



January 30, 2017

Director of the Division of Enforcement
Department for Environmental Protection
300 Fair Oaks Lane
Frankfort, KY 40601

Chief, Environmental Enforcement Section
Environmental and Natural Resources Division
U.S. Department of Justice
601 D street NW
Washington, DC 20005
DOJ Case No. 90-5-1-1-08591

Ms. Denisse Diaz, Chief
NPDES Permitting and Enforcement Branch
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, Georgia 30303

Re: Consent Decree Case No. 2:05-cv-00199-WOB

To Whom It May Concern:

Pursuant to the above-referenced Consent Decree, Sanitation District No. 1 (SD1) is required to submit quarterly reports that demonstrate SD1's compliance with the Consent Decree:

42. Quarterly Reports. The District shall submit to the Cabinet/EPA a quarterly report that describes the District's progress in complying with this Consent Decree for the previous quarter no later than thirty days after the end of each calendar quarter. The first such report shall be submitted to the Cabinet/EPA no later than thirty days after the second full quarter after entry of this Consent Decree.

Information contained within the enclosed Quarterly Report No. 37 describes SD1's compliance with Consent Decree Case No. 2:05-cv-00199-WOB for the period of October 1, 2016 through December 31, 2016. The report also contains an outlook for the upcoming calendar quarter period of January 1, 2017 through March 31, 2017. An

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annual review of 2016, with comparisons to previous years, is included in the report, as well.

A certification, as required by the Consent Decree (paragraph 68), is also enclosed.

To the best of my knowledge and belief, the enclosed report is true, accurate, and complete, and further demonstrates SD1's commitment to the mission of protecting and enhancing the water resources and quality of life in Northern Kentucky.

If you have any questions or concerns, do not hesitate to contact me at 859-578-7465 or by e-mail at achaney@sd1.org.

Best regards,

Adam Chaney
Executive Director



AC/wck
Enclosures

Sanitation District No. 1
January 30, 2017

Consent Decree
Quarterly Report No. 37
(October 1, 2016 through December 31, 2016)



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CERTIFICATION

Consent Decree Quarterly Report No. 37
Consent Decree Case No. 2:05-cv-00199-WOB

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.


Adam Chaney
Executive Director

1-30-17
Date

COMMONWEALTH OF KENTUCKY

)ss.

COUNTY OF Kenton

The foregoing instrument was acknowledged before me this 30 day of January, 2017 by Adam Chaney, Executive Director of Sanitation District No. 1.


NOTARY PUBLIC

Kenton County, Kentucky

My commission expires: 9-1-20

Angela M. Cook
Notary Public
Kentucky, State at Large
Comm. Exp. 09-01-2020
Notary ID 562735

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CONSENT DECREE QUARTERLY REPORT NO. 37

January 30, 2017



Sanitation District No. 1
1045 Eaton Drive
Ft. Wright, KY 41017

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LIST OF ACRONYMS AND ABBREVIATIONS

AWWA	American Water Works Association
Cabinet	Kentucky Energy and Environment Cabinet
CSAP	Continuous Sewer Assessment Program
CSO	Combined Sewer Overflow
CVG	Cincinnati-Northern Kentucky International Airport
EPA	U.S. Environmental Protection Agency
KDOW	Kentucky Division of Water
KYTC	Kentucky Transportation Cabinet
LDSAP	Large Diameter Sewer Assessment Program
NWS	National Weather Service
O&M	Operations and Maintenance
RADAR	Radio Detection and Ranging
SCADA	Supervisory Control and Data Acquisition
SD1	Sanitation District No. 1
SSO	Sanitary Sewer Overflow

SECTION 1. INTRODUCTION

1.1 Purpose

This Quarterly Report is submitted to fulfill the requirements of Sanitation District No. 1's (SD1) Consent Decree as entered on April 18, 2007. This Consent Decree is a legal agreement with the U.S. Environmental Protection Agency (EPA) and the Kentucky Energy and Environment Cabinet (Cabinet). The purpose of the Consent Decree is to address sanitary sewer overflows (SSOs) in SD1's sanitary sewer system and combined sewer overflows (CSOs) in the combined sewer system, in an effort to improve water quality throughout SD1's service area. Specifically, Section V Reporting Requirements, states that:

42. Quarterly Reports. The District shall submit to the Cabinet/EPA a quarterly report that describes the District's progress in complying with this Consent Decree for the previous quarter no later than thirty days after the end of each calendar quarter.

1.2 Report Period

Information contained within this report describes SD1's compliance with Consent Decree Case No. 2:05-cv-00199-WOB for the period of October 1, 2016 through December 31, 2016. This report also contains an outlook for the upcoming calendar quarter period of January 1, 2017 through March 31, 2017.

1.3 Consent Decree Compliance Schedule

A comprehensive compliance schedule for meeting the requirements of the Consent Decree can be found in Appendix A. A more detailed listing of the projects and activities conducted to comply with the requirements of the Consent Decree, including schedules, project updates for the current reporting period, and planned activity for the following quarter can be found in Appendix B.

Additionally, Appendix B provides a schedule of the projects proposed in the first five years of the Watershed Plans for Northern Kentucky, as well as status updates on CSO

and SSO reduction projects that have not been formally proposed. The Watershed Plans were submitted on March 31, 2011, approved by the Cabinet and EPA in a letter dated February 14, 2014, and resubmitted March 14, 2014 with agreed to revisions, as requested in the February 14, 2014 letter.

Initial Watershed Projects

As shown in Appendix B, SD1 has completed the Initial Watershed Projects. A request to remove a project (Western Regional – Richwood project C-039-00) was included in the revised Watershed Plans, submitted on March 31, 2011. Approval of the request to remove the project was granted in a letter dated May 13, 2013 from the Cabinet and the EPA. SD1 submitted its final Initial Watershed Projects Annual Report on June 7, 2013.

Pump Station Backup Power Plan

As shown in Appendix B, SD1 has completed the Pump Station Operation Plan for Backup Power, before the Consent Decree deadline of December 31, 2015. SD1 submitted its Pump Station Operation Plan for Backup Power on December 14, 2007 and received regulatory approval on May 14, 2008. Of the 127 pump stations identified in the plan, 15 are permanently eliminated, and 112 have fully implemented backup power solutions to mitigate overflows during power failures.

The schedule provided in Appendix B of this report only identifies 110 pump stations, because 17 of the 127 pump stations that required backup power were completed prior to the approval of the plan in 2007. The 17 projects that were identified as complete in Table 3.1 of the Pump Station Operation Plan for Backup Power, submitted on December 14, 2007, are not included in the final schedule provided in Appendix B of this report.

SECTION 2. OVERFLOW DATA

This section of the Quarterly Report presents SD1's estimates of overflow activity in the collection systems.

Overflow Categories

For reporting and system performance measurement purposes, SD1 has categorized sewer overflows throughout the service area into five distinct categories:

- *SSOs Due to Wet-Weather Capacity Issues:* Recurring and Inactive overflows from SD1's sanitary sewer system, due to a lack of capacity during wet weather. This category includes wet-weather discharges at pump stations that may or may not have a constructed bypass. Overflows are determined to be "Recurring" if they have been observed to overflow twice in a running twelve month period. Overflows are determined to be "Inactive" until they occur more than once in a running twelve month period. Inactive overflows are generally under investigation as suspected or predicted hydraulic model overflow points in the collection system.
- *SSOs Due to Operational Issues:* Overflows from SD1's sanitary sewer system, including pump stations that are not a result of wet-weather capacity issues. Many of these are one-time, dry-weather occurrences caused by temporary system issues that are investigated and corrected as soon as practicable.
- *Wet-Weather CSOs:* Wet-weather discharges from the combined sewer system that occur no later than 48 hours after any storm event. Wet-weather CSOs may also be caused by high river impacts.
- *Dry-Weather CSOs:* Dry-weather discharges from the combined sewer system that occur 48 hours after any storm event, during normal river conditions.
- *Building Backups:* The release of raw sewage from a service lateral into a building in SD1's service area. Building backups can be caused by several factors, such as constrained capacity during wet weather, or a blockage or collapse in the private service lateral or the public main line. Building backups can be determined to be associated with the operation of public sewer system, or can be due to other causes beyond the control of SD1.

Quantitative Estimates

SD1 uses three general methods for developing quantitative overflow estimates:

- Field inspections are performed after wet-weather events to identify evidence of activations. This inspection program has been in place since 2005 and is adjusted, as needed, for record keeping and sewer overflow response cleanup.

SD1's Collection Systems Department and Infrastructure Capital Planning Department perform routine inspections after rain events at prioritized Recurring and Inactive SSO locations to confirm overflow activity, and assess the need for sewer overflow response cleanup. Generally, SD1 conducts post-wet-weather inspections of SSOs when cumulative rainfall depth exceeds one inch or two inches for a single storm event. Most SSOs are inspected in the one-inch storm event. Less active SSOs, as determined by modeling and inspection histories, are inspected in the two-inch storm event. Similarly, all CSOs are inspected when the combined sewer system experiences half an inch of cumulative rainfall in a single storm event. Immediately following a storm event, SD1's network of wireless rain gauges is used to determine which sewersheds were impacted, and if enough rain fell in a specific sewershed to warrant field inspections. Inspection routes are fixed to sewersheds, to better account for variation in storm magnitude and intensity across the District's approximate 200 square-mile service area. Political boundaries and average rainfalls are not used to determine when and where inspections are performed. If an isolated region of the service area experiences rainfall that triggers an inspection, SSO assessment efforts are focused only on the portion of the collection system that may be impacted. This continuous and precise inspection effort to verify overflow activity throughout the collection system ensures accurate record keeping, appropriate cleanup response, and characterization of capacity issues for wet-weather modeling. The field-based characterization of overflows ensures that the hydraulic model SD1 utilizes is effectively maintained and improved upon, which helps identify the most appropriate solutions for mitigation.

- Simple hydraulic estimating, using the Manning's Gravity Flow and Pipe Calculation, to report overflows from pump stations with constructed bypasses, and industry standard volume estimations techniques and calculations are used for spills or for any witnessed overflow from a manhole. The only exceptions to this calculation methodology are at the Lakeview Pump Station and, as of January 2016, at the Highland Heights Pump Station. These two pump stations have flow meters in the bypass pipes that are used as the primary sources of overflow volumes estimation. If a flow meter malfunctions at one of these pump stations during an overflow, the Manning's Gravity Flow and Pipe Calculation will be used

as the default method of volume estimation. These methods have been used historically for reporting purposes.

- SD1's hydraulic models are used for quarterly activation and volume estimations of wet-weather CSOs and SSOs. SD1 completed a year-long flow monitoring program in 2008, consisting of more than 245 flow meters and 45 rain gauges installed throughout the combined and separated systems, to update the calibration of SD1's system-wide hydraulic models. This calibration was undertaken to provide a model network that could confidently be used as an accurate tool in preparing SD1's Watershed Plans. Currently, SD1 maintains approximately 70 flow meters and 25 rain gauges throughout the year, which are used to continuously update and refine the models and investigate capacity issues. Additionally, the models are being used to provide information about the current performance of SD1's system on a quarterly basis. With the historical and current flow monitoring and inspection data, SD1 maintains its highly calibrated network of hydraulic models to provide an accurate representation of the collection system. These modeling and monitoring tools confidently provide estimates of overflow activations and volumes from the sewer systems as a result of wet weather. The models are continuously revised to incorporate rehabilitation and maintenance activities, completed capital projects, private developments, data gathered from GPS surveys, and mapping of discovered infrastructure. This process ensures that the models are kept up-to-date and accurately reflect the current collection system. This approach is consistent with SD1's commitment to provide the best available information on overflow activity.

For this submittal, SD1 has collected rainfall data from a series of 23 rain gauges located across the system, to simulate the wet weather that occurred between October 1, 2016 and December 31, 2016. The results of the model simulations have been summarized and included as an estimate of the frequency and total volume of the overflow locations within SD1's system for this period. These results are not a summary of observed or confirmed activations, but are a confident estimate of the overflow statistics based on the calibrated and verified models.

Precipitation Data

Rainfall statistics are an important component of overflow reporting, as rainfall conditions represent an uncontrolled variable impacting SD1’s wet-weather CSO and SSO activity. Quarterly CSO and SSO activations and volumes change over time, due to natural variations in rainfall patterns and antecedent moisture conditions. Over time, SD1 expects system improvements to show a clear trend in reduced overflow activity. However, reviewing overflow reports for any individual quarter, relative to previous quarters, also requires careful review of the rainfall associated with each period, in order to understand the impact of shifting rainfall patterns. For this reason, storm event summaries are included in all overflow reporting submittals. The data in Table 2.1 is from the Cincinnati-Northern Kentucky International Airport (CVG) rain gauge, maintained by the National Weather Service (NWS), in northeast Boone County.

Table 2.1 Summary of Storm Events at CVG, per National Weather Service (October 1, 2016 through December 31, 2016)

Month	Approximate # of Storm Events¹	Rainfall (in)
October	4	2.92
November	6	1.51
December	10	4.42
Total	20	8.85

¹ A storm event is defined as at least 0.01" of rain with a minimum inter-event time of 7 hours.

The historical average of fourth quarter cumulative rainfall depth from 1951 through 2005 at CVG is approximately 9.23 inches. For further comparison, the typical year (1970) produced approximately 8.05 inches of rainfall during the fourth quarter. The NWS’s recorded cumulative depth of rainfall for the fourth quarter of 2016, 8.85 inches, is approximately four percent less than the historical average and 10 percent greater than the typical year’s fourth quarter.

The remainder of this section provides updates on overflows that occurred throughout SD1’s service area during the period of October 1, 2016 through December 31, 2016. A cumulative accounting of SD1’s overflow activity throughout 2016, and annual comparisons from 2008 through 2016, can be found in Appendix C.

2.1 SSOs Due to Wet Weather Capacity Issues

This section summarizes the Recurring and Inactive overflows from SD1's sanitary sewer system, due to lack of capacity during wet weather. Wet-weather discharges at pump stations that may or may not have a constructed bypasses are also included in this section. Sanitary Sewer Overflows are classified as Recurring if evidence of overflow is found at least twice in a twelve month period. Sanitary Sewer Overflows are classified as Inactive until evidence of overflow is confirmed more than once in a twelve month period. An Inactive SSO is generally under investigation for at least two years as a suspected or predicted hydraulic model overflow point in the collection system, until it is confirmed as a Recurring SSO or is eliminated.

Recurring Wet-Weather SSOs

Modeled activation and volume statistics of SD1's 108 Recurring SSOs, for the current reporting period, can be found in Appendix D. The Recurring SSO list is updated annually in the April Quarterly Report to reflect the latest information from ongoing system characterization, based upon field inspections, flow monitoring, and hydraulic modeling. The variation in annual precipitation also influences the year-to-year changes to the Recurring SSO list. A detailed list of structure numbers and transaction descriptions for the revisions made to the current Recurring SSO list can be found in Quarterly Report No. 34, submitted on April 30, 2016. Forthcoming revisions to the current Recurring Wet-Weather SSO list will be published in Quarterly Report No. 38, due on April 30, 2017.

During the fourth quarter of 2016, SD1 performed approximately 263 post-wet-weather inspections at approximately 155 Recurring and Inactive SSOs. Approximately 73 of the 263 post-wet-weather inspections confirmed overflow evidence or high river impacts. There were two storm events that prompted these post-wet-weather SSO inspections. The storm dates and the largest recorded rainfall depths in the service area are provided below:

- October 19-21 – 4.18 inches near the City of Union in Boone County
- December 17 – 2.66 inches near the City of Alexandria in Campbell County

Recurring Wet-Weather SSO Pump Stations Listed in the Consent Decree

In addition to the 108 Recurring SSOs, there are also 14 pump stations identified in the Consent Decree that have historically documented recurring wet- weather capacity issues.

As previously described, the Lakeview Pump Station is the only pump station listed in the Consent Decree that has a metered bypass to calculate overflow volumes. All other overflow volumes at Consent Decree listed pump stations are estimated using the Manning's Gravity Flow and Pipe Calculation with start/stop times provided by telemetry.

Table 2.2 lists each of the 14 pump stations identified in Exhibit E of the Consent Decree, and demonstrates their observed wet-weather SSO occurrences and estimated discharge volumes for the fourth quarter of 2016.

Table 2.2 Discharges from Consent Decree Pump Stations Due to Lack of Capacity during Wet Weather
(October 1, 2016 through December 31, 2016)

Name of Pump Station	Number of Wet-Weather Related Discharge Occurrences	Total Estimated Volume (gallons)
Lakeview	2	1,001,400
Alex-Licking	0	0
Allen Fork	0	0
Crestview	0	0
Harrison Harbor	0	0
Highland Acres	0	0
Kentucky Aire	0	0
Riley Road	0	0
Ripple Creek	0	0
South Hampton	0	0
South Park	0	0
Sunset	0	0
Taylorport	0	0
Union	0	0
TOTAL	2	1,001,400

Gray denotes where required capital improvements have been made to pump stations.

On December 17, 2016, an overflow occurred at the Lakeview Pump Station during a storm event that produced approximately 2.19 inches of rain in the Lakeview

sewershed. SD1 notified KDOW of other pump station overflows during this event, but did not provide initial notification of the Lakeview Pump Station overflow due to an oversight by a new operator. In preparation of Quarterly Report No. 37, SD1's hydraulic model predicted an SSO at the Lakeview Pump Station for the storm event, which was subsequently confirmed by a review of the SCADA data. The flow meter installed in the Lakeview Pump Station bypass pipe successfully recorded the SSO, which lasted for approximately eight hours and spilled approximately 260,000 gallons. The new operator has received additional training. The wet-weather SSO has been accounted for in Table 2.2 and all cumulative accounts of wet-weather SSOs in Appendices C and G.

