

2018 Annual Report
National Pollutant Discharge Elimination System

For The
City of Cambridge, Massachusetts
Combined Sewer Overflow Permit
#MA0101974

Submitted to
U.S. Environmental Protection Agency
Water Technical Unit


MA Department of Environmental Protection
Bureau of Resource Protection

Submitted by

City of Cambridge
Department of Public Works



I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Signature of Authorized Official: Louis A. DePasquale
City Manager, City of Cambridge

April 29, 2019

Date

TABLE OF CONTENTS

1. Purpose of Report	5
2. Hydraulic Model Updates	6
2.1 CAM002	6
2.2 CAM401A.....	6
2.3 CAM005	6
2.4 CAM007	6
2.5 CAM017	7
3. Combined Sewer Overflow Monitoring Plan	7
3.1 Existing CSO monitoring methodology.....	7
3.2 Summary of 2018 CSO Activations	11
3.3 Rainfall Characteristics	14
3.4 Combined Sewer Overflow Comparison	25
3.5 Monitoring Recommendations.....	29
3.6 Coordination with MWRA	31
4. Status of CSO Abatement Projects	31
4.1 Project Updates	31
4.2 Project Schedule	32
5. Modifications to Nine Minimum Controls Plan	34

Tables

Table 3.1 – Summary of Combined Sewer Regulator Structures

Table 3.2 – Summary of 2018 Activations at Alewife Brook CSOs

Table 3.3 – Summary of 2018 Activations at Charles River CSOs

Table 3.4 – Frequency of Rainfall Events per Storm Depth Range

Table 3.5 – Annual Rainfall Volume Distribution per Storm Depth Range

Table 3.6 – Percent of Annual Rainfall Volume per Storm Depth Range

Table 3.7 – Number of Storm Events at Selected Ranges of 15-min Peak Intensity

Table 3.8 – Comparison of Storms Greater Than 1 inch of Total Rainfall, Typical Year Versus 2018

TABLE OF CONTENTS

Table 3.9 – Comparison of Storms with 15-min Peak Intensities Greater than 0.40 Inches/hour, Typical Year Versus 2018

Table 3.10– Comparison of 2018 and Typical Year CSO Results

Table 4.1 – City of Cambridge CSO Abatement Projects and Status

Figures

Figure 3.1 – Active CSO Locations

Figure 3.2 – Rain Gauge Locations

Figure 3.3 – Model Rain Gauge Distribution

Figure 3.4 – Twenty Year Average Rainfall in the Northeast US

Graphs

Graph 3.1 – Typical Year Rainfall versus 2018 Rainfall

Graph 3.2 – Frequency Comparison of Total Rainfall Volume Distribution by Percentage

Appendix

APPENDIX I	2018 Precipitation Data
APPENDIX II	2018 Monthly CSO Activations
APPENDIX III	2018 CSO Notifications
APPENDIX IV	CSO Regulator Structure Profiles

1. Purpose of Report

This report has been prepared in accordance with Part I, Section D of Permit No. MA0101974, issued to the City of Cambridge Department of Public Works on September 30, 2009. The permit authorizes the City of Cambridge to discharge flow from twelve (12) Combined Sewer Overflows (CSO) located in eleven (11) regulator structures to the receiving water bodies named in the permit.

The City of Cambridge is additionally required to provide a comparison between the precipitation for the year and the precipitation of the typical year under future planned conditions in the MWRA Final CSO Facilities Plan or “Notice of Project Change for the Long Term CSO Control Plan for Alewife Brook” document. Also, required for each CSO is a comparison between the activation volume and frequency for the year and the volume and frequency during a typical year under future planned conditions.

Finally, an evaluation was performed of whether the CSO activation volumes and frequencies for 2018 are in accordance with the estimate in the MWRA Final CSO Facilities Plan or the report entitled “Notice of Project Change for the Long Term CSO Control Plan for Alewife Brook”, given the precipitation which occurred during the year, and the CSO abatement activities which have been implemented. Where CSO discharges are determined to be greater than the activation frequency or volume in either document, an assessment of the results was completed and documented. A discussion of remaining CSO abatement activities and an assessment of the impact of those projects on attaining the level of CSO control identified in the relevant document or any amendments is provided in this document.

2. Hydraulic Model Updates

The existing hydraulic model was updated prior to the 2018 CSO monitoring assessment. Model re-calibration was performed under both dry and wet weather conditions using 2018 flow data, when available, for the systems listed below. The Chartered Institution of Water and Environmental Management (CIWEM) Urban Drainage Group has established guideline tolerances for wet weather and dry weather flow calibration in its Code of Practice for the Hydraulic Modeling of Sewer Systems.

2.1 CAM002

MWRA meter data was available at the 15" outlet pipe connecting to the Alewife Brook sewer inside the CAM002 CSO regulator for dry and wet weather calibration. The depth data recorded was compared to the CAM002 regulator level in the model. After calibration, the CAM002 contributing area was reduced in order to bring the simulated peak flows and volumes within the acceptable CIWEM guidelines.

2.2 CAM401A

Dry and wet weather calibration was performed for areas upstream of the CAM401A CSO regulator. Sediment depth and catchment runoff area were slightly increased during calibration based on the flow meter installation report and flow data. A pipe blockage with an elevation of 15.6 ft was added to the downstream of the 60"x66" pipe to simulate constantly stagnant water with a depth of 1.3ft as recorded by the flow meter. Modelled peak flows and flow volumes, as compared to the metered data, fell within the acceptable CIWEM guidelines.

2.3 CAM005

Three MWRA flow meters upstream of the CAM005 CSO regulator were used for calibration. Model configuration and sedimentation information was updated based on the meter installation reports and as-built drawings. The model continues to underestimate peak flows on the 30" MWRA sewer pipe, however the simulated volumes are within 10% range. The overflow meter on the 54" pipe located closest to the regulator overflow met the CIWEM guidelines for wet weather calibration. This meter was used to assess the CSO predictive accuracy of the model.

2.4 CAM007

At this location, only dry weather calibration was performed since no flow meter data was available at the time of re-calibration. The model simulated lower velocities and higher depths than the observed MWRA meter data (M1MP1), which is located upstream of the CAM007 CSO regulator.

2.5 CAM017

In the CAM017 area, flow data was downloaded from the City Flowview Site. The model simulations of peak flow and volume correlated well with the metered data collected, therefore no additional calibration was performed at this location during the 2018 calendar year.

3. Combined Sewer Overflow Monitoring Plan

As part of the 2018 Annual CSO reporting process, a review of the available meter data for 2018 was performed. This data review was used to identify periods with good quality meter data that could be used to cross-check against model results and also identify potential meter malfunctions and data discontinuities. CSO activations and volumes presented in this report are based on model-simulated data but they were cross-checked against MWRA or City of Cambridge meter data, when available. Where flow meter data was available, the modeled and metered CSO activations were well correlated. The following section provides an overview of the meter and model correlation at each CSO regulator.

3.1 Existing CSO monitoring methodology

3.1.1 Existing CSO Structures

In accordance with the City of Cambridge’s current CSO permit, the city has a total of twelve CSOs located in 11 regulator structures (listed in Table 3.1), five regulator structures are located on the Charles River and six regulator structures are located on Alewife Brook.

Seven of the twelve existing CSOs are currently open, four located on the Alewife Brook and three on the Charles River. On the Alewife Brook, the CAM004 and CAM400 regulators were permanently closed and CAM002B is temporarily closed. On the Charles River, both CAM009 and CAM011 have been temporarily closed. Figure 3.1 presents the locations of the seven active CSOs throughout the City of Cambridge.

Table 3.1 Summary of Combined Sewer Regulator Structures

Regulator Structure	Location	Status	Waterbody
CAM 001	Alewife Brook Parkway @ Foch St.	Open	Alewife Brook
CAM 002	2A-Massachusetts Ave. at Alewife Brook Parkway	Open	Alewife Brook
	2B-Massachusetts Ave. at Alewife Brook Parkway	Closed ¹	Alewife Brook
CAM 004	Fresh Pond Rotary	Closed ²	Alewife Brook

Regulator Structure	Location	Status	Waterbody
CAM 400	Alewife Brook Parkway and Harrison Avenue	Closed ³	Alewife Brook
CAM 401A	Sherman Street at railroad crossing	Open	Alewife Brook
CAM 401B	Massachusetts Ave. at Alewife Brook Parkway	Open	Alewife Brook
CAM 005	Mount Auburn Street @ Lowell Street	Open	Charles River
CAM 007	Memorial Drive at Hawthorne Street	Open	Charles River
CAM 009	Memorial Dr. at Old Murray Rd.	Closed ⁴	Charles River
CAM 011	Plympton St. @Memorial Dr.	Closed ⁴	Charles River
CAM 017	Binney Street at Land Blvd.	Open	Charles River

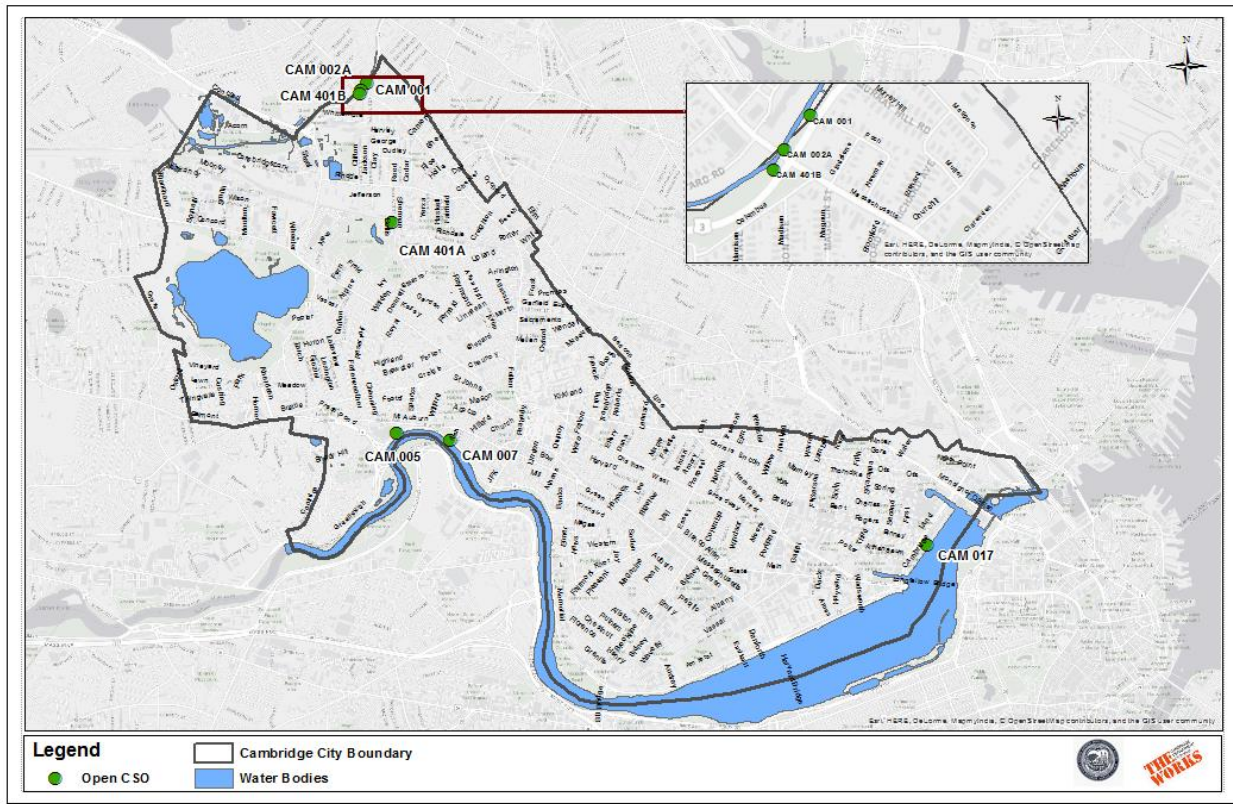
¹ Temporarily Closed

² Permanently closed on December 27, 2015

³ Permanently closed on March 31, 2011

⁴ City retains the right to re-open once a hydraulic study is completed

Figure 3.1 Active CSO Regulator Locations



3.1.2 CSO Monitoring

The following section outlines the current methodology for CSO monitoring at each location including metering as well as network model representation and simulation.

CAM 001 Monitoring

The permitted configuration for CAM 001 consisted of an 18” overflow pipe with a steel plate at the end. The plate covered the bottom portion of the 18” pipe. The top of the steel plate was 5-3/4 inches below the crown of the 18” pipe. This created a restricted 70.6 square inch opening with an overflow elevation of 4.36 Feet (CCB). The 16” sewer pipe upstream of regulator vault is at -1.48 Feet (CCB), which provides a maximum depth of 5.84 feet water inside the regulator vault. The final configuration for CAM 001 consists of a 10” PVC pipe outlet with a 15” PVC elbow for floatable controls. There is also a brick weir set as elevation 4.36 feet (CCB). The configuration of the CAM001 regulator has not changed since the 2017 Annual CSO Report submission.

The modelled data predicted a very small activation on September 18th 2018 with a total volume of approximately .016 MG. The CAM 001 metered data recorded on the outfall pipe indicated 13 spills (during which the depth and velocity at the outfall meter were both above zero). The meter located on the CAM001 outfall pipe has historically been problematic indicating some velocity and depth changes that are not directly linked to rainfall events.

CAM 002A Monitoring

The City of Cambridge CAM002A outfall pipe flow meter data had only negative values during the 2018 period of record and was therefore not used for correlation with the model results for 2018 report. The City's SCADA consultants will trouble shoot this anomaly moving forward. There was one CSO activation reported by DPW in 2018 (September 18th) at this regulator. The InfoWorks ICM network model replicated this spill in September 18, 2018. In addition, the model simulated three other spills on June 28th, July 17th and August 11th. During those same storm events, the depth sensor in the CAM002 regulator indicated depths within inches of the established threshold of 10.78 ft. The model was used to report the 2018 spill count (4 spills) and volume (1.43 MG) at CAM002A.

CAM 004 Monitoring

The CAM 004 CSO regulator was located within the Drain Vault 5 structure in the Alewife Brook Rotary at the junction of Concord Avenue and The Alewife Brook Parkway. The CAM004 outfall was permanently closed on December 27, 2015, as part of a multiyear construction project in accordance with the MWRA's LTCP for the Alewife Brook.

CAM 400 Monitoring

Sewer separation work in this area was completed in March 2011 and the CAM 400 CSO regulator was permanently closed in accordance with the MWRA's LTCP for the Alewife Brook.

CAM 401A Monitoring

The CAM 401A regulator structure includes floatables control brush screens mounted on a static weir structure, as well as flap gates located just downstream of the weir. Due to the complicated nature of the structure and the difficulty identifying spill activations and calculating flow, the City's model was used to determine the activation volume at the CAM 401A regulator. Data from the MWRA and City's meters located just upstream and downstream of the brush screens was compared to the model-simulated spill results. The DPW level data indicated six activations during 2018. The model simulated 18 spill events, including the 6 events indicated in the DPW data. A similar list of spill events was reflected in the MWRA meter depth data located just upstream of the CAM 401A regulator. The modelled spill activations (15 spills) and volume (5.007 MG) at 401A are being referenced in this 2018 report.

CAM 401B Monitoring

At the CAM 401B regulator, depth and flow is recorded inside of the regulator structure and a flow meter is also mounted on the 401B CSO outfall pipe. One CSO activation (April 16) was reported at the CAM401B regulator during 2018 due to SCADA data output. However, overflow data at this regulator are all negatives therefore could not be used for validation. The City's SCADA consultants will trouble shoot this anomaly moving forward. The model simulated the same September 18 spill event, as well as two additional smaller spills (one on July 17 and another one on August 11). The modelled spill activations and volumes are being referenced in this 2018 report.

CAM 005 Monitoring

The CAM 005 outfall is monitored with a depth/velocity sensor mounted on the upstream side of the outfall weir. DPW level data indicated 12 spill events. The flow depth data was reviewed for correlation with the rainfall data, as well as correlation with the InfoWorks ICM network model's simulation of spills at CAM005. The model simulated eight CSO activations at CAM005 in 2018 with a total volume of approximately 1.98 MG, as shown in Table 3.3.

CAM 007 Monitoring

This structure is monitored using a DPW depth sensor within the regulator and positive depth meter readings indicate a CSO spill, which occurred once during 2018 on September 18th. The model simulated 3 spills at this location in 2018 (July 17th, August 12th and September 18th).

It should be noted that in the case of CAM007, a backwater condition from the Charles River has been observed. A review of the level data downstream of the CAM007 weir indicated flow going from the outfall pipe into the regulator structure, therefore the July 17th event was not considered a CSO spill. At CAM007, two spills with a total volume of .053 MG are being reported.

CAM017 Monitoring

The CAM 017 regulator structure underwent a major construction project in 2013 that reconfigured the weir structure. Previously, the overflows at CAM 017 were regulated by a 10-ft wide static weir at an elevation of 14.39ft-CCB. Three bending weirs were installed in different chambers. Two of the weirs are set at an elevation of 15.19ft-CCB and are 7.5-ft wide. The other bending weir was set at 15.08ft-CCB and is 9.5-ft wide. The new weirs have a variable release elevation based on the hydraulic conditions in the system. CSO meter data for this regulator was available from the ADS Flowview website. The metered data indicated CSO spills during the same three events for which the model simulated CSO spills. The modelled CAM 017 spill activations and volumes are being reported herein, however it should be noted that the calculation of CSO volume at this location is dependent upon the modelled CAM 017 bending weir operation parameters which match the manufacturer's settings.

3.2 Summary of 2018 CSO Activations

In 2018 there were a total of twenty-three activations at the four active Alewife Brook CSO regulators and fourteen activations occurred at the three Charles River CSO regulators. A summary of 2018 activations for the Alewife Brook and Charles River outfalls is provided in Table 3.2 and 3.3, respectively.

3.2.1 Alewife Brook CSO Results

The four active CSO outfalls along Alewife Brook spilled a total of twenty-three times in 2018 resulting in approximately 6.63 MG of CSO volume. All of the four active CSOs spilled on September 18th and three of the four CSOs also spilled on July 17th and August 11th. The following is an overview of each of the Alewife Brook CSO results;

- There was one spill simulated with a volume of 0.016 MG at CAM001 in 2018 (September 18th). As previously stated, the nature of the CAM001 outfall data has historically been problematic;
- The model simulation results indicated four spill events with a total volume of 1.43 MG at CAM002 during 2018, which matched well with appreciable water level increases recorded by the meter in the regulator structure;
- The City's InfoWorks ICM model was used to determine spill activations and spill volumes in the 401A regulator, however the results were compared to the available depth data in the adjacent CS pipe. The model simulated 15 spills with a total volume of 5.0 MG. The City's depth data was not available for the entire year, however when data was available, the City's data indicated six spill events that matched the model-simulated spill dates;
- At the CAM 401B regulator the model simulated three activations, one 0.18 MG spill on September 18th and two smaller spills ~.02 MG on July 17th and August 11th) for a total volume of 0.177 MG. The City's level data in the 401B structure indicate one spill on September 18th, assuming a threshold of 5.47 ft to the outfall pipe invert.

Table 3.2 Summary of 2018 Activations at Alewife Brook CSOs

Receiving Water	Outfall No.	Metered Results		Modelled Results	
		2018 CSO Spills	Meter Type (Threshold)	2018 CSO Spills	2018 CSO Volume (MG)
Alewife Brook	CAM 001	13	Outfall Pipe Area-Velocity (V>0 ft/s & D>0 ft)	1	0.016
	CAM 002A	1	Level Sensor (D>10.78 ft)	4	1.43
	CAM 002B ¹	-	-	-	-
	CAM 004 ²	-	-	-	-
	CAM 400 ³	-	-	-	-
	CAM 401A	6	Level Sensor (D>2.67 ft)	15	5.007
	CAM 401B	1	Level Sensor (D>5.47 ft)	3	0.177
	TOTAL	21	-	23	6.63

1 CAM 002B is temporarily closed
 2 Permanently closed December 27, 2015
 3 Permanently closed on March 31, 2011

3.2.2 Charles River CSO Results

The three active CSO outfalls on the Charles River spilled a total of thirteen times in 2018 resulting in approximately 4.75 MG of CSO volume. All three Charles River CSOs spilled during the August 11th/12th, and September 18th storm events. The following is an overview of each of the Charles River CSO results;

- The City’s level meter at the CAM005 regulator recorded two CSO activations on June 28 and September 18, 2018 (assuming that depths above 1.93’ constitute a spill event). The model simulations for 2018 captured these two spills, as well as six other small spills for a total of 8 spills and a total volume of 1.98MG. The spills on July 17th, August 11th and September 18th accounted for approximately 92% of the total spill volume at this location;
- At the CAM007 regulator, two spills were simulated on August 12th and September 18th in the model. Metered depth data from the City’s meter indicated a spill on September 18th.

- At CAM017, the City’s flow metering data showed good correlation with the model’s representation of spill over the bending weir at this location. The model simulated three spill events on July 17th, August 12th and September 18th, whereas the metered data indicated inclinometer readings and concurrent depth increases during two of these events (July 17th and August 12th). During the September 18th storm event, the inclinometer did not appear to register a spill event, however this storm event was very similar in total volume and peak intensity to the August 12th event.

