

Appendix C

History of Flood Management and Reservoir Release Decisions in the Delaware Basin

- History of Flood Management Decisions on the Main Stem Delaware River
- History of Reservoir Release Decisions in the Upper Delaware
- Supreme Court of the United States, Amended Decree, State of New Jersey v. State of New York and City of New York, June 7, 1954.

History of Flood Management Decisions on the Main Stem Delaware River

Large structural projects were the flood protection measure of choice in the early and mid 20th Century, and the first Delaware River Basin Commission (DRBC) Comprehensive Plan included a large dam on the Delaware River at Tock's Island. Such a large dam and its dedicated flood storage capacity would have significantly reduced, though not eliminated, flooding on the middle and lower main stem. The 1975 decision by the DRBC to defer the Tocks Island Dam decision, the Scenic River designation of the main stem Delaware, and Congressional de-authorization of the Tock's Island project, left the middle and lower river without the flood control once envisioned in the original Comprehensive Plan of the DRBC.

Due to a host of economic, environmental and political reasons, the national trend in flood management moved away from large scale flood control projects and instead towards floodplain management and mitigating measures such as acquisition, elevation, floodplain regulations, and stormwater management. In addition, while spill mitigation programs at existing water supply reservoirs may provide some reduction in flood crests along tributary streams, they cannot be depended upon to produce the major reductions in flood peaks sought by property owners along the middle and lower Delaware. The following is a brief summary of past studies and plans that speak to flood management in the Basin.

Level B Study

The DRBC's 1981 Level B Study was a comprehensive water resources planning study funded by the U.S. Water Resources Council and the DRBC after the Tocks Island decision. In considering main stem flood potential, the study looked at the flood control provided by the four Corps of Engineer reservoirs upstream of Trenton, NJ. These reservoirs (F.E. Walter, Beltzville, Jadwin, and Prompton) provide 68 billion gallons of dedicated flood storage capacity and are designed and managed to maintain this capacity. They are located on tributaries and control less than 10 percent of the drainage area of the Delaware River above Trenton. The Level B Study noted that in a repetition of the 1955 flood, these facilities, which were built after 1955, would have reduced the flood level at Trenton by 1.3 feet. In other words, the crest at Trenton would have been reduced from 28.6 feet to 27.3 feet – still 7.3 feet above flood stage.

In further addressing main stem flood potential, the Level B Study cited an analysis performed by the National Weather Service after record flooding from Hurricane Agnes in the Susquehanna River Basin in 1972. This analysis modeled the Hurricane as if it had been centered over the Delaware River Basin, and calculated a flood crest of 31 ft at Trenton – 11 feet above flood stage and 2.4 feet higher than the record flood of 1955. The Preferred Plan of the Level B Study did not recommend any additional flood control dams other than those previously constructed in the Delaware River Basin. The study noted that non-structural flood mitigation measures such as flood warning and emergency

preparedness, floodplain property acquisition, floodplain management, flood insurance, and stormwater management, should be given more consideration than in the past.

1984 Delaware River Basin Study by the Corps of Engineers

The 1984 Corps study was authorized by Congress through a recommendation from the House Committee on Public Works and Transportation, after the DRBC expressed interest in the development of a flood damage reduction program for main stem communities in the absence of the Tocks Island Dam. The study included a detailed analysis of flood damage potential along the main stem of the Delaware River below Tocks Island. The study reviewed existing flood control projects, developed updated flood hydrology, identified major damage centers, developed estimated annual flood damages based on a flood risk assessment, and evaluated both structural and non-structural flood protection measures. All forms of impoundments and impoundment sites were reviewed for controlling flood waters on the main stem. The impoundments were screened using a set of seven criteria listed on pages 63 and 70 of the study report. These criteria are summarized below:

- 1) Projects were to be located above the City of Trenton, New Jersey.
- 2) Projects were to have a minimum of 20,000 acre-ft (6.52 billion gallons) of available flood control storage – either run of river or pumped storage.
- 3) Projects could not be located on Federal or state-designated scenic rivers or protected areas, nor on the main stem of the Delaware River.
- 4) Projects which were Part of the Level B Comprehensive Plan, and are designated for water supply, were considered unavailable to provide flood protection unless they had additional capacity to add-on flood control.
- 5) Projects could not require “extensive” relocation of major roads, railways, or structures which made them “obviously” economically infeasible.
- 6) Sites previously eliminated or deferred for environmental, social or cultural reasons were automatically eliminated.
- 7) Projects could not be economically feasible as a single flood control project if they were already infeasible as a flood control component of a multipurpose project.

