



City of Burlington

CSO Control Progress Report 2019 - 2020



Contents

Section I. Compliance with Minimum Controls.....	3
Section II. Condition & Operation of Combined Sewer System	6
Section III. Summary of Precipitation Data for 2019 & 2020 CSO Events.....	7
Section IV. Summary of 2019 & 2020 CSO Events.....	7
Section V. LTCP Status	8
Section VI. Summary of CSO Control Projects in 2019 & 2020	9



Section I. Compliance with Minimum Controls

Minimum Control 1: Proper operation and maintenance programs for collection systems and CSO outfalls

A copy of Burlington's Collection System Operation & Maintenance Plan is included with this report as **Attachment A**. This plan details the levels of service, prioritization, critical locations, and routine maintenance activities on Burlington's collection system.

We have also attached a copy of the City's Emergency Response Plan, as **Attachment B**. Copies of the City staff responsible for the Emergency Response Plan is also included with this attachment.

The Water Resources Division maintains an annual budget to support both routine and emergency operation and maintenance activities each year.

A list of Burlington's critical facilities is also included with this report as **Attachment C**.

The City's street sweeping program is discussed under Minimum Control 7.

Burlington owns and maintains approximately 46 miles of combined sewer pipes. The City has been undergoing a comprehensive pipe assessment and rehabilitation program since 2016. Burlington has lined approximately 10,000 linear feet of combined sewer pipe to date. In the coming construction season, the City will be lining 19,041 linear feet of combined sewer pipes, and wholesale replacing 21,065 feet of combined sewer pipes.

Minimum Control 2: Maximum use of the collection system for storage without endangering public health or property, or causing solids deposition problems

Ongoing maintenance work and emergency response measures for the combined sewer collection system are detailed in the O&M and Emergency Response Plans, referenced above.

Over the years there have been a number of constructed storage pipes, vaults or cisterns to attenuate peak flows of either combined sewer or stormwater discharges to our combined sewer system. For example:

- In 1988 a 6 ft diameter by 500 ft long in-line storage pipe (approx. 100,000 gallons) was constructed along the banks of Englesby Brook to store and slowly feed combined sewer flows in to the Pine Street collection system. A vortex valve on the downstream end of this storage pipe regulates flows.
- In 2000, twin 8 foot square by 375 foot long in-line box culverts (approx. 180,000 gallons) were constructed as part of the Main Street reconstruction project to attenuate stormwater flow from Main Street into the combined sewer system at the top of College Street. This system's flows are also regulated by a vortex valve.



- In 2010 the City installed two (2) 5,000 gallon off-line storage tanks on South Prospect Street to manage combined sewer flows that historically had resulted in basement flooding along that street during heavy rainfall.

Minimum Control 3: Review and modification of pretreatment requirements to assure that CSO impacts are minimized

Burlington Water Resources is actively working to develop a dedicated Industrial Pollution Prevention Program. Earlier this fall, the City and its consultant distributed a questionnaire to business owners in the City to gather more detailed information on how those entities are using our sewers. Pending ongoing development of a Memorandum of Understanding and proposed statutory updates with DEC, the City plans to have a final plan in 2021.

Minimum Control 4: Maximization of flow to the treatment plant for treatment consistent with an evaluation of alternative treatment options

Burlington has three wastewater treatment facilities. Each plant serves some portion of a combined sewer system. As part of Burlington's original \$52M wastewater upgrade started in 1988, miles of combined sewer was separated and our three (3) wastewater plants underwent full upgrades to handle the remainder of combined sewer flows. While North and East plants can fully treat 100% of all flows entering them, Main Plant still collects the largest area of combined sewer mainly from the oldest sections of the City, and is the only plant that had to be designed with dedicated wet-weather treatment infrastructure. The design of Main plant included redirecting combined sewer flows from an on-site box culvert that had typically bypassed the wastewater plant to a vortex (swirl) separator that was best available technology at that time to handle high hydraulic loading rates associated with a historic 1-year frequency storm event. Treated effluent from our 40 foot diameter separator is then disinfected with a bromine-based disinfectant for the following reasons: 1) bromine is twice as strong an oxidant than chlorine, 2) its efficacy is not reduced by ammonia, and 3) its decay rate is greater than chlorine so that less residual enters Lake Champlain. By intercepting this box culvert's flows Burlington reduced a large number of combined sewer overflows that used to go directly into the lake.

In terms of flow maximization, a few overflow weirs in CSO manholes have been raised in order to direct more volume to the wastewater plants and minimize the frequency and duration of overflows.

- The weir in Gazo CSO manhole N3.18 was raised by two (2) courses of brick in the early 2000s to maximize flows to North plant.
- An overflow weir in our Colchester CSO manhole R1.12 was also raised a few times over the last ten years to maximize flows to East plant.
- In the early 2000s a 6" high post was bolted to the top of an overflow weir in Maple Street's manhole M1.03 to direct more flow into the 18" dry weather pipe before spilling into an overflow pipe that is directly connected to the head end of said box culvert.



