MSD
Metropolitan Sewer District

700 West Liberty Street
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April 30, 2015

Chief, NPDES Permitting & Enforcement Branch
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Jeff Cummins, Director
Division of Enforcement
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300 Fair Oaks Lane
Frankfort, KY 40601

Subject: Quarterly Report 38
Civil Action No. 3:08-cv-00608-CRS

Attention Chief:

Please find attached our Quarterly Report, prepared in accordance with Paragraph 29 of our Amended Consent Decree. This report is for the period January 1, 2015 – March 31, 2015, pertaining to Consent Decree compliance activities. Included are sections on Project WIN activities related to: NMC, SORP, Discharge Abatement Plans, Public Outreach, Education, Notification and Participation, CMOM and Performance Overview.

I certify under penalty of law that this document and all attachments were prepared under our 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.

If you have questions or need additional information, please contact me at (502) 540-6136.

Sincerely,

Angela Akridge

Angela Akridge, PE.
Infrastructure Planning and Environmental Compliance Director

cc: Greg Heitzman, PE
Paula Purifoy

Louisville and Jefferson County Wet Weather Consent Decree Quarterly Report #38

Reporting Period:

January 1, 2015 through March 31, 2015

Submitted To:

Kentucky Department of Environmental Protection

United States Environmental Protection Agency

United States Department of Justice

Submitted By:

Louisville and Jefferson County Metropolitan Sewer District
700 W. Liberty Street
Louisville, Kentucky 40203-1911

Submittal Date:

April 30, 2015

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INTRODUCTION

The Louisville and Jefferson County Metropolitan Sewer District (MSD) is currently under an Amended Consent Decree with the Kentucky Department of Environmental Protection (KDEP), the United States Environmental Protection Agency (EPA), and the United States Department of Justice. The Amended Consent Decree was signed by United States District Judge Simpson on April 10, 2009, and filed in United States District Court, Western Division of Kentucky, Louisville Division, on April 15, 2009.

Quarterly Reporting Period

This is the thirty-seventh Quarterly Report submitted in accordance with Paragraph 29 of the Amended Consent Decree. This report covers the time period from January 1, 2015, through March 31, 2015. **The structure for this report is outlined as follows:**

Section 1: Program Activities for Nine Minimum Controls (NMC) - This section describes the data collected for NMC 2 – Maximization of Storage in the Collection System, and NMC 4 – Maximization of Flow at the Morris Forman Water Quality Treatment Center (WQTC) that were active during the reporting period (January 1, 2015, through March 31, 2015).

Section 2: Program Activities for Sewer Overflow Response Protocol (SORP) - This section describes the training attendance records, overflow data, and overflow reconnaissance inspection routes related to SORP that were active during the reporting period (January 1, 2015, through March 31, 2015).

Section 3: Program Activities for Discharge Abatement Plans (DAP) - This section describes the schedule and status for projects related to the DAP by means of an updated Gantt chart for active DAP projects during the reporting period, and the anticipated projects and activities that are scheduled for continued compliance with the Amended Consent Decree.

Section 4: Program Activities for Public Outreach, Education, Notification and Participation - This section describes the activities related to public outreach that were active during the reporting period (January 1, 2015, through March 31, 2015).

Section 5: Capacity Management, Operations and Maintenance Report - The CMOM program activities and programmatic activities for WQTCs generating capital projects will be reported in a Gantt chart for the reporting period (January 1, 2015, through March 31, 2015), and include the schedule for activities planned for the next two reporting periods (April 1, 2015, through September 30, 2015), are included in this section for continued compliance with the Amended Consent Decree.

Section 6: Performance Overview - This section provides an accounting of unauthorized discharge occurrences from the separate sanitary sewer and combined sewer system and the estimated volumes of each. A discussion of the probable reductions in both unauthorized discharge points and the discharges from MSD's Combined Sewer Overflow (CSO) locations, identified in the Morris Forman Water Quality Treatment Center (WQTC) Kentucky Pollutant Discharge Elimination System (KPDES) permit, that are expected to result from MSD's projects and activities during the reporting period are also contained in this section.

Performance information on Jeffersontown WQTC blending events, bypasses at WQTCs, DMR information, and phosphorus monitoring at WQTCs is included in this section.

SECTION 1: Program Activities for Nine Minimum Controls

1.1 Nine Minimum Controls Program Background

Per Paragraph 24.a. of the Amended Consent Decree, the Nine Minimum Controls (NMC) Compliance Report was initially submitted to EPA and KDEP on February 10, 2006. MSD received an approval letter, dated February 22, 2007, for the NMC Compliance Report. The approved NMC Compliance document can be viewed on the MSD Project WIN website http://www.msdprojectwin.org. Highlights of the NMC program implementation over this reporting period are outlined below.

1.2 NMC 2: Maximization of Storage in the Collection System

MSD has continued operation of Phase 1 and Phase 2 of the Real Time Control system. During this reporting period, approximately 223.95 MG were stored in the system during rain events and routed to the Morris Forman Water Quality Treatment Center (WQTC) once the system was able to handle the flow. See the figure at the end of this section for a detailed report.

The gates at SWOR2 have been placed in manual control due to what was diagnosed as a failure of the gate level sensors that are integral to the integration of this site in the RTC schema. The sensors were replaced in the last quarter of 2013, but the problem could not be resolved at that time due to the gate-closed proximity switches also being diagnosed as defective. A description of corrective action progress is included in the Section 1.3 activities associated with Morris Forman WQTC performance.

1.3 NMC 4: Maximization of Flow at the Morris Forman Water Quality Treatment Center (WQTC)

The following charts illustrate performance in maximizing flow to the Morris Forman WQTC. The top of the chart shows rainfall inches per day. The middle part of the chart shows Morris Forman WQTC effluent flow and secondary treatment flow. The difference between these is the secondary bypass flow. The bottom of the chart shows days with a CSO activation at the five CSOs in the vicinity of the Morris Forman WQTC (CSOs 015, 016, 191, 210, and 211). Note that the flow meter downstream from CSO 211 is known to be affected by backwater effects of the Ohio River and the ultrasonic signal is sometimes blocked by mist and condensation when air and sewage temperatures are significantly different, so CSO activations at CSO 211 are keyed to water levels upstream and downstream of the inflatable dam in the Main Diversion Structure. The other CSO activations are tied to flow measurement downstream of the respective CSOs. At times, “blips” representing very small volumes of overflow are indicated by flow meters even though an overflow cannot be verified by level measurements or other indicators. These blips are not reported as overflows, but are noted in the CSO monitoring data reported in Appendix B. There are occasions in which a communications failure with telemetry has led to short-term gaps in the data. In addition, indications of rainfall and CSO activations are shown on the day they happened, but are not aligned with the exact time, so the effluent flow graph (which is tied to actual time) may show peaks that are offset from the indicated rain or CSO events by as much as 24 hours.

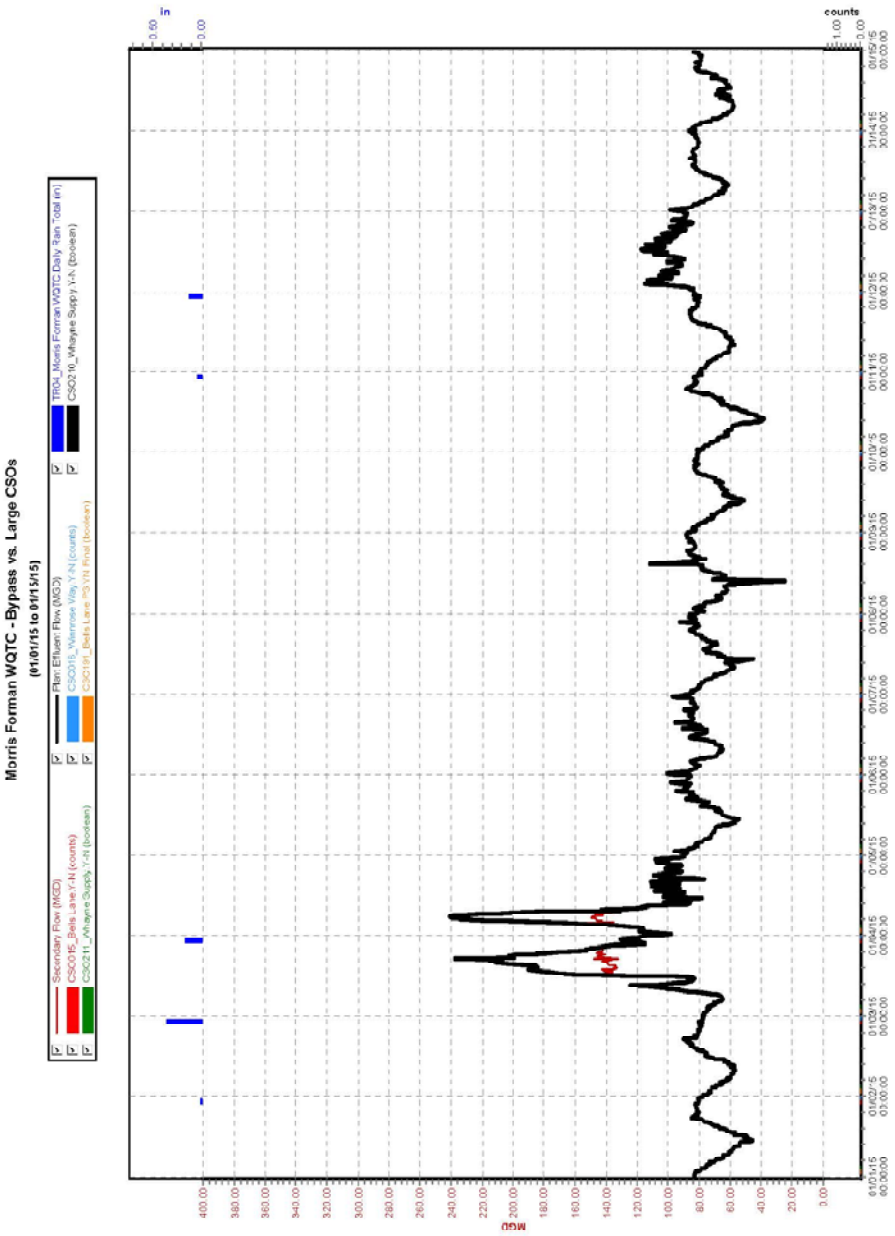
There were a several minor outages in the headworks during this reporting period, but wet

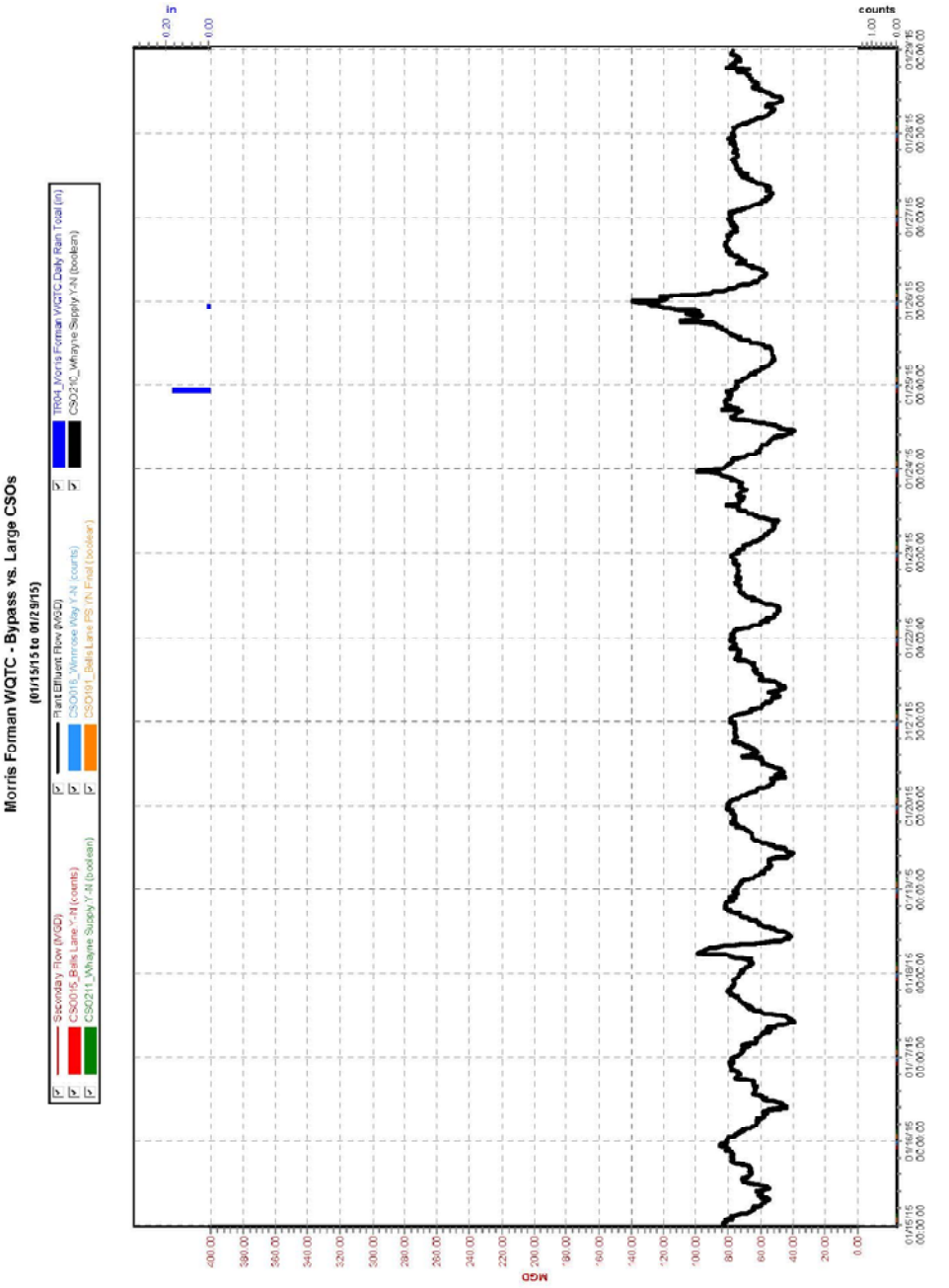
weather capacity was not significantly affected. The major capacity impact was related to high water conditions in the Ohio River requiring the use of the Final Effluent Pump Station (FEPS) for a substantial part of the quarter. FEPS Pump #1 was out of service for planned maintenance for the majority of the quarter. On March 13 FEPS Pump # 2 developed severe vibrations during a pumping event, leading to its eventual shutdown. Pumping capacity was reduced to roughly 200 MGD for a short time, until Pump # 1 could be put back in service. While this did not by itself trigger a CSO, the reduced pumping capacity affected CSO volumes during this significant wet weather event.

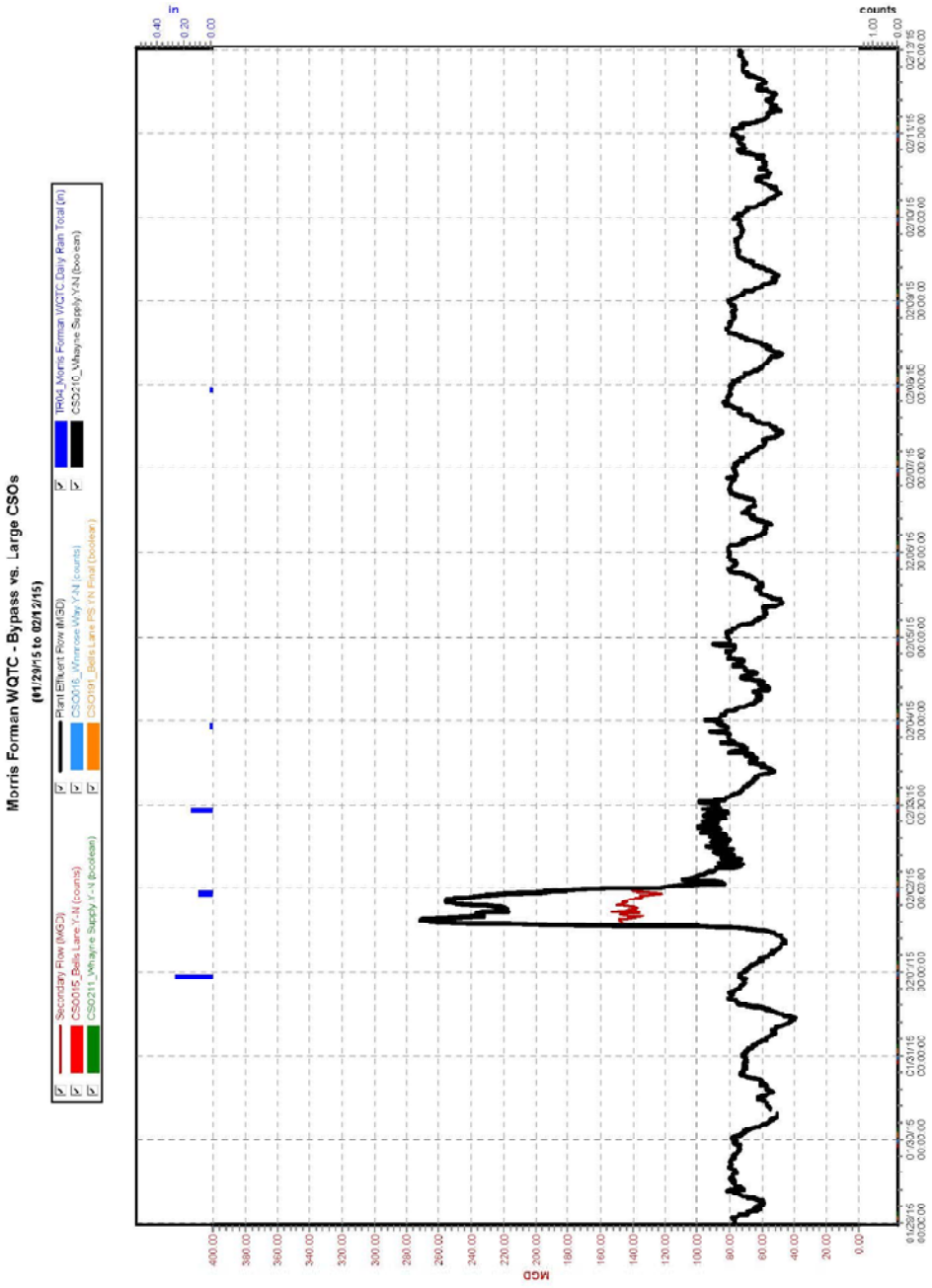
In addition to high river conditions, there were several very significant and extended wet weather events during the quarter. A significant rain event occurred February 21st at a time when high blanket depths in the Sedimentation Basins reduced the effective capacity to 290 MGD before CSO discharges occurred at CSO210. On March 4th heavy amounts of snow melt and rain caused discharges at CSO015, CSO016 and CSO210. This wet weather event was followed by wet weather events on March 10th, March 13th and March 14th. These back-to-back precipitation events resulted starting a 14 day long secondary bypass event and several CSO discharge events from all the CSOs in the Morris Forman WQTC area. On March 24th to the 26th more rain fell over the Morris Forman WQTC service area. The Morris Forman WQTC was able to handle the rain events with very little secondary bypassing early March 25th with no overflows from the major CSOs. The majority of the rain fell on March 26th. Morris Forman WQTC was able to sustain flows of 310 MGD while discharging at CSO015, CSO16 and CSO210.

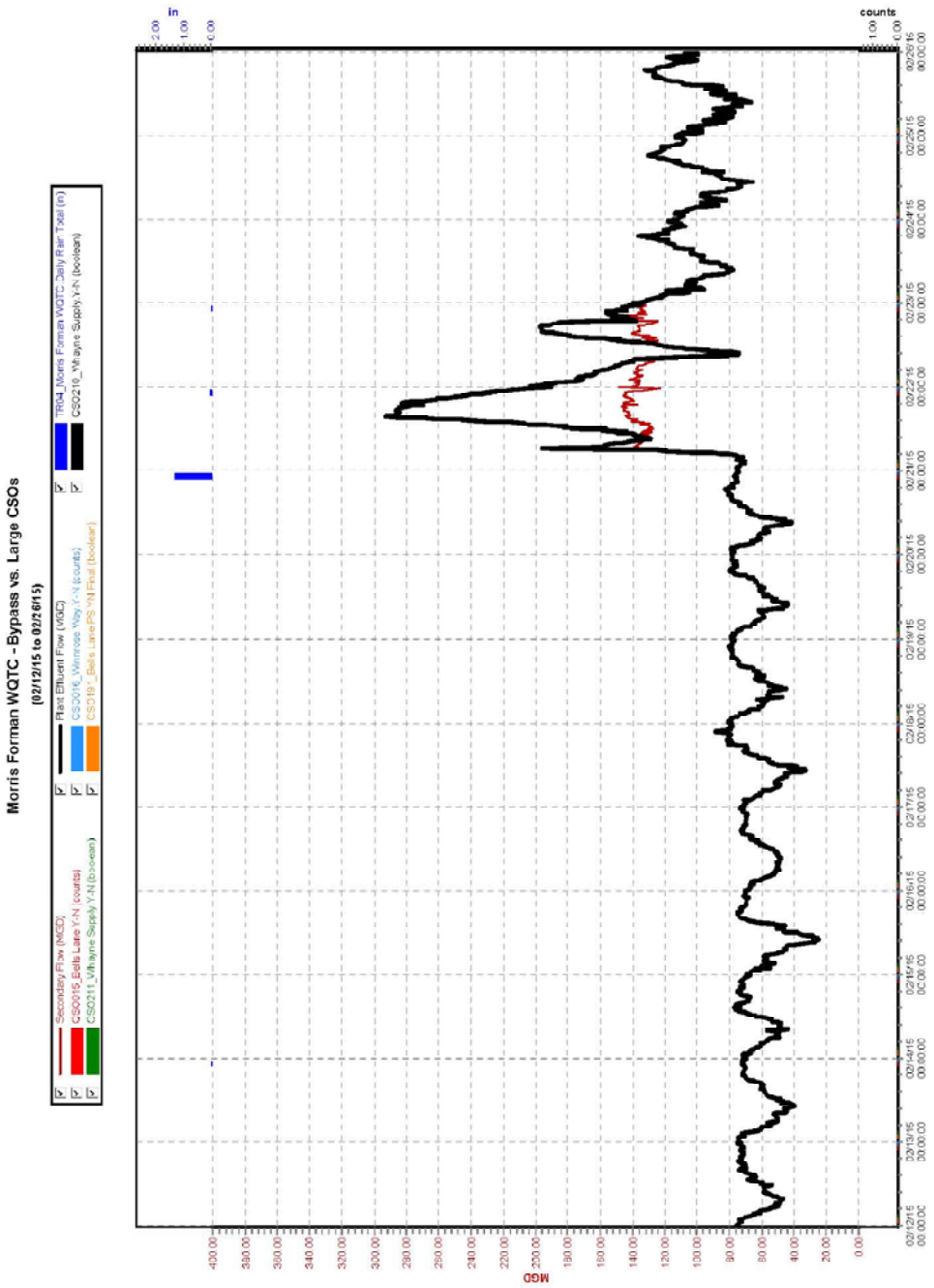
There were a few outages in Secondary Treatment for this period. Clarifier B-2 was out of service for the majority of the quarter for maintenance. During rain events in this quarter, Morris Forman WQTC was able to maintain flows of 120 MGD to 140 MGD and above through the secondary treatment process.

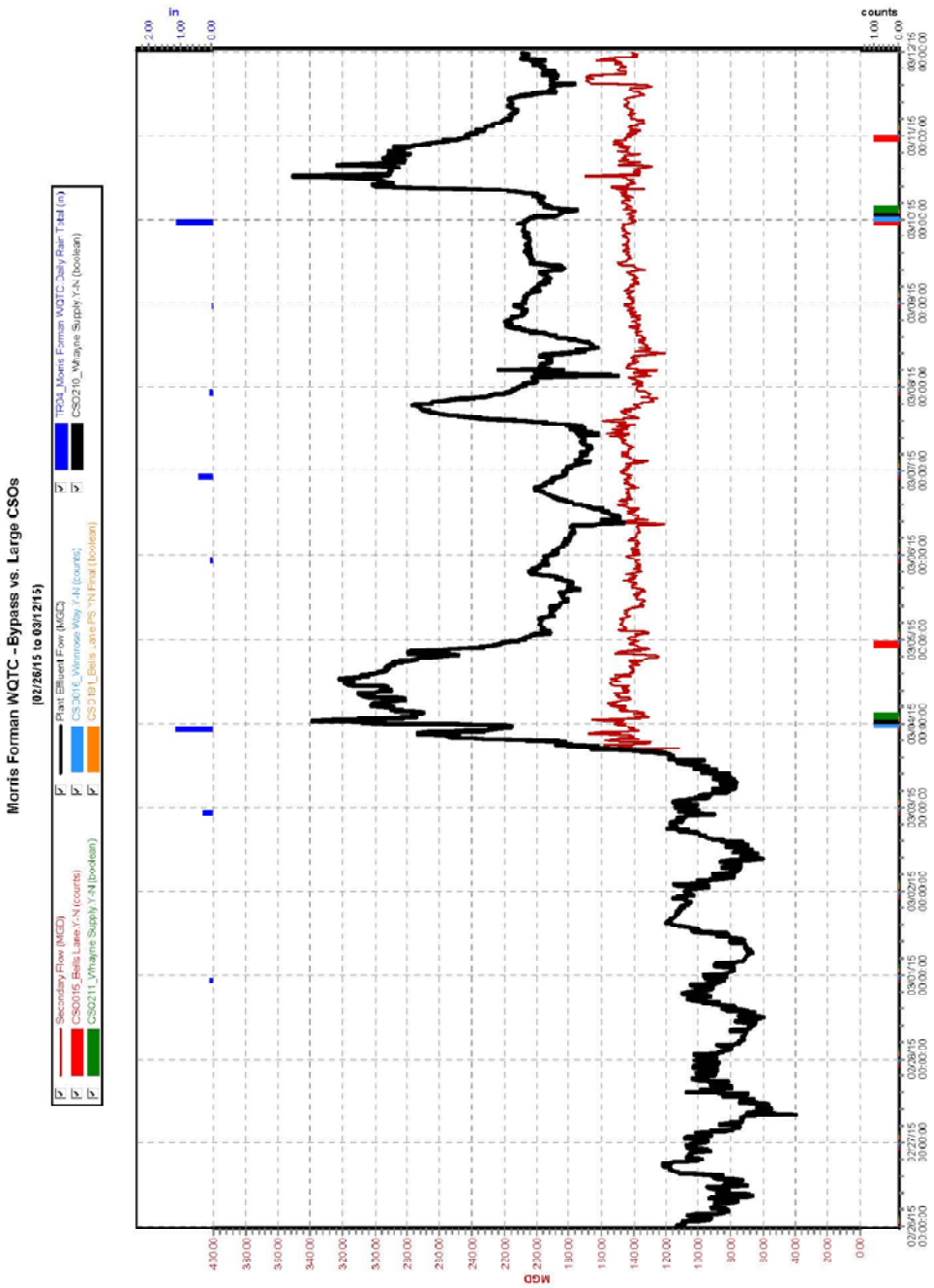
The Morris Forman Headworks Replacement Project is scheduled to be bid in May 2015. Meanwhile, design is also underway for a replacement of equipment at the Morris Forman WQTC High-Yard Substation. A 100% final construction review was recently conducted with the design consultant and is expected to be bid in May 2015. Although the Morris Forman WQTC High-Yard Substation Project does not directly impact plant capacity, the project will require scheduled plant power outages during construction to make connections.

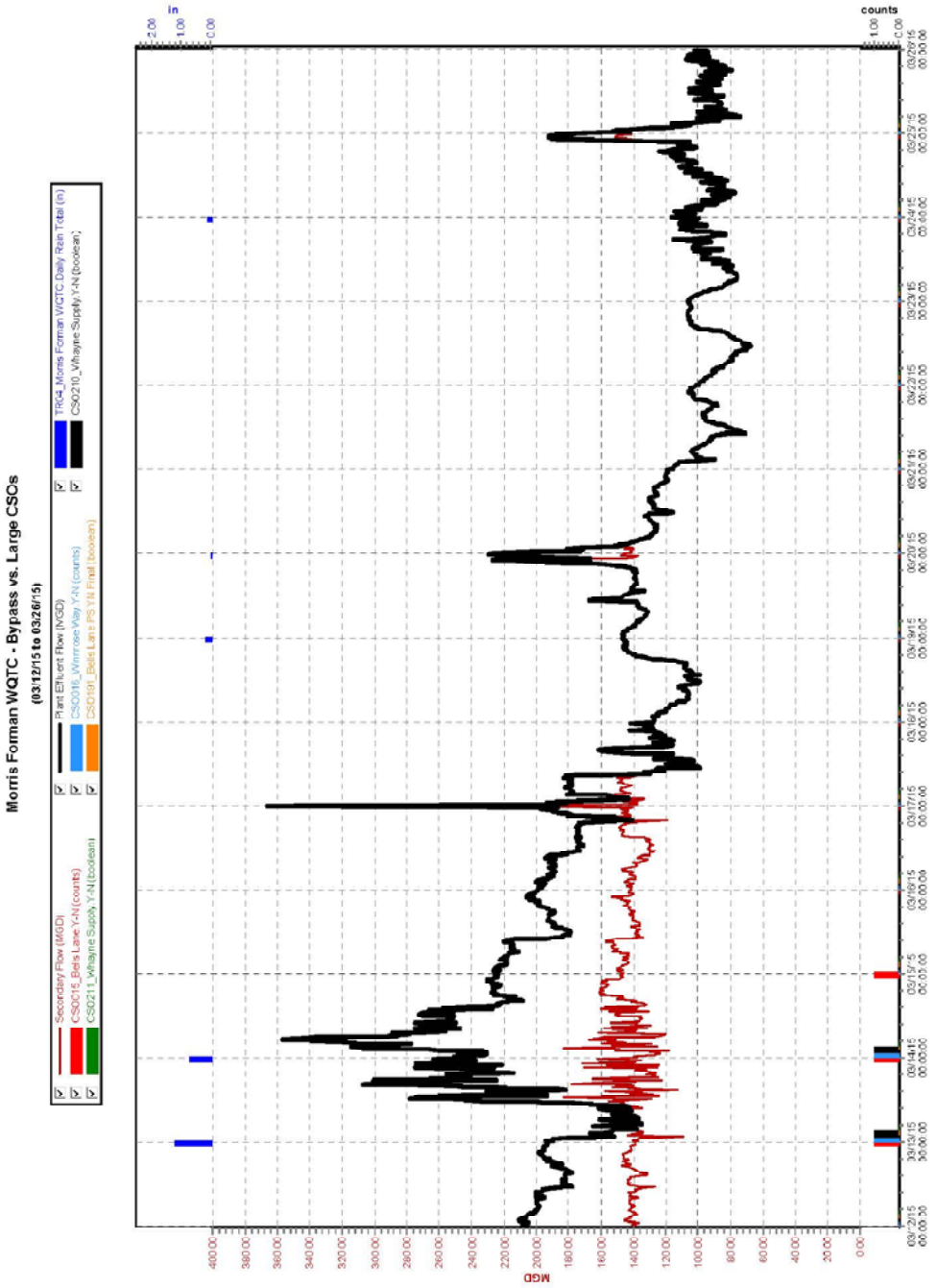

Morris Forman WQTC - Bypass vs. Large CSOs
(01/01/15 to 01/15/15)
Secondary Flow (MGD)
CSO015_Bells Lane I-N (counts)
CSO21_Whayne Supply I-N (boolean)
Plan Effluent Flow (MGD)
CSO015_Valmose Way I-N (counts)
CSO181_Bells Lane HS I-N Final (boolean)
TRDL_Morris Forman WQTC Daily Rain Total (in)
CSO210_Whayne Supply I-N (boolean)
in
counts
MGD

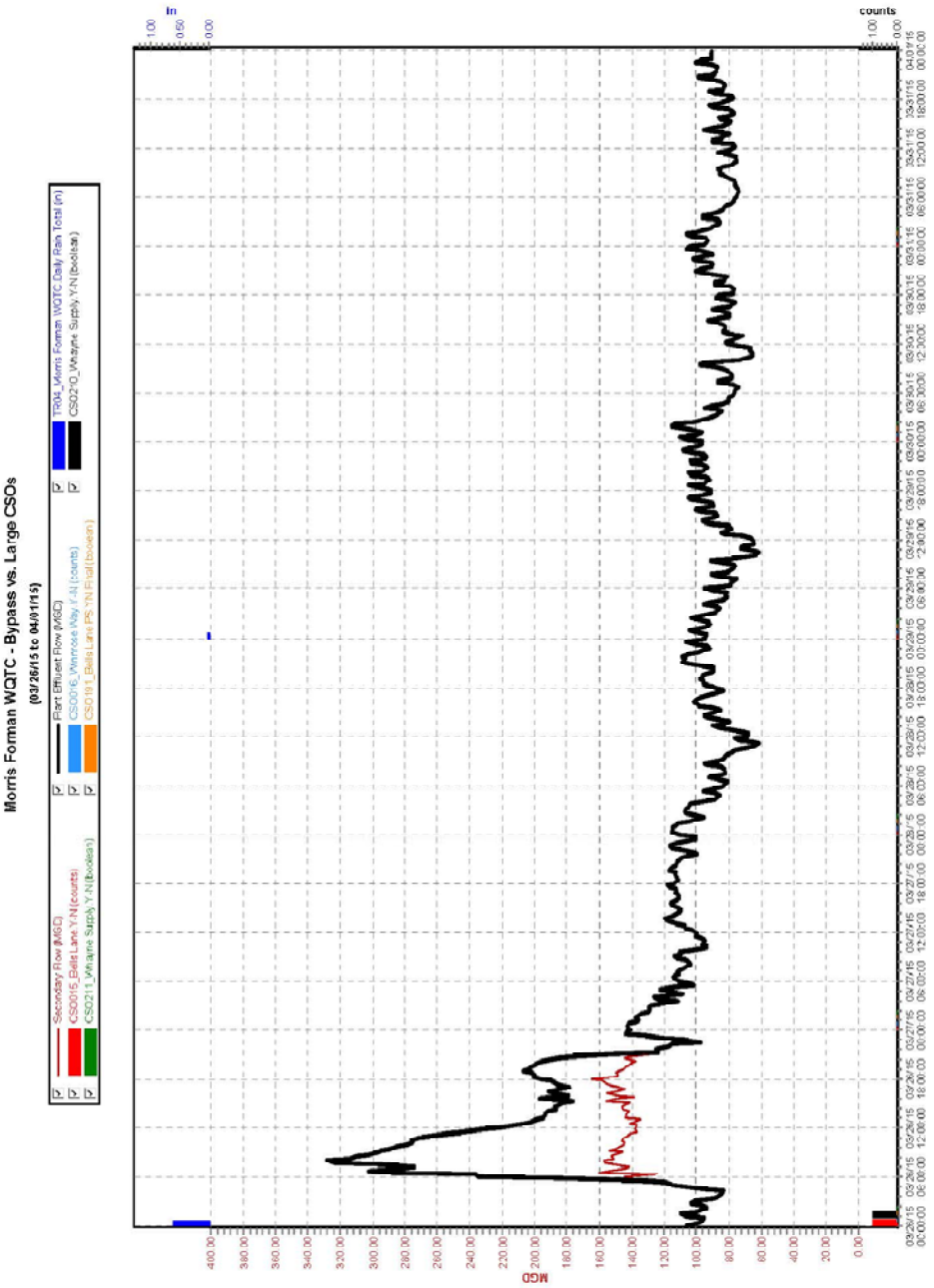

Morris Forman WQTC - Bypass vs. Large CSOs
(01/15/15 to 01/29/15)
Secondary Flow (MGD)
CSO015_Balls Lane Y-N (counts)
CSO211_Whayne Supply Y-N (boolean)
Plant Effluent Flow (MGD)
CSO016_Winnrose Way Y-N (counts)
CSO191_Balls Lane PS (hr) Final (boolean)
TR04_Morris Forman WQTC Daily Rain Total (in)
CSO21C_Whayne Supply Y-N (boolean)
in
counts
MGD


Morris Forman WQTC - Bypass vs. Large CSOs
(01/29/15 to 02/12/15)
Secondary Flow (MG)
CSO015_Bells Lane Y-N (counts)
CSO211_Wayne Supply Y-N (boolean)
Plant Effluent Flow (MGD)
CSO016_Winrose Way Y-N (counts)
CSO191_Bells Lane PS Y-N Final (boolean)
TRI04_Morris Forman WQTC Daily Rain Total (in)
CSO210_Wayne Supply Y-N (boolean)
in
counts
MGD


Morris Forman WQTC - Bypass vs. Large CSOs
(02/12/15 to 02/26/15)
Secondary Flow (MGD)
CSO015_Bells Lane Y-N (counts)
CSO211_Wilkayne Supply Y-N (boolean)
Plant Effluent Flow (MGD)
CSO016_Wenrose Way Y-N (counts)
CSO191_Bells Lane PS_YN Final (boolean)
TR04_Morris Forman WQTC_Daily Rain Total (in)
CSO216_Wilkayne Supply Y-N (boolean)
in
counts
MGD


Morris Forman WQTC - Bypass vs. Large CSOs
(02/26/15 to 03/12/15)
Secondary Flow (MGD)
CSO015_Bells Lane Y-N (counts)
CSO211_Wilhayne Supply Y-N (boolean)
Plant Effluent Flow (MGD)
CSO016_Winnrose Way Y-N (counts)
CSO151_Bells Lane PS_Y-N Final (boolean)
TR04_Morris Forman WQTC_Daily Rain Total (in)
CSO210_Wilayne Supply Y-N (boolean)
in
counts
MGD


Morris Forman WQTC - Bypass vs. Large CSOs
(03/12/15 to 03/26/15)
Secondary Flow (MGD)
CSO015_Bells Lane Y-N (counts)
CSO211_Wayne Supply Y-N (boolean)
Plant Effluent Flow (MGD)
CSO016_Winnrose Way Y-N (counts)
CSO181_Bells Lane PS Y-N Final (boolean)
TRG4_Morris Forman WQTC Daily Rain Total (in)
CSO210_Wayne Supply Y-N (boolean)
in
counts
MGD


Morris Forman WQTC - Bypass vs. Large CSOs
(03/26/15 to 04/01/15)
Secondary Flow (MGD)
CSO015_Bells Lane Y-N (counts)
CSO21_Wayne Supply Y-N (boolean)
Plant Effluent Flow (MGD)
CSO016_Winnose Alley Y-N (counts)
CSO18_Bells Lane PS_Y-N Pump (boolean)
TKML_Morris Forman WQTC Daily Rain Total (in)
CSO21O_Wayne Supply Y-N (boolean)
in
counts
MGD

There were no KPDES permit violations at Morris Forman WQTC in January. There were five violations in February and four in March, due to sustained elevated flows, higher than normal BOD and TSS loadings, limitations in solids handling, and limited options for offloading excess solids to the landfill as a result of wet conditions and severe landfill odor concerns. In February the violations were 7 day and monthly for BOD and TSS and percent removal for TSS. In March the violations were 7 day and monthly for BOD and TSS.

During this reporting period, the following activities were continued and/or completed:

- RTC Integration – Staff is working with the RTC consultant to review, revise and begin implementing the draft wet weather SOP for the system that also includes the Southeast Diversion Structure, Buechel Basin, Northern Ditch Diversion, and the Derek R Guthrie WQTC Wet Weather Treatment Facility. Full integration in an automated mode will not be achieved until the RTC software (CSoft) is upgraded to the most current version and the hydraulic engine is converted to use MSD's InfoWorks ICM hydraulic model. While this work is being done, the SOP is being implemented incrementally, starting with a period of manual operation to validate the control assumptions, followed by increasing levels of system automation as the automated controls for individual components are implemented, validated, and then incorporated into the overall RTC system. During this reporting period, MSD completed the development of the CSoft ICM Controller, began building the Csoft Model, completed the preliminary ICM model reductions for use with CSoft, and initiated simulations, troubleshooting, and calibrations.. Staff continued to review SOPs for the Southeast Diversion Structure, Buechel Basin, Northern Ditch Diversion, and the Derek R Guthrie WQTC Wet Weather Treatment Facilities. During next reporting period, MSD anticipates beginning the rollout and implementation of the new version of Csoft and completing InfoWorks ICM hydraulic model integration. A workshop will be held to review the updated SOPs and operational improvements for the RTC Phase II sites. Based on the outcomes of the workshop, it is anticipated that staff will begin implementing revised SOPs for the Southeast Diversion Structure, Buechel Basin, Northern Ditch Diversion, and the Derek R Guthrie WQTC Wet Weather Treatment Facilities. Full implementation of the revised SOPs will be completed after the CSoft and InfoWorks ICM hydraulic model integration is complete. The anticipated completion date for this integration is fall 2015.
- RTC Performance Assessment – The main objective of the RTC Performance Assessment is to determine whether the available flow and storage capacities within the system are being utilized to their full potential. MSD staff continued to review and prioritize for implementation strategies for performance improvement. During the next reporting period, MSD staff and the RTC consultant will continue to work to implement the hardware, software and set-point changes as applicable on a site-by-site basis. Work on implementing these improvements will continue through the next reporting period.
- Headworks Replacement Project – Design efforts to replace the existing headworks to improve reliability and plant hydraulics are complete. MSD staff received and reviewed the 100% design submittal. During the next reporting period, it is anticipated that the

project will be bid and awarded for construction.

- SWOR2 Modifications – Construction activities continued during this reporting period. Equipment is installed and the contractor started the preparation for acceptance testing. It is anticipated that construction and final acceptance will be completed during the next reporting period.

WET WEATHER STORAGE IN THE MORRIS FORMAN SEWER SYSTEM VIA REAL TIME CONTROL

Louisville/Jefferson County
Metropolitan Sewer District

WET WEATHER STORAGE IN THE MORRIS FORMAN SEWER SYSTEM VIA THE RTC SYSTEM

Period	
From :	01/01/2015
To :	03/31/2015

Event Number	Wet Weather Event			Rainfall			CSO Saved Volume (MG)								High River Levels	Comments
				Average*	Max**											
	Start Date	End Date	Duration	TRFD (in)	TRFD (in)	Rain Gauge	SWPS SG Chamber (14.5)	SWOR2 (7.5)	Brady Lake and Executive Inn Storage (13.4)	Southern Outfall (3.5)	Ashland (1.0)	Ohio River Interceptor (4.1)	Sneads Branch (2.5)	Total (46.5)		
2015-001	1-3-15 4:45	1-4-15 5:30	24:45:00	0.36	0.51	TR04	0.30	0.15	0.00	0.80	0.00	2.50	0.00	3.75	No	Small storm cells heterogeneously distributed over the service area. SWOR2 was manually controlled, with gates in the open position and minimal utilization of the available storage MDS was manually operated. (The event end date was modified to account for a technical malfunction at Snead Branch which did not permit normal closing of the event).
2015-006	2-1-15 11:00	2-2-15 10:50	23:50:00	0.44	0.52	TR15	2.30	0.80	0.10	1.40	0.15	3.50	0.10	8.35	No	Moderate storm cells heterogeneously distributed over the service area. SWOR2 was manually controlled, with gates in the open position and minimal utilization of the available storage. MDS was manually operated.
2015-008	2-21-15 3:05	2-22-15 9:40	30:35:00	1.11	1.33	TR04	10.75	1.65	1.75	3.15	0.75	2.05	0.10	20.20	No	Large storm cells homogeneously distributed over the service area. SWOR2 was manually controlled with gates in the open position and minimal available storage utilization. MDS was manually operated
2015-012/013/014	3-3-15 18:20	3-10-15 0:40	150:20:00	2.14	2.38	TR12	25.10	8.45	12.70	4.55	3.00	5.90	2.30	62.00	Yes	Very large storm cells homogeneously distributed over the service area. Back-to-back storm cells with dewatering of storage sites between cells. SWOR2 was manually controlled, with gates in the open position and minimal available storage utilization. However, storage occurred at this site due to backflow at SWSG and inflows greater than its gate's capacity. SWSG and MDS were manually operated. Brady Lake had a regulator malfunction during the event leading to the temporary opening of its gates.
2015-015	3-10-15 3:45	3-13-15 1:10	69:25:00	1.31	1.48	TR01	22.30	10.50	8.40	3.70	2.30	4.85	2.30	54.35	Yes	Large storm cells homogeneously distributed over the service area. SWOR2 was manually controlled, with gates in the open position and minimal available storage utilization. However, storage occurred at this site due to backflow at SWSG and inflows greater than its gate's capacity. SWSG and MDS were manually operated. MDS and SWSG were manually operated. Brady Lake had a regulator malfunction during the event leading to the temporary opening of its gates.
2015-016	3-13-15 9:05	3-16-15 19:35	82:30:00	1.95	2.38	TR15	23.60	7.85	9.00	4.30	1.70	5.60	2.90	54.95	Yes	Large storm cells homogeneously distributed over the service area. SWOR2 was manually controlled, with gates in the open position and minimal available storage utilization. However, storage occurred at this site due to backflow at SWSG and inflows greater than its gate's capacity. MDS and SWSG were manually operated.
2015-017	3-24-15 15:15	3-25-15 4:55	13:40:00	0.51	0.62	TR04	11.60	0.00	1.50	3.50	0.40	2.90	0.45	20.35	No	Moderate storm cells homogeneously distributed over the service area. SWOR2 was manually controlled, with gates in the open position and minimal utilization of the available storage. MDS and SWSG were manually operated.
TOTAL							**95.95**	**29.40**	**33.45**	**21.40**	**8.30**	**27.30**	**8.15**	**223.95**		

SECTION 2: Program Activities for Sewer Overflow Response Protocol

2.1 SORP Program Background

Per Paragraph 24.d. of the Amended Consent Decree, MSD initially submitted the Sewer Overflow Response Protocol (SORP) to EPA and KDEP on February 10, 2006, and received comments on March 13, 2006.

MSD completely revised the SORP documentation in 2011. The draft of this revised document was submitted for comment on August 22, 2011. Comments from the EPA and KDEP were received and addressed, and the document was resubmitted October 28, 2011. Final approval of the updated SORP document was received February 21, 2012. A hard copy of the approved document has been distributed to each division throughout MSD and a viewable, downloadable electronic version has been posted to the MSD Project WIN website www.msdprojectwin.org.

The current approved SORP document is dated February 21, 2012, and can be viewed on the MSD Project WIN website (www.msdprojectwin.org**)**. Updates to the SORP document were submitted in August 2012, with confirmation of approvals on October 25, 2012. These updates are posted on the Project WIN website. The following activities were performed during this reporting period.

2.2 Overflow Management and Field Documentation

- Monitored approximately 155 sanitary sewer overflow (SSO) sites, which have been grouped into routes based on the range of rainfall rates necessary to cause a SSO. These routes are monitored during rain events depending on the magnitude and location of the storm. If an overflow is observed, a Discharge Work Order is created to document the event. During this quarter, Engineering staff documented 73 unauthorized discharges through route reconnaissance. Inspection routes were run during rain events as described in the following table:

Route Description	03/04/15	03/10/15	03/13/15
ENGINEERING RAIN EVENT SSO INSPECTION ROUTE	X	X	X
RS JEFFERSONTOWN RAIN EVENT SSO INSPECTION ROUTE (JTOWN MANHOLES WITHIN 2000 LF OF HEADWORKS)	X	X	X
RS JEFFERSONTOWN/FERN CREEK RAIN EVENT SSO INSPECTION ROUTE	X	X	X
RS MIDDLE/MUDDY FORK RAIN EVENT SSO INSPECTION ROUTE	X	X	X
RS HIKES POINT RAIN EVENT SSO INSPECTION ROUTE	X	X	X

- Due to capacity-related issues during this reporting period, MSD Operations staff hauled 9,500 gallons of sewage. MSD also hauled due to other issues as indicated in the following table:

MSD Hauled Volumes In Gallons (January 1, 2015 - March 31, 2015)				
Problem	**January**	**February**	**March**	**Total**
LACK OF SYSTEM CAPACITY	-	9,500	-	9,500
MECHANICAL FAILURE	-	-	431,900	431,900
OBSTRUCTION-NOT GREASE / ROO	-	-	70,000	70,000
Grand Total	**-**	**9,500**	**501,900**	**511,400**

2.3 Staff Training and Communication

- Reviewed and updated the training documentation for the 2015 first quarter SORP training that included Preparing, Monitoring and Response to Overflows.
- Commenced planning for the 2015 second quarter SORP training that will focus on Overflow Assessment, Establishing Control Zones, Mitigation and Documentation.
- Conducted the following SORP Quarterly training sessions which were attended by 242 employees.

Staff Training Participation - January 1, 2015 - March 31, 2015				
Date	**Dept./Area**	**Location**	**Module**	**Attendees**
3/10/2015	Morris Foreman Staff	MFWQTC	Preparing, Monitoring and Response to Overflows	9
3/11/2015	Morris Foreman Staff	MFWQTC	Preparing, Monitoring and Response to Overflows	23
3/11/2015	Morris Foreman Staff	MFWQTC	Preparing, Monitoring and Response to Overflows	15
3/12/2015	RMS/ENG Staff	CMF A & B	Preparing, Monitoring and Response to Overflows	29
3/13/2015	I&FP Staff	CMF A	Preparing, Monitoring and Response to Overflows	8
3/17/2015	Morris Foreman Staff	MFWQTC	Preparing, Monitoring and Response to Overflows	8
3/18/2015	Morris Foreman Staff	MFWQTC	Preparing, Monitoring and Response to Overflows	28
3/18/2015	Morris Foreman Staff	MFWQTC	Preparing, Monitoring and Response to Overflows	3
3/19/2015	RMS/ENG Staff	CMF A & B	Preparing, Monitoring and Response to Overflows	56
3/20/2015	I&FP Staff	CMF A	Preparing, Monitoring and Response to Overflows	15
3/25/2015	Central OPS	CCWQTC	Preparing, Monitoring and Response to Overflows	23
3/25/2015	East OPS	FFWQTC	Preparing, Monitoring and Response to Overflows	18
4/1/2015	West OPS	DRGWQTC	Preparing, Monitoring and Response to Overflows	7
Total				242

SECTION 3: Program Activities for Discharge Abatement Plans

3.1 Integrated Overflow Abatement Plan (IOAP)

As a requirement of the Amended Consent Decree, per Paragraph 25, MSD is to prepare and submit for review and approval discharge abatement plans for the elimination of unauthorized discharges from the separate sanitary sewer system and the combined sewer system, the reduction and control of discharges from the CSO locations identified in the Morris Forman WQTC KPDES permit, and the improvement of water quality in the receiving waters.

The Final Sanitary Sewer Discharge Plan and the Final CSO Long Term Control Plan were submitted concurrently and certified on December 19, 2008, under the title of the Integrated Overflow Abatement Plan (IOAP). The IOAP was accepted by the Federal Court and incorporated by reference into the Amended Consent Decree by an Order signed February 12, 2010, that was entered into public record February 15, 2010.

MSD submitted an IOAP modification request to EPA/KDEP on September 20, 2012, with partial approval granted via certified letter on October 25, 2012. The modified project package, including program descriptions, progress, and updated supporting text, was submitted to EPA/KDEP for approval on June 14, 2013. On June 19, 2014, MSD received approval of the 2012 IOAP Modification from EPA/KDEP. The project and program modifications proposed within this submittal resulted from additional information gathered from ongoing system monitoring, hydraulic modeling, and best professional judgment. MSD's adaptive management approach to overflow abatement has justified modifications which will result in a higher level of overflow control to be completed faster than originally proposed for approximately the same overall budget.

3.2 Sanitary Sewer Discharge Plan (SSDP)

The Sanitary Sewer Discharge Plan (SSDP) addresses the overflows and unauthorized discharges from the separate sanitary sewer system. Three separate plans have been submitted under this program as described below and outlined in Paragraph 25.a. of the Amended Consent Decree.

3.2.1 Updated Sanitary Sewer Overflow Plan Implementation

MSD prepared and submitted the Updated Sanitary Sewer Overflow Plan (SSOP) on February 10, 2006. This plan included an overview of the MSD sanitary sewer overflow abatement program and specific actions taken to reduce/eliminate overflows from the sanitary sewer system. This document included a list of the proposed improvements to be accomplished by December 31, 2008. Activities required under the Updated SSOP have been completed.

3.2.2 Interim Sanitary Sewer Discharge Plan

MSD submitted an Interim Sanitary Sewer Discharge Plan (ISSDP) for approval on September 30, 2007. Comments were received on January 8, 2008. MSD resubmitted the revised ISSDP on March 7, 2008, and received an approval letter for the ISSDP on July 24, 2008. The approved ISSDP document can be viewed on the MSD Project WIN website (www.msdprojectwin.org).

All projects required by the ISSDP have been completed and certified, with the exception of

the Derek R. Guthrie WQTC expansion. During this reporting period the Derek R. Guthrie WQTC was operational in accordance with information previously submitted. The project has achieved overflow reduction performance as planned and designed. No treatment capacity related sanitary sewer overflows have occurred with the exception of the discharges related to the bar screen failure previously reported in the February 20, 2013, DMR (January – March 2013 reporting period) for Derek R. Guthrie WQTC, and one discharge October 6, 2013, related to a grit system problem that reduced plant capacity to 150 MGD for a short time. MSD is currently working with KDEP and EPA to move towards certification.

3.2.3 Final Sanitary Sewer Discharge Plan

MSD submitted for approval a Final Sanitary Sewer Discharge Plan (SSDP) on December 19, 2008, as Volume 3 of the Integrated Overflow Abatement Plan (IOAP). The IOAP was accepted by the Federal Court and incorporated by reference into the Amended Consent Decree by an Order signed February 12, 2010, that was entered into public record February 15, 2010. A revised SSDP was included in the IOAP revision, submitted June 14, 2013. On June 19, 2014, MSD received approval of the 2012 IOAP Modification from EPA/KDEP. The following is a summary of activities that support elimination of the Prospect WQTCs.

- Prospect WQTC Elimination Projects Easement Status - A total of 54 easements have been identified, and all 54 easements have been acquired.
- Project Status Details:
  - River Road Interceptor – project complete.
  - River Road Interceptor Phase 1A – project complete
  - Harrods Creek Pump Station – project under construction.
  - Harrods Creek Interceptor and Force Main Phase 1 – project complete.
  - Harrods Creek Interceptor and Force Main Phase 2 – project complete.
  - Harrods Creek Force Main Phase 3A – project complete.
  - Harrods Creek Force Main Phase 3B – project complete.
  - Shadow Wood WQTC Elimination – project under construction
  - Hunting Creek North WQTC Elimination - project under construction.
  - Timberlake and Hunting Creek South WQTC Elimination – project has been awarded and construction will start in February 2015.
  - Ken Carla WQTC Elimination – project has been awarded and construction will start January 2015.

3.3 CSO Long Term Control Plan

The CSO Long Term Control Plan (LTCP) addresses the overflows and unauthorized discharges from the CSS. Two separate plans have been submitted under this program as described below and outlined in Paragraph 25.b. of the Amended Consent Decree.

3.3.1 Interim CSO Long Term Control Plan

The Interim CSO LTCP was initially submitted to EPA and KDEP on February 10, 2006. MSD received an approval letter dated February 22, 2007, for the Interim LTCP. The approved Interim LTCP can be viewed on the MSD Project WIN website (www.msdprojectwin.org).

This plan includes an overview of the MSD program, efforts taken to reduce/eliminate discharges from the CSS and the list of proposed improvements to be accomplished by December 31, 2008. All projects associated with this plan have been completed.

3.3.2 Final CSO Long Term Control Plan

MSD submitted for approval the Final CSO LTCP on December 19, 2008, as Volume 2 of the Integrated Overflow Abatement Plan (IOAP). The IOAP was accepted by the Federal Court and incorporated by reference into the Amended Consent Decree by an Order signed February 12, 2010, that was entered into public record February 15, 2010. A revised LTCP was included in the IOAP revision, submitted June 14, 2013. On June 19, 2014, MSD received approval of the 2012 IOAP Modification from EPA/KDEP.

3.3.3 Green Program Update

MSD continued program activities to provide incentives to private property owners to reduce the amount of impervious surface that drains to the combined sewer system.

During the reporting period, MSD updated the green infrastructure website (http://www.msdgreen.org). Through this website, information on high profile projects, program activities, forms and documents outlining participation in incentive programs (green infrastructure, downspout disconnection, urban reforestation) is provided in an accessible format.

The green program incentives are being applied to reflect the values of green projects in CSO areas or regions based on the latest modeling results. This application ties incentives directly to overflow reductions in various CSO regions to promote green projects in the areas that provide the most value. Project opportunities are optimized to best use available funding and provide additional overflow volume reduction benefits to complment LTCP projects.

Qualified Post Construction Inspector (QPCI) training for property owners with green infrastructure on private property was administered during the reporting period, and will continue to be administered in the next reporting period. These inspectors submit reports to MSD for review and enforcement. This training promotes consistency in inspections and provides regulatory updates to attendees, allowing MSD to effectively manage green infrastructure.

Continued coordination with the green and MS4 program is on-going to optimize resources and regulations to improve water quality.

