



Evaluation of the Implementation of a Real-Time Public CSO Notification System for MWRA CSO Outfalls Along the Charles River, Upper Mystic River, and Alewife Brook

August 29, 2025

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1. Introduction

Exhibit D Item 3 in both the *2024 Final Determination to Adopt a Water Quality Standards Variance for Combined Sewer Overflow Discharges to Alewife Brook/Upper Mystic River Basin (Alewife Variance)* and the *2024 Final Determination to Adopt a Water Quality Standards Variance for Combined Sewer Overflow Discharges to Lower Charles River/Charles Basin (Charles River Variance)* requires MWRA to conduct an evaluation of the “feasibility of implementing a real-time on site public notification system for CSO discharges, such as a warning light system”¹. The variances state that “The evaluation shall include, but not be limited to, an assessment of costs, coordination with property owners and abutting municipalities, power needs, permitting requirements, logistics of implementation, and success of similar systems in other cities. Simultaneously, MWRA and the Cities of Cambridge and Somerville shall identify and implement interim measures for enhanced notification to the public of CSO discharges. MWRA and the Cities of Cambridge and Somerville shall consult with watershed advocacy groups to inform development of the scope of the evaluation and identification of interim measures.”²

This report presents the findings of the real-time on-site public notification feasibility assessment conducted by MWRA in accordance with the Variance requirements, and is organized into the following chapters:

- Chapter 1: Introduction
- Chapter 2: Public Access Locations Potentially Affected by CSO Discharges
- Chapter 3: Interim Public Notification Measures in MWRA System
- Chapter 4: Existing Public Notification Measures in Other Cities
- Chapter 5: Other Potential Public Notification Systems/Technologies
- Chapter 6: Indicator Beacon Pilot Project for Outfall MWR205A
- Chapter 7: Summary and Recommendations
- Chapter 8: References
- Appendix A: CSO Outfall Locations

2. Public Access Locations Potentially Affected by CSO Discharges

MWRA and the Cities of Cambridge and Somerville are currently in the process of developing the Updated CSO Long-Term Control Plan (LTCP) to mitigate CSO discharges into the Charles River, Mystic River, and Alewife Brook (the Variance waters). Of the remaining CSO outfalls to be addressed in the LTCP that discharge into the Variance waters, eight are owned and operated by MWRA. Figure 2-1 provides a map of the MWRA-owned CSO outfalls.

¹ *2024 Final Determination to Adopt a Water Quality Standards Variance for Combined Sewer Overflow Discharges to Alewife Brook/Upper Mystic River Basin*, and *2024 Final Determination to Adopt a Water Quality Standards Variance for Combined Sewer Overflow Discharges to Lower Charles River/Charles Basin* Exhibit D, Item 3.

² Ibid. Reference to City of Somerville is in the Alewife Variance, only.

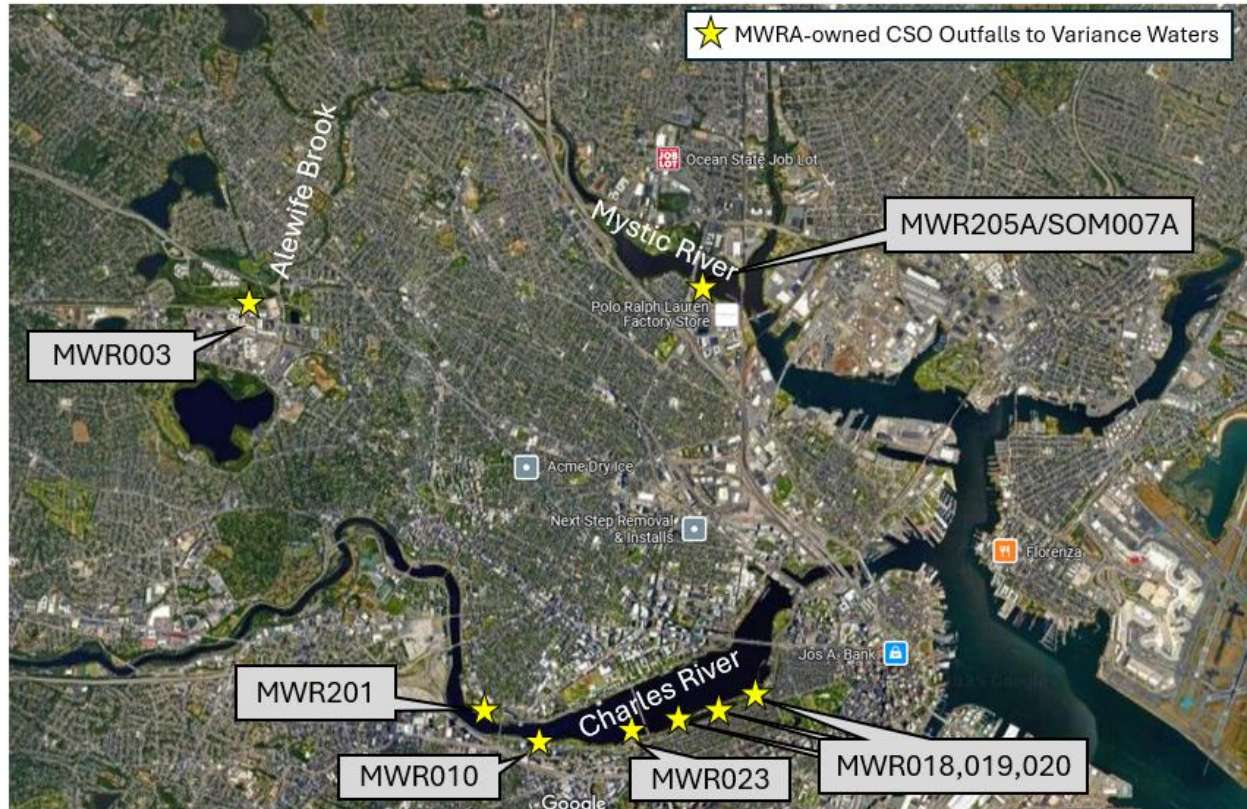


Figure 2-1. MWRA-Owned CSO Outfalls to Variance Waters

Each of the outfalls has the potential to discharge CSO into its associated receiving water body during a CSO discharge event, therefore MWRA has been tasked with evaluating the feasibility of implementing a real-time notification system to alert those in proximity of that water body if a CSO outfall is or has recently discharged.

