	98
17	69	62	61	63	67	82	96	95	94	100	91	97
18	69	65	61	65	61	81	95	101	96	99	98	99
19	70	69	61	61	60	92	81	100	97	98	98	98
20	70	79	69	54	59	93	76	100	100	e98	97	91
21	67	75	65	54	58	96	90	100	100	e98	98	94
22	66	69	62	56	54	100	93	101	98	105	100	94
23	67	70	63	56	63	103	96	100	99	101	96	63
24	67	66	63	58	61	109	90	99	98	100	97	89
25	66	66	63	58	65	106	92	101	100	101	95	94
26	67	67	63	59	67	103	92	99	101	90	94	93
27	66	67	61	45	67	100	92	103	98	101	98	89
28	66	67	60	49	65	111	93	101	98	101	100	96
29	67	65	58	55	68	111	98	101	98	96	100	94
30	66	62		62	66	110	96	102	99	90	101	96
31	66	61		63		101		99	100		98	
Total	2059	2059	1865	1831	1857	2669	2621	3089	3047	3009	3018	2803
Mean	66.4	66.4	64.3	59.1	61.9	86.1	87.4	99.6	98.3	100	97.4	93.4

Year total 29,927 $(ft^3/s)\cdot d$ Mean 81.8 ft^3/s

Table 16. - Diversions to New York City water supply
Million gallons per day for 24-hour period beginning 0800 local time
(River Master daily operation record)

Date 1991	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Oct. 11, 1991 to date	Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Oct. 11, 1991 to date
Dec. 1	453	0	0	547	Jan. 1	306	291	0	561
2	453	0	0	545	2	266	205	0	560
3	19	0	0	536	3	210	207	0	558
4	520	0	0	535	4	238	298	0	558
5	395	0	117	535	5	255	299	0	558
6	452	0	104	535	6	258	299	0	558
7	452	0	101	536	7	270	299	0	558
8	452	0	104	536	8	263	299	0	558
9	452	0	98	536	9	254	300	0	558
10	452	0	106	536	10	253	300	0	558
11	452	0	101	537	11	254	301	0	558
12	453	0	98	537	12	254	300	0	558
13	453	0	111	537	13	80	455	0	558
14	197	0	53	533	14	0	473	0	557
15	0	0	0	525	15	0	475	0	556
16	457	0	100	525	16	0	475	0	555
17	453	0	97	526	17	0	475	0	554
18	453	102	100	528	18	0	475	0	554
19	453	102	100	529	19	0	475	0	553
20	453	102	96	531	20	0	476	0	552
21	453	102	100	533	21	0	476	0	551
22	453	103	102	535	22	0	476	0	551
23	453	203	100	538	23	0	476	0	550
24	453	288	98	542	24	0	476	0	549
25	453	300	100	546	25	0	476	0	548
26	453	300	97	550	26	0	477	0	548
27	453	300	100	554	27	0	477	0	547
28	453	300	102	557	28	0	477	0	547
29	453	300	74	561	29	0	477	0	546
30	256	300	0	561	30	0	476	0	545
31	255	301	0	561	31	0	476	0	545
Total	12,512	3,103	2,359			3,161	12,417	0	

Table 16. - Diversions to New York City water supply - continued
Million gallons per day for 24-hour period beginning 0800 local time
(River Master daily operation record)

Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average to date Oct. 11, 1991 or Feb. 27, 1992	Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Feb. 27, 1992 to date
Feb. 1	0	476	0	544	Mar. 1	205	477	0	657
2	0	476	0	543	2	208	477	0	662
3	0	476	0	543	3	208	477	0	666
4	0	476	0	542	4	207	477	0	669
5	0	477	0	542	5	206	475	0	670
6	0	477	0	541	6	207	477	0	672
7	0	477	0	541	7	203	477	0	673
8	0	477	0	540	8	201	477	0	673
9	0	476	0	540	9	217	477	0	675
10	267	476	0	541	10	205	478	0	675
11	453	476	0	544	11	207	479	0	676
12	453	476	0	547	12	206	480	0	677
13	456	479	0	551	13	197	480	0	677
14	453	475	0	554	14	191	481	0	677
15	452	474	0	556	15	195	481	0	677
16	453	474	0	559	16	196	482	0	677
17	0	474	0	559	17	200	482	0	677
18	0	474	0	558	18	200	482	0	677
19	0	472	0	557	19	197	482	0	677
20	0	476	0	557	20	210	482	0	678
21	0	476	0	556	21	192	482	0	678
22	0	476	0	556	22	190	482	0	677
23	0	476	0	555	23	113	480	0	674
24	105	474	0	555	24	113	482	0	671
25	105	476	0	555	25	235	482	0	673
26	106	476	0	556	26	235	482	0	674
27	105	476	0	581	27	236	482	0	676
28	206	476	0	632	28	235	483	0	677
29	205	477	0	648	29	228	483	0	678
					30	197	483	0	678
					31	199	483	0	678
Total	3,819	13,797	0			6,239	14,884	0	

Table 16. - Diversions to New York City water supply - continued

Million gallons per day for 24-hour period beginning 0800 local time

(River Master daily operation record)

Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average to date Feb. 27, 1992 or Apr. 23, 1992	Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Apr. 23, 1992 to date
Apr. 1	197	483	0	679	May 1	197	483	0	679
2	197	483	0	679	2	197	483	0	679
3	198	483	0	679	3	198	483	0	679
4	197	463	0	678	4	197	463	0	678
5	192	483	0	678	5	192	483	0	678
6	197	483	0	678	6	197	483	0	678
7	199	483	0	678	7	199	483	0	678
8	197	483	0	678	8	197	483	0	678
9	197	483	0	678	9	197	483	0	678
10	201	483	0	678	10	201	483	0	678
11	203	483	0	679	11	203	483	0	679
12	182	483	0	678	12	182	483	0	678
13	197	483	0	678	13	197	483	0	678
14	199	155	0	672	14	199	155	0	672
15	283	297	94	672	15	283	297	94	672
16	283	298	98	672	16	283	298	98	672
17	282	298	102	672	17	282	298	102	672
18	266	299	98	672	18	266	299	98	672
19	276	298	95	672	19	276	298	95	672
20	285	297	98	672	20	285	297	98	672
21	283	297	109	672	21	283	297	109	672
22	266	298	89	672	22	266	298	89	672
23	283	297	80	660	23	283	297	80	660
24	284	275	98	658	24	284	275	98	658
25	281	298	99	665	25	281	298	99	665
26	284	297	102	670	26	284	297	102	670
27	142	476	147	689	27	142	476	147	689
28	148	491	144	704	28	148	491	144	704
29	142	491	145	715	29	142	491	145	715
30	144	335	143	703	30	144	335	143	703
					31				
Total	6,685	11,756	1,741			6,685	11,756	1,741	

Table 16. - Diversions to New York City water supply - continued

Million gallons per day for 24-hour period beginning 0800 local time

(River Master daily operation record)

Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average to date Apr. 23, 1992 or June 17, 1992	Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 17, 1992 to date
June 1	465	193	98	748	July 1	455	295	186	610
2	0	192	96	736	2	456	295	182	631
3	0	0	98	721	3	456	296	188	649
4	297	0	99	714	4	455	296	189	665
5	299	0	105	707	5	456	295	187	679
6	11	0	0	691	6	456	295	187	692
7	0	0	0	676	7	456	296	192	704
8	0	0	0	662	8	456	296	194	715
9	0	0	143	651	9	457	296	188	725
10	0	0	149	641	10	457	295	188	734
11	0	0	138	631	11	457	296	210	743
12	0	0	141	621	12	456	296	190	751
13	0	0	140	612	13	456	296	143	756
14	0	0	140	603	14	456	296	94	759
15	218	0	149	598	15	455	296	94	762
16	298	0	142	596	16	457	296	95	765
17	316	0	141	457	17	456	295	93	768
18	301	0	137	448	18	456	0	104	761
19	298	6	141	447	19	304	0	96	750
20	297	0	139	444	20	304	286	141	750
21	300	0	139	443	21	304	297	141	750
22	451	3	139	468	22	303	297	138	749
23	453	0	202	495	23	303	297	159	749
24	453	0	188	513	24	302	297	126	749
25	453	0	185	527	25	332	297	143	749
26	455	0	187	538	26	346	297	145	750
27	455	0	185	548	27	287	297	140	750
28	455	0	182	555	28	304	297	147	750
29	459	0	184	562	29	304	297	143	750
30	457	273	187	587	30	293	297	144	749
					31	303	297	156	749
Total	7,191	667	3,974			12,198	8,579	4,723	

Table 16. - Diversions to New York City water supply - continued
Million gallons per day for 24-hour period beginning 0800 local time
(River Master daily operation record)

Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 17, 1992 to date	Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 17, 1992 to date
Aug. 1	301	297	142	749	Sept. 1	458	296	151	751
2	303	297	134	749	2	10	297	145	747
3	301	297	144	749	3	456	296	148	749
4	305	297	141	749	4	458	296	148	751
5	310	297	153	749	5	457	296	148	753
6	299	298	142	749	6	457	296	146	755
7	301	298	145	749	7	457	297	144	757
8	304	298	143	748	8	458	297	146	758
9	303	297	138	748	9	459	296	146	760
10	302	297	142	748	10	459	295	151	762
11	301	297	146	748	11	305	296	149	761
12	303	296	144	748	12	297	296	149	761
13	301	296	143	748	13	297	296	147	761
14	295	296	176	748	14	456	295	160	763
15	152	297	120	745	15	458	295	148	764
16	307	297	141	745	16	460	4	149	763
17	302	297	145	745	17	453	0	148	761
18	302	297	146	745	18	457	0	148	759
19	303	296	150	745	19	457	0	155	758
20	301	296	144	745	20	456	0	144	756
21	303	298	141	745	21	458	0	156	754
22	302	298	150	745	22	457	0	150	753
23	303	297	152	745	23	457	0	148	751
24	301	297	156	745	24	457	0	147	750
25	304	296	144	745	25	457	0	148	749
26	303	296	178	746	26	457	0	148	747
27	302	296	146	746	27	457	0	146	746
28	302	296	140	746	28	455	0	146	744
29	300	296	109	745	29	457	0	152	743
30	456	297	146	747	30	458	9	154	742
31	457	297	140	749					
Total	9,529	9,202	4,481			12,795	4,453	4,465	

Table 16. - Diversions to New York City water supply - continued
Million gallons per day for 24-hour period beginning 0800 local time
(River Master daily operation record)

Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 17, 1992 to date	Date 1992	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 17, 1992 to date
Oct. 1	458	0	145	741	Nov. 1	452	296	139	742
2	458	0	158	739	2	453	296	151	743
3	458	0	149	738	3	453	248	158	744.
4	457	0	138	737	4	453	295	30	744
5	457	0	150	736	5	453	296	101	745
6	457	0	152	735	6	453	278	100	746
7	456	0	149	734	7	453	297	99	747
8	456	0	167	733	8	452	297	102	747
9	459	0	134	731	9	452	296	125	748
10	459	0	150	730	10	452	296	93	749
11	459	0	147	729	11	452	296	101	749
12	459	0	152	728	12	453	296	110	750
13	459	0	131	727	13	453	23	109	749
14	458	0	164	726	14	453	0	105	748
15	458	0	145	725	15	454	0	97	746
16	454	97	147	725	16	454	0	101	745
17	453	98	149	725	17	453	0	104	744
18	453	109	159	725	18	453	0	112	743
19	452	219	148	725	19	453	0	86	742
20	452	296	148	727	20	453	0	110	740
21	453	296	149	728	21	453	0	106	739
22	453	296	158	730	22	453	0	101	738
23	454	296	142	731	23	311	0	58	736
24	473	309	152	732	24	452	0	100	735
25	454	297	148	734	25	453	0	102	734
26	454	296	152	735	26	454	0	96	732
27	454	296	162	736	27	454	255	107	733
28	453	296	159	738	28	454	295	99	734
29	453	296	158	739	29	454	296	116	734
30	453	296	151	740	30	452	296	102	735
31	453	296	156	741					
Total	14,139	4,089	4,669			13,447	4,652	3,120	

Table 17. - 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 ft^3/s	Powerplant release forecasts: Rio Reservoir ft^3/s	Uncontrolled runoff: Present conditions ft^3/s	Uncontrolled runoff: Weather adjustment ft^3/s	Date	Discharge ft^3/s	Indicated deficiency ft^3/s	Balancing adjustment ft^3/s	Fishery program payback adjustment ft^3/s	Directed release ft^3/s	Computation of the balancing adjustment: Adjusted directed release: Daily ft^3/s	Adjusted directed release: Cumulative $(ft^3/s)\cdot d$	Actutal deficiency: Daily ft^3/s	Actutal deficiency: Cumulative $(ft^3/s)\cdot d$	Cumulative difference $(ft^3/s)\cdot d$	Balancing adjustment (ft^3/s)
1991/92	1	2	3	4		5	6	7	8	9	10	11	12	13	14	15

MONTAGUE DESIGN RATE = 1,100 ft^3/s DECEMBER 1, 1991 TO APRIL 25, 1992
1,700 ft^3/s APRIL 26 TO JUNE 16, 1992

The estimated Montague discharge was greater than the Montague design rate December 1, 1991 to May 24, 1992

May 22	0	0	1,418	0	May 25	1,418	282	0	282
23	0	248	1,277	0	26	1,525	175	0	175
24	228	355	1,204	16	27	1,803	0	0	0
25	228	355	1,543	228	28	2,354	0	0	0
26	816	142	1,409	236	29	2,603	0	0	0
27	816	35	1,517	16	30	2,384	0	0	0
28	0	0	1,404	0	31	1,404	296	-150	146

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 Co. 6 = 0.
Col. 7 = Col. 15 (4 days earlier).
Col. 8 = Fishery program payback from Table 4.
Col. 9 = Design rate - Col. 5 + Col. 7 + Col. 8, when positive; otherwise Col.9 = 0.
Col 10 = Col. 7, from Table 18.
Col.11 = Summation of Col. 10.

Col. 12 = Design rate + Col. 8 - (Col. 9 + Col. 10 from Table 18), when positive; otherwise Col. 12 = 0.
Col. 13 = Summation of Col. 12.
Col. 14 = Col. 11 - Col. 13.
Col. 15 = Col. 14 divided by minus 10, limited to ±110.

Note: Cols. 7, 10-15 are used only for the computation of the balancing adjustment June 17 to November 30, 1992.

Table 17. - New York City Reservoir release design data - continued
(River Master daily operation record)

Date of advauce estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases: Powerplant release forecasts: Lake Wallenpaupack ft^3/s	Powerplant release forecasts: Rio Reservoir ft^3/s	Uncontrolled runoff: Present conditions ft^3/s	Uncontrolled runoff: Weather adjustment ft^3/s	Date	Discharge ft^3/s	Indicated deficieucy ft^3/s	Balancing adjustment ft^3/s	Fishery program payback adjust-ment ft^3/s	Directed release ft^3/s	Computation of the balancing adjustment: Adjusted directed release: Daily ft^3/s	Adjusted directed release: Cumulative $(ft^3/s)\cdot d$	Actutal deficiency: Daily ft^3/s	Actutal deficiency: Cumulative $(ft^3/s)\cdot d$	Cumulative difference $(ft^3/s)\cdot d$	Balancing adjustment (ft^3/s)
1992	1	2	3	4		5	6	7	8	9	10	11	12	13	14	15
May 29	0	0	1,269	67	June 1	1,336	364		-150	214						
The estimated Montague discharge was greater than the Montague design rate June 2-20, 1992																
MONTAGUE DESIGN RATE = 1,860 ft^3/s JUNE 17 - NOVEMBER 30, 1992																
June 18	0	0	1,390	150	21	1,540	320	0	0	320	320	320	207	207	113	-11
19	0	213	1,314	356	22	1,883	0	0	0	0	0	320	157	364	-44	+4
The estimated Montague discharge was greater than the Montague design rate June 23-27, 1992																
25	0	0	1,174	0	28	1,174	686	+4	-110	580	589	909	219	583	326	-33
26	0	213	1,116	22	29	1,351	509	+4	-26	487	486	1,395	320	903	492	-49
27	522	284	1,150	0	30	1,956	0	+4	0	0	0	1,395	0	903	492	-49

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 Co. 6 = 0.
Col. 7 = Col. 15 (4 days earlier).
Col. 8 = Fishery program payback from Table 4.
Col. 9 = Design rate - Col. 5 + Col. 7 + Col. 8, when positive; otherwise Col.9 = 0.
Col 10 = Col. 7, from Table 18.
Col.11 = Summation of Col. 10.

