

## Flood Mitigation in the Delaware River Basin

by: Kenneth J. Warren\*

On September 21, 2006, the governors of Pennsylvania, Delaware, New Jersey and New York jointly signed a letter to the Delaware River Basin Commission requesting the Commission to form an interstate task force to develop a set of recommended measures for alleviating and mitigating flooding impacts along the Delaware River and its tributaries. The governors' letter recognized the effects of the severe flooding of the Delaware River in June, 2006, the third such flood event in only two years. The governors specified that the recommended measures include a basin-wide flood management operating plan for the basin's existing reservoirs. This plan would serve as a counterpart to the Commission's drought management plan.

Legal analysis of the authority to control flows within the Delaware River Basin properly starts with a review of the 1954 Decree of the United States Supreme Court in *State of New Jersey v. State of New York*. The Decree resolved competing claims among the basin states and the City of New York for water from the basin. The Decree authorized New York City to withdraw from the basin up to 800 million gallons per day to meet its drinking water and other needs upon New York City's completion of the construction of the Cannonsville, Pepacton and Neversink Reservoirs in the upper basin. The Decree required New York City to provide compensating releases from its reservoirs in order to meet a minimum flow target at Montague, New Jersey. The Decree empowered a river master to determine the releases from New York City reservoirs that would be required to maintain this flow at the United States Geological Survey (USGS) gauging station at Montague.

The Decree also required New York City to release an additional quantity of water, termed an Excess Release Quantity (ERQ). The decree defines the ERQ in technical terms keyed to New York City's estimated water consumption during the year compared with the safe

yield of all of its water sources. If New York City does not need the full amount of water which it is entitled to divert pursuant to the Decree, a large percentage of that excess water must be released for the benefit of the downbasin states commencing on June 15 of each year.

In 1961, seven years after entry of the Supreme Court Decree, the basin states and the federal government entered into the Delaware River Basin Compact to provide coordinated administration of the resources of the basin through a joint exercise of their authorities as sovereigns. The Compact confers upon the Commission broad authority to manage the basin's water resources, including the power to build facilities to control flooding and "from time to time as need appears, in accordance with the doctrine of equitable apportionment, to allocate the waters of the basin to and among the states signatory to this compact and to and among their respective political subdivisions." The Compact, however, limits the Commission's authority by imposing the requirement that the Commission not impair the diversions, compensating releases and rights provided in the Decree without the unanimous consent of the parties to the Decree, unless the Commission declares a state of emergency resulting from a drought or catastrophe.

The Commission has on occasion successfully facilitated the agreement of the parties to the Decree to modify the releases authorized by the Decree. One significant modification, known as the good faith agreement, established a drought operating plan triggered by the amount of water from time to time stored in the New York City basin reservoirs. The plan calls for reduced diversions by New York City and reductions in the flow objectives at Montague and Trenton when water levels fall below levels specified in a rule curve included in the Commission's docket adopting the plan. The Commission codified these changes to the Decree formula in the Commission's Water Code.

One shortcoming of the Decree is its failure to provide for ecological flows. In 1954, almost 20 years before establishment of the United States Environmental Protection Agency, water allocation decisions did not ordinarily take ecological needs into account. More recently, however, the basin states, the federal government and New York City have recognized the importance of protecting the aquatic community, including the trout fishery that prospered in the tail waters of the New York City reservoirs. Consequently, through various resolutions the Commission, with the consent of the Decree parties, has established on a temporary basis various banks of water in the New York City reservoirs that can be released during summer or other critical times to control temperature in the upper portion of the River (vital for trout) and habitat protection. These temporary banks have proven to be useful in enhancing the fisheries, but are neither optimal nor intended as a long term solution. The Commission and Decree parties are currently examining options for a long term, flexible plan that if unanimously approved by the Decree parties may involve modification to the ERQ, the flow targets or the diversions specified in the Decree.

Although managing flows in times of drought, ensuring sufficient drinking water and controlling salinity in the Delaware River estuary have been among the principal concerns over the past several decades, flood control has now come to the fore. As a result of the devastating floods in 2005 and 2006, the governors have requested the Commission to examine flood mitigation options. The Commission has quickly responded to the governors' request.