Table 3.3 Summary of 2018 Activations at Charles River CSOs

Receiving Water	Outfall No.	Metered Results		Modelled (Metered) Results	
		2018 CSO Spills	Meter Type (Threshold)	2018 CSO Spills	2018 CSO Volume (MG)
Charles River	CAM 005	12	Level Sensor (D>0 ft)	8	1.979
	CAM 007	1	Level Sensor (D>0 ft)	2	0.053
	CAM 009	-	-	-	-
	CAM 011	-	-	-	-
	CAM 017	3	Level Sensor & Inclinometer (D>1.5 ft, V>0 ft/s and inclinometer activation)	3	2.72
	TOTAL	16	-	13	4.752

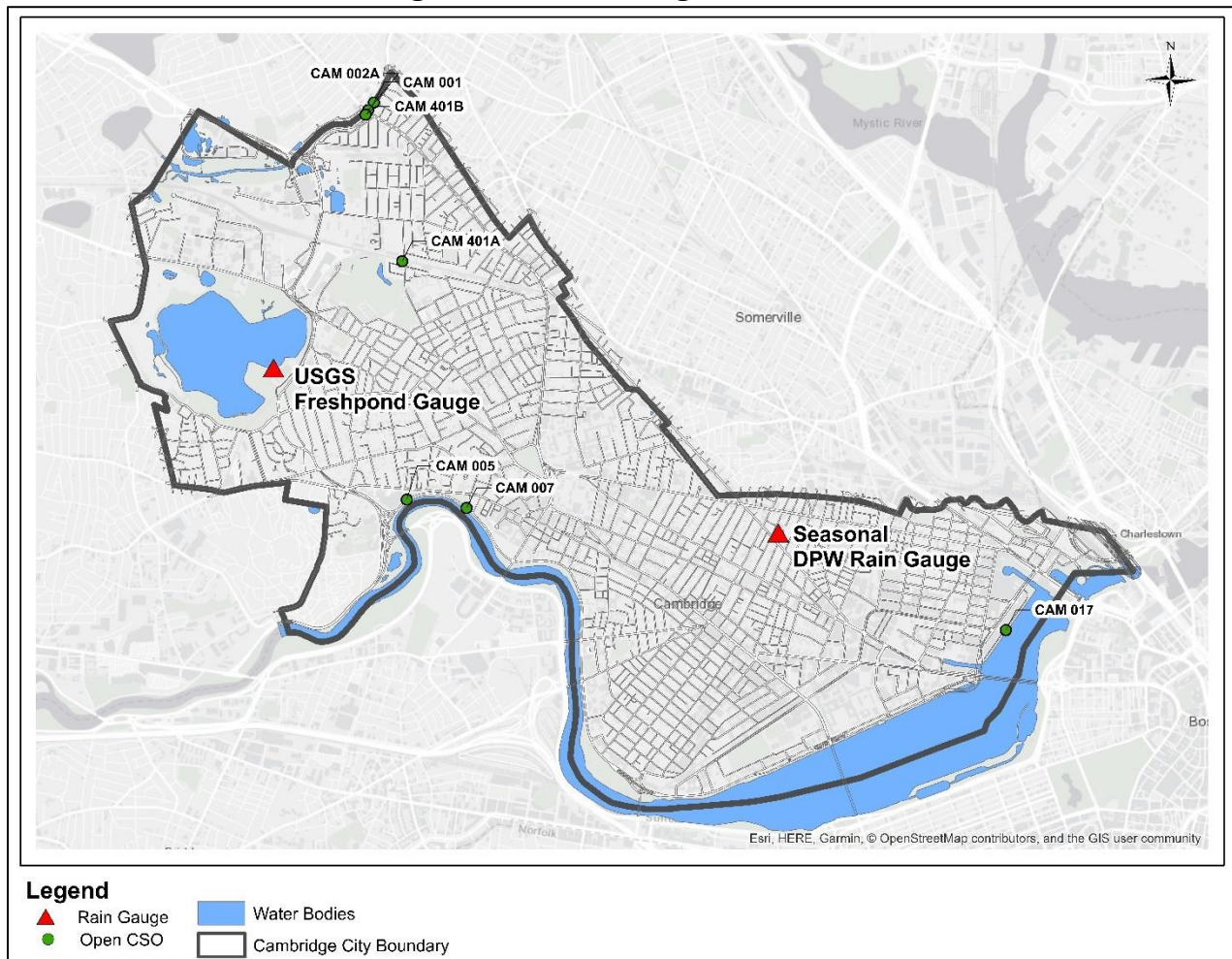
*CAM 009 and CAM 011 are temporarily closed

3.3 Rainfall Characteristics

Under the City of Cambridge Combined Sewer Overflow Permit MA0101974, as part of the CSO NPDES Annual Report, precipitation data from the previous calendar year (2018) must be analyzed against the typical year (1992) rainfall record.

The City of Cambridge currently operates one seasonal rain gauge on the roof of the Cambridge DPW that in 2018 was operational from June 1, 2018 through November 21, 2018. The Cambridge DPW gauge data is presented in Appendix I. In addition to the seasonal DPW rainfall gauge, a second rain gauge operated by the USGS is in Fresh Pond. Figure 3.2 shows the location of the two rainfall gauges used to obtain 2018 rainfall data.

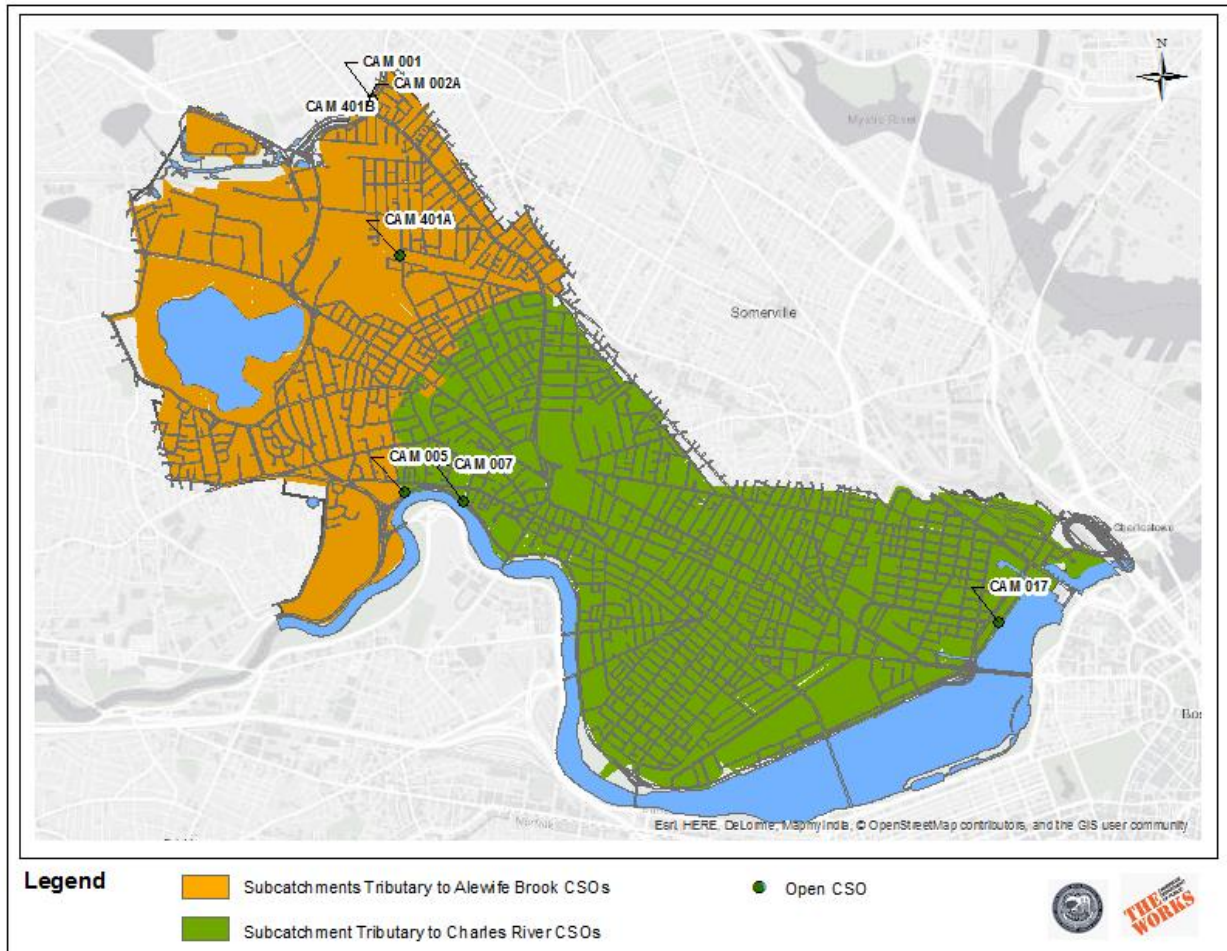
Figure 3.2 Rain Gauge Locations



Given the geographic location of the two rain gauges in the two different watersheds in the City (Alewife Brook and Charles River), it was determined that the USGS Fresh Pond gauge would be most spatially representative of the Alewife Brook subcatchments and CSOs, as well as Charles River areas in close proximity to the west of the City, whereas the DPW seasonal gauge provides a more spatially representative rainfall data for most of the Charles River subcatchments and CSOs. Figure 3.3 presents the model subcatchments tributary to the Alewife Brook CSOs and those tributary to the Charles River CSOs.

The Cambridge DPW gauge is removed over the winter months, therefore to create a year-long rainfall series for the Charles River catchments, missing rainfall data was filled in with rainfall data from the USGS gage from January 1st through May 30th, November 22 through December 31, 2018. The two 2018 annual rainfall series (the USGS Fresh Pond Gauge data for the Alewife Brook and the hybrid series data for the Charles River catchments) were compared to the typical year rainfall to assess any similarities and differences in the rainfall distribution and patterns.

Figure 3.3 Model Subcatchments



As shown in Graph 3.1, the accumulated 2018 USGS Fresh Pond and CDPW rainfall data are both more than the typical year (1992) rainfall. In addition, Figure 3.4 presents a map of the twenty-year average precipitation in the Northeast United States, indicating that the average total precipitation from 1981 to 2010 is between 45 and 50 inches, which is smaller than the observed 2018 total rainfall (52.24 inches in the DPW/USGS hybrid rainfall series and 51.42 inches in the USGS rainfall series at Fresh Pond). MWRA model simulations and CSO analyses employ the USGS Fresh Pond rainfall series alone, which may result in differences in CSO reporting.

A review of the distribution of storms in 2018 by total rainfall was performed. Tables 3.4 and 3.5 present a comparison of storm frequency and volumes within various ranges of total precipitation for the two 2018 series and for the typical year. The USGS/DPW hybrid gauge recorded twelve storms more than the typical year (130 versus 118). On the other hand, the 2018 USGS rain series had a larger number of storms totaling 136 for the year. The number of storms were counted assuming an inter-event time equal to six hours. Both 2018 rainfall series had a larger total rainfall than the typical year (11.55% greater for the USGS Fresh Pond series). The Fresh Pond gage had 81

storms in the <0.25inch range, with a total volume of 5.59in and the hybrid meter recorded less storms in this lower range (75) with a very similar total volume (5.27 inches).

Graph 3.1 Typical Year Rainfall versus 2018 Rainfall

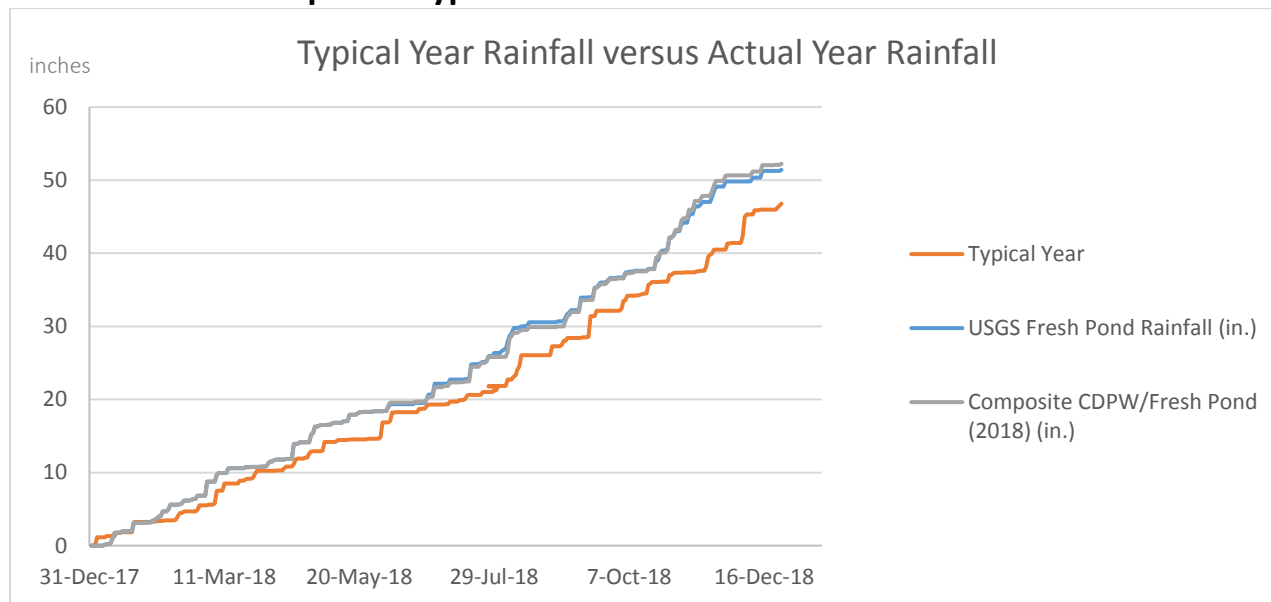
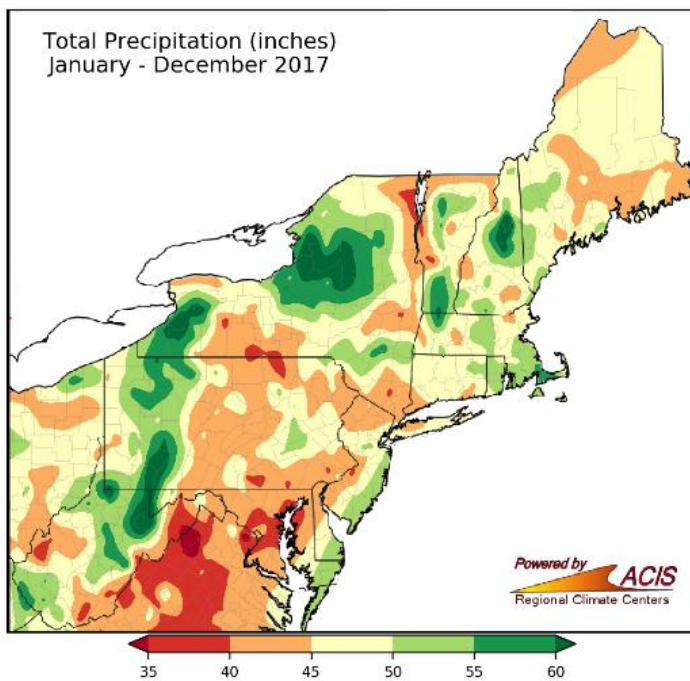


Figure 3.4 Twenty Year Average Rainfall in the Northeast US



¹Map from Northeast Regional Climate Center

The number of the typical year storms and volumes in the 0.25 to 0.50-inch range was slightly higher than those in 2018 USGS Fresh Pond but slightly lower than the USGS/DPW hybrid’s number and volumes as shown in Tables 3.4 and 3.5. In the 0.50 to 1.0-inch volume range, the hybrid and Fresh Pond rainfall series had 2-3 more recorded storm events than in the typical year.

For storms with volumes greater than 1.0 inch and less than 2.0 inches, the hybrid and the Fresh Pond rainfall series had 11.5% and 10% more rainfall, respectively, than the typical year volume in the same range. The 2018 rainfall series had 5-6 more storm events in the 1.0 inch to 2.0 inch range than the typical year series. Both 2018 Fresh Pond and hybrid rainfall have 2 storms above 2.0 inches, while the typical year rainfall includes three storms of this magnitude.

Table 3.4 Frequency of Rainfall Events per Storm Depth Range

Rainfall Series	Total Rainfall (inches)	Total Number of Storms	Number of Storms by Depth				
			Depth <0.25 inches	Depth 0.25 to 0.50 inches	Depth 0.5 to 1.0 inches	Depth 1.0 to 2.0 inches	Depth >=2.0 inches
Typical Year	46.83	118	70	17	17	11	3
Fresh Pond/CDPW Composite	52.24	130	75	18	19	16	2
Fresh Pond (USGS)	51.42	136	81	16	20	17	2

Table 3.5. Annual Rainfall Depth Distribution per Storm Depth Range

Rainfall Series	Total Rainfall (inches)	Total Number of Storms	Total Rainfall Depth of Storms				
			Depth <0.25 inches	Depth 0.25 to 0.50 inches	Depth 0.5 to 1.0 inches	Depth 1.0 to 2.0 inches	Depth >=2.0 inches
Typical Year	46.83	118	4.52	6.33	12.01	15.06	8.91
Fresh Pond/CDPW Composite	52.24	130	5.27	6.47	13.00	23.41	4.09
Fresh Pond (USGS)	51.42	136	5.59	5.92	13.78	22.04	4.09

Table 3.6 and Graph 3.2 present the distribution of the total depth of storms by percentage. In 2018, the hybrid series had rainfall mostly concentrated in the 0.5-1.0inch range and the 1.0-to-2.0 inch range, being the latter the most dominant in overall depth. On the other hand, the 2018 USGS series and the typical year had most of the rainfall concentrated in the 0.50-to-1.0 inch and the 1.0-to-2.0 inch range with the latter being less dominant when compared to the hybrid series. However, the

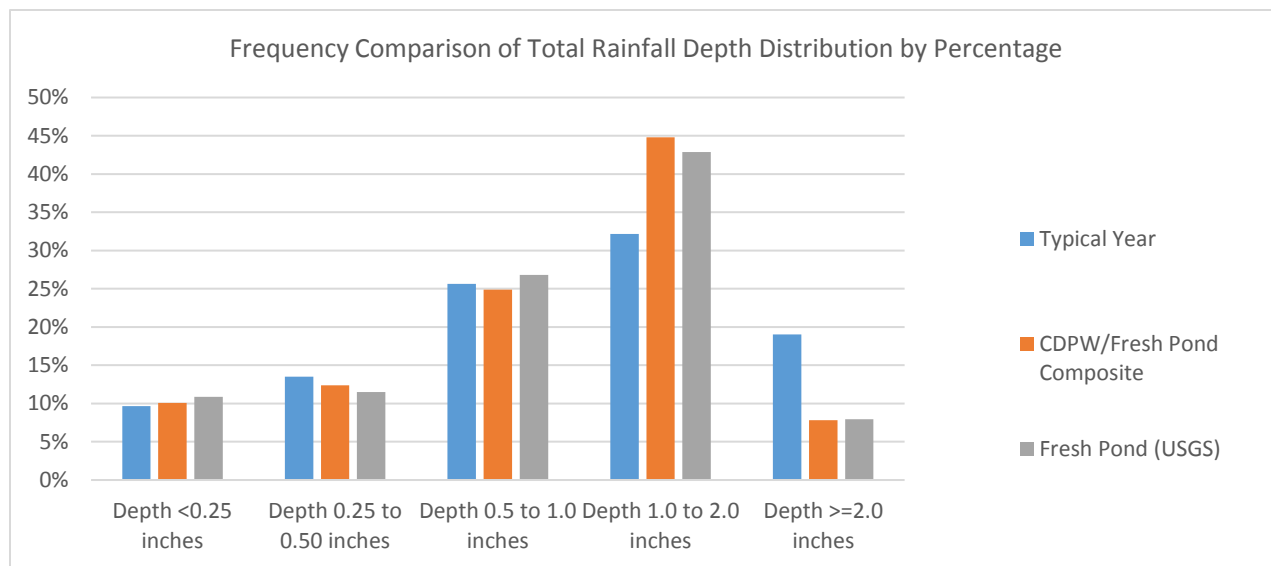
typical year had a larger amount of annual rainfall accumulated in events greater than 2 inches compared with the amount in 2018.

Table 3.6 Percent of Annual Rainfall Depth per Storm Depth Range

Rainfall Series	Total Rainfall (inches)	Total Number of Storms	Depth of Storms by Percentage				
			Depth <0.25 inches	Depth 0.25 to 0.50 inches	Depth 0.5 to 1.0 inches	Depth 1.0 to 2.0 inches	Depth >=2.0 inches
Typical Year	46.83	118	9.65%	13.52%	25.65%	32.16%	19.03%
CDPW/Fresh Pond Composite	52.24	130	10.09%	12.39%	24.89%	44.81%	7.83%
Fresh Pond (USGS)	51.42	136	10.87%	11.51%	26.80%	42.86%	7.95%

This variability amongst the 2018 series and the typical year indicates that significant deviations with regards to CSO performance are to be expected between CSOs in the Alewife Brook versus the Charles River basins. Overall performance measured against the typical year is a function not only of storm volumes but also of storm intensity, which is analyzed in this section.

Graph 3.2 Frequency Comparison of Total Rainfall Depth Distribution by Percentage



In addition to the analysis of storm events by total rainfall depth, the storm intensities of the 2018 and the typical year rainfall series were also compared. Table 3.7 presents the distribution of storms among of the rainfall series by 15-minute peak intensity. Table 3.8 presents the average and peak intensities for storms greater than 1 inch in depth and Table 3.9 presents the same metrics for storm events with a 15-minute peak intensity greater than 0.40in/hr.

Table 3.7 Number of Storm Events at Selected Ranges of 15-min Peak Intensity

Rainfall Series	No. of Storms	Total Rainfall	Number of Peak Intensity				
			0.01 to 0.10	0.10 to 0.25	0.25 to 0.50	0.50 to 1.0	> 1.0
		(inches)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)
Typical Year	118	46.83	60	27	16	10	5
Fresh Pond/CDPW Composite	130	41.58	63	26	24	12	5
Fresh Pond (USGS)	136	51.42	68	30	15	12	11

As outlined in Table 3.8, the typical year includes fourteen storm events over one inch whereas both hybrid and the Fresh Pond gauge recorded eighteen and fifteen events greater than one inch in total rainfall, respectively. Storm events were counted assuming an inter-event time equal or greater than six hours (i.e. if no rain occurs between the end of one rainfall period and the beginning of the next then they are counted as two separate events). Recurrence intervals listed in Table 3.8 indicate that the typical year has three storms over one inch in rainfall (12/11/1992, 10/23/1992, and 9/22/1992) near or above the 1-year recurrence interval, whereas the 2018 data showed no storm events with a recurrence interval greater than 1 year.