Col. 12 = Design rate + Col. 8 - (Col. 9 + Col. 10 from Table 18), when positive; otherwise Col. 12 = 0.
Col. 13 = Summation of Col. 12.
Col. 14 = Col. 11 - Col. 13.
Col. 15 = Col. 14 divided by minus 10, limited to ±110.

Note: Cols. 7, 10-15 are used only for the computation of the balancing adjustment June 17 to November 30, 1992.

Table 17. - 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 ft^3/s	Powerplant release forecasts: Rio Reservoir ft^3/s	Uncontrolled runoff: Present conditions ft^3/s	Uncontrolled runoff: Weather adjustment ft^3/s	Date	Discharge ft^3/s	Indicated deficiency ft^3/s	Balancing adjustment ft^3/s	Fishery program payback adjust-ment ft^3/s	Directed release ft^3/s	Computation of the balancing adjustment: Adjusted directed release: Daily ft^3/s	Adjusted directed release: Cumulative $(ft^3/s)\cdot d$	Actutal deficiency: Daily ft^3/s	Actutal deficiency: Cumulative $(ft^3/s)\cdot d$	Cumulative difference $(ft^3/s)\cdot d$	Balancing adjustment (ft^3/s)
1992	1	2	3	4		5	6	7	8	9	10	11	12	13	14	15
June 28	522	284	1,096	0	July 1	1,902	0	+4	0	0	0	1,395	0	903	492	-49
29	522	284	986	36	2	1,828	32	-33	0	0	0	1,395	149	1,052	343	-34
30	643	71	854	63	3	1,631	229	-49	0	180	180	1,575	411	1,463	112	-11
July 1	0	0	791	0	4	791	1,069	-49	-110	910	914	2,489	934	2,397	92	-9
2	0	0	730	39	5	769	1,091	-49	-110	932	932	3,421	732	3,129	292	-29
3	0	120	706	370	6	1,169	691	-34	-110	547	546	3,967	256	3,385	582	-58
The estimated Montague discharge was greater than the Montague design rate July 7-11, 1992																
9	0	0	1,046	241	12	1,287	573	-58	0	515	512	4,479	112	3,497	982	-98
10	0	213	937	179	13	1,329	531	-58	0	473	473	4,952	932	4,429	523	-52
The estimated Montague discharge was greater than the Montague design rate July 14-22, 1992																
20	643	71	1,325	118	23	2,157	0	-52	0	0	0	4,952	21	4,450	502	-50
21	643	71	1,147	0	24	1,861	0	-52	0	0	0	4,952	0	4,450	502	-50
22	643	0	971	70	25	1,684	176	-52	0	124	124	5,076	0	4,450	626	-63
23	0	0	882	290	26	1,172	688	-52	-110	526	534	5,610	394	4,844	766	-77
24	0	106	1,097	91	27	1,294	566	-50	0	516	511	6,121	0	4,844	1,277	-110
25	228	142	1,128	65	28	1,563	297	-50	0	247	247	6,368	0	4,844	1,524	-110
The estimated Montague discharge was greater than the Montague design rate July 29-31, 1992																

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 Co. 6 = 0.
Col. 7 = Col. 15 (4 days earlier).
Col. 8 = Fishery program payback from Table 4.
Col. 9 = Design rate - Col. 5 + Col. 7 + Col. 8, when positive; otherwise Col.9 = 0.
Col 10 = Col. 7, from Table 18.
Col.11 = Summation of Col. 10.

Col. 12 = Design rate + Col. 8 - (Col. 9 + Col. 10 from Table 18), when positive; otherwise Col. 12 = 0.
Col. 13 = Summation of Col. 12.
Col. 14 = Col. 11 - Col. 13.
Col. 15 = Col. 14 divided by minus 10, limited to ±110.

Table 17. - 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 ft^3/s	Powerplant release forecasts: Rio Reservoir ft^3/s	Uncontrolled runoff: Present conditions ft^3/s	Uncontrolled runoff: Weather adjustment ft^3/s	Date	Discharge ft^3/s	Indicated deficiency ft^3/s	Balancing adjustment ft^3/s	Fishery program payback adjust-ment ft^3/s	Directed release ft^3/s	Computation of the balancing adjustment: Adjusted directed release: Daily ft^3/s	Adjusted directed release: Cumulative $(ft^3/s)\cdot d$	Actutal deficiency: Daily ft^3/s	Actutal deficiency: Cumulative $(ft^3/s)\cdot d$	Cumulative difference $(ft^3/s)\cdot d$	Balancing adjustment (ft^3/s)
1992	1	2	3	4		5	6	7	8	9	10	11	12	13	14	15
July 29	228	0	1,294	110	Aug. 1	1,632	228	-110	0	118	118	6,486	0	4,844	1,642	-110
The estimated Montague discharge was greater than the Montague design rate August 2-8, 1992																
Aug. 6	0	0	1,740	22	9	1,762	98	-110	0	0	0	6,486	133	4,977	1,509	-110
The estimated Montague discharge was greater than the Montague design rate August 10-14, 1992																
12	230	71	1,512	54	15	1,867	0	-110	0	0	0	6,486	146	5,123	1,363	-110
13	0	57	1,288	543	16	1,888	0	-110	0	0	0	6,486	436	5,559	927	-93
14	0	106	1,347	468	17	1,921	0	-110	0	0	0	6,486	475	6,034	452	-45
15	230	142	1,273	503	18	2,148	0	-110	0	0	0	6,486	0	6,034	452	-45
16	230	142	1,104	63	19	1,539	321	-110	-51	160	160	6,646	0	6,034	612	-61
17	230	0	1,085	73	20	1,388	472	-93	-110	269	274	6,920	14	6,048	872	-87
18	230	0	1,127	50	21	1,407	453	-45	-110	298	305	7,225	55	6,103	1,122	-110
19	230	0	1,212	8	22	1,450	410	-45	-110	255	262	7,487	312	6,415	1,072	-107
20	0	0	1,107	0	23	1,107	753	-61	-110	582	585	8,072	755	7,170	902	-90
21	0	213	1,034	0	24	1,247	613	-87	-9	517	516	8,588	807	7,977	611	-61
22	230	284	922	0	25	1,436	424	-110	0	314	314	8,902	496	8,473	429	-43
23	230	213	869	7	26	1,319	541	-107	0	434	434	9,336	26	8,499	837	-84
24	230	0	772	0	27	1,002	858	-90	-110	658	662	9,998	0	8,499	1,499	-110
25	230	0	720	18	28	968	892	-61	-110	721	728	10,726	128	8,627	2,099	-110
26	230	0	918	68	29	1,216	644	-43	-88	513	511	11,237	343	8,970	2,267	-110
27	0	0	906	542	30	1,448	412	-84	0	328	328	11,565	828	9,798	1,767	-110
28	0	0	802	168	31	970	890	-110	-110	670	672	12,237	712	10,510	1,727	-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 = Design rate - Col. 5, when positive; otherwise Co. 6 = 0.
Col. 7 = Col. 15 (4 days earlier).
Col. 8 = Fishery program payback from Table 4.
Col. 9 = Design rate - Col. 5 + Col. 7 + Col. 8, when positive; otherwise Col.9 = 0.
Col 10 = Col. 7, from Table 18.
Col.11 = Summation of Col. 10.

Col. 12 = Design rate + Col. 8 - (Col. 9 + Col. 10 from Table 18), when positive; otherwise Col. 12 = 0.
Col. 13 = Summation of Col. 12.
Col. 14 = Col. 11 - Col. 13.
Col. 15 = Col. 14 divided by minus 10, limited to ±110.

Table 17. - 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 ft^3/s	Powerplant release forecasts: Rio Reservoir ft^3/s	Uncontrolled runoff: Present conditions ft^3/s	Uncontrolled runoff: Weather adjustment ft^3/s	Date	Discharge ft^3/s	Indicated deficiency ft^3/s	Balancing adjustment ft^3/s	Fishery program payback adjust-ment ft^3/s	Directed release ft^3/s	Computation of the balancing adjustment: Adjusted directed release: Daily ft^3/s	Adjusted directed release: Cumulative $(ft^3/s)\cdot d$	Actutal deficiency: Daily ft^3/s	Actutal deficiency: Cumulative $(ft^3/s)\cdot d$	Cumulative difference $(ft^3/s)\cdot d$	Balancing adjustment (ft^3/s)
1992	1	2	3	4		5	6	7	8	9	10	11	12	13	14	15
Aug. 29	230	0	1,379	0	Sept. 1	1,609	251	-110	0	141	141	12,378	496	11,006	1,372	-110
30	230	0	989	0	2	1,219	641	-110	-110	421	428	12,806	1,098	12,104	702	-70
31	230	0	876	0	3	1,106	754	-110	-110	534	545	13,351	585	12,689	662	-66
Sept. 1	230	0	748	0	4	978	882	-110	-110	662	667	14,018	547	13,236	782	-78
2	230	0	644	0	5	874	986	-110	-110	766	768	14,786	658	13,894	892	-89
3	0	0	634	51	6	685	1,175	-70	-110	995	999	15,785	1,079	14,973	812	-81
4	0	0	592	0	7	592	1,268	-66	-110	1,092	1,092	16,877	1,132	16,105	772	-77
5	0	0	608	87	8	695	1,165	-78	-110	977	978	17,855	1,048	17,153	702	-70
6	231	0	664	441	9	1,336	524	-89	-110	325	328	18,183	308	17,461	722	-72
7	231	0	661	115	10	1,007	853	-81	-110	662	671	18,854	721	18,182	672	-67
8	231	0	665	80	11	976	884	-77	-56	751	758	19,612	32	18,214	1,398	-110
9	231	0	646	63	12	940	920	-70		850	835	20,447	175	18,389	2,058	-110
10	0	0	600	586	13	1,186	674	-72		602	602	21,049	442	18,831	2,218	-110
11	0	170	1,686	0	14	1,856	4	-67		0	0	21,049	530	19,361	1,688	-110
12	231	266	1,114	0	15	1,611	249	-110		139	139	21,188	418	19,779	1,409	-110
13	231	266	1,084	0	16	1,581	279	-110		169	169	21,357	536	20,315	1,042	-104
14	231	160	902	0	17	1,293	567	-110		457	437	21,794	537	20,852	942	-94
15	468	142	837	0	18	1,447	413	-110		303	318	22,112	228	21,080	1,032	-103
16	468	128	756	0	19	1,352	508	-110		398	401	22,513	541	21,621	892	-89
17	0	0	584	42	20	626	1,234	-104		1,130	1,132	23,645	1,412	23,033	612	-61
18	0	0	593	211	21	804	1,056	-94		962	965	24,610	1,275	24,308	302	-30
19	468	0	667	0	22	1,135	725	-103		622	629	25,239	509	24,817	422	-42
20	468	0	621	121	23	1,210	650	-89		561	555	25,794	155	24,972	822	-82
21	468	0	634	289	24	1,391	469	-61		408	408	26,202	88	25,060	1,142	-110
22	468	0	585	469	25	1,522	338	-30		308	308	26,510	0	25,060	1,450	-110
23	468	0	1,687	0	26	2,155	0	-42		0	0	26,510	0	25,060	1,450	-110
24	0	0	838	343	27	1,181	679	-82		597	597	27,107	767	25,827	1,280	-110
25	0	0	814	333	28	1,147	713	-110		603	603	27,710	713	26,450	1,170	-110
26	468	0	892	145	29	1,505	355	-110		245	243	27,953	0	26,540	1,413	-110
27	468	0	1,110	285	30	1,863	0	-110		0	0	27,953	44	26,584	1,369	-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 = Desigu rate - Col. 5, when positive; otherwise Co. 6 = 0.
Col. 7 = Col. 15 (4 days earlier).
Col. 8 = Fishery program payback completed Sept. 11, 1992
Col. 9 = Design rate - Col. 5 + Col. 7 + Col. 8, when positive; otherwise Col.9 = 0.
Col 10 = Col. 7, from Table 18.
Col.11 = Summation of Col. 10.

Col. 12 = Design rate + Col. 8 - (Col. 9 + Col. 10 from Table 18), when positive; otherwise Col. 12 = 0.
Col. 13 = Summation of Col. 12.
Col. 14 = Col. 11 - Col. 13.
Col. 15 = Col. 14 divided by minus 10, limited to ±110.

Table 17. - 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 ft^3/s	Powerplant release forecasts: Rio Reservoir ft^3/s	Uncontrolled runoff: Present conditions ft^3/s	Uncontrolled runoff: Weather adjustment ft^3/s	Date	Discharge ft^3/s	Indicated deficiency ft^3/s	Balancing adjustment ft^3/s	Fishery program payback adjustment ft^3/s	Directed release ft^3/s	Computation of the balancing adjustment: Adjusted directed release: Daily ft^3/s	Adjusted directed release: Cumulative $(ft^3/s)\cdot d$	Actutal deficiency: Daily ft^3/s	Actutal deficiency: Cumulative $(ft^3/s)\cdot d$	Cumulative difference $(ft^3/s)\cdot d$	Balancing adjustment (ft^3/s)
1992	1	2	3	4		5	6	7	8	9	10	11	12	13	14	15
Sept. 28	468	0	1,004	0	Oct. 1	1,472	388	-110		278	279	28,232	319	26,903	1,329	-110
29	0	0	1,073	0	2	1,073	787	-110		677	679	28,911	1,089	27,992	919	-92
30	0	57	899	0	3	956	904	-110		794	796	29,707	956	28,948	759	-76
Oct. 1	0	0	822	0	4	822	1,038	-110		928	929	30,636	1,049	29,997	639	-64
2	0	0	746	0	5	746	1,114	-110		1,004	1,006	31,642	1,256	31,253	389	-39
3	0	0	716	0	6	716	1,144	-92		1,052	1,052	32,694	1,302	32,555	139	-14
4	0	0	680	0	7	680	1,180	-76		1,104	1,106	33,800	1,326	33,881	-81	+8
5	0	0	640	0	8	640	1,220	-64		1,156	1,153	34,953	1,353	35,234	-281	+28
6	0	0	582	0	9	582	1,278	-39		1,239	1,235	36,188	1,255	36,489	-301	+30
7	0	0	554	29	10	583	1,277	-14		1,263	1,267	37,455	567	37,056	399	-40
8	0	0	538	111	11	649	1,211	+8		1,219	1,219	38,674	0	37,056	1,618	-110
9	0	0	512	774	12	1,286	574	+28		602	602	39,276	0	37,056	2,220	-110
The estimated Montague discharge was greater than the Montague design rate October 13-18, 1992																
16	0	0	2,545	397	19	2,942	0	-110		0	0	39,276	146	37,202	2,074	-110
17	0	0	2,292	35	20	2,327	0	-110		0	0	39,276	96	37,298	1,978	-110
18	0	0	1,866	31	21	1,897	0	-110		0	0	39,276	335	37,633	1,643	-110
19	0	0	1,828	14	22	1,842	18	-110		0	0	39,276	395	38,028	1,248	-110
20	0	0	1,700	0	23	1,700	160	-110		50	50	39,326	435	38,463	863	-86
21	0	0	1,510	0	24	1,510	350	-110		240	248	39,574	478	38,941	633	-63
22	0	0	1,454	0	25	1,454	406	-110		296	298	39,872	578	39,519	353	-35
23	0	0	1,330	194	26	1,524	336	-110		226	230	40,102	0	39,519	583	-58
The estimated Montague discharge was greater than the Montague design rate October 27-31, 1992																
Oct. 29	0	0	1,336	0	Nov. 1	1,336	524	-58		466	465	40,567	425	39,944	623	-62
30	0	71	1,331	24	2	1,426	434	-58		376	377	40,944	387	40,331	613	-61
The estimated Montague discharge was greater than the Montague design rate November 3-30, 1992																

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 Co. 6 = 0.
Col. 7 = Col. 15 (4 days earlier).
Col. 8 = Fishery program payback completed Sept. 11, 1992
Col. 9 = Design rate - Col. 5 + Col. 7 + Col. 8, when positive; otherwise Col.9 = 0.
Col 10 = Col. 7, from Table 18.
Col.11 = Summation of Col. 10.