In order to maximize the visibility of these notifications to the public, the intent would be to place CSO notification signage and alert systems in high-traffic areas near the outfalls and/or public access locations so that people walking along the shore or considering recreating on the waterbodies would be able to see these warnings. This would be beneficial in encouraging individuals to refrain from water-related recreational activities like boating and fishing during and immediately following CSO activation events in order to limit contact with waters potentially impacted by CSO.

CSO alert systems and informational signage could be placed at each of the noted CSO outfalls, however, some of the outfalls are in locations that are not directly accessible to the public. For example, outfall MWR201 is located at the Cottage Farm CSO Facility, which is a restricted-access MWRA facility. Table 2-1 summarizes the locations and general public accessibility of each of the eight MWRA-owned CSO outfalls in the Variance waters. Map locations and images of each of these outfalls can also be found in Appendix A.

Table 2-1. Public Accessibility of MWRA-Owned CSO Outfalls in Variance Waters

Outfall	Receiving Water	Outfall Location	Access to the Public
MWR003	Alewife Brook	West of Alewife Station Access Road, Cambridge, MA	Located near MBTA garage at Alewife Station. Nearby public access to Fitchburg Cutoff Path and Minuteman Bikeway. Shoreline outfall is approximately 200 feet from the commonly used walking/bike path and is not readily visible from the path.

Table 2-1. Public Accessibility of MWRA-Owned CSO Outfalls in Variance Waters

Outfall	Receiving Water	Outfall Location	Access to the Public
MWR205A	Upper Mystic River	Near intersection of Fellsway and Grand Union Boulevard, Somerville, MA	Located off a major roadway (Fellsway). Walking/biking path along the edge of the river just south of Wellington Underpass is within 50 feet of the outfall structure, which is readily visible from the walking/biking path.
MWR201	Charles River	Magazine Beach, 668 Memorial Drive, Cambridge, MA	Located at the Cottage Farm CSO Facility, access restricted only to MWRA personnel and approved visitors. Outfall is a submerged, off-shore discharge between Magazine Beach and the Boston University Bridge. Magazine Beach is a publicly accessible park and includes the Magazine Beach Cartop Boat Launch. The outfall is approximately 300 feet downstream of the boat launch.
MWR010	Charles River	North side of Storrow Drive, opposite Saint Mary's Street, Boston, MA	Submerged off-shore outfall located just off the Dr. Paul Dudley White path. Publicly accessible location with frequent pedestrians, cyclists, etc.
MWR018	Charles River	Esplanade, opposite Hereford Street, Boston, MA	Submerged off-shore outfall. Adjacent shoreline features include Stoneham Playground and waterfront pathways (Dr Paul Dudley White Path and Healthy Heart Trail). These trails are public access and are frequented by pedestrians, cyclists, etc.
MWR019	Charles River	Esplanade, opposite Dartmouth Street, Boston, MA	Submerged off-shore outfall. Adjacent shoreline features include waterfront pathways (Dr Paul Dudley White Path and Healthy Heart Trail). These trails are public access and are frequented by pedestrians, cyclists, etc.
MWR020	Charles River	Esplanade, opposite Berkeley Street, Boston, MA	Submerged off-shore outfall. Adjacent shoreline features include waterfront pathways (Dr Paul Dudley White Path and Healthy Heart Trail). These trails are public access and are frequented by pedestrians, cyclists, etc.
MWR023	Charles River	North side of Storrow Drive, adjacent to Charlesgate area, Boston, MA	Shoreline outfall located just off the Dr. Paul Dudley White path, which is a publicly accessible path on the edge of the water with frequent pedestrians, cyclists, etc.

In order to maximize the visibility of CSO information, it would be optimal to place informational signage or warning systems close to CSO outfalls, as well as at highly trafficked locations near the water, particularly in areas of recreation like public parks, near boat houses/access ramps, or along pathways.

Figures 2-2 and 2-3 below provide some of the locations of water-related recreational facilities in the Charles River area and the Mystic River area, respectively. These facilities include yacht clubs, access ramps, and university boat houses in the general vicinity of the CSO outfalls. Other public access points may also exist that are not identified on this map. This map shows a total of 19 facilities on the Charles River and seven on the Mystic River. No facilities of these types were identified along Alewife Brook. These locations could be potential candidates for notification of CSO discharge events, as their recreational activities could be affected by water quality conditions.