All but two of several hundred potential impoundments were eliminated from consideration using these criteria, and the two remaining sites were eliminated due to either high cost or their small impact on main stem flooding. The study presents, on pages 66-69, a complete list of the impoundment sites meeting the 20,000 acre-ft criterion. Also eliminated were 30 local levee/floodwall measures for riverside communities in Monroe, Northampton, Hunterdon, Warren, Mercer, Bucks, and Burlington Counties. A three level screening process based on cost vs. annual average damages of the protected community was used and eliminated all the structures from further consideration. The study located 12 out of 58 riverside communities where local non-structural flood protection measures were economically justified. The individual structures identified for application of protection measures accounted for only 2 percent of the 12,000 total floodplain structures in the study area. At the time, interest at the local

level in sponsoring further studies of non-structural protective measures was extremely limited. Nearly 30 years had passed without a major main stem flood.

2004 Water Resources Plan for the Delaware River Basin

A resolution adopting a new Water Resources Plan for the Delaware River Basin was signed by the four basin governors and the federal commissioner in September of 2004. The purpose of the plan was to provide a uniform framework for addressing water resources issues in the basin. It stressed the interrelatedness of water resource issues and the need for considering all aspects of water resources in decision-making. The formulation of the plan was based on recommendations of a Watershed Advisory Council, representing a spectrum of private, public, and non-profit interests, and the recommendations of DRBC advisory committees. The plan is comprised of five Key Result Areas, the second of which is Waterway Corridor Management. Flood loss reduction is included primarily in this category, although Key Result Area No. 3 – Linking Land and Water Resource Management includes storm water management. Page 31 of the plan lists the three goals for Waterway Corridor Management. These are:

- 2.1 Prevent or minimize flood-induced loss of life and property, and protect floodplain ecology.
- 2.2 Enhance water-based recreation in the river and tributaries.
- 2.3 Protect and restore healthy and biologically diverse riparian and aquatic ecosystems.

In its description of the major components of flood loss reduction, the plan lists assessment of flood hazards, pre and post disaster mitigation strategies, linking flood control with storm water management, minimizing ecological impacts of floods, enhancement of flood forecasting, and public education on the natural functions of floodplains, risks of development in the floodplain, and the need for hazard mitigation plans. While the plan does not prescribe new dams, it recognizes the flood control benefits provided by existing structures. The plan includes a matrix of goals and objectives, and includes two objectives for Goal 2.1. These are:

- 2.1.A Upgrade and modernize flood warning and forecasting capabilities.
- 2.1.B Characterize flood damage risks; prioritize and implement actions to reduce risks and losses, and address human induced ecological impacts of hydromodification.

The plan lists on-line availability of Advanced Hydrologic Prediction Service products, compliance with the Disaster Mitigation Act of 2000 and restoration of hydrologically impaired waterways as desired outcomes for the two objectives. The recent flooding has resulted in the initiation of several studies aimed at characterizing flood damage risk and identifying actions to reduce flood losses. These studies, combined with the recommendations of the Task Force provide an opportunity to complete the work plan to address Goal 2.1 and its two objectives, and determine the extent to which large new structural control measures on the main stem Delaware River will play a part.