Col. 12 = Design rate - (Col. 9 + Col. 10 from Table 18), when positive; otherwise Col. 12 = 0.
Col. 13 = Summation of Col. 12.
Col. 14 = Col. 11 - Col. 13.
Col. 15 = Col. 14 divided by minus 10, limited to ±110.

Table 18. - Controlled releases for reservoirs in the upper Delaware River basin
and segregation of flow of Delaware River at Montague, N.J.
(River Master daily operation record)
Mean discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1991	1	2	3	4		5	6		7	8	9	10	11	12	13
Nov. 28		6	26	5	Nov. 30	0	0	Dec. 1		37	0	2,913	2,950		
29		6	26	5	Dec. 1	0	323	2		37	323	2,640	3,000		
30		6	3	5	2	0	812	3		14	812	4,034	4,860		
Dec. 1		6	9	5	3	0	783	4		20	783	9,497	10,300		
2		6	8	5	4	0	465	5		19	465	7,936	8,420		
3		6	8	5	5	0	709	6		19	709	5,922	6,650		
4		6	8	5	6	0	277	7		19	277	4,934	5,230		
5		6	8	5	7	0	99	8		19	99	4,382	4,500		
6		6	8	5	8	0	266	9		19	266	4,345	4,630		
7		6	8	5	9	0	517	10		19	517	4,574	5,110		
8		6	8	5	10	0	447	11		19	447	4,544	5,010		
9		6	8	5	11	0	255	12		19	255	4,116	4,390		
10		6	8	5	12	0	567	13		19	567	3,884	4,470		
11		6	8	5	13	0	493	14		19	493	4,368	4,880		
12		6	8	5	14	0	138	15		19	138	6,163	6,320		
13		6	8	5	15	0	447	16		19	447	5,554	6,020		
14		6	8	5	16	0	695	17		19	695	4,496	5,210		
15		6	8	5	17	162	603	18		19	765	3,796	4,580		
16		6	8	5	18	0	674	19		19	674	3,257	3,950		
17		6	8	5	19	0	436	20		19	436	3,045	3,500		
18		6	8	5	20	132	460	21		19	592	2,789	3,400		
19		6	9	5	21	0	404	22		20	404	3,156	3,580		
20		6	8	5	22	0	418	23		19	418	2,903	3,340		
21		6	9	5	23	0	234	24		20	234	2,636	2,890		
22		6	9	5	24	0	78	25		20	78	2,482	2,580		
23		6	9	5	25	0	277	26		20	277	2,343	2,640		
24		6	9	5	26	0	443	27		20	443	1,947	2,410		
25		6	9	5	27	0	220	28		20	220	1,840	2,080		
26		6	9	5	28	0	0	29		20	0	2,020	2,040		
27		6	9	5	29	0	110	30		20	110	2,400	2,530		
28		6	9	5	30	0	465	31		20	465	2,915	3,400		
Total	0	186	289	155		294	12,115		0	630	12,409	121,831	134,870		

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 1600 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. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1991/92	1	2	3	4		5	6		7	8	9	10	11	12	13
Dec. 29		6	9	5	Dec. 31	0	266	Jan. 1		20	266	2,554	2,840		
30		6	9	5	Jan. 1	0	358	2		20	358	2,352	2,730		
31		6	9	5	2	354	660	3		20	1,014	2,156	3,190		
Jan. 1		6	9	5	3	191	667	4		20	858	2,522	3,400		
2		6	9	5	4	0	266	5		20	266	2,904	3,190		
3		6	9	5	5	0	167	6		20	167	4,023	4,210		
4		6	9	5	6	347	323	7		20	670	3,460	4,150		
5		6	9	5	7	359	358	8		20	717	3,043	3,780		
6		6	9	5	8	356	556	9		20	912	2,518	3,450		
7		6	9	5	9	350	326	10		20	676	2,624	3,320		
8		6	9	5	10	392	192	11		20	584	2,536	3,140		
9		6	9	5	11	0	0	12		20	0	2,470	2,490		
10		6	9	5	12	0	121	13		20	121	2,339	2,480		
11		6	9	5	13	352	461	14		20	813	2,427	3,260		
12		6	9	5	14	344	440	15		20	784	4,876	5,680		
13		6	9	6	15	340	589	16		21	929	5,160	6,110		
14		6	9	6	16	346	528	17		21	874	3,505	4,400		
15		6	9	6	17	344	220	18		21	564	3,415	4,000		
16		6	9	5	18	0	28	19		20	28	3,352	3,400		
17		6	9	5	19	66	333	20		20	399	2,581	3,000		
18		6	9	5	20	339	532	21		20	871	2,609	3,500		
19		6	9	5	21	348	358	22		20	706	2,674	3,400		
20		6	9	5	22	344	340	23		20	684	2,796	3,500		
21		6	9	5	23	348	340	24		20	688	4,092	4,800		
22		6	9	5	24	346	223	25		20	569	5,211	5,800		
23		6	9	5	25	0	0	26		20	0	4,380	4,400		
24		6	9	5	26	0	248	27		20	248	3,432	3,700		
25		6	9	5	27	348	379	28		20	727	3,253	4,000		
26		8	9	5	28	703	379	29		22	1,082	2,996	4,100		
27		8	9	5	29	701	330	30		22	1,031	2,847	3,900		
28		6	8	5	30	697	298	31		19	995	2,686	3,700		
Total	0	190	278	158		8,315	10,286		0	626	18,601	97,793	117,020		

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 1600 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. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11		
Jan. 29		6	9	5	Jan. 31	712	117	Feb. 1		20	829	2,251	3,100		
30		6	8	5	Feb. 1	0	0	2		19	0	2,381	2,400		
31		6	8	5	2	0	145	3		19	145	2,336	2,500		
Feb. 1		6	8	5	3	816	422	4		19	1,238	2,243	3,500		
2		6	8	5	4	808	227	5		19	1,035	1,946	3,000		
3		6	8	5	5	836	265	6		19	1,101	1,980	3,100		
4		6	8	5	6	837	297	7		19	1,134	1,747	2,900		
5		6	8	5	7	836	142	8		19	978	1,603	2,600		
6		6	8	5	8	0	0	9		19	0	1,581	1,600		
7		6	8	5	9	0	121	10		19	121	1,360	1,500		
8		6	8	5	10	832	404	11		19	1,236	1,645	2,900		
9		6	8	5	11	828	0	12		19	828	1,553	2,400		
10		6	8	5	12	822	0	13		19	822	1,359	2,200		
11		6	8	5	13	834	0	14		19	834	1,447	2,300		
12		6	8	5	14	845	0	15		19	845	1,536	2,400		
13		6	8	5	15	0	0	16		19	0	1,381	1,400		
14		6	8	5	16	0	0	17		19	0	1,981	2,000		
15		6	8	5	17	835	28	18		19	863	2,318	3,200		
16		6	8	5	18	841	121	19		19	962	2,319	3,300		
17		6	8	5	19	829	0	20		19	829	2,552	3,400		
18		6	8	5	20	628	0	21		19	628	3,173	3,820		
19		6	8	5	21	817	283	22		19	1,100	2,651	3,770		
20		6	8	5	22	0	0	23		19	0	2,651	2,670		
21		6	8	5	23	0	138	24		19	138	2,713	2,870		
22		6	8	5	24	710	493	25		19	1,203	2,508	3,730		
23		6	8	5	25	721	195	26		19	916	2,955	3,890		
24		6	8	5	26	727	418	27		19	1,145	2,996	4,160		
25		6	8	5	27	708	340	28		19	1,048	3,033	4,100		
26		6	8	5		703	220	29		19	923	3,118	4,060		
Total	0	174	233	145		16,525	4,376		0	552	20,901	63,317	84,770		

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 1600 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. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11	12	13
Feb. 27		6	8	5	Feb. 29	0	0	Mar. 1		19	0	3,691	3,710		
28		6	8	5	Mar. 1	0	230	2		19	230	3,561	3,810		
29		6	8	5	2	290	326	3		19	616	3,175	3,810		
Mar. 1		6	8	3	3	231	181	4		19	412	3,069	3,500		
2		6	31	5	4	232	0	5		42	232	3,226	3,500		
3		6	8	5	5	233	0	6		19	233	3,668	3,920		
4		6	8	5	6	228	0	7		19	228	3,773	4,020		
5		6	8	5	7	0	0	8		19	0	4,871	4,890		
6		6	8	5	8	0	252	9		19	252	5,939	6,210		
7		6	8	5	9	210	319	10		19	529	5,602	6,150		
8		6	8	5	10	232	691	11		19	923	7,248	8,190		
9		6	8	5	11	421	461	12		19	882	15,599	16,500		
10		6	8	5	12	230	557	13		19	787	10,994	11,800		
11		6	8	5	13	220	514	14		19	734	7,907	8,660		
12		6	8	5	14	0	312	15		19	312	6,649	6,980		
13		6	8	5	15	0	443	16		19	443	5,478	5,940		
14		6	8	5	16	230	447	17		19	677	4,604	5,300		
15		6	8	5	17	234	528	18		19	762	4,049	4,830		
16		6	8	5	18	293	394	19		19	687	4,224	4,930		
17		6	8	5	19	413	397	20		19	810	3,761	4,590		
18		6	8	5	20	233	372	21		19	605	3,376	4,000		
19		6	8	5	21	0	152	22		19	152	3,219	3,390		
20		6	8	5	22	0	270	23		19	270	3,071	3,360		
21		6	8	5	23	228	489	24		19	717	2,734	3,470		
22		6	8	5	24	231	287	25		19	518	2,693	3,230		
23		6	8	5	25	230	333	26		19	563	2,598	3,180		
24		6	8	5	26	230	344	27		19	574	7,727	8,320		
25		6	8	5	27	652	344	28		19	996	12,685	13,700		
26		6	8	5	28	0	355	29		19	355	9,626	10,000		
27		6	8	5	29	0	348	30		19	348	7,663	8,030		
28		6	8	5	30	172	394	31		19	566	6,755	7,340		
Total	0	186	271	155		5,673	9,740		0	612	15,413	173,235	189,260		

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 1600 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. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 18. - Coutrolled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled		Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other			Total	Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11	12	13
Mar. 29		6	8	5	Mar. 31	111	394	Apr. 1		19	505	6,646	7,170		
30		6	8	5	Apr. 1	167	383	2		19	550	6,181	6,750		
31		6	8	5	2	171	354	3		19	525	5,626	6,170		
Apr. 1		6	8	5	3	170	408	4		19	578	4,853	5,450		
2		6	8	5	4	0	511	5		19	511	4,510	5,040		
3		6	8	5	5	0	394	6		19	394	4,207	4,620		
4		6	8	5	6	255	426	7		19	681	3,660	4,360		
5		6	8	5	7	166	511	8		19	677	3,474	4,170		
6		6	8	15	8	183	560	9		29	743	3,288	4,060		
7		17	8	15	9	162	397	10		40	559	3,461	4,060		
8		19	8	15	10	168	397	11		42	565	3,433	4,040		
9		19	8	15	11	0	351	12		42	351	4,327	4,720		
10		19	8	15	12	0	507	13		42	507	6,831	7,380		
11		19	8	15	13	169	372	14		42	541	5,767	6,350		
12		19	8	15	14	173	525	15		42	698	4,920	5,660		
13		19	8	15	15	144	408	16		42	552	4,546	5,140		
14		19	8	15	16	350	443	17		42	793	5,125	5,960		
15		19	23	15	17	0	521	18		57	521	10,822	11,400		
16		19	23	15	18	0	688	19		57	688	14,955	15,700		
17		19	23	15	19	0	688	20		57	688	13,655	14,400		
18		19	23	17	20	191	688	21		59	879	8,752	9,690		
19		19	23	15	21	164	709	22		57	873	8,940	9,870		
20		19	23	15	22	169	674	23		57	843	9,400	10,300		
21		19	23	15	23	173	734	24		57	907	8,606	9,570		
22		19	23	15	24	161	674	25		57	835	8,988	9,880		
23		19	23	15	25	0	691	26		57	691	10,652	11,400		
24		19	23	15	26	0	706	27		57	706	9,537	10,300		
25		19	23	15	27	347	752	28		57	1,099	7,684	8,840		
26		19	23	15	28	170	716	29		57	886	6,627	7,570		
27		19	23	15	29	169	716	30		57	885	5,748	6,690		
Total	0	451	435	372		3,933	16,298		0	1,258	20,231	205,221	226,710		

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 1600 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. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled		Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other			Total	Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11	12	13
Apr. 28	0	19	25	15	Apr. 30	167	525	May 1	0	59	692	5,099	5,850		
29	0	19	25	15	May 1	170	706	2	0	59	876	4,565	5,500		
30	0	19	25	15	2	0	716	3	0	59	716	4,925	5,700		
May 1	0	19	25	15	3	0	578	4	0	59	578	5,773	6,410		
2	0	19	25	15	4	170	677	5	0	59	847	4,814	5,720		
3	0	20	25	15	5	0	415	6	0	60	415	4,755	5,230		
4	0	20	25	15	6	0	397	7	0	60	397	4,693	5,150		
5	0	19	25	15	7	0	457	8	0	59	457	4,434	4,950		
6	0	19	25	15	8	710	234	9	0	59	944	4,087	5,090		
7	0	19	25	15	9	0	0	10	0	59	0	4,501	4,560		
8	0	19	25	15	10	0	301	11	0	59	301	4,100	4,460		
9	0	19	25	15	11	165	525	12	0	59	690	3,321	4,070		
10	0	19	25	15	12	0	457	13	0	59	457	3,124	3,640		
11	0	19	25	15	13	0	160	14	0	59	160	2,871	3,090		
12	0	19	25	25	14	0	181	15	0	69	181	2,800	3,050		
13	0	19	25	25	15	163	167	16	0	69	330	2,641	3,040		
14	0	19	25	15	16	0	0	17	0	59	0	3,001	3,060		
15	0	19	25	15	17	0	85	18	0	59	85	2,966	3,110		
16	0	19	25	15	18	172	333	19	0	59	505	2,396	2,960		
17	0	19	25	17	19	0	231	20	0	61	231	2,358	2,650		
18	0	19	25	23	20	0	159	21	0	67	159	2,014	2,240		
19	0	19	25	25	21	0	163	22	0	69	163	1,898	2,130		
20	0	19	88	31	22	166	167	23	0	138	333	1,599	2,070		
21	0	45	314	45	23	0	0	24	0	404	0	1,496	1,900		
22	282	71	367	45	24	0	0	25	282	201	0	1,787	2,270		
23	175	73	231	45	25	0	199	26	175	174	199	1,962	2,510		
24	0	70	150	29	26	828	312	27	0	249	1,140	1,781	3,170		
25	0	46	153	29	27	820	340	28	0	228	1,160	1,662	3,050		
26	0	46	43	29	28	817	340	29	0	118	1,157	1,575	2,850		
27	0	46	43	29	29	820	0	30	0	118	820	1,582	2,520		
28	146	54	43	43	30	191	14	31	140	0	205	2,765	3,110		
Total	603	890	1,982	695		5,359	8,839		597	2,970	14,198	97,345	115,110		

