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Water  
District



**PORLAND WATER DISTRICT  
CITY OF WESTBROOK, MAINE**

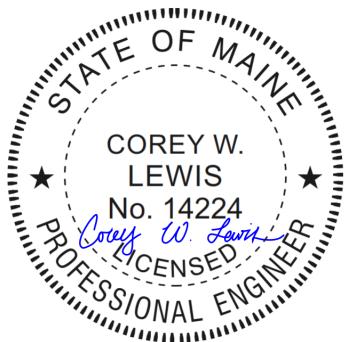
**MAY 2024**

## **Westbrook CSO Master Plan Update**

# Westbrook CSO Master Plan Update

## For the Portland Water District and City of Westbrook, Maine

May 2024



5/31/2024

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# Section 1 Summary, Findings & Recommendations

## 1.1 Summary

This Westbrook Combined Sewer Overflow (CSO) Master Plan Update (Plan) for the Portland Water District (PWD) and City of Westbrook (City) was prepared to meet the conditions set forth in Special Condition J (4) of PWD's and the City's Maine Pollutant Discharge Elimination System (MEPDES) Permit and Waste Discharge License. By December 31, 2023, PWD and the City are required to submit to the Maine Department of Environmental Protection (herein referred to as "Maine DEP" or "DEP") an update of the Westbrook CSO Master Plan. This Plan was submitted by December 31, 2023 and was approved by Maine DEP on May 9, 2024. Refer to Appendix A for DEP comments and approval letter.

Wastewater from residential, commercial, institutional and industrial sources is collected in the Westbrook collection system and Portland Water District (PWD) interceptor system for transport and eventual treatment at the Westbrook Wastewater Treatment Facility (WWTF). There are five licensed combined sewer overflow (CSO) outfalls that are part of the Westbrook/PWD interceptor sewer system. These CSOs discharge to the Presumpscot River and are included in the PWD and City's Maine Pollutant Discharge Elimination System (MEPDES) Permit #ME0100846 and Maine Waste Discharge License (WDL) # W001510-6D-I-R, July 2017. Table 1-1 lists the 5 actively licensed CSOs.

**Table 1-1 Maine DEP Permitted CSOs and Receiving Waters Classifications**

CSO Outfall #	Location	Receiving Water & Class
002	Warren Parking Lot Regulator	Presumpscot River, Class C
003	Siphon Inlet Structure	Presumpscot River, Class C
004	Dunn Street Regulator	Presumpscot River, Class C
007	Brown Street Regulator	Presumpscot River, Class C
008	King Street Regulator	Presumpscot River, Class C

Wright-Pierce was retained by PWD and Westbrook to review and summarize PWD and Westbrook's CSO abatement efforts since the previous Westbrook CSO Master Plan update, conduct supplemental flow metering in the Spring of 2022 and 2023 in select portions of the Westbrook sewer system, to update and calibrate PWD's existing hydraulic/hydrologic EPA SWMM model of PWD's interceptor sewers in Westbrook using the results of the supplemental flow metering, and to complete hydraulic/hydrologic model runs to simulate the response of the interceptor sewers to 1-, 2-, 5- and 10-year, 24-hour recurrence interval (RI) design storms. The results of these tasks were then used to update the Westbrook CSO Master Plan.

## 1.2 Findings

Flow metering results from the Spring 2022 and Spring 2023 flow metering periods conducted by Wright-Pierce revealed that there are portions of the Westbrook sanitary sewer system that appear to be experiencing excessive I/I during periods of wet weather and/or high groundwater conditions. Direct inflow is suspected as the main cause of excess flows in most of these sewer segments identified to have excess wet weather flows, but additional flow metering further upstream in sewersheds to further identify and isolate I/I sources is recommended to confirm these assumptions.

Model runs of the updated PWD SWMM model of the PWD interceptor sewers in Westbrook project that without further intervention, discharges are expected at CSOs 002, 003, 004, and 007 during 5- and 10-year, 24-hour return interval (RI) storms. Results from the calibrated interceptor sewer model also appear to somewhat contradict the reported historical pattern of discharges at CSOs 007 and 008 during storms smaller than the 1-year, 24-hour RI storm. However, it is also noted that both CSO 007 and 008 utilize cross-connections to shared stormwater/CSO outfall pipes that also convey flows from the nearby storm drain systems to the Presumpscot River. When the Presumpscot River level rises during significant wet weather events or during spring snowmelt conditions, it is suspected that surcharging in these shared CSO/stormwater outfall pipes is occurring back to the CSO weir walls in both CSO 007 and 008, and this could have occasionally contributed to erroneous CSO flow meter readings in the past that were then reported as CSO discharges. Further study of the CSO 007 and 008 regulator structures and the sewers between them is recommended to help determine the extent to which these CSOs are active.

Based on Wright-Pierce's analysis of supplemental flow meter data and projections by the updated PWD SWMM hydraulic/hydrologic model of PWD's interceptor sewers in Westbrook, the following short-term and long-term CSO abatement goals are recommended for PWD and Westbrook:

### **Short Term Goals**

- Reduce surcharging at the siphon structure that is contributing to discharges at CSO 002, 003 and 004.
- Complete additional flow metering and sewer investigation at CSOs 007 and 008 to better understand the sewer system hydraulics at these two locations and confirm if additional CSO abatement work is needed to facilitate their eventual closure.
- Complete supplemental sanitary sewer system flow metering and I/I investigations in the sewers tributary to the siphon and the Cottage Place Pump Station to identify and isolate sources of extraneous flow that effectively occupy a significant portion of the existing sanitary sewer system's capacity at times.

### **Long-Term Goals**

- Complete strategic I/I source elimination projects in the sewers tributary to the siphon and the Cottage Place Pump Station over the next CSO Master Plan cycles to cost-effectively recapture existing sanitary sewer system capacity that is temporarily lost to excess I/I entering the sanitary sewers during wet weather.
- Reduce CSO discharges to comply with National CSO Control Policy. This could result in closure or conversion of remaining CSOs, or reduction in overflow events to comply with guidelines in National CSO Control Policy.

### **1.3 Recommendations**

Table 1-2 that follows summarizes the anticipated planning-level cost to implement the recommended CSO Master Plan projects during the next 5-year Master Plan Cycle and Table 1-3 provides a recommended 5-year CSO Master Plan Implementation Schedule.

The targeted project completion dates listed in Table 1-3 are contingent upon when final approval of the CSO Master Plan is granted by Maine DEP. Target completion dates will be adjusted as necessary pending Maine DEP's review comments and subsequent time to revise the CSO Master Plan. Depending on the results of short-term CSO abatement projects, subsequent CSO abatement projects and/or phases may change in scope or be eliminated as part of future CSO Master Plan Updates.

**Table 1-2 PWD & Westbrook 5-Year CSO Master Plan - Planning-Level Capital Costs**

Item	Description	Planning-Level Costs
<b>CSO 002, 003, 004 Abatement Projects</b>		
1	Project 003-2a: WP Meter Basin 102-97 Phase 1 Flow Metering	\$145,000
2	Project 003-2b: WP Meter Basin 102-97 Phase 2 SSES and I/I Identification	\$125,000-\$575,000
3	Project 003-3a: WP Meter Basin 102-13 Phase 1 Flow Metering	\$65,000
4	Project 003-3b: WP Meter Basin 102-13 Phase 2 SSES and I/I Identification	\$125,000-\$575,000
5	Project 003-1a: Design and Construct Offline Storage Tank	\$10,000,000
<b>CSO 007 &amp; 008 Abatement Projects</b>		
6	Projects 007-1 and 008-1: CSO Confirmation Flow Metering	\$78,000
7	Project 007-2a: Dana Court Pump Station - Design and Construct Force Main Upgrades	\$543,000
<b>Total Project Costs (See Note 2)</b>		<b>\$11,150,000-12,000,000</b>

Notes:

1. The totals listed in this table assume all recommended CSO projects and project phases discussed in Section 8 are completed. As abatement projects are completed it is possible that some subsequent projects or project phases may no longer be necessary.
2. Total Project Costs may increase as Project 003-2c costs are better defined after the completion of Project 003-2b.
3. The cost for Item 5, Project 003-1a, Design and Construct Offline Storage Tank, is based on an assumed \$10/gallon of storage provided based on other similar projects Wright-Pierce has been involved with. The cost for offline storage tanks varies due to many factors including but not limited to soils, presence of bedrock, depth to groundwater, presence of other utilities, and land acquisition costs. An updated cost for this tank will be developed during preliminary design once more information becomes available.
4. Refer to Appendix A for Maine DEP comments regarding Project 003-1a.

**Table 1-3 PWD & Westbrook 5-Year CSO Master Plan Cycle Implementation Schedule**

Item	Description	Completion Date
<b>CSO 002, 003, 004 Abatement Projects</b>		
1	Project 003-2a: WP Meter Basin 102-97 Phase 1 Flow Metering	December 31, 2024
2	Project 003-2b: WP Meter Basin 102-97 Phase 2 SSES and I/I Identification	December 31, 2025
3	Project 003-3a: WP Meter Basin 102-13 Phase 1 Flow Metering	December 31, 2026
4	Project 003-3b: WP Meter Basin 102-13 Phase 2 SSES and I/I Identification	December 31, 2027
5	Project 003-1a: Design and Construct Offline Storage Tank	December 31, 2028
<b>CSO 007 &amp; 008 Abatement Projects</b>		
6	Projects 007-1 and 008-1: CSO Confirmation Flow Metering	December 31, 2025
7	Project 007-2a: Dana Court Pump Station - Design and Construct Force Main Upgrades	December 31, 2028

Table 1-4 has also been presented as a suggested 20-year CSO Master Plan implementation schedule for all of the recommended abatement projects discussed in Section 8. Planning-level costs and dates for projects beyond the next 5-year CSO Master Plan cycle have not been prepared since their necessity and scope will be contingent on the results of the projects recommended in the 5-year implementation schedule.

**Table 1-4 Westbrook & PWD 20-Year CSO Implementation Schedule**

Project Description	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
<b>CSOs 002, 003 &amp; 004</b>																					
<b>Project 003-1: 1.0 MG Offline Storage Tank</b>																					
003-1a: Design and Construct Offline Storage Tank																					
003-1b: Post-Construction Flow Monitoring																					
<b>Project 003-2: WP Meter Basin 102-97 I/I Source Removal</b>																					
003-2a: Phase 1 Flow Metering																					
003-2b: Phase 2 SSES and I/I Identification																					
003-2c: Phase 3 Targeted I/I Removal																					
003-2d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-3: WP Meter Basin 102-13 I/I Source Removal</b>																					
003-3a: Phase 1 Flow Metering																					
003-3b: Phase 2 SSES and I/I Identification																					
003-3c: Phase 3 Targeted I/I Removal																					
003-3d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-4: WP Meter Basin 101-325 I/I Source Removal</b>																					
003-4a: Phase 1 Flow Metering																					
003-4b: Phase 2 SSES and I/I Identification																					
003-4c: Phase 3 Targeted I/I Removal																					
003-4d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-5: WP Meter Basin 3-2 I/I Source Removal</b>																					
003-5a: Phase 1 Flow Metering																					
003-5b: Phase 2 SSES and I/I Identification																					
003-5c: Phase 3 Targeted I/I Removal																					
003-5d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-6: WP Meter Basin 101-25 I/I Source Removal</b>																					
003-6a: Phase 1 Flow Metering																					
003-6b: Phase 2 SSES and I/I Identification																					
003-6c: Phase 3 Targeted I/I Removal																					
003-6d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-7: WP Meter Basin 101-169 I/I Source Removal</b>																					
003-7a: Phase 1 Flow Metering																					
003-7b: Phase 2 SSES and I/I Identification																					
003-7c: Phase 3 Targeted I/I Removal																					

Project Description	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
003-7d: Phase 4 Post-Const. Flow Metering																					
Project 003-9: Evaluate Closures of CSO 002, 003 and 004																					
<b>CSO 007</b>																					
Project 007-1: CSO Confirmation Metering & CCTV		X																			
Project 007-2: Dana Court PS Force Main Upgrade				X	X	X															
007-2a: Design and Construct Force Main Upgrades																					
007-2b: Post-Construction Flow Monitoring						X															
Project 007-3: I/I Source Confirmation & Removal (Tentative)																					
007-3a: Phase 1 Supplemental Flow Metering																					
007-3b: Phase 2 SSES and I/I Identification																					
007-3c: Phase 3 Targeted I/I Removal																					
007-3d: Phase 4 Post-Construction Flow Metering																					
Project 007-4: Evaluate Closure of CSO 007																					
<b>CSO 008</b>																					
Project 008-1: CSO Confirmation Metering		X																			
Project 008-2: I/I Source Confirmation & Removal (Tentative)																					
008-1b: Phase 2 Supplemental Flow Metering																					
008-1b: Phase 3 SSES and I/I Identification																					
008-1c: Phase 4 Targeted I/I Removal																					
008-1d: Phase 5 Post-Construction Flow Metering																					
Project 008-2: Evaluate Closure of CSO 008																					
CSO Master Plan Updates	X					X					X				X			X			X

## Section 2 Introduction, Background and Purpose of CSO Master Plan Update

### 2.1 Introduction

This City of Westbrook Combined Sewer Overflow (CSO) Master Plan Update (Plan) was prepared to meet the conditions set forth in Special Condition J (4) of the Portland Water District's (PWD) and City of Westbrook's (City) Maine Pollutant Discharge Elimination System (MEPDES) Permit and Waste Discharge License. By June 31, 2021, PWD and the City were required to submit to the Maine Department of Environmental Protection (herein referred to as "Maine DEP" or "DEP") an update of the City of Westbrook CSO Master Plan. Maine DEP granted an extension to this deadline until December 31, 2023 to allow more time for flow metering to capture larger storms needed for SWMM model calibration.

### 2.2 Background

Wastewater from residential, commercial, institutional and industrial sources is collected in the Westbrook collection system and Portland Water District (PWD) interceptor system for transport and eventual treatment at the Westbrook Wastewater Treatment Facility (WWTF).

There are five licensed combined sewer overflow (CSO) outfalls that are part of the Westbrook interceptor sewer system. These CSOs discharge to the Presumpscot River and are included in the Portland Water District's Maine Pollutant Discharge Elimination System (MEPDES) Permit #ME0100846 and Maine Waste Discharge License (WDL) # W001510-6D-I-R, July 2017.

The October 9, 1991 Administrative Consent Agreement between the Board of Environmental Protection, City of Westbrook (City) and the Portland Water District (PWD) required the Portland Water District and the City of Westbrook to submit a sewer system master plan for the abatement of combined sewer overflows. In response, PWD and the City of Westbrook submitted the *Sewer System Master Plan for Westbrook, Maine*, in December of 1993 to Maine DEP and the Environmental Protection Agency (EPA). The Master Plan was revised to address DEP and EPA comments in December 1996. The 1996 *CSO Master Plan for Westbrook Maine, Volume II* included a goal to control CSOs to the one-year return period rainstorm. This abatement level was approved by EPA on February 24, 1997 and Maine DEP on March 26, 1997. A revised CSO abatement projects implementation schedule was approved by Maine DEP in October 1999. The *Combined Sewer Overflow Master Plan Update Study for Westbrook ME* prepared by Woodard and Curran in 2008 served to update the 1996 *CSO Master Plan for Westbrook, Maine Volume II* study. The CSO abatement projects Implementation Schedule from the 2008 *Combined Sewer Overflow Master Plan Update Study for Westbrook ME* report was updated by Woodard and Curran in 2010 in response to Maine DEP comments. The CSO Master Plan was updated again in 2014 by Jordan Environmental Engineering.

On August 6, 2016, Maine DEP and PWD entered into an Administrative Consent Agreement (ACA) regarding several CSO abatement projects that were not completed by the implementation dates listed in the updated 2010 Implementation Schedule from the *Combined Sewer Overflow Master Plan Update Study for Westbrook ME* report. The City has since completed these CSO abatement projects listed in the ACA. The ACA also required PWD to submit an evaluation of the flows and capacities of the collection system, interceptors, pump stations and the Westbrook WWTF to determine whether additional storage capacity or sewer separation projects are required to achieve the goals of the Westbrook CSO Master Plan. The required CSO abatement projects and evaluation listed in the ACA were incorporated into Special Condition J (4) of PWD's 2017 Maine Pollutant Discharge Elimination

System (MEPDES) Permit #ME0100846 and Maine Waste Discharge License (WDL) #W001510-6D-I-R for the Westbrook WWTF. This City of Westbrook CSO Master Plan Update serves to fulfill the requirements of the ACA and PWD's MEPDES Permit to complete and submit the subject evaluation.

### 2.3 Purpose of CSO Master Plan

The purpose of this City of Westbrook CSO Master Plan Update is to set forth a recommended plan, including budgetary costs and implementation schedule, for abating or eliminating the impacts of CSO discharges in the Westbrook sewer system. The elements of this CSO Master Plan Update, and their respective Sections within this Plan, are as follows:

1. CSO Assessment and Monitoring

- a. *Section 3, Receiving Waters of CSO Overflows*
- b. *Section 4, CSO Flow Monitoring*
- c. *Section 5, Sewer System Flow Monitoring*
- d. *Section 6, Treatment Facility Evaluation*

2. Prioritization and Alternative Analysis

- a. *Section 7, CSO Abatement Prioritization*
- b. *Section 8, Screening and Evaluation of Control Alternatives*
- c. *Section 9, Recommended CSO Abatement Plan*

3. Implementation Schedule

- a. *Section 9, Recommended CSO Abatement Plan*

4. Proposed Budget

- a. *Section 9, Recommended CSO Abatement Plan*

Section 1 - Summary, Conclusions and Recommendations acts as an executive summary of Sections 2 through 9.

### 2.4 Study Approach

The development of this study was based readily available CSO program data from PWD and Westbrook including:

- Previous design reports, studies and record drawings of key sewer system components, past CSO abatement and I/I removal projects, CSO structures and major pump stations.
- Historical Westbrook CSO Master Plan Update studies.
- Annual CSO Progress Reports from 2014 to 2021.
- Recent CSO flows and activity data from 2014 to 2022, including precipitation information.
- Permanent and temporary sewer system flow meter data between 2014 and 2022.
- Readily available pump station flow/runtime data between 2014 and 2021.
- Planned capital improvement projects within sewer service areas including sewer collection system projects, storm drain projects, and roadway replacement projects.
- Sewer service area with known capacity issues, grit accumulation, grease accumulation, and historical SSOs.
- Sewer system GIS data from both the City of Westbrook and PWD.

The original goal of the 1996 CSO Master Plan was control of CSO discharges to an average of one discharge per year. However, in 2007, Maine DEP required as part of its approval of the 2008 CSO Master Plan Update that PWD and Westbrook also consider an abatement goal to eliminate all CSO discharges. This CSO Master Plan Update includes a discussion of both abatement goals (1 discharge per year, on average, and elimination of all CSOs) including the selected design storm for sizing facilities to achieve each goal, the equivalent excess sewer flow volume that would need to be eliminated or captured to achieve each goal, and the technical and financial feasibility of achieving these goals as part of the evaluation of CSO abatement project alternatives.

### 2.4.1 Summary of Historical CSO Abatement Projects (2008-2022)

PWD and the City of Westbrook have been working to complete the recommended CSO abatement projects outlined in the updated 2010 Implementation Schedule from the *Combined Sewer Overflow Master Plan Update Study for Westbrook ME* report as well as other wastewater system improvements. Table 2-1 summarizes the CSO abatement projects status since 2008. Figure 2-1 provides a visual representation of the projects completed with respect to the associated CSOs and drainage areas.

**Table 2-1 Summary CSO Abatement Projects Completed (2008-2022)**

Projects Completed	Associated CSO	Year
<b>Portland Water District</b>		
Project N202A - Enlarge sewer pipe from Warren Ave. regulator to Interceptor	002	2011
Project N203A - Raise overflow weir at Warren Ave CSO regulator	002	2012
Project N203B - Install Screens, Warren Avenue, Siphon Inlet & Dunn Street	002	2020*
Project N207- Continue monitoring the Westbrook sewer system to identify excessive inflow/infiltration.	002	Ongoing
Project N301 – New Bar Racks at Cottage Place PS	003	2008
Project N402 - Seal off overflow flap gate in Dunn Street CSO regulator	004	2009
Project N404A - Enlarge sewer pipe from Dunn Street CSO regulator to interceptor	004	2011
Project N404B - Raise Overflow Weir in Dunn Street CSO regulator	004	2011
Project N504 - Separate CB on Wayside Drive	005	2008
Project N601 - Separate CB on Lincoln St.	006	2008
Project N701A – Re-evaluate best option to further abate Brown Street and King	007	2015
Project N701B - Dana Court PS capacity increase or storage facility	007	2019
Project N703 – Separate CB on Reserve Street	007	2015
Project N704 – Enlarge sewer pipe from Brown Street CSO to Dana Court PS	007	2015
Project N705A - Raise Overflow Weir in Brown Street CSO regulator	007	2017
Project N709 - 2014 CSO Master Plan Update	007	2014

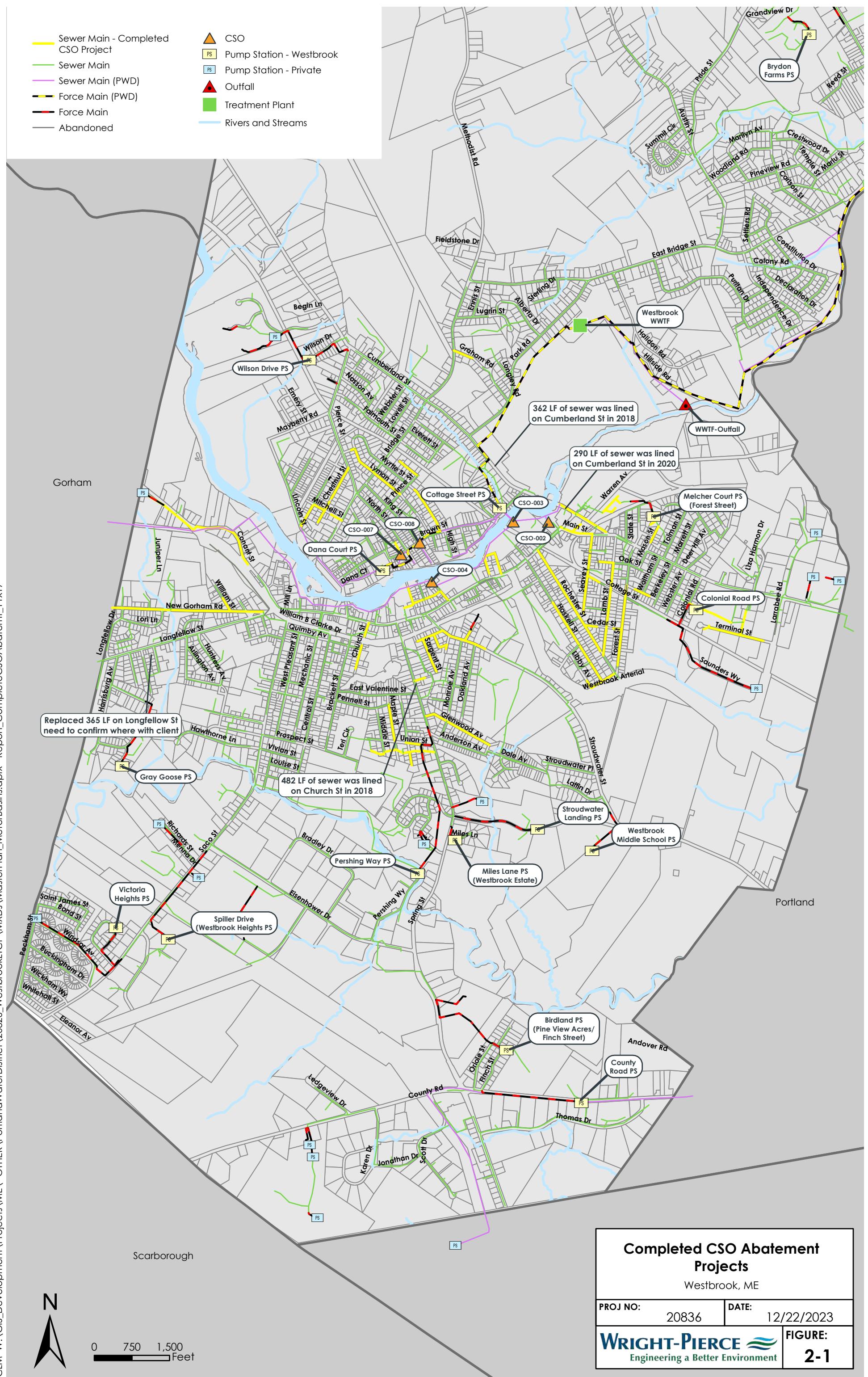
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Project N801 – Enlarge sewer pipe from King Street CSO to Brown Street CSO	008	2017
Project N802A - Raise Overflow Weir in King Street CSO regulator	008	2017
Reduced bar rack spacing at Cottage Place and East Bridge Pump Stations to improve pump station reliability.	002, 003, 004, 007, 008	2023
<b>City of Westbrook</b>		
Project N201A - Separate Rochester and Haskell Streets	002	2018
Project N 201B – Replace sewers on Rochester St., Haskell St., Boothby Ave., Lawrence St., Libby Ave., Cedar St., Forest St. and Gray St.**	002	2010
Project N204 - Replace stone sewer on Seavey Street	002	2017
Project N205 – Develop and implement a miscellaneous I/I removal program	--	2011-2015
Project N302 - Connect 8 catch basins on Cumberland Street to storm drain system	003	2012/2021
Project N303 - Replace or eliminate various sewer pipes near the end of Melcher	003	2010
Project N304 - Replace sewer in gully next to Melcher Court (from Newcomb Place).	003	2010
Project N311 – Line leaky sewer on Main Street	003	2016
Project N313 – Replace leaky sewers on Spiers and Stevens Streets	003	2016
Project N401 - Separate CBs on Pleasant, Doyle, Highland, and Sargent, Streets	004	2010
Project N406 – Replace leaky sewers on Cloudman, Foster and Dunn Streets	004	2016
Project N407 – Line leaky sewer on Stroudwater Street, etc.	004	2016
Project N501 - Separate CBs on Maple Street; replace Union Street Sewer	005	2019
Project N503 – Separate CBs on Glennwood Street	005	2016
Project N505 - Replace leaking sewers on New Gorham Road	005	2019
Project N506 – Replace leaky sewers on Conant Street and Route 25	005	2016
Project N602 - Replace leaking sewers on Kennard, Chestnut, and Mitchell Street	006	2018
Project N702B – Separate Cole Street gully sewer	007	2018
Project N703 - Separate catch basin at intersection of Brown and Reserve Streets	007	2015
Replaced leaky sewers between State Street and Melcher Court	002	2022
Relined sewers and manholes on Bridge Street	003, 007, 008	2023
Submit Long Term Control Plan (LCTP) Update	--	2022***

\*Baffle was installed at Siphon CSO structure. No screens installed at Warren Ave. and Dunn St. CSOs.

\*\*Boothby Avenue sewers were relined. Sewers on the other streets listed as part of the potential project areas were further evaluated by Westbrook and it was determined that projects were not necessary in these areas as infiltration and inflow were minimal.

\*\*\*Extension was granted by Maine DEP until December 31, 2023



The 2010 Implementation Schedule also included two projects that were not completed prior to this CSO Master Plan update. Project N306A, to evaluate the size and options for a storage facility at the siphon inlet structure, has been completed as part of this CSO Master Plan update. Project N306B, to construct a new storage facility at the siphon inlet structure, is discussed further in Section 8 and 9 of the report.

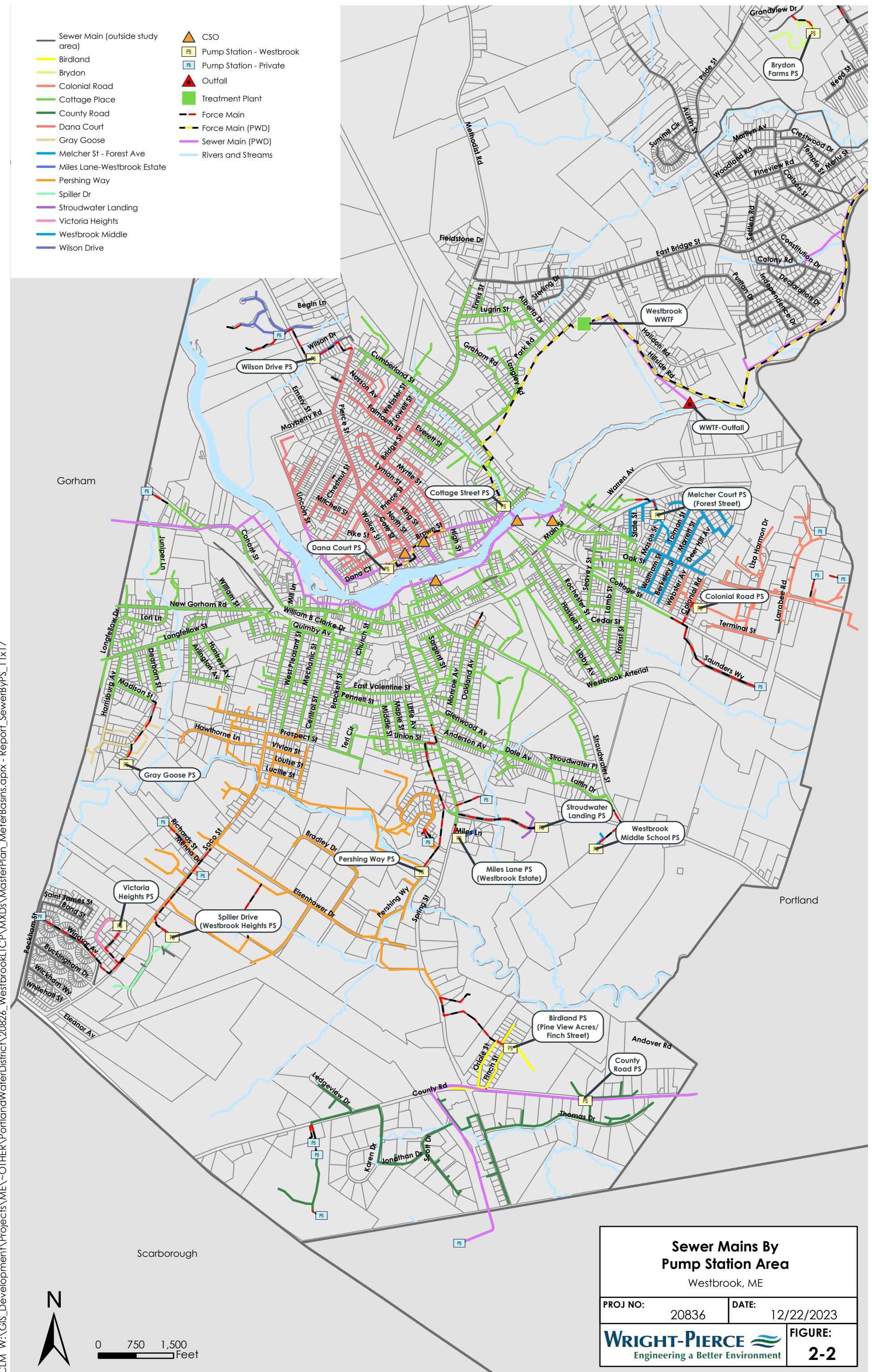
### 2.4.2 Description of Existing Collection System and Treatment Facilities

The following is a general discussion of the existing sewers in Westbrook and PWD's Westbrook WWTF. Detailed discussions of the sewer systems and WWTF can be found in Section 5 and Section 6 of this report, respectively.