New Jersey Governor's Task Force Report

After the floods of September 2004 and April 2005, New Jersey Acting Governor Richard Codey established the Delaware River Flood Mitigation Task Force. On August 22, 2006, Governor Jon Corzine released the final report of the Flood Mitigation Task Force which includes 37 recommendations directed at flood loss reduction. The recommendations are detailed and consistent with Goal 2.1 of the Delaware River Basin Water Resources Plan. However, the report goes further than the basin plan in its implications for large main stem structural projects. The Executive Summary introduces the major findings of the report with the statement that "The floodplains should be expected to flood," and follows this with the finding that "No set of measures, alone or in combination, will stop or eliminate flooding in the Delaware River Floodplain." The report does not rule out structural solutions for flood control, and encourages studies of their viability, but states that "Any study should focus on local nonstructural and structural measures, and should not revisit the federal and state policy and funding decisions that terminated the proposed Tocks Island dam project."

Post Flood Direction by DRBC Commissioners

Since the June 2006 flood, the DRBC commissioners have met in public sessions concerning flood issues. DRBC staff have also participated in hearings and briefings related to the causes of the flooding. The major concern voiced by riverside citizens has been the need for more flood control. Many riverside property owners believe that changes to management of existing water supply reservoirs could significantly lower flood levels along the main stem, and that reservoir spills and upstream development are largely responsible for the spate of recent flooding. The commissioners have responded by establishing this Task Force, providing funding for the development of a flood analysis model for the basin's reservoirs, and approving a temporary spill mitigation program for the three New York City Delaware Basin reservoirs. Consensus among the commissioners is that spill mitigation will not achieve major flood control along the main stem, and that a comprehensive program is needed to address flood loss reduction.

History of Reservoir Release Decisions in the Upper Delaware

The Delaware River Basin Commission (DRBC), a federal-interstate compact agency, was formed in 1961 by the signatories to the Delaware River Basin Compact -- Delaware, New Jersey, New York, Pennsylvania, and the United States -- to provide for cooperative management of the water resources of the Basin. There are five Commissioners: the Governors of the four basin states and a federal representative appointed by the president (Ref. 1). The DRBC has regulatory, as well as management, planning and resource development authorities.

The compact establishing the DRBC provided the Commission with the authority, in accordance with the doctrine of equitable apportionment, to allocate the waters of the basin to and among the States that are signatory to the DRBC compact and to and among their political subdivisions, and to impose conditions, obligations and release requirements related thereto, all subject to certain conditions and limitations. A key limitation is that the Commission may not, without the unanimous consent of the parties to the 1954 Supreme Court decree^a, diminish or otherwise adversely affect the diversions, compensating releases, rights, conditions, obligations and provisions for the administration thereof contained in the decree (Ref. 1). The Decree Party representatives are the governors of the four basin states and the mayor of New York City.

Supreme Court Decree

On May 4, 1931, the U. S. Supreme Court issued a decree authorizing New York City (NYC) to divert an average of up to 440 million gallons of water per day (mgd) from two reservoirs it proposed to construct in the Delaware River Basin (the basin) for its water supply system in the Hudson River Basin (Ref. 2). This decree temporarily settled the case of the New Jersey v. New York, 283 U.S. 336 (1931), and resolved an interstate dispute over NYC's diversion of water from the basin. The decree also required NYC to release sufficient water from its Delaware Basin reservoirs to maintain flow targets in the Delaware River at Port Jervis, NY and Trenton, NJ.

The 1931 decree was superseded by an amended decree issued by the Supreme Court on June 7, 1954 in the same matter, 347 U.S. 995 (1954) (Ref. 2) (hereinafter, "the Decree"). This second adjudication arose when NYC sought to increase its diversion upon construction of a proposed third reservoir within the Delaware Basin. The amended decree increased NYC's allowable diversion to an average of 800 mgd from the three Delaware Basin reservoirs, on condition that NYC release sufficient water from the reservoirs to maintain a minimum basic flow of 1,750 cubic feet per second (cfs) in the Delaware River at Montague, NJ. In addition, the Decree authorized New Jersey to continue its existing diversion of up to an average of 100 mgd from the basin without providing compensating releases. The Decree designated the Chief Hydraulic Engineer of the U.S. Geological Survey (USGS) or that official's designee as the Delaware River Master (River Master) (Ref. 3). The River Master's duties include ensuring that the provisions of the Decree are carried out (Ref. 4).