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 1600 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. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11	12	13
May 29	214	50	135	31	May 31	1,410	457	June 1	216	0	1,867	14,917	17,000		
30	0	45	43	29	June 1	531	699	2	0	117	1,230	14,853	16,200		
31	0	45	34	14	2	530	692	3	0	93	1,222	9,385	10,700		
June 1	0	19	25	15	3	999	777	4	0	59	1,776	7,435	9,270		
2	0	19	25	17	4	1,514	500	5	0	61	2,014	5,685	7,760		
3	0	19	25	34	5	1,421	699	6	0	78	2,120	11,402	13,600		
4	0	19	25	12	6	1,445	830	7	0	56	2,275	12,569	14,900		
5	0	19	25	15	7	1,453	848	8	0	59	2,301	9,040	11,400		
6	0	19	29	15	8	1,480	844	9	0	63	2,324	7,073	9,460		
7	0	19	25	15	9	1,455	840	10	0	59	2,295	5,656	8,010		
8	0	19	36	29	10	1,453	649	11	0	84	2,102	4,474	6,660		
9	0	40	45	29	11	781	340	12	0	114	1,121	3,865	5,100		
10	0	40	45	34	12	521	418	13	0	119	939	3,202	4,260		
11	0	43	150	51	13	0	309	14	0	244	309	2,727	3,280		
12	0	71	370	46	14	0	394	15	0	487	394	2,429	3,310		
13	0	71	190	46	15	511	408	16	0	307	919	2,074	3,300		
14	0	71	179	29	16	514	465	17	0	279	979	1,822	3,080	0	0
15	0	46	152	34	17	524	177	18	0	232	701	1,687	2,620	0	0
16	0	48	370	46	18	523	188	19	0	464	711	1,555	2,730	0	0
17	0	70	370	46	19	521	160	20	0	486	681	1,573	2,740	0	0
18	320	71	370	46	20	0	0	21	320	167	0	1,653	2,140	223	223
19	0	71	370	46	21	0	226	22	0	487	226	1,477	2,190	110	333
20	0	73	370	46	22	520	273	23	0	489	793	1,288	2,570	0	333
21	0	73	368	46	23	524	262	24	0	487	786	1,517	2,790	0	333
22	0	73	368	46	24	524	284	25	0	487	808	1,885	3,180	0	333
23	0	73	370	46	25	512	252	26	0	489	764	1,597	2,850	0	333
24	0	73	370	46	26	530	149	27	0	489	679	1,552	2,720	0	333
25	580	73	470	46	27	0	0	28	589	0	0	1,531	2,120	370	703
26	487	73	367	46	28	0	202	29	486	0	202	1,312	2,000	250	953
27	0	73	367	46	29	536	379	30	0	486	915	1,069	2,470	0	953
Total	1,601	1,518	6,088	1,047		20,732	12,721		1,611	7,042	33,453	138,304	180,410		

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 1600 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. 7.
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 ft^3/s computed algebraically, but not greater than Col. 7; except that part Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 17 = 13,556 $ft^3/s \cdot d$

Table 18. - Controlled releases for reservoirs in the upper Delaware River basin
and segregation of flow of Delaware River at Moutague, N.J. - continued
(River Master daily operation record)
Mean discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11	12	13
June 28	0	71	367	51	June 30	529	418	July 1	0	489	947	954	2,390	0	953
29	0	74	367	68	July 1	630	206	2	0	509	836	875	2,220	110	1,063
30	180	99	367	45	2	641	0	3	180	331	641	808	1,960	110	1,173
July 1	910	71	798	45	3	0	0	4	914	0	0	816	1,730	-20	1,153
2	932	71	794	67	4	0	0	5	932	0	0	1,018	1,950	200	1,353
3	547	99	379	68	5	0	0	6	546	0	0	1,494	2,040	290	1,643
4	0	71	365	43	6	636	0	7	0	479	636	1,395	2,510	0	1,643
5	0	71	365	43	7	645	145	8	0	479	790	1,081	2,350	0	1,643
6	0	71	367	43	8	627	287	9	0	481	914	1,075	2,470	0	1,643
7	0	70	368	43	9	802	305	10	0	481	1,107	1,122	2,710	0	1,643
8	0	71	365	43	10	809	171	11	0	479	980	1,091	2,550	0	1,643
9	515	88	362	62	11	809	0	12	512	0	809	939	2,260	510	2,153
10	473	99	362	71	12	0	77	13	473	59	77	851	1,460	-290	1,863
11	0	99	360	45	13	788	298	14	0	504	1,086	870	2,460	0	1,863
12	0	71	360	45	14	972	319	15	0	476	1,291	973	2,740	0	1,863
13	0	71	360	45	15	889	138	16	0	476	1,027	1,867	3,370	0	1,863
14	0	71	360	45	16	814	0	17	0	476	814	2,400	3,690	0	1,863
15	0	71	360	45	17	646	78	18	0	476	724	2,080	3,280	0	1,863
16	0	70	359	45	18	0	0	19	0	474	0	2,216	2,690	0	1,863
17	0	70	359	45	19	0	244	20	0	474	244	2,022	2,740	0	1,863
18	0	70	359	50	20	646	521	21	0	479	1,167	1,434	3,080	0	1,863
19	0	73	359	71	21	640	167	22	0	503	807	1,270	2,580	0	1,863
20	0	104	359	68	22	644	0	23	0	531	644	1,195	2,370	21	1,884
21	0	97	357	45	23	643	0	24	0	499	643	1,338	2,480	0	1,884
22	124	71	357	45	24	647	0	25	124	349	647	1,430	2,550	124	2,008
23	526	73	416	45	25	0	0	26	534	0	0	1,356	1,890	140	2,148
140	516	91	357	63	26	0	195	27	511	0	195	1,984	2,690	511	2,659
25	247	73	357	63	27	230	394	28	247	246	624	2,383	3,500	247	2,906
26	0	70	357	45	28	234	291	29	0	472	525	1,823	2,820	0	2,906
27	0	71	356	45	29	233	255	30	0	472	488	1,710	2,670	0	2,906
28	0	71	356	45	30	225	344	31	0	472	569	2,249	3,290	0	2,906
Total	4,970	2,413	12,134	1,592		14,379	4,853		4,973	11,166	19,232	44,119	79,490		

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. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
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 ft^3/s computed algebraically, but not greater than Col. 7; except that part Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 17 = 13,556 $ft^3/s \cdot d$

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11		
July 29	118	73	354	45	July 31	214	43	Aug. 1	118	354	257	3,991	4,720	118	3,024
30	0	74	354	45	Aug. 1	0	57	2	0	473	57	4,030	4,560	0	3,024
31	0	74	354	45	2	0	259	3	0	473	259	2,988	3,720	0	3,024
Aug. 1	0	74	354	45	3	232	475	4	0	473	707	2,290	3,470	0	3,024
2	0	74	353	45	4	234	420	5	0	472	654	2,364	3,490	0	3,024
3	0	74	353	45	5	217	244	6	0	472	461	2,517	3,450	0	3,024
4	0	71	353	45	6	229	316	7	0	469	545	1,916	2,930	0	3,024
5	0	71	351	48	7	234	171	8	0	470	405	1,625	2,500	0	3,024
6	0	71	351	71	8	0	0	9	0	493	0	1,727	2,220	110	3,134
7	0	101	351	68	9	0	238	10	0	520	238	2,482	3,240	0	3,134
8	0	101	351	68	10	235	401	11	0	520	636	2,594	3,750	0	3,134
9	0	101	351	70	11	232	521	12	0	522	753	2,045	3,320	0	3,134
10	0	102	350	45	12	233	213	13	0	497	446	1,827	2,770	0	3,134
11	0	77	350	45	13	229	372	14	0	472	601	1,467	2,540	0	3,134
12	0	71	350	45	14	231	64	15	0	466	295	1,419	2,180	110	3,244
13	0	73	348	45	15	0	60	16	0	466	60	1,364	1,890	110	3,354
14	0	73	347	45	16	0	0	17	0	465	0	1,385	1,850	100	3,454
15	0	73	42	45	17	231	18	18	0	160	249	1,651	2,060	0	3,454
16	160	73	42	45	18	227	163	19	160	0	390	1,660	2,210	160	3,614
17	269	74	155	45	19	233	0	20	274	0	233	1,503	2,010	260	3,874
18	298	76	184	45	20	224	0	21	305	0	224	1,471	2,000	250	4,124
19	255	70	147	45	21	227	0	22	262	0	227	1,211	1,700	-50	4,074
20	582	70	470	45	22	0	0	23	585	0	0	995	1,580	-170	3,904
21	517	97	348	71	23	0	39	24	516	0	39	1,005	1,560	-190	3,714
22	314	97	348	71	24	230	220	25	314	202	450	914	1,880	110	3,824
23	434	97	348	71	25	219	479	26	434	82	698	1,136	2,350	434	4,258
24	658	97	463	102	26	455	394	27	662	0	849	969	2,480	662	4,920
25	721	122	504	102	27	229	486	28	728	0	715	907	2,350	600	5,520
26	513	122	343	46	28	227	188	29	511	0	415	1,014	1,940	190	5,710
27	328	70	343	45	29	0	0	30	328	130	0	1,032	1,490	-260	5,450
28	670	70	557	45	30	0	46	31	672	0	46	992	1,710	-40	5,410
Total	5,837	2,563	10,269	1,688		5,022	5,887		5,869	8,651	10,909	54,491	79,920		

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 1600 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. 7.
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 ft^3/s computed algebraically, but not greater than Col. 7; except that part Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 17 = 13,556 $ft^3/s \cdot d$

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague								
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11	12	13
Aug. 29	141	70	141	45	Aug. 31	236	106	Sept. 1	141	115	342	1,022	1,620	-130	5,280
30	421	73	309	46	Sept. 1	0	0	2	428	0	0	652	1,080	-670	4,610
31	534	70	430	45	2	435	148	3	545	0	583	582	1,710	-40	4,570
Sept. 1	662	70	552	45	3	233	305	4	667	0	538	665	1,870	120	4,690
2	766	70	653	45	4	233	234	5	768	0	467	625	1,860	110	4,800
3	995	71	883	45	5	0	46	6	999	0	46	625	1,670	-80	4,720
4	1,092	97	925	70	6	0	0	7	1,092	0	0	618	1,710	-40	4,680
5	977	97	811	70	7	0	103	8	978	0	103	599	1,680	-70	4,610
6	325	73	209	46	8	231	369	9	328	0	600	842	1,770	20	4,630
7	662	101	500	70	9	226	333	10	671	0	559	470	1,700	-50	4,580
8	751	101	589	68	10	232	262	11	758	0	494	1,278	2,530	758	5,338
9	850	71	719	45	11	226	0	12	835	0	226	1,459	2,520	770	6,108
10	602	71	486	45	12	0	0	13	602	0	0	1,418	2,020	270	6,378
11	0	70	135	45	13	0	110	14	0	250	110	1,220	1,580	-170	6,208
12	139	70	133	45	14	233	234	15	139	109	467	975	1,690	-60	6,148
13	169	70	131	45	15	223	252	16	169	77	475	849	1,570	-180	5,968
14	457	70	322	45	16	430	248	17	437	0	678	645	1,760	10	5,978
15	303	70	178	70	17	473	284	18	318	0	757	875	1,950	200	6,178
16	398	73	258	70	18	466	167	19	401	0	633	686	1,720	-30	6,148
17	1,130	101	961	70	19	0	0	20	1,132	0	0	448	1,580	-170	5,978
18	962	99	821	45	20	0	0	21	965	0	0	585	1,550	-200	5,778
19	622	71	515	43	21	469	213	22	629	0	682	669	1,980	230	6,008
20	561	70	442	43	22	541	298	23	555	0	839	866	2,260	510	6,518
21	408	70	295	43	23	469	18	24	408	0	487	1,285	2,180	408	6,926
22	308	70	195	43	24	467	0	25	308	0	467	1,455	2,230	308	7,234
23	0	70	40	43	25	476	0	26	0	153	476	1,411	2,040	0	7,234
24	597	70	484	43	26	0	0	27	597	0	0	1,093	1,690	-60	7,174
25	603	70	490	43	27	0	0	28	603	0	0	1,147	1,750	0	7,174
26	245	70	128	45	28	472	18	29	243	0	490	1,417	2,150	243	7,417
27	0	70	39	45	29	471	152	30	0	154	623	1,193	1,970	44	7,461
Total	15,680	2,289	12,774	1,511		7,242	3,900		15,716	858	11,142	27,674	55,390		

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 1600 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. 7.
Col. 9 = Col. 5 + Col. 6.
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Col. 12 = Col. 11 - Col. 8 - 1,750 ft^3/s computed algebraically, but not greater than Col. 7; except that part Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 17 = 13,556 $ft^3/s \cdot d$

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague *							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11		
Sept. 28	278	70	164	45	Sept.30	449	74	Oct. 1	279	0	523	1,018	1,820	70	7,531
29	677	68	566	45	Oct. 1	0	0	2	679	0	0	771	1,450	-300	7,231
30	794	70	681	45	2	0	64	3	796	0	64	840	1,700	-50	7,181
Oct. 1	928	70	814	45	3	0	0	4	929	0	0	811	1,740	-10	7,171
2	1,004	70	891	45	4	0	0	5	1,006	0	0	604	1,610	-140	7,031
3	1,052	70	937	45	5	0	0	6	1,052	0	0	558	1,610	-140	6,891
4	1,104	70	993	43	6	0	0	7	1,106	0	0	534	1,640	-110	6,781
5	1,156	70	1,040	43	7	0	0	8	1,153	0	0	507	1,660	-90	6,691
6	1,239	70	1,120	45	8	0	0	9	1,235	0	0	605	1,840	90	6,781
7	1,263	70	1,151	46	9	0	0	10	1,267	0	0	1,293	2,560	810	7,591
8	1,219	70	1,103	46	10	0	0	11	1,219	0	0	3,701	4,920	1,219	8,810
9	602	70	486	46	11	0	0	12	602	0	0	2,588	3,190	602	9,412
10	0	70	39	46	12	0	0	13	0	155	0	3,195	3,350	0	9,412
11	0	71	39	46	13	0	0	14	0	156	0	2,594	2,750	0	9,412
12	0	71	39	46	14	0	142	15	0	156	142	2,122	2,420	0	9,412
13	0	71	39	46	15	0	95	16	0	156	95	1,919	2,170	0	9,412
14	0	71	39	46	16	0	10	17	0	156	10	1,994	2,160	0	9,412
15	0	71	39	46	17	0	60	18	0	156	60	1,904	2,120	0	9,412
16	0	71	39	46	18	51	60	19	0	156	111	1,603	1,870	110	9,522
17	0	71	39	46	19	177	0	20	0	156	177	1,587	1,920	96	9,618
18	0	71	39	45	20	0	0	21	0	155	0	1,525	1,680	-70	9,548
19	0	71	39	45	21	0	0	22	0	155	0	1,465	1,620	-130	9,418
20	50	71	39	45	22	0	0	23	50	105	0	1,425	1,580	-170	9,248
21	240	71	131	46	23	32	0	24	248	0	32	1,350	1,630	-120	9,128
22	296	71	181	46	24	0	0	25	298	0	0	1,282	1,580	-170	8,958
23	226	71	111	48	25	0	53	26	230	0	53	1,897	2,180	230	9,188
24	0	73	39	46	26	474	312	27	0	158	786	1,826	2,770	0	9,188
25	0	70	39	46	27	469	468	28	0	155	937	1,608	2,700	0	9,188
26	0	71	39	46	28	470	284	29	0	156	754	1,550	2,460	0	9,188
27	0	71	39	46	29	458	333	30	0	156	791	1,523	2,470	0	9,188
28	0	71	39	46	30	466	96	31	0	156	562	1,512	2,230	0	9,188
Total	12,128	2,187	10,993	1,412		3,046	2,051		12,149	2,443	5,097	47,711	67,400		