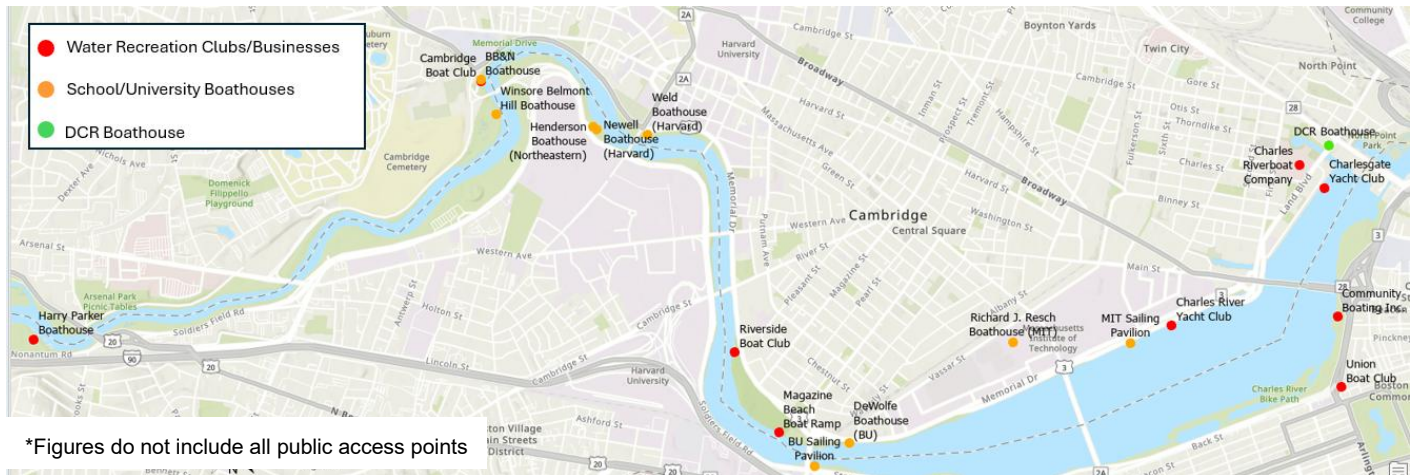


Figure 2-2. Water-Related Recreational Facilities on the Charles River

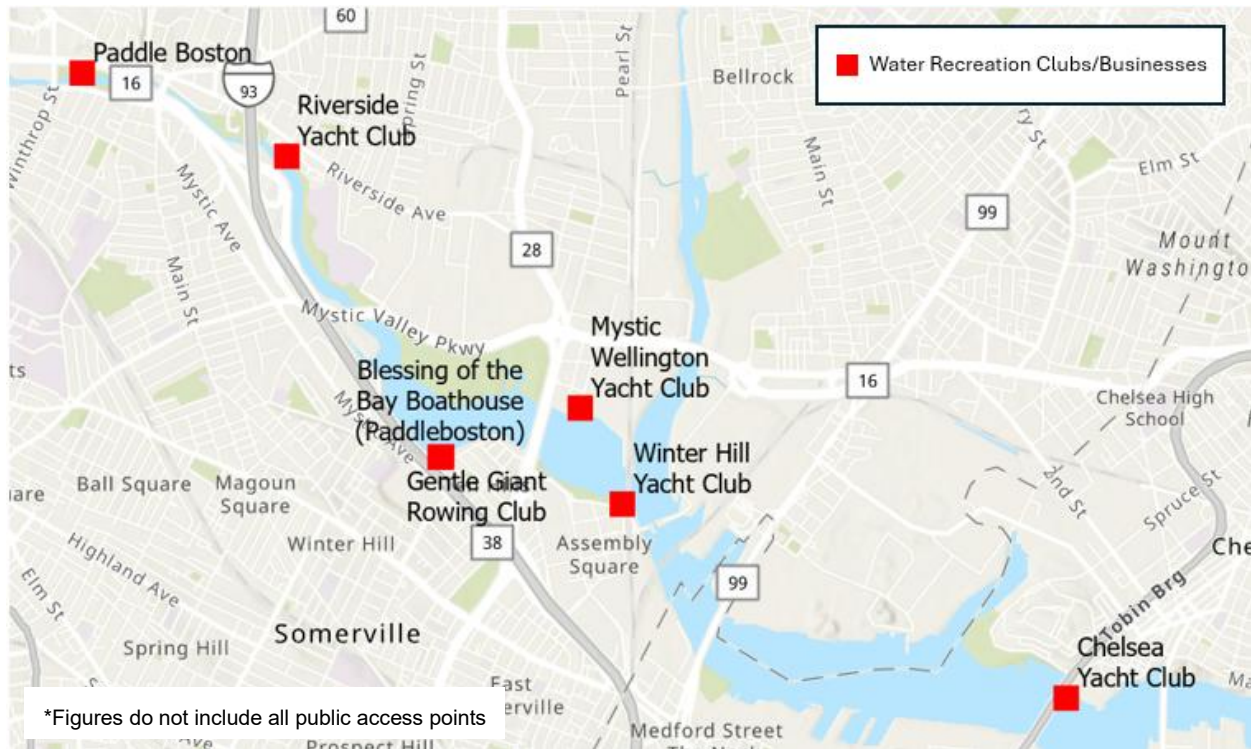


Figure 2-3. Water-Related Recreational Facilities on the Mystic River

3. Interim Public Notification Measures in the MWRA System

Given that the evaluation of real-time CSO notification systems is still ongoing, MWRA is taking interim measures to help the public stay informed about CSO events in the Variance waters. In December 2024, MWRA began placing informational sandwich boards at three distinct locations along the Alewife Brook Greenway path where flooding

tends to occur, prior to storms with the potential to cause both flooding and CSOs. Figure 3-1 provides the approximate locations where the sandwich boards are placed along the pathway.

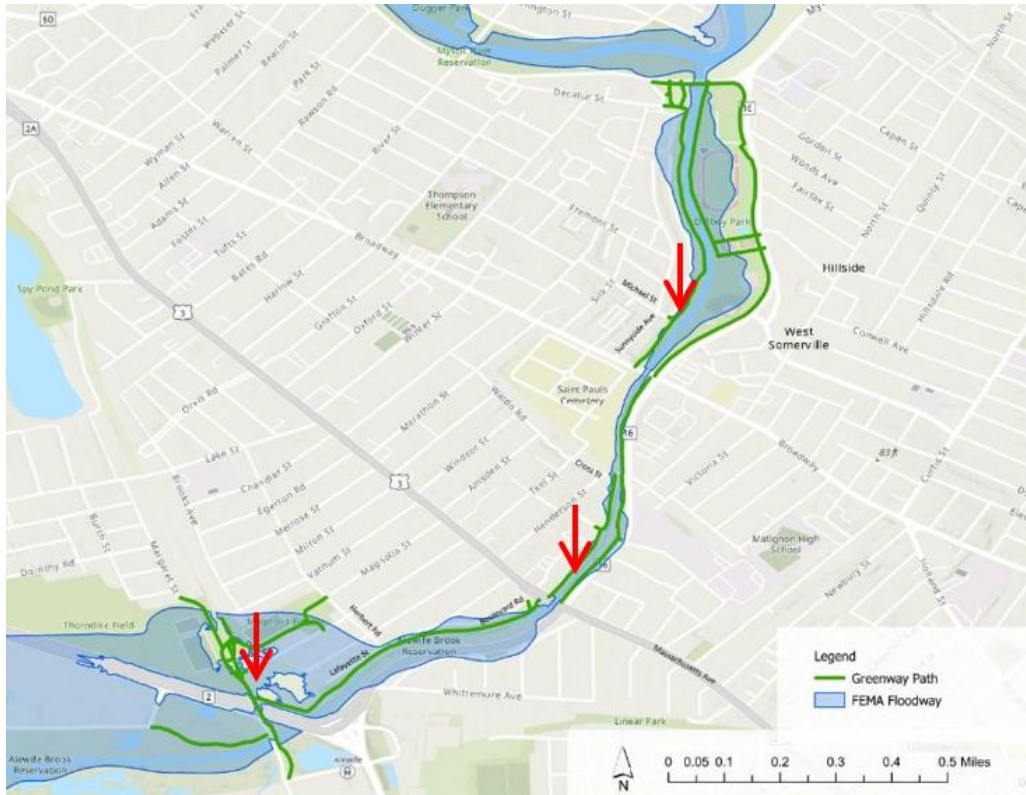


Figure 3-1. Locations of MWRA CSO Notification Sandwich Boards on Alewife Brook Greenway Path

The boards are placed at the boardwalk near Route 2 (Figure 3-2), on the pathway just north of Massachusetts Avenue (Figure 3-3), and on the pathway off Sunnyside Avenue adjacent to Michael Street (Figure 3-4). These sandwich boards provide information to passing individuals about CSOs and the potential for exposure to bacteria and other pollutants during significant rainfall events. These boards are placed in their respective locations for rain events predicted to be greater than two inches of rainfall in a span of 24 hours and with a high peak intensity.



