



City of Chattanooga

Mayor Andy Berke

February 26, 2018

VIA CERTIFIED MAIL

Ms. Sara Janovitz
Environmental Engineer
Clean Water Enforcement Branch
US EPA-Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Re: *United States of America et. al. v. City of Chattanooga, No. 1:12-cv-0024*
Annual Report No. 5 – January 2017 to December 2017

Dear Ms. Janovitz:

On behalf of the City of Chattanooga, Tennessee ("City"), and in accordance with the Consent Decree entered by the United States District Court for the Eastern District of Tennessee (Southern Division), on April 24, 2013, in the case styled the United States of America et. al. v. City of Chattanooga, No. 1:12-cv-0024 ("Consent Decree"), we are submitting to both the Environmental Protection Agency ("EPA") and the Tennessee Department of Environment and Conservation ("TDEC") the fifth annual report required pursuant to paragraph 40 of the Consent Decree. This report is also being submitted in accordance with the letter from Denise Diaz, dated September 16, 2013, establishing the dates for reporting under the Consent Decree.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Ms. Sara Janovitz
February 26, 2018
Page Two

Please let me know if you have any questions regarding our submittal.

Sincerely,



Michael C. Patrick, P.E.
Director, Waste Resources Division

Enclosure

cc: Karl Fingerhood, Esq., US DOJ
Chief, Environmental Enforcement Section, US DOJ
Chief, Clean Water Enforcement Branch, US EPA Region 4
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Annual Report No. 5

January 1 - December 31, 2017

Prepared for

**Environmental Protection Agency and
Tennessee Department of Environment and
Conservation**

City of Chattanooga
Waste Resources Division
Consent Decree Program
Case No. 1:12-cv-00245

Prepared by

City of Chattanooga
Waste Resources Division

Submitted by

JACOBS

Jacobs Engineering Group Inc.
Consent Decree Program Manager

Chattanooga, Tennessee

February 26, 2018

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Acronyms and Abbreviations

AOP	Additional Operational Plan
BOD	Biochemical Oxygen Demand
CAP	Capacity Assurance Program
CD	Consent Decree
CMOM	Capacity, Management, Maintenance and Operations
CSOTF	Combined Sewer Overflow Treatment Facility
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
FOG	Fats, Oils, and Grease
FSE	Food Service Establishment
IJA	Inter-Jurisdictional Agreement
ISS	Interceptor Sewer System
KPI	Key Performance Indicator
MBWWTP	Moccasin Bend Wastewater Treatment Plant
MG	Million Gallons
MH	Manhole
N/A	Not Applicable
No.	Number
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PCCMP	Post Construction Compliance Monitoring Program
PM	Preventive Maintenance
PS	Pump Station
SORP	Sewer Overflow Response Protocol
SSO	Sanitary Sewer Overflow
TDEC	Tennessee Department of Environment and Conservation
TSS	Total Suspended Solids
WQS	Water Quality Standards

1.0 Introduction

1.1 Purpose

On April 24, 2013, the City of Chattanooga (“City”) entered into a Consent Decree with the United States and the State of Tennessee, in the case styled *United States of America et. al. v. City of Chattanooga, No. 1:12-cv-00245* (“CD”). Pursuant to Section IX of the CD, the City is required to submit annual reports on a yearly basis to the Environmental Protection Agency (“EPA”) and Tennessee Department of Environment and Conservation (“TDEC”). Chattanooga has prepared this report to satisfy the reporting requirements found in Paragraph 40 of the CD, which covers the period from January 1, 2017 through December 31, 2017 (“Reporting Period”). This report is also being submitted in accordance with the letter from Denise Diaz, dated September 16, 2013, establishing the dates for the reporting under the CD.

1.2 Requirements

As detailed in Section IX of the CD, the City is required to report a summary of Capacity, Management, Operations and Management (“CMOM”) Program as implemented or modified pursuant to the CD, including a comparison of actual performance with any performance measures that have been established. Additionally, the 1st five annual reports are to include a trends analysis of the number, volume, duration, and cause of Chattanooga’s Sanitary Sewer Overflow (“SSO”) events for a 24-month rolling period, updated to reflect the SSO events that occurred during the previous 12-month period. Beginning with the 6th annual report, this trends analysis will cover SSO events spanning a 5-year rolling period, which in this case, would be the next Annual Report. The Annual Report also includes an update regarding the status of major Post Construction Compliance Monitoring Program (“PCCMP”) activities, as applicable, relating to the Chattanooga Creek Combined Sewer Overflow Treatment Facilities (“CSOTFs”).

2.0 CMOM Programs

The City has completed the development of its CMOM program pursuant to Paragraph 20 of the CD. As of the end of the Reporting Period, all nine (9) of the nine CMOM programs have been developed by Chattanooga, submitted to TDEC and EPA, and approved. Table 2-1 on the following page summarizes the status of the CMOM Programs, including updates and key performance indicators (“KPIs”) related to implementation of those that have received EPA approval.

**Table 2-1
CMOM Program Summary**

January 1, 2017 - December 31, 2017						
CMOM Program	CMOM Program Status	CD Reference	CMOM Program KPI	CMOM KPI Purpose	Established Performance Measure	Actual Measured Performance
Sewer Overflow Response Protocol ("SORP")	Approved by EPA and TDEC 5/29/2014	Section VI, Paragraph 20(a)(ii)	Maintain records of all sanitary sewer overflow ("SSO") responses and response times	Chattanooga has established a standard SSO Report Form for recording all required SSO related information, maintained via 311 calls, Cityworks Work Orders, and daily work activity summaries	Limit SSO response time to be within one hour after notification of event	Average SSO response time for 2017 was ~15 minutes
Sewer Overflow Response Protocol ("SORP")	Approved by EPA and TDEC 5/29/2014	Section VI, Paragraph 20(a)(ii)	Provide notice to TDEC as required by National Pollutant Discharge Elimination ("NPDES") Permit within 24 hours of being made aware of an SSO event	Chattanooga has identified Interceptor Sewer System ("ISS") staff responsible for compiling SSO report and providing required notification	Notify TDEC of SSO events within 24 hours after being made aware of event	One 24-hour report was not made to TDEC within the 24-hour time period
Inter-Jurisdictional Agreement ("IJA") Program	Approved by EPA and TDEC 9/16/2014	Section VI, Paragraph 20(i)	Adherence to the Implementation Schedule	To ensure that proper agreements are in place that adhere to EPA requirements	Total number of required new agreements initiated compared to total required to date	Chattanooga has initiated negotiation of 8 out of 7 required IJA agreements and executed 4 of those agreements pursuant to the program as of 2017
Gravity Line Preventive Maintenance Program	Approved by EPA and TDEC 12/3/2014 Updated and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(d)	Annual Chemical Root Control Footage	To keep roots out of pipelines until a more permanent solution is in place	50,000 feet/year	33,195 feet were treated in 2017

