City of Worcester
Department of Public Works & Parks

Quinsigamond Ave Combined Sewer Overflow Treatment Facility
NPDES Permit Number: MA 0102997

Annual Report #15

For the period

January 1 through December 31, 2019

Blackstone River, Millbury, MA

Table 1- QCSOTF 2019 Activation and Discharge

Event	Date	Duration-Hours	Discharge-Million Gallons	Rainfall-Inches
1	1/01/2019	1.9	2.115	0.26
2	1/24/2019	18.4	55.192	1.51
3	3/16/2019	8.0	4.150	0.58
4	4/15/2019	8.5	14.940	1.23
5	4/22/2019	15.4	17.810	1.68
6	4/26/2019	15.1	12.370	1.31
7	7/06/2019	2.8	6.457	0.85
8	7/12/2019	2.6	4.022	0.98
9	7/17/2019	2.4	5.796	0.46
10	7/22/2019	5.8	10.710	1.96
11	8/07/2019	3.9	10.429	1.76
12	8/28/2019	3.2	10.945	1.52
13	9/02/2019	2.5	10.380	0.94
14	10/16/2019	6.4	35.537	3.21
15	10/27/2019	5.1	13.481	1.42
16	11/24/2019	7.2	3.776	1.38
17	12/10/2019	21.3	5.235	1.05
18	12/14/2019	18.2	9.015	1.36
	TOTALS	148.4	232.36	23.46
	AVERAGE	8.3	12.91	1.30

Table 2- QCSOTF Bypass Event

Event	Date	Duration-Hours	Discharge-Million Gallons	Rainfall-Inches
1	10/17/2019	.70	**	3.21
	TOTALS	**.70**	**	**3.21**

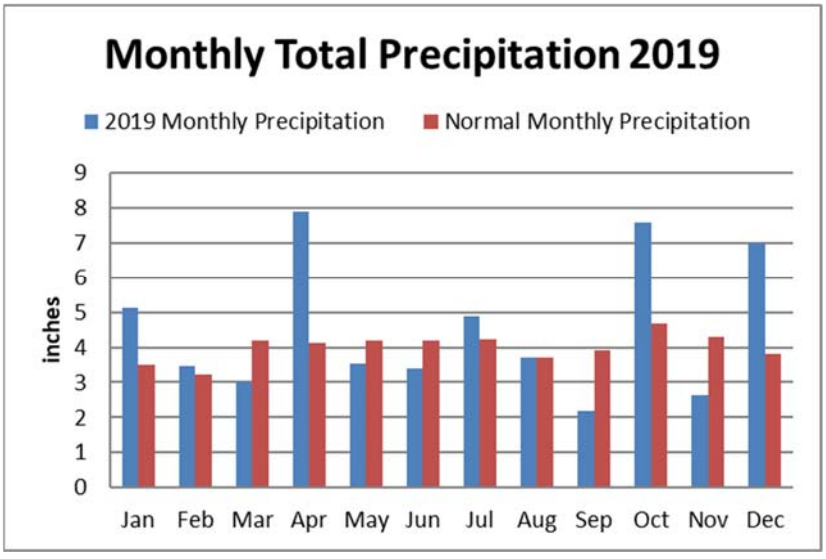
The October 17, 2019 event listed in Table 2 was an untreated bypass of the station for approximately 41 minutes of the overall 6.4 hour event. Due to the length of the overall event and high intensity of this rainfall the system became overtaxed and the overflow to the system was bypassed to allow the station to continue treating at maximum capacity. Upon alleviating the immediate conditions the bypass was closed and the system operated normally for the remainder of the event as indicated in Table 1 above.

2019 Precipitation Summary

Total rainfall measured at Worcester Regional Airport in 2019 was 54.40 inches, making it an above average year (Average = 48.07). Total annual rainfall was about 12% above the long-term average and 6.8 inches greater than the average of the representative period (1967-1971) used in the Phase 1 CSO Long Term Control Plan (CDM 2002).

Monthly distribution of precipitation shows 6 months below average levels and 6 months above average. April was the wettest month of the year recording 7.88 inches of rain. There were 60 rainfall events of over 0.25 inches which is well above the average of 46 such events annually over the long term and during the representative period.

The peak hourly precipitation of 1.14 inches occurred on August 7, 2019 and the maximum daily rainfall of 2.20 inches occurred on October 17, 2019.



Precipitation analysis and hourly precipitation is based on records from the Worcester Regional Airport. However, Worcester DPW&P installed a rain gauge at the QCSOTF and it was operational during 2019. The rainfall totals included in the activation and discharge table are from the QCSOTF rain gauge. Hourly data is not available from this gauge, thus precipitation analysis relied upon the airport data.

Phase II CSO LTCP Status

Status of the implementation of the Phase II CSO Long Term Control Plan's Recommended Plan as set forth in Part I.E.

1. The City of Worcester has completed all four of the required weir modifications to regulators at the locations identified.