Table 3.8 Comparison of Storms Greater 1 Inch of Total Rainfall, Typical Year Versus 2018

Rainfall Series	No. of Storms	Date	Duration (h)	Total Rainfall (in)	Average Int. (in/h)	15-min Peak Int. (in/h)	Recurrence Interval
Typical Year	14	12/11/1992	39.5	3.88	0.10	0.24	2-5Y
		9/22/1992	22.0	2.79	0.13	0.65	1-2Y
		5/31/1992	29.3	2.24	0.08	0.48	<1Y
		3/6/1992	34.0	1.89	0.06	0.22	<1Y
		11/21/1992	34.8	1.88	0.05	0.36	<1Y
		8/17/1992	25.5	1.81	0.07	0.80	<1Y
		1/23/1992	16.0	1.36	0.09	0.40	<1Y
		6/5/1992	17.3	1.34	0.08	1.00	<1Y
		9/3/1992	12.3	1.19	0.10	0.68	<1Y
		10/23/1992	3.0	1.18	0.39	1.08	~1Y
		1/4/1992	20.8	1.15	0.06	0.48	<1Y
		5/2/1992	5.5	1.14	0.21	1.32	<1Y
		8/15/1992	38.5	1.10	0.03	0.28	<1Y
		4/16/1992	30.0	1.02	0.03	0.28	<1Y

Rainfall Series	No. of Storms	Date	Duration (h)	Total Rainfall (in)	Average Int. (in/h)	15-min Peak Int. (in/h)	Recurrence Interval
Fresh Pond/CDPW Composite	18	4/15/2018	22.8	2.06	0.09	0.56	<1Y
		7/17/2018	14.3	2.03	0.14	1.16	<1Y
		8/12/2018	19.5	1.91	0.10	2.25	<1Y
		3/2/2018	21.0	1.89	0.09	0.24	<1Y
		11/2/2018	21.3	1.85	0.09	0.54	<1Y
		10/27/2018	25.0	1.63	0.07	0.36	<1Y
		9/18/2018	14.0	1.61	0.12	2.18	<1Y
		11/9/2018	16.5	1.57	0.10	0.48	<1Y
		9/25/2018	12.3	1.53	0.12	0.94	<1Y
		1/12/2018	17.3	1.46	0.08	0.60	<1Y
		9/10/2018	14.0	1.38	0.10	0.48	<1Y
		11/26/2018	17.8	1.35	0.08	0.20	<1Y
		6/27/2018	20.5	1.32	0.06	1.15	<1Y
		4/25/2018	25.5	1.30	0.05	0.48	<1Y
		11/16/2018	7.3	1.19	0.16	0.48	<1Y
		11/13/2018	13.0	1.18	0.09	0.24	<1Y
		3/7/2018	27.5	1.16	0.04	0.24	<1Y
		1/23/2018	9.0	1.08	0.12	0.60	<1Y
Fresh Pond (USGS)	15	4/15/2018	22.8	2.06	0.09	0.56	<1Y
		7/17/2018	17.3	2.03	0.12	1.00	<1Y
		3/2/2018	21.0	1.89	0.09	0.24	<1Y
		9/18/2018	13.5	1.71	0.13	2.28	<1Y
		11/2/2018	14.8	1.60	0.11	0.44	<1Y
		6/27/2018	20.5	1.46	0.07	1.36	<1Y
		1/12/2018	17.3	1.46	0.08	0.60	<1Y
		11/26/2018	17.8	1.35	0.08	0.20	<1Y
		10/27/2018	25.8	1.15	0.04	0.24	<1Y
		11/9/2018	15.5	1.14	0.07	0.44	<1Y
		11/13/2018	12.5	1.10	0.09	0.20	<1Y
		11/15/2018	14.8	1.10	0.07	0.24	<1Y
		1/23/2018	9.0	1.08	0.12	0.60	<1Y
		8/11/2018	5.8	1.07	0.18	1.16	<1Y
		9/10/2018	12.8	1.00	0.08	0.36	<1Y

Table 3.9 lists storms with peak intensities greater than 0.40in/hr and their average intensities for all three-rainfall series.

Table 3.9 Comparison of Storms with 15-min Peak Intensities Greater than 0.40 Inches/hour, Typical Year Versus 2018

Rainfall Series	No. of Storms	Date	Duration (hours)	15-min Peak Intensity	Average Intensity	Recurrence Interval
Typical Year	20	9/9/1992	0.5	1.72	1.14	<1Y
		5/2/1992	5.5	1.32	0.21	<1Y
		8/11/1992	10.5	1.24	0.08	<1Y
		10/23/1992	3.0	1.08	0.39	~1Y
		6/5/1992	17.3	1.00	0.08	<1Y
		7/11/1992	0.5	0.84	0.44	<1Y
		8/17/1992	25.5	0.8	0.07	<1Y
		10/10/1992	5.3	0.72	0.09	<1Y
		10/10/1992	6.5	0.68	0.1	<1Y
		9/3/1992	12.3	0.68	0.1	<1Y
		7/31/1992	18.8	0.68	0.03	<1Y
		9/22/1992	22.0	0.65	0.13	<1Y
		7/29/1992	0.5	0.64	0.4	<1Y
		6/20/1992	2.3	0.56	0.15	<1Y
		1/14/1992	9.5	0.52	0.05	<1Y
		5/31/1992	29.3	0.48	0.08	<1Y
		1/4/1992	20.8	0.48	0.06	<1Y
		3/11/1992	12.3	0.48	0.08	<1Y
		6/20/1992	0.3	0.44	0.44	<1Y
		10/11/1992	12.8	0.44	0.05	<1Y
Fresh Pond/CDPW Composite	26	8/12/2018	19.5	2.249	0.10	<1Y
		9/18/2018	14.0	2.18	0.12	<1Y
		7/26/2018	2.3	1.344	0.22	<1Y
		7/17/2018	14.3	1.16	0.14	<1Y
		6/27/2018	20.5	1.149	0.06	<1Y
		4/27/2018	7.8	0.96	0.11	<1Y
		9/25/2018	12.3	0.94	0.12	<1Y
		5/15/2018	4.0	0.92	0.23	<1Y
		8/14/2018	2.8	0.699	0.16	<1Y

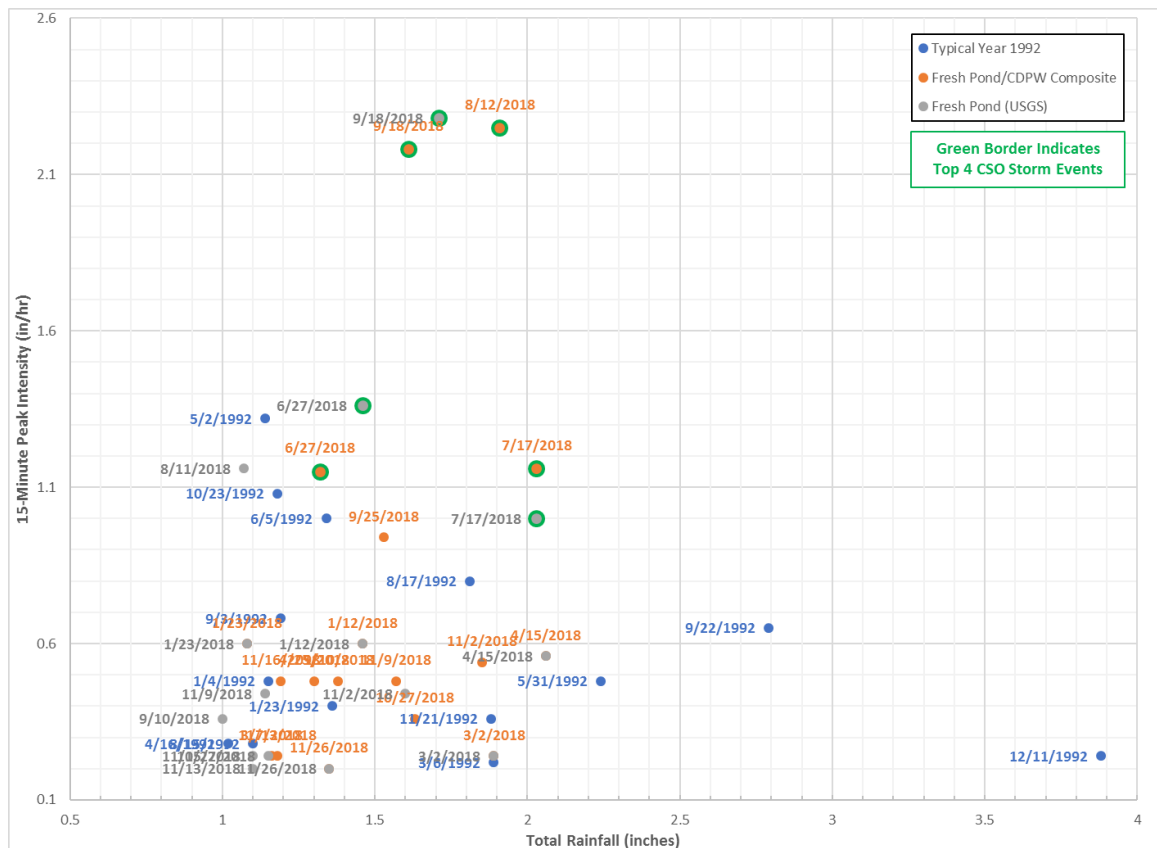
Rainfall Series	No. of Storms	Date	Duration	15-min Peak Intensity	Average	Recurrence Interval
Fresh Pond/CDPW Composite	26	8/22/2018	2.3	0.639	0.15	<1Y
		7/6/2018	2.5	0.639	0.20	<1Y
		8/11/2018	5.3	0.627	0.12	<1Y
		1/12/2018	17.3	0.6	0.08	<1Y
		1/23/2018	9.0	0.6	0.12	<1Y
		6/24/2018	11.3	0.568	0.06	<1Y
		4/15/2018	22.8	0.56	0.09	<1Y
		11/2/2018	21.3	0.541	0.09	<1Y
		8/17/2018	10.3	0.49	0.03	<1Y
		4/25/2018	25.5	0.48	0.05	<1Y
		10/29/2018	10.8	0.48	0.06	<1Y
		11/9/2018	16.5	0.48	0.10	<1Y
		9/10/2018	14.0	0.479	0.10	<1Y
		11/16/2018	7.3	0.478	0.16	<1Y
		9/26/2018	3.8	0.449	0.08	<1Y
		6/5/2018	6.5	0.407	0.06	<1Y
9/12/2018	8.0	0.405	0.05	<1Y		
Fresh Pond (USGS)	27	9/18/2018	13.5	2.28	0.13	<1Y
		8/14/2018	2.5	1.68	0.31	<1Y
		6/24/2018	11.0	1.64	0.11	<1 Y
		6/27/2018	20.5	1.36	0.07	<1 Y
		7/6/2018	2.0	1.16	0.28	<1 Y
		8/11/2018	5.8	1.16	0.18	<1 Y
		10/30/2018	1.0	1.16	0.52	<1 Y
		7/26/2018	2.3	1.12	0.23	<1 Y
		9/27/2018	2.3	1.12	0.15	<1 Y
		7/17/2018	17.3	1.00	0.12	<1 Y
		10/29/2018	9.0	1.00	0.09	<1 Y
		8/22/2018	1.5	0.96	0.33	<1 Y
		6/5/2018	2.5	0.96	0.18	<1 Y
		4/27/2018	7.8	0.96	0.11	<1 Y
5/15/2018	4.0	0.92	0.23	<1 Y		

Rainfall Series	No. of Storms	Date	Duration	15-min Peak Intensity	Average	Recurrence Interval
Fresh Pond (USGS)	27	8/12/2018	8.0	0.92	0.07	<1 Y
		9/25/2018	13.8	0.76	0.09	<1 Y
		10/23/2018	3.5	0.6	0.07	<1 Y
		1/12/2018	17.3	0.6	0.08	<1 Y
		1/23/2018	9.0	0.6	0.12	<1 Y
		4/15/2018	22.8	0.56	0.09	<1 Y
		10/11/2018	11.3	0.52	0.06	<1 Y
		8/4/2018	2.0	0.52	0.23	<1 Y
		4/25/2018	25.5	0.48	0.05	<1 Y
		11/2/2018	14.8	0.44	0.11	<1 Y
		11/9/2018	15.5	0.44	0.07	<1 Y
		8/12/2018	3.0	0.44	0.19	<1 Y

Comparison of peak intensity distributions of the 2018 rainfall series and the typical year shows that 2018 Fresh Pond rainfall data had 26 storms with a peak intensity higher than 0.40 in/hr. The typical year has a total of five storms with an average intensity greater than 0.30in/h. Four out of these five have a duration of 30 minutes or less and only the 10/23/1992 is more significant in terms of duration (3 hours) and rainfall accumulation (1.18 inches). On the other hand, the 2018 hybrid series had zero events with an average rainfall intensity greater than 0.30in/h and 2018 Fresh Pond rainfall series has three storms (8/14/2018, 10/30/2018, 8/22/2018) with average intensity greater than 0.30 inch/hour, and all of them have a duration of more than 30 minutes and a rainfall accumulation of 0.77 inches, 0.52 inches and 0.50 inches, respectively.

The typical year and 2018 storm events (for both the hybrid and Fresh Pond time series) are presented in Graph 3.3. This figure includes all storms over 1” of total rainfall and clearly indicates several 2018 storm events that were outliers with respect to their 15-minute peak intensity and total volume ratios (shown with a green outline). Those events include June 27th, July 17th, August 12th and September 18th, 2018. These storm events with high peak intensity and total volume, as would be expected, were responsible for a majority of the CSO spills recorded in 2018, as previously outlined in this report.

Graph 3.3 Typical Year and 2018 Rainfall Events, Peak 15-Minute Intensity for Storms Greater than 1” Total Rainfall



3.4 Combined Sewer Overflow Comparison

With the analysis of the 2018 rainfall complete and the CSO spill count and activations for 2018 calculated, the 2018 CSO results were then compared to those anticipated during the typical rainfall year. Table 3.10 presents the 2018 and typical year model simulation results for the existing conditions Cambridge network model, as well as the LTCP model. As noted previously, there are a number of inactive CSOs on both the Alewife Brook and the Charles River systems that are included in the table for consistency. The main differences between the 2018 and LTCP condition include:

1. CAM002 (outstanding LTCP work)
 - Remove temporary plate partially blocking the CAM002A outfall pipe*
 - Remove bulkhead to connect CAM002 regulator to the Alewife Brook Conduit*

*This work was completed by the City after the reporting period for this report.
2. SOM001-A in LTCP (note that SOM001-A is not owned by Cambridge but its modification may affect the performance of Cambridge’s CSOs):

- Expand the underflow pipe equivalent diameter from 2 to 3 feet **

**This work was completed by the MWRA on 03/27/2019

Table 3.10 Comparison of 2018 and Typical Year CSO Results

OUTFALL	2018 RAINFALL UNDER 2018 SYSTEM CONDITIONS		TYPICAL YEAR RAINFALL UNDER 2018 SYSTEM CONDITIONS		TYPICAL YEAR RAINFALL WITH LONG TERM CONTROL PLAN*	
	ACTIVATION FREQUENCY	VOLUME (MG)	ACTIVATION FREQUENCY	VOLUME (MG)	ACTIVATION FREQUENCY	VOLUME (MG)
ALEWIFE BROOK						
CAM 001	1	0.016	0	0.000	5	0.190
CAM 002	4	1.43	6	1.510	4	0.690
CAM 004 ¹	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	N/A
CAM 400 ²	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	N/A
CAM 401A	15	5.007	9	3.679	5	1.610
CAM 401B	3	0.177	2	0.100	7	2.150
TOTAL	23	6.630	17	5.289	21	4.630⁴
CHARLES RIVER						
CAM 005	8	1.979	6	0.922	3	0.840
CAM 007	2	0.053	1	0.030	1	0.030
CAM 009 ³	0	0	0	0	2	0.010
CAM 011 ³	0	0	0	0	0	0
CAM 017	3	2.720	1	0.380	1	0.450
TOTAL	13	4.752	8	1.332	7	1.330

*VALUES REFLECT TARGET CSO VOLUMES AT LTCP COMPLETION AS PER CSO PERMIT. THESE ARE NOT MODEL RESULTS.

1. CAM 004 CLOSED ON DECEMBER 27, 2015

2. CAM 400 CLOSED ON MARCH 31, 2011

3. TEMPORARILY PLUGGED

4. THIS TOTAL DOES NOT INCLUDED MWRA 003 AND SOM 001, THE TOTL LTCP VOLUME OF CSO IS 7.29 MG PER YEAR IF THESE ARE INCLUDED

Alewife Brook Comparisons

The Alewife Brook in existing conditions showed a total of twenty-three activations with 6.63 MG volume under the 2018 rainfall series while in a typical year it resulted in a total of seventeen spills and 5.29 MG in total. The seventeen spills are slightly lower than the 21 target spills in the LTCP model. The total volume of 5.29 MG is slightly higher than the targeted 4.63MG in a typical year in LTCP conditions since the 2018 conditions do not include the changes to the CAM002 underflow and the SOM001A underflow outlined earlier.

A summary of the CSO activations under different rainfall and system conditions is provided below.

CAM 001

The 2018 rainfall under the existing conditions resulted in one activation with an overflow volume of 0.016 MG, while the typical year rainfall in the existing conditions model generates no spills. CAM 001, therefore, meets the targeted 5 spills and total volume of 0.19 MG during the typical year in LTCP conditions.

CAM 002

The 2018 rainfall under existing conditions resulted in four activations and a volume of 1.43 MG. The typical year under 2018 system conditions generated six activations and a volume of 1.51 MG, which is more than the targeted 0.69MG under LTCP conditions during a typical rainfall year in LTCP conditions. Adjustments to the CAM002 regulator under the LTCP are expected to reduce both the frequency and volume of spills at CAM002.

CAM 004

This structure was closed as of December 27, 2015 and the LTCP has CAM 004 closed since that date.

CAM 401A

The 2018 rainfall under existing conditions resulted in fifteen overflows with 5.007 MG of volume in current model conditions. In a typical year rainfall under current system conditions, there were nine activations and a total of 3.68 MG of CSO volume at CAM 401A. This is more than the targeted 1.61MG in LTCP conditions in a typical year.

CAM 401B

The 2018 rainfall under existing conditions resulted in three spills and a total volume of 0.18 MG, while during the typical year rainfall under current conditions two spills are activated with a total of 0.10 MG. The typical year rainfall under LTCP targets 7 spill events and a total of 2.15MG therefore the existing conditions model currently meets this target. As stated above, a review of the

401A and 401B results together indicates that the combined, targeted LTCP volume in a typical year (3.76 MG) is close to being achieved with the total volume of 3.78 MG in the existing conditions model under the typical year rainfall.

Charles River Comparisons

The Charles River system in existing conditions showed a total of thirteen activations with 4.75 MG volume under the 2018 rainfall series while in a typical year it resulted in a total of eight spills and 1.33 MG in total. The 2018 results are only one spill event and 0.002 MG (2,000 gallons) higher than the targeted 7 spills and 1.33 MG in a typical year in LTCP conditions.

A summary of the CSO activations under different rainfall and system conditions is provided below.

CAM 005

The 2018 rainfall under the existing conditions resulted in eight activations with an overflow volume of 1.98 MG, while the typical year rainfall in the existing conditions model generates six spills and a total of 0.92 MG. The typical year rainfall under LTCP conditions targets three spills and a total volume of 0.84MG in a year, therefore the spill count and total volume are not currently being met at the CAM005 regulator.

CAM 007

The 2018 rainfall under the existing conditions resulted in two spills with a total volume of 0.053 MG, while the typical year rainfall under existing conditions generates one spill with a total volume of 0.03 MG. The typical year rainfall under LTCP conditions targets total volume of 0.03 MG at CAM007 and the existing conditions model under typical year rainfall is meeting that target.

CAM 009 and CAM 011

CAM 009 and CAM 011 are temporarily plugged. The LTCP has both outfalls open. The City of Cambridge plans to keep these outfalls closed until a more comprehensive study can be completed in this area on the effects of climate change and upstream conditions.

CAM 017

The 2018 rainfall under existing conditions resulted in three spills and a total volume of 2.72 MG at CAM017, while the typical year rainfall under 2018 system conditions would generate one 0.38 MG spill. This is .07 MG (70,000 gallons) lower than the targeted 0.45MG in a typical year under LTCP conditions.

3.5 Monitoring Recommendations

The 2018 CSO data analysis carried out on both the metered CSO data and the modeled CSO simulations identified a number of recommendations for the 2018 CSO monitoring and analysis, as outlined below.

CAM 001

Manhole “Smart Covers” which measure flow depth were installed in early 2019 in various locations, including the CAM001 regulator. This data will be regularly reviewed and compared to the modelled depths at CAM001 in order to calibrate spills at this location.

CAM 002

The four model-simulated spill events matched one metered and reported spill on September 18, 2018 at CAM002. The other 3 modelled spill dates cannot be verified with the available meter data from the overflow pipe. It is recommended that the CAM002 outfall data be regularly reviewed during the upcoming year to identify any spurious readings that may be unrelated to rainfall, as well as any gaps in data availability. The model at CAM 002 should also be further enhanced with valid upstream inflow meter data and regulator level data to calibrate the model’s representation of the CSO structure. Installation of a smart cover level sensor at this location would provide additional calibration data for the CAM002 regulator.

CAM 401A

At CAM401A, the modelled spill events are well correlated with the depth data available from both the City meter and the MWRA meter. In the LTCP model under the typical year, however, the spill count and volume is not meeting the regulatory requirements. Installation of a secondary form of monitoring at the CAM 401A regulator is recommended. In particular, the City will attempt to monitor whether the scrub brush set up is turning in conjunction with the depth threshold being reached. This will serve to confirm the validity of the depth threshold being used for spill activations and volumes, as measured by the City’s level sensor.

CAM 401B

At CAM401B, the modelled CSO results match the DPW flow meter data for the larger storm event. The level data at 401B did not indicate spills during two of the three storm events simulated in the model. The model’s representation of CSO catchment as well as the upstream of the structure were calibrated using SCADA data. Continuous review of the CAM401B meter data is recommended during the coming year to identify any spurious readings that may be unrelated to rainfall, as well as any gaps in data availability. The City will work on trouble shooting flow meter data issues that have been identified.

CAM005

At CAM005, the level data is being recorded at the weir. Given the contributions of stormwater inflows on the outfall pipe, downstream of the weir, it is possible that this level sensor is seeing some backwater conditions. The City intends to install a smart cover on manhole just upstream of the CAM005 regulator (where the 54” diameter combined sewer comes into the regulator structure). This will allow for a review of the level data on the combined sewer in conjunction with the City’s existing level data in the regulator structure to more thoroughly understand the balance of depth and flow between the incoming combined sewer and the depth in the regulator. In turn, the City will be able to refine the threshold being used to indicate a spill event at CAM005.

CAM007

At CAM007, the potential for backwater conditions has been noted and therefore during the next calendar year recalibration of the model at this location is recommended. The level data available on the river side of the weir will be reviewed in parallel with the overflow weir depth data, in order to more thoroughly understand the model simulation of CSO, particularly during large storm events and when the river level may be impacting the regulator structure and outfall pipe.