**Table 2-1
CMOM Program Summary**

January 1, 2017 - December 31, 2017						
CMOM Program	CMOM Program Status	CD Reference	CMOM Program KPI	CMOM KPI Purpose	Established Performance Measure	Actual Measured Performance
Gravity Line Preventive Maintenance Program	Approved by EPA and TDEC 12/3/2014 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(d)	Footage of Pipeline Hydraulically Cleaned During the Calendar Year	To stay on schedule to get all pipelines clean and keep them clean	1,000,000 feet/year	1,372,779 feet in 2017
Gravity Line Preventive Maintenance Program	Approved by EPA and TDEC 12/3/2014 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(d)	Number of MACP Level 1 Manhole Inspections During the Calendar Year	To stay on schedule to get all Level 1 inspections complete	1,000/year until 2017 and then 2,000/year	2,988 inspections in 2017
Gravity Line Preventive Maintenance Program	Approved by EPA and TDEC 12/3/2014 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(d)	Number of MACP Level 2 Manhole Inspections During the Calendar Year	To stay on schedule to get all Level 2 inspections complete	900/year until 2017 and then 500/year	880 inspections*
Gravity Line Preventive Maintenance Program	Approved by EPA and TDEC 12/3/2014 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(d)	The Number of SSOs caused by the build-up of debris, sediment, roots, and grease in the collection system	To measure the effectiveness of preventive maintenance at reducing SSOs	A reduction in maintenance-related SSOs	There were 29 SSOs associated with blockages in 2017 as compared to 27 in 2016

**Table 2-1
CMOM Program Summary**

January 1, 2017 - December 31, 2017						
CMOM Program	CMOM Program Status	CD Reference	CMOM Program KPI	CMOM KPI Purpose	Established Performance Measure	Actual Measured Performance
Gravity Line Preventive Maintenance Program	Approved by EPA and TDEC 12/3/2014 Revised and Revised by EPA 9/25/2017	Section VI, Paragraph 20(d)	Footage of pipelines and frequency that preventive maintenance hydraulic cleaning is performed	To measure the effectiveness of preventive maintenance at reducing SSOs	Preventive Hydraulic Line Cleaning Frequency Maximum ft. 2 months – 25,000 ft. 4 months – 50,000 ft. 6 months – 50,000 ft. 8 months – 50,000 ft. 12 months- 225,000 ft. 18 months- 250,000 ft. 36 months- 350,000 ft.	Preventive Hydraulic Line Cleaning Frequency Actual ft. 2 months- 0 ft. 4 months- 0 ft. 6 months- 61,203 ft. 8 months- 24,643 ft. 12 months- 387,961 ft. 18 months- 173,659 ft. 36 months- 202,177 ft.
Fats, Oils, and Grease (“FOG”) Management Program	Approved by EPA and TDEC 7/21/2015	Section VI, Paragraph 20(c)	Number of FOG-related SSOs	Measure FOG Program Success	Yearly Reduction in FOG-related SSOs	There were 6 SSOs associated with grease blockages
Fats, Oils, and Grease (“FOG”) Management Program	Approved by EPA and TDEC 7/21/2015	Section VI, Paragraph 20(c)	Number of annual inspections vs the total number of Food Service Establishments (“FSEs”)	Measure FOG Program Workload	100%	89%, which is an increase of 9% from 2016

**Table 2-1
CMOM Program Summary**

January 1, 2017 - December 31, 2017						
CMOM Program	CMOM Program Status	CD Reference	CMOM Program KPI	CMOM KPI Purpose	Established Performance Measure	Actual Measured Performance
Fats, Oils, and Grease ("FOG") Management Program	Approved by EPA and TDEC 7/21/2015	Section VI, Paragraph 20(c)	Number of annual Noncompliance Notifications vs the total inspections	Evaluate the Effectiveness of Program Enforcement	Below 15%	5% of total inspections yielded a non-compliance notification
Fats, Oils, and Grease ("FOG") Management Program	Approved by EPA and TDEC 7/21/2015	Section VI, Paragraph 20(c)	FOG Hot Spots	Identify and Reduce the amount of sewer that is classified as a FOG hot spot area.	Reduce linear footage by 10%	9.1% reduction
Fats, Oils, and Grease ("FOG") Management Program	Approved by EPA and TDEC 7/21/2015	Section VI, Paragraph 20(c)	Number of FSEs Added Annually	Measure Program Progress	Have every existing FSE included in Program so only new ones are added	36 FSEs were added during the reporting period
Fats, Oils, and Grease ("FOG") Management Program	Approved by EPA and TDEC 7/21/2015	Section VI, Paragraph 20(c)	Annual FOG Management Program Update Completed on Time	Evaluate the effectiveness of FOG Program and identify new goals and KPIs	Complete Annually	The City reviewed the document April 25, 2017. Changes to the FOG program did not require an approval letter
Fats, Oils, and Grease ("FOG") Management Program	Approved by EPA and TDEC 7/21/2015	Section VI, Paragraph 20(c)	Number of Pretreatment Program Employees Trained on FOG Management Program	Training	100%	100%

**Table 2-1
CMOM Program Summary**

January 1, 2017 - December 31, 2017						
CMOM Program	CMOM Program Status	CD Reference	CMOM Program KPI	CMOM KPI Purpose	Established Performance Measure	Actual Measured Performance
Pump Station Operations Program	Approved by EPA and TDEC 10/22/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(e)	Pump Station ("PS") Operational Checks	Ensure proper operation of PSs; determine if condition issues are present	95% adherence to PS/CSOTF visit schedule	91% completed on time
Pump Station Preventive Maintenance Program	Approved by EPA and TDEC 3/17/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(f)	Preventive Maintenance ("PM") Completion Schedule	Assure all PMs are being completed as scheduled	95% adherence to PM schedule	90% completed on time, a 10% improvement from 2016
Pump Station Preventive Maintenance Program	Approved by EPA and TDEC 3/17/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(f)	Number of Preventable Work Orders	Limit and track work orders that could have been preventable	Less than 5 preventable work orders per month	Average of 6 preventable work orders per month, a 1% improvement from 2016
Pump Station Preventive Maintenance Program	Approved by EPA and TDEC 3/17/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(f)	Track Work Orders Found Via PM Activities	Evaluate the success of the PM program	Track the number of CMs generated as a result of a PM	66 CMs generated from 1720 PMs (4%)
Pump Station Preventive Maintenance Program	Approved by EPA and TDEC 3/17/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(f)	Track the Age of Work Orders	Not let the work orders get lost in the process	No work orders older than 6 months	The average time to complete work orders was 27 days