MSD developed a Water Quality Standards Academy course to educate staff and partners on the background and application of water quality regulations and standards in Kentucky. The course was inspired by the EPA Water Quality Standards Academy, and included demonstrations, interactive activities, and homework exercises. Topics covered included:

- Waters of the US
- Designated Uses and Use Attainability Analysis
- Water Quality Criteria
- Antidegradation
- Water Quality Standards and Permits
- Monitoring and Sampling
- Data Management and Data Quality
- Impaired Waters and TMDLs
- Tools for Protecting and Improving Watersheds

The Water Quality Standards Academy 14-hour training was developed in the first quarter of 2015 and held over the course of several sessions between February 26 and March 17. The course included approximately 85 participants from MSD staff and partners including, MS4 co-permittees, Kentucky Transportation Cabinet (KYTC), University of Louisville, Parklands, and industrial customers.

As part of our Integrated Overflow Abatement Plan, MSD has committed to produce a Water Quality Synthesis Report every two (2) years that provides information to the public on the state of our streams in Jefferson County. Our last report was submitted in 2011, and since that time, MSD has continued environmental data collection and water quality trending for eleven watersheds in, or near, Jefferson County. MSD formally requested to extend the next Synthesis Report submittal to December 31, 2014, and modify the due date for subsequent reports to even numbered years (letter dated September 20, 2013) and received verbal approval for this change in submittal dates.

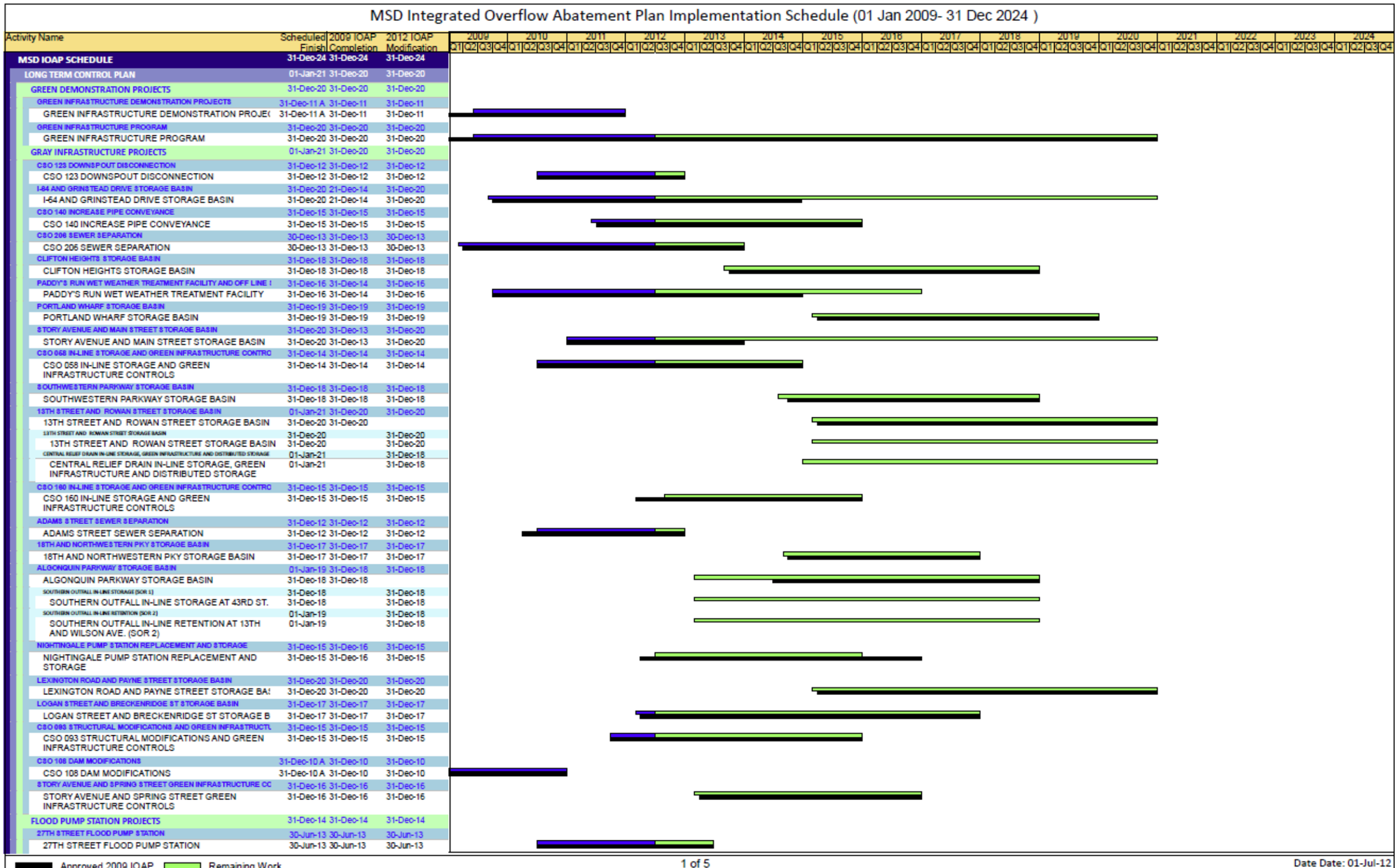
MSD's objective for this Synthesis Report has been to continue making water quality trends readily accessible and understandable to the general public and to assess a wide variety of water quality and environmental indicators. The report focuses on trends in the condition of fish diversity, aquatic insects, stream habitat, algae, and dissolved oxygen. Because of the one-year extension that was granted, additional environmental data was able to be incorporated, including benthic macroinvertebrate, aquatic habitat, dry and wet weather sampling at 42 sites, algae analyses, and fish diversity assessments. The additional 12-month period used to collect and analyze this data has offered significant improvements to the report and allowed us to produce a much more informative product. A draft report was included in the FY14 Annual Report submittal and the final 2014 Water Quality Synthesis Report is included in Appendix F.

3.4 Activity Progress Chart

A Gantt chart showing the previous and Proposed IOAP Modification schedules (Refer to IOAP, Volume 1 – Figure 6.3.1 for the previous) for the entire program is provided below.

MSD Integrated Overflow Abatement Plan Implementation Schedule (01 Jan 2009- 31 Dec 2024)

Activity Name	Scheduled Finish	2009 IOAP Completion	2012 IOAP Modification
MSD IOAP SCHEDULE	31-Dec-24	31-Dec-24	31-Dec-24
LONG TERM CONTROL PLAN	01-Jan-21	31-Dec-20	31-Dec-20
GREEN DEMONSTRATION PROJECTS	31-Dec-20	31-Dec-20	31-Dec-20
GREEN INFRASTRUCTURE DEMONSTRATION PROJECTS	31-Dec-11 A	31-Dec-11	31-Dec-11
GREEN INFRASTRUCTURE DEMONSTRATION PROJE(	31-Dec-11 A	31-Dec-11	31-Dec-11
GREEN INFRASTRUCTURE PROGRAM	31-Dec-20	31-Dec-20	31-Dec-20
GREEN INFRASTRUCTURE PROGRAM	31-Dec-20	31-Dec-20	31-Dec-20
GRAY INFRASTRUCTURE PROJECTS	01-Jan-21	31-Dec-20	31-Dec-20
CSO 123 DOWNSPOUT DISCONNECTION	31-Dec-12	31-Dec-12	31-Dec-12
CSO 123 DOWNSPOUT DISCONNECTION	31-Dec-12	31-Dec-12	31-Dec-12
I-64 AND GRINSTEAD DRIVE STORAGE BASIN	31-Dec-20	21-Dec-14	31-Dec-20
I-64 AND GRINSTEAD DRIVE STORAGE BASIN	31-Dec-20	21-Dec-14	31-Dec-20
CSO 140 INCREASE PIPE CONVEYANCE	31-Dec-15	31-Dec-15	31-Dec-15
CSO 140 INCREASE PIPE CONVEYANCE	31-Dec-15	31-Dec-15	31-Dec-15
CSO 206 SEWER SEPARATION	30-Dec-13	31-Dec-13	30-Dec-13
CSO 206 SEWER SEPARATION	30-Dec-13	31-Dec-13	30-Dec-13
CLIFTON HEIGHTS STORAGE BASIN	31-Dec-18	31-Dec-18	31-Dec-18
CLIFTON HEIGHTS STORAGE BASIN	31-Dec-18	31-Dec-18	31-Dec-18
PADDY'S RUN WET WEATHER TREATMENT FACILITY AND OFF LINE I	31-Dec-16	31-Dec-14	31-Dec-16
PADDY'S RUN WET WEATHER TREATMENT FACILITY	31-Dec-16	31-Dec-14	31-Dec-16
PORTLAND WHARF STORAGE BASIN	31-Dec-19	31-Dec-19	31-Dec-19
PORTLAND WHARF STORAGE BASIN	31-Dec-19	31-Dec-19	31-Dec-19
STORY AVENUE AND MAIN STREET STORAGE BASIN	31-Dec-20	31-Dec-13	31-Dec-20
STORY AVENUE AND MAIN STREET STORAGE BASIN	31-Dec-20	31-Dec-13	31-Dec-20
CSO 058 IN-LINE STORAGE AND GREEN INFRASTRUCTURE CONTRO	31-Dec-14	31-Dec-14	31-Dec-14
CSO 058 IN-LINE STORAGE AND GREEN INFRASTRUCTURE CONTROLS	31-Dec-14	31-Dec-14	31-Dec-14
SOUTHWESTERN PARKWAY STORAGE BASIN	31-Dec-18	31-Dec-18	31-Dec-18
SOUTHWESTERN PARKWAY STORAGE BASIN	31-Dec-18	31-Dec-18	31-Dec-18
13TH STREET AND ROWAN STREET STORAGE BASIN	01-Jan-21	31-Dec-20	31-Dec-20
13TH STREET AND ROWAN STREET STORAGE BASIN	31-Dec-20	31-Dec-20	
13TH STREET AND ROWAN STREET STORAGE BASIN	31-Dec-20		31-Dec-20
13TH STREET AND ROWAN STREET STORAGE BASIN	31-Dec-20		31-Dec-20
CENTRAL RELIEF DRAIN IN-LINE STORAGE, GREEN INFRASTRUCTURE AND DISTRIBUTED STORAGE	01-Jan-21		31-Dec-18
CENTRAL RELIEF DRAIN IN-LINE STORAGE, GREEN INFRASTRUCTURE AND DISTRIBUTED STORAGE	01-Jan-21		31-Dec-18
CSO 160 IN-LINE STORAGE AND GREEN INFRASTRUCTURE CONTRO	31-Dec-15	31-Dec-15	31-Dec-15
CSO 160 IN-LINE STORAGE AND GREEN INFRASTRUCTURE CONTROLS	31-Dec-15	31-Dec-15	31-Dec-15
ADAMS STREET SEWER SEPARATION	31-Dec-12	31-Dec-12	31-Dec-12
ADAMS STREET SEWER SEPARATION	31-Dec-12	31-Dec-12	31-Dec-12
18TH AND NORTHWESTERN PKY STORAGE BASIN	31-Dec-17	31-Dec-17	31-Dec-17
18TH AND NORTHWESTERN PKY STORAGE BASIN	31-Dec-17	31-Dec-17	31-Dec-17
ALGONQUIN PARKWAY STORAGE BASIN	01-Jan-19	31-Dec-18	31-Dec-18
ALGONQUIN PARKWAY STORAGE BASIN	31-Dec-18	31-Dec-18	
SOUTHERN OUTFALL IN-LINE STORAGE (SOR 1)	31-Dec-18		31-Dec-18
SOUTHERN OUTFALL IN-LINE STORAGE AT 43RD ST.	31-Dec-18		31-Dec-18
SOUTHERN OUTFALL IN-LINE RETENTION (SOR 2)	01-Jan-19		31-Dec-18
SOUTHERN OUTFALL IN-LINE RETENTION AT 13TH AND WILSON AVE. (SOR 2)	01-Jan-19		31-Dec-18
NIGHTINGALE PUMP STATION REPLACEMENT AND STORAGE	31-Dec-15	31-Dec-16	31-Dec-15
NIGHTINGALE PUMP STATION REPLACEMENT AND STORAGE	31-Dec-15	31-Dec-16	31-Dec-15
LEXINGTON ROAD AND PAYNE STREET STORAGE BASIN	31-Dec-20	31-Dec-20	31-Dec-20
LEXINGTON ROAD AND PAYNE STREET STORAGE BA!	31-Dec-20	31-Dec-20	31-Dec-20
LOGAN STREET AND BRECKENRIDGE ST STORAGE BASIN	31-Dec-17	31-Dec-17	31-Dec-17
LOGAN STREET AND BRECKENRIDGE ST STORAGE B	31-Dec-17	31-Dec-17	31-Dec-17
CSO 093 STRUCTURAL MODIFICATIONS AND GREEN INFRASTRUCTL	31-Dec-15	31-Dec-15	31-Dec-15
CSO 093 STRUCTURAL MODIFICATIONS AND GREEN INFRASTRUCTURE CONTROLS	31-Dec-15	31-Dec-15	31-Dec-15
CSO 108 DAM MODIFICATIONS	31-Dec-10 A	31-Dec-10	31-Dec-10
CSO 108 DAM MODIFICATIONS	31-Dec-10 A	31-Dec-10	31-Dec-10
STORY AVENUE AND SPRING STREET GREEN INFRASTRUCTURE CC	31-Dec-16	31-Dec-16	31-Dec-16
STORY AVENUE AND SPRING STREET GREEN INFRASTRUCTURE CONTROLS	31-Dec-16	31-Dec-16	31-Dec-16
FLOOD PUMP STATION PROJECTS	31-Dec-14	31-Dec-14	31-Dec-14
27TH STREET FLOOD PUMP STATION	30-Jun-13	30-Jun-13	30-Jun-13
27TH STREET FLOOD PUMP STATION	30-Jun-13	30-Jun-13	30-Jun-13



Approved 2009 IOAP Remaining Work
Completed Work

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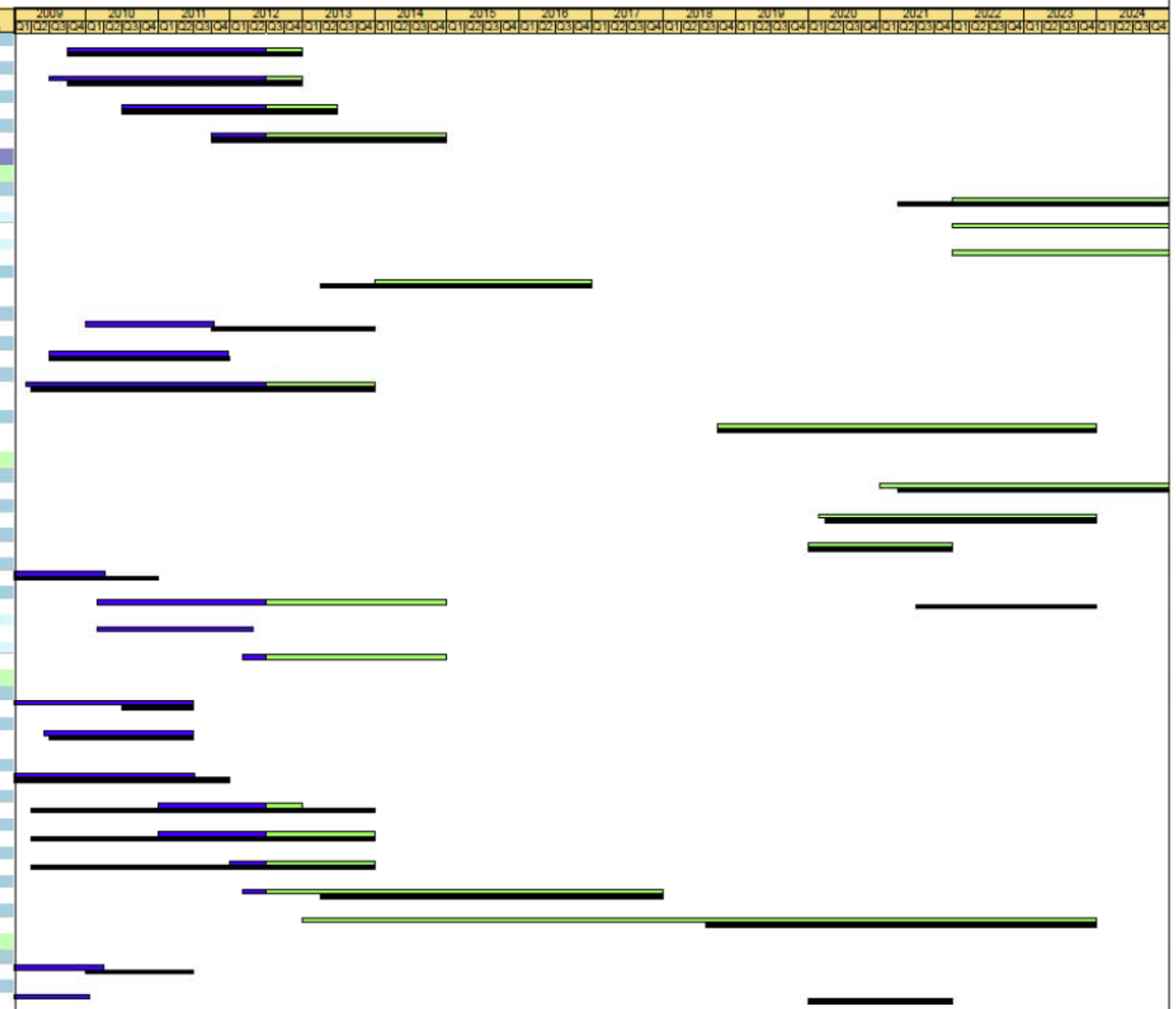
Date Date: 01-Jul-12

MSD Integrated Overflow Abatement Plan Implementation Schedule (01 Jan 2009- 31 Dec 2024)

Activity Name	Scheduled Finish	2009 IOAP Completion	2012 IOAP Modification
34TH STREET FLOOD PUMP STATION	31-Dec-12	31-Dec-12	31-Dec-12
34TH STREET FLOOD PUMP STATION	31-Dec-12	31-Dec-12	31-Dec-12
4TH STREET FLOOD PUMP STATION	31-Dec-12	31-Dec-12	31-Dec-12
4TH STREET FLOOD PUMP STATION	31-Dec-12	31-Dec-12	31-Dec-12
SHAWNEE FLOOD PUMP STATION	30-Jun-13	30-Jun-13	30-Jun-13
SHAWNEE FLOOD PUMP STATION	30-Jun-13	30-Jun-13	30-Jun-13
17TH STREET FLOOD PUMP STATION	31-Dec-14	31-Dec-14	31-Dec-14
17TH STREET FLOOD PUMP STATION	31-Dec-14	31-Dec-14	31-Dec-14
SANITARY SEWER DISCHARGE PLAN	31-Dec-24	31-Dec-24	31-Dec-24
BEARGRASS CREEK MIDDLE FORK AREA	31-Dec-24	31-Dec-24	31-Dec-24
GOOSE CREEK PUMP STATION	31-Dec-24	31-Dec-24	31-Dec-24
GOOSE CREEK PUMP STATION	31-Dec-24	31-Dec-24	
GOOSE CREEK PS PH1 - DEVONDALE PS WW STORAGE	31-Dec-24		31-Dec-24
GOOSE CREEK PS PH1 - DEVONDALE PS WW STOR/	31-Dec-24		31-Dec-24
GOOSE CRK PS PH2 - PS & WET WEATHER STORAGE	31-Dec-24		31-Dec-24
GOOSE CRK PS PH2 - PS & WET WEATHER STORAGE	31-Dec-24		31-Dec-24
ANCHOR ESTATES- ANCHOR ESTS PS 1 & 2 PS ELIMINATIONS	31-Dec-16	31-Dec-16	31-Dec-16
ANCHOR ESTATES- ANCHOR ESTS PS 1 & 2 PS ELIMINATIONS	31-Dec-16	31-Dec-16	31-Dec-16
ANCHOR ESTATES- VANNAH PS ELIMINATION	15-Oct-11 A	31-Dec-13	31-Dec-13
ANCHOR ESTATES- VANNAH PS ELIMINATION	15-Oct-11 A	31-Dec-13	31-Dec-13
HURSTBOURNE I&I INVESTIGATION & REHABILITATION	27-Dec-11 A	31-Dec-11	31-Dec-11
HURSTBOURNE I&I INVESTIGATION & REHABILITATION	27-Dec-11 A	31-Dec-11	31-Dec-11
MIDDLE FORK RELIEF INTERCEPTOR, WET WEATHER STORAGE, AN	31-Dec-13	31-Dec-13	31-Dec-13
MIDDLE FORK RELIEF INTERCEPTOR, WET WEATHER STORAGE, AND UMFLS DIVERSION 1 - BUECHEL BASIN	31-Dec-13	31-Dec-13	31-Dec-13
MIDDLE FORK RELIEF INTERCEPTOR, WET WEATHER STORAGE, AN	31-Dec-23	31-Dec-23	31-Dec-23
MIDDLE FORK RELIEF INTERCEPTOR, WET WEATHER STORAGE, AND UMFLS DIVERSION 2 PS & WET	31-Dec-23	31-Dec-23	31-Dec-23
CEDAR CREEK AREA	31-Dec-24	31-Dec-24	31-Dec-24
LITTLE CEDAR CREEK INTRECEPTOR IMPROVEMENTS	31-Dec-24	31-Dec-24	31-Dec-24
LITTLE CEDAR CREEK INTRECEPTOR IMPROVEMENTS	31-Dec-24	31-Dec-24	31-Dec-24
IDLEWOOD INLINE STORAGE	31-Dec-23	31-Dec-23	31-Dec-23
IDLEWOOD INLINE STORAGE	31-Dec-23	31-Dec-23	31-Dec-23
BARDSTOWN RD PS IMPROVEMENTS	31-Dec-21	31-Dec-21	31-Dec-21
BARDSTOWN RD PS IMPROVEMENTS	31-Dec-21	31-Dec-21	31-Dec-21
RUNNING FOX PS ELIMINATION	05-Apr-10 A	31-Dec-10	31-Dec-10
RUNNING FOX PS ELIMINATION	05-Apr-10 A	31-Dec-10	31-Dec-10
FAIRMOUNT RD PS IMPROVMENTS	01-Jan-15	31-Dec-23	31-Dec-23
FAIRMOUNT RD PS IMPROVMENTS	31-Dec-14	31-Dec-23	
FAIRMOUNT RD PS IMPROVEMENTS	24-Apr-12 A		31-Dec-23
FAIRMOUNT RD PS IMPROVEMENTS	24-Apr-12 A		31-Dec-23
FAIRMOUNT STORAGE BASIN	01-Jan-15		31-Dec-15
FAIRMOUNT STORAGE BASIN	01-Jan-15		31-Dec-15
COMBINED SEWER SYSTEM AREA	31-Dec-23	31-Dec-23	31-Dec-23
HAZELWOOD PS I&I INVESTIGATION & REHABILITATION	30-Jun-11 A	30-Jun-11	30-Jun-11
HAZELWOOD PS I&I INVESTIGATION & REHABILITATIO	30-Jun-11 A	30-Jun-11	30-Jun-11
SONNE PUMP STATION I&I INVESTIGATION & REHABILITATION	30-Jun-11 A	30-Jun-11	30-Jun-11
SONNE PUMP STATION I&I INVESTIGATION & REHABILITATION	30-Jun-11 A	30-Jun-11	30-Jun-11
CAMP TAYLOR SSES	08-Jul-11 A	31-Dec-11	31-Dec-13
CAMP TAYLOR SSES	08-Jul-11 A	31-Dec-11	31-Dec-13
CAMP TAYLOR SANITARY SEWER #1A	31-Dec-12	31-Dec-13	31-Dec-13
CAMP TAYLOR SANITARY SEWER #1A	31-Dec-12	31-Dec-13	31-Dec-13
CAMP TAYLOR SANITARY SEWER #1B	31-Dec-13	31-Dec-13	31-Dec-13
CAMP TAYLOR SANITARY SEWER #1B	31-Dec-13	31-Dec-13	31-Dec-13
CAMP TAYLOR SANITARY SEWER #2	31-Dec-13	31-Dec-13	31-Dec-13
CAMP TAYLOR SANITARY SEWER #2	31-Dec-13	31-Dec-13	31-Dec-13
CAMP TAYLOR #3- SEWER REHABILITATION	31-Dec-17	31-Dec-17	31-Dec-17
CAMP TAYLOR #3- SEWER REHABILITATION	31-Dec-17	31-Dec-17	31-Dec-17
CAMP TAYLOR #4-SEWER REHABILITATION & REPLACEMENT	31-Dec-23	31-Dec-23	31-Dec-23
CAMP TAYLOR #4-SEWER REHABILITATION & REPLACI	31-Dec-23	31-Dec-23	31-Dec-23
FLOYDS FORK AREA	01-Apr-10 A	31-Dec-21	01-Apr-10
WOODLAND HILL PS DIVERSION	01-Apr-10 A	30-Jun-11	01-Apr-10
WOODLAND HILL PS DIVERSION	01-Apr-10 A	30-Jun-11	01-Apr-10
ASHBURTON PS IMPROVEMENTS AND DIVERSION	22-Jan-10 A	31-Dec-21	22-Jan-10
ASHBURTON PS IMPROVEMENTS AND DIVERSION	22-Jan-10 A	31-Dec-21	22-Jan-10



Approved 2009 IOAP Remaining Work
Completed Work

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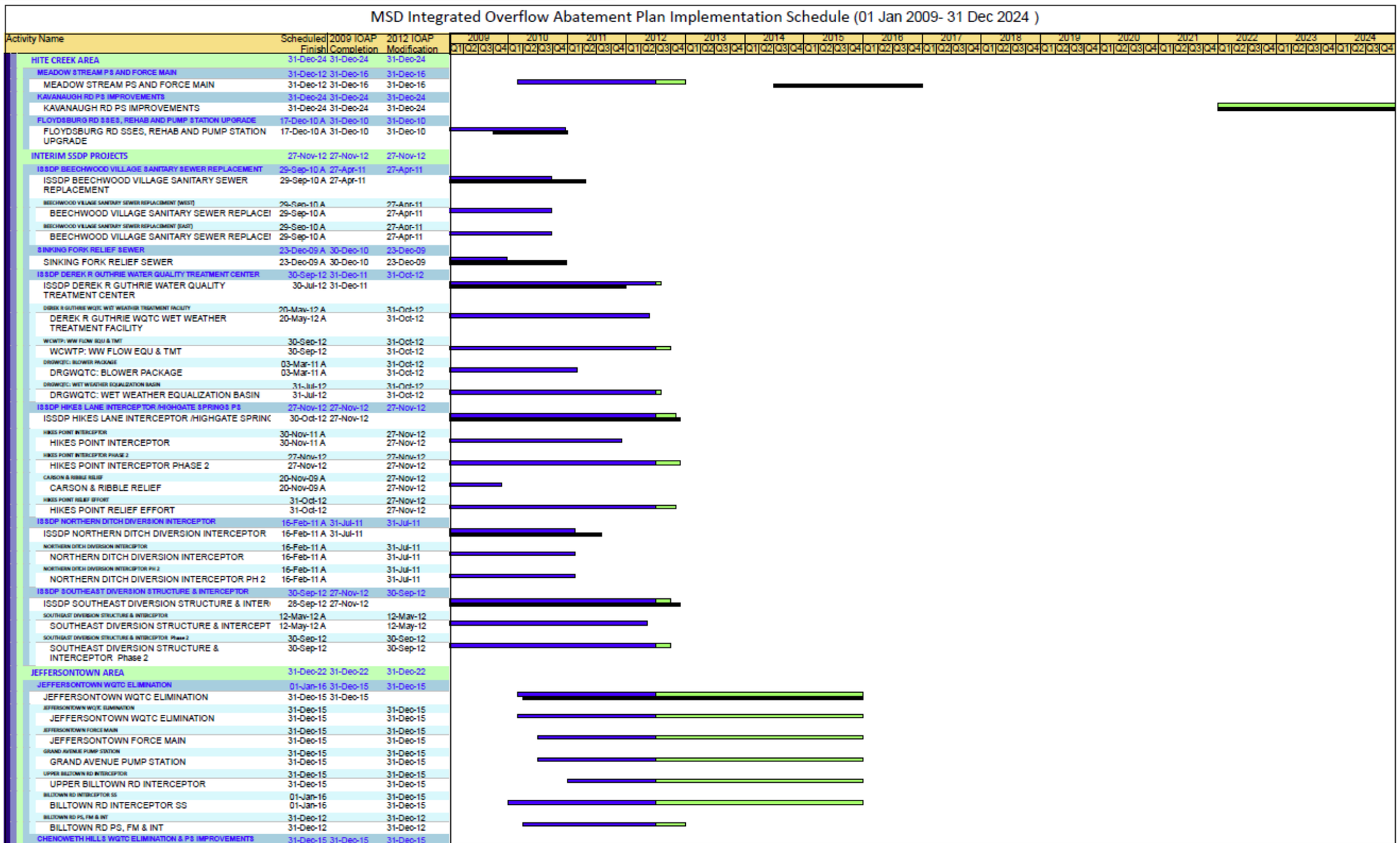
Date Date: 01-Jul-12

MSD Integrated Overflow Abatement Plan Implementation Schedule (01 Jan 2009- 31 Dec 2024)

Activity Name	Scheduled Finish	2009 IOAP Completion	2012 IOAP Modification
HITE CREEK AREA	31-Dec-24	31-Dec-24	31-Dec-24
MEADOW STREAM PS AND FORCE MAIN	31-Dec-12	31-Dec-16	31-Dec-16
MEADOW STREAM PS AND FORCE MAIN	31-Dec-12	31-Dec-16	31-Dec-16
KAVANAUGH RD PS IMPROVEMENTS	31-Dec-24	31-Dec-24	31-Dec-24
KAVANAUGH RD PS IMPROVEMENTS	31-Dec-24	31-Dec-24	31-Dec-24
FLOYDSBURG RD SSES, REHAB AND PUMP STATION UPGRADE	17-Dec-10 A	31-Dec-10	31-Dec-10
FLOYDSBURG RD SSES, REHAB AND PUMP STATION UPGRADE	17-Dec-10 A	31-Dec-10	31-Dec-10
INTERIM SSDP PROJECTS	27-Nov-12	27-Nov-12	27-Nov-12
ISSDP BEECHWOOD VILLAGE SANITARY SEWER REPLACEMENT	29-Sep-10 A	27-Apr-11	27-Apr-11
ISSDP BEECHWOOD VILLAGE SANITARY SEWER REPLACEMENT	29-Sep-10 A	27-Apr-11	
BEECHWOOD VILLAGE SANITARY SEWER REPLACEMENT [WEST]	29-Sep-10 A		27-Apr-11
BEECHWOOD VILLAGE SANITARY SEWER REPLACEI	29-Sep-10 A		27-Apr-11
BEECHWOOD VILLAGE SANITARY SEWER REPLACEMENT [EAST]	29-Sep-10 A		27-Apr-11
BEECHWOOD VILLAGE SANITARY SEWER REPLACEI	29-Sep-10 A		27-Apr-11
SINKING FORK RELIEF SEWER	23-Dec-09 A	30-Dec-10	23-Dec-09
SINKING FORK RELIEF SEWER	23-Dec-09 A	30-Dec-10	23-Dec-09
ISSDP DEREK R GUTHRIE WATER QUALITY TREATMENT CENTER	30-Sep-12	31-Dec-11	31-Oct-12
ISSDP DEREK R GUTHRIE WATER QUALITY TREATMENT CENTER	30-Jul-12	31-Dec-11	
DEREK R GUTHRIE WQTC WET WEATHER TREATMENT FACILITY	20-May-12 A		31-Oct-12
DEREK R GUTHRIE WQTC WET WEATHER TREATMENT FACILITY	20-May-12 A		31-Oct-12
WCWTP: WW FLOW EQU & TMT	30-Sep-12		31-Oct-12
WCWTP: WW FLOW EQU & TMT	30-Sep-12		31-Oct-12
DRGWQTC: BLOWER PACKAGE	03-Mar-11 A		31-Oct-12
DRGWQTC: BLOWER PACKAGE	03-Mar-11 A		31-Oct-12
DRGWQTC: WET WEATHER EQUALIZATION BASIN	31-Jul-12		31-Oct-12
DRGWQTC: WET WEATHER EQUALIZATION BASIN	31-Jul-12		31-Oct-12
ISSDP HIKES LANE INTERCEPTOR /HIGHGATE SPRINGS PS	27-Nov-12	27-Nov-12	27-Nov-12
ISSDP HIKES LANE INTERCEPTOR /HIGHGATE SPRINC	30-Oct-12	27-Nov-12	
HIKES POINT INTERCEPTOR	30-Nov-11 A		27-Nov-12
HIKES POINT INTERCEPTOR	30-Nov-11 A		27-Nov-12
HIKES POINT INTERCEPTOR PHASE 2	27-Nov-12		27-Nov-12
HIKES POINT INTERCEPTOR PHASE 2	27-Nov-12		27-Nov-12
CARSON & RIBBLE RELIEF	20-Nov-09 A		27-Nov-12
CARSON & RIBBLE RELIEF	20-Nov-09 A		27-Nov-12
HIKES POINT RELIEF EFFORT	31-Oct-12		27-Nov-12
HIKES POINT RELIEF EFFORT	31-Oct-12		27-Nov-12
ISSDP NORTHERN DITCH DIVERSION INTERCEPTOR	16-Feb-11 A	31-Jul-11	31-Jul-11
ISSDP NORTHERN DITCH DIVERSION INTERCEPTOR	16-Feb-11 A	31-Jul-11	
NORTHERN DITCH DIVERSION INTERCEPTOR	16-Feb-11 A		31-Jul-11
NORTHERN DITCH DIVERSION INTERCEPTOR	16-Feb-11 A		31-Jul-11
NORTHERN DITCH DIVERSION INTERCEPTOR PH 2	16-Feb-11 A		31-Jul-11
NORTHERN DITCH DIVERSION INTERCEPTOR PH 2	16-Feb-11 A		31-Jul-11
ISSDP SOUTHEAST DIVERSION STRUCTURE & INTERCEPTOR	30-Sep-12	27-Nov-12	30-Sep-12
ISSDP SOUTHEAST DIVERSION STRUCTURE & INTERI	28-Sep-12	27-Nov-12	
SOUTHEAST DIVERSION STRUCTURE & INTERCEPTOR	12-May-12 A		12-May-12
SOUTHEAST DIVERSION STRUCTURE & INTERCEPT	12-May-12 A		12-May-12
SOUTHEAST DIVERSION STRUCTURE & INTERCEPTOR Phase 2	30-Sep-12		30-Sep-12
SOUTHEAST DIVERSION STRUCTURE & INTERCEPTOR Phase 2	30-Sep-12		30-Sep-12
JEFFERSONTOWN AREA	31-Dec-22	31-Dec-22	31-Dec-22
JEFFERSONTOWN WQTC ELIMINATION	01-Jan-16	31-Dec-15	31-Dec-15
JEFFERSONTOWN WQTC ELIMINATION	31-Dec-15	31-Dec-15	
JEFFERSONTOWN WQTC ELIMINATION	31-Dec-15		31-Dec-15
JEFFERSONTOWN WQTC ELIMINATION	31-Dec-15		31-Dec-15
JEFFERSONTOWN FORCE MAIN	31-Dec-15		31-Dec-15
JEFFERSONTOWN FORCE MAIN	31-Dec-15		31-Dec-15
GRAND AVENUE PUMP STATION	31-Dec-15		31-Dec-15
GRAND AVENUE PUMP STATION	31-Dec-15		31-Dec-15
UPPER BILLTOWN RD INTERCEPTOR	31-Dec-15		31-Dec-15
UPPER BILLTOWN RD INTERCEPTOR	31-Dec-15		31-Dec-15
BILLTOWN RD INTERCEPTOR SS	01-Jan-16		31-Dec-15
BILLTOWN RD INTERCEPTOR SS	01-Jan-16		31-Dec-15
BILLTOWN RD PS, FM & INT	31-Dec-12		31-Dec-12
BILLTOWN RD PS, FM & INT	31-Dec-12		31-Dec-12
CHENOWETH HILLS WQTC ELIMINATION & PS IMPROVEMENTS	31-Dec-15	31-Dec-15	31-Dec-15



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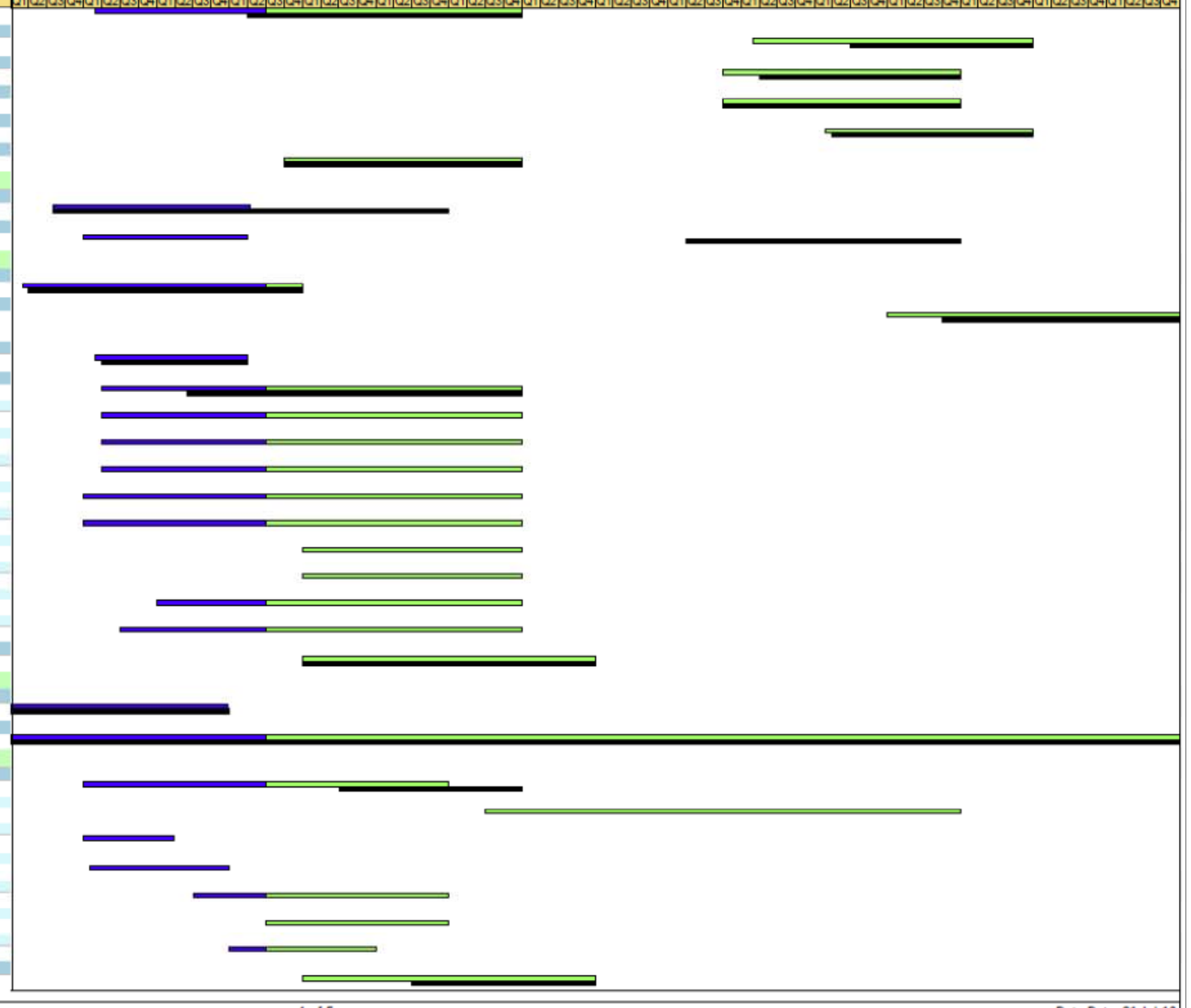
MSD Integrated Overflow Abatement Plan Implementation Schedule (01 Jan 2009- 31 Dec 2024)

Activity Name	Scheduled Finish	2009 IOAP Completion	2012 IOAP Modification
CHENOWETH HILLS WQTC ELIMINATION & PS ELIMINA	31-Dec-15	31-Dec-15	31-Dec-15
DELL RD & CHARLANE PKWY INTERCEPTOR IMPROVEMENTS	31-Dec-22	31-Dec-22	31-Dec-22
DELL RD & CHARLANE PKWY INTERCEPTOR IMPROVE	31-Dec-22	31-Dec-22	31-Dec-22
RAINTREE & MARIAN CT PH1 - PS ELIMINATION	31-Dec-21	31-Dec-21	31-Dec-21
RAINTREE & MARIAN CT PH1 - PS ELIMINATION	31-Dec-21	31-Dec-21	31-Dec-21
RAINTREE & MARIAN CT PS ELIMINATION	31-Dec-21	31-Dec-21	31-Dec-21
RAINTREE & MARIAN CT PS ELIMINATION	31-Dec-21	31-Dec-21	31-Dec-21
MONTICELLO PS ELIMINATION	31-Dec-22	31-Dec-22	31-Dec-22
MONTICELLO PS ELIMINATION	31-Dec-22	31-Dec-22	31-Dec-22
KLONDIKE INTERCEPTOR	31-Dec-15	31-Dec-15	31-Dec-15
KLONDIKE INTERCEPTOR	31-Dec-15	31-Dec-15	31-Dec-15
MILL CREEK AREA	13-Apr-12 A	31-Dec-21	31-Dec-21
SHIVELY INTERCEPTOR	13-Apr-12 A	31-Dec-14	31-Dec-14
SHIVELY INTERCEPTOR	13-Apr-12 A	31-Dec-14	31-Dec-14
EAST ROCKFORD LANE PS RELOCATION	30-Mar-12 A	31-Dec-21	31-Dec-21
EAST ROCKFORD LANE PS RELOCATION	30-Mar-12 A	31-Dec-21	31-Dec-21
OHIO RIVER FORCE MAIN AREA	31-Dec-24	31-Dec-24	31-Dec-24
MELLWOOD SYS 1 - MELLWOOD PS & FORCE MAIN	31-Dec-12	31-Dec-12	31-Dec-12
MELLWOOD SYS 1 - MELLWOOD PS & FORCE MAIN	31-Dec-12	31-Dec-12	31-Dec-12
MELLWOOD SYS 2 - WINTON & MOCKINGBIRD PS ELIM & PIPE UPGF	31-Dec-24	31-Dec-24	31-Dec-24
MELLWOOD SYS 2 - WINTON & MOCKINGBIRD PS ELIM & PIPE UPGRADES	31-Dec-24	31-Dec-24	31-Dec-24
DERINGTON CT PS I/I INVESTIGATION & REHABILITATION	30-Mar-12 A	31-Mar-12	31-Mar-12
DERINGTON CT PS I/I INVESTIGATION & REHABILITATI	30-Mar-12 A	31-Mar-12	31-Mar-12
PROSPECT WQTC ELIMINATIONS	31-Dec-15	31-Dec-15	31-Dec-15
PROSPECT WQTC ELIMINATIONS	31-Dec-15	31-Dec-15	
HARRODS CREEK PS & FM	31-Dec-15		31-Dec-15
HARRODS CREEK PS & FM	31-Dec-15		31-Dec-15
HARRODS CREEK INT	31-Dec-15		31-Dec-15
HARRODS CREEK INT	31-Dec-15		31-Dec-15
HARRODS CREEK INT PH 2	31-Dec-15		31-Dec-15
HARRODS CREEK INT PH 2	31-Dec-15		31-Dec-15
RIVER ROAD INT	31-Dec-15		31-Dec-15
RIVER ROAD INT	31-Dec-15		31-Dec-15
TIMBERLAKE & HUNTING CREEK S WQTC ELIM	31-Dec-15		31-Dec-15
TIMBERLAKE & HUNTING CREEK S WQTC ELIM	31-Dec-15		31-Dec-15
KEN CARLA WQTC ELIM	31-Dec-15		31-Dec-15
KEN CARLA WQTC ELIM	31-Dec-15		31-Dec-15
HARRODS CREEK INT PH 3	31-Dec-15		31-Dec-15
HARRODS CREEK INT PH 3	31-Dec-15		31-Dec-15
SHADOW WOOD WWTP ELIM	31-Dec-15		31-Dec-15
SHADOW WOOD WWTP ELIM	31-Dec-15		31-Dec-15
N HUNTING CREEK PS & FM	31-Dec-15		31-Dec-15
N HUNTING CREEK PS & FM	31-Dec-15		31-Dec-15
PROSPECT #3 - ORFM SYSTEM IMPROVEMENTS	31-Dec-16	31-Dec-16	31-Dec-16
PROSPECT #3 - ORFM SYSTEM IMPROVEMENTS	31-Dec-16	31-Dec-16	31-Dec-16
OTHER PROJECTS	30-Dec-24	31-Dec-24	30-Dec-24
CPE/CCP MODIFICATIONS TO WQTC	19-Dec-11 A	31-Dec-11	31-Dec-11
CPE/CCP MODIFICATIONS TO WQTC	19-Dec-11 A	31-Dec-11	31-Dec-11
I/I REDUCTION PROGRAM	30-Dec-24	31-Dec-24	30-Dec-24
I/I REDUCTION PROGRAM	30-Dec-24	31-Dec-24	30-Dec-24
POND CREEK AREA	31-Dec-24	31-Dec-24	31-Dec-24
LEE ANN WAY PUMP STATION IMPROVEMENTS	31-Dec-21	31-Dec-15	31-Dec-15
LEE ANN WAY PUMP STATION IMPROVEMENTS	31-Dec-14	31-Dec-15	
LEA ANN WAY SANITARY SEWER I/I REHAB	31-Dec-21		31-Dec-15
LEA ANN WAY SANITARY SEWER I/I REHAB	31-Dec-21		31-Dec-15
LEE ANN WAY PS SYSTEM SSES	30-Mar-11 A		31-Dec-15
LEE ANN WAY PS SYSTEM SSES	30-Mar-11 A		31-Dec-15
LEE ANN WAY PH 2 ICA	31-Dec-11 A		31-Dec-15
LEE ANN WAY PH 2 ICA	31-Dec-11 A		31-Dec-15
LEE ANN WAY SSR PH 1	31-Dec-14		31-Dec-15
LEE ANN WAY SSR PH 1	31-Dec-14		31-Dec-15
LEE ANN WAY SSR PH 2	01-Jan-15		31-Dec-15
LEE ANN WAY SSR PH 2	01-Jan-15		31-Dec-15
LEE ANN WAY INTERCEPTOR I/I REHAB	31-Dec-13		31-Dec-15
LEE ANN WAY INTERCEPTOR I/I REHAB	31-Dec-13		31-Dec-15
OUTER LOOP & CAVEN AREA PIPE UPGRADES	31-Dec-16	31-Dec-16	31-Dec-24
OUTER LOOP & CAVEN AREA PIPE UPGRADES	31-Dec-16	31-Dec-16	31-Dec-24



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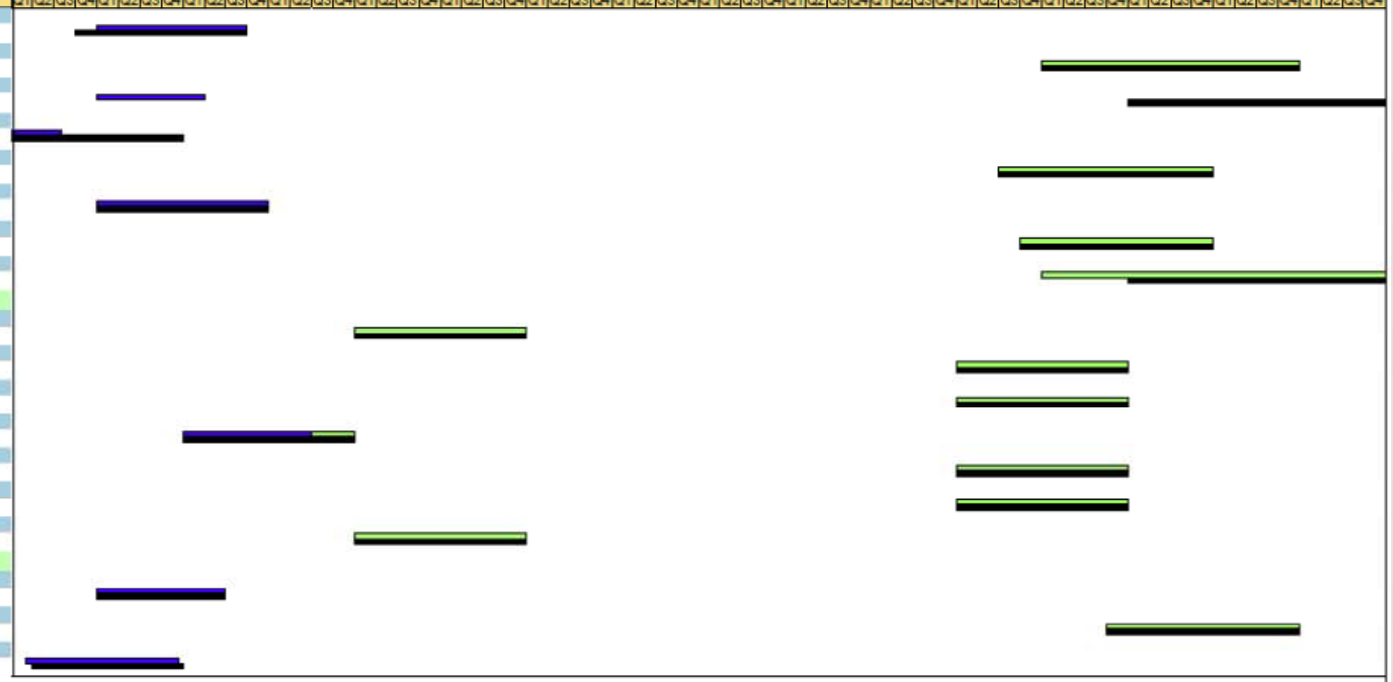
MSD Integrated Overflow Abatement Plan Implementation Schedule (01 Jan 2009- 31 Dec 2024)

Activity Name	Scheduled Finish	2009 IOAP Completion	2012 IOAP Modification
EDSEL PS I/I INVESTIGATION & REHABILITATION	27-Sep-11 A	30-Sep-11	30-Sep-11
EDSEL PS I/I INVESTIGATION & REHABILITATION	27-Sep-11 A	30-Sep-11	30-Sep-11
CINDERELLA PS ELIMINATION	31-Dec-23	31-Dec-23	31-Dec-23
CINDERELLA PS ELIMINATION	31-Dec-23	31-Dec-23	31-Dec-23
GOVERNMENT CENTER PS ELIMINATION	01-Apr-11 A	31-Dec-24	31-Dec-24
GOVERNMENT CENTER PS ELIMINATION	01-Apr-11 A	31-Dec-24	31-Dec-24
AVANTI PS ELIMINATION	28-Jul-09 A	31-Dec-10	31-Dec-10
AVANTI PS ELIMINATION	28-Jul-09 A	31-Dec-10	31-Dec-10
CHARLESWOOD INTERCEPTOR EXTENSION	31-Dec-22	31-Dec-22	31-Dec-22
CHARLESWOOD INTERCEPTOR EXTENSION	31-Dec-22	31-Dec-22	31-Dec-22
LANTANA PS I/I INVESTIGATION & REHABILITATION	29-Dec-11 A	31-Dec-11	29-Dec-11
LANTANA PS I/I INVESTIGATION & REHABILITATION	29-Dec-11 A	31-Dec-11	29-Dec-11
LEVEN PS ELIMINATION	31-Dec-22	31-Dec-22	31-Dec-22
LEVEN PS ELIMINATION	31-Dec-22	31-Dec-22	31-Dec-22
CAVEN AVENUE WW STORAGE	31-Dec-24	31-Dec-24	31-Dec-24
CAVEN AVENUE PS ELIMINATION	31-Dec-24	31-Dec-24	31-Dec-24
SMALL WWTP AREA	31-Dec-21	31-Dec-21	31-Dec-21
RIDING RIDGE PS IMPROVEMENTS	31-Dec-14	31-Dec-14	31-Dec-14
RIDING RIDGE PS IMPROVEMENTS	31-Dec-14	31-Dec-14	31-Dec-14
LUCAS LN PS INLINE STORAGE	31-Dec-21	31-Dec-21	31-Dec-21
LUCAS LN PS INLINE STORAGE	31-Dec-21	31-Dec-21	31-Dec-21
ST. RENE RD PS INLINE STORAGE	31-Dec-21	31-Dec-21	31-Dec-21
ST. RENE RD PS INLINE STORAGE	31-Dec-21	31-Dec-21	31-Dec-21
LAKE FOREST PS IMPROVEMENTS	31-Dec-12	31-Dec-12	31-Dec-12
LAKE FOREST PS IMPROVEMENTS	31-Dec-12	31-Dec-12	31-Dec-12
GUNPOWDER PS INLINE STORAGE	31-Dec-21	31-Dec-21	31-Dec-21
GUNPOWDER PS INLINE STORAGE	31-Dec-21	31-Dec-21	31-Dec-21
FOX HARBOR INLINE STORAGE	31-Dec-21	31-Dec-21	31-Dec-21
FOX HARBOR INLINE STORAGE	31-Dec-21	31-Dec-21	31-Dec-21
FAIRWAY VIEW PS IMPROVEMENTS	31-Dec-14	31-Dec-14	31-Dec-14
FAIRWAY VIEW PS IMPROVEMENTS	31-Dec-14	31-Dec-14	31-Dec-14
SOUTHEASTERN DIVERSION AREA	31-Dec-23	31-Dec-23	31-Dec-23
PARKVIEW ESTATES I/I INVESTIGATION & REHABILITATION	28-Jun-11 A	30-Jun-11	30-Jun-11
PARKVIEW ESTATES I/I INVESTIGATION & REHABILITA	28-Jun-11 A	30-Jun-11	30-Jun-11
SUTHERLAND INTERCEPTOR	31-Dec-23	31-Dec-23	31-Dec-23
SUTHERLAND INTERCEPTOR	31-Dec-23	31-Dec-23	31-Dec-23
BEARGRASS INTERCEPTOR REHABILITATION PH 2	14-Dec-10 A	31-Dec-10	31-Dec-10
BEARGRASS INTERCEPTOR REHABILITATION PH 2	14-Dec-10 A	31-Dec-10	31-Dec-10



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SECTION 4: Program Activities for Public Outreach, Education, Notification and Participation

4.1 Public Notification Program

MSD has developed a program aimed at notifying the community of the objectives of Project WIN and how to lessen the risks associated with coming into contact with sewage overflows.

4.2 Public Education Programs

MSD has developed a public education program aimed at disseminating information to the public on MSD's primary business functions with emphasis on wastewater, storm water and flood protection. Efforts continued to utilize various media outlets, including television, radio, magazines, and newspapers to serve as a conduit for circulating information to the public.

During the reporting period, MetroTV aired programs detailing the IOAP Public Input Meetings, and a rain barrel installation video.

Additionally, MSD is in the process of creating water quality sampling videos and partnering with educational organizations to assist with watershed videos. These efforts will be underway in FY16 and ultimately available to the public.

4.3 Public Outreach Programs

MSD has developed a public education program aimed at expanding the public's knowledge on MSD's primary business functions of wastewater, storm water and flood protection, with an emphasis on Project WIN Program elements.

4.3.1 IOAP Project and Program Meetings

MSD facilitates meetings for the Wet Weather Team (WWT), and the public to review regulatory commitments, update progress on projects and initiatives, and to gather public input on efforts.

MSD has developed a partnership with Louisville Metro for providing project information and soliciting feedback from stakeholders using a Structured Public Involvement approach. Structured Public Involvement is meant to facilitate relevant input on the design process as MSD prepares to design and construct CSO basins. Our current IOAP outreach activities and public meetings are using this process to elicit qualitative and quantitative information and enhance our engagement with customers. The Structured Public Involvement approach assures anonymity for each participant using transceivers to compile data which can then be correlated on a customer-specific basis. The plan for Structured Public Involvement includes implementing a four-meeting process that leads stakeholders through the project Design Stages: Orientation, Concept, Advanced, and then a Pardon Our Dust meeting upon construction. Online surveys are also being made available to allow those not in attendance at public meetings to provide similar project-specific input. Creating this secondary online opportunity has been successful and generated responses that otherwise would not have

been accounted for at the public meetings. Additional information regarding the Structured Public Involvement Process and meetings held during this reporting period may be found at the Project WIN Public Input Website (http://www.msdprojectwin.org/Public-Input.aspx).

During the reporting period, MSD facilitated and planned for the following meetings:

- A Design Orientation meeting for the Portland Storage Basin and Portland Green Infrastructure at CSO190 was held on Tuesday, February 9, 2015, at Western Middle School. MSD Staff spoke about plans for these projects, provided an overview of IOAP progress to date, and gathered input using the Structured Public Involvement Process.
- A Concept Design meeting for Southwestern Parkway Storage Basin was held on Tuesday, March 23, 2015, at Shawnee Golf Course Clubhouse. MSD Staff spoke about plans for the Shawnee Park Uplands Master Plan and the MSD Southwestern Parkway Storage Basin Project, provided an overview of IOAP progress to date, and gathered input using the Structured Public Involvement Process.
- Facilitated a Wet Weather Team Stakeholder meeting on March 24, 2015, at the Metropolitan Sewer District (700 West Liberty Street) to provide updates on MSD's IOAP progress and activities to date, planned activities for 2015, and an update of activities for MSD's 20-year Comprehensive Facility Plan, including detailed presentations on the Stormwater and Wastewater Service Areas.