Figure 3-2. MWRA CSO Notification Sandwich Board at Boardwalk near Route 2



Figure 3-3. MWRA CSO Notification Sandwich Board on Path North of Massachusetts Avenue



Figure 3-4. MWRA CSO Notification Sandwich Board on Path off Sunnyside Avenue Opposite Michael Street

In addition to the physical sandwich boards along Alewife Brook, MWRA posts to social media when the sandwich boards are placed to notify the public of the potential significant rainfall events and to encourage community members to register for notifications of CSO activations. Figure 3-5 shows a tweet made on December 10, 2024, from the official MWRA X (formerly Twitter) account notifying residents across the MWRA system of the ongoing rainfall, and to warn of potential CSO discharges during that time. This post was shown to receive positive feedback from local environmental advocacy groups.



Figure 3-5. MWRA Tweet Notifying of Rainfall Event and Promoting Online CSO Notification Sign Up

Included in this tweet is a link to the MWRA Subscription Services page, where community members can sign up to receive email or text notifications for near real-time CSO updates.

On May 5, 2025, MWRA, and the Cities of Cambridge and Somerville held a Real-Time CSO Notification Public Meeting to discuss the current status and future plans of each entity's CSO notification program.

4. Existing Public Notification Measures in Other Cities

As part of the investigation process to assess CSO notification systems, the variances require MWRA to investigate existing notification systems in other cities to identify the methods, costs, operations and maintenance systems that are currently in use elsewhere. Research was conducted on various existing real-time CSO notification systems that are used for public awareness. A memorandum was produced by the City of Cambridge that identified existing notification systems, one of which is located in communities serviced by MWRA. The four different case studies described were from DC Water in Washington DC, Lancaster, PA, Chelsea, MA and the Allegheny County Sanitary Authority (ALCOSAN) in Pittsburgh, PA. Information on these case studies is presented below.

4.1. DC Water Indicator Beacons

The District of Columbia Water and Sewer Authority, or DC Water, is the regional regulatory agency that supplies wastewater treatment services to over 1.6 million residents in the Washington DC area. The DC Water wastewater system is serviced by the Blue Plains Wastewater Treatment Facility that treats an average of 384 million gallons per day (MGD). The DC Water system contains over 48 CSO outfalls that discharge to the Anacostia River, Rock Creek, and the Potomac River during active CSO events.

Similar to the MWRA receiving water bodies, swimming is not permitted in several of the DC area rivers, but recreational activities like boating and fishing commonly occur and can put the public at risk of exposure to bacteria and other contaminants during CSO events. In response to this risk, DC Water entered into a Consent Decree with the U.S. Government in 2005 to implement a Long-Term Control Plan (LTCP) to mitigate CSO discharges into the affected receiving waters. As part of this Consent Decree, DC Water implemented an indicator beacon system at various public access locations near or at CSO outfalls to notify the public of CSO discharge events.

These indicator beacons are gradually being installed, with the process having begun in 2018 and is estimated to be complete by 2030. Of the 12 beacons planned for installation, as of February 2025, five are active, with four along the Anacostia River and one along the Potomac River. The beacons are fully grid powered and automated, with human input only used to override the system in the event of a malfunction. Since they are fully automated, the beacons run year-round with routine maintenance inspections to check that they are working properly.

The beacon on the Potomac River is operated through cell signal from its associated CSO outfall. The four beacons on the Anacostia River are all operated based on a signal from a tunnel overflow structure connected to a CSO outfall and all go on at the same time. DC Water's indicator beacons have two LED light colors: a red light that flashes for the duration of an active CSO discharge event, and a yellow light that flashes for 24 hours after the event has concluded. The color change is pre-programmed into the beacon for when the cell signal from a nearby CSO outfall starts or stops and will activate all the beacon lights on the affected water body.

In addition to the indicator lights, permanent signage was installed near the CSO outfalls to inform the public about CSOs and their potential health risks. Figure 4-1 shows an example of a CSO outfall warning sign in the DC Water System. The sign also provides an official phone number for concerned individuals to call and report any issues that they may observe.

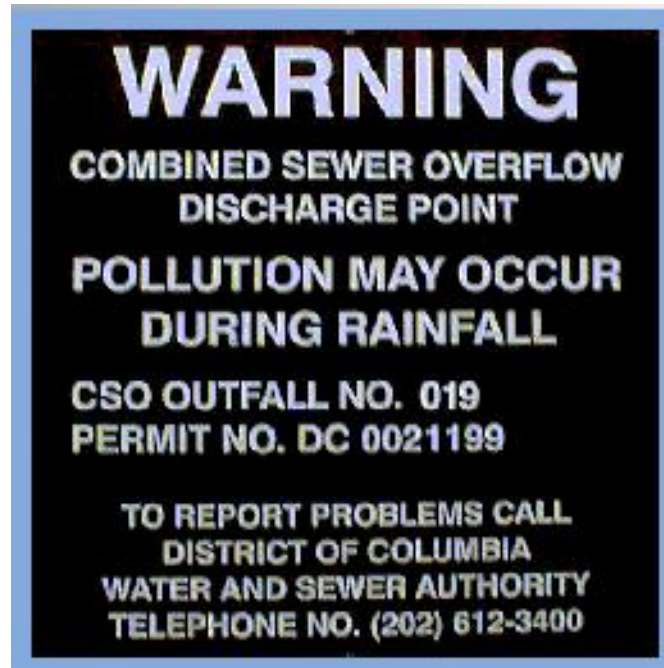


Figure 4-1. DC Water CSO Outfall Signage

The estimated construction cost for these indicator beacons was not available from DC Water, as the costs and plans were lumped into the budget for a larger series of construction projects.