#### 2.4.2.1 Westbrook Sewer Collection System

PWD owns and operates two major interceptor sewers located in Westbrook, Maine that collect and transport wastewater flows from the sewer systems of several communities in the Westbrook region including Westbrook, Gorham, and a portion of Windham. PWD's Westbrook interceptor system includes three major pump stations that help convey flow to PWD's Westbrook WWTF. The Dana Court Pump Station serves most of the downtown Westbrook area north of the Presumpscot River to roughly Cumberland Street between Myrtle and Bridge Street to the east and Lincoln Street to the west. The Cottage Place Pump Station conveys sewer flows from Gorham, a portion of Windham south of the Presumpscot River, Westbrook sewers south of the Presumpscot River, and Westbrook sewers to the north of the Presumpscot River to roughly East Bridge Street in Westbrook, including the drainage area of PWD's Dana Court Pump Station (Figure 2-2). The remaining Westbrook sewers along East Bridge Street and to the north and east are served by PWD's East Bridge Pump Station at the intersection of East Bridge Street and Route 302 in Westbrook. There are no combined sewers in the East Bridge Pump Station service area and excessive inflow and infiltration (I/I) has been significantly reduced by previous sewer system work completed in this area. Therefore, this service area was not considered a candidate for additional I/I investigation and is not considered further in the CSO Master Plan update. Both the Cottage Place and East Bridge Pump Stations pump sewer flows directly to PWD's Westbrook WWTF on Park Road in Westbrook for treatment.

The City of Westbrook also owns and operates 13 pump stations within its sewer system. For the purposes of this study, the sewers in Westbrook have been divided up into 16 pump station service areas. Each service area will be generally referred to by the name of the pump station serving that drainage area (Figure 2-2).



Combined sanitary and storm waters that enter the sewers and exceed their capacity discharge from combined sewer overflows within the PWD interceptor sewer system. These CSOs were originally designed as part of the interceptor sewer system to provide protection against property damage from combined sewer flows backing up into basements or overwhelming wastewater pumping facilities during large storm events. These CSO discharges are authorized by PWD's Maine Pollutant Discharge Elimination System (MEPDES) permit. PWD currently maintains five licensed CSO discharge locations within its interceptor sewers in Westbrook:

- Warren Parking Lot (CSO 002)
- Siphon Inlet (CSO 003)
- Dunn Street (CSO 004)
- Brown Street (CSO 007)
- King Street (CSO 008)

ADS Flowshark area-velocity flow meters are installed in the CSO discharge pipe at each CSO location to monitor and measure flow during CSO events. Figure 2-2 includes the locations of the five licensed CSOs. Each of the CSO structures is described in more detail in Section 4. Originally, about 10% of the City of Westbrook's sewer system was combined, mainly in the older sections of the City corresponding to the downtown areas closest to the Presumpscot River. As of 2020, about 3% of the system remains combined.

### 2.4.2.2 Westbrook Wastewater Treatment Facility

The Westbrook WWTF located on Park Road in Westbrook is owned and operated by PWD and receives sewer flows directly from the Cottage Place Pump Station and the East Bridge Pump Station. The WWTF accepts flows from Westbrook, Gorham and small portion of Windham. The WWTF was originally constructed in 1978 and has undergone various upgrades over time including an upgrade to the secondary system ongoing as of December 2023. While originally part of the WWTF, screening and grit removal devices are no longer utilized. Instead, screening is provided at Cottage Place and East Bridge Pump Stations. Grit is allowed to settle out in the aeration basins and is removed from the aeration basins semi-annually. The facility provides biological treatment via the activated sludge process using two parallel treatment trains. Each of the two aeration basins at the WWTF are followed by two 90-foot diameter clarifiers. Secondary clarifier effluent is chlorinated in one of two parallel chlorine contact tanks and then dechlorinated prior to being discharged to the Presumpscot River through a 42-inch reinforced concrete outfall pipe with a diffuser. The diffuser consists of fourteen equally spaced risers with ports measuring 6 inches in diameter to enhance rapid and complete mixing of the discharged effluent with the receiving waters. Biosolids dewatering at the WWTF is accomplished by means of a gravity sludge thickener and screw press. Dewatered sludge is landfilled by a third-party contractor.

## 2.5 Summary of EPA/DEP CSO Regulations/Guidelines

Chapter 570 of the Maine DEP Combined Sewer Overflow Abatement guidelines outlines the basis by which a discharge from a combined overflow point within a sewerage system can be permitted. In order for a CSO to be allowable by the Maine DEP Chapter 570 guidelines, the discharge must meet the following conditions:

1. Discharge in excess of design capacity: The discharge consists of wastewater in excess of design capacity of the sewerage system or treatment facilities;
2. Discharge not due to mechanical failure: The discharge is not the result of mechanical failure, improper design or inadequate operation or maintenance, and;

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3. CSO Master Plan: The licensee is actively developing or implementing a CSO Master Plan in accordance with Chapter 570 guidelines, and as approved by the Department; or the licensee has implemented the CSO Master Plan, and a discharge occurs that is caused by conditions exceeding those upon which the Plan is based.

PWD and the City of Westbrook meets all the above criteria for allowable CSOs at its licensed overflows.

The MEPDES discharge license for PWD and the City of Westbrook, as co-permittees, (WDL #W001510-6D-I-R/MEPDES Permit #ME0100846) was renewed on July 6, 2017, for a five-year period. The highlights of this permit, as pertaining to this CSO Master Plan, are summarized below:

- PWD and the City of Westbrook are licensed to discharge an unspecified quantity of excess combined sanitary and storm water during wet weather events from five combined sewer overflow outfalls into the Presumpscot River.
- PWD/Westbrook are required to submit a CSO Master Plan Update and abatement schedule on or before June 30, 2022 (extension was granted until December 31, 2023 via January 6, 2023 letter from Maine DEP).
- CSO Compliance Monitoring must be conducted, including block testing or flow monitoring at all CSO locations and annual CSO flow volumes reported.
- Requirement to implement and follow the Nine Minimum Controls (NMC) These minimum controls are set forth to reduce CSO activity and pollutant discharges while long-range plans are being completed. The NMC will be discussed further in Section 8 of this plan.
- Annual CSO Progress Reports must be submitted each year summarizing CSO flow activity and volumes and CSO Abatement project status updates.
- PWD and Westbrook are required to complete the following CSO abatement projects listed in Table 2-2 from the August 2, 2016 ACA with Maine DEP:

**Table 2-2 CSO Abatement Projects from Maine DEP**

Project Number	Description	Deadline	Status
<b>PWD</b>			
N705A/N705B	Raise Overflow Weir in Brown Street CSO Regulator	12/31/2017	Complete
N802A/N802B	Raise Overflow Weir in King Street CSO Regulator	12/31/2017	Complete
N203B	Install Screens, Warren Avenue, Siphon Inlet & Dunn Street	12/31/2018	Complete
N701B	Dana Court PS capacity increase or storage	3/31/2019	Complete
N204	Replace Stone Sewer on Seavey Street	12/01/2017	Complete
N201A	Separate Rochester and Haskell Streets	12/31/2017	Complete
N602	Replace Leaking Sewers on Kennard, Chestnut, & Mitchell St.	12/31/2018	Complete
<b>Westbrook</b>			
N501	Separate CB's on Maple, Replace Union Street Sewer	12/31/2019	Complete
N505	Replace Leaking Sewers on New Gorham Road	12/31/2019	Complete

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The City and PWD have completed all these permit terms with the completion and submission of this CSO Master Plan Update.

# Section 3 Receiving Waters of CSO Overflows

## 3.1 Receiving Water Quality Standards

Table 3-1 below summarizes PWD's five permitted CSOs within the Westbrook sewer collection system, as well as their respective receiving waters and waterbody classification. Figures showing the locations of the CSOs are included in Sections 2 and 5.

**Table 3-1 Maine DEP Permitted CSOs and Receiving Waters Classifications**

CSO Outfall #	Location	Receiving Water & Class
002	Warren Parking Lot Regulator	Presumpscot River, Class C
003	Siphon Inlet Structure	Presumpscot River, Class C
004	Dunn Street Regulator	Presumpscot River, Class C
007	Brown Street Regulator	Presumpscot River, Class C
008	King Street Regulator	Presumpscot River, Class C

A summary of the waterbody classification requirements for Class C waterbodies is included below.

### 3.1.1 Class C Waters

According to Maine law, 38 M.S.R.A §465.4, Class C waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation. The dissolved oxygen content (a measure of waterbody health with regard to aquatic lifeforms) of Class C water may not be less than 5 parts per million or 60% of saturation, whichever is higher, except that in identified salmonid spawning areas where water quality is sufficient to ensure spawning, egg incubation and survival of early life stages, that water quality sufficient for these purposes must be maintained. In order to provide additional protection for the growth of indigenous fish,

The dissolved oxygen may not be less than 6.5 parts per million as a 30-day average based upon a temperature of 24 degrees centigrade or the ambient temperature of the water body, whichever is less. Between April 15th and October 31st, the number of Escherichia coli bacteria in Class C waters may not exceed a geometric mean of 100 CFU per 100 milliliters over a 90-day interval or 236 CFU per 100 milliliters in more than 10% of the samples in any 90-day interval. Discharges to Class C waters may cause some changes to aquatic life, except that the receiving waters must be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

## 3.2 Impairments To Use Due To CSO Overflows

### 3.2.1 State Water Quality Assessment

The State of Maine 2016 Integrated Water Quality Monitoring and Assessment Report lists the Presumpscot River main stem downstream of the former Saccarappa Dam site in Westbrook (Waterbody #ME 0106000103\_609-R\_01) as, "Category 2: Rivers and Streams Attaining Some Designated Uses—Insufficient Information for Other Uses". For this segment of the Presumpscot River, it is currently attaining the dissolved oxygen and bio-criteria standards for a Class C waterbody. There is insufficient data to determine if other designated uses are being attained or not at this time. In addition, a Statewide Bacteria TMDL was implemented in 2009 to support action to reduce public health

risk from waterborne disease-causing organisms. PWD and the City's wastewater discharge license requires PWD and the City to implement CSO control projects in accordance with the most currently approved City of Westbrook CSO Master Plan and CSO abatement implementation schedule. The continued implementation of the CSO abatement projects in the City of Westbrook CSO Master Plan will help support the goal of the Statewide Bacteria TMDL in this river segment and elimination or abatement of CSO events at any of the five CSOs could further improve water quality within the segment of the Presumpscot River immediately downstream of the CSO discharge outfalls.

# Section 4 CSO Flow Monitoring

## 4.1 Introduction

The PWD has been monitoring flow at its CSO discharge points in the Westbrook sewer collection system since 1996. Prior to expected CSO events based on forecasted weather, PWD and City staff monitor the pump stations and CSO equipment to make sure that it is functioning properly, and in the event of a power outage, that the emergency generators are in operation at the pump stations equipped with generators. CSO events due to pump station mechanical failure are not permitted and are reported to DEP with non-compliance/discharge incident reports if they occur.

The CSO flow meter data at each CSO location is reviewed after a rain event to see if a CSO has occurred. A summary of CSO events is compiled in the subsequent month and is available to stakeholders. The City and PWD also submit an annual CSO report to DEP which describes activity for all five permitted CSOs. The following sections describe the five active CSOs in the Westbrook sewer system.

### Warren Parking Lot CSO 002

CSO 002 consists of a large reinforced concrete storage and regulator structure situated between two parking lots with the Presumpscot River to the north, Main Street to the southeast and Cumberland Street to the northeast (Figure 4-5). During dry weather, sewer flows pass from a manhole to the east of the structure to a manhole south of the regulator structure and then to a manhole to the west of the structure and onto the 18-inch diameter interceptor sewer that runs along the Presumpscot River in the parking lot to the north of the CSO 002 regulator structure. The manhole to the south of the regulator structure includes a 42-inch diameter overflow pipe that is connected to the regulator structure. During wet weather flows, excess combined sewer flows through the 42-inch diameter overflow pipe to the regulator structure. Once the hydraulic grade line of the CSO structure exceeds the weir elevation, flows discharge over the weir in the regulator structure and out the CSO 002 outfall pipe that runs northward from the regulator structure to the Presumpscot River. Permanent CSO flow metering equipment is mounted in the regulator structure and measures sewer depths and flows in the incoming 18-inch overflow pipe.

**Figure 4-1 Warren Parking Lot Regulator Structure (CSO 002)**



The image shows the inside of the CSO 002 regulator structure including the weir wall in the foreground of the image and monitoring equipment that is attached to the ladder rungs in the upper right-hand side of the figure. The outfall channel is in the lower right-hand corner of the image.

### **Siphon Inlet CSO 003**

The siphon inlet structure CSO 003 is located along the southern bank of the Presumpscot River in a public park to the east of the Springfield Terminal railroad tracks (Figure 4-6). CSO 003 is located downstream of both CSO 002 and CSO 004. The triple-barreled siphon consists of two underground cast-in-place concrete open-channel regulator structures along the northern and southern banks of the Presumpscot River and two 21-inch diameter pipelines and one 12-inch pipeline under the Presumpscot River connecting the inlet and outlet structures. The siphon's inlet structure is located on the southern bank of the Presumpscot River and the outlet structure is located on the northern bank. Collected sewer flows south of the Presumpscot River pass through the siphon and onto the Cottage Place Pump Station where they are then pumped to the Westbrook WWTF for treatment. Without tailwater conditions, the siphon pipelines can theoretically carry about 19.3 MGD when flowing full and up to 24 MGD with tailwater before CSO 003 would be activated. The siphon's theoretical capacity exceeds the peak

pumping capacity of the downstream Cottage Place Pump Station (15.1 MGD). When siphon flows exceed the peak pumping capacity of the Cottage Place Pump Station during wet weather conditions as a result of excess I/I in the sanitary sewers, PWD must throttle the flows into the pump station using an adjustable sluice gate to prevent overflows out of the pump station wetwell and property damage. The throttling of flows to the Cottage Place Pump Station results in surcharged conditions in the siphon structure and excess flows are discharged out of CSO 003 on the inlet side of the siphon.

PWD's 42-inch South Side Interceptor sewer collects flows from the Westbrook sewers generally to the south and west of Haskell Street, as well as from the towns of Windham and Gorham, and flows into the siphon inlet structure from the west. PWD's 18-inch interceptor sewer that collects flows from the sewers generally to the north and east of Haskell Street enters the siphon inlet structure from the east. The combined incoming sewer flows from the two interceptor sewers then pass under the Presumpscot River through the siphon pipelines to the siphon outlet structure on the northern bank of the Presumpscot and onto the Cottage Place Pump Station, where it is then pumped to the Westbrook WWTF for treatment. When sewage flows from the 42-inch and 18-inch PWD interceptor sewers become elevated during wet weather a result of I/I entering the Westbrook upstream sewers, the water level in the siphon inlet structure surcharges until the siphon's hydraulic capacity is exceeded. The excess flows then pass over a partition wall with a trash baffle to an outlet channel to the CSO 003 outfall pipe and out to the Presumpscot River.

**Figure 4-2 Siphon Inlet Structure CSO 003**



The image includes the CSO 003 overflow channel to the outfall pipe with monitoring equipment in the upper portion of the image.

#### Dunn Street CSO 004

The Dunn Street Regulator CSO structure is located at the northern dead end of Dunn Street that intersects the public walking trail along the southern bank of the Presumpscot River. Flows from the 21-inch diameter sewer along Dunn Street enter the CSO 004 regulator structure from the south and then flow eastward through a short segment of 15-inch diameter sewer equipped with a backflow prevention check valve into the 42-inch PWD South Side Interceptor sewer. The CSO regulator structure also includes a cast-in-place concrete partition wall that extends to about half the regulator structure's height and is equipped with an adjustable steel plate that acts as a sharp crested weir for measuring CSO flows. When the PWD interceptor becomes surcharged from excess I/I entering from the Westbrook sewers, the interceptor's ability to receive additional flows from the 21-inch sewer along Dunn Street becomes limited and excess flows from the 21-inch sewer eventually surcharge over the CSO weir in the partition wall and out a CSO outfall pipe on the other side of the partition wall to the Presumpscot River to prevent additional surcharging into basements along Dunn Street (Figure 4-7).

**Figure 4-3 Dunn Street Regulator Structure CSO 004**



The image shows the inside of the CSO 004 regulator structure including the weir wall with adjustable weir plate. The overflow outfall channel is in the upper portion of the image.

### Brown Street CSO 007

The Brown Street CSO consists of a manhole structure located on Brown Street between the intersection of North Street and Reserve Street that is constructed with a brick partition wall surrounding a CSO outfall pipeline to divert excess flows to the Presumpscot River during wet weather when the sewer system's capacity is exceeded. Flows enter the manhole via 8-inch, 12-inch and 18-inch diameter influent sewers and exit the structure through a 24-inch diameter sewer. During CSO events, the water level in the manhole surcharges until it flows over the brick partition wall. A doppler area-velocity meter records the outgoing flows in the 24-inch CSO outfall pipeline. The CSO outfall pipeline is connected to a shared stormwater outfall pipe that discharges to the Presumpscot River.

**Figure 4-4 Brown Street CSO 007 Structure**



The image shows the inside of the CSO 007 regulator manhole including the CSO diversion wall in the upper half of the manhole and the monitoring equipment in the lower portion of the image.

### King Street CSO 008

Similar to the Brown Street CSO, the King Street CSO structure consists of a manhole structure located on Brown Street near the intersection of Brown Street and King Street that is constructed with a brick partition wall surrounding a 24-inch CSO outfall pipeline that runs along King Street to divert extraneous flows to the Presumpscot River during wet weather when the sewer system's capacity is exceeded. Flows normally enter the manhole via 24-inch diameter influent sewer and exit through 24-inch diameter effluent sewer. During CSO events, the water level in the manhole surcharges until it eventually flows over the brick partition wall and through the 24-inch diameter CSO outfall pipe. A doppler area-velocity meter records the outgoing flows in the CSO outfall pipeline. The CSO outfall pipeline is connected to a shared stormwater outfall pipe that discharges to the Presumpscot River.

**Figure 4-5 King Street CSO 008 Structure**



The image shows the inside of the CSO 008 regulator manhole including the CSO diversion wall in the upper half of the manhole and the monitoring equipment in the lower portion of the image.

## 4.2 CSO Activity Analysis

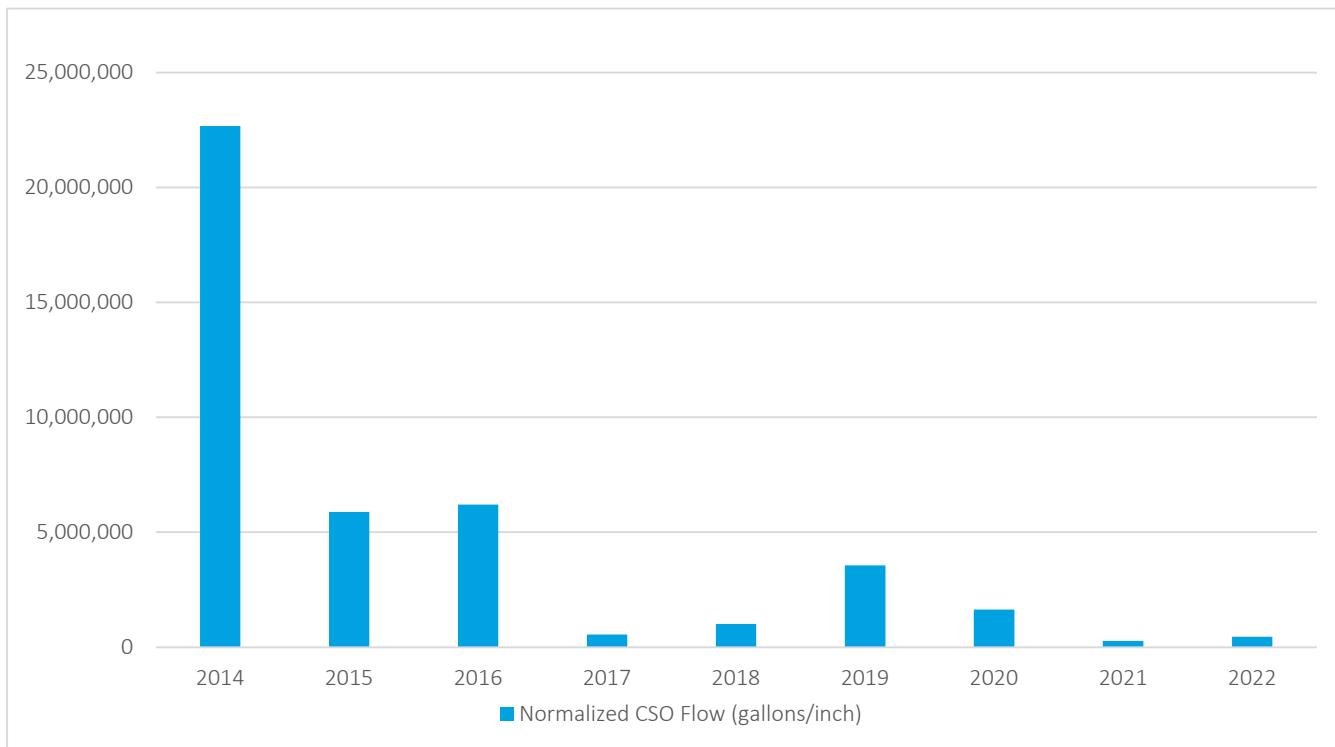
Table 4-1 that follows presents annual data on CSO discharge volumes, rainfall for the Westbrook area, CSO discharge volumes normalized to wet weather event precipitation, and average CSO wet weather event precipitation magnitude from 2014 through 2022. The volume and number of CSO events has been reduced considerably during this period and the storm event size (in terms of total rainfall) required to trigger a CSO discharge is trending upward, indicating that the CSOs are becoming less active over time and for only larger storms. This downward trend in CSO activity is attributed to ongoing sewer collection system and pump station upgrades completed by PWD and the City of Westbrook.

**Table 4-1 Summary of Annual CSO Volumes and Rainfall (2014-2022)**

Year	No. of CSO Events	Annual CSO Volume (Gallons)	Normalized CSO Volume (Gallons/Inch)	Average CSO Event Rainfall (Inch)
2014	70	11,932,000	22,673,917	0.641
2015	49	4,423,000	5,879,895	0.65
2016	38	7,447,100	6,206,495	0.92
2017	2	1,285,000	544,765	2.49
2018	6	1,631,000	1,005,502	1.71
2019	4	9,816,000*	3,552,277	2.27
2020	3	3,227,000	1,629,919	1.72
2021	4	1,038,000	275,708	2.68
2022	2	926,156	451,971	1.50

\*77% of the 2019 CSO discharge volume was from a single storm that included 3.47 inches of rain between 12/13/2019 and 12/14/2019.

Figure 4-1 summarizes CSO activity in terms of CSO discharge volume per inch precipitation from the wet weather events that caused the CSO discharges.

**Figure 4-6 Annual CSO Volume Normalized by Precipitation 2014-2022**

It is clear from this figure that CSO activity has been significantly reduced in the Westbrook sewer system since 2014.

Figure 4-2 and Figure 4-3 show the annual CSO discharge volumes and annual CSO discharge volumes normalized to event precipitation at each of PWD's licensed CSO outfalls in the Westbrook collection system between 2014 through 2022, respectively. Figure 4-4 summarizes the annual number of CSO events or activations at each licensed CSO during the same period.

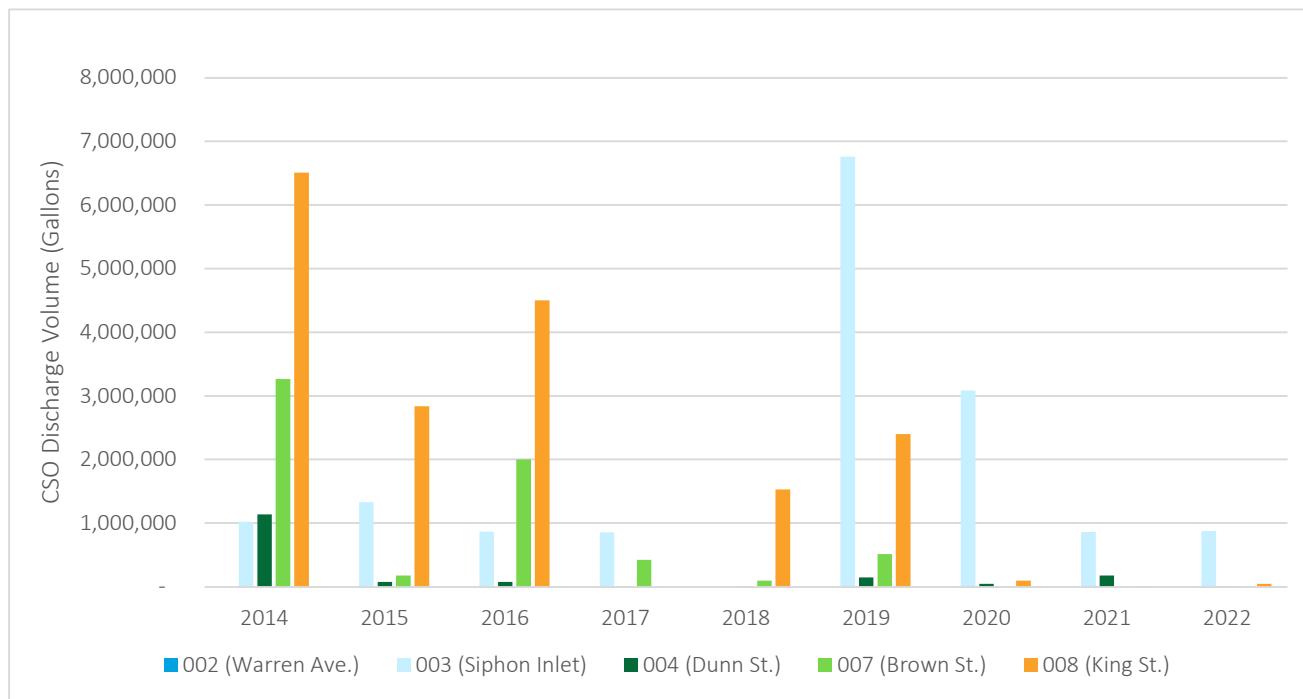
Figure 4-2 shows that the more active CSOs in the collection system, on average, are the Siphon Inlet CSO (003), the King Street CSO (008) and the Brown Street CSO (007). The Dunn Street CSO (004) was less active, on average, and the Warren Avenue Parking Lot CSO (002) did not have any discharges during this period.

When normalized to precipitation, the CSO volumes in Figure 4-3 indicate a significant downward trend in CSO activity per inch precipitation since 2014, with the Siphon Inlet CSO (003) and King Street CSO (008) being the most active, on average, over the past 5 years.

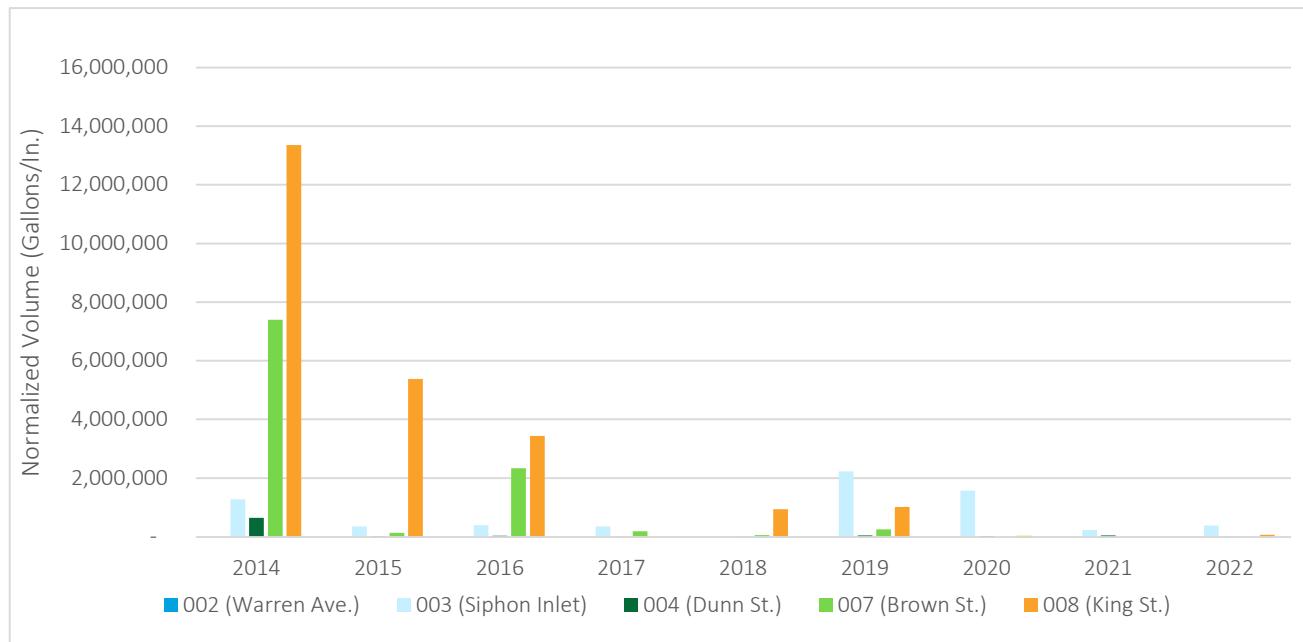
In 2017, PWD raised the weir elevations in the regulator structures for the Brown Street CSO (007) and King Street CSO (008). Figure 4-4 indicates a distinct drop in the number of CSO activations per year at these two CSOs after 2017, correlating to this change.

