MASSACHUSETTS WATER RESOURCES AUTHORITY
Deer Island
33 Tafts Avenue
Boston, MA 02128

Frederick A. Laskey
Executive Director

Telephone: (617) 242-6000
Fax: (617) 788-4899
TTY: (617) 788-4971

January 31, 2024

Susannah L. King
Wastewater Management Section Chief
MassDEP, Northeast Regional Office
205B Lowell Street
Wilmington, MA 01867

Todd J. Borci
Office of Environmental Stewardship
US EPA New England
5 Post Office Square Suite 100 (OES 04-4)
Boston, MA 02109-3912

Re: Charles River and Alewife Brook/Upper Mystic River CSO Variances
Annual Report on Progress of Additional CSO System Optimization Measures

Dear Ms. King and Mr. Borci:

The Massachusetts Water Resources Authority ("MWRA") is pleased to submit the attached annual report for 2023, on the progress of combined sewer overflow ("CSO") "Additional System Optimization" measures. MWRA is required to evaluate these measures in accordance with conditions established in the *Final Determination to Adopt a Variance for Combined Sewer Overflow Discharges to Charles River Basin* and the *Final Determination to Adopt a Variance for Combined Sewer Overflow Discharges to Alewife Brook/Upper Mystic River Basin*, dated August 30, 2019 ("Variances"). Specifically, subsection E.2. of the Variances require, in relevant part, as follows: "[b]eginning in 2021 and on or before January 31 of each year until the end of this Variance, MWRA shall submit to MassDEP and EPA and shall post on its website, progress reports on the implementation of the Additional System Optimization measures."

As reported in the last progress update in January 2023, MWRA has completed all four of the Additional System Optimization measures to be studied under the Variances, with the intent of evaluating whether implementation of these measures will improve CSO performance and water quality. A summary of additional activities performed during 2023 regarding these four Optimization Measures is included in the attached progress report. MWRA continues to perform remaining activities as set forth in the other conditions in the Variances, including collection system maintenance, water quality sampling and reporting requirements, and public notification of CSO discharges.

Please do not hesitate to contact me, at dave.coppes@mwra.com, should you have questions or need additional information.

Very truly yours,

David W. Coppes, P.E.
Chief Operating Officer

cc: Frederick Laskey, Executive Director
Rebecca Weidman, Deputy Chief Operating Officer
Colleen Rizzi, Director, Environmental and Regulatory Affairs
Brian L. Kubaska, P.E., Chief Engineer
Betsy Reilley, Director, Environmental Quality

MWRA CSO Variances
Additional System Optimization Measures

Progress Report as of January 31, 2024

MWR205 & SOM007/MWR205A Somerville Marginal CSO Reduction Project, Study and Preliminary Design

Variance Milestones: Notice to Proceed December 2020 | Report December 2021

Summary Description:
Evaluate alternatives and feasibility of reducing CSO activation frequency and volume at the Somerville Marginal CSO Treatment Facility and associated CSO outfalls SOM007A/MWR205A, and MWR205, including:

- Construction of dry weather connection relief/control from the City of Somerville's CSO regulator RE071A to MWRA's Somerville-Medford Branch Sewer
- Relocation of MassDOT I-93 drainage from upstream to downstream of the Somerville-Marginal facility to reduce the frequency and volume of facility activations

Progress to Date:

Satisfying the variance requirements, MWRA issued on December 23, 2021, The Somerville-Marginal CSO Facility Evaluation report and the Somerville Marginal CSO Facility New Pipe Connection Preliminary Design Assessment report https://www.mwra.com/cso/variances/122721-somerville.pdf. The reports evaluated various alternatives to further reduce CSO towards meeting LTCP goals at SOM007A/MWR205A and MWR205 and develop a preliminary design for the most viable alternative. In summary, the reports recommended construction of a connecting chamber between an existing 42-inch storm drain tributary to the 85 x 90-inch influent combined sewer to the Somerville Marginal CSO Facility and the Somerville Medford Branch Sewer, with a control gate to limit flows to the interceptor during larger storm events, controlled base on available system capacity. The proposed system modification is predicted to bring the discharge volume from Somerville Marginal CSO Facility (MWR205) to within approximately two to three MG (3-5%) of the LTCP volume target and reducing the discharge from the high tide discharge into the Upper Mystic River (SOM007A/MRW205A) to within approximately 0.2 MG of the LTCP goal. Model predictions also indicated that the activation frequency would drop from 30 to 18 activations at MWR205, well below the LTCP target of 39 and would meet the activations goal of three per year at SOM007A/MWR205A. Although the recommended system modifications showed increases to the treated CSO discharge volume at Prison Point, an overall volume reduction of 29 MG was predicted from hydraulically connected CSO discharges. Accordingly, MWRA retained Hazen and Sawyer to advance the design of the supplemental connection and control gate through final design and bidding.