4.2. Lancaster, PA Indicator Beacons

The City of Lancaster in Pennsylvania provides wastewater treatment services to itself as well as 13 tributary municipalities, in total serving over 130,000 residents. The city currently owns and operates a partially combined sewer system with 60 miles of fully separated sewer, roughly 88 miles of combined sewer, and five CSO outfalls that discharge to the Conestoga River. The Lancaster sewer system is serviced by the Advanced Wastewater Treatment Plant, which has a capacity of roughly 32 MGD. Due to the extent of the combined sewer system, the city of Lancaster entered into a Consent Decree in 2017 to implement an LTCP to mitigate CSO discharges into the receiving waters. Part of this Consent Decree mandated that a real-time onsite notification system be implemented to notify the public of CSO events to minimize human contact with contaminated waters.

In response to the Consent Decree, the City of Lancaster installed indicator beacons at four CSO outfalls within the system in 2021, with each beacon programmed to respond to radio signals from flowmeters connected to the CSO outfalls. The outfalls discharge to a river with no tidal activity that affects the flowmeter, so the flowmeters were considered to be a reliable method to identify CSO activations.

Similar to DC Water, the indicator beacons flash red during an active CSO event and yellow for 24 hours after the event has concluded, with the color change pre-programmed into the beacons. The beacons are powered with a combination of grid power for the flowmeter programmable logic controllers (PLCs) and solar panels to charge the light batteries. Since they are fully automated, the beacons are operated year-round, with routine maintenance performed to keep them in good working condition.

In addition to the warning lights, the City of Lancaster installed permanent signage at the CSO outfalls and in various public areas to inform passing individuals about what CSOs are and their potential health risks, as well as warning them not to engage in water-related activities during or following rainfall events. Figure 4-2 shows an example of one of the indicator beacons and informational signage placed above a CSO outfall, and Figure 4-3 shows additional

signage placed in a highly trafficked public area. The city also provides live online updates on CSO events through emails and the city website for those who may not be visiting the affected locations but would still like to stay informed.



Figure 4-2. Lancaster CSO Indicator Beacon and Signage at an Outfall



Figure 4-3. Lancaster CSO Outfall Signage

The estimated cost to the City of Lancaster to purchase the equipment and install the four beacons and the informational signage was \$72,950.

4.3. Chelsea, MA Indicator Beacons

The City of Chelsea's collection system is comprised of 70% combined sewers and 30% separate sewers. The collection system ties into MWRA's interceptor system and has three CSO outfalls that discharge into Chelsea Creek. In an effort to bring awareness to the public of the risks of CSO discharges, the Chelsea Board of Health (BOH) installed a total of seven beacon lights in 2023. The beacon locations were strategically chosen through collaboration with the Chelsea DPW, MassDEP, and Green Roots, a local environmental advocacy organization. Figure 4-4 shows an image of one of the indicator beacons installed in Chelsea near a public waterfront access point. These beacons feature an amber light that illuminates during a CSO activation and remains on for 24 hours after the event has concluded.



Figure 4-4. Chelsea Indicator Beacon Light

The beacon is manually triggered, with Chelsea BOH staff notifying 911 to illuminate the beacons from a central switch after verification from a CSO alarm. When a CSO activation is detected, all of the indicator beacons in the system illuminate to provide warnings throughout the entire area. The indicator beacons rely primarily on solar panels to charge the batteries for the lights.

In addition to the lights, the beacons also have permanent signage to inform the public of their purpose. This signage was designed and developed in coordination with communities along the Mystic River watershed for consistency in

communication. Shown in Figure 4-5, the signage provides warning to passing individuals not to engage in water-related activities like swimming, boating, or fishing in this area for roughly 48 hours after a rainfall event due to health risks from CSO contamination. Additional space is provided for the Chelsea BOH to place temporary warning signs during active CSO events lasting longer than two hours. This space is manually updated by BOH staff and provides a small note that if the space is left empty, there has been no recent CSO activity. Finally, a QR code on the lower left section of the sign provides a link to additional information about what CSOs are and for passersby to sign up for online notifications for CSO events.



Figure 4-5. Close Up of Chelsea Indicator Beacon Signage

With the exception of manual signage updates, the indicator beacons are remotely activated. Therefore, the beacon system can operate year-round, allowing community members to stay informed about potential CSO events regardless of the time of year. The purchase and installation of these indicator beacons cost the City of Chelsea approximately \$32,600.

4.4. ALCOSAN Flagging System

Allegheny County Sanitary Authority, or ALCOSAN, is a regional entity in Pennsylvania that owns and operates over 90 miles of sewer interceptors that service 83 municipalities in the surrounding area. The ALCOSAN system includes 259 CSO outfall structures and 59 sanitary sewer overflow (SSO) outfall structures that discharge into the Allegheny River, Monongahela River, and the Ohio River. Due to the significant number of CSO and SSO outfalls within the system, ALCOSAN entered into a Consent Decree in 2007 to make efforts towards mitigating CSO and SSO discharges in the system. As part of this Consent Decree, ALCOSAN was required to implement a “flag system for notification used by marinas” to inform the public of CSO events when they occur.

To assess when CSO discharges occur, a level sensor was installed in the wet well of the ALCOSAN wastewater treatment facility, with hydraulic modeling used to assess the water elevation at which a CSO event is likely to occur. When the sensor in the wet well is triggered by a rain event, ALCOSAN staff are notified and mobilize to “raise orange CSO flags at designated points along the waterways.” Figure 4-6 shows an example of the CSO notification flags that are raised in the area. These flags remain up for the duration of the CSO event and are lowered 48 hours after the CSO event has concluded.



Figure 4-6. ALCOSAN CSO Notification Flag

The flag system is manually operated by ALCOSAN staff, so no direct power input is needed. Flags are raised at nine public access locations during CSO events, and staff must travel to these locations to raise and lower the warning flags. This work is seasonal and only occurs between April 1 and October 31, with the rest of the year excluded due to limited water-related activities during those months. ALCOSAN flagging staff are available seven days a week, but only from the hours of 8 AM to 7 PM, creating the potential for some delayed notification response if a CSO event occurs during off hours.