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. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
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Col. 13 - Season limit of cumulative credit beginning June 17 = 13,556 $ft^3/s \cdot d$

Table 18. - Controlled releases for 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 discharge in cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1992	1	2	3	4		5	6		7	8	9	10	11	12	13
Oct. 29	466	71	348	46	Oct. 31	0	14	Nov. 1	465	0	14	1,421	1,900	150	9,338
30	376	71	260	46	Nov. 1	0	14	2	377	0	14	1,459	1,850	100	9,438
31	0	71	39	40	2	466	234	3	0	150	700	2,230	3,080	0	9,438
Nov. 1	0	68	36	25	3	712	269	4	0	129	981	5,450	6,560	0	9,438
2	0	48	32	25	4	464	305	5	0	105	769	4,436	5,310	0	9,438
3	0	48	32	25	5	507	252	6	0	105	759	4,206	5,070	0	9,438
4	0	48	32	25	6	706	202	7	0	105	908	3,847	4,860	0	9,438
5	0	48	34	25	7	0	0	8	0	107	0	3,573	3,680	0	9,438
6	0	48	34	25	8	114	181	9	0	107	295	3,168	3,570	0	9,438
7	0	48	34	25	9	95	159	10	0	107	254	2,909	3,270	0	9,438
8	0	48	34	23	10	0	160	11	0	105	160	2,615	2,880	0	9,438
9	0	48	32	23	11	0	85	12	0	103	85	2,772	2,960	0	9,438
10	0	48	32	23	12	0	74	13	0	103	74	4,223	4,400	0	9,438
11	0	48	32	25	13	0	0	14	0	105	0	8,255	8,360	0	9,438
12	0	48	32	25	14	0	0	15	0	105	0	6,415	6,520	0	9,438
13	0	48	32	25	15	0	252	16	0	105	252	5,143	5,500	0	9,438
14	0	48	32	25	16	208	387	17	0	105	595	4,340	5,040	0	9,438
15	0	50	32	25	17	12	312	18	0	107	324	3,959	4,390	0	9,438
16	0	50	32	25	18	0	202	19	0	107	202	3,771	4,080	0	9,438
17	0	50	32	25	19	173	397	20	0	107	570	3,233	3,910	0	9,438
18	0	50	32	25	20	0	330	21	0	107	330	2,943	3,380	0	9,438
19	0	50	32	25	21	0	46	22	0	107	46	3,247	3,400	0	9,438
20	0	50	32	25	22	0	262	23	0	107	262	7,501	7,870	0	9,438
21	0	50	32	25	23	0	500	24	0	107	500	11,593	12,200	0	9,438
22	0	50	34	25	24	0	688	25	0	109	688	9,503	10,300	0	9,438
23	0	50	34	26	25	0	798	26	0	110	798	8,992	9,900	0	9,438
24	0	50	34	26	26	0	618	27	0	110	618	8,702	9,430	0	9,438
25	0	50	34	26	27	0	696	28	0	110	696	7,904	8,710	0	9,438
26	0	50	34	26	28	0	528	29	0	110	528	6,532	7,170	0	9,438
27	0	51	34	26	29	0	425	30	0	111	425	5,654	6,190	0	9,438
Total	842	1,556	1,535	806		3,457	8,390		842	3,055	11,847	149,996	165,740		

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 1600 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. 7.
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 ft^3/s compnted algebraically, but not greater than Col. 7; except that part Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 17 = 13,556 $ft^3/s \cdot d$

Table 19. - Consumption of Water by New York City - 1950 to 1992.
Data furnished by New York City, Department of
Environmental Protection, Bureau of Water Supply

Year	Average daily consumption			Annual consumption (bg)
	City proper (Mgal/d)	Outside communities (Mgal/d)	Total (Mgal/d)	
1950	953.3	29.1	982.4	358.576
51	1,041.9	28.1	1,070.0	390.550
52	1,087.0	32.7	1,119.7	409.810
53	1,093.9	44.6	1,138.5	415.552
54	1,063.4	46.3	1,109.7	405.040
1955	1,109.9	45.3	1,155.2	421.648
56	1,111.3	48.9	1,160.2	424.633
57	1,169.0	57.2	1,226.2	447.563
58	1,152.9	49.6	1,202.5	438.912
59	1,204.3	60.3	1,264.6	461.579
1960	1,199.4	58.9	1,258.3	460.529
61	1,221.0	64.0	1,285.0	469.022
62	1,207.6	68.8	1,276.4	465.896
63	1,218.0	76.7	1,294.7	472.582
64	1,189.2	79.4	1,268.6	464.295
1965	1,052.1	71.2	1,123.3	409.995
66	1,044.9	73.2	1,118.1	408.128
67	1,135.3	71.0	1,206.3	440.302
68	1,242.0	78.2	1,320.2	483.175
69	1,328.7	80.1	1,408.8	514.229
1970	1,400.3	90.4	1,490.7	544.116
71	1,423.6	87.9	1,511.5	551.695
72	1,412.4	83.0	1,495.4	547.340
73	1,448.9	95.4	1,544.3	563.681
74	1,441.8	96.3	1,538.1	561.409
1975	1,415.0	92.1	1,507.1	550.093
76	1,435.0	95.8	1,530.8	560.264
77	1,483.0	104.7	1,587.7	579.510
78	1,479.4	103.0	1,582.4	577.566
79	1,513.0	104.6	1,617.6	590.426
1980	1,506.3	110.1	1,616.3	591.582
81	1,309.5	100.0	1,409.5	514.475
82	1,383.0	104.8	1,487.8	543.060
83	1,424.2	112.6	1,536.8	561.010
84	1,465.2	113.9	1,579.1	577.963
1985	1,325.4	106.5	1,431.9	522.656
86	1,351.1	115.2	1,466.3	535.200
87	1,447.1	119.8	1,566.9	571.885
88	1,484.3	125.6	1,609.9	589.090
89	1,402.0	113.4	1,515.4	553.158
1990	1,424.4	122.4	1,546.8	564.577
91	1,469.9	123.6	1,593.5	581.628
92	1,368.7	113.9	1,482.6	542.632

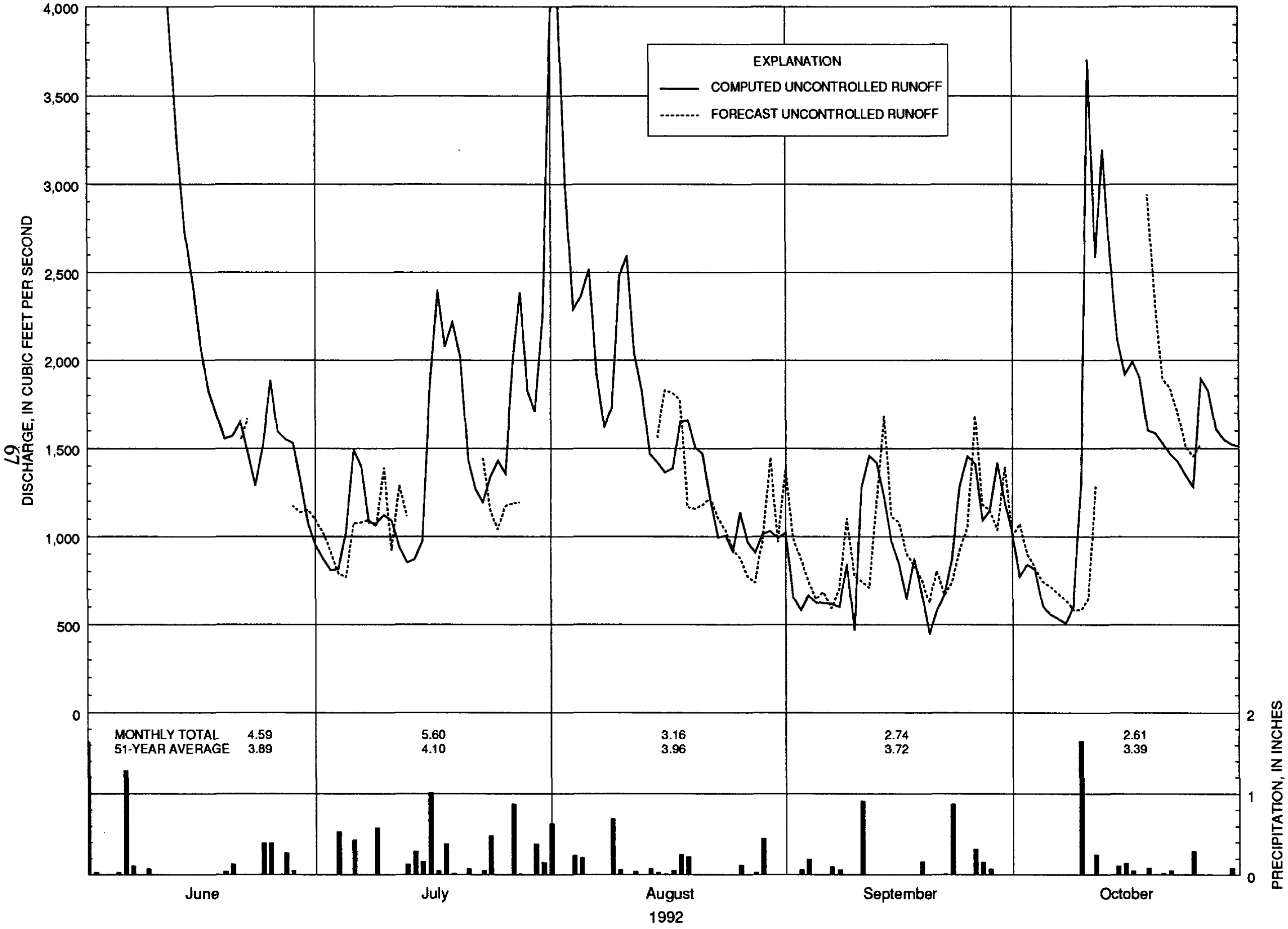

Figure 3.-Uncontrolled runoff component, Delaware River at Montague, N.J., June 1 to October 31, 1992.

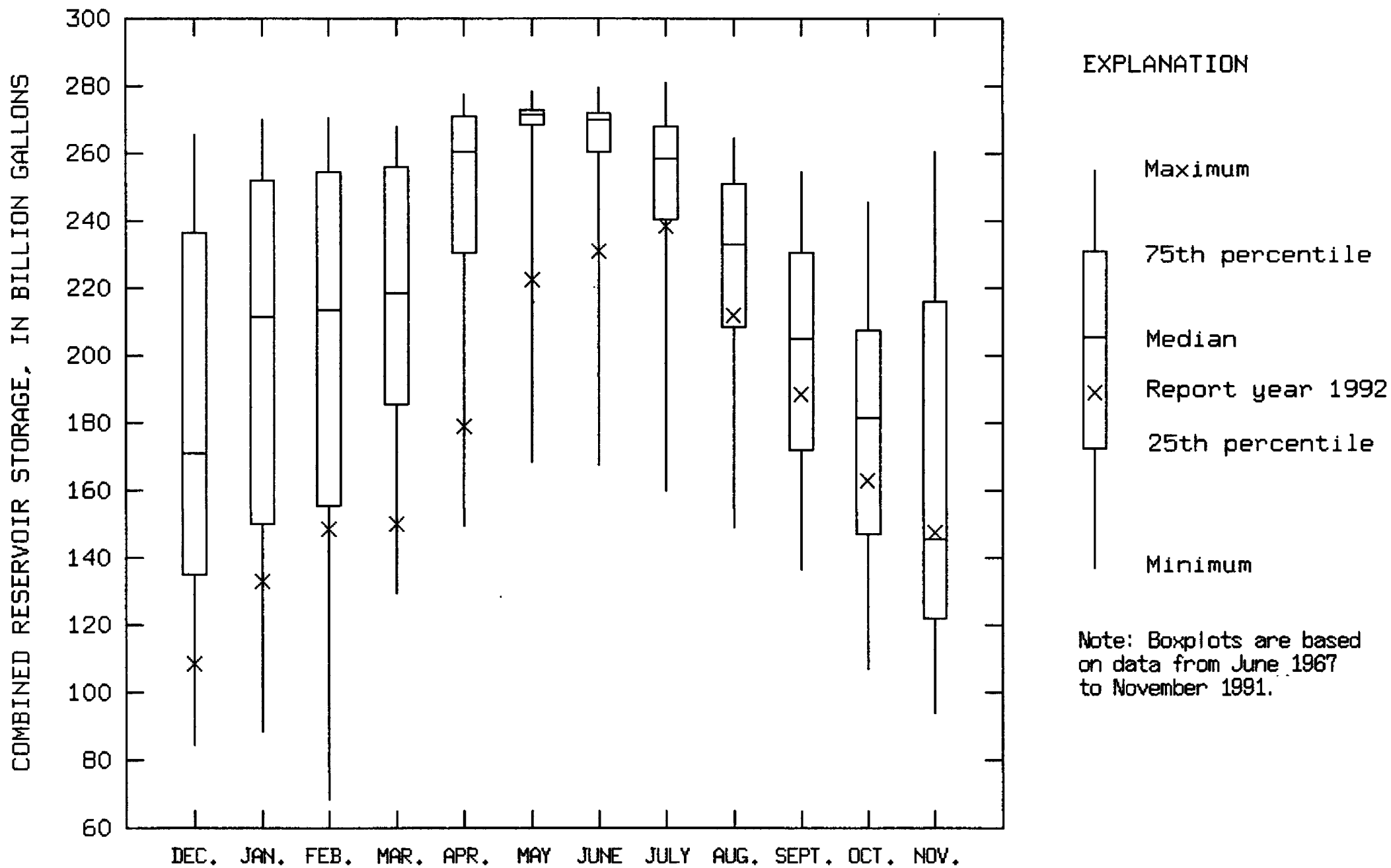

Figure 4.- Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs on the first day of the month, December 1991 to November 1992, compared to June 1967 to November 1991.