Wet Weather SSO Pump Stations Not Listed in the Consent Decree

In addition to tracking the recurring wet-weather SSOs at the pump stations listed in the Consent Decree, SD1 continuously monitors all pump stations throughout the service area for recurring wet-weather capacity issues. During the current reporting period, the Highland Heights Pump Station is the only pump station not listed in the Consent Decree where SD1 observed wet-weather capacity issues. As of January 2016, the estimated overflow volumes provided at the Highland Heights Pump Station have been calculated by a flow meter in the bypass pipe. The Highland Heights Pump Station discharged five times, intermittently, over ten days, for an approximate total of 2,167,950 gallons of SSO.

Inactive Wet-Weather SSOs

No inactive wet-weather SSOs were observed by SD1 during the current reporting period.

2.2 SSOs Due to Operational Issues

This category of overflows includes discharges from SD1's separate or combined sanitary sewer systems that are not a result of wet-weather capacity issues. Many of these are one-time occurrences caused by temporary system failure or mechanical failures, in dry or wet weather, that are investigated and corrected as soon as possible.

During the fourth quarter of 2016, there were a total of 13 SSOs due to operational issues throughout SD1’s service area. A total estimated overflow volume of 79,700 gallons discharged during these incidents.

These SSOs were immediately acted upon and the problems repaired as soon as possible. The sewers where structural or maintenance failures occurred were put into or updated in the Continuous Sewer Assessment Program (CSAP) to be inspected and cleaned as determined by the CSAP logic, which also provides appropriate next actions to permanently address the causes of the failure. All overflow events are recorded in Lucity and are periodically reviewed to identify if any trends or localized problem areas exist that warrant the need for increased inspections, new preventative maintenance routines, repairs or rehabilitation projects.

Figure 2.1 demonstrates the primary causes of the overflows, and Figure 2.2 demonstrates the corresponding total estimated overflow volume of each category of operational failure.

Figure 2.1 Occurrences of SSO Due to Operational Issues per Cause
(October 1, 2016 through December 31, 2016)

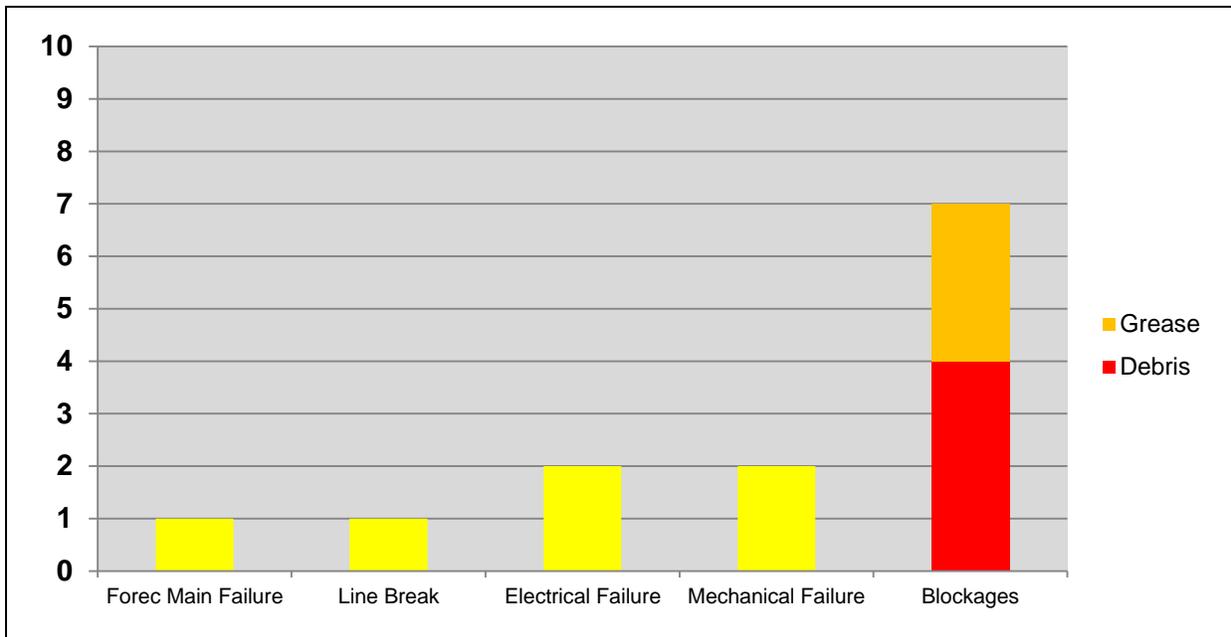
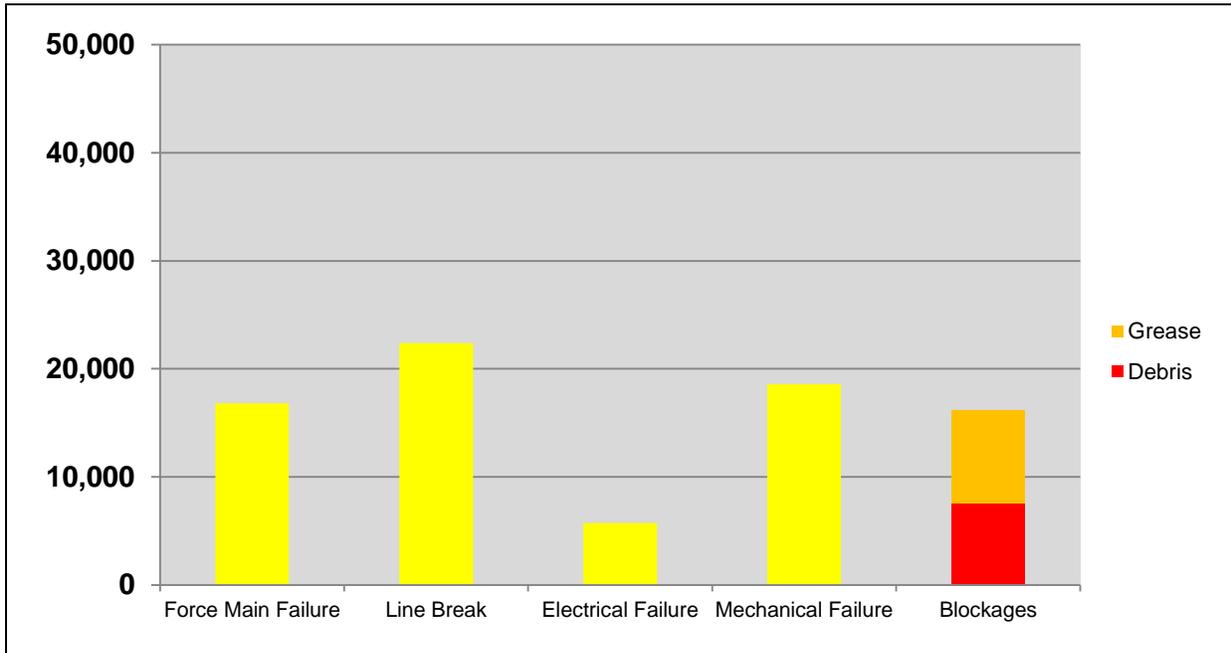


Figure 2.2 Gallons of SSO Due to Operational Issues per Cause
 (October 1, 2016 through December 31, 2016)



2.3 Wet Weather CSOs

Included in Appendix E are the modeled activation and volume statistics for SD1’s 95 CSOs. These data were generated from the hydraulic modeling program previously described in Section 2.1.

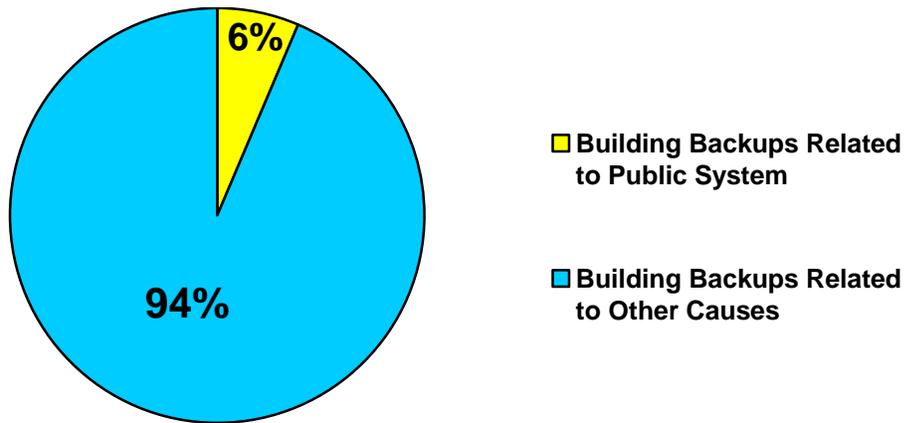
2.4 Dry Weather CSOs

No dry-weather CSOs were observed by SD1 during the current reporting period.

2.5 Building Backups

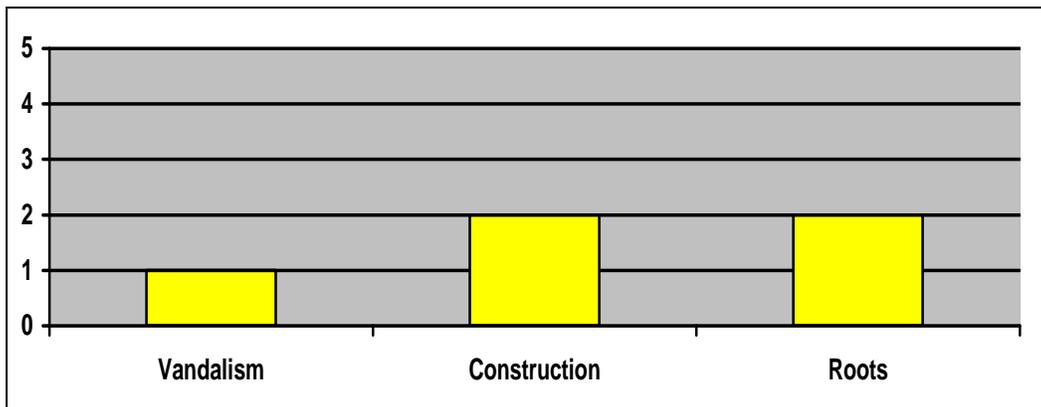
During the current reporting period, there were approximately 79 building backups recorded throughout SD1’s service area. Of these 79 backups, approximately five were related to the condition or operation of the public sewers and 74 were caused by other issues, as shown in Figure 2.3.

Figure 2.3 Building Backups: Public System vs. Other Causes
 (October 1, 2016 through December 31, 2016)



The building backups determined to not be related to the condition or operation of the public sewers, were caused by blockages in private service laterals and internal plumbing issues. The causes of the five building backups determined to be related to the condition or operation of the public sewer lines are detailed in Figure 2.4.

Figure 2.4 Occurrences of Public System Related Building Backups per Cause
 (October 1, 2016 through December 31, 2016)



The sewers where blockages occurred were put into or updated in SD1's CSAP to be inspected and cleaned, as determined by the program logic, which also provides appropriate next actions to permanently address the cause of the blockages.

All building backups are recorded in Lucity and are periodically reviewed to identify if any trends or localized problem areas exist that warrant the need for increased inspections, new preventative maintenance routines, repairs or rehabilitation projects.

SECTION 3. ANNUAL REVIEW OF OVERFLOW DATA

The activities, programs and projects SD1 implements are intended to reduce the frequency and volume of SSOs and CSOs throughout SD1's service area. These efforts include Capacity, Management, Operations and Maintenance programs, implementation of the Nine Minimum Controls for CSOs, and various capital improvement projects. As a means to gauge the benefits of these efforts, this section accounts for the reductions or increases in annual overflow activity from year to year and provides an analysis as to what has contributed to these changes. Rainfall and Ohio River stage level data considered in this analysis are also provided, as each represents an uncontrolled variable that significantly impacts SD1's wet-weather CSO and SSO activity. In general, focus on weather and river conditions are included for the last four years, with year-to-year changes between 2015 and 2016, while older overflow and operational data are included for historical reference. Additional summary comparisons of SD1's overflow data, since 2008, can be found in Appendix C.

3.1 Summary of Precipitation Data

As previously described in Section 2, overflow activations and volumes will constantly change over time, with or without system improvements, due to the natural variations in rainfall patterns, associated groundwater levels, and antecedent moisture conditions. Therefore, SD1 must take into consideration the influence of precipitation to determine the actual impact of system improvements.

Rainfall Conditions

The cumulative rainfall depth data in Tables 3.1 and 3.2 are based on total rainfall data recorded at the Cincinnati-Northern Kentucky International Airport (CVG) by the National Weather Service (NWS). The storm event data is based on an estimate of the number of events observed at the rain gauges within the SD1 system. An event is defined as a period of time where rainfall is bracketed by at least seven hours of no rainfall.

The historical average for annual cumulative rainfall from 1950 to 2005 at CVG is 41.05 inches, according to the NWS.

Table 3.1 Rain Events and Total Rainfall by Quarter (2013 through 2016)

Qtr.	2013			2014			2015			2016		
	# of Storm Events	Rainfall (in)	Avg. Storm (in)	# of Storm Events	Rainfall (in)	Avg. Storm (in)	# of Storm Events	Rainfall (in)	Avg. Storm (in)	# of Storm Events	Rainfall (in)	Avg. Storm (in)
1st	28	9.31	0.33	30	7.85	0.26	22	10.47	0.48	24	10.57	0.44
2nd	31	14.39	0.46	28	15.74	0.56	36	12.49	0.35	36	10.15	0.28
3rd	15	14.17	0.94	25	10.00	0.40	31	9.77	0.32	31	13.65	0.44
4th	27	12.76	0.47	27	8.63	0.31	26	14.65	0.56	20	8.85	0.44
Total	101	50.63	0.50	110	42.22	0.38	115	47.38	0.41	111	43.22	0.39

A storm event is defined as at least 0.01" of rain with a minimum inter-event time of 7 hours.

Table 3.2 Rain Events and Total Rainfall Change from 2015 to 2016

Qtr.	Change from 2015 to 2016	
	# of Storm Events	Rainfall (in)
1st	2	0.10
2nd	0	-2.34
3 rd	0	3.88
4th	-6	-5.80
Total	-4	-4.16

The daily precipitation statistics in Figures 3.1 and 3.2 are also derived from daily rainfall totals maintained by the NWS rain gauge at CVG.

Figure 3.1 Daily Precipitation (2013 through 2016)

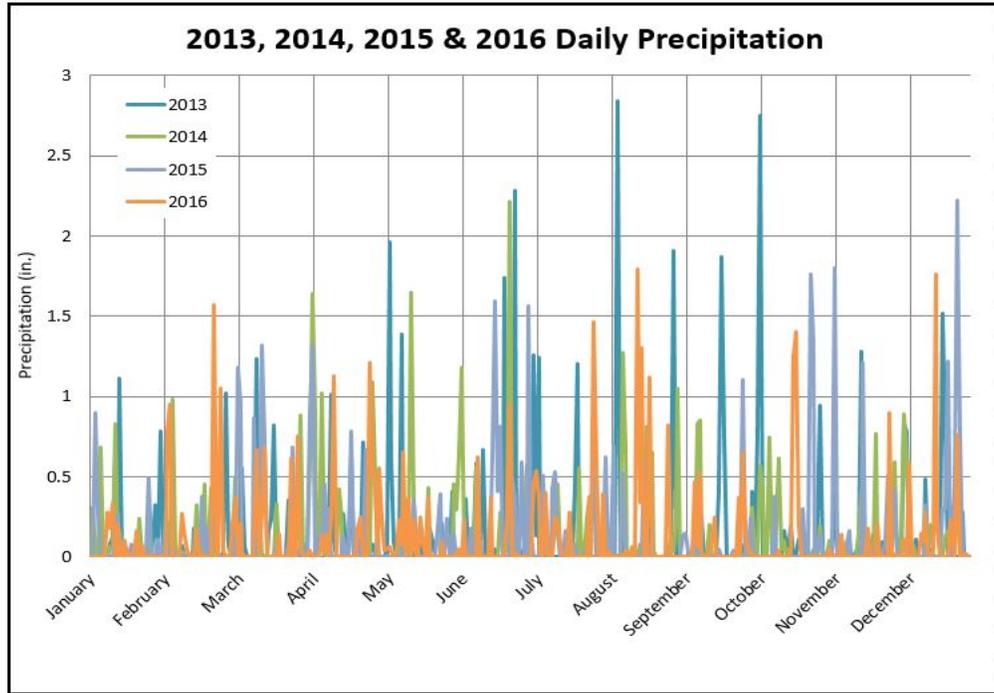
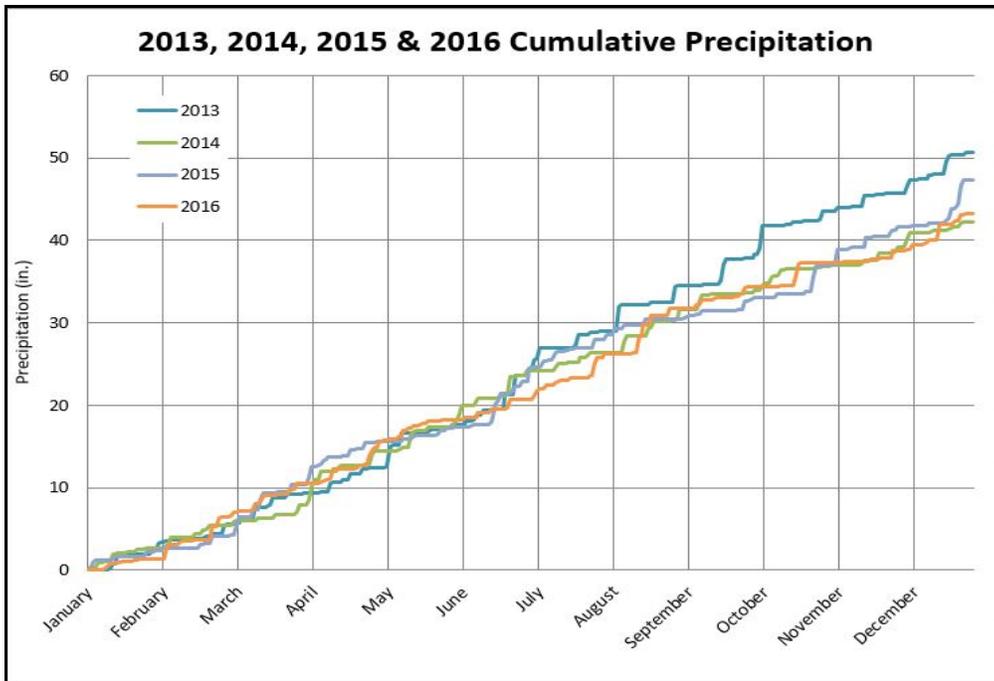


Figure 3.2 Cumulative Precipitation (2013 through 2016)



The cumulative depth of rainfall in 2016 at CVG was 43.22 inches and represented a nine percent decrease in rainfall from 2015. The number of rainfall events in 2016

decreased only three percent from 2015, and on average, storms had slightly lower rainfall intensities in 2016 at CVG. The cumulative rainfall depth in 2016 of 43.24 inches is six percent higher than the typical year rainfall amount of 40.81 inches; while the average storm size of 0.39 inches per storm is very close to the typical year average storm size of 0.40 inches per storm. Reviewing rainfall over the past four years reveals that annual totals in 2016 compare very closely to 2014, with both years producing cumulative rainfall depths similar to the typical year. The cumulative rainfall depths from 2013 and 2015 also compare closely, indicating higher rainfall totals than average.

