CITY OF SOMERVILLE, MASSACHUSETTS
JOSEPH A. CURTATONE
MAYOR
DEPARTMENT of INFRASTRUCTURE & ASSET MANAGEMENT
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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- 2019 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 2019.

If you have any questions, please contact me at 617-625-6600 x 5416 or jfosbrook@somervillema.gov

Regards,

Jessi Fosbrook

Jess Fosbrook, PE
Director of Engineering

Attachment: NPDES Permit No. MA0101982- 2019 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

2019 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 SOM-001A, and one on the Mystic River designated as SOM-007A.

Activation Frequency and Discharge Volumes

In accordance with Part I, Section C, Paragraph 4, the City of Somerville maintains a meter at SOM-001A to supply direct measurement of discharges from SOM-001A, and utilizes estimates provided by the Massachusetts Water Resources Authority (MWRA) to determine discharges from SOM-007A.

SOM-001A

SOM-001A 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 2019, the CSO at this location activated a total of nine (9) times, in comparison to the twenty-two (22) activations recorded in calendar year 2018. The table below summarizes the duration and volume of each discharge as measured by the meter, the cumulative precipitation depth, and the peak 15-minute interval depth.

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Activation Dates	Duration (hours)	Volume (gal)	Cumulative Precip. (in)	Peak 15-minute Interval (in)
15-Apr-2019	0.33	164,906	0.75	0.37
30-Jun-2019	0.58	491,240	0.33	0.25
6-Jul-2019	0.42	142,238	1.26	0.28
17-Jul-2019	0.17	35,385	0.39	0.6
31-Jul-2019	0.33	131,306	0.52	0.47
7-Aug-2019	2.75	3,583,451	1.77	0.61
28-Aug-2019	0.42	318,896	0.98	0.21
2-Sep-2019	1.33	2,069,045	0.68	0.49
17-Oct-2019	0.75	1,046,628	1.08	0.24

Notes:

1. Cumulative precipitation data acquired from the BWSC Charlestown, MA rain gauge.
2. Peak interval data acquired from the USGS Fresh Pond Cambridge, MA rain gauge.

Table 1: SOM001A 2019 CSO Activations

SOM-007A

SOM-007A, jointly permitted to MWRA as MWR-205A, discharges treated effluent from the MWRA Somerville Marginal CSO screening and disinfection facility to a location upstream of the Amelia Earhart Dam on the Mystic River during mid- to high-tide conditions. Under low tide conditions, discharge from the facility is through MWR-205. While SOM-007A is permitted to Somerville under the above referenced permit, MWR-205 and MWR-205A are permitted to MWRA under Permit No. MA0103284. MWRA provides data for the Somerville Marginal Facility.

SOM007A discharges reported in Table 2 are from MWRA model results and MWRA temporary metering program data for the entirety of 2019. The temporary metering data indicates a total of twelve (12) activations in calendar 2019. The MWRA model predicted volume is total discharge, comprising both treated CSO and separate storm water entering the overflow conduit downstream of the CSO facility.

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Activation Frequency Period	Metered Activations	Metered Volume [1]	Modeled Activations [1]	Modeled Volume (MG)
2019	12	N/A	8	14.52

Note:

1. Storm events in which the model and meter did not match tended to have high rainfall variation, characteristic of thunderstorm events or occurred during the colder months in freezing conditions (see footnote 2).

Table 2: SOM007A/MWR205A/MWR205 2019 CSO Activation Summary Table

Activation Dates	Metered Duration (hours)	Model Volume (Mgal)	Model Duration (hours)
20-Jan-2019 [1]		2	3.75
24-Jan-2019	2.58		
15-Apr-2019	1.83	2.31	2.5
22-Apr-2019	1.84	0.12	0.75
21-Jun-2019	0.25		
29-Jun-2019	0.42		
6-Jul-2019	0.5	0.54	0.75
17-Jul-2019	0.08		
31-Jul-2019	0.17		
7-Aug-2019	1.08	0.4	0.75
28-Aug-2019	0.42	0.21	0.5
2-Sep-2019	0.5		
16-Oct-2019	3.25	8.34	3.75
14-Dec-2019		0.6	1.75

Note:

1. The model predicts an activation on the 1/20/2019 storm event but does not predict an activation on the 1/24/2019 event. This apparent discrepancy may be attributed to snowfall. There are two possibilities. First, the precipitation recorded by the rain gage may have been snowfall, in which case no runoff would have occurred. In this case, the snowfall would appear as precipitation

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because the rain gages are heated. The 2nd possibility is that the precipitation actually fell as rainfall but was absorbed by snow on the ground. In this case, less runoff would be produced than predicted by the model. Model predictions during the colder months is less accurate than during the warmer months.

Table 3: SOM007A/MWR205A 2019 CSO Activations by Storm

Additional information regarding operation of SOM-007A/MWR-205A and MWR-205 can be found in the MWRA's annual CSO discharge report.