During the next reporting period, the following meetings are planned.

- A planned Concept Design input meeting to incorporate Structured Public Involvement for the Portland Green Infrastructure at CSO 190 project, originally scheduled for March 5, 2015, was rescheduled to April 14, 2015 due to snow. The Advanced Design Stage of the Portland Green Infrastructure at CSO 190 project will be held May 12, 2015, at Western Middle School.
- A Concept Design Stage public input meeting for the Clifton Heights Storage Basin project is planned for May 19, 2015 at the American Printing House for the Blind.
- A Wet Weather Team Stakeholder meeting is scheduled for June 23, 2015.

SECTION 5: Capacity Management Operations and Maintenance Report

Per Paragraph 24.c of the Amended Consent Decree, the Capacity Management Operations and Maintenance (CMOM) Self Assessment Report was submitted to EPA and KDEP on February 10, 2006. MSD received a letter of approval on August 22, 2006. The approved CMOM document can be viewed on the MSD Project WIN website (www.msdprojectwin.org**)**.

The primary objectives of CMOM are as follows:

Capacity – Ensuring that adequate wet and dry weather capacity is maintained in existing and new infrastructure.

Management – Implementing programs in support of operations and maintenance activities required to ensure KPDES permit compliance and promote public health by remedying design, construction and operational deficiencies; training staff; and performing activities in a safe manner.

Operations – Implementing written standard operating procedures to operate system components as designed to meet permit requirements.

Maintenance – Implementing systematic, comprehensive asset maintenance and rehabilitation programs to prevent overflows, maximize system reliability and ensure system sustainability.

Although the program implementation deadlines from the CMOM Self Assessment Report were previously met, MSD continued to enhance the activities listed below during this reporting period. Highlights of the CMOM program implementation over this reporting period are outlined below.

5.1 Management Programs

M-E-9 Infrastructure Rehabilitation

Activity details are provided in the CMOM schedule provided as **Section 5.4 – CMOM Activity Schedule**.

M-E-10 System Capacity Assurance Program

Included in the goals of the CMOM Self-Assessment Report, The System Capacity Assurance Plan (SCAP) is the basis for applying capacity decision criteria to support watershed community values. It provides a programmatic approach for confirming available capacity within MSD's sanitary sewer system, creating capacity credits through system improvement and rehabilitation, identifying hydraulic constrictions, and proposing capacity improvements that support interim and long-term performance objectives. SCAP revisions, including credit and balance projections and discussion of approach for multi-family residential unit populations were discussed with EPA and KDEP and submitted electronically for review on July 21, 2014. The final SCAP revision was submitted for approval on December 9, 2014 and approval was received February 5, 2015. A copy of the approved SCAP can be found on the Project WIN website (www.msdprojectwin.org).

A current copy of the SCAP Credit Balance is included as **Appendix D**.

5.2 Operations Programs

O-A-1 Pump Station Operations Programs (Routine Operating Programs)

Activity details are provided in the CMOM schedule provided as **Section 5.4 – CMOM Activity Schedule**.

O-A-2 Pump Station Operations Programs (Emergency Operating Programs)

Activity details are provided in the CMOM schedule provided as **Section 5.4 – CMOM Activity Schedule**.

5.3 Comprehensive Performance Evaluations and Composite Correction Plans (CPE/CCP)

Per requirements of MSD's 2009 Amended Consent Decree, MSD implemented a Comprehensive Performance Evaluation (CPE) and Composite Correction Plan (CCP) program for the District's water quality treatment centers (WQTCs). Although the IOAP CPE assessments defined specific WQTC improvements to be completed by December 31, 2011, MSD will continue to implement CPE/CCP activities as part of the District's CMOM Program. This section will list such activities per WQTC as they occur each reporting period and will be outlined below.

5.3.1 Hite Creek Water Quality Treatment Center

During this reporting period, the following Hite Creek WQTC activities occurred.

- In January 2015, MSD Board awarded the construction project for the Hydraulic Improvements for the Hite Creek WQTC.
- MSD staff continued to work with the consultant to complete an alternative solids and tertiary filter replacement study.

During the next reporting period, the following Hite Creek WQTC activities are planned.

- MSD expects construction will begin on the Hite Creek WQTC Hydraulic Improvements Project.
- MSD anticipates receiving KDOW comments. Once received, MSD will address all comments and re-submit a final Hite Creek WQTC Facilities Plan Update.
- MSD staff will continue to work with the consultant to complete an alternative solids and tertiary filter replacement study.

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule.**

5.3.2 Floyds Fork Water Quality Treatment Center

During this reporting period, the Floyds Fork WQTC expansion was in full operation and able to accept the additional flow from upstream customers. MSD has accepted and has officially closed the project. The expansion project provides an average daily design capacity of 6.5 MGD.

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule.**

5.3.3 Derek R. Guthrie Water Quality Treatment Center

During this reporting period, MSD continued working on updating the Derek R. Guthrie WQTC Facilities Plan with the alternative analysis finalized and exhibits revised along with preparing an internal review of the document. There were substantial completion walk throughs for the Influent Pump Station Building along the continuing repairs on the Wet Weather Pump Station.

During this reporting period, the following Derek R. Guthrie WQTC activities occurred.

- Design began for the Secondary Clarifiers 1, 2 & 3 collection mechanism replacement and removal and upgrade of Return Activated Sludge (RAS) Pumps 1 and 4, including replacement of pumps 1 through 4 variable frequency drives.

During the next reporting period, the following Derek R. Guthrie WQTC activities are planned.

- During the next reporting period, the draft Facilities Plan document will be reviewed by MSD staff and project schedule will be updated for a draft KDOW submittal. Progress is expected to be made on the repairs to the Wet Weather Pumps in order to continue pump testing.
- Design will continue for the Secondary Clarifiers 1, 2 & 3 collection mechanism replacement and removal and upgrade of Return Activated Sludge (RAS) Pumps 1 and 4, including replacement of pumps 1 through 4 variable frequency drives. It is anticipated that construction will begin fall 2016.

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.4 Cedar Creek Water Quality Treatment Center

During this reporting period, MSD staff began to work with a consultant to complete an alternative solids and tertiary filter replacement study. The study is to review options to improve plant operations and efficiency.

During the next reporting period, MSD staff will continue to work with the consultant to complete an alternative solids and tertiary filter replacement study.

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.5 Prospect Area Water Quality Treatment Center Updates

An elimination plan for the five WQTCs serving Prospect (Timberlake, Hunting Creek North, Hunting Creek South, Ken Carla, and Shadow Wood), was submitted to EPA and KDEP on March 31, 2009. Approval of this plan was received on September 24, 2009, and work is proceeding on the projects defined in the IOAP. See **Section 3 – Program Activities for Discharge Abatement Plans** for an update on the design and construction of the projects that make up the elimination plan for the Prospect Area WQTCs.

5.3.5.1 Timberlake Water Quality Treatment Center

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.5.2 Hunting Creek North Water Quality Treatment Center

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.5.3 Hunting Creek South Water Quality Treatment Center

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.5.4 Ken Carla Water Quality Treatment Center

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.5.5 Shadow Wood Water Quality Treatment Center

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.6 Jeffersontown Water Quality Treatment Center

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.7 Starview Water Quality Treatment Center

During this reporting period, MSD completed design plans and easement acquisition for the Middletown Sanitary Recapture Phase II-Section C and Chenoweth Run Interceptor Section 1 Project (Budget ID E93352) for the elimination of the Starview WQTC. The plant flows will be diverted to the Floyds Fork WQTC.

During the next reporting period, it is anticipated that the Middletown Sanitary Recapture Phase II-Section C and Chenoweth Run Interceptor Section 1 project will be advertised for construction by MSD, with construction beginning mid-2015. The Starview WQTC is scheduled to be off-line prior to December 31, 2015.

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule**.

5.3.8 Berrytown Water Quality Treatment Center

During this reporting period, MSD awarded the Middletown Sanitary Recapture Phase II - Section D Project (Budget ID E93353) for the elimination of the Berrytown WQTC to Flynn Contracting. Construction has started and the project is currently 40% complete and scheduled for completion in July 2015. The plant flows will be diverted to the Floyds Fork WQTC. The gravity portion of this project is approximately 25% of the total length of gravity line required to eliminate the Starview WQTC. The Berrytown WQTC is scheduled to be off-line prior to December 31, 2015.

Schedules for CPE/CCP related capital projects are provided in **Section 5.4 – CMOM Activity Schedule.**

5.3.9 Other Water Quality Treatment Centers

CMOM related capital projects will be provided in the schedule provided as **Section 5.4 – CMOM Activity Schedule**.

- McNeely Lake – The McNeely Lake Sanitary Sewer and Force Main project is currently in construction phase and is scheduled for completion in May 2015. This gravity portion is approximately 75% of the total length of gravity line required to eliminate the McNeely Lake WQTC. A private developer is responsible for extending the remaining gravity sewer through a future residential development to within 600 feet of the McNeely Lake WQTC. The design of the interceptor that will serve to eliminate the McNeely Lake WQTC and the Brookbend Way PS is complete. During the next reporting period, MSD will award and begin the decommissioning of the McNeely Lake WQTC and Brookbend PS. MSD anticipates completing the elimination of the McNeely Lake WQTC by December 31, 2015, but is dependent on the private developer portion being completed.
- Bancroft WQTC – The scope of this project has been modified from storage at Devondale PS to eliminating the Devondale PS as part of the IOAP and conveying flow to a 0.33 MGD Pump Station and a 0.25 MG Storage Basin at the Bancroft site. Design of this project is complete. The project was advertised for construction and awarded in November, 2014. Construction began on January 5, 2015. Excavation for the Basin in ongoing. During the next reporting period, it is anticipated that the earthwork for the basin will be complete as well as the gravity sewer and force main required by the project. The Bancroft WQTC and Devondale Pump Station are scheduled to be off-line by December 31, 2015.
- Middletown Industrial Park WQTC – MSD's Board approved the acquisition of the Middletown Industrial Park WQTC system on January 26, 2015. The City of Middletown will continue to operate and maintain the sewer system until flow is diverted and the WQTC is offline. At that time, MSD will take over full operations and maintenance of the system. MSD initiated a design project to eliminate the plant. A private developer was responsible for the Middletown Sanitary Recapture Phase I Project which constructed a portion of the Chenoweth Run Interceptor to eliminate the Starview and Berrytown plants. This interceptor will also provide a gravity outlet for the Middletown Industrial Park WQTC. MSD will design and construct an approximately 800 linear foot collector line for the

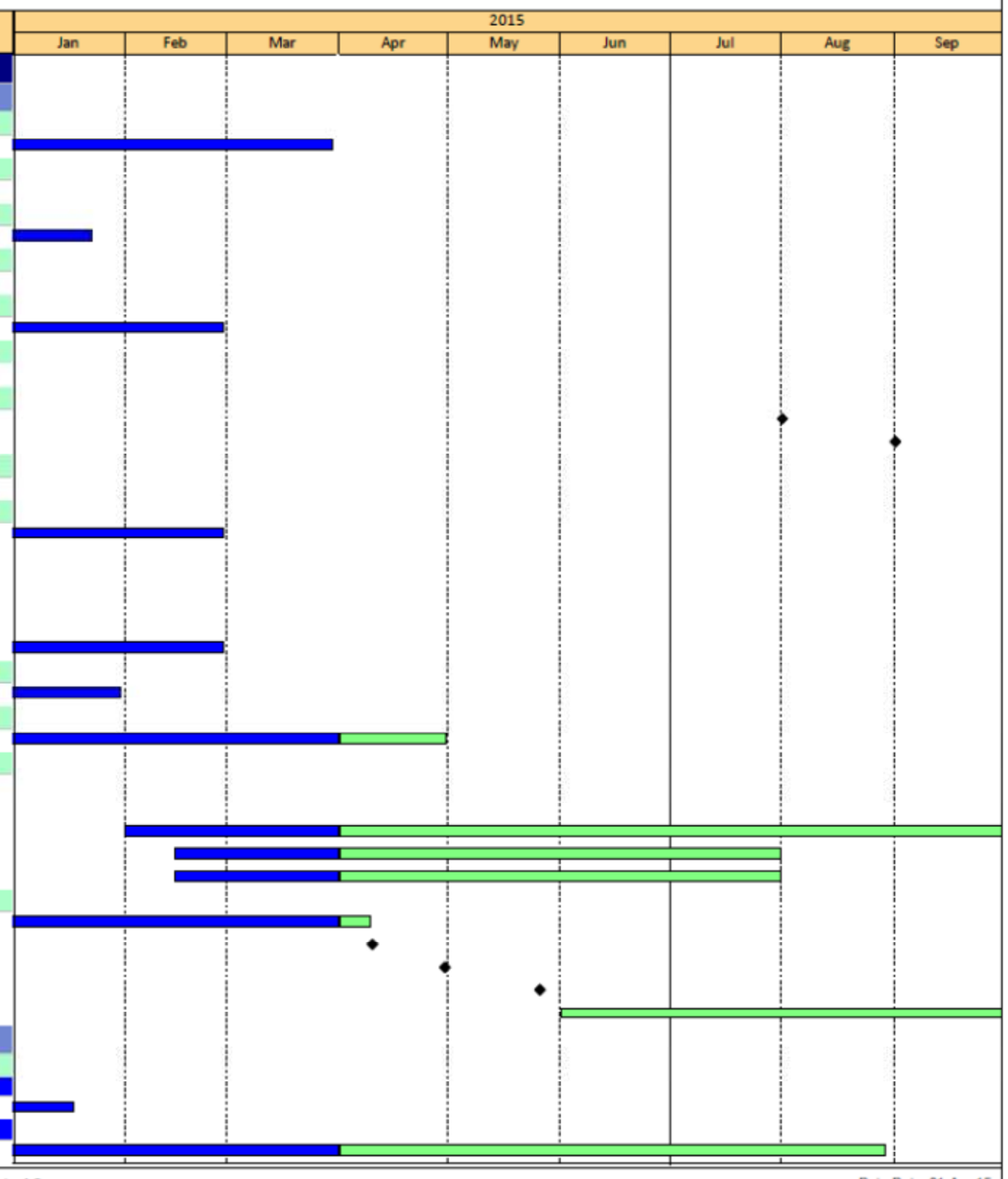
elimination. During the next reporting period, MSD will complete the design and it is anticipated that construction will begin. The Middletown Industrial Park WQTC is scheduled to be off-line by December 31, 2015.

5.4 CMOM Activity Schedule

CMOM capital project milestones for the period of January 1, 2015, through March 31, 2015, as well as a look-ahead for the period of April 1, 2015, through June 30, 2015, are provided in the schedule below.

MSD CMOM FY14 Annual Commitments Schedule (01 January 2015 - 30 September 2015) Date: 15-Apr-15

Activity ID	Activity Name	Physical % Complete	Start	Finish
CMOM FY ANNUAL REPORT COMMITMENTS FINAL			04-Jan-13 A	15-Aug-16
M-E-9 Infrastructure Rehabilitation			01-Apr-13 A	29-May-16
Annual I/I FY13 Project (H09206)			30-Mar-14 A	30-Mar-15 A
A5100	Warranty	100%	30-Mar-14 A	30-Mar-15 A
Lea Ann Way East - Stonybrook Rehabilitation Project (C08433)			01-Nov-13 A	01-Nov-14 A
A4020	Warranty	100%	01-Nov-13 A	01-Nov-14 A
Prospect Phase I Sanitary Sewer Rehabilitation Project (H11311)			20-Sep-13 A	23-Jan-15 A
A3240	Construction	100%	20-Sep-13 A	23-Jan-15 A
Meadow Stream Sanitary Sewer Rehabilitation Project (H11305)			21-Oct-13 A	21-Oct-14 A
A4910	Construction	100%	21-Oct-13 A	21-Oct-14 A
Lea Ann Way East - Fegenbush Rehabilitation Project (C08433)			28-Feb-14 A	28-Feb-15 A
A4010	Warranty	100%	28-Feb-14 A	28-Feb-15 A
Lea Ann Way East - Fern Creek Rehabilitation Project (C08433)			01-Oct-13 A	01-Oct-14 A
A5690	Warranty	100%	01-Oct-13 A	01-Oct-14 A
Beargrass Interceptor Rehab Project (H09207)			01-Aug-15	01-Sep-15
A5370	Ad	0%	01-Aug-15*	
A5380	Bid Open	0%	01-Sep-15*	
Camp Taylor Area 3 Rehab Project (H09218)			01-Dec-13 A	31-Dec-14 A
A5450	Construction	100%	01-Dec-13 A	31-Dec-14 A
Annual I/I FY14 Project (H14184)			28-Jan-14 A	28-Feb-15 A
A5730	Construction	100%	28-Jan-14 A	28-Feb-15 A
A6150	Hillridge	100%	28-Jan-14 A	30-Dec-14 A
A6160	Rosa Terrace	100%	28-Jan-14 A	30-Oct-14 A
A6170	Starview	100%	28-Jan-14 A	30-Oct-14 A
A6180	Goose Creek	100%	28-Jan-14 A	30-Dec-14 A
A6190	LAW Quad3 Whispering Hills Phase I	100%	28-Jan-14 A	28-Feb-15 A
Goose Creek PS SSES (H11407)			01-Apr-13 A	31-Jan-15 A
A4950	Planning	100%	01-Apr-13 A	31-Jan-15 A
Nightingale PS SSES (H11313)			15-Jul-13 A	30-Apr-15
A5110	Planning	95%	15-Jul-13 A	30-Apr-15
FY15 Annual Sewer Rehabilitation (H09208)			15-Oct-14 A	01-Feb-16
A5490	Bid Open	100%	15-Oct-14 A	
A5520	Award	100%	24-Nov-14 A	
A5530	Construction	20%	01-Feb-15 A	01-Feb-16
A5540	LAW Quad 3 - Whispering Hills Phase3 2	10%	15-Feb-15 A	31-Jul-15
A5650	LAW Quad 4	50%	15-Feb-15 A	31-Jul-15
Melco Basin Tree Removal (F14171)			01-Nov-14 A	29-May-16
A6250	Design	75%	01-Nov-14 A	09-Apr-15
A6260	Ad	0%	10-Apr-15*	
A6270	Bid Open	0%	30-Apr-15*	
A6280	Award	0%	26-May-15*	
A6290	Construction	0%	01-Jun-15*	29-May-16
Pump Station Operations Programs			04-Jan-13 A	15-Aug-16
O-A-2 Emergency Operation Programs			04-Jan-13 A	15-Aug-16
Royster Basin Generator Project (H12163)			28-Aug-14 A	18-Jan-15 A
A4840	Construction	100%	28-Aug-14 A	18-Jan-15 A
St. Matthews #4 Pump Station Modification Project (H14211)			29-Aug-14 A	29-Aug-15
A5840	Warranty	55%	29-Aug-14 A	29-Aug-15

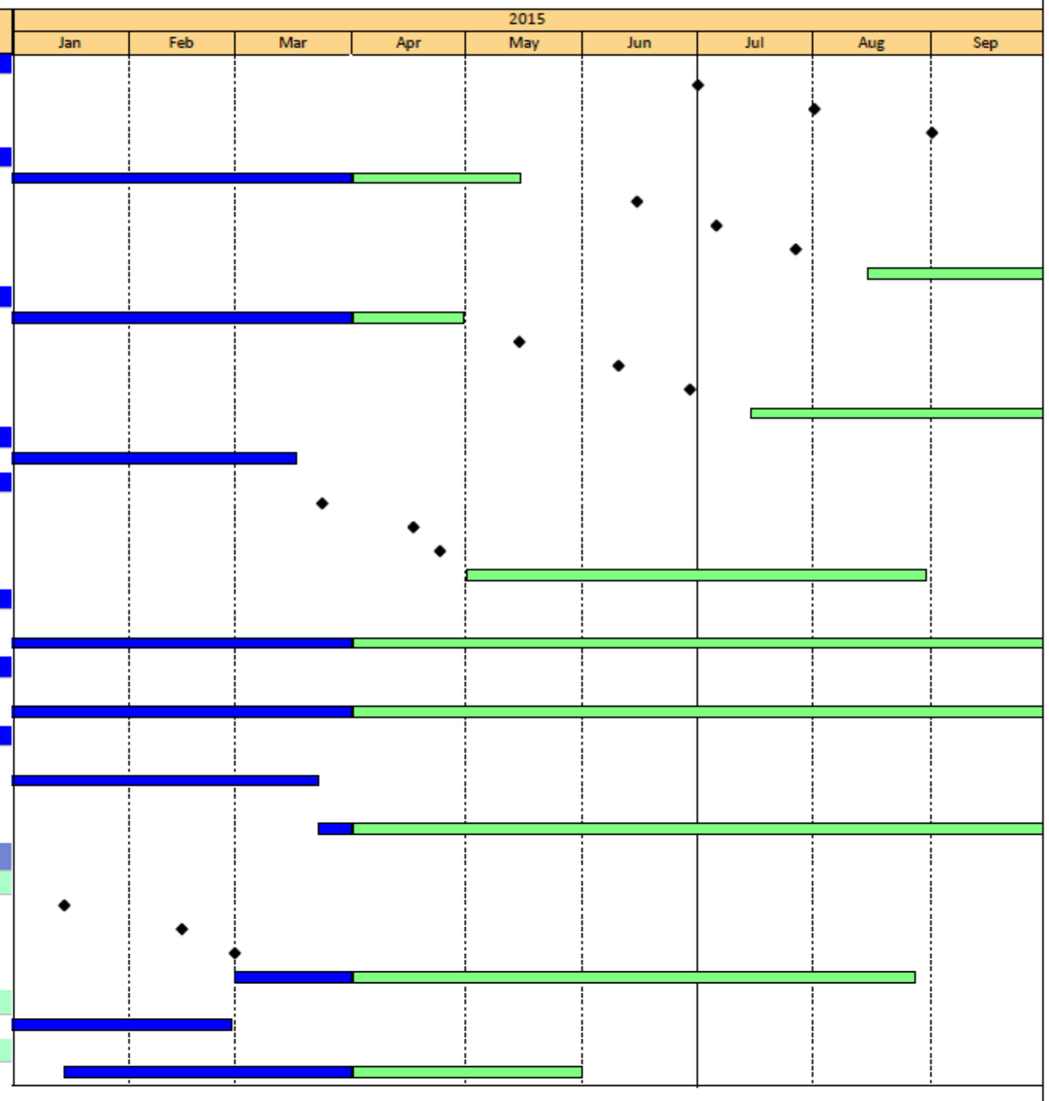


1 of 2 Date Date: 01-Apr-15

MSD CMOM FY14 Annual Commitments Schedule (01 January 2015 - 30 September 2015)

Date: 15-Apr-15

Activity ID	Activity Name	Physical % Complete	Start	Finish
Gunpowder Pump Station FM Modification Project (H14211)			**01-Jul-15**	**01-Sep-15**
A6050	Ad	0%	01-Jul-15*	
A6070	Award	0%	01-Aug-15*	
A6060	Bid Open	0%	01-Sep-15*	
4th Street FPS Gate and Switch Gear Replacement Project (F12095)			**04-Jan-13 A**	**15-Aug-16**
A5150	Design	70%	04-Jan-13 A	15-May-15
A5160	Ad	0%	15-Jun-15*	
A5170	Bid Open	0%	06-Jul-15*	
A5180	Award	0%	27-Jul-15*	
A5190	Construction	0%	15-Aug-15*	15-Aug-16
Melco Basin Crane (F14170)			**01-Dec-14 A**	**15-Jul-16**
A6200	Design	90%	01-Dec-14 A	30-Apr-15
A6210	Ad	0%	15-May-15*	
A6220	Bid Open	0%	10-Jun-15*	
A6230	Award	0%	29-Jun-15*	
A6240	Construction	0%	15-Jul-15*	15-Jul-16
Starkey Flood Pump Station Rooftop A/C (F15006)			**15-Dec-14 A**	**17-Mar-15 A**
A5660	Construction	100%	15-Dec-14 A	17-Mar-15 A
Bridgepointe Pump Station Access Road			**24-Mar-15 A**	**30-Aug-15**
A6310	Ad	100%	24-Mar-15 A	
A6320	Bid Open	0%	17-Apr-15*	
A6330	Award	0%	24-Apr-15*	
A6300	Construction	0%	01-May-15*	30-Aug-15
Fairway View Pump Station Upgrade (H09177)			**22-Aug-14 A**	**31-Dec-15**
A6340	Construction	100%	22-Aug-14 A	30-Dec-14 A
A6350	Warranty	25%	31-Dec-14 A	31-Dec-15
Riding Ridge Pump Station Improvements (H09175)			**23-Sep-14 A**	**15-Nov-15**
A6360	Construction	100%	23-Sep-14 A	15-Nov-14 A
A6370	Warranty	10%	15-Nov-14 A	15-Nov-15
Rosa Terrace Pump Station Improvement			**01-Oct-14 A**	**22-Mar-16**
A6440	Award	100%	01-Oct-14 A	31-Oct-14 A
A6450	Construction	100%	03-Nov-14 A	23-Mar-15 A
A6400	Design	100%		13-Nov-14 A
A6460	Warranty	5%	23-Mar-15 A	22-Mar-16
CPE/CPE Treatment Plant Activities			20-Jun-14 A	27-Aug-15
MFWQTP Rubbertown Sampling Manholes (H09374)			15-Jan-15 A	27-Aug-15
A6100	Ad	100%	15-Jan-15 A	
A6130	Bid Open	100%	15-Feb-15 A	
A6110	Award	100%	01-Mar-15 A	
A6120	Construction	10%	01-Mar-15 A	27-Aug-15
West County Force Main Assessment (H09519)			20-Jun-14 A	28-Feb-15 A
A5340	Planning	100%	20-Jun-14 A	28-Feb-15 A
West County Water Quality Treatment Center Gate 145 Electrical Service & Actuator (F14164)			15-Jan-15 A	31-May-15
A6380	Design	60%	15-Jan-15 A	31-May-15



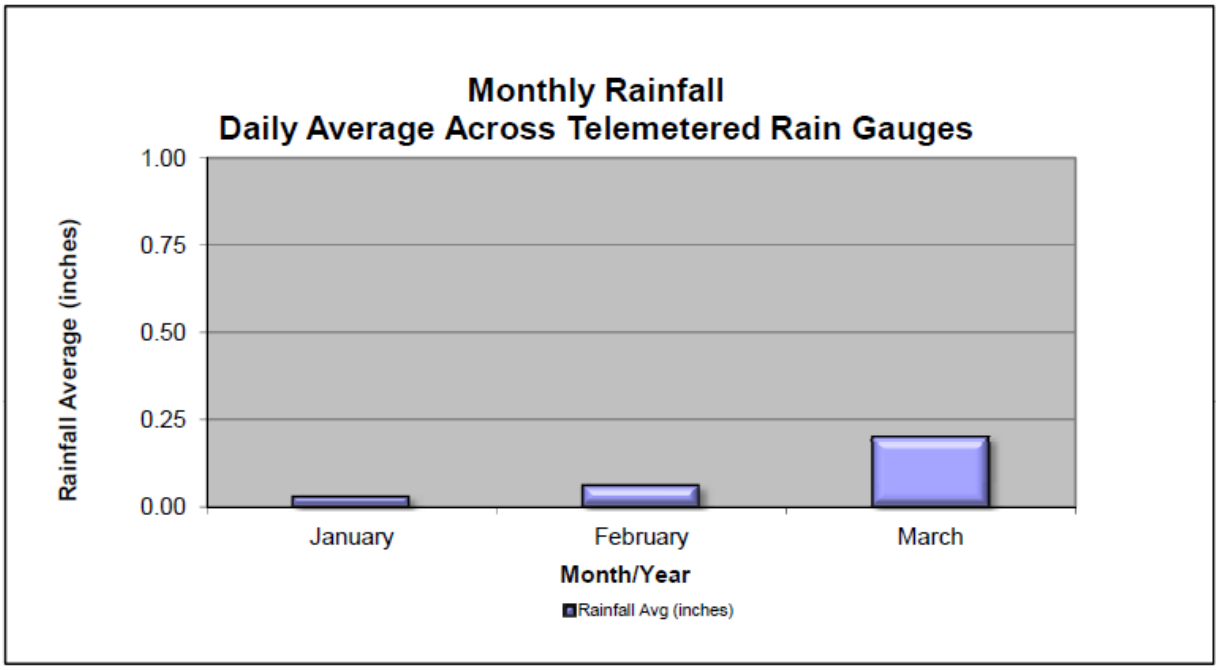
2 of 2

Date Date: 01-Apr-15

SECTION 6: Project WIN Performance Overview

6.1 Rainfall

The number and the volume of wet weather overflows are directly related to the amount of rain that has fallen during the reporting period. The following graph shows the Jefferson County average rainfall amounts for the last quarter. Data was pulled from MSD's Rain Gauge Network.



A storm frequency analysis for CSOs is included as **Appendix B**.

6.2 Collection System Unauthorized Discharges

6.2.1 Collection System Overflows to Waters of the United States (WUS)

MSD recorded information related to overflows reaching Waters of the United States (WUS) for the reporting period. This information is entered and maintained in Hansen utilizing procedures reviewed and improved through efforts associated with various components of the Amended Consent Decree. Details of these overflows will be included in the Annual Report for the period of July 1, 2014, through June 30, 2015, and will be posted on the Project WIN website. During this quarter, 159 unauthorized discharges to the Waters of the United States (WUS) have been reported.

Unauthorized Discharges (Waters of the United States)			
Problem	Dry Weather	Wet Weather	Total
Blending At Jtown WQTC	0	3	3
Bypass At WQTC	0	5	5
Lack of System Capacity	0	132	132
Mechanical Failure	2	1	3
Obstruction-Not Grease / Roots	1	0	1
Structural Failure	3	1	4
Utility Damaged MSD Asset	1	0	1
Electrical Problems at MSD	0	4	4
Pumped Overflow	0	6	6
Total	7	152	159

February/March Weather Event Summary

There were several significant rain and snow events during the quarter that led to more reported overflows than normal. No overflows were reported in January or February 2015 due to rain events, two were reported due to structural or mechanical failure. However, February and March 2015 experienced snow storms combined with heavy rain that led to 146 wet weather overflows reported in March.

Wet weather related overflow events began with eight inches of snow that fell February 16, 2015. By the end of February, snow from that event had melted and ground conditions were wet. At the beginning of March, the ground was already saturated from February snow melt and heavy rain began to fall. On March 3rd and March 4th, almost 2 inches of rain fell, followed by almost 12 inches of snow on March 4th and March 5th. On March 6th the temperatures began to rise and subsequently the snow began to melt. The significant storm & snow runoff coupled with the already saturated ground conditions led to extreme overflow events. Additional smaller storms later in March exacerbated the problems and additional wet weather related overflows were recorded.

This string of weather events described above, and the wet weather related overflows documented this quarter due to those weather events are of a magnitude that MSD considers to be beyond the level of control for overflows identified in the IOAP.

6.2.2 Overflows to Ground (EXT)

MSD recorded information related to overflows to the ground that did not reach Waters of the United States for the reporting period. This information is entered and maintained in Hansen utilizing procedures reviewed and improved through efforts associated with various components of the Amended Consent Decree. These overflows will be included in the Annual Report for the period of July 1, 2014, through June 30, 2015.

6.2.3 Overflows to Interior (INT)

MSD recorded information related to overflows to building interiors for the reporting period. This information is entered and maintained in Hansen utilizing procedures reviewed and improved through efforts associated with various components of the Amended Consent Decree. These overflows, that are the result of an issue in the main line, will be included in the

Annual Report for the period of July 1, 2014, through June 30, 2015.

6.2.4 Dry Weather CSOs

MSD recorded information related to dry weather overflows from permitted combined sewer overflow outfalls. This information is entered and maintained in Hansen utilizing procedures reviewed and improved through efforts associated with various components of the Amended Consent Decree. A detailed report of these overflows will be included in the Annual Report for the period of July 1, 2014, through June 30, 2015. The table below summarizes dry weather CSOs that occurred during the quarter. **Appendix A-1** includes details on the dry weather overflows that occurred in the quarter.

There was one dry weather overflow recorded at CSOs with a volume of 9,200 gallons.

Dry Weather CSO - January 1, 2015 - March 31, 2015					
CSO	Type of Discharge	Date/Time	Problem	Cause	Volume (GAL)
CSO184	DISDW	2/20/15 3:10 PM	UTILITY DAMAGED MSD ASSET	Water main break at the intersection of Alexander Avenue and Keswick Boulevard	9,200

6.3 CSO Reductions

Included in **Appendix B** is the CSO data for this quarter. A summary of any data anomalies and the CSO data for each monitored overflow has been graphed along with rainfall information from the nearest rain gauge to facilitate review of the overflows that occurred.

- No CSO reduction projects were completed during the reporting period.

6.4 SSO Reductions

Estimation of SSO volume is not available in the same manner as it is for the CSO locations. The SSO volume reductions are estimates based on actual observations or from flow monitoring information.

- No SSO reduction projects were completed during the reporting period.

6.5 Gravity Line Preventive Maintenance

Each quarter, data and statistics relating to the cleaning, inspection, and maintenance of sewer assets performed under the Gravity Line Preventive Maintenance (GLPM) are reported. The following data was compiled for the period of January 1, 2015, through March 31, 2015. The first table includes data and targets. The second table includes unplanned maintenance and other maintenance activities that are performed in response to inspection.

Rolling Quarterly GLPM Performance With Targets							
	Apr-Jun	Jul-Sep	Oct-Dec	**Jan-Mar**	Total	Target/ qtr	% of Annual Target
Combined Sewer Area							
Catch Basins Cleaned CSO Area - PM	3,327	3,097	6,741	**6,015**	19,180	4,460	34%
CSO Inspections	1,293	1,288	1,790	**1,239**	5,610	1,272	24%
Sanitary Sewer Area							
Catch Basins Cleaned SSO Area - PM	796	685	1,397	**45**	2,923	1,144	1%
County Wide							
Sewer Main Inspections MSD Crews (LF)	353,379	334,927	184,384	**166,228**	1,038,918	198,000	21%
Sewer Main Inspections Contractor (LF)	95,460	124,237	141,872	**272,606**	634,175	198,000	34%
Total Inspections (LF)	448,839	459,164	326,256	**438,834**	1,673,094	396,000	28%

Rolling quarterly GLPM performance is related to unplanned maintenance; therefore no targets have been developed.

Rolling Quarterly GLPM Performance					
	Apr-Jun	Jul-Sep	Oct-Dec	**Jan-Mar**	Total
Combined Sewer Area					
Catch Basins Cleaned CSO Area - UM	341	256	500	**194**	1,291
CSO Debris Removal WO	175	168	168	**78**	589
Chemical Root Treatment CSO Area (LF)	0	0	0	**0**	0
Root Cutting CSO Area (LF)	6,420	15,758	740	**475**	23,393
Flushing and Cleaning of Sewer Mains CSO Area (LF)	3,999	457,624	4,822	**5,798**	472,243
Sanitary Sewer Area					
Catch Basins Cleaned SSO Area - UM	796	67	71	**42**	976
Chemical Root Treatment SSO Area (LF)	407	0	48,803	**0**	49,210
Root Cutting SSO Area (LF)	23,721	48,289	24,253	**15,057**	111,321
Flushing and Cleaning of Sewer Mains SSO Area (LF)	37,728	496,040	53,352	**23,000**	610,121

6.6 Water Quality Treatment Center Bypasses

6.6.1 Bypass Events

The table below summarizes the bypasses that occurred during this reporting period.

6.6.2 Bypass Corrective Actions

Each quarter, an assessment of bypasses is conducted to determine the root cause of the bypass, the failure category, corrective actions to be taken, possible programmatic solutions, and corrective action completion date. Refer to the table below for causes of bypasses and respective corrective actions that occurred January 1, 2015 through March 31, 2015.

Bypass Summary – July 1, 2014 to September 30, 2014					
DATE	WQTC	WORK ORDER	FAILURE CODE	BYPASS DESCRIPTION	FAILURE RESOLUTION
Capacity (CAP)					
3/4/2015	BERRYTOWN	2319385	CAP	On March 4, 2015, Berrytown WQTC bypassed disinfection and dechlorination treatment. Because of elevated levels in the aeration tank, approximately 191,000 gallons was bypassed. As a precaution, MSD turned off plant aeration to minimize the loss of biosolids. The design flow at Berrytown WQTC is 0.075 MG. We are unable to determine the exact flow rate at the time of bypass because the plant flow meter was maxed at a rate of 0.430 MDG.	Plant is to be eliminated in 2015. Snow accumulation of approximately 12 inches occurred at this facility after bypass began. Disinfected and cleaned by MSD staff.
3/10/2015	BERRYTOWN	2323203	CAP	On March 10, 2015, Berrytown WQTC bypassed disinfection and dechlorination treatment. Because of elevated levels in the aeration tank, approximately 65,500 gallons was bypassed. As a precaution, MSD turned off plant aeration to minimize the loss of biosolids. The design flow at Berrytown WQTC is 0.075 MG. We are unable to determine the exact flow rate at the time of bypass because the plant flow meter was maxed at a rate of 0.430 MDG.	Plant is to be eliminated in 2015. Disinfected and cleaned by MSD staff.

Bypass Summary – July 1, 2014 to September 30, 2014					
DATE	WQTC	WORK ORDER	FAILURE CODE	BYPASS DESCRIPTION	FAILURE RESOLUTION
3/14/2015	BERRYTOWN	2325355	CAP	On March 14, 2015, Berrytown WQTC bypassed disinfection and dechlorination treatment. Because of elevated levels in the aeration tank, approximately 206,700 gallons was bypassed. As a precaution we turned off plant aeration to minimize the loss of biosolids. The design flow at Berrytown WQTC is 0.075 MG. We are unable to determine the exact flow rate at the time of bypass because the plant flow meter was maxed at a rate of 0.430 MDG.	Plant is to be eliminated in 2015. Disinfected and cleaned by MSD staff.
3/14/2015	CEDAR CREEK	2325349	CAP	On March 14, 2015, Cedar Creek WQTC bypassed tertiary and UV treatment due to increased wet weather flows that exceeded plant capacity. In the interest of protecting the UV equipment from damage, MSD reduced flow to the UV channels, which prevented a shut down of the UV system. Plant flow was at a maximum of 23.544 MGD. Approximately 35,000 gallons were bypassed. The design flow at Cedar Creek WQTC is 7.5 MG. Flow during the duration of the bypass was 1.037 MGD.	MSD staff diverted flow into the #1 Oxidation ditch in order to protect the UV equipment and maintain tertiary treatment for the majority of plant flows. Disinfected and cleaned by MSD staff.

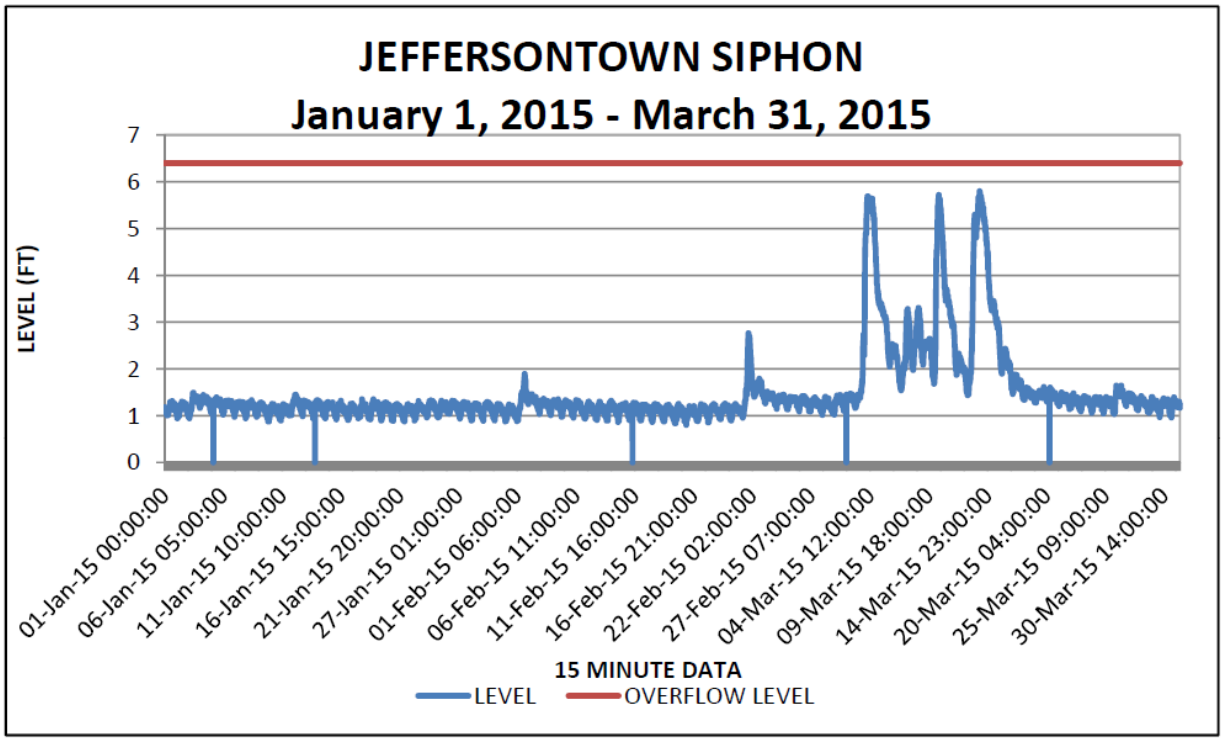
Bypass Summary – July 1, 2014 to September 30, 2014					
DATE	WQTC	WORK ORDER	FAILURE CODE	BYPASS DESCRIPTION	FAILURE RESOLUTION
3/16/2015	TIMBERLAKE	2325628	CAP	On March 16, 2015, Timberlake WQTC bypassed disinfection and dechlorination treatment due to the Ohio River being in flood stage and completely submerging the facility's chlorine contact tank. The bypass stopped at 2:00 pm on March 20, 2015, when river levels receded. Approximately 364,000 gallons were bypassed.	The plant is scheduled to be eliminated before January 1, 2016. Chlorine contact basin was cleaned on March 24, 2015 and put back in service same day.
Human Error (OPN)					
N/A	N/A	N/A	N/A	No bypasses of this category occurred during the reporting period.	N/A
Facility Failure (Mechanical - MCH, Electrical - ELE, Structural - SRT)					
N/A	N/A	N/A	N/A	No bypasses of this category occurred during the reporting period.	N/A
External Power failures (LGE Related-PWR)					
N/A	N/A	N/A	N/A	No bypasses of this category occurred during the reporting period.	N/A
Utility Damage					
N/A	N/A	N/A	N/A	No bypasses of this category occurred during the reporting period.	N/A

6.6.3 Jeffersontown Water Quality Treatment Center

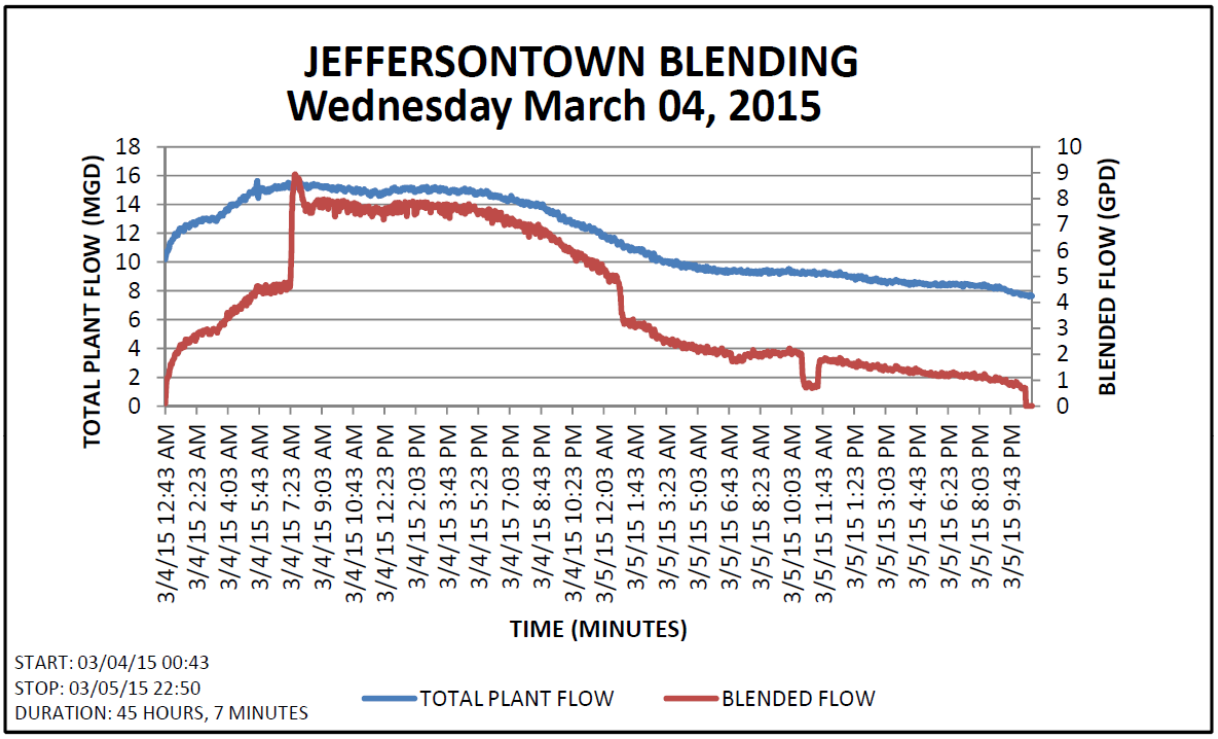
MSD submitted a Jeffersontown WQTC Process Control Plan on October 31, 2008, as required by paragraph 26.a of the Amended Consent Decree. MSD received comments on December 12, 2008, and resubmitted the plan January 16, 2009, and again on February 20, 2009. MSD received conditional approval of this document from EPA on April 1, 2009, pending finalization of the Amended Consent Decree that was under consideration by the Federal Court at the time the Process Control Plan was submitted. The Process Control Plan was accepted by the Federal Court and incorporated by reference into the Amended Consent Decree by an Order signed February 12, 2010, that was entered into public record February 15, 2010.

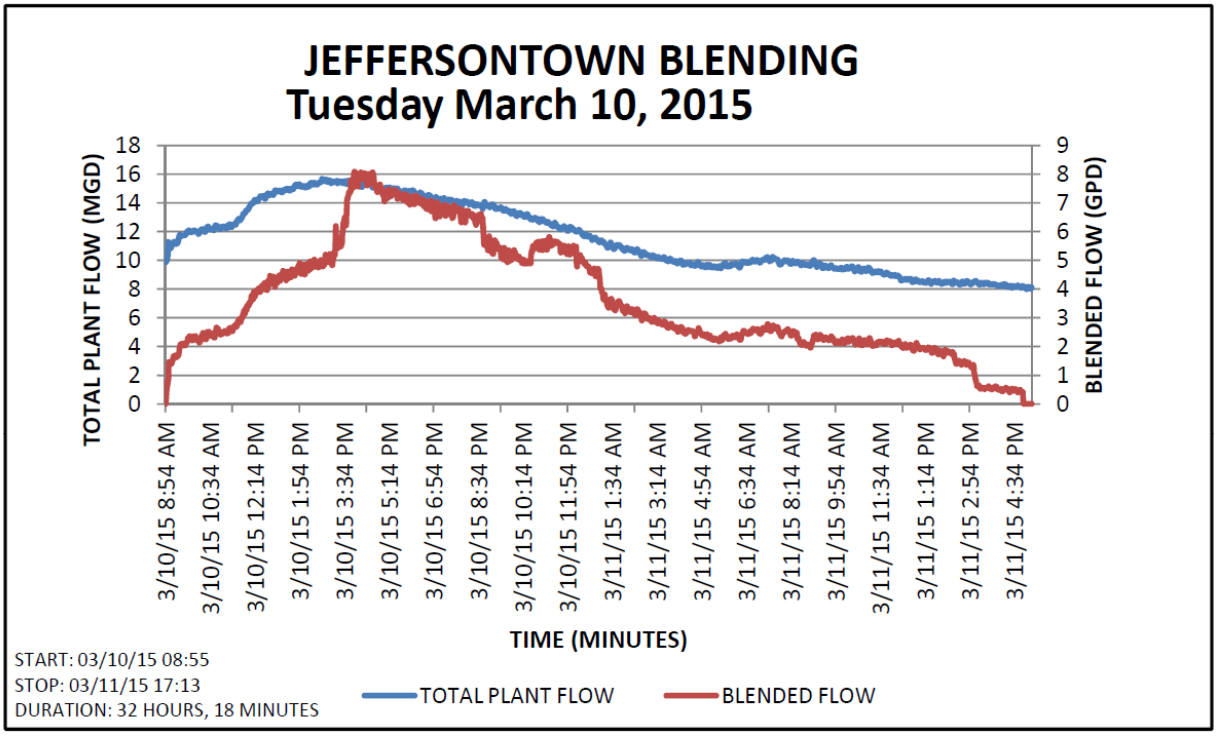
The following activities occurred at the Jeffersontown WQTC during the reporting period:

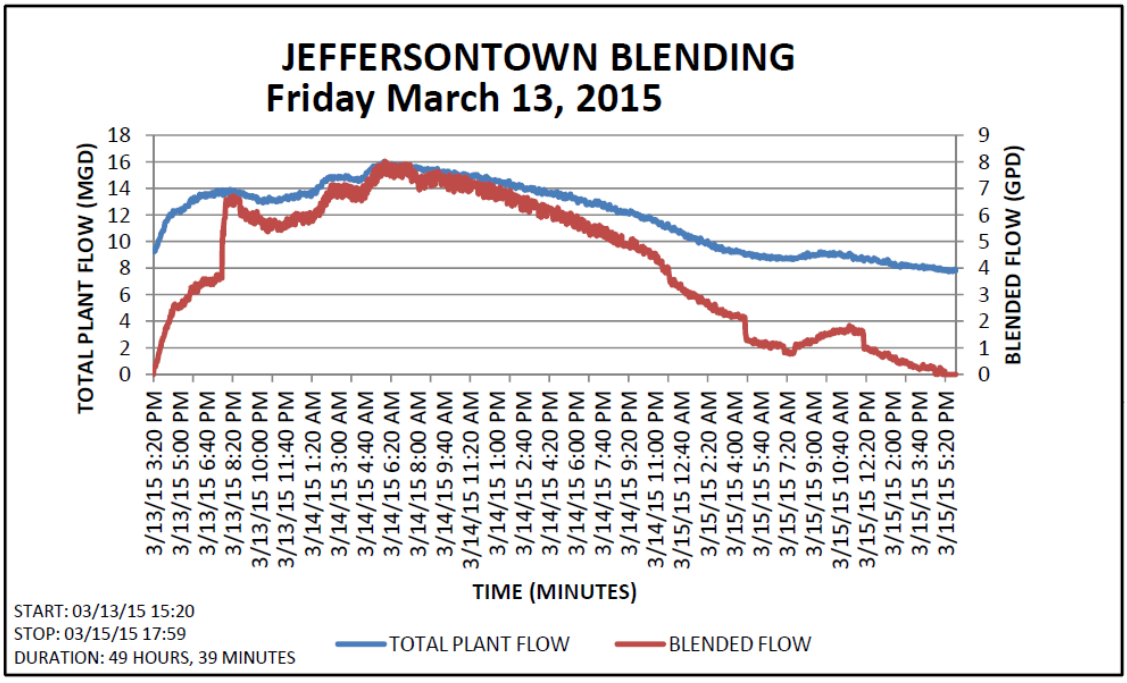
- Inspections were conducted upstream of the Jeffersontown WQTC Headworks three times. Refer to Section 2 for SSO Route information. Overflows were reported up stream of the siphon at manhole 28173 three times on March 4th, March 10th, and March 14th.



- There were three blending events during the reporting period. Below are charts for each blending event that show total plant flow during the blending event.

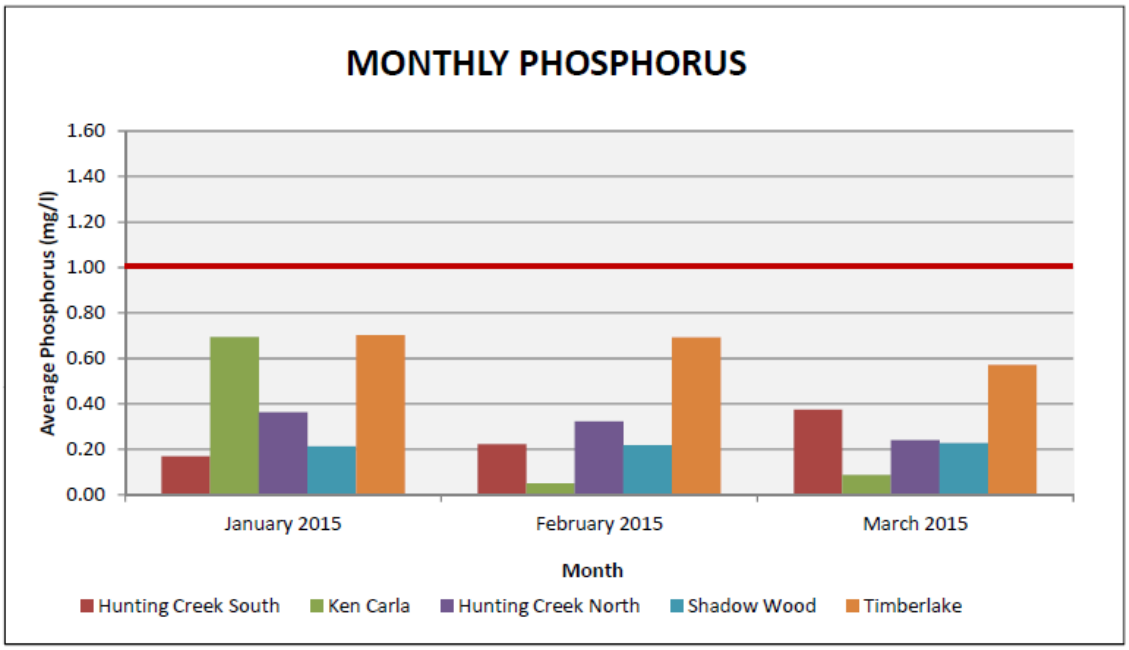

JEFFERSONTOWN BLENDING
Wednesday March 04, 2015
TOTAL PLANT FLOW (MGD)
BLENDED FLOW (GPD)
TIME (MINUTES)
START: 03/04/15 00:43
STOP: 03/05/15 22:50
DURATION: 45 HOURS, 7 MINUTES
TOTAL PLANT FLOW
BLENDED FLOW


JEFFERSONTOWN BLENDING
Tuesday March 10, 2015
TOTAL PLANT FLOW (MGD)
BLENDED FLOW (GPD)
TIME (MINUTES)
START: 03/10/15 08:55
STOP: 03/11/15 17:13
DURATION: 32 HOURS, 18 MINUTES
TOTAL PLANT FLOW
BLENDED FLOW



6.7 Phosphorus Monitoring at the Prospect WQTCs

As part of the Amended Consent Decree, MSD has agreed to submit phosphorus monitoring data including the calculations of monthly averages with the quarterly reports. MSD WQTCs were under the 1mg/l limit during the reporting period, per the Amended Consent Decree requirement. The following chart displays monthly average phosphorus results for the Prospect WQTCs.



