Flexible Flow Management Program 2017
General Study Workplan

1. Introduction

On October 21, 2017, the Parties to the 1954 Supreme Court Decree (Delaware, New Jersey, New York, New York City, Pennsylvania) (Decree Parties) entered into an agreement, the 2017 Flexible Flow Management Program (FFMP2017). FFMP2017 is a two-part, ten-year agreement, which builds on the experience gained from the last 10 years of similar programs, also known as the Flexible Flow Management Programs (FFMPs). During the first five years, the Decree Parties agreed to study and investigate different aspects of the FFMP2017, assess their effectiveness, impacts and benefits under current and future stressors, and evaluate alternatives for achieving the program's goals and objectives. Also, during the first five years, the Decree Parties will evaluate and select models and other tools for use with the analysis and to support planning and operations.

These studies will be focused on three major issues (Section IV.2 and IV.3 of FFMP2017): 1) potential detachment of releases from the New York City Delaware Reservoirs from the position of the salt front during drought emergency; 2) increasing New Jersey's Diversion during drought conditions; and 3) increasing or optimizing storage available for the lower basin for flow augmentation (i.e., alternate operations, structural modification, new infrastructure). These three studies will be evaluated in relation to estuary salinity, aquatic and fishery resources, water-supply availability for multiple purposes, flood mitigation, and projections of future sea-level rise as well as topics identified in section IV.6. A variety of alternatives under scenarios of current and future environmental conditions will be tested through modeling and may include sea-level rise and long-term trends in climate and hydrology. Specific scenarios will be developed in separate scopes of work for each study.

The three major studies are explained in Section 2 along with three additional studies that may be undertaken concurrently or during the second five-year period of the agreement. They are related to the volume of the ERQ Banks, the balancing adjustment, and the calculation of the ERQ. Additional ancillary studies will be conducted as needed to inform the three major studies.

The Decree Parties will engage the Delaware River Basin Commission's (DRBC) Regulated Flow Advisory Committee (RFAC) (http://www.nj.gov/drbc/about/advisory/RFAC_index.html) at multiple steps during these studies. RFAC and the Decree Parties will collaborate on developing a study statement for each of the studies. These studies could address, but are not limited to, salinity and sea-level rise, models and modeling, tailwater fisheries management, endangered species assessment, and storage options. Progress on the studies will be reported periodically at RFAC meetings by investigators. Other elements of public outreach, such as listening sessions, may also be conducted by both RFAC and individual Decree Parties. Results from the studies and input into recommendations to the Decree Party Principals will be requested from RFAC participants.

The Subcommittee on Ecological Flows (SEF) of RFAC will be utilized to gather and synthesize scientifically based technical information to inform the development and revision of guidelines for the use of the Thermal Mitigation and Rapid Flow Change Mitigation Banks. The RFAC may engage SEF in the investigation of additional issues related to aquatic life and habitat impacts for the FFMP2017 Studies. In addition, other subcommittees or expert panels of/associated with RFAC may be formed and utilized in a similar manner regarding other issues, such as salinity, water supply, and wastewater management.

2. Studies

Below is a description of each of the studies to be undertaken during the FFMP2017. For all the studies, additional matters that will also be evaluated are identified in Section IV.2 of the FFMP2017.

2.1. Interim Excess Release Quantity (IERQ) Banks

The FFMP2017 established Thermal Mitigation and Rapid Flow Change Mitigation banks. The water in these banks is allocated from the IERQ, which is derived from the Excess Quantity in the 1954 Supreme Court Decree, Section III.B.1(d). Over the last ten years, the Decree Parties have used the provisions within previous FFMPs for these purposes, but there are no formal guidelines or protocols for doing so. With the experience gained under previous flow management programs, the advice of experts, and input from the public, interim guidelines will be developed by the Decree Parties, RFAC, and SEF for both Thermal Mitigation and Rapid Flow Change Mitigation banks. Once the guidelines are developed and approved by the Decree Parties, they will be used to manage releases from the banks for the duration of FFMP2017. During this time, the guidelines may be revised based on information gathered from their implementation. During the implementation of the guidelines, data will be gathered to assess the effectiveness of the guidelines in meeting the objectives for each bank. In addition, the use of the banks will be modeled in the development of future flow-management programs.

Timeline: Interim guidelines by June 1, 2019, revisions will be on-going.
Deliverables: Interim guidelines for use of the banks.

2.2. Balancing Adjustment

The ODRM is required to direct compensating releases from the New York City reservoirs as defined by the 1954 Supreme Court Decree to meet the flow objective at the Montague gage. The directed releases are determined by calculating the amount of flow that is predicted to be in the river when releases from the reservoirs would arrive. As many factors contribute to the amount of flow in the river and forecasting methodologies are inexact, the ODRM may direct releases that result in flows over or under the flow objective. To account for these instances, the ODRM utilizes a balancing adjustment procedure during the year (resets on June 15th) that attempts to balance the total amount of water directed to be released with the total amount of water that would have been directed with exact forecasting. The balancing adjustment procedure will be examined over the first five years of the agreement to assess its effects on river flows, habitat, and the effectiveness at achieving its intended goal.