Two-Part Governance of Delaware River Flows – DRBC and the Decree Parties

The 1954 Decree did not constitute a permanent apportionment of the waters of the basin. Rather, the Decree expressly provided that the parties could apply to the court for further action or relief at any time (Ref. 3). The Decree also provided that the diversions it allowed would not constitute prior appropriations or confer any superiority of right with respect to use of the Delaware's waters (Ref. 3). The uncertainty as to diversion rights and release requirements in the long term created an incentive for the parties to exert greater collective control over apportionment of the river's flow. They did so through the Delaware River Basin Compact, which provides that "[e]ach of the signatory states and their respective political subdivisions . . . in recognition of reciprocal benefits, hereby waives and relinquishes for the duration of this compact any right, privilege or power it may have to apply for any modification of the terms of the decree . . . which would increase or decrease the diversions authorized or increase or decrease the releases required thereunder . . . (Ref. 1). The initial term of the compact is 100 years. As noted above, without the unanimous consent of the parties to the Decree, the compact gives the Commission no authority to "diminish or otherwise adversely affect the diversions, compensating releases, rights, conditions, [and] obligations" . . . contained in the Decree. If the Decree Parties concur, however, they can act together through the Commission to modify the conditions established by the Court.

Over time, the Commission has identified areas where a departure from strict application of the terms of the decree can assist in the conservation of the basin's water and other resources. The Commission has supported Decree Party negotiations leading to a series of understandings codified in Commission regulations that are aimed at protecting public health and welfare during times of drought and enhancing the basin's fisheries. The most significant of these are a set of consensus recommendations contained in the Decree Parties' "Good Faith Recommendations" for interstate water management of 1982 (Ref. 6). A subset of these Good Faith recommendations became the subjects of Commission Resolutions Nos. 83-13, 84-7, and 88-22 (Revised), establishing regulations codified at Sections 2.5.3 through 2.5.6 of the DRBC Water Code. These rules are generally known as the "reservoir drought operating plans" (Ref. 7). The measures incorporated in these resolutions were prompted by a record drought in the 1960s and were made to conserve storage and continue to provide flow augmentation during periods of drought or extended dry weather. The drought operating plans, which consist of phased reductions in diversions and releases based upon reservoir storage curves, have been invoked numerous times since their adoption in the early 1980s.

Additional understandings among the Decree Parties have been established through DRBC regulation in the form of a docket and subsequent docket revisions. Docket D-77-20 CP and amendments thereto (Ref. 8) primarily concern protection and enhancement of the cold-water fisheries below the three NYC Delaware Basin reservoirs (the "tailwater fisheries"). Through a series of experimental programs approved in the form of dockets, the Commission and the Decree Parties have attempted to improve the tailwater fisheries, while recognizing the diversions to New York City (NYC) and New Jersey and the Montague flow target, all prescribed by the Decree, as well as the constraints imposed by limited reservoir storage, particularly during drought.

Recent Negotiations

The parties to the 1954 U.S. Supreme Court Decree are in the process of developing a Flexible Flow Management Plan (FFMP) for managing Delaware River Basin impoundments, including the NYC water supply reservoirs, for multiple objectives. These objectives include water supply, which encompasses the need to control salt concentrations near major urban intakes in the upper reaches of the Delaware Estuary; ecological flows; and flood mitigation. One component of the FFMP is a permanent “Discharge Mitigation Program.” This program currently is undergoing revision in response to comments submitted during the recent public comment period on the FFMP.

^a The Compact also states that DRBC, after consultation with the River Master, may by unanimous consent of its members declare a state of emergency resulting from a drought or catastrophe and may authorize and direct an increase or decrease in any diversion permitted or releases required by the Decree, in such manner and for such limited time as may be necessary to meet such emergency condition. Compact § 3.3(a).