This detailed design effort has progressed over the past year. The design process has taken longer than originally anticipated due to necessary additional geotechnical investigations, coordination on an adjacent roadway projects planned by the Massachusetts Department of Transportation, and resolution of interference with an adjacent City of Somerville sewer that will be impacted as a result of the significant depth and extent of the substantial excavation to construct the new connection and control gate. Despite the additional investigations and coordination, Hazen produced 100% design documents, which have been reviewed by the MWRA. The construction project is expected to be bid soon and the Construction notice to proceed is anticipated to be issued in the summer of 2024.

Alewife Brook Pump Station Optimization Evaluation Project
Variance Milestones: Notice to Proceed April 2020 | Report: April 2021

Summary Description:
Evaluate maximizing beneficial use of enhanced pumping capacity at the recently rehabilitated Alewife Brook Pump Station (ABPS) to lower wastewater elevations in the upstream collection system and potentially reduce CSO activations and volumes at upstream CSO outfalls discharging to Alewife Brook.

Progress to Date:

On April 27, 2021, MWRA issued the Final Alewife Brook Pump Station Optimization Evaluation report https://www.mwra.com/cso/variances/042721-alewife.pdf. A brief summary of the report's findings is provided as follows.

An alternative ABPS operating strategy was developed based on the collection, analyses, and synthesis of ABPS record drawings, operational history and SCADA station data, field-collected data from pump performance tests, hydraulic model runs, and refined field implementation of initial proposed alternative operations strategies.

Model results suggested that an alternative operating strategy of lowering the wetwell at the start of a storm event, would result in marginal improvements to the reduction of CSO activation frequency and discharge volume for the six outfalls tributary to the Alewife Brook. A comparison of the typical year model using the final wet weather ABPS operating strategy indicated a total reduction in CSO volume of 0.25 million gallons.

Although providing only nominal improvement in CSO discharge volumes, the report recommended the final wet weather ABPS operating strategy be implemented into the station's controls, given the noted wet weather pump operation was greatly improved with no observed pump cycling as the wet well level fluctuated, as determined through field trials. A reduction in cycling provided a more stable operation and should result in reduced fatigue/wear on the pumps, which can extend the service life, reducing station maintenance cost. An additional benefit noted is a reduction in the risk of the wet weather pumps being simultaneously triggered OFF, followed by a quick rise in the wet well prior to the pumps cycling ON that could potentially impact upstream CSO discharges.

The new operating strategy has been incorporated in the station controls via the MWRA SCADA system. The station now has two operating strategies: the existing operating strategy for dry weather flow conditions and the final wet weather ABPS operating strategy for storm events. MWRA continues to evaluate and adjust its operational protocols to maximize wastewater conveyance to the Deer Island Wastewater treatment facility, which requires controlling pumps to maximize wastewater elevations downstream of the ABPS while simultaneously maintaining a wet well elevation to support minimizing the occurrence up upstream CSO discharges.

CSO System Optimization for Alewife Brook, Study and Preliminary Design
Variance Milestones: Notice to Proceed December 2020 | Report December 2022

Summary Description:
Using the calibrated hydraulic model and coordinating technical evaluations with the cities of Cambridge and Somerville, MWRA will conduct system optimization evaluations at the remaining active regulators tributary to CSO outfalls discharging to the Alewife Brook watershed.

Progress to Date:

As reported in the last two annual reports, MWRA commenced the CSO optimization investigations for Alewife Brook CSO outfalls in August 2020, ahead of the Variances' December 2020 milestone. MWRA coordinated these efforts with the departments of public works in Cambridge and Somerville. MWRA's consultant reviewed the CSO regulator configurations and modeled hydraulic performance. MWRA had initially focused efforts on outfalls that it forecasted would not attain the LTCP activation and volume goals by December 2021. Various alternatives have been evaluated and documented in Semiannual Reports 6 and 7, as well as the Final CSO Post Construction Monitoring and Performance report submitted on December 29, 2021.