Geographic Variation of Storm Magnitudes and Intensities in 2016

While the CVG rain gauge maintained by the NWS generally represents rainfall across all of SD1's service area, it is important to note that isolated storm events captured by the SD1 rain gauge network and other weather stations, can vary significantly in magnitude and intensity. It should also be noted that the third quarter of 2016 experienced several large, isolated storms in portions of the SD1 service area that are not well represented by the standard summary of the CVG rain gauge in the preceding tables and figures. Quarterly Report No. 36 provided a supplemental summary of 25 storm events that produced 22.15 inches of rain in Kenton and Campbell Counties, per the Kentucky Mesonet weather station in the City of Highland Heights. Kentucky Mesonet is the official source of weather and climate data for the Commonwealth of Kentucky and is associated with the NWS. If the larger isolated storm events recorded by the Kentucky Mesonet weather station in the third quarter were included in the preceding 2016 summaries, then the cumulative rainfall depth for the year would be 51.72 inches, approximately 20 percent more than the cumulative rainfall recorded at CVG, and the average storm would be 0.49 inches. When accounting for these larger, isolated events, 2016 compares much closer to 2013 than it does to 2014. This is an important distinction that must be made, when reviewing the relative wet-weather overflow volumes provided in Section 3.2.1.

For the sake of maintaining continuity in the standardized reporting of rainfall statistics, this and all other Quarterly Reports tally only the cumulative rainfall depths and event durations recorded by the NWS-maintained rain gauge at CVG. However, Figure 3.3 provides further clarification on the locations of all the rain gauges used for modeling and reporting, and Table 3.3 details the significant variation in the maximum return periods of 2016 for each SD1 rain gauge, as compared to maximum returns at CVG.

Figure 3.3 Rain Gauge Locations

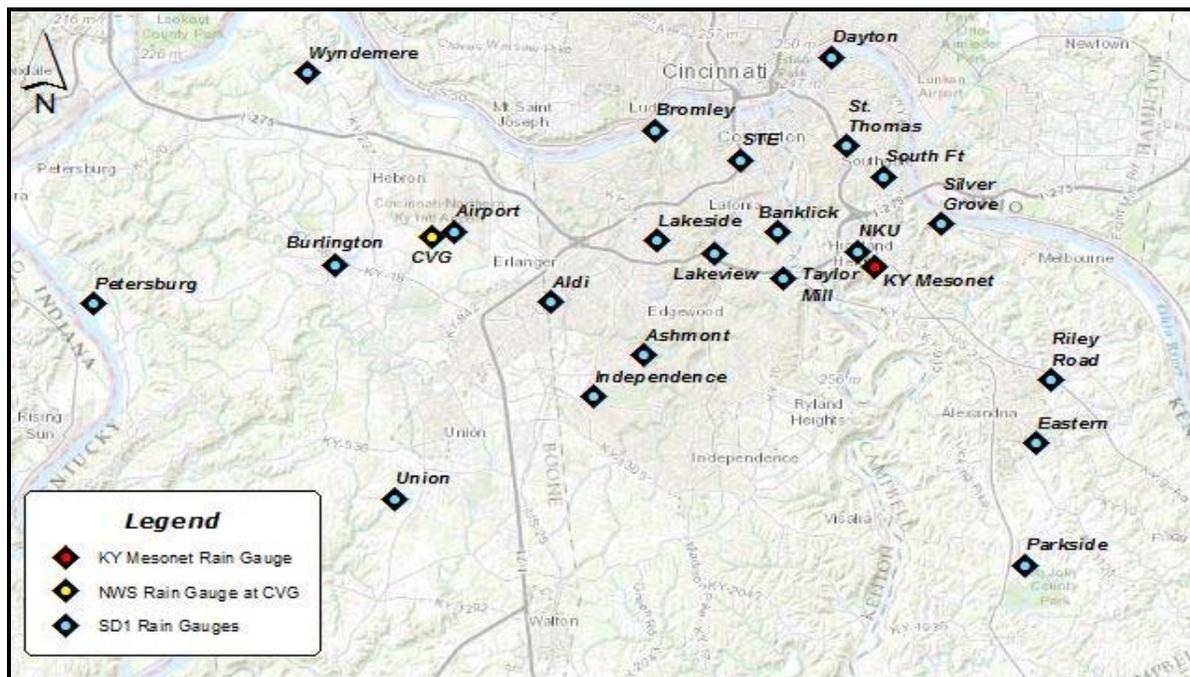


Figure 3.3 Variation in 2016 Maximum Return Periods per Rain Gauge

Rain Gauge	Total Rainfall (in)	Maximum Return Period						
		15-Min	30-Min	1-HR	3-HR	6-HR	12-HR	24-HR
Airport	37.78	> 1 yr	> 1 yr	> 6 mth	> 6 mth	> 6 mth	> 4 mth	> 3 mth
Aldi	41.40	> 2 yr	> 2 yr	> 2 yr	> 2 yr	> 2 yr	> 1 yr	> 9 mth
Ashmont	46.76	> 2 yr	> 5 yr	> 5 yr	> 5 yr	> 2 yr	> 2 yr	> 2 yr
Banklick	44.35	> 1 yr	> 1 yr	> 2 yr	> 2 yr	> 1 yr	> 9 mth	> 6 mth
Bromley	43.07	> 5 yr	> 10 yr	> 10 yr	> 2 yr	> 2 yr	> 1 yr	> 9 mth
Burlington	40.56	> 2 yr	> 1 yr	> 9 mth	> 6 mth	6 mth	> 4 mth	> 9 mth
Dayton	41.05	> 10 yr	> 10 yr	> 10 yr	> 5 yr	> 5 yr	> 2 yr	> 1 yr
Eastern	42.12	> 2 yr	> 10 yr	> 10 yr	> 5 yr	5 yr	> 2 yr	> 2 yr
Florence	34.58	> 2 yr	> 1 yr	> 2 yr	> 1 yr	1 yr	> 6 mth	> 1 yr
Independence	43.27	> 2 yr	> 2 yr	> 2 yr	> 1 yr	> 1 yr	> 6 mth	> 6 mth
Lakeside	41.68	> 2 yr	> 2 yr	> 2 yr	> 1 yr	> 1 yr	> 6 mth	> 6 mth
Lakeview	44.06	> 2 yr	> 1 yr	> 9 mth	> 9 mth	> 9 mth	> 6 mth	> 6 mth
NKU	39.37	> 1 yr	> 1 yr	> 1 yr	> 5 yr	> 2 yr	> 1 yr	> 9 mth
Parkside	40.41	> 10 yr	> 5 yr	> 5 yr	> 5 yr	> 5 yr	> 2 yr	> 2 yr
Petersburg	35.91	> 1 yr	> 1 yr	> 9 mth	> 6 mth	> 6 mth	> 4 mth	> 9 mth
Silver Grove	46.46	> 2 yr	> 5 yr	> 5 yr	> 10 yr	> 10 yr	> 5 yr	> 2 yr
South FT	44.69	> 2 yr	> 10 yr	> 10 yr	> 25 yr	> 25 yr	> 10 yr	> 5 yr
St Elizabeth	43.87	> 2 yr	> 5 yr	> 5 yr	> 5 yr	> 5 yr	> 2 yr	> 1 yr
St Thomas	40.73	> 1 yr	> 5 yr	> 10 yr	> 10 yr	> 10 yr	> 5 yr	> 2 yr
Sunset	46.16	> 2 yr	> 5 yr	> 5 yr	> 2 yr	> 2 yr	> 1 yr	> 1 yr
Taylor	42.03	> 5 yr	> 25 yr	> 50 yr	> 10 yr	> 5 yr	> 2 yr	> 2 yr
Union	38.33	> 2 yr	> 1 yr	> 1 yr	> 5 yr	> 2 yr	> 2 yr	> 2 yr
Wyndemere	38.93	> 6 mth	6 mth	> 1 yr	> 2 yr	> 1 yr	> 9 mth	> 6 mth
CVG	43.24	> 2 yr	> 9 mth	> 4 mth	> 4 mth	> 4 mth	> 4 mth	> 6 mth

Return periods per Huff-Angel's 1992 Rainfall Frequency Atlas of the Mid-West (Bulletin 71)

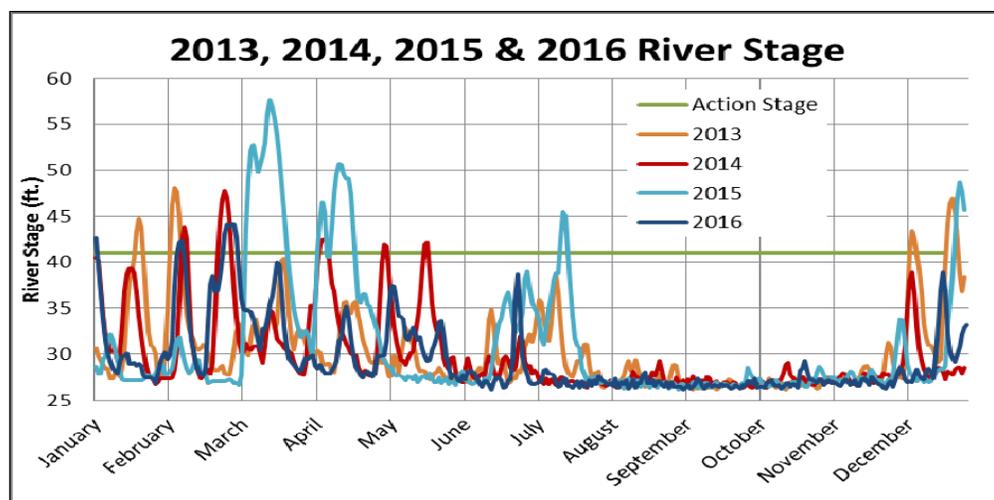
Provided in Appendix F, is a map rendered from NWS RADAR data that displays significant spatial variation in the magnitude of a single third-quarter storm event. For the selected event, the RADAR indicates portions of the SD1 service area may have received more than three times the total rainfall than the location of the CVG rain gauge.

Ohio River Impacts

SD1's system is influenced in multiple ways by the local Ohio River stage level. In addition to increasing groundwater levels that cause additional infiltration to occur, SD1's system operation is also impacted when the river stage is above 41 feet, as shown in Figure 3.4. When the Ohio River reaches the Army Corps of Engineers' specified river stages during flood conditions, flood gates on the CSO outfalls are closed to isolate the sewer system from high river water. Other sewer system flood gates are opened or closed to isolate portions of the interceptor and combined sewers to re-route sewer flows to the flood pumping stations. The flood pumping stations and gates were designed by the Army Corps of Engineers to protect the river cities from flooding internally due to elevated river levels, or during rain events when the flows in the combined sewers cannot flow out into the river due to the elevated river levels. SD1 continues to work on eliminating river water intrusion through a program to install duckbill-style check valves on CSO outfalls, effective up to river levels of 47 feet.

Table 3.4 shows the number of days each quarter that the river stage exceeded 41 feet from 2013 to 2016. On average, the Ohio River is at or above 41 feet for 26 days of the year, based upon the daily river stage readings from 1970 to 2005.

Figure 3.4 Daily River Stage (2013 through 2016)



**Table 3.4 Number of Days Ohio River Stage Level above 41 Feet
(2013 through 2016)**

Quarter	2013	2014	2015	2016
1	8	8	18	9
2	0	8	14	0
3	0	0	4	0
4	8	0	5	0
Total	8	16	41	9

In 2016 the Ohio River stage level of 41 feet was exceeded for nine days, 17 days less than the 35-year average. The Ohio River stage exceedances above 41 feet occurred only in the first quarter of 2016. During the first quarter, the Ohio River reached a maximum of 44.4 feet. The historic high river conditions in the first half of 2015 had a significant influence on the SD1 collection system that increased CSO volumes and contributed to dry-weather CSOs due to settling debris. The below average year for high river days in 2016 resulted in noticeable reductions in wet and dry weather CSOs. A more detailed summary of the above presented information and how it relates to changes in CSO overflow frequency and volume is included in Section 3.4 of this report.

3.2 Review of SSOs Due to Wet Weather Capacity Issues

3.2.1 Recurring Wet Weather SSOs

On the following page, Table 3.5 provides a summary of the approximate number of activations and approximate total volume of recurring wet-weather SSOs from 2008 through 2016, including wet-weather overflows that occurred at pump stations.

Table 3.6 provides the quarterly changes in wet-weather SSO activations and volumes from 2015 to 2016. Generally, 2015 was a wetter year than 2016, so wet-weather SSO volumes decreased slightly by five percent. However, 2016 experienced a two percent increase in SSO activations over 2015, which is likely attributable to the isolated intense storm events in the third quarter of 2016. A more detailed analysis of the recent fluctuations in SSO activity and volume follows Table 3.6.

Table 3.5 Recurring Wet Weather SSOs by Quarter (2008 through 2016)

		1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter	Total
2008	Activations	285	211	24	56	576
	Volume (MG)	103	39	2	14	158
2009	Activations	152	175	147	177	651
	Volume (MG)	26	24	20	35	105
2010	Activations	128	351	123	134	736
	Volume (MG)	30	55	14	41	140
2011	Activations	428	1,097	256	441	2,222
	Volume (MG)	106	232	23	124	485
2012	Activations	340	129	427	171	1,067
	Volume (MG)	52	8	43	20	123
2013	Activations	132	281	491	330	1,234
	Volume (MG)	23	23	62	66	174
2014	Activations	66	247	109	40	462
	Volume (MG)	11	22	2	6	41
2015	Activations	141	224	217	381	963
	Volume (MG)	32	28	13	60	133
2016	Activations	256	131	466	136	989
	Volume (MG)	38	14	52	23	127

Table 3.6 Recurring Wet Weather SSOs Change from 2015 to 2016

			Change from 2015 to 2016	
Qtr.	Activations	Volume (MG)		
1st	115	6		
2nd	-93	-14		
3rd	243	39		
4th	-245	-37		
Total	20	-6		

The modest decrease in SSO volume from 2015 to 2016 is primarily due to lower rainfall totals in portions of the SD1 service area that are served by separate sewer systems. However, localized pockets of intense rainfall in 2016, particularly during the third quarter, caused the number of SSO activations to slightly increase over the total activations of 2015. While on-going model updates and calibration refinements will continue to introduce variance when comparing the current year's overflow predictions to previous years, model updates made in 2016 do not appear to have any significant impact on the recent activation and volume changes since 2015.

Approximately 41 million gallons of SSO is the lowest annual total volume since SD1 entered into the Consent Decree. The record low was recorded in 2014. In 2016, SD1 estimates that approximately 127 million gallons of SSO were spilled. The model updates and calibrations since the beginning of 2014 account for approximately 16 million gallons of the 86 million-gallon increase between the two years, or 18 percent.

As described in Section 3.1, the cumulative rainfall depths recorded at CVG were very similar in 2016 and 2014, but localized storm magnitudes and intensities were not. A review of the SD1 rain gauge network indicates that storms in 2014 had significantly lower maximum return periods than the storms in 2016. No storm event, at any duration, recorded by any SD1 rain gauge in 2014 exceed a 2-year return period, while SD1 rain gauges recorded storms that exceeded the 5-year return period approximately 49 times in 2016. After accounting for all of the model calibrations since 2014, the remaining 70 million-gallon difference in SSO volume between 2014 and 2016 is attributable entirely to these isolated intense storm events that were not recorded by the CVG rain gauge. Hence, the total SSO volume of 2016 is more in line with what was recorded in the wetter year of 2015.

The model, inspections, and the flow monitoring operations that support the model calibrations, generally indicate a decreasing trend in SSO activations and total spill volumes. SD1's capital improvements and collection system management programs are clearly having the intended impacts on wet-weather SSO activity. Appendix G provides SSO volume trends.

3.2.2 Inactive Wet Weather SSOs

SD1 has performed wet-weather SSO investigations since 2005, but has only tracked Inactive SSO occurrences for inclusion in the Quarterly Reports since the beginning of 2009. In 2011, a total of 36 new Inactive SSOs were identified during a record rainfall year that produced more than 73 inches of rain. Most of the Inactive SSOs observed in 2011 were added to the Recurring SSO list in 2012. The Recurring SSO list peaked at 183 known locations shortly after the record rainfall year produced so many new Inactive SSOs. Inspections and subsequent revisions since the record rainfall year of 2011 indicate sharp declines from both of the Recurring SSO and Inactive SSO lists. There are currently 27 known Inactive SSOs that have observed overflow evidence at least once during a 12 month period, and 72 Inactive SSOs that are suspected spill points from modeling evidence. All known or suspected Inactive SSOs are inspected regularly to verify wet-weather overflow activity and future status revisions.

