CITY OF SOMERVILLE, MASSACHUSETTS
KATJANA BALLANTYNE
MAYOR
DEPARTMENT of INFRASTRUCTURE & ASSET MANAGEMENT
ENGINEERING DIVISION

RICHARD E. RAICHE, PE, PMP
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Kevin Brander, PE
Section Chief Municipal Services Section
DEP Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887

And

Todd J. Borci
Office of Environmental Stewardship
US EPA New England
5 Post Office Square, Suite 100
Boston, MA 021109-3912

Re: NPDES Permit No. MA0101982 - 2021 Annual Report

Dear Mr. Brander and Mr. Borci,

Enclosed please find copies of the City of Somerville's Annual Report for National Pollutant Discharge Elimination System (NPDES) permit (Permit No. MA0101982) for calendar year 2021.

If you have any questions, please contact me at 617-448-3716 or lhiller@somervillema.gov.

Regards,

LucicaHiller

Lucica S. Hiller, EIT
Stormwater Program Manager

Attachment: NPDES Permit No. MA0101982- 2021 Annual Report

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cc:
Massachusetts Department of Environmental Protection
1 Winter Street, 5th Floor
Boston, MA 02108
Attn. David Ferris

MassDEP Surface Water Discharge (NPDES) Permitting Program
627 Main Street, 2nd Floor
Worcester, MA 01608

U.S. Environmental Protection Agency
Water Technical Unit (OES04-SMR)
5 Post Office Square, Suite 100
Boston, MA 02109-3912

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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
COMBINED SEWER OVERFLOW PERMIT NO. MA0101982

2021 ANNUAL REPORT

This report has been prepared in accordance with Part I, Section D of the above referenced permit issued to the City of Somerville Department of Public Works on 11 June 2012. The permit authorizes the City of Somerville to discharge flows from two Combined Sewer Overflows (CSO), one on the Alewife Brook designated as SOM001A, and one on the Mystic River designated as SOM007A.

1. Activation Frequency and Discharge Volumes

In accordance with Part I, Section C, Paragraph 4, the City of Somerville (the City) maintains a meter at SOM001A to supply direct measurement of discharges from SOM001A, and utilizes estimates provided by the Massachusetts Water Resources Authority (MWRA) to determine discharges from SOM007A.

SOM001A

SOM001A is located on the Alewife Brook at a location within the City of Cambridge where flow from the western and central portions of Somerville discharges to the MWRA's Alewife Brook Conduit via Somerville's Tannery Brook Conduit. In calendar year 2021, the CSO at this location activated a total of eight (8) times, in comparison to the three (3) activations recorded in calendar year 2020, nine (9) activations recorded in calendar year 2019, and twenty-two (22) activations recorded in calendar year 2018. Table 1 summarizes the duration and estimated volume[1] of each discharge as measured by the existing permanent meter installation, the cumulative precipitation depth, and the peak 15-minute interval depth.

Of the eight (8) activations at SOM001A, four (4) had a duration of one hour or less, while four (4) had a duration longer than one hours, with two (2) events having a duration longer than two hours. During those times, the instantaneous rainfall created peak flows in the Tannery Brook Conduit that exceeded the

[1] Outfall discharge volumes and durations are calculated using data from the seasons and considering the physical configurations and constraints.

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hydraulic capacity of the 36" connection to the Alewife Brook Conduit, and the peak hydraulic grade line exceeded the SOM001A overflow weir elevation.

Table 1: SOM001A 2021 CSO Activations

Activation Dates	Duration (hours)	Volume (gallons)	Cumulative Precipitation (inch) (1)	Peak 15-minute Interval (inch) (1)
02-Jul-2021	1.08	3,020,000	3.14	0.31
09-Jul-2021	2.08	3,060,000	2.50	0.22
27-Jul-2021	0.67	1,060,000	1.02	0.24
19-Aug-2021	1.58	2,890,000	1.97	0.24
22-Aug-2021	0.42	270,000	0.65	0.16
02-Sep-2021	4.66	6,070,000	3.85	0.21
26-Oct-2021	0.75	1,420,000	1.57	0.14
30-Oct-2021	0.42	186,000	1.51	0.18

Notes:
1. Cumulative precipitation and peak interval data acquired from the Somerville DPW Building rain gauge.