References

1. Delaware River Basin Commission, Delaware River Basin Compact, Section 3.3, Paragraph a, October 27, 1961.
2. Supreme Court of the United States, Delaware Diversion Case, State of New Jersey v. State of New York and City of New York, Opinion of Justice Holmes, May 4, 1931.
3. Supreme Court of the United States, Amended Decree, State of New Jersey v. State of New York and City of New York, June 7, 1954.
4. U.S. Geological Survey, Office of the Delaware River Master, Internet web site, <http://wwwrvares.er.usgs.gov/orh/nrwww/public/odrm>.
5. U.S. Geological Survey, Report of the River Master of the Delaware River, U.S. Geological Survey Open File Report, Filed Annually from 1955 to Present.
6. States of Delaware, New Jersey, New York, and Pennsylvania, and New York City, Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree of 1954 to the Delaware River Basin Commission Pursuant to Commission Resolution 78-20.
7. Delaware River Basin Commission, Delaware River Basin Water Code, December 1996.
8. Delaware River Basin Commission, Docket D-77-20 CP, May 1977; Docket D-77-20 CP (Revised), November 1983; Docket D-77-20 CP (Revision 2), June 1993; Docket D-77-20 CP (Revision 3), February 1997; and Docket D-77-20 CP (Revision 4), April 1999.



Office of the Delaware River Master

SUPREME COURT OF THE UNITED STATES

No. 5, ORIGINAL.--OCTOBER TERM, 1950.

State of New Jersey, Complainant,

v.

State of New York and City of New York, Defendants,
Commonwealth of Pennsylvania and State of Delaware, Intervenors.

AMENDED DECREE

[June 7, 1954.]

The Court, having considered the amended petition of the City of New York, joined by the State of New York, to which is appended the consent of the State of New Jersey, the answer filed by the State of New Jersey seeking affirmative relief and the answers filed by the Commonwealth of Pennsylvania and the State of Delaware, the evidence and exhibits adduced by the parties, the report of Kurt F. Pantzer, Esquire, Special Master, and statements from all the parties addressed to the Court expressing the intention of the parties not to file exceptions or objections to the report, and being fully advised in the premises, now enters the following order:

I. REPORT OF SPECIAL MASTER APPROVED. The "Report of the Special Master Recommending Amended Decree," filed May 27, 1954, is in all respects approved and confirmed.

II. 1931 DECREE SUPERSEDED. The decree of this Court entered May 25, 1931 (283 U.S. 805) is modified and amended as hereinafter provided and, upon the entry of this amended decree, the provisions of the decree of May 25, 1931, shall be of no further force and effect.

III. DIVERSIONS BY THE CITY OF NEW YORK ENJOINED EXCEPT AS HEREIN AUTHORIZED The State and City of New York are enjoined from diverting water from the Delaware River or its tributaries except to the extent herein authorized and upon the terms and conditions herein provided.

A. *Authorized Diversions.*

1. *440 M. G. D.* The City of New York may divert from the Delaware River watershed to its water supply system the equivalent of 440 million gallons daily (m. g. d.) until the City completes and places in operation its reservoir presently under construction on the East Branch of the Delaware River.

2. *490 M. G. D.* After the completion and commencement of operation of the East Branch reservoir, the City may divert the equivalent of 490 m. g. d. until the completion of its proposed dam and reservoir at Cannonsville on the West Branch of the Delaware River, provided, however, that in the event of an abnormal or unforeseeable interruption of its facilities, the City may divert in excess of the equivalent of 490 m. g. d. to meet its emergency requirements, but in no event shall such diversion impair the obligation of the City to make the releases hereinafter specified.

3. *800 M. G. D.* After the completion of the Cannonsville reservoir, the City may divert the equivalent of 800 m. g. d.

4. *Computation of Diversion.* At no time during any twelve-month period, commencing June 1, shall the aggregate total quantity diverted, divided by the number of days elapsed since the preceding May 31, exceed the applicable permitted rate of diversion.