**Table 2-1
CMOM Program Summary**

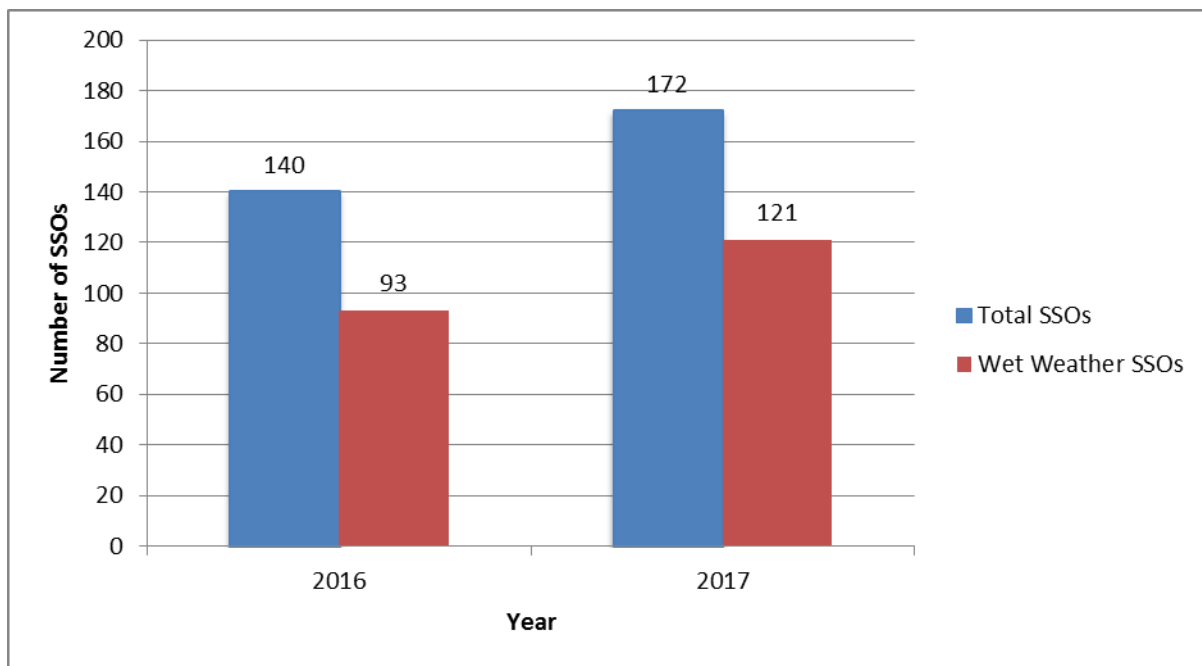
January 1, 2017 - December 31, 2017						
CMOM Program	CMOM Program Status	CD Reference	CMOM Program KPI	CMOM KPI Purpose	Established Performance Measure	Actual Measured Performance
Pump Station Preventive Maintenance Program	Approved by EPA and TDEC 3/17/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(f)	Percentage of Emergency Work Orders	Track the reliability of the City assets	Less than 10% of the work orders are emergencies	Emergency work orders were 0% of total work orders written
Pump Station Preventive Maintenance Program	Approved by EPA and TDEC 3/17/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(f)	Work Orders Awaiting Parts	Track the number of work orders incomplete due to materials and parts	No Work Orders Older than 30 days Awaiting Parts	129 requests with an average delivery time of 13.5 days
Pump Station Preventive Maintenance Program	Approved by EPA and TDEC 3/17/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(f)	Work Backlog	Measure Progress	Not more than 6 weeks of work	73% of work orders written were closed
Pump Station Preventive Maintenance Program	Approved by EPA and TDEC 3/17/2015 Revised and reapproved by EPA 9/25/2017	Section VI, Paragraph 20(f)	Overtime as a Percent of Total Hours Worked	Evaluate the use and cost of labor	Less than 5%	9.5% OT
Capacity Assurance Program ("CAP")	Approved by EPA and TDEC 10/13/2016	Section VI, Paragraph 20(h)	Applicable CD components to be identified during program implementation	N/A	N/A	N/A

* Including 494 inspections that were done in November and December of 2016 and not recorded.

3.0 SSO Trends Analysis

The City conducted a trends analysis of the cause, duration, and volume of SSO events for the 24-month period spanning January 1, 2016 through December 31, 2017. Rainfall data collected during the same time period was included in the analysis to illustrate the effects of heavy, sustained rainfall on the occurrence, duration, and volume of the recorded SSO events. Figure 3-1 below provides a summary of SSO events by year for the reporting period:

Figure 3-1
SSO Events by Year



There was a slight upward trend in SSO events from 2016 to 2017 as illustrated in Figure 3-1. There was a corresponding upward trend in rainfall as described further in this section and illustrated in Figure 3-2. The majority of SSO events during the reporting period were wet-weather related. There were 93 wet-weather related SSOs in 2016 and 121 wet-weather SSOs in 2017, which were 66% and 70% of the total SSOs in 2016 and 2017, respectively. This is a 4% overall increase in wet-weather SSOs. As for SSOs that were not related to wet weather, there were 47 in 2016 and 51 in 2017, which was an increase of 9%.

Based on data from rain gages installed throughout Chattanooga, the observed rainfall was 64% more in 2017 than 2016 and 11% higher than normal rainfall.

There was one storm event in 2017 that had total rainfall beyond the 2-year 24-hour design storm event of 3.67 inches as defined in the Consent Decree. This event began on October 7, 2017 and had a rainfall total of 3.75 inches. There were 5 SSOs associated with this event.

Pursuant to Paragraph 1.3.5.2 of the City’s NPDES permit TN0024210, the City notified TDEC regarding unavoidable construction on MBWWTP. On September 25, 2017, Detritors #1 and #2 were taken offline to perform the associated rehab work. Through analysis of the rainfall events during this period, there was 1 SSO that the data shows can be likely attributed to this construction effort. This SSO is shown in Table 3-2.

Table 3-2
 SSOs Attributed to Required Construction

Start Date	Start Time	Location	Source	Estimated Duration (hrs)	Estimated Volume (gal)	SSO Destination	Cause
10/8/2017	5:45 PM	122 Rowland Gap Rd (West Bank)	Manhole	12.00	6,272,000	Tennessee River	Wet Weather

Figure 3-2 depicts SSO events by cause per month. Wet weather was the leading cause of SSOs during the reporting period, followed by blockages. This chart also depicts the increased monthly rainfall observed in 2017 versus 2016.

Figure 3-3 depicts total SSO events per month. The average number of SSOs per month for the reporting period was approximately 14, which is a 17% increase from 2016. This average is significantly impacted by the above average number of SSOs reported in April, which correlates to a heavy rain event. After April 2017, SSOs did not seem to increase as significantly with heavy rain events and the average SSOs per month dropped to 6. This seems to indicate the implementation of the CMOM program under the Consent Decree, which is now in its fifth year, is continuing to have a positive effect on the City’s performance in reducing SSOs.