At its meeting on September 27, 2006, the Commission adopted several resolutions to respond to flooding concerns. Resolution No. 2006-18 reflected the agreement of the Decree Parties to establish a temporary spill mitigation program for the New York City Delaware River Basin reservoirs. This interim spill mitigation program may potentially reduce spill rates and

offer a measure of peak flow reduction during a flood event. The resolution provided that whenever the usable storage in the New York City Delaware Basin reservoirs is above the 80% rule curve, supplemental releases from these reservoirs will be made as specified in the resolution. The 80 per cent rule curve reflects the percentage of usable storage in the reservoirs that will trigger releases. For example, between September 1, 2006 and February 1, 2007, releases will be made when the reservoirs are more than 80 per cent full.

Although the Interim Spill Mitigation Program may provide some benefits, particularly immediately downstream of the New York City reservoirs, the effect is limited. New York City's desire to store significant water in the New York City reservoirs to maintain its water source and the absence of release works at the reservoirs that are capable of releasing water at rates necessary for effective flood management operation constrain the use of these reservoirs for flood control. These factors therefore limit the flood mitigation benefits achievable through the Spill Mitigation Program.

In Resolution No. 2006-19, the Commission responded directly to the governors' request by establishing a task force to recommend a set of comprehensive flood mitigation measures for the Delaware River basin. The task force is developing recommendations for flood mitigation operating plans for the reservoirs throughout the basin, not just for the New York City reservoirs. In addition, the task force is charged with considering stormwater management, open space and farmland preservation, flood plain regulations, flood warning systems and other potential flood mitigation measures. The Commission has asked the task force to provide a preliminary action plan with recommendations by the end of 2006 to enable initial measures to be implemented as early as possible in 2007.

The charge to the task force recognizes the complexity of flood mitigation. Coordinated storage and releases from reservoirs throughout the basin may have a significant effect on river flows. In addition, land development constitutes a major source of increased flooding. As impervious surfaces are placed over lands that previously supported groundwater recharge, runoff enters streams at increasing volumes and velocities. When open space and farmland acreage is developed, the natural flood mitigation function of landscapes is removed. As impervious surfaces increase, the construction of homes and other structures in flood plains poses higher risks as they are likely to more frequently flood. The Commission has asked the task force to examine all of these issues in an effort to develop a comprehensive program to reduce flooding.

As evidence of their commitment to address flood mitigation, the basin states collectively pledged \$500,000 to enable the Commission to develop a model for evaluating the potential for reservoirs throughout the basin to be used to mitigate flooding on the Delaware River and its tributaries. As stated in Resolution No. 2006-20, the model would enable the Commission to evaluate the feasibility of various reservoir operating alternatives and the effect of reservoir voids of different magnitudes on flooding at locations downstream from the rivers. The construction of this model is an important step in developing effective, coordinated operating plans for the reservoirs.

The Commission also adopted Resolution No. 2006-21 authorizing the Executive Director to accept funds from the National Oceanic and Atmospheric Administration for the purchase of two snow pack gauges to be installed in the watersheds of the Delaware River Basin New York City reservoirs. The depth of the snow pack is an important indicator of the amount of water available to refill the reservoirs in the spring. In the event a significant snow pack

exists, it may be prudent for New York City to create voids in the reservoirs to accommodate the melting snow and any additional precipitation and runoff.

Although the recent flooding underscored the importance of flood control measures, flood mitigation should be viewed as only one objective of a multi-purpose flow regime. Protecting water supplies in times of drought, maintaining ecological flows, avoiding salt water intrusion and promoting navigation are among the other important objectives in any long range plan. Developing a flexible plan to address these important objectives is an effort that will have far-reaching impact on the basin's resources inhabitants and ecology. Although reconciling the partially competing interests of the Decree parties is not a simple task, the ability of the Commission to establish knowledgeable task forces, to provide a forum for public input and to apply technical expertise to flow management issues provides reason for optimism that the Decree party negotiations will be successful.

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