B. Conditions and Obligations Imposed in Connection With Diversions and Releases by City. The diversions and releases by the City of New York from the Delaware River shall be made under the supervision and direction of the River Master, hereinafter appointed, and shall be subject to the following conditions and obligations:

1. *Compensating Releases--The Montague Formula.* The City shall release water from its reservoirs as follows:

(a) Until the East Branch reservoir is completed and placed in operation, on the day following each day in which the average flow in the Delaware River falls short of 0.50 cubic feet per second per square mile (c. s. m.), either at Montague, New Jersey (below the mouth of the Neversink River), or at Trenton, New Jersey (0.50 c. s. m. being equivalent to a flow of 1740 cubic feet per second (c. f. s.) at Montague and 3400 c. f. s. at Trenton), the City shall release water from the Neversink reservoir at an average of 0.66 c. s. m. or 61.38 c. f. s.

(b) Upon the completion and placing in operation of the Neversink and East Branch reservoirs, the City shall release water from one or more of its storage reservoirs in the upper Delaware watershed. Such releases shall be in quantities designed to maintain a minimum basic rate of flow at the gaging station of the United States Geological Survey (U. S. G. S.) at Montague of 1525 c. f. s. (985.6 m. g. d.) until the Cannonsville project is completed and its reservoir first filled to the extent that 50 billion gallons above the lowest outlet are available for diversion and release, and of 1750 c. f. s. (1131.1 m. g. d.) thereafter. Compliance by the City with directions of the River Master with respect to such releases shall be considered full compliance with the requirements of this subsection (b).

(c) At the commencement of the calendar year following the completion and placing in operation of the Neversink and East Branch reservoirs and of each calendar year thereafter, the City of New York shall estimate and report to the River Master the anticipated consumption of water during such year to be provided for by the City from all its sources of supply. The City shall, as

hereinafter provided, release in the aggregate from all its storage reservoirs in the upper Delaware watershed, in addition to the quantity of water required to be released for the purpose of maintaining the then applicable minimum basic rate of flow as hereinabove provided, a quantity of water equal to 83 per cent of the amount by which the estimated consumption during such year is less than the City's estimate of the continuous safe yield during such year of all its sources obtainable without pumping. In any such year the City's estimate of anticipated consumption shall not exceed by more than 7 1/4 billions gallons the actual consumption in any previous calendar year; and its safe yield in any such year, obtainable without pumping, shall be estimated at not less than 1355 m. g. d. after the Neversink and East Branch reservoirs are put into operation; and at not less than 1665 m. g. d. after the Cannonsville reservoir is put into operation. If, at any time after the completion of the Cannonsville reservoir and prior to the year 1993, the continuous net safe yield for water supply of all of the City's sources of water supply, obtainable without pumping, is increased by the development of additional sources, such greater safe yield shall be used in determining the excess releases.

(d) The City of New York shall release the excess quantity provided for in subsection (c) at rates designed to release the entire quantity in 120 days. Commencing with the fifteenth day of June each year, the excess releases shall continue for as long a period, but not later than the following March 15, as such additional quantity will permit. Such period is hereafter referred to as the "seasonal period." The excess quantity required to be released in any seasonal period shall in no event exceed 70 billion gallons. In releasing the excess quantity specified for any seasonal period, the City shall not be required to maintain a flow at Montague greater than the applicable minimum basic rate plus the excess quantity divided by 120 days, or in any event greater than 2650 c. f. s., nor to release at rates exceeding the capacity of its release works. The City shall in each seasonal period continue its excess releases until March 15 or until the aggregate quantity of the flow at Montague in excess of the basic rate or in excess of such higher rates as are not the result of the City's prior releases, is equal to the total specified excess quantity.

(e) The terms and conditions provided in subsections (b), (c) and (d) hereof shall continue to be applicable in all respects in the event that the U. S. G. S. gaging station at Montague shall be relocated at a point below the confluence of the Neversink River with the Delaware River.

2. *Minimum Capacity of Release Works at Reservoirs of City.* In constructing the Cannonsville reservoir, the City shall install release works of such capacity as will provide a minimum aggregate release capacity from all its reservoirs in the Delaware River watershed of not less than 1600 c. f. s. under conditions of maximum reservoir depletion.