Figure 3-4 depicts cumulative SSO duration per month or the sum of the durations of each SSO event that was recorded per month during the reporting period. The average cumulative SSO duration per month was approximately 292 hours, which is a 38% increase from 2016. This average is also significantly inflated by the SSO duration in April. When April is removed from the analysis, the average cumulative duration per month is approximately 164 hours.

Figure 3-5 depicts cumulative SSO volume per month or the sum of the volumes of each SSO event that was recorded per month during the reporting period. The average cumulative SSO volume per month for the reporting period was found to be approximately 5 million gallons, which is a 67% increase from 2016. Again this average is significantly increased by April’s value and after April, the average dropped to 2 million gallons per month.

Figure 3-2
SSO Events by Cause

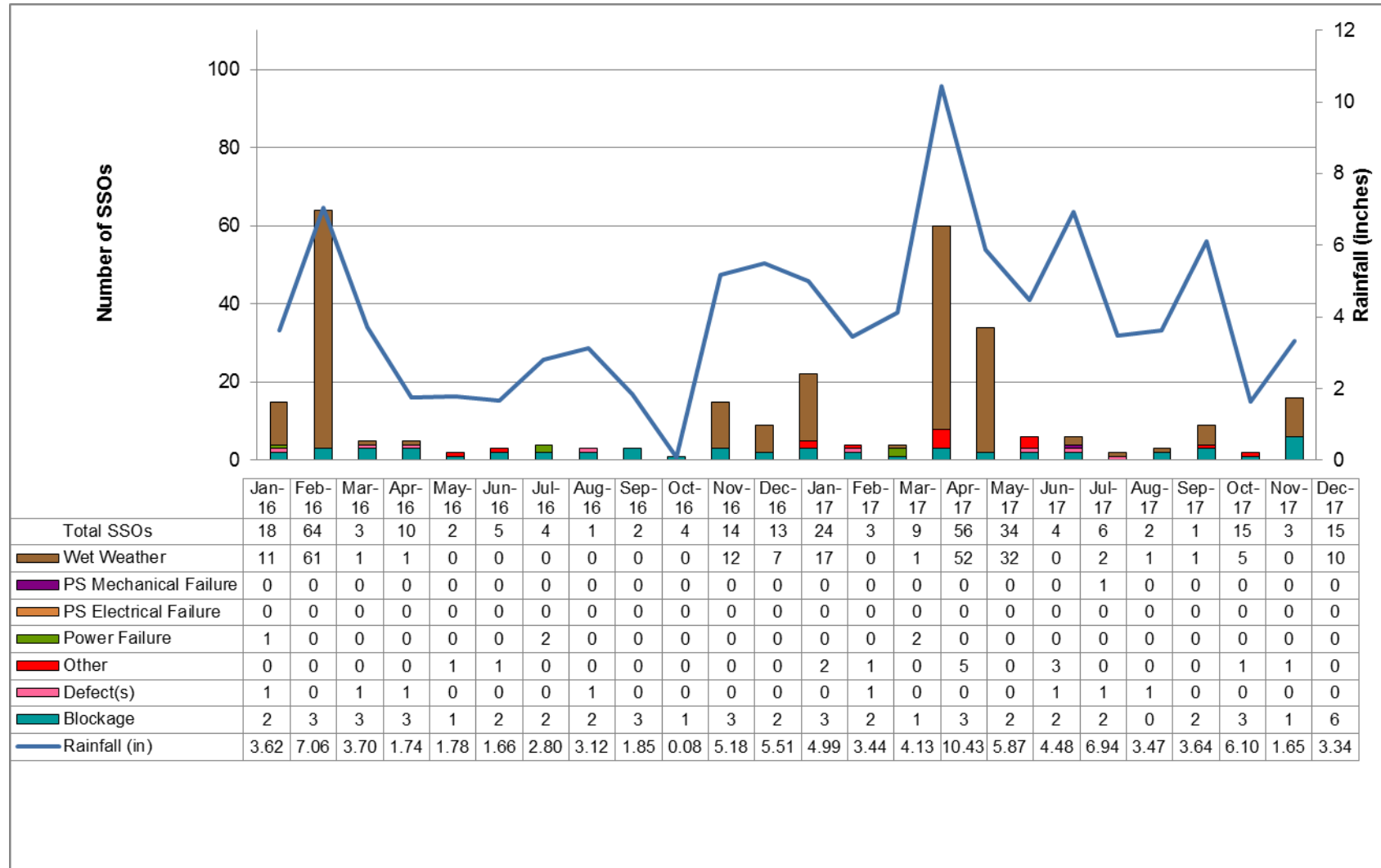


Figure 3-3
Monthly SSO Quantities

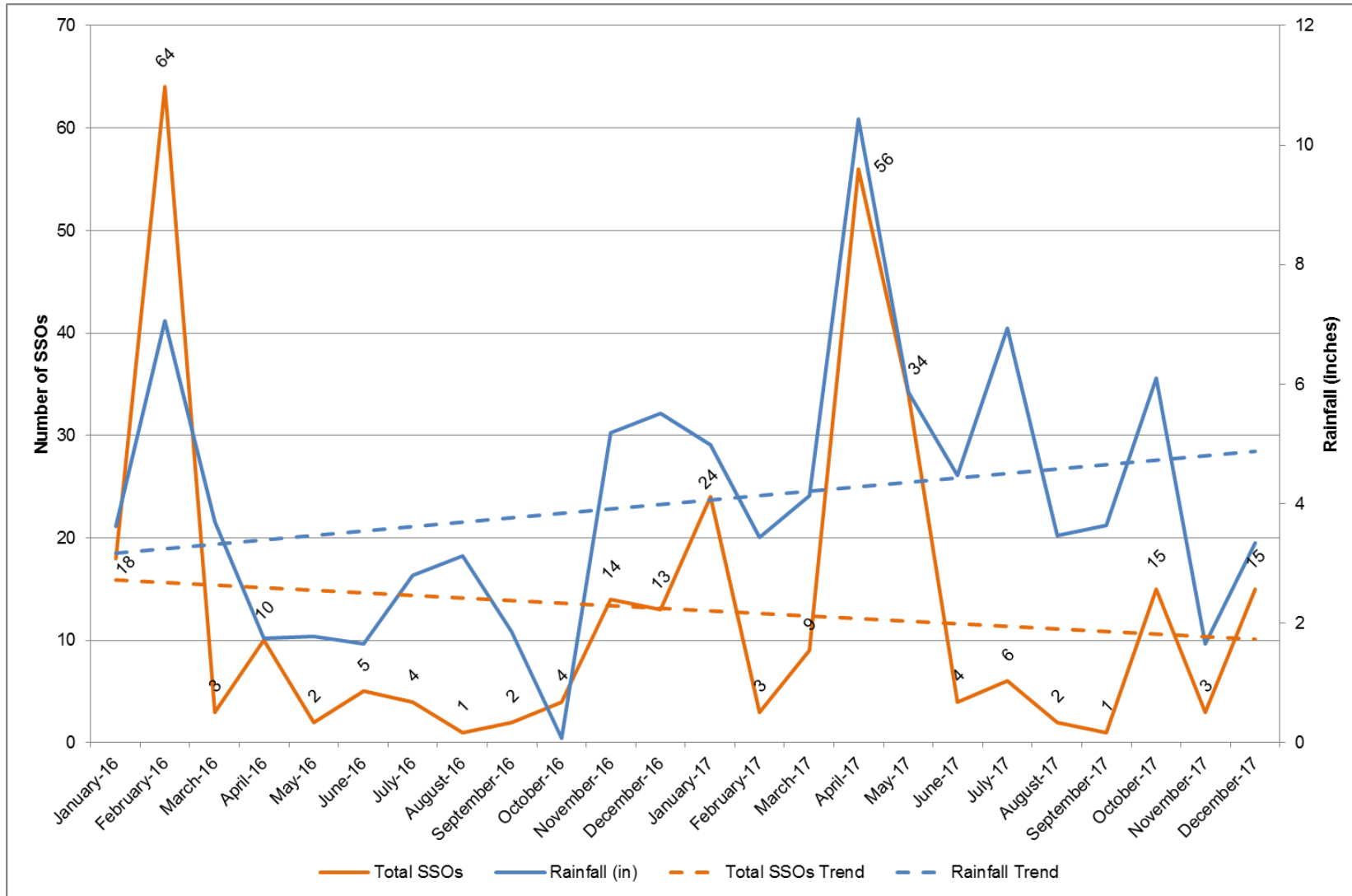


Figure 3-4
Monthly SSO Durations

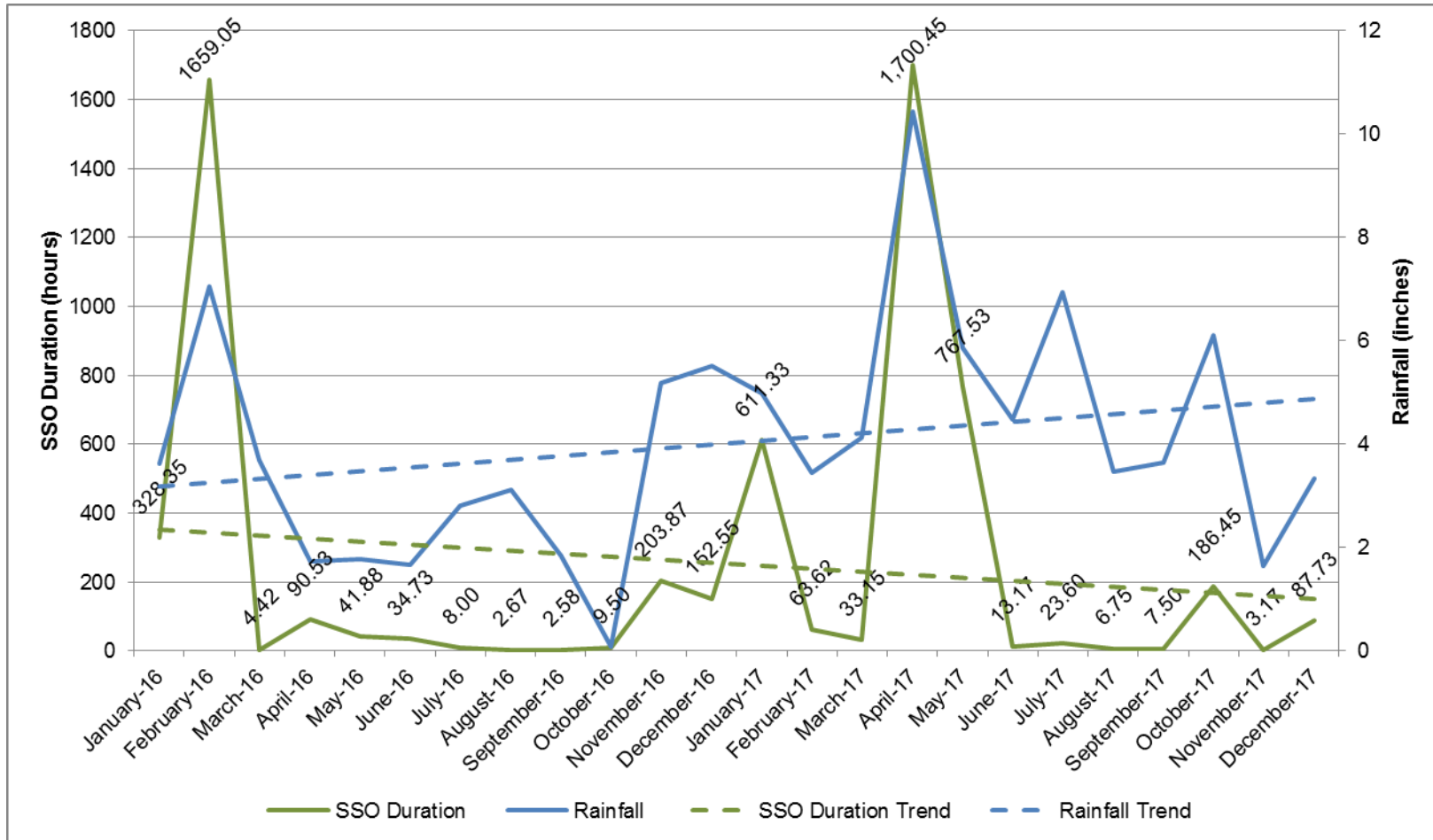
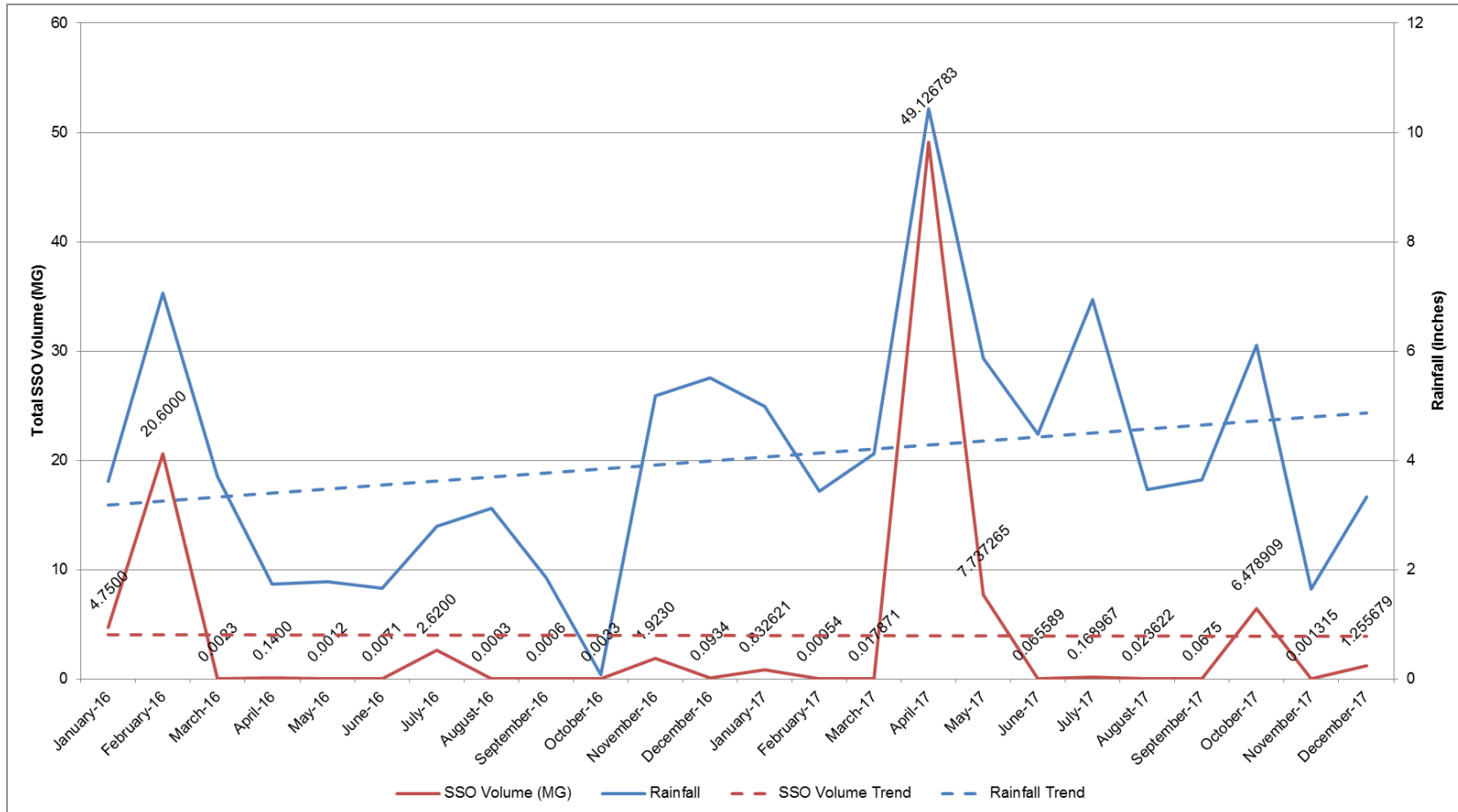