SD1 recorded six new Inactive SSOs at five pump stations in 2016. The Inactive SSO events were triggered by the same third quarter isolated storms that have been previously described. Four of the five Inactive SSOs occurred at pump stations that were previously classified as Recurring SSO Pump Stations. The pump stations had not experienced recurring SSO activity in two or more years, until the third quarter of 2016. Of the four pump stations with previously known recurring activity, three will remain classified as Inactive until further activity is observed, or two years pass with no further activity. The Keavy Road Pump Station will be reclassified as a Recurring SSO Pump Station in future reports, since it discharged twice within a single year. Refer to Quarterly Report No. 36 for further detail on the new Inactive SSOs described here.

SD1 anticipates that the number of activations and volumes for this category of overflows to vary from year to year, depending on the size of the rain events that occur and the antecedent moisture conditions during rain events. Inactive SSOs will generally remain under investigation as suspected or predicted overflow points that must be confirmed with regular inspection or flow monitoring before status revisions are made.

3.3 Review of SSOs Due to Operational Issues

Historically, SD1 has used a metric called Wastewater Collection System Integrity, from the American Water Works Association's (AWWA) 2007 Annual Survey Data &

Analyses Report, to measure how its annual SSOs due to operational issues compare to the rest of the wastewater industry in the Southern Region. SD1 has been in the top quartile (3.8 failures, per 100 miles of pipe, per year) for seven years in a row for the utilities AWWA surveyed in the Southern Region in 2017. However, the AWWA continues to regularly update these benchmarks regionally and nationally. SD1 began comparing itself against the better nation-wide benchmark provided in the 2011 AWWA Annual Survey. The 2011 AWWA survey established benchmark rates for failures leading to SSOs from 45 wastewater utilities across the entire country. The nation-wide top quartile was found to be 2.5 failures leading to SSO, per 100 miles of collection system piping, per year. SD1 currently operates and maintains more than 1,600 miles of collection system piping, which equates to the 2011 AWWA nation-wide top-quartile benchmark of 40 SSOs per year, due to operational issues. As shown in Table 3.7, below, SD1 was in the industry's nation-wide top quartile in 2012 and 2014, and just shy of the top quartile in 2015. In 2016, SD1 landed in the second quartile of the AWWA's benchmark for failures leading to SSOs. It should be noted, however, that the 2011 AWWA benchmark for Wastewater Collection System Integrity does not include pump station failures, but SD1 does include pump station failures in its official tally of SSOs Due to Operational Issues. If the pump station failures recorded in the tally provided below were removed, SD1 would be in or very near the nation-wide top quartile for four of the past five years. SD1 recorded 13 pump station failures that led to SSOs in 2016.

Table 3.7 provides a summary of the number of activations and corresponding volume of SSOs due to operational issues from 2008 to 2016.

Table 3.7 SSOs Due to Operational Issues (2008 through 2016)

Year	Total Number of Occurrences	Total Volume (Million Gallons)
2008	143	5.05
2009	108	31.44
2010	63	3.49
2011	66	8.03
2012	38	0.32
2013	55	33.18
2014	39	1.35
2015	44	2.03
2016	56	1.86
Change from 2015 to 2016	12	-0.17

3.4 Review of Wet Weather CSOs

Table 3.8 provides a summary of the approximate number of activations and approximate total volume of CSOs occurring from 2008 through 2016.

Table 3.8 Recurring Wet Weather CSOs by Quarter (2008 through 2016)

		1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter	Total
2008	Activations	943	899	542	504	2,888
	Volume (MG)	1,798	685	119	267	2,869
2009	Activations	607	1,244	828	610	3,289
	Volume (MG)	266	436	397	403	1,502
2010	Activations	456	971	461	444	2,332
	Volume (MG)	426	435	279	435	1,575
2011	Activations	600	1,538	795	705	3,638
	Volume (MG)	1,097	2,029	319	1,152	4,597
2012	Activations	640	650	781	621	2,692
	Volume (MG)	547	196	353	328	1,424
2013	Activations	588	1,063	879	633	3,163
	Volume (MG)	471	351	666	618	2,106
2014	Activations	484	846	848	528	2,706
	Volume (MG)	273	485	196	194	1,148
2015	Activations	420	1042	904	768	3,134
	Volume (MG)	752	591	333	654	2,310
2016	Activations	655	946	1149	482	3,232
	Volume (MG)	614	271	622	313	1,820

On the following page, Table 3.9 provides the quarterly differences in modeled activation and volume between for 2015 and 2016.

Table 3.9 Recurring Wet Weather CSOs Changes from 2015 to 2016

Qtr.	Changes from 2015 to 2016	
	Activations	Volume (MG)
1st	235	-138
2nd	-96	-320
3rd	245	289
4th	-286	-341
Total	98	-510

The total wet-weather CSO volume decreased by 510 million gallons from 2015 to 2016, primarily due to marginally lower cumulative rainfall totals and significantly less high river days in 2016. With the exception of the third quarter, every quarter saw reductions in CSO volume from the previous year. As previously described in Section 3.1, the third quarter of 2016 experienced several isolated storm events in portions of the combined system, which likely account for higher CSO volumes during that quarter. With regard to high river occurrences, there were nine high river days during 2016, all of which occurred during the first quarter. In 2015, there were 41 high river days, with occurrences in each quarter, and an historic stage spanning 18 consecutive days of the first quarter, which drove CSO volumes higher than normal in 2015. While 2016 produced approximately 22 percent less wet-weather CSO volume than 2015, wet-weather CSO activations slightly increased by approximately three percent. A similar trend is also present in the wet-weather SSO activations and volume, as summarized in section 3.2.1. The cause of the increased wet-weather CSO activations in 2016 is also likely attributable to the localized intense storm events of the third quarter.

3.5 Review of Dry Weather CSOs

On the following page, Table 3.10 provides a summary of the dry-weather CSOs that have occurred from 2008 to 2016.

Table 3.10 Dry Weather CSOs (2008 through 2016)

Year	Total Number of Occurrences	Total Volume (Million Gallons)
2008	15	9
2009	8	0.104
2010	5	0.264
2011	2	1.790
2012	4	0.104
2013	5	0.017
2014	3	7.309
2015	9	1.416
2016	4	1.089
Change from 2015 to 2016	-5	-0.327

Two of the three dry-weather CSOs in 2014 were unavoidable discharges related to a landslide and a barge accident, and were confirmed to be probable Force Majeure events in a letter from the Cabinet and EPA dated November 24, 2014. The combined volume of the two Force Majeure dry-weather CSOs was 7,308,000 gallons.

In 2015, SD1 experienced dry-CSOs related to debris settling in the system, following historic high river conditions in the first half of the year. Additionally, the replacement of the collapsed Riviera Drive interceptor, along Taylor Creek, in the City of Bellevue contributed to recurring dry-weather CSO issues. Detailed descriptions of the collapse, the subsequent complications, and SD1's corrective actions were provided in Quarterly Reports No. 30, No. 32 and No. 33. Of the uncharacteristically high annual total of nine dry-weather CSOs, six were directly related to the collapse of the Riviera Drive interceptor and the emergency replacement project. Many of the complications that led to the six dry-weather CSOs during the reconstruction of the interceptor were unforeseeable, such as vandalism of bypass pumping operations and excessive debris from historic high river conditions, which may qualify for Force Majeure consideration.

In 2016, two additional dry-weather CSOs were observed during the replacement of the collapsed Riviera interceptor, due to mechanical failures of the bypass pumping operation. The interceptor reconstruction has been complete since March 9, 2016, and no further dry-weather CSOs related to the project have been recorded.

The other causes of dry-weather CSOs in 2016 were due to a blockage of debris in a CSO diversion and an electrical failure at the Eighth Street Pump Station.

3.6 Review of O&M Activities

SD1's CSAP prioritizes which sewers in the combined sewer system need inspection, cleaning and repair or rehabilitation. Regularly scheduled O&M activities for key assets in the combined sewer system ensure that sewers are kept clean and unobstructed to reduce overflows or downstream blockages at the diversion locations.

Table 3.11 demonstrates SD1's commitment to continually improve the performance of its collection systems, through regular assessment, maintenance, repair, and replacement. All 2016 totals in Table 3.10 are subject to revision, as quality control on work order records closed in December of 2016 was still being performed during the production of this report.

Table 3.11 O&M and Rehab/Replacement Activities (2008 through 2016)

	Manholes Inspected	Manholes Repaired	Manholes Replaced	New Manholes Installed ¹	Sewers Cleaned (LF)	Sewers Inspected (LF)	Sewers Rehabilitated (LF of CIPP) ²	Sewers Repaired and Replaced (LF)
2008	5,985	485	55	26	706,441	1,414,803	953	18,442
2009	4,688	332	59	53	530,303	1,411,818	2,251	17,658
2010	1,285	320	96	39	455,110	1,095,080	29,528	27,157
2011	1,852	656	30	50	375,303	978,484	84,717	11,392
2012	1,871	407	38	49	462,281	1,204,988	51,100	31,391
2013	1,258	314	33	35	613,968	1,523,239	59,137	12,680
2014	524	200	12	32	683,140	1,435,544	32,782	8,323
2015	261	241	20	16	409,167	1,939,187	27,786	6,347
2016	327	313	14	21	364,125	1,414,554	46,038	6,920
Total	18,051	3,268	357	321	4,599,838	12,417,697	334,092	133,647
¹ Does not include manholes installed or lines repaired or replaced as part of CIP projects or newly acquired private development.								
² SD1 entered into a cured-in-place-pipe lining contract, which accounts for increases in lineal footage rehabilitated 2010 through 2012.								

As part of SD1's Nine Minimum Controls for solids & floatable control and the reduction of dry-weather CSOs, SD1 implemented an aggressive early program to retrofit catch basins to trap debris from entering the collection system. Historically, SD1 has inspected each catch basin in the combined system at least once per year to look for

potential grit and debris issues, as well as structural condition issues. Recent modifications to annual catch basin inspection frequencies, based on the extensive knowledge acquired in the first seven years of the program, have been documented in the Nine Minimum Controls 2016 Annual Report, as well as the CMOM Fiscal Year 2016 Annual Report. SD1 also constructed five large grit pits along the Ohio River and Licking River interceptors to remove grit and other solids from the sewers, as a part of its solids and floatable control requirement in the Nine Minimum Controls. These retrofitted catch basins and installed grit pits continue to effectively trap and remove debris from the interceptors and maximize flow to the treatment plant.

Table 3.12, summarizes the activities that ensure that the combined sewer system will perform as effectively as possible. All 2016 totals in Table 3.12 are subject to revision, as quality control on work order records closed in December of 2016 was still being performed during the production of this report.

Table 3.12 Combined Sewer System O&M Activities (2008 through 2016)

	Catch Basin Cleanings	Catch Basin Cleaning (Yards of Debris Removed)	Catch Basin Inspections ¹	New Catch Basin Installs	Catch Basins Replaced	Catch Basins Repaired	Grit Pit Cleaning (Yards of Debris Removed)
2008	1,211	N/A	2,057	0	159	128	358
2009	888	427	3,328	5	224	65	439
2010	787	469	4,070	2	140	78	355
2011	1,392	525	4,125	2	90	211	365
2012	1,431	466	3,750	7	61	38	415
2013	1,393	630	4,072	5	59	59	408
2014	544	312	2,971	1	28	45	360
2015	1,408	450	2,066	0	18	65	213
2016	791	378	865	1	10	108	324
Total	9,845	3,657	27,304	23	789	797	3,237

¹ Includes catch basins owned by SD1, KYTC, municipalities, counties and private. Includes recorded inspections for full condition assessment and post-maintenance visual inspections.

3.7 Review of Building Backups

Table 3.13 provides a summary of the building backups reported from 2008 to 2016.

**Table 3.13 Building Backups: Public System vs. Other Causes
(2008 through 2016)**

Backup Cause	2008	2009	2010	2011	2012	2013	2014	2015	2016
Public System	39	36	36	146	44	44	57	25	31
Other Causes	402	482	644	513	428	627	514	530	634
Total	441	518	680	659	472	671	571	555	665

The approximate number of building backups that were related to the condition or operation of the public sewer system increased approximately 24 percent from 2015 to 2016. The 31 building backups in 2016 that were determined to be related to the public system represents the second lowest annual total on record, since SD1 entered into the Consent Decree in 2007. The 31 backups in 2016 were due to the following:

- Blockage of roots (12 backups)
- Blockage of debris (4 backups)
- Blockage of grease (4 backups)
- Construction (3 backups)
- Pipe defective (3 backups)
- Lack of capacity during wet weather (2 backups)
- Vector truck blew water into building (2 backups)
- Vandalism (1 backup)

The sewers where these blockages occurred were put into or updated in SD1's CSAP to be inspected and cleaned as determined by the program logic, which also provides appropriate next actions to permanently address the cause of the blockages. SD1 installed a backflow preventer on the service lateral that experienced two backups due to lack of capacity during wet weather.

All building backups are recorded in Lucity and are periodically reviewed to identify if any trends or localized problem areas exist that warrants the need for a larger-scale inspection routine, rehabilitation, or repair project.

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APPENDIX A:
Consent Decree Compliance Schedule

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Consent Decree Compliance Schedule

	CONSENT DECREE ACTIVITY	PERCENT COMPLETE	DUE DATE	DATE OF COMPLETION
ASSESSED STIPULATED PENALTY				
✓	\$14,000 for 9 DWOs occurring April 18, 2009 through June 30, 2010	100%	1/9/2011	12/21/2010
✓	\$22,000 for 11 DWOs occurring July 1, 2010 through June 30, 2014	100%	1/2/2015	12/8/2015
CIVIL PENALTY				
✓	Pay Civil Penalties to EPPC and US EPA	100%	06/18/07	06/18/07
CMOM PROGRAM REQUIREMENTS – 2007 through 2016				
✓	Submit CMOM Program Self-Assessment	100%	10/18/07	10/17/07
✓	Submit Grease Control Program	100%	10/18/07	09/17/07
✓	Submit Pump Station Backup Power Plan	100%	04/18/08	12/14/07
✓	Submit Sewer Overflow Response Plan (SORP)	100%	10/18/07	10/09/07
Submit CMOM Annual Report				
✓	CMOM Annual Report 1	100%	12/31/07	12/28/07
✓	CMOM Annual Report 2	100%	12/31/08	12/19/08
✓	CMOM Annual Report 3	100%	12/31/09	12/18/09
✓	CMOM Annual Report 4	100%	12/31/10	12/21/10
✓	CMOM Annual Report 5	100%	12/31/11	12/21/11
✓	CMOM Annual Report 6	100%	12/31/12	12/31/12
✓	CMOM Annual Report 7	100%	12/31/13	12/31/13
✓	CMOM Annual Report 8	100%	12/31/14	12/31/14
✓	CMOM Annual Report 9	100%	12/31/15	12/31/15
✓	CMOM Annual Report 10	100%	12/31/16	12/03/16
	CMOM Annual Report 11	0%	12/31/17	
Phased Grease Control Implementation				
✓	Phase 1 Tasks	100%	01/08/09	01/08/09
✓	Phase 2 Tasks	100%	01/08/10	01/08/10
✓	Phase 3 Tasks	100%	01/08/11	01/08/11
✓	Phase 4 Tasks / Full Implementation	100%	01/08/12	12/31/11
Complete Pump Station Backup Power Projects (110 Total)				
		100%	12/31/15	10/30/15
Complete SORP Annual Review				
✓	SORP Annual Review 1	100%	05/14/09	07/10/09
✓	SORP Annual Review 2	100%	11/10/10	10/01/10
✓	SORP Annual Review 3	100%	11/10/11	11/10/11
✓	SORP Annual Review 4	100%	11/10/12	11/10/12
✓	SORP Annual Review 5	100%	11/10/13	11/08/13
✓	SORP Annual Review 6	100%	11/10/14	11/11/14
✓	SORP Annual Review 7	100%	11/10/15	11/10/15
✓	SORP Annual Review 8	100%	11/10/16	11/08/16
	SORP Annual Review 9	0%	11/10/17	
INITIAL WATERSHED PROJECTS				
✓	Complete Initial Watershed Projects (51 Total)	100%	12/31/14	06/06/12
Submit Initial Watershed Projects Annual Report				
✓	Initial Watershed Projects Annual Report 1	100%	04/18/08	04/08/08
✓	Initial Watershed Projects Annual Report 2	100%	06/07/09	06/05/09
✓	Initial Watershed Projects Annual Report 3	100%	06/07/10	06/04/10
✓	Initial Watershed Projects Annual Report 4	100%	06/07/11	06/07/11
✓	Initial Watershed Projects Annual Report 5	100%	06/07/12	06/07/12
✓	Initial Watershed Projects Annual Report 6 (Final Submission)	100%	06/07/13	06/06/13
NMC PROGRAM REQUIREMENTS – 2007 through 2016				
✓	Submit NMC Documentation of Compliance	100%	04/18/08	03/12/08
✓	Complete Additional NMC Compliance Activities (51 Total)	100%	04/18/09	4/18/09 ¹
Submit NMC Annual Report				
✓	NMC Annual Compliance Report 1	100%	09/04/09	05/11/09
✓	NMC Annual Compliance Report 2	100%	09/04/10	06/04/10
✓	NMC Annual Compliance Report 3	100%	09/04/11	06/21/11
✓	NMC Annual Compliance Report 4	100%	09/04/12	07/02/12
✓	NMC Annual Compliance Report 5	100%	09/04/13	09/04/13
✓	NMC Annual Compliance Report 6	100%	09/04/14	09/04/14
✓	NMC Annual Compliance Report 7	100%	09/04/15	09/04/15
✓	NMC Annual Compliance Report 8	100%	09/04/16	09/02/16
	NMC Annual Compliance Report 9	0%	09/04/17	