In addition to flag notifications, ALCOSAN provides permanent signage to make the public aware of CSO risks. ALCOSAN also provides real-time email and text notifications for CSO events that residents can opt into to stay informed of water quality hazards from CSO.

The cost to implement this system was not readily available. The ALCOSAN staff responsible for raising and lowering flags conduct this work as part of their typical duties. There were no construction costs for implementation, as the flags were mounted on existing flagpoles at the marinas. Although the cost to print the orange CSO flags is unknown, it is assumed to be minimal.

5. Alternative Public Notification Systems/Technologies

In addition to the previously discussed notification systems that have been implemented in other communities across the US, other technologies and protocols were identified that have been developed but not yet tested or implemented on a wider scale. These additional approaches are summarized below.

5.1 Water Quality Buoys

The Gowanus Canal is a 100-foot wide, 1.8-mile-long canal located in New York City. The canal has faced significant pollution issues from various forms of industrial waste being dumped into the canal since its creation in the 1800s, in addition to CSO outfalls discharging into the canals during significant rainfall events. The New York City Department of Environmental Protection (NYC DEP) installed several water quality buoys in Gowanus Canal, mainly to monitor turbidity in the water to check whether pollutant-filled sediment is getting stirred up and migrating further along the water body. These buoys take measurements in real time and relay data through a SCADA system by way of bluetooth cell signal and satellite. The buoys contain sensors that can measure a variety of water quality parameters in the canal in real time, including turbidity, dissolved oxygen, pH, and salinity. However, they are not capable of measuring bacterial concentration in real time, which would be the main pollutant concern from a CSO discharge.

While the costs for this system in Gowanus Canal were not available, these buoys are generally expensive and can cost from a few thousand dollars to hundreds of thousands of dollars, depending on the parameters being measured and the size and quantity of buoys needed.

5.2 LED Message Boards

The use of LED message boards on indicator beacons could be beneficial to provide additional details, like the time of a CSO discharge, during a rainfall event. Message boards would be useful as they are easy to read and could be repurposed for other messages during the dry seasons. Potential downsides to this approach would be the additional power that would need to be supplied from the power grid that would incur additional annual costs, and the challenge of developing the intended information (such as CSO volume) within a reasonable timeframe for posting on the message board.

5.3 Remotely Operated Deployable Drones

Some municipalities have considered deploying drones, or remotely operated boats, to the locations of CSO outfalls during discharge events. These drones would likely have some sort of alert mechanism, such as a beacon, attached to notify people in the surrounding area of their purpose. The use of remote-controlled systems would reduce the need for on-site power sources, and with a small quantity of mobile drones the alerts could potentially be moved to wherever the CSO discharge will occur, rather than having standing equipment at every outfall. One of the major downsides to this approach, however, is that this equipment is sophisticated and would require specially trained staff to be deployed to potentially multiple sites during a storm event, which would likely be costly and logistically difficult.

5.4 Auditory Alert Systems

Similar to LED message boards, an audio message component could potentially read out the announcements about the timing of CSO activations, and mention additional details as needed. An audio warning could potentially attract the attention of passersby and would increase accessibility to those who may not notice the signage or be able to read the print.

5.5 Indicator Buoy Lights

Indicator buoy lights could be employed to notify the public of CSO activations. These buoys would contain lights that would be signaled to glow and/or flash during active CSO events. This approach would require educating the general public about what the lights mean. In addition, locating permanent buoys in waterways would be challenging in terms of avoiding the creation of navigation hazards and in the effort required to maintain the buoys.

6. Indicator Beacon Pilot Project for Outfall MWR205A

As part of further investigations into real time notification methods that could be implemented into the current CSO public notification program, MWRA is pilot testing an indicator beacon at the jointly permitted SOM007A/MWR205A outfall similar to those already implemented in several other cities. In addition to carrying out its current public notification responsibilities, MWRA will activate the beacon when SOM007A/MWR205A discharges. The motivation for this pilot study is to continue to promote public awareness of the increased health risks due to bacteria or other pollutants associated with urban stormwater runoff and CSO discharges and to assess the effectiveness of indicator beacons as a CSO notification measure.

6.1 Pilot Project Location

The pilot indicator beacon will be located at the SOM007A/MWR205A outfall near Assembly Square in Somerville. The beacon will be placed on the far, riverside corner of the outfall platform and will be anchored onto the top slab of the structure. Figure 6-1 shows the proposed beacon location.



Figure 6-1. Outfall SOM007A/MWR205A Proposed Indicator Beacon Proposed Location

This location was selected given its relative isolation from other CSOs well upstream within the Alewife Brook, as well as its proximity to multiple yacht clubs and a public boating dock. These establishments have a clear line-of-sight to the beacon allowing the light to be seen during and following CSO discharge events. This location was considered a good pilot site given the proximity to MWRA's Somerville Marginal CSO Treatment Facility's remote sampling building that is located just 500 feet away from the outfall (Figure 6-2), and the likelihood of a successful radio connection to this MWRA facility.



Figure 6-2. MWRA Somerville Marginal CSO Treatment Facility Remote Sampling Building

6.2 Cost and Installation

The main components of the indicator beacon used in this pilot study include the master radio antenna that is used to communicate with the MWRA Somerville Marginal CSO Treatment Facility's CSO remote sampling building, the beacon post, solar panel, enclosure with lithium battery, radio receiver control module, receiver antenna, and the LED beacon light. In total, the material costs for this beacon were approximately \$9,275. This material cost includes the engineering services for assistance with the installation of the system and onsite testing. Figure 6-3 is an example of a similarly-configured indicator beacon light used by the City of Chelsea.