In addition to the balancing adjustment procedure, the ODRM is updating the methodology for the calculation of the directed releases. This includes investigating different options for forecasting inputs to the Delaware River upstream of the Montague gage including runoff from rainfall and hydropower release estimates.

Timeline: December 2020
Deliverables: Summary of balancing adjustment procedures.

2.3. Salinity

The salinity study will evaluate impacts and conditions resulting from the *"detachment of releases from the New York City Delaware Reservoirs from the position of the salt front during drought emergency and replacing the benefit that New York City releases have with respect to the salt front with an alternative methodology or methodologies that will provide comparable protection for existing resources within the Basin"* (Section IV.2 and IV.3.a.i, FFMP2017). This study will include an evaluation of the impacts to the aquatic and fishery resources, the effect of projections of sea-level rise on salinity and possible synergistic effects from various combinations of releases.

Alternatives may include, but are not limited to, flow objectives, storage, and augmentation releases from the upper- and lower-basin reservoirs in conjunction with detachment of New York City releases from the position of the salt front during drought emergency. The resulting analyses and conclusions will be used to inform Decree Party negotiations for Phase II of the FFMP2017 agreement.

Timeline: No later than May 2022.
Deliverables: Report summarizing the benefits and drawbacks of each alternative.

2.4. New Jersey Diversion

The study will evaluate the impacts of increasing the New Jersey diversion limit by varying amounts in the different stages of drought, during both basin-wide and lower-basin drought status. Evaluation of the effects of the increased diversion will include the items identified in the FFMP2017.

Timeline: December 2022.
Deliverables: Report summarizing the benefits and drawbacks of each alternative.

2.5. Storage

The development and use of existing storage are aspects of flow management identified in the FFMP2017 and previously considered by the Decree Parties during the Good Faith Negotiations in the early 1980s. Additional storage may be useful for increasing the basin's drought resiliency under current and future conditions, such as sea-level rise, and allow for more flexibility in meeting lower basin objectives. As part of the first five years of the FFMP2017, the potential increase in available storage for the lower basin, from the optimization of existing storage, the expansion of existing storage or the development of new storage, will be studied considering water planning efforts conducted by the DRBC, States, Decree Parties, and Office of the Delaware River Master (ODRM).

Timeline: December 2022.
Deliverables: Report summarizing the benefits and drawbacks of each alternative

2.6. Excess Release Quantity (ERQ) Calculation

The release of the excess quantity, known as the Excess Release Quantity (ERQ), was established by the 1954 Supreme Court Decree. The Good Faith Agreement, DRBC dockets and Water Code, and FFMP agreements subsequently modified the ERQ's calculation and use. The FFMP2017 fixes the ERQ at 10BG, which is based upon a New York City system safe yield of 1,290 mgd and the peak demand between 2002 and 2006, and limits the quantity available during drought. During the second five years of the FFMP2017, beginning June 1, 2023, the Decree Parties and RFAC will review the history, purpose, and evolution of the ERQ; reexamine the calculation methodology; and identify and stipulate a new method of calculating and using the ERQ. The study will consider the various factors of the ERQ and their historical basis, including, but not limited to:

- The prevention of unbalanced diversions between New York City Reservoir Systems, without dictating internal reservoir operations of New York City, to ensure continued balanced use between the Hudson Basin Reservoirs and the Delaware Basin Reservoirs; and
- As an element of the Montague Formula for compensating releases to manage spill and water resources to maximize the benefit to the river and downstream users and promote equitable downstream flows during low flow months.

Timeline: December 2027.
Deliverables: Document recording the methodology for calculating the ERQ and its use that will be incorporated and utilized in the next management plan.

3. Models and Tools

A wide variety and range of tools have been used in the past to assess various flow management program components and goals. These tools included, but are not limited to, Delaware River Basin - Planning Support Tool (DRB-PST, an upgrade to the Daily Flow Model and OASIS), the Flood Analysis Model (HEC-RESSIM), various water quality models (Empirical, DYNHYD Toxi-5, CH3D-Z, EFDC-WASP8) and the REFDSS habitat assessment tool. Since the time of previous analyses, models and tools have been improved and others were developed and/or are being developed for the basin and estuary that could potentially be used to evaluate some of the issues under consideration.

The criteria for selection of models and tools should be based on their ability to simulate historical events and patterns and their effectiveness in providing the types of information required to accurately assess the different management objectives. The entity conducting the study will propose appropriate model selection and assumptions. Selection will be reviewed by a combination of the Decree Parties and experts as appropriate to the study. The Decree Parties may decide to update the models or tools or to include additional models and tools, as needed.

4. Summary

The Decree Parties have agreed to complete a number of studies required by the FFMP2017 that examine different protocols and procedures that have been a part of the Decree Party process for many years (some date back to 1954). These studies are meant to analyze the impacts and conditions of these protocols and procedures and determine if there is a more optimal way to manage and conserve the water resources of the Delaware River Basin. Opportunities for stakeholder/public involvement and input will be provided through RFAC and through individual Decree Party forums.