Testimony of

Cathleen Curran Myers, Deputy Secretary for the Office of Water Management

Department of Environmental Protection

On

Flooding, Flood Mitigation, and the Flexible Flow Management Plan

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Chairman Melio, Chairman Fairchild, and members of the committee: I appreciate the opportunity to appear before you today to discuss Pennsylvania's flooding program, especially with regard to the Delaware River Flooding in 2004-06.

Flooding in Pennsylvania

Pennsylvania has the most extensive flood protection program in the nation. As a result of abundant rainfall, over 83,000 miles of streams and beautiful hilly topography, Pennsylvania is tied with North Carolina as the most flood-prone state. As early as 1936, the legislature authorized our predecessor agencies to provide structural protection to the state's flood prone communities. Since 1940, the Department of Environmental Protection's Bureau of Waterways Engineering and its predecessors have constructed about 200 channel improvement and flood protection projects in nearly 100 communities, at a current dollar cost of about $485 million. These flood control projects are initiated by local municipalities and funded through the Capital Budget process. DEP provides the design, site and environmental assessment, construction coordination and oversight for the projects from feasibility to installation. In addition to the capital budget funding of local projects, the Governor's budget again provides $2.8 million for local flood protection projects, including grants for non-routine maintenance and specialized equipment for project maintenance.

Since 2004, Pennsylvania has experienced 3 devastating floods in the Delaware Basin, of a magnitude not experienced since 1955. The June 2006 flood on the Susquehanna River broke historic records for flood crests in major communities from Bloomsburg to Hershey. We will continue to engage the Delaware and Susquehanna River Basin Commissions in assisting with outreach and assessment of our flood warning and response systems.

Governor Rendell has made flood mitigation and response an administration priority for 2007-08, including a $2.2M increased budget item for technical assistance for stormwater and flood planning, including creation of an interagency task force with a senior level Flood Mitigation Coordinator to work full time on flooding-- before, during and after a flood. These funds will leverage nearly $5 million in federal funding for restoration projects resulting from the June 2006 flooding. One aspect of this initiative will be a new emphasis on non-structural measures, such as buyouts, flood proofing, greenways and stream and wetland improvements, which can often eliminate or reduce the footprint of expensive structural solutions.

Flooding on the Delaware

Historic Water Supply Shortages

The public health and safety crisis that originally brought Delaware Basin states to the negotiating table to find a better way to manage the shared water resources of the Delaware River was drought, not flooding. By the middle of the last century, the basin states and New York City had sued each other in the US Supreme Court in three different decades. When our normally plentiful rains don't fall, there is

simply not enough water for the 15 million people in the basin who depend upon Delaware River water, reservoir storage to augment natural flows.

New York City (NYC) built three water storage reservoirs in the Delaware headwaters in the Catskills - Cannonsville, Pepacton, and Neversink - to store and save spring runoff for the dry times. Some of the water stored in the NYC reservoirs is piped to NYC residents. Most importantly for thirsty Philadelphians, the remainder is dedicated for release into the river for downstream use and as freshwater flow to hold salt seawater at bay when rainfall is scarce. About 2.5 million Pennsylvania and New Jersey residents living downstream of the Delaware Water Gap depend upon the water stored in those NYC reservoirs in dry months. During a recent drought, nearly half of the water in the river at Trenton came from the NYC reservoirs.

Lessons from Historical Flood Data

After more than fifty years without a flood of this magnitude, three devastating floods took place along the main stem Delaware River in a two-year period between September 2004 and June 2006. The June 2006 flood was so widespread it also broke historic flooding records in nine communities in the Susquehanna River Basin. Extraordinary rains filled the three NYC reservoirs. As the rains continued, water began to overflow and spill over the dam spillways, much like an overflowing bathtub. As a result, some flood victims erroneously concluded that the reservoirs caused the flooding and that absent reservoir spills, their homes and businesses could be spared inundation in the future. The historical data support neither of these contentions. In fact, seven of the ten worst main stem floods in the Delaware Basin occurred with no reservoir spills contributing water and three occurred when reservoirs were spilling. Surprisingly, even when a large impoundment is full and spilling, it has the effect of lowering peak flood stages downstream, because the impoundment slows the rate of flow of the storm runoff as it enters and travels through the impoundment. In the April 2005 Flood, the effect of the spilling Neversink Reservoir was to halve the peak rate flowing out of the reservoir.

Operating Reservoirs for Flood Mitigation and Water Supply

The Delaware Basin has thirteen reservoirs for multiple purposes ranging from water supply storage, to power generation, recreation and flood control. Flood control reservoirs, including those owned and operated by the U.S. Army Corps of Engineers, maintain year-round flood storage voids capable of capturing and temporarily storing runoff from major storm events. Like an empty bathtub, these reservoirs can capture massive inflow rates, store the water temporarily, and then release it at controlled rates to prevent that water from contributing to downstream flooding.

In contrast, water supply reservoirs are operated to be as full as possible at all times. Water supply reservoirs fill during the winter and spring months of normal years. They are managed to be at full capacity by late spring in order to provide water supply storage for the drier summer and fall seasons. Intentionally *not* filling the reservoirs, or "maintaining voids" decreases the safe yield of a water supply reservoir and puts the public at risk of running out of water. Similar constraints on maintaining voids for flood control apply to reservoirs created for other purposes. Recreation reservoirs, like Nockamixon, must maintain a constant water level so docks and boats and swimming areas do not get stranded. Operators of power generation reservoirs, like Wallenpaupack, must operate in accordance with licenses issued by the Federal Energy Regulatory Commission.