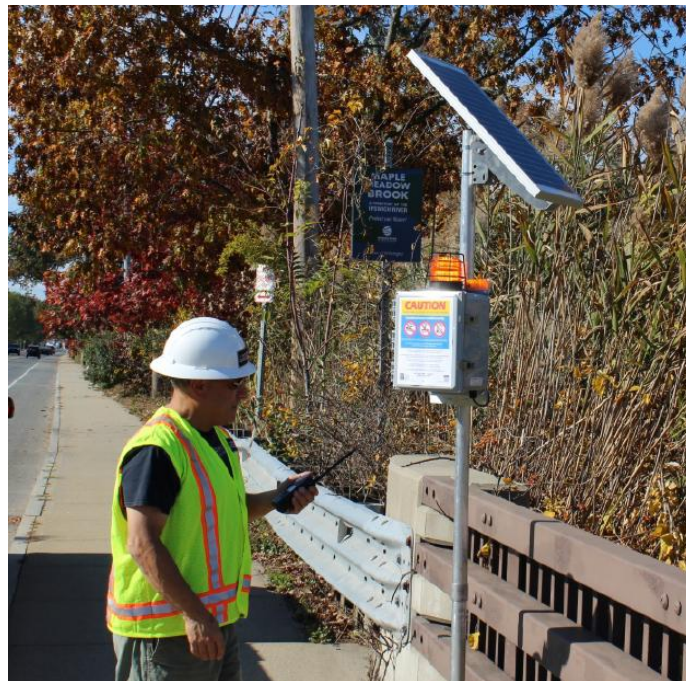


Figure 6-3. Example of Indicator Beacon Light

The beacon and its systems will be installed by MWRA maintenance staff. The beacon is expected to be manually activated through a SCADA screen by MWRA's 24-7 operational staff. In the event of a CSO activation, the amber strobe light will be activated and will remain on for 48 hours after the CSO discharge has ended, signaling the public to refrain from water-related recreational activities during this time.

6.3 System Maintenance and Life Expectancy

The routine maintenance protocol for this indicator beacon will include hosing down the solar panels annually to combat particle settlement so that solar energy is being sufficiently harnessed and checking the system voltage every 3-4 months to confirm that the batteries are in good working condition.

The lifespan of the lithium batteries is estimated to be roughly three to five years while the solar panels will have a roughly 20-year lifespan. The various other electrical components including the electrical enclosure, the radio receiver control module and the receiver antenna are expected to have a lifespan of over 20 years. All equipment will be subject to routine maintenance and will be replaced as needed.

6.4 Current Status and Next Steps

The materials for the indicator beacon have been purchased. Installation and SCADA programming are expected to be performed Fall 2025. Outreach to nearby yacht clubs and other abutters will be conducted so that the local community is aware of the beacon and its purpose. Startup and testing of the beacon is to begin following the completion of the outreach process. MWRA hopes to gain feedback from the community on the beacon's effectiveness during the pilot process.

7. Summary

Based on the research conducted for this report, the most common technologies used for CSO warnings and notifications include indicator beacons, flagging systems, and informational signage. Some newer technologies like remote-controlled drones could be promising, but currently have significant challenges that must be overcome.

Electronic notifications have proven to be effective avenues to reach the wider public. Nearly every notification system investigated in this feasibility study has an electronic notification component, providing updates to the public through website updates and/or social media posts. Each of them also utilizes an opt-in, subscription service, allowing the public to receive real-time CSO updates through emails, phone calls, or text messages. MWRA also uses electronic messaging, through Everbridge, to keep the public informed about CSO activations. Members of the public can sign up to receive near real-time CSO notifications through MWRA's website.

MWRA will operate its pilot beacon at outfall SOM007A/MWR205A and assess its effectiveness based on feedback from the public. Pending the results of the pilot study, MWRA may evaluate the feasibility of similar installations at other MWRA-owned CSO outfalls. Additionally, the temporary sandwich boards manually placed and removed along the Alewife Brook have proven to be popular. MWRA will continue this program and may consider partnering with other entities to assist in deploying the sandwich boards.

Power input and reliability are two of the important considerations when assessing a real-time notification system utilizing beacons, as larger power inputs can incur costs for grid power usage and supplies. Indicator beacons are typically powered using a combination of grid and solar power. While these beacons can be programmed to be partially or fully automated, MWRA does not plan to automate any part of its CSO notification program. If indicator beacons are incorporated into the program, MWRA staff will manually activate the beacons after confirming a CSO activation.

Another concern about the use of indicator beacons is the potential for the public to misinterpret their meaning. There is potential for the beacons to cause unnecessary anxiety or fear in the wider public if their purpose is not properly understood. Conversely, it should also be communicated to the public that although they exist to warn of water quality issues caused by CSO, safe water quality should not be assumed simply because the indicator beacon is not flashing, as there are several other pollutants and environmental factors that affect the quality of the water. If this technology is to be implemented, a concerted effort must also be made to further educate the public about the beacons and CSOs. Efforts might include installing informational signage on and near the beacons, posts on social media, and coordinating with watershed groups and/or local recreational groups to improve the efficacy of general knowledge.

The existing indicator beacon systems investigated in this report operate such that some or all of the beacons in a system would illuminate if one outfall on that water body were to discharge. It would be logical that if an upstream outfall begins to discharge at a sufficient volume, indicator beacons downstream of that outfall should illuminate as well, given that the impacts of the upstream CSOs could affect these areas. This approach would be potentially applicable on the Charles River, as it contains six of the eight MWRA-owned CSO outfalls discussed in this report. Further investigation is needed to determine the criteria for which this approach should be implemented.

Further investigations would also be needed to assess optimal locations for notification technology and informational signage, including but not limited to potential land use permissions, permitting, installation and maintenance costs, and community outreach. Some potential locations could be in communities such as Medford that have public access locations but do not have CSOs. Collaboration with abutting establishments and municipalities would be beneficial to coordinate potential locations for these systems as well as to maximize the reach of the notification system.

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Appendix A: CSO Outfall Locations