MWRA Model Comparison

MWRA modeled the 2019 system conditions for the 2019 rainfall as summarized in the table below:

Outfall	Regulator	Level Only Meter[1]	January 1 - December 31, 2019					
			Meter[2]			Model		
			Activation Frequency	Duration (hrs)	Volume (MG)[3]	Activation Frequency	Duration (hrs)	Volume (MG)
SOM001A	RE-01A		9	4.93	7.98	7	6.19	9.08
SOM007A/MWR205A [4]		Y	12	26.17	N/A	8	14.5	14.52

Notes:

1. For locations indicated with a "Y," the meter measured level/activation only; volume measurement is not available (N/A)
2. Flow volume methodology varies depending on regulator configuration and other factors and may be by direct measurement in the outfall pipe, use of weir equation, use of scattergraph, and other methods to estimate volumes. Where activations occurred and volume is reported as 0.00 MG, the estimated volume was less than 0.01 MG. In locations where no volume calculation methodology could be applied, such as the sites with level-only sensors, no volume was estimated (N/A).
3. 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 MWR205 is the total treated CSO and does not include separate stormwater entering the Somerville-Marginal Conduit. The reported discharge at high tide Outfall SOM007A/MWR205A is total flow, both separate stormwater and CSO. Because the reported MWR205 discharge is the total amount of CSO, the SOM007A/MWR205A discharge is not counted in the "Grand Total."

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

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Evaluation

At SOM-001A, a 24-inch orifice plate was installed in 2013 by the MWRA with construction that provided for greater hydraulic capacity of the connection between the City's Tannery Brook Conduit and MWRA's Alewife Brook Conduit. The 24-inch orifice plate was intended to temporarily maintain the pre-construction capacity of the connection prior completion of sewer separation in Cambridge and the closure of Outfall CAM-004, but it may have caused a hydraulic restriction that increased discharges under cloudburst (short, high rainfall intensity) conditions. This orifice plate was removed by the MWRA on March 27th, 2019, resulting in an equivalent 36-inch diameter connection and a commensurate reduction in overflow in 2019. Of the nine (9) activations at SOM-001A, only two (2) had a duration of over an hour, and five (5) of the activations were 30 minutes or less. During those times, the instantaneous rainfall created peak flows in the Tannery Brook Conduit that exceeded the hydraulic capacity of the 36" connection to the Alewife Brook Conduit.

CSO Abatement Work Report

In 2013, the MWRA completed construction to eventually upgrade the size of the local sewer connection between Somerville's Tannery Brook Conduit and MWRA's interceptor system (as mentioned above and further described below) and installed an underflow baffle to control the discharge of floatable materials.

In 2013, the City of Somerville completed an investigation of the regulator manholes that divert high level flows from the city's connection to the MWRA Cambridge Branch interceptor to the Alewife Brook Conduit. The resulting report was submitted for review in 2014; however, no additional actions have been required.

At SOM001A, MWRA removed a temporary orifice plate that had restricted the capacity of the connection to the sewer system pending completion of Cambridge's CAM004 (Huron Ave./Concord Ave.) sewer separation project (completed in December 2015) and construction of upgrades to MWRA's Alewife Brook Pumping Station (completed in early 2019). Removing the orifice plate increased the dry weather flow connection to the interceptor from a 24-inch diameter opening to a 36-inch equivalent diameter opening. MWRA also removed an obstruction over the connection that had further restricted the dry weather connection capacity. Meter data collected after the orifice plate was removed in 2019 have shown a significant decrease in CSO discharges.

Meter data collected at SOM001A in 2018 and 2019 indicated that wet weather flows conveyed by Somerville's Tannery Brook Conduit to the SOM001A regulator had increased since the MWRA model was initially developed and calibrated in the 1990's.

No modifications to the city's system that connects to the Somerville Marginal Mystic River CSO discharges have taken place in 2019. The Alewife Brook/Upper Mystic River CSO Variance issued by MassDEP to the MWRA and the cities of Cambridge and Somerville on August 30, 2019, includes conditions requiring the evaluation of specific modifications to the Somerville Marginal system that might influence discharges from the CSOs permitted to the City of Somerville and MWRA.

The City of Somerville is currently in the fourth year of a multiyear program to conduct a Sewer System Evaluation Study. Last year, the City conducted manhole sealing in areas tributary to the Tannery Brook

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and the Alewife Brook Conduit. The City has additionally scheduled pipeline inspections, including cleaning, CCTV inspection, and flow isolation continuing in Summer through Fall 2020 and Spring through Fall 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 is currently in development and expected to start in Spring or Fall 2021.

The City of Somerville is currently undertaking a City-Wide Drainage and Water Quality Improvements Plan including a Hydraulic Model Update and Master Planning effort. The Master Plan will evaluate options to reduce CSO in combined system areas, mitigate localized flooding, and evaluate potential water quality features. The Drainage and Water Quality Improvements Plan will further evaluate system capacity and develop strategic opportunities for sewer and drainage improvement projects.

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