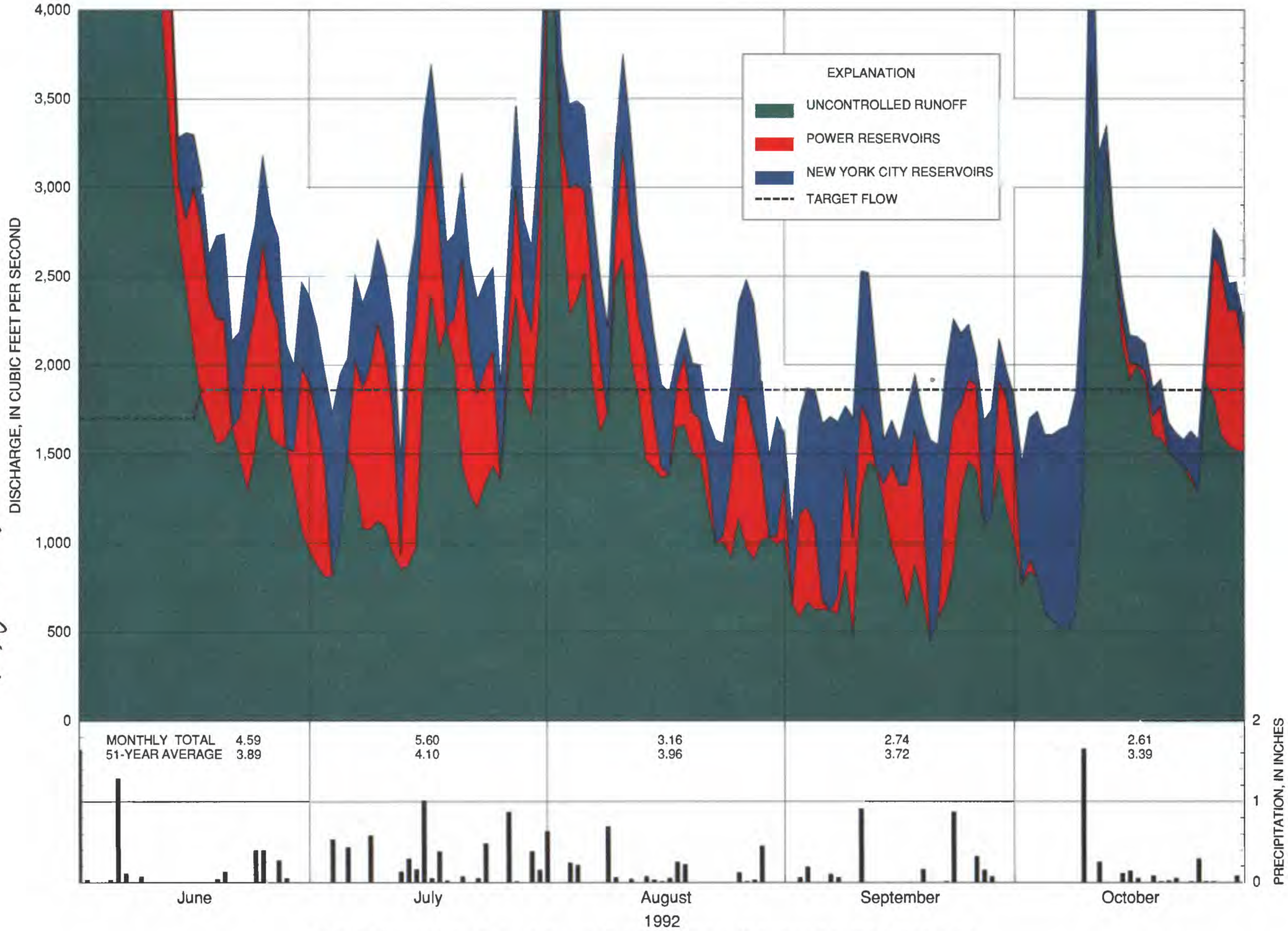

Plate 1.-Components of flow, Delaware River at Montague, N.J., June 1 to October 31, 1992.

69 (page 71 follows)

Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

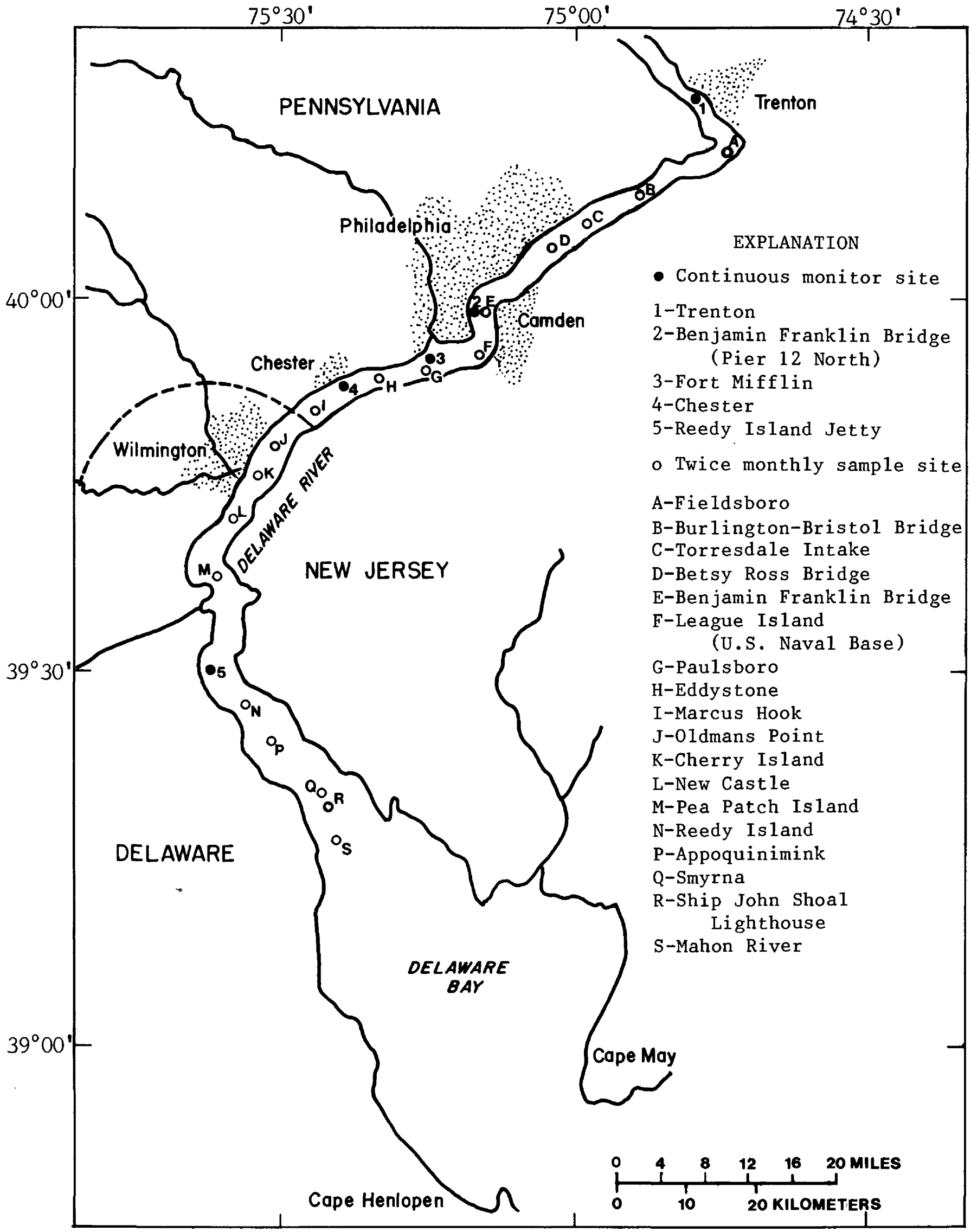

Figure 5.- Location of water quality monitoring sites in the Delaware River Estuary.

Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

by Kirk E. White

INTRODUCTION

This section describes the water-quality monitoring program conducted by the U.S. Geological Survey in the Delaware River Estuary during the1992 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 between Trenton, N.J., and Reedy Island Jetty, Del. Data were acquired continuously by electronic instruments at five monitor sites, one at Trenton just upstream of the head of tidewater and four in the estuary (fig. 5). At 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 twice a month from March to November at 18 sites between Fieldsboro, N.J., and the mouth of the Mahon River (fig. 5). At each of these sites, samples of water were collected at the center of the river channel. These samples were analyzed for 28 parameters including temperature, chloride, alkalinity, specific conductance, dissolved oxygen, and pH.

Data obtained from the continuous monitoring sites were processed by computer 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 Pennsylvania, Volume 1, Delaware River Basin." The twice a month sampling was done by the State of Delaware for the Delaware River Basin Commission (DRBC). These data are available from the DRBC and from STORET, the U.S. Environmental Protection Agency's data storage system.

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

ESTAURINE WATER-QUALITY DATA DURING 1992

The following is a summary and a discussion of the data that were collected during the 1992 report year.

Streamflow

Streamflow is a vital factor which influences the water quality of the estuary. Increased streamflow usually results in better water quality by limiting salt-water intrusion and diluting the concentration of dissolved minerals. The increased streamflow results in a lower specific conductance and lower chloride level. Increased streamflow also aids in maintaining lower water temperature during warm weather and supports higher dissolved-oxygen levels.

On the basis of streamflow records for the Delaware River at Trenton, monthly mean streamflow was lowest during September (4,232 ft^3/s) and highest during June (14,730 ft^3/s) (table 11). The monthly mean streamflow was above the respective monthly mean for the period of record in June and November, and below the monthly mean for the remainder of the year.

Temperature

The significance of water temperature in regard to water quality in the estuary lies in the profound influence temperature has on the various physical, chemical, and biological properties of 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 factor that controls water temperature in the estuary is climate; however, various uses of the water by man also have notable effects.

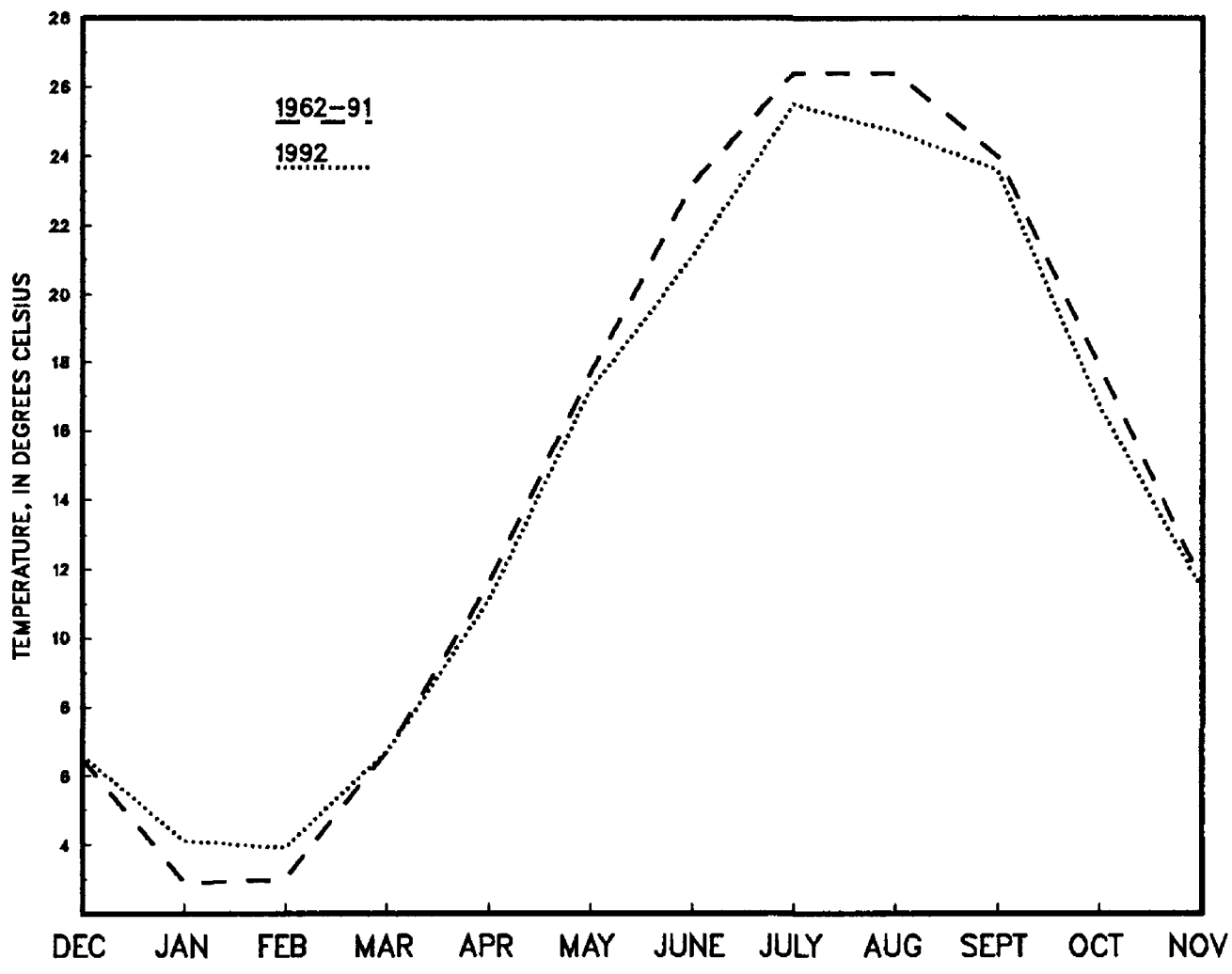

Figure 6.- Mean monthly temperatures of the Delaware River at Benjamin Franklin Bridge, Philadelphia, Pennsylvania.

Based on records from Benjamin Franklin Bridge (Pier 12 North), Philadelphia, Pa., monthly mean temperatures for the 1992 report year were below normal during October, November, and April through September and equaled or exceeded the norm during the rest of the year. Normal is based on historical temperature records from 1962 to 1991 (fig. 6).

Specific Conductance and Chloride

Specific conductance is the ability of a solution to conduct electricity. It can be used as an indicator of the amount of ionized material in solution and relates approximately to dissolved-solids content.

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 a considerable effect on specific conductance. Increasing streamflows reduce the concentration of dissolved solids, thus lowering specific conductance and chloride levels. 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 levels 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 estimated from that correlation are presented in tables 20 and 22. The correlation is less reliable when chloride concentrations are lower than 30mg/L because other ionized materials may be present in amounts large enough to affect the conductance-chloride correlation. Therefore, chloride concentrations derived from specific conductance are not given when chloride concentrations of less than 30 mg/L are indicated. Chloride concentrations at Chester, Pa., (table 21) were furnished by Scott Paper Company.

At Fort Mifflin, the maximum daily chloride concentration equaled or exceeded 50 mg/L 5.2 percent of the time (table 20). The maximum was 64 mg/L on September 26. At Chester, the minimum daily chloride concentration equaled or exceeded 50 mg/L, 18 percent of the time. The maximum daily concentration was greater than 50 mg/L, 48 percent of the time (table 21). The maximum daily chloride concentration was 254 mg/L on September 25. Minimum chloride concentrations at Reedy Island Jetty did not go below 250 mg/L. Maximum chloride concentrations at Reedy Island Jetty typically ranged from 2,000 to 7,000 mg/L. The maximum at this site was 8,600 mg/L on January 4.