Appendix A-1 - Discharge Work Orders – Dry Weather CSOs

APPENDIX A-1
UNAUTHORIZED DISCHARGES
TO WATERS OF UNITED STATES
JANUARY 1, 2015 THROUGH MARCH 31, 2015

Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
MORRIS FORMAN	KY0022411	825 FETTER AVE	2/20/15 3:10 PM	02/20/15 03:21 PM	9200	Sewer Manhole	CSO184	STREAM	SOUTH FORK BEARGRASS CREEK	Water main break at the intersection of Alexander Avenue and Keswick Boulevard resulting in a significant amount of water in the combined sewer system	UTILITY DAMAGED MSD ASSET	2314658	No cleanup was necessary, overflow discharged directly to improved channel of Beargrass Creek.	No repairs needed. Louisville Water Co. completed work at 3:30 pm

Appendix A-2 - Discharge Work Orders – Bypass

APPENDIX A-2
UNAUTHORIZED DISCHARGES TO WATERS OF UNITED STATES
JANUARY 1, 2015 THROUGH MARCH 31, 2015

Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
BERRYTOWN	KY0036501	1203 HEAFER RD	03/04/15 9:40: AM	03/05/15 05:30 PM	191000	Sewer Treatment Plant	MSD0209	STREAM	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	BYPASS AT WQTC	2319385	MSD CLEANED & SANITIZED THE AREA	PLANT IS TO BE ELIMINATED IN 2015. SNOW ACCUMULATION OF APPROXIMATELY 12 INCHES OCCURRED AT THIS FACILITY AFTER BYPASS BEGAN
BERRYTOWN	KY0036501	1203 HEAFER RD	03/10/15 3:30: PM	03/11/15 01:20 PM	65500	Sewer Treatment Plant	MSD0209	STREAM	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	BYPASS AT WQTC	2323203	MSD CLEANED & SANITIZED THE AREA	PLANT IS TO BE ELIMINATED IN 2015. DISINFECTED AND CLEANED BY MSD STAFF
BERRYTOWN	KY0036501	1203 HEAFER RD	03/14/15 1:40: AM	03/15/15 12:15 PM	206700	Sewer Treatment Plant	MSD0209	STREAM	FLOYDS FORK	Rain event caused a lack of system capacity	BYPASS AT WQTC	2325355	MSD cleaned & sanitized the area	Plant is to be eliminated in 2015
CEDAR CREEK	KY0098540	8605 CEDAR CREEK RD	03/14/15 6:50: AM	03/14/15 08:00 AM	35000	Sewer Treatment Plant	MSD0289	GROUND	CEDAR CREEK	Rain event caused lack of system capacity of the sand filter system	BYPASS AT WQTC	2325349	MSD cleaned & sanitized the area	MSD staff diverted flow into the #1 Oxidation ditch to protect the UV equipment and maintain tertiary treatment for the majority of plant flows
TIMBERLAKE	KY0043087	5504 TIMBER RIDGE DR	03/16/15 6:00: AM	03/20/15 02:00 PM	364000	Sewer Treatment Plant	MSD0293	GROUND	HARRODS CREEK	Rain event caused River to rise causing contact chamber to be submerged under water.	BYPASS AT WQTC	2325628	Contractor cleaned CL2 tank.	The plant is scheduled to be eliminated before January 1, 2016. Chlorine contact basin was cleaned on March 24, 2015 and put back in service same day.

Appendix A-3 - Discharge Work Orders – Blending

APPENDIX A-3
UNAUTHORIZED DISCHARGES TO WATERS OF UNITED STATES
JANUARY 1, 2015 THROUGH MARCH 31, 2015

Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
JEFFERSONTOWN	KY0025194	10725 OLD TAYLORSVILLE RD	03/04/15 12:43 AM	03/05/15 10:50 PM	7711175	Sewer Treatment Plant	MSD0255	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT.	BLENDING AT JTOWN WQTC	2319250	PIPE DISCHARGE SUBMERGED- NO CLEAN UP.	PER ACD, WQTC TO BE ELIMINATED BY DEC 31, 2015
JEFFERSONTOWN	KY0025194	10725 OLD TAYLORSVILLE RD	03/10/15 8:55 AM	03/11/15 05:13 PM	4893106	Sewer Treatment Plant	MSD0255	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	BLENDING AT JTOWN WQTC	2322895	PIPE DISCHARGE SUBMERGED- NO CLEAN UP	PER ACD, WQTC TO BE ELIMINATED BY DEC 31, 2015
JEFFERSONTOWN	KY0025194	10725 OLD TAYLORSVILLE RD	03/13/15 3:20: PM	03/15/15 05:59 PM	8919626	Sewer Treatment Plant	MSD0255	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	BLENDING AT JTOWN WQTC	2325293	PIPE DISCHARGE SUBMERGED- NO CLEAN UP	PER ACD, WQTC TO BE ELIMINATED BY DEC 31, 2015

Appendix A-4 - Discharge Work Orders – Waters of the United States

APPENDIX A-4
UNAUTHORIZED DISCHARGES TO WATERS OF UNITED STATES
JANUARY 1, 2015 THROUGH MARCH 31, 2015

Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
MORRIS FORMAN	KY0022411	804 N ARBOR DR	3/10/15 3:55 PM	03/11/15 04:15 AM	18500	Sewer Manhole	00056-W	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2323193	MSD CLEANED & SANITIZED THE AREA	HAULING TO PREVENT FURTHER DISCHARGE
MORRIS FORMAN	KY0022411	804 N ARBOR DR	3/13/15 8:03 PM	03/15/15 12:25 AM	25515	Sewer Manhole	00056-W	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325306	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	804 N ARBOR DR	3/4/15 3:05 AM	03/04/15 11:15 PM	53680	Sewer Manhole	00746	DITCH	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319256	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	804 N ARBOR DR	3/13/15 8:03 PM	03/15/15 12:07 AM	42100	Sewer Manhole	00746	DITCH	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325307	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	806 PINE WAY	3/13/15 9:15 PM	03/15/15 12:17 AM	32440	Sewer Manhole	00817	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325309	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	4315 PRUITT CT	3/14/15 10:43 AM	03/14/15 10:59 PM	1000	Sewer Manhole	08426	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325410	WO# 2325607	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	4313 PRUITT CT	3/10/15 5:11 PM	03/11/15 02:11 PM	1000	Sewer Manhole	08427	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323237	WO# 2324311	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	4339 PRUITT CT	3/14/15 10:47 AM	03/14/15 11:00 PM	6000	Sewer Manhole	08431	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325412	WO# 2325608	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3726 FINCASTLE RD	3/4/15 5:14 AM	03/05/15 07:10 AM	25000	Sewer Manhole	08717	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319310	WO# 2321296	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3726 FINCASTLE RD	3/10/15 12:11 PM	03/11/15 02:02 PM	50000	Sewer Manhole	08717	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323226	WO# 2324822	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3726 FINCASTLE RD	3/14/15 8:59 AM	03/14/15 10:14 PM	11000	Sewer Manhole	08717	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325425	WO# 2325621	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1001 BRECKENRIDGE LN	3/4/15 1:56 AM	03/05/15 09:07 PM	9276279	Sewer Manhole	08935-SM	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319301	NO CLEAN UP PERFORMED – PIPE DISCHARGING UNDERWATER, DIRECTLY INTO STREAM	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1001 BRECKENRIDGE LN	3/10/15 10:38 AM	03/12/15 12:47 AM	10105914	Sewer Manhole	08935-SM	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2322946	NO CLEAN UP PERFORMED – PIPE DISCHARGING UNDERWATER, DIRECTLY INTO STREAM	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1001 BRECKENRIDGE LN	3/13/15 3:18 PM	03/16/15 12:22 AM	17914139	Sewer Manhole	08935-SM	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325299	NO CLEAN UP PERFORMED – PIPE DISCHARGING UNDERWATER, DIRECTLY INTO STREAM	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3620 CHARLANE PKY	3/10/15 2:50 PM	03/11/15 06:35 AM	18000	Sewer Manhole	104289	GROUND	BEATTY BROOK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323211	WO# 2323311	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	7713 WESTPORT RD	3/14/15 8:03 AM	03/14/15 09:10 AM	39000	Sewer Manhole	105936	GROUND	GOOSE CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325357	WO# 2325565	LOCATION INCLUDED IN IOAP.
TIMBERLAKE	KY0043087	8900 U S HIGHWAY 42	3/31/15 12:10 PM	03/31/15 01:00 PM	250	Sewer Node	107555-T	GROUND	HARRODS CREEK	FORCE MAIN BREAK	STRUCTURAL FAILURE	2333215	MSD CLEANED & SANITIZED THE AREA	CONTRACTOR REPAIRED LINE
HITE CREEK	KY0022420	10723 COPPER RIDGE DR	3/10/15 3:35 PM	03/10/15 09:00 PM	30000	Sewer Manhole	108674	GROUND	HITE CREEK	SEWERS AT CAPACITY	LACK OF SYSTEM CAPACITY	2323218	MSD PERSONNEL USED LIME TO CLEAN THE IMPACTED AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP; REFERRED TO BRYON RICHARDSON FOR MH REPAIR
HITE CREEK	KY0022420	7302 FLOYDSBURG RD	3/4/15 8:20 AM	03/05/15 06:00 PM	20200	Sewer Manhole	108953	DITCH	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319368	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP

APPENDIX A-4
UNAUTHORIZED DISCHARGES TO WATERS OF UNITED STATES
JANUARY 1, 2015 THROUGH MARCH 31, 2015

Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
HITE CREEK	KY0022420	7302 FLOYDSBURG RD	3/13/15 7:20 PM	03/14/15 10:43 PM	41075	Sewer Manhole	108953	DITCH	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325305	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
HITE CREEK	KY0022420	7302 FLOYDSBURG RD	3/13/15 7:20 PM	03/14/15 10:43 PM	41075	Sewer Manhole	108957	DITCH	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325304	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	1600 BELMAR DR	3/10/15 3:37 PM	03/11/15 02:08 PM	7500	Sewer Manhole	13946	GROUND	CAMP TAYLOR DITCH	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323235	WO# 2324815	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1600 BELMAR DR	3/14/15 8:43 AM	03/14/15 02:20 PM	4000	Sewer Manhole	13946	GROUND	CAMP TAYLOR DITCH	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325413	WO# 2325609	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1726 FRASER DR	3/4/15 1:00 AM	03/05/15 10:00 PM	66000	Sewer Manhole	16649	DITCH	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319371	WO# 2321404	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1726 FRASER DR	3/8/15 4:30 PM	03/08/15 09:45 PM	2250	Sewer Manhole	16649	DITCH	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-DUE TO SNOW THAWING.	LACK OF SYSTEM CAPACITY	2322443	WO# 2322443	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1726 FRASER DR	3/10/15 9:34 AM	03/12/15 01:45 AM	75000	Sewer Manhole	16649	DITCH	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2322948	WO# 2324850	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1726 FRASER DR	3/13/15 3:33 PM	03/16/15 06:30 AM	3500	Sewer Manhole	16649	DITCH	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325300	WO# 2325626	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	7404 ARROWWOOD RD	3/6/15 2:05 AM	03/06/15 02:18 AM	325	Sewer Manhole	21628-W	DITCH	GOOSE CREEK	BOTH PUMPS WERE AIR LOCKED	MECHANICAL FAILURE	2321373	NO DEBRIS	BLED AIR FROM PUMPS
MORRIS FORMAN	KY0022411	3302 TROUT CREEK DR	3/4/15 6:14 AM	03/05/15 07:30 AM	4500	Sewer Manhole	23211	STREAM	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319357	WO# 2321347	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3302 TROUT CREEK DR	3/10/15 4:19 PM	03/11/15 01:40 PM	15000	Sewer Manhole	23211	STREAM	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2324804	WO# 2324808	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3302 TROUT CREEK DR	3/14/15 9:40 AM	03/14/15 10:30 PM	12000	Sewer Manhole	23211	STREAM	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325421	WO# 2325619	LOCATION INCLUDED IN IOAP.
DEREK R. GUTHRIE	KY0078956	6102 COOPER CHAPEL RD	1/23/15 3:30 PM	01/23/15 05:15 PM	525	Sewer Manhole	25479	CATCH BASIN	PENNSYLVANIA RUN	OBSTRUCTION OF GRAVITY LINE TO STATION OR FORCEMAIN FROM STATION.	OBSTRUCTION-NOT GREASE / ROOTS	2301106	MSD CLEANED AND SANITIZED AREA.	MSD CONTRACTOR HAULED STATION UNTILL REPAIRS WERE COMPLETED.
DEREK R. GUTHRIE	KY0078956	6102 COOPER CHAPEL RD	3/4/15 2:45 AM	03/04/15 09:15 PM	11100	Sewer Manhole	25479	CATCH BASIN	PENNSYLVANIA RUN	RAIN EVENT CAUSED BY LACK OF SYSTEM CAPACITY	LACK OF SYSTEM CAPACITY	2319251	MSD CLEANED & SANITIZED THE AREA	MSD CONTRACTOR HAULED SITE.
DEREK R. GUTHRIE	KY0078956	6102 COOPER CHAPEL RD	3/9/15 9:45 AM	03/10/15 10:25 PM	19800	Sewer Manhole	25479	CATCH BASIN	PENNSYLVANIA RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2322884	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
DEREK R. GUTHRIE	KY0078956	6102 COOPER CHAPEL RD	3/14/15 2:40 AM	03/14/15 04:15 PM	20375	Sewer Manhole	25479	CATCH BASIN	PENNSYLVANIA RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325365	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
DEREK R. GUTHRIE	KY0078956	9317 LANTANA DR	3/9/15 12:55 PM	03/10/15 07:10 PM	11475	Sewer Manhole	25484	STREAM	PENNSYLVANIA RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2323005	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	3317 BROWNSBORO RD	3/4/15 2:30 PM	03/06/15 05:00 PM	27500	Sewer Manhole	26752	DITCH	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2321091	WO# 2321411	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3317 BROWNSBORO RD	3/10/15 1:38 PM	03/12/15 12:15 AM	75000	Sewer Manhole	26752	DITCH	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323192	WO# 2324846	LOCATION INCLUDED IN IOAP.

APPENDIX A-4
UNAUTHORIZED DISCHARGES TO WATERS OF UNITED STATES
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Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
MORRIS FORMAN	KY0022411	3317 BROWNSBORO RD	3/14/15 9:00 AM	03/16/15 06:00 AM	2500	Sewer Manhole	26752	DITCH	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325401	WO# 2325640	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1012 ALTA CIR	3/4/15 2:50 AM	03/06/15 07:00 AM	360000	Sewer Manhole	27005	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319253	WO# 2321384	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1013 ALTA CIR	3/4/15 7:40 AM	03/06/15 09:33 AM	1000	Sewer Manhole	27007	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319375	WO# 2321407	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1013 ALTA CIR	3/10/15 12:25 PM	03/12/15 10:35 AM	66000	Sewer Manhole	27007	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323186	WO# 2324828	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1013 ALTA CIR	3/13/15 2:15 PM	03/14/15 05:33 AM	2500	Sewer Manhole	27007	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325295	WO# 2325629	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1044 ALTA VISTA RD	3/4/15 7:30 AM	03/06/15 07:00 AM	72000	Sewer Manhole	27008	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319374	WO# 2321405	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1044 ALTA VISTA RD	3/11/15 12:30 PM	03/12/15 10:30 AM	16500	Sewer Manhole	27008	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323921	WO# 2324855	LOCATION INCLUDED IN IOAP.
DEREK R. GUTHRIE	KY0078956	10304 CAVEN AVE	3/4/15 12:30 AM	03/05/15 08:30 AM	43500	Sewer Manhole	27116	STREAM	MUD CREEK	LACK OF SYSTEM CAPACITY - HEAVY RAIN	LACK OF SYSTEM CAPACITY	2319276	MSD CLEANED AND SANITIZED AFFECTED AREA	A SOLUTION FOR THIS IS INCLUDED IN THE IOAP
DEREK R. GUTHRIE	KY0078956	10304 CAVEN AVE	3/10/15 10:00 AM	03/10/15 09:30 PM	17250	Sewer Manhole	27116	STREAM	MUD CREEK	lack of system capacity	LACK OF SYSTEM CAPACITY	2322907	msd cleaned and sanitized affected area	location included in ioap
DEREK R. GUTHRIE	KY0078956	10304 CAVEN AVE	3/13/15 6:05 PM	03/15/15 06:00 PM	36000	Sewer Manhole	27116	STREAM	MUD CREEK	HEAVY RAIN EXCEEDED CAPACITY	LACK OF SYSTEM CAPACITY	2325289	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS IN THE IOAP
JEFFERSONTOWN	KY0025194	3258 RUCKRIEGEL PKY	3/4/15 4:09 AM	03/05/15 09:00 AM	21000	Sewer Manhole	28173	GROUND	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319290	WO# 2321223	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3258 RUCKRIEGEL PKY	3/10/15 2:14 PM	03/11/15 08:30 PM	9000	Sewer Manhole	28173	GROUND	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323198	WO# 2323294	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3258 RUCKRIEGEL PKY	3/14/15 10:50 AM	03/14/15 07:54 PM	18000	Sewer Manhole	28173	GROUND	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325405	WO# 2325596	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3506 CHARLANE PKY	3/10/15 2:40 PM	03/11/15 06:40 AM	12000	Sewer Manhole	28250	DITCH	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323204	WO# 2323305	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3506 CHARLANE PKY	3/14/15 11:15 AM	03/14/15 07:47 PM	15000	Sewer Manhole	28250	DITCH	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325408	WO# 2325604	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3620 CHARLANE PKY	3/10/15 2:45 PM	03/11/15 06:30 AM	18000	Sewer Manhole	28340	GROUND	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323208	WO# 2323309	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3406 DELL RD	3/10/15 2:28 PM	03/10/15 08:35 PM	9000	Sewer Manhole	28415	GROUND	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323195	WO# 2323291	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3406 CHARLANE PKY	3/4/15 4:25 AM	03/05/15 09:15 AM	17000	Sewer Manhole	28451	GROUND	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319296	WO# 2321284	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	3406 CHARLANE PKY	3/10/15 2:35 PM	03/11/15 06:27 AM	18000	Sewer Manhole	28451	GROUND	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323201	WO# 2323301	LOCATION INCLUDED IN IOAP.

APPENDIX A-4
UNAUTHORIZED DISCHARGES TO WATERS OF UNITED STATES
JANUARY 1, 2015 THROUGH MARCH 31, 2015

Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
JEFFERSONTOWN	KY0025194	3406 CHARLANE PKY	3/14/15 11:20 AM	03/14/15 07:45 PM	16500	Sewer Manhole	28451	GROUND	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325407	WO# 2325598	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	11401 GRAND AVE	3/4/15 9:00 AM	03/05/15 09:30 AM	54000	Sewer Manhole	28551	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319380	WO# 2321348	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	11401 GRAND AVE	3/10/15 9:33 AM	03/11/15 05:45 AM	1000	Sewer Manhole	28551	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2322949	WO# 2323296	LOCATION INCLUDED IN IOAP.
JEFFERSONTOWN	KY0025194	11401 GRAND AVE	3/13/15 4:19 PM	03/15/15 10:10 AM	108000	Sewer Manhole	28551	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325301	WO# 2325572	LOCATION INCLUDED IN IOAP.
DEREK R. GUTHRIE	KY0078956	6810 SANDSTONE BLVD	3/14/15 9:00 AM	03/14/15 02:00 PM	9000	Sewer Manhole	29948	GROUND	FERN CREEK	RAIN EVENT LACK OF SYSTEM CAPACITY	LACK OF SYSTEM CAPACITY	2325388	MSD PERSONNEL TO CLEAN AND SANITIZE AFFECTED AREA UNDER WORKORDER# 2325397	NO REPAIR NEEDED DISCHARGE ON PRIVATE PROPERTY DUE TO MAIN SEWER DISCHARGING DUE TO RAIN EVENT LACK OF SYSTEM CAPACITY
MORRIS FORMAN	KY0022411	8113 SHELBYVILLE RD	3/14/15 10:15 AM	03/14/15 07:30 PM	96000	Sewer Manhole	30376	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325403	WO# 2325593	LOCATION INCLUDED IN IOAP.
HITE CREEK	KY0022420	10723 COPPER RIDGE DR	3/14/15 9:56 AM	03/14/15 02:30 PM	28800	Sewer Manhole	30521	STREAM	HITE CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325382	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
DEREK R. GUTHRIE	KY0078956	6808 SANDSTONE BLVD	3/10/15 3:30 PM	03/11/15 05:30 PM	3000	Sewer Manhole	31073	DITCH	FERN CREEK	lack of system capacity	LACK OF SYSTEM CAPACITY	2323137	msd to clean and sanitize affected area	area included in IOAP
DEREK R. GUTHRIE	KY0078956	6808 SANDSTONE BLVD	3/14/15 5:15 AM	03/14/15 08:15 AM	4500	Sewer Manhole	31073	DITCH	FERN CREEK	LACK OF SYSTEM CAPACITY - HEAVY RAIN	LACK OF SYSTEM CAPACITY	2325360	MSD CLEANED AND SANITIZED AFFECTED AREA	A SOLUTION FOR THIS IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	1552 CHEROKEE RD	3/11/15 2:30 AM	03/12/15 10:30 AM	16500	Sewer Manhole	40471	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN	LACK OF SYSTEM CAPACITY	2324286	WO# 2324861	LOCATION IS NEW TO SSO ROUTES AND WILL NE INSPECTED AND MONITORED FOR OBSTRUCTIONS OR JUST CAPACITY ISSUES
MORRIS FORMAN	KY0022411	1552 CHEROKEE RD	3/13/15 2:45 PM	03/16/15 05:50 AM	3500	Sewer Manhole	40471	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325298	WO# 2325632	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	2105 INDIAN HILLS TRL	3/5/15 8:55 AM	03/05/15 09:35 AM	1000	Sewer Manhole	40872	GROUND	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY	LACK OF SYSTEM CAPACITY	2321163	MSD CLEANED & SANITIZED THE AREA	SOLUTION FOR THIS LOCATION CAN BE FOUND IN THE IOAP
MORRIS FORMAN	KY0022411	2105 INDIAN HILLS TRL	3/4/15 8:10 AM	03/05/15 12:30 PM	85500	Sewer Manhole	40874	STREAM	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319347	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	5 RIO VISTA DR	3/4/15 8:19 AM	03/05/15 12:30 PM	42750	Sewer Manhole	40879	STREAM	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319344	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	2 RIO VISTA DR	3/15/15 10:43 AM	03/18/15 01:55 PM	9999	Sewer Manhole	40880	GROUND	MUDDY FORK BEARGRASS CREEK	Rain event caused a lack of system capacity	LACK OF SYSTEM CAPACITY	2325551	MSD cleaned & sanitized the area	a solution for this location is included in the ioap
MORRIS FORMAN	KY0022411	4640 BARBOUR LN	3/4/15 8:20 AM	03/05/15 11:00 AM	25800	Sewer Manhole	42680	STREAM	LITTLE GOOSE CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319370	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	8409 SABERDEE DR	3/10/15 2:00 PM	03/10/15 08:50 PM	4100	Sewer Manhole	43472	DITCH	GOOSE CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2323210	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	1011 ALTA CIR	3/4/15 7:40 AM	03/06/15 07:00 AM	1000	Sewer Manhole	45796	DITCH	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319378	WO# 2321409	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1011 ALTA CIR	3/11/15 10:00 AM	03/12/15 10:35 AM	16500	Sewer Manhole	45796	DITCH	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN	LACK OF SYSTEM CAPACITY	2324288	WO# 2324863	LOCATION INCLUDED IN THE IOAP

APPENDIX A-4
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MORRIS FORMAN	KY0022411	1011 ALTA CIR	3/13/15 2:20 PM	03/16/15 05:40 AM	3500	Sewer Manhole	45796	DITCH	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325296	WO# 2325630	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1132 ROSTREVOR CIR	3/4/15 3:00 AM	03/06/15 07:00 AM	340000	Sewer Manhole	45835	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319254	WO# 2321385	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1132 ROSTREVOR CIR	3/10/15 12:40 PM	03/12/15 12:15 AM	60000	Sewer Manhole	45835	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323191	WO# 2324835	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1132 ROSTREVOR CIR	3/13/15 2:00 PM	03/16/15 05:30 AM	3500	Sewer Manhole	45835	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325288	WO# 2325627	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1802 ROUND RIDGE RD	3/4/15 2:00 PM	03/05/15 11:15 AM	66000	Sewer Manhole	46600	STREAM	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2321116	WO# 2321357	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1802 ROUND RIDGE RD	3/10/15 8:10 PM	03/11/15 10:10 AM	1000	Sewer Manhole	46600	STREAM	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323254	WO# 2324219	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1802 ROUND RIDGE RD	3/14/15 8:35 AM	03/15/15 08:55 AM	72000	Sewer Manhole	46600	STREAM	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325361	WO# 2325589	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	201 BULLITT LN	3/10/15 7:10 PM	03/11/15 06:20 AM	1000	Sewer Manhole	47582	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323251	WO# 2323288	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	202 OXMOOR LN	3/10/15 6:50 PM	03/11/15 06:08 AM	36000	Sewer Manhole	47583	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323248	WO# 2323281	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	202 OXMOOR LN	3/14/15 7:01 AM	03/15/15 09:21 AM	144000	Sewer Manhole	47583	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325352	WO# 2325579	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	8021 CHRISTIAN CT	3/10/15 7:07 PM	03/11/15 06:05 AM	33000	Sewer Manhole	47593	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323250	WO# 2323284	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	8021 CHRISTIAN CT	3/14/15 7:20 AM	03/14/15 07:27 PM	76000	Sewer Manhole	47593	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325356	WO# 2325586	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	2216 FAIRLAND AVE	3/14/15 10:00 AM	03/14/15 10:50 PM	6000	Sewer Manhole	49445	GROUND	BUECHEL BRANCH	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325415	WO# 2325617	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1 AUDUBON PLAZA DR	3/30/15 8:42 PM	03/31/15 05:00 PM	7110	Sewer Main	50351	STREAM	SOUTH FORK BEARGRASS CREEK	STRUCTURAL FAILURE OF THE MAIN SEWER	STRUCTURAL FAILURE	2332904	MSD CONTRACTOR CLEANED THE IMPACTED AREA	MSD CONTRACTOR REPAIRED THE MAIN SEWER
MORRIS FORMAN	KY0022411	3305 INDIAN CREEK CT	3/4/15 6:21 AM	03/05/15 07:20 AM	25000	Sewer Manhole	51160	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319354	WO# 2321346	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3305 INDIAN CREEK CT	3/10/15 12:35 PM	03/11/15 01:45 PM	10000	Sewer Manhole	51160	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323229	WO# 2324812	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3305 INDIAN CREEK CT	3/13/15 5:25 PM	03/15/15 02:10 PM	129000	Sewer Manhole	51160	GROUND	SOUTH FORK BEARGRASS CREEK	LACK SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325325	WO# 2325655	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1418 TREVILIAN WAY	3/4/15 1:21 AM	03/04/15 05:30 PM	9000	Sewer Manhole	51594	DITCH	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319316	WO# 2321301	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1418 TREVILIAN WAY	3/10/15 12:17 PM	03/11/15 01:45 PM	3000	Sewer Manhole	51594	DITCH	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323227	WO# 2324819	LOCATION INCLUDED IN IOAP.

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MORRIS FORMAN	KY0022411	1418 TREVILIAN WAY	3/13/15 11:00 AM	03/14/15 09:20 AM	3500	Sewer Manhole	51594	DITCH	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325219	WO# 2325567	LOCATION INCLUDED IN IOAP.
DEREK R. GUTHRIE	KY0078956	4005 KIRBY LN	3/14/15 12:50 PM	03/15/15 12:17 AM	6870	Sewer Manhole	61266	DITCH	FERN CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325428	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
DEREK R. GUTHRIE	KY0078956	4005 KIRBY LN	3/17/15 10:52 PM	03/18/15 08:20 AM	14200	Sewer Manhole	61266	DITCH	FERN CREEK	FORCE MAIN BREAK	MECHANICAL FAILURE	2326477	MSD CLEANED & SANITIZED THE AREA	CONTRACTOR REPAIRED THE FORCE MAIN
MORRIS FORMAN	KY0022411	1804 ROUND RIDGE RD	3/4/15 2:00 PM	03/05/15 11:15 AM	66000	Sewer Manhole	65623	STREAM	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2321089	WO# 2321356	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1804 ROUND RIDGE RD	3/10/15 8:10 PM	03/11/15 10:10 AM	1000	Sewer Manhole	65623	STREAM	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323253	WO# 2324211	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	1804 ROUND RIDGE RD	3/14/15 8:35 AM	03/18/15 08:55 AM	72000	Sewer Manhole	65623	STREAM	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325359	WO# 2325587	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	4640 BARBOUR LN	3/10/15 5:50 PM	03/11/15 03:10 AM	56000	Sewer Manhole	65633	STREAM	LITTLE GOOSE CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2323219	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
MORRIS FORMAN	KY0022411	3726 FINCASTLE RD	3/4/15 5:13 AM	03/05/15 05:25 PM	5000	Sewer Manhole	66349	GROUND	CAMP TAYLOR DITCH	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2319305	WO# 2321290	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3726 FINCASTLE RD	3/10/15 12:10 PM	03/11/15 02:02 PM	7000	Sewer Manhole	66349	GROUND	CAMP TAYLOR DITCH	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323225	WO# 2324826	LOCATION TAPE AND TEMPORARY SIGNS PLACED.
MORRIS FORMAN	KY0022411	3726 FINCASTLE RD	3/14/15 8:59 AM	03/14/15 10:15 PM	3000	Sewer Manhole	66349	GROUND	CAMP TAYLOR DITCH	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325426	WO# 2325622	LOCATION INCLUDED IN IOAP.
HUNTING CREEK NORTH	KY0029106	7300 SHADWELL LN	3/14/15 2:25 PM	03/15/15 02:58 PM	50	Sewer Manhole	66701	STREAM	HUNTING CREEK	LACK OF SYSTEM CAPACITY - RAIN	LACK OF SYSTEM CAPACITY	2325460	MSD CREW WILL CLEAN AND LAY LIME	NO REPAIRS NEEDED AT THIS TIME BY MSD
CEDAR CREEK	KY0098540	9905 FAIRMOUNT RD	3/4/15 9:40 AM	03/04/15 10:00 AM	100	Sewer Manhole	81710	GROUND	BIG RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319416	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP
DEREK R. GUTHRIE	KY0078956	7100 BLAZIER CT	3/3/15 11:45 AM	03/03/15 02:00 PM	200	Sewer Main	82504	GROUND	FERN CREEK	broken pipe	LACK OF SYSTEM CAPACITY	2318737	contractor cleaned	contractor repaired line with slip
MORRIS FORMAN	KY0022411	7913 SHELBYVILLE RD	3/4/15 12:30 PM	03/05/15 11:33 AM	2000	Sewer Manhole	84155	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2321045	WO# 2321354	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	7913 SHELBYVILLE RD	3/10/15 6:15 PM	03/11/15 06:12 AM	72000	Sewer Manhole	84155	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323238	WO# 2323282	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	7913 SHELBYVILLE RD	3/14/15 6:50 AM	03/14/15 09:28 AM	60000	Sewer Manhole	84155	GROUND	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325351	WO# 2325560	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	37 ARROWHEAD RD	3/14/15 8:50 AM	03/15/15 08:45 AM	1000	Sewer Manhole	89791	GROUND	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325399	CLEANING NOT NECESSARY.	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	8021 CHRISTIAN CT	3/10/15 7:05 PM	03/11/15 05:57 AM	15000	Sewer Manhole	90700	CATCH BASIN	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323249	WO# 2323280	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	8021 CHRISTIAN CT	3/14/15 7:15 AM	03/15/15 09:25 AM	36000	Sewer Manhole	90700	CATCH BASIN	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325354	WO# 2325561	LOCATION INCLUDED IN IOAP.

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HITE CREEK	KY0022420	7250 FLOYDSBURG RD	3/4/15 8:20 AM	03/05/15 06:00 PM	20200	Sewer Manhole	90776	DITCH	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319366	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
MORRIS FORMAN	KY0022411	3305 BENT CREEK CT	3/4/15 10:38 AM	03/05/15 05:35 PM	4000	Sewer Service Line	BU05074039	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2321050	WO# 2321350	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3305 BENT CREEK CT	3/10/15 4:30 PM	03/11/15 01:43 PM	1000	Sewer Service Line	BU05074039	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323232	WO# 2324329	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3305 BENT CREEK CT	3/14/15 9:58 AM	03/14/15 10:32 PM	5000	Sewer Service Line	BU05074039	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325418	WO# 2325618	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	3303 TROUT CREEK DR	3/10/15 4:30 PM	03/11/15 01:41 PM	3000	Sewer Service Line	BU05091039	GROUND	SOUTH FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323233	WO# 2324315	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	825 FETTER AVE	2/20/15 3:10 PM	02/20/15 03:21 PM	9200	Sewer Manhole	CSO184	STREAM	SOUTH FORK BEARGRASS CREEK	Water main break at the intersection of Alexander Avenue and Keswick Boulevard resulting in a significant amount of water in the combined sewer system	UTILITY DAMAGED MSD ASSET	2314658	No cleanup was necessary, overflow discharged directly to improved channel of Beargrass Creek.	No repairs needed. Louisville Water Co. completed work at 3:30 pm
MORRIS FORMAN	KY0022411	4108 LEE AVE	3/10/15 3:37 PM	03/11/15 02:07 PM	300	Sewer Service Line	KK14815019	GROUND	CAMP TAYLOR DITCH	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2323230	WO# 2324339	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	4108 LEE AVE	3/14/15 8:45 AM	03/14/15 02:22 PM	1000	Sewer Service Line	KK14815019	GROUND	CAMP TAYLOR DITCH	LACK OF SYSTEM CAPACITY-HEAVY RAIN.	LACK OF SYSTEM CAPACITY	2325423	WO# 2325620	LOCATION INCLUDED IN IOAP.
MORRIS FORMAN	KY0022411	7404 ARROWWOOD RD	3/4/15 9:33 AM	03/05/15 10:00 PM	164025	Sewer Lift Station	MSD0040-PS	DITCH	GOOSE CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319414	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
MORRIS FORMAN	KY0022411	7404 ARROWWOOD RD	3/10/15 2:15 PM	03/11/15 01:00 AM	61500	Sewer Lift Station	MSD0040-PS	DITCH	GOOSE CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2323199	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
MORRIS FORMAN	KY0022411	7404 ARROWWOOD RD	3/13/15 7:20 PM	03/15/15 01:15 AM	88750	Sewer Lift Station	MSD0040-PS	DITCH	GOOSE CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325294	CONTRACTOR CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
MORRIS FORMAN	KY0022411	806 PINE WAY	3/4/15 3:45 AM	03/05/15 11:15 PM	65250	Sewer Lift Station	MSD0057-LS	STREAM	MIDDLE FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319258	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
BERRYTOWN	KY0036501	1812 N ENGLISH STATION RD	3/4/15 9:30 AM	03/05/15 11:00 AM	38250	Sewer Lift Station	MSD0073-LS	GROUND	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2320525	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
DEREK R. GUTHRIE	KY0078956	9317 LANTANA DR	3/4/15 4:30 AM	03/04/15 09:00 PM	4950	Sewer Lift Station	MSD0101-PS	DITCH	PENNSYLVANIA RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319261	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
DEREK R. GUTHRIE	KY0078956	9317 LANTANA DR	3/14/15 2:50 AM	03/14/15 12:30 PM	14500	Sewer Lift Station	MSD0101-PS	DITCH	PENNSYLVANIA RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325363	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
FLOYDS FORK	KY0102784	17009 OLDE COPPER CT	3/4/15 8:51 AM	03/05/15 11:00 AM	7845	Sewer Lift Station	MSD0165-PS	DITCH	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2320545	MSD CLEANED & SANITIZED THE AREA	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
MORRIS FORMAN	KY0022411	2120 INDIAN HILLS TRL	3/5/15 1:15 AM	03/05/15 01:27 AM	300	Sewer Lift Station	MSD0186-PS	DITCH	MUDDY FORK BEARGRASS CREEK	#5 pump tripped out at station causing discharge from wet well	ELECTRICAL PROBLEMS AT MSD	2321146	msd cleaned and sanitized area	reset pump put station back in service
MORRIS FORMAN	KY0022411	2120 INDIAN HILLS TRL	3/5/15 8:55 AM	03/05/15 09:10 AM	1500	Sewer Lift Station	MSD0186-PS	DITCH	MUDDY FORK BEARGRASS CREEK	#5 pump tripped out	ELECTRICAL PROBLEMS AT MSD	2321162	msd clean sanitized area	making repairs to #5 pump
MORRIS FORMAN	KY0022411	2120 INDIAN HILLS TRL	3/15/15 10:43 AM	03/18/15 01:55 PM	9999	Sewer Lift Station	MSD0186-PS	DITCH	MUDDY FORK BEARGRASS CREEK	Rain event caused a lack of system capacity	LACK OF SYSTEM CAPACITY	2325549	MSD cleaned & sanitized the area	a solution for this location is included in the IOAP.

APPENDIX A-4
UNAUTHORIZED DISCHARGES TO WATERS OF UNITED STATES
JANUARY 1, 2015 THROUGH MARCH 31, 2015

Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
MORRIS FORMAN	KY0022411	4200 RIVER RD	3/15/15 10:20 AM	03/22/15 12:00 PM	9999	Sewer Lift Station	MSD0188-PS	GROUND	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325547	NO CLEANUP - STATION UNDERWATER	SITE FOUND DURING RAIN EVENT RECON- WILL MONITOR & EVALUATE FOR REPAIR
BERRYTOWN	KY0036501	1203 HEAFER RD	3/4/15 9:40 AM	03/05/15 05:30 PM	191000	Sewer Treatment Plant	MSD0209	STREAM	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	BYPASS AT WQTC	2319385	MSD CLEANED & SANITIZED THE AREA	PLANT IS TO BE ELIMINATED IN 2015. SNOW ACCUMULATION OF APPROXIMATELY 12 INCHES OCCURRED AT THIS FACILITY AFTER BYPASS BEGAN
BERRYTOWN	KY0036501	1203 HEAFER RD	3/10/15 3:30 PM	03/11/15 01:20 PM	65500	Sewer Treatment Plant	MSD0209	STREAM	FLOYDS FORK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	BYPASS AT WQTC	2323203	MSD CLEANED & SANITIZED THE AREA	PLANT IS TO BE ELIMINATED IN 2015. DISINFECTED AND CLEANED BY MSD STAFF
BERRYTOWN	KY0036501	1203 HEAFER RD	3/14/15 1:40 AM	03/15/15 12:15 PM	206700	Sewer Treatment Plant	MSD0209	STREAM	FLOYDS FORK	Rain event caused a lack of system capacity	BYPASS AT WQTC	2325355	MSD cleaned & sanitized the area	Plant is to be eliminated in 2015
STARVIEW	KY0031712	423 BERMUDA WAY	3/4/15 6:45 PM	03/04/15 06:50 PM	75	Sewer Lift Station	MSD0247B-PS	STREAM	CHENOWETH RUN	pumps tripped out on overload	ELECTRICAL PROBLEMS AT MSD	2321111	msd cleaned and sanitized area	reset over loads
JEFFERSONTOWN	KY0025194	10725 OLD TAYLORSVILLE RD	3/4/15 12:43 AM	03/05/15 10:50 PM	7711175	Sewer Treatment Plant	MSD0255	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT.	BLENDING AT JTOWN WQTC	2319250	PIPE DISCHARGE SUBMERGED- NO CLEAN UP.	PER ACD, WQTC TO BE ELIMINATED BY DEC 31, 2015
JEFFERSONTOWN	KY0025194	10725 OLD TAYLORSVILLE RD	3/10/15 8:55 AM	03/11/15 05:13 PM	4893106	Sewer Treatment Plant	MSD0255	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	BLENDING AT JTOWN WQTC	2322895	PIPE DISCHARGE SUBMERGED- NO CLEAN UP	PER ACD, WQTC TO BE ELIMINATED BY DEC 31, 2015
JEFFERSONTOWN	KY0025194	10725 OLD TAYLORSVILLE RD	3/13/15 3:20 PM	03/15/15 05:59 PM	8919626	Sewer Treatment Plant	MSD0255	STREAM	CHENOWETH RUN	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	BLENDING AT JTOWN WQTC	2325293	PIPE DISCHARGE SUBMERGED- NO CLEAN UP	PER ACD, WQTC TO BE ELIMINATED BY DEC 31, 2015
CEDAR CREEK	KY0098540	8605 CEDAR CREEK RD	3/14/15 6:50 AM	03/14/15 08:00 AM	35000	Sewer Treatment Plant	MSD0289	GROUND	CEDAR CREEK	Rain event caused lack of system capacity of the sand filter system	BYPASS AT WQTC	2325349	MSD cleaned & sanitized the area	MSD staff diverted flow into the #1 Oxidation ditch to protect the UV equipment and maintain tertiary treatment for the majority of plant flows
TIMBERLAKE	KY0043087	5504 TIMBER RIDGE DR	3/16/15 6:00 AM	03/20/15 02:00 PM	364000	Sewer Treatment Plant	MSD0293	GROUND	HARRODS CREEK	Rain event caused River to rise causing contact chamber to be submerged under water.	BYPASS AT WQTC	2325628	Contractor cleaned CL2 tank.	The plant is scheduled to be eliminated before January 1, 2016. Chlorine contact basin was cleaned on March 24, 2015 and put back in service same day.
DEREK R. GUTHRIE	KY0078956	5006 LEA ANN WAY	3/4/15 8:26 AM	03/04/15 08:15 PM	1803000	Sewer Lift Station	MSD1010-PS	STREAM	NORTHERN DITCH	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	PUMPED OVERFLOW	2319364	PIPE DISCHARGE SUBMERGED- NO CLEANUP	USING THREE AUXILIARY PUMPS
DEREK R. GUTHRIE	KY0078956	5006 LEA ANN WAY	3/10/15 2:20 PM	03/10/15 09:35 PM	441000	Sewer Lift Station	MSD1010-PS	STREAM	NORTHERN DITCH	rain event caused lack of system capacity	PUMPED OVERFLOW	2323194	pipe discharge submerged- no cleanup	placed auxiliary pumps to pump overflow
DEREK R. GUTHRIE	KY0078956	5006 LEA ANN WAY	3/10/15 2:40 PM	03/10/15 09:35 PM	375000	Sewer Lift Station	MSD1010-PS	STREAM	NORTHERN DITCH	lack of system capacity	PUMPED OVERFLOW	2323197	pipe discharge submerged- no cleanup	placed auxiliary pumps to pump overflow
DEREK R. GUTHRIE	KY0078956	5006 LEA ANN WAY	3/10/15 2:50 PM	03/10/15 03:15 PM	15750	Sewer Lift Station	MSD1010-PS	STREAM	NORTHERN DITCH	rain event caused lack of system capacity	PUMPED OVERFLOW	2323202	pipe discharge submerged- no cleanup	placed auxiliary pump to pump overflow
DEREK R. GUTHRIE	KY0078956	5006 LEA ANN WAY	3/10/15 5:20 PM	03/10/15 09:35 PM	112050	Sewer Lift Station	MSD1010-PS	STREAM	NORTHERN DITCH	rain event caused a lack of system capacity	PUMPED OVERFLOW	2323206	pipe discharge submerged- no cleanup	placed auxiliary pump to pump overflow
DEREK R. GUTHRIE	KY0078956	5006 LEA ANN WAY	3/14/15 3:50 AM	03/14/15 06:20 PM	2454500	Sewer Lift Station	MSD1010-PS	STREAM	NORTHERN DITCH	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	PUMPED OVERFLOW	2325362	MSD CLEANED & SANITIZED THE AREA	AUXILIARY PUMPS SET UP TO PREVENT FLOODING
DEREK R. GUTHRIE	KY0078956	9114 CINDERELLA LN	3/4/15 3:30 AM	03/04/15 09:05 PM	4675	Sewer Lift Station	MSD1013-PS	DITCH	FISHPOOL CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2319263	MSD CLEANED & SANITIZED THE AREA	SITE FOUND DURING RAIN EVENT RECON- WILL MONITOR & EVALUATE FOR REPAIR
DEREK R. GUTHRIE	KY0078956	9114 CINDERELLA LN	3/10/15 1:15 PM	03/10/15 10:20 PM	14250	Sewer Lift Station	MSD1013-PS	DITCH	FISHPOOL CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2323003	MSD CLEANED & SANITIZED THE AREA	SITE FOUND DURING RAIN EVENT RECON- WILL MONITOR & EVALUATE FOR REPAIR
DEREK R. GUTHRIE	KY0078956	9114 CINDERELLA LN	3/14/15 5:05 AM	03/14/15 04:40 PM	34750	Sewer Lift Station	MSD1013-PS	DITCH	FISHPOOL CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325364	MSD CLEANED & SANITIZED THE AREA	SITE FOUND DURING RAIN EVENT RECON- WILL MONITOR & EVALUATE FOR REPAIR

APPENDIX A-4
UNAUTHORIZED DISCHARGES TO WATERS OF UNITED STATES
JANUARY 1, 2015 THROUGH MARCH 31, 2015

Associated Wastewater Treatment Plant Name	Associated Treatment Plant KPDES #	Overflow Location	Overflow Start Date & Time	Overflow Stop Date & Time	Volume of Overflow	Source Asset Type	Source Asset ID	Facility Discharges To	Receiving Stream	Cause of Overflow	Due To	WO #	Cleanup Efforts by MSD	Repair Efforts by MSD
MORRIS FORMAN	KY0022411	420 W RIVER RD	3/16/15 7:00 AM	03/22/15 12:00 PM	9999	Sewer Lift Station	MSD1017-PS	STREAM	OHIO RIVER	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325639	NO CLEANUP- STATION UNDERWATER	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
MORRIS FORMAN	KY0022411	2700 RIVER GREEN CIR	3/16/15 6:15 AM	03/22/15 12:00 PM	9999	Sewer Lift Station	MSD1132-PS	GROUND	MUDDY FORK BEARGRASS CREEK	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325635	NO CLEANUP- STATION UNDERWATER	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
MORRIS FORMAN	KY0022411	231 N CAMPBELL ST	3/16/15 7:00 AM	03/22/15 12:00 PM	9999	Sewer Lift Station	MSD1137-PS	GROUND	OHIO RIVER	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325637	NO CLEANUP- STATION UNDERWATER	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.
FLOYDS FORK	KY0102784	2410 S POPE LICK RD	3/12/15 11:15 AM	03/13/15 01:15 AM	50000	Sewer Lift Station	MSD1189-PS			BROKEN 18" FORCE MAIN	MECHANICAL FAILURE	2324825	MSD RAKED AND BAGGED DEBRIS & SANITIZED THE AREA	MSD & CONTRACTOR MADE NEEDED REPAIRS
DEREK R. GUTHRIE	KY0078956	4005 KIRBY LN	3/17/15 6:50 PM	03/18/15 09:10 AM	8600	Sewer Main	MSD1203-PS	GROUND	FERN CREEK	structural failure of force main	STRUCTURAL FAILURE	2326469	msd cleaned & sanitized the area	msd contractor hauled station until repairs were made
HUNTING CREEK NORTH	KY0029106	6100 MAYFAIR AVE	3/16/15 6:00 AM	03/20/15 01:00 PM	9999	Sewer Lift Station	MSD1206-PS	GROUND	OHIO RIVER	LACK OF SYSTEM CAPACITY DUE TO RAIN EVENT	LACK OF SYSTEM CAPACITY	2325633	NO CLEANUP- STATION UNDERWATER	A SOLUTION FOR THIS LOCATION IS INCLUDED IN THE IOAP.

Appendix B – CSO Flow Monitoring Data

APPENDIX B
CSO Flow Monitoring Data
January 1, 2015 Through March 31, 2015

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There are known problems with some flow monitor locations that may be inflating actual overflow volumes (for example storm water flows).
MSD is currently working on a plan to fully identify and correct these issues.

CSO	Volume (gal)	Occurences
CSO015	50,426,010	5
CSO016	27,139,943	4
CSO018	9,598,940	3
CSO019	36,520,101	15
CSO020	1,430,278,178	6
CSO029	148,332	3
CSO031	222,316	1
CSO036	138,366	7
CSO038	12,018,725	2
CSO050	3,469,311	9
CSO051	54,379	3
CSO053	544,058	7
CSO054	110,657	13
CSO055	28,265	3
CSO058	26,178	5
CSO083	567	1
CSO084	24,498	4
CSO088	1,029,203	6
CSO091	36,248	5
CSO092	129,529	11
CSO097	4,652,443	10
CSO104	39,566	2
CSO105	45,582,626	13
CSO106	44,883	6
CSO108	3,147,022	3
CSO110	10,659,978	6
CSO113	226,581	4
CSO117	13,002,104	8
CSO118	22,913,041	11
CSO120	1,367,092	4
CSO121	2,449,233	9
CSO125	7,305,670	4
CSO126	16,360,864	3
CSO127	3,630,387	9
CSO130	93,908	10
CSO132	202,591,965	7
CSO137	1,144,731	8

CSO	Volume (gal)	Occurences
CSO140	2,425,779	5
CSO141	505,398	12
CSO146	13,826,527	7
CSO148	382,983	7
CSO150	1,023,786	3
CSO151	9,128,658	11
CSO152	7,469,757	11
CSO153	2,593,917	8
CSO155	26,054	4
CSO160	49,843	9
CSO161	6,010	2
CSO166	30,189,236	5
CSO167	7,852,792	7
CSO174	1,088,897	4
CSO180	81,415	3
CSO181	133,315	2
CSO182	1,586,824	13
CSO184	152,667	7
CSO185	82,424	5
CSO189	35,496,450	5
CSO193	2,214	2
CSO196	21,355	3
CSO199	17,260	4
CSO200	5,954	3
CSO202	2,454	2
CSO203	3,001	1
CSO205	158	1
CSO206	1,756,432	10
CSO207	506,517	12
CSO208	179,315	13
CSO210	3,662,580	6
CSO211	12,021,596	2

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There are known problems with some flow monitor locations that may be inflating actual overflow volumes (for example storm water flows).
MSD is currently working on a plan to fully identify and correct these issues.

CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO015	3/5/15 2:00 PM	3/5/15 3:15 PM	0.05	1.66	2,772,559	1.83	0.54	48 hr	Atlas 14	4,602,448
CSO015	3/10/15 11:30 AM	3/11/15 8:45 AM	0.89	1.12	8,132,334	2.77	0.50	12 hr	Atlas 14	9,108,214
CSO015	3/13/15 2:45 PM	3/14/15 3:30 AM	0.53	1.85	15,863,428	2.87	0.70	24 hr	Atlas 14	29,347,341
CSO015	3/14/15 1:45 PM	3/15/15 4:30 PM	0.54	1.85	3,910,363	2.97	0.70	24 hr	Atlas 14	7,234,172
CSO015	3/26/15 6:30 AM	3/26/15 7:15 AM	0.03	0.67	199,754	0.82	0.35	3 hr	Atlas 14	133,835
CSO015 Count										**5**
CSO015 Total										**50,426,010**
CSO016	3/4/15 12:15 AM	3/4/15 5:15 PM	0.71	1.71	6,186,470	1.4	0.55	48 hr	Atlas 14	10,578,864
CSO016	3/10/15 10:30 AM	3/10/15 4:45 PM	0.26	1.09	5,986,338	2.79	0.49	12 hr	Atlas 14	6,525,109
CSO016	3/13/15 11:45 AM	3/14/15 6:30 AM	0.78	1.84	5,449,515	2.9	0.70	24 hr	Atlas 14	10,027,108
CSO016	3/26/15 6:30 AM	3/26/15 7:00 AM	0.02	0.52	17,044	0.66	0.24	3 hr	Atlas 14	8,863
CSO016 Count										**4**
CSO016 Total										**27,139,943**
CSO018	3/4/15 12:45 AM	3/5/15 7:15 AM	1.27	1.75	1,884,657	1.84	0.57	48 hr	Atlas 14	3,298,149
CSO018	3/10/15 8:45 AM	3/11/15 5:45 PM	1.37	1.30	1,937,434	3.05	0.59	12 hr	Atlas 14	2,518,664
CSO018	3/13/15 12:30 PM	3/15/15 8:00 PM	2.31	1.68	2,251,266	2.98	0.63	24 hr	Atlas 14	3,782,126
CSO018 Count										**3**
CSO018 Total										**9,598,940**
CSO019	1/3/15 5:00 AM	1/4/15 12:15 PM	1.30	0.61	1,087,807	0.62	0.23	24 hr	Atlas 14	663,562
CSO019	1/12/15 12:15 AM	1/12/15 2:45 PM	0.60	0.19	360,982	0.22	0.07	24 hr	Atlas 14	68,587
CSO019	1/18/15 3:30 AM	1/18/15 4:30 AM	0.04	0.06	91,365	0.25	0.04	1 hr	Atlas 14	5,482
CSO019	1/25/15 4:30 PM	1/26/15 3:15 AM	0.45	0.16	330,548	0.23	0.07	12 hr	Atlas 14	52,888
CSO019	1/29/15 5:45 AM	1/29/15 6:30 AM	0.03	0.06	102,154	0.3	0.04	1 hr	Atlas 14	6,129
CSO019	2/1/15 11:45 AM	2/2/15 2:15 AM	0.60	0.38	1,706,160	0.61	0.19	3 hr	Atlas 14	648,341
CSO019	2/21/15 6:30 AM	2/22/15 4:00 AM	0.90	1.17	306,891	1.46	0.45	12 hr	Atlas 14	359,063
CSO019	3/1/15 4:45 PM	3/1/15 11:45 PM	0.29	0.09	649,250	0.19	0.03	24 hr	Atlas 14	58,432
CSO019	3/3/15 1:30 PM	3/4/15 5:30 PM	1.17	1.73	7,226,960	1.45	0.56	48 hr	Atlas 14	12,502,640
CSO019	3/5/15 8:30 AM	3/5/15 8:30 AM	0.00	1.73	822	1.92	0.56	48 hr	Atlas 14	1,421
CSO019	3/7/15 1:00 PM	3/7/15 6:15 PM	0.22	0.49	952,041	1.82	0.19	24 hr	Atlas 14	466,500
CSO019	3/10/15 10:45 AM	3/10/15 10:45 PM	0.50	0.88	7,412,597	2.6	0.39	12 hr	Atlas 14	6,523,086
CSO019	3/13/15 9:45 AM	3/14/15 7:00 PM	1.39	1.82	7,018,033	2.7	0.67	24 hr	Atlas 14	12,772,821
CSO019	3/24/15 8:00 PM	3/24/15 10:15 PM	0.09	0.16	102,994	0.32	0.10	0.5 hr	Atlas 14	16,479
CSO019	3/26/15 3:15 AM	3/26/15 7:00 PM	0.66	0.58	4,094,260	0.92	0.28	3 hr	Atlas 14	2,374,671
CSO019 Count										**15**
CSO019 Total										**36,520,101**
CSO020	2/1/15 1:45 PM	2/1/15 2:45 PM	0.04	0.42	7,434,473	0.51	0.20	3 hr	Atlas 14	3,122,479
CSO020	2/21/15 3:45 PM	2/21/15 6:00 PM	0.09	1.18	143,018	1.39	0.46	12 hr	Atlas 14	168,761

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There are known problems with some flow monitor locations that may be inflating actual overflow volumes (for example storm water flows).
MSD is currently working on a plan to fully identify and correct these issues.

CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO020	3/3/15 8:15 PM	3/6/15 10:00 PM	2.57	1.73	47,869,312	1.83	0.56	48 hr	Atlas 14	82,813,910
CSO020	3/7/15 1:45 PM	3/9/15 6:15 PM	2.19	Discharge		1.78	Snowmelt			291,320,060
CSO020	3/10/15 6:45 AM	3/15/15 4:00 PM	6.86	1.09	867,870,016	4.65	0.49	12 hr	Atlas 14	1,052,590,501
CSO020	3/26/15 6:00 AM	3/26/15 7:00 AM	0.04	0.41	640,164	0.6	0.17	12 hr	Atlas 14	262,467
CSO020 Count										**6**
CSO020 Total										**1,430,278,178**
CSO029	3/10/15 11:00 AM	3/10/15 12:45 PM	0.07	1.26	63,655	2.88	0.57	12 hr	Atlas 14	80,206
CSO029	3/14/15 1:15 AM	3/14/15 3:45 AM	0.10	1.93	31,441	3.12	0.73	24 hr	Atlas 14	60,681
CSO029	3/26/15 4:30 AM	3/26/15 4:30 AM	0.00	0.54	13,787	0.58	0.23	3 hr	Atlas 14	7,445
CSO029 Count										**3**
CSO029 Total										**148,332**
CSO031	3/10/15 5:00 PM	3/11/15 11:45 AM	0.78	1.26	176,441	3.02	0.57	12 hr	Atlas 14	222,316
CSO031 Count										**1**
CSO031 Total										**222,316**
CSO036	1/29/15 5:15 AM	1/29/15 5:15 AM	0.00	0.04	68,750	0.24	0.03	2 hr	Atlas 14	2,750
CSO036	2/4/15 11:45 PM	2/5/15 4:45 PM	0.71	0.03	444,271	0.5	0.02	2 hr	Atlas 14	13,328
CSO036	2/6/15 1:30 AM	2/6/15 7:00 AM	0.23	Discharge		0.46	Snowmelt			4,867
CSO036	2/21/15 1:15 PM	2/21/15 2:15 PM	0.04	1.25	3,505	1.44	0.48	24 hr	Atlas 14	4,381
CSO036	3/10/15 10:45 AM	3/10/15 1:45 PM	0.12	1.34	28,036	3.01	0.61	12 hr	Atlas 14	37,569
CSO036	3/13/15 10:30 AM	3/14/15 3:45 AM	0.72	1.89	35,077	3.15	0.71	24 hr	Atlas 14	66,296
CSO036	3/26/15 4:15 AM	3/26/15 5:45 AM	0.06	0.55	16,681	0.65	0.23	3 hr	Atlas 14	9,175
CSO036 Count										**7**
CSO036 Total										**138,366**
CSO038	2/21/15 2:30 PM	2/22/15 6:15 PM	1.16	1.29	294,549	1.55	0.50	24 hr	Atlas 14	379,968
CSO038	3/4/15 12:30 AM	3/8/15 3:00 AM	4.10	1.79	6,502,099	1.89	0.58	48 hr	Atlas 14	11,638,758
CSO038 Count										**2**
CSO038 Total										**12,018,725**
CSO050	1/3/15 10:45 AM	1/3/15 3:15 PM	0.19	0.43	50,163	0.28	0.16	24 hr	Atlas 14	21,570
CSO050	1/4/15 12:45 AM	1/4/15 3:45 AM	0.12	0.43	43,219	0.44	0.16	24 hr	Atlas 14	18,584
CSO050	2/1/15 12:00 PM	2/1/15 6:45 PM	0.28	0.43	97,098	0.62	0.20	3 hr	Atlas 14	41,752
CSO050	2/21/15 1:30 PM	2/21/15 4:45 PM	0.14	1.24	9,629	1.51	0.49	12 hr	Atlas 14	11,940
CSO050	3/3/15 6:30 PM	3/4/15 4:30 PM	0.92	1.95	300,979	1.56	0.63	48 hr	Atlas 14	586,909
CSO050	3/10/15 6:45 AM	3/10/15 5:30 PM	0.45	1.11	1,015,898	3.06	0.50	12 hr	Atlas 14	1,127,647
CSO050	3/13/15 10:00 AM	3/14/15 9:30 AM	0.98	2.10	740,147	3.19	0.78	24 hr	Atlas 14	1,554,309
CSO050	3/24/15 7:45 PM	3/24/15 8:15 PM	0.02	0.15	50,264	0.31	0.09	1 hr	Atlas 14	7,540
CSO050	3/26/15 3:00 AM	3/26/15 6:15 AM	0.14	0.61	162,394	0.75	0.28	3 hr	Atlas 14	99,060
CSO050 Count										**9**

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CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO050 Total										**3,469,311**
CSO051	3/10/15 11:00 AM	3/10/15 2:30 PM	0.15	1.11	41,030	3.04	0.50	12 hr	Atlas 14	45,543
CSO051	3/13/15 10:30 AM	3/13/15 10:30 AM	0.00	2.10	80	1.44	0.78	24 hr	Atlas 14	168
CSO051	3/14/15 1:00 AM	3/14/15 4:15 AM	0.14	2.10	4,128	3.14	0.78	24 hr	Atlas 14	8,668
CSO051 Count										**3**
CSO051 Total										**54,379**
CSO053	1/3/15 10:45 AM	1/3/15 4:30 PM	0.24	0.41	21,142	0.32	0.15	24 hr	Atlas 14	8,668
CSO053	2/1/15 1:00 PM	2/1/15 1:30 PM	0.02	0.43	1,630	0.5	0.21	3 hr	Atlas 14	701
CSO053	3/3/15 6:45 PM	3/4/15 12:45 PM	0.75	1.92	45,169	1.35	0.62	48 hr	Atlas 14	86,724
CSO053	3/10/15 7:00 AM	3/10/15 2:00 PM	0.29	1.15	169,272	3.05	0.52	12 hr	Atlas 14	194,663
CSO053	3/13/15 10:15 AM	3/14/15 4:00 AM	0.74	2.00	90,582	3.08	0.75	24 hr	Atlas 14	181,165
CSO053	3/24/15 8:00 PM	3/24/15 8:00 PM	0.00	0.14	3,290	0.32	0.09	1 hr	Atlas 14	461
CSO053	3/26/15 4:15 AM	3/26/15 6:00 AM	0.07	0.62	115,606	0.8	0.30	3 hr	Atlas 14	71,676
CSO053 Count										**7**
CSO053 Total										**544,058**
CSO054	1/3/15 5:45 AM	1/3/15 1:15 PM	0.31	0.41	2,988	0.16	0.15	24 hr	Atlas 14	1,225
CSO054	1/4/15 12:45 AM	1/4/15 4:00 AM	0.14	0.41	511	0.42	0.15	24 hr	Atlas 14	209
CSO054	1/12/15 5:15 AM	1/12/15 5:15 AM	0.00	0.16	153	0.14	0.06	24 hr	Atlas 14	24
CSO054	1/18/15 3:00 AM	1/18/15 3:15 AM	0.01	0.07	2,464	0.23	0.06	1 hr	Atlas 14	172
CSO054	1/25/15 8:45 PM	1/25/15 9:30 PM	0.03	0.17	748	0.22	0.07	12 hr	Atlas 14	127
CSO054	1/29/15 5:00 AM	1/29/15 5:00 AM	0.00	0.04	3,100	0.27	0.03	1 hr	Atlas 14	124
CSO054	2/1/15 11:00 AM	2/1/15 5:30 PM	0.27	0.43	4,212	0.59	0.21	3 hr	Atlas 14	1,811
CSO054	3/3/15 6:15 PM	3/4/15 3:15 PM	0.87	1.92	6,667	1.47	0.62	48 hr	Atlas 14	12,801
CSO054	3/10/15 6:30 AM	3/10/15 2:30 PM	0.33	1.15	56,839	3.06	0.52	12 hr	Atlas 14	65,365
CSO054	3/13/15 9:45 AM	3/14/15 9:30 AM	0.99	2.00	13,339	3.13	0.75	24 hr	Atlas 14	26,678
CSO054	3/19/15 6:45 PM	3/19/15 7:15 PM	0.02	0.20	2,475	2.17	0.08	12 hr	Atlas 14	495
CSO054	3/24/15 2:15 PM	3/24/15 8:00 PM	0.24	0.14	4,265	0.32	0.09	1 hr	Atlas 14	597
CSO054	3/26/15 3:00 AM	3/26/15 5:45 AM	0.11	0.62	1,656	0.79	0.30	3 hr	Atlas 14	1,027
CSO054 Count										**13**
CSO054 Total										**110,657**
CSO055	3/4/15 2:30 AM	3/4/15 6:00 AM	0.15	1.92	12,147	0.9	0.62	48 hr	Atlas 14	23,321
CSO055	3/10/15 11:00 AM	3/10/15 12:15 PM	0.05	1.15	3,524	2.79	0.52	12 hr	Atlas 14	4,052
CSO055	3/14/15 1:15 AM	3/14/15 3:45 AM	0.10	2.00	446	3.07	0.75	24 hr	Atlas 14	891
CSO055 Count										**3**
CSO055 Total										**28,265**
CSO058	2/21/15 3:15 PM	2/21/15 4:00 PM	0.03	1.28	164	1.52	0.49	24 hr	Atlas 14	210
CSO058	3/3/15 6:45 PM	3/4/15 5:15 PM	0.94	1.82	2,728	1.44	0.59	24 hr	Atlas 14	4,965

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CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO058	3/10/15 6:45 AM	3/10/15 2:30 PM	0.32	1.19	11,794	2.99	0.54	12 hr	Atlas 14	14,035
CSO058	3/13/15 10:30 AM	3/14/15 4:15 AM	0.74	1.89	1,047	3.02	0.72	24 hr	Atlas 14	1,979
CSO058	3/26/15 4:15 AM	3/26/15 11:30 AM	0.30	0.51	9,783	0.74	0.21	3 hr	Atlas 14	4,989
CSO058 Count										**5**
CSO058 Total										**26,178**
CSO083	3/10/15 12:30 PM	3/10/15 12:30 PM	0.00	1.21	469	2.68	0.55	12 hr	Atlas 14	567
CSO083 Count										**1**
CSO083 Total										**567**
CSO084	3/3/15 11:30 PM	3/4/15 5:30 AM	0.25	1.67	4,248	0.79	0.54	48 hr	Atlas 14	7,095
CSO084	3/10/15 11:00 AM	3/10/15 2:15 PM	0.14	1.21	7,081	2.85	0.55	12 hr	Atlas 14	8,568
CSO084	3/13/15 10:45 AM	3/14/15 4:15 AM	0.73	1.72	5,088	2.87	0.65	24 hr	Atlas 14	8,751
CSO084	3/26/15 4:45 AM	3/26/15 4:45 AM	0.00	0.47	179	0.55	0.18	12 hr	Atlas 14	84
CSO084 Count										**4**
CSO084 Total										**24,498**
CSO088	3/4/15 4:00 AM	3/4/15 5:30 AM	0.06	1.70	19,061	0.79	0.55	24 hr	Atlas 14	32,404
CSO088	3/6/15 7:45 AM	3/6/15 9:30 AM	0.07	Discharge		1.75	Snowmelt			11,423
CSO088	3/7/15 3:00 PM	3/7/15 5:15 PM	0.09	0.04		1.75	0.04	0.5 hr	Atlas 14	11,667
CSO088	3/10/15 7:15 AM	3/12/15 1:00 PM	2.24	1.09	351,594	2.79	0.49	12 hr	Atlas 14	383,237
CSO088	3/13/15 12:15 PM	3/15/15 8:15 PM	2.33	1.69	252,810	2.78	0.63	24 hr	Atlas 14	427,249
CSO088	3/20/15 12:00 AM	3/20/15 2:00 AM	0.08	0.19	859,066	1.88	0.07	12 hr	Atlas 14	163,223
CSO088 Count										**6**
CSO088 Total										**1,029,203**
CSO091	3/3/15 11:30 PM	3/4/15 5:15 AM	0.24	1.61	3,319	0.71	0.52	24 hr	Atlas 14	5,343
CSO091	3/10/15 10:45 AM	3/10/15 2:00 PM	0.14	1.26	17,382	2.83	0.57	12 hr	Atlas 14	21,901
CSO091	3/13/15 2:45 PM	3/13/15 2:45 PM	0.00	1.67	17	1.81	0.63	24 hr	Atlas 14	28
CSO091	3/14/15 12:30 AM	3/14/15 4:00 AM	0.15	1.67	4,815	2.87	0.63	24 hr	Atlas 14	8,041
CSO091	3/26/15 4:30 AM	3/26/15 4:45 AM	0.01	0.42	2,225	0.49	0.17	12 hr	Atlas 14	934
CSO091 Count										**5**
CSO091 Total										**36,248**
CSO092	1/3/15 10:45 AM	1/3/15 10:45 AM	0.00	0.32	17	0.12	0.12	24 hr	Atlas 14	5
CSO092	1/4/15 3:15 AM	1/4/15 3:15 AM	0.00	0.32	1,045	0.32	0.12	24 hr	Atlas 14	334
CSO092	1/12/15 2:15 AM	1/12/15 11:30 AM	0.39	0.16	988	0.17	0.06	24 hr	Atlas 14	158
CSO092	2/1/15 1:00 PM	2/1/15 6:00 PM	0.21	0.37	378	0.5	0.17	12 hr	Atlas 14	140
CSO092	2/21/15 1:30 PM	2/21/15 7:45 PM	0.26	1.21	327	1.39	0.47	24 hr	Atlas 14	395
CSO092	3/3/15 6:45 PM	3/4/15 4:30 PM	0.91	1.61	13,377	1.22	0.52	24 hr	Atlas 14	21,537
CSO092	3/6/15 1:15 PM	3/6/15 5:00 PM	0.16	0.02	1,073	1.65	0.02	1 hr	Atlas 14	21
CSO092	3/10/15 6:45 AM	3/10/15 3:45 PM	0.37	1.26	65,906	2.87	0.57	12 hr	Atlas 14	83,042

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CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO092	3/13/15 11:45 AM	3/14/15 5:45 AM	0.75	1.67	11,556	2.89	0.63	24 hr	Atlas 14	19,298
CSO092	3/24/15 8:00 PM	3/24/15 8:00 PM	0.00	0.10	381	0.27	0.06	0.25 hr	Atlas 14	38
CSO092	3/26/15 4:30 AM	3/26/15 6:15 AM	0.07	0.42	10,859	0.56	0.17	12 hr	Atlas 14	4,561
CSO092 Count										**11**
CSO092 Total										**129,529**
CSO097	1/7/15 6:45 AM	1/8/15 10:30 AM	1.16	0.01	99,225,844	0.34	0.01	0.25 hr	Atlas 14	992,258
CSO097	2/1/15 1:30 PM	2/1/15 2:45 PM	0.05	0.36	30,148	0.42	0.17	12 hr	Atlas 14	10,853
CSO097	2/21/15 3:00 PM	2/21/15 7:15 PM	0.18	1.17	55,811	1.29	0.45	24 hr	Atlas 14	65,299
CSO097	3/3/15 7:15 PM	3/5/15 5:00 PM	1.91	1.63	648,910	1.72	0.53	48 hr	Atlas 14	1,057,723
CSO097	3/7/15 1:30 PM	3/7/15 9:00 PM	0.31	0.28	503,806	1.67	0.30	0.5 hr	Atlas 14	141,066
CSO097	3/8/15 1:45 PM	3/8/15 5:15 PM	0.15	Discharge		1.63	Snowmelt			14,055
CSO097	3/10/15 7:00 AM	3/12/15 12:15 AM	1.72	1.20	747,780	2.83	0.55	12 hr	Atlas 14	897,336
CSO097	3/13/15 10:45 AM	3/15/15 6:30 PM	2.32	1.59	893,979	2.79	0.60	24 hr	Atlas 14	1,421,426
CSO097	3/19/15 8:00 PM	3/19/15 9:15 PM	0.05	0.18	11,394	1.77	0.07	24 hr	Atlas 14	2,051
CSO097	3/26/15 4:45 AM	3/26/15 7:45 AM	0.12	0.46	109,512	0.59	0.20	3 hr	Atlas 14	50,375
CSO097 Count										**10**
CSO097 Total										**4,652,443**
CSO104	3/10/15 12:30 PM	3/10/15 2:00 PM	0.06	0.95	34,207	2.57	0.42	12 hr	Atlas 14	32,497
CSO104	3/14/15 3:45 AM	3/14/15 4:15 AM	0.02	1.91	3,701	2.79	0.72	24 hr	Atlas 14	7,069
CSO104 Count										**2**
CSO104 Total										**39,566**
CSO105	1/3/15 5:15 AM	1/4/15 4:30 AM	0.97	0.59	46,027	0.6	0.22	24 hr	Atlas 14	27,156
CSO105	1/12/15 12:30 AM	1/12/15 10:15 AM	0.41	0.17	81,838	0.2	0.07	24 hr	Atlas 14	13,912
CSO105	1/18/15 3:15 AM	1/18/15 4:00 AM	0.03	0.10	22,453	0.28	0.08	1 hr	Atlas 14	2,245
CSO105	1/25/15 4:30 PM	1/25/15 10:45 PM	0.26	0.17	14,699	0.22	0.07	12 hr	Atlas 14	2,499
CSO105	2/1/15 11:30 AM	2/1/15 7:30 PM	0.33	0.37	801,563	0.6	0.17	3 hr	Atlas 14	296,578
CSO105	2/21/15 3:45 AM	2/22/15 1:00 AM	0.89	1.35	45,329	1.68	0.54	12 hr	Atlas 14	61,193
CSO105	3/3/15 2:15 PM	3/4/15 6:30 PM	1.18	1.65	10,069,069	1.43	0.54	48 hr	Atlas 14	16,613,964
CSO105	3/5/15 2:30 PM	3/5/15 9:45 PM	0.30	1.65	8,685	1.82	0.54	48 hr	Atlas 14	14,330
CSO105	3/8/15 12:45 PM	3/12/15 1:30 PM	4.03	0.49	27,666,677	2.61	0.19	24 hr	Atlas 14	13,556,672
CSO105	3/13/15 1:00 AM	3/14/15 5:15 AM	1.18	1.86	6,932,132	2.8	0.72	24 hr	Atlas 14	12,893,766
CSO105	3/24/15 1:45 PM	3/24/15 10:30 PM	0.36	0.14	40,336	0.33	0.09	0.5 hr	Atlas 14	5,647
CSO105	3/26/15 3:15 AM	3/26/15 12:00 PM	0.36	0.51	4,106,170	0.8	0.25	3 hr	Atlas 14	2,094,147
CSO105	3/29/15 10:30 PM	3/29/15 10:30 PM	0.00	0.03	17,223	0.69	0.03	1 hr	Atlas 14	517
CSO105 Count										**13**
CSO105 Total										**45,582,626**
CSO106	1/3/15 10:30 AM	1/3/15 10:30 AM	0.00	0.32	559	0.12	0.12	24 hr	Atlas 14	179

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CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO106	3/3/15 11:15 PM	3/4/15 12:45 PM	0.56	1.63	23,896	1.12	0.53	48 hr	Atlas 14	38,950
CSO106	3/4/15 9:45 PM	3/4/15 10:30 PM	0.03	1.63	235	1.52	0.53	48 hr	Atlas 14	382
CSO106	3/19/15 11:30 AM	3/19/15 2:30 PM	0.12	0.18	1	1.66	0.07	24 hr	Atlas 14	0
CSO106	3/24/15 4:15 PM	3/24/15 7:00 PM	0.11	0.10	864	0.21	0.06	0.25 hr	Atlas 14	86
CSO106	3/26/15 4:15 AM	3/26/15 4:30 AM	0.01	0.46	11,490	0.5	0.20	3 hr	Atlas 14	5,285
CSO106 Count										**6**
CSO106 Total										**44,883**
CSO108	3/4/15 3:45 AM	3/4/15 8:00 PM	0.68	1.84	531,403	1.61	0.60	48 hr	Atlas 14	977,781
CSO108	3/10/15 11:00 AM	3/10/15 9:00 PM	0.42	1.37	669,604	3.2	0.62	12 hr	Atlas 14	917,357
CSO108	3/13/15 3:15 PM	3/14/15 6:15 PM	1.12	1.75	715,363	3.12	0.65	24 hr	Atlas 14	1,251,885
CSO108 Count										**3**
CSO108 Total										**3,147,022**
CSO110	2/1/15 2:00 PM	2/1/15 2:30 PM	0.02	0.36	31,784	0.42	0.17	12 hr	Atlas 14	11,442
CSO110	2/21/15 3:15 PM	2/21/15 6:15 PM	0.12	1.25	183,472	1.41	0.48	24 hr	Atlas 14	229,340
CSO110	3/3/15 7:45 PM	3/4/15 9:30 PM	1.07	1.62	2,190,725	1.47	0.53	48 hr	Atlas 14	3,548,975
CSO110	3/10/15 7:15 AM	3/11/15 1:45 AM	0.77	1.34	2,010,870	2.96	0.61	12 hr	Atlas 14	2,694,566
CSO110	3/13/15 10:45 AM	3/14/15 10:00 PM	1.47	1.71	2,298,047	3.05	0.64	24 hr	Atlas 14	3,929,660
CSO110	3/26/15 4:45 AM	3/26/15 7:15 AM	0.10	0.43	572,080	0.57	0.18	12 hr	Atlas 14	245,995
CSO110 Count										**6**
CSO110 Total										**10,659,978**
CSO113	3/3/15 11:30 PM	3/4/15 1:00 PM	0.56	1.61	49,403	1.11	0.52	24 hr	Atlas 14	79,538
CSO113	3/10/15 7:15 AM	3/10/15 3:15 PM	0.33	1.26	64,644	2.86	0.57	12 hr	Atlas 14	81,452
CSO113	3/13/15 2:45 PM	3/14/15 5:15 AM	0.60	1.67	34,743	2.89	0.63	24 hr	Atlas 14	58,021
CSO113	3/26/15 4:30 AM	3/26/15 5:00 AM	0.02	0.42	18,024	0.49	0.17	12 hr	Atlas 14	7,570
CSO113 Count										**4**
CSO113 Total										**226,581**
CSO117	1/4/15 4:15 AM	1/4/15 4:30 AM	0.01	0.33	36,116	0.34	0.12	24 hr	Atlas 14	11,918
CSO117	2/1/15 1:15 PM	2/1/15 2:30 PM	0.05	0.42	356,660	0.49	0.19	3 hr	Atlas 14	149,797
CSO117	2/21/15 2:45 PM	2/21/15 4:45 PM	0.08	1.23	151,099	1.47	0.47	24 hr	Atlas 14	185,852
CSO117	3/3/15 7:30 PM	3/4/15 5:15 PM	0.91	1.70	2,665,936	1.33	0.55	48 hr	Atlas 14	4,532,092
CSO117	3/7/15 3:15 PM	3/7/15 5:45 PM	0.10	0.04	3,235,692	1.75	0.04	0.5 hr	Atlas 14	129,428
CSO117	3/10/15 7:15 AM	3/10/15 6:00 PM	0.45	1.30	2,722,762	3	0.59	12 hr	Atlas 14	3,539,591
CSO117	3/13/15 10:30 AM	3/14/15 6:45 AM	0.84	1.85	2,135,319	3.11	0.70	24 hr	Atlas 14	3,950,339
CSO117	3/26/15 4:30 AM	3/26/15 7:00 AM	0.10	0.53	949,220	0.68	0.22	12 hr	Atlas 14	503,087
CSO117 Count										**8**
CSO117 Total										**13,002,104**
CSO118	1/3/15 5:45 AM	1/4/15 4:00 AM	0.93	0.33	6,268	0.34	0.12	24 hr	Atlas 14	2,068

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CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO118	2/1/15 12:00 PM	2/1/15 6:00 PM	0.25	0.39	163,271	0.51	0.18	3 hr	Atlas 14	63,676
CSO118	2/21/15 3:30 AM	2/21/15 3:45 PM	0.51	1.20	8,208	1.44	0.46	24 hr	Atlas 14	9,849
CSO118	3/3/15 6:45 PM	3/4/15 5:00 PM	0.93	1.67	2,568,714	1.31	0.54	48 hr	Atlas 14	4,289,752
CSO118	3/7/15 1:15 PM	3/7/15 7:00 PM	0.24	0.04	16,122,349	1.72	0.04	0.5 hr	Atlas 14	644,894
CSO118	3/10/15 6:45 AM	3/10/15 3:30 PM	0.36	1.21	5,313,570	2.88	0.55	12 hr	Atlas 14	6,429,420
CSO118	3/13/15 10:00 AM	3/14/15 5:45 PM	1.32	1.72	6,328,524	2.93	0.65	24 hr	Atlas 14	10,885,062
CSO118	3/19/15 7:00 PM	3/19/15 7:45 PM	0.03	0.19	1,921	1.9	0.08	6 hr	Atlas 14	365
CSO118	3/24/15 2:45 PM	3/24/15 8:30 PM	0.24	0.12	6,301	0.29	0.06	0.5 hr	Atlas 14	756
CSO118	3/26/15 4:15 AM	3/26/15 6:45 AM	0.10	0.47	1,248,700	0.62	0.18	12 hr	Atlas 14	586,889
CSO118	3/26/15 3:15 PM	3/26/15 4:00 PM	0.03	0.47	657	0.72	0.18	12 hr	Atlas 14	309
CSO118 Count										**11**
CSO118 Total										**22,913,041**
CSO120	3/3/15 11:30 PM	3/4/15 12:45 PM	0.55	1.76	123,291	1.24	0.57	24 hr	Atlas 14	216,993
CSO120	3/10/15 7:15 AM	3/10/15 3:45 PM	0.35	1.13	583,836	2.89	0.51	12 hr	Atlas 14	659,735
CSO120	3/13/15 10:45 AM	3/14/15 6:15 AM	0.81	1.81	233,100	2.91	0.68	24 hr	Atlas 14	421,911
CSO120	3/26/15 4:30 AM	3/26/15 6:00 AM	0.06	0.48	142,611	0.62	0.19	3 hr	Atlas 14	68,453
CSO120 Count										**4**
CSO120 Total										**1,367,092**
CSO121	1/3/15 11:45 AM	1/3/15 11:45 AM	0.00	0.36	1,853	0.13	0.13	24 hr	Atlas 14	667
CSO121	2/21/15 5:00 AM	2/21/15 5:15 PM	0.51	1.24	721	1.53	0.48	24 hr	Atlas 14	894
CSO121	3/3/15 10:45 PM	3/4/15 7:15 AM	0.35	1.76	17,022	0.91	0.57	24 hr	Atlas 14	29,958
CSO121	3/10/15 4:30 AM	3/11/15 12:45 AM	0.84	1.13	823,543	2.89	0.51	12 hr	Atlas 14	930,604
CSO121	3/13/15 10:30 AM	3/15/15 7:15 PM	2.36	1.81	811,668	2.94	0.68	24 hr	Atlas 14	1,469,119
CSO121	3/19/15 8:30 PM	3/20/15 7:45 AM	0.47	0.20	3,923	2.01	0.08	12 hr	Atlas 14	785
CSO121	3/24/15 2:15 PM	3/24/15 2:15 PM	0.00	0.12	203	0.22	0.07	0.5 hr	Atlas 14	24
CSO121	3/26/15 4:00 AM	3/26/15 6:00 AM	0.08	0.48	35,254	0.62	0.19	3 hr	Atlas 14	16,922
CSO121	3/26/15 3:30 PM	3/26/15 3:45 PM	0.01	0.48	543	0.74	0.19	3 hr	Atlas 14	261
CSO121 Count										**9**
CSO121 Total										**2,449,233**
CSO125	3/3/15 11:30 PM	3/4/15 5:00 PM	0.73	1.66	1,214,252	1.31	0.54	24 hr	Atlas 14	2,015,659
CSO125	3/10/15 7:15 AM	3/10/15 8:30 PM	0.55	1.08	2,499,504	2.74	0.49	12 hr	Atlas 14	2,699,464
CSO125	3/13/15 10:45 AM	3/14/15 12:45 PM	1.08	1.50	1,626,025	2.59	0.56	24 hr	Atlas 14	2,439,037
CSO125	3/26/15 4:30 AM	3/26/15 5:00 AM	0.02	0.40	378,775	0.47	0.17	12 hr	Atlas 14	151,510
CSO125 Count										**4**
CSO125 Total										**7,305,670**
CSO126	3/4/15 3:30 AM	3/4/15 1:15 PM	0.41	1.66	305,456	1.18	0.54	24 hr	Atlas 14	507,056
CSO126	3/10/15 10:45 AM	3/11/15 2:00 AM	0.64	1.08	4,902,387	2.73	0.49	12 hr	Atlas 14	5,294,578

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CSO126	3/13/15 10:45 AM	3/14/15 9:15 PM	1.44	1.50	7,039,486	2.59	0.56	24 hr	Atlas 14	10,559,229
CSO126 Count										**3**
CSO126 Total										**16,360,864**
CSO127	1/3/15 11:00 AM	1/3/15 11:15 AM	0.01	0.45	90,696	0.16	0.17	24 hr	Atlas 14	40,813
CSO127	1/4/15 3:45 AM	1/4/15 4:00 AM	0.01	0.45	3,148	0.46	0.17	24 hr	Atlas 14	1,417
CSO127	2/1/15 1:00 PM	2/1/15 6:15 PM	0.22	0.37	122,961	0.49	0.17	12 hr	Atlas 14	45,496
CSO127	2/21/15 2:15 PM	2/21/15 3:45 PM	0.06	1.07	10,655	1.19	0.41	24 hr	Atlas 14	11,401
CSO127	3/3/15 7:00 PM	3/4/15 6:00 PM	0.96	1.67	544,316	1.35	0.54	48 hr	Atlas 14	909,007
CSO127	3/7/15 3:30 PM	3/7/15 5:15 PM	0.07	0.04	285,814	1.71	0.04	0.5 hr	Atlas 14	11,433
CSO127	3/10/15 7:00 AM	3/10/15 9:15 PM	0.59	1.09	1,037,845	2.76	0.50	12 hr	Atlas 14	1,131,251
CSO127	3/13/15 8:45 AM	3/14/15 1:00 PM	1.18	1.55	928,955	2.64	0.58	24 hr	Atlas 14	1,439,881
CSO127	3/26/15 4:45 AM	3/26/15 6:30 AM	0.07	0.42	94,500	0.56	0.17	3 hr	Atlas 14	39,690
CSO127 Count										**9**
CSO127 Total										**3,630,387**
CSO130	1/3/15 5:15 AM	1/4/15 3:15 AM	0.92	0.34	13,930	0.33	0.13	24 hr	Atlas 14	4,736
CSO130	1/11/15 11:45 PM	1/12/15 5:30 AM	0.24	0.16	25,381	0.14	0.06	24 hr	Atlas 14	4,061
CSO130	1/18/15 3:15 AM	1/18/15 3:45 AM	0.02	0.07	29,109	0.23	0.06	0.5 hr	Atlas 14	2,038
CSO130	1/23/15 7:00 PM	1/23/15 8:00 PM	0.04	0.08	5,059	0.15	0.05	2 hr	Atlas 14	405
CSO130	1/25/15 4:00 PM	1/25/15 10:15 PM	0.26	0.15	6,541	0.23	0.07	12 hr	Atlas 14	981
CSO130	1/29/15 5:15 AM	1/29/15 6:00 AM	0.03	0.03	27,917	0.26	0.02	2 hr	Atlas 14	838
CSO130	2/1/15 11:15 AM	2/1/15 8:00 PM	0.36	0.39	30,860	0.59	0.18	3 hr	Atlas 14	12,035
CSO130	2/14/15 1:45 PM	2/14/15 1:45 PM	0.00	0.04	1,629	0.05	0.03	2 hr	Atlas 14	65
CSO130	2/19/15 2:00 PM	2/19/15 2:00 PM	0.00	Discharge		0.24	Snowmelt			934
CSO130	2/21/15 3:15 AM	2/22/15 5:15 PM	1.58	1.15	58,969	1.39	0.44	12 hr	Atlas 14	67,815
CSO130 Count										**10**
CSO130 Total										**93,908**
CSO132	1/3/15 11:00 AM	1/3/15 11:00 AM	0.00	0.38	31,027	0.11	0.14	24 hr	Atlas 14	11,790
CSO132	1/4/15 3:45 AM	1/4/15 4:00 AM	0.01	0.38	4,380	0.39	0.14	24 hr	Atlas 14	1,664
CSO132	2/1/15 1:15 PM	2/1/15 6:00 PM	0.20	0.38	120,691	0.51	0.17	12 hr	Atlas 14	45,863
CSO132	2/21/15 2:15 PM	2/21/15 5:15 PM	0.12	1.09	271,887	1.27	0.42	12 hr	Atlas 14	296,357
CSO132	3/3/15 7:00 PM	3/5/15 8:45 PM	13.87	1.67	120,759,942	1.78	0.55	24 hr	Atlas 14	201,669,103
CSO132	3/24/15 8:30 PM	3/24/15 8:30 PM	0.00	0.12	243,928	0.28	0.07	0.25 hr	Atlas 14	29,271
CSO132	3/26/15 4:30 AM	3/26/15 6:45 AM	0.09	0.40	1,344,789	0.56	0.17	12 hr	Atlas 14	537,916
CSO132 Count										**7**
CSO132 Total										**202,591,965**
CSO137	1/3/15 10:45 AM	1/3/15 11:00 AM	0.01	0.32	16,747	0.12	0.12	24 hr	Atlas 14	5,359
CSO137	2/1/15 1:15 PM	2/1/15 1:30 PM	0.01	0.36	2,490	0.4	0.17	12 hr	Atlas 14	897

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CSO137	2/21/15 3:30 AM	2/21/15 3:30 AM	0.00	1.17	354	0.57	0.45	24 hr	Atlas 14	414
CSO137	2/21/15 2:45 PM	2/21/15 2:45 PM	0.00	1.17	769	1.25	0.45	24 hr	Atlas 14	899
CSO137	3/3/15 7:00 PM	3/4/15 1:00 PM	0.75	1.63	188,021	1.13	0.53	48 hr	Atlas 14	306,474
CSO137	3/10/15 7:00 AM	3/10/15 2:45 PM	0.32	1.20	394,708	2.83	0.55	12 hr	Atlas 14	473,650
CSO137	3/13/15 8:30 AM	3/14/15 5:45 AM	0.89	1.59	188,896	2.75	0.60	24 hr	Atlas 14	300,345
CSO137	3/26/15 4:30 AM	3/26/15 5:00 AM	0.02	0.46	123,244	0.52	0.20	3 hr	Atlas 14	56,692
CSO137 Count										**8**
CSO137 Total										**1,144,731**
CSO140	3/3/15 11:15 PM	3/4/15 12:45 PM	0.56	1.67	163,079	1.18	0.54	24 hr	Atlas 14	272,341
CSO140	3/7/15 3:45 PM	3/7/15 5:30 PM	0.07	0.04	875,057	1.72	0.04	0.5 hr	Atlas 14	35,002
CSO140	3/10/15 9:30 AM	3/10/15 11:00 PM	0.56	1.10	729,978	2.77	0.50	12 hr	Atlas 14	802,975
CSO140	3/13/15 10:30 AM	3/14/15 4:30 AM	0.75	1.63	799,566	2.68	0.61	24 hr	Atlas 14	1,303,292
CSO140	3/26/15 4:30 AM	3/26/15 4:30 AM	0.00	0.45	27,040	0.51	0.18	12 hr	Atlas 14	12,168
CSO140 Count										**5**
CSO140 Total										**2,425,779**
CSO141	1/4/15 12:30 AM	1/4/15 3:45 AM	0.14	0.36	1,760	0.37	0.13	24 hr	Atlas 14	633
CSO141	2/1/15 11:45 AM	2/1/15 7:15 PM	0.31	0.39	7,401	0.58	0.19	3 hr	Atlas 14	2,886
CSO141	2/21/15 4:15 AM	2/21/15 4:15 PM	0.50	1.24	28,327	1.52	0.48	24 hr	Atlas 14	35,126
CSO141	2/22/15 12:15 PM	2/22/15 2:45 PM	0.10	0.02	220,121	1.48	0.02	0.5 hr	Atlas 14	4,402
CSO141	3/3/15 8:15 AM	3/4/15 7:00 PM	1.45	1.76	85,897	1.51	0.68	24 hr	Atlas 14	151,178
CSO141	3/5/15 3:45 AM	3/5/15 3:45 PM	0.50	1.76	3,683	1.87	0.57	24 hr	Atlas 14	6,483
CSO141	3/7/15 10:30 AM	3/7/15 8:00 PM	0.40	0.04	1,360,131	1.82	0.04	0.5 hr	Atlas 14	54,405
CSO141	3/9/15 9:30 PM	3/10/15 7:00 PM	0.90	1.11	74,494	2.89	0.51	12 hr	Atlas 14	82,688
CSO141	3/13/15 8:30 AM	3/14/15 12:45 PM	1.18	1.81	60,722	2.94	0.68	24 hr	Atlas 14	109,906
CSO141	3/19/15 8:15 AM	3/20/15 5:15 AM	0.87	0.20	115,045	2.01	0.08	12 hr	Atlas 14	23,009
CSO141	3/24/15 2:15 PM	3/24/15 8:15 PM	0.25	0.12	51,699	0.31	0.07	0.5 hr	Atlas 14	6,204
CSO141	3/26/15 3:00 AM	3/26/15 3:45 PM	0.53	0.48	59,328	0.79	0.19	3 hr	Atlas 14	28,477
CSO141 Count										**12**
CSO141 Total										**505,398**
CSO146	2/1/15 1:00 PM	2/1/15 6:00 PM	0.21	0.38	325,213	0.52	0.17	12 hr	Atlas 14	123,581
CSO146	2/21/15 1:45 PM	2/21/15 5:30 PM	0.16	1.24	204,001	1.45	0.48	24 hr	Atlas 14	252,962
CSO146	3/3/15 7:15 PM	3/4/15 6:00 PM	0.95	1.66	1,397,788	1.33	0.54	48 hr	Atlas 14	2,320,328
CSO146	3/7/15 2:00 PM	3/7/15 6:00 PM	0.17	0.04	7,108,255	1.71	0.04	0.5 hr	Atlas 14	284,330
CSO146	3/10/15 7:00 AM	3/10/15 7:15 PM	0.51	1.31	3,073,227	2.97	0.59	12 hr	Atlas 14	4,025,927
CSO146	3/13/15 10:30 AM	3/14/15 12:15 PM	1.07	1.84	3,390,909	3.15	0.69	24 hr	Atlas 14	6,239,272
CSO146	3/26/15 4:30 AM	3/26/15 6:45 AM	0.09	0.42	1,381,256	0.57	0.17	12 hr	Atlas 14	580,127
CSO146 Count										**7**

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CSO146 Total										**13,826,527**
CSO148	1/3/15 10:30 AM	1/3/15 3:00 PM	0.19	0.32	11,520	0.19	0.12	24 hr	Atlas 14	3,686
CSO148	2/1/15 1:00 PM	2/1/15 5:45 PM	0.20	0.36	14,144	0.47	0.17	12 hr	Atlas 14	5,092
CSO148	2/21/15 2:15 PM	2/21/15 3:30 PM	0.05	1.17	2,737	1.27	0.45	24 hr	Atlas 14	3,202
CSO148	3/3/15 6:45 PM	3/4/15 3:00 PM	0.84	1.63	61,893	1.2	0.53	48 hr	Atlas 14	100,885
CSO148	3/10/15 6:45 AM	3/10/15 2:30 PM	0.32	1.20	134,709	2.83	0.55	12 hr	Atlas 14	161,651
CSO148	3/13/15 8:30 AM	3/14/15 4:45 AM	0.84	1.59	55,284	2.74	0.60	24 hr	Atlas 14	87,902
CSO148	3/26/15 4:15 AM	3/26/15 6:15 AM	0.08	0.46	44,706	0.58	0.20	3 hr	Atlas 14	20,565
CSO148 Count										**7**
CSO148 Total										**382,983**
CSO150	3/4/15 2:30 AM	3/4/15 7:30 AM	0.21	1.92	46,489	1.03	0.62	48 hr	Atlas 14	89,260
CSO150	3/10/15 10:30 AM	3/10/15 5:30 PM	0.29	1.15	316,379	3.06	0.52	12 hr	Atlas 14	363,835
CSO150	3/13/15 1:00 PM	3/14/15 7:00 AM	0.75	2.00	285,346	3.1	0.75	24 hr	Atlas 14	570,691
CSO150 Count										**3**
CSO150 Total										**1,023,786**
CSO151	1/3/15 11:30 AM	1/3/15 3:30 PM	0.17	0.33	1,911	0.19	0.12	24 hr	Atlas 14	630
CSO151	1/4/15 3:45 AM	1/4/15 4:45 AM	0.04	0.33	50,210	0.34	0.12	24 hr	Atlas 14	16,569
CSO151	2/1/15 12:45 PM	2/1/15 8:00 PM	0.30	0.37	287,876	0.53	0.17	12 hr	Atlas 14	106,514
CSO151	2/21/15 12:45 PM	2/21/15 8:45 PM	0.33	1.16	172,743	1.32	0.45	24 hr	Atlas 14	200,382
CSO151	3/3/15 7:00 PM	3/6/15 6:45 PM	2.49	1.62	1,968,277	1.71	0.53	24 hr	Atlas 14	3,188,609
CSO151	3/7/15 12:15 PM	3/8/15 7:15 PM	0.71	0.28	1,537,304	1.66	0.30	0.5 hr	Atlas 14	430,445
CSO151	3/10/15 5:30 AM	3/12/15 5:45 AM	2.01	1.20	1,604,882	2.82	0.55	12 hr	Atlas 14	1,925,859
CSO151	3/13/15 8:45 AM	3/16/15 11:15 PM	3.60	1.55	1,970,783	2.75	0.58	24 hr	Atlas 14	3,054,713
CSO151	3/19/15 7:15 PM	3/19/15 11:00 PM	0.16	0.17	163,566	1.72	0.07	6 hr	Atlas 14	27,806
CSO151	3/24/15 8:30 PM	3/24/15 8:45 PM	0.01	0.10	47,793	0.25	0.06	0.25 hr	Atlas 14	4,779
CSO151	3/26/15 4:45 AM	3/26/15 4:30 PM	0.49	0.42	410,359	0.69	0.17	12 hr	Atlas 14	172,351
CSO151 Count										**11**
CSO151 Total										**9,128,658**
CSO152	1/3/15 11:00 AM	1/3/15 11:15 AM	0.01	0.32	32,260	0.12	0.12	24 hr	Atlas 14	10,323
CSO152	1/4/15 3:45 AM	1/4/15 4:15 AM	0.02	0.32	72,024	0.33	0.12	24 hr	Atlas 14	23,048
CSO152	2/1/15 1:15 PM	2/1/15 6:15 PM	0.21	0.37	871,828	0.51	0.17	12 hr	Atlas 14	322,577
CSO152	2/21/15 1:45 PM	2/21/15 6:15 PM	0.19	1.21	613,276	1.39	0.47	24 hr	Atlas 14	742,064
CSO152	3/3/15 7:00 PM	3/4/15 6:15 PM	0.97	1.61	1,662,541	1.31	0.52	24 hr	Atlas 14	2,676,691
CSO152	3/7/15 2:15 PM	3/7/15 6:15 PM	0.17	0.28	608,337	1.65	0.30	0.5 hr	Atlas 14	170,334
CSO152	3/10/15 7:00 AM	3/10/15 7:15 PM	0.51	1.26	1,370,911	2.87	0.57	12 hr	Atlas 14	1,727,348
CSO152	3/13/15 9:00 AM	3/14/15 12:30 PM	1.15	1.67	913,052	2.93	0.63	24 hr	Atlas 14	1,524,797
CSO152	3/19/15 8:00 PM	3/19/15 8:15 PM	0.01	0.19	51,277	1.84	0.07	24 hr	Atlas 14	9,743

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CSO152	3/24/15 8:30 PM	3/24/15 8:30 PM	0.00	0.10	77,452	0.27	0.06	0.25 hr	Atlas 14	7,745
CSO152	3/26/15 4:45 AM	3/26/15 7:00 AM	0.09	0.42	607,351	0.57	0.17	12 hr	Atlas 14	255,088
CSO152 Count										**11**
CSO152 Total										**7,469,757**
CSO153	2/1/15 12:45 PM	2/1/15 2:30 PM	0.07	0.39	126,382	0.47	0.19	3 hr	Atlas 14	49,289
CSO153	2/21/15 2:45 PM	2/21/15 2:45 PM	0.00	1.24	1,751	1.44	0.48	24 hr	Atlas 14	2,171
CSO153	3/3/15 6:45 PM	3/4/15 3:00 PM	0.84	1.76	436,610	1.32	0.57	24 hr	Atlas 14	768,433
CSO153	3/7/15 2:15 PM	3/7/15 2:15 PM	0.00	0.04	215,501	1.82	0.04	0.5 hr	Atlas 14	8,620
CSO153	3/10/15 6:45 AM	3/10/15 1:45 PM	0.29	1.13	726,409	2.85	0.51	12 hr	Atlas 14	820,842
CSO153	3/13/15 9:45 AM	3/14/15 3:45 AM	0.75	1.81	446,967	2.88	0.68	24 hr	Atlas 14	809,009
CSO153	3/24/15 8:00 PM	3/24/15 8:00 PM	0.00	0.12	56,979	0.31	0.07	0.5 hr	Atlas 14	6,838
CSO153	3/26/15 4:15 AM	3/26/15 6:15 AM	0.08	0.48	268,156	0.63	0.19	3 hr	Atlas 14	128,715
CSO153 Count										**8**
CSO153 Total										**2,593,917**
CSO155	3/4/15 12:00 AM	3/4/15 5:00 AM	0.21	1.95	764	0.89	0.63	48 hr	Atlas 14	1,489
CSO155	3/10/15 11:00 AM	3/10/15 1:15 PM	0.09	1.11	11,772	2.97	0.50	12 hr	Atlas 14	13,066
CSO155	3/14/15 1:00 AM	3/14/15 3:45 AM	0.11	2.10	2,793	3.13	0.78	24 hr	Atlas 14	5,865
CSO155	3/26/15 4:15 AM	3/26/15 5:45 AM	0.06	0.61	9,234	0.74	0.28	3 hr	Atlas 14	5,633
CSO155 Count										**4**
CSO155 Total										**26,054**
CSO160	1/4/15 4:15 AM	1/4/15 4:15 AM	0.00	0.36	3,080	0.37	0.13	24 hr	Atlas 14	1,109
CSO160	1/29/15 5:30 AM	1/29/15 5:30 AM	0.00	0.05	8,321	0.26	0.03	3 hr	Atlas 14	416
CSO160	2/1/15 11:30 AM	2/1/15 7:15 PM	0.32	0.42	4,306	0.62	0.19	3 hr	Atlas 14	1,809
CSO160	2/21/15 5:00 AM	2/21/15 9:15 PM	0.68	1.30	6,204	1.61	0.50	12 hr	Atlas 14	8,066
CSO160	3/3/15 5:45 PM	3/4/15 5:45 PM	1.00	1.81	3,993	1.47	0.59	24 hr	Atlas 14	7,228
CSO160	3/10/15 5:15 AM	3/10/15 4:00 PM	0.45	1.22	7,407	3.03	0.55	12 hr	Atlas 14	9,037
CSO160	3/13/15 9:30 AM	3/14/15 10:00 AM	1.02	1.90	11,150	3.12	0.72	24 hr	Atlas 14	21,184
CSO160	3/19/15 7:00 PM	3/19/15 8:00 PM	0.04	0.20	3,739	2.09	0.08	12 hr	Atlas 14	748
CSO160	3/26/15 4:45 AM	3/26/15 4:45 AM	0.00	0.52	475	0.63	0.22	3 hr	Atlas 14	247
CSO160 Count										**9**
CSO160 Total										**49,843**
CSO161	1/3/15 11:00 AM	1/3/15 3:30 PM	0.19	0.36	14,815	0.24	0.13	24 hr	Atlas 14	5,334
CSO161	1/4/15 3:15 AM	1/4/15 4:00 AM	0.03	0.36	1,880	0.37	0.13	24 hr	Atlas 14	677
CSO161 Count										**2**
CSO161 Total										**6,010**
CSO166	3/3/15 11:30 PM	3/5/15 1:15 AM	1.07	1.67	3,441,194	1.65	0.54	48 hr	Atlas 14	5,746,793
CSO166	3/7/15 4:30 PM	3/7/15 4:45 PM	0.01	0.04	50,293	1.71	0.04	0.5 hr	Atlas 14	2,012

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CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO166	3/10/15 7:15 AM	3/11/15 10:30 AM	1.14	1.09	6,607,890	2.76	0.50	12 hr	Atlas 14	7,202,600
CSO166	3/13/15 10:30 AM	3/15/15 2:30 PM	2.17	1.55	10,883,783	2.64	0.58	24 hr	Atlas 14	16,869,864
CSO166	3/26/15 5:00 AM	3/26/15 5:30 AM	0.02	0.42	876,112	0.49	0.17	3 hr	Atlas 14	367,967
CSO166 Count										**5**
CSO166 Total										**30,189,236**
CSO167	1/3/15 11:00 AM	1/3/15 11:00 AM	0.00	0.38	2,478	0.11	0.14	24 hr	Atlas 14	942
CSO167	2/1/15 1:15 PM	2/1/15 1:45 PM	0.02	0.38	17,230	0.43	0.17	12 hr	Atlas 14	6,547
CSO167	2/21/15 2:45 PM	2/21/15 3:45 PM	0.04	1.09	4,634	1.27	0.42	12 hr	Atlas 14	5,051
CSO167	3/3/15 7:00 PM	3/4/15 8:30 PM	1.06	1.67	609,612	1.52	0.55	24 hr	Atlas 14	1,018,052
CSO167	3/10/15 6:15 AM	3/20/15 1:30 PM	10.30	1.06	6,333,407	4.51	0.48	12 hr	Atlas 14	6,713,412
CSO167	3/24/15 8:30 PM	3/24/15 8:30 PM	0.00	0.12	4,925	0.28	0.07	0.25 hr	Atlas 14	591
CSO167	3/26/15 4:30 AM	3/26/15 6:30 AM	0.08	0.40	270,493	0.55	0.17	12 hr	Atlas 14	108,197
CSO167 Count										**7**
CSO167 Total										**7,852,792**
CSO174	3/3/15 11:30 PM	3/4/15 5:15 AM	0.24	1.66	13,901	0.73	0.54	48 hr	Atlas 14	23,076
CSO174	3/10/15 10:45 AM	3/10/15 2:00 PM	0.14	1.31	627,970	2.94	0.59	12 hr	Atlas 14	822,641
CSO174	3/14/15 1:15 AM	3/14/15 4:00 AM	0.11	1.84	99,386	3.09	0.69	24 hr	Atlas 14	182,871
CSO174	3/26/15 4:30 AM	3/26/15 4:45 AM	0.01	0.42	143,595	0.49	0.17	12 hr	Atlas 14	60,310
CSO174 Count										**4**
CSO174 Total										**1,088,897**
CSO180	3/10/15 10:45 AM	3/10/15 1:15 PM	0.10	1.31	47,674	2.89	0.59	12 hr	Atlas 14	62,453
CSO180	3/14/15 1:00 AM	3/14/15 3:45 AM	0.11	1.84	3,439	3.08	0.69	24 hr	Atlas 14	6,328
CSO180	3/26/15 4:15 AM	3/26/15 4:15 AM	0.00	0.42	30,083	0.44	0.17	12 hr	Atlas 14	12,635
CSO180 Count										**3**
CSO180 Total										**81,415**
CSO181	3/10/15 12:45 PM	3/10/15 12:45 PM	0.00	1.34	139	2.89	0.61	12 hr	Atlas 14	186
CSO181	3/14/15 11:45 AM	3/18/15 5:00 PM	4.22	1.89	70,439	3.23	0.71	24 hr	Atlas 14	133,129
CSO181 Count										**2**
CSO181 Total										**133,315**
CSO182	1/3/15 10:45 AM	1/4/15 11:00 AM	1.01	0.30	2,082,534	0.31	0.11	24 hr	Atlas 14	624,760
CSO182	1/12/15 2:15 AM	1/12/15 3:30 AM	0.05	0.17	134,841	0.14	0.07	24 hr	Atlas 14	22,923
CSO182	2/1/15 1:00 PM	2/1/15 6:00 PM	0.21	0.37	62,405	0.5	0.17	12 hr	Atlas 14	23,090
CSO182	2/21/15 1:30 PM	2/21/15 5:45 PM	0.18	1.29	48,232	1.5	0.50	24 hr	Atlas 14	62,219
CSO182	3/3/15 7:15 PM	3/4/15 6:45 PM	0.98	1.62	150,342	1.33	0.53	48 hr	Atlas 14	243,553
CSO182	3/7/15 1:30 PM	3/7/15 5:45 PM	0.18	0.28	175,843	1.67	0.30	0.5 hr	Atlas 14	49,236
CSO182	3/10/15 7:00 AM	3/10/15 9:30 PM	0.60	1.37	158,173	2.99	0.62	12 hr	Atlas 14	216,697
CSO182	3/13/15 10:15 AM	3/14/15 3:30 PM	1.22	1.76	178,620	3.13	0.66	24 hr	Atlas 14	314,370

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CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO182	3/19/15 7:45 PM	3/19/15 8:15 PM	0.02	0.19	3,356	1.94	0.07	12 hr	Atlas 14	638
CSO182	3/24/15 8:30 PM	3/24/15 8:30 PM	0.00	0.09	1,392	0.26	0.05	0.5 hr	Atlas 14	125
CSO182	3/25/15 4:45 AM	3/25/15 4:45 AM	0.00	0.09	76	0.28	0.05	0.5 hr	Atlas 14	7
CSO182	3/26/15 5:15 AM	3/26/15 6:45 AM	0.06	0.43	63,411	0.56	0.18	12 hr	Atlas 14	27,267
CSO182	3/26/15 3:45 PM	3/26/15 4:00 PM	0.01	0.43	4,508	0.64	0.18	12 hr	Atlas 14	1,938
CSO182 Count										**13**
CSO182 Total										**1,586,824**
CSO184	1/24/15 8:00 AM	1/24/15 10:30 AM	0.10	Discharge		0.15	Snowmelt			30,730
CSO184	1/25/15 2:15 PM	1/25/15 2:15 PM	0.00	0.12	18,949	0.09	0.05	12 hr	Atlas 14	2,274
CSO184	1/26/15 3:30 AM	1/26/15 10:45 AM	0.30	0.12	85,382	0.19	0.05	12 hr	Atlas 14	10,246
CSO184	1/29/15 5:15 AM	1/29/15 11:30 AM	0.54	0.05	1,689,852	0.25	0.04	1 hr	Atlas 14	84,493
CSO184	2/19/15 8:15 AM	2/19/15 12:00 PM	0.16	Discharge		0.22	ater Main Bre			9,202
CSO184	3/10/15 12:00 PM	3/10/15 12:45 PM	0.03	1.27	12,110	2.76	0.58	12 hr	Atlas 14	15,380
CSO184	3/26/15 11:00 PM	3/26/15 11:00 PM	0.00	0.43	796	0.51	0.18	12 hr	Atlas 14	342
CSO184 Count										**7**
CSO184 Total										**152,667**
CSO185	1/3/15 3:00 PM	1/3/15 10:30 PM	0.31	0.34	36,386	0.29	0.13	0.25 hr	Atlas 14	12,371
CSO185	3/10/15 11:00 AM	3/10/15 1:30 PM	0.10	1.27	42,872	2.86	0.58	12 hr	Atlas 14	54,448
CSO185	3/14/15 3:45 AM	3/14/15 4:45 AM	0.04	1.70	2,667	2.91	0.64	24 hr	Atlas 14	4,534
CSO185	3/19/15 8:30 PM	3/20/15 11:30 AM	0.00	0.19	2,365	1.88	0.07	12 hr	Atlas 14	929
CSO185	3/26/15 4:30 AM	3/26/15 4:30 AM	0.00	0.43	23,587	0.47	0.18	12 hr	Atlas 14	10,143
CSO185 Count										**5**
CSO185 Total										**82,424**
CSO189	3/3/15 11:45 PM	3/4/15 6:00 PM	0.76	1.65	7,435,123	1.4	0.54	48 hr	Atlas 14	12,267,952
CSO189	3/7/15 5:00 AM	3/7/15 5:00 AM	0.00	Discharge		1.74	Snowmelt			60,058
CSO189	3/10/15 11:15 AM	3/10/15 6:00 PM	0.28	0.95	9,481,121	2.6	0.42	12 hr	Atlas 14	9,007,065
CSO189	3/13/15 10:45 AM	3/14/15 8:45 AM	0.92	1.91	6,815,379	2.81	0.72	24 hr	Atlas 14	13,017,373
CSO189	3/26/15 4:30 AM	3/26/15 6:45 AM	0.09	0.51	2,243,141	0.74	0.25	3 hr	Atlas 14	1,144,002
CSO189 Count										**5**
CSO189 Total										**35,496,450**
CSO193	3/4/15 2:15 AM	3/4/15 2:15 AM	0.00	1.79	413	0.51	0.58	48 hr	Atlas 14	739
CSO193	3/10/15 12:15 PM	3/10/15 12:30 PM	0.01	1.26	1,170	2.83	0.57	12 hr	Atlas 14	1,475
CSO193 Count										**2**
CSO193 Total										**2,214**
CSO196	3/10/15 11:00 AM	3/10/15 12:45 PM	0.07	1.30	13,986	2.86	0.59	12 hr	Atlas 14	18,182
CSO196	3/14/15 1:15 AM	3/14/15 3:45 AM	0.10	1.96	1,258	3.2	0.74	24 hr	Atlas 14	2,465
CSO196	3/26/15 4:30 AM	3/26/15 4:30 AM	0.00	0.49	1,445	0.5	0.20	12 hr	Atlas 14	708

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CSO196 Count										**3**
CSO196 Total										**21,355**
CSO199	1/15/15 8:00 PM	1/15/15 8:00 PM	0.00	0.01	927,974	0.17	0.01	0.25 hr	Atlas 14	9,280
CSO199	3/10/15 11:00 AM	3/10/15 12:45 PM	0.07	1.30	4,497	2.86	0.59	12 hr	Atlas 14	5,846
CSO199	3/14/15 1:15 AM	3/14/15 4:00 AM	0.11	1.96	836	3.2	0.74	24 hr	Atlas 14	1,638
CSO199	3/26/15 4:30 AM	3/26/15 4:30 AM	0.00	0.49	1,013	0.5	0.20	12 hr	Atlas 14	497
CSO199 Count										**4**
CSO199 Total										**17,260**
CSO200	3/10/15 10:45 AM	3/10/15 12:30 PM	0.07	1.30	4,262	2.8	0.59	12 hr	Atlas 14	5,541
CSO200	3/14/15 1:00 AM	3/14/15 1:00 AM	0.00	1.96	51	2.77	0.74	24 hr	Atlas 14	99
CSO200	3/26/15 4:15 AM	3/26/15 4:30 AM	0.01	0.49	640	0.5	0.20	12 hr	Atlas 14	314
CSO200 Count										**3**
CSO200 Total										**5,954**
CSO202	3/10/15 12:15 PM	3/10/15 12:15 PM	0.00	1.30	1,381	2.76	0.59	12 hr	Atlas 14	1,795
CSO202	3/26/15 4:15 AM	3/26/15 4:15 AM	0.00	0.49	1,345	0.45	0.20	12 hr	Atlas 14	659
CSO202 Count										**2**
CSO202 Total										**2,454**
CSO203	3/10/15 12:30 PM	3/10/15 12:30 PM	0.00	1.30	2,309	2.8	0.59	12 hr	Atlas 14	3,001
CSO203 Count										**1**
CSO203 Total										**3,001**
CSO205	3/10/15 12:30 PM	3/10/15 12:30 PM	0.00	1.37	116	2.78	0.62	12 hr	Atlas 14	158
CSO205 Count										**1**
CSO205 Total										**158**
CSO206	1/3/15 10:45 AM	1/3/15 11:00 AM	0.01	0.45	22,424	0.2	0.18	0.25 hr	Atlas 14	10,091
CSO206	1/4/15 3:30 AM	1/4/15 4:00 AM	0.02	0.45	32,336	0.46	0.18	0.25 hr	Atlas 14	14,551
CSO206	2/1/15 12:15 PM	2/1/15 6:00 PM	0.24	0.38	132,002	0.49	0.17	12 hr	Atlas 14	50,161
CSO206	2/21/15 1:30 PM	2/21/15 4:45 PM	0.14	1.08	59,565	1.18	0.42	24 hr	Atlas 14	64,330
CSO206	3/3/15 6:45 PM	3/4/15 5:00 PM	0.93	1.70	454,737	1.34	0.55	24 hr	Atlas 14	773,053
CSO206	3/7/15 2:30 PM	3/7/15 4:45 PM	0.09	0.04	1,369,828	1.74	0.04	0.5 hr	Atlas 14	54,793
CSO206	3/10/15 6:45 AM	3/10/15 3:15 PM	0.35	1.17	218,053	2.87	0.53	12 hr	Atlas 14	255,122
CSO206	3/13/15 8:30 AM	3/14/15 6:15 AM	0.91	1.55	316,288	2.69	0.58	24 hr	Atlas 14	490,247
CSO206	3/26/15 5:00 AM	3/26/15 6:30 AM	0.06	0.42	71,525	0.55	0.18	3 hr	Atlas 14	30,041
CSO206	3/26/15 3:30 PM	3/26/15 4:00 PM	0.02	0.42	33,436	0.63	0.18	3 hr	Atlas 14	14,043
CSO206 Count										**10**
CSO206 Total										**1,756,432**
CSO207	1/2/15 4:00 AM	1/2/15 3:30 PM	0.48	0.01	657,917	0.01	0.01	0.25 hr	Atlas 14	6,579
CSO207	1/2/15 11:45 PM	1/4/15 9:45 PM	1.92	0.36	212,882	0.37	0.13	24 hr	Atlas 14	76,638

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CSO207	1/11/15 5:00 PM	1/13/15 1:00 PM	1.83	0.16	470,465	0.17	0.06	24 hr	Atlas 14	75,274
CSO207	1/18/15 3:15 AM	1/18/15 1:45 PM	0.44	0.10	166,298	0.26	0.09	1 hr	Atlas 14	16,630
CSO207	1/25/15 1:00 PM	1/26/15 5:15 AM	0.68	0.16	316,247	0.22	0.07	12 hr	Atlas 14	50,599
CSO207	1/29/15 5:00 AM	1/29/15 2:00 PM	0.37	0.05	633,920	0.27	0.03	3 hr	Atlas 14	31,696
CSO207	2/1/15 11:15 AM	2/2/15 7:00 AM	0.82	0.42	106,495	0.63	0.19	3 hr	Atlas 14	44,728
CSO207	3/13/15 8:45 AM	3/14/15 10:45 PM	1.58	1.90	58,018	3.12	0.72	24 hr	Atlas 14	110,234
CSO207	3/19/15 8:00 AM	3/20/15 1:00 PM	1.21	0.20	214,821	2.1	0.08	12 hr	Atlas 14	42,964
CSO207	3/24/15 2:00 PM	3/25/15 6:00 AM	0.67	0.14	144,205	0.34	0.09	1 hr	Atlas 14	20,189
CSO207	3/26/15 4:00 AM	3/27/15 11:45 AM	1.32	0.52	50,758	0.86	0.22	3 hr	Atlas 14	26,394
CSO207	3/29/15 11:00 PM	3/30/15 2:30 AM	0.15	0.01	459,163	0.68	0.01	0.25 hr	Atlas 14	4,592
CSO207 Count										**12**
CSO207 Total										**506,517**
CSO208	1/3/15 5:45 AM	1/3/15 3:00 PM	0.39	0.40	967	0.25	0.15	24 hr	Atlas 14	387
CSO208	1/4/15 12:45 AM	1/4/15 3:45 AM	0.12	0.40	2,900	0.41	0.15	24 hr	Atlas 14	1,160
CSO208	1/18/15 3:00 AM	1/18/15 3:15 AM	0.01	0.07	5,921	0.24	0.06	0.25 hr	Atlas 14	414
CSO208	1/29/15 5:00 AM	1/29/15 5:00 AM	0.00	0.04	230	0.28	0.03	0.5 hr	Atlas 14	9
CSO208	2/1/15 11:00 AM	2/1/15 7:15 PM	0.34	0.41	41,011	0.61	0.19	12 hr	Atlas 14	16,814
CSO208	2/21/15 3:15 AM	2/21/15 7:15 PM	0.67	1.26	22,666	1.56	0.48	24 hr	Atlas 14	28,559
CSO208	3/3/15 6:15 PM	3/4/15 5:45 PM	0.98	1.88	30,172	1.54	0.61	48 hr	Atlas 14	56,724
CSO208	3/5/15 2:15 PM	3/5/15 6:15 PM	0.17	1.88	7,751	2.01	0.61	48 hr	Atlas 14	14,571
CSO208	3/10/15 4:45 AM	3/10/15 3:15 PM	0.44	1.16	23,579	3.03	0.52	12 hr	Atlas 14	27,352
CSO208	3/13/15 9:45 AM	3/14/15 4:00 AM	0.76	1.98	12,846	3.07	0.75	24 hr	Atlas 14	25,435
CSO208	3/24/15 7:45 PM	3/24/15 8:15 PM	0.02	0.15	14,073	0.31	0.09	1 hr	Atlas 14	2,111
CSO208	3/26/15 3:00 AM	3/26/15 6:00 AM	0.12	0.67	8,605	0.83	0.32	3 hr	Atlas 14	5,766
CSO208	3/26/15 3:00 PM	3/26/15 3:00 PM	0.00	0.67	19	0.91	0.32	3 hr	Atlas 14	13
CSO208 Count										**13**
CSO208 Total										**179,315**
CSO210	2/21/15 4:00 PM	2/21/15 6:00 PM	0.08	1.34	31,831	1.61	0.52	12 hr	Atlas 14	42,653
CSO210	3/4/15 12:00 AM	3/4/15 6:15 PM	0.76	1.71	834,119	1.46	0.55	48 hr	Atlas 14	1,426,343
CSO210	3/7/15 5:00 PM	3/7/15 5:00 PM	0.00	0.49	3,573	1.79	0.19	24 hr	Atlas 14	1,751
CSO210	3/10/15 9:30 AM	3/10/15 5:45 PM	0.34	1.09	914,616	2.8	0.49	12 hr	Atlas 14	996,932
CSO210	3/13/15 11:30 AM	3/14/15 7:00 AM	0.81	1.84	603,041	2.9	0.70	24 hr	Atlas 14	1,109,595
CSO210	3/26/15 5:30 AM	3/26/15 8:00 AM	0.10	0.52	164,052	0.66	0.24	3 hr	Atlas 14	85,307
CSO210 Count										**6**
CSO210 Total										**3,662,580**
CSO211	3/4/15 12:30 AM	3/4/15 4:30 PM	0.67	1.71	2,147,454	1.38	0.55	48 hr	Atlas 14	3,672,147
CSO211	3/10/15 11:00 AM	3/10/15 7:00 PM	0.33	1.09	7,660,045	2.79	0.49	12 hr	Atlas 14	8,349,449

DRAFT

There are known problems with some flow monitor locations that may be inflating actual overflow volumes (for example storm water flows).
MSD is currently working on a plan to fully identify and correct these issues.