CAM017

The model and metered data are currently well correlated with respect to spill activation, however the two depth sensors did show a lack of correlation at various times throughout the year. The City plans to adjust the depth/velocity meter locations in order to ensure better correlation between the depth at the bending weir and the depth in the combined sewer upstream. Future calibration work will also be focused on adjusting the model's Real-time control parameters and the bending weir parameters against the available inclinometer data. It is recommended that a flow meter be installed in the Binney Street combined sewer upstream of the CAM017 regulator, as well as on the inflow to Bending Weirs 1 & 2, in order to further refine model calibration.

3.6 Coordination with MWRA

System-wide, periodic coordination with the MWRA is advised in order to routinely incorporate changes in the regional system and capture existing and final LTCP conditions. MWRA depth data has been used to cross check with the City meter depth. There are variabilities between the City and MWRA data and we will continue to coordinate to validate the results. Pump operations and system optimization at different key MWRA facilities is critical and may have a significant impact on Cambridge CSOs as the combined system ties to MWRA's interceptors.

4. Status of CSO Abatement Projects**4.1 Project Updates**

The City of Cambridge continues to implement abatement projects to remove stormwater from its combined sewer system, however continued sewer separation is dependent upon cost effective strategies to manage water quality from stormwater discharges, in particular from Phosphorous. This may include designing systems in which some portion of the stormwater continues to discharge to the sewer system, when there would be no impact on CSOs. Such abatement projects include:

- Cardinal Medeiros and Binney St sewer separation
- Cottage Lopez drainage improvements
- Willard St Outfall
- Talbot Street Outfall
- Monsignor O'Brien Highway sewer separation and new Lechmere Canal outfall
- The Port I/I removal and flood alleviation project

The information provided in this Annual Report conforms to information and data submitted to the MWRA for inclusion in their court-ordered annual report on CSO abatement project progress.

As described in more detail in the MWRA 2015 CSO Annual Progress Reports (available at <http://www.mwra.com/cso/csoannualreports.htm>), the CSO Control Plan for Alewife Brook includes four (4) project components for which the City of Cambridge is responsible, including:

- CAM004 Stormwater Outfall and Wetland Basin (Contract 12)
- CAM004 Sewer Separation (Contracts 8A, 8B, and 9)
- CAM400 Common Manhole Separation (Contract 13)
- Interceptor Connection Relief and Floatables Control (Contract 4)

All of these projects have been completed.

4.2 Project Schedule

Design and construction milestones for the Alewife Brook projects were added to Schedule Seven (7) in 2006 when EPA and DEP approved the regional long-term CSO control plan. Dates of completion are listed below.

Project	Benefit	Implementation Status
Contract 4: Interceptor Connection Relief and Floatables Control	Upgrades connections between Cambridge and MWRA systems to provide greater capacity; provides floatables control.	Project completed in October 2010.
Contract 13: CAM400 Manhole Separation	Removes stormwater from the sewer system; eliminate CSO at Outfall CAM400.	Project completed in March 2012.
Contract 12: CAM004 Stormwater Outfall and Wetland Basin	Conveys separated stormwater flows to wetland system for treatment and flow attenuation.	Project completed in 2014.
Contracts 8A, 8B and 9: CAM004 Sewer Separation	Removes stormwater from the sewer system; eliminate CSO at Outfall CAM004.	CAM004 CSO closed in 2015

Table 4.1 – City of Cambridge CSO Abatement Projects and Status

CSO Outfall	Required Project Type Under 2nd Stipulation	Receiving Water	Contract / Project Name	Completion Date or Proposed Completion Date	Notes
CAM001	Floatables Control	Alewife	Contract 4 - Floatables	October 2010	Baffles installed.
CAM002	Floatables control; interceptor relief	Alewife	Contract 4 - Floatables	October 2010	Baffles installed 2010 and blocked underflow.
CAM004	Sewer Separation	Alewife	2A/2B Fresh Pond Parkway	2001	CSO is now controlled by Drain Vault 5
CAM004	Sewer Separation	Alewife	Contract 8A/8B/9	December 27 st 2015	Completed in 2015
CAM004	Sewer Separation	Alewife	Contract 12- Stormwater Outfall	April 2013	Stormwater outfall and treatment wetland
CAM400	Sewer Separation / common manholes	Alewife	Contract 13	March 2011	CSO regulator eliminated; converted to stormwater outfall.
CAM401A	Floatables Control	Alewife	Bellis Circle	2005	Installed brush screen
CAM401B	Floatables control; interceptor relief	Alewife	Contract 4- Floatables	October 2010	Baffles installed in 2010 and underflow throttled.
CAM005	Hydraulic Relief	Charles	MWRA CAM005 Hydraulic Relief	2000	For full project description see: http://www.mwra.com/annual/cssoar/2009/cssoar2009.pdf
CAM007	Floatables Control	Charles	Contract 5	2009	Baffle installed
CAM009	Floatables Control	Charles	Contract 5	2009	Outfall temporarily plugged
CAM011	Floatables Control	Charles	Contract 5	2009	Outfall temporarily plugged
CAM017	Floatables Control	Charles	Contract 5	2009	Baffles were installed in 2009.
CAM017	Hydraulic Relief	Charles	CAM 017 Hydraulic Relief	2013	Bending weirs and baffles installed in 2014

5. Modifications to Nine Minimum Controls Plan

The Nine Minimum Controls Plan (NMCP) was substantially updated in its entirety and submitted together with the first annual report (April 2009). The plan provides a summary of the evaluations undertaken to address each control measure since the original plan was developed in 1997.

Enhancements were made to the NMCP to meet the minimum implementation levels stipulated in the permit. These Public Notification requirements were further updated to reflect changes in current permit requirements. These enhancements were summarized in Table 5.1.

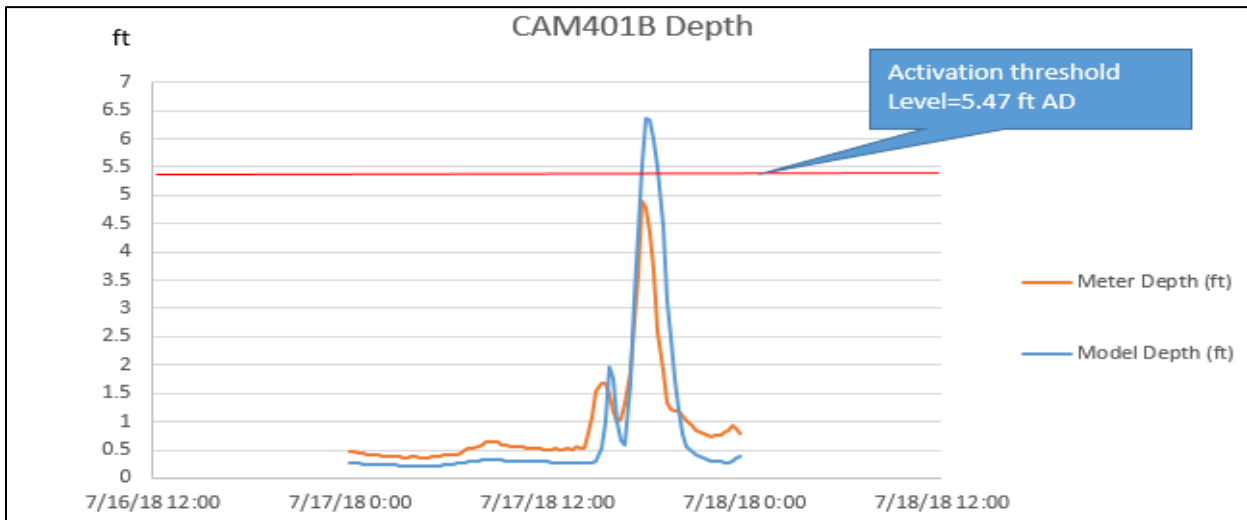
Table 5.1 –Enhancements to the Nine Minimum Controls Plan

Control Measure	Proposed Enhancement
1. Proper Operation and Regular Maintenance Programs	<ul style="list-style-type: none"> • Adherence to detailed “Good Housekeeping Manual” to provide specific guidance and protocols for major DPW tasks • Development and utilization of routine inspection forms and work order system • Update of infrastructure assets and nomenclature • Update of DPW organizational structure and budget figures
2. Maximization of Storage in the Collection System	<ul style="list-style-type: none"> • Update database of existing key regulator components • Establish procedure for documentation of purpose and benefits to any future modifications to existing structures
3. Review and Modification of Pretreatment Requirements	<ul style="list-style-type: none"> • Adherence to recently developed Wastewater and Stormwater Use Regulations, inspection frequencies and enforcement activities
4. Maximization of Flow to POTW	<ul style="list-style-type: none"> • Maintain updated inventory of CSO capital projects; • Continue funding for annual cleaning and remedial repair and reconstruction contracts
5. Prohibition/Elimination of Dry Weather Discharges	<ul style="list-style-type: none"> • The City is unaware of any dry weather discharges from CSO outfalls
6. Control of Solid and Floatable Materials in CSOs	<ul style="list-style-type: none"> • Continue to implement floatable controls projects in conformance with revised Schedule Seven milestone deadlines. • Continue to require compliance with new City Wastewater and Stormwater Use Regulations
7. Pollution Prevention Programs to Reduce Contaminants in CSOs	<ul style="list-style-type: none"> • Adherence to “Good Housekeeping Manual” guidance and protocols to reduce the City’s contribution of contaminants to stormwater; • Adherence to City of Cambridge Integrated Pest Management plan to reduce contributions of pesticides, fungicides, herbicides and fertilizer to run-off; • Continue aggressive recycling, street sweeping and household hazardous waste collections and management • Continue with public education and outreach activities • Continue to require compliance with new City Wastewater and Stormwater Use Regulations

Control Measure	Proposed Enhancement
8. Public Notification	<ul style="list-style-type: none"> • Beginning on October 17 2017, email notifications will be made within 12-hours of the onset of a CSO activation from either CAM002 or CAM401B to EPA, DEP, local health agents and the Mystic River Watershed Association and post such activations on the DPW website. <p>* Public notification is based on real time monitoring at CAM002 and CAM401B. More Frequent maintenance of these meters should improve precision of public notification reporting</p>
9. Monitoring to Characterize CSO Impacts and Efficacy of CSO Controls	<ul style="list-style-type: none"> • On a regulator site-specific basis, use revised weir equations and parameters and/or hydraulic models and analysis to estimate effluent volumes released during CSO events

While the Public Notifications for CSOs in the Alewife Brook for 2018 were less than the reported 2018 activations, troubleshooting of City’s meters (area-velocity and ultrasonic level sensors) discussed in various sections throughout this report, will help to eliminate the minimal discrepancies that remain between the metered data activations and the modelled activations. On such example is provided in Graph 5.1 below. The model indicated a spill, while the metered data did not indicate a spill based on the threshold at the 401B regulator of D>5.47 ft (Table 3.2). The metered depth data shows the depth reaching to approximately 6” below the threshold and does not, therefore, indicate a spill. The model simulated a 0.05 MG spill during this storm event. In the case of the 401B regulator, the overflow metering data could not be used to corroborate the depth data. The City continues to monitor its meter data in order to understand the level of confidence in the depth values and in the thresholds being used for spill reporting. In the meantime, the city will report both modelled and metered results at each CSO location.

**Graph 5.1 Depth Comparison Between the Meter Data and Model Result
July 17, 2018 Rainfall Event**



APPENDIX I
2018 DAILY RAINFALL
DATA

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
1/1/18	0.00	0.00	0.00
1/2/18	0.00	0.00	0.00
1/3/18	0.00	0.00	0.00
1/4/18	0.00	0.00	0.00
1/5/18	0.00	0.00	0.00
1/6/18	0.00	0.00	0.00
1/7/18	0.00	0.00	0.00
1/8/18	0.11	0.00	0.04
1/9/18	0.09	0.00	0.04
1/10/18	0.03	0.00	0.04
1/11/18	0.08	0.00	0.04
1/12/18	0.59	0.02	0.44
1/13/18	0.87	0.04	0.60
1/14/18	0.00	0.00	0.00
1/15/18	0.00	0.00	0.00
1/16/18	0.00	0.00	0.00
1/17/18	0.18	0.01	0.04
1/18/18	0.00	0.00	0.00
1/19/18	0.00	0.00	0.00
1/20/18	0.00	0.00	0.00
1/21/18	0.00	0.00	0.00
1/22/18	0.09	0.00	0.04
1/23/18	1.08	0.05	0.60
1/24/18	0.00	0.00	0.00
1/25/18	0.00	0.00	0.00
1/26/18	0.00	0.00	0.00
1/27/18	0.00	0.00	0.00
1/28/18	0.03	0.00	0.04
1/29/18	0.00	0.00	0.00
1/30/18	0.02	0.00	0.04
1/31/18	0.00	0.00	0.00
Total	3.17		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
2/1/18	0.04	0.00	0.04
2/2/18	0.23	0.01	0.08
2/3/18	0.00	0.00	0.00
2/4/18	0.32	0.01	0.12
2/5/18	0.23	0.01	0.24
2/6/18	0.00	0.00	0.00
2/7/18	0.70	0.03	0.20
2/8/18	0.00	0.00	0.00
2/9/18	0.00	0.00	0.00
2/10/18	0.27	0.01	0.28
2/11/18	0.63	0.03	0.12
2/12/18	0.00	0.00	0.00
2/13/18	0.00	0.00	0.00
2/14/18	0.00	0.00	0.00
2/15/18	0.00	0.00	0.00
2/16/18	0.04	0.00	0.04
2/17/18	0.17	0.01	0.08
2/18/18	0.32	0.01	0.12
2/19/18	0.06	0.00	0.04
2/20/18	0.01	0.00	0.04
2/21/18	0.00	0.00	0.00
2/22/18	0.07	0.00	0.04
2/23/18	0.14	0.01	0.08
2/24/18	0.01	0.00	0.04
2/25/18	0.44	0.02	0.12
2/26/18	0.00	0.00	0.00
2/27/18	0.00	0.00	0.00
2/28/18	0.00	0.00	0.00
Total	3.68		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS

2018 DAILY RAINFALL DATA

USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
3/1/18	0.00	0.00	0.00
3/2/18	1.89	0.08	0.24
3/3/18	0.00	0.00	0.00
3/4/18	0.00	0.00	0.00
3/5/18	0.03	0.00	0.04
3/6/18	0.00	0.00	0.00
3/7/18	0.92	0.04	0.24
3/8/18	0.26	0.01	0.08
3/9/18	0.00	0.00	0.00
3/10/18	0.00	0.00	0.00
3/11/18	0.00	0.00	0.00
3/12/18	0.00	0.00	0.00
3/13/18	0.62	0.03	0.08
3/14/18	0.02	0.00	0.04
3/15/18	0.01	0.00	0.04
3/16/18	0.00	0.00	0.00
3/17/18	0.00	0.00	0.00
3/18/18	0.00	0.00	0.00
3/19/18	0.00	0.00	0.00
3/20/18	0.00	0.00	0.00
3/21/18	0.00	0.00	0.00
3/22/18	0.11	0.00	0.04
3/23/18	0.00	0.00	0.00
3/24/18	0.00	0.00	0.00
3/25/18	0.04	0.00	0.04
3/26/18	0.00	0.00	0.00
3/27/18	0.00	0.00	0.00
3/28/18	0.01	0.00	0.04
3/29/18	0.01	0.00	0.04
3/30/18	0.06	0.00	0.08
3/31/18	0.00	0.00	0.00
Total	3.98		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
4/1/18	0.00	0.00	0.00
4/2/18	0.07	0.00	0.04
4/3/18	0.42	0.02	0.16
4/4/18	0.20	0.01	0.12
4/5/18	0.01	0.00	0.04
4/6/18	0.21	0.01	0.12
4/7/18	0.04	0.00	0.04
4/8/18	0.00	0.00	0.00
4/9/18	0.00	0.00	0.00
4/10/18	0.00	0.00	0.00
4/11/18	0.00	0.00	0.00
4/12/18	0.07	0.00	0.08
4/13/18	0.00	0.00	0.00
4/14/18	0.00	0.00	0.00
4/15/18	0.07	0.00	0.08
4/16/18	1.99	0.08	0.56
4/17/18	0.00	0.00	0.00
4/18/18	0.00	0.00	0.00
4/19/18	0.21	0.01	0.16
4/20/18	0.00	0.00	0.00
4/21/18	0.00	0.00	0.00
4/22/18	0.00	0.00	0.00
4/23/18	0.00	0.00	0.00
4/24/18	0.00	0.00	0.00
4/25/18	1.05	0.04	0.48
4/26/18	0.25	0.01	0.20
4/27/18	0.88	0.04	0.96
4/28/18	0.00	0.00	0.00
4/29/18	0.06	0.00	0.04
4/30/18	0.15	0.01	0.08
Total	5.68		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
5/1/18	0.00	0.00	0.00
5/2/18	0.00	0.00	0.00
5/3/18	0.01	0.00	0.04
5/4/18	0.01	0.00	0.04
5/5/18	0.00	0.00	0.00
5/6/18	0.21	0.01	0.28
5/7/18	0.06	0.00	0.24
5/8/18	0.00	0.00	0.00
5/9/18	0.00	0.00	0.00
5/10/18	0.01	0.00	0.04
5/11/18	0.00	0.00	0.00
5/12/18	0.20	0.01	0.12
5/13/18	0.00	0.00	0.00
5/14/18	0.00	0.00	0.00
5/15/18	0.91	0.04	0.92
5/16/18	0.00	0.00	0.00
5/17/18	0.00	0.00	0.00
5/18/18	0.00	0.00	0.00
5/19/18	0.18	0.01	0.08
5/20/18	0.14	0.01	0.20
5/21/18	0.00	0.00	0.00
5/22/18	0.04	0.00	0.04
5/23/18	0.01	0.00	0.04
5/24/18	0.00	0.00	0.00
5/25/18	0.00	0.00	0.00
5/26/18	0.00	0.00	0.00
5/27/18	0.05	0.00	0.04
5/28/18	0.04	0.00	0.04
5/29/18	0.00	0.00	0.00
5/30/18	0.00	0.00	0.00
5/31/18	0.00	0.00	0.00
Total	1.87		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
6/1/18	0.00	0.00	0.00
6/2/18	0.03	0.00	0.08
6/3/18	0.00	0.00	0.00
6/4/18	0.49	0.02	0.20
6/5/18	0.45	0.02	0.96
6/6/18	0.00	0.00	0.00
6/7/18	0.00	0.00	0.00
6/8/18	0.00	0.00	0.00
6/9/18	0.00	0.00	0.00
6/10/18	0.00	0.00	0.00
6/11/18	0.00	0.00	0.00
6/12/18	0.00	0.00	0.00
6/13/18	0.02	0.00	0.08
6/14/18	0.00	0.00	0.00
6/15/18	0.00	0.00	0.00
6/16/18	0.00	0.00	0.00
6/17/18	0.00	0.00	0.00
6/18/18	0.14	0.01	0.20
6/19/18	0.00	0.00	0.00
6/20/18	0.00	0.00	0.00
6/21/18	0.00	0.00	0.00
6/22/18	0.00	0.00	0.00
6/23/18	0.00	0.00	0.00
6/24/18	0.54	0.02	0.80
6/25/18	0.63	0.03	1.64
6/26/18	0.00	0.00	0.00
6/27/18	0.04	0.00	0.08
6/28/18	1.42	0.06	1.36
6/29/18	0.00	0.00	0.00
6/30/18	0.00	0.00	0.00
Total	3.76		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
7/1/18	0.00	0.00	0.00
7/2/18	0.00	0.00	0.00
7/3/18	0.00	0.00	0.00
7/4/18	0.00	0.00	0.00
7/5/18	0.00	0.00	0.00
7/6/18	0.56	0.02	1.16
7/7/18	0.00	0.00	0.00
7/8/18	0.00	0.00	0.00
7/9/18	0.00	0.00	0.00
7/10/18	0.00	0.00	0.00
7/11/18	0.02	0.00	0.04
7/12/18	0.00	0.00	0.00
7/13/18	0.00	0.00	0.00
7/14/18	0.04	0.00	0.08
7/15/18	0.03	0.00	0.04
7/16/18	0.00	0.00	0.00
7/17/18	2.01	0.08	1.00
7/18/18	0.02	0.00	0.04
7/19/18	0.00	0.00	0.00
7/20/18	0.00	0.00	0.00
7/21/18	0.00	0.00	0.00
7/22/18	0.18	0.01	0.12
7/23/18	0.14	0.01	0.36
7/24/18	0.00	0.00	0.00
7/25/18	0.06	0.00	0.08
7/26/18	0.69	0.03	1.12
7/27/18	0.00	0.00	0.00
7/28/18	0.00	0.00	0.00
7/29/18	0.00	0.00	0.00
7/30/18	0.00	0.00	0.00
7/31/18	0.00	0.00	0.00
Total	3.75		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
8/1/18	0.00	0.00	0.00
8/2/18	0.01	0.00	0.04
8/3/18	0.00	0.00	0.00
8/4/18	0.45	0.02	0.52
8/5/18	0.00	0.00	0.00
8/6/18	0.00	0.00	0.00
8/7/18	0.00	0.00	0.00
8/8/18	0.27	0.01	0.24
8/9/18	0.20	0.01	0.24
8/10/18	0.00	0.00	0.00
8/11/18	1.07	0.04	1.16
8/12/18	0.79	0.03	0.92
8/13/18	0.32	0.01	0.36
8/14/18	0.77	0.03	1.68
8/15/18	0.00	0.00	0.00
8/16/18	0.00	0.00	0.00
8/17/18	0.09	0.00	0.32
8/18/18	0.14	0.01	0.16
8/19/18	0.03	0.00	0.08
8/20/18	0.01	0.00	0.04
8/21/18	0.00	0.00	0.00
8/22/18	0.51	0.02	0.96
8/23/18	0.00	0.00	0.00
8/24/18	0.00	0.00	0.00
8/25/18	0.00	0.00	0.00
8/26/18	0.00	0.00	0.00
8/27/18	0.00	0.00	0.00
8/28/18	0.00	0.00	0.00
8/29/18	0.00	0.00	0.00
8/30/18	0.00	0.00	0.00
8/31/18	0.00	0.00	0.00
Total	4.66		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
9/1/18	0.00	0.00	0.00
9/2/18	0.00	0.00	0.00
9/3/18	0.00	0.00	0.00
9/4/18	0.00	0.00	0.00
9/5/18	0.00	0.00	0.00
9/6/18	0.14	0.01	0.40
9/7/18	0.00	0.00	0.00
9/8/18	0.00	0.00	0.00
9/9/18	0.00	0.00	0.00
9/10/18	0.55	0.02	0.36
9/11/18	0.45	0.02	0.32
9/12/18	0.23	0.01	0.20
9/13/18	0.32	0.01	0.24
9/14/18	0.00	0.00	0.00
9/15/18	0.00	0.00	0.00
9/16/18	0.00	0.00	0.00
9/17/18	0.00	0.00	0.00
9/18/18	1.71	0.07	2.28
9/19/18	0.00	0.00	0.00
9/20/18	0.00	0.00	0.00
9/21/18	0.00	0.00	0.00
9/22/18	0.03	0.00	0.04
9/23/18	0.00	0.00	0.00
9/24/18	0.00	0.00	0.00
9/25/18	1.29	0.05	0.76
9/26/18	0.02	0.00	0.04
9/27/18	0.34	0.01	1.12
9/28/18	0.34	0.01	0.24
9/29/18	0.00	0.00	0.00
9/30/18	0.00	0.00	0.00
Total	5.42		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
10/1/18	0.06	0.00	0.04
10/2/18	0.31	0.01	0.16
10/3/18	0.26	0.01	0.20
10/4/18	0.00	0.00	0.00
10/5/18	0.00	0.00	0.00
10/6/18	0.00	0.00	0.00
10/7/18	0.08	0.00	0.08
10/8/18	0.02	0.00	0.04
10/9/18	0.00	0.00	0.00
10/10/18	0.00	0.00	0.00
10/11/18	0.65	0.03	0.52
10/12/18	0.03	0.00	0.04
10/13/18	0.11	0.00	0.08
10/14/18	0.00	0.00	0.00
10/15/18	0.03	0.00	0.04
10/16/18	0.07	0.00	0.08
10/17/18	0.00	0.00	0.00
10/18/18	0.02	0.00	0.04
10/19/18	0.00	0.00	0.00
10/20/18	0.00	0.00	0.00
10/21/18	0.00	0.00	0.00
10/22/18	0.00	0.00	0.00
10/23/18	0.26	0.01	0.60
10/24/18	0.02	0.00	0.04
10/25/18	0.00	0.00	0.00
10/26/18	0.00	0.00	0.00
10/27/18	1.09	0.05	0.24
10/28/18	0.06	0.00	0.04
10/29/18	0.81	0.03	1.00
10/30/18	0.52	0.02	1.16
10/31/18	0.00	0.00	0.00
Total	4.40		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND, CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
11/1/18	0.00	0.00	0.00
11/2/18	0.29	0.01	0.36
11/3/18	1.50	0.06	0.44
11/4/18	0.00	0.00	0.00
11/5/18	0.28	0.01	0.20
11/6/18	0.60	0.03	0.32
11/7/18	0.01	0.00	0.04
11/8/18	0.00	0.00	0.00
11/9/18	0.92	0.04	0.44
11/10/18	0.22	0.01	0.16
11/11/18	0.00	0.00	0.00
11/12/18	0.00	0.00	0.00
11/13/18	1.11	0.05	0.20
11/14/18	0.00	0.00	0.00
11/15/18	0.08	0.00	0.08
11/16/18	1.02	0.04	0.24
11/17/18	0.00	0.00	0.00
11/18/18	0.00	0.00	0.00
11/19/18	0.29	0.01	0.08
11/20/18	0.35	0.01	0.20
11/21/18	0.00	0.00	0.00
11/22/18	0.00	0.00	0.00
11/23/18	0.00	0.00	0.00
11/24/18	0.00	0.00	0.00
11/25/18	0.66	0.03	0.40
11/26/18	0.79	0.03	0.20
11/27/18	0.62	0.03	0.20
11/28/18	0.00	0.00	0.00
11/29/18	0.00	0.00	0.00
11/30/18	0.00	0.00	0.00
Total	8.74		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 USGS METER AT FRESHPOND CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
12/1/18	0.00	0.00	0.00
12/2/18	0.70	0.03	0.20
12/3/18	0.02	0.00	0.04
12/4/18	0.00	0.00	0.00
12/5/18	0.00	0.00	0.00
12/6/18	0.00	0.00	0.00
12/7/18	0.00	0.00	0.00
12/8/18	0.00	0.00	0.00
12/9/18	0.00	0.00	0.00
12/10/18	0.00	0.00	0.00
12/11/18	0.00	0.00	0.00
12/12/18	0.00	0.00	0.00
12/13/18	0.00	0.00	0.00
12/14/18	0.00	0.00	0.00
12/15/18	0.00	0.00	0.00
12/16/18	0.51	0.02	0.20
12/17/18	0.01	0.00	0.04
12/18/18	0.00	0.00	0.00
12/19/18	0.00	0.00	0.00
12/20/18	0.00	0.00	0.00
12/21/18	0.89	0.04	0.28
12/22/18	0.01	0.00	0.04
12/23/18	0.00	0.00	0.00
12/24/18	0.00	0.00	0.00
12/25/18	0.00	0.00	0.00
12/26/18	0.00	0.00	0.00
12/27/18	0.00	0.00	0.00
12/28/18	0.03	0.00	0.04
12/29/18	0.00	0.00	0.00
12/30/18	0.00	0.00	0.00
12/31/18	0.14	0.01	0.16
Total	2.31		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
1/1/18	0.00	0.00	0.00
1/2/18	0.00	0.00	0.00
1/3/18	0.00	0.00	0.00
1/4/18	0.00	0.00	0.00
1/5/18	0.00	0.00	0.00
1/6/18	0.00	0.00	0.00
1/7/18	0.00	0.00	0.00
1/8/18	0.11	0.00	0.04
1/9/18	0.09	0.00	0.04
1/10/18	0.03	0.00	0.04
1/11/18	0.08	0.00	0.04
1/12/18	0.59	0.02	0.44
1/13/18	0.87	0.04	0.60
1/14/18	0.00	0.00	0.00
1/15/18	0.00	0.00	0.00
1/16/18	0.00	0.00	0.00
1/18/18	0.18	0.01	0.04
1/18/18	0.00	0.00	0.00
1/19/18	0.00	0.00	0.00
1/20/18	0.00	0.00	0.00
1/21/18	0.00	0.00	0.00
1/22/18	0.09	0.00	0.04
1/23/18	1.08	0.05	0.60
1/24/18	0.00	0.00	0.00
1/25/18	0.00	0.00	0.00
1/26/18	0.00	0.00	0.00
1/27/18	0.00	0.00	0.00
1/28/18	0.03	0.00	0.04
1/29/18	0.00	0.00	0.00
1/30/18	0.02	0.00	0.04
1/31/18	0.00	0.00	0.00
Total	3.17		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
2/1/18	0.04	0.00	0.04
2/2/18	0.23	0.01	0.08
2/3/18	0.00	0.00	0.00
2/4/18	0.32	0.01	0.12
2/5/18	0.23	0.01	0.24
2/6/18	0.00	0.00	0.00
2/7/18	0.70	0.03	0.20
2/8/18	0.00	0.00	0.00
2/9/18	0.00	0.00	0.00
2/10/18	0.27	0.01	0.28
2/11/18	0.63	0.03	0.12
2/12/18	0.00	0.00	0.00
2/13/18	0.00	0.00	0.00
2/14/18	0.00	0.00	0.00
2/15/18	0.00	0.00	0.00
2/16/18	0.04	0.00	0.04
2/18/18	0.17	0.01	0.08
2/18/18	0.32	0.01	0.12
2/19/18	0.06	0.00	0.04
2/20/18	0.01	0.00	0.04
2/21/18	0.00	0.00	0.00
2/22/18	0.07	0.00	0.04
2/23/18	0.14	0.01	0.08
2/24/18	0.01	0.00	0.04
2/25/18	0.44	0.02	0.12
2/26/18	0.00	0.00	0.00
2/27/18	0.00	0.00	0.00
2/28/18	0.00	0.00	0.00
Total	3.68		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
3/1/18	0.00	0.00	0.00
3/2/18	1.89	0.08	0.24
3/3/18	0.00	0.00	0.00
3/4/18	0.00	0.00	0.00
3/5/18	0.03	0.00	0.04
3/6/18	0.00	0.00	0.00
3/7/18	0.92	0.04	0.24
3/8/18	0.26	0.01	0.08
3/9/18	0.00	0.00	0.00
3/10/18	0.00	0.00	0.00
3/11/18	0.00	0.00	0.00
3/12/18	0.00	0.00	0.00
3/13/18	0.62	0.03	0.08
3/14/18	0.02	0.00	0.04
3/15/18	0.01	0.00	0.04
3/16/18	0.00	0.00	0.00
3/18/18	0.00	0.00	0.00
3/18/18	0.00	0.00	0.00
3/19/18	0.00	0.00	0.00
3/20/18	0.00	0.00	0.00
3/21/18	0.00	0.00	0.00
3/22/18	0.11	0.00	0.04
3/23/18	0.00	0.00	0.00
3/24/18	0.00	0.00	0.00
3/25/18	0.04	0.00	0.04
3/26/18	0.00	0.00	0.00
3/27/18	0.00	0.00	0.00
3/28/18	0.01	0.00	0.04
3/29/18	0.01	0.00	0.04
3/30/18	0.06	0.00	0.08
3/31/18	0.00	0.00	0.00
Total	3.98		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
4/1/18	0.00	0.00	0.00
4/2/18	0.07	0.00	0.04
4/3/18	0.42	0.02	0.16
4/4/18	0.20	0.01	0.12
4/5/18	0.01	0.00	0.04
4/6/18	0.21	0.01	0.12
4/7/18	0.04	0.00	0.04
4/8/18	0.00	0.00	0.00
4/9/18	0.00	0.00	0.00
4/10/18	0.00	0.00	0.00
4/11/18	0.00	0.00	0.00
4/12/18	0.07	0.00	0.08
4/13/18	0.00	0.00	0.00
4/14/18	0.00	0.00	0.00
4/15/18	0.07	0.00	0.08
4/16/18	1.99	0.08	0.56
4/18/18	0.00	0.00	0.00
4/18/18	0.00	0.00	0.00
4/19/18	0.21	0.01	0.16
4/20/18	0.00	0.00	0.00
4/21/18	0.00	0.00	0.00
4/22/18	0.00	0.00	0.00
4/23/18	0.00	0.00	0.00
4/24/18	0.00	0.00	0.00
4/25/18	1.05	0.04	0.48
4/26/18	0.25	0.01	0.20
4/27/18	0.88	0.04	0.96
4/28/18	0.00	0.00	0.00
4/29/18	0.06	0.00	0.04
4/30/18	0.15	0.01	0.08
Total	5.68		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
5/1/18	0.00	0.00	0.00
5/2/18	0.00	0.00	0.00
5/3/18	0.01	0.00	0.04
5/4/18	0.01	0.00	0.04
5/5/18	0.00	0.00	0.00
5/6/18	0.21	0.01	0.28
5/7/18	0.06	0.00	0.24
5/8/18	0.00	0.00	0.00
5/9/18	0.00	0.00	0.00
5/10/18	0.01	0.00	0.04
5/11/18	0.00	0.00	0.00
5/12/18	0.20	0.01	0.12
5/13/18	0.00	0.00	0.00
5/14/18	0.00	0.00	0.00
5/15/18	0.91	0.04	0.92
5/16/18	0.00	0.00	0.00
5/18/18	0.00	0.00	0.00
5/18/18	0.00	0.00	0.00
5/19/18	0.18	0.01	0.08
5/20/18	0.14	0.01	0.20
5/21/18	0.00	0.00	0.00
5/22/18	0.04	0.00	0.04
5/23/18	0.01	0.00	0.04
5/24/18	0.00	0.00	0.00
5/25/18	0.00	0.00	0.00
5/26/18	0.00	0.00	0.00
5/27/18	0.05	0.00	0.04
5/28/18	0.04	0.00	0.04
5/29/18	0.00	0.00	0.00
5/30/18	0.00	0.00	0.00
5/31/18	0.00	0.00	0.00
Total	1.87		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
6/1/18	0.00	0.00	0.00
6/2/18	0.01	0.00	0.02
6/3/18	0.00	0.00	0.00
6/4/18	0.10	0.00	0.06
6/5/18	0.07	0.00	0.08
6/6/18	0.00	0.00	0.00
6/7/18	0.00	0.00	0.00
6/8/18	0.00	0.00	0.00
6/9/18	0.00	0.00	0.00
6/10/18	0.00	0.00	0.00
6/11/18	0.00	0.00	0.00
6/12/18	0.00	0.00	0.00
6/13/18	0.00	0.00	0.00
6/14/18	0.00	0.00	0.00
6/15/18	0.00	0.00	0.00
6/16/18	0.00	0.00	0.00
6/18/18	0.00	0.00	0.00
6/18/18	0.02	0.00	0.04
6/19/18	0.00	0.00	0.00
6/20/18	0.00	0.00	0.00
6/21/18	0.00	0.00	0.00
6/22/18	0.00	0.00	0.00
6/23/18	0.00	0.00	0.00
6/24/18	0.05	0.00	0.08
6/25/18	0.03	0.00	0.08
6/26/18	0.00	0.00	0.00
6/27/18	0.00	0.00	0.00
6/28/18	0.18	0.01	0.16
6/29/18	0.00	0.00	0.00
6/30/18	0.00	0.00	0.00
Total	0.45		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
7/1/18	0.00	0.00	0.00
7/2/18	0.00	0.00	0.00
7/3/18	0.05	0.00	0.09
7/4/18	0.00	0.00	0.00
7/5/18	0.00	0.00	0.00
7/6/18	0.16	0.01	0.21
7/7/18	0.00	0.00	0.00
7/8/18	0.00	0.00	0.00
7/9/18	0.00	0.00	0.00
7/10/18	0.00	0.00	0.00
7/11/18	0.01	0.00	0.02
7/12/18	0.00	0.00	0.00
7/13/18	0.00	0.00	0.00
7/14/18	0.03	0.00	0.04
7/15/18	0.00	0.00	0.01
7/16/18	0.00	0.00	0.00
7/17/18	0.67	0.03	0.39
7/18/18	0.01	0.00	0.01
7/19/18	0.00	0.00	0.00
7/20/18	0.00	0.00	0.00
7/21/18	0.00	0.00	0.00
7/22/18	0.15	0.01	0.12
7/23/18	0.02	0.00	0.03
7/24/18	0.00	0.00	0.00
7/25/18	0.05	0.00	0.13
7/26/18	0.21	0.01	0.45
7/27/18	0.00	0.00	0.01
7/28/18	0.00	0.00	0.00
7/29/18	0.00	0.00	0.00
7/30/18	0.00	0.00	0.00
7/31/18	0.00	0.00	0.00
Total	1.37		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

8/1/18	0.00	0.00	0.00
8/2/18	0.00	0.00	0.00
8/3/18	0.00	0.00	0.00
8/4/18	0.00	0.00	0.00
8/5/18	0.00	0.00	0.00
8/6/18	0.00	0.00	0.00
8/7/18	0.00	0.00	0.00
8/8/18	0.00	0.00	0.00
8/9/18	0.00	0.00	0.00
8/10/18	0.00	0.00	0.00
8/11/18	0.21	0.01	0.21
8/12/18	0.64	0.03	0.75
8/13/18	0.10	0.00	0.08
8/14/18	0.15	0.01	0.23
8/15/18	0.00	0.00	0.00
8/16/18	0.00	0.00	0.00
8/17/18	0.07	0.00	0.16
8/18/18	0.05	0.00	0.02
8/19/18	0.01	0.00	0.01
8/20/18	0.00	0.00	0.01
8/21/18	0.00	0.00	0.00
8/22/18	0.14	0.01	0.21
8/23/18	0.00	0.00	0.00
8/24/18	0.00	0.00	0.00
8/25/18	0.00	0.00	0.00
8/26/18	0.00	0.00	0.00
8/27/18	0.00	0.00	0.00
8/28/18	0.00	0.00	0.00
8/29/18	0.00	0.00	0.00
8/30/18	0.00	0.00	0.00
8/31/18	0.00	0.00	0.00
Total	1.37		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

9/1/18	0.00	0.00	0.00
9/2/18	0.00	0.00	0.00
9/3/18	0.00	0.00	0.00
9/4/18	0.00	0.00	0.00
9/5/18	0.00	0.00	0.00
9/6/18	0.02	0.00	0.02
9/7/18	0.00	0.00	0.01
9/8/18	0.00	0.00	0.00
9/9/18	0.00	0.00	0.00
9/10/18	0.27	0.01	0.16
9/11/18	0.19	0.01	0.06
9/12/18	0.07	0.00	0.05
9/13/18	0.13	0.01	0.14
9/14/18	0.00	0.00	0.00
9/15/18	0.00	0.00	0.00
9/16/18	0.00	0.00	0.00
9/17/18	0.00	0.00	0.00
9/18/18	0.54	0.02	0.73
9/19/18	0.00	0.00	0.00
9/20/18	0.00	0.00	0.00
9/21/18	0.00	0.00	0.01
9/22/18	0.01	0.00	0.02
9/23/18	0.00	0.00	0.00
9/24/18	0.00	0.00	0.00
9/25/18	0.51	0.02	0.31
9/26/18	0.06	0.00	0.15
9/27/18	0.03	0.00	0.04
9/28/18	0.11	0.00	0.07
9/29/18	0.00	0.00	0.00
9/30/18	0.00	0.00	0.00
Total	1.95		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

10/1/18	0.02	0.00	0.01
10/2/18	0.10	0.00	0.04
10/3/18	0.10	0.00	0.07
10/4/18	0.00	0.00	0.00
10/5/18	0.00	0.00	0.00
10/6/18	0.00	0.00	0.00
10/7/18	0.03	0.00	0.02
10/8/18	0.00	0.00	0.01
10/9/18	0.00	0.00	0.00
10/10/18	0.00	0.00	0.00
10/11/18	0.21	0.01	0.12
10/12/18	0.01	0.00	0.01
10/13/18	0.04	0.00	0.02
10/14/18	0.00	0.00	0.00
10/15/18	0.00	0.00	0.01
10/16/18	0.06	0.00	0.09
10/17/18	0.00	0.00	0.00
10/18/18	0.00	0.00	0.01
10/19/18	0.00	0.00	0.00
10/20/18	0.00	0.00	0.00
10/21/18	0.00	0.00	0.01
10/22/18	0.00	0.00	0.00
10/23/18	0.09	0.00	0.11
10/24/18	0.01	0.00	0.01
10/25/18	0.00	0.00	0.00
10/26/18	0.00	0.00	0.00
10/27/18	0.52	0.02	0.12
10/28/18	0.02	0.00	0.01
10/29/18	0.22	0.01	0.16
10/30/18	0.00	0.00	0.00
10/31/18	0.00	0.00	0.00
Total	1.45		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

11/1/18	0.00	0.00	0.00
11/2/18	0.13	0.01	0.14
11/3/18	0.53	0.02	0.18
11/4/18	0.00	0.00	0.00
11/5/18	0.13	0.01	0.07
11/6/18	0.24	0.01	0.10
11/7/18	0.00	0.00	0.00
11/8/18	0.00	0.00	0.00
11/9/18	0.41	0.02	0.16
11/10/18	0.12	0.00	0.06
11/11/18	0.00	0.00	0.00
11/12/18	0.00	0.00	0.00
11/13/18	0.39	0.02	0.08
11/14/18	0.00	0.00	0.00
11/15/18	0.00	0.00	0.00
11/16/18	0.40	0.02	0.16
11/17/18	0.00	0.00	0.00
11/18/18	0.00	0.00	0.00
11/19/18	0.09	0.00	0.02
11/20/18	0.14	0.01	0.04
11/21/18	0.00	0.00	0.00
11/22/18	0.00	0.00	0.00
11/23/18	0.00	0.00	0.00
11/24/18	0.00	0.00	0.00
11/25/18	0.66	0.03	0.40
11/26/18	0.79	0.03	0.20
11/27/18	0.62	0.03	0.20
11/28/18	0.00	0.00	0.00
11/29/18	0.00	0.00	0.00
11/30/18	0.00	0.00	0.00
Total	4.65		

CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS
 2018 DAILY RAINFALL DATA
 COMPOSITE FRESH POND (1.1.2018-5.30.2018, 11.21.2018-12-31.2018) & DPW
 RAINFALL GAUGE (6.1.2018-11.20.2018), CAMBRIDGE, MA

Date	Daily Rainfall (in.)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
12/1/18	0.00	0.00	0.00
12/2/18	0.70	0.03	0.20
12/3/18	0.02	0.00	0.04
12/4/18	0.00	0.00	0.00
12/5/18	0.00	0.00	0.00
12/6/18	0.00	0.00	0.00
12/7/18	0.00	0.00	0.00
12/8/18	0.00	0.00	0.00
12/9/18	0.00	0.00	0.00
12/10/18	0.00	0.00	0.00
12/11/18	0.00	0.00	0.00
12/12/18	0.00	0.00	0.00
12/13/18	0.00	0.00	0.00
12/14/18	0.00	0.00	0.00
12/15/18	0.00	0.00	0.00
12/16/18	0.51	0.02	0.20
12/17/18	0.01	0.00	0.04
12/18/18	0.00	0.00	0.00
12/19/18	0.00	0.00	0.00
12/20/18	0.00	0.00	0.00
12/21/18	0.89	0.04	0.28
12/22/18	0.01	0.00	0.04
12/23/18	0.00	0.00	0.00
12/24/18	0.00	0.00	0.00
12/25/18	0.00	0.00	0.00
12/26/18	0.00	0.00	0.00
12/27/18	0.00	0.00	0.00
12/28/18	0.03	0.00	0.04
12/29/18	0.00	0.00	0.00
12/30/18	0.00	0.00	0.00
12/31/18	0.14	0.01	0.16
Total	2.31		

APPENDIX II

MONTHLY CSO VOLUMES

January 2018 Daily Rainfall and Combined Sewer Overflows

		Alewife Brook					Charles River		
January	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook Pkwy	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
1/1	N/A	0.000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000
1/2	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/3	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/4	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/5	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/6	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/7	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/8	N/A	0.110	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/9	N/A	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/10	N/A	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/11	N/A	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/12	N/A	0.590	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/13	N/A	0.870	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/14	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/15	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/16	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/17	N/A	0.180	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/18	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/19	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/20	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/21	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/22	N/A	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/23	N/A	1.080	0.000	0.000	0.060	0.000	0.000	0.000	0.000
1/24	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/25	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/26	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/27	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/28	N/A	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/29	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/30	N/A	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1/31	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	N/A	3.170	0.000	0.000	0.060	0.000	0.000	0.000	0.000