Figure 3-5
Monthly SSO Volumes



4.0 PCCMP Activities

4.1 Purpose

As detailed in Section 2.4.1.5 of the PCCMP, the Annual Report also includes an update regarding major PCCMP activities, as applicable, relating to the Chattanooga Creek CSOTFs

This project included developing a set of procedures and analysis from EPA guidance documents into the Long Term Control Plan-Post Construction Compliance Monitoring Program document. The purpose of this document is to determine a plan of operations for sampling and analyzing the Central Avenue and William Street CSO Outfalls to verify compliance of the discharges with State water quality standards (“WQS”) and protection of designated uses as well as to ascertain the effectiveness of CSO controls.

The full analysis of the data was included in the Additional Operational Plan (“AOP”). The AOP was submitted to TDEC on October 16, 2017. The impact of the CSO Outfall discharges on Chattanooga Creek was assessed and this analysis is detailed in the AOP.

4.2 Requirements

As detailed in Section 2.4.1.5 of the PCCMP, the City is required to report the status of the following major PCCMP activities, as applicable, relating to the Chattanooga Creek CSOTFs:

- CSOTF effluent and Chattanooga Creek monitoring data;
- Performance monitoring data;
- Outfall activation: number of discharge events, discharge volume as estimated from outfall flow data, and any relevant comments;
- Rainfall data: map of gauge locations and summary of results, including annual rainfall total depth, annual average intensity, annual average event duration, total number of events, event distribution by depth and the maximum event depth; and
- Flow monitoring: map of gauge sites and summary of results.

The information listed above is provided in the following subsections. Performance monitoring data, as detailed in the PCCMP, currently includes CSOTF effluent and Chattanooga Creek monitoring data as well as outfall activation data. Thus, performance monitoring does not have its own separate data listed.

4.3 CSOTF Effluent and Chattanooga Creek

CSOTF Effluent and Chattanooga Creek data was compiled by parameter and is shown by month in Table 4-3 through Table 4-8b in the AOP, submitted October 16, 2017.

4.4 Performance Monitoring Data

Performance monitoring data includes the data from section 4.3 and 4.5.

4.5 Outfall Activation

The CSOTFs discharged to Chattanooga Creek twenty-eight (28) times during the reporting period. Twenty-five (25) of those times were from Central CSO (002), and three (3) times were from Williams St CSO (003). These discharge events are shown in Table 4-1 below.

Table 4-1
CSOTF Discharges into Chattanooga Creek

Day	Location of Discharge	Start Time	End Time	Gallons Discharged	Duration (hrs)	Discharge Type
20-Jan-17	Central Ave. CSO (002)	3:21	17:42	5,057,620	13.38	Treated
28-Mar-17	Central Ave. CSO (002)	4:16	16:24	4,131,625	5.32	Treated
3-Apr-17	Central Ave. CSO (002)	10:51	19:11	591,906	1.23	Treated
23-Apr-17	Central Ave. CSO (002)	6:38	14:43	2,671,575	6.95	Treated
23-Apr-17	Williams St. CSO (003)	7:03	22:26	2,912,326	9.63	Treated
27-Apr-17	Central Ave. CSO (002)	6:46	11:24	4,378,051	15.43	Treated
27-Apr-17	Williams St. CSO (003)	7:01	16:04	12,863,751	8.07	Treated
1-May-17	Central Ave. CSO (002)	7:20	17:25	5,604,376	4.40	Treated
30-Jun-17	Central Ave. CSO (002)	10:26	23:59	1,422,293	6.60	Treated
3-Jul-17	Central Ave. CSO (002)	18:38	20:21	1,992,277	9.03	Treated
8-Oct-17	Williams St. CSO (003)	17:37	20:17	9,000,479	36.87	Treated
23-Oct-17	Central Ave. CSO (002)	9:52	23:18	5,203,039	39.68	Treated
11-Sept thru 13-Sept	Central Ave. CSO (002)	21:48	12:29	5,102,881	21.85	Treated
18-April thru 19-April	Central Ave. CSO (002)	9:51	6:36	1,417,537	12.55	Treated
1-July thru 2-July	Central Ave. CSO (002)	0:00	13:40	3,960,667	23.48	Treated
20-Dec thru 23-Dec	Central Ave. CSO (002)	6:33	23:45	77,870	1.52	Treated

