City of Burlington
Department of Public Works
Water Resources Division

City of Burlington

CSO Control Progress Report 2021

Contents

Annual Update – Calendar Year 2021

The City has continued to make steady progress on implementing combined sewer mitigation projects during calendar year 2021. Most notably, construction was completed on 13 Green Stormwater Infrastructure (GSI) projects in the Pine Street CSO watershed. These projects were designed to manage the 24-hour, 2.7" storm per the 2016 Vermont Combined Sewer Overflow Rule. The systems include surface bioretention and several subsurface infiltration systems to maximize detention of stormwater for just over 4 acres of impervious surface.

Additional updates are highlighted in the applicable sections below. Moving forward, the City plans to maintain the historic information contained in this report on its website, and include only relevant annual updates in this report for efficiency.

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.

2021 Updates:

- The City launched DTS/VUEWorks in 2021, and is currently in the process of fully implementing and leveraging all of the features of the program. We anticipate this will allow us to provide far more robust operation and maintenance reporting in future reports.
- The City continued CIPP lining efforts in 2021, and completed the following lining work:
    - Sanitary Sewer: 2671 linear feet
    - Combined Sewer: 2417 linear feet
    - Stormwater: 3361

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 as Attachments A and B.

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 foot diameter by 500 foot 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. A vortex valve also regulates this system's flows.
- 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.

2021 Updates:

- The City cleaned 3,380 linear feet of combined sewer lines
- The City cleaned 5,061 linear feet of sanitary sewer lines
- The City inspected and cleaned the two 5,000 gallon storage tanks on South Prospect Street in 2021

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

Burlington continued to develop an Industrial Pollution Prevention Program (IPPP) during 2021, with ongoing support from our consultant team at Hoyle, Tanner and Associates, Inc. (Hoyle, Tanner). We made the following progress on this effort during the past calendar year:

- Updated the Master Industrial User List due to ongoing COVID issues/business closings and any changes in classifications
- Analyzed Significant Industrial User (SIU) water usage data
- Prepared and issued a Final Phase 2 Survey for the Federal Categorical Users, Significant Industrial Users and Medium Impact Users
- Direct follow-up with identified Industrial Users and provided assistance, as needed, to complete the Phase 2 Survey

- Conducted preliminary calculations for the Wastewater Treatment Facility Headworks Loading Analysis
- Developed preliminary IPPP costs
- Continued with the preparation of the IPPP Development document specifically the Compliance Monitoring, Program Organization and Cost Recovery Methodologies

The City will continue to develop this program in the coming year, with a current target of the end of 2022 for the final program recommendations for implementation.

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 (~7.5 inches) 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. No CSOs during dry weather occurred during 2021.

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%2010-28-19_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.

All five (5) of the City's Combined Sewer Overflow Structures are equipped with Mission monitoring devices which notify staff when an overflow is occurring, and record the duration of the overflow. All five of the Mission CSO monitors were upgraded in December of 2021, in response to the ongoing phase-out of 3G service which several of the old monitors were using.

We continue to manage the 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) "roving" flow meters deployed on an as-needed basis for our overall flow meter efforts. The City operates a BlueSiren rain gauge device at Main Plant to track ongoing precipitation data. These devices have reached the end of their functional life over the last year, and we have experienced some challenges with data collection. **These equipment-related issues are reflected in the event summaries provided in Sections III and IV of this report.**

The City is working with our consultant, Hoyle Tanner, to procure a more comprehensive flow monitoring system. One key lesson from our initial flow monitoring efforts is that the harsh environment of a sewer or combined sewer manhole lead to a shorter life span for the monitoring device itself. This has required significant staff time during peak rain months. Through our contract with Hoyle, Tanner, we intend to procure services with a company that is able to manage the flow monitoring equipment, and provide the City with the resulting data as well as web-based access to real-time monitoring information. This will substantially alleviate the burden on City staff resources, and provide the opportunity for devices to be replaced and repaired so as to minimize disruptions in data collection.

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 is now utlizing 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. The City continues to utilize the SeeClickFix platform for the intake of citizen reports about ongoing maintenance and emergency repairs needed.

DTS/VUEWorks will allow the City to report on various maintenance items relevant to the Long-Term Control Plan, including:

- Scheduling and tracking of preventative maintenance activities on our collection system (catch basins, storage structures, sewer lines, etc.)
- Tracking of basement backup reports
- Tracking of surcharge reports within the collection system.

Section III. Summary of 2021 CSO Events and Associated Precipitation Data

The following table is a summary of the CSO events and the associated precipitation events during the calendar year 2021. Return frequency is estimated based on the NRCC table and Burlington Interpolations.

Date	Location	CSO Duration (min)	CSO Volume (gal)	Storm Duration (min)	Event Peak (in)	Total Rainfall (in)	Return Frequency (years)
7/18/2021	Pine	264	100,000 - 500,000	--[1]	--	1.4	--
7/20/2021	Colchester	2	>100 - 1,000	--	--	1.24	--
	Pine (1)	20	>10,000 - 100,000				
	Pine (2)	36	>10,000 - 100,000				
	Park	36	>10,000 - 100,000				
8/14/2021	Pine	80	14809.11	10	0.01	0.1	7
	Park	99	>10,000 - 100,000				
	N. Champlain	75	>1,000 - 10,000				
8/30/2021	Park	16	> 1,000 - 10,000	760	30	0.23	< 1
9/8/2021	Park	15	>1,000 - 10,000	725	1.21	2.08	11.65
	Pine	88	>100,000 - 500,000				
10/31/2021	Pine	33	10,000 - 100,000	725	0.4	1	< 1

It is important to note that a series of projects constructed under the American Recovery and Reinvesment Act in 2009 and 2010, and several additional capital-funded project constructed since that time 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**.

However, we have seen several apparent localized rain cells over the sewershed for Park and North Champlain which have triggered CSOs at those locations, where activations had previously been quite

[1] There was an unknown equipment failure at our rain gauge during the 7/18 and 7/20 events. This has been corrected, and a new gauge will be procured as part of the broader flow monitoring effort this coming year.

infrequent. The pipes and manholes downstream of those locations were checked after these CSO events to ensure there was not an O&M issue contributing to the CSO activation. As part of our enhanced H/H project with Hoyle, Tanner, the City is looking to install a localized rain gauge in the Old North End to monitor the localized rainfall depth and intensity in this area of the City.

Section V. LTCP Status

The City submitted a draft Long-Term Control Plan (LTCP) to DEC in the Spring of 2021. We are actively working to finalize the plan incorporating DEC feedback, and intend to submit the final draft LTCP by early February of 2022.

As part of that effort, one major project developed for CSO control is a storage tank in Calahan Park. The Water Resources Division participated in the Master Planning Process for Calahan Park with Burlington Parks, Recreation, and Waterfront in 2021.

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 GSI projects within the Combined Sewer System to provide CSO control. The first round of these projects were completed in 2021, within the drainage area contributing to the Pine Street CSO. The design summary of these specific projects has been included with this report as **Attachment G**.

The second phase of this grant project is in final design, and is planned for construction in the late spring or early summer of 2022. Due to a variety of factors, the City will have several completed designs for the second phase that will exceed the original grant award. The City intends to seek other funding sources to pursue these additional designs, with a goal of constructing the remaining projects in late 2022 or early 2023.

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.

The City is also aiming to formally adopt a Combined Sewer Offset Mitigation Policy in 2022. This policy will allow the City to leverage new and redevelopment projects in sensitive areas of the collection system to provide appropriate mitigation measures for stormwater and sanitary sewer flows.