April 2018 Daily Rainfall and Combined Sewer Overflows

			Alewife Brook				Charles River		
April	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook Pkwy	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
4/1	2.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/2	0.000	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/3	0.000	0.420	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/4	0.970	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/5	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/6	1.210	0.210	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/7	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/12	0.040	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/15	0.000	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/16	0.000	1.990	0.000	0.000	0.030	0.000	0.000	0.000	0.000
4/17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/19	0.000	0.210	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/21	0.580	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/22	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/25	1.020	1.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/26	0.700	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/27	0.000	0.880	0.000	0.000	0.211	0.000	0.058	0.000	0.000
4/28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/29	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/30	0.000	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	6.830	5.680	0.000	0.000	0.211	0.000	0.058	0.000	0.000

May 2018 Daily Rainfall and Combined Sewer Overflows

			Alewife Brook				Charles River		
May	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook Pkwy	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
5/1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/2	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/3	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/4	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/5	0.830	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/6	0.120	0.210	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/7	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/10	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/12	0.030	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/14	1.190	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/15	0.200	0.910	0.000	0.000	0.177	0.000	0.000	0.000	0.000
5/16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/19	0.190	0.180	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/20	0.000	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/22	0.130	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/23	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/25	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/26	1.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/27	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/28	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/29	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5/31	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	4.470	1.870	0.000	0.000	0.177	0.000	0.000	0.000	0.000

June 2018 Daily Rainfall and Combined Sewer Overflows

		Alewife Brook					Charles River		
June	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook Pkwy	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
6/1	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/2	0.060	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/4	0.690	0.490	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/5	0.410	0.450	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/13	0.010	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/18	0.120	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/24	0.347	0.540	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/25	0.343	0.630	0.000	0.000	0.147	0.000	0.030	0.000	0.000
6/26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/27	0.047	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6/28	1.273	1.420	0.000	0.100	0.353	0.000	0.000	0.000	0.000
6/29	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.000	0.000
6/30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	3.309	0.170	0.000	0.100	0.500	0.000	0.120	0.000	0.000

July 2018 Daily Rainfall and Combined Sewer Overflows

			Alewife Brook				Charles River		
July	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook Pkwy	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
7/1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/3	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/6	0.490	0.560	0.000	0.000	0.126	0.000	0.000	0.000	0.000
7/7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/11	0.040	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/14	0.080	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/15	0.010	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/17	2.010	2.010	0.000	0.380	0.959	0.020	0.524	0.000	1.210
7/18	0.020	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/22	0.450	0.180	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/23	0.070	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/25	0.150	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/26	0.640	0.690	0.000	0.000	0.080	0.000	0.000	0.000	0.000
7/27	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7/31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	4.120	3.750	0.000	0.380	1.085	0.020	0.524	0.000	1.210

August 2018 Daily Rainfall and Combined Sewer Overflows

			Alewife Brook				Charles River		
August	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook Pkwy	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
8/1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/2	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/4	0.000	0.450	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/8	0.000	0.270	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/9	0.000	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/11	0.630	1.070	0.000	0.270	0.670	0.016	0.126	0.000	0.000
8/12	1.908	0.790	0.000	0.000	0.000	0.000	0.013	0.005	1.420
8/13	0.302	0.320	0.000	0.000	0.000	0.000	0.030	0.000	0.000
8/14	0.460	0.770	0.000	0.000	0.090	0.000	0.000	0.000	0.000
8/15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/17	0.220	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/18	0.147	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/19	0.022	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/20	0.012	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/22	0.410	0.510	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8/31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	4.110	4.660	0.000	0.270	0.760	0.016	0.169	0.005	1.420

September 2018 Daily Rainfall and Combined Sewer Overflows

			Alewife Brook				Charles River		
September	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook Pkwy	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
9/1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/6	0.070	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/7	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/10	0.798	0.550	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/11	0.582	0.450	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/12	0.200	0.230	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/13	0.400	0.320	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/18	1.610	1.710	0.016	0.660	1.340	0.141	1.118	0.048	0.090
9/19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/21	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/22	0.030	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/23	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/24	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/25	1.527	1.290	0.000	0.000	0.080	0.000	0.000	0.000	0.000
9/26	0.190	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/27	0.103	0.340	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/28	0.330	0.340	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/29	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	5.860	5.420	0.016	0.660	1.420	0.141	1.118	0.048	0.090

October 2018 Daily Rainfall and Combined Sewer Overflows

			Alewife Brook				Charles River		
October	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook Pkwy	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
10/1	0.070	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/2	0.310	0.310	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/3	0.300	0.260	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/7	0.080	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/8	0.010	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/11	0.640	0.650	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/12	0.020	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/13	0.110	0.110	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/15	0.010	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/16	0.170	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/18	0.010	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/19	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/21	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/23	0.260	0.260	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/24	0.040	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/26	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/27	1.570	1.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/28	0.060	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10/29	0.670	0.810	0.000	0.070	0.210	0.000	0.000	0.000	0.000
10/30	0.000	0.520	0.000	0.000	0.100	0.000	0.000	0.000	0.000
10/31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	4.340	4.400	0.000	0.070	0.310	0.000	0.000	0.000	0.000

November 2018 Daily Rainfall and Combined Sewer Overflows

		Alewife Brook					Charles River		
November	Rain Gauges		CAM001	CAM002	CAM401A	CAM401B	CAM005	CAM007	CAM017
	Cambridge DPW	USGS Fresh Pond	Foch St. @Alewife Brook Pkwy.	Mass Ave. @ Alewife Brook	Sherman St. @ B&M Railroad	Mass Ave./Columbus Ave. @ Alewife Brook Pkwy	Lowell St. @ Mt. Auburn St.	Memorial Dr. @ Hawthorne St.	Edwin Land Blvd. @ Binney St.
	(in)	(in)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
11/1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/2	0.385	0.290	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/3	1.595	1.500	0.000	0.000	0.050	0.000	0.000	0.000	0.000
11/4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/5	0.397	0.280	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/6	0.723	0.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/7	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/9	1.216	0.920	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/10	0.354	0.220	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/13	1.180	1.110	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/15	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/16	1.190	1.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/19	0.270	0.290	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/20	0.430	0.350	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/21	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/22	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/23	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/24	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/25	N/A	0.660	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/26	N/A	0.790	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/27	N/A	0.620	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/28	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/29	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/30	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	7.740	8.740	0.000	0.000	0.050	0.000	0.000	0.000	0.000

APPENDIX III
CSO NOTIFICATIONS



Alert: CSO Activation in Alewife Brook

**TO: Patrick Herron, Executive Director, Mystic River Watershed Association
Sam Lipson, Director, Environmental Health Unit, Cambridge Dept. of Public Health
Christine Connolly Bongiorno, Director, Arlington Department of Public Health
Angela Braun, Director, Belmont Department of Public Health
Kevin Brander, Department of Environmental Protection
Todd Borci, United States Environmental Protection Agency
William Walsh-Rogalski, United States Environmental Protection Agency**

FROM: James Wilcox, Cambridge DPW

CC: City of Somerville - Richard Willette, DPW Director of Operations; Vital Deshpande, Env. Coord.

**Friends of Alewife Reservation – Ellen Mass
MWRA – Ria Convery, David Parker, David Wu, Nicole Johnson, Wenley Jiang, Wendy Leo, Maret Smolow, Nadine Smoske, Mark Sullivan
Representative Denise Provost
Mystic River Watershed Association – Beth MacBlane, Kim Provo
Town of Arlington – Michael Rademacher, DPW Director
Town of Belmont – Glenn Clancy, Director Department of Community Development
City of Cambridge Department of Public Works – Owen O’Riordan, Kathy Watkins, James Wilcox,
Catherine Daly Woodbury, Jeya Niranan, Brian McLane, Rebecca Fuentes, Wendy Robinson, Kelly Dunn, Dan Riviello, Mike Abcunas, Catherine Mitrano**

RE: Notice Alert: CSO Activation in Alewife Brook

DATE: April 16, 2018

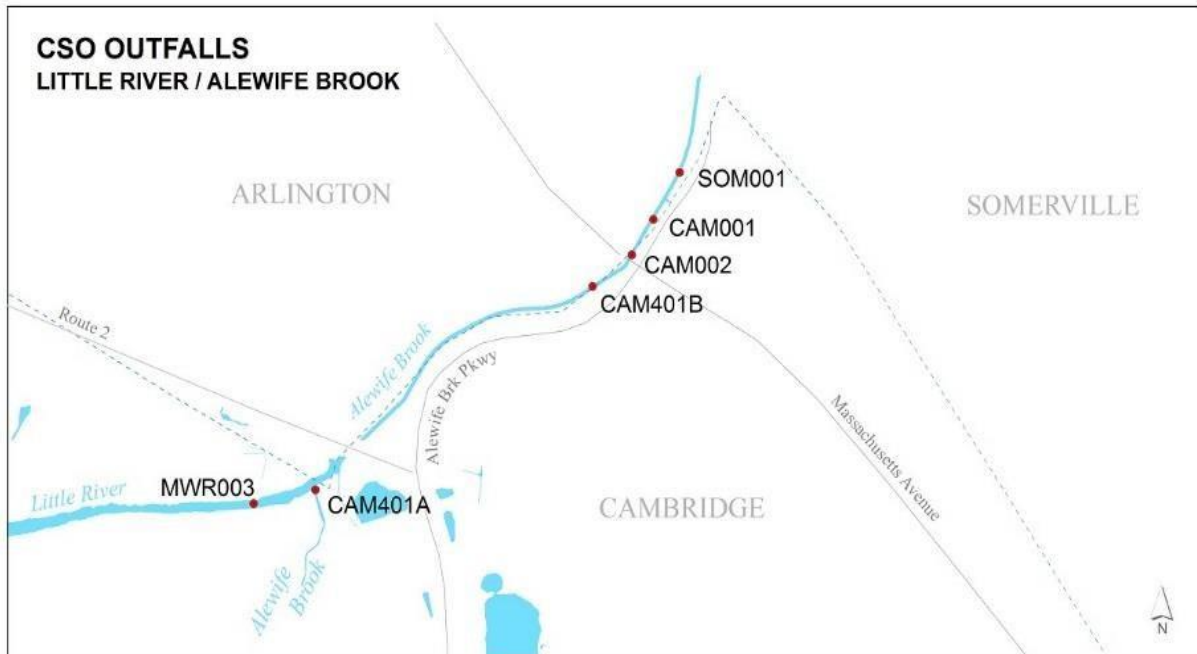
In accordance with the conditions of the Department of Environmental Protection's (DEP) Alewife Brook/Upper Mystic River Variance we are hereby notifying you that a Combined Sewer Overflow (CSO) occurred at CAM401B on April 16, 2018 at 4:40pm and discharged into the Alewife Brook. The Variance approved workplan requires the Cambridge Department of Public Works (DPW) to notify local health agents, DEP, EPA and MRWA within 12 hours of when a CSO event occurs. It was determined that CAM002 was the most active outfall and would be the most suitable indicator of CSO activity along the Alewife Brook. This notification does not reflect the absence of any activation at other sites. Rather, the notice is intended to be confirmation to users of the resource that untreated sewage discharges to the Brook/River have occurred.

The water quality in Alewife Brook is often impaired due to bacterial and other pollutants from a number of sources, including stormwater runoff, CSOs and cross connections between sanitary sewers and stormwater drains. Water quality in the brook during both wet and dry weather generally fails to meet state bacteria standards for fishing and swimming. Contaminant sources originate in the watershed communities of Belmont, Arlington, Cambridge and Somerville, all of which are undertaking programs to identify and control the sources of pollution to the brook.

Portions of Cambridge and Somerville are served by combined stormwater and sanitary sewer systems, common in older cities. There are six CSO outfalls on Alewife Brook (see the attached map for locations) which discharge untreated CSO (a mixture of wastewater and stormwater) during moderate and heavy rainfall to relieve the system and prevent sewer backups into homes, businesses, and streets. In addition,

bordering communities also have separate drainage pipes that collect stormwater runoff and carry it to the brook. Discharges from CSOs and from separate stormwater pipes include bacteria and other pathogens, oxygen-demanding pollutants, solids and other contaminants. Public health officials recommend avoiding contact with the brook during and for 48 hours following rain storms, as there may be increased health risks during these periods. Contact with floodwaters should also be avoided as they may contain similar contaminants and pose associated health risks. Clean up information following a flood is available on the MA Department of Environmental Protection web site at: <http://www.mass.gov/dep/floodcleanup.htm> For real-time water data at Fresh Pond Reservoir, you can view the United States Geological Survey National Water System website at: <http://waterdata.usgs.gov/ma/nwis> Please contact Catherine Daly Woodbury at 617-349-4818 or James Wilcox at 617-349-6426 if you have any questions.

CSO Outfalls along the Little River/Alewife Brook





Notice Alert: CSO Activation in Alewife Brook

**TO: Patrick Herron, Executive Director, Mystic River Watershed Association
Sam Lipson, Director, Environmental Health Unit, Cambridge Dept. of Public Health
Christine Connolly Bongiorno, Director, Arlington Department of Public Health
Angela Braun, Director, Belmont Department of Public Health
Kevin Brander, Department of Environmental Protection
Todd Borci, United States Environmental Protection Agency
William Walsh-Rogalski, United States Environmental Protection Agency**

FROM: James Wilcox, Cambridge DPW

CC: City of Somerville - Richard Willette, DPW Director of Operations; Vithal Deshpande, Env. Coord.

**Friends of Alewife Reservation – Ellen Mass
MWRA – Ria Convery, David Parker, David Wu, Nicole Johnson, Wenley Jiang, Wendy Leo, Maret
Smolow, Nadine Smoske, Mark Sullivan
Representative Denise Provost
Mystic River Watershed Association – Beth MacBlane, Kim Provo
Town of Arlington – Michael Rademacher, DPW Director
Town of Belmont – Glenn Clancy, Director Department of Community Development
City of Cambridge Department of Public Works – Owen O’Riordan, Kathy Watkins, James Wilcox,
Catherine Daly Woodbury, Jeya Niranjana, Brian McLane, Rebecca Fuentes, Kate Riley, Wendy Robinson, Dan Riviello, Mike Abcunas, Catherine Mitrano**

RE: Notice Alert: CSO Activation in Alewife Brook

DATE: September 18, 2018

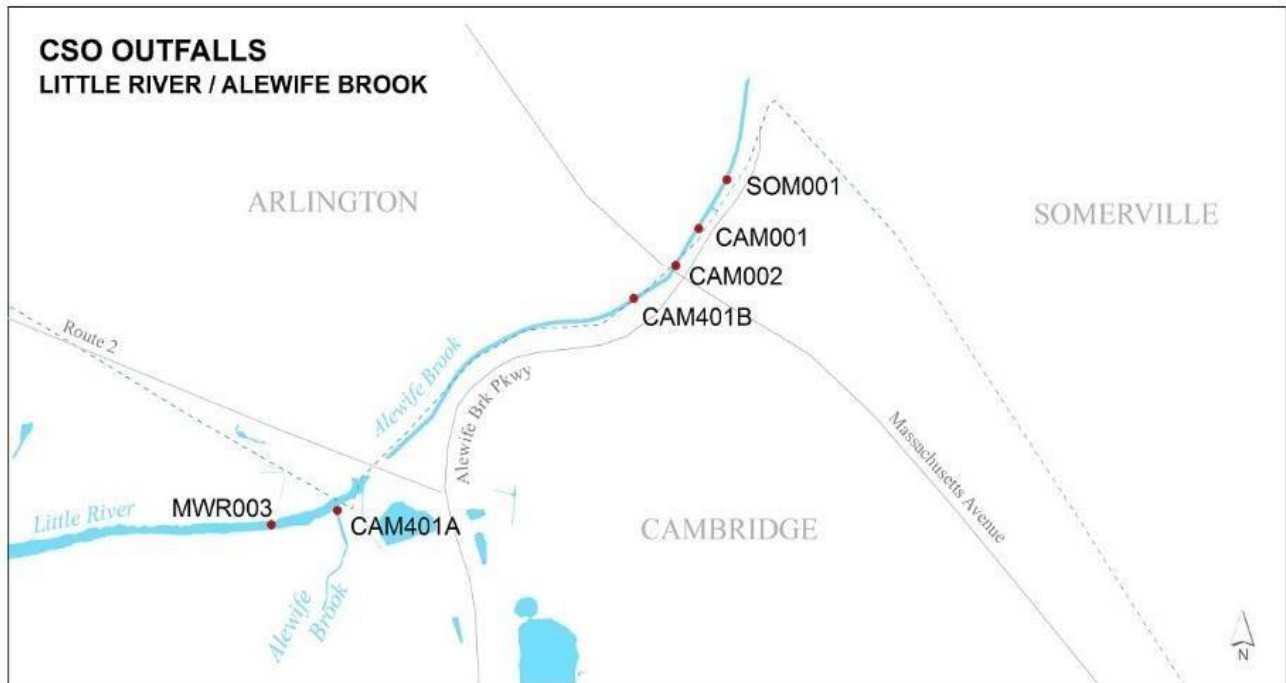
In accordance with the conditions of the Department of Environmental Protection's (DEP) Alewife Brook/Upper Mystic River Variance we are hereby notifying you that a Combined Sewer Overflow (CSO) occurred at CAM002 on September 18, 2018 and discharged into the Alewife Brook. The Variance approved workplan requires the Cambridge Department of Public Works (DPW) to notify local health agents, DEP, EPA and MRWA within 24 hours of when a CSO event occurs. It was determined that CAM002 was the most active outfall and would be the most suitable indicator of CSO activity along the Alewife Brook. This notification does not reflect the absence of any activation at other sites. Rather, the notice is intended to be confirmation to users of the resource that untreated sewage discharges to the Brook/River have occurred.

The water quality in Alewife Brook is often impaired due to bacterial and other pollutants from a number of sources, including stormwater runoff, CSOs and cross connections between sanitary sewers and stormwater drains. Water quality in the brook during both wet and dry weather generally fails to meet state bacteria standards for fishing and swimming. Contaminant sources originate in the watershed communities of Belmont, Arlington, Cambridge and Somerville, all of which are undertaking programs to identify and control the sources of pollution to the brook.

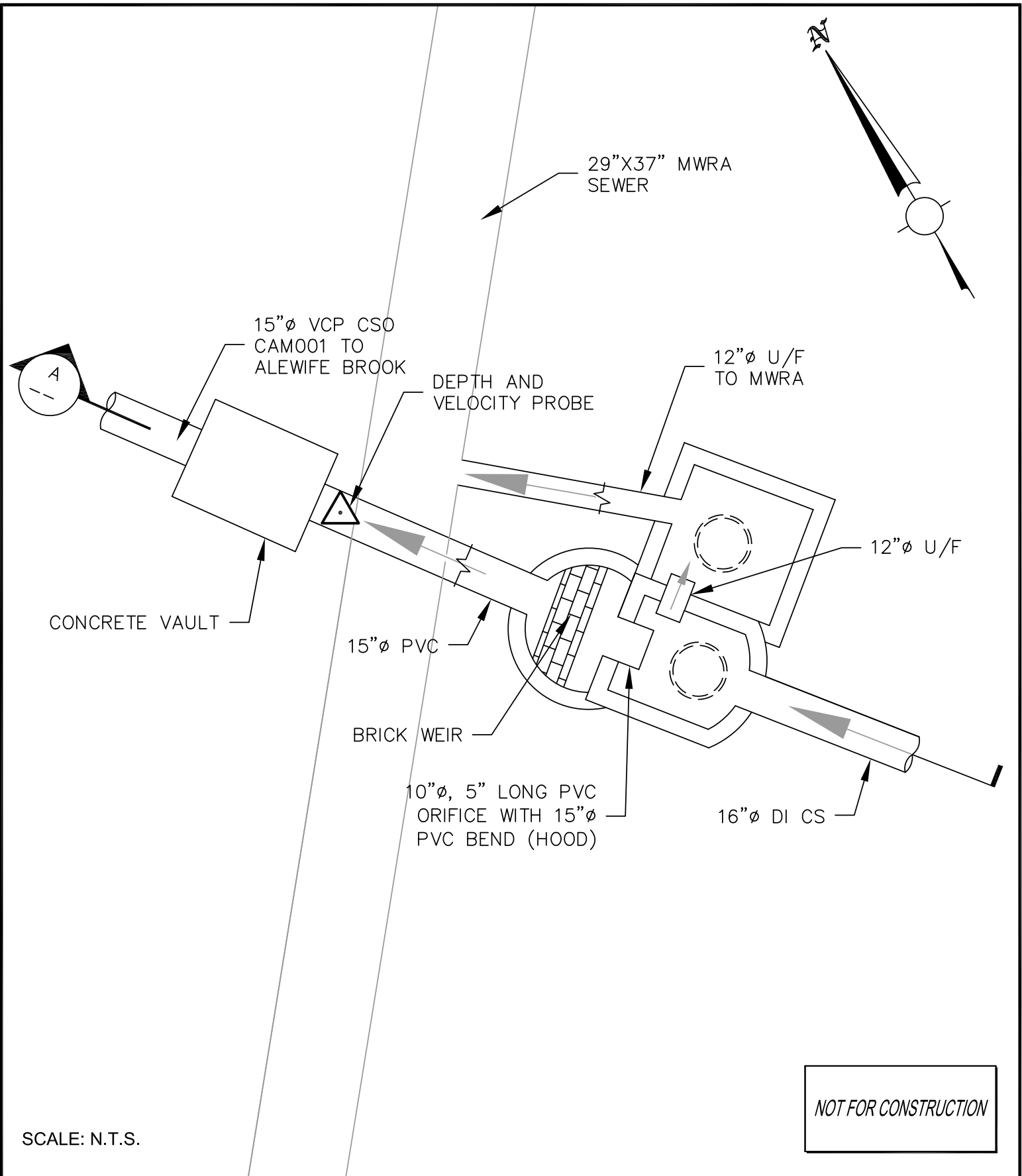
Portions of Cambridge and Somerville are served by combined stormwater and sanitary sewer systems, common in older cities. There are six CSO outfalls on Alewife Brook (see the attached map for locations) which discharge untreated CSO (a mixture of wastewater and stormwater) during moderate and heavy rainfall to relieve the system and prevent sewer backups into homes, businesses, and streets. In addition,

bordering communities also have separate drainage pipes that collect stormwater runoff and carry it to the brook. Discharges from CSOs and from separate stormwater pipes include bacteria and other pathogens, oxygen-demanding pollutants, solids and other contaminants. Public health officials recommend avoiding contact with the brook during and for 48 hours following rain storms, as there may be increased health risks during these periods. Contact with floodwaters should also be avoided as they may contain similar contaminants and pose associated health risks. Clean up information following a flood is available on the MA Department of Environmental Protection web site at: <http://www.mass.gov/dep/floodcleanup.htm> For real-time water data at Fresh Pond Reservoir, you can view the United States Geological Survey National Water System website at: <http://waterdata.usgs.gov/ma/nwis> Please contact Catherine Daly Woodbury at 617-349-4818 or James Wilcox at 617-349-6426 if you have any questions.