3. *Releases to be Continued in Spite of Interference.* In the event that any works hereafter constructed by public or private interests in the watershed of the Delaware River outside of the State of New York shall prevent the proper operation of the U. S. G. S. gaging station at Montague or interfere with the effective operation of the above release requirements by diverting water past the station or by intercepting the natural flow and storing it in reservoirs with an aggregate storage capacity in excess of 25 billion gallons, the City of New York shall continue to make the releases above specified which would be required in the absence of such interference, and appropriate gaging stations shall be established for that purpose.

4. *Inspection Permitted.* The States of New Jersey and Delaware and the

Commonwealth of Pennsylvania, through accredited representatives, and the River Master, shall at all reasonable times have the right to inspect the dams, reservoirs and other works constructed by the City of New York, to inspect the diversion areas and the inflow, outflow and diverted flow of such areas, to inspect the meters and other apparatus installed by the City of New York and to inspect all records pertaining to inflow, outflow and diverted flow.

IV. TREATMENT OF PORT JERVIS SEWAGE. The effluent from the sewage treatment plant at the City of Port Jervis, New York, shall be treated so as to effect a reduction of 85 per cent in the organic impurities and shall be treated with a chemical germicide, or otherwise, so that the *E. coli* originally present in the sewage shall be reduced by 90 per cent. Untreated industrial waste from plants in the City of Port Jervis shall not be allowed to enter the Delaware and Neversink Rivers. The treatment of such industrial wastes shall be such as to render the effluent practically free from suspended matter and nonputrescent. The treatment of both sewage and industrial waste shall be maintained so long as any diversion is made from the Delaware River or its tributaries.

V. DIVERSIONS BY NEW JERSEY AUTHORIZED UNDER SPECIFIED CONDITIONS.

A. *Authorized Diversions.* The State of New Jersey may divert outside the Delaware River watershed, from the Delaware River or its tributaries in New Jersey, without compensating releases, the equivalent of 100 m. g. d., if the State shall not, prior to July 1, 1955, repeal Chapter 443 of the New Jersey Laws of 1953, and if, when the Commonwealth of Pennsylvania accepts the conditions as specified in Section 19 of that Chapter, the State of New Jersey shall join with the Commonwealth of Pennsylvania in requesting the consent of Congress to the agreement embodied in Chapter 443 of the New Jersey Laws of 1953 and an Act of the Commonwealth of Pennsylvania accepting the conditions of such New Jersey Act.

B. *Conditions and Obligations Imposed in Connection with Diversions by New Jersey.* The diversions by New Jersey from the Delaware River shall be made under the supervision of the River Master and shall be subject to the following conditions and obligations:

1. Until the State of New Jersey builds and utilizes one or more reservoirs to store waters of the Delaware River or its tributaries for the purpose of diverting the same to another watershed, the State may divert not to exceed 100 m. g. d. as a monthly average, with the diversion on any day not to exceed 120 million gallons.

2. If and when the State of New Jersey has built and is utilizing one or more reservoirs to store waters of the Delaware River or its tributaries for the purpose of diversion to another watershed, it may withdraw water from the Delaware River or its tributaries into such impounding reservoirs without limitation except during the months of July, August, September and October of any year, when not more than 100 m. g. d. as a monthly average and not more than 120 million gallons in any day shall be withdrawn.

3. Regardless of whether the State of New Jersey builds and utilizes storage reservoirs for diversion, its total diversion for use outside of the Delaware River watershed without compensating releases shall not exceed an average of 100 m. g. d. during any calendar year.

VI. EXISTING USES NOT AFFECTED BY AMENDED DECREE. The parties to this proceeding shall have the right to continue all existing uses of the waters of

the Delaware River and its tributaries, not involving a diversion outside the Delaware River watershed, in the manner and at the locations presently exercised by municipalities or other governmental agencies, industries or persons in the Delaware River watershed in the States of New York, New Jersey and Delaware and the Commonwealth of Pennsylvania.

VII. RIVER MASTER.

A. *Designation.* Subject to the concurrence of the Director of the U. S. Geological Survey, the Chief Hydraulic Engineer of the U. S. Geological Survey, or such other engineer of the U. S. Geological Survey as shall at any time be designated by the Chief Hydraulic Engineer, is hereby designated as River Master.