However, operations of reservoirs not designed for flood control may sometimes be modified to provide some voids to mitigate flooding, without seriously diminishing their primary function for water supply, recreation or power generation. Governor Rendell led the basin in providing funding for development of a flood modeling tool that would allow analysis of all thirteen of the major reservoirs and impoundments in the basin to determine the extent to which changes in operations could contribute to flood mitigation.

The NYC Reservoirs

The NYC reservoirs are operated to provide releases downstream throughout the year to achieve river level targets at Montague and Trenton. During drought emergencies, those releases are critical to protecting downstream municipal and industrial water supplies, including the Philadelphia water supply

reservoirs may provide some assistance to NY and NJ residents on the tributaries directly controlled by the dams, but further downstream we need to find other solutions.

What *ARE* the Answers to Reducing Flood Damage in Pennsylvania?

Governor Rendell has provided leadership in three key action in response to these disasters:

1) Directed the Delaware River Basin Commission to form a broad based task force of local leaders, scientists and legislators to find answers to flooding on the Delaware (report anticipated end of June 2007);
2) Mandated development of a half million dollar flood analysis modeling tool to evaluate possible operational changes at all thirteen major basin reservoirs to reduce flooding;
3) Accelerated negotiations among the parties to the 1954 Consent Decree to develop a Flexible Flow Management Plan, (FFMP) with a new, more comprehensive framework that would consider flood impacts, water supply and fisheries and allow the basin operations to evolve with the science of water resource management.

From these actions will come critical data and feedback on the best courses of action to improve our flood mitigation program. Draft recommendations discussed at recent public meetings indicate the task force has concluded that no set of mitigation measures will *eliminate* flooding along the Delaware River mainstem and its tributaries in an extraordinary rainfall like those of recent memory. Much of the burden will fall on local government zoning and planning to direct future growth out of the floodways and protect those currently in harm's way. A combination of non-structural and structural measures can improve the basin's resiliency -- reduce the frequency and severity of floods, reduce flood damage, and prepare for and recover from flooding.

In the next few weeks we expect to receive the recommendations of the task force, hire a Flood Coordinator and adopt a flexible flow management program on the Delaware that integrates flood mitigation more significantly than any previous basin program, and provides for adaptive management going forward. In the longer term, legislation may be needed to fully implement some of the recommendations, so we appreciate this opportunity to begin a dialogue.

intake at Torresdale. Philadelphia depends on that intake on the Delaware River for more than half of its water supply. During extreme droughts, when flows to Philadelphia's Schuylkill River intake decrease, the city water department may rely even more heavily on water from the Torresdale intake on the Delaware. The water released from the New York City reservoirs, in combination with releases from Beltzville and Blue Marsh Reservoirs also pushes back the salt water from Delaware Bay which creeps upriver as natural flows diminish; crucial to keeping salinity downstream of the Torresdale intake.

Over the past several years, releases from the basin's New York City (NYC) reservoirs have been increased during the summer months to maintain adequate cold-water flows for fish in the upper watershed and in the winter months to mitigate the potential for spills. A world class trout fishery has developed in the tailrace and downstream of the three reservoirs as an unintended but welcome result of releases of cold reservoir water throughout the summer and fall to augment lower basin river flows.

The following factors limit the potential for creating and maintaining year-round voids at the NYC reservoirs.

U.S. Supreme Court Decree
The U.S. Supreme Court Decree of 1954 gives NYC the legal right to take an average of up to 800 million gallons per day (mgd) from its three Delaware Basin reservoirs to supply the city with drinking water. Although New York City has historically taken less than its full allocation, it manages the reservoirs to achieve full storage in the late spring in order to hedge against the possibility that a severe drought might develop.

Water Supply Needs
During dry periods, the states of Delaware, Pennsylvania, and New Jersey rely on releases from the NYC reservoirs to maintain flows in the main stem Delaware River that are needed to furnish the region with vital water supplies as well as to sustain aquatic life and support popular fishing and boating activities. Some 2.5 million Pennsylvania and New Jersey residents obtain their drinking water from the Delaware River downstream of the Delaware Water Gap. During droughts, freshwater inflows to the Delaware Estuary are needed to repel salt that might otherwise creep upstream through tidal action and threaten the water supply intakes of the City of Philadelphia and the New Jersey American Water Company. During the month of August 1999, an average of 73 percent of the flow of the main stem at Montague, N.J. and 46 percent of the flow of the main stem at Trenton were comprised of releases from the three NYC reservoirs.

Forecasting Limitations
Weather forecasting is not yet sufficiently advanced to furnish reliable drought predictions. Severe droughts can develop within a matter of months. By way of example, on May 1, 2001, NYC's Delaware Basin reservoirs were 100 percent full, holding approximately 271 billion gallons (bg) of water. By December 15, 2001, less than eight months later, combined reservoir storage had declined to 63.348 bg, or only 23.4 percent of capacity. One frequent request by flooding victims is that a 20 percent year-round void be maintained in the NYC Delaware reservoir system. If a void of this size – some 54 bg – had been in effect in May 2001, the reservoirs would have entered the drought with approximately 217 bg of stored water rather than 271 bg. In that case, by December 15, the three giant impoundments would have been nearly empty. The system did not refill again until spring 2003. Since 1980, there have been 11 drought events triggered by declines in NYC reservoir storage.

Weather forecasting is improving in accuracy and some have suggested that in place of permanent voids, water could be released to make space in anticipation of impending storm events. Unfortunately, that is not enough time for reservoirs *not* designed for flood control to release enough water to create big enough voids to make a significant reduction in flooding in locations more than a few miles below the dams. To illustrate, by the time you reach Easton, PA, about 80% of the water in the mainstem comes from parts of the watershed unaffected by the NYC reservoirs. Creation of voids in the NYC