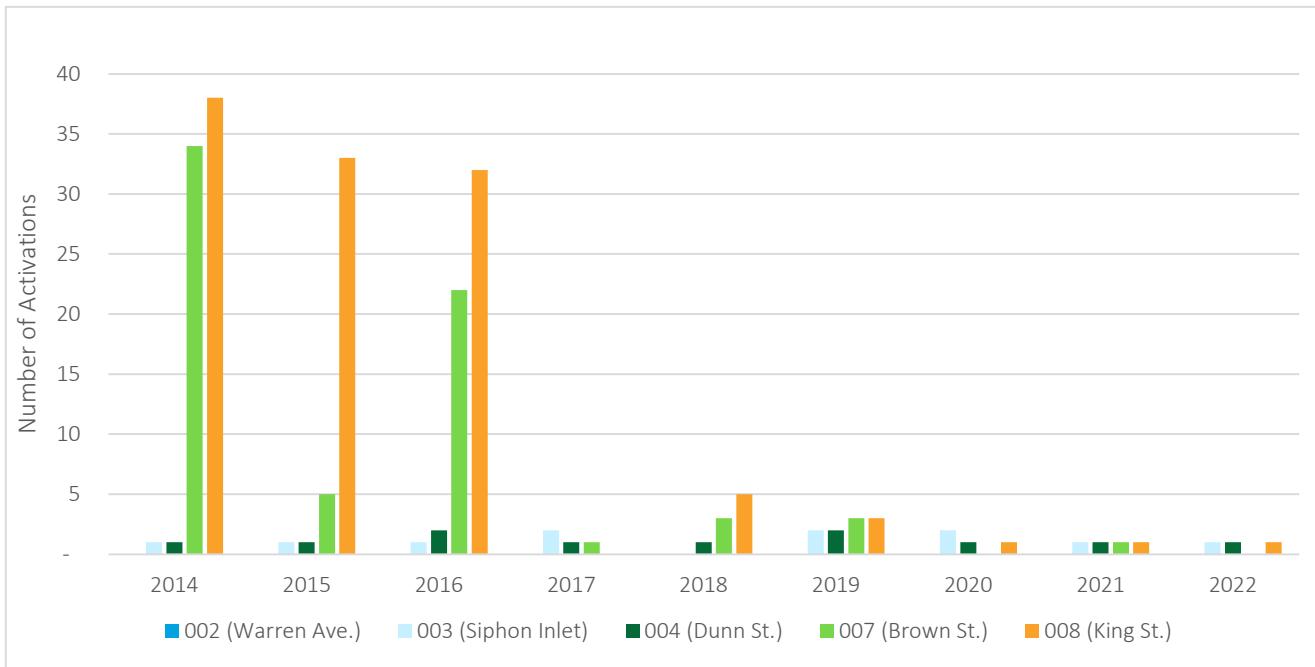
Overall, the data suggests that the Westbrook sewer system has seen a marked downward trend in CSO activity and volumes since 2014, attributable to PWD and Westbrook's ongoing CSO abatement progress.

**Figure 4-7 Annual CSO Outfall Discharges 2014-2022**



**Figure 4-8 Annual CSO Outfall Discharges Normalized to Precipitation 2014-2022**



**Figure 4-9 Annual CSO Activations 2014-2022**

# Section 5 Sewer System Flow Monitoring

## 5.1 Introduction

PWD contracts with a private flow monitoring services company to maintain 8 permanent area/velocity flow meters, 6 of which are currently dedicated to measuring flows at the 5 CSOs and 2 in the interceptor sewers entering the siphon inlet structure. PWD also maintains permanent magnetic flow meters at the Cottage Place, Dana Court and East Bridge Pump Stations. The data collected over the years has helped identify areas of high inflow and infiltration (I/I) and has led to several I/I reduction projects including sewer separation, relining and sewer and manhole replacement. This data is also useful in calibration of PWD's SWMM hydraulic/hydrologic model of PWD's Westbrook interceptor sewers.

However, the 2014 Westbrook CSO Master Plan Update study also recommended that other key locations of the Westbrook sewer system be monitored to obtain sufficient information about the interceptor sewer system hydraulics to make informed decisions about the most effective CSO abatement projects and assist with their design. To achieve the recommended goal of the 2014 Master Plan Update study, PWD and Westbrook retained Wright-Pierce to complete supplemental temporary flow monitoring in the Westbrook sewer collection system between February and May of 2022, and then again in February to June of 2023 due to lack of sufficient storms of sufficient magnitude in February to May 2022. Wright-Pierce also completed an evaluation of available pump station data provided by PWD and Westbrook to further supplement the flow metering data, as described in Section 5.2 that follows. The purposes of the supplemental flow monitoring and evaluation of flow meter and pump station flow data were to:

1. Supplement PWD's permanent flow meters in the Westbrook sewer system,
2. Provide additional data to help refine and calibrate the existing SWMM hydraulic/hydrologic model of PWD's Westbrook interceptor system and CSO outfalls,
3. Provide additional insight into which portions of the Westbrook sewer system are the most reactive to wet weather events and may contain potential sources of extraneous inflow and infiltration sources,
4. Help establish which areas of the Westbrook sewer system should be prioritized for additional I/I investigation,
5. Help with the evaluation and design of potential future CSO abatement projects.

The results of the pump station flow data analysis are summarized in Section 5.2. The results of the supplemental flow metering completed by WP are described in Section 5.3.

## 5.2 Pump Station Flow Analysis

Wright-Pierce reviewed available flow meter, totalizer, and pump run time data for 12 of the 13 pump stations in the Westbrook sewer system that are owned by the City of Westbrook and 2 of the 3 pump stations that are owned by PWD to understand the comparative baseline flows in these pump station service areas. PWD's East Bridge Pump Station and Westbrook's Brydon Farms Pump Station were excluded from study because they do not influence any of the active CSOs. Of the 14 pump stations reviewed, only Cottage Place Pump Station and Dana Court Pump Station are currently equipped with flow meters that can measure and record instantaneous flow measurements. Flow information from the other 12 pump stations was limited to totalizer and pump run time data. Table 3 summarizes the pump station service areas in terms of inch-miles of sewer served by the pump station, pump station average daily flow (ADF), average daily flow normalized to the pump station service area, and the associated CSO influenced by the pump station service area.

**Table 5-1 Westbrook Pump Stations Summary**

Pump Station ID	Service Area (LF sewer served)*	Inch-miles of sewer*	ADF (GPD)**	Normalized ADF (GPD/inch-mi)	Associated CSOs
Birdland	21,700	36.64	158,506	4,326	004
Colonial Road	16,582	27.70	66,982	2,418	004
Cottage Place	288,375	576	2,708,640	4,702	003, 008
County Road	17,602	29.14	151,938	5,214	003, 004
Dana Court	37,839	71.99	362,880	5,041	007
Gray Goose	3,929	5.95	--	--	003, 004
Melcher Court	12,095	20.20	24,060	1,191	002,003
Miles Lane	465	0.70	1,742	2,489	003, 004
Pershing Way	46,925	80.68	114,180	1,415	003, 004
Spiller Drive	1,810	2.60	26,940	10,362	003, 004
Stroudwater Landing	888	1.31	8,106	6,188	003, 004
Victoria Heights	1,675	2.53	4,544	1,796	003, 004
Westbrook Middle Sch.	385	0.43	17,554	40,823	003
Wilson Drive	3,783	5.73	13,574	2,369	007

\*estimated from sewer system GIS data provided by the City of Westbrook and PWD. Service areas include any tributary pump station service areas for the purposes of calculating the normalized ADF.

\*\*estimated from available totalizer and flow meter data provided by PWD and the City of Westbrook.

The following observations were made with regard to the normalized average flows from the pump station service areas:

1. Many of Westbrook's smaller pump stations are not equipped with a flow meter to provide peak instantaneous flow data for analysis. Westbrook sewer system staff rely on pump totalizer runtime data to provide an average daily pump station flow rate. This calculated average flow does not account for diurnal variations in domestic sewer flows throughout the day, making it difficult to draw conclusions as to the presence of I/I in a pump station catchment based solely on this data. As these pump stations are upgraded over time, Westbrook should consider installing permanent in-line flow meters at the pump stations to help monitor pump station performance over time and help detect the possible presence of excess I/I in the pump station service areas. Additionally, flow metering could occur in the drainage areas served by the pump stations to isolate areas of higher I/I.
2. The Spiller Drive Pump Station service area has a high average daily flow considering the small number of sewer users in its service area. This is likely attributable to the industrial garment/textile cleaning business (Cintas) connected to the pump station service area sewers that has a high water use rate. Even if it is not related to Cintas, the flows in this drainage area are very small.

3. The Stroudwater Landing Pump Station service area appears to have a somewhat higher average daily flow when normalized to the service area. However, the pump station serves only two recently constructed assisted living facilities, so it would be expected that the higher water usage at these facilities is the likely reason for the higher normalized average daily flow, and not extraneous water entering the sewers through leaking pipes or offset pipe joints.
4. Westbrook Middle School Pump Station has a very high average daily flow considering the relatively small service area. This is likely due to the relatively high daily water use at Westbrook Middle School.
5. If Spiller Drive, Stroudwater Landing and Westbrook Middle School pump station service areas are omitted because of their relatively high water use rates compared to the quantity of sewers in the service area that tend to skew their normalized average daily flow, it is notable that County Road Pump Station has only the 5<sup>th</sup> largest service area by inch-miles of pipe, but has the highest normalized average daily flow of the remaining pump station service areas. This is likely due to the relatively high number of commercial users in the County Road Pump Station service area, and not a result of elevated baseline flows, since the sewers in this part of Westbrook are comparatively newer than sewers in other portions of downtown Westbrook and would be expected to have lower I/I rates than older sewers in the downtown areas near the Presumpscot River.

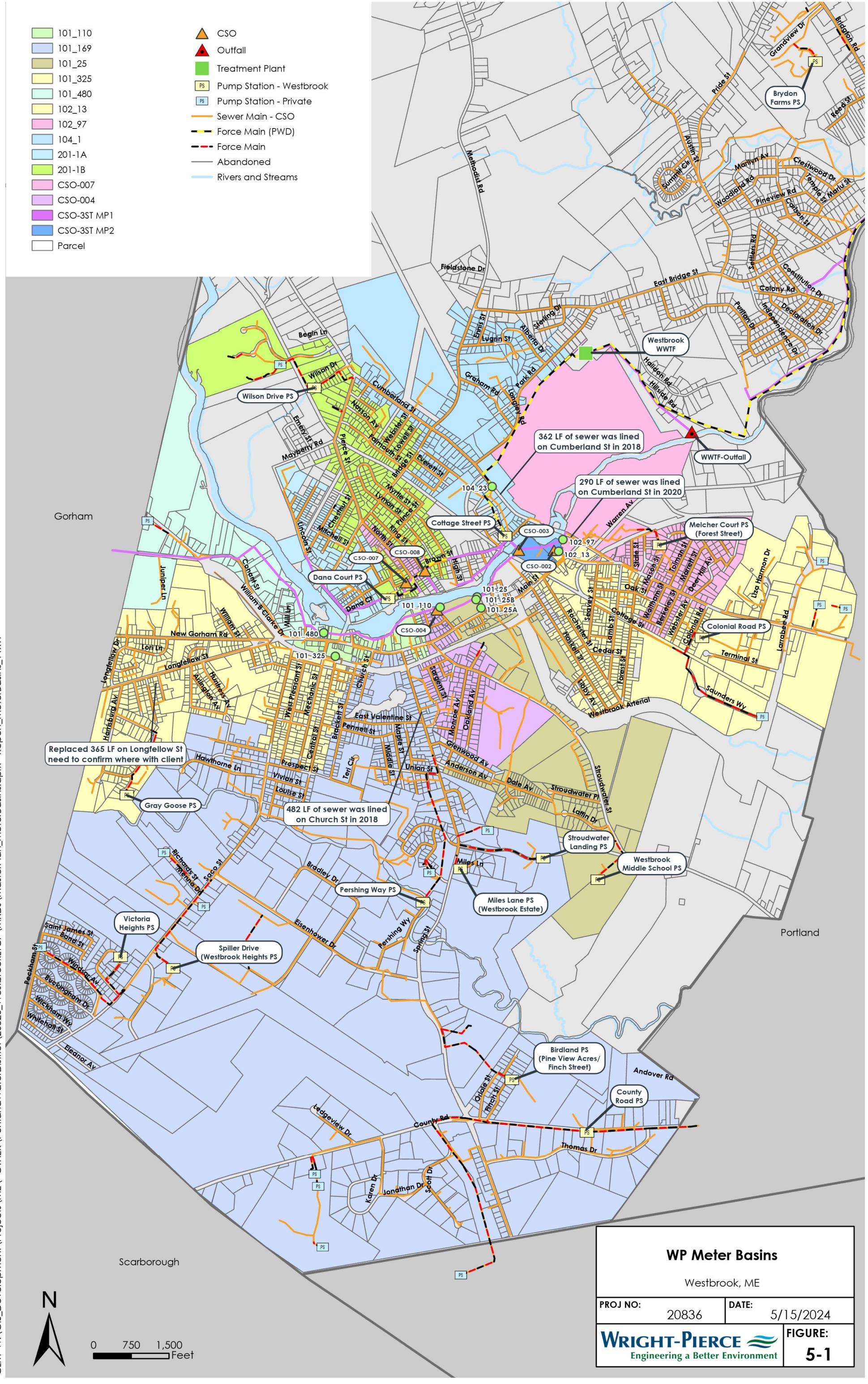
### 5.3 Sewer System Flow Metering

In addition to PWD's permanent area-velocity flow meters installed at each of the active CSO locations and interceptor sewers, WP deployed eight supplemental temporary area-velocity flow meters throughout the Westbrook sewer system to better characterize the hydraulics of the sewer system's response to wet weather events, with a focus on the sewers to the south of the Presumpscot River that are tributary to CSO 003 at the siphon inlet, which is the most active CSO in the Westbrook sewer system (Refer to Appendix B). The supplemental flow metering allowed WP to update and calibrate PWD's hydraulic/hydrologic model of the interceptor sewers in the Westbrook sewer system for storms captured during the two flow metering periods, and project potential CSO discharges from the active CSO locations during larger storms. The projected CSO volumes were then used for planning future CSO abatement projects, as discussed in Section 9. The supplemental flow metering also provided additional insight into areas of the sewer system that may be potential sources of extraneous flow and the target of future I/I investigations by Westbrook. The temporary flow meters were deployed between February 2022 and May 2022 and again between March 2023 and June 2023. The portions of the sewer system that were captured by the supplemental flow meters are shown in Figure 5-1.

The flow metering program included the installation, maintenance, and removal of the eight meters over the course of the monitoring periods. Wright-Pierce field technicians installed and maintained the meters. Site visits were conducted as needed to address data issues or equipment issues. Manual depth and velocity measurements were taken periodically at site visits to check and calibrate the meters. Both rounds of flow metering were conducted using SmartWater area-velocity sensors.

Metered flows were downloaded, reviewed, and analyzed to help identify portions of the collection system suspected of elevated flows during wet weather. The flow metering analysis involved calculating the peaking factor for each WP flow meter basin by relating the peak storm flow to the average baseline flow during the metering period. The peak-to-average flow ratios provided a general indication of the reactivity of the sewers in each meter basin to metered storm events. However, the size of the meter basins and their average pipe diameter differed

between basins, so the peak and average baseline flows were first normalized to the size of the meter basins and average pipe diameter to provide a better relative comparison of peak flow ratios between meter basins. The sewers in the meter basins with the highest peak flow ratios, normalized to the meter basin size and average pipe diameter, were presumed to be the most reactive to the storm events captured during the two metering periods. Prioritizing these most reactive sewers for further I/I investigation will provide a cost-effective approach to future I/I abatement.



### **5.3.1 Spring 2022 Flow Metering Results**

The two largest precipitation events during the initial supplemental metering period between February 2022 and May 2022 occurred on March 7, 2022 and April 8, 2022, and resulted in 0.75 inches of precipitation over about 12 hours and 1.51 inches of precipitation over about 11 hours, respectively. In terms of storm recurrence intervals, both the March 7, 2022 and April 8, 2022 storms were less than a 1-year storm. Smaller storms such as the two described were not well suited for calibrating PWD's hydraulic/ hydrologic model of the interceptor sewers for the purposes of simulating larger storms. Therefore, WP recommended that a second round of temporary flow metering be conducted to capture at least a 1-year storm event for model calibration. The results of the second round of flow metering are discussed in Section 5.3.2.

Although not well suited for calibrating PWD's hydraulic/ hydrologic model, a review of the metered peak flows during these two storms in comparison to the average baseline flows measured during the entire metering period was still informative and can assist Westbrook in narrowing future I/I investigation and removal work to meter basins that are more responsive to wet weather events. Table 5-2 summarizes the average sewer flows in each WP meter basin and the peak flows measured during the March 7, 2022 and April 8, 2022 storms.

**Table 5-2 WP Flow Metering Results Summary – Spring 2022**

Meter ID	Meter Basin Size (in-mi)	Average Flows (MGD)	Peak Flows (MGD)		Normalized Flow (GPD/in-mi)			Peak Flow Ratio	
			3/7/2022 storm	4/8/2022 storm	Average	Peak Flow 3/7/2022 storm	Peak Flow 4/8/2022 storm	3/7/2022 storm	4/8/2022 storm
101-25	32.31	0.680	2.051	2.12	21,039	63,479	65,491	3.02	3.11
101-110	24.67	1.929	3.622	4.05	78,192	146,818	164,005	1.88	2.10
101-169	212.72	0.176	1.87	2.28	827	8,791	10,704	10.62	12.94
101-325	71.17	0.226	2.364	1.54	3,170	33,216	21,666	10.48	6.83
101-480	33.18	0.149	0.77	1.03	4,492	23,116	30,892	5.15	6.88
102-13	75.07	0.074	1.093	2.36	989	14,560	31,491	14.72	31.84
102-97	28.67	0.080	--	0.42	2,795	--	14,615	--	5.23
104-1	37.75	0.018	--	0.20	483	--	5,325	--	11.03

Notes:

1. Meter data was not usable from WP Meters 102-97 and 104-1 during 3/7/2022 storm due to meter malfunctions.

Table 5-2 also includes the calculated peak-to-average flow ratios for each storm, normalized to the size of the meter basins in miles and average pipe diameter in inches.

The peak flow ratios were averaged for the two storms and WP Meter Basin 102-13 had the highest peak-to-average flow ratio for the two storms (23.3), followed by Meter Basin 101-169 (11.8), Meter Basin 104-1 (11.0) and Meter Basin 101-325 (8.6). Although WP Meter Basin 104-1 basin does not directly contribute to flows to CSO 003 at the siphon inlet, it could, in effect, contribute to surcharging of siphon flows back to the siphon inlet during large storm events by occupying a significant portion of the available capacity in the sewers just upstream of the Cottage Place Pump Station into which WP Meter Basin 104-1 flows. WP Meter Basins 101-480 and 102-97 averaged peak flow ratios of 6.0 and 5.2, respectively for the two storms, which are relatively moderate compared to those of the four meter basins previously mentioned. WP Meter Basins 101-25 and 101-110 had peak flow ratios less than 4 for the two storms.

### **5.3.2 Spring 2023 Flow Metering Results**

The two largest precipitation events during the Spring 2023 supplemental metering period between late March 2023 and June 2023 occurred on May 1, 2023 and May 20, 2023. The May 1, 2023 storm resulted in 2.88 inches of precipitation over about 30 hours and the May 20, 2023 storm resulted in 2.95 inches of precipitation over about 10.5 hours. In terms of storm recurrence intervals, the May 1, 2023 storm was between a 1-year and 2-year storm and the May 20, 2023 storm was between a 2-year and 5-year storm. The two described storms were used to calibrate PWD's hydraulic/ hydrologic model of the interceptor sewers for the purposes of simulating larger storms.

Table 5-3 that follows summarizes the average sewer flows in each WP meter basin and the peak flows measured during the May 1, 2023 and May 20, 2023 storms.

It should also be noted that Wright-Pierce installed another flow meter in SMH 101-171 at the intersection of Main Street and Ash Street during the Spring 2023 flow metering period that was not previously installed during the Spring 2022 flow metering period. Additionally, the flow meter installed in SMH 101-169 during the Spring 2022 round of flow metering was removed and relocated to SMH 3-2 on the cross-country gravity sewer that flows along the Stroudwater River and into the Pershing Way Pump Station near the pump station wetwell during the second round of supplemental flow metering that was completed by Wright-Pierce in the Spring of 2023 to provide additional insight into a portion of the sewers in the relatively large WP Meter Basin 101-169. The location of the supplemental flow meter in SMH 3-2 and the tributary area is shown in Figure 5-2.

Figure 5-2 WP Meter Basin 101-169 Supplemental Meter Location SMH 3-2

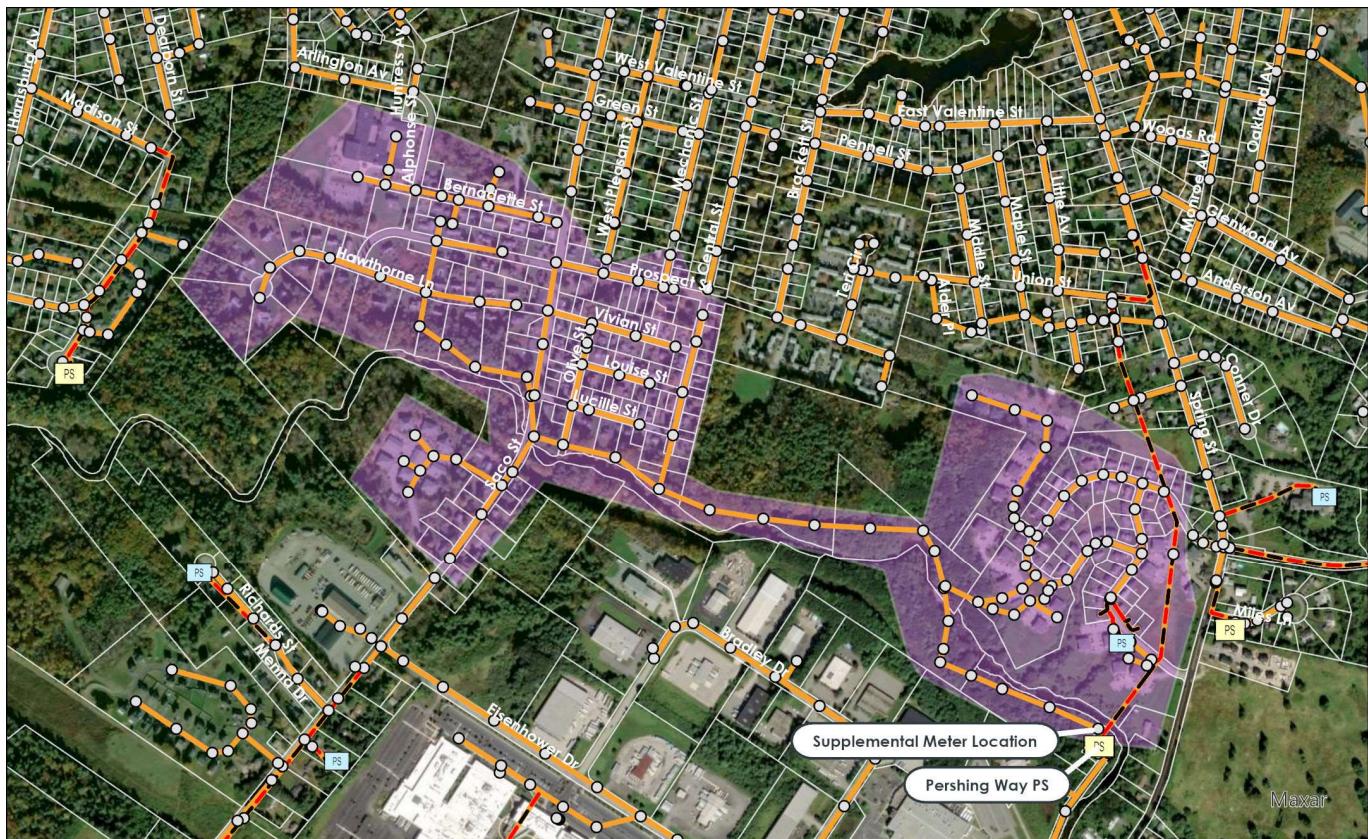


Table 5-3 WP Flow Metering Results Summary – Spring 2023

Meter ID	Meter Basin Size (in-mi)	Average Flows (MGD)	Peak Flows (MGD)		Normalized Flow (GPD/in-mi)			Peak Flow Ratio	
			5/1/2023 storm	5/20/2023 storm	Average	Peak Flow 5/1/2023 storm	Peak Flow 5/20/2022 storm	3/7/2022 storm	4/8/2022 storm
101-25	6.46	0.017	1.078	0.415	2,632	166,873	64,241	63.41	24.41
101-110	24.67	1.346	6.535	6.145	54,560	264,897	249,088	4.86	4.57
101-325	71.17	0.026	1.192	0.032	365	16,749	450	45.85	1.23
101-480	33.18	0.411	3.539	1.165	12,387	106,661	35,112	8.61	2.83
102-13	75.07	0.720	4.080	3.181	9,591	54,349	42,374	5.67	4.42
102-97	28.67	0.038	1.535	1.136	1,325	53,540	39,623	40.39	29.89
104-1	37.75	0.016	0.662	0.117	424	17,536	3,099	41.38	7.31
3-2	39.11	0.009	0.310	0.088	230	7,926	2,250	34.44	9.78

### 5.3.3 Flow Metering Analysis

#### 5.3.3.1 WP Flow Meter Basins

The WP meter basins with the highest observed peak to average flow ratios are described in greater detail in the discussion that follows, based on flow meter data collected by Wright-Pierce between February 2022 and May 2022 and March and June 2023. Generally, sewers with an average flow of 1.0 MGD or less would be expected to have a design peak to average flow ratio between about 4:1 to 5.5:1<sup>1</sup>, which includes an allotment for a reasonable amount of I/I. Sewers with peak to average flow ratios higher than this benchmark that do not have a significant sewer user, such as a major medical or industrial facility, that could affect the peak to average flow ratios would be suspected of potentially containing excess I/I during wet weather or high groundwater conditions. Therefore, for the purposes of this study, WP meter basins with peak to average flow ratios of about 5:1 or less, for the four storm events that were selected for analysis during the Spring 2022 and Spring 2023 flow metering periods, were assumed to be less likely to have excessive I/I than the other WP meter basins with higher peak to average flow ratios during these same storm events. These WP meter basins with peak to average flow ratios of 5:1 or less have been excluded from the flow metering analysis discussion that follows because they are of lower priority in terms of potential future I/I abatement. The high priority meter basins with peak to average flow ratios higher than 5:1 were included in the flow metering analysis that follows and are described in numerical order based on the flow meter ID. The discussions also include recommended preliminary next steps for the City of Westbrook to further investigate and isolate possible sources of excess I/I in these meter basins.

The baseline infiltration rates in the meter basins with higher peak to average flow ratios during both the Spring 2022 and Spring 2023 supplemental flow metering periods were estimated using the Stevens-Schutzbach empirical method that relates the assumed typical minimum daily flows occurring between the hours of 12:00 AM and 6:00 AM to the average daily flows to estimate the baseline infiltration rate. The estimated baseline infiltration rates were then normalized to the meter basin sizes (inch-diameter-miles or idm) to allow for a relative comparison between meter basins of different sizes. The Massachusetts Department of Environmental Protection uses a baseline infiltration benchmark of 4,000 gpd/idm to determine if a sewer catchment is suspected of excess baseline infiltration and warrants further investigation. This benchmark was used to help provide insight into the potential sources of excess flow in the meter basins with the highest peak to average flow ratios.

**WP Meter Basin 101-25:** Figure 5-1 at the beginning of Section 5.3 shows that the approximate Meter Basin 101-25 area that includes the residential and commercial area bounded by Main Street, Dunn Street, the Westbrook Arterial Highway, and William L. Clarke Drive, the residential area along Abbey Road, the Hannaford supermarket, a portion of the Westbrook Regional Vocational Center, Westbrook Middle School and residential neighborhoods along Laffin Drive, Stroudwater Place, Dale Avenue, Village Lane and a portion of Stroudwater Street.

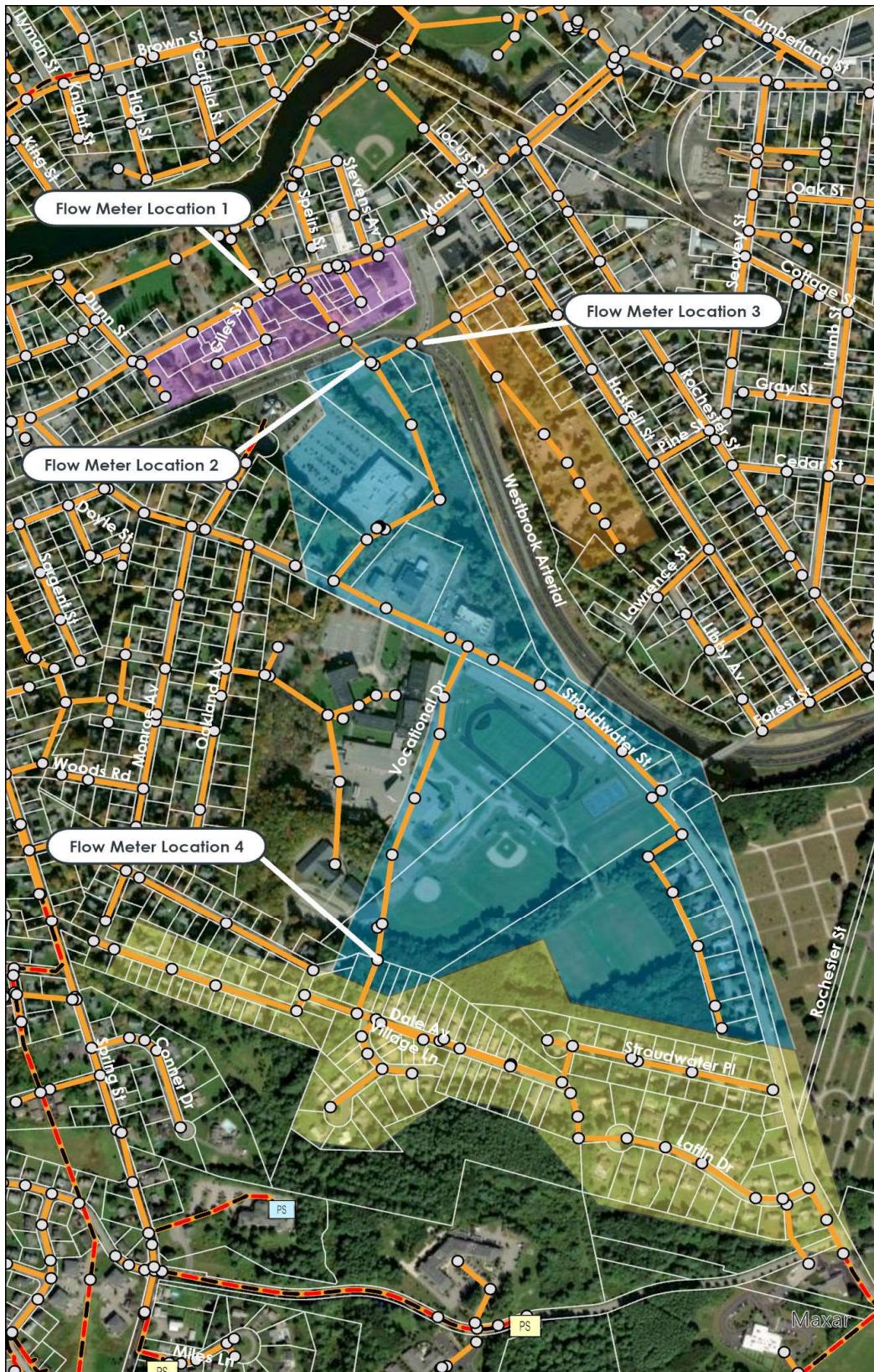
During the 2022 supplemental flow metering conducted by Wright-Pierce, WP Meter Basin 101-25 had a relatively low peak to average flow ratio for the March 7, 2022 and April 8, 2022 storms (about 3:1 for both storms). However, some of the flow meter data appears suspect and the flow meter may not have been functioning properly during the 2022 flow metering period. In contrast, the peak to average flow ratios in WP Meter Basin 101-25 for the May 1, 2023 and May 20, 2023 storms during the Spring 2023 flow metering period were significantly higher (about 63:1 and 24:1, respectively). The estimated baseline infiltration in this meter basin was below the 4,000 gpd/idm-benchmark indicator.