CSO	Start Date-Time	End Date-Time	Duration (days)	Rain Total (in)	Volume per Inch	Antecedent Rain (in)	Frequency (Years)	Period	Standard	Total Volume (gal)
CSO211 Count										**2**
CSO211 Total										**12,021,598**

Appendix C – Acronyms

Appendix C – Acronyms for Project WIN Quarterly Report

AAM	Advanced Asset Management
AAOV	Annual Average Overflow Volume
ADAPS	Automated Data Processing System
BGC	Beargrass Creek
BMP	Best Management Practices
CCP	Composite Correction Plan
CD	Consent Decree
CMF	Central Maintenance Facility
CMMS	Computerized Maintenance Management System
CMOM	Capacity Management Operations and Maintenance
CPE	Comprehensive Performance Evaluations
CSO	Combined Sewer Overflow
CSS	Combined Sewer System
CSSA	Continuing Sewer System Assessment
DAP	Discharge Abetement Plan (DAP)
DMR	Discharge Monitoring Report
eB	Enterprise Bridge (Spescom scanning software for document management)
EMC	Event Mean Concentration
EPA	Environmental Protection Agency
ERP	Enforcement Response Plan
FM	Force Main
FOG	Fats, Oil & Grease
FPS	Flood Pump Station
FSE	Food Service Establishment
FY	Fiscal Year
GCE	Grease Control Equipment
GIS	Geographical Information System
GLPM	Gravity Line Preventive Maintenance
HMI	Human Machine Interface
I&FP	Infrastructure & Flood Protection (MSD Division)
ICA	Interceptor Condition Assessment
ID	Identification
I&I	Inflow and Infiltration
IMS	Information Management System
IOAP	Integrated Overflow Abatement Plan
ISSDP	Interim Sanitary Sewer Discharge Plan
IT	Information Technology
IWD	Industrial Waste Department
JCPS	Jefferson County Public Schools

KDEP	Kentucky Department of Environmental Protection
KPDES	Kentucky Pollutant Discharge Elimination System
KY	Kentucky
LE	Lateral Extension
LID	Low Impact Development
LIMS	Laboratory Information Management System
LTC	Long Term Control
LTCP	Long Term Control Plan
LOJIC	Louisville and Jefferson County Information Consortium
MDS	Main Diversion Structure
MEB	Main Equipment Building
MFWTP	Morris Forman Wastewater Treatment Plant
MG	Million Gallons
MGD	Million Gallons Per Day
MLK	Martin Luther King
MO	Metro Operations
MOA	Memorandum of Agreement
MOR	Monthly Operating Report
MOU	Memorandum of Understanding
MSD	Metropolitan Sewer District (Louisville and Jefferson County)
NDD	Non-Domestic Dischargers
NMC	Nine Minimum Controls
NPR	National Public Radio
ORSANCO	Ohio River Valley Water Sanitation Commission
PACP	Pipeline Assessment and Certification Program
PCM	Post Construction Monitoring
PI	Plant Information System
PM	Preventive Maintenance
POC	Pollutants of Concern
PP	Pumping Package
PS	Pump Station
PSC	Property Service Connection
RDII	Rainfall-Derived Infiltration and Inflow
RS	Regulatory Services
RTC	Real Time Control
SCADA	Supervisory Control And Data Acquisition
SCAP	System Capacity Assurance Plan
SIU	Significant Industrial User
SOP	Standard Operating Procedure
SORP	Sewer Overflow Response Protocol
SSDP	Sanitary Sewer Discharge Plan
SSES	Sanitary Sewer Evaluation Study

SSO	Sanitary Sewer Overflow
SSOP	Sanitary Sewer Overflow Plan
SWOR2	Southwestern Outfall Relief - Phase 2
SWPS	Southwestern Pump Station
TM	Technical Memorandum
TMDL	Total Maximum Daily Load
TV	Television
UIM	Utility Information Management
UK	University of Kentucky
USACE	US Army Corps of Engineers
USF&W	United States Fish and Wildlife
USGS	United States Geological Survey
WDR	Wastewater Discharge Regulators
WIN	Waterway Improvements Now
WQT	Water Quality Tool
WQTC	Water Quality Treatment Center
WW	Wet Weather
WWT	Wet Weather Team
WWTP	Wet Weather Treatment Facility

Appendix D – SCAP Balance

MSD
Metropolitan Sewer District

Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
CCREEK						
235533	CEDAR CK IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	6,521	6,521
236380	FAIRMOUNT ROAD MH REHAB	SCAPCREDIT		6/5/09	10,734	17,255
362688	CCRK IFP ACTIVITY NOV08-MAY12	SCAPCREDIT		5/1/12	2,161	19,416
362689	CCRK IFP ACTIVITY JUN12-AUG12	SCAPCREDIT		8/31/12	2,047	21,463
320989	LITTLE CEDAR CREEK I/I REHABIL	SCAPCREDIT		9/27/12	652,907	674,370
263934	ST JAMES CROSSINGS	LAT EXT	9,000	11/30/12	-19,575	654,795
196927	SONIC SPRINGS	LAT EXT	3,600	12/5/12	-7,830	646,965
14SC1000	FY13 IFP ACTIVITY FIRST HALF - CEDAR CREEK	SCAPCREDIT		12/31/13	2,048	649,013
13LE1155	RAISING CANE'S CEDARLOOK DRIVE	LAT EXT	1,175	5/23/14	-2,556	646,457
239030	POPLAR LAKES PH 1	LAT EXT	18,000	1/26/15	-39,150	607,307
FFORK						
235557	FLOYDSFRK IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	14,540	14,540
362638	FY09 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/08	1	14,541
362647	FY09 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/09	4	14,545
362651	FY10 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/09	524	15,069
230379	SHAKES RUN SECTION 4	LAT EXT	3,770	1/5/10	-8,200	6,869
362655	FY10 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/10	81	6,950
362661	FY11 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/10	14,155	21,105
362669	FY11 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/11	22,707	43,812
242480	CLAIBOURNE CROSSINGS PHASE 2	LAT EXT	0	10/17/11	0	43,812
359320	CALENDAR 2011 SUMP PUMP CREDIT	SCAPCREDIT		12/31/11	4,000	47,812
362674	FY12 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/11	2	47,814
362678	FY12 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/12	331	48,145

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
332823	SINGLE FAMILY HOME	LAT EXT	400	7/13/12	-870	47,275
315945	BROOKFIELD SEC 3	LAT EXT	12,800	10/26/12	-27,840	19,435
361689	LAKE FOREST REHAB PH1	SCAPCREDIT		12/18/12	174,769	194,204
362683	FY13 IFP ACTIVITY FIRST HALF - FFORK	SCAPCREDIT		12/31/12	3	194,207
331397	BROOKFIELD SEC 2A	LAT EXT	14,400	5/8/13	-31,320	162,887
13LE1062	SPEEDWAY #9451	LAT EXT	540	2/18/15	-1,175	161,713
HCREEK						
235561	HITE CK IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	6,404	6,404
362641	FY09 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/08	2	6,406
362648	FY09 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/09	8	6,414
362652	FY10 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/09	8	6,422
362657	FY10 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/10	329	6,751
295322	FLOYDSBURG RD I/I INVEST/REHAB	SCAPCREDIT		12/17/10	28,437	35,188
320906	FLOYDSBURG ROAD I/I REHABILITA	SCAPCREDIT		12/17/10	28,437	63,625
362662	FY11 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/10	3	63,628
362670	FY11 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/11	5	63,633
246638	CHAPMAN COURT S/S	LAT EXT	800	9/28/11	-1,740	61,893
362675	FY12 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/11	332	62,225
362679	FY12 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/12	5,002	67,227
290181	CAMDEN WOOD APARTMENTS	LAT EXT	12,400	8/31/12	-26,970	40,257
304536	MAGNOLIA SPRINGS EAST PRIV P/S	LAT EXT	9,500	12/1/12	-20,663	19,595
335610	ROCK SPRINGS FARM SEC 4B	LAT EXT	6,400	12/7/12	-13,920	5,675
362684	FY13 IFP ACTIVITY FIRST HALF - HCREEK	SCAPCREDIT		12/31/12	3	5,678
JTOWN						

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
235563	J-TOWN IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	6,203	6,203
359323	CALENDAR 2008 SUMP PUMP CREDIT	SCAPCREDIT		12/31/08	4,000	10,203
254871	LAKESIDE BAPT CHURCH PRIV PS	LAT EXT	2,500	8/10/10	-5,438	4,766
340213	JEFFERSONTOWN ENG REHAB	SCAPCREDIT		8/11/11	997,448	1,002,214
359324	CALENDAR 2011 SUMP PUMP CREDIT	SCAPCREDIT		12/31/11	4,000	1,006,214
337261	SINGLE FAMILY 2909 PELHAM CT	LAT EXT	400	5/28/13	-870	1,005,344
13LE1010	SWOPE HR & TRAINING BLDG	LAT EXT	400	6/28/13	-870	1,004,474
13LE1092	BALE EQUIPMENT	LAT EXT	450	10/25/13	-979	1,003,495
14SC1002	FY13 IFP ACTIVITY FIRST HALF - JEFFERSONTC	SCAPCREDIT		12/31/13	3,458	1,006,953
13LE1098	UNIPAK	LAT EXT	720	2/27/14	-1,566	1,005,387
LE924043	Bluegrass Indoor Carting	LAT EXT	400	5/1/14	-870	1,004,517
13LE1067	PARK COMMUNITY	LAT EXT	2,220	12/31/14	-4,829	999,688
MCREEK						
359380	CALENDAR 2005 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/05	12,000	12,000
359381	CALENDAR 2007 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/07	24,000	36,000
235568	MILL CK IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	51,530	87,530
359382	CALENDAR 2008 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/08	16,000	103,530
362642	FY09 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/08	93	103,623
362649	FY09 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/09	1,507	105,130
236614	DEVEROES	LAT EXT	960	9/9/09	-2,088	103,042
362653	FY10 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/09	25,272	128,314
359383	CALENDAR 2009 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/09	32,000	160,314
253586	KINGSFORD RETAIL CENTER	LAT EXT	480	1/6/10	-1,044	159,270
238421	6840 DIXIE HWY OUTLOT	LAT EXT	2,100	4/28/10	-4,568	154,703
362658	FY10 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/10	6,213	160,916

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Metropolitan Sewer District

Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
259408	FAMILY DOLLAR 5105 DIXIE	LAT EXT	1,200	7/2/10	-2,610	158,306
264294	SAINT PETER THE APOSTLE CATHOL	LAT EXT	2,000	7/23/10	-4,350	153,956
276215	FAMILY DOLLAR - KRISTIN WAY	LAT EXT	400	10/12/10	-870	153,086
362664	FY11 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/10	22,740	175,826
359384	CALENDAR 2010 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/10	4,000	179,826
359325	CALENDAR 2010 SUMP PUMP CREDIT	SCAPCREDIT		12/31/10	8,000	187,826
320916	SONNE AVE PS REHABILITATION -	SCAPCREDIT		6/30/11	120,800	308,626
362671	FY11 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/11	11,615	320,241
299399	FAMILY DOLLAR - GREENWOOD RD	LAT EXT	800	10/4/11	-1,740	318,501
309018	PRP PERFORMING ARTS ADDITION	LAT EXT	1,134	11/9/11	-2,466	316,034
359385	CALENDAR 2011 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/11	12,000	328,034
362676	FY12 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/11	3,245	331,279
359326	CALENDAR 2011 SUMP PUMP CREDIT	SCAPCREDIT		12/31/11	12,000	343,279
318096	CRACKER BARREL OLD COUNTRY	LAT EXT	6,000	1/19/12	-13,050	330,229
262545	DIXIE MANOR SHOPPING CENTER	LAT EXT	965	5/21/12	-2,099	328,130
300374	FORT KNOX FEDERAL CREDIT UNION	LAT EXT	400	6/26/12	-870	327,260
362680	FY12 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/12	2,807	330,067
361693	FY12 MILL CREEK REHAB	SCAPCREDIT		6/30/12	81,675	411,742
231800	PIONEER MOBILE HOME PARK	LAT EXT	11,200	7/24/12	-24,360	387,382
237457	WAVERLY HILLS	LAT EXT	400	9/18/12	-870	386,512
341883	NHK SPRING PRECISION	LAT EXT	17,800	10/19/12	-38,715	347,797
334997	BEECHLAND BAPTIST CHURCH	LAT EXT	2,715	12/5/12	-5,905	341,892
359327	CALENDAR 2012 SUMP PUMP CREDIT	SCAPCREDIT		12/31/12	148,000	489,892
362685	FY13 IFP ACTIVITY FIRST HALF - MCREEK	SCAPCREDIT		12/31/12	3,458	493,350
359386	CALENDAR 2012 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/12	4,000	497,350
343763	SOUTHEAST CHRISTIAN CHURCH SW	LAT EXT	6,000	1/18/13	-13,050	484,300

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
224875	ASHBY GREEN APARTMENT HOMES	LAT EXT	36,400	3/20/13	-79,170	405,130
265944	RIVERPORT PHASE 4A - MICHELIN	LAT EXT	400	6/6/13	-870	404,260
314887	DAYTON FREIGHT	LAT EXT	1,200	9/10/13	-2,610	401,650
13LE1014	LOUISVILLE FREE PUBLIC LIBRARY SOUTHWES	LAT EXT	8,200	9/26/13	-17,835	383,815
357140	FAMILY DOLLAR CANE RUN ROAD	LAT EXT	832	10/3/13	-1,810	382,005
13LE1171	SINGLE FAMILY HOME 3700 ROMANIA DR	LAT EXT	400	1/29/14	-870	381,135
MFORK						
359400	CALENDAR 2007 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/07	84,000	84,000
359328	CALENDAR 2007 SUMP PUMP CREDIT	SCAPCREDIT		12/31/07	20,000	104,000
235566	MID FORK IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	43,779	147,779
359329	CALENDAR 2008 SUMP PUMP CREDIT	SCAPCREDIT		12/31/08	8,000	155,779
236517	ANCHOR ESTATES MH REHAB	SCAPCREDIT		1/16/09	15,552	171,331
217235	SINKING FORK ICA PHASE I REHAB	SCAPCREDIT		3/30/09	437,967	609,298
235376	MIDDLE FORK INT REHAB PH1	SCAPCREDIT		5/15/09	487,744	1,097,042
179246	SHADY GLEN OF LYNDON PERSONAL	LAT EXT	-500	5/26/09	1,088	1,098,130
250572	1316 WITAWANGA AVE	LAT EXT	400	11/4/09	-870	1,097,260
359331	CALENDAR 2009 SUMP PUMP CREDIT	SCAPCREDIT		12/31/09	24,000	1,121,260
359401	CALENDAR 2009 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/09	4,000	1,125,260
197432	ALMOST HOME KENNELS - ALL PET	LAT EXT	3,700	3/16/10	-8,048	1,117,212
260064	OXMOOR GOLF FRONT 9	LAT EXT	400	4/15/10	-870	1,116,342
260065	OXMOOR GOLF BACK 9	LAT EXT	400	4/15/10	-870	1,115,472
229834	THE BROOK HOS- DUPONT ADDITION	LAT EXT	1,763	4/27/10	-3,835	1,111,637
265723	Z-XPRESS CAR WASH	LAT EXT	5,449	7/2/10	-11,852	1,099,786
255793	HERR LANE APARTMENTS - 4 PLEX	LAT EXT	1,200	7/14/10	-2,610	1,097,176
255792	HERR LANE APARTMENTS - 8 PLEX	LAT EXT	2,400	7/14/10	-5,220	1,091,956

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Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
274303	FARM CREDIT SERVICES	LAT EXT	525	9/9/10	-1,142	1,090,814
278015	METROPOLITAN UROLOGY	LAT EXT	400	12/15/10	-870	1,089,944
359402	CALENDAR 2010 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/10	8,000	1,097,944
359333	CALENDAR 2010 SUMP PUMP CREDIT	SCAPCREDIT		12/31/10	12,000	1,109,944
285637	SHELBYHURST OFFICE BUILDING 1	LAT EXT	6,600	1/20/11	-14,355	1,095,589
313465	DORSEY POINTE/CODOMINIUMS 8-13	LAT EXT	2,400	1/27/11	-5,220	1,090,369
291263	BROWNS LANE BUILDING	LAT EXT	400	4/14/11	-870	1,089,499
293400	FOUR PLEX APARTMENTS	LAT EXT	1,200	6/14/11	-2,610	1,086,889
330019	FY11 ANCHOR ESTATES REHAB	SCAPCREDIT		8/11/11	1,359	1,088,248
310046	EL NAPEL - MCMAHAN CENTER	LAT EXT	3,100	10/31/11	-6,743	1,081,506
314591	CHOCOLATE MARTINI BAR/REST	LAT EXT	3,275	11/29/11	-7,123	1,074,382
320983	HURSTBOURNE I/I INVESTIGATION	SCAPCREDIT		12/27/11	1,408,279	2,482,661
359335	CALENDAR 2011 SUMP PUMP CREDIT	SCAPCREDIT		12/31/11	16,000	2,498,661
321228	SINGLE FAMILY UNIT	LAT EXT	400	2/15/12	-870	2,497,791
321647	SINGLE FAMILY	LAT EXT	400	3/27/12	-870	2,496,921
328074	SINGLE FAMILY-703 FOUNTAIN AVE	LAT EXT	400	6/22/12	-870	2,496,051
193195	CEDAR LAKE LODGE WASHBURN	LAT EXT	1,900	8/20/12	-4,133	2,491,919
320923	ST MATTHEWS I/I REHABILITATION	SCAPCREDIT		8/23/12	20,841	2,512,760
337796	CHAMPPS	LAT EXT	635	9/5/12	-1,381	2,511,379
347126	ADVANCE PRODUCTION SYSTEMS	LAT EXT	400	12/28/12	-870	2,510,509
359336	CALENDAR 2012 SUMP PUMP CREDIT	SCAPCREDIT		12/31/12	92,000	2,602,509
339367	BAPTIST RADIATION ONCOLOGY	LAT EXT	1,500	1/4/13	-3,263	2,599,246
340778	PANDA RESTAURANT	LAT EXT	1,725	1/16/13	-3,752	2,595,494
349044	BLAIRWOOD POOL ADDITION	LAT EXT	400	1/29/13	-870	2,594,624
328659	SINGLE FAMILY HOME - 6911 AMBR	LAT EXT	400	2/4/13	-870	2,593,754
352805	POOL HOUSE 9213 REIGATE COURT	LAT EXT	200	2/20/13	-435	2,593,319

MSD
Metropolitan Sewer District

Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
14LE1001	MIRANDA LAGRANGE RD	LAT EXT	400	3/19/13	-870	2,592,449
350246	SINGLE FAMILY - 218 BLISS AVE	LAT EXT	400	3/20/13	-870	2,591,579
349974	SINGLE FAMILY 205 N WATTERSON	LAT EXT	400	3/26/13	-870	2,590,709
342433	SHELBYHURST 700 OFFICE BLDG	LAT EXT	7,500	4/15/13	-16,313	2,574,397
350340	JARED THE GALLERY OF JEWELRY	LAT EXT	770	4/16/13	-1,675	2,572,722
13LE1009	Single family 11716 Wetherby Ave	LAT EXT	400	6/7/13	-870	2,571,852
13SC1000	FY14 STARVIEW REHABILITATION	SCAPCREDIT		6/30/13	14,183	2,586,035
13LE1001	Single Family 835 Fountain Ave	LAT EXT	400	8/28/13	-870	2,585,165
355162	PROPOSED RESTAURANT	LAT EXT	7,540	9/10/13	-16,400	2,568,766
13LE1045	SINGLE FAMILY 8325 WHIPPS MILL RD	LAT EXT	400	9/30/13	-870	2,567,896
319292	WATERMARK ON HURSTBOURNE	LAT EXT	71,600	10/22/13	-155,730	2,412,166
331542	DENTAL/MEDICAL OFFICE BLDG	LAT EXT	400	10/28/13	-870	2,411,296
13LE1128	SINGLE FAMILY HOME 1327 ETAWAH AVE	LAT EXT	400	11/5/13	-870	2,410,426
13LE1144	SINGLE FAMILY 1329 ETAWAH AVE	LAT EXT	400	11/5/13	-870	2,409,556
13LE1165	SINGLE FAMILY 8504 LORE LANE	LAT EXT	400	11/25/13	-870	2,408,686
13LE1146	CITY OF ST MATTHEWS COMMUNITY CTR PARI	LAT EXT	1,500	11/26/13	-3,263	2,405,423
13LE1099	NICKLIES - ST MATTHEWS	LAT EXT	1,920	12/11/13	-4,176	2,401,247
353963	DORSEY COMMONS TRACTS 1.2.3	LAT EXT	4,335	12/18/13	-9,429	2,391,819
14SC1003	FY13 IFP ACTIVITY FIRST HALF - MIDDLE FORK	SCAPCREDIT		12/31/13	3,230	2,395,049
352026	MCMAHAN PLAZA PHASE II BLDG B	LAT EXT	766	12/31/13	-1,666	2,393,382
13LE1117	THE VININGS	LAT EXT	850	4/10/14	-1,849	2,391,534
14LE1021	KODA KENTUCKY ORGAN DONOR AFFILIATES	LAT EXT	400	6/18/14	-870	2,390,664
14LE1128	WALDORF SCHOOL OF LOUISVILLE	LAT EXT	400	6/30/14	-870	2,389,794
NDITCH						
359404	CALENDAR 2007 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/07	28,000	28,000

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
235569	N.DITCH IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	11,147	39,147
236363	NORTHERN DITCH INT REHAB PH1	SCAPCREDIT		11/25/08	108,760	147,907
359339	CALENDAR 2009 SUMP PUMP CREDIT	SCAPCREDIT		12/31/09	4,000	151,907
234678	THE LIGHTHOUSE PROMISE COMPLEX	LAT EXT	2,825	3/5/10	-6,144	145,763
284728	SUBWAY - NEW CUT RD	LAT EXT	1,314	12/21/10	-2,858	142,905
359340	CALENDAR 2010 SUMP PUMP CREDIT	SCAPCREDIT		12/31/10	4,000	146,905
320908	PARKVIEW ESTATES REHABILITATIO	SCAPCREDIT		6/28/11	36	146,941
312810	WILLOW PLACE APT COMMUNITY CEN	LAT EXT	400	11/11/11	-870	146,071
359341	CALENDAR 2011 SUMP PUMP CREDIT	SCAPCREDIT		12/31/11	24,000	170,071
359405	CALENDAR 2011 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/11	12,000	182,071
315723	JCPS EARLY CHILDHOOD DEVELOP	LAT EXT	6,000	1/26/12	-13,050	169,021
312057	DOLLAR GENERAL - MEDALLION CT	LAT EXT	400	3/21/12	-870	168,151
312659	KROGER L-350 FUEL STATION	LAT EXT	400	8/20/12	-870	167,281
359343	CALENDAR 2012 SUMP PUMP CREDIT	SCAPCREDIT		12/31/12	24,000	191,281
13LE1147	CARLON ROOFING	LAT EXT	992	12/5/13	-2,158	189,123
13LE1126	JENNINGS CROSSING TRACT 3	LAT EXT	2,100	12/12/13	-4,568	184,556
14SC1004	FY13 IFP ACTIVITY FIRST HALF - NORTHERN DI	SCAPCREDIT		12/31/13	329	184,885
ORFM						
359433	CALENDAR 2007 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/07	56,000	56,000
359344	CALENDAR 2007 SUMP PUMP CREDIT	SCAPCREDIT		12/31/07	4,000	60,000
235572	ORFM IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	19,826	79,826
362643	FY09 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/08	2	79,828
362650	FY09 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/09	3,836	83,664
362654	FY10 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/09	7,322	90,986
263548	SINGLE FAMILY CONNECTION	LAT EXT	400	5/18/10	-870	90,116

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Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
213488	NORTHEAST CHRISTIAN CHURCH	LAT EXT	10,000	6/28/10	-21,750	68,366
362660	FY10 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/10	6,630	74,996
362665	FY11 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/10	165	75,161
362672	FY11 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/11	4,124	79,285
280837	SPRINGHURST TOWNE CTR LOT C	LAT EXT	400	9/20/11	-870	78,415
320920	SHADOW WOOD I/I REHABILITATION	SCAPCREDIT		9/30/11	14,279	92,694
311412	SPRINGHURST CHEVROLET	LAT EXT	855	10/14/11	-1,860	90,834
359345	CALENDAR 2011 SUMP PUMP CREDIT	SCAPCREDIT		12/31/11	16,000	106,834
359434	CALENDAR 2011 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/11	16,000	122,834
362677	FY12 IFP ACTIVITY FIRST HALF	SCAPCREDIT		12/31/11	7,258	130,092
320921	DERINGTON COURT I/I REHABILITA	SCAPCREDIT		3/1/12	56,208	186,300
187028	GLENVIEW PARK SUBD SECTION 1	LAT EXT	4,400	3/5/12	-9,570	176,730
213450	GLENVIEW PARK SUB. SEC 2	LAT EXT	5,600	3/5/12	-12,180	164,550
322455	FIRST LADY NAILS	LAT EXT	400	3/12/12	-870	163,680
362681	FY12 IFP ACTIVITY SECOND HALF	SCAPCREDIT		6/30/12	18,220	181,900
292239	SPRINGHURST RESTAURANT/ RETAIL	LAT EXT	3,440	7/5/12	-7,482	174,418
323821	TIRE DISCOUNTERS WESTPORT RD	LAT EXT	400	12/11/12	-870	173,548
363238	FY13 PROSPECT MANHOLE REHAB	SCAPCREDIT		12/18/12	72,703	246,251
341319	RAISING CANES RETAIL CENTER	LAT EXT	1,225	12/18/12	-2,664	243,587
359346	CALENDAR 2012 SUMP PUMP CREDIT	SCAPCREDIT		12/31/12	24,000	267,587
363235	FY13 MUDDY FORK MH REHAB	SCAPCREDIT		12/31/12	41,653	309,240
362686	FY13 IFP ACTIVITY FIRST HALF - ORFM	SCAPCREDIT		12/31/12	1,148	310,388
360262	SINGLE FAMILY 3419 HILLVALE RD	LAT EXT	400	5/13/13	-870	309,518
343729	RETAIL & RESTAURANT	LAT EXT	3,500	6/21/13	-7,613	301,906
334154	GLENVIEW PARK SUBD SEC 4	LAT EXT	3,600	11/7/13	-7,830	294,076
13LE1024	Overlook at Beech Spring Farm Sec 4	LAT EXT	5,600	12/31/13	-12,180	281,896

Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
199896	SPRINGDALE OFFICE BUILDING	LAT EXT	4,210	3/11/14	-9,157	272,739
225863	SPRING FARM LAKES SEC 1	LAT EXT	4,800	5/16/14	-10,440	262,299
177756	SUMMIT GARDENS PHASE 1	LAT EXT	32,000	9/22/14	-69,600	192,699
14LE1121	Riverside Sewer Extension	LAT EXT	1,200	11/10/14	-2,610	190,089
13LE1071	SPRING FARM LAKE SEC 2	LAT EXT	6,000	1/16/15	-13,050	177,039
352634	BAUER PROPERTY	LAT EXT	2,920	2/12/15	-6,351	170,688
PCREEK						
235574	POND CRK IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	71,782	71,782
359347	CALENDAR 2008 SUMP PUMP CREDIT	SCAPCREDIT		12/31/08	4,000	75,782
359438	CALENDAR 2008 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/08	4,000	79,782
359439	CALENDAR 2009 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/09	12,000	91,782
359348	CALENDAR 2009 SUMP PUMP CREDIT	SCAPCREDIT		12/31/09	4,000	95,782
192513	BANNON CROSSINGS SECTION 3A-1	LAT EXT	800	2/17/10	-1,740	94,042
261115	EMERGENCY RESTORATION	LAT EXT	400	4/27/10	-870	93,172
276977	DADISMAN BUILDERS-POPLAR TREE	LAT EXT	400	10/13/10	-870	92,302
266833	THORNTONS @ PRESTON HWY	LAT EXT	400	12/1/10	-870	91,432
280751	NOTTINGTON HILLS SEC 1	LAT EXT	4,400	12/29/10	-9,570	81,862
359350	CALENDAR 2010 SUMP PUMP CREDIT	SCAPCREDIT		12/31/10	12,000	93,862
187739	GLENGARRY INDUSTRIAL PARK	LAT EXT	4,300	1/13/11	-9,353	84,510
277777	TIRE DISCOUNTERS - BOERSTE WAY	LAT EXT	2,960	3/21/11	-6,438	78,072
304408	UPS SUPPLY CHAIN SOLUTIONS #7	LAT EXT	2,250	9/14/11	-4,894	73,178
320918	EDSEL I/I REHABILITATION - FY1	SCAPCREDIT		9/27/11	106,700	179,878
313444	PLANET FITNESS - JEFF BLVD	LAT EXT	1,600	11/4/11	-3,480	176,398
312391	LONGHORN STEAKHOUSE RESTAURANT	LAT EXT	4,840	11/29/11	-10,527	165,871
320919	LANTANA I/I REHABILITATION - F	SCAPCREDIT		12/29/11	5,000	170,871

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Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
359351	CALENDAR 2011 SUMP PUMP CREDIT	SCAPCREDIT		12/31/11	20,000	190,871
310845	ZAXBY'S RESTAURANT	LAT EXT	3,750	2/28/12	-8,156	182,715
255044	ISA-RECYCLING CENTER	LAT EXT	400	3/13/12	-870	181,845
312814	MILLER TRANSPORTATION	LAT EXT	1,800	3/19/12	-3,915	177,930
324554	NORTONS TEMPORARY OFFICE	LAT EXT	900	4/16/12	-1,958	175,972
234102	ETHOS AT VALLEY FARM SR LIVING	LAT EXT	7,050	6/19/12	-15,334	160,638
322367	SHEPHERDS CARE MEMORY HOME	LAT EXT	2,000	6/21/12	-4,350	156,288
307332	LOUISVILLE INDUSTRIAL BLDG B	LAT EXT	2,520	8/6/12	-5,481	150,807
279860	BANNON CROSSINGS SEC 3B-2	LAT EXT	9,600	8/10/12	-20,880	129,927
312053	DOLLAR GENERAL - CLEARWATER FA	LAT EXT	400	8/13/12	-870	129,057
343455	SINGLE FAMILY 1812 GREYLING DR	LAT EXT	400	10/12/12	-870	128,187
243109	OVERBROOK APARTMENTS	LAT EXT	41,200	11/9/12	-89,610	38,577
359354	CALENDAR 2012 SUMP PUMP CREDIT	SCAPCREDIT		12/31/12	56,000	94,577
329624	COPART	LAT EXT	400	2/20/13	-870	93,707
346082	ZAXBYS	LAT EXT	2,065	5/2/13	-4,491	89,216
320924	LEA ANN WAY INTERCEPTOR I&I RE	SCAPCREDIT		6/30/13	1,017,423	1,106,639
335385	HARRISON LOW PRESSURE S/S	LAT EXT	1,600	7/2/13	-3,480	1,103,159
320940	4 RESIDENCE SFU 7821 MANSLICK	LAT EXT	400	8/16/13	-870	1,102,289
361336	RENAISSANCE SOUTH BUSINESS	LAT EXT	540	9/6/13	-1,175	1,101,114
324886	PNC BANK	LAT EXT	400	9/6/13	-870	1,100,244
13LE1083	SINGLE FAMILY HOME 5402 (H) E MANSLICK RD	LAT EXT	400	9/26/13	-870	1,099,374
353125	PEGASUS TRANSPORTATION	LAT EXT	250	12/9/13	-544	1,098,831
341439	PRESTON GARDENS APTS	LAT EXT	22,200	12/10/13	-48,285	1,050,546
308206	APPLEGATE FARMS	LAT EXT	57,200	12/10/13	-124,410	926,136
14SC1005	FY13 IFP ACTIVITY FIRST HALF - POND CREEK	SCAPCREDIT		12/31/13	21,344	947,480
13LE1179	TIMBERBEND SUBDIVISION SEC 5B	LAT EXT	6,400	2/14/14	-13,920	933,560

Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
13LE1035	RENAISSANCE SOUTH BUSINESS PARK TRACT	LAT EXT	5,415	4/10/14	-11,778	921,782
13LE1115	VERIZON-OUTER LOOP	LAT EXT	400	4/22/14	-870	920,912
348014	ASHTON PARK TOWN HOMES	LAT EXT	9,000	4/24/14	-19,575	901,337
280180	LOUISVILLE INDUSTRIAL CTR F	LAT EXT	2,480	5/16/14	-5,394	895,943
14LE1085	Williams Properties - Self Storage Facility	LAT EXT	400	5/28/14	-870	895,073
13LE1034	6300 GEIL LANE WAREHOUSE	LAT EXT	720	6/9/14	-1,566	893,507
284215	HURSTBOURNE POINTE APTS	LAT EXT	9,600	7/7/14	-20,880	872,627
344230	AUSTIN PARK APARTMENTS PH6	LAT EXT	27,600	8/25/14	-60,030	812,597
13LE1105	JEFFERSON COMMONS	LAT EXT	17,075	11/13/14	-37,138	775,459
13LE1017	APEX ON PRESTON APT HOMES(Formally CITYS	LAT EXT	84,400	1/13/15	-183,570	591,889
SEDIV						
359355	CALENDAR 2007 SUMP PUMP CREDIT	SCAPCREDIT		12/31/07	8,000	8,000
359440	CALENDAR 2007 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/07	128,000	136,000
235575	SE DIV IFP WORK AUG05-NOV08	SCAPCREDIT		11/1/08	71,472	207,472
236214	GOLDSMITH BUECHB ICA PHI REHAB	SCAPCREDIT		12/22/08	314,808	522,280
236296	BEARGRASS INT REHAB PH1 SEDIV	SCAPCREDIT		12/22/08	122,688	644,968
359441	CALENDAR 2008 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/08	16,000	660,968
359356	CALENDAR 2008 SUMP PUMP CREDIT	SCAPCREDIT		12/31/08	4,000	664,968
229854	TINY HANDS DAYCARE	LAT EXT	1,225	10/20/09	-2,664	662,304
359357	CALENDAR 2009 SUMP PUMP CREDIT	SCAPCREDIT		12/31/09	12,000	674,304
359443	CALENDAR 2009 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/09	8,000	682,304
235291	SULLIVAN COLLEGE OF TECHNOLOGY	LAT EXT	900	2/11/10	-1,958	680,346
238328	LOUISVILLE COLLEGIATE SPORTS	LAT EXT	400	3/1/10	-870	679,476
241759	FRISCHS BIG BOY RESTAURANT	LAT EXT	2,400	3/5/10	-5,220	674,256
257275	LOUISVILLE JUNIOR ACADEMY	LAT EXT	520	4/16/10	-1,131	673,125

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Capacity Credit Balance Sheet per Credit Basin

APNO	APNAME	APTYPE	FLOW	Release Date	Approved Credit Required/ Flow Reduction	Running Total
320993	BEARGRASS CREEK PHASE II - FY1	SCAPCREDIT		12/14/10	10,368	683,493
359358	CALENDAR 2010 SUMP PUMP CREDIT	SCAPCREDIT		12/31/10	4,000	687,493
359444	CALENDAR 2010 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/10	24,000	711,493
286513	GARDINER POINT RESIDENCE HALL	LAT EXT	10,800	2/16/11	-23,490	688,003
276378	TIRE DISCOUNTERS - BARDSTOWN	LAT EXT	1,500	5/6/11	-3,263	684,741
287888	BEVERAGE WAREHOUSE	LAT EXT	1,180	5/30/11	-2,567	682,174
296295	KEN TOWERY -3800 S HURSTBOURNE	LAT EXT	400	7/1/11	-870	681,304
359445	CALENDAR 2011 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/11	8,000	689,304
359359	CALENDAR 2011 SUMP PUMP CREDIT	SCAPCREDIT		12/31/11	64,000	753,304
307018	HOOK PROPERTY FAMILY DOLLAR	LAT EXT	400	8/10/12	-870	752,434
359361	CALENDAR 2012 SUMP PUMP CREDIT	SCAPCREDIT		12/31/12	68,000	820,434
359446	CALENDAR 2012 DOWNSPOUT CREDIT	SCAPCREDIT		12/31/12	4,000	824,434
187741	BROOKSTONE SENIOR APARTMENTS	LAT EXT	16,800	3/11/13	-36,540	787,894
232601	RAINTREE/MARIAN CT P/S ELIM	LAT EXT	105,800	6/14/13	-230,115	557,779
330437	COLLEGIATE ATHLETIC FIELD	LAT EXT	800	11/26/13	-1,740	556,039
14SC1006	FY13 IFP ACTIVITY FIRST HALF - SE DIVERSION	SCAPCREDIT		12/31/13	20,623	576,662

Appendix E – IOAP Project Crosswalk

Appendix E
IOAP Project Crosswalk

Project Name	PROGRAM	ASSET ID	PROJECT ID
Avanti PS Elimination	IOAP	21229-W	S_PO_WC_PC07_M_01_A
Sinking Fork Relief Sewer	ISSDP	21103	SFRS
Sinking Fork Relief Sewer	ISSDP	63319	SFRS
Sinking Fork Relief Sewer	ISSDP	25012	SFRS
Beargrass Interceptor Rehab Ph. 2	IOAP	51594	S_SD_MF_NB06_S_13_C
Floydsburg Rd. I/I Investigation & Rehabilitation	IOAP	108958	S_HC_HC_MSD1086_M_07_C_A
Floydsburg Rd. I/I Investigation & Rehabilitation	IOAP	108956	S_HC_HC_MSD1086_M_07_C_A
Floydsburg Rd. I/I Investigation & Rehabilitation	IOAP	MSD1086-PS	S_HC_HC_MSD1086_M_07_C_A
Floydsburg Rd. I/I Investigation & Rehabilitation	IOAP	90776	S_HC_HC_MSD1086_M_07_C_A
Floydsburg Rd. I/I Investigation & Rehabilitation	IOAP	108957	S_HC_HC_MSD1086_M_07_C_A
Floydsburg Rd. I/I Investigation & Rehabilitation	IOAP	108953	S_HC_HC_MSD1086_M_07_C_A
Running Fox PS Elimination	IOAP	MSD1080-LS	S_CC_CC_MSD1080_S_01_C
Beechwood Village Sanitary Sewer Replacement	ISSDP	21153	BVSSR
Beechwood Village Sanitary Sewer Replacement	ISSDP	21101	BVSSR
Beechwood Village Sanitary Sewer Replacement	ISSDP	21156	BVSSR
Beechwood Village Sanitary Sewer Replacement	ISSDP	21061	BVSSR
Hazelwood PS I/I Investigation & Rehabilitation	IOAP	55667	S_MC_MF_55665_S_07_C
Hazelwood PS I/I Investigation & Rehabilitation	IOAP	55665	S_MC_MF_55665_S_07_C
Parkview Estates I/I Investigation & Rehabilitation	IOAP	47250	S_SD_MF_NB03_S_07_C
Sonne PS I/I Investigation & Rehabilitation	IOAP	MSD0042-PS	S_OR_MF_42007_S_07_C
Woodland Hills PS Diversion	IOAP	33003	S_FF_FF_NB01_S_01_C_A
Anchor Estates- Anchor Ests PS 1 & 2 PS Eliminations	IOAP	0057-W	S_MI_MF_NB06_M_01_A_A - 1
Northern Ditch Diversion Interceptor	ISSDP	MSD0271	NDDI
Edsel PS I/I Investigation & Rehabilitation	IOAP	MSD1048-PS	S_PO_WC_PC11_M_07_C
Edsel PS I/I Investigation & Rehabilitation	IOAP	94009	S_PO_WC_PC11_M_07_C
Edsel PS I/I Investigation & Rehabilitation	IOAP	92098	S_PO_WC_PC11_M_07_C
Edsel PS I/I Investigation & Rehabilitation	IOAP	92099	S_PO_WC_PC11_M_07_C
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	13946	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	44396	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	66349	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	51301	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	36763	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	8717	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	44397	S_SF_MF_30917_M_09_A

Appendix E
IOAP Project Crosswalk

Project Name	PROGRAM	ASSET ID	PROJECT ID
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	13931	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	99259	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	104223	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	13943	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements 3 - Sewer Replacement & Sewer Rehabilitation	IOAP	104231	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	44397	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	104223	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	104231	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	13946	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	13931	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	66349	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	51301	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	99259	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	36763	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	13943	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	44396	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 1 - SSES	IOAP	8717	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	13943	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	13931	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	66349	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	8717	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	13946	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	99259	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	51301	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	36763	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	104223	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	104231	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	44397	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 2 - Sewer Replacement and Rehabilitation	IOAP	44396	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	44397	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	51301	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	99259	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	13943	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	8717	S_SF_MF_30917_M_09_A

Appendix E
IOAP Project Crosswalk

Project Name	PROGRAM	ASSET ID	PROJECT ID
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	13946	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	13931	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	44396	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	104223	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	36763	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	66349	S_SF_MF_30917_M_09_A
Camp Taylor System Improvements Phase 4 - Storage Basin and Sewer Upsize	IOAP	104231	S_SF_MF_30917_M_09_A
Hurstbourne I/I Investigation & Rehabilitation	IOAP	67535	S_MI_MF_NB07_S_07_C
Hurstbourne I/I Investigation & Rehabilitation	IOAP	47650	S_MI_MF_NB07_S_07_C
Hurstbourne I/I Investigation & Rehabilitation	IOAP	47656	S_MI_MF_NB07_S_07_C
Hurstbourne I/I Investigation & Rehabilitation	IOAP	1793	S_MI_MF_NB07_S_07_C
Lantana PS #1 I/I Investigation and Rehabilitation	IOAP	25484	S_PO_WC_PC05_M_07_C
Lantana PS #1 I/I Investigation and Rehabilitation	IOAP	MSD0101-PS	S_PO_WC_PC05_M_07_C
Lantana PS #1 I/I Investigation and Rehabilitation	IOAP	93719	S_PO_WC_PC05_M_07_C
Derington Ct. PS I/I Investigation & Rehabilitation	IOAP	MSD0095-PS	S_OR_MF_NB03_S_07_C
Derington Ct. PS I/I Investigation & Rehabilitation	IOAP	20155	S_OR_MF_NB03_S_07_C
Southeastern Diversion Structure and Interceptor	ISSDP	72571-X	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	30704	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	30702	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	63779	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	8426	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	8427	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	8431	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	49647	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	8430	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	18654	SDSI
Southeastern Diversion Structure and Interceptor	ISSDP	30701	SDSI
Derek R. Guthrie WQTC Wet Weather Facility	ISSDP	MSD0277	DRGWQTC
Derek R. Guthrie WQTC Wet Weather Facility	ISSDP	32688	DRGWQTC
Derek R. Guthrie WQTC Wet Weather Facility	ISSDP	59169	DRGWQTC
Derek R. Guthrie WQTC Wet Weather Facility	ISSDP	22307	DRGWQTC
Derek R. Guthrie WQTC Wet Weather Facility	ISSDP	22385	DRGWQTC
Derek R. Guthrie WQTC Wet Weather Facility	ISSDP	22370	DRGWQTC
Derek R. Guthrie WQTC Wet Weather Facility	ISSDP	32682	DRGWQTC

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Project Name	PROGRAM	ASSET ID	PROJECT ID
Hikes Lane Interceptor and Highgate Springs	ISSDP	18370	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18434	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	30681	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	MSD0012-PS	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	49673	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	49236	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18483	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	49224	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18134	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18471	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18318-W	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18505	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18595	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	73111	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	49672	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	17571	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18302	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18297	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	18299	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	30680	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	48886	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	48888	HLIHSPS
Hikes Lane Interceptor and Highgate Springs	ISSDP	48885	HLIHSPS
Lake Forest PS SSO Investigation	IOAP	MSD1169-LS	S_FF_LF_NB01_S_13_C_A
Meadow Stream Pump Station & Force Main Upgrade	IOAP	MSD1082-PS	S_HC_HC_MSD1082_S_09A_C
Meadow Stream Pump Station & Force Main Upgrade	IOAP	91087	S_HC_HC_MSD1082_S_09A_C
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	41374	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	MSD0007-PS	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	MSD0024-PS	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	26752	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	MSD0023-PS	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	MSD0010-PS	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	24472	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	MSD0006-PS	S_OR_MF_NB01_M_01_B

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Project Name	PROGRAM	ASSET ID	PROJECT ID
Mellwood System Improvements & PS Elimination - Mellwood PS and FM Improvements	IOAP	24152-W	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	MSD0007-PS	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	24472	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	41374	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	26752	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	MSD0023-PS	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	MSD0024-PS	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	24152-W	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	MSD0010-PS	S_OR_MF_NB01_M_01_B
Mellwood System Improvements & PS Elimination - Winton and Mockingbird Valley Elimination	IOAP	MSD0006-PS	S_OR_MF_NB01_M_01_B
Anchor Estates PS Elimination 1 - Vannah PS Elimination	IOAP	MSD0057-LS	S_MI_MF_NB06_M_01_A_A - 2
Anchor Estates PS Elimination 1 - Vannah PS Elimination	IOAP	00056-W	S_MI_MF_NB06_M_01_A_A - 2
Anchor Estates PS Elimination 1 - Vannah PS Elimination	IOAP	817	S_MI_MF_NB06_M_01_A_A - 2
Anchor Estates PS Elimination 1 - Vannah PS Elimination	IOAP	0057-W	S_MI_MF_NB06_M_01_A_A - 2
Anchor Estates PS Elimination 1 - Vannah PS Elimination	IOAP	746	S_MI_MF_NB06_M_01_A_A - 2
Anchor Estates PS Elimination 1 - Vannah PS Elimination	IOAP	1106	S_MI_MF_NB06_M_01_A_A - 2
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	47583	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	47604	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	47603	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	2933	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	2935	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	8537	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	72289	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	30376	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	45796	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	115183	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	84155	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	23211	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	40559	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	51160	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	51180	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	47582	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	47034	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	72288	S_MISF_MF_NB01_M_01_C_A1

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Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	115184	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	115185	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	08935-SM	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	45835	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	51161	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	IS021A-SI	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	23212	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	47593	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	27005	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	15194	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	2932	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	27007	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 1- Buechel Basin	IOAP	90700	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	47583	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	115184	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	45796	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	47582	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	72289	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	40559	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	23211	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	27007	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	08935-SM	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	15194	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	IS021A-SI	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	51180	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	2933	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	51161	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	51160	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	47604	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	115185	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	23212	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	47603	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	27005	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	2935	S_MISF_MF_NB01_M_01_C_A1

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Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	8537	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	90700	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	2932	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	47034	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	72288	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	47593	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	30376	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	84155	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	115183	S_MISF_MF_NB01_M_01_C_A1
Middle Fork Relief Interceptor, Wet Weather Storage, and UMFLS Diversion 2 - PS Diversion and	IOAP	45835	S_MISF_MF_NB01_M_01_C_A1
Fairway View PS Improvements	IOAP	MSD1065-PS	S_HC_HS_NB01_S_03_C_A
Riding Ridge PS Improvements	IOAP	MSD1060-LS	S_HC_HN_NB01_S_03_C_A
Shively Interceptor	IOAP	MSD0047-PS	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	4498	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	MSD0049-PS	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	4542	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	81814-W	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	MSD0016-PS	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	MSD0044-PS	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	MSD0048-PS	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	MSD0050-PS	S_MC_WC_NB01_M_01_A
Shively Interceptor	IOAP	MSD0043-PS	S_MC_WC_NB01_M_01_A
Chenoweth Hills WQTC Elimination & PS Improvements	IOAP	92061	S_JT_JT_NB01A_M_03_C
Chenoweth Hills WQTC Elimination & PS Improvements	IOAP	86052	S_JT_JT_NB01A_M_03_C
Chenoweth Hills WQTC Elimination & PS Improvements	IOAP	MSD0263	S_JT_JT_NB01A_M_03_C
Chenoweth Hills WQTC Elimination & PS Improvements	IOAP	MSD1043-PS	S_JT_JT_NB01A_M_03_C
Chenoweth Hills WQTC Elimination & PS Improvements	IOAP	MSD0196-PS	S_JT_JT_NB01A_M_03_C
Chenoweth Hills WQTC Elimination & PS Improvements	IOAP	64096	S_JT_JT_NB01A_M_03_C
Chenoweth Hills WQTC Elimination & PS Improvements	IOAP	MSD0263A-PS	S_JT_JT_NB01A_M_03_C
Fairmount Road Pump Station Off-Line Storage	IOAP	81316	S_FF_CC_81316_M_03_C_A
Fairmount Road Pump Station Off-Line Storage	IOAP	97362	S_FF_CC_81316_M_03_C_A
Jeffersontown WQTC Elimination	IOAP	28391	S_JT_JT_NB01_M_01_C_A
Jeffersontown WQTC Elimination	IOAP	64505	S_JT_JT_NB01_M_01_C_A
Jeffersontown WQTC Elimination	IOAP	28392	S_JT_JT_NB01_M_01_C_A