Consent Decree Compliance Schedule

	CONSENT DECREE ACTIVITY	PERCENT COMPLETE	DUE DATE	DATE OF COMPLETION
PUBLIC PARTICIPATION				
✓	Watershed Summit	100%	N/A	08/30/07
✓	Watershed Community Council Meeting 1	100%	N/A	11/27/07
✓	Watershed Community Council Meeting 2	100%	N/A	02/26/08
✓	Watershed Community Council Meeting 3	100%	N/A	05/20/08
✓	Watershed Community Council Meeting 4	100%	N/A	08/19/08
✓	Watershed Community Council Meeting 5	100%	N/A	11/18/08
✓	Watershed Community Council Meeting 6	100%	N/A	02/17/09
✓	Watershed Community Council Meeting 7	100%	N/A	05/20/10
✓	Watershed Community Council Meeting 8	100%	N/A	11/03/10
PUMP STATION OVERFLOW ELIMINATION PLAN (PSOEP) – 2007 through 2016				
✓	Submit PSOEP	100%	10/18/07	09/18/07
Submit PSOEP Annual Report				
✓	PSOEP Annual Report 1	100%	05/14/09	05/11/09
✓	PSOEP Annual Report 2	100%	05/14/10	05/14/10
✓	PSOEP Annual Report 3	100%	05/14/11	05/13/11
✓	PSOEP Annual Report 4	100%	05/14/12	05/14/12
✓	PSOEP Annual Report 5	100%	05/14/13	05/14/13
✓	PSOEP Annual Report 6	100%	05/14/14	05/13/13
✓	PSOEP Annual Report 7	100%	05/14/15	05/14/15
✓	PSOEP Annual Report 8	100%	05/14/16	05/14/16
	PSOEP Annual Report 9	0%	05/14/17	
REPORTING – 2007 through 2016				
Submit Quarterly Report				
✓	Submit Quarterly Report 1	100%	01/30/08	01/30/08
✓	Submit Quarterly Report 2	100%	04/30/08	04/30/08
✓	Submit Quarterly Report 3	100%	07/30/08	07/30/08
✓	Submit Quarterly Report 4	100%	10/30/08	10/30/08
✓	Submit Quarterly Report 5	100%	01/30/09	01/30/09
✓	Submit Quarterly Report 6	100%	04/30/09	04/30/09
✓	Submit Quarterly Report 7	100%	07/30/09	07/30/09
✓	Submit Quarterly Report 8	100%	10/30/09	10/30/09
✓	Submit Quarterly Report 9	100%	01/30/10	01/29/10
✓	Submit Quarterly Report 10	100%	04/30/10	04/30/10
✓	Submit Quarterly Report 11	100%	07/30/10	07/30/10
✓	Submit Quarterly Report 12	100%	10/30/10	10/29/10
✓	Submit Quarterly Report 13	100%	01/30/11	01/28/11
✓	Submit Quarterly Report 14	100%	04/30/11	04/29/11
✓	Submit Quarterly Report 15	100%	07/30/11	07/29/11
✓	Submit Quarterly Report 16	100%	10/30/11	10/28/11
✓	Submit Quarterly Report 17	100%	01/30/12	01/30/12
✓	Submit Quarterly Report 18	100%	04/30/12	04/30/12
✓	Submit Quarterly Report 19	100%	07/30/12	07/30/12
✓	Submit Quarterly Report 20	100%	10/30/12	10/30/12
✓	Submit Quarterly Report 21	100%	01/30/13	01/30/13
✓	Submit Quarterly Report 22	100%	04/30/13	04/30/13
✓	Submit Quarterly Report 23	100%	07/30/13	07/30/13
✓	Submit Quarterly Report 24	100%	10/30/13	10/30/13
✓	Submit Quarterly Report 25	100%	01/30/14	01/30/14
✓	Submit Quarterly Report 26	100%	04/30/14	04/30/14
✓	Submit Quarterly Report 27	100%	07/30/14	07/30/14
✓	Submit Quarterly Report 28	100%	10/30/14	10/30/14
✓	Submit Quarterly Report 29	100%	01/30/15	01/30/15
✓	Submit Quarterly Report 30	100%	04/30/15	04/30/15
✓	Submit Quarterly Report 31	100%	07/30/15	07/30/15
✓	Submit Quarterly Report 32	100%	10/30/15	10/30/15
✓	Submit Quarterly Report 33	100%	01/30/16	01/29/16
✓	Submit Quarterly Report 34	100%	04/30/16	04/30/16
✓	Submit Quarterly Report 35	100%	07/30/16	07/29/16
✓	Submit Quarterly Report 36	100%	10/30/16	10/30/16
✓	Submit Quarterly Report 37	100%	01/30/17	01/30/17
	Submit Quarterly Report 38	0%	04/30/17	

Consent Decree Compliance Schedule

	CONSENT DECREE ACTIVITY	PERCENT COMPLETE	DUE DATE	DATE OF COMPLETION
STATE ENVIRONMENTAL PROJECTS				
✓	Setup 6 Separate Escrow Accounts	100%	10/18/07	10/18/07
✓	Conservancies	100%	04/18/12	04/18/12
✓	<i>Boone County</i>	100%	04/18/12	03/26/12
✓	<i>Campbell County</i>	100%	04/18/12	02/23/12
✓	<i>Kenton County</i>	100%	04/18/12	04/17/12
✓	Licking River Watershed Watch	100%	04/18/12	09/28/11
✓	Split Rock	100%	04/18/12	12/18/08
✓	Education Programs	100%	04/18/12	08/04/11
✓	State Environmental Project Completion Report	100%	06/17/12	06/15/12
SUPPLEMENTAL PROJECTS				
✓	Supplemental Environmental Projects	100%	04/18/12	04/12/12
✓	SEP Completion Reports	100%	06/17/12	06/15/12
WATERSHED PLANS				
Framework for Developing Watershed Plans				
✓	Obtain Public Input on Framework for Watershed Plans	100%	04/09/08	04/09/08
✓	Submit Framework for Watershed Plans	100%	04/18/08	04/17/08
First Round Watershed Plans				
✓	Obtain Public Input on First Round of Watershed Plans	100%	06/27/09	06/08/09
✓	<i>Public Comment Period (5/7/09-6/8/09)</i>	100%	06/08/09	06/08/09
✓	<i>Boone County Public Meeting</i>	100%	N/A	05/14/09
✓	<i>Campbell County Public Meeting</i>	100%	N/A	05/19/09
✓	<i>Kenton County Public Meeting</i>	100%	N/A	05/21/09
✓	Submit First Round of Watershed Plans	100%	06/30/09	06/30/09
✓	Resubmit First Round of Watershed Plans	100%	03/31/11	03/31/11
✓	Resubmit First Round of Watershed Plans - Revision	100%	10/03/13	10/01/13
✓	Final Submission of First Round of Watershed Plans	100%	03/15/14	03/14/14
Second Round Watershed Plans				
	Obtain Public Input on Second Round of Watershed Plans	0%	To Be Determined ²	
	Submit Second Round of Watershed Plans	0%	To Be Determined ²	
Third Round Watershed Plans				
	Obtain Public Input on Third Round of Watershed Plans	0%	To Be Determined ²	
	Submit Third Round of Watershed Plans	0%	To Be Determined ²	
Consent Decree Compliance				
	Consent Decree Compliance - Percentage of Term Complete	54%	12/31/25	

¹ Project schedules for three of the 51 projects were extended beyond 4/18/2009, as described in the 2009 NMC Annual Report. The three projects were complete as of December 2009.

² Deadline is dependent on the approval date of each Watershed Plan.

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APPENDIX B:
Watershed Improvement Projects

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Initial Watershed Projects

CIP Title	Basin	Scheduled Completion Date	Actual Completion Date	Status
Initial Watershed Projects				
Strawberry PS Elimination	North	2006	2005	Complete
Beechwood Outfall Sewer Replacement	North	2007	2007	Complete
Eastern Regional - Contract 1--Pond Creek Force Main and Gravity Sewer to Eastern Regional WRF	East	2008	2007	Complete
Eastern Regional - Contract 2--Kahn's Gravity Sewer and Gravity Sewer to the Pond Creek PS	East	2008	2007	Complete
US 27 at Summit Assessment	East	2008	2006	Complete
Eastern Regional - Contract 4--Alex-Licking Gravity Sewer & Force Main to Contract 1	East	2009	2008	Complete
Eastern Regional - Contract 6--Pond Creek PS	East	2008	2007	Complete
Eastern Regional - Contract 8A--Alex-Licking PS	East	2009	2009	Complete
Parkside PS Relocation	East	2008	2007	Complete
Eastern Regional Water Reclamation Facility	East	2008	2008	Complete
Highland Heights PS Study	East	2006	2006	Complete
Wilson/Waterworks Road Relief Sewer Study	East	2008	2007	Complete
Pinehill/Skyview Terrace Sewer	East	2006	2005	Complete
Eastern Regional - Contract 7--Riley Road #2 PS	East	2009	2009	Complete
Eastern Regional - Contract 3--Riley Force Main and Gravity Sewer to the ERWRF	East	2009	2010	Complete
Western Regional - KDOT - Turkeyfoot Road Force Main	West	2006	2005	Complete
Western Regional - Union Sewer (North and South)	West	2013	2008	Complete
American Sign PS Rehabilitation	West	2008	2008	Complete
Allen Fork Collection System - Phase I Improvements	West	2009	2007	Complete
Duncan Drive Assessment Project	West	2007	2006	Complete
Western Regional - Sunnybrook Sewer	West	2013	2010	Complete
Western Regional - Gunpowder Interceptor Sewer	West	2013	2010	Complete
Banklick PS Screening Facility	Central	2006	2005	Complete
Stevenson Road Relief Sewer Project Phase II	Central	2006	2006	Complete
Latonia Combined Sewer Separation	Central	2009	2007	Complete
Licking River Sewer Crossing Study	Central	2007	2007	Complete
McMillan PS Removal	Central	2006	2005	Complete
Meyer Road PS Rehabilitation	Central	2008	2008	Complete
Macke PS Rehabilitation	Central	2008	2008	Complete

Initial Watershed Projects

CIP Title	Basin	Scheduled Completion Date	Actual Completion Date	Status
Initial Watershed Projects				
Richwood PS Improvements	Central	2006	2005	Complete
Patton Street Sewer Study	Central	2006	2006	Complete
South Hills Outfall	Central	2008	2007	Complete
Grit Chamber Projects	Multiple	2010	2008	Complete
Fort Wright Illicit Discharge Removal	Multiple	2007	2006	Complete
Fort Wright Sanitary Sewer Rehabilitation Phase 1	Multiple	2007	2006	Complete
Fort Wright Outfall Sewer - Phase II	Multiple	2006	2006	Complete
Dry Creek Treatment Plant - Grit Removal Modifications	Multiple	2006	2005	Complete
Large Diameter Sewer Assessment Program - Phase III	Multiple	2007	2006	Complete
Brookwood Subdivision SSES Study	Multiple	2006	2006	Complete
Southern Kenton Drainage Study	Multiple	2007	2006	Complete
Wilson Road Sewer Assessment Project	Multiple	2006	2005	Complete
Apple Drive Sewer Outfall	Multiple	2006	2006	Complete
Bluegrass Swim Club Sewer Separation	Multiple	2008	2007	Complete
Eastern Regional – Sunset Pump Station and Force Main Improvements	East	2010	2010	Complete
Western Regional Conveyance System to Western Regional WRF	West	2013	2012	Complete
Western Regional Water Reclamation Facility	West	2013	2012	Complete
Western Regional - Narrows Road Diversion PS	West	2013	2012	Complete
Western Regional - Frogtown Interceptor Sewer (from Sunnybrook Dr. to Frogtown Rd.)	West	2014	2012	Complete
Western Regional - South Fork Gunpowder Interceptor Sewer and Rosetta Sewer	West	2013	2012	Complete
Western Regional - Turkeyfoot Industrial Road Force Main	West	2013	2012	Complete
Western Regional - Richwood Sewer and Force Main	West	Removed from Initial Watershed Projects. Approved in letter from Cabinet dated May 13, 2013.		

Watershed Plan Projects: Five Year Program

System-wide Programs

CIP Title	Basin	Project Description	Target Project Benefit	Scheduled Completion Date	Actual Completion Date	Past Activity for 10/01/2016 to 12/31/2016	Planned Activity for 01/01/2017 to 03/31/2017
<i>(Schedules listed in this section are subject to change based on the approval of SD1's Watershed Plans.)</i>							
Priority Inflow and Infiltration Source Identification & Removal Program							
Lakeview I/I Source Identification & Removal	Central	SSES activities and I/I removal in areas where found to be cost effective and feasible upstream of the Lakeview Pump Station	Reduce I/I and SSOs in Lakeview PS service area	Beyond 2016	n/a	Flow Monitoring and Initial Design	Flow Monitoring and Initial Design
Licking River Siphon Source Identification and Removal	Central	SSES activities and I/I removal in areas where found to be cost effective and feasible upstream of the Licking River Siphon	Reduce I/I and SSOs in Licking River Siphon area	Beyond 2016	n/a	Initial Design	Initial Design
Taylor Creek Source Identification and Removal	East	SSES activities and I/I removal in areas where found to be cost effective and feasible in the Taylor Creek area	Reduce I/I and SSOs in Taylor Creek area	Beyond 2016	n/a	Initial Design	Initial Design
Green Programs (DRIP & GrIPP)							
Boone Woods YMCA Detention Model	North	Partnership with Northern Kentucky University Center for Applied Ecology to retrofit a detention basin on Boone Woods YMCA property	Improve Water Quality	2010	2010	Complete	
City of Covington: 12th Street Bioswale	North	Partnership with City of Covington to install street planters leading to a bioswale and rain garden along 12th Street	Reduce CSO volume	2011	2011	Complete	
City of Covington: Main Strasse Gateway Biofiltration Swale	North	Partnership with City of Covington and Transit Authority of Northern Kentucky to install biofiltration swales on city property at the Bakewell parking lot	Reduce CSO volume	2012	2013	Complete	
Notre Dame Academy Basin Retrofit	North	Partnership with Notre Dame Academy to retrofit an existing detention basin on school property	Reduce CSO volume	2009	2009	Complete	
City of Ft. Thomas: Rossford Park Rain Garden	East	Partnership with City of Ft. Thomas to install rain gardens at Rossford Park	Improve Water Quality	2012	2012	Complete	
City of Ft. Thomas: Memorial Parkway Bioswale	East	Partnership with City of Ft. Thomas to install a bioswale at the Northern Kentucky Water District property located along Memorial Parkway.	Improve Water Quality	2010	2010	Complete	
Kenton County School District: Turkeyfoot Middle School	Central	Partnership with Kenton County School District to install rain garden at Turkeyfoot Middle School	Improve Water Quality	2010	2010	Complete	
City of Covington: Madison Ave. Rain Garden	North	Partnership with City of Covington to install two rain gardens or street planters within the right-of-way along Madison Avenue	Reduce CSO volume	2013	2013	Complete	
Kenton County Public Library: Mary Ann Morgan Branch	North	Partnership with Kenton County Library to install rain gardens and permeable pavers on site at the Mary Ann Morgan Branch	Reduce CSO volume	2013	2013	Complete	
Demonstration Projects (Pilot Projects & Innovative Technology Testing)							
St. Elizabeth Detention Basin Retrofit	North	Modification of an existing dry detention basin located on property owned by St. Elizabeth Medical Center.	Reduce CSO volume in the Willow Run Sewershed	2009	2009	Complete Post-Construction Monitoring	
Prisoner's Lake Rainwater Harvesting	North	Construction of a small storm water pumping station and force main to capture storm water runoff from Prisoner's Lake that will be re-used in an irrigation pond for a small public golf course.	Manage storm water entering the CSS	2010	2010	Complete	
Terraced Reforestation	North	Construction of a series of vegetated, terraced berms within the I-71/75 right-of-way in the City of Covington.	Manage storm water entering the CSS	2010	2011	Complete Post-Construction Monitoring	
Watershed Controls Pilot Projects - Regional and Decentralized Controls							
Regional Project: Banklick Regional Wetlands	Central	Constructed wetland that treats flow diverted from Banklick Creek to reduce bacteria concentrations.	Improve water quality of Banklick Creek	2011	2011	Complete Post-Construction Monitoring	
Decentralized Control Project	Central	Storm water control measures such as wetlands, biofiltration basins, and enhanced retention serving upstream drainage areas smaller than one square mile, but typically greater than five acres	Improve water quality of local streams	Beyond 2016	n/a	Initial Design	Initial Design