<sup>1</sup> WEF/ASCE MOP-FD-5 *Gravity Sanitary Sewer Design and Construction*

The observed high peak to average flow ratios during the May 1, 2023 and May 20, 2023 storms, coupled with the relatively low baseline infiltration rate in this catchment, could be indicative of inflow sources directly connected to the sewers causing the observed excess peak flows during wet weather.

Historically, the sewers in WP Meter Basin 101-25 have not been targeted as a high priority area for sewer separation or other I/I reduction projects when compared to previously identified higher priority I/I abatement areas in earlier versions of the Westbrook CSO Master Plan. It is recommended that Westbrook conduct supplemental flow metering in this meter basin to verify the findings of the supplemental flow metering and further isolate potential I/I sources for further field investigation and potential removal. A temporary area-velocity flow meter in the sewers just downstream of the Westbrook Middle School Pump Station force main terminus or a permanent in-line instantaneous magnetic flow meter should also be installed at the Westbrook Middle School Pump Station to monitor flows from the pump station so that these flows can be better characterized and separated out from those of the remaining gravity sewers in WP Meter Basin 101-25. Suggested supplemental flow metering locations in the gravity sewers in WP Meter Basin 101-25 are shown in Figure 5-3.

Figure 5-3 WP Meter Basin 101-25 Supplemental Meter Locations



**WP Meter Basin 101-169:** Meter Basin 101-169 is the largest meter basin in geographic area and linear footage of sewers south of the Presumpscot River (Figure 5-1). Meter Basin 101-169 includes the service areas of seven of the City's 16 pump stations. Generally, Meter Basin 101-169 can be divided into three areas:

- The gravity sewers serving the residential districts to the north of the Stroudwater River that flow toward the collector sewer on Ash Street,
- the gravity sewers to the north of the Stroudwater River that flow to the cross-country collector sewer along the Stroudwater River that flows to Pershing Way Pump Station (WP Meter Basin 3-2),
- the service areas of the seven pump stations and gravity sewers to the south of the Stroudwater River that eventually flow to Pershing Way Pump Station that pumps its flows to the gravity sewer on Spring Street and the residential areas served by the gravity sewer on Spring Street and Main Street up to the connection to the collector sewer at the intersection of Main Street and Ash Street (PWD Meter in SMH 101-171).

During the Spring 2022 supplemental flow metering conducted by Wright-Pierce, WP Meter Basin 101-169 had relatively high peak to average flow ratios of about 10:1 and 12:1 for the March 7<sup>th</sup> and April 8<sup>th</sup> storms, respectively. The estimated baseline infiltration during the 2022 supplemental flow metering period was not indicative of excessive groundwater infiltration in WP Meter Basin 101-169. Westbrook has also recently completed several projects to renew and separate the public sewer mains in the areas of Maple Street, Union Street, Glenwood Avenue and Church Street within WP Meter Basin 101-169. There are no known publicly-owned catch basins or stormwater cross-connections in this meter basin. Therefore, it is likely that the inflow sources contributing to peak wet weather flows are privately owned. However, with only one season of flow metering data available, it is difficult to confirm this assumption. Addition flow metering and field investigation is recommended to confirm potential sources of inflow.

Given the relatively large size of this meter basin, Wright-Pierce and PWD deployed flow meters at two other manhole locations in WP Meter Basin 101-169 during the Spring 2023 flow metering period. Meters were deployed in SMH 101-171 (PWD) and SMH 3-2 (WP). The peak to average flow ratios in PWD's meter in SMH 101-171 were less than 5:1 for the May 1, 2023 and May 20, 2023 storms, so this catchment was not included as a priority area for further I/I investigation. The peak to average flow ratios in WP Meter Basin 3-2 were above the 5:1 benchmark and the analysis of the flow meter results from WP Meter Basin 3-2 is discussed separately in this Section.

To further characterize flows in WP Meter Basin 101-169 and isolate potential I/I sources, it is recommended that the City of Westbrook purchase and deploy supplemental portable flow meters in the following locations:

1. Within the remaining gravity sewers flowing into the Pershing Way Pump Station wetwell that convey flows from the sewers to the west of Spring Street and south of the Stroudwater River,
2. Within the gravity sewer on Spring Street downstream of the Birdland force main terminus manhole to capture flows from the sewers served by the Birdland and County Road Pump Stations in the southern portion of WP Meter Basin 101-169.

The City of Westbrook should also consider installing a temporary flow meter downstream of the force main terminus of the private pump station that serves the “Hamlet” housing subdivision along the southern end of Saco

Street near the Scarborough town line as part of future I/I investigation in this meter basin. A temporary flow meter would help quantify the flows from this private pump station and its service area. Flow information from this private pump station is currently unavailable and water usage records for sewer billing purposes would not necessarily provide insight into potential extraneous flows entering the sewers in this area via numerous sewer service connections.

**WP Meter Basin 101-325:** WP Meter Basin 101-325 generally includes the neighborhoods around West Pleasant, Mechanic, and Central Streets, Longfellow Street and connecting side streets, and New Gorham Road and connecting side streets (Figure 5-1). The sewers served by Gray Goose Pump Station on Wigeon Lane are tributary to this meter basin as well.

The observed peak to average flow ratios for the WP Meter Basin 101-325 sewers for three of the four the largest storms captured during the Spring 2022 and Spring 2023 flow metering periods were greater than 5:1, which would indicate a significant response in the sewer flows to these storm events. The estimated baseline infiltration in this meter basin during the 2022 and 2023 flow metering periods was below the 4,000 gpd/idm-benchmark and not indicative of excessive groundwater infiltration. The City of Westbrook also recently replaced 365 linear feet of sewer on Longfellow Street and a significant portion of the sewer mains on New Gorham Road. There are no known publicly-owned catch basins or stormwater cross-connections in this meter basin. Therefore, it is likely that the inflow sources contributing to peak wet weather flows are privately owned. However, further flow metering in this meter basin is recommended to confirm this assumption. The City of Westbrook should consider purchasing and deploying additional supplemental City-owned portable flow meters into WP Meter Basin 101-325 at the suggested supplemental meter locations shown in Figure 5-5 that follows to further isolate sources of extraneous flows and facilitate future I/I investigations in this meter basin.

It should also be noted that Gray Goose Pump Station does not currently have an in-line flow meter to provide instantaneous flow data for analysis as part of this study. Therefore, it is also recommended that the City either deploy a temporary area velocity meter in the gravity sewers downstream of the Gray Goose Pump Station or a permanent magnetic in-line flow meter at the pump station to help provide additional information about the hydraulics of these sewers in this area during wet weather events and to isolate these flows from the rest of the gravity sewers in this meter basin.

**Figure 5-4 WP Meter Basin 101-325 Supplemental Meter Locations**

**WP Meter Basin 102-13:** The WP Meter Basin 102-13 area includes a mostly residential area bounded by the Westbrook Arterial Highway, Cumberland Street, Main Street and Forest Street, as well as the commercial district served by the Colonial Road Pump Station and the Saunders Industrial Park that is served by a private pump station (Refer to Figure 5-1).

During the 2022 supplemental flow metering conducted by Wright-Pierce, WP Meter Basin 102-13 had peak to average flow ratios of about 14:1 and 32:1 during the March 7, 2022 and April 8, 2022 storms, respectively. During the 2023 supplemental flow metering period, the peak to average flow ratios were about 5:1 and 4:1 for the May 1, 2023 and May 20, 2023 storms, respectively. The calculated baseline infiltration rate in the WP Meter Basin 102-13 during the Spring 2022 flow metering period was below the 4000 gpd/idm-benchmark but was above the benchmark during the Spring 2023 flow metering period. A significant amount of sewer system renewal and separation work has been completed by the City of Westbrook in the residential portion of this meter basin. The City of Westbrook has also recently completed additional sewer replacement work in a portion of the commercial district served by the Colonial Road Pump Station in the Terminal St. and Patrick Drive area.

The widely varying peak to average flow ratios and estimated baseline infiltration rates between the Spring 2022 and Spring 2023 flow metering periods makes it difficult to say whether groundwater infiltration or direct inflow is the dominant contributor to excess flows in this meter basin. Therefore, additional flow metering is recommended to further characterize flows in this meter basin and isolate potential I/I sources.

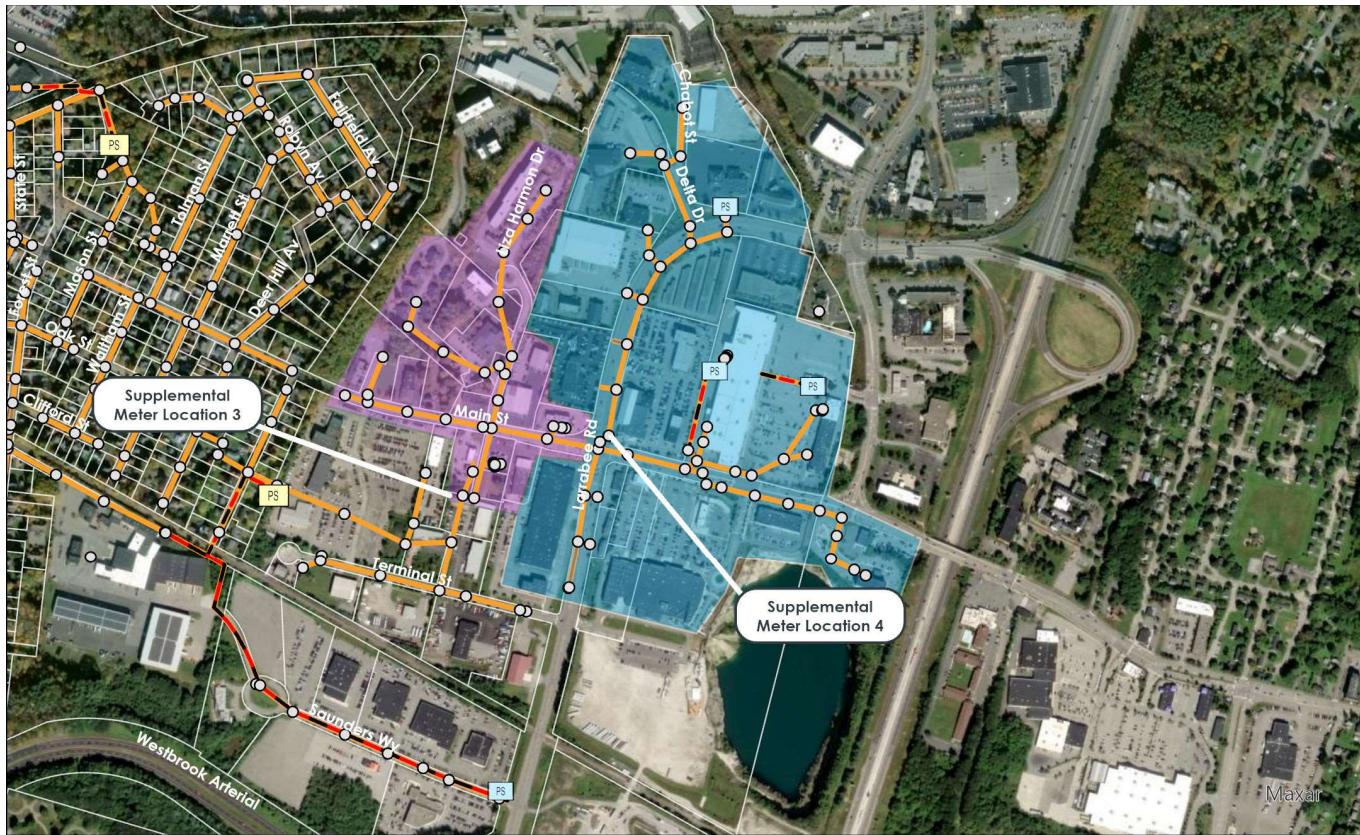
Westbrook does not currently have flow meter data from the private pump station serving Saunders Industrial Park, so it is unclear how the private pump station reacts to wet weather events. Monitoring flows from this pump station could help further narrow down the area of focus for possible further I/I reduction efforts in Meter Basin 102-13.

Westbrook also does not currently have a flow meter connected to the discharge of the Colonial Road Pump Station, so instantaneous flow measurements from this station could not be analyzed as part of this study. It would be beneficial to either install an area-velocity flow meter in the sewers just downstream of the Colonial Road Pump Station's force main terminus or install a permanent in-line magnetic flow meter at the Colonial Road Pump Station to collect instantaneous flow information on sewers in the eastern portion of WP Meter Basin 102-13 served by the Colonial Road Pump Station during wet weather since significant sewer rehabilitation work was recently completed by Westbrook in the residential neighborhoods in the western portion of Meter Basin 102-13.

Four suggested supplemental flow meter locations in WP Meter Basin 201-13 are shown in Figures 5-5 and 5-6 for the City's consideration to further isolate flows in this meter basin. Isolation of flows in the Supplemental Meter Location 1 and 2 areas shown in Figure 5-5 would be dependent on also collecting instantaneous flow meter data from the Saunders Way Industrial Park private pump station.

**Figure 5-5 WP Meter Basin 102-13 Supplemental Meter Locations 1 and 2**



**Figure 5-6 WP Meter Basin 102-13 Supplemental Meter Locations 3 and 4**

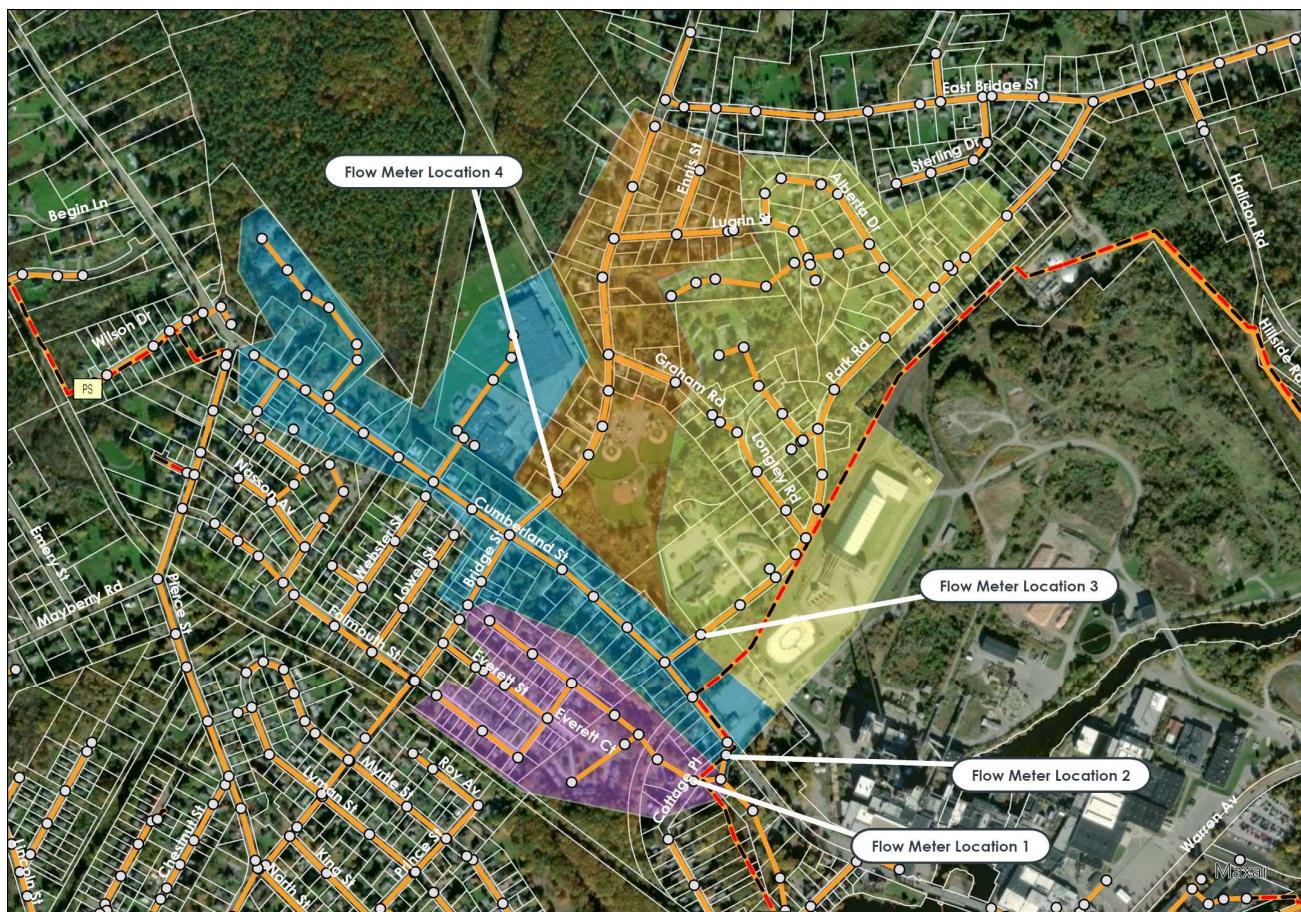
**WP Meter Basin 102-97:** WP Meter Basin 102-97 is a relatively large geographic area that includes the Sappi industrial complex on the South side of the Presumpscot River, and the residential areas between Warren Avenue and Deer Hill Avenue north of Main Street, and the neighborhoods south of Main Street between Berkeley Street, Mason Street and Cottage Street (Figure 5-1).

The March 7, 2022 storm was not captured during the 2022 WP flow metering period because of a meter malfunction, but the peak to average flow ratio during the April 8, 2022 storm was about 5:1. The peak to average flow ratio during the May 1, 2023 and May 20, 2023 storms was about 40:1 and 30:1, respectively. The estimated baseline infiltration rates during the Spring 2022 and Spring 2023 flow metering periods were both below the 4,000 gpd/idm-benchmark. According to data provided by PWD and Westbrook, there are several privately-owned stormwater catch basins in the Sappi industrial complex that are connected to this WP meter basin. The City recently separated two other publicly-owned catch basins that were connected to the sanitary sewer on Cumberland Street. The observed high peak to average flow ratios during the May 1, 2023 and May 20, 2023 storms are likely due to the presence of the private catch basins and other inflow sources directly connected to the sanitary sewers.

**WP Meter Basin 104-1:** WP Meter Basin 104-1 generally includes the sewers on the north side of the Presumpscot River between Cumberland Street, Bridge Street, and the railroad tracks, the sewers between Cumberland Street and Park Road, Alberta Drive and Methodist Road, and the sewers between Cumberland Street and Methodist Road, to

the west of Methodist Road (Figure 5-1). This meter basin consists of mostly mix-use residential areas, but also includes a community health clinic, the Westbrook Community Center and the Congin School. During the Spring 2022 supplemental flow metering period, the flow meter in this basin malfunctioned during the March 7<sup>th</sup> storm, so flow data for that storm could not be analyzed. The observed peak to average flow ratio for the April 8, 2022 storm was about 11:1. The estimated baseline infiltration during the 2022 flow metering period was below the 4,000 gpd/idm-benchmark and was not indicative of excessive baseline infiltration. During the Spring 2023 supplemental flow metering period, the peak to average flow ratios were about 41:1 and 10:1 for the May 1<sup>st</sup> and 20<sup>th</sup> storms, respectively. The estimated baseline infiltration during the Spring 2023 flow metering period was also below the baseline infiltration benchmark and not indicative of excessive baseline infiltration. The observed high peak to average flow ratios and relatively low baseline infiltration seem to indicate that direct inflow sources are mainly contributing to peak wet weather flow. There are no known publicly-owned catch basins or stormwater cross-connections in this meter basin. Therefore, it is likely that the inflow sources contributing to peak wet weather flows are privately owned. Additional supplemental flow metering by the City of Westbrook in this meter basin is recommended to confirm this assumption and further isolate sources of potential inflow. Figure 5-7 provides some suggested additional supplemental flow meter locations for the WP Meter Basin 104-1.

**Figure 5-7 WP Meter Basin 104-1 Supplemental Meter Locations**



**WP Meter Basin 3-2:** Figure 5-2 is Section 5.3.2 shows the general extent of WP Meter Basin 3-2. As previously mentioned, the flow meter monitoring flows from this area was installed during the Spring 2023 flow metering period conducted by Wright-Pierce to provide further insight into a portion of the sewers in the relatively large geographic area within the WP Meter Basin 101-169. The sewers in this meter basin serve mostly residential users, but also serve the Saccarappa Elementary School. High peak to average flow ratios of about 43:1 and 9:1 during the May 1<sup>st</sup> and May 20<sup>th</sup>, 2023 storms, respectively, were observed in this meter basin. However, the estimated baseline infiltration was below the 4,000 gpd/idm-benchmark and not indicative of excess baseline infiltration in these sewers. There are no known publicly-owned catch basins or stormwater cross-connections in this meter basin. Therefore, it is likely that the inflow sources contributing to peak wet weather flows are privately owned. However, given the limited data from the single Spring 2023 flow metering period, additional I/I investigations in this meter basin are recommended to confirm these assumptions.

#### 5.3.3.2 PWD Permanent Flow Meter Basins

Flow meter data from PWD's permanent flow meters installed in the 42-inch and 24-inch interceptor sewers upstream of the siphon inlet structure and the 24-inch upstream sewer at CSO 004 on Dunn Street were also analyzed during the same two metering periods conducted by Wright-Pierce to help further characterize sewer flows influencing CSOs 002, 003 and 004. The results of the flow analysis of these meters are summarized in the subsequent sections by meter location ID.

**PWD CSO 003A MP-1:** This permanent PWD flow meter is installed in the 42-inch diameter interceptor sewer flowing northeast into the siphon inlet structure. It collects flows from WP Meter Basins 101-480, 101-325, 101-169, 101-25, and the meter basin of the permanent PWD flow meter at CSO 004 on Dunn Street. The peak to average flow ratios for the March 7<sup>th</sup> and April 8<sup>th</sup>, 2022 storms were about 4:1 for both storms, respectively. The peak to average flow ratios for the May 1<sup>st</sup> and 20<sup>th</sup> 2023 storms were about 2:1 and 1:1, respectively. These peak to average flow ratios are comparatively lower to those observed in other WP meter basins with high peak flow ratios that are tributary to this meter location during the same storms, which likely indicates that peak flows from tributary meter basins are being somewhat attenuated by the internal storage capacity of the PWD interceptor sewers by the time they reach this flow meter.

**PWD CSO 003A MP-2:** This permanent PWD flow meter is installed in the 18-inch diameter interceptor sewer flowing southwest into the siphon inlet structure. It collects flows from WP Meter Basins 102-13 and 102-97, and is hydraulically downstream of CSO 002. The peak to average flow ratios in the meter basin during the March 7<sup>th</sup> and April 8<sup>th</sup>, 2022 storms were about 5:1 and 7:1, respectively. The peak to average flow ratios during the May 1<sup>st</sup> and 20<sup>th</sup> 2023 storms were about 7:1 and 4:1, respectively. These moderate peak to average flow ratios seem to indicate the likely presence of upstream I/I that in the tributary meter basins that is being somewhat attenuated by the internal storage capacity of the PWD interceptor sewers by the time they reach this flow meter. This assumption is corroborated by the observed high peak to average flow ratios in WP Meter Basins 102-13 and 102-97 during these same storms.

The presence of excess flows in this meter basin could, at times, contribute to overflows at CSO 002, as the sewers reach their hydraulic capacity. However, model runs completed by Wright-Pierce of PWD's updated interceptor sewer model indicate that activations at CSO 002 are primarily being caused by surcharging in the downstream 18-inch diameter PWD interceptor between CSO 002 and CSO 003. The surcharging in the 18-inch diameter interceptor sewer during large storm events effectively prevents the incoming sewer flows from WP Meter Basins 102-13 and 102-97 from moving downstream into the 18-inch inch diameter PWD interceptor. This leads to

surcharging in the CSO 002 regulator structure and the potential to cause overflows out of CSO 002 to the Presumpscot River.

**PWD CSO 004 Flow Meter:** This permanent PWD flow meter is installed in the 21-inch diameter sewer pipe upstream of the CSO 004 regulator structure on Dunn Street. In general, it measures flows from three areas:

- The mixed commercial and residential area between Foster Street, Dunn Street, and William L. Clarke Drive (Route 25),
- The residential neighborhoods associated with northern Stroudwater Street between Route 25 and the Westbrook Regional Vocation Center, Pleasant Street, Sargent Street, Oakland Avenue and Monroe Avenue and connecting side streets, and 3)
- The Westbrook Regional Vocational Center.

The peak to average flow ratios in this meter basin during the March 7, 2022 and April 8, 2022 storms were about 4:1 and 5:1, respectively. The peak to average flow ratios in this meter basin during May 1, 2023 and 20, 2023 storms were about 7:1 and 4:1, respectively. These moderate peak to average flow ratio may indicate that there could be I/I sources present in the upstream sewers. However, model runs completed by Wright-Pierce using PWD's updated interceptor sewer model indicate that activations at CSO 004 are primarily being caused by surcharging in the downstream 42-inch diameter PWD interceptor between CSO 003 and CSO 004. The surcharging in the interceptor sewer during large storm events effectively prevents the incoming sewer flows from the Dunn Street CSO catchment from moving downstream into the 42-inch diameter PWD interceptor and leads to surcharging in the CSO 004 regulator structure and overflows out of CSO 004. Therefore, remedying downstream surcharging is likely to be more effective at curtailing discharges at CSO 004 than removing potential I/I sources in the upstream sewers.

**PWD CSOs 007 and 008:** Data from permanent PWD flow meters installed in the CSO 007 and CSO 008 regulator structures were also reviewed to determine if, in general, the sewers in these catchments were responding to large storm events with a significant increase in observed flows. However, surcharging in the shared stormwater and CSO outfall pipes at both CSO 007 and CSO 008 during large storms could be causing erroneous flow data readings from the flow meters installed in the CSO outfall pipes. Model runs completed by Wright-Pierce of PWD's updated interceptor sewer model also indicate the possible presence of a backwater effect in the sewers between CSO 007 and CSO 008, which should be investigated further to determine if there is a hydraulic restriction. It is recommended that additional flow metering and investigation of the hydraulics at both of these CSOs and the sewers between both CSO locations be completed to help determine if CSOs are actually occurring at these locations or if the apparent discharges are the result of erroneous flow meter readings when the stormwater outfall pipes downstream of CSO 007 and 008 surcharge during large storm events.

PWD also maintains a permanent flow meter in the 12-inch diameter influent sewer entering the CSO 007 manhole from the northeast along Brown Street. Flows from the 18-inch cross-country influent sewer entering the manhole from the north and the 8-inch diameter influent sewer entering the manhole from the southwest along Brown Street are not currently monitored. Based on flow meter data provided by PWD of the sewer flows in the 12-inch influent sewer that flows into the CSO 007 manhole, the observed peak to average flow ratios in this sewer's catchment area during three out of the four largest storms captured during the Spring 2022 and Spring 2023 flow metering period was less than 5:1. The peak to average flow ratio during the May 1, 2023 storm was about 6:1.

Therefore, it is difficult to conclude whether significant sources of extraneous flows are present in this catchment area without further study.

# Section 6 Treatment Facility Evaluation

## 6.1 General

The Westbrook WWTF located on Park Road in Westbrook is owned and operated by PWD and receives sewer flows directly from the Cottage Place Pump Station and the East Bridge Pump Station. The WWTF was originally constructed in 1978 and has undergone various upgrades over time including an upgrade to the secondary system ongoing as of December 2023. While originally part of the WWTF, screening and grit removal devices are no longer utilized. Instead, screening is provided at Cottage Place and East Bridge Pump Stations. Grit is allowed to settle out in the aeration basins and is removed from the aeration basins semi-annually. The facility provides biological treatment via the activated sludge process using two parallel treatment trains. Each of the two aeration basins are followed by a 90-foot diameter clarifier. Secondary clarifier effluent is chlorinated in one of two parallel chlorine contact tanks and then dechlorinated prior to being discharged to the Presumpscot River through a 42-inch reinforced concrete outfall pipe with a diffuser. The diffuser consists of fourteen equally spaced risers with ports measuring 6 inches in diameter to enhance rapid and complete mixing of the discharged effluent with the receiving waters. Biosolids dewatering at the WWTF is accomplished by means of a gravity sludge thickener and screw press. Dewatered sludge is landfilled by a third-party contractor.

A process flow diagram of the Westbrook WWTF is included in Appendix C.

## 6.2 Current Flows and Loads

The WWTF currently treats an average daily flow of approximately 3.2 MGD, which is roughly 70% of its permitted capacity of 4.54 MGD. While the plant has currently been evaluated to have a peak capacity of 15.7 MGD, when both Cottage Place Pump Station and East Bridge Pump Station are pumping at full capacity, a peak flow of 16.7 MGD (11,600 gpm) can be delivered to the WWTF. Typical peaking factors for plants in the 3.2 to 4.54 MGD range with limited infiltration and inflow are approximately 3:1. Therefore, the current peaking factor of approximately 5:1 at the Westbrook WWTF is indicative of significant infiltration and inflow within the system. While a comprehensive model was not developed for the facility capacity as part of this evaluation, the overflow rates of the current 90-foot clarifiers are at or beyond capacity during peak flow events.

## 6.3 Future Loads and Permitting Considerations

The WWTF has additional capacity on an average daily basis. However, when a WWTF's average daily flows and loads approach 80% of permitted capacity, that is typically the time to evaluate the need for upgrades to increase capacity. Westbrook is growing and it is expected that sewer flows and loads could increase over time. To ensure that this additional wastewater can be pumped to the WWTF for treatment and avoid increases in CSOs, it is expected that I/I removal projects will need to occur in the collection system to make room for increased development. From a peak flow perspective, the WWTF achieves its maximum hydraulic capacity when both Cottage Place Pump Station and East Bridge Pump Station operate concurrently and there is no additional hydraulic capacity at the WWTF at this time.

Therefore, increasing pumping capacity at the Cottage Place Pump Station and increasing capacity at the WWTF in an attempt to reduce surcharging at the siphon and CSO discharges is not recommended. In the future, if sending flow in excess of current peak flows to the WWTF is considered again, additional analysis would be needed.