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Jeffersontown WQTC Elimination	IOAP	28395	S_JT_JT_NB01_M_01_C_A
Jeffersontown WQTC Elimination	IOAP	IS028-SI	S_JT_JT_NB01_M_01_C_A
Jeffersontown WQTC Elimination	IOAP	31733	S_JT_JT_NB01_M_01_C_A
Jeffersontown WQTC Elimination	IOAP	28551	S_JT_JT_NB01_M_01_C_A
Jeffersontown WQTC Elimination	IOAP	MSD0255	S_JT_JT_NB01_M_01_C_A
Jeffersontown WQTC Elimination	IOAP	28173	S_JT_JT_NB01_M_01_C_A
Klondike Interceptor	IOAP	26651	S_SD_MF_NB04_S_01_B_A
Klondike Interceptor	IOAP	26650	S_SD_MF_NB04_S_01_B_A
Klondike Interceptor	IOAP	20644	S_SD_MF_NB04_S_01_B_A
Klondike Interceptor	IOAP	66232	S_SD_MF_NB04_S_01_B_A
Klondike Interceptor	IOAP	49513	S_SD_MF_NB04_S_01_B_A
Klondike Interceptor	IOAP	25676	S_SD_MF_NB04_S_01_B_A
Lea Ann Way System Improvements	IOAP	MSD1200-PS	S_PO_WC_PC08_M_01_C
Lea Ann Way System Improvements	IOAP	29933	S_PO_WC_PC08_M_01_C
Lea Ann Way System Improvements	IOAP	31074	S_PO_WC_PC08_M_01_C
Lea Ann Way System Improvements	IOAP	31073	S_PO_WC_PC08_M_01_C
Lea Ann Way System Improvements	IOAP	57874	S_PO_WC_PC08_M_01_C
Lea Ann Way System Improvements	IOAP	29948	S_PO_WC_PC08_M_01_C
Lea Ann Way System Improvements	IOAP	MSD1010-PS	S_PO_WC_PC08_M_01_C
Prospect #1 - WQTC Eliminations	IOAP	MSD0192-PS	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	MSD1063-PS	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	MSD0123-PS	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	MSD0193-PS	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	40870	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	MSD1044-PS	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	MSD0183-PS	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	22436	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	40872	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	40871	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	65635	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	42680	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	89791	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	89646	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	40879	S_OR_MF_NB04_M_03_B_B

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Prospect #1 - WQTC Eliminations	IOAP	42675	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	40880	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	MSD0186-PS	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	65633	S_OR_MF_NB04_M_03_B_B
Prospect #1 - WQTC Eliminations	IOAP	65623	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	40870	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	89791	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	65623	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	MSD0123-PS	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	MSD1044-PS	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	89646	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	40879	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	40880	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	MSD0186-PS	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	MSD1063-PS	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	MSD0192-PS	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	MSD0183-PS	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	65633	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	22436	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	42675	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	40872	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	65635	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	MSD0193-PS	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	40871	S_OR_MF_NB04_M_03_B_B
Prospect #2 - Harrods Creek PS and FM	IOAP	42680	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	40871	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	65635	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	22436	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	89646	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	40879	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	40880	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	MSD0193-PS	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	MSD0183-PS	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	MSD1063-PS	S_OR_MF_NB04_M_03_B_B

Appendix E
IOAP Project Crosswalk

Project Name	PROGRAM	ASSET ID	PROJECT ID
Prospect #3 - ORFM System Improvemetns	IOAP	MSD0192-PS	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	42675	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	40872	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	65633	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	MSD1044-PS	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	MSD0186-PS	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	MSD0123-PS	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	40870	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	65623	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	42680	S_OR_MF_NB04_M_03_B_B
Prospect #3 - ORFM System Improvemetns	IOAP	89791	S_OR_MF_NB04_M_03_B_B
Anchor Estates PS Elimination 2 - Anchor Estates #1 and #2 PS Elimination	IOAP	1106	S_MI_MF_NB06_M_01_A_A - 1
Anchor Estates PS Elimination 2 - Anchor Estates #1 and #2 PS Elimination	IOAP	MSD0057-LS	S_MI_MF_NB06_M_01_A_A - 1
Anchor Estates PS Elimination 2 - Anchor Estates #1 and #2 PS Elimination	IOAP	817	S_MI_MF_NB06_M_01_A_A - 1
Anchor Estates PS Elimination 2 - Anchor Estates #1 and #2 PS Elimination	IOAP	00056-W	S_MI_MF_NB06_M_01_A_A - 1
Anchor Estates PS Elimination 2 - Anchor Estates #1 and #2 PS Elimination	IOAP	746	S_MI_MF_NB06_M_01_A_A - 1
Caven Ave Pump Station Elimination	IOAP	70212	S_PO_WC_PC09_M_09B_C
Caven Ave Pump Station Elimination	IOAP	61667	S_PO_WC_PC09_M_09B_C
Caven Ave Pump Station Elimination	IOAP	MSD0133-PS	S_PO_WC_PC09_M_09B_C
Caven Ave Pump Station Elimination	IOAP	17724	S_PO_WC_PC09_M_09B_C
Caven Ave Pump Station Elimination	IOAP	61687	S_PO_WC_PC09_M_09B_C
Caven Ave Pump Station Elimination	IOAP	27116	S_PO_WC_PC09_M_09B_C
Ashburton PS Improvements & Diversion	IOAP	MSD0165-PS	S_FF_FF_NB03_M_01_C_A
Bardstown Rd. PS Improvements	IOAP	88545	S_CC_CC_MSD1025_S_03_B
East Rockford PS Relocation	IOAP	04699-W	S_MC_WC_NB02_S_03_C
Fox Harbor Inline Storage	IOAP	62769	S_HC_HN_NB03_S_09A_A_A
Gunpowder PS Inline Storage	IOAP	MSD1055-LS	S_HC_HN_NB02_S_09A_C_B
Lucas Lane PS Inline Storage	IOAP	MSD0199-LS	S_FF_BT_NB01_S_09A_C_A
Raintree and Marian Ct 1 - PS Elimination	IOAP	28395A	S_JT_JT_NB03_M_01_C
Raintree and Marian Ct 1 - PS Elimination	IOAP	28719	S_JT_JT_NB03_M_01_C
Raintree and Marian Ct 1 - PS Elimination	IOAP	28729-W	S_JT_JT_NB03_M_01_C
Raintree and Marian Ct 1 - PS Elimination	IOAP	MSD0149-PS	S_JT_JT_NB03_M_01_C
Raintree and Marian Ct 2 - Pipe Upgrades	IOAP	MSD0149-PS	S_JT_JT_NB03_M_01_C
Raintree and Marian Ct 2 - Pipe Upgrades	IOAP	28395A	S_JT_JT_NB03_M_01_C

Appendix E
IOAP Project Crosswalk

Project Name	PROGRAM	ASSET ID	PROJECT ID
Raintree and Marian Ct 2 - Pipe Upgrades	IOAP	28719	S_JT_JT_NB03_M_01_C
Raintree and Marian Ct 2 - Pipe Upgrades	IOAP	28729-W	S_JT_JT_NB03_M_01_C
St. Rene Rd. PS Inline Storage	IOAP	94187	S_FF_CH_NB01_S_09A_C_A
Charleswood Interceptor Extension	IOAP	25480	S_PO_WC_PC03_M_01_C
Charleswood Interceptor Extension	IOAP	25479	S_PO_WC_PC03_M_01_C
Charleswood Interceptor Extension	IOAP	25477	S_PO_WC_PC03_M_01_C
Charleswood Interceptor Extension	IOAP	MSD0130-PS	S_PO_WC_PC03_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28415	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	98564	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28250	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	99649	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28416	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28340	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	104289	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28414	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28417	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28413	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28249	S_JT_JT_NB02_M_01_C
Dell Rd and Charlane Pkwy Interceptor Improvements	IOAP	28336	S_JT_JT_NB02_M_01_C
Leven PS Elimination	IOAP	36419	S_PO_WC_PC10_M_01_C
Monticello PS Elimination	IOAP	27969	S_JT_JT_NB04_M_01_A
Monticello PS Elimination	IOAP	MSD0151-PS	S_JT_JT_NB04_M_01_A
Cinderella PS Elimination	IOAP	MSD1013-PS	S_PO_WC_PC04_M_01_C
Cinderella PS Elimination	IOAP	60679	S_PO_WC_PC04_M_01_C
Cinderella PS Elimination	IOAP	35309	S_PO_WC_PC04_M_01_C
Idlewood Inline Storage	IOAP	63094	S_CC_CC_70158_M_09A_C
Idlewood Inline Storage	IOAP	63095	S_CC_CC_70158_M_09A_C
Idlewood Inline Storage	IOAP	70158	S_CC_CC_70158_M_09A_C
Idlewood Inline Storage	IOAP	28984	S_CC_CC_70158_M_09A_C
Idlewood Inline Storage	IOAP	28998	S_CC_CC_70158_M_09A_C
Sutherland Interceptor	IOAP	16649	S_SD_MF_NB05_M_01_A
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	43472	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	MSD1024-PS	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	105936	S_MI_MF_NB04_M_03_B

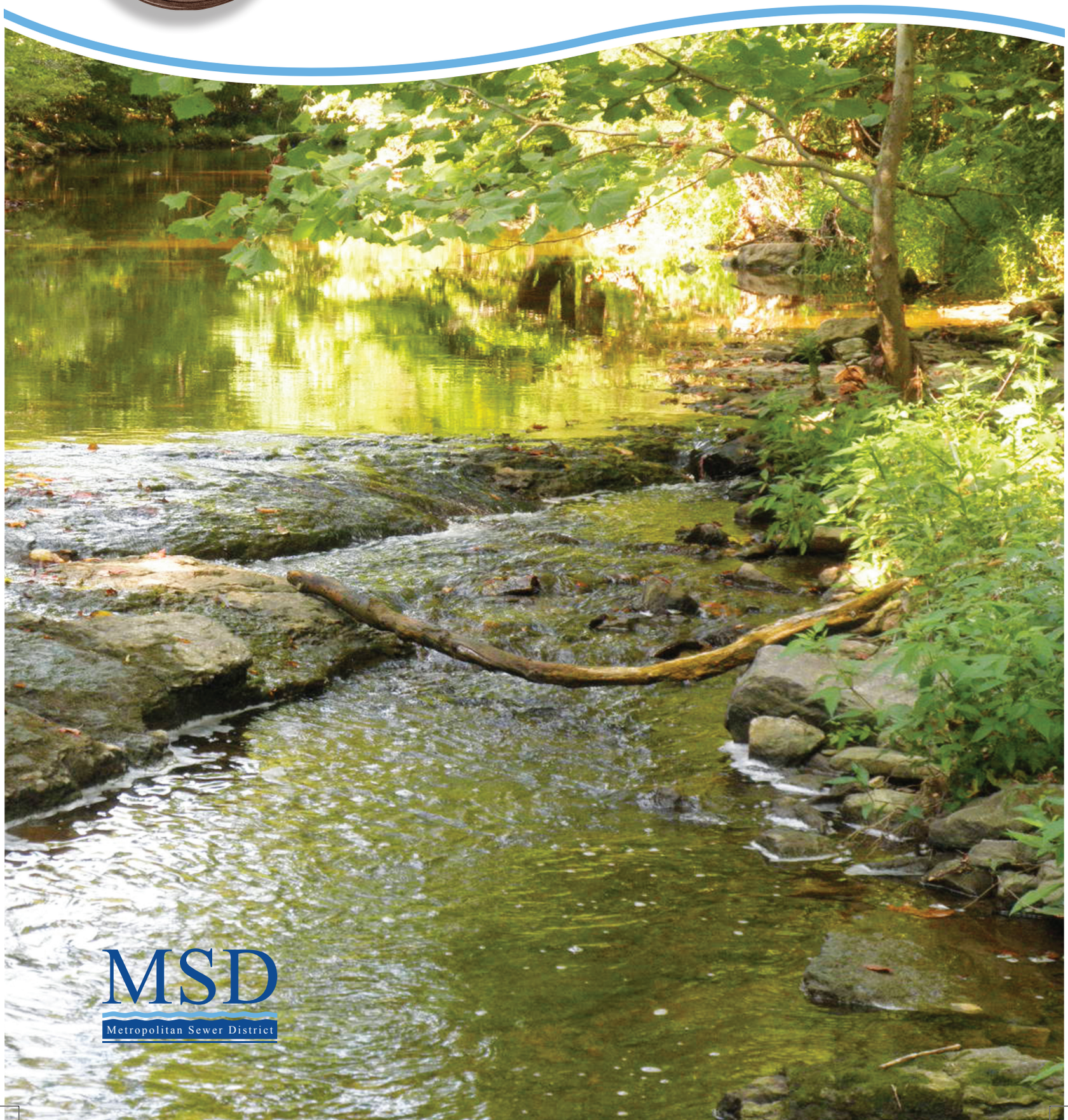
Appendix E
IOAP Project Crosswalk

Project Name	PROGRAM	ASSET ID	PROJECT ID
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	62418	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	62420	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	21628-W	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	91630	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	46891	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 1 - Devondale Wet Weather Storage	IOAP	91629	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	62420	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	91629	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	46891	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	MSD1024-PS	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	62418	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	43472	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	91630	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	105936	S_MI_MF_NB04_M_03_B
Goose Creek PS Improvements & Wet Weather Storage 2 - PS and FM Upgrades	IOAP	21628-W	S_MI_MF_NB04_M_03_B
Government Center PS Elimination	IOAP	94541	S_PO_WC_PC06_M_01_C
Government Center PS Elimination	IOAP	MSD0180-PS	S_PO_WC_PC06_M_01_C
Government Center PS Elimination	IOAP	94542	S_PO_WC_PC06_M_01_C
Kavanaugh Rd. PS Improvements	IOAP	MSD1085-PS	S_HC_HC_MSD1085_S_03_A
Little Cedar Creek Interceptor Improvements	IOAP	67997	S_CC_CC_67997_M_01_C
Little Cedar Creek Interceptor Improvements	IOAP	89197	S_CC_CC_67997_M_01_C
Little Cedar Creek Interceptor Improvements	IOAP	89196	S_CC_CC_67997_M_01_C
Little Cedar Creek Interceptor Improvements	IOAP	86423	S_CC_CC_67997_M_01_C
Little Cedar Creek Interceptor Improvements	IOAP	89195	S_CC_CC_67997_M_01_C
Little Cedar Creek Interceptor Improvements	IOAP	86424	S_CC_CC_67997_M_01_C
Eden Care PS SSO Investigation	IOAP	MSD1105-PS	S_FF_FF_NB02_S_13_C
Leland Road SSO Investigation	IOAP	96020	S_OR_MF_NB02_S_13_C

Appendix F – 2014 Water Quality Synthesis Report

State of the Streams

2014 Water Quality Synthesis Report



MSD

Metropolitan Sewer District

To Our Community

As we share the progress of the past few years and our future plans in this report, MSD is continuing along a path of providing clean, safe waterways for our community. Our 2014 Water Quality Synthesis Report is the culmination of more than 15 years assessing the water quality of our local streams and the Ohio River.

In partnership, MSD and the U.S. Geological Survey collect physical, chemical and biological data from 27 locations along our waterways—known as the Long-Term Monitoring Network. This data is collected by permanent sampling devices which record stream flow, dissolved oxygen and water temperature. Teams of biologists collect samples of algae, fish and aquatic insects at these 27 sites every two years between May and October. Additionally, the teams collect water samples before, during and after significant rain events in the warmer months.

The most recent data reveal:

- The Middle and South Forks of Beargrass Creek continue to have a rating of "poor."
- Northern Ditch, in the Okolona area, shows significant improvement for fish and aquatic insects.
- Bacteria is an ongoing concern with most of the watersheds.
- Harrods Creek, Floyds Fork, Brier Creek and Cedar Creek in Bullitt County—which are less developed watersheds—in general support better aquatic communities.

MSD has made a great deal of progress with decreasing sewer overflows into our waterways and remains ahead of the national curve, but there is more work to be done. The Clean Water Act—passed in 1972—contains aggressive water quality standards for cities like Louisville. MSD entered into a Consent Decree in 2005 with the Kentucky Division of Water, the U.S. Environmental Protection Agency (EPA)-Region 4 and the U.S. Department of Justice to satisfy Clean Water Act requirements.

The Consent Decree requires MSD to minimize combined sewer overflows and eliminate sanitary sewer overflows, while rehabilitating our community's aging sewer system. The program is on schedule and within budget to meet these goals by 2024.

MSD is committed to setting a national standard for best practices in offering Louisville Metro exceptional wastewater, drainage and flood protection services. I invite you to join with us in making Louisville Metro a better place for all. The community and environment benefit when we all join together to do our part.

Sincerely,

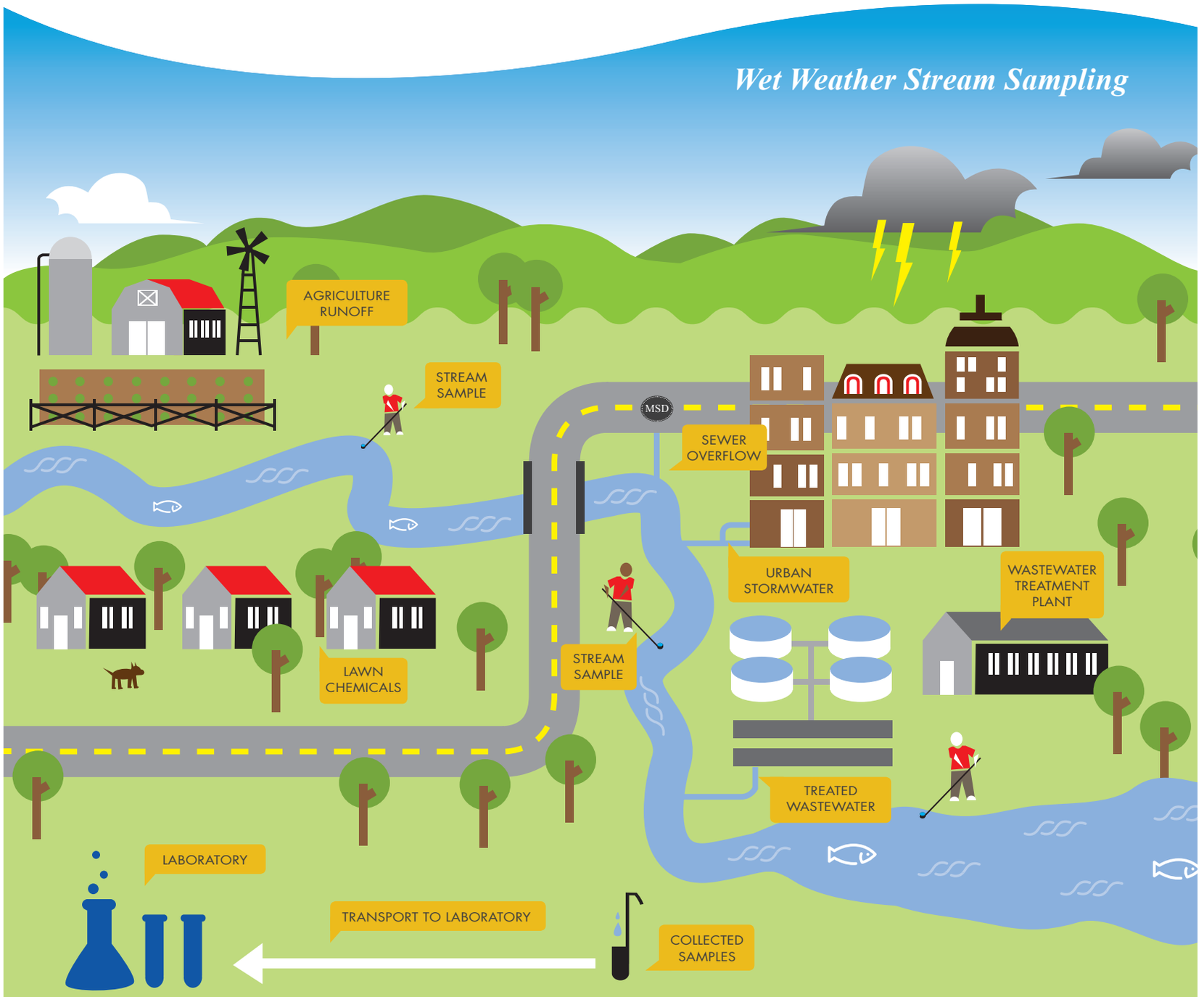
Greg C. Heitzman

Greg C. Heitzman
Executive Director

MSD
Metropolitan Sewer District

This 2014 Water Quality Synthesis Report provides a snapshot of the streams in our community – how they're doing and whether or not they're improving. The data we collect will help us make decisions about where we should focus our attention and tell us how we are doing in our mission to improve water quality in the region.

On the cover: *Big Run, just South of Glenmary Subdivision in Southeastern Jefferson County*



State of the Streams

2014 Water Quality Synthesis Report

Executive Summary

The Louisville and Jefferson County Metropolitan Sewer District (MSD), in cooperation with the United States Geological Survey (USGS), operates a Long-Term Monitoring Network (LTMN) to collect physical, chemical and biological data about streams in the Metro Area. MSD collects the water quality and biological data and USGS collects stream flow. This Synthesis Report is focused on the conditions of fish, aquatic insects, algae, stream habitat, bacteria, nutrients (nitrogen and phosphorus compounds), total suspended solids, trace metals, stream flow, dissolved oxygen, and water temperature of the streams in our community, and whether or not these things are improving. We've been collecting data at 27 Long Term Monitoring Network sites since 1999. This information will help us make decisions about where to focus our attention, and tell us how we're doing in our mission to improve water quality in the region.

The health of aquatic communities (fish, insects and algae) in streams can be compromised by one or more factors associated with urban streams:

- overflows from sewer systems
- significant and rapid runoff from impervious (hard surfaced) areas
- stream bank erosion due to increases in runoff
- sediment that covers habitat needed by fish and aquatic insects
- channel modifications such as straightening and shoring up with concrete or stones
- lack of rocks and boulders that create cascades and ponding areas
- insufficient vegetation along the banks
- periods of very low flow, high temperatures, or low dissolved oxygen

We can't control some of these factors - like low flows due to dry spells or high temperatures. Making improvements related to other factors will require numerous projects over several years, and we're committed to a program that should help. There are also things that individuals can do on private property, like minimizing the use of lawn chemicals, not mowing up to the banks of streams, or not cutting trees on the banks. We'll review these things throughout the report, and we'll look at how our major watersheds are doing with detailed sections in the report.

The charts on the next page reflect analyses of data as far back as 1999. They tell us that in 2013 for fish, algae and stream habitat, more than half the sites were in "good to excellent" condition, whereas for aquatic insects most sites were classified "poor to fair." The cooler than normal stream temperatures during 2013 sampling likely resulted in lower than normal observed aquatic insect health. Trends in fish, aquatic insects and stream habitat health indicate that more than half of the sites were improving. The algal communities at most sites either had no trend or were declining.

Biologist using a D-frame dip net to sample aquatic insects in a stream riffle.

We're also looking at other things like bacteria, nutrients and trace metals that can affect water quality. We found that:

- 20 of the 27 Long-Term Monitoring Network sites had fecal coliform readings that averaged more than the recreational contact standard of 200 colonies per 100 milliliters. From 2000 to 2013, 18 of the sites' average readings were above the recreational contact standard, so this is a concern for us.
- Oxygen is a necessary element for all forms of life, including fish and other aquatic life forms. Only one site had a "poor" status for dissolved oxygen, 4 were "fair", 19 were "good" and 3 sites do not have data. An analysis of trends in dissolved oxygen conditions (2007 to 2012) indicates that 2 sites were declining (Pennsylvania Run at Mt. Washington Road and the South Fork of Beargrass Creek at Brownsboro Road), 18 had no trend, and 4 sites were improving.
- 12 sites met water temperature standards of being no more than 31.7°C (89.1°F) 90% of the time, 12 sites met the criteria 100% of the time, and there was no data for the other 3 sites.

Partnering with the community for clean and safe waterways

- Nutrients consist of nitrates, total Kjeldahl nitrogen, and total phosphorus. We found that sites in the east and southeast parts of the region had the highest readings for nutrients while areas to the northeast and southwest had lower levels.
- For total suspended solids, only the site along Pond Creek at Manslick Road was a concern, with the other sites showing much lower readings.
- Trace metals (cadmium, copper, lead, and zinc) rarely exceed the criteria for aquatic life, and they are not a large issue of concern.

In general, we've found that streams within urban sections of our community have poorer results, especially in the lower sections of the watersheds. A variety of things contribute to the poorer water quality, but bacteria is the pollutant of major concern. As we continue to address sewer overflows, we expect this to improve. Our challenge will be to implement projects and programs, along with cooperative agreements with others, that will show tangible improvements.

For additional details on individual watersheds, please refer to the appropriate chapters in this report.

2013 Status Category	Fish	Aquatic Insects	Algae	Stream Habitat	Dissolved[1] Oxygen	Water[1] Temp	Fecal Coliform[2]	Percent of Site's Samples that are in the Upper Third of All Samples[3]			
Excellent	7 Sites		7 Sites				Average of 2013 Monthly Geometric Means	Nitrate	Total Kjeldahl Nitrogen	Total Phosphorus	Total Suspended Solids
Good	6 Sites	1 Site	10 Sites	14 Sites	19 Sites	12 Sites	7 Sites	13 Sites	13 Sites	12 sites	13 sites
Fair	8 sites	14 sites	7 sites	6 sites	4 sites	12 Sites	–	6 sites	7 sites	7 sites	8 sites
Poor	6 sites	12 sites	3 sites	7 sites	1 site	0 Sites	20 Sites	8 sites	7 sites	8 sites	6 sites

[1] Three of the sites have no data for these parameters.

[2] Green color indicates that the average is less than the bacteria criteria for recreational contact and red indicates that average is greater than the bacteria criteria for recreational contact.

[3] Green color indicates that percent is less than 29%, yellow indicates percent between 29-47% and red indicates percent greater than 47%.

Trend Category	Fish	Aquatic Insects	Algae	Stream Habitat	Dissolved[1] Oxygen	Water[1] Temp	Fecal Coliform[4]
	Oldest to 2013				2007 to 2012		Period of Record Median (middle value) of the Monthly Geometric Means
Improving	18 sites	13 sites	6 sites	14 sites	4 sites	0 sites	9 sites
No Trend	6 sites	9 sites	10 sites	10 sites	18 sites	24 sites	– –
Declining	3 sites	5 sites	11 sites	3 sites	2 sites	0 sites	18 sites

[1] Three sites have no data for these parameters.

[4] Green color indicates that the long-term median of monthly geometric means is less than the bacteria criteria for recreational contact and red indicates that the long-term median is greater than the bacteria criteria for recreational contact.

Introduction

About The Metropolitan Sewer District (MSD)

MSD was formed in 1946 to take over the operation and maintenance of Louisville's sewer systems. While wastewater treatment was added with the construction of the Morris Forman plant in the late 1950s, the basic mission remained the same through the 1970s.

Today, MSD is responsible for a much larger wastewater collection and treatment network, which continues to expand; a comprehensive public stormwater drainage system for most of Jefferson County; the operation and maintenance of the community's Ohio River flood protection system; the LOJIC computerized mapping and geographic information system; and several other programs — including stream monitoring and hazardous materials control — designed to protect and enhance the environment.

MSD is a non-profit regional utility service. Revenue comes from wastewater and stormwater service fees, plus charges for extending wastewater lines and connecting new customers. MSD does not receive supplementary income from taxes or from other local government agencies. All of the agency's revenue is used for operation, maintenance and extension, and improvement of services.

MSD is governed by an eight-member board. All members are appointed by the Louisville Metro Mayor, with the approval of the Metro Council. Members serve three-year terms and can be reappointed. The full Board meets once a month; committees meet as needed.

MSD periodically reports on the condition and quality of streams within its jurisdiction. This report fulfills requirements for MSD to produce a biennial Synthesis Report. As described below, MSD monitors the condition of streams in the Long Term Monitoring Network (LTMN) using a variety of methods.

Wet weather stream sampling.

MSD monitors streams throughout Louisville Metro, collecting samples on a regular basis and under various conditions in order to assess the quality of the water. Several steps have already been taken that are aimed at improving stream water quality. The stream monitoring program has been in place for more than 20 years. Projects that contribute to improving water quality have been underway longer than that. In the 1980s MSD began an effort to eliminate small neighborhood wastewater treatment plants and to replace aging, on-site septic systems with new sanitary sewers. In the past 30 years, more than 260 small treatment plants and approximately 190 pumping stations have been eliminated by diverting their flow to larger, regional facilities, and more than 40,000 homes that relied on septic tanks or straight pipes (that discharge waste directly to streams) have been connected to sanitary sewers.

More recently, MSD has initiated programs that improve maintenance of the collection and treatment facilities, assess the conditions of sewer systems (replacing them when practical), and offer assistance to property owners who are willing to reduce the amount of rainfall runoff into combined sewer systems that currently carry both wastewater and stormwater.

This report looks at several different criteria to assess how the streams and their watersheds are doing. What we're most interested in is whether or not water quality is improving. MSD is spending millions of dollars to reduce pollution from overflows and to provide more effective treatment of wastewater. The water quality in our streams is an indicator of how much progress is being made, and it can guide us in selecting and scheduling future projects.

In selecting the criteria for assessing stream water quality, we should also ask ourselves:

- Is the parameter a good indicator of stream water quality and ecosystem health?
- Do the indicators tell a meaningful story about the streams?
- Are the tests we run affordable, and will they continue to be available in the future?

So how do we go about assessing the water quality in our streams? Some of the criteria that we use are identified in our Municipal Separate Storm Sewer System (MS4) permit. They're mostly related to bacteria, chemicals and metals. But we also look at conditions in the streams that either support, or hamper, other living organisms like fish, algae and macroinvertebates. We'll explain these in more detail later in the report, but they're good indicators when it comes to the health of the streams.

MSD has eliminated more than 260 small treatment plants and approximately 190 pumping stations in Jefferson County

Partners with the Community

Eliminating and reducing overflows from sanitary and combined sewers is an obvious way to improve water quality, but there are also other methods that can be very effective, providing additional benefits to the community and the environment. Let's look at some of those other methods.

Eliminating Wastewater Treatment Plants

In 1980 MSD owned and operated six wastewater treatment plants. Three were regional facilities, serving large areas of the community, and three were small neighborhood plants, also known as package plants. A large portion of the community was served by privately owned package plants. These smaller facilities were expensive to operate and difficult to properly maintain. Some of the treatment plants were overstressed with more customers than they could handle, and nearing the end of their useful lives, requiring major investments in upgrades, but the private owners were reluctant to spend money on them.

In the mid-1980s we began a program to expand our wastewater system and to eliminate several of the package plants. Over the next 30+ years new regional plants were constructed and existing regional plants were expanded and upgraded. We also extended our network of sanitary sewers from the regional plants and diverted flow from the package plants to the regional systems. With every package plant elimination a "point source" of pollution was also eliminated. Today there are six regional plants, and eight package plants that are owned by MSD with only a handful of privately owned package plants still in existence. By the end of 2015 we plan to eliminate all of our remaining package plants and one of our regional plants.

Eliminating On-Site Wastewater Disposal Systems

Before sanitary sewers were available to provide service, many areas outside the city limits of Louisville were served by on-site wastewater disposal systems. This usually consisted of a septic tank where the waste would decompose and settle to the bottom. The water at the top then went to either a seepage pit or a lateral field.

A seepage pit usually consisted of a brick-lined hole in the ground. The pit was approximately three feet in diameter and sometimes more than twenty feet deep. They were usually located in the southwestern part of Jefferson County, where sandy soils were thought to allow better absorption of water from the septic tank. In reality, they do not work very well, and the State of Kentucky no longer approves the installation of seepage pits anywhere.

Lateral fields consist of a series of pipes with holes that allow the water to soak into the ground. The system can work relatively well if the tank is cleaned regularly and if the soil characteristics are such that the ground will absorb the water slowly, but in many areas of Jefferson County the soil is primarily clay and poorly drained, and the water table is high. During periods of rain, the ground becomes saturated and the ground water table rises above the level of the septic tank system, potentially allowing sewage to make its way to the streams.

In the mid-1980s, MSD's sewer expansion program was constructed with the capacity to allow property owners to abandon their on-site systems and connect to new sanitary sewers that would convey raw wastewater to regional treatment plants for treatment.

BENEFITS OF ELIMINATING WASTEWATER TREATMENT PLANTS

- Wastewater can be treated more effectively at regional facilities
- Flow from the system will be discharged to the Ohio River or to a larger stream
- Overflows from small package plants are eliminated

BENEFITS OF ELIMINATING ON-SITE WASTEWATER DISPOSAL SYSTEMS

- Regional treatment plants are much more effective at treating wastewater than septic tanks
- Failing septic systems create health hazards from raw wastewater standing in yards
- Drainage is improved since the flow from each home (approximately 200 gallons per day) doesn't have to be absorbed in the ground

Green Infrastructure

Capturing and infiltrating stormwater before it can reach streams and sewers reduces pollution in waterways. MSD's green infrastructure program uses engineered systems that act like natural landscapes to capture, cleanse and ultimately reduce the amount of stormwater entering sewers, creeks and waterways.

In combined sewer areas where pipes carry both wastewater and stormwater flows, green infrastructure projects help to reduce sewer overflows. By keeping rainwater from entering sewer systems, pipes are less full and less likely to overflow.

Solutions can take many forms and can also be installed by homeowners and businesses. A program was initiated in 2009 that allows MSD to partner with commercial, industrial and institutional property owners who are willing to install green infrastructure projects (see www.msdgreen.org).

RAIN GARDENS and Bio-swales are shallow areas with amended soil that absorb rainwater runoff into the ground.

PERVIOUS PAVEMENT consists of porous materials that allow stormwater to soak through the pavement and into the soil.

GREEN ROOFS capture stormwater with vegetation or other devices before it drains into sewers and waterways.

RAIN BARRELS and Cisterns allow property owners to collect stormwater and then use the water during dry periods.

Sewer System Evaluation Studies

MSD is under a federal Consent Decree that requires an inspection of the sewer system over a 10-year period. Besides assessing the condition of the sewers, MSD also uses the studies to develop recommendations for improvements that will reduce the amount of stormwater and groundwater that enters the sewers. Sewer System Evaluation Studies (SSESs) are extensive, and several different methods are used to gather information on the lines. Some of these methods include:

- **Closed Circuit Television Inspection**. A small camera is inserted in a manhole and run through the sewer while a technician makes notes on the condition of the pipe. Items noted include roots, hairline cracks, larger breaks, offset pipe joints, leaks, and property service connections that were not installed correctly.
- **Manhole Inspections**. A crew assesses the condition of the inside of manholes, noting any structural defects or areas where water is entering the manhole.
- **Smoke Testing**. A harmless white smoke is forced into sewers at manholes. The smoke finds its way to the surface through cracks in the sewer, from catch basins or downspouts that may be connected to the sewer, or sometimes inside homes if sump pumps and floor drains are connected directly to the sewer.

MSD has more than 3,200 miles of combined and sanitary only sewers that will be inspected over a 10-year period.

Once the studies are completed, the data is used to make recommendations for corrective actions. These can include replacing pipes, lining pipes and manholes, making repairs and disconnecting catch basins and downspouts. Removing excess rainwater and groundwater increases the available capacity in sewers and reduces the number and frequency of overflows that pollute streams.

It only takes four sump pumps running at the same time to completely fill an 8-inch diameter sewer.

Sewer Replacement Projects

In some cases, the problems are so extensive that MSD has chosen to replace the sanitary sewers in entire areas rather than doing point repairs or lining specific sections of pipes. In the Camp Taylor area, near the Louisville Zoo, sewers were installed during World War I to serve an army training facility. After the war ended, the property was subdivided and homes built with little thought to planning for utilities. This resulted in buildings being constructed over sanitary sewers and lines that are undersized for the number of properties that are connected to them. MSD has recently initiated a project to replace all of the sewers in two sections of Camp Taylor, affecting almost 500 properties.

BENEFITS OF SEWER REPLACEMENT PROJECTS

- New sewer systems that are less prone to wet weather problems
- Backups into homes and businesses caused by wet weather are eliminated
- In Beechwood Village the amount of wastewater being pumped from manholes into streams has been reduced from 20 million gallons per year to zero gallons per year

In the Beechwood Village area, groundwater levels are high, and several homes had their sump pumps connected directly to the sanitary sewer system. During rainstorms, water from the sump pumps would overwhelm the sanitary sewers, resulting in back-ups into homes. In order to prevent the back-ups, MSD would pump wastewater from a number of manholes directly into nearby creeks and ditches. As part of MSD's federal Consent Decree, these pumping arrangements had to be ended, and MSD decided to rehabilitate the sewers and disconnect all sump pumps from the system. It took six years and more than $6.5 million to complete the project, but since its completion in 2011 MSD has not had to pump any water from the Beechwood Village area manholes.

Wet Weather Storage Basins

Sometimes it's just too expensive to remove enough stormwater from the sewer system to eliminate overflows. In those cases it makes more sense to capture the excess flows, hold the water in a nearby basin until the level in the sewer drops back to normal, and then return the excess volume of water to the sewer system where it can be transported to a regional treatment plant.

MSD has constructed two large wet weather storage basins in the past year, allowing us to capture up to 120 million gallons of wastewater during any rain event where flows exceed the capacity of the sewer system.

Flood Protection Projects

Most people don't associate flood protection projects with improving water quality, but capturing the peak flows from storms reduces both the volume and the velocity in creeks and streams. Much of the erosion along stream banks is caused by rushing water, as it scours the sides of the streams. This increases the solids in the stream and chokes off the oxygen, both of which are harmful to fish and other stream life. Trees along the sides of streams can be lost during rain events, leading to less shade over the water. This raises the water temperature, which is also harmful to fish and plant life.

Flood storage basins are primarily intended to reduce flooding volumes, but reducing the velocity in creeks and streams is an added benefit.

18 million gallon wet weather storage basin at the Derek R. Guthrie Water Quality Treatment Center

Bells Lane wet weather storage basin under construction

The Long-Term Monitoring Network

In 1988, MSD and the United States Geological Survey (USGS) began monitoring water quality and stream flow throughout the Jefferson County area. This program, called the Long-Term Monitoring Network (LTMN), has changed over the years and currently includes 27 LTMN sites selected to represent streams in the Metro area (see map on page 14).

Streams are constantly changing. They are affected by rainfall runoff, temperature, land use, man-made pollutants, and a number of other factors. Assessing water quality in streams can be complicated, and MSD uses a wide variety of chemical, physical, and biological data at each LTMN site to evaluate stream quality. MSD collects and analyzes the information in accordance with standards set by the Environmental Protection Agency and the Kentucky Division of Water. A Quality Assurance Project Plan has been implemented to ensure high quality data for all these methods.

This report provides information on the important chemical and physical aspects of water quality, such as data on nutrients, total suspended solids, trace metals, dissolved oxygen, water temperature, and stream flow that are collected frequently each year. It includes wet and dry weather stream sampling through June 2014. Information also is collected on things that actually live in or near the streams, such as fish, aquatic insects (macroinvertebrates), algae, indicator bacteria, and stream habitat. Known as the biological community in streams, these organisms require clean water and suitable habitat to survive, and therefore they are an integrative tool that can be used to indicate whether streams are clean or polluted, doing better, or getting worse. The latest biological sampling was performed in 2013.

MSD has been collecting biological data since 1999, but it is not enough just knowing whether some of these organisms live in the waters. We need to know about their biological communities - what kinds (species) there are, how many of each, and if they are healthy. These communities are excellent indicators of stream health because they live in the water prior to sampling for weeks (algae) to months (insects) to years (fish) and, over that time, integrate environmental conditions such as water quality, stream flow, and the influence of other communities and habitat quality. More importantly, different species have different tolerances to the amount and types of water quality and flow conditions. Their presence, abundance, and health are indicative of conditions they experienced during their lives. By comparing past monitoring results to the most recent measures, we can determine whether sections of our streams are improving, staying the same, or declining. Also, with the right equipment they are easy to collect and identify in the field or laboratory.

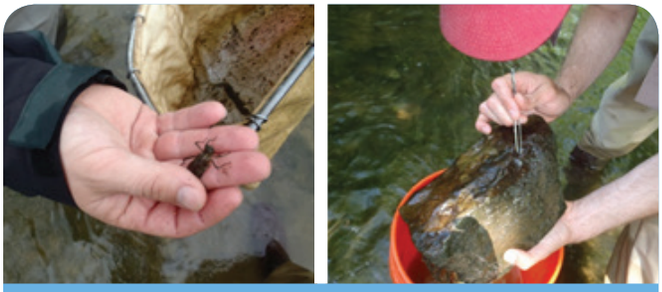
Stream habitat, along with fish, aquatic insect, and algal communities were evaluated using separate number scoring systems that consider the types and numbers of species and other factors present and the ability of each species to tolerate stressful conditions and other factors (see tables on each type). The resulting number scores are translated into a narrative rating of “excellent”, “good”, “fair”, or “poor” that considers the region of the state and the size of the stream.

Data analysis for biological and habitat assessment parameters in this report included evaluating the newest results and determining general trends based on a comparison of the oldest and newest results for each monitoring site. A trend was noted if the category changed by ten percent or more over time.

Fish: Fish are used as biological indicators in streams because of their stable populations. Fish can live for several years and are the most mobile of the three communities, moving to areas most suitable for their growth and survival as needed. Fish are particularly responsive to changes in flows, food supply, and habitat quality. They are found in many different types of streams, it’s easy to distinguish different species, and much is known about the life histories and tolerance levels of various species. Data collected between 1999 and 2013 were included in this report.

Fish are collected using a common scientific survey method known as electro-fishing. Electricity is used to stun fish before they are caught. This method is used to sample fish populations and normally the fish are returned to the stream unharmed in as little as ten minutes after being stunned. One person operates the equipment that stuns the fish while others catch the stunned fish with a net and place them in a bucket of stream water. The fish are identified and then returned to the stream.

Aquatic Insects: Aquatic insects that live on, under, and around rocks and sediment on the bottoms of streams, also called benthic macroinvertebrates, are useful as biological indicators in streams. Macroinvertebrates are organisms without backbones, which are visible to the eye without the aid of a microscope. These insects can live in water for weeks or months but are less able than fish to move to areas most suitable for their growth and survival. They include beetles, mayflies, stoneflies, dragonflies, aquatic worms, snails, leeches and a number of other organisms. They are particularly responsive to changes in flows, sediment, food supply, and habitat quality. Data collected between 2000 and 2013 was included in this report.



Collecting aquatic insects with a net, called a kick sampler, or from rocks that are in the sampling area. The "bugs" are picked, bottled in alcohol, and sent to a lab where they are identified, counted, and results are entered into a database for analysis.

Algae: The small green plant-like organisms that live on the rocks and other materials on the bottoms of streams are called benthic algae. These algae have limited mobility, staying in areas suitable for their survival for weeks to months. They are particularly responsive to stream nutrient concentrations, sunlight, and the effects of sedimentation. Data collected between 2001 and 2013 were included in this report. The photo below shows a biologist placing ceramic tiles for collecting algae in the Middle Fork of Beargrass Creek. Tiles are securely anchored in a stream and left to grow algae for a minimum of 15 days before collection for later identification and enumeration in a lab.

Placing ceramic tiles for collecting algae in the Middle Fork of Beargrass Creek.

Stream Habitat: Stream habitat is both the underwater environment that is used as a living space by fish, aquatic insects, other plants and animals, and the vegetation conditions near the stream channel. Fish, aquatic insects, and algae must rely on their local environment for food and shelter. Streams that have a variety of habitats, with shallow and deep areas, fast and slow water, and places with plenty of rocks and shade are characteristics of good habitats. Streams with eroding banks, large amounts of silt and sediment, and straightened stream channels are characteristics of poorer habitats. Data collected between 2005 and 2013 were included in this report. A Kentucky stream habitat index was used that has ten metrics (measures) to determine habitat condition and includes measures of the frequency of riffles and bends, overall bank stability, velocity/depth variability, amount of flow, percent vegetative protection along banks, width of the riparian area, suitability of streambed for insect/fish cover, sediment deposition/bed stability, embeddedness of rocks, and the degree of channel alteration.

Streams that have a variety of habitats, with shallow and deep areas, fast and slow water, and places with plenty of rocks and shade are characteristics of good habitats.

Indicator Bacteria: Bacteria and viruses that live in the water and on the bottom of streams are both natural and critical components in healthy streams. Some bacteria and viruses in wastewater inflows and runoff from urban surfaces, however, can lead to less healthy conditions, especially if they come from untreated animal or human waste. There are two types of bacteria that are commonly used to indicate whether streams are clean or polluted, getting better or worse. Fecal coliform bacteria are one type, more generally indicative of the presence of some kinds of fecal material. The other type, *E. coli* bacteria, is more indicative of the presence of fecal material from warm blooded animals, including humans. Both bacteria types have established criteria by the Kentucky Division of Water, mainly related to body contact recreation by humans. MSD has collected data on fecal coliform bacteria since 2000 and *E. coli* bacteria since 2011. These data were included in this report. Unlike fish and aquatic insects, which used computed indices of health, the status and trends of bacteria at each site were measured by computing the geometric means of samples collected in each month from April through October and comparing the average (status of 2013) and the period of record medians of these geometric means to the Kentucky criteria for contact recreation.

AQUATIC COMMUNITIES ARE ASSESSED USING MULTIPLE INDICATORS (KNOWN AS METRICS) DEVELOPED BY THE KENTUCKY DIVISION OF WATER. METRICS FOR EACH COMMUNITY ARE COMBINED FOR AN OVERALL COMMUNITY SCORE FOR A STREAM. NARRATIVE CRITERIA (EXCELLENT, GOOD, FAIR, POOR) FOR A SCORE ARE BASED ON REGIONAL STREAM DATA AND SIZE.

FISH COMMUNITY METRICS	AQUATIC INSECT COMMUNITY METRICS	ALGAE COMMUNITY METRICS (MOSTLY DIATOMS)
Total number of native species present in a sample. Non-natives are indicators of impairment (only used in wadeable streams).	A measure derived from pollution tolerance values assigned to insects present within a sample (Modified Hilsenhoff Biotic Index).	Total number of certain species present in a sample that are susceptible to impairment by sedimentation (Siltation Index).
Total number of species present that fall within the darter tribe, madtom genus, and sculpin genus.	Total number of mayfly, stonefly, and caddisfly classifications present in a sample.	How many different species and how evenly distributed they are (Shannon Diversity Index).
Total number of intolerant (most susceptible to impairment) species present in a sample.	Total number of all classifications present in a sample, also known as taxa richness.	Total number of diatom taxa, also known as taxa richness.
Total number of species that require relatively clean gravel for simple spawning.	Relative abundance (percent) of mayfly, stonefly, and caddisfly taxa excluding the relatively tolerant caddisfly genus *Cheumatopsyche*.	Relative abundance of pollution tolerant species that increase in abundance due to impairment (Pollution Tolerance Index).
Relative abundance of individuals of species that consume insects, excluding tolerant individuals.	Relative abundance of organisms that require hard, silt-free surfaces on which to "cling".	Relative abundance of individuals that are in the *Fragilaria* Group (*Fragilaria* Group Richness).
Relative abundance of pollution tolerant species that increase in abundance due to impairment.	Relative abundance of midges and freshwater worms, which are generally pollution tolerant organisms.	Relative abundance of individuals that are in the *Cymbella* Group (*Cymbella* Group Richness).
Relative abundance of species that are atypical of headwater streams.	Relative abundance of mayfly taxa (only in headwater streams).	

Dissolved Oxygen and Stream Temperature: Both fish and aquatic insects rely on oxygen that is dissolved in water to "breathe". When oxygen levels are too low, it causes stress on all aquatic organisms. A dissolved oxygen reading less than four milligrams per liter at any time, or average readings of less than five milligrams per liter over a 24-hour period, are considered stressful for aquatic organisms. Dissolved oxygen can be lowered by natural factors such as low streamflow, hot days, and lack of shade, and also by excessive algae and organic pollution. Stream temperature also is important to the health of aquatic communities. Water temperatures in excess of 31.7°C (89.1°F) also stress the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen.

MSD and the USGS have continuously monitored stream temperature and dissolved oxygen at the 27 LTMN sites since 2000. This level of effort highlights MSD's commitment to effectively monitor the quality and condition of streams in Jefferson County. The data are collected using protocols developed by the USGS. It is important to note that collection of continuous dissolved oxygen data requires diligent attention to cleaning and calibrating the monitor probes that are used to collect the readings every 15 minutes. In some streams, the probes can become dirty or covered by silt, resulting in missing or erroneous data. MSD has developed a Quality Assurance Project Plan with USGS to improve the maintenance of these probes. Dissolved oxygen and water temperature data collected by MSD and USGS between 2005 and 2013 were assessed for this report.

For this report, the average daily dissolved oxygen concentration was calculated from dissolved oxygen readings collected at 15 minute intervals. Days with more than half of the data missing were not included in the analysis. Results were grouped into rating categories based on the percent of days when average dissolved oxygen concentrations were above five parts per million. A "good" rating is when 100 percent of the days with valid data per year were above five parts per million, a "fair" rating is when more than 90 percent of days with valid data per year were above five parts per million; and a "poor" rating is when less than 90 percent of days with valid data per year were above five parts per million.

The 15 minute water temperature data were used to compute a maximum for each day with valid data to compare to the criteria. A "good" rating is when 100 percent of the days with valid data per year were below the criteria of 31.7°C (89.1°F), a "fair" rating is when more than 90 percent of days per year were within criteria, and a "poor" rating is when less than 90 percent of days per year were within the criteria.

Total Suspended Solids: The amount of sediment carried in a stream depends on the amount of erosion of unprotected land surfaces, wash off of impervious surfaces, and erosion or scouring of the stream banks and beds in the watershed during rainfall events. When carried in large amounts, sediment can deposit on and reduce the quality of stream habitat for fish and other aquatic organisms downstream. Data on the concentrations of total suspended solids in streams is a measure of those processes. MSD monitored concentrations of total suspended solids in streams periodically from 2000 to 2004 and on a quarterly basis since 2005 at all sites.

Stream Nutrients: The amount of nutrients carried in a stream depends on the amount of wash off of various land surfaces and the erosion or scouring of the stream bed and banks during rainfall events. Nutrients are necessary for the growth of algae, which is a food source for fish and aquatic insects. When carried in large amounts, however, nutrients can lead to excessive algal growth and reduce both the dissolved oxygen and quality of stream habitat needed by fish and other aquatic organisms in a stream. Data on the concentrations of total phosphorus, nitrate nitrogen, and total Kjeldahl nitrogen (a laboratory measure of the total ammonia and organic nitrogen) in streams are chemical analyses that help measure, in part, the chemical health of a stream. MSD monitored concentrations of nutrients (nitrogen and phosphorus) in streams periodically from 2000 to 2004 and on a quarterly basis since 2005 at all sites.

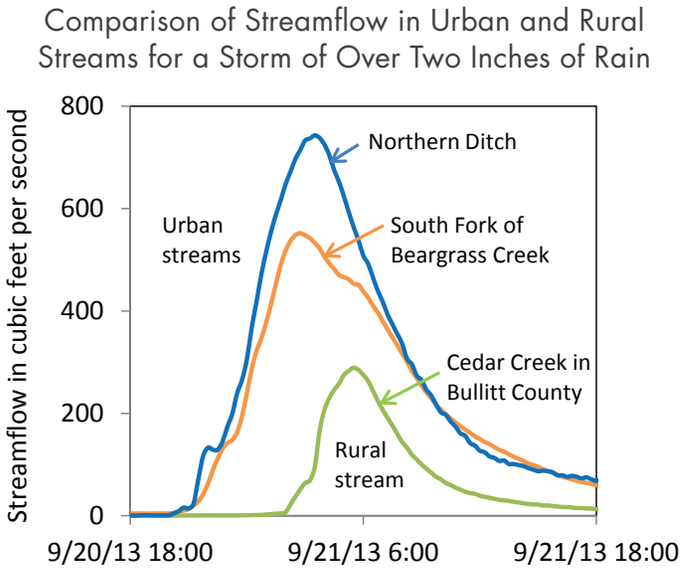
Owing to a current lack of water quality criteria for nutrients and total suspended solids in streams, a relative comparison of all LTMN data was used. The breakpoint concentration between the upper third and lower two thirds of all samples at all 27 MSD LTMN sites collected since 2005 were calculated for each of these constituents. The percent of samples above these breakpoints for each site was considered indicative of how each site qualitatively relates to other streams in the Louisville Metro area. In a sense, by using all data at all sites for comparison, this approach is a combined measure of status and trends.

Trace Metals: Trace metals generally are carried, as the name implies, in trace amounts, either dissolved or more commonly on particles (sediment) in stream flow. The amount of metals carried in a stream not only depends on the amount of wash off of various land surfaces during rainfall events but also in the discharge of wastewaters during both low and high flows. Trace amounts of metals are necessary for the healthy growth of algae, fish, and aquatic insects. When carried in excess of their needs, however, metals in water can lead to unhealthy exposure to fish and other aquatic organisms. Data on the concentrations of total metals in streams are chemical analyses that, in part, reflect the chemical health of a stream. MSD monitored concentrations of total metals in streams periodically from 2000 to 2004 and on a quarterly basis since 2005. Concentrations of total metals at each site were compared to the Kentucky acute Aquatic Life Criteria (ALC), where they exist, based either on a published value or on an equation using total hardness concentrations.

MSD Laboratory personnel perform analyses of water samples.

Streamflow: The amount of flow in a stream has a major influence on fish and aquatic insects. Streamflow varies naturally in response to rain, and seasonally tends to be higher in the winter and spring, lower in summer and fall. Streams may flow very little or not at all during times of drought. Periodic low flows can stress aquatic organisms by reducing the amount of stream habitat available to them, and if concurrent with hot air temperatures, can lead to excessive stream temperature and low dissolved oxygen conditions. Very high flow can reduce habitat quality critical to organisms by eroding stream banks and beds, by moving or covering stream bed habitat like rocks and woody debris, and by physical scouring or displacement of organisms. Higher stream flow can increase significantly both in frequency and volume in areas where impervious (hard) surfaces such as roofs and roads prevent water from filtering into the soil. MSD and the USGS have continuously monitored stream flow at 25 of the 27 LTMN sites. The analysis of stream flow for this report focused simply on a comparison of the average annual runoff at each LTMN site since 1999. Stream flow data is used by many agencies besides MSD for a variety of purposes, including planning for water supply, floods, and droughts, as well as understanding stream conditions in different land use settings.

The graph of streamflow (to the right) illustrates the differences in runoff from three watersheds of different land use. The urban watersheds, Northern Ditch and the South Fork of Beargrass Creek, tend to have higher streamflow during the same storm than the similar sized rural or undeveloped watershed, Cedar Creek in Bullitt County. These urban streams have more impervious surfaces (17 and 22 percent, respectively), including roadways, rooftops and driveways, where decreased infiltration of rain results in more water running off and therefore, higher stream flows. Less developed watersheds in the outer perimeter of the Louisville Metro area tend to have a more gradual or at least smaller rise in stream flow, like the Cedar Creek example.



This USGS streamflow gage (gray box in photo) is located on Cedar Creek at Thixton Lane. This type of gage is used to continuously monitor stream temperature, dissolved oxygen, and stream flow. The antenna to the right of the box transmits data to a satellite for real time monitoring results via the web at *http://waterwatch.usgs*.gov

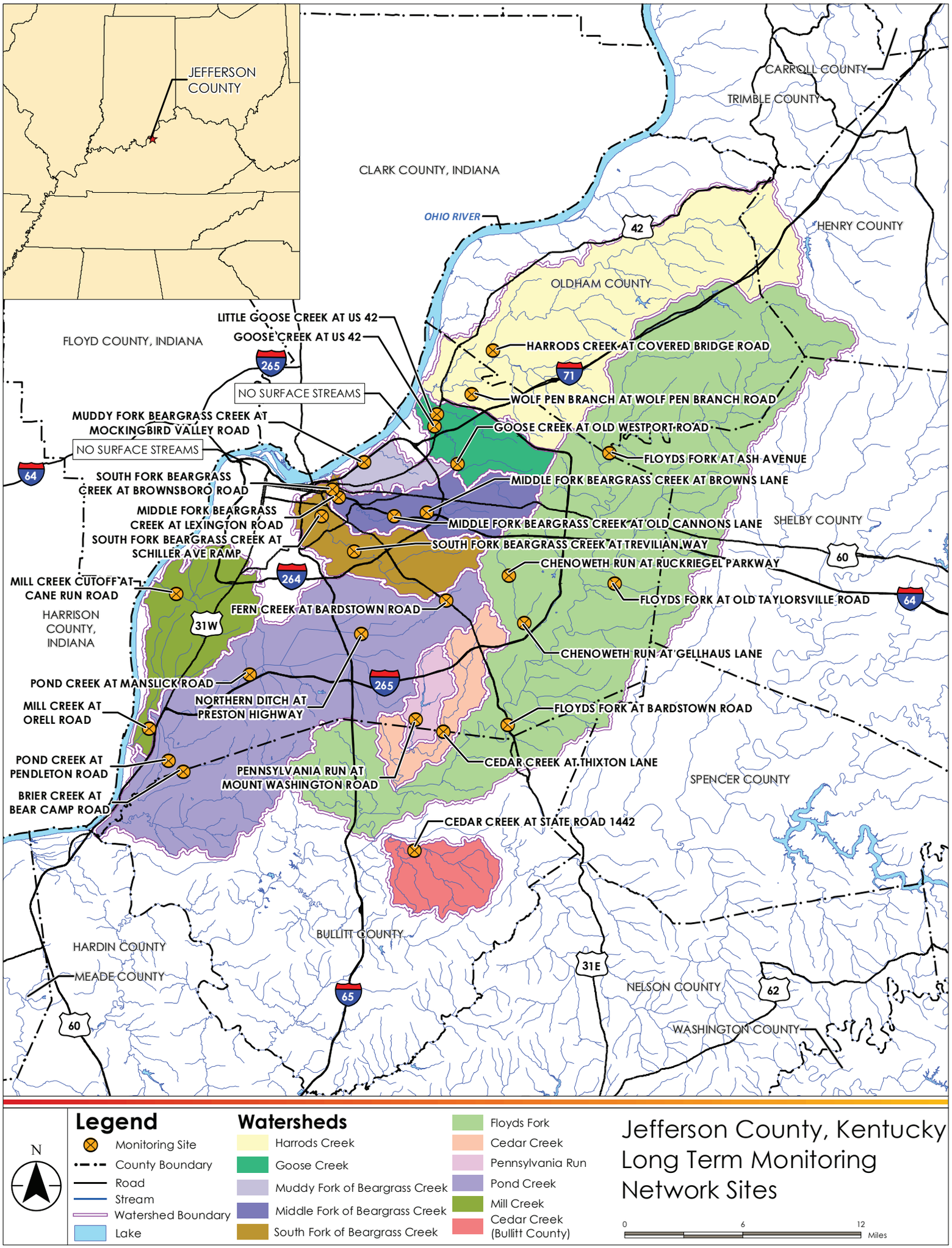
Watershed Reports

There are ten primary watersheds in Jefferson County, Kentucky (see the map on the facing page). Two of the streams (Harrods Creek and Floyds Fork) have their headwaters in other counties and flow into Jefferson County. About a quarter of the Pond Creek watershed lies in Bullitt County, and that water enters the main stem of the creek near the southwestern tip of Jefferson County.