Day	Location of Discharge	Start Time	End Time	Gallons Discharged	Duration (hrs)	Discharge Type
22-Jan thru 23 Jan	Central Ave. CSO (002)	21:26	3:02	13,650,921	78.08	Treated
22-June thru 23-June	Central Ave. CSO (002)	18:25	17:31	496,940	14.08	Treated
28-Oct thru 29-Oct	Central Ave. CSO (002)	10:17	4:19	8,632,164	33.55	Treated
29-April thru 30-April	Central Ave. CSO (002)	19:35	2:48	24,197,814	52.02	Treated
4-July thru 7-July	Central Ave. CSO (002)	7:34	20:16	1,809,777	13.40	Treated
4-May thru 6-May	Central Ave. CSO (002)	14:18	8:52	3,300,222	17.65	Treated
5-April thru 6-April	Central Ave. CSO (002)	21:11	12:46	849,409	20.23	Treated
5-Dec thru 6-Dec	Central Ave. CSO (002)	20:28	2:56	21,017	4.68	Treated
5-June thru 6-June	Central Ave. CSO (002)	2:26	19:07	8,436,958	83.50	Treated
5-Sept thru 6-Sept	Central Ave. CSO (002)	21:06	14:17	16,794,364	15.38	Treated
7-Nov thru 8-Nov	Central Ave. CSO (002)	14:37	14:10	6,192,091	9.05	Treated
8-Oct thru 10-Oct	Central Ave. CSO (002)	9:55	14:06	2,749,163	2.67	Treated

4.6 Rainfall Data

The PCCMP used ADS rain gauge 11 (RG11) to determine when to sample because this gauge is closest to the project area. A map detailing the location of RG11 can be found in Figure 4-1, below. Table 4-2 shows the measured statistical values of rainfall data based on RG11, and Table 4-3 shows the rain event distribution by depth. For purposes of this report, only 2017 rainfall data through May is included, but all applicable rainfall data was incorporated into the AOP analysis.

Figure 4-1
Location of RG11 and Flow Monitor

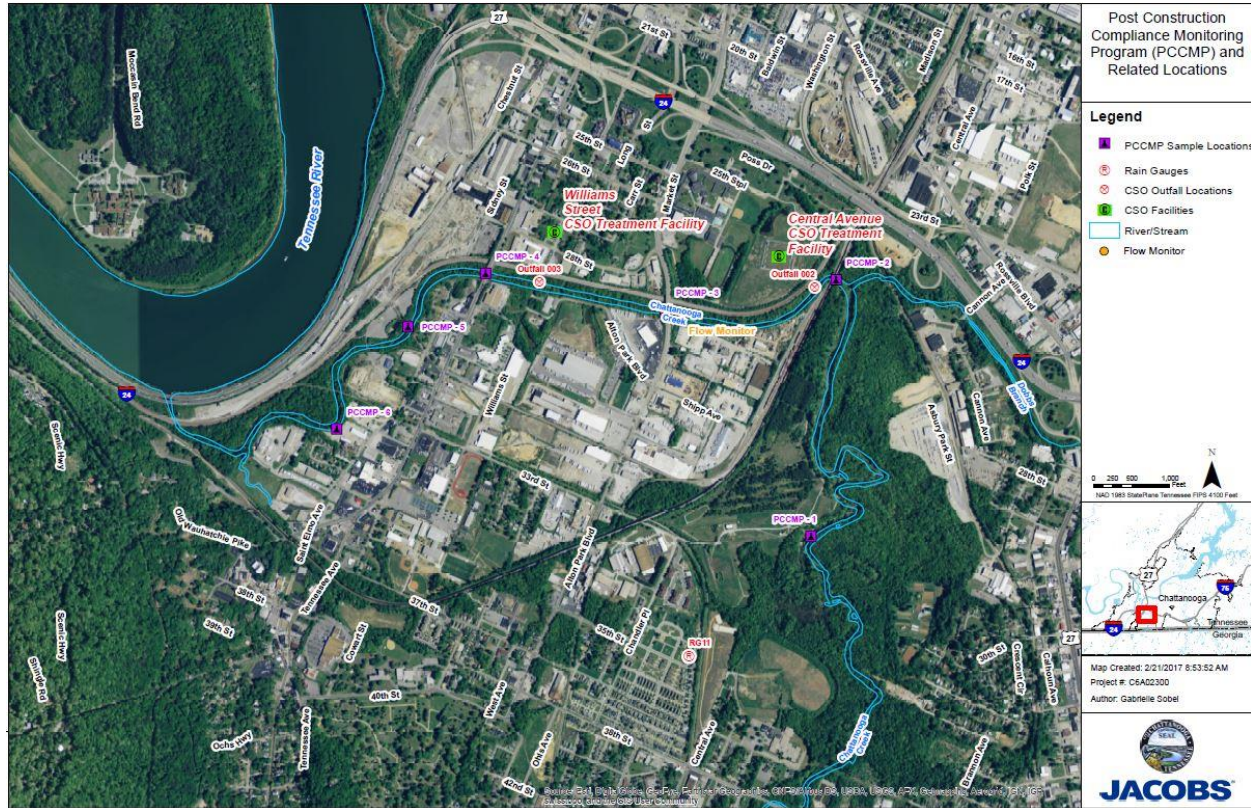


Table 4-2
Statistical Metrics of Rainfall Data for RG11

Statistical Metric	Value
Annual Rainfall Total Depth (in.):	30.91
Annual Average Intensity (in./hr.):	0.099
Annual Average Event Duration (hr.):	17
Total Number of Events:	38
Maximum Event Depth (in.):	3.16

Table 4-3
Rain Event Distribution by Depth for RG11

Date	Storm Total (in)	Duration (hr)	Intensity (in/hr)
1/3/2017	1.25	58	0.022
1/11/2017	0.32	11	0.029
1/12/2017	0.04	1	0.040
1/20/2017	2.11	24	0.088
1/23/2017	1.79	45	0.040
1/25/2017	0.28	3	0.093
2/2/2017	0.03	12	0.003

Date	Storm Total (in)	Duration (hr)	Intensity (in/hr)
2/8/2017	0.67	58	0.012
2/15/2017	0.58	5	0.116
2/19/2017	0.44	22	0.020
2/22/2017	0.22	17	0.013
2/25/2017	0.27	1	0.270
2/27/2017	0.28	3	0.093
2/28/2017	1.01	7	0.144
3/1/2017	0.23	4	0.058
3/7/2017	0.79	11	0.072
3/10/2017	0.39	2	0.195
3/12/2017	0.17	15	0.011
3/14/2017	0.49	19	0.026
3/18/2017	0.17	1	0.170
3/20/2017	0.03	1	0.030
3/21/2017	0.62	1	0.620
3/26/2017	0.3	6	0.050
3/28/2017	1.27	6	0.212
3/31/2017	0.16	4	0.040
4/3/2017	1.44	7	0.206
4/6/2017	0.53	31	0.017
4/20/2017	2.43	68	0.036
4/24/2017	3.16	42	0.075
4/27/2017	1.34	4	0.335
5/1/2017	1.96	36	0.054
5/6/2017	1.85	62	0.030
5/12/2017	0.12	2	0.060
5/19/2017	0.15	6	0.025
5/21/2017	0.86	4	0.215
5/25/2017	1.59	50	0.032
5/28/2017	0.8	8	0.100
5/29/2017	0.77	7	0.110

4.7 Flow Monitoring

A Channel Master flow monitor was installed in Chattanooga Creek that measures the stage and velocity of the creek in order to gage the instantaneous flow needed for model inputs. A map depicting the location of the flow monitor can be found in Figure 4-1, above. Figures 4-2, 4-3, and 4-4 depict the flow, velocity, and depth measured at this flow meter from January 2016 through May 2017.