# Section 7 CSO Abatement Prioritization

## 7.1 Evaluation of Priority CSOs

Chapter 570 of the Maine DEP Combined Sewer Overflow Abatement program rules require that a CSO Facilities Plan (a.k.a., CSO Master Plan) place high priority on abatement of CSOs that affect waters having the greatest potential for public use or benefit and attempt to relocate any remaining discharges to areas where minimal impacts or losses of uses would occur.<sup>1</sup> Two additional abatement priorities have been included along with the minimum Chapter 570 CSO abatement priorities to help rank the priority of the active CSO locations: the volume of discharges per CSO event (#8) and the number of CSO activations per year (#9). CSO abatement priorities for the City of Westbrook and PWD are as follows:

1. Discharges that occur during dry weather periods
2. Discharges that may impact public drinking water intakes
3. Discharges that may impair water contact recreational uses or create public health concerns in the receiving waters
4. Discharges into areas determined to have redeemable shellfish resources or important fish or wildlife habitat
5. Discharges that contain industrial or medical wastes
6. Discharges that function during the months of June through September
7. Discharges that cause localized nuisance conditions
8. The volume of discharges per CSO event
9. Number of CSO activations per year

Each licensed CSO was ranked on the applicability of these priorities, ranging from not applicable (score of 0), to highly important/highly likely (score of 5). The CSOs with the highest score rank as the highest priority CSOs for elimination or abatement. It is important to note that input from PWD and the City of Westbrook and Maine DEP is essential to complete the final prioritization ranking process. Table 7-1 at the end of this section summarizes the priorities scoring for each CSO.

CSO ranking Priority #6 scoring was based on the average number of activations at each licensed CSO between June and September over the over the last 6 years (2017 to 2022). CSO ranking Priorities #8 and #9 were based on the average annual CSO discharge volume and average number of annual CSO activations, respectively, over the last 6 years.

The CSO priority scoring indicates that the recommended priority ranking for elimination or abatement of PWD's five licensed CSOs in the City of Westbrook would be as follows:

1. Siphon Inlet CSO 003
2. King Street CSO 008
3. Brown Street CSO 007
4. Dunn Street CSO 004
5. Warren Avenue CSO 002

<sup>1</sup> Chapter 570 Combined Sewer Overflow Abatement, Maine DEP Paragraph 3.B.

The CSO discharge data between 2014-2022 indicates that because of PWD and Westbrook's recent efforts to reduce I/I in the Westbrook sewer collection system, most of the CSO flow discharged to the Presumpscot River is out of CSO 003 at the siphon inlet. Therefore, the Siphon Inlet CSO 003 is the highest priority because it serves industrial users in Westbrook, it can contribute to local nuisance conditions being located near a public park and walking trail, and by having the highest CSO volumes, on average, over the past 6 years. CSOs 007 and 008 were determined to be very similar in priority. Both CSO points have historically discharged between June and September in the last 6 years, based on the reported discharge volumes, and the number of CSO events per year over the past 6 years are similar, with both averaging 2 discharges per year. However, the average volume discharged per year from CSO 008 was 4 times higher than CSO 007, based on the reported CSO activations data from PWD. Therefore, CSO 008 would be considered the second highest abatement priority, CSO 007 the third highest priority, and CSO 004 and CSO 002, which are much less active and discharge less volume than the other CSOs, would be considered the lowest abatement priority, based solely on scoring. However, as previously mentioned, surcharging in the shared stormwater and CSO outfall pipes at both CSO 007 and CSO 008 during large storms could be resulting in erroneous flow data readings from the flow meters installed in the CSO 007 and CSO 008 outfall pipes.

Given this information, PWD and Westbrook should prioritize CSO abatement at CSO 003 and further investigation of the sewer hydraulics at CSOs 007 and 008 to help confirm if recorded flows at CSO 007 and CSO 008 are attributable to excess flows in the sanitary sewers or surcharging of the shared CSO and stormwater outfall pipes at both locations. Model runs completed by Wright-Pierce of the updated PWD interceptor sewer model indicate that discharges at CSO 002 and CSO 004 are hydraulically linked to surcharging of the sewers upstream of Cottage Place Pump Station, through the siphon and back to CSOs 002 and 004 through the 20-inch and 42-inch interceptor sewers, respectively. Therefore, prioritizing CSO abatement at CSO 003 is expected to lead to discharge reductions at CSO 002 and CSO 004 as well.

**Table 7-1 CSO Prioritization**

Priority	CSO Location				
	Warren Parking Lot (CSO #002)	Siphon Inlet (CSO #003)	Dunn Street (CSO #004)	Brown Street (CSO #007)	King Street (CSO #008)
1. Discharges that occur during dry weather periods	0	0	0	0	0
2. Discharges that may impact public drinking water intakes	0	0	0	0	0
3. Discharges that may impair water contact recreational uses or create public health concerns in the receiving waters	5	5	5	5	5
4. Discharges into areas determined to have redeemable shellfish resources or important fish or wildlife habitat	0	0	0	0	0
5. Discharges that contain industrial or medical wastes	1	2	0	0	0
6. Discharges that function during the months of June through September	0	0	0	1	1
7. Discharges that cause localized nuisance conditions	1	2	1	1	1
8. Volume of CSO Discharges	1	5	2	3	4
9. Number of CSO Activations	1	2	2	2	2
<b>Total Score</b>	<b>9</b>	<b>16</b>	<b>10</b>	<b>12</b>	<b>13</b>

Notes for Prioritization Scoring:

0 = Not Applicable, 1 = Not very important/likely, 2 = Somewhat important/likely, 3 = Important/likely, 4 = Very important/likely, 5 = Highest importance/highly likely

# Section 8 Screening and Evaluation of Control Alternatives

## 8.1 Introduction

As part of PWD and Westbrook's joint MEPDES wastewater discharge license, Westbrook and PWD are required to implement EPA's Nine Minimum Controls, as described in the 1994 EPA CSO Control Policy<sup>1</sup> and Maine DEP's Chapter 570 *Combined Sewer Overflow Abatement* rules published in 2000. The EPA's Nine Minimum Controls (NMCs) are minimum technology-based controls that can be used to address CSO issues without extensive engineering studies or significant construction costs, prior to implementation of long-term control measures. The PWD/Westbrook MEPDES wastewater discharge license also requires the development of this CSO Master Plan, including the screening and evaluation of control alternatives to reduce or eliminate the impacts of CSO overflows on receiving waters. This section provides a status update on PWD and Westbrook's efforts to implement EPA's NMCs, Maine DEP's Chapter 570 rules, and the screening and evaluation of long-term control alternatives for mitigation of CSOs.

## 8.2 Summary of Nine Minimum Controls

The City of Westbrook and PWD have been actively pursuing the recommended Nine Minimum Controls in EPA's 1994 CSO Control Policy and the Maine DEP's Chapter 570 Rules published in 2000 since the previous CSO Master Plan update. The EPA Nine Minimum Controls and PWD and Westbrook's efforts towards these recommended controls between 2014 and 2022 are discussed in greater detail in the sections that follow.

### 8.2.1 Proper Operation and Regular Maintenance

The Westbrook WWTF has an Operations and Maintenance (O&M) Manual in place to ensure that PWD's interceptor sewer system, pump stations and treatment facility function in a way to maximize treatment of wastewater and comply with MEPDES discharge license requirements. The City of Westbrook also has developed O&M manuals and standard operating procedures for its collection system maintenance staff for the operations and maintenance of its pump stations and sewer system.

PWD inspects the five licensed CSO structures on a weekly basis and its three pump stations are monitored continuously through SCADA and are visited frequently as part of routine maintenance checks. Westbrook completes an in-depth inspection of the 13 pump stations discussed in this study at the beginning of each month and also performs routine maintenance checks on a weekly basis. Both PWD and Westbrook have ongoing sewer maintenance programs to provide reliable sanitary sewer collection services. The sewer maintenance programs include routine sewer cleaning and inspection.

### 8.2.2 Maximum Use of the Collection System for Storage

The City of Westbrook cleaned over 440,000 linear feet of its sewers between 2014 and 2022, removing over 127 cubic yards of debris. Westbrook also performed CCTV inspection of over 97,000 linear feet of its sewers between 2014 and 2022. The City of Westbrook cleaned, on average, over 400 catch basins annually between 2014 and 2022, removing 174 cubic yards of debris. Routine cleaning of the sewers and removal of grit from catch basins connected to the sanitary sewer helps maximize the available capacity of the sanitary sewer system.

<sup>1</sup> Guidance for Nine Minimum Controls, Combined Sewer Overflows, USEPA 8320B-95-003, May 1995

In addition to the numerous sewer system renewal projects described in Section 2.4.1, the City of Westbrook has also removed 19 roof leaders, 21 sump pumps, and 11 catch basins from the Westbrook sewer system to reduce the amount of extraneous flow occupying a portion of the sanitary sewer system's capacity. As of 2022, there were still 41 roof leaders, 38 sump pumps, and 7 catch basins that remain connected to Westbrook's sanitary sewer system. Five of these catch basins are on private Sappi property.

Between 2014 and 2022, the City of Westbrook spent, on average, over \$2.5M annually on CSO abatement initiatives and has cumulatively spent over \$26MM.

### **8.2.3 Review and Modification of Pretreatment Requirements**

PWD and Westbrook have an industrial pretreatment program as part of their MEPDES wastewater discharge license. Their industrial pretreatment program is reviewed every five years with the renewal of the MEPDES permit.

### **8.2.4 Maximization of Flow to the Treatment Facility**

The Dana Court and Cottage Place Pump Stations have undergone several upgrades since the 1990s to maintain their long-term pumping capacity. The Cottage Place Pump Station (which has a design capacity of 15.1 MGD) and East Bridge Pump Station, together, have historically been capable of pumping up to 16.7 MGD to the Westbrook WWTF that has a 16.7 MGD secondary treatment capacity. Therefore, flows to the Westbrook WWTF are currently being maximized. The Westbrook WWTF was also recently upgraded to improve its secondary treatment capabilities.

In 2014, PWD upsized most of the 12-inch diameter Dana Court Pump Station force main to 14-inch diameter pipe to increase its theoretical pumping capacity and replace the aging force main pipe. Currently, only about 476 linear feet of the force main is 12-inch pipe between the intersection of Brown and King Street and the intersection of Brown Street and Myrtle Street. In 2019, PWD retained Stantec to complete an evaluation of the Dana Court Pump Station's flow capacity to evaluate the pump station's performance compared to the station's expected peak design flow. According to the evaluation, when all three pumps were running, the observed flow from the Dana Court Pump Station ranged between 4.7 and 5.0 MGD. The evaluation concluded that if the remaining 476 linear feet of 12-inch force main piping were upsized to 14-inch pipe, the capacity of the Dana Court Pump Station could theoretically be increased to 5.2 MGD. Recent flow meter data from PWD indicates that the station's capacity is currently between 4.2 to 4.5 MGD. Wright-Pierce completed model runs of the PWD interceptor sewer model for 1-, 2-, 5-, and 10-year design storms, assuming that the remaining 12-inch portion of the Dana Court Pump Station force main was upsized and the Dana Court Pump Station could pump at the theoretical 5.2 MGD peak capacity with three pumps operating in parallel. The results of the model runs indicate that increasing the theoretical capacity of the Dana Court Pump Station to 5.2 MGD leads to a reduction in the theoretical discharges at CSO 007 and CSO 008, but shows an increase in discharges at CSO 003. This likely indicates that pumping more flows from the Dana Court Pump Station toward the Cottage Place Pump Station would effectively exacerbate the observed surcharging at the Cottage Place Pump Station and in the siphon.

Westbrook has also recently upgraded Melcher Court and County Road pump stations within the study area to maximize their capacity and maintain reliable transport of wastewater flows. Melcher Court, Pershing Way, County Road and Colonial Road pump stations have dedicated generators to maintain pumping capacity during power outages, and Westbrook's other 10 pump stations in the study area are capable of being powered by portable generators.

### **8.2.5 Elimination of CSOs During Dry Weather**

Between 2014 and 2022, there was only one dry-weather discharge out of the Brown Street CSO 007, which was due to a contractor's temporary bypass pumping system sewer plug failing during a sewer replacement project. Only about 1,000 gallons of wastewater discharged out of the CSO during that event. There were no dry-weather discharges out of the five licensed CSOs between 2014 and 2022 as a result of mechanical failures at PWD or Westbrook's pump stations or as a result of sewer blockages.

### **8.2.6 Control of Solid and Floatable Material in CSOs**

In 2021, PWD installed a baffle in the siphon inlet CSO 003 regulator structure to reduce the likelihood of floatables discharging out of CSO 003 when it is active during weather events. Westbrook has also implemented several anti-littering initiatives described in Section 8.2.7 that have helped reduce the amount of solids and floatables entering the stormwater and sanitary sewers.

### **8.2.7 Pollution Prevention Program**

The Portland Water District continues to educate the public by posting relevant information on the organization's website ([www.pwd.org](http://www.pwd.org)). Mailers addressing proper materials to be flushed, the impacts of disposable wipes on the collection system and FOG have been enclosed with customers' monthly bills. The Maine Water Environment Association, in coordination with the Portland Water District, has instituted a television campaign to educate the public regarding the proper disposal of wipes.

Westbrook's Sustainability Coordinator administers anti-litter and anti-pollution campaigns through My Place Teen Center, the City's Sustainability Newsletter and the City's online webpage. The Sustainability Coordinator also attends local events, such as Together Days, promoting these initiatives using a poster presentation and homemade slime.

Westbrook provides every residential unit with a trash and a recycling container, has an active downtown cleanup program and also discusses proper trash disposal in the City's public newsletter. Westbrook also has an anti-littering ordinance that is enforced by Code Enforcement and the Police Department and have bulky and hazardous waste programs that encourage road-side pickup of bulky waste and provide designated hazardous waste disposal sites to deter residents from illegal dumping and littering.

The City of Westbrook performs street sweeping every year to help prevent sand, grit, trash and debris from entering the sanitary and stormwater sewers. On average, the City removed over 700 tons of debris annually between 2014 and 2022.

The City of Westbrook has also implemented several stormwater pollution prevention measures and best management practices between 2014 and 2021 including, tree box filters on Chestnut Street and Michell Street, permeable pavers at the County Road Pump Station, and a city rain garden.

### **8.2.8 Public Notification**

All five licensed CSOs are currently posted with the following signage to notify the public:

PORTRLAND WATER DISTRICT  
WET WEATHER  
SEWAGE DISCHARGE  
LICENSE #  
CSO# AND NAME

As previously mentioned in Section 8.2.7, both PWD and Westbrook are also actively engaged in public awareness initiatives to notify the public of the impacts of pollution and illegal dumping on CSO discharges.

### **8.2.9 Monitoring to Effectively Characterize CSO Impacts and Effectiveness of CSO Controls**

PWD has permanent flow meters installed at each of the five licensed CSO locations. PWD currently contracts with a private flow metering and assessment contractor to operate and maintain the permanent flow meters at each CSO location and provide PWD with downloaded CSO activity data on a regular basis.

## **8.3 Description of Generic Control Alternatives**

CSO abatement strategies that are most applicable to the PWD/Westbrook CSOs were evaluated for each CSO and its tributary sewers as part of this study. The applicable abatement options are generally categorized as:

- I/I source removal,
- Sewer transport and treatment capacity increases, and
- Temporary storage of excess flow (in-line and offline)

Long-term control of CSOs in the Westbrook sewer system can be achieved by any of these abatement strategies. However, to strike a balance between the cost and effectiveness of CSO abatement, it is recommended that PWD and Westbrook employ a combination of these strategies, as applicable, to each CSO and its tributary sewers. Each of these control alternatives is described in greater detail in Sections 8.3.1 through 8.3.4 below, followed by an evaluation of their applicability to each of the CSOs in Section 8.5.1 through 8.5.4.

### **8.3.1 Inflow/Infiltration Source Removal**

**Inflow Sources:** Potential sources of stormwater and groundwater inflow in the Westbrook sewer system include cross-connected stormwater infrastructure, private property drains (roof, basement, yard, foundation etc.), and sump pump connections to the sanitary sewer. The City has completed sanitary sewer separation projects to successfully remove 11 catch basins, 19 roof leaders, 21 sump pumps and to date. However, there are still 7 catch basins (5 private and 2 public), 41 private roof leaders and 38 private sump pumps known to be connected to the sanitary sewer system as of 2021. Five catch basins still connected to the sanitary sewer are privately owned and on private Sappi property, and despite several attempts by Westbrook to work with Sappi toward disconnecting these inflow sources, success has been limited thus far.

**Infiltration Sources:** Groundwater infiltration is also possible through seams, joints and cracks in the below ground sanitary sewer infrastructure itself. The amount of groundwater infiltration into the sanitary sewers is related to the infrastructure's current condition and quality of its original installation. The City inspects a significant portion of its sanitary sewers annually to, in part, help assess the severity of these factors that contribute to the degree of potential infiltration in those sewers. The inspections and follow-up assessments become the baseline for future sewer system capital improvement planning. The City has also completed several sewer rehabilitation and renewal

projects as part of its previous CSO Master Plan to help reduce/remove sources of infiltration into the sanitary sewers.

In many cases, even after sources of direct inflow are removed and deteriorated sewer piping is relined or replaced to reduce sources of groundwater infiltration, high volumes of infiltration could still occur through broken or leaky service connections. Sewer piping and service connections installed in trenches over ledge are susceptible to rapid, storm-induced infiltration. When the trenches fill with groundwater (storm-induced or seasonally), infiltration takes the path of least resistance. Even when main sewer lines are relined, the groundwater may rise to an elevation where infiltration into service connection lines is a major problem. Westbrook should work with residents to address issues with service lateral pipes as much as practicable during sewer renewal projects when it is most cost-effective to also rehabilitate the service laterals. When service laterals are replaced during construction, it is often also discovered that roof drains, foundation perimeter drains, or sump pumps are also connected to the sanitary sewer services. These sources of inflow can then be reconnected into the storm drain system or daylighted to natural drainage areas. One drawback of redirecting inflow into stormwater collection systems or to daylight is the pollutant load this water can also carry to waterways. Westbrook is a regulated Municipal Separate Stormwater Sewer System (MS4) community under the Maine DEP stormwater Phase II regulations, so the City should also weigh the benefits of inflow removal from the sewer system against the potential drawbacks of introducing the same flow to the stormwater system.

As part of its overall CSO abatement strategy, PWD and Westbrook should consider removal of private inflow sources such as roof drains, foundation drains, and basement sump pumps. Despite the risk of public resistance to this abatement approach, it may be more cost-effective to remove these sources, in some cases, rather than to continue to upgrade the capacity of public sewers, pump stations or treatment systems. Each private source would have to be individually reviewed to determine the cost-effectiveness and technical feasibility of rerouting private I/I from the sanitary collection system to the storm drain system. It is also important to note that the timeframe to complete private I/I removal projects is often more protracted than public I/I source removal. Public outreach and education are key to building the trust of the community that will be needed to implement a successful private I/I removal program, and this integral project phase can take time. Concurrently, changes to the City's sewer ordinances will need to be reviewed and adopted by local officials in order to effectively enforce sustained private I/I removal from the sanitary sewers.

Historically, the cost of maintaining or modifying the private sewer service connection from the property line to the building has been borne by the property owner. However, low-interest loan funding from the State of Maine through the CWSRF program is now available to help finance the replacement of services up to the outside wall of the building foundation. However, work inside a private building or structure is not eligible for State funding, and temporary construction easements would still be required to replace private sewer services on private property. The cost to remove roof drains, foundation drains, sump pumps, etc. from the sanitary sewer can range from a few hundred dollars to thousands of dollars, depending on site-specific conditions. Once direct inflow sources are disconnected from the sanitary sewer, follow-up inspections are recommended to confirm these sources remain disconnected.

PWD and Westbrook should complete additional flow metering of the Westbrook sewers that influence CSO discharge and continue to build upon its current knowledge base of flow monitoring data and manhole and sewer inspection efforts to identify and determine those I/I removal projects that are most cost-effective for implementation. As street reconstruction projects occur, Westbrook should continue to place a high priority on

reviewing all historically documented I/I sources and confirm their previous removal or continued existence. A single catch basin or broken pipe/abandoned service in a low-lying area could have a major impact on the amount of extraneous flow being conveyed to an interceptor or pump station with potential CSO consequences. Ideally, complete elimination of CSOs could be realized cost-effectively by implementing this alternative alone.

### **8.3.2 Collection, Pumping, and Treatment System Capacity Increase**

PWD completed several projects between 2010 and 2021 to increase the capacity of the trunk sewers between several of the CSO regulator structures and PWD's interceptor sewers. PWD also completed capacity upgrades at Dana Court pump station in 2014 to enable conveyance of greater peak flows to the Westbrook WWTF and reduce the frequency and duration of CSO events. Recent sewer capacity increase projects include:

- 2011 - Project N202A - Enlarge sewer pipe from Warren Avenue regulator to interceptor (CSO 002)
- 2011 - Project N404A - Enlarge sewer pipe from Dunn Street CSO regulator to interceptor (CSO 004)
- 2014 - Project N701B - Dana Court pump station force main upgrades (CSO 007 & 008)
- 2017 - Project N704 - Enlarge sewer pipe from Brown Street CSO to Dana Court pump station (CSO 007)
- 2017 - Project N801 - Enlarge sewer pipe from King Street CSO to Brown Street CSO (CSO 008)
- Future – Phase 2 Dana Court pump station force main capacity increase (CSO 007 & 008)

The Westbrook WWTF has been upgraded several times since its original construction in 1978 and is currently rated to treat 16.7 MGD through its secondary treatment system, which was recently upgraded to improve treatment efficiency and accommodate enhanced nutrient removal. As previously mentioned, the Cottage Place Pump Station is currently designed for a peak hourly flow of 15.1 MGD with 3 pumps operating with a fourth pump available as a standby. The East Bridge Pump Station's flows constitute the remainder of the Westbrook WWTF's current 16.7 MGD secondary treatment capacity. The Cottage Place Pump Station does have the ability to add another pump to increase its peak design capacity to 16.1 MGD. However, an increase in the Cottage Place Pump Station's pumping capacity would also require significant additional investment at the Westbrook WWTF to further increase its secondary treatment capacity. Therefore, an increase in the Cottage Place Pump Station's capacity is not recommended at this time.

### **8.3.3 In-Line Storage**

In-line peak sewer flow storage refers to the use of the inherent volumetric capacity of the sewers to temporarily contain peak flows before wastewater surcharging reaches a critical point such as an overflow out of a sewer manhole or backflow into a basement through a sewer service lateral pipe. Raising a weir in a CSO regulator structure to increase surcharging before a CSO activates, or employing the use of an in-line storage conduit such as a sewer pipe or box culvert and a flow restriction device to surcharge the conduit are two examples of possible in-line flow storage strategies. In some cases, instrumentation and control systems can also be provided to automate flow restriction, release of stored flows, and annunciation of alarm conditions, if desired.

The primary advantages of in-line storage are that the footprint of these facilities is typically smaller than offline storage facilities, captured peak flows do not need to be pumped back into the sewer system, post-storm maintenance is minimal, and existing infrastructure can sometimes be utilized for flow storage at relatively low cost, if available. The primary disadvantages of in-line flow storage are the restrictions on feasible storage capacity while maintaining gravity flow and the high capital cost to implement them if existing facilities are not already available. Typically, this abatement alternative is associated with deep, long, and relatively flat interceptor piping with large easements or adjacent land available to install below-grade conduits.

PWD has previously raised the weirs at four of the licensed CSO regulator structures in the Westbrook sewer system as part of the Westbrook CSO Master Plan to maximize the in-line storage capacity of its existing interceptor sewers. In-line storage capacity projects included:

- 2011 - Project N404B - Raise Overflow Weir in Dunn Street CSO regulator (CSO 004)
- 2012 - Project N203A - Raise overflow weir at Warren Avenue CSO regulator (CSO 002)
- 2017 - Project N705A - Raise Overflow Weir in Brown Street CSO regulator (CSO 007)
- 2017 - Project N802A - Raise Overflow Weir in King Street CSO regulator (CSO 008)

Several communities in Maine have installed in-line storage facilities specifically to minimize CSOs, including two in Portland. PWD and Westbrook currently do not have any in-line sewer storage facilities in the Westbrook sewer system, but have completed several projects to raise the weirs in the CSO regulator structures to maximize in-line storage while not flooding out nearby basements.

In-line storage facilities may be possible along the interceptor sewers downstream of CSO 007 and 008 and the interceptor sewers upstream of the siphon. The technical feasibility, advantages and disadvantages of in-line storage facilities are discussed in Section 8.5.

#### **8.3.4 Off-Line Storage**

Off-line peak sewer flow storage refers to the temporary diversion of excess sewer flows to separate storage facilities. Dedicated sewer flow diversion structures or overflow pipes within sewer manholes can be used to divert flows to offline storage facilities. Examples of offline storage facilities are partially below-grade or fully below-grade storage tanks or chambers. The stored excess wastewater is then returned to the sewer system with dedicated pumping facilities after peak flow conditions have subsided and there is adequate sewer capacity to accept the additional flow. Tipping gates and/or tank washdown facilities can also be provided to help clean the storage tanks and decrease the need for intervention by sewer system operations staff. The primary advantage of off-line storage is its typically higher storage capacity potential per square foot of facility, when compared to in-line storage facilities. The primary disadvantages of off-line storage are high capital cost, typically larger footprint than in-line storage facilities, the potential for odors if the stored wastewater needs to be held for long periods of time, and more labor-intensive operation and maintenance requirements.

Several communities in Maine have installed off-line storage facilities, including one currently being constructed in Portland. PWD and Westbrook currently do not have any offline sewer storage facilities in the Westbrook sewer system.

### **8.4 Design Storm**

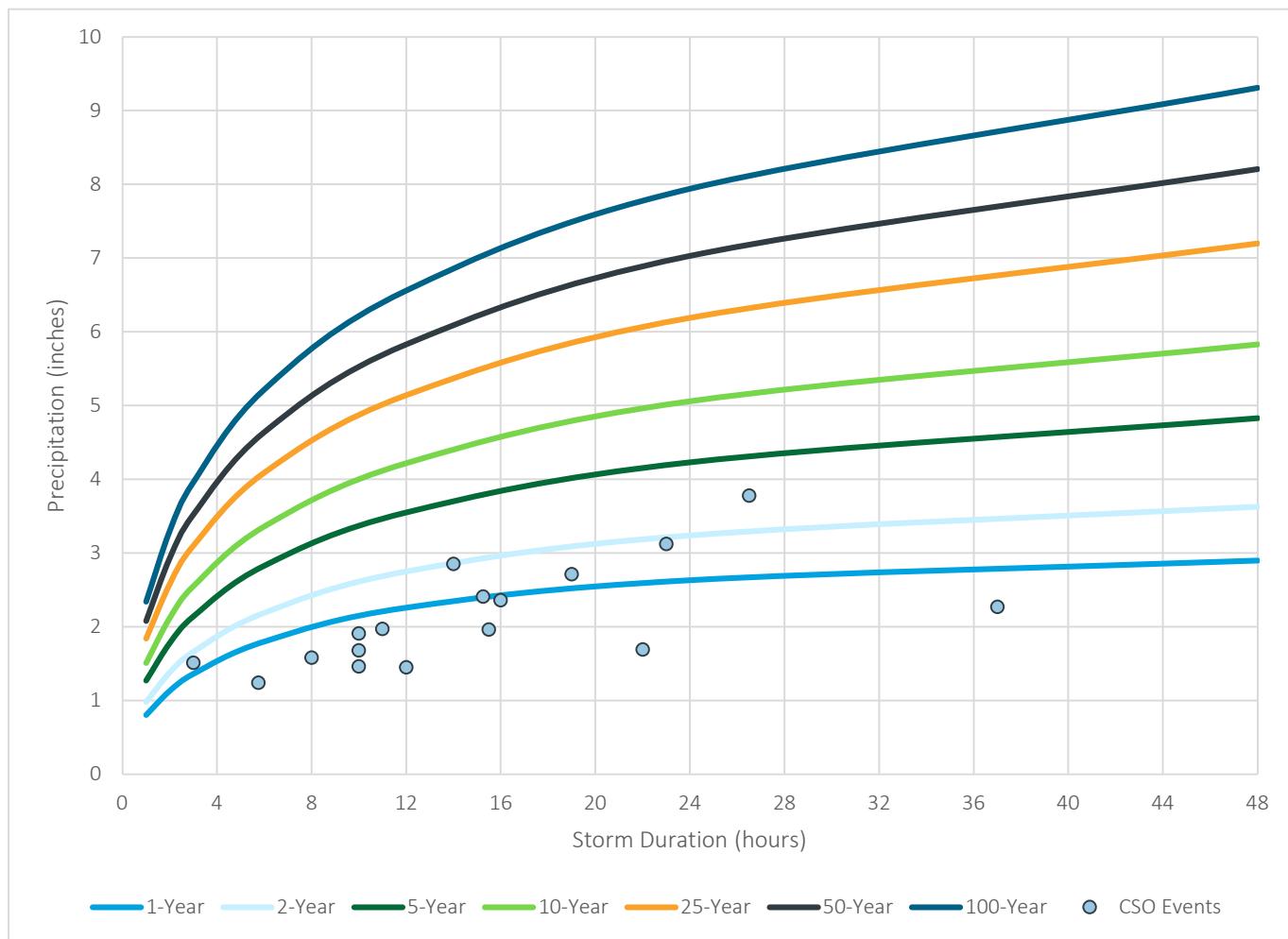
The 1996 Westbrook CSO Master Plan established the 1-year, 24-hour recurrence interval (RI) storm as the design storm to control CSOs in the Westbrook sewer system. As part of DEP's approval of the 2008 CSO Master Plan Update, DEP requested that PWD and Westbrook also consider various abatement alternatives to essentially eliminate all CSOs from the system.

CSO volumes and storm durations were analyzed for each storm event that resulted in a CSO at any of the five licensed CSOs in the Westbrook sewer system between 2014 to 2022. The goal was to determine the recurrence interval storm event that causes a CSO. Establishing this baseline helps to set the design storm. Precipitation totals and storm durations for each storm event were obtained from Westbrook and PWD and compared with total

precipitation volumes from the National Oceanic and Atmospheric Administration (NOAA) weather station located at the Portland Jetport in South Portland, Maine. In cases where there were discrepancies in recorded precipitation amounts, NOAA precipitation totals were used.

Figure 8-1 shows the RI curves<sup>2</sup> for 1-year through 100-year storm events of varying duration and precipitation in the Westbrook region. Also shown are the precipitation and storm duration data points for each reported CSO event recorded at the five licensed CSOs between 2017 and 2022. The data in Figure 8-1 shows that 70% of the reported CSOs that occurred between 2017 and 2022 were for storms with a less than 1-year recurrence interval for varying durations.

**Figure 8-1 Recurrence Intervals for Recorded CSO Events, 2017-2022**



Reported CSO volumes were summed for storms with a less than 1-year 24-hour RI and compared with total reported CSO volumes at each location between 2017 and 2022 (Table 8-1). The data indicates that nearly half of the reported CSO discharge volume between 2017 and 2022 occurred during storms with a less than 1-year 24-

<sup>2</sup> Extreme Precipitation in New York & New England. (2021). Retrieved 13 September 2021, from <http://precip.eas.cornell.edu/>

hour RI for the Westbrook region. If controlled to the 2-year 24-hour RI storm, it appears that all but one of the historically reported CSO events could theoretically be eliminated based on historical storm data for reported CSO discharge events between 2017 and 2022.