Minimum Control 5: Prohibition of CSOs during dry weather

Ongoing routine maintenance is intended to reduce the likelihood of dry weather overflows in the combined sewer system. While occasional clogging does occur, emergency response protocols have been adequate overall in mitigating overflows during dry weather.

Minimum Control 6: Control of solid and floatable materials in CSOs

The City's collection system includes a number of features to control solid and floatable materials in CSOs. Catch basin hoods are employed in structures with appropriate space to accommodate them. There are miscellaneous orifice plates and other control structures distributed throughout the system, though there has been no concerted effort to locate and map those features.

Catch basin cleaning efforts (outlined in Attachment A) also contribute to the ongoing control of solid and floatable materials in CSOs.

The City has been supporting Green Up Day efforts since they began, and each year this effort leads to a significant amount of trash and other debris being removed from the City's roads and right-of-way. Along similar lines, the recent ban on the use of plastic bags has also contributed to an overall reduction in debris in our collection system.

Street sweeping efforts are further outlined in the following section.

Minimum Control 7: Establishment of pollution prevention programs to minimize contaminants in CSOs

Burlington's Department of Public Works has operated a street cleaning program for over a decade. A map of the current street cleaning routes and their frequency is included with this document as **Attachment D**. As part of Burlington's ongoing Integrated Planning and Asset Management efforts, we are actively working to enhance street cleaning procedures to reduce the amount of road debris and buildup entering the City's collection system.

Burlington's DPW also provides recycling collection services to residents and businesses throughout the City. Recycling has been mandatory for all residents and business in the City since 1992. City recycling crews operate a fleet of three trucks, which operate five days a week. Burlington's recycling program diverts an estimated 5,940,000 pounds of recyclables from the landfill annually. The City also provides public trash and recycling receptacle throughout the downtown core and waterfront, known as "Big Bellies" which are emptied and maintained on a routine basis.

As a regulated Municipal Separate Storm Sewer System (MS4) community, Burlington is required by permit to provide water quality education programs each year. Along with several other Chittenden County municipalities, we are members of the Regional Stormwater Education Program, Rethink Runoff (www.rethinkrunoff.org.) For the purposes of outreach and education efforts, the City applies these efforts throughout Burlington regardless of the sewershed.



Minimizing increased sewer flows from unnecessary water usage helps maintain sewer capacity. The City maintains water conservation literature and other resources for customers. Excess water usage is flagged each billing cycle, and letters are issued to those customers alerting them to a potential issue and offering resources to correct any leaks or deficiencies in their plumbing system. A Leak Detection Guide is available in hard copy at our offices, or online at:

https://www.burlingtonvt.gov/sites/default/files/tiles/Leak%20Detection%20Guide%20FINAL%202010-28-19_0.pdf.

Minimum Control 8: Public notification to ensure that the public receives adequate notification of CSOs and CSO impacts, which shall, at a minimum, comply with §34-404 of this Rule

Per the requirements of 10 V.S.A. § 1295(e)(1), each of the City's CSO outfalls is marked with permanent signage, which identifies the outfall and warns of the potential threat to public health posed by recreating nearby.

The City has a Standard Operating Procedure in place to ensure notifications are made consistent with 10 V.S.A. § 1259(b-c). An overview of this process is included with this report as **Attachment E**. The City utilizes several platforms to issue required notifications, including VT Alert, social media (i.e. Facebook & Twitter), and Front Porch Forum.

Minimum Control 9: Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls

The City maintains up-to-date GIS data on our collection systems. Public-facing maps of the collection system are available on our website at: <https://www.burlingtonvt.gov/DPW/Mapping-Links>. Burlington's Water Resources is also in the process of procuring an official asset management system, which will further refine the data we maintain on our infrastructure as well as enhance our condition monitoring and operation/maintenance of our combined sewer system..

All five (5) of the City's Combined Sewer Structures are equipped with Mission 'float' devices which notify staff when an overflow is occurring. The City's flow metering efforts have continued to evolve during the 2019 and 2020 seasons. We now have four (4) permanent flow meters (Blue Siren technology) installed at the Pine Street, Park Street, Gazo Avenue, and Colchester Avenue CSO structures, and six (6) flow meters deployed on an as-needed basis for our overall flow meter efforts. Finally, the City operates a BlueSiren rain gauge device at Main Plant to track ongoing precipitation data.

Data collected on precipitation and overflow events has been included in Sections III and IV of this report.

Section II. Condition & Operation of Combined Sewer System

Burlington's Collection System is actively maintained per the Operation & Maintenance Plan described in Section I of this report, included as **Attachment A**. The City utilizes the SeeClickFix platform to track



ongoing maintenance and emergency repairs needed, and those records are archived and maintained within that platform.

The City is in the process of launching a robust Asset Management software system known as “DTS/VUEWorks.” This product will further allow the City to assess, and prioritize infrastructure maintenance each year.

Section III. Summary of Precipitation Data for 2019 & 2020 CSO Events

The following table is a summary of the precipitation events that lead to Combined Sewer Overflow (CSO) events during the calendar year 2019. Return frequency is estimated based on the NRCC table and Burlington Interpolations.