Watershed Plan Projects: Five Year Program

Specific Basin Projects

CIP Title	Basin	Project Description	Target Project Benefit	Scheduled Completion Date	Actual Completion Date	Past Activity for 10/01/2016 to 12/31/2016	Planned Activity for 01/01/2017 to 03/31/2017
<i>(Schedules listed in this section are subject to change based on the approval of SD1's Watershed Plans.)</i>							
Van Deren Sanitary Sewer Improvements	North	Sanitary and storm sewer improvements in a 100 home area to separate common manholes and remove illicit connections and I/I	Reduce SSOs and illicit discharges in Lakeside Park	2011	2011	Complete	
Avon Drive Sanitary Sewer Improvements	North	Replacement of 570 LF of 12-inch sewer with 24-inch pipe and installation of new storm sewer	Reduce SSOs in Lakeside Park	2010	2010	Complete	
Willow Run Direct Entry Point Bar Racks	North	Installed bar racks on 10 direct entry points where open storm channels discharge into sewer system	Reduce debris entry into system, maintain capacity and reduce blockages	2009	2010	Complete	
KYTC Basin - Green Infrastructure Retrofit	North	Conversion of traditional detention basin near I-75 to provide greater detention and infiltration by modifying the outlet structure and other improvements	CSO reduction, informs future green infrastructure design	2012	2011	Complete Post-Construction Monitoring	
Lakeview PS Pump Replacement	Central	Replacement of 8 pumps at the Lakeview pump station along with piping and electrical improvements to provide a reliable peak capacity of 22.5 MGD	Reduce SSOs at Lakeview PS and increase PS reliability	2014	2013	Complete	
Church Street (gray, green, and watershed controls)	Central	The separation of street load on six streets, new biofiltration basin and installation of approximately 1,300 linear feet of new 72-inch sewer.	Reduce CSO frequency and volume into Banklick Creek and improve structural integrity of sewer infrastructure.	2014	Ph 1 - 2015	Ph 1 - Complete Post-Construction Monitoring	
					Ph 2 - n/a	Ph 2 - Construction	Ph 2 - Construction
Vernon Lane – Public & Private Source I/I Removal	Central	Combination of private I/I removal, sewer rehabilitation, manhole lining, and stormwater BMPs in area comprising approximately 270 homes	Eliminate Vernon Ln. SSO and improve water quality	Beyond 2016	Ph 1 - 2014	Ph 1 - Complete Post-Construction Monitoring	
					Ph 2 - n/a	Ph 2 - Construction	Ph 2 - Construction
Ash Street PS and Forcemain	East	Construction of a new approximately 7 MGD pump station in Silver Grove and new force main to the Riley Rd. Pump Station in Alexandria. Also includes new force main to redirect flow from the Silver Grove PS to the Ash St. PS	Reduce overflows from Silver Grove CSO and SSO reduction in the Highland Heights PS and Silver Grove PS service areas.	2017	n/a	Final Design	Final Design
Riviera Sewer Replacement	East	Replacement of approximately 4,100 LF of deteriorated 24-inch pipe in the Taylor Creek area	Reduce CSOs into Taylor Creek and address structural issues	Beyond 2016	n/a	Initial Design	Initial Design
		Emergency repair of approximately 1,300 LF of collapsed 24-inch pipe. Upsize to 54-inch pipe.	Replace collapsed inceptor and provide additional capacity.	2016	2016	Complete	Complete
Lakeside Park – Public Sewer Rehab and Private Source Removal	North	Combination of private I/I removal, sewer rehabilitation/replacement and manhole lining, and stormwater BMPs where feasible in Lakeside Park	Eliminate SSOs in Lakeside Park	Beyond 2016	Ph 1 & 2 - 2014	Ph 1 & 2 - Complete	
					2016	Ph 3 - In Progress	Construction
Willow Run Dynamic Control Facility	North	Construction of a dynamic weir facility at the Willow Run overflow diversion to provide in-line storage	CSO reduction using in-line storage	Beyond 2016	n/a	Initial Design	Initial Design

Other Committed Projects

CIP Title	Basin	Project Description	Target Project Benefit	Scheduled Completion Date	Actual Completion Date	Past Activity for 10/01/2016 to 12/31/2016	Planned Activity for 01/01/2017 to 03/31/2017
<i>(Schedules listed in this section are subject to change based on the approval of SD1's Watershed Plans.)</i>							
Donnemeyer Improvements, Newport Pavilion Improvements, Bellevue Relief Sewer, Wilson/Waterworks Road, Covert Run	East	Multiple sewer projects including replacement with larger 18-30 -inch diameter sewers in the Taylor Creek area. Also included private source I/I removal	Reduce CSO and SSO in Taylor Creek area and address basement flooding	2011	2011	Complete	
Dry Creek WWTP Headworks Improvements	North	Construction of a new 110 MGD headworks facility at the Dry Creek WWTP	Increase reliability and wet weather treatment capacity at Dry Creek WWTP	2013	2013	Complete	

Additional CSO and SSO Reduction Projects

Project Title	Basin	Project Description	Target Project Benefit	Scheduled Completion Date	Actual Completion Date	Planned Activity for 2017
CSO Reduction						
Aqua on the Levee	East	In partnership with a developer to construct a 48" separate storm outfall through the Ohio River levee in Newport. Project will provide storm water offloading opportunity for 5 acres, and extended opportunity for 19 acres of additional offloading along Saratoga St. Maximum extent of offloading opportunity with new storm outfall will be 38 acres, including Washington St.	Reduce CSO volumes at Saratoga St and Washington St CSOs approximately 4 MG in typical year with proximal separation. Extended separation will provide approximately 7.5 MG reduction in typical year. The maximum extent separation will provide more than 17 MG of CSO reduction during the typical year.	2017	N/A	Permitting & Construction
Catch Basin Retrofits C480-11	Central & North	Strategically disconnect catch basins in the CSS that are tied into the collection lines, main interceptors, or the regulating diversion MHs. Reconnect the catch basins to the wet-weather CSO outfall line, effectively removing the inflows from the CSS mainlines. Retrofit all reconnected CBs with solids and floatable controls.	Partial removal of street inflows in various areas of the combined system: Kenner St (Ludlow) = 2 CBs Adams St + Eastern Ave (Covington) = 3 CBs Garrard St + Riverside Dr (Covington) = 4 CBs Greenup St + Riverside Dr (Covington) = 2 CBs Pike St + Rohmann Ave (Covington) = 4 CBs Virginia Ave + 45th St (Covington) = 2 CBs Warren St (Covington) = 3 CBs	2011	2011	Complete
Covington Detention Basins	North	In partnership with the City of Covington, construct detention basins in the low lying areas of the Peasleburg neighborhood to mitigate flooding from peak storm events.	The detention basins will provide approximately 2.5 to 3.5 MG of typical year CSO reduction in the Willow Run system.	2015	2015	Complete
Hazen Street, Ludlow Separation	North	In partnership with the City of Ludlow, replace and reconfigure CSS catch basins to improve drainage.	Consolidates CSS catch basins on Hazen St and at the entrance of River's Breeze Condominiums. Extends the initial scope of disconnection in Ludlow, beyond what was identified in Figure 8.2a of the Watershed Plans. Full disconnection will be possible with a new 42" separate storm pipe on West St.	2013	2013	Complete
Injection Wells Pilot	North, Central, East	Disconnect catch basins in portions of the CSS in Ludlow, Covington, and Bellevue for deep well injection into the alluvium, in three pilot areas.	Reduce activations and volumes at the Adella St CSO (Ludlow), E 6th St CSO (Covington), and Patchen St CSO (Bellevue)	Beyond 2016	N/A	Drill monitoring wells to determine WQ and infiltration rates. Permitting.
Jacob Price Ph1	Central	Stormwater offloading from approximately 7.5 acres of Covington Housing development	Reduce CSO approximately 5.5 million gallons at Robbins St and 11th St.	2014	2014	Complete
Jacob Price Ph3	Central	Additional stormwater offloading of 9 acres adjacent to Jacob Price Ph 1 redevelopment, including installation of BMP for WQ..	CSO reduction at 9th St and 10th St.	Beyond 2017	N/A	Final Design
Park Hills Separation	North	In partnership with the City of Park Hills, replace and locally separate CSS catch basins to improve drainage. Streets improved: Alhambra Ct, Exter Dr, Coram St, Harriet St, Irishrose Ln, Old State Rd, South Arlington Rd.	Removes catch basins from the local CSS and redirects to a drainage ditch. The ditch drains to Willow Run CSS, further downstream. This localized separation provides opportunity to completely remove the identified street flows from the Willow Run CSS with the replacement of the Brent Spence Bridge.	2015	2015	Complete

Additional CSO and SSO Reduction Projects

Project Title	Basin	Project Description	Target Project Benefit	Scheduled Completion Date	Actual Completion Date	Planned Activity for 2017
CSO Reduction						
State Route KY9 Realignment	Central	In partnership with KY Transportation Cabinet, offload stormwater from the existing CSS on approximately 2.5 miles of newly realigned state route KY9, along the Licking River in Newport. KYTC's proposed 36" separate storm pipe will be upsized by SD1 to 60" to accommodate additional offloading in the future. Utilizes two existing CSO outfalls and requires the construction of one new separate storm outfall through the levee.	Reduces CSO volumes in the short term at 4th St, 9th St, 10th St, and 12 St CSOs by approximately 10 MG. Maximum extent of potential separation in Newport is approximately 167 acres with the new separate storm outfall, which will provide approximately 63 MG of CSO reduction. Project also rehabilitates all intersecting sanitary assets and eliminates discovered illicit connections to the CSO outfalls.	2016	N/A	Construction
Victory Ave Storm Sewer Improvement	Central	Construct a new 15" separate storm sewer to alleviate flooding of private property in south Covington.	Allows disconnection of four existing CSS catch basins that collect approximately 0.3 acres of street runoff. Reduces combined flows tributary to the Banklick PS and offloads to the Banklick Creek.	2016	2016	Complete
Water's Edge	East	Construct a new 36" separate storm sewer and disconnect existing CSS catch basins on Taylor Ave in Bellevue. Integrate BMPs for WQ. Four phases of offloading.	Reduce CSO volumes at Taylor Ave CSO and other local CSOs by approximately 6.1 MG in the typical year with Ph 1 and 15.68 MG with Ph 4. Improves flooding issues on Taylor and Eden Avenues.	2017	N/A	Construction
SSO Reduction						
Elsmere Corridor	Central	Upsize approximately 6,600 feet of existing gravity main from Covered Bridge Rd to Raintree Court, in the city of Elsmere.	Upsizing the sewers will eliminate approximately 1.87 MG of wet weather SSO in the typical year.	Beyond 2017	N/A	Initial Design
Lakeview Pipe Upgrades	Central	Approximately 85,000 feet of conveyance upgrades in the Lakeview sewershed, as described in Watershed Plans Section 3.3.1.d.	Addresses remaining SSOs in the Lakeview sewershed after the redirection of portions of the sewershed to Western Regional Water Reclamation Facility, Lakeview Pump Station upgrades, I/I removal, and storage.	Beyond 2017	N/A	Initial Design
Richwood Forcemain Reroute	West	Remove Richwood PS from the Dry Creek/Lakeview PS sewershed and reroute to Western Regional Water Reclamation Facility with a new 20" force main.	Reduces SSO volume in the 2 year 6 hour event by approximately 1.4 MG, and eliminates six Recurring and Inactive SSOs.	2016	N/A	Construction
43rd St and Decoursey Ave	Central	Evaluate and improve hydraulics in existing 18" main in south Covington.	Eliminate recurring basement backups in approximately 10 homes.	Beyond 2017	N/A	Initial Design

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 1 Projects (4 total projects)						
Alex Licking	East	Permanent Generator	n/a	2008	2008	Complete
American Sign	West	Permanent Generator	n/a	2008	2008	Complete
Riley Road	East	Permanent Generator	n/a	2009	2009	Complete
Sunset	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2010	2010	Complete
CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 2 Projects (21 total projects)						
Kahns	East	PS Elimination	n/a	2007	2007	Complete
Meadow Hill	Central	PS Elimination Study	PS Elimination	Study - 2008 2012 - 2015	2008 2010	Complete
Riley Road No. 1	East	PS Elimination	n/a	2009	2009	Complete
Riley Road No. 2						
Riverwatch PS	North	PS Elimination Study	PS Elimination	Study - 2008 2012 - 2015	2008 2008	Complete
South Park Industrial	North	PS Elimination Study	Backup Dry Prime Pump with a Diesel	Study - 2008 2012 - 2015	2008 2010	Complete
Wedgewood Dr	Central	PS Elimination Study	Electrical hook up for portable generator	Study - 2008 2015	2008 2015	Complete
Willow Bend No. 2	West	PS Elimination Study	PS Elimination	Study - 2008 2013	2008 2013	Complete
Army Reserve	East	PS Elimination Study	Electrical hook up for portable generator	Study - 2008 2013-2014	2008 2014	Complete
Eagles Landing	West	PS Elimination Study	Electrical hook up for portable generator	Study - 2008 2013-2014	2008 2014	Complete
Evergreen	Central	PS Elimination Study	Electrical hook up for portable generator	Study - 2008 2014	2008 2014	Complete
Lamphill	East	PS Elimination Study	Electrical hook up for portable generator	Study - 2008 2011	2008 2011	Complete
Mill House Crossing	Central	PS Elimination Study	Backup Dry Prime Pump with a Diesel	Study - 2008 2012	2008 2012	Complete
Ridgefield	North	PS Elimination Study	Backup Dry Prime Pump with a Diesel	Study - 2008 2014	2008 2014	Complete
War Admiral	West	PS Elimination Study	PS Elimination	Study - 2008 2012 - 2015	2008 2011	Complete
Blackstone	West	PS Elimination Study	Electrical hook up for portable generator	Study - 2008 2015	2008 2015	Complete
Dublin Green No. 1	West	PS Elimination Study	PS Elimination	Study - 2008 2015	2008 2012	Complete
Fowler Creek	West	PS Elimination	These stations were eliminated after the Western Regional collection system became operational.	2013	2011	Complete
Gammon Calmet	West	PS Elimination		2013	2012	Complete
Gunpowder	West	PS Elimination		2013	2012	Complete
Union	West	PS Elimination		2013	2012	Complete

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 3 Projects (24 total projects)						
Airport Exchange Ind Park	North	Permanent Generator	n/a	2009	2009	Complete
Barrs Branch	East	Permanent Generator	Portable Generator	2009	2009	Complete
Cedar Point	East	Permanent Generator	n/a	2009	2009	Complete
Bullitsville	North	Permanent Generator	n/a	2008	2008	Complete
Catalpa	Central	Permanent Generator	n/a	2009	2009	Complete
Centerplex	East	Permanent Generator	n/a	2008	2008	Complete
Hempsteade	West	Permanent Generator	n/a	2009	2009	Complete
Highland Heights	East	Portable Generator	n/a	2009	2009	Complete
Dublin Green No. 2	West	Permanent Generator	n/a	2009	2009	Complete
Brookwood	East	Permanent Generator	n/a	2009	2009	Complete
Ky Aire	West	Permanent Generator	n/a	2008	2007	Complete
Levi	West	Permanent Generator	n/a	2008	2007	Complete
Maple Ave	Central	Permanent Generator	n/a	2009	2009	Complete
Sand Run	North	Permanent Generator	n/a	2008	2008	Complete
Saturn	West	Permanent Generator	n/a	2009	2009	Complete
Second Street	Central	Permanent Generator	n/a	2009	2009	Complete
Skyport	North	Permanent Generator	n/a	2008	2008	Complete
South Hampton	West	Permanent Generator	n/a	2008	2007	Complete
Thornwilde	North	Permanent Generator	n/a	2008	2008	Complete
Bunning Lane	East	PS Elimination Study	Electrical hook up for portable generator	2015	2015	Complete
Kees	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2011	2011	Complete
Overlook	East	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete
Riverview Farms	North	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete
Stillwater	East	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 4 Projects (50 total projects)						
Banklick	Central	Permanent Generator	n/a	2009-2014	2009	Complete
Cedar	Central	Permanent Generator	n/a	2009-2014	2009	Complete
Fowler Ridge	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2010	Complete
Lassing Green	West	Permanent Generator	n/a	2009-2014	2009	Complete
Leathers Rd	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2010	Complete
Marshall Rd	Central	Permanent Generator	n/a	2009-2014	2010	Complete
Mineola Pike	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2010	Complete
Newport Steel Mill	East	Permanent Generator	n/a	2009-2014	2009	Complete
Paul Rd	East	Permanent Generator	Portable Generator	2009-2014	2010	Complete
Rosewood Lane	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2010	Complete
Shadow Lake	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2009	Complete
Wolf Rd	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2009	Complete
Air Park West	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2011	Complete
Arbortech	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Arborwood	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Brandtly Ridge	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Brentwood	North	Permanent Generator	Electrical hook up for portable generator	2015	2014	Complete
Brushup Lane	West	Permanent Generator	PS Elimination	2012	2012	Complete
Carlisle Ave	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Cinnamon Ridge	West	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Cold Spring Crossing	East	Permanent Generator	Permanent Generator	2014	2014	Complete
Cold Spring Plaza	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Darma Ct	East	Permanent Generator	Electrical hook up for portable generator	2013-2014	2014	Complete
Deer Creek No. 1	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2011	Complete
Deer Creek No. 2	North	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2011	Complete
Eighth Street	Central	Connect to Grid Power	Permanent Generator	2015	2015	Complete
Gerrard Ave	East	Permanent Generator	Portable Generator	2009-2014	2011	Complete
Golf Course	Central	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Hampton Ridge	West	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete
Harrison Harbor	East	Permanent Generator	Portable Generator	2009-2014	2011	Complete

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 4 Projects (continued)						
Harvest Hill	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
ICH	Central	Permanent Generator	Electrical hook up for portable generator	2011	2011	Complete
IDI	North	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Independence Station Rd	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2009-2014	2011	Complete
Jefferson Ave	East	Permanent Generator	Portable Generator	2009-2014	2011	Complete
Jericho Rd	Central	Permanent Generator	Electrical hook up for portable generator	2011	2011	Complete
Jonathan	West	Permanent Generator	Electrical hook up for portable generator	2015	2015	Complete
Litton	North	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Ohio Ave	East	Permanent Generator	Portable Generator	2009-2014	2011	Complete
Orchard Estates	West	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Parkside No. 2	East	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Patton Street	Central	Dual Utility Power Feed	Permanent Generator	2015	2014	Complete
Ria Vista	North	Permanent Generator	Electrical hook up for portable generator	2011	2011	Complete
Silver Grove	East	Permanent Generator	Permanent Generator	2015	2015	Complete
St Annes	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Sycamore	West	Permanent Generator	PS Elimination	2015	2012	Complete
Taylor Mill Rd	Central	Permanent Generator	Electrical hook up for portable generator	2011	2011	Complete
Wilder	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete
Wyndemere	North	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete
Youell Rd	West	Permanent Generator	Electrical hook up for portable generator	2012	2012	Complete

Pump Station Backup Power Plan

CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 5 Projects (6 total projects)						
Keavy	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2010-2015	2010	Complete
Meadow Lane	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2010-2015	2009	Complete
Cardinal Cove	North	Permanent Generator	Permanent Generator	2015	2013	Complete
Crestview	East	Permanent Generator	Backup Dry Prime Pump with a Diesel	2015	2015	Complete
Ripple Creek	East	PS Elimination Study	PS Elimination	2010-2015	2010	Complete
Winters Lane No. 2	East	Permanent Generator	Electrical hook up for portable generator	2014	2014	Complete
CIP Title	Basin	Original Proposed Solution	Updated Solution	Scheduled Completion Date	Actual Completion Date	Final Status as of October 2015
Category 6 Projects (5 total projects)						
Enzweiller	East	Permanent Generator	n/a	2012-2015	2009	Complete
Mafred	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012-2015	2009	Complete
Ridgeway	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012-2015	2009	Complete
Richwood	West	Permanent Generator	Backup Dry Prime Pump with a Diesel	2012	2012	Complete
Twin Lakes	Central	Permanent Generator	Backup Dry Prime Pump with a Diesel	2014	2014	Complete

Progress Summary	Number
2007 Complete Projects	4
2008 Complete Projects	8
2009 Complete Projects	24
2010 Complete Projects	11
2011 Complete Projects	16
2012 Complete Projects	18
2013 Complete Projects	2
2014 Complete Projects	16
2015 Complete Projects	11
Total Complete	110

Pump Station Overflow Elimination Plan

CIP Title	Basin	Scheduled Completion Date	Actual Completion Date	Activity for 10/01/2016 to 12/31/2016	Planned Activity for 01/01/2017 to 03/31/2017
Pump Station Overflow Elimination Projects					
Alex-Licking	East	12/31/2010	2008	Complete	Complete
Allen Fork	North	12/31/2015	2014	Complete	Complete
Ash Street	East	12/31/2018 ¹	n/a	In-Progress	In-Progress
Crestview	East	12/31/2015	2015	Complete	Complete
Harrison Harbor	East	12/31/2010	*See PS Overflow Elimination Annual Report May 11, 2009	Complete	Complete
Highland Acres	West	12/31/2010	2010	Complete	Complete
Kentucky Aire	West	12/31/2013	2014	Complete	Complete
Riley Road No.1	East	12/31/2010	2009	Complete	Complete
Ripple Creek	Central	12/31/2010	2010	Complete	Complete
South Hampton	West	3/31/2013	2012	Complete	Complete
South Park	North	12/31/2010	2010	Complete	Complete
Sunset	Central	12/31/2010	2010	Complete	Complete
TaylorSPORT	North	12/31/2010	2004	Complete	Complete
Union	West	3/31/2013	2012	Complete	Complete
Lakeview	Central	12/31/2023 ²	n/a	In-Progress	In-Progress

¹ Anticipated completion date has been provided. The approved deadline for completion of the construction is two years after obtaining a cleared site certificate.