CSO Outfalls along the Little River/Alewife Brook



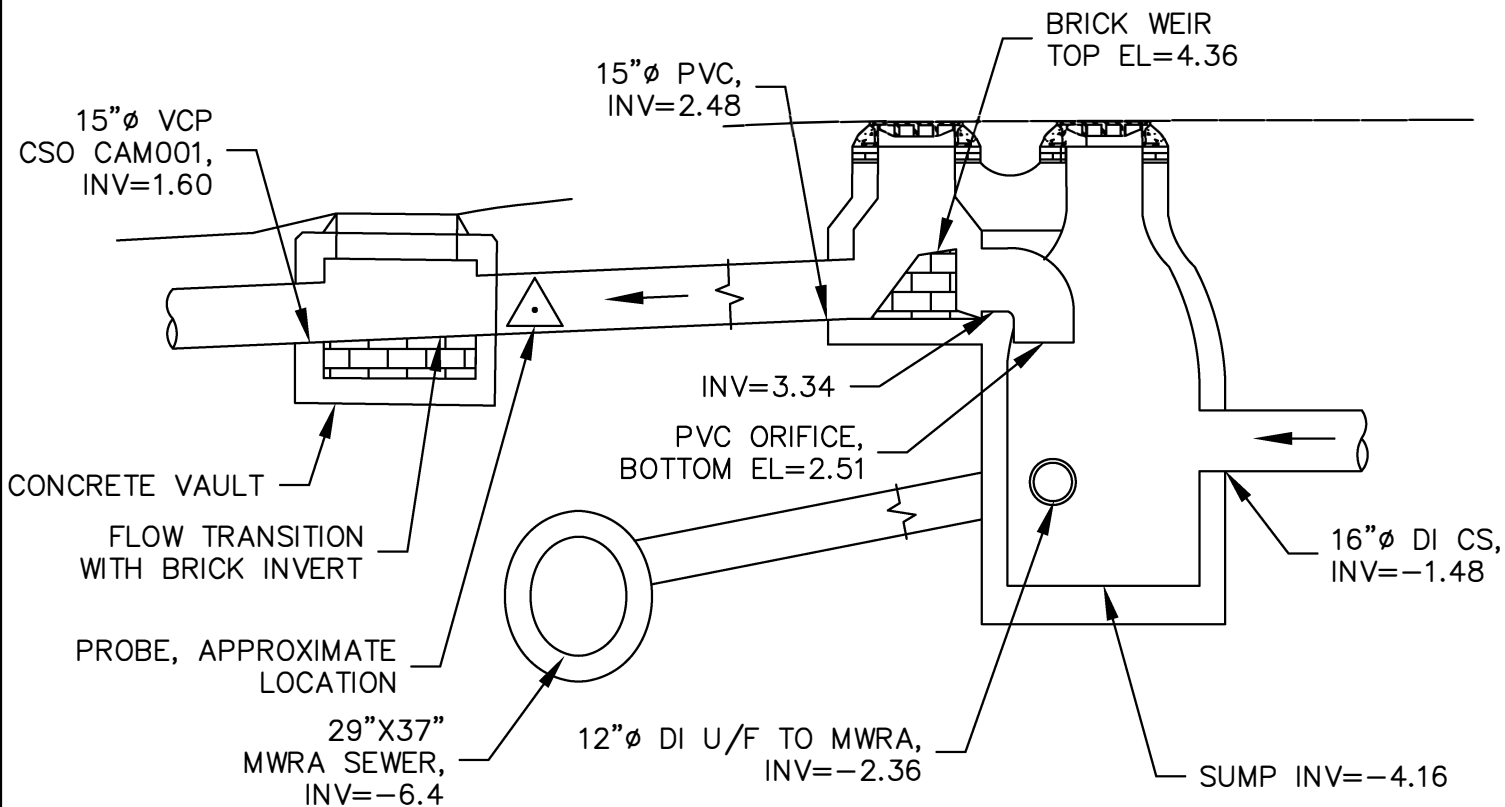
APPENDIX IV
CSO Regulator Structure Profiles



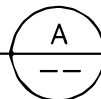
SCALE: N.T.S.

NOT FOR CONSTRUCTION

CSO REGULATOR STRUCTURE CAM001 PLAN



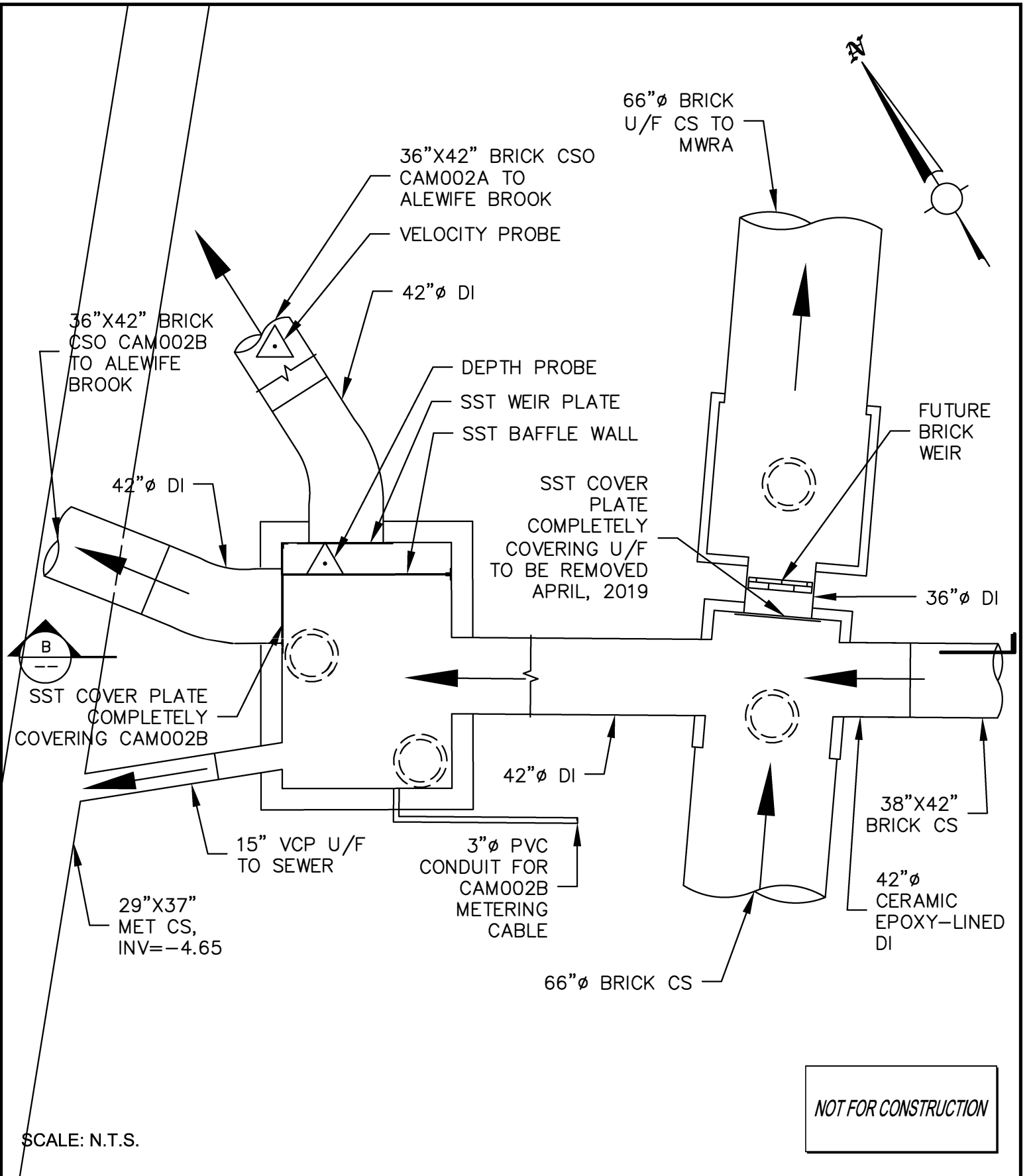
SECTION



NOT FOR CONSTRUCTION

SCALE: N.T.S.

CSO REGULATOR STRUCTURE
CAM001 PROFILE



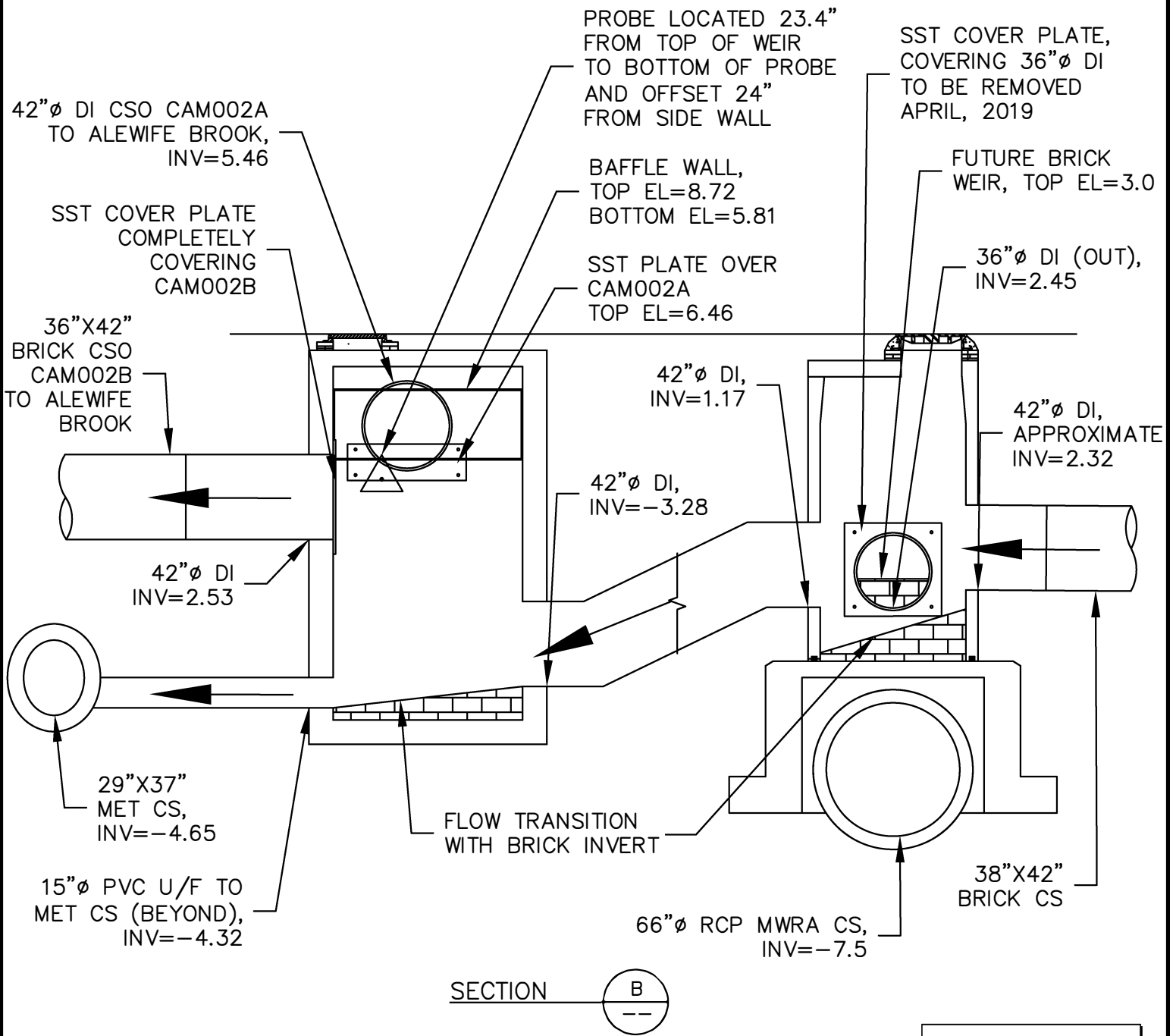
NOT FOR CONSTRUCTION

SCALE: N.T.S.

CSO REGULATOR STRUCTURE CAM002 PLAN

NOTES:

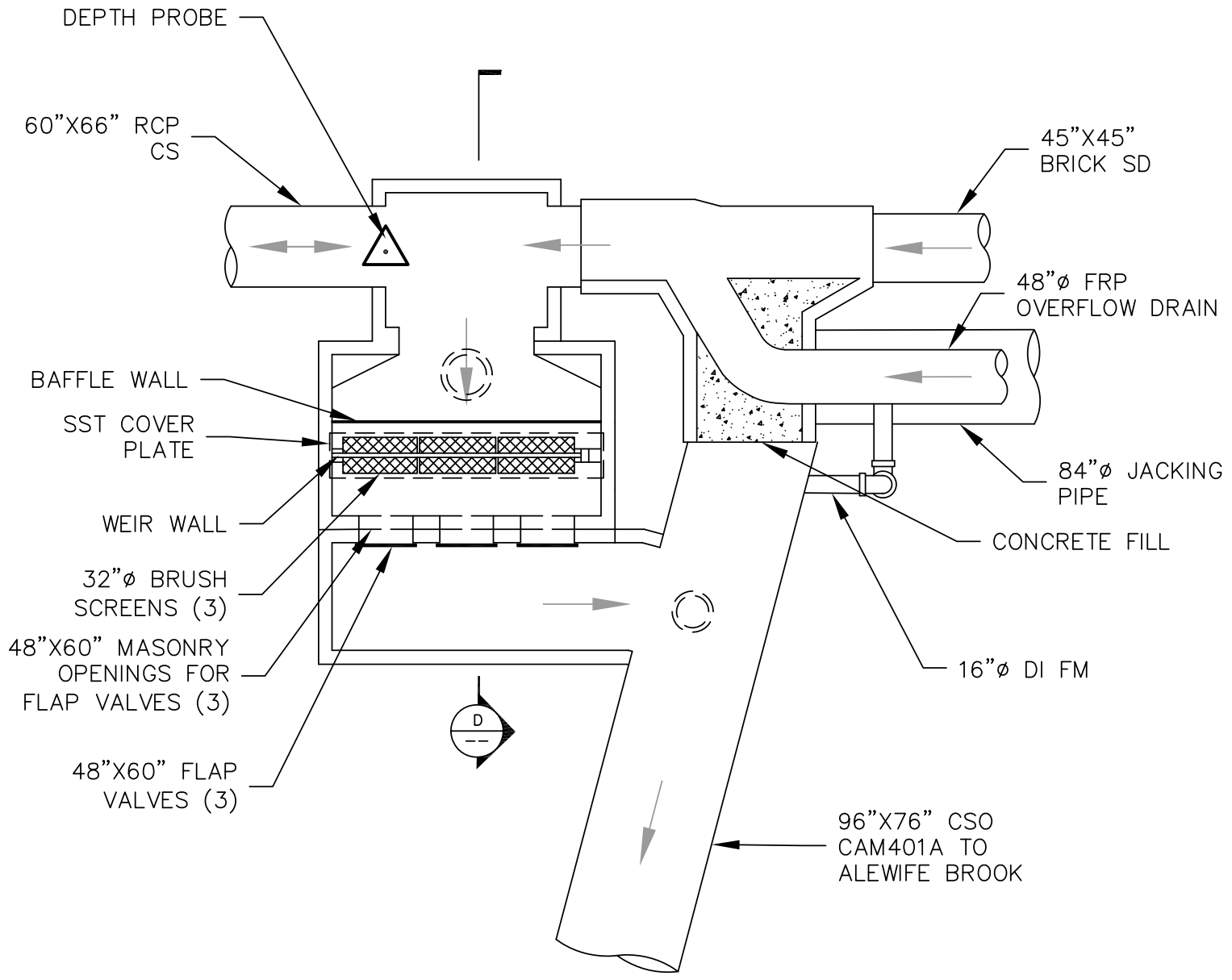
- 1) VELOCITY PROBE IN CAM002A, APPROXIMATELY LOCATED AT PIPE BOTTOM 13' DOWNSTREAM FROM WEIR



NOT FOR CONSTRUCTION

SCALE: N.T.S.

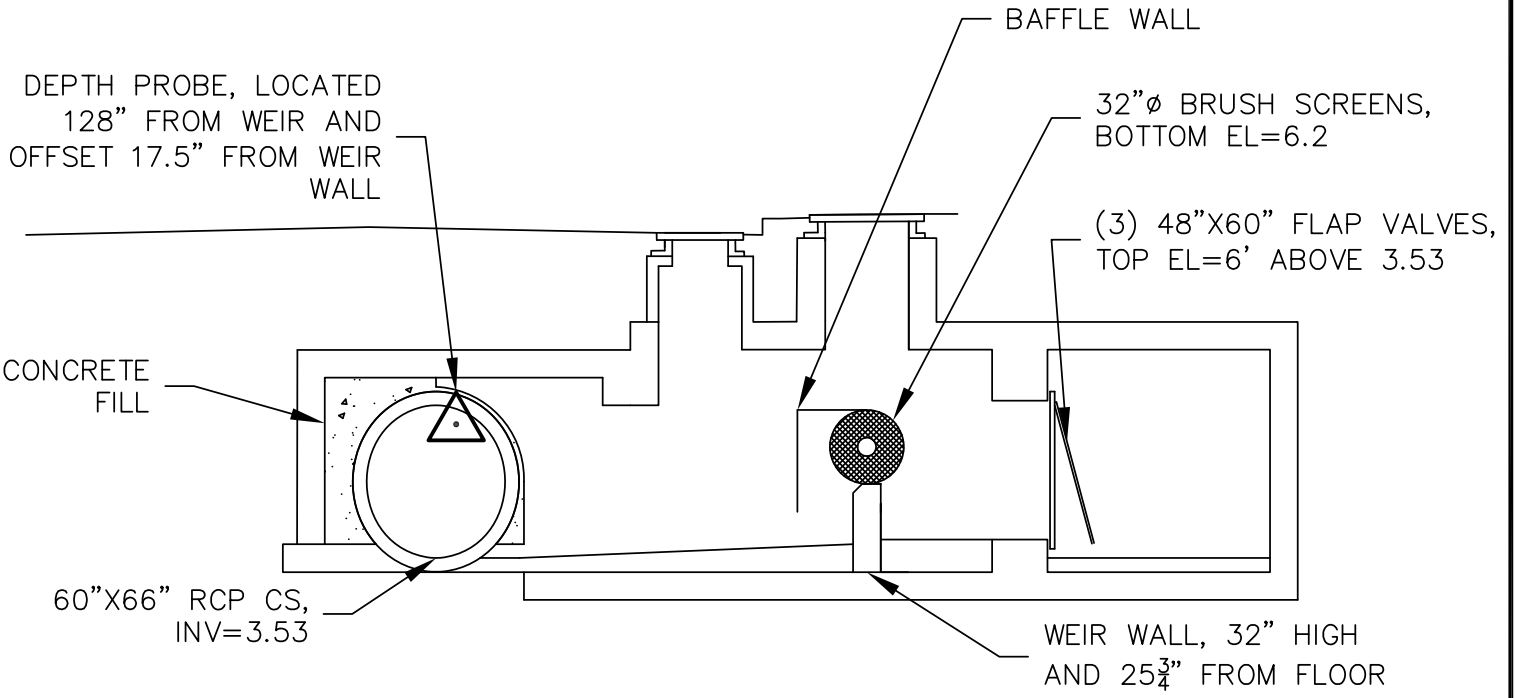
**CSO REGULATOR STRUCTURE
CAM002 PROFILE**



SCALE: N.T.S.