**Table 8-1 CSO Flows for Storms with Less Than 1-Year Recurrence Interval 2017 - 2022**

Location	CSO Flow (gallons), less than 1-year RI	% of Total CSO Flow
Warren Avenue CSO 002	0	0%
Siphon Inlet CSO 003	5,113,000	41%
Dunn Street CSO 004	59,000	16%
Brown Street CSO 007	846,000	82%
King Street CSO 008	2,753,156	68%
<b>Sum of CSO Flows</b>	<b>8,771,156</b>	<b>49%</b>

Wright-Pierce also updated PWD's SWMM model of the PWD interceptor sewers in Westbrook and calibrated the model to the May 1, 2023 and May 20, 2023 storms that were captured during the Spring 2023 flow metering period in order to model and predict potential CSO discharges during future 1-year, 2-year, 5-year and 10-year 24-hour RI design storms. The PWD SWMM model was calibrated using real-time flow meter data provided by PWD and supplemented with the WP flow meter data, along with the calibration storm hydrographs from the May 1 and May 20, 2023 storms. The calibrated model did not predict any discharges at any of the CSO locations during 1-year and 2-year, 24-hour RI storms. However, the model did predict that discharges would occur during the 5-year and 10-year, 24-hour RI storms, with projected discharge volumes of about 500,000 gallons and 1.76 million gallons, respectively (Table 8-2). These projected discharge volumes assume that the Cottage Place Pump Station is operating at its full design capacity of 15.1 MGD.

It also should be noted that the PWD SWMM model used to project the expected discharges from various design storms as part the previous CSO Master Plan update assumed a maximum flow rate at the Cottage Place Pump Station of 14.9 MGD. The rationale for this selected peak flow at Cottage Place Pump Station was not provided with the available SWMM model notes, and Wright-Pierce was unable to determine a reason why the siphon, the influent piping to Cottage Place Pump Station and the Cottage Place Pump Station would not be capable of conveying its 15.1 MGD peak design capacity, so the reason for using 14.9 MGD as the peak Cottage Place Pump Station capacity in previous model is unknown at this time. For the purposes of this study, the model runs used to evaluate potential future CSO abatement alternatives assume that the Cottage Place Pump Station can convey its design capacity of 15.1 MGD.

Considering the magnitude of the predicted discharge volumes summarized in Table 8-2, it appears impractical to eliminate 100% of all CSO discharges up to a 10-year, 24-hour storm within the next 5-year CSO Master Plan cycle. Therefore, it is instead recommended that PWD and Westbrook focus their abatement efforts on controlling flows up to the 5-year, 24-hour design storm during the next 5-year CSO Master Plan Cycle.

**Table 8-2 PWD SWMM Design Storm CSO Discharge Volume Projections**

Design Storm Event			CSO Volumes (MG)					
Storm Description	Depth (in)	Peak Int. (in/hr)	Warren CSO 002	Siphon CSO 003	Dunn CSO 004	Brown CSO 007	King Street CSO 008	Total
1 Year, 24-Hour	2.60	0.78	--	--	--	--	--	0.000
2 Year, 24-Hour	3.10	0.99	--	--	--	--	--	0.000
5 Year, 24-Hour	3.90	1.25	0.24	0.25	--	0.02	--	0.50
10 Year, 24-Hour	4.60	1.47	0.75	0.86	0.04	0.13	--	1.76

## 8.5 Screening and Evaluation of Long-Term Control Alternatives

The following sections discuss the effectiveness and relative cost of the CSO control alternatives described in Section 8.3. Section 9 of this plan summarizes the recommended long-term control plan along with the preliminary cost estimates.

The costs presented in this section (as well as Sections 1 and 9) are planning-level estimates only, which are based upon an ENR Construction Cost Index of 13515 (December 2023). Section 9 presents the cost of abatement alternatives in 2023 dollars as well as the potential future cost across the future implementation plan. The estimated budgetary costs presented herein for CSO abatement capital investments and improvements include a multiplication factor of 1.4 to account for anticipated indirect costs (e.g., follow-up studies, permitting, technical services, legal fees, and project administration) to help implement a project.

### 8.5.1 Warren Avenue Parking Lot CSO 002

The Warren Avenue parking lot CSO 002 has not been reported to have discharged in 10+ years, including during three large storms between 2014 and 2022 equivalent or greater than a 25-year 24-hour storm recurrence interval. However, the updated PWD interceptor sewer SWMM model that was calibrated to the May 1, 2023 and May 20, 2023 storms predicts that CSO 002 could potentially discharge during 5-year and 10-year, 24-hour RI storms. The model also indicates that CSO 002 is expected to discharge as a result of surcharging in the interceptor pipe between the siphon and CSO 002. Given this discrepancy between the historically reported lack of CSO discharges and the results of the calibrated model, Wright-Pierce completed supplemental field investigations of the CSO 002 structure's geometry and weir elevations to help confirm the accuracy of the model parameters for CSO 002. The supplemental field investigations revealed that there appeared to be a discrepancy between the elevation of the top of the weir at CSO 002 as field-verified by Wright-Pierce, and the elevation that was historically used in PWD's weir equation to confirm whether a discharge at CSO 002 had occurred and to calculate the discharge volume. Therefore, it is possible that the weir elevation that was being used historically in PWD's weir equation to calculate CSO discharges at CSO 002 was erroneously indicating no CSO discharge during a few historical storms when overflows out of CSO 002 may have occurred. Based on the findings of the calibrated model and supplemental field investigation of CSO 002, addressing the surcharging in the interceptor between the siphon and CSO 002 and at the siphon will likely control discharges at CSO 002 up to the 5-year, 24-hour RI storm in the most cost-effective manner. CSO abatement alternatives to address surcharging at the siphon and CSO 003 are discussed in greater

detail in Section 8.5.2. It may also be prudent for PWD to first relocate the level measuring device for CSO 002 to a more advantageous location and complete additional field investigation of CSO 002 during a future wet weather event to confirm if the CSO is actually discharging or not before it is closed.

### **8.5.2 Siphon Inlet CSO 003**

The annual number of CSO discharge events at the siphon inlet CSO 003 has ranged between 1 to 3 events between 2014 and 2022 with a total of 14 recorded events, averaging 1.1 million gallons per event. Therefore, CSO 003 cannot be closed at this time and additional abatement work is needed to reduce peak flows at the siphon inlet structure to eliminate future discharges from CSO 003.

Wright-Pierce completed a general review of the interceptor hydraulics between the siphon, CSO 003, CSO 002 and CSO 004 using the calibrated PWD SWMM model to understand how discharges at each of these three CSO locations are related. The results indicate that because of the complex hydraulics between these interceptors and three CSO locations, changes to abate discharges at one CSO location can, in effect, exacerbate discharges at the other locations. Therefore, CSO abatement alternatives to mitigate discharges at CSO 003 should also consider the resulting effect on CSO 002 and 004.

Several model runs for the 1, 2, 5, and 10-year design storms were completed using the PWD SWMM interceptor model with modifications based on the theoretical completion of several CSO abatement alternatives to help in the initial screening of CSO abatement alternatives for CSO 003, taking into consideration the impacts on CSO 002 and 004. Wright-Pierce modeled the following specific CSO abatement scenarios listed below. The evaluated CSO storage tank sizes are discussed further in Section 8.5.2.2 below.

- **Scenario 1:** Existing interceptor sewer conditions (no changes).
- **Scenario 2:** Addition of 0.75 MG tank at CSO 003.
- **Scenario 3:** Addition of 1.0 MG tank at CSO 003.
- **Scenario 4:** Addition of 0.75 MG tank at CSO 003 and upsize 18-inch interceptor between CSOs 002 and 003 to 24-inch pipe.
- **Scenario 5:** Addition of 1.0 MG tank at CSO 003 and upsize 18-inch interceptor between CSOs 002 and 003 to 24-inch pipe.
- **Scenario 6:** Upsize 12-inch Dana Court Pump Station force main to bring capacity to 5.2 MGD.
- **Scenario 7:** Upsize 12-inch Dana Court Pump Station force main to bring capacity to 5.2 MGD and add a 0.75-MG storage tank at CSO 003.
- **Scenario 8:** Upsize 12-inch Dana Court Pump Station force main to bring capacity to 5.2 MGD and add a 1.0-MG storage tank at CSO 003.
- **Scenario 9:** Upsize 12-inch Dana Court Pump Station force main to bring capacity to 5.2 MGD, add a 0.75-MG storage tank at CSO 003 and upsize 18-inch interceptor between CSOs 002 and 003 to 24-inch pipe.
- **Scenario 10:** Upsize 12-inch Dana Court Pump Station force main to bring capacity to 5.2 MGD, add a 1.0-MG storage tank at CSO 003, and upsize 18-inch interceptor between CSOs 002 and 003 to 24-inch pipe.

Appendix D includes summary tables of the modeled abatement scenarios for the design storms.

Table 8-3 that follows provides a summary of the initial screening of relevant CSO 003 discharge abatement options based on Westbrook and PWD's historical CSO program information, the Spring 2022 and Spring 2023 supplemental flow metering data and projections from the updated PWD SWMM hydraulic/hydrologic Interceptor model. The table indicates whether each option appears to be technically feasible to implement from a planning-level perspective and provides the advantages and disadvantages of each abatement option.

Each of the screened abatement options in Table 8-3 can be considered on a stand-alone basis or in combination with one or more of the other abatement options to achieve the greatest cost/benefit to PWD and Westbrook.

**Table 8-3 Screening-Level Evaluation of CSO Abatement Options – Siphon Inlet CSO 003**

Options	Advantages	Disadvantages	Advance for further evaluation?
<p><b>1. I/I Removal:</b></p> <p>Continue program of flow monitoring and I/I investigation in the sewers tributary to CSO 003 to document significant sources of I/I within collection system. Continue to include high value I/I removal projects in sewer system Capital Improvements Plan.</p>	<ol style="list-style-type: none"> <li>1. Removes I/I sources contributing to CSO 003 discharges and improves existing infrastructure that must be renewed anyway to maintain reliable sewer collection services.</li> <li>2. Removes extraneous water that occupies existing sewer pipeline capacity and thereby limits future development and economic growth potential.</li> <li>3. If completed in a phased approach, capital costs can be amortized over a longer period than other abatement options, which translates to a more gradual financial impact to sewer users.</li> <li>4. Implementing I/I removal projects in CSO 002 and 004 catchments that are tributary to CSO 003 catchment increase the cost-benefit of those projects.</li> </ol>	<ol style="list-style-type: none"> <li>1. Protracted implementation timeline, which could translate to future discharges from CSO 003 that could have been avoided if a different abatement option was selected.</li> <li>2. Difficult to quantify and predict future I/I abatement effectiveness when compared to other CSO abatement strategies.</li> <li>3. Higher overall cost to implement than other CSO abatement alternatives.</li> <li>4. Typically, more disruptive to the public than abatement projects with discrete project sites such as underground storage facilities on public property or existing sewer easements.</li> </ol>	YES

Options	Advantages	Disadvantages	Advance for further evaluation?
<p><b>2. Siphon Capacity Increase:</b></p> <p>Upgrade the siphon structure to increase its capacity to transport flow under the Presumpscot River to the downstream gravity sewers and Cottage Place Pump Station.</p>	<ol style="list-style-type: none"> <li>1. Immediate reduction in discharges at CSO 003 during wet weather, provided that downstream sewers, Cottage Place Pump Station and WWTF can transport the additional flow.</li> <li>2. May also reduce or eliminate discharges at CSOs 002 and 004 by reducing surcharging in upstream interceptors.</li> <li>3. Provides additional redundancy to existing siphon.</li> </ol>	<ol style="list-style-type: none"> <li>1. Capacity increase is limited by the capacity of the downstream sewers, Cottage Place Pump Station and WWTF to accept additional flow.</li> <li>2. Would also require upgrades to the Cottage Place Pump Station and WWTF to accommodate additional flow.</li> <li>3. Higher annual costs to operate and maintain larger and additional infrastructure.</li> <li>4. Does not recapture available capacity in the existing sewers by removing I/I sources.</li> <li>5. Higher short-term capital cost to sewer users than phased I/I removal.</li> </ol>	NO
<p><b>3. In-Line Storage of CSO Flow:</b></p> <p>Utilize existing collection system piping or install new in-line storage conduit within drainage area.</p>	<ol style="list-style-type: none"> <li>1. Lower annual O&amp;M costs than Option 4.</li> <li>2. Potentially improves existing infrastructure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Storage capacity would be insufficient to significantly reduce discharges at CSO 003 for 5-year design storm, based on a desk-top review of the topographic conditions, interceptor invert elevations, and modeled hydraulic profiles and for the 42-inch and 18-inch interceptor sewers entering the siphon inlet.</li> <li>2. Does not recapture available capacity in the existing sewers by removing I/I sources.</li> </ol>	NO

Options	Advantages	Disadvantages	Advance for further evaluation?
<p>4. <i>Off-Line Storage of CSO Flow:</i>  Off-line gravity-operated storage tank at the public athletic field next to siphon inlet chamber.</p>	<ol style="list-style-type: none"> <li>1. A roughly 0.75-MG storage tank placed at CSO 003 could eliminate discharges at CSO 003 up to the 5-year storm (Table 8-2).</li> <li>2. Depending on its inlet elevation, a storage tank at CSO 003 could also eliminate discharges at CSO 004 and reduce discharges at CSO 002 during a 5-year storm, improving its cost-benefit compared to other alternatives.</li> <li>3. More immediate CSO abatement results than Option 1.</li> </ol>	<ol style="list-style-type: none"> <li>1. Higher annual costs to operate and maintain additional infrastructure.</li> <li>2. Does not improve existing infrastructure.</li> <li>3. Does not recapture available capacity in the existing sewers by removing I/I sources.</li> <li>3. Higher short-term capital cost to sewer users than other abatement options.</li> </ol>	YES

Based on the initial screening, the I/I removal and offline storage tank abatement options were advanced for further study and evaluation for CSO 003. The following sections provide a brief outline of the conceptual designs, project implementation considerations (land acquisition, permitting, construction considerations, etc.) and capital costs of each of the options listed above for planning-level comparison purposes.

#### **8.5.2.1 CSO 003 Abatement Option 1: I/I Removal**

Based on the results of the WP supplemental flow metering discussed in Section 5, prioritizing future I/I investigations in WP meter basins 101-25, 101-169, 101-325, 102-13, 102-97 and 3-2 is expected to identify the most cost-effective I/I sources for elimination in the CSO 003 catchment. WP Meter Basins 102-97 and 102-13 are also tributary to CSO 002, so they should be Westbrook’s top priority for additional flow metering and I/I investigation to further increase the cost-benefit of completing these tasks within the next 5-year timeframe.

I/I source removal in all six of the highest priority WP meter basins should be carried out in a phased approach that starts with further flow metering and I/I source investigation to refine and narrow the focus areas. The I/I investigations would then be followed by targeted I/I abatement projects, also implemented in phases, based on the severity of I/I present in the sewers to minimize disruption to the public and to spread out capital expenditures in a more gradual approach that is less impactful to sewer users in the short-term. This process should be repeated for each of the meter basins, focusing on supplemental flow metering in two WP meter basins every other year until all six WP meter basins have been investigated.

According to data provided by PWD and Westbrook, are also several privately owned catch basins on the Sappi industrial site that are connected to the sanitary sewers in WP meter basin 102-97. Disconnection of catch basins from sanitary sewers tends to have a better payback in terms of dollars spent per gallon of inflow removed than removing other sources of private inflow such as roof or foundation drains, so this project would be desirable from a cost-benefit perspective. However, due to significant budget cutbacks, reduced production at Sappi’s Westbrook facility, and high engineering staff turnover at Sappi, the City has been unsuccessful thus far in coordinating the disconnection of these catch basins from the sanitary sewer system. It is recommended that the City continue to engage in discussions with Sappi about the City’s goal of removing these private catch basins from the public sanitary sewer system.

The total capital cost to implement I/I source removal in the sewers affecting CSO 003, and CSOs 002 and 004 that are hydraulically tied to the siphon and CSO 003 at the siphon, depends upon the results of further I/I investigation in these sewers to narrow down the I/I abatement focus area. Therefore, planning-level costs have been developed in Table 8-3 to provide an anticipated capital cost range to investigate the priority WP Meter Basins affecting CSO 003, but have not been developed for future I/I removal and post construction monitoring work at this time. The phased I/I removal approach presented in Table 8-3 would be repeated on a staggered timetable with a long-term goal of investigating and removing significant I/I sources in these six meter basins within the next 20 years.

**Table 8-4 Planning-Level Capital Costs – CSO 003 Abatement Option 1: I/I Removal**

Item	Description	Planning-Level Cost (See Note 1)
<b>Phase 1 - Supplemental flow metering (See Note 2)</b>		
1	Flow Meter Purchase (assumes 8 meters @ \$10,000/meter)	\$80,000
2	Flow Meter O&M (8 meters @ \$5,000/meter)	\$40,000

Item	Description	Planning-Level Cost (See Note 1)
3	Post-Metering Data Processing and Analysis (per WP Meter Basin)	\$25,000
	<b>Subtotal (for all six WP Meter Basins)</b>	<b>\$270,000</b>
4	Contingency (10%)	\$30,000
	<b>Total Estimated Phase 1 Project Cost (for all 6 WP Meter Basins)</b>	<b>\$300,000</b>
<b>Phase 2 - Phase 2 - SSES and CCTV inspections (per meter basin)</b>		
1	Sewer System Evaluation Survey (SSES) (See Note 3)	\$75,000
2	Sewer System CCTV Inspections (See Note 4)	--
2a	10,000 LF (@ \$5.00/LF inspected)	\$50,000
2b	25,000 LF (@ \$5.00/LF inspected)	\$125,000
2c	50,000 LF (@ \$5.00/LF inspected)	\$250,000
2d	100,000 LF (@ \$5.00/LF inspected)	\$500,000
	<b>Subtotal</b>	<b>\$125,000-\$575,000</b>
3	Contingency (10%)	\$13,000-\$60,000
	<b>Total Estimated Phase 2 Project Cost (per WP Meter Basin)</b>	<b>\$140,000-\$640,000</b>
	<b>Total Estimated Phase 2 Project Cost (for all 6 Meter Basins)</b>	<b>\$840,000-\$3,900,000</b>
<b>CSO Abatement Option 1, Phase 1 and Phase 2 Projects Costs</b>		<b>\$1,140,000-\$4,200,000</b>

Notes:

1. Costs are presented in round numbers considering the preliminary planning stage of project development.
2. Flow metering costs assume that Wesbrook will purchase, deploy and maintain flow meters in-house.
3. SSES costs assume 2 weeks of investigative fieldwork (dye testing, smoke testing, basement inspections) and development of a technical memorandum documenting the survey results.
4. CCTV inspection unit costs are placeholder costs based on historical projects with similar scope in southern Maine. Depending on project-specific factors such as the scope of the CCTV inspection project and the complexity of completing the inspections in the areas being inspected, the assumed unit cost could potentially increase or decrease.

### 8.5.2.2 CSO 003 Abatement Option 4: Off-line Storage

As previously mentioned in Section 8.5.2, PWD's existing SWMM model of the Westbrook interceptor sewers was used to model the impacts of installing an offline storage tank in the athletic field adjacent to CSO 003 and the siphon inlet. Due to the complex hydraulics in the interceptors between CSO 002, 003 and 004, the tank's theoretical inlet elevation and volume were iteratively adjusted to achieve a balance between volume capture at CSO 003 and hydraulic grade line control between all three CSOs during the simulated design storms. The model results show that a 0.75-MG storage tank with an inlet elevation set to control the hydraulic grade line at CSO 002 and 004 could eliminate discharges at CSO 003 and 004, and achieve an 83% reduction in CSO discharge volume at CSO 002 during a 5-year storm. Constructing a 1.0-MG tank at CSO 003 with an inlet elevation set to control the hydraulic grade line at CSO 002 and 004 could eliminate CSO discharges at CSO 002, 003 and 004 up to a 5-year storm.

Figure 8-2 shows the generally expected location of the offline storage tank and the 18-inch interceptor sewer between the siphon and CSO 002.

**Figure 8-2 CSO 003 Abatement Option 4: Off-line Storage Tank**



The modeled CSO storage tank sizes at CSO 003 are based on assumed existing conditions in the Westbrook sewer system with the goal of 100% CSO control at CSO 003 for a 5-year, 24-hour RI storm. This study-phase conceptual tank sizing does not account for potential future build-out in the CSO 003 catchment since this can be highly variable and hard to predict with any degree of certainty. However, it is expected that the recent commercial development that has begun at the Rock Row development properties will add a significant amount of additional flow to a portion of the WP Meter Basin 102-13 sewers in the near-term and will increase baseline flows to the siphon. The additional baseline flow is likely to impact future discharges at CSO 003. Therefore, the preliminary design of an offline storage facility in the athletic field near the siphon, that would include additional review of the interceptor hydraulics and determination of the tank's final working volume, should account for this potential near-term additional baseline flow as well in order to increase the confidence level that the goal of 100% CSO capture at CSO 003 during a 5-year storm will be achieved.

To be conservative in estimating budgetary-level planning cost for this project at this preliminary study phase, Table 8-5 provides an estimated budgetary-level construction costs for a 1.0-MG offline gravity-operated storage facility under the athletic field near CSO 003. The final working volume of the offline storage facilities would be

determined at the preliminary design stage of the project and these budgetary-level cost estimates should be refined at that time.

**Table 8-5 Planning-Level Capital Costs - CSO 003 Abatement Option 4: Off-line Storage Tank**

Item	Description	Budgetary-Level Costs (See Notes 1 & 2)
<b>CSO 003 Option 4 –Offline CSO Storage Tank (1.0-million-gallon capacity)</b>		
1	Mobilization/Demobilization	\$500,000
2	Site Work	\$500,000
3	Precast Concrete Tank	\$5,000,000
4	Erosion Control	\$50,000
5	Site Restoration and Landscaping	\$200,000
6	Temporary Excavation Support/Sheeting	\$500,000
7	Groundwater Dewatering	\$100,000
8	Hazardous Materials Removal, Storage and Disposal (allowance)	\$50,000
<b>Subtotal</b>		<b>\$7,000,000</b>
9	Construction Contingency (15%)	\$1,050,000
10	Technical Services (25%)	\$1,750,000
11	Legal and Administrative (2%)	\$140,000
12	Project Financing (1%)	\$70,000
<b>Total Project Cost</b>		<b>\$10,000,000</b>

Notes:

1. Costs are presented in round numbers considering the preliminary planning stage of project development.
2. Planning-level construction cost estimate items generally include the labor, materials and the contractor's overhead and profit to complete the specific item and incidental work associated with the item unless otherwise indicated.
3. The cost for CSO 003 Abatement Option 4 Offline Storage Tank, is based on an assumed \$10/gallon of storage provided based on other similar projects Wright-Pierce has been involved with. The cost for offline storage tanks varies due to many factors including but not limited to soils, presence of bedrock, depth to groundwater, presence of other utilities, and land acquisition costs. An updated cost for this tank will be developed during preliminary design once more information becomes available.

Based on the screening and evaluation of the feasible CSO 003 abatement options, it is recommended that PWD and Westbrook advance Option 4 (offline CSO storage tank) as a solution over the next 5 years to control discharges from CSO 003 to a 5-year storm and advance Option 1 (I/I removal) as a long-term solution to eventually remove sources of extraneous groundwater and stormwater entering the sanitary sewers that, in effect, limit future economic development in Westbrook and increase pumping and treatment costs borne by the sanitary sewer system users.

### **8.5.3 Dunn Street CSO 004**

The annual number of CSO discharge events at the Dunn Street CSO 004 has ranged between 1 to 2 events between 2014 and 2022 with a total of 11 recorded events, averaging about 152,000 gallons discharged per event. Between 2017 and 2022, CSO 004 tended to activate during storms equivalent to about a 1-year storm or greater. This indicates that CSO 004 has likely been controlled to the 1-year, 24-hour storm for the Westbrook area as a result of previous CSO discharge abatement work completed by PWD and Westbrook. However, it is not yet a good candidate for closure since it is still activating 1 to 2 times per year.

The updated PWD interceptor sewer SWMM model that was calibrated to the May 1, 2023 and May 20, 2023 storms predicts that CSO 004 is expected to discharge during 5-year and 10-year, 24- hour RI storms. Similar to CSO 002, the model also indicates that discharges at CSO 004 are likely the result of surcharging in the interceptor pipe between the siphon and CSO 004. Therefore, addressing the surcharging in the interceptor sewers between CSO 004 and the siphon and at the siphon is expected to also help control discharges at CSO 004 up to the 5-year, 24-hour RI storm. CSO abatement alternatives to address surcharging at the siphon and CSO 003 were discussed in Section 8.5.2.

### **8.5.4 Brown Street CSO 007**

The annual number of CSO discharge events at the Brown Street CSO 007 has ranged between 0 to 52 days with discharging as a result of 0 to 34 storm events that triggered CSO discharges between 2014 and 2022, with a total of 90 recorded events during this period, averaging about 9,000 gallons per event. However, the average reported CSO discharge event volume is somewhat skewed by the relatively high number of small-volume discharge events reported at CSO 007 between 2014 and 2016. For example, CSO 007 was reported to have discharges on 52 separate days during 34 storm events that triggered CSO discharges in 2014 with a reported discharge volume from each event less than 100,000 gallons within a 24-hour period. After adjustments were made to the CSO flow monitoring approach and the CSO weir walls were raised in 2017, CSO 007 experienced only seven reported CSO discharge events between 2017 and 2022, averaging between 1-2 events per year, and with an average reported discharge of 0.57 million gallons per event. Historical storm data indicates that CSO 007 was reported to have discharged during several storms that were smaller than a 1-year, 24-hour storm RI for the Westbrook area between 2017 and 2022.

It is also important to note that the CSO 007 outfall pipe that conveys excess flows from the CSO regulator manhole discharges into a 24-inch outfall pipe to the Presumpscot River that also conveys stormwater flows from 3 other storm drain sewers in the area. It is suspected that, historically, stormwater flows have surcharged in the shared outfall pipe, backing up flows to the CSO regulator structure weir wall. The stormwater surcharging could have potentially registered as erroneous CSO flows by the flow metering equipment in the CSO outfall pipe and impacted the number and volume of actual discharge events out of CSO 007. The updated PWD interceptor sewer SWMM model that was calibrated to the May 1, 2023 and May 20, 2023 storms predicts that CSO 007 would discharge during storms greater than the 5-year, 24- hour RI storms. The model also indicated the possible presence of a tailwater effect occurring in the interceptor sewers between CSOs 007 and 008. Therefore, it is not recommended that CSO 007 be closed at this time. Additional supplemental flow metering in the CSO 007 catchment and investigation of the interceptor sewers between CSO 007 and 008 should be completed to confirm whether CSOs are occurring at CSO 007 during storms smaller than the 1-year, 24-hour RI storm, possible sources of extraneous flows in the CSO 007 catchment, and the possible cause of the observed tailwater effect between CSOs 007 and 008.

Appendix D includes summary tables of modeled abatement scenarios for the design storms that impact CSO 007.

Table 8-6 provides a summary of the initial screening of the typical discharge abatement options for CSO 007. However, before any of the feasible abatement alternatives that are advanced for further study and development are implemented, additional flow metering and investigation of the sewers between CSO 007 and CSO 008 should be completed, as previously discussed, to help determine the potential causes of the historically reported CSO discharges from CSO 007 during storms smaller than the 5-year storm that are contrasted by the results of the SWMM model projections. Additional study of the sewers in this area will help inform which abatement option (or combination of abatement options) is expected to eventually eliminate discharges at CSO 007 in the most cost-effective manner.

**Table 8-6 Screenings Level Evaluation of Abatement Options – Brown Street CSO 007**

Options	Advantages	Disadvantages	Advance for further evaluation?
<p><b>1. I/I Removal:</b></p> <p>Continue program of flow monitoring and I/I investigation in the sewers tributary to CSO 007 to document significant sources of I/I within collection system. Continue to include high value I/I removal projects in sewer system Capital Improvements Plan</p>	<ol style="list-style-type: none"> <li>1. Abates I/I contributing to CSO 007 discharges and improves existing infrastructure that must be renewed anyway to maintain reliable sewer collection services.</li> <li>2. Removes extraneous water sources that occupy existing sewer pipeline capacity and thereby limit future development and economic growth potential.</li> <li>3. If completed in a phased approach, capital costs are amortized over a longer period than other abatement options, which translates to a more gradual financial impact to sewer users.</li> <li>4. I/I removal projects in CSO 007 catchment area can also potentially reduce discharges at the upstream CSO 008 by effectively recapturing available wet weather sewer capacity downstream of CSO 008.</li> </ol>	<ol style="list-style-type: none"> <li>1. Protracted implementation timeline, which could translate to future discharges from CSO 007 that could have been avoided if a different abatement option was selected.</li> <li>2. Difficult to quantify and predict future I/I abatement effectiveness when compared to other CSO abatement strategies.</li> <li>3. Typically, more disruptive to the public than abatement projects with discrete project sites such as underground storage facilities on public property or existing sewer easements.</li> </ol>	YES

Options	Advantages	Disadvantages	Advance for further evaluation?
<p><b>2. <i>Sewer Capacity Increase/ In-line Storage:</i></b></p> <p>Replace the 24-inch interceptor sewer between the SMH upstream of Dana Court PS and CSO 007 with larger diameter pipe or install a new shallower in-line linear storage conduit or box culvert along the same approximate route as the existing 24-inch interceptor between CSO 007 and the Dana Court Pump Station and raise the CSO weir wall in the CSO 007 overflow manhole.</p>	<ol style="list-style-type: none"> <li>1. Immediate reduction in discharges at CSO 007.</li> <li>2. Could also reduce or eliminate discharges at CSO 008 upstream.</li> </ol>	<ol style="list-style-type: none"> <li>1. The 24-inch interceptor was recently replaced and still has a significant amount of remaining useful service life.</li> <li>2. Higher annual costs to operate and maintain additional infrastructure.</li> <li>3. Does not improve existing infrastructure.</li> <li>4. Does not recapture available capacity in the existing sewers by removing I/I sources.</li> <li>5. Higher short-term capital cost to sewer users than phased I/I removal.</li> <li>6. Storage capacity may not be sufficient to eliminate all CSO 007 discharges for a 10-year storm.</li> <li>7. Relies on also completing Option 3 to avoid potentially flooding out Dana Court PS during peak flow conditions.</li> </ol>	NO
<p><b>3. <i>Dana Court Pump Station Capacity Increase:</i></b></p> <p>Replace the 12-inch section of the Dana Court PS force main with 14-inch pipe to increase its capacity from 4.3 MGD to 5.2 MGD.</p>	<ol style="list-style-type: none"> <li>1. Predicted to eliminate discharges at CSO 007 up to the 5-year storm and significantly reduce discharges during the 10-year storm, based on modeling results.</li> <li>2. May also help to reduce or eliminate discharges at CSO 008.</li> </ol>	<ol style="list-style-type: none"> <li>1. Essentially pushes extraneous flows to Cottage Place Pump Station, which is expected to exacerbate sewer surcharging at that location and discharges at CSO 003.</li> <li>2. Does not recapture available capacity in the existing sewers by removing I/I sources.</li> </ol>	YES

Options	Advantages	Disadvantages	Advance for further evaluation?
<p><b>4. <i>Off-Line Storage of CSO Flow:</i></b></p> <p>Install new offline storage tank to store excess peak flows from CSO 007 and then meter the stored flows back into the sanitary sewer system after peak wet weather flows receded and the sewers could then accept the additional flow.</p>	<p>This alternative would be infeasible because there is not sufficient space to install an offline storage tank of any significant size near CSO 007. Therefore, it will not be considered further.</p>		NO

Based upon the initial screening-level evaluation, Option 1 (I/I removal) and Option 2 (capacity increase at the Dana Court Pump Station by upsizing a portion of the force main) should be advanced for further evaluation and development once additional flow metering and sewer investigation in this area has been completed. It should also be noted that Option 2 has already been included in the PWD capital improvement plan and is scheduled for 2027. The following sections provide a brief outline of the conceptual designs, project implementation considerations and capital costs for planning-level comparison purposes.