Appendix A: MWRRA-owned CSO Outfalls

Locations and Map Images

MWR010 – Charles River



Located on Storrow Drive opposite of Marsh Plaza



Image of Outfall Signage

MWR018 – Charles River



Located on Storrow Drive opposite of Hereford Street



Image of Outfall Signage

MWR019 – Charles River



Located on Storrow Drive opposite of Dartmouth Street

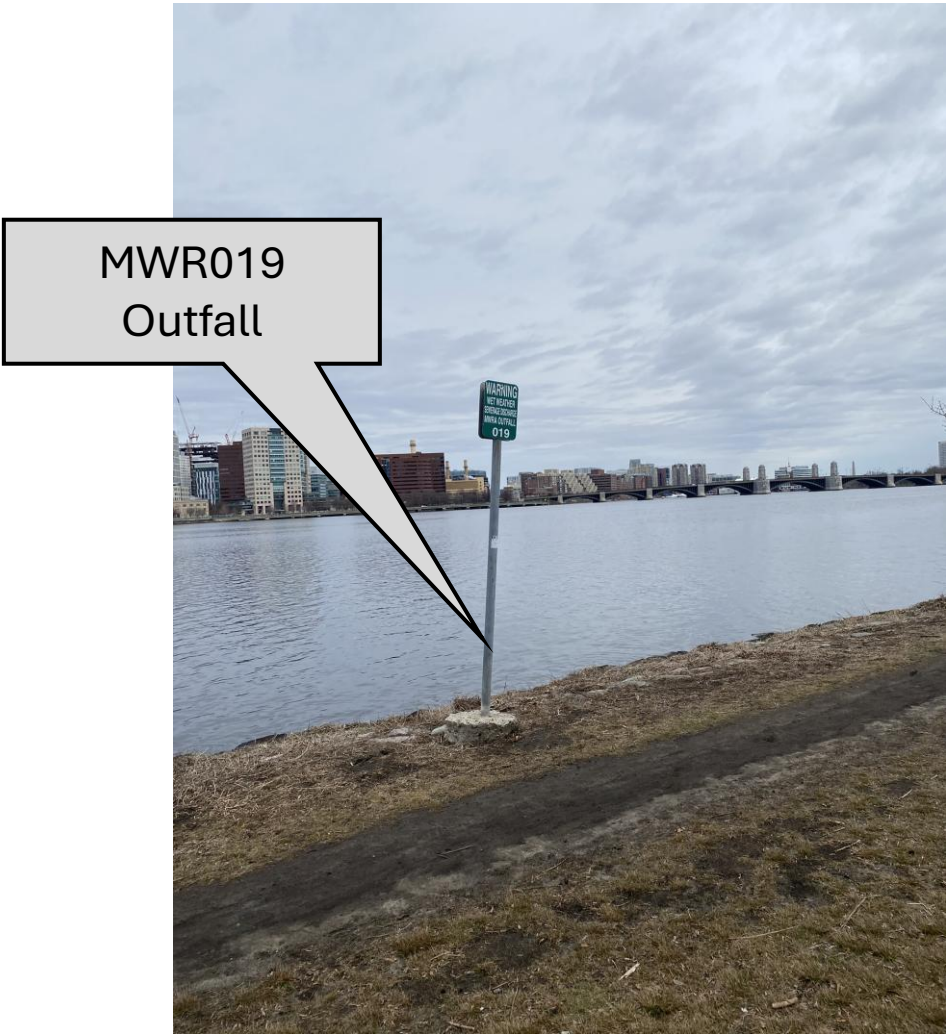


Image of Outfall Signage

MWR020 – Charles River



Located on Storrow Drive opposite of Berkeley Street



Image of Outfall Signage

MWR023 – Charles River



Located on Storrow Drive opposite of Charlesgate E



Image of Outfall Signage

MWR201 – Charles River



Located at MWRA Cottage Farm CSO Treatment Facility



Image of Outfall Signage

MWR205A – Mystic River

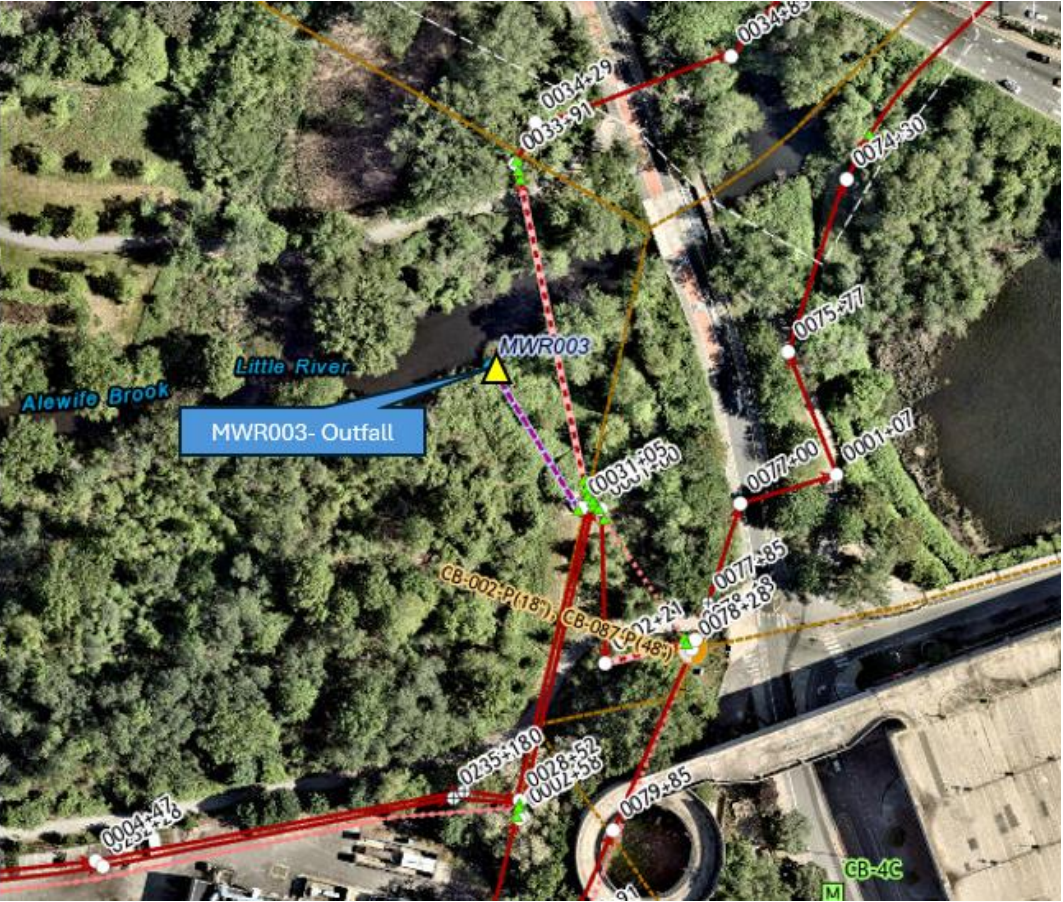


Located at Fellsway and Grand Union Blvd



Image of Outfall Signage

MWR003 – Alewife Brook



Located at Alewife Station Access Road



Image of Outfall Signage