During 2022, further optimization evaluations were performed for all six active Alewife Brook CSO outfalls (CAM001, CAM002, MWR003, SOM001A, CAM401A, and CAM401B). The findings of these evaluations were submitted in the Alewife Brook and Lower Charles River System Optimization Evaluations Report on December 29, 2022, and posted to MWRA's website. https://www.mwra.com/cso/variances/122922-alewife-charles.pdf.

In summary, the model was used to assess the impacts of incrementally raising the weirs and/or increasing the size of the dry weather flow connections at the regulators associated with these outfalls. Upstream and downstream systems were evaluated for adverse hydraulic impacts resulting from the modeled change in weir height or connection size.

For the Alewife Brook, no additional optimization measures were recommended for any of the remaining six CSO outfalls (CAM001, CAM002, CAM401A, CAM401B, MWR003, and SOM001A). This was due to model predictions of the following with the optimization measures in place:

- increases in the system's water surface levels to unacceptable elevations near the ground surface, especially during larger storm events (*i.e.*, adverse hydraulic impacts);
- shifting the CSO volumes or activations to other Alewife brook outfalls; and
- small CSO improvements with significant construction concerns, as well as community impacts and costs to implement (CAM001 & CAM401A).

CSO System Optimization for Lower Charles River, Study and Preliminary Design
Variance Milestones: Notice to Proceed December 2020 | Report December 2022

Summary Description:
Using the calibrated hydraulic model and coordinating technical evaluations with the City of Cambridge and the Boston Water and Sewer Commission, MWRA will conduct system optimization evaluations at the remaining active regulators tributary to CSO outfalls discharging to the Charles River watershed.

Progress to Date:

As reported in the last two annual reports, MWRA commenced the CSO optimization investigations for Charles River CSO outfalls in August 2020, ahead of the variance's December 2020 milestone. MWRA coordinated these efforts with the department of public works in Cambridge and the Boston Water and Sewer Commission (BWSC). MWRA initially focused efforts on outfalls that it forecasted would not attain the LTCP activation and volume goals by December 2021.

During 2022, further optimization evaluations were performed for all eight CSO outfalls that can discharge untreated CSO to the Charles River, and one outfall that can discharge treated CSO. The remaining untreated CSOs include CAM005, CAM007, CAM017, MWR010, MWR018, MWR019, MWR020, and MWR023, while the treated discharge is from the MWRA's Cottage Farm facility at

outfall MWR201. The findings of these evaluations were submitted in the Alewife Brook and Lower Charles River System Optimization Evaluations Report on December 29, 2022, and posted to MWRA's website. https://www.mwra.com/cso/variances/122922-alewife-charles.pdf.

In summary, the model was used to assess the impacts of incrementally raising the weirs and/or increasing the size of the dry weather flow connections at the regulators associated with these outfalls. For the Cottage Farm CSO facility, potential modifications to facility operations were evaluated. Upstream and downstream systems were evaluated for adverse hydraulic impacts resulting from the modeled change in weir height or connection size.

For the Charles River, outfall CAM005 was the only outfall recommend for further optimization. No optimization measures were recommended at the remaining outfalls along the Charles River (outfalls CAM007, CAM017, MWR010, MWR018, MWR019, MWR020, MWR201 [Cottage Farm CSO facility], and the regulators upstream of outfall MWR023). Increasing the weir height or the regulator connection capacity resulted in unacceptable increases in the system's water surface levels to elevations near the ground surface, especially during larger storm events (i.e., adverse hydraulic impacts). Further adjustments to the operational activation and deactivation levels at Cottage Farm CSO facility were found to provide minimal benefit. The analysis performed showed that raising the weir at regulator RE051 by 1 foot and lengthening the weir to 10 feet would reduce the CSO activation frequency and volume without creating adverse impacts on the hydraulic grade line in up to a 10-year 24-hour storm.

Over the last year, continued investigation of the CAM005 regulator structure has been performed. This included a laser scan of the regulator structure by a City of Cambridge contractor. Unfortunately, the laser scan did not provide usable data to further evaluate the constructability or design of a new longer weir wall and floatables baffle reconfiguration. Therefore, in the coming months, MWRA intends to develop and procure a consultant to: (a) collect additional data on the existing RE051 regulator structure; (b) develop a preliminary design technical memorandum to include the results of the evaluation of existing flow data; (c) identify and document construction constraints specific to the location of RE051; and (d) complete the preparation of plans and specifications associated with the modifications to the weir wall and underflow baffle structure.