² Revised deadline approved by Cabinet in a letter dated May 13, 2013.

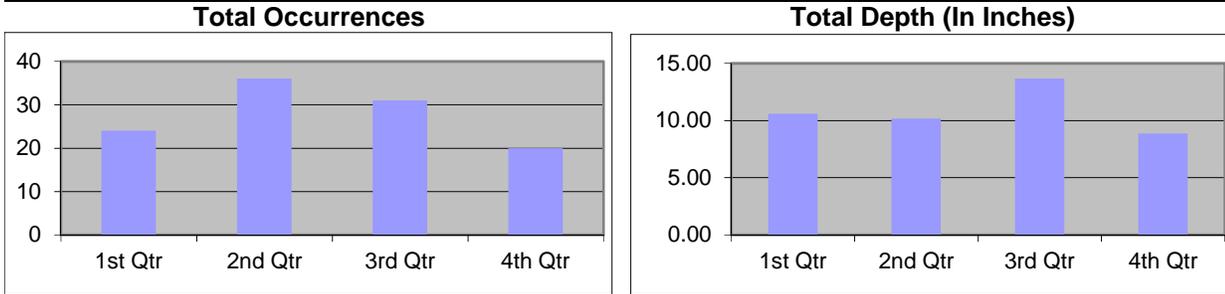
APPENDIX C:

Annual and Cumulative Overflow Data

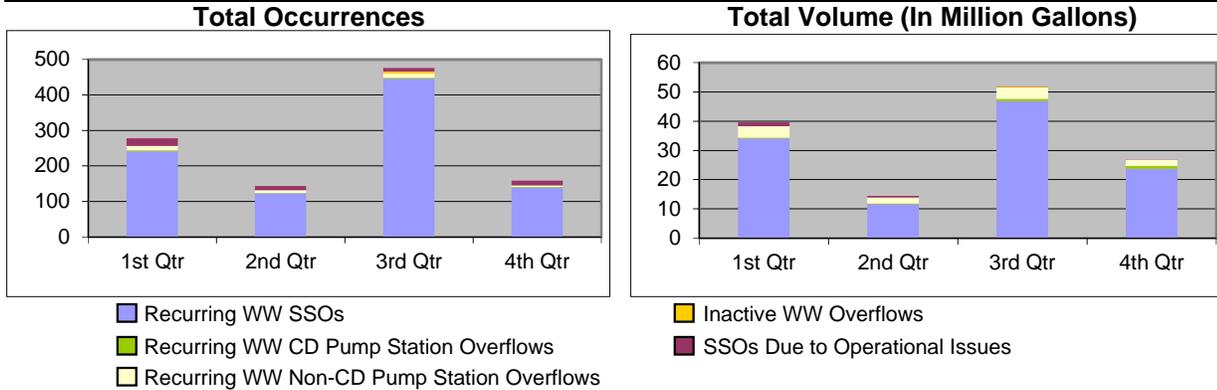
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Cumulative Overflow Data
January 1, 2016 through December 31, 2016

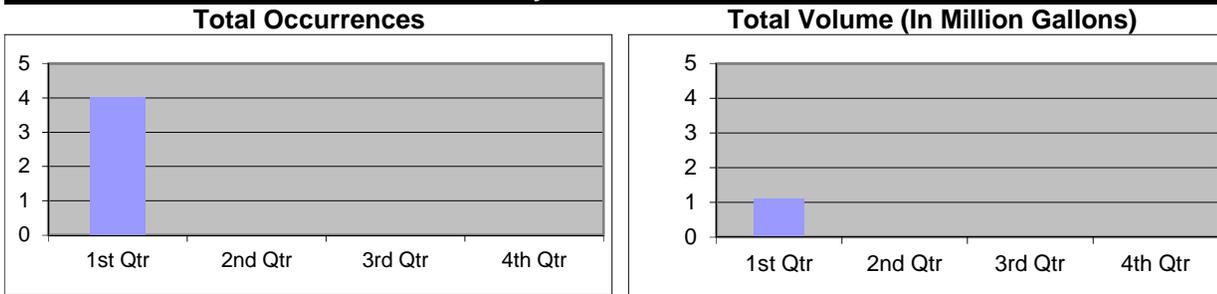
Rainfall at CVG



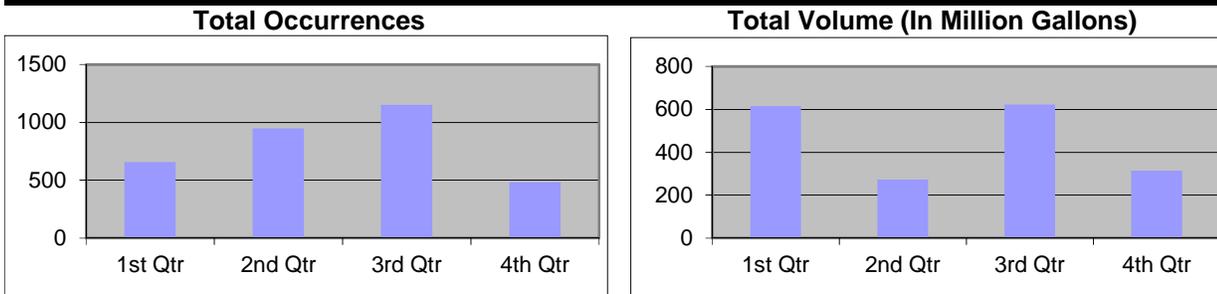
SSOs - Due to Wet Weather (WW) and Operational Issues



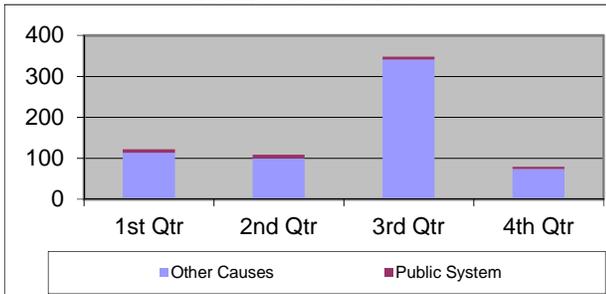
Dry Weather CSOs



Wet Weather CSOs



Building Backups



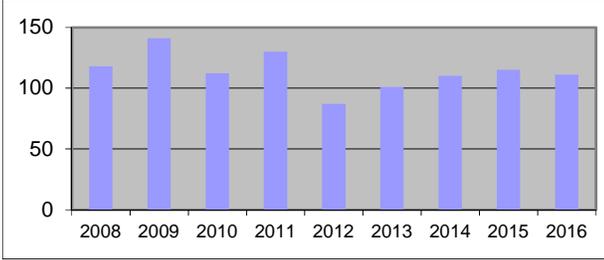
2016 Overflow Summary

	Occurrences	Volume
Rainfall	111	43.220 inches
Recurring WW SSOs	992	130.575 MG
Inactive WW SSOs	6	0.039 MG
Operational SSOs	56	1.855 MG
Dry Weather CSOs	4	1.089 MG
Wet Weather CSOs	3232	1819.310 MG
Building Backups (Other Causes)	627	
Building Backups (Public System)	31	

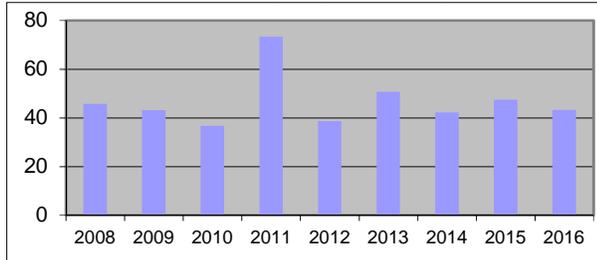
Annual Cumulative Overflow Data 2008 through 2016

Rainfall at CVG

Total Occurrences

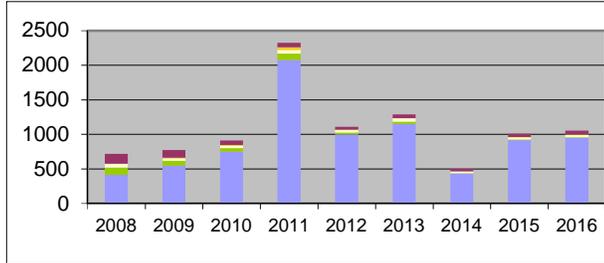


Total Depth (In Inches)

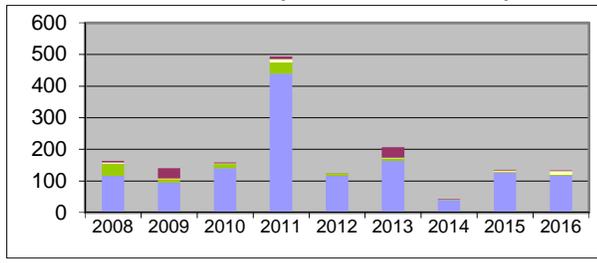


SSOs - Due to Wet Weather (WW) and Operational Issues

Total Occurrences



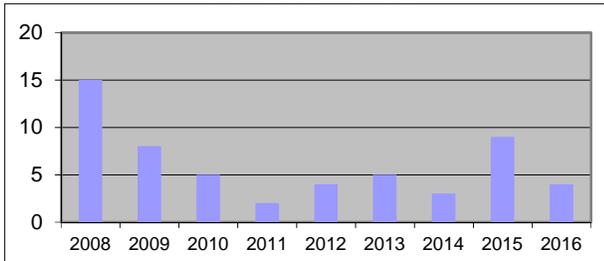
Total Volume (In Million Gallons)



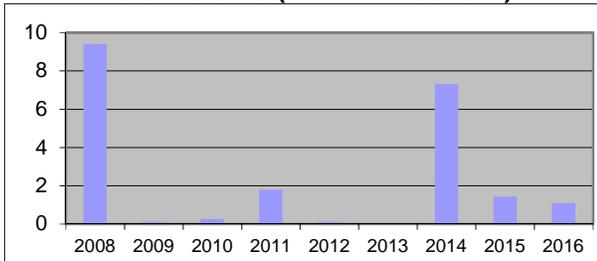
- Recurring WW SSOs
- Recurring WW CD Pump Station Overflows
- Inactive WW Overflows
- SSOs Due to Operational Issues
- Recurring WW Other Pump Station Overflows

Dry Weather CSOs

Total Occurrences

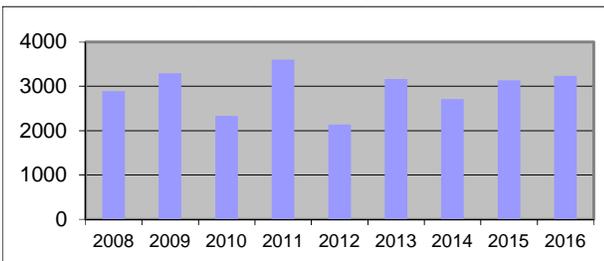


Total Volume (In Million Gallons)

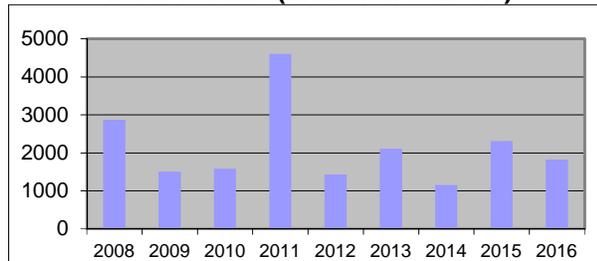


Wet Weather CSOs

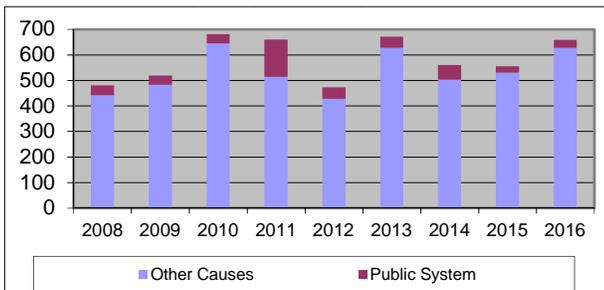
Total Occurrences



Total Volume (In Million Gallons)



**Building Backups
Total Occurrences**



Change from 2015 to 2016-Q3

	Occurrences	Volume
Rainfall	-4	-4.16 inches
Recurring WW SSOs	34	0.099 MG
Inactive WW SSOs	-3	-2.118 MG
Operational SSOs	12	-0.179 MG
Dry Weather CSOs	-5	-0.327 MG
Wet Weather CSOs	98	-490.25 MG
Building Backups (Other Causes)		
	97	
Building Backups (Public System)		
	6	

APPENDIX D:
Recurring Wet Weather SSOs

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Recurring Wet Weather SSOs

No.	MHID	City	County	Model Predicted Overflow Activations	Model Predicted Overflow Volume (MG)
1	0020006	Silver Grove	Campbell	7	0.99
2	0020007	Silver Grove	Campbell	5	0.06
3	0020008	Unicorp Campbell County	Campbell	3	0.04
4	0020030	Silver Grove	Campbell	0	0.00
5	0020032	Unicorp Campbell County	Campbell	1	0.16
6	0040003	Fort Thomas	Campbell	1	0.03
7	0050022	Fort Thomas	Campbell	1	0.12
8	0060001	Unicorp Campbell County	Campbell	1	0.15
9	0060002	Unicorp Campbell County	Campbell	1	0.01
10	0060004	Unicorp Campbell County	Campbell	1	0.01
11	0110010	Highland Heights	Campbell	1	0.17
12	0120018	Highland Heights	Campbell	0	0.00
13	0120019	Highland Heights	Campbell	0	0.00
14	0150003	Wilder	Campbell	0	0.00
15	0150005	Wilder	Campbell	0	0.00
16	0150009	Wilder	Campbell	1	0.59
17	0150063	Wilder	Campbell	1	0.00
18	0150064	Wilder	Campbell	1	0.24
19	0150065	Wilder	Campbell	1	0.37
20	0150356	Southgate	Campbell	0	0.00
21	0150399	Wilder	Campbell	6	0.88
22	0200003	Fort Thomas	Campbell	0	0.00
23	0220056	Fort Thomas	Campbell	1	0.02
24	0220058	Fort Thomas	Campbell	1	0.01
25	0260001	Fort Thomas	Campbell	1	0.01
26	0270020	Fort Thomas	Campbell	0	0.00
27	0270026	Fort Thomas	Campbell	2	0.03
28	0270062	Fort Thomas	Campbell	0	0.00
29	0270103	Fort Thomas	Campbell	0	0.00
30	0280001	Fort Thomas	Campbell	0	0.00
31	0280073	Fort Thomas	Campbell	0	0.00
32	0360004	Dayton	Campbell	0	0.00
33	0360074	Dayton	Campbell	0	0.00
34	0380005	Fort Thomas	Campbell	2	0.01
35	0400002	Fort Thomas	Campbell	2	0.17
36	0400017	Fort Thomas	Campbell	0	0.00
37	0410010	Fort Thomas	Campbell	2	0.05
38	0410019	Fort Thomas	Campbell	2	0.06
39	0410036	Fort Thomas	Campbell	0	0.00
40	0430006	Newport	Campbell	1	0.04
41	0530083	Newport	Campbell	1	0.11
42	0860001	Wilder	Campbell	10	11.48
43	0860003	Wilder	Campbell	0	0.00
44	0860016	Wilder	Campbell	0	0.00
45	1010002	Fort Thomas	Campbell	1	0.01
46	1090069	Edgewood	Kenton	1	0.02
47	1110067	Erlanger	Kenton	2	0.26
48	1110161	Erlanger	Kenton	1	0.03
49	1110174	Elsmere	Kenton	1	0.01
50	1190012	Erlanger	Kenton	2	0.25