B. *Duties.* The River Master shall either in person or through his assistants possess, exercise and perform the following duties and functions:

1. *General Duties.*

(a) Administer the provisions of this decree relating to yields, diversions and releases so as to have the provisions of this decree carried out with the greatest possible accuracy;

(b) Conserve the waters in the river, its tributaries and in any reservoirs maintained in the Delaware River watershed by the City of New York or any which may hereafter be developed by any of the other parties hereto;

(c) Compile and correlate all available data on the water needs of the parties hereto;

(d) Check and correlate the pertinent stream flow gagings on the Delaware River and its tributaries;

(e) Observe, record and study the effect of developments on the Delaware River and its tributaries upon water supply and other necessary, proper and desirable uses; and

(f) Make periodic reports to this Court, not less frequently than annually, and send copies thereof to the Governors of Delaware, New Jersey, New York and Pennsylvania, and to the Mayor of the City of New York.

2. *Specific Duties with Respect to the Montague Release Formula.* In connection with the releases of water which the City of New York is required to make under Par. III-B-1 (b) of this decree, the River Master, in co-operation with the City of New York, shall, by appropriate observation and estimates, perform the following duties:

(a) Determine the average times of transit of the flow between the release works of the several reservoirs of the City and Montague and between the release works of other storage reservoirs in the watershed and Montague;

(b) Make a daily computation of what the average flow observed on the previous day at Montague would have been, except for that portion previously contributed by releases of the City or as affected by the contributing or withholding of water at other storage reservoirs, for the purpose of computing the volume of water that would have had to be released in order to have maintained precisely the basic rate on that day;

(c) Take account of all changes that can be anticipated in the flow from that

portion of the watershed above Montague not under the City's control and allow for the same by making an appropriate adjustment in the computed volume of the daily release; and

(d) After taking into consideration (a), (b) and (c), direct the making of adjusted daily releases designed to maintain the flow at Montague at the applicable minimum basic rate.

C. Distribution of Costs. The compensation of, and the costs and expenses incurred by, the River Master shall be borne equally by the State of Delaware, State of New Jersey, Commonwealth of Pennsylvania, and the City of New York.

D. Replacement. In the event that for any reason the Chief Hydraulic Engineer of the U. S. G. S. or his designee cannot act as River Master, this Court will, on motion of any party, appoint a River Master and fix his compensation.

VIII. NO PRIOR APPROPRIATION NOR APPORTIONMENT. No diversion herein allowed shall constitute a prior appropriation of the waters of the Delaware River or confer any superiority of right upon any party hereto in respect of the use of those waters. Nothing contained in this decree shall be deemed to constitute an apportionment of the waters of the Delaware River among the parties hereto.

IX. DECREE WITHOUT PREJUDICE TO THE UNITED STATES. This decree is without prejudice to the United States. It is subject to the paramount authority of Congress in respect to commerce on navigable waters of the United States; and it is subject to the powers of the Secretary of the Army and Chief of Engineers of the United States Army in respect to commerce on navigable waters of the United States.

X. RETENTION OF JURISDICTION; NO ESTOPPEL. Any of the parties hereto, complainant, defendants or interveners, may apply at the foot of this decree for other or further action or relief, and this Court retains jurisdiction of the suit for the purpose of any order or direction or modification of this decree, or any supplemental decree that it may deem at any time to be proper in relation to the subject matter in controversy. The fact that a party to this cause has not filed exceptions to the report of the Special Master or to the provisions of this decree shall not estop such party at any time in the future from applying for a modification of the provisions of this decree, notwithstanding any action taken by any party under the terms of this decree.

XI. COSTS OF THIS PROCEEDING. The costs of this proceeding shall be paid by the parties in the following proportions: State of New Jersey, 26 2/3 per cent, City of New York, 26 2/3 per cent, State of New York, 10 per cent, Commonwealth of Pennsylvania, 26 2/3 per cent, and State of Delaware, 10 per cent.