Table 20. - Daily maximum and minimum chloride concentrations, Delaware River at Fort Mifflin, Pa., in milligrams per liter
December 1, 1991 to November 30, 1992
{A dash (-) indicates missing data; *indicates less than 30 mg/L (milligrams per liter); Max is maximum value; Min is minimum value}

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	37	*	37	*	41	*	41	*	*	*	*	*	39	*	37	*	—	—	39	*	38	33	41	37
2	33	*	32	*	39	*	38	*	*	*	*	*	33	*	35	*	—	—	32	*	38	33	38	34
3	38	*	33	*	35	*	42	31	*	*	*	*	*	*	*	*	—	—	31	*	37	31	59	31
4	43	*	32	*	36	*	40	31	*	*	*	*	*	*	36	*	30	*	33	*	35	32	59	30
5	*	*	40	*	41	*	42	33	*	*	*	*	*	*	35	*	35	*	34	*	38	33	55	*
6	*	*	34	*	34	*	38	33	*	*	*	*	*	*	32	*	34	*	34	*	39	34	38	*
7	*	*	38	*	35	*	42	32	*	*	30	*	*	*	32	*	34	*	36	*	37	32	36	*
8	*	*	35	*	39	*	44	30	*	*	*	*	*	*	32	*	32	*	42	*	36	33	36	*
9	*	*	30	*	41	*	51	30	*	*	38	*	*	*	32	*	31	*	40	*	37	32	33	*
10	33	*	32	*	41	*	46	*	*	*	*	*	*	*	33	*	*	*	35	30	38	32	*	*
11	33	*	33	*	35	*	43	*	*	*	*	*	*	*	38	*	30	*	47	*	39	33	*	*
12	*	*	33	*	37	*	39	*	*	*	*	*	*	*	35	*	41	*	44	31	44	34	*	*
13	*	*	32	*	32	*	37	*	*	*	*	*	*	*	33	*	43	*	51	31	42	35	37	*
14	30	*	35	*	52	*	31	*	*	*	*	*	*	*	35	*	35	*	47	31	41	34	40	*
15	33	*	47	*	36	*	32	*	30	*	*	*	*	*	46	*	38	*	44	31	38	30	39	*
16	38	*	51	*	58	*	31	*	37	*	*	*	*	*	44	*	44	*	41	31	34	*	33	*
17	30	*	34	*	57	31	*	*	36	*	*	*	*	*	39	*	55	*	40	31	38	31	*	*
18	35	*	39	*	43	*	30	*	35	*	*	*	*	*	36	*	55	*	39	32	34	31	*	*
19	37	*	39	*	47	30	*	*	37	*	*	*	35	*	36	*	44	*	45	32	34	31	*	*
20	30	*	30	*	51	30	32	*	36	*	*	*	30	*	36	*	42	*	37	31	35	30	*	*
21	30	*	30	*	43	30	33	*	35	*	*	*	*	*	34	*	34	*	40	33	34	30	*	*
22	30	*	*	*	38	*	32	*	36	*	30	*	*	*	36	*	33	*	40	34	33	*	*	*
23	*	*	*	*	37	*	51	*	42	*	*	*	*	*	37	*	31	*	48	34	34	30	37	*
24	30	*	45	*	38	*	51	*	42	*	*	*	*	*	35	*	31	*	45	36	35	30	33	*
25	*	*	47	*	41	*	36	*	37	*	*	*	*	*	38	*	*	*	48	37	38	33	*	*
26	*	*	38	*	47	30	32	*	37	*	*	*	*	*	37	*	*	*	64	38	37	32	*	*
27	33	*	37	*	53	31	44	*	34	*	*	*	*	*	34	*	31	*	52	35	42	35	*	*
28	*	*	38	*	54	*	40	*	30	*	31	*	*	*	34	*	30	*	45	33	40	36	*	*
29	*	*	35	*	52	30	*	*	30	*	35	*	*	*	31	*	38	*	39	34	41	38	*	*
30	38	*	35	*			*	*	30	*	35	*	*	*	32	*	33	*	38	34	42	37	*	*
31	37	*	34	*			*	*			37	*			—	—	39	*			41	36		

Table 21. - Daily maximum and minimum chloride concentrations, Delaware River at Chester, Pa ., in milligrams per liter
December 1, 1991 to November 30, 1992. Collection and analysis by Scott Paper Company.
{A dash (-) indicates missing data; * indicates less than 30 mg/L (milligrams per liter); Max is maximum value; Min is minimum value}

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	91	64	55	*	40	32	42	40	60	30	30	*	40	*	30	*	63	35	77	48	95	65	116	100
2	150	80	41	*	43	35	47	37	63	*	31	*	40	*	30	*	62	38	93	51	94	58	—	—
3	80	49	56	36	46	41	44	40	35	*	35	*	30	*	38	30	50	37	120	50	90	56	82	61
4	45	35	56	*	50	35	47	42	31	*	55	*	35	*	36	30	40	36	93	48	120	61	120	52
5	37	30	46	30	41	40	40	33	32	*	45	*	36	*	36	*	55	40	148	52	184	74	70	48
6	36	30	37	30	44	38	43	36	56	*	55	*	*	*	34	*	63	41	140	60	156	75	82	43
7	34	*	40	30	48	40	42	*	64	31	64	*	45	*	39	30	62	45	140	57	134	65	50	46
8	85	*	41	31	50	38	45	37	57	45	41	*	*	*	38	33	62	38	115	52	118	64	75	40
9	98	*	50	*	44	36	45	36	52	*	54	*	*	*	41	35	64	42	110	54	133	65	52	34
10	74	*	60	34	60	40	45	37	34	31	*	*	43	*	41	33	64	35	110	50	130	68	65	38
11	68	*	60	*	62	37	45	37	38	36	*	*	41	*	40	35	65	36	100	60	140	64	55	40
12	98	*	40	30	62	40	45	35	—	—	*	*	42	*	36	33	45	34	125	58	110	60	65	36
13	98	*	50	32	74	43	38	30	—	—	*	*	52	*	42	*	50	40	116	65	100	65	41	36
14	32	*	58	32	75	42	40	36	—	—	40	*	34	*	42	*	72	43	110	60	102	54	38	30
15	40	*	62	30	100	*	37	30	—	—	*	*	55	*	36	33	69	44	110	62	90	55	36	32
16	38	*	90	*	60	44	38	32	—	—	*	*	44	*	48	39	66	*	95	60	78	60	67	35
17	60	*	90	32	52	46	38	*	—	—	*	*	*	*	46	33	67	52	95	68	67	51	62	35
18	48	30	58	*	55	44	38	30	—	—	*	*	*	*	45	36	68	55	95	64	110	58	52	32
19	35	30	37	30	50	46	40	*	—	—	*	*	37	*	45	35	66	41	92	70	86	50	55	*
20	60	*	40	*	45	32	42	*	*	*	32	*	42	*	42	38	64	38	110	63	72	60	43	32
21	34	30	44	*	49	40	40	34	56	*	33	*	*	*	43	34	56	44	140	66	92	54	55	32
22	38	30	42	30	48	44	68	*	38	*	31	*	*	*	42	38	50	35	172	72	95	54	56	30
23	34	30	38	30	54	40	56	31	34	*	32	*	*	*	45	35	44	40	150	65	102	60	32	*
24	34	31	48	35	46	40	50	*	34	*	32	*	*	*	40	32	78	37	235	60	88	57	38	30
25	85	34	48	*	54	48	36	32	34	*	31	*	30	*	43	36	72	36	254	82	86	58	31	*
26	85	44	40	34	54	42	38	*	32	*	30	*	30	*	40	36	68	36	147	88	115	56	30	*
27	85	30	41	3	60	35	58	36	36	32	34	*	33	*	43	36	68	48	115	50	120	58	32	*
28	36	*	38	30	45	42	42	30	34	*	32	*	32	*	68	42	74	40	110	55	150	60	28	*
29	33	*	47	40	80	31	68	*	31	*	36	*	32	*	64	40	71	40	90	59	154	63	48	*
30	45	*	45	*			68	30	*	*	*	*	34	*	68	50	77	38	100	59	117	64	50	*
31	55	*	53	*			42	*			36	32		*	55	*	70	48			140	60		

Table 22 - Daily maximum and minimum chloride concentrations, Delaware River at Reedy Island Jetty, Del. , in milligrams per liter
December 1, 1991 to November 30, 1992.
{A dash (-) indicates missing data; Max is maximum value; Min is minimum value}

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	6300	3500	6000	2500	6300	2600	6600	2100	4100	1000	2900	930	—	—	4600	1700	4400	2000	5100	2300	5900	3100	5400	3000
2	6700	3500	6100	2600	6700	2700	5900	2100	4100	1200	3400	820	—	—	4100	1700	4600	1900	5100	2400	6100	3100	6100	3200
3	7600	3600	7000	3000	8000	3300	6200	2700	3300	840	—	—	—	—	4700	1900	4400	1900	5000	2500	5600	3200	5600	3200
4	6200	2800	8600	4200	7900	3600	5700	2500	4000	850	—	—	—	—	4300	1900	4000	1900	4600	2200	6400	2900	4900	3100
5	4300	2200	7800	3800	6000	2700	5200	2700	3900	840	—	—	—	—	4100	1800	4000	1800	5200	2300	7400	3700	4500	2800
6	4300	1800	7200	3900	7600	2900	4700	2600	3600	860	—	—	—	—	3800	1900	4200	1700	5100	2700	6700	4000	4900	2500
7	5100	1800	6000	3700	7900	3600	5600	2800	4000	860	—	—	—	—	4100	1800	4400	1700	5000	2600	6900	3700	4600	2400
8	4700	1700	5700	3300	8000	3900	5500	2600	4100	1200	—	—	—	—	4300	1800	4800	1900	4900	2600	7000	3700	5200	2600
9	5200	1000	6200	3300	6400	3500	4700	2400	4000	1200	—	—	—	—	4200	1900	4400	1900	4900	2600	7000	4100	5500	2500
10	5000	1600	6300	3400	4900	2900	5200	2500	3900	1100	—	—	—	—	4400	1800	4800	1800	4900	2700	6800	3700	5000	2600
11	5100	1600	6100	3100	5900	2800	5400	1900	3600	1200	3300	760	—	—	4300	1800	4800	1900	4600	2500	6500	3600	5800	2600
12	4500	1600	5800	3000	4900	2600	3000	1300	3700	1200	3000	810	—	—	4400	1600	4500	1700	4600	2400	6300	3500	5600	2600
13	4700	1500	5800	3000	6000	3000	2600	850	4000	1200	3000	730	—	—	4400	1800	4400	1800	5000	2700	5800	3300	5100	2100
14	4500	1400	6600	3100	6900	3200	4000	730	3300	1300	3000	720	—	—	4200	1700	4400	2200	4600	2700	6100	3200	3900	2100
15	2200	900	4200	2300	7100	3400	3800	720	3500	1300	3000	720	—	—	4900	1900	5000	2600	4500	2600	6000	3200	—	—
16	3100	580	5100	1600	7200	3400	4100	700	3700	1200	3000	710	—	—	4500	1900	4800	2400	4800	2600	6200	3200	—	—
17	4400	890	5100	1900	6200	3100	4400	810	3500	1300	2800	770	—	—	4900	2000	—	—	4900	2500	5500	2700	—	—
18	—	—	4900	1600	6500	3000	3500	870	3900	1400	2900	680	1100	590	4500	1900	—	—	5400	2500	5900	2900	—	—
19	—	—	4600	1200	6400	3100	4000	1100	4100	1400	2500	660	1800	620	4400	2000	4700	2400	4700	2300	5000	2900	—	—
20	—	—	6400	1700	6000	3000	4600	1400	3600	1300	2700	660	1500	550	3900	1900	4800	2200	5900	2300	7200	3000	—	—
21	—	—	6500	1900	5500	2900	4100	1300	3200	1300	2500	680	2300	550	3700	1900	4800	2100	5500	2600	6000	3400	—	—
22	—	—	5800	2200	4700	2900	3900	1500	2800	1100	2500	670	2800	510	4600	1700	4800	2200	5800	2700	6200	2800	—	—
23	—	—	6600	2400	5600	2700	4100	1500	2200	1100	—	—	3100	790	4100	2100	5200	2100	5600	2600	5900	3100	—	—
24	—	—	6400	2100	5200	2900	4000	1300	2500	970	—	—	3800	1200	4700	2000	5500	2200	6600	2700	6000	3200	2900	1100
25	—	—	3300	1400	6000	3100	3600	1300	3100	910	—	—	3900	1100	4900	2000	5600	2300	6800	3800	5200	2800	3000	760
26	5500	2400	4500	1400	6100	3300	3300	1300	3300	950	—	—	4600	1100	5500	2000	6100	2500	7300	3100	6500	3000	2300	660
27	4600	2300	5400	1300	5900	2900	4100	1600	3000	950	—	—	4600	1400	5400	2000	6100	2700	6500	3300	5500	3000	1800	600
28	4800	2200	5300	1800	5800	2700	3500	860	3600	900	—	—	4800	1500	5400	1900	6000	2800	6300	3200	5300	2700	1600	520
29	5200	2300	5900	2100	4900	2300	2800	640	3900	800	—	—	4800	1700	5000	1900	5700	2600	5600	3100	5300	2800	1800	520
30	5600	2500	6000	2100			3700	760	3900	1100	—	—	4800	1800	5200	2000			5800	3100	5300	2700	1800	460
31	6800	2800	6500	2500			4000	990			—	—			5000	2100					5500	2700		

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 atmosphere and photosynthesis in aquatic plants. Maximum dissolved-oxygen concentrations are controlled 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, daily mean dissolved-oxygen concentration at the Benjamin Franklin Bridge was below 5 mg/L from July 14 through August 3, August 12 through September 25, and September 27-29 (table 23). The minimum daily mean at Benjamin Franklin Bridge was 3.5 mg/L on September 7. At Chester, the daily mean dissolved-oxygen concentration was below 5 mg/L on July 16-29; August 1,2, 10-30; and September 1,2, and 9 (table 24). The lowest daily mean was 3.8 mg/L on August 19 and 20. The minimum hourly value was 3.5 mg/L on August 20. At Reedy Island Jetty, the minimum hourly value was 4.5 mg/L on August 16.

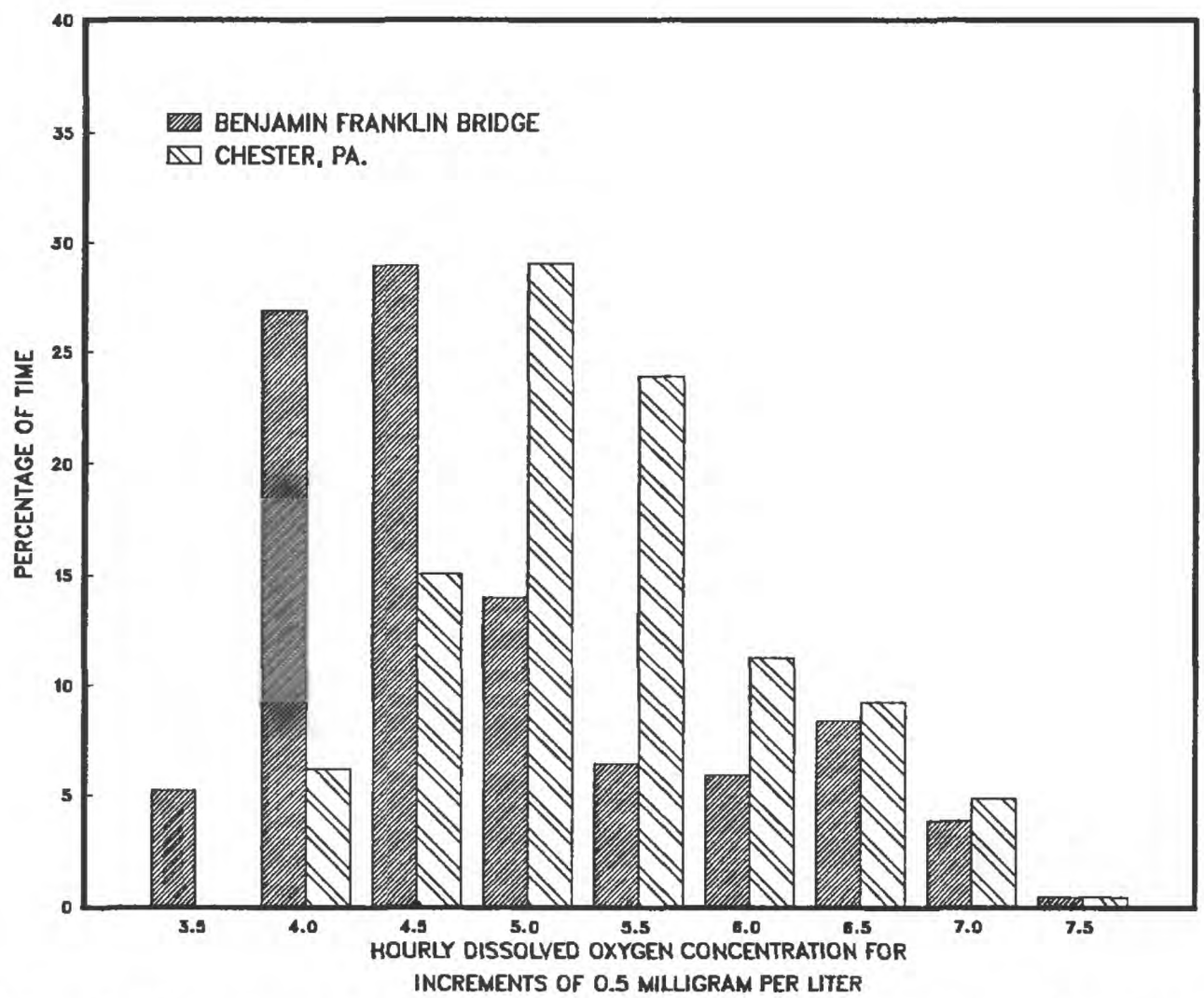

Figure 7.- Frequency of occurrance of disolved-oxygen concentrations at two stations in the Delaware River during July, August, and September, 1992.