#### **8.5.4.1 Brown Street CSO 007: Option 1 – I/I Removal**

Additional flow metering in the sewers upstream of the CSO 007 regulator structure should be completed to confirm the presence of extraneous flows in the sanitary sewers entering the CSO 007 regulator structure manhole and to help confirm whether the flow meter readings in the CSO 007 outfall are attributable to actual overflows of the sanitary sewer or surcharging stormwater in the shared outfall pipe causing erroneous flow meter readings during storm events.

Assuming that supplemental flow metering reveals excess flows in the sewer tributary to CSO 007, the capital costs to implement I/I source removal in these sewers would depend upon the results of further I/I investigation to narrow down the I/I abatement focus area. Planning-level placeholder costs are presented in Table 8-7 to provide an anticipated capital cost range to investigate the sewers affecting CSO 007, but capital costs for potential future I/I abatement work in these sewers have not been developed at this time.

**Table 8-7 Planning Level Capital Costs – CSO 007 Abatement Option 1: I/I Removal**

Item	Description	Planning-Level Cost (See Note 1)
<b>Phase 1 - Supplemental flow metering (See Note 2)</b>		
2	Flow Meter O&M (4 meters @ \$5,000/meter)	\$20,000
3	Post-Metering Data Processing and Analysis	\$25,000
	<b>Subtotal</b>	<b>\$45,000</b>
4	Contingency (10%)	\$5,000
<b>Total Estimated Phase 1 Project Cost</b>		<b>\$50,000</b>

Notes:

1. Costs are presented in round numbers considering the preliminary planning stage of project development.
2. Flow metering costs assume that Wesbrook has already purchased flow meters and this cost is carried under CSO 003 Abatement Option 1 project. Costs also assume that Westbrook will deploy and maintain flow meters in-house.

#### **8.5.4.2 Brown Street CSO 007: Option 3 – Dana Court Pump Station Capacity Increase**

As previously described in Section 8.2.4, the upsizing of the remaining 476 linear feet of 12-inch force main to 14-inch pipe is expected to increase the capacity of the Dana Court Pump Station up to a peak hourly flow rate of 5.2 MGD. The 12-inch diameter portion of the force main that would need to be upsized to accommodate the pump station capacity increase is shown in green in Figure 8-2 that follows.

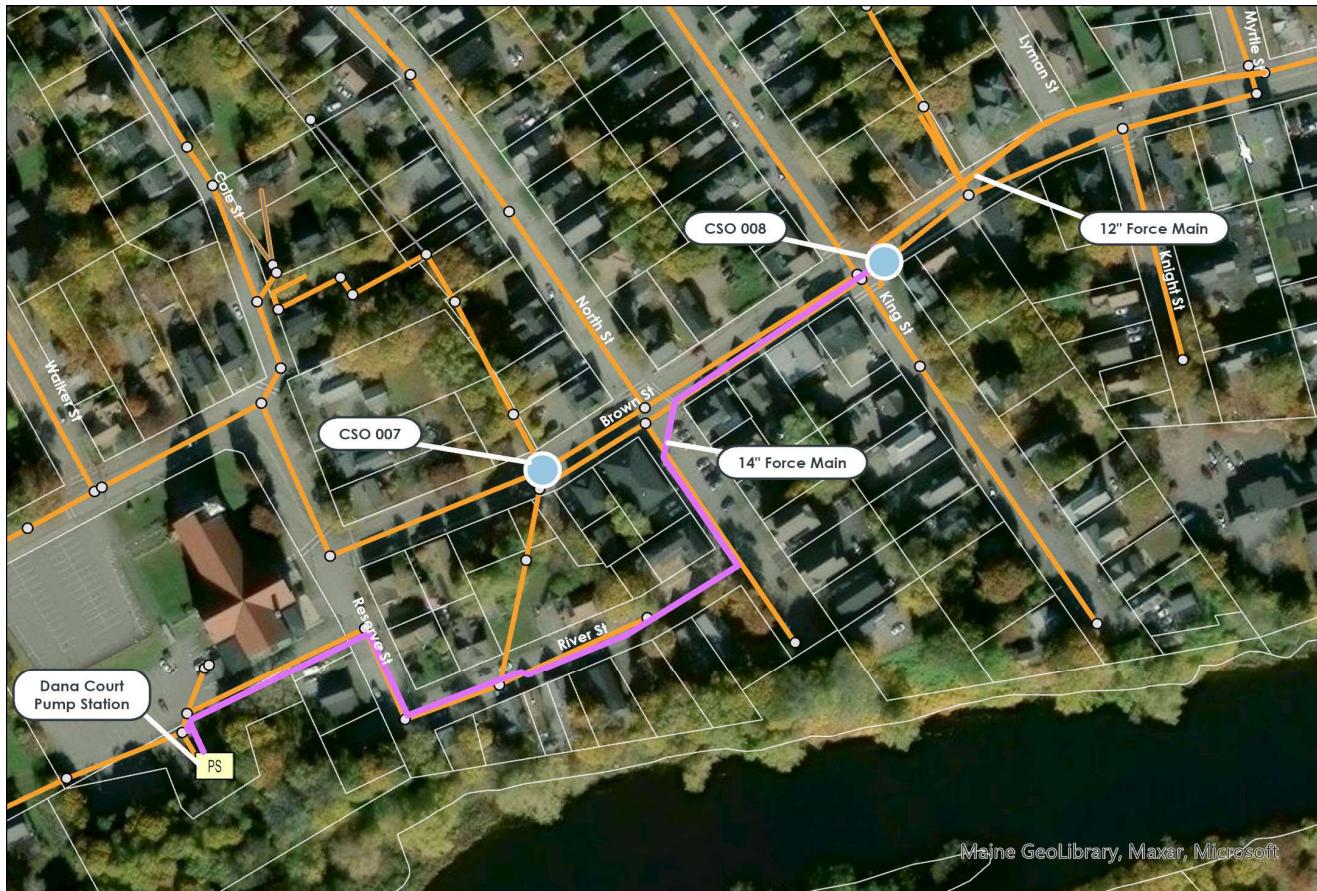
**Figure 8-3** Brown St. CSO 007: Option 3 – Dana Ct. PS Capacity Increase

Table 8-8 provides a summary of the estimated planning level capital costs to implement CSO 007 abatement Option 3 to upsize the remaining 12-inch portion of the Dana Court Pump Station force main.

**Table 8-8** Planning Level Capital Costs – CSO 007 Abatement Option 3: Dana Ct. PS Capacity Increase

Item	Description	Planning-Level Costs (See Note 1)
CSO 007 Option 3 –Dana Court Pump Station Capacity Increase		
1	Mobilization/Demobilization	\$50,000
2	Site Work	\$25,000
3	14-inch Force Main (HDPE) Installation	\$150,000
4	Trench Paving	\$40,000
5	Erosion Control	\$25,000
6	Site Restoration	\$25,000
7	Groundwater Dewatering	\$15,000

Item	Description	Planning-Level Costs (See Note 1)
8	Hazardous Materials Removal, Storage and Disposal (allowance)	\$50,000
	<b>Subtotal</b>	<b>\$380,000</b>
10	Construction Contingency (15%)	\$57,000
11	Technical Services (25%)	\$95,000
12	Legal and Administrative (2%)	\$7,000
13	Project Financing (1%)	\$4,000
	<b>Total Project Cost</b>	<b>\$543,000</b>

Notes:

1. Planning-level construction cost estimate items generally include the labor, materials and the contractor's overhead and profit to complete the specific item and incidental work associated with the item unless otherwise indicated.

### 8.5.5 King Street CSO 008

The annual reported number of CSO discharge events at the Brown Street CSO 008 has ranged between 0 and 38 events between 2014 and 2022, with a total of 114 recorded events during this period, averaging about 157,000 gallons per event. However, like CSO 007, the average CSO discharge event volume is somewhat skewed by the relatively high number of reported small-volume discharge events at CSO 008 between 2014 and 2016. CSO 008 was reported to have discharged on 38 occasions in 2014, most of which were less than 150,000 gallons. CSO 007 was reported to have experienced eleven CSO discharge events between 2017 and 2022, averaging 2 events per year, and with an average reported discharge of about 370,000 gallons per event. Storm data indicates that CSO 008 discharged between 2017 and 2022 during several storms that were smaller than a 1-year, 24-hour storm for the Westbrook area.

However, like CSO 007, the CSO 008 outfall pipe that conveys excess flows from the CSO regulator manhole discharges into an outfall pipe to the Presumpscot River that also conveys stormwater flows from nearby storm drain sewers. Like CSO 007, it is suspected that stormwater flows have historically surcharged in the shared stormwater/CSO 008 outfall pipe, backing up flows to the CSO 008 weir wall. This surcharging could have registered as erroneous CSO flows by the flow metering equipment and impacted the recorded number and volume of discharges at CSO 008. In the absence of additional information on the influent sewer flows to the CSO 008 regulator manhole during these events, it is impossible to confirm the validity of the historical CSO 008 flow meter data. Model runs of the updated PWD SWMM interceptor sewer model that was calibrated to the May 1, 2023 and May 20, 2023 storms did not project discharges from CSO 008 during a simulated 10-year 24-hour RI storm or smaller storms.

Considering the contrasting historical CSO 008 outfall flow meter data and the updated PWD interceptor model run results, it is not recommended that CSO 008 be closed at this time. Additional flow metering of the influent sewer into the CSO 008 regulator manhole should be completed during the next 5-year CSO Master Plan cycle to confirm if CSOs are occurring at CSO 008 during storms smaller than the 1-year, 24-hour RI storm, or if surcharging stormwater is influencing flow meter readings in the CSO 008 outfall pipe. Additional flow metering will also help

detect the potential presence of excess I/I in the sewers upstream of the CSO 008 manhole for further investigation.

Table 8-9 provides a summary of planning level costs for PWD or Westbrook to deploy a supplemental flow meter in the influent sewer entering the CSO 008 regulator structure.

**Table 8-9 Planning Level Capital Costs – CSO 008 Additional Flow Metering**

Item	Description	Planning-Level Costs
<b>CSO 008 Additional Flow Metering</b>		
1	Flow Meter O&M (1 meters @ \$5,000/meter)	\$5,000
2	Post-Metering Data Processing and Analysis	\$10,000
	<b>Subtotal</b>	<b>\$25,000</b>
3	Contingency (10%)	\$3,000
<b>Total Project Cost</b>		<b>28,000</b>

# Section 9 Recommended CSO Abatement Plan

## 9.1 Introduction

Section 8 of the CSO Master Plan screened and evaluated the feasible long-term control options for each of the five remaining active CSOs in the Westbrook sewer system and made recommendations for which abatement options to advance for further development. Planning-level costs to implement each recommended CSO abatement option were also presented. To implement the recommended CSO abatement plan in the most cost-effective manner, it is important to emphasize that Westbrook and PWD should pursue a phased approach to CSO abatement.

Implementation of any of the recommended CSO abatement projects should be followed by post-construction flow monitoring and investigation to determine the results of the project. Implementation of short-term projects and initial phases of long-term projects may reduce or eliminate the need to pursue subsequent phases or other recommended long-term abatement projects. This Section presents a phased long-term CSO abatement schedule and potential project funding options to help implement these projects over the next 20 years.

## 9.2 CSO Abatement Plan and Implementation Schedule

Table 9-1 and Table 9-2 that follow summarize the anticipated planning-level cost to implement the recommended CSO abatement projects described in Section 8 that are expected to occur during the next 5-year CSO Master Plan Cycle and a recommended implementation schedule for those projects, respectively. Implementation of the projects listed in Table 9-1 and Table 9-3 target the following short-term CSO abatement goals:

- Reduce surcharging at the siphon structure that is contributing to discharges at CSO 002, 003 and 004.
- Complete additional flow metering and sewer investigation at CSOs 007 and 008 to better understand the sewer system hydraulics at these two locations and confirm if additional CSO abatement work is needed to facilitate their eventual closure.
- Complete supplemental sanitary sewer system flow metering and I/I investigations in the sewers tributary to the siphon and the Cottage Place Pump Station to identify and isolate sources of extraneous flow that effectively occupy a significant portion of the existing sanitary sewer system's capacity at times and limit future buildout and economic development in Westbrook.

Completion Dates listed in Table 9-2 are contingent upon when final approval of the CSO Master Plan is granted by Maine DEP. Target completion dates will be adjusted as necessary pending Maine DEP's review comments and subsequent time to revise the CSO Master Plan.

**Table 9-1 PWD & Westbrook 5-Year Planning-Level Capital Costs**

Item	Description	Planning-Level Costs
<b>CSO 002, 003, 004 Abatement Projects</b>		
1	Project 003-2a: WP Meter Basin 102-97 Phase 1 Flow Metering	\$145,000
2	Project 003-2b: WP Meter Basin 102-97 Phase 2 SSES and I/I Identification	\$125,000-\$575,000
3	Project 003-3a: WP Meter Basin 102-13 Phase 1 Flow Metering	\$65,000
4	Project 003-3b: WP Meter Basin 102-13 Phase 2 SSES and I/I Identification	\$125,000-\$575,000
5	Project 003-1a: Design and Construct Offline Storage Tank	\$10,000,000

Item	Description	Planning-Level Costs
<b>CSO 007 &amp; 008 Abatement Projects</b>		
6	Projects 007-1 and 008-1: CSO Confirmation Flow Metering	\$78,000
7	Project 007-2a: Dana Court Pump Station - Design and Construct Force Main Upgrades	\$543,000
<b>Total Project Costs (See Note 2)</b>		<b>\$11,150,000-12,000,000</b>

Notes:

5. The totals listed in this table assume all recommended CSO projects and project phases discussed in Section 8 are completed. As abatement projects are completed it is possible that some subsequent projects or project phases may no longer be necessary.
6. Total Project Costs may increase as Project 003-2c costs are better defined after the completion of Project 003-2b.
7. The cost for Project 003-1a Design and Construct Offline Storage Tank, is based on an assumed \$10/gallon of storage provided based on other similar projects Wright-Pierce has been involved with. The cost for offline storage tanks varies due to many factors including but not limited to soil properties, presence of bedrock, depth to groundwater, presence of other utilities, and land acquisition costs. An updated cost for this tank will be developed during preliminary design once more information becomes available.
8. Refer to Appendix A for Maine DEP comments regarding Project 003-1a.

**Table 9-2 PWD & Westbrook 5-Year CSO Master Plan Cycle Implementation Schedule**

Item	Description	Completion Date
<b>CSO 002, 003, 004 Abatement Projects</b>		
1	Project 003-2a: WP Meter Basin 102-97 Phase 1 Flow Metering	December 31, 2024
2	Project 003-2b: WP Meter Basin 102-97 Phase 2 SSES and I/I Identification	December 31, 2025
3	Project 003-3a: WP Meter Basin 102-13 Phase 1 Flow Metering	December 31, 2026
4	Project 003-3b: WP Meter Basin 102-13 Phase 2 SSES and I/I Identification	December 31, 2027
5	Project 003-1a: Design and Construct Offline Storage Tank	December 31, 2028
<b>CSO 007 &amp; 008 Abatement Projects</b>		
6	Projects 007-1 and 008-1: CSO Confirmation Flow Metering	December 31, 2025
7	Project 007-2a: Dana Court Pump Station - Design and Construct Force Main Upgrades	December 31, 2028

Table 9-3 has also been presented as a suggested 20-year CSO Master Plan implementation schedule for all of the recommended abatement projects discussed in Section 8. Planning-level costs for projects beyond the next 5-year CSO Master Plan cycle have not been prepared since their necessity and scope will be dependent on the results of the projects recommended in the 5-year implementation schedule.

**Table 9-3 Westbrook & PWD 20-Year CSO Implementation Schedule**

Project Description	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
<b>CSOs 002, 003 &amp; 004</b>																					
<b>Project 003-1: 1.0 MG Offline Storage Tank</b>																					
003-1a: Design and Construct Offline Storage Tank																					
003-1b: Post-Construction Flow Monitoring																					
<b>Project 003-2: WP Meter Basin 102-97 I/I Source Removal</b>																					
003-2a: Phase 1 Flow Metering																					
003-2b: Phase 2 SSES and I/I Identification																					
003-2c: Phase 3 Targeted I/I Removal																					
003-2d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-3: WP Meter Basin 102-13 I/I Source Removal</b>																					
003-3a: Phase 1 Flow Metering																					
003-3b: Phase 2 SSES and I/I Identification																					
003-3c: Phase 3 Targeted I/I Removal																					
003-3d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-4: WP Meter Basin 101-325 I/I Source Removal</b>																					
003-4a: Phase 1 Flow Metering																					
003-4b: Phase 2 SSES and I/I Identification																					
003-4c: Phase 3 Targeted I/I Removal																					
003-4d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-5: WP Meter Basin 3-2 I/I Source Removal</b>																					
003-5a: Phase 1 Flow Metering																					
003-5b: Phase 2 SSES and I/I Identification																					
003-5c: Phase 3 Targeted I/I Removal																					
003-5d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-6: WP Meter Basin 101-25 I/I Source Removal</b>																					
003-6a: Phase 1 Flow Metering																					
003-6b: Phase 2 SSES and I/I Identification																					
003-6c: Phase 3 Targeted I/I Removal																					
003-6d: Phase 4 Post-Const. Flow Metering																					
<b>Project 003-7: WP Meter Basin 101-169 I/I Source Removal</b>																					
003-7a: Phase 1 Flow Metering																					
003-7b: Phase 2 SSES and I/I Identification																					
003-7c: Phase 3 Targeted I/I Removal																					

 IMPLEMENTATION TIMELINES TO BE DETERMINED AS  
PART OF A FUTURE CSO MASTER PLAN UPDATE.

Project Description	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
003-7d: Phase 4 Post-Const. Flow Metering																					
Project 003-9: Evaluate Closures of CSO 002, 003 and 004																					
<b>CSO 007</b>																					
Project 007-1: CSO Confirmation Metering & CCTV		X																			
Project 007-2: Dana Court PS Force Main Upgrade				X	X	X															
007-2a: Design and Construct Force Main Upgrades																					
007-2b: Post-Construction Flow Monitoring						X															
Project 007-3: I/I Source Confirmation & Removal (Tentative)																					
007-3a: Phase 1 Supplemental Flow Metering																					
007-3b: Phase 2 SSES and I/I Identification																					
007-3c: Phase 3 Targeted I/I Removal																					
007-3d: Phase 4 Post-Construction Flow Metering																					
Project 007-4: Evaluate Closure of CSO 007																					
<b>CSO 008</b>																					
Project 008-1: CSO Confirmation Metering		X																			
Project 008-2: I/I Source Confirmation & Removal (Tentative)																					
008-1a: Phase 2 Supplemental Flow Metering																					
008-1b: Phase 3 SSES and I/I Identification																					
008-1c: Phase 4 Targeted I/I Removal																					
008-1d: Phase 5 Post-Construction Flow Metering																					
Project 008-2: Evaluate Closure of CSO 008																					
CSO Master Plan Updates	X					X					X				X			X			X

## Notes:

1. Depending on the results of short-term CSO abatement projects, subsequent CSO abatement projects and/or phases listed in the table above may change in scope or be eliminated as part of future CSO Master Plan Updates.
2. Projects 007-1 and 008-1a should be completed concurrently due to the inter-related hydraulics between CSO 007 and 008.

**Technical References**

Enfinger, Kevin, L.; Kimbrough, Hal, R., ADS Environmental Services LLC, (2004). "Scattergraph Principles and Practice: A Comparison of Various Applications of the Manning Equation",  
<https://www.adsenv.com/sites/default/files/whitepapers/sg%2002%20paper%202008-07-31.pdf>

Massachusetts Department of Environmental Protection (2017). "Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Surveys", <https://www.mass.gov/doc/guidelines-for-performing-infiltrationinflow-analyses-and-sewer-system-evaluation-surveys/download>

Stevens, P.L. and Schutzbach, J.S. (1998). "New Diagnostic Tools Improve the Accuracy of the Manning Equation," Proceedings of the Water Environment Federation Technical Exhibition and Conference; Orlando, FL. Water Environment Federation: Alexandria, VA.

## Appendix A

### Maine DEP Comments and Approval Letter

MAINE DEP COMMENTS ON 90% DRAFT CSO  
MASTER PLAN RECEIVED ON FEBRUARY 6, 2024



JANET T. MILLS  
GOVERNOR

STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



MELANIE LOYZIM  
COMMISSIONER

## Memorandum

TO: Corey Lewis, P.E., Wright Pierce  
FROM: Mike Riley, P.E. Maine DEP - DWQM *MSR*  
SUBJECT: DEP Comments on 2023 CSO MPU from the City of Westbrook/PWD

DATE: February 6, 2024

1. What is the siphons configuration (triple barrel?), pipe size, and design capacity? Is it operating at close to that capacity? How often is it cleaned? The capacity did not appear to be listed anywhere in the Master Plan Update (MPU).
2. Is the hydraulic bottleneck, where the surcharging emanates from, at the siphon inlet structure or at Cottage Place PS wetwell? Is the capacity of the siphon inadequate or is it the capacity of Cottage Place PS (15.1 MGD) that cannot keep up? Where does the surcharging emanate from?
3. There seems to be a discrepancy between what the model runs predict and actual historical CSO activity at CSO 002. There has been no reported activity at CSO 002 since 2012, over ten years ago, and yet the model predicts activity for both five- and ten-year storms. How do you account for the variance in actual versus predicted activity at CSO 002?
4. Is the weir height for CSO 002 accurately reflected in the model? Do you think the model is accurately reflecting wet weather flows and hydraulic grades in the interceptor near CSO 002?
5. We think CSO 002 is an excellent candidate for closure. What would concern you about closing this CSO in 2024 prior to the advent of offline storage at CSO 003?
6. How do you propose to determine if the activity at CSO 007 and CSO 008 is real or the result of a backwater effect from using common stormwater outfall pipes. The stormwater line becomes surcharged, which then surcharges the CSO outfall pipe all the way back to the regulator structure creating the appearance of CSO discharge activity when it may actually be the backwater on the downstream side of the weir being mistaken for CSO discharge.
7. Whenever a consultant refers to complying with the National CSO Control Policy (1994) they should also mention compliance with the DEP's Chapter 570 (2000) which regulates CSO activity in Maine and is more stringent than the National CSO Control Policy. For example, in 2007 the DEP requested that Westbrook revise their original abatement goal of one event per year proposed in their 1996 CSO Master Plan to elimination of all CSO discharges into the Presumpscot River.

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PRESQUE ISLE, MAINE 04769  
(207) 764-0477 FAX: (207) 760-3143

8. Is there any sequencing of pumping at the East Bridge Pump Station to try to avoid pumping when Cottage Place is also pumping?
9. The potential for private stormwater connections from the Sappi site seems quite high based on the description of interconnectedness expressed in the MPU. The narrative also expressed a reluctance to request that SAPPI separate the private stormwater connections from the public sewer because of the poor financial state of the mill. The MPU did not venture whether separation of the SAPPI site would be something the City would entertain. We have found in other CSO communities that private stormwater connections from schools and industrial complexes can play a large role in contributing to high peaking factors during wet weather. So, the question is, would the City be willing to pay for the separation of these stormwater connections, located on private property, if they were proven to be any of the following:
  - a. a large source of I/I entering the public sewer system?
  - b. because of their central location a main contributor to surcharging at the siphon and within the PWD interceptor system?
  - c. the biggest remaining source of excess water in the Westbrook collection system?
10. Does the City/PWD know of any private stormwater connections from the Westbrook Middle School, which is in one of the meter basins with a high peaking factor? Typical connections we've found in other communities, include roof drains, parking lot drains and field drains. This can add a huge inrush of stormwater into the sewer system, consuming capacity and potentially contributing to surcharging.
11. Can inline storage be increased at CSO's 2 or 4, via weir height adjustment, as this hasn't been looked at since 2011?
12. Are there plans to re-meter WP Meter Basin 102-97, as well as the other metering locations which experienced equipment failure?
13. Are there any plans for the City to assess a stormwater fee for illicit stormwater connections to the public sewer? We understand that some of the existing illicit connections are in areas where there are no good options for discharge of stormwater, except for the public sewer. And that it may be desirable to leave these connections in place but charge a fee for the capacity they consume in the public sewer.
14. Westbrook /PWD is a regional sewer system with the flow from two satellite communities (Gorham and portions of Windham) entering Westbrook and being conveyed to PWD's Westbrook WWTF for treatment via PWD's interceptor. Are there stipulations in place as part of the current interlocal agreement, or a planned future one, that would prevent I/I issues in the largely unregulated satellite collection systems, if such existed, from being conveyed to the host community? In other words, what policies does Westbrook /PWD have in place to make sure the host community doesn't inherit high wet weather flows from the satellite communities that would make Westbrook's CSO challenge even more difficult?

15. Table 1-2, Note 1: Westbrook/PWD must agree to complete all projects listed in this table. These projects can only be removed by request to DEP that demonstrates they are unnecessary or provide sufficient rationale for extending their due date or postponing them.
16. Table 2-1: Are the anticipated flow reductions from the two additional City of Westbrook projects at the end of Table 2-1 sufficient to offset the additional development that has taken place at Rock Row and other parts of the city since the 2014/2015 CSO MPU per ch. 570?
17. Section 4: It would be helpful if the regulator pictures had captions describing what is shown from where the picture is taken.
18. Figure and Table numbers throughout the text of the document don't always agree with the actual figure and table numbers.
19. Figure 5-1: It would be helpful to include meter locations on this figure along with the meter basins and/or on the figures later in this section. It would also be helpful if all non-PWD sewer mains were one color that contrasts better with the different meter basin colors rather than green and yellow depending on whether work had been done there as part of previous projects.
20. Figures 5-2 through 5-7: light green for the sewer mains doesn't contrast well with the satellite imagery. It would be helpful if the mains were shown in a different color that contrasts better.
21. Figure 5-6: There are a lot of flat roofs in this meter basin. Are roof leaders on any of these buildings part of the 41 that are known to still be connected to the sewer system?
22. Section 8.2.2: Of the 41 roof leaders, 28 sump pumps, and 7 catch basins, how many are feasible to remove/have storm sewer that has sufficient capacity in close proximity? Have studies and/or surveys been completed to confirm the accuracy of these numbers?
23. Section 8.3.1: Section 8.2.2. stated there are 7 catch basins connected, but here it says 10. Were 3 removed in 2022, or are the additional 3 included here the private Sappi catch basins?
24. Section 8.5.4: The first sentence says 0 to 52 events, but later on it says there were 42 events in 2014 and the annual report lists 40 events. Which number is correct?
25. Table 8-8: Subheading references 1.0 MG storage tank instead of Dana Ct. PS capacity increase.

We look forward to discussing these comments with you, and staff from the City of Westbrook and PWD, next week. There will be five staff members from the DEP in attendance consisting of the CSO group and Emily Brown, Westbrooks's DEP inspector from DEP's Southern Maine Regional Office. We look forward to the meeting.

EC: Jonathan Rice, P.E., Maine DEP - CSO Group  
Camden Clark, P.E., Maine DEP – CSO Group  
Breanne Blasidell, P.E., Maine DEP – CSO Group  
Emily Brown, Maine DEP, SMRO

Mr. Corey Lewis, P.E.

February 6, 2024

**RESPONSES TO MAINE DEP COMMENTS ON 90% DRAFT  
CSO MASTER PLAN RECEIVED ON FEBRUARY 6, 2024**

1. What is the siphons configuration (triple barrel?), pipe size, and design capacity? Is it operating at close to that capacity? How often is it cleaned? The capacity did not appear to be listed anywhere in the Master Plan Update (MPU).

The siphon is a triple barrel configuration with two 21-inch diameter pipes and one 12-inch pipe. The siphon's capacity far exceeds the design capacities of the Cottage Place Pump Station (15.1 MGD) and the Westbrook WWTF (16.7 MGD secondary treatment capacity), and the capacity depends on the tailwater conditions. Without tailwater, the siphon pipelines can carry about 19.3 MGD when flowing full and up to 24 MGD with tailwater before CSO 003 is activated. PWD has indicated that the siphon has not been recently cleaned and they are concerned about damage that might be caused by pigging the siphon under the river.

2. Is the hydraulic bottleneck, where the surcharging emanates from, at the siphon inlet structure or at Cottage Place PS wetwell? Is the capacity of the siphon inadequate or is it the capacity of Cottage Place PS (15.1 MGD) that cannot keep up? Where does the surcharging emanate from?

The siphon capacity exceeds the capacity of the Cottage Place Pump Station (15.1 MGD) and the Westbrook WWTF. Increasing flow is impractical and discussed within the report.

3. There seems to be a discrepancy between what the model runs predict and actual historical CSO activity at CSO 002. There has been no reported activity at CSO 002 since 2012, over ten years ago, and yet the model predicts activity for both five- and ten-year storms. How do you account for the variance in actual versus predicted activity at CSO 002?

PWD indicated that there seems to be a discrepancy between the elevation of the top of the weir at CSO 002 that was field-verified by Wright-Pierce, and what was historically used in PWD's weir equation to calculate CSO overflows. Therefore, it is possible that the weir elevation that was being used in PWD's weir equation to calculate CSO discharges at CSO 002 was erroneously indicating no CSO discharge during a few historical storms when overflows out of CSO 002 may have occurred.

4. Is the weir height for CSO 002 accurately reflected in the model? Do you think the model is accurately reflecting wet weather flows and hydraulic grades in the interceptor near CSO 002?

Yes, Wright-Pierce field-verified the weir heights/elevations for this CSO and interceptor sizes and invert elevations in this area for the calibration of the model.

5. We think CSO 002 is an excellent candidate for closure. What would concern you about closing this CSO in 2024 prior to the advent of offline storage at CSO 003?