SOM007A

SOM007A, jointly permitted to MWRA as MWR205A, discharges treated effluent from the MWRA Somerville Marginal CSO Screening and Disinfection Facility, together with separate stormwater that enters the facility's outfall, to a location upstream of the Amelia Earhart Dam in the Mystic River Basin during mid- to high-tide conditions. Under low tide conditions, discharge from the facility is through MWR205 downstream of the dam. While SOM007A is permitted to Somerville under the above referenced permit, MWR205 and MWR205A are permitted to MWRA under Permit No. MA0103284. MWRA provides discharge data for the Somerville Marginal Facility.

Discharges at SOM007A, summarized in Table 2 and detailed in Table 3, are from MWRA's model results and MWRA's metering. The metering data indicates a total of seventeen (17) activations and total discharge volume of 67.57 MG in calendar year 2021. The CSO discharge volume also at SOM007A/MWR205A is total discharge, comprising both treated CSO and separate storm water entering the overflow conduit downstream of the CSO facility.

Additional information regarding discharges at SOM007A/MWR205A and MWR205 can be found in the MWRA's 2021 Annual CSO Discharge Report.

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Table 2: SOM007A/MWR205A/MWR205 2021 CSO Activation Summary Table

Activation Frequency Period	Metered Activations	Metered Volume (MG)
2021	17	67.57

Table 3: SOM007A/MWR205A 2021 CSO Activations by Storm

Activation Dates	Metered Volume (MG)	Metered Duration (hours)
16-Jan-21	0.02	0.25
16-Apr-21	1.99	3.35
28-May-21	5.46	4.75
2-Jul-21	5.25	3.08
3-Jul-21	3.24	2.75
9-Jul-21	17.81	3.93
27-Jul-21	0.308	0.33
9-Aug-21	0.47	0.33
19-Aug-21	15.48	1.85
22-Aug-21	0.57	1
23-Aug-21	2.32	2.33
1-Sep-21	9.57	8.5
10-Sep-21	1.03	1.08
5-Oct-21	0.16	0.41
26-Oct-21	0.34	0.33
30-Oct-21	3.02	1.92
12-Nov-21	0.53	0.83

2. MWRA Model Comparison

The comparison of metered estimates and MWRA modeled CSO discharges from January 1, 2021 to December 31, 2021 for the 2021 rainfall is summarized in Table 4.

The model was able to replicate the storm responses for most storm events in the 2021 period. However, it is not possible to match all the modeled and metered activations for every meter and storm event. These differences may be attributed to various condition or combination of conditions, including rainfall

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data quality and rainfall spatial variation, unknown transient conditions in the collection system, and the accuracy of overflow metering data. For discharges at SOM007A/MWR205A, MWRA is currently reviewing the facility meter data to assess inconsistencies in observed flow and water levels.

Table 4: SOM001A and SOM007A/MWR205A CSO Volume & Frequency for Metered and Modeled Events

Outfall	Regulator	January 1, 2021 – December 31, 2021			
		Meter		Model	
		Activation Frequency	Volume (MG)	Activation Frequency	Volume (MG)
SOM001A (1)	RE-01A	8	17.98	8	10.98
SOM007A/MWR205A (2)		17(3)	67.57	12(3)	41.79

Notes:

1. 1. The meter data reported for SOM001A is the data from the City of Somerville permanent meter installation.
2. 2. Outfall SOM007A/MWR205A, jointly permitted to the City of Somerville and MWRA, provides high tide relief to MWRA's Somerville-Marginal Conduit. The Somerville-Marginal Conduit conveys treated CSO from MWRA's Somerville-Marginal Facility and separate stormwater to the tidal portion of the Mystic River below the Amelia Earhart Dam, at Outfall MWR205. The reported discharge at high tide Outfall SOM007A/MWR205A is total flow, both separate stormwater and CSO.
3. 3. MWRA is currently reviewing the facility meter data to assess inconsistencies in observed flow and water levels.