Figure 7 shows the frequency of occurance of hourly dissolved-oxygen concentrations observed at Benjamin Franklin Bridge and Chester during the critical summer period, July through September, 1992. At Chester, dissolved-oxygen concentration was equal to or below 4 mg/L, 6 percent of the time in 1992, as compared to never dropping that low in 1991, and 4 percent of the time in 1990. At Benjamin Franklin Bridge, the dissolved-oxygen concentration was equal to or below 4 mg/L, 32 percent of the time in 1992 as compared with 51 percent of the time in 1991 and 9 percent of the time in 1990.

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. Usually, 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 recorded at Benjamin Franklin Bridge, Chester, and Reedy Island Jetty were in a range of 6.2 to 8.1. The pH range for each station was: Reedy Island Jetty, 7.0 to 8.1; Chester, 6.5 to 7.6; Benjamin Franklin Bridge, 6.2 to 7.3. The pH in the estuary tends to be lowest near Trenton, N.J., and to increase downstream.

Table 23. - Dissolved oxygen, Delaware River at Benjamin Franklin Bridge at Philadelphia, Pa.
Daily mean dissolved oxygen in milligrams per liter
December 1, 1991 to November 30, 1992.
{ A dash (-) indicates missing data}

Day	December	January	February	March	April	May	June	July	August	September	October	November
1	8.5	11.7	9.5	10.2	9.9	7.5	—	6.2	4.5	4.2	—	6.9
2	8.6	11.5	10.3	10.5	10.0	7.7	5.6	6.3	4.5	4.1	—	7.0
3	8.7	11.6	10.1	10.6	10.2	7.6	6.2	6.5	4.8	4.0	—	6.9
4	9.4	11.6	10.0	10.5	10.3	7.7	6.7	6.1	5.1	—	—	7.0
5	10.5	11.6	9.5	10.3	10.0	7.6	7.0	6.3	5.2	3.7	6.2	7.3
6	10.6	11.5	10.1	10.6	9.8	7.7	7.0	6.5	5.6	3.6	6.3	7.7
7	10.5	11.5	11.3	10.5	9.6	7.7	6.7	6.6	5.9	3.5	6.3	7.8
8	10.3	11.4	11.2	10.2	9.3	7.5	6.4	6.8	6.1	—	6.2	8.1
9	10.1	11.2	11.6	10.1	9.1	6.9	6.4	6.7	5.9	—	6.2	8.2
10	10.2	8.8	11.3	10.1	9.2	6.9	6.5	6.6	5.7	—	6.0	8.2
11	10.4	7.5	10.7	9.8	9.3	6.5	6.3	6.2	5.3	—	5.9	8.1
12	10.8	7.3	10.8	9.8	9.1	6.5	6.3	5.8	4.8	4.0	—	8.1
13	—	7.3	10.6	9.5	9.1	6.4	—	5.2	4.6	4.0	5.9	8.3
14	—	7.2	103	9.4	8.9	6.2	—	4.7	4.5	4.0	5.9	8.4
15	—	7.4	10.1	9.2	8.9	—	—	4.5	4.5	3.9	5.9	8.7
16	11.6	7.7	9.0	9.2	8.6	7.1	—	4.4	4.3	3.7	5.9	9.0
17	11.5	8.2	9.2	9.2	8.5	6.6	—	4.3	3.9	3.7	6.1	9.1
18	11.4	7.8	10.0	9.1	8.5	6.3	—	4.1	3.6	4.1	6.1	9.2
19	11.7	8.0	9.9	9.3	8.4	6.2	—	4.0	3.5	4.4	6.1	9.1
20	11.4	7.9	10.1	9.3	8.4	6.2	—	3.9	3.7	4.5	6.5	9.2
21	11.3	8.1	10.2	9.5	8.4	6.2	—	4.0	3.9	4.4	6.6	9.2
22	11.3	8.1	10.3	9.8	8.3	6.6	—	4.1	4.1	4.2	6.7	9.1
23	11.2	7.9	10.2	9.8	8.3	7.0	5.9	4.0	4.2	4.2	6.7	9.1
24	11.2	7.7	10.4	9.8	8.6	7.3	6.1	3.8	4.3	4.6	6.8	9.5
25	11.3	8.1	10.5	9.8	8.9	7.4	6.2	3.7	4.2	4.9	6.8	9.7
26	11.4	8.6	10.4	9.7	8.8	6.9	6.5	3.6	3.9	5.1	6.9	9.6
27	11.5	8.8	10.2	10.1	8.4	6.2	6.5	3.6	3.8	4.6	7.0	9.3
28	11.5	8.8	10.0	10.4	7.9	5.7	6.6	3.7	3.8	4.2	6.9	—
29	11.4	9.0	10.2	10.6	7.5	5.6	6.4	4.2	4.0	4.0	6.9	—
30	11.5	9.3		10.3	7.3	—	6.4	4.7	4.1	—	6.8	—
31	11.7	9.8		9.9		—		4.9	4.2		6.9	

Table 24. - Dissolved oxygen, Delaware River at Chester, Pa.
Daily mean dissolved oxygen in milligrams per liter
December 1, 1991 to November 30, 1992.
{A dash (-) indicates missing data}

Day	December	January	February	March	April	May	June	July	August	September	October	November
1	8.4	10.8	—	10.7	10.1	7.7	7.0	7.0	4.8	4.9	6.3	7.5
2	8.2	10.7	—	10.7	10.1	7.7	6.9	6.8	4.9	4.8	6.6	7.7
3	8.5	10.6	—	10.6	10.0	7.7	7.1	6.5	5.0	5.0	6.9	8.0
4	8.6	10.8	—	10.5	9.9	7.6	7.1	6.3	5.0	5.1	6.9	7.6
5	9.0	10.8	—	10.3	9.7	7.6	6.9	6.3	5.0	5.0	7.3	7.2
6	9.1	10.7	—	10.3	9.7	7.8	6.7	6.2	5.1	5.3	7.5	7.1
7	9.1	10.8	—	10.3	9.5	7.8	6.7	6.2	5.1	5.2	7.4	7.2
8	9.1	10.9	—	10.0	9.4	7.7	6.7	6.3	5.2	5.1	7.4	7.3
9	9.0	10.7	—	9.9	9.3	7.4	6.5	6.2	5.1	4.9	7.3	7.4
10	9.0	10.6	—	9.7	9.1	7.0	6.3	6.1	4.9	5.1	7.2	7.5
11	9.0	10.7	—	9.7	8.9	6.9	6.3	5.9	4.7	5.1	6.8	7.6
12	9.2	10.7	—	9.7	8.7	7.1	6.5	5.6	4.7	5.1	6.7	7.8
13	9.2	10.6	—	9.7	8.7	7.0	6.8	5.4	4.4	5.2	6.7	8.2
14	9.3	10.5	—	9.8	8.7	6.9	7.2	5.3	4.5	5.3	6.5	8.2
15	—	11.1	—	9.8	8.7	6.9	7.4	5.1	4.5	5.3	6.5	8.3
16	—	11.2	—	9.9	8.4	6.6	7.6	4.9	4.5	5.4	6.5	8.5
17	11.0	11.3	—	9.9	8.2	6.9	7.6	4.8	4.2	5.4	6.6	8.5
18	11.0	—	11.3	9.9	7.9	6.4	7.3	4.5	4.0	5.4	6.5	8.5
19	11.4	—	11.2	10.0	8.4	6.6	6.5	4.3	3.8	5.6	6.6	8.3
20	11.2	—	11.0	9.8	8.2	6.9	5.7	4.3	3.8	5.5	6.9	8.4
21	11.2	—	11.0	9.8	8.2	7.1	5.4	4.4	3.9	5.6	7.2	8.6
22	11.2	—	10.9	9.8	8.0	7.7	5.7	4.6	4.0	5.6	7.2	8.5
23	11.0	—	10.8	9.8	7.8	8.4	6.3	4.7	4.1	5.7	7.3	8.4
24	11.0	—	10.8	9.9	7.6	8.7	6.7	4.7	4.2	6.1	7.3	8.7
25	11.1	—	10.8	10.0	7.5	8.0	7.0	4.9	4.4	6.5	7.3	8.7
26	11.1	—	10.8	10.0	7.5	7.7	7.5	4.9	4.2	6.9	7.4	8.7
27	11.1	—	10.7	10.0	7.5	7.4	7.7	4.8	4.2	6.5	7.6	8.9
28	11.0	—	10.7	10.2	7.5	7.4	7.6	4.7	4.4	6.2	7.6	9.1
29	10.7	—	10.6	10.3	7.5	7.7	7.5	4.9	4.7	6.0	7.5	9.1
30	10.7	—		10.2	7.6	7.5	7.3	5.1	4.8	6.1	7.4	9.0
31	10.9	—		10.2		7.3		5.0	5.1		7.4	

Section IV

APPENDICES

(page 85 follows)

AGREEMENT

The Parties to the 1954 U. S. Supreme Court Decree convened at 1:30 p.m. on April 22, 1992, at the University of Delaware's Goodstay Center, Wilmington, Delaware, pursuant to the DRBC Resolution No. 83-13, to consider modification of current diversions to New York City and New Jersey, releases from the New York City reservoirs, target flows at the Montague and Trenton gauging stations and continuation of drought warning beyond the 180 days provided in Resolution No. 83-13.

The modifications agreed to were:

1. New York City would continue its diversions from the Basin at a level not to exceed 750 mgd;

2. New Jersey would continue its diversions at a level not to exceed 95 mgd;

3. The Montague and Trenton target flows shall be 1700 cfs and 2800 cfs respectively;

4. Establishment of an emergency fisheries protection program designed to allow special stream releases whenever requested by the NYDEC. The emergency program includes the following provisions:

   a. No net loss of storage.

   b. Maximum use of 6000 cfs-days to be paid back by reductions in releases required for Montague.

   c. Credits from releases required for Montague targets may occur at the following rates:

When design target flow equals or exceeds	Allowed credit reduction in directed release
1700 cfs	150 cfs
1600 cfs	100 cfs
1500 cfs	50 cfs

   d. This emergency program begins May 1, 1992 and usage ends October 31, 1992 but reductions to Montague directed releases will continue until total storage is paid back or until reservoirs spill.

e. This emergency fisheries program will continue during drought warning and automatically terminate upon the Basin being in drought emergency as determined by Resolution No. 83-13. While continuing in this drought warning, conservation releases will remain at the basic release level.

f. The operation of this emergency program will be directed by NYDEC and will be coordinated with the River Master and New York City. DRBC will be informed of the River Master's directed releases each day when it is computed and NYDEC will report each request for an augmented release.

5. The parties will reconvene, by meeting or telephone conference call, to reconsider these arrangements when a significant change in storage, hydrology, and/or salt front conditions so dictate; and

6. These modifications will take effect immediately and will continue until modified by unanimous agreement of the parties or terminated by any one of the parties.

Jeanne M. Fox 4/22/92
State of New Jersey Date

Russell C. Pitt, Pleasant 4/22/92
State of New York Date

4/22/92
State of Delaware Date

4/22/92
Commonwealth of Pennsylvania Date

4-22-92
City of New York Date

AGREEMENT

The Parties to the 1954 U. S. Supreme Court Decree convened at 1:00 p.m. on May 20, 1992, at the Delaware River Basin Commission offices in West Trenton, New Jersey, pursuant to the DRBC Resolution No. 83-13, to consider modification of current diversions to New York City and New Jersey, releases from the New York City reservoirs, target flows at the Montague and Trenton gauging stations and continuation of drought warning beyond the 180 days provided in Resolution No. 83-13 and pursuant to Resolution No. 88-22 (Revised) to consider the possible Banking of the Excess Release Quantity.

The modifications agreed to were:

1. The Delaware Basin remains in a Drought Warning.

2. New York City would continue its diversions from the Basin at a level not to exceed 750 mgd;

3. New Jersey would continue its diversions at a level not to exceed 95 mgd;

4. The Montague and Trenton target flows shall be 1700 cfs and 2800 cfs respectively;

5. The emergency fisheries protection program designed to allow special stream releases whenever requested by the NYDEC will continue. The emergency program includes the following provisions:

a. No net loss of storage.

b. Maximum use of 6000 cfs-days to be paid back by reductions in releases required for Montague.

c. Credits from releases required for Montague targets may occur at the following rates:

When design target flow equals or exceeds	Allowed credit reduction in directed release
1700 cfs	150 cfs
1600 cfs	100 cfs
1500 cfs	50 cfs

d. This emergency program began May 1, 1992 and usage ends October 31, 1992 but reductions to Montague directed releases will continue until total storage is paid back or until reservoirs spill.

e. At no time shall the directed conservation release under this program exceed the augmented releases as established in Resolution No. 77-20 CP (Revised).

f. For the period ending June 24, 1992, the maximum storage available for this emeregency fisheries program shall be increased by 2000 cfs-days.

g. This emergency fisheries program will continue during drought warning and automatically terminate upon the Basin being in drought emergency as determined by Resolution No. 83-13. While continuing in this drought warning, conservation releases will remain at the basic release level.

h. The operation of this emergency program will be directed by NYDEC and will be coordinated with the River Master and New York City. DRBC will be informed of the River Master's directed releases each day when it is computed and NYDEC will report each request for an augmented release.

6. The Excess Release Quantity shall be suspended for water year beginning June 1, 1992.

7. The parties will reconvene, by meeting or telephone conference call, to reconsider these arrangements when a significant change in storage, hydrology, and/or salt front conditions so dictate; and

8. These modifications will take effect immediately and will continue until modified by unanimous agreement of the parties or terminated by any one of the parties.

Jeanne M. Fox 5/20/92
State of New Jersey Date

Russell C. Mt. Pleasant 5/20/92
State of New York Date

Robert R. Raskin 6/2/92
State of Delaware Date

5/20/92
State of Delaware Date

John E. McSpadden 5/20/92
Commonwealth of Pennsylvania Date

Joseph J. Lowry 5-20-92
City of New York Date