Event Date	Location	Storm Duration (minutes)	Event Peak (inches)	Total Rainfall (inches)	Return Frequency
5/19/2019	Pine Street	180	0.31	0.49	< 1 year storm
6/20/2019	Pine Street	260	0.85	0.870	< 1 year storm
7/11/2019	Pine Street	175	0.64	0.86	< 1 year storm
7/28/2019	North Champlain	160	0.61	0.71	< 1 year storm
7/28/2019	Park Street	160	0.61	.71	< 1 year storm
8/6/2019	Gazo Avenue	60	0.14	0.16	< 1 year storm
8/21/2019	Pine Street	300	0.66	0.86	< 1 year storm
9/23/2019	Pine Street	255	0.98	1.02	< 1 year storm
10/31/2019	Gazo Avenue Pine Street	1610	1.99	3.41	11.25 year storm

The following table is a summary of the precipitation events that lead to Combined Sewer Overflow (CSO) events during the calendar year 2020.

Event Date	Location	Storm Duration (minutes)	Event Peak (inches)	Total Rainfall (inches)	Return Frequency
5/15/2020	Pine Street	270	0.55	0.58	< 1 year storm
5/29/2020	Park Street	260	1.21	1.94	5.83 year storm
	Pine Street	725	1.21	2.08	2.72 year storm
6/30/2020	Park Street	230	0.61	0.75	< 1 year storm
	Pine Street				
8/2/2020	Gazo Avenue	90	0.81	1.08	2 year storm
	Park Street	90	0.85	1.09	2 year storm
8/4/2020	Gazo Avenue	930	1.55	2.12	2.29 year storm

Section IV. Summary of 2019 & 2020 CSO Events

The following table is a summary of Combined Sewer Overflow (CSO) events occurring during the calendar year 2019.



Event Date	CSO Location	CSO Duration (minutes)	CSO Volume (gallons)
5/19/2019	Pine Street	36	27,762
6/20/2019	Pine Street	100	177,395.89
7/11/2019	Pine Street	36	79,121.72
7/28/2019	North Champlain ¹	20	1,000 – 10,000
	Park Street	31	UNK
8/6/2019 ²	Gazo Avenue	5	100 – 1,000
8/21/2019 ³	Pine Street	60	100,000 – 250,001
9/23/2019	Pine Street	70	144,313.83
10/31/2019	Gazo Avenue	28	4,274.30
	Pine Street	845	951,541.64

The following table is a summary of Combined Sewer Overflow (CSO) events occurring during the calendar year 2020.

Event Date	CSO Location	CSO Duration (minutes)	CSO Volume (gallons)
5/15/2020	Pine Street	47	20,000-50,000 ⁴
5/29/2020	Park Street	55	31,616.15
	Pine Street	65	142,923.38
6/30/2020	Park Street	35	14,925.97
	Pine Street	15	19,374.69
8/2/2020	Gazo Avenue	115	7,834.87
	Manhattan -Park Street	65	17,556.49
8/4/2020	Gazo Avenue	50	6,637
8/4/2020	Pine Street	120	150,000-200,000 ⁵

It is important to note that a series of projects constructed under the American Recovery and Reinvestment Act in 2009 and 2010 have dramatically decreased the frequency and duration of CSOs at Manhattan/North Champlain and Park Street CSOs. Those projects are outlined further in **Attachment F**.

Section V. LTCP Status

The City has continued to work with AECOM to develop and finalize a draft Long Term Control Plan. The City intends to submit a final draft of the LTCP to DEC in Spring of 2021. As part of that effort, one major project developed for CSO control is a storage tank in Calahan Park. Water Resources is participating in the Master Planning Process for Calahan Park with Burlington Parks, Recreation, and Waterfront in 2021.

¹ The City does not currently have a flow meter installed at the Manhattan Drive CSO outfall; reported volume was estimated based on total duration of event

² This event was not large enough for the overflow meter to trigger, therefore the CSO volume was not captured.

³ The BlueSiren monitor failed during this event and did not capture flow data.

⁴ There was an error with the flow meter on this date; reported volume was estimated based on total duration of event

⁵ Velocity on sensor failed; reported volume was estimated based on total duration of event



Section VI. Summary of CSO Control Projects

Burlington has made a concerted effort since 2009 to implement Green Stormwater Infrastructure (GSI) practices to manage and mitigate stormwater flows to the combined sewer. A full summary of the GSI practices Burlington has installed to date, including the amount of impervious surface managed, is included with this report as **Attachment F**.

The City was awarded just over \$1 million in early 2019 to construct 12 Green Stormwater Infrastructure (GSI) projects within the Combined Sewer System to provide CSO control. The first round of these projects will be constructed in the area contributing to Pine Street CSO, and are currently slated to begin construction in the summer of 2021. The design summary of these specific projects has been included with this report as **Attachment G**.

It is also important to note that the City's Chapter 26 Ordinance requires all new and redevelopment projects resulting in a total of more than 2,500 square feet of impervious surface to implement stormwater management measures to mitigate impacts to the City collection system.