4. Hydraulic Model Updates

The City of Somerville is currently undertaking a Citywide Drainage and Water Quality Improvements Plan including a Hydraulic Model Update and Master Planning effort. The Master Plan is evaluating options to reduce CSOs in the combined system areas, mitigate localized flooding, and evaluate potential water quality features. The Drainage and Water Quality Improvements Plan is evaluating system capacity and developing strategic opportunities for sewer and drainage improvement projects at a sewershed level. Seven sewersheds have been delineated, and the evaluations include field investigations, model updates and calibrations, root cause analysis, and concept development in each sewershed. The evaluations for the sewersheds tributary to SOM007A and SOM001A have been completed.

During calendar year 2021, the Somerville hydraulic model was updated with several system modifications:

1. Included Real Time Controls Paraments at the Alewife Brook Pump Station that reflect the most updated operations at the pump station.
2. Added a 42-inch storm drain tributary to the 85x90-inch combined sewer upstream of Somerville Marginal CSO Facility and re-delineated its tributary area. This new connection is currently in the design phase and expected to be completed in 2024.

The City will continue to update the model using information from both Cambridge and MWRA.

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3. CSO Abatement Work Report

The City has continued pipeline inspections, including cleaning, CCTV inspection, and flow isolation work though out 2021. These activities are informing the City's pipe rehabilitation efforts to further reduce Infiltration and Inflow (I/I). The City's pipe rehabilitation program has started in the Fall of 2021, with the first rehabilitation project going out to bid in Spring 2022.

SOM001A

For SOM001A, the most recently updated and calibrated MWRA hydraulic model predicts that the typical year activations and discharge volumes will not meet the LTCP goals by December 31, 2021. The City and MWRA have been working together on field inspections, modeling, and the reevaluation of system conditions to explain and attempt to mitigate higher CSO activity. MWRA has modified the Alewife Brook Pumping Station wet weather operation strategy as recommended in the MWRA Alewife Brook Pumping Station Optimization Evaluation Report (April 27, 2021). The modified pumping strategy improves pumping operation, even it results in only minor CSO discharge reduction at upstream Alewife Brook outfalls, including at SOM001A.

MWRA has investigated a range of alternatives to potentially reduce the activation frequency and volume and work towards achieving the LTCP goals. One promising alternative included raising the weir in the SOM001A regulator, increasing the conveyance of flow between the SOM001A regulator and the interceptor system, and diverting upstream flows away from the Tannery Brook Drain. This alternative has been evaluated but a feasible plan to meet the LTCP goals has not yet been identified. The City of Somerville's model estimates significant flooding in Davis Square when this alternative is considered. For this reason, Somerville and MWRA continue to work together to investigate additional alternatives that might provide CSO reduction benefits, including the flood control measures evaluated in the Citywide Drainage and Water Quality Improvements Plan.

SOM007A

For SOM007A, the most recently updated and calibrated MWRA hydraulic model predicts that the typical year activations and discharge volumes will meet the LTCP goals after December 31, 2021.

MWRA is currently in the design phase of constructing a new connection from the facility influent conduit to the interceptor and replace tide gate. Survey has been conducted and borings needed to design the connecting structure and gate chamber are being coordinated with MassDOT and are expected this spring. Project is scheduled to bid in Spring 2023 and be completed in Spring 2024.

No modifications to the City's system that connects to the Somerville Marginal Mystic River CSO discharges have taken place in 2021. The City is currently rehabilitating the Marginal Sewer Interceptor, which is the most downstream sewer collecting flow from the City and conveying it to the Somerville-Medford Branch Sewer or for treatment at the Somerville Marginal CSO Facility in larger storms.

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