Based on the reported lack of CSO activity between 2014 and 2023, we would normally agree that this CSO would be a good candidate for closure, but the modeled storm results with the updated and field-verified model indicate that additional field investigation during 5+ year storm event should be completed to confirm if the CSO is discharging, or not, during storms of this size. The configuration of the CSO 002 diversion structure is somewhat complex so the CSO discharge volume calculations currently rely on level measurements that are not taken directly adjacent to the weir itself, as would be standard practice for calculating flow rates over a weir. Additionally, as noted in the response to Question #3, it is also possible that a discrepancy in the CSO 002 weir elevation that is being used to calculate CSO discharge volumes may have erroneously indicated that there were not historical CSO

dscharges at CSO 002 between 2014 and 2022. It may be prudent to first relocate the level measuring device for CSO 002 to a more advantageous location and complete additional field investigation of CSO 002 during a future wet weather event to confirm if the CSO is actually discharging or not before it is closed.

6. How do you propose to determine if the activity at CSO 007 and CSO 008 is real or the result of a backwater effect from using common stormwater outfall pipes. The stormwater line becomes surcharged, which then surcharges the CSO outfall pipe all the way back to the regulator structure creating the appearance of CSO discharge activity when it may actually be the backwater on the downstream side of the weir being mistaken for CSO discharge.

Survey of the sanitary sewer and storm drain invert elevations, CCTV inspections of the sanitary sewers between CSO 007 and CSO 008 to confirm pipe sizes and any obstructions, short-term flow metering, and additional modeling of the storm drains that are cross-connected at these locations may be needed in some combination to confirm the hydraulics of the sewer and storm drains in these locations. The modeled overflows were much less than actual reported overflows and we were unable to reconcile this in the absence of additional field investigation and analysis as described above prior to the 12/31/23 deadline for the CSO MPU.

7. Whenever a consultant refers to complying with the National CSO Control Policy (1994) they should also mention compliance with the DEP's Chapter 570 (2000) which regulates CSO activity in Maine and is more stringent than the National CSO Control Policy. For example, in 2007 the DEP requested that Westbrook revise their original abatement goal of one event per year proposed in their 1996 CSO Master Plan to elimination of all CSO discharges into the Presumpscot River.

**Noted. A discussion will be added to the report to include this information.**

8. Is there any sequencing of pumping at the East Bridge Pump Station to try to avoid pumping when Cottage Place is also pumping?

The capacity of the Westbrook WWTF can receive the full capacity of Cottage Place Pump Station and the East Bridge Pump Station. They are independent and there is no need to sequence them or alter their current operation.

9. The potential for private stormwater connections from the Sappi site seems quite high based on the description of interconnectedness expressed in the MPU. The narrative also expressed a reluctance to request that SAPPI separate the private stormwater connections from the public sewer because of the poor financial state of the mill. The MPU did not venture whether separation of the SAPPI site would be something the City would entertain. We have found in other CSO communities that private stormwater connections from schools and industrial complexes can play a large role in contributing to high peaking factors during wet weather. So, the question is, would the City be willing to pay for the separation of these stormwater connections, located on private property, if they were proven to be any of the following:

- a. a large source of I/I entering the public sewer system?

- b. because of their central location a main contributor to surcharging at the siphon and within the PWD interceptor system?
- c. the biggest remaining source of excess water in the Westbrook collection system?

The City of Westbrook has already approached Sappi about removing the cross-connected storm drains from the Westbrook sewer system. Westbrook met with Gordon Lane from St. Germain (consultants for Sappi) and Brad Bryant of Sappi. They have stated they would work to get the catch basins removed and incorporate the work into their yearly capital improvements plan.

10. Does the City/PWD know of any private stormwater connections from the Westbrook Middle School, which is in one of the meter basins with a high peaking factor? Typical connections we've found in other communities, include roof drains, parking lot drains and field drains. This can add a huge inrush of stormwater into the sewer system, consuming capacity and potentially contributing to surcharging.

Westbrook confirmed that at one time, there was one cross-connection at the Westbrook Middle School, but the cross-connection was replumbed and the issue was resolved before the supplemental flow metering by Wright-Pierce occurred in 2022 and 2023. Other than that, Westbrook is not aware of any other cross-connections at Westbrook Middle School.

11. Can inline storage be increased at CSO's 2 or 4, via weir height adjustment, as this hasn't been looked at since 2011?

In-line storage within the current interceptor pipes cannot be increased. The updated model indicates that the pipes are already surcharged during CSOs.

12. Are there plans to re-meter WP Meter Basin 102-97, as well as the other metering locations which experienced equipment failure?

Westbrook received two proposals for flow metering services in Meter Basin 102-97 and 102-13 on February 15, 2024.

13. Are there any plans for the City to assess a stormwater fee for illicit stormwater connections to the public sewer? We understand that some of the existing illicit connections are in areas where there are no good options for discharge of stormwater, except for the public sewer. And that it may be desirable to leave these connections in place but charge a fee for the capacity they consume in the public sewer.

This topic was previously discussed at City Council meetings and there are currently no plans to assess a stormwater fee for illicit connections into the sewer system.

14. Westbrook /PWD is a regional sewer system with the flow from two satellite communities (Gorham and portions of Windham) entering Westbrook and being conveyed to PWD's Westbrook WWTF for treatment via PWD's interceptor. Are there stipulations in place as part of the current interlocal agreement, or a planned future one, that would prevent I/I issues in the largely unregulated satellite collection systems, if such existed, from being conveyed to the host community? In other words, what policies does Westbrook /PWD have in place to make sure the host community doesn't inherit high wet weather flows from the satellite communities that would make Westbrook's CSO challenge even more difficult?

Both Gorham and Windham are far below their allotted capacity. There is no requirement for managing these flows and the allotted capacity has not been exceeded. This report addresses high flows from the City of Westbrook and their combined collection system.

15. Table 1-2, Note 1: Westbrook/PWD must agree to complete all projects listed in this table. These projects can only be removed by request to DEP that demonstrates they are unnecessary or provide sufficient rationale for extending their due date or postponing them.

**Noted.**

16. Table 2-1: Are the anticipated flow reductions from the two additional City of Westbrook projects at the end of Table 2-1 sufficient to offset the additional development that has taken place at Rock Row and other parts of the city since the 2014/2015 CSO MPU per ch. 570?

Since other development and the Rock Row contribution to sewer flows is a moving target, it is difficult to determine if the recommended abatement projects will offset additional sewer flows from future development in Westbrook. The City is also trying to balance the needs of the City's CSO program with the gubernatorial mandate to increase the available inventory of affordable housing in southern Maine, with Westbrook being one of the communities targeted to meet this increased housing demand.

17. Section 4: It would be helpful if the regulator pictures had captions describing what is shown from where the picture is taken.

**Noted. Captions will be added.**

18. Figure and Table numbers throughout the text of the document don't always agree with the actual figure and table numbers.

**Noted. WP will review the table and figure references in the report and update them, as needed.**

19. Figure 5-1: It would be helpful to include meter locations on this figure along with the meter basins and/or on the figures later in this section. It would also be helpful if all non- PWD sewer mains were one color that contrasts better with the different meter basin colors rather than green and yellow depending on whether work had been done there as part of previous projects.

**Noted. WP will update the figure.**

20. Figures 5-2 through 5-7: light green for the sewer mains doesn't contrast well with the satellite imagery. It would be helpful if the mains were shown in a different color that contrasts better.

**Noted. WP will update the figures.**

21. Figure 5-6: There are a lot of flat roofs in this meter basin. Are roof leaders on any of these buildings part of the 41 that are known to still be connected to the sewer system?

**This area of Westbrook has been specifically targeted in the past and many of the roof leaders have been removed.**

22. Section 8.2.2: Of the 41 roof leaders, 28 sump pumps, and 7 catch basins, how many are feasible to remove/have storm sewer that has sufficient capacity in close proximity?

**This is one topic Westbrook plans to explore extensively when Westbrook develops and carries out SSES tasks for the meter basins outlined in this plan.**

23. Have studies and/or surveys been completed to confirm the accuracy of these numbers?

**Studies have not been completed to date. Westbrook expects to get a better understanding of these numbers with the planned flow metering and SSES work recommended in this plan.**

24. Section 8.3.1: Section 8.2.2. stated there are 7 catch basins connected, but here it says 10. Were 3 removed in 2022, or are the additional 3 included here the private Sappi catch basins?  
**There are five catch basins on Sappi's property and two within the City. This will be updated in the report.**

25. Section 8.5.4: The first sentence says 0 to 52 events, but later on it says there were 42 events in 2014 and the annual report lists 40 events. Which number is correct?

**52 separate CSO overflows and volumes were recorded at the Brown Street CSO 007 in 2014. Some of the reported overflows occurred during the same storm event whose effects spanned multiple days, so they were reported as a single CSO event on the annual CSO Activities and Volumes report. In terms of storm events responsible for discharges from CSO 007, it was reported that there were 34 storm/wet weather events that triggered discharges at the Brown Street CSO 007 in 2014.**

**There were 40 storm events that resulted in CSO discharges in Westbrook that were reported on the 2014 CSO Activity and Volume form, but the Brown Street CSO was not reported to have discharged on all of the 40 storm events. The reference to the Brown Street CSO discharging on 42 occasions in Section 8.5.4 of the report is an error and will be corrected in the final draft of the Master Plan report.**

26. Table 8-8: Subheading references 1.0 MG storage tank instead of Dana Ct. PS capacity increase. Noted. **This will be corrected for the final draft of the report.**

MAINE DEP APPROVAL LETTER FOR WESTBROOK CSO  
MASTER PLAN UPDATE



JANET T. MILLS  
GOVERNOR

STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



MELANIE LOYZIM  
COMMISSIONER

May 9, 2024

Mr. Corey Lewis, P.E.  
Lead Project Engineer  
Wright Pierce

Re: DEP Approval of CSO Master Plan Update for City of Westbrook / Portland Water District

Dear Corey,

Thank you for providing responses to the questions and comments contained in our 2/6/2024 memo regarding the City of Westbrook/Portland Water District's CSO Master Plan Update (MPU), which was submitted at the end of 2023.

We'd also like to thank the staff from the City of Westbrook, PWD and Wright Pierce for meeting with our CSO group to discuss the MPU in detail on February 13<sup>th</sup>.

At this point, the only remaining unanswered questions revolve around the true nature and extent of CSO activity at CSO 002 on the south side of the river and at CSO 007 and 008 on the north side.

With respect to CSO 002, we support the plan to move the existing level measuring system to a more optimal location. The hope is that it will gauge CSO 002 activity more accurately and help determine the fate of this location.

With respect to CSO's 007 and 008, we support moving ahead with an analysis to determine whether the surcharging of stormwater outfall pipes, shared by CSO 007 and 008, is creating unreliable CSO data from these two locations.

We'd like to request a summary of findings from both investigations be submitted for the DEP's review, as soon as they become available but no later than March 1, 2025, when the next round of CSO reporting is due.

Lastly and most importantly, due to the uncertainties with regard to potential new flows from Rock Row as described in Response #16, and the uncertainty regarding the true level of CSO activity at CSO 002, the DEP feels that erring on the side of a 1.75-MG tank as opposed to a 1-MG tank would place the City/PWD in a much better position to handle the increased future flows at the siphon without CSO activity. Once again, we strongly urge you to model the larger tank size, in addition to the smaller version, during detailed design to see if it would be a better investment and provide more operational latitude for the City/PWD.

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Page 2 of 2  
Mr. Corey Lewis, P.E.  
May 9, 2024

Based on having received satisfactory responses to the questions that can currently be answered and contingent upon the City/PWD's willingness to provide DEP with a summary of findings on the CSO investigations mentioned previously, we can now grant approval of the 2024 CSO MPU for the City of Westbrook/PWD.

Should you have any questions on the approval or want to discuss any comments in more detail let me know and we'll arrange a virtual meeting. As I mentioned in our February get together, I feel the process has worked well in Westbrook. Granting the time extension allowed the hydraulic model of the interceptor system to be fully calibrated, which has led to a pretty clear understanding of what the issues are and how they can be corrected. A pretty clear path forward, which is a good thing for both Westbrook and PWD.

Best regards,

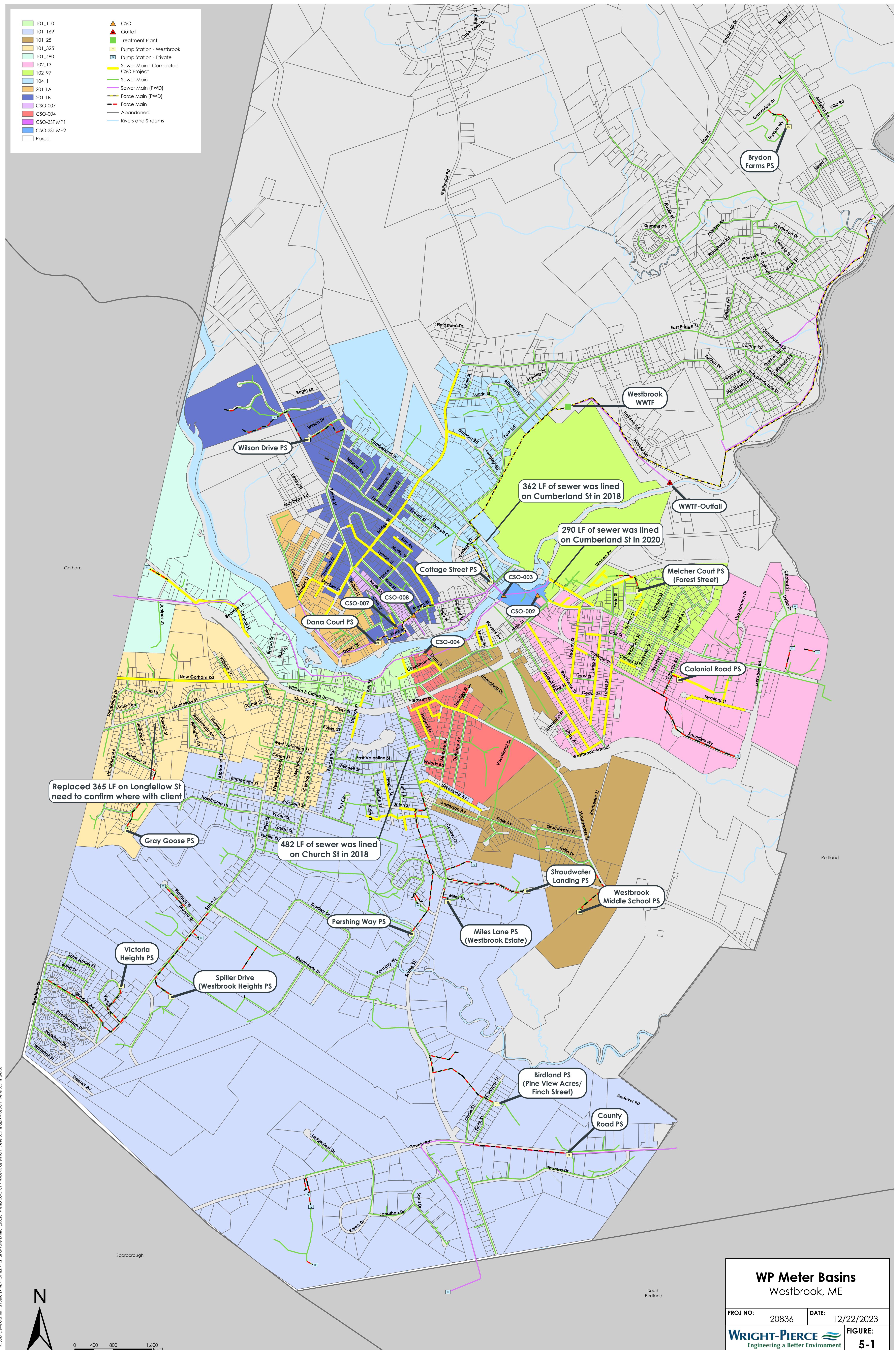
*Mike Riley*

Mike Riley, P.E.  
Senior Environmental Engineer  
CSO and FSP Coordinator  
Michael.S.Riley@maine.gov  
(207) 719-0809

EC:

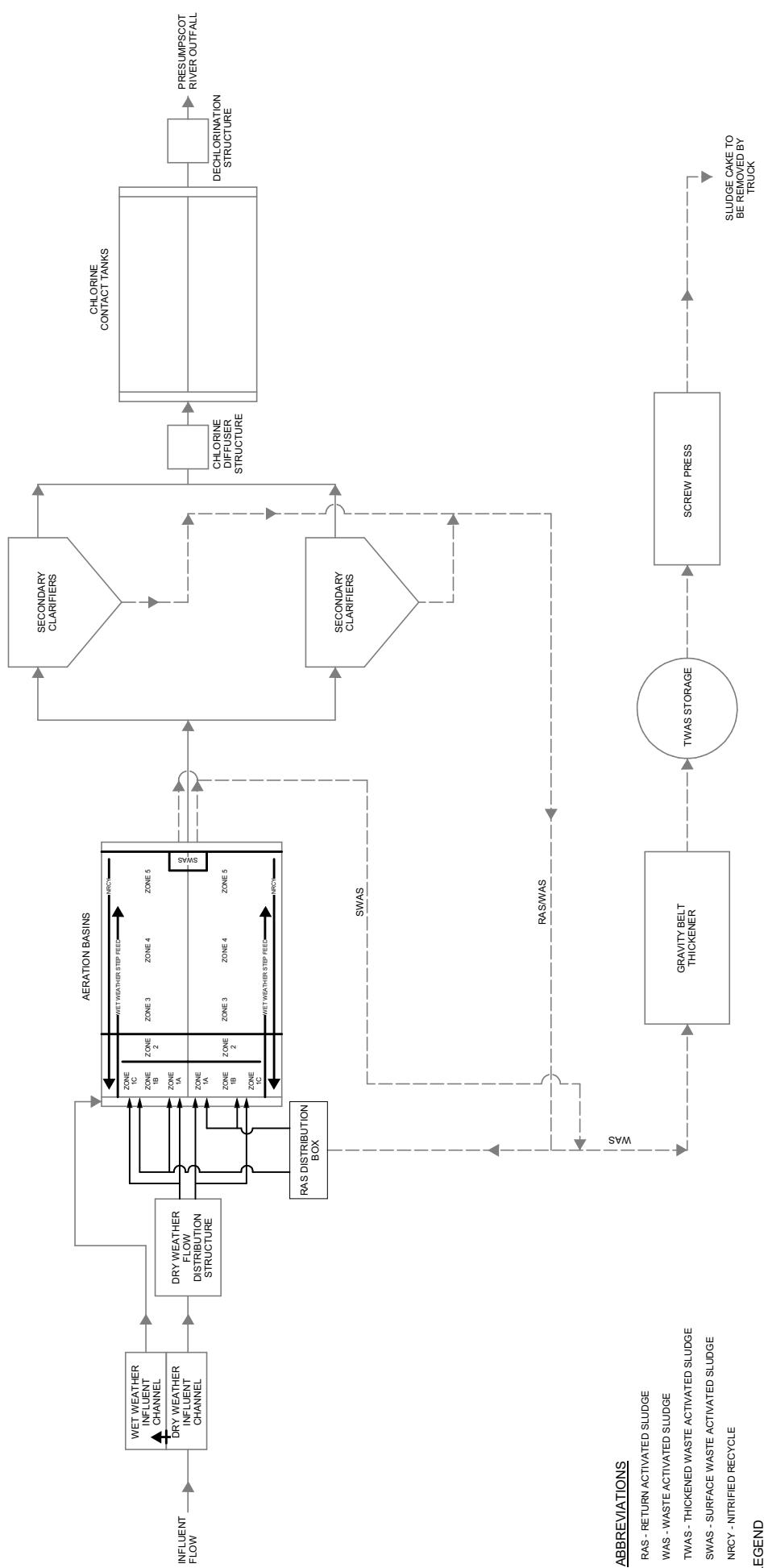
Eric Dudley, P.E., City of Westbrook  
Katherine Kelley, P.E., City of Westbrook  
Scott Firmin, PWD  
Charlene Poulin, PWD  
Miles Sabine, PWD  
Chris Dwinal, Senior Project Manager Wright Pierce  
Steve Guerrette, Wright Pierce  
Emily Brown DEP Compliance - SMRO  
Jonathan Rice, P.E., CSO Group – Augusta  
Camden Clark, P.E., CSO Group – Augusta  
Breanne Blaisdell, P.E., CSO Group - Augusta

**Appendix B**  
**WP Flow Meter Basins Map (24"x36")**



## Appendix C

### Westbrook WWTF Process Flow Diagram



B. LEVIN

PROJECT ENGINEER  
DESIGNED BY  
E. KOPOT  
J. JOHNSONDRAWN BY  
C. CHECKED BY  
B. LEVINIF THIS DRAWING IS NOT  
MEASURED, THEN DRAWING  
IS NOT TO FULL SCALE  
0 1/2' 1'ISSUED FOR  
DATE  
REV.

DATE: SEPTEMBER 2020	HAZEN NO.: 90407-000	CONTRACT NO.: 1	DRAWING NUMBER: G-03
GENERAL PLANT FLOW SCHEMATIC	PORTLAND WATER DISTRICT PORTLAND, MAINE	WESTBROOK WWTF AERATION AND SECONDARY CLARIFIER UPGRADES	

## Appendix D

### CSO Abatement Scenario SWMM Model Runs

# Portland Water District - Westbrook, ME - SWMM Model Alternatives Analysis Results

## Predicted CSO Volumes, by Design Storm

SWMM Model Scenario 1 - Existing Conditions									
Design Storm Event	Rainfall Depth (in.) & Peak Intensity (in./hr)	CSO VOLUMES (MG)						Description	
		Warren WB	Siphon	Dunn Street	Brown Street	King Street	Total Volume (MG)		
		CSO 002	CSO 003	CSO 004	CSO 007	CSO 008	0.00		
1 Year, 24-Hour	2.60	0.78							
2 Year, 24-Hour	3.10	0.99							
5 Year, 24-Hour	3.90	1.25	0.24	0.25		0.02		0.50	The existing conditions model runs predict that the system generally has a 2-year, 24-hour level of service (LOS). Modeled overflow volumes for a 5-year event total 0.5 MG, and 1.76 MG for the 10-year event.
10 Year, 24-Hour	4.60	1.47	0.75	0.86	0.04	0.13	1.76		

SWMM Model Scenario 2 - 0.75 MG Tank @ CSO-003									
Design Storm Event	Rainfall Depth (in.) & Peak Intensity (in./hr)	CSO VOLUMES (MG)						Description	
		Warren WB	Siphon	Dunn Street	Brown Street	King Street	Total Volume (MG)		
		CSO 002	CSO 003	CSO 004	CSO 007	CSO 008	0.00		
1 Year, 24-Hour	2.60	0.78							
2 Year, 24-Hour	3.10	0.99							
5 Year, 24-Hour	3.90	1.25	0.04			0.02		0.06	Scenario 2 model runs analyze the impacts of a 0.75 MG storage tank at CSO-003 with an overflow weir into the tank set at 11.4' vs. the 15.03' high overflow into the river. The results predict that CSO-003 now has a 5-year, 24-hour LOS, while the 10-year event is reduced by 56%.
10 Year, 24-Hour	4.60	1.47	0.67	0.38		0.13		1.18	Additionally, the tank reduces CSO volumes at CSO-002 and CSO-004 by reducing peak hydraulic grade lines (HGL). CSO-004 now has a 10-year LOS and volumes at CSO-002 are reduced by 83% and 11% for the 5-year and 10-year events.

SWMM Model Scenario 3 - 1.00 MG Tank @ CSO-003									
Design Storm Event	Rainfall Depth (in.) & Peak Intensity (in./hr)	CSO VOLUMES (MG)						Description	
		Warren WB	Siphon	Dunn Street	Brown Street	King Street	Total Volume (MG)		
		CSO 002	CSO 003	CSO 004	CSO 007	CSO 008	0.00		
1 Year, 24-Hour	2.60	0.78							
2 Year, 24-Hour	3.10	0.99							
5 Year, 24-Hour	3.90	1.25				0.02		0.02	Scenario 3 model runs analyze the impacts of a 1 MG storage tank at CSO-003 with an overflow weir into the tank set at 11.4'. The results predict that CSO-003 now has a 5-year, 24-hour LOS, while the 10-year event is reduced by 71%. Additionally, the tank reduces CSO volumes at CSO-002 and CSO-004 by reducing peak HGL. CSO-004 now has a 10-year LOS and CSO-002 has a 5-year LOS, while the 10-year is reduced by 17%
10 Year, 24-Hour	4.60	1.47	0.62	0.25		0.13		1.00	

SWMM Model Scenario 4 - 0.75 MG Tank @ CSO-003, Interceptor Upgrade from CSO-002 to CSO-003									
Design Storm Event	Rainfall Depth (in.) & Peak Intensity (in./hr)	CSO VOLUMES (MG)						Description	
		Warren WB	Siphon	Dunn Street	Brown Street	King Street	Total Volume (MG)		
		CSO 002	CSO 003	CSO 004	CSO 007	CSO 008	0.00		
1 Year, 24-Hour	2.60	0.78							
2 Year, 24-Hour	3.10	0.99							
5 Year, 24-Hour	3.90	1.25		0.08		0.02		0.10	Scenario 4 model runs analyze the impacts of a 0.75 MG storage tank at CSO-003 with an overflow weir into the tank set at 11.4', and an interceptor upgrade between CSO-002 and CSO-003. The results predict that overflows at CSO-003 will reduce by 68% for the 5-year event, while overflows will actually increase by 22% for the 10-year event. However, the modifications would eliminate overflows at CSO-002 and CSO-004 through the 10-year, 24-hour event.
10 Year, 24-Hour	4.60	1.47		1.05		0.13		1.18	

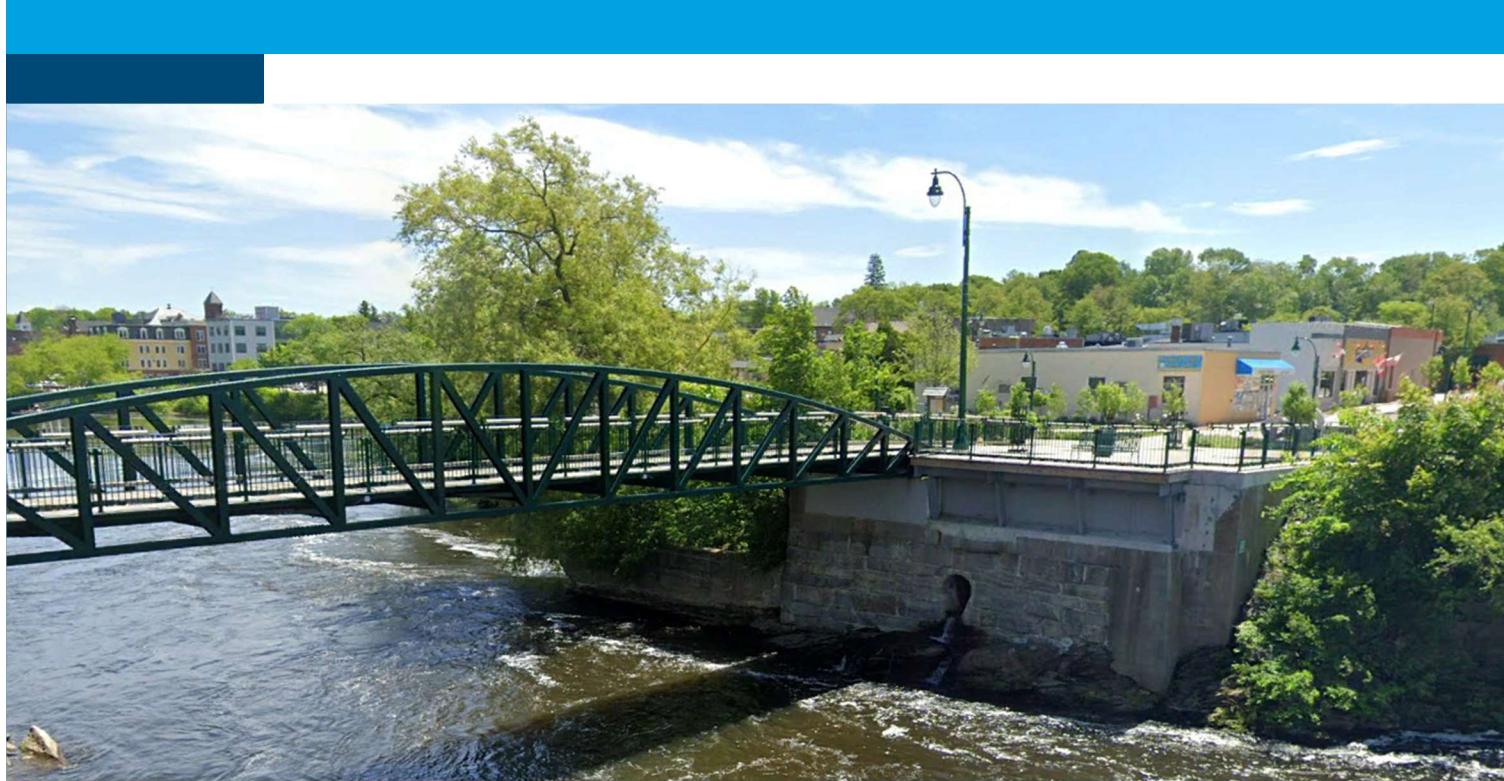
SWMM Model Scenario 5 - 1.00 MG Tank @ CSO-003, Interceptor Upgrade from CSO-002 to CSO-003									
Design Storm Event	Rainfall Depth (in.) & Peak Intensity (in./hr)	CSO VOLUMES (MG)						Description	
		Warren WB	Siphon	Dunn Street	Brown Street	King Street	Total Volume (MG)		
		CSO 002	CSO 003	CSO 004	CSO 007	CSO 008	0.00		
1 Year, 24-Hour	2.60	0.78							
2 Year, 24-Hour	3.10	0.99							
5 Year, 24-Hour	3.90	1.25		0.08		0.02		0.02	Scenario 5 model runs analyze the impacts of a 1 MG storage tank at CSO-003 with an overflow weir into the tank set at 11.4', and an interceptor upgrade between CSO-002 and CSO-003. The results predict that CSO-003 now has a 5-year, 24-hour LOS, while the 10-year event is reduced by 2%. Additionally, the modifications would eliminate overflows at CSO-002 and CSO-004 through the 10-year, 24-hour event.
10 Year, 24-Hour	4.60	1.47		1.05		0.13		0.97	

SWMM Model Scenario 6 - 5.2 MGD Dana Court PS									
Design Storm Event	Rainfall Depth (in.) & Peak Intensity (in./hr)	CSO VOLUMES (MG)						Description	
		Warren WB	Siphon	Dunn Street	Brown Street	King Street	Total Volume (MG)		
		CSO 002	CSO 003	CSO 004	CSO 007	CSO 008	0.00		
1 Year, 24-Hour	2.60	0.78							
2 Year, 24-Hour	3.10	0.99							
5 Year, 24-Hour	3.90	1.25	0.25	0.27			0.52	Scenario 6 model runs analyze the impacts of an increase in capacity of the Dana Court PS to 5.2 MGD. The results predict that CSO-007 would now have a 5-year, 24-hour LOS.	
10 Year, 24-Hour	4.60	1.47	0.72	0.92	0.04	0.06	1.73		

SWMM Model Scenario 7 - 5.2 MGD Dana Court PS, 0.75 MG Tank @ CSO-003				
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