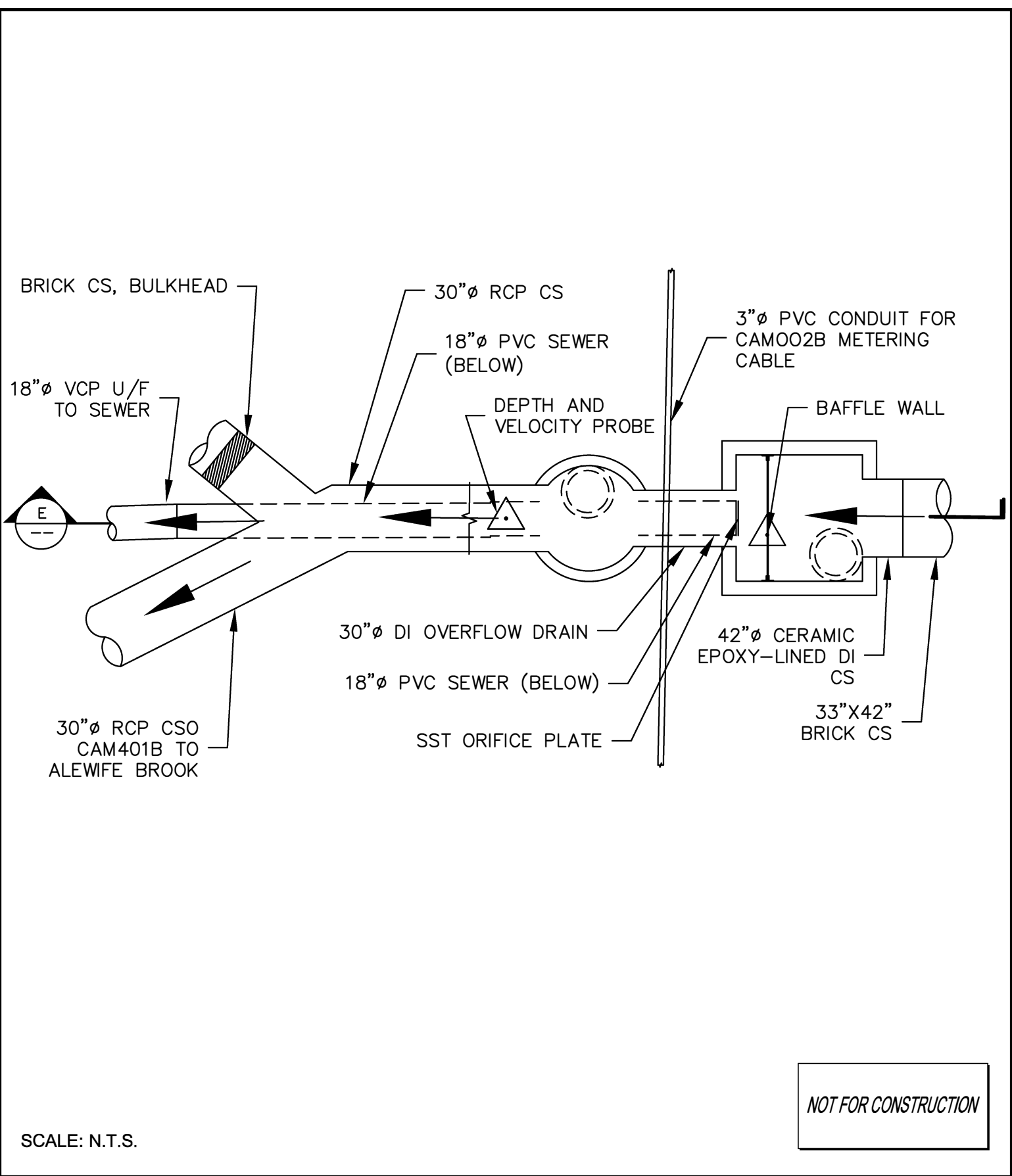
NOT FOR CONSTRUCTION

CSO REGULATOR STRUCTURE
CAM0401A PLAN

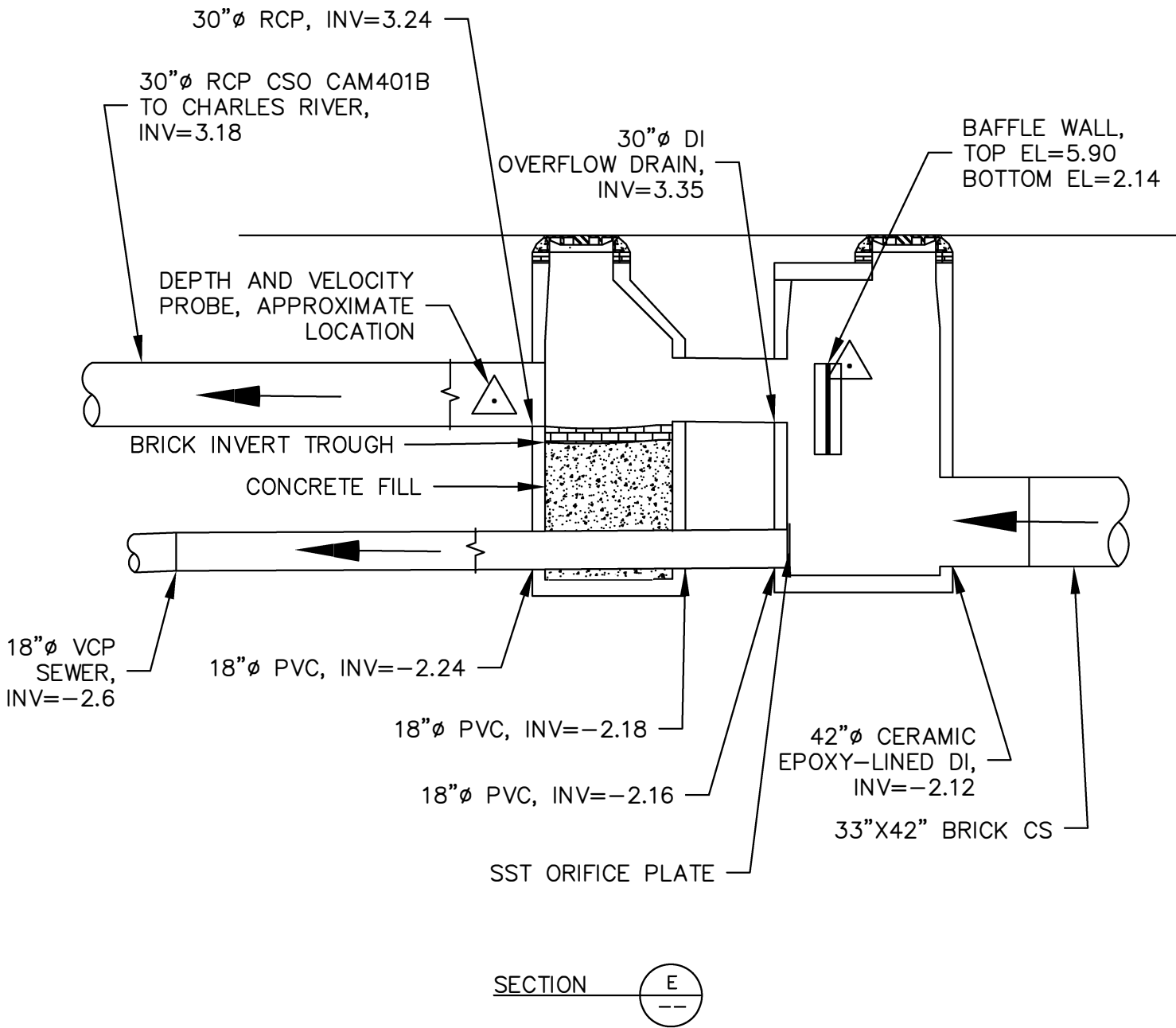


NOT FOR CONSTRUCTION

**CSO REGULATOR STRUCTURE
CAM401A PROFILE**



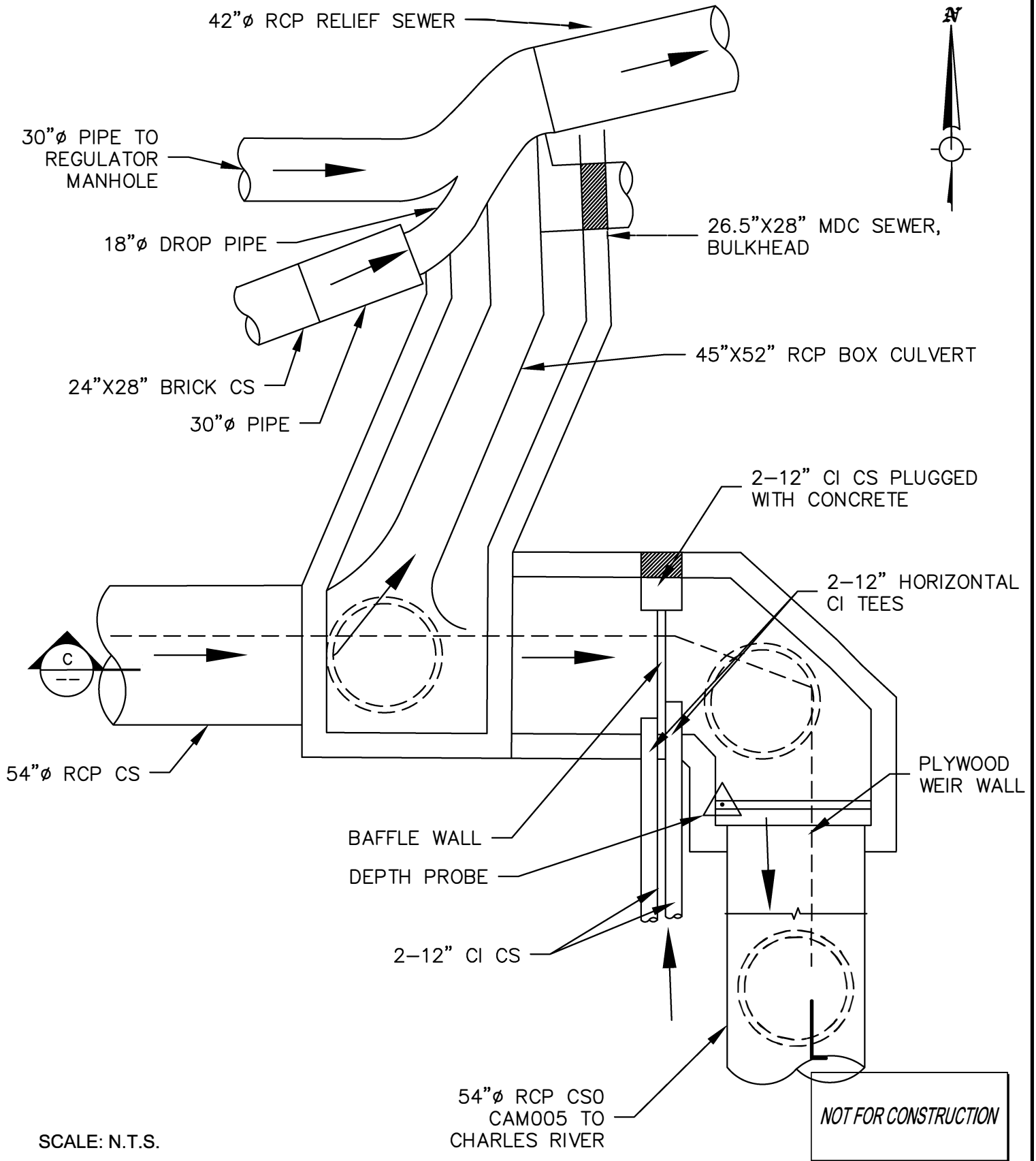
**CSO REGULATOR STRUCTURE
CAM401B PLAN**



NOT FOR CONSTRUCTION

SCALE: N.T.S.

CSO REGULATOR STRUCTURE CAM401B PROFILE



**CSO REGULATOR STRUCTURE
CAM005 PLAN**

BAFFLE WALL,
BOTTOM EL=13.22

52"X45"RCP
BOX CULVERT

PLYWOOD WEIR WALL,
TOP EL=14.82*
BOTTOM EL=10.94*

DEPTH PROBE,
LOCATED ON
WEIR WALL,
23.2" BELOW
TOP OF WEIR
WALL AND 5"
FROM WALL OF
CAM005

54"∅ RCP CS,
INV=10.94*

54"∅ RCP CS,
INV=10.94*

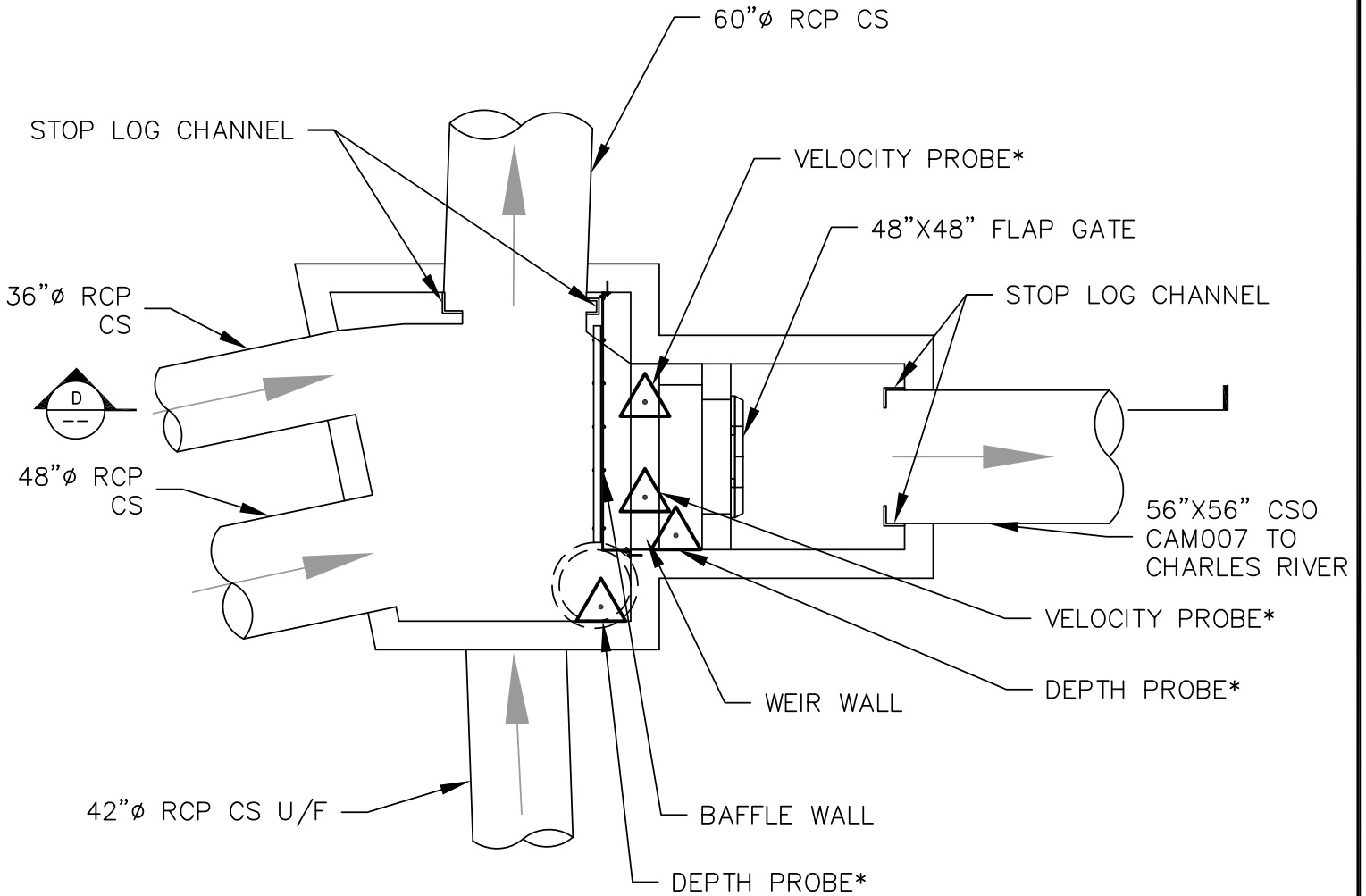
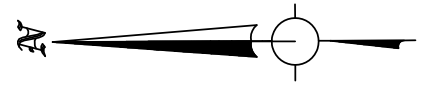
SECTION



NOT FOR CONSTRUCTION

SCALE: N.T.S.

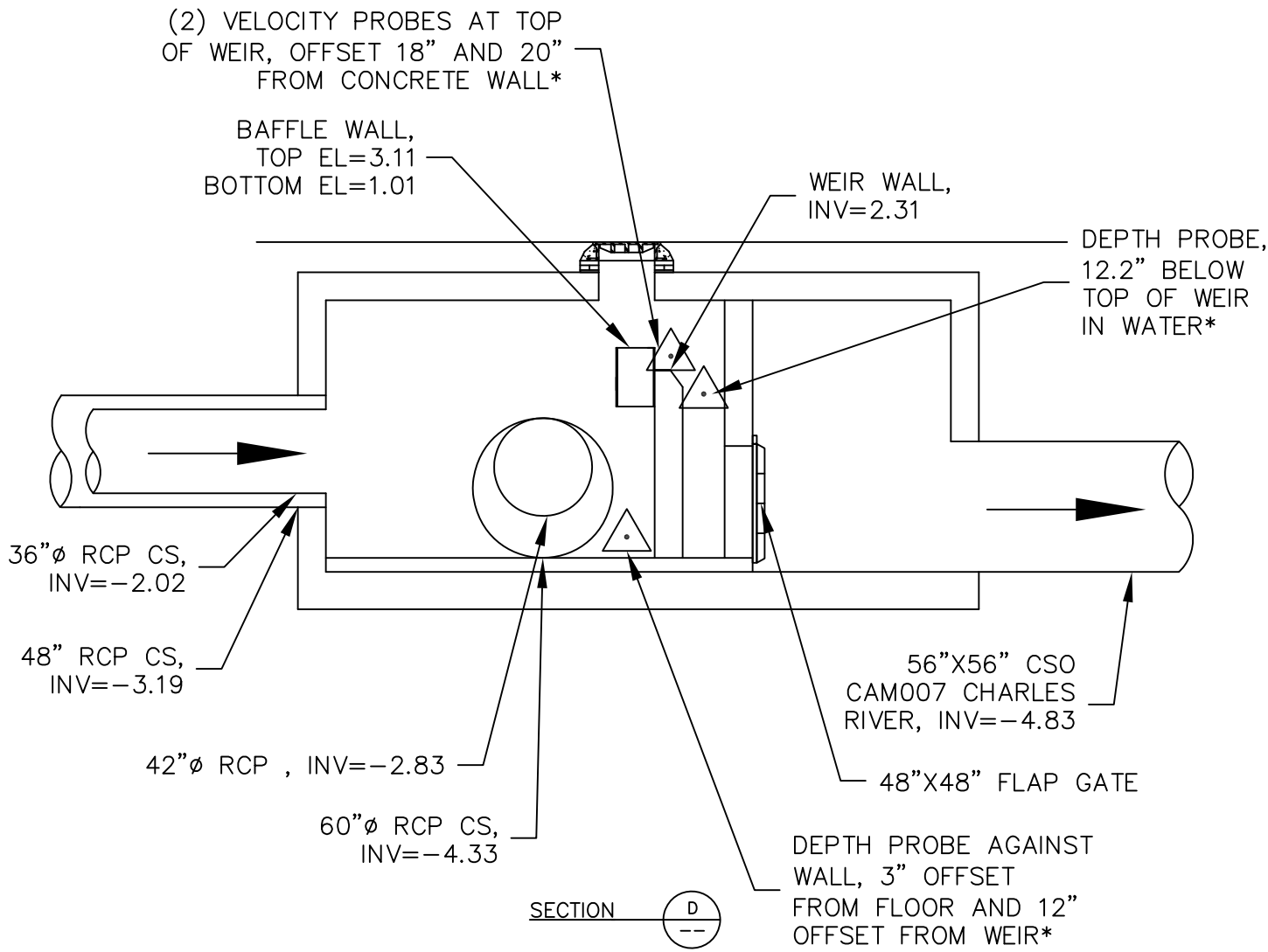
CSO REGULATOR STRUCTURE CAM005 PROFILE



NOT FOR CONSTRUCTION

SCALE: N.T.S.

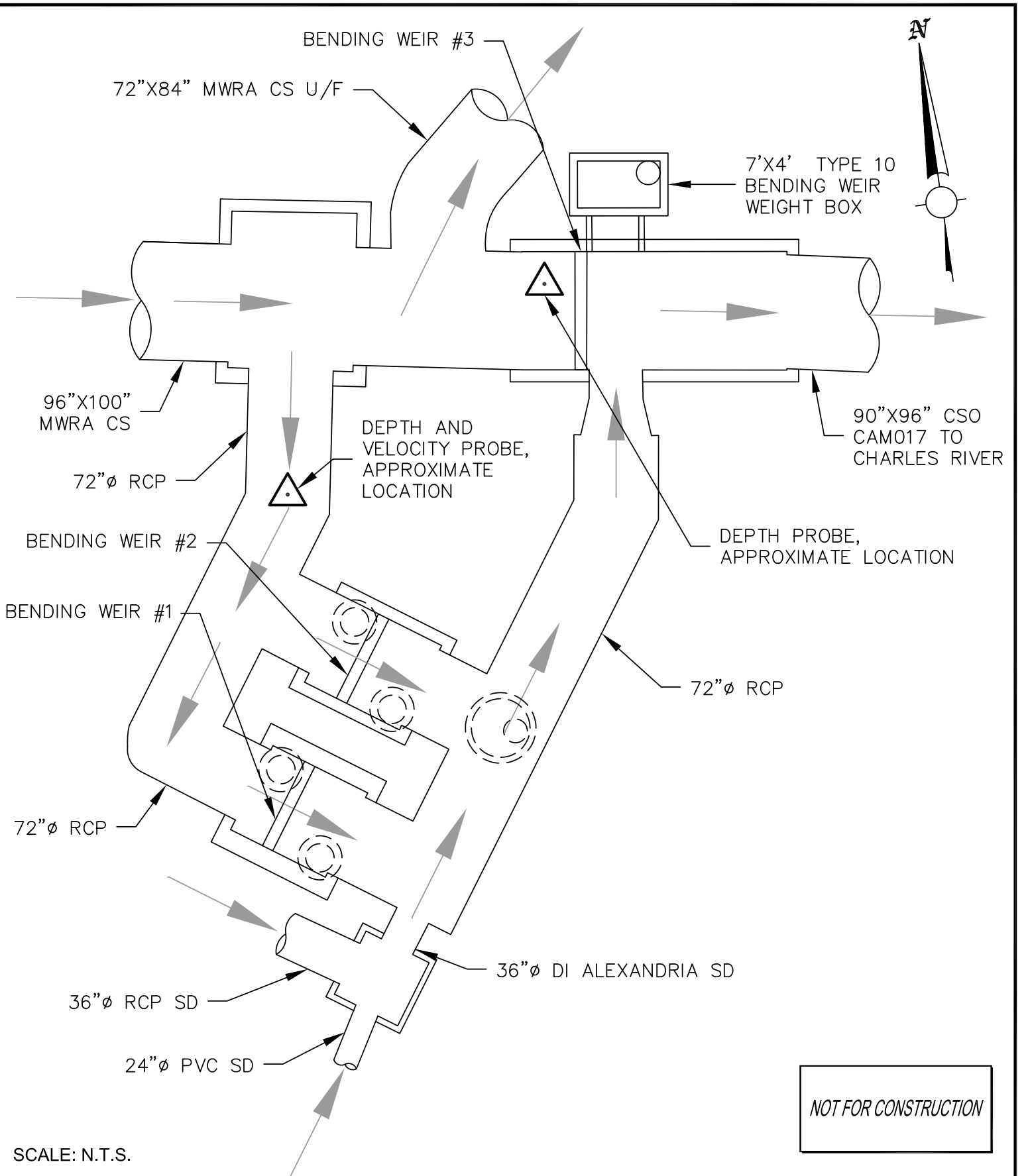
CSO REGULATOR STRUCTURE CAM007 PLAN



NOT FOR CONSTRUCTION

SCALE: N.T.S.

**CSO REGULATOR STRUCTURE
CAM007 PROFILE**



NOT FOR CONSTRUCTION

SCALE: N.T.S.

**CSO REGULATOR STRUCTURE
CAM017 PLAN**