Figure 4-2
Flow Rate in cfs at Flow Monitor

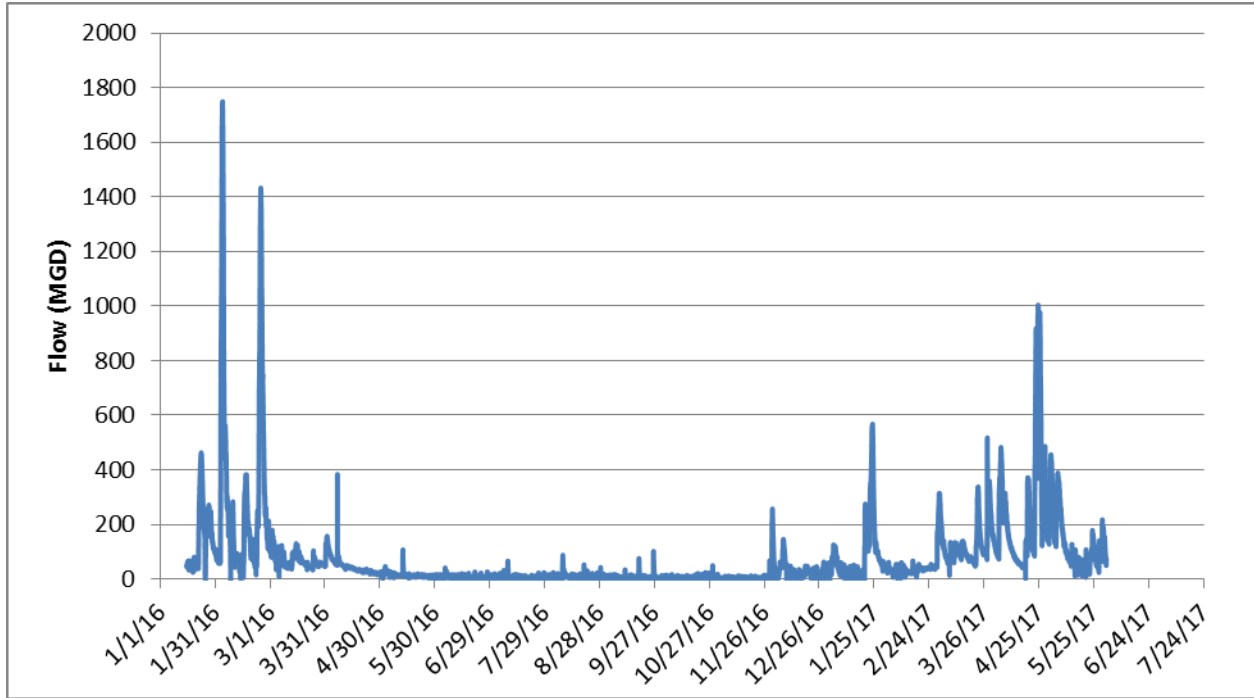


Figure 4-3
Velocity in ft/s at Flow Monitor

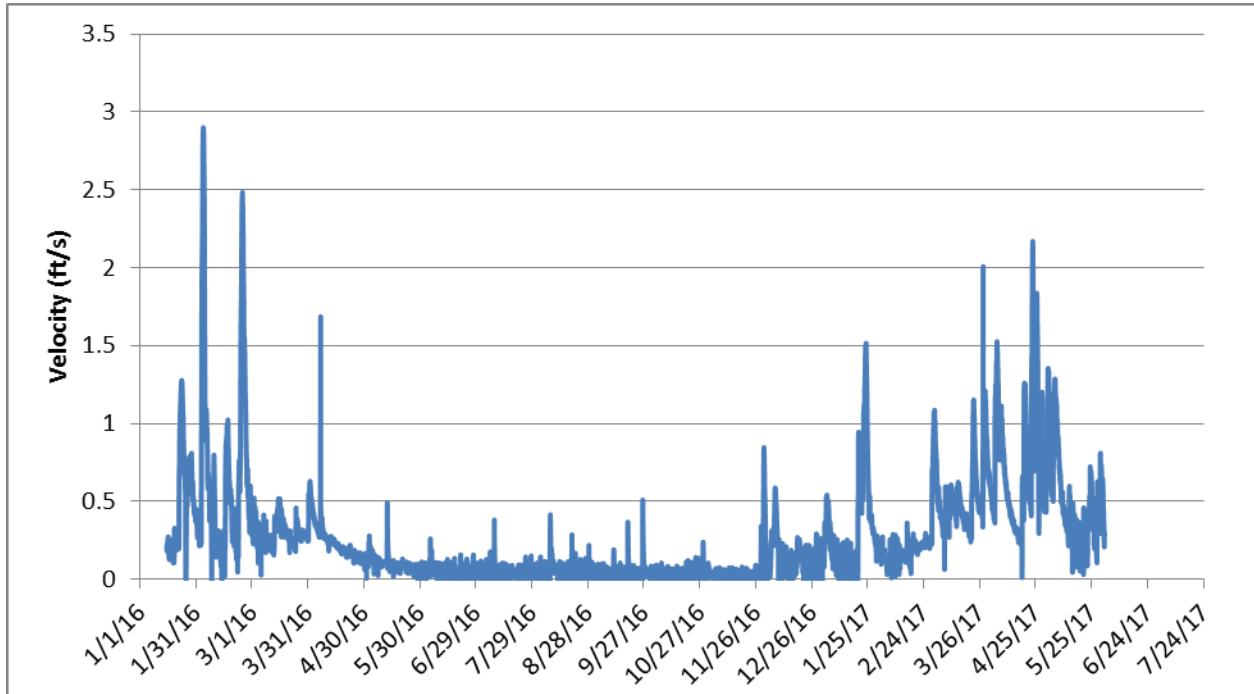


Figure 4-4
Depth in inches at Flow Monitor