Recurring Wet Weather SSOs

No.	MHID	City	County	Model Predicted Overflow Activations	Model Predicted Overflow Volume (MG)
51	1220016	Erlanger	Kenton	2	0.02
52	1220054	Erlanger	Kenton	2	0.22
53	1240008	Erlanger	Kenton	2	0.14
54	1240012	Erlanger	Kenton	1	0.01
55	1550036	Fort Mitchell	Kenton	1	0.00
56	1550053	Fort Mitchell	Kenton	0	0.00
57	1560092	Fort Mitchell	Kenton	2	0.13
58	1560121	Fort Mitchell	Kenton	1	0.00
59	1700008	Covington	Kenton	0	0.00
60	1730086	Unicorp Kenton County	Kenton	1	0.57
61	1730100	Crescent Springs	Kenton	2	0.06
62	1730103	Fort Mitchell	Kenton	1	0.09
63	1760047	Edgewood	Kenton	2	0.48
64	1760048	Edgewood	Kenton	2	0.32
65	1790003	Crescent Springs	Kenton	1	0.00
66	1830067	Unicorp Boone County	Boone	0	0.00
67	1850140	Covington	Kenton	6	0.23
68	1850141	Covington	Kenton	6	0.74
69	1870013	Covington	Kenton	0	0.00
70	1870014	Covington	Kenton	0	0.00
71	1920086	Cold Spring	Campbell	1	0.00
72	1920097	Cold Spring	Campbell	1	0.00
73	1920163	Cold Spring	Campbell	0	0.00
74	1940006	Fort Wright	Kenton	1	0.04
75	1940038	Fort Wright	Kenton	2	0.01
76	1940039	Fort Wright	Kenton	2	0.06
77	1940044	Fort Wright	Kenton	2	0.02
78	1990018	Covington	Kenton	1	0.36
79	2020035	Taylor Mill	Kenton	2	0.14
80	2020203	Covington	Kenton	0	0.00
81	2070019	Elsmere	Kenton	1	0.09
82	2090008	Elsmere	Kenton	4	0.27
83	2100002	Elsmere	Kenton	1	0.02
84	2100007	Elsmere	Kenton	0	0.00
85	2100036	Elsmere	Kenton	1	0.01
86	2100037	Elsmere	Kenton	0	0.00
87	2100057	Elsmere	Kenton	1	0.00
88	2100128	Elsmere	Kenton	0	0.00
89	2100129	Elsmere	Kenton	4	0.84
90	2110002	Elsmere	Kenton	2	0.08
91	2110006	Elsmere	Kenton	0	0.00
92	2120001	Elsmere	Kenton	2	0.02
93	2120041	Elsmere	Kenton	0	0.00
94	2130026	Erlanger	Kenton	0	0.00
95	2130027	Erlanger	Kenton	0	0.00
96	2130028	Erlanger	Kenton	0	0.00
97	2170097	Crestview Hills	Kenton	0	0.00
98	2280023	Unicorp Kenton County	Kenton	2	0.23
99	2290001	Crescent Springs	Kenton	1	0.00

Recurring Wet Weather SSOs

No.	MHID	City	County	Model Predicted Overflow Activations	Model Predicted Overflow Volume (MG)
100	2300011	Erlanger	Kenton	2	0.02
101	2300016	Erlanger	Kenton	0	0.00
102	2300019	Erlanger	Kenton	1	0.18
103	2300121	Independence	Kenton	4	0.68
104	2300123	Unicorp Kenton County	Kenton	2	0.45
105	2301219	Erlanger	Kenton	1	0.69
106	2301274	Erlanger	Kenton	0	0.00
107	2370003	Unicorp Boone County	Boone	0	0.00
108	2400001	Unicorp Boone County	Boone	0	0.00
TOTAL				138	23.65

Threshold for model activation is 0.01 MGD and 0.001 MG

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APPENDIX E:
Wet Weather CSOs

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Wet Weather CSOs

No.	CSO ID	KPDES Permit #	Model Predicted Activations	Model Predicted Overflow Volume (MG)
1	0010220	To Be Permitted	3	0.29
2	0030031	KY0021466 - Outfall 10	0	0.00
3	0200069	KY0021466 - Outfall 11	4	0.14
4	0330100	KY0021466 - Outfall 12	0	0.00
5	0340050	KY0021466 - Outfall 14	4	0.09
6	0340051	KY0021466 - Outfall 13	3	0.05
7	0360079	To Be Permitted	4	0.50
8	0540157	To Be Permitted	7	0.12
9	0540156	To Be Permitted	7	0.13
10	0540158	To Be Permitted	1	0.01
11	0550134	To Be Permitted	1	0.03
12	0570089	KY0021466 - Outfall 16	3	5.93
13	0570090	KY0021466 - Outfall 17	1	0.32
14	0600094	KY0021466 - Outfall 18	7	0.20
15	0600096	To Be Permitted	3	0.03
16	0600097	KY0021466 - Outfall 19	8	0.60
17	0600104	To Be Permitted	1	0.00
18	0610071	KY0021466 - Outfall 21	10	3.56
19	0610072	KY0021466 - Outfall 20	2	0.04
20	0620075	KY0021466 - Outfall 23	10	1.32
21	0620077	KY0021466 - Outfall 22	5	0.05
22	0630054	To Be Permitted	0	0.00
23	0630061	KY0021466 - Outfall 83	7	0.30
24	0640090	KY0021466 - Outfall 24	11	16.13
25	0650054	To Be Permitted	0	0.00
26	0650090	KY0021466 - Outfall 26	4	0.96
27	0650098	To Be Permitted	1	1.78
28	0650100	KY0021466 - Outfall 25	2	0.03
29	0660085	To Be Permitted	5	0.08
30	0690059	To Be Permitted	0	0.00
31	0690067	To Be Permitted	4	0.02
32	0730129	To Be Permitted	11	0.33
33	0770096	KY0021466 - Outfall 28	7	0.26
34	0790084	KY0021466 - Outfall 31	15	1.96
35	0790086	KY0021466 - Outfall 29	10	12.33
36	0840111	To Be Permitted	0	0.00
37	0840112	To Be Permitted	10	0.53
38	0840116	KY0021466 - Outfall 27	12	1.16
39	0870078	KY0021466 - Outfall 33	3	0.07
40	0870079	KY0021466 - Outfall 34	13	6.53
41	0880081	KY0021466 - Outfall 36	10	6.85
42	0880082	KY0021466 - Outfall 35	3	0.09
43	0890081	To Be Permitted	0	0.00
44	0910065	KY0021466 - Outfall 38	8	26.14
45	0910066	To Be Permitted	0	0.00

Wet Weather CSOs

No.	CSO ID	KPDES Permit #	Model Predicted Activations	Model Predicted Overflow Volume (MG)
46	0910068	KY0021466 - Outfall 37	11	12.85
47	0910084	To Be Permitted	2	0.10
48	0930102	KY0021466 - Outfall 43	0	0.00
49	0930103	KY0021466 - Outfall 42	1	0.00
50	0930104	KY0021466 - Outfall 40	2	0.01
51	0930105	KY0021466 - Outfall 41	16	4.92
52	0930106	KY0021466 - Outfall 39	0	0.00
53	0960063	KY0021466 - Outfall 45	2	0.12
54	0960064	KY0021466 - Outfall 44	2	0.01
55	0980073	KY0021466 - Outfall 46	4	0.03
56	0980080	KY0021466 - Outfall 47	4	0.01
57	0980081	KY0021466 - Outfall 48	16	12.42
58	1320112	To Be Permitted	0	0.00
59	1350155	KY0021466 - Outfall 49	1	0.04
60	1380132	To Be Permitted	1	0.04
61	1380146	To Be Permitted	1	0.01
62	1420141	KY0021466 - Outfall 50	7	0.14
63	1420142	KY0021466 - Outfall 51	17	12.22
64	1420144	KY0021466 - Outfall 52	0	0.00
65	1420145	KY0021466 - Outfall 53	0	0.00
66	1420146	KY0021466 - Outfall 54	0	0.00
67	1420147	KY0021466 - Outfall 55	2	0.03
68	1440204	KY0021466 - Outfall 59	3	0.02
69	1440206	KY0021466 - Outfall 61	7	0.48
70	1440207	To Be Permitted	0	0.00
71	1440209	KY0021466 - Outfall 56	21	25.10
72	1440508	KY0021466 - Outfall 60	7	0.15
73	1470089	KY0021466 - Outfall 62	1	0.10
74	1470093	KY0021466 - Outfall 63	10	15.91
75	1480185	To Be Permitted	8	0.52
76	1480187	KY0021466 - Outfall 30	13	120.28
77	1490132	KY0021466 - Outfall 65	3	0.50
78	1490172	KY0021466 - Outfall 64	0	0.00
79	1500131	KY0021466 - Outfall 66	10	1.89
80	1510133	To Be Permitted	0	0.00
81	1710114	KY0021466 - Outfall 69	1	0.07
82	1710116	KY0021466 - Outfall 68	11	2.51
83	1710119	KY0021466 - Outfall 70	8	1.21
84	1710121	KY0021466 - Outfall 71	4	0.54
85	1710124	KY0021466 - Outfall 72	4	0.83
86	1720109	KY0021466 - Outfall 73	11	3.41
87	1730259	KY0021466 - Outfall 75	8	0.42
88	1730262	To Be Permitted	1	0.00
89	1730263	KY0021466 - Outfall 74	10	0.45
90	1840130	To Be Permitted	7	0.23

Wet Weather CSOs				
No.	CSO ID	KPDES Permit #	Model Predicted Activations	Model Predicted Overflow Volume (MG)
91	1850158	KY0021466 - Outfall 76	6	4.40
92	1870193	KY0021466 - Outfall 78	7	0.33
93	1870194	KY0021466 - Outfall 79	2	0.03
94	1880090	KY0021466 - Outfall 81	6	0.85
95	1880091	KY0021466 - Outfall 80	4	0.51
		TOTAL	482	312.64

Threshold for model activation is 0.01 MGD and 0.001 MG

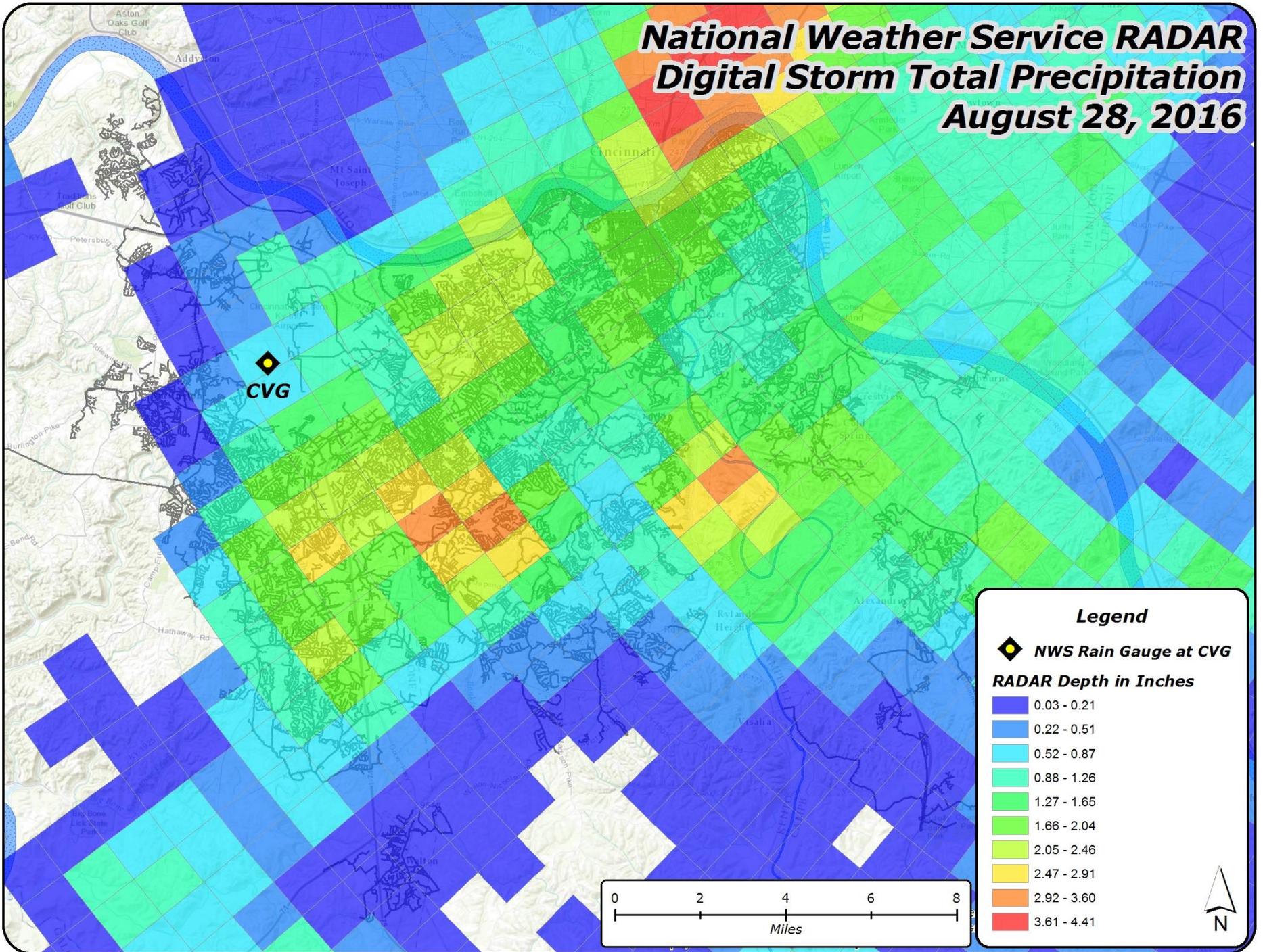
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APPENDIX F:

***Total Precipitation of August 28, 2016 Storm Event
per NWS RADAR***

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National Weather Service RADAR Digital Storm Total Precipitation August 28, 2016



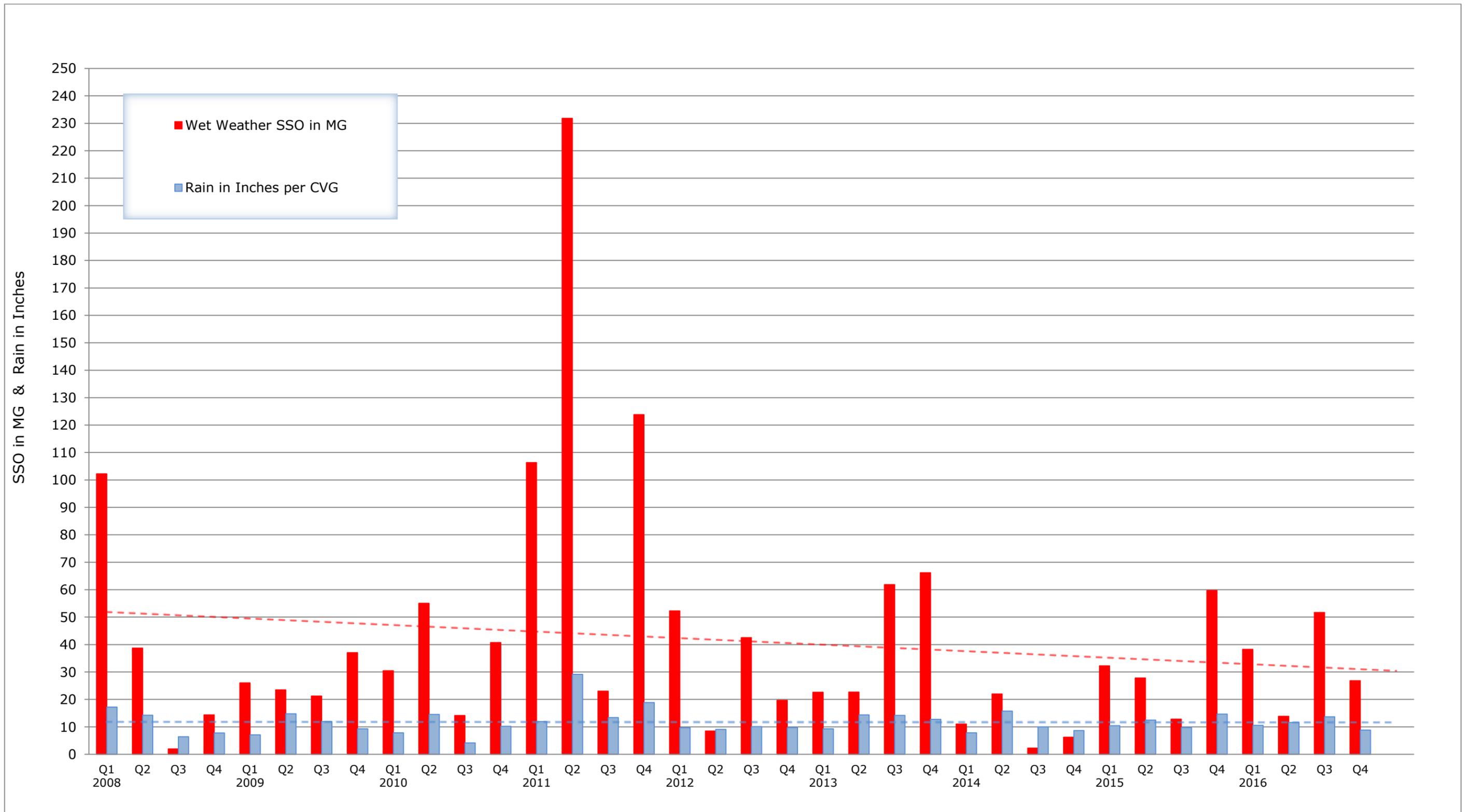
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APPENDIX G:

Quarterly Trends in Rainfall and Wet Weather SSO Volumes

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Quarterly Trends of Estimated Total Wet Weather SSO Volume and Cumulative Rainfall Depth Recorded at CVG
Showing Reduction in SSO



Reduction in Total Lakeview Pump Station SSO Volumes (2000-2016)