2. The Green Hill Pond Diversion Project has been completed, diverting the pond overflow out of the combined sewer system.

3. The Kelly Square Control Station Rehabilitation project design is complete.

4. The Kelly Square Control Station construction was complete in April 2008. Technical problems were encountered with the communications between the CSO treatment facility and the control station. After extensive trial runs and equipment modifications the gate structure was made fully operational in September 2008.

5. The original deadline was June 1st, 2008; an extension was requested on March 25, 2008 and, given the lack of a reply, assumed to be approved.

6. The original deadline was June 1st, 2010; an extension was requested on March 25, 2008 and, given the lack of a reply, assumed to be approved.

For both items #5 and #6, Worcester DPW&P has previously indicated that discussion of the need for additional pumping capacity must take place between EPA, DEP and Worcester. There is concern that additional pumping to the Upper Blackstone WWTP during wet weather events may not be beneficial to the Blackstone River and the environment. Before we proceed with design and installation we need to analyze the pros and cons of this approach and weigh the benefits to water quality. This issue would most appropriately be addressed through an Integrated Water Resources Management Plan which Worcester DPW&P is currently developing.

Precipitation and Operational Data Comparisons

Item four of the Annual Report requires a statistical review of treated discharges, precipitation, and the relationship to facility upgrades in the Long Term Control Plan.

The intent of the analysis is to verify a reduction in facility discharges resulting from structural systemic upgrades.

Treated discharges occurred in 9 out of the 12 months of the year with more than one event occurring in 6 months. Monthly rainfall was above normal in January, February and July; significantly above average in April, October and December; below normal in March, May, June, September and November; and slightly below normal in August.

The total of eighteen (18) treated discharges in 2019 is higher than the average number of yearly events under the current NPDES permit which became effective in August 2005. The low was in 2015 with six (6) treated discharges. Based on rainfall data, of the eighteen (18) occurrences of treated discharges in 2019, twelve (12) (67%) were associated with rainfall events of over one (1) inch and two (2) of these were triggered by rainfall in excess of two (2) inches. The average rainfall event associated with a treated discharge was 1.46 inches. Storms that included the monthly maximum hour rainfall intensity produced 44% of the treated discharges. Those that included the monthly maximum daily rainfall produced 44% of the treated discharges. Storms that included both the monthly maximum hour rainfall intensity and the monthly maximum daily rainfall produced 38% of the treated discharges. There were 60 storms producing over 0.25 inches of rain and all treated discharges were associated with such events. There were 31 hours during the year that had rainfall intensities exceeding 0.25 inches per hour. Of these, 28 (90%) were associated with treated discharges. Antecedent conditions, rainfall duration, peak intensity, groundwater levels and other factors all contribute to discharge occurrence and make it difficult if not impossible to determine a causative link that could serve as a predictor of future discharges.

A review of 2019 flow data for the Blackstone River taken from the USGS Stream Gauge # 01109730 at West Main Street in Millbury revealed that QCSOTF treated discharges did not occur at river flows of less than approximately 300 cfs with the majority occurring at river flows of 500 CFS or greater. There were eleven (11) additional river flow events of 300 cfs or greater that were not associated with a treated discharge from QCSOTF. This is not to suggest a cause and effect relationship between river flows and discharges. Rather, it simply suggests that only those storms producing river flows downstream in Millbury of over 300 cfs resulted in treated discharges at the plant. This relationship may be useful as the river flows account for antecedent conditions such as high groundwater and previous rainfall and therefore may be better indicators than rainfall itself.

Overall, 2019 was an above average year for rainfall with April, October and December returning significantly higher than normal rainfall. The majority of rainfall events included significant periods of high intensity. These conditions resulted in a number of events with significant rainfall over a short duration. Weather, and precipitation in particular, remains the driver behind QCSOTF activation. The unique properties of each rain event will continue to dictate the number of treated discharges that occur each year.

Nine Minimum Controls Update

Item #5-A summary of modifications to the approved NMC program which have been evaluated and a description of those which will be implemented during the coming year. In the first annual report submitted in accordance with this permit, the permittee shall submit a public notification plan to describe the measures actively being taken to meet NMC #9, and an evaluation of further measures to enhance the public notification program, including use of web postings with CSO information. (See NMC #9 in Part IA.1.a.viii)

For a summary of modifications to the NMC program please refer to Item # 3 of this report (Status of implementation of the Phase II CSO Long Term Control Plan's Recommended Plan)

With regards to a public notification plan relative to NMC #9, Worcester DPW&P Staff previously created a web-based information outlet for combined sewer system information. It remains our intent to build upon this and create a comprehensive Sewer Operations page within the City of Worcester DPW&P website. This will eventually include additional information on all facets of the City's sewerage system, including the CSO facility, and some precipitation data.

Worcester DPW&P Sewer Operations information can be found at http://www.worcesterma.gov/water-sewer/sewer-system.