# Balancing Adjustment Study – Statement of Work

DRAFT

## Introduction

An empirical model, incorporating a recession and routing strategy, is used for forecasting the average daily flow at Montague. ODRM segregates the previous day’s flow at the gaging station to calculate flow in the river from uncontrolled input (ie. not from NYC reservoirs or powerplants). ODRM uses forecasts of powerplant inflows and runoff from rainfall to determine whether releases are required from New York City reservoirs to maintain the flow objective at Montague. These procedures have been refined over nearly six decades of use and generally give good results during periods of relatively stable flow.

However, as stated in the ODRM 1958 annual report, *“It is impossible, because of the many factors involved, to precisely predict in advance the resultant flow at Montague. However, over a period of time any cumulative error in the estimating procedure should be eliminated as far as possible. To accomplish this, a balancing adjustment is applied to the indicated deficiency or excess in computing the directed release. This adjustment is based on the* ***amount by which the directed release is greater or less than the release actually required to maintain the prescribed rate of flow at Montague****….”* This was the first instance that the balancing adjustment was described in an annual report and ODRM has utilized different procedures to calculate the amount since that time.

Currently, the Balancing Adjustment is applied only when the directed release is greater than the conservation release. Conservation releases from the New York City reservoirs are specified in the 2017 Flexible Flow Management Program. No Balancing Adjustment calculation occurs if the directed release is less than the conservation release sum from Cannonsville, Pepacton, and Neversink Reservoirs. This approach prevents accruing a Balancing Adjustment during times where the conservation releases to the Delaware River are greater than the directed releases required. When the directed release is larger than the conservation release, the Balancing Adjustment procedure is applied.

When directed releases are determined to have been excessive (greater than required), then the Balancing Adjustment reduces the directed release requirement. Conversely, if prior directed releases have been insufficient, then the Balancing Adjustment increases the directed release requirement. The Balancing Adjustment is computed as 10 percent of the difference between the cumulative directed release and the cumulative directed release required for exact forecasting, and is applied until the difference reaches zero. Using a percentage of the cumulative difference helps to distribute correction over time. The maximum daily balancing adjustment is also limited to +/- 50 cfs to further preclude unacceptably large variations in the adjusted flow objective.

## Objective

Section IV.4 of the Flexible Flow Management Program 2017 (FFMP 2017), requires the Decree Parties to study, evaluate, and consider the River Master’s balancing adjustment procedure. The scope of work below was developed in order to accomplish this study.

## Approach and methods

Directed releases data from 2010 to present will be compiled and summarized. A group of experts will then review the data and determine possible alternatives that could improve the process. The possible alternatives will be tested, reviewed, and presented to the Decree Party Work Group. A decision to implement a new or modified Balancing Adjustment will be made by ODRM in coordination with the Decree Parties, and a report documenting the study and outcome will be produced. Details of this approach are listed below:

### Tasks

#### Data Collection and Model Development

1. The ODRM directed releases information has been compiled from January 1, 2010 to December 31, 2019. This will be utilized as the input information in the scenarios. However, this data included the current process of correcting for the balancing adjustment. The compiled file will be modified to remove the influence of the current process.
2. The current script that was developed for the design modernization process will be utilized again for this study. Some updates were requested at the January 7, 2020 workshop meeting and these will be incorporated.
3. Current process analysis. The current process will be analyzed to see how the balancing adjustment performed over the period of data. Some pre-existing criticisms that can be evaluated include that the current process is “overly complex”, “isn’t effective” and “carries a balance for long periods of time”. Performance in dry vs wet years will also be analyzed.

#### Alternatives and Metrics Development

1. A workshop will be held to brainstorm alternative balancing adjustment methodologies and metrics for evaluation. Attendees will include USGS experts that have participated in the design modernization workshops and the Decree Party Workgroup (DPWG) (tentatively schedule around end of June timeframe)
	1. Alternatives for the methods regarding implementation of the balancing adjustment will need to be articulated and then distilled to a list for consideration and testing.
	2. Metrics that will test the performance of the balancing adjustment methodologies will be brainstormed and the selected for assessment.
		1. Current ideas include, but are not limited to:
			1. How often through the year is the balancing adjustment at 0?
			2. How frequently is the balancing adjustment capped at +50 or -50 cfs?
			3. What is the magnitude of cumulative excess or deficit that the current balancing adjustment approach results in each year?
2. The set of alternatives and metrics will be shared with the public for input and feedback (likely through DRBC’s Regulated Flow Advisory Group (RFAC)).

#### Scenario Performance Testing

1. The alternatives selected during the workshop will be tested with the script and selected metrics.
2. Results will be shared with the DPWG for feedback and potential further evaluation of no more than three alternatives.
3. Final results will be shared with the DPWG and the public (likely through RFAC).

### Reporting and Decision

1. A report will be produced that explains the methods used to evaluate the alternatives and the results.
2. A selection of the new methodology for the balancing adjustment will be made by the Office of the Delaware River Master in coordination with the Decree Parties.

## Coordination and Communication

A Design Modernization Study (DMS) will be occurring concurrently with the Balancing Adjustment Study. One goal of the Design Modernization is to improve forecasted flow at Montague. Inputs from the DMS may necessitate changes to the Balancing Adjustment Study scope after work has begun. The balancing adjustment team will coordinate with USGS experts that have been engaged in the ODRM design modernization process. At least one workshop will occur with this group to develop different methods to incorporate a balancing adjustment and metrics to evaluate these methods. These USGS experts are already engaged in the directed release process and know how best it can be improved, including the balancing adjustment.

In addition, the DPWG will be invited to the same workshop to provide input into the different methods and metrics. There will be regular updates to the DPWG and opportunities for input and feedback. Meetings with RFAC will occur to solicit public input and present study results.

## Team

Kendra Russell – ODRM

Noah Knowles – USGS

Liz Hittle – USGS

Vin Difrenna – ODRM

Amy McHugh – ODRM

## Schedule

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| --- | --- |
| Activity | Completion Date |
| Input data modification | June 1, 2021 |
| Current process analysis | June 1, 2021 |
| Prep for workshop meeting | June 15, 2021 |
| Alternatives and Metrics Workshop | June 30, 2021 |
| Public Input on Alternatives and Metrics Selection | RFAC Meeting |
| Script adjustments | August 1, 2021 |
| Scenario Testing | August 31, 2021 |
| Results Workshop | October 31, 2021 |
| Draft Report | February 28, 2022 |
| Decision/Changes implemented | May 30, 2022 |

## Balancing Adjustment Modifications Discussed at DPWG Meeting in March, 2019

* Remove cap of +/- 50 cfs
* Implement a threshold under which the entire balancing adjustment is resolved daily (rather than dividing out over 10 days)
* Have the balancing adjustment released at +/-50 cfs until it is used up (ex 200 cfs in 50 cfs increments for 4 days)
* Have a larger cap than +/- 50 cfs
* Use balancing adjustment as a bank
* Does the balancing adjustment need to reset?
* If it resets, have the balancing adjustment reset aligned with another “year”
* No balancing adjustment