MSD has been collecting stream samples from these watersheds for decades, along with a watershed that lies entirely in Bullitt County. Cedar Creek in Bullitt County was included in MSD's sampling program to act as a "control" because there is relatively little development in the watershed and impervious surfaces (roads, parking lots, roofs, etc.) are minimal when compared to the ten other watersheds.

In order to assess our past efforts to improve water quality, and to make decisions on future actions, samples are collected from streams and those samples are analyzed for a number of parameters, including bacteria, suspended solids, oxygen demand, nutrients, metals and more. This report utilizes stream samples that were collected through June 2014. We also evaluate habitats in the streams for a variety of organisms like fish, algae and aquatic insects. This information is compared to previous samples and compiled into reports for each watershed. The results are presented on the following pages in this section.

Big Run, along the Glenmary golf course in Southeastern Jefferson County


JEFFERSON COUNTY
CLARK COUNTY, INDIANA
OHIO RIVER
CARROLL COUNTY
TRIMBLE COUNTY
HENRY COUNTY
OLDHAM COUNTY
FLOYD COUNTY, INDIANA
LITTLE GOOSE CREEK AT US 42
GOOSE CREEK AT US 42
NO SURFACE STREAMS
NO SURFACE STREAMS
MUDDY FORK BEARGRASS CREEK AT MOCKINGBIRD VALLEY ROAD
SOUTH FORK BEARGRASS CREEK AT BROWNSBORO ROAD
MIDDLE FORK BEARGRASS CREEK AT LEXINGTON ROAD
SOUTH FORK BEARGRASS CREEK AT SCHILLER AVE RAMP
MILL CREEK CUTOFF AT CANE RUN ROAD
HARRISON COUNTY, INDIANA
POND CREEK AT MANSLICK ROAD
MILL CREEK AT ORELL ROAD
POND CREEK AT PENDLETON ROAD
BRIER CREEK AT BEAR CAMP ROAD
HARRODS CREEK AT COVERED BRIDGE ROAD
WOLF PEN BRANCH AT WOLF PEN BRANCH ROAD
GOOSE CREEK AT OLD WESTPORT ROAD
FLOYDS FORK AT ASH AVENUE
MIDDLE FORK BEARGRASS CREEK AT BROWNS LANE
MIDDLE FORK BEARGRASS CREEK AT OLD CANNONS LANE
SHELBY COUNTY
SOUTH FORK BEARGRASS CREEK AT TREVILIAN WAY
CHENOWETH RUN AT RUCKRIEGEL PARKWAY
FLOYDS FORK AT OLD TAYLORSVILLE ROAD
FERN CREEK AT BARDSTOWN ROAD
CHENOWETH RUN AT GELLHAUS LANE
NORTHERN DITCH AT PRESTON HIGHWAY
FLOYDS FORK AT BARDSTOWN ROAD
CEDAR CREEK AT THIXTON LANE
PENNSYLVANIA RUN AT MOUNT WASHINGTON ROAD
SPENCER COUNTY
CEDAR CREEK AT STATE ROAD 1442
BULLITT COUNTY
HARDIN COUNTY
MEADE COUNTY
NELSON COUNTY
WASHINGTON COUNTY
42
265
71
64
264
31W
265
60
64
31E
65
60
62
Legend
Monitoring Site
County Boundary
Road
Stream
Watershed Boundary
Lake
Watersheds
Harrods Creek
Goose Creek
Muddy Fork of Beargrass Creek
Middle Fork of Beargrass Creek
South Fork of Beargrass Creek
Floyds Fork
Cedar Creek
Pennsylvania Run
Pond Creek
Mill Creek
Cedar Creek (Bullitt County)
N
0
6
12
Miles
Jefferson County, Kentucky
Long Term Monitoring Network Sites

3.1

Harrods Creek Watershed

The small streams that eventually form Harrods Creek originate in Trimble County. Harrods Creek flows southwest through Oldham County and drains into the Ohio River in northern Jefferson County near Prospect. The Harrods Creek watershed drains approximately 92 square miles. Commercial and residential development has been expanding in the area.

Watershed Assessment

The health of the aquatic communities in the two sites of the Harrods Creek watershed was variable over time and between sites. The fish communities in Harrods Creek currently were rated "good" but were variably in "fair" to "excellent" condition over time. Fish communities in Wolf Pen Branch have been declining from "good' in 2002 to "fair" condition in 2005-2013. Since 2000, the aquatic insect community at the Harrods Creek site has declined steadily from an "excellent" to a "fair" condition in 2013 and also has declined since 2005 in Wolf Pen Branch from "fair" to "poor" conditions. The algal community at the Harrods Creek site improved from "good" in 2001 to "excellent" in 2011 and 2013 but the change in the assessment was less than 10% so no trend was indicated. The Wolf Pen Branch site was in "fair" condition in 2013, and was rated variably "fair" to "excellent" in the past but the long term change was less than 10% so no trend was indicated.

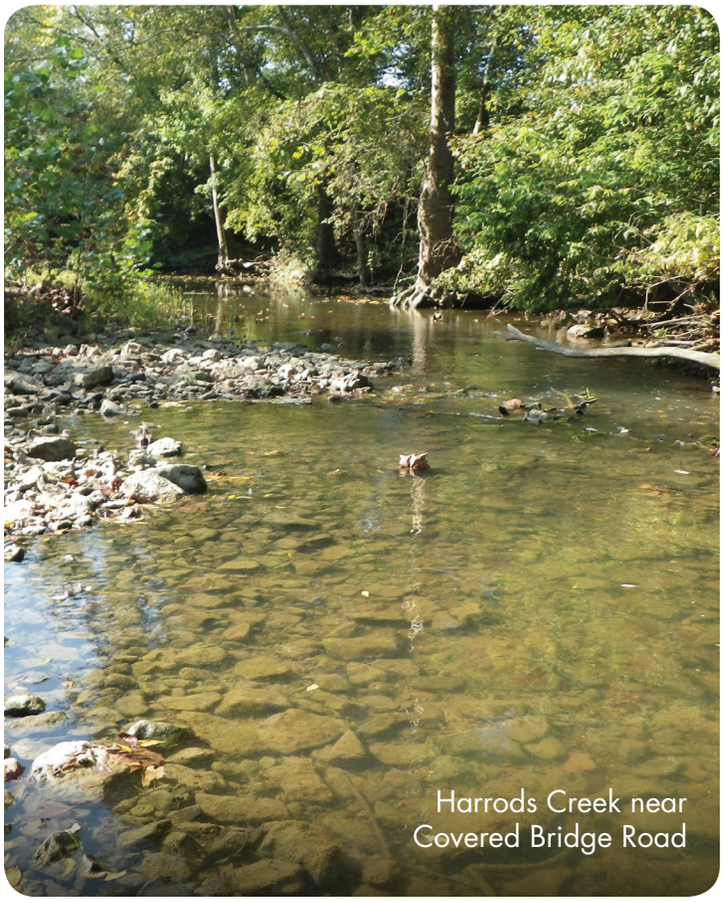
In Harrods Creek, stream habitat quality was classified as "good" in all years since 2005. Habitat quality improved from "poor" to "good" in Wolf Pen Branch between 2005 and 2013. Sediment deposition and an unstable stream bed were identified as habitat limitations in Wolf Pen Branch during previous years.

For fecal coliform bacteria, the period of record median (the middle value) of the monthly geomeans for the Harrods Creek site was below the recreational standard of 200 colonies/100ml, whereas, the median for Wolf Pen Branch was above the standard. Individual monthly geomeans were variably above and below the standard, with no apparent trend over time. For the three years of data of *E. coli* bacteria, most of the monthly geomeans at the Wolf Pen Branch site were above the recreational standard of 130 colonies/100ml, whereas, many of Harrods Creek geomeans were not.

Total phosphorus, nitrate, total Kjeldahl nitrogen, and total suspended solids values were relatively low at both sites compared to other LTMN sites, indicating that currently excessive nutrients are not a major concern in the watershed.

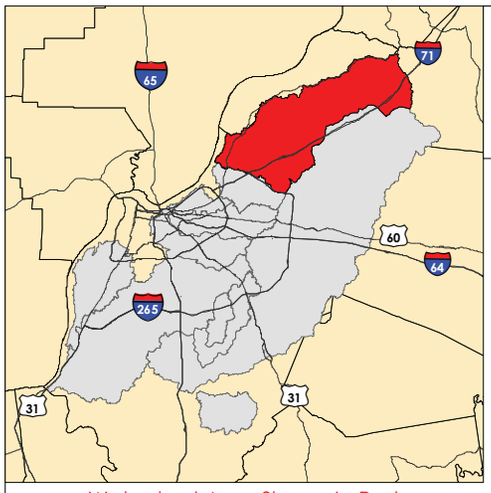
More recent wet weather event sampling data confirms the historical data here in that trace metals are not much of an issue of concern in these streams.

Dissolved oxygen conditions were in "good" condition at the Harrods Creek site for the last five years and water temperature criteria (no more than 31.7°C (89.1°F)) were met 96.7 to 100 percent of the time. The Wolf Pen Branch site had no data. Periodic hot days and low stream flows occasionally can cause exceedances of dissolved oxygen or temperature criteria.



Harrods Creek near Covered Bridge Road

HARRODS CREEK WATERSHED WATER QUALITY STATUS AND TRENDS



Watershed Area Shown In Red

CLARK COUNTY, INDIANA

TRIMBLE COUNTY

Ohio River

Harrods Creek

Wolf Pen Branch

HENRY COUNTY

OLDHAM COUNTY

JEFFERSON COUNTY

SHELBY COUNTY

42 53 393 71 329 22 265 264 64 60

Harrods Creek at Covered Bridge Road
(70.3 square miles and 9 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	—	↓	—	—	↑	—	B	~

Wolf Pen Branch at 8111 Wolf Pen Branch Road
(2.08 square miles and 24 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↓	↓	—	↑	ND	ND	A	~

N

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

RATINGS KEY

TREND
- ↑ Improving
- ↓ Declining
- ~ Varies
- — No Change
- ND No Data

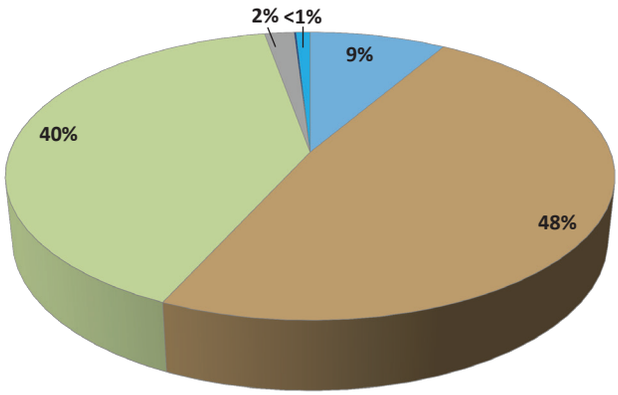
STATUS
- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria

Background and Land Use

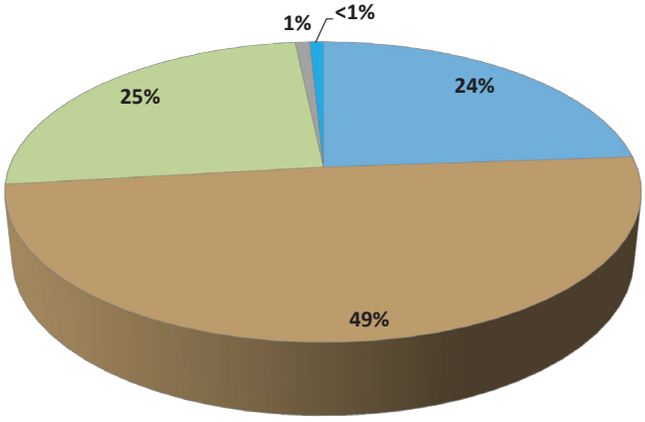
MSD has been monitoring water quality and flow in Harrods Creek at Covered Bridge Road since 1999. There are 70.3 square miles of land draining to the monitoring site on Harrods Creek at Covered Bridge Road. This land is mostly agricultural and forest. Nine percent of the land has been developed for urban and suburban uses. Approximately 1.3 percent of the land is covered by impervious surfaces such as roads, rooftops and driveways.

MSD has been monitoring water quality of the Wolf Pen Branch tributary since 2002; flow is not monitored at this location. There are 2 square miles of land draining to the monitoring site on Wolf Pen Branch. This land is a mix of agricultural, forest, and 24 percent is developed for urban and suburban uses. Approximately 7 percent of the land is covered by impervious surfaces.

Land Use Upstream of Harrods Creek at Covered Bridge Road



Land Use Upstream of Wolf Pen Branch at 8111 Wolf Pen Branch Road



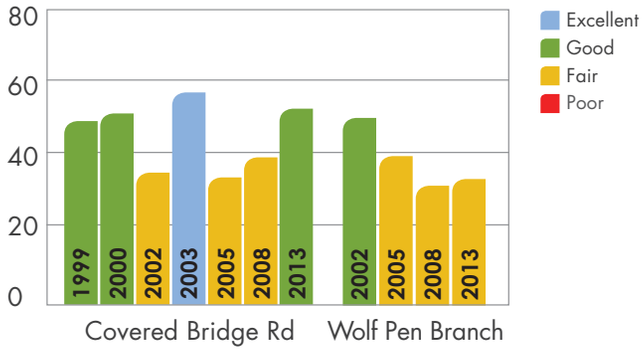
Urban & Suburban
Agriculture
Barren
Water & Wetland
Forest
Grassland

Monitoring Findings

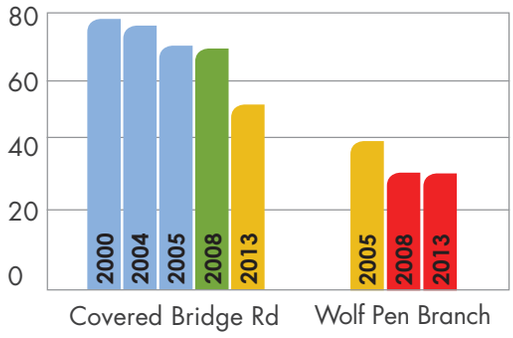
MSD has monitored the fish communities in Harrods Creek at Covered Bridge Road since 1999. During this time, the fish communities were variably in "fair" to "excellent" condition and currently "good". Fish communities in Wolf Pen Branch have been declining from "good' in 2002 to "fair" condition in 2005-2013.

Since 2000, the aquatic insect communities at the Harrods Creek site have declined steadily from an "excellent" to a "fair" condition in 2013. The aquatic insect communities in Wolf Pen Branch also have declined since 2005 from "fair" to "poor" condition.

Condition of the Fish Communities in the Harrods Creek Watershed

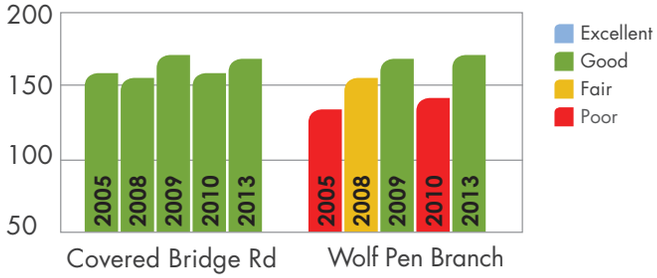


Condition of Aquatic Insect Communities in the Harrods Creek Watershed



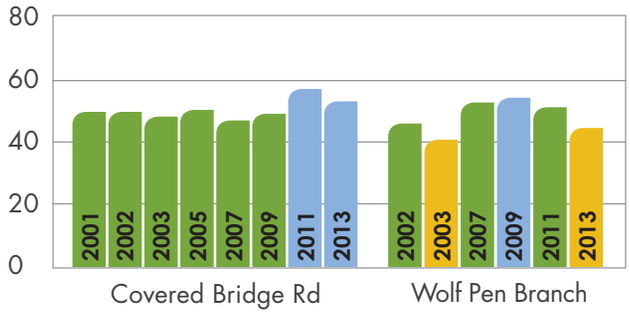
MSD has assessed stream habitat when fish and aquatic insects were sampled since 2005. In Harrods Creek, habitat was classified as "good" in all years since. Habitat quality improved from "poor" to "good" in Wolf Pen Branch between 2005 and 2013. Sediment deposition and an unstable stream bed were identified as habitat limitations in the Wolf Pen Branch site in previous years.

Condition of Stream Habitat Communities in the Harrods Creek Watershed



MSD has monitored benthic algal communities, largely diatoms, in the Harrods Creek watershed since 2001. Using a Diatom Bioassessment Index (DBI), the Covered Bridge Road site was rated "good" from 2001 through 2009 and improved to an "excellent" condition in 2011 and 2013. The Wolf Pen Branch site was rated variably "fair" to "excellent" through 2009 but has declined to a "fair" condition in 2013.

Condition of Algal Communities in the Harrods Creek Watershed



MSD plans to eliminate five neighborhood wastewater treatment plants in the Prospect area in 2015, including the Timberlake plant *(above right)* and the Hunting Creek South plant *(right)*.

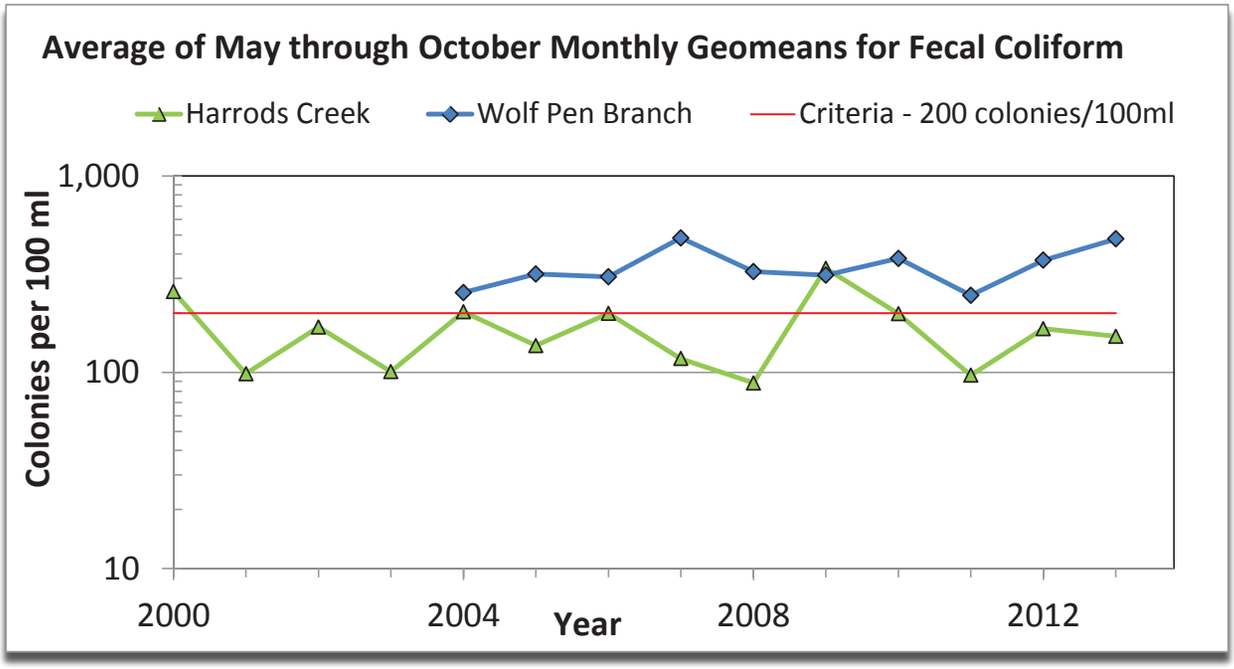
Timberlake wastewater treatment plant in Prospect

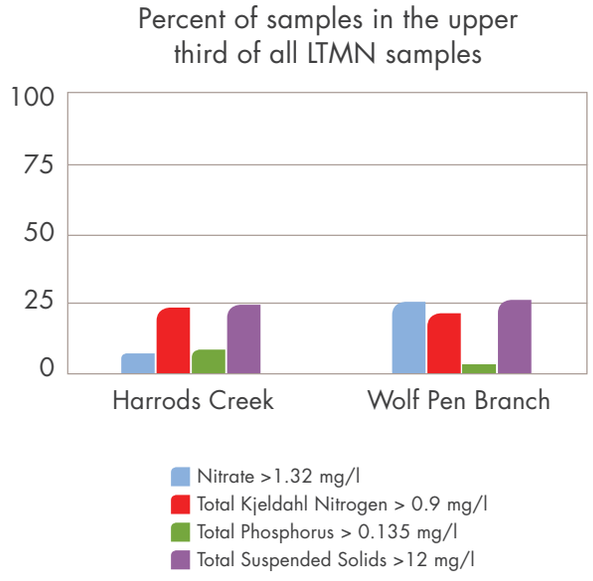
Hunting Creek South wastewater treatment plant in Prospect

Since 2000, MSD has monitored fecal coliform bacteria three to five times a month during the recreational season (April-October). *E. coli* bacteria were collected similarly, but only since 2011. The monthly geomeans of bacteria concentrations were calculated and compared to the recreational contact standard or criteria for each type.

For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. The period of record median (the middle value) of the monthly geomeans for the Harrods Creek site was below the recreational standard of 200 colonies/100ml, whereas, the 10 year median for Wolf Pen Branch was above the standard. Individual monthly geomeans were variably above and below the standard (not shown), with no apparent trend over the period of record. There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season.

For the three years of data collection of *E. coli* bacteria (not shown), most of the monthly geomeans at the Wolf Pen Branch site were above the recreational standard of 130 colonies/100ml, whereas, many of Harrods Creek geomeans were not.





MSD monitored the concentrations of nutrients (nitrogen and phosphorus) and total suspended solids in streams periodically from 2000 to 2005 and on a quarterly basis since 2005 at two sites in the Harrods Creek watershed. The percent of samples taken at these sites which fall into the upper third of all samples at all 27 sites were calculated as a comparison to other streams in the watershed and throughout the Metro area.

Both sites in the Harrods Creek watershed had relatively low numbers of samples in the upper third for nutrient data, with most parameters under 25%. The sites also had very similar values for all parameters with the exception of nitrate, which was somewhat higher at the Wolf Pen Branch site than the Harrods Creek site.

MSD monitored concentrations of trace metals in streams periodically from 2000 to 2005 and on a quarterly basis since 2005. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The acute ALC for total concentrations of cadmium, copper, lead, and zinc were not exceeded in any samples at either of the two sites.

MSD and the US Geological Survey continuously monitor streamflow, dissolved oxygen, and water temperature on Harrods Creek at Covered Bridge Road (Highway 329). Streamflow has been monitored at this USGS gage (number 03292470) since 1999.

Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than four parts per million (as an instantaneous standard) or five parts per million (as a mean daily standard) are what is deemed necessary. Water temperatures in excess of 31.7°C (89.1°F) are very stressful on the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen. In general, extended periods of low stream flows also can cause stress on aquatic communities.

Dissolved oxygen criteria were met 95.5 to 100 percent of the time and in "good" condition at the Harrods Creek site for the last five years, but in 2007 it was 87.8 percent and in 'fair' condition. Occasional excursions of low dissolved oxygen likely were a result of very low stream flows on very warm days or some other transient factor.

Water temperature criteria were met 100 percent of the time in 2008 to 2010 at the Harrods Creek site. The percent of the time that the criteria were met in 2007, 2011, and 2012 was 99.3, 96.7, and 98.6 percent, respectively. Temperature data was not available for the Wolf Pen Branch site. Periodic hot days and low stream flows are common in the summer and occasionally cause an exceedance of the criteria.

Wolf Pen Branch

3.2

Goose Creek Watershed

The streams that form the Goose Creek Watershed, Little Goose Creek and Goose Creek, flow northwest from Anchorage to Glenview Acres. Goose Creek enters into the Ohio River near Lime Kiln Lane and River Road.

Watershed Assessment

The fish and algal communities and stream habitat at all three Goose Creek sites are in "good to excellent" health in 2013, whereas, the aquatic insect communities generally were in "poor" or "fair" health at all three sites. The health of the fish communities and stream habitat generally have improved over time. The algal communities upstream at Old Westport Road have improved over time, but conditions in aquatic insect and algal communities in Goose Creek at US 42 have declined. Sediment deposition and unstable banks have been identified in these streams as a limitation of the habitat quality that would affect both insects and algae health.

For fecal coliform bacteria, the period of record medians (the middle values) of the monthly geomeans for the two Goose Creek sites were above the recreational standard of 200 colonies/100ml, whereas, the period of record median for the Little Goose Creek site was below the standard. Individual monthly geomeans were variably above and below the standard, with no apparent trend over time. For the three years of data on *E. coli* bacteria, most of the monthly geomeans at the three sites were above the recreational standard of 130 colonies/100ml.

Compared to the other LTMN sites, Goose Creek at US 42 also had a relatively high number of nitrate samples in the upper third at 48 percent. Little Goose Creek at US 42 had some of the highest values for nitrate, total Kjeldahl nitrogen, and total suspended solids, with nearly 80 percent of its samples in the upper third of all LTMN samples for nitrate and over 60 percent of samples in the upper third for the latter two parameters. Goose Creek at Old Westport Road, had lower numbers of samples in the upper third for nitrogen, total Kjeldahl nitrogen, total phosphorus and total suspended solids compared to the other two sites in the watershed. Total suspended solids are relatively low at the two Goose Creek sites. Total phosphorus is relatively low at all the three sites.

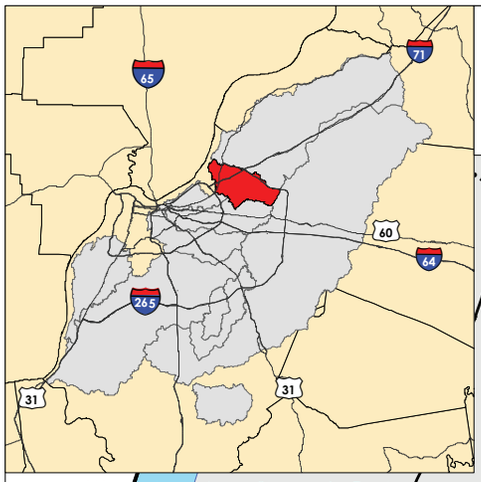

Little Goose Creek

The land use upstream of the Little Goose Creek site is 66 percent urban and in Goose Creek it is about 50 percent urban. Little Goose Creek, however, has almost twice the impervious area of Goose Creek. Differences in land use and management practices, like the use of lawn fertilizers, within these watersheds likely account for some of the observed differences.

More recent wet weather event sampling data confirms the historical data that trace metals are not a large issue of concern in these LTMN streams.

Dissolved oxygen criteria were met 100 percent of the time at the Little Goose Creek site. Conditions were in the "good" range at both Goose Creek sites as well. Water temperature criteria (no more than 31.7°C (89.1°F)) were met 100 percent of the time at all three sites. Periodic hot days and low stream flows are common in the summer and occasionally can cause an exceedance of these criteria, but that is not the case in these sites.

GOOSE CREEK WATERSHED
WATER QUALITY STATUS AND TRENDS



Watershed Area Shown In Red

CLARK COUNTY, INDIANA

OLDHAM COUNTY

JEFFERSON COUNTY

Ohio River

Little Goose Creek

Goose Creek

42

71

265

264

60

Little Goose Creek at US 42
(5.82 square miles and 66 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	—	—	↑	—	—	B	~

Goose Creek at US 42
(10.1 square miles and 49 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↓	↓	—	—	—	A	~

Goose Creek at Old Westport Road
(6.0 square miles and 53 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	—	↑	↑	—	—	A	~

N

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

TREND
- ↑ Improving
- ↓ Declining
- ~ Varies
- — No Change
- ND No Data

STATUS
- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria

RATINGS KEY

Background and Land Use

There are 19 square miles of land in the Goose Creek Watershed. The land use associated with each monitoring site, like the entire watershed, is a mix of urban, forest and some agriculture. MSD monitors three stream sites in the watershed: Goose Creek at Old Westport Road, Goose Creek at US 42 and Little Goose Creek at US 42.

The areas draining to the two sites in Goose Creek have very similar land uses. There are 6.0 square miles draining to Goose Creek at Old Westport Road, with almost 10 percent impervious surfaces, such as roads, rooftops and driveways. There are 10.1 square miles of land draining to Goose Creek at US 42, with almost 11 percent impervious surfaces. Approximately half of the land is used for urban and suburban purposes, approximately 40 percent is forested and 10 percent is agriculture.

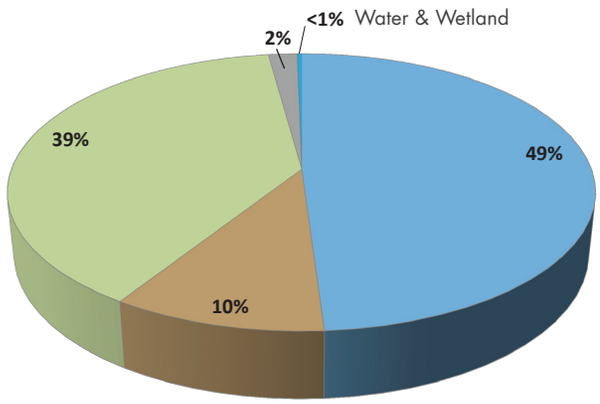
There are 5.82 square miles of land draining to Little Goose Creek at US 42, with 18 percent impervious surfaces. With 66 percent of the land area used for urban and suburban development, there is less agriculture and forest in this tributary to Goose Creek. This watershed is the most developed of the three Goose Creek sites.

Goose Creek, north of Old Westport Road

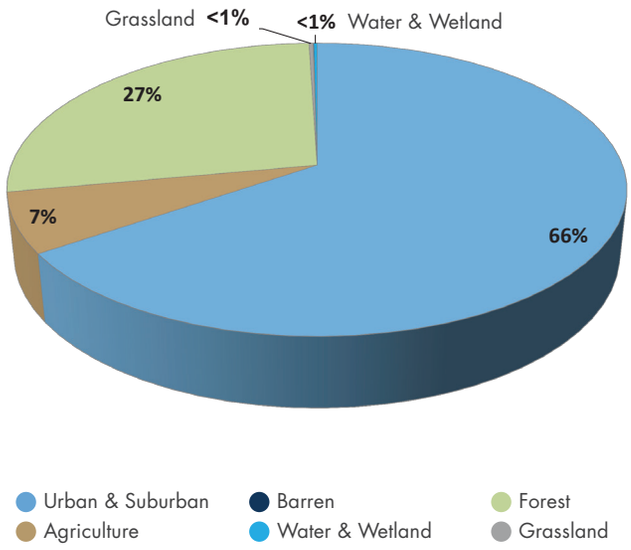
Monitoring Findings

MSD monitored fish communities in the Goose Creek watershed since 1999. The fish communities generally have improved at all three sites since then. The fish communities at the Old Westport Road site have improved from "fair" in 2000 to "good" in 2013. Conditions at the US 42 site have improved from "fair" in 1999 to "excellent" in 2013. The fish communities in Little Goose Creek have improved most dramatically from "very poor" prior to 2000 to "excellent" in 2008 and "good" in 2013.

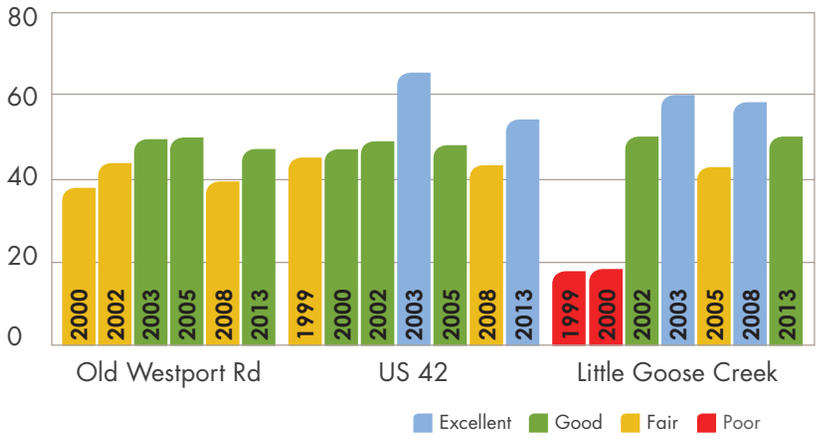
Land Use Upstream of Goose Creek at US 42



Land Use Upstream of Little Goose Creek at US 42



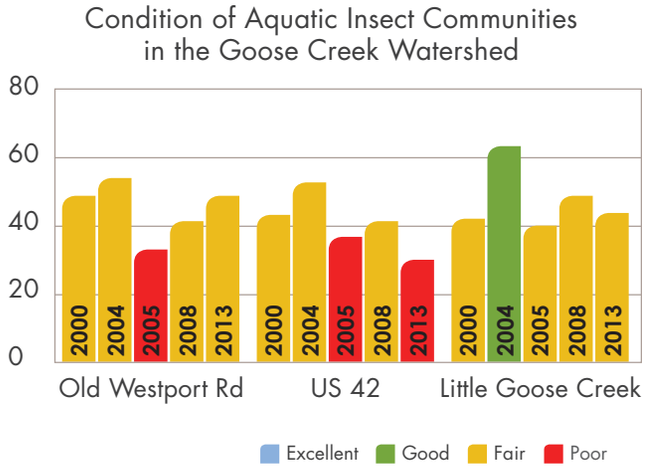
Condition of the Fish Communities in the Goose Creek Watershed

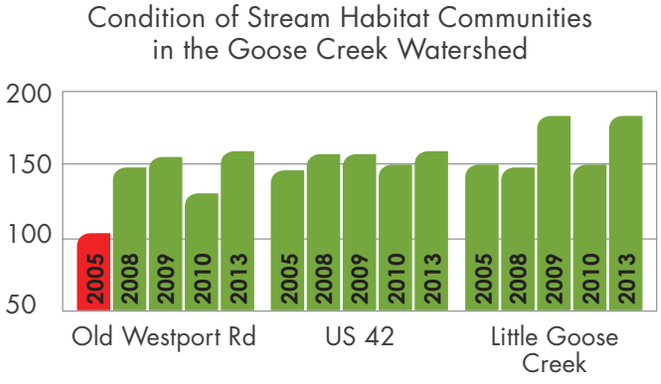


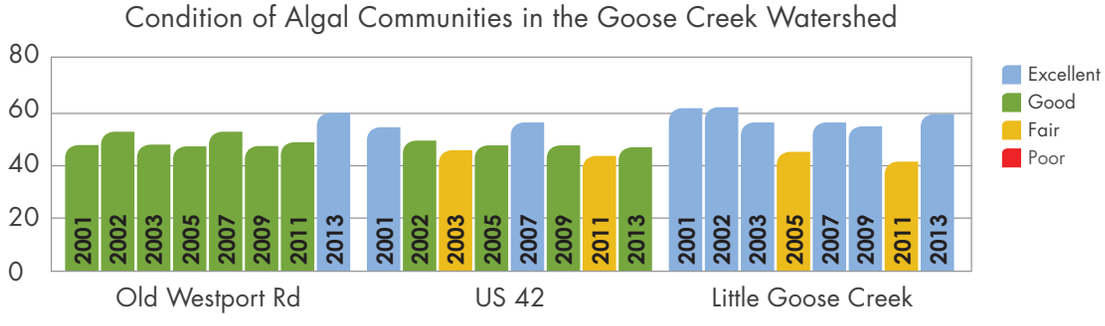
MSD monitored aquatic insect communities at the three sites since 2000. The aquatic insect communities generally were classified as "poor" or "fair" at all three sites, except in 2004, when Little Goose Creek was classified as "good". Overall, the aquatic insect communities in Goose Creek appear to have declined some between 2004 and 2013, especially in Goose Creek at US 42.

MSD has assessed stream habitat quality when fish and aquatic insects were sampled since 2005. At all three sites, stream habitat was classified as "good" since 2008 and trends indicate improvement over time at Old Westport Road and at Little Goose Creek. Sediment deposition and unstable banks were identified in these streams as a limitation of the habitat quality and Old Westport Road is lacking somewhat in rocky riffles that are used as habitat by aquatic organisms.

MSD has monitored benthic algal communities, largely diatoms, at the three sites since 2001. Using a Diatom Bioassessment Index (DBI), the upstream Old Westport Road site was rated "good" through 2011 and was "excellent" in 2013. The downstream US 42 site was rated variably "fair" to "excellent" throughout and was "good" in 2013. The Little Goose Creek site was generally "excellent" throughout and in 2013, but twice it dipped into "fair" condition in 2005 and 2011.







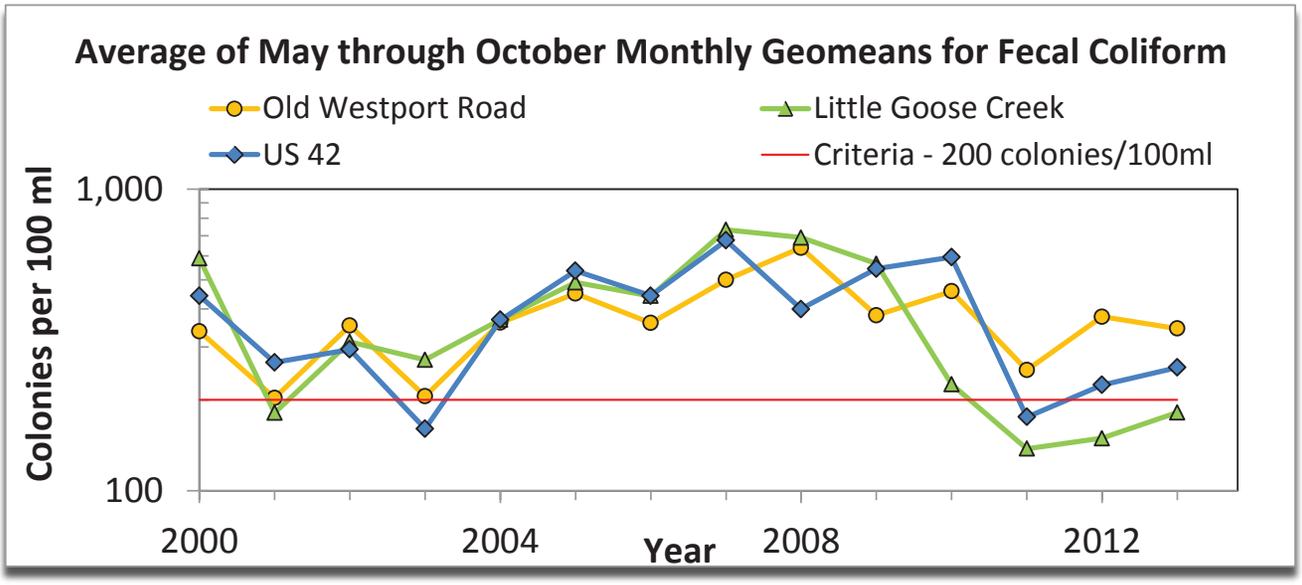
The Bancroft Subdivision treatment facility is the only plant remaining in the Goose Creek Watershed. It is scheduled for elimination in 2015.

Since 2000, MSD has monitored fecal coliform bacteria three to five times a month during the recreational season (April-October). *E coli* bacteria were collected similarly but only since 2011. The monthly geometric means (geomeans) of bacteria concentrations were calculated and compared to the recreational contact standard for each type.

For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. The period of record median of the monthly geomeans for all three sites were above the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variably above and below the standard (not shown), with no apparent trend over the period of record.

There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season. Also, the average annual values for 2004 through 2010 are considerably higher than most other years.

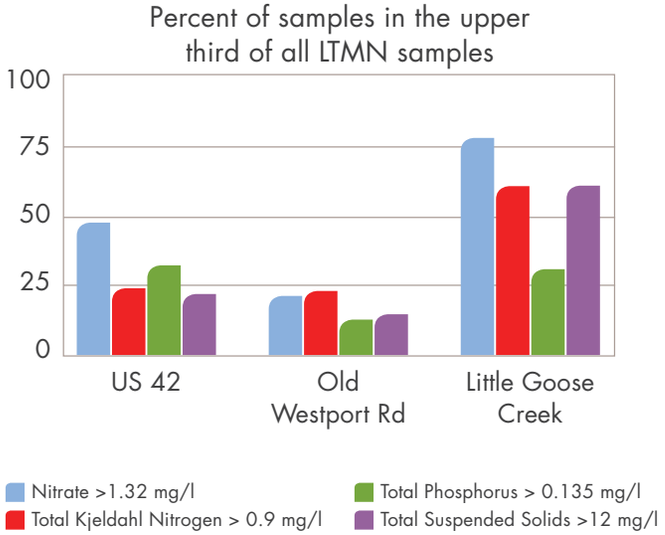
For the three years of data collection of *E coli* bacteria (not shown), most all of the monthly geomeans at the three sites were above the recreational standard of 130 colonies/100ml.



The Kentucky standard for fecal coliform for recreational contact in streams – between May 1 and October 31 – is 200 colonies per 100ml.

MSD monitored the concentrations of nutrients (nitrogen and phosphorus) and total suspended solids periodically from 2000 to 2005 and, more consistently, on a quarterly basis since 2005 at the three sites. The breakpoint concentration between the upper third and lower two thirds of all samples at all 27 MSD LTMN sites collected since 2005 were calculated for each of these constituents. The percent of samples above these breakpoints for each of the three sites is indicative of how they compare to each other and to other LTMN streams in the Metro area.

The Little Goose Creek site had significantly higher values than the other two sites for nitrate, total Kjeldahl nitrogen, and total suspended solids, and nitrate is relatively high much of the time at the site, with almost 80 percent of the nitrate samples in the upper third of all LTMN samples. Total phosphorus is relatively low at the three sites. Total suspended solids are relatively low at the two Goose Creek sites.



MSD monitored concentrations of trace metals in streams periodically from 2000 to 2005 and on a quarterly basis since 2005. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The acute ALC for total concentrations of cadmium, lead, and zinc were not exceeded in any samples at either of the two sites. The ALCs, however, were exceeded for copper in one sample at Old Westport Road.

MSD and the US Geological Survey continuously monitor streamflow, dissolved oxygen, and water temperature at the three sites in the Goose Creek watershed. Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than four or five parts per million are what is deemed necessary. Water temperatures in excess of 31.7°C (89°F) are very stressful on the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen. In general, extended periods of low stream flows also can cause stress on aquatic communities.

US GEOLOGICAL SURVEY - GAGING STATIONS

USGS GAGE NUMBER	STREAM NAME AND LOCATION OF FLOW GAGE	YEAR STARTED
03292474	Goose Creek at Old Westport Road	1996
03292475	Goose Creek at US 42	1999
03292480	Little Goose Creek at US 42	1998

Dissolved oxygen criteria were met 100 percent of the time at the Little Goose Creek site for the last six years. Dissolved oxygen conditions were above five parts per million and in the "good" range at both Goose Creek sites as well. Occasional excursions of low dissolved oxygen likely were a result of very low stream flows on very warm days or some other transient factor.

Water temperature criteria were met 100 percent of the time each year over the last six years at all three sites. Periodic hot days and low stream flows are common in the summer and occasionally cause an exceedance of the criteria, but that is not the case in these sites.

DISSOLVED OXYGEN

SITE	PERCENT OF THE TIME DISSOLVED OXYGEN CRITERIA WERE MET EACH YEAR					
	2007	2008	2009	2010	2011	2012
Old Westport Road	99.6%	96.7%	98.8%	93.5%	98.2%	98.3%
US 42	100.0%	100.0%	100.0%	98.6%	99.7%	99.4%
Little Goose Creek	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

3.3

Muddy Fork of Beargrass Creek Watershed

The Muddy Fork of Beargrass Creek is one of the three streams that join to form the larger Beargrass Creek watershed. The Muddy Fork flows west from Windy Hills toward the Ohio River, then southwest along Interstate 71 before joining with the South Fork to become Beargrass Creek near Mellwood and Story Avenues. Historically, major segments of Muddy Fork have been straightened along Interstate 71 and along Mockingbird Valley Road.

Watershed Assessment

The fish communities at the Muddy Fork at Mockingbird Valley Road site were highly variable from year to year, but conditions were "good" in 2013. The aquatic insect communities were consistently classified as in "poor" and "very poor" condition. Algal communities were rated "excellent" through 2007 and then declined to "fair" condition in 2011 and 2013. Stream habitat on Muddy Fork was consistently "poor" and associated with straightening of the channel, lack of trees and other protective vegetation along the stream banks, eroding banks, and a largely silt stream bottom. These issues have contributed to sediment accumulating in the stream, not ideal habitat for aquatic organisms.

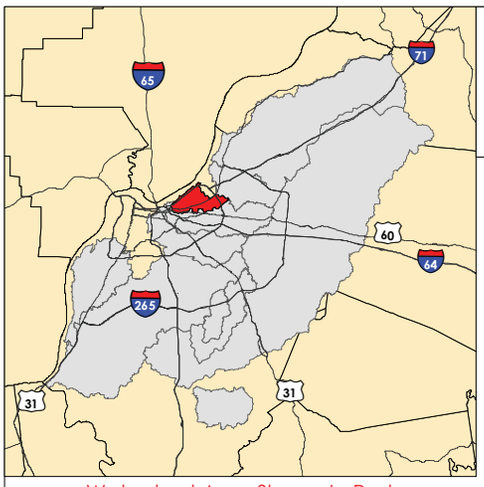
For fecal coliform bacteria, the period of record median (the middle value) of the monthly geomeans for the Muddy Fork site was above the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variable but usually above the standard, with no apparent trend over the period of record. For the three years of data collection of *E. coli* bacteria, most all of the monthly geomeans at the site were above the recreational standard of 130 colonies/100ml.

Nutrient and total suspended solids levels in this largely forested urban residential watershed are in the lower concentration groupings compared to other LTMN sites. More recent wet weather event sampling data confirms the historical LTMN metals data that trace metals are not an issue of concern in this stream.

Dissolved oxygen conditions were "good" (criteria met more than 93.5 percent of the time) at the Muddy Fork sites over the last six years. Water temperature criteria (no more than 31.7°C (89.1°F)) at the Muddy Fork site were met 100 percent of the time over the last six years, except for occasional excursions in 2010 and 2012. Periodic hot days and low stream flows are common in the summer and occasionally can cause an exceedance of these criteria.

The Mellwood Avenue Pumping Station near Muddy Fork at Mockingbird Valley Road eliminated an overflow from the existing sewer system.

MUDDY FORK OF BEARGRASS CREEK WATERSHED
WATER QUALITY STATUS AND TRENDS



Watershed Area Shown In Red

Muddy Fork of Beargrass Creek at Mockingbird Valley Road (6.2 square miles and 46 percent urban)								
2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	—	↑	↓	↑	—	—	A	~

CLARK COUNTY, INDIANA

Harrods Creek

Little Goose Creek

Ohio River

42

Goose Creek

71

JEFFERSON COUNTY

Muddy Fork of Beargrass Creek

Beargrass Creek

Middle Fork of Beargrass Creek

LEXINGTON RD

60

150

64

264

31

South Fork of Beargrass Creek

South Fork of Beargrass Creek

N

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

TREND

- Improving
- Declining
- Varies
- No Change
- ND No Data

STATUS

- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria

RATINGS KEY

Background and Land Use

There are about 9 square miles of land draining the entire Muddy Fork Watershed and 6.2 square miles of land draining to the Muddy Fork at Mockingbird Valley Road site. The land use draining to the monitoring site, like the entire Muddy Fork watershed, is a mix of forest and urban and suburban uses. Fifty-two percent of the watershed is classified as forest. However, this area of Louisville is densely developed and many of the areas classified as forested are actually tree-covered developed areas. There is a small area of agricultural land in the very upper part of the watershed. Impervious surfaces such as roads, rooftops and driveways cover about 9 percent of this watershed.

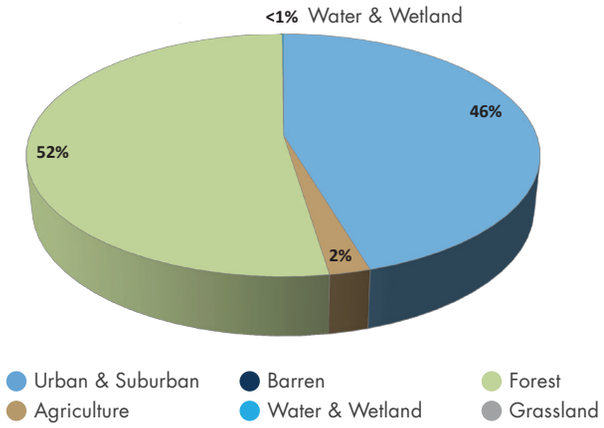
Monitoring Findings

MSD monitored the fish communities in the Muddy Fork since 2002. The fish communities at the Muddy Fork at Mockingbird Valley Road site were highly variable from year to year, but conditions were "good" in 2013.

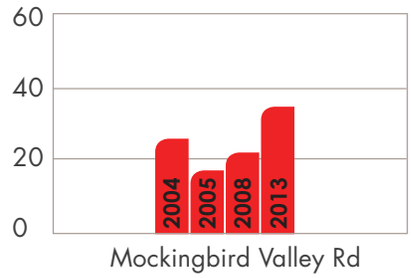
MSD monitored aquatic insect communities at the Muddy Fork site since 2004. The aquatic insect communities were consistently classified as "poor" and "very poor" at the Mockingbird Valley Road site on Muddy Fork.

MSD has assessed stream habitat when fish and aquatic insects were sampled since 2005. Habitat on Muddy Fork was consistently "poor" and associated with straightening of the channel, lack of trees and other protective vegetation along the stream banks, and eroding banks. These issues have contributed to silt and sediment accumulating in the stream, which covers habitats used by aquatic insects and fish.

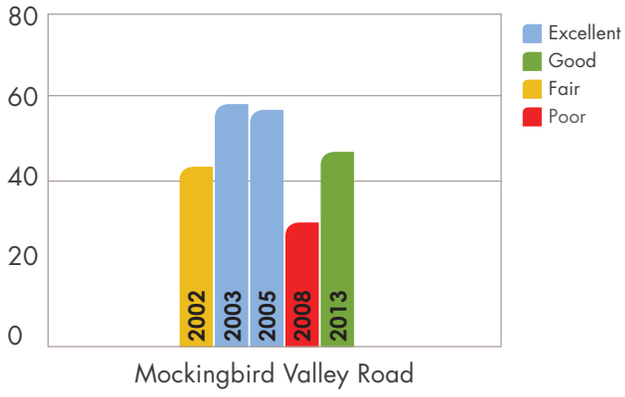
Land Use Upstream of Muddy Fork of Beargrass Creek at Mockingbird Valley Road



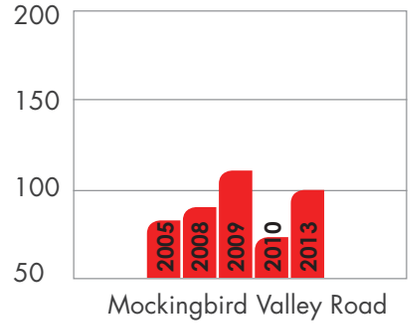
Condition of Aquatic Insect Communities in the Muddy Fork of Beargrass Creek Watershed



Condition of Fish Communities in the Muddy Fork of Beargrass Creek Watershed



Condition of Stream Habitat Communities Muddy Fork of Beargrass Creek Watershed



Since 2000, MSD has monitored fecal coliform bacteria three to five times a month during the recreational season (April-October). *E. coli* bacteria were collected similarly but only since 2011. The monthly geometric means (geomeans) of bacteria concentrations were calculated and compared to the recreational contact standard for each type.

For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. The period of record median of the monthly geomeans for the Muddy Fork site was above the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variable but usually above the standard (not shown), with no apparent trend over the period of record.

There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season. For the three years of data collection of *E. coli* bacteria (not shown), most all of the monthly geomeans at the site were above the recreational standard of 130 colonies/100ml.

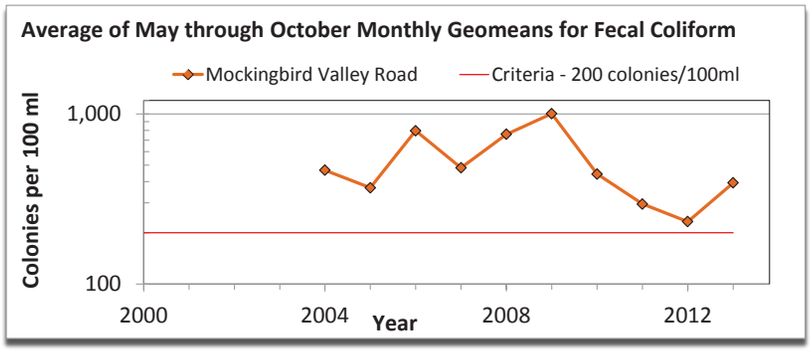
MSD has monitored benthic algal communities, largely diatoms, in the Muddy Fork watershed since 2002. Using a Diatom Bioassessment Index (DBI), the Muddy Fork site was rated "excellent" through 2007 and then declined to "fair" condition in 2011 and 2013. The site showed significant decline in the condition of the algal communities over the period of study.

MSD monitored the concentrations of nutrients (nitrogen and phosphorus) in streams and total suspended solids periodically from 2000 to 2005 and on a quarterly basis since 2005 at the Muddy Fork site. The percent of samples taken at these sites which fall into the upper third of all LTMN samples were calculated as a comparison to other streams in the area. Nutrient and total suspended solids levels in this largely forested urban residential watershed are generally in the low concentration grouping compared to the other LTMN sites.

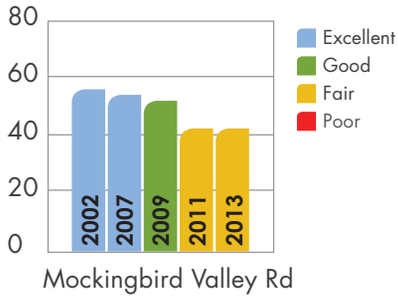
MSD monitored concentrations of trace metals in streams periodically from 2000 to 2005 and on a quarterly basis since 2005. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The ALCs were exceeded for cadmium in nine samples, copper in 11 samples, for lead in 11 samples, and zinc in two samples.

MSD and the US Geological Survey continuously monitor streamflow, dissolved oxygen, and water temperature on the Muddy Fork of Beargrass Creek at Mockingbird Valley Road (USGS gage 03293530) since 2002. Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than four parts per million (as an instantaneous standard) or five parts per million (as a mean daily standard) are what is deemed necessary. Water temperatures in excess of 31.7°C (89°F) are very stressful on the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen. In general, extended periods of low stream flows also can cause stress on aquatic communities.

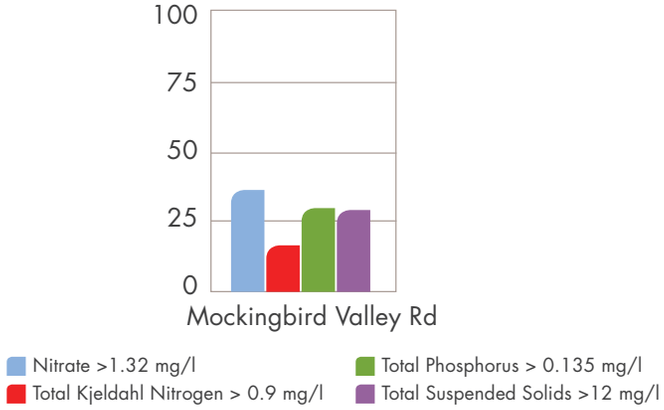
Dissolved oxygen conditions were "good" (criteria met more than 93.5 percent of the time) at the Muddy Fork sites over the last six years. Water temperature criteria at the Muddy Fork site were met 100 percent of the time over the last six years, except for occasional excursions in 2010 and 2012. Periodic hot days and low stream flows are common in the summer and occasionally can cause an exceedance of these criteria.



Condition of Algal Communities in the Muddy Fork of Beargrass Creek Watershed



Percent of samples in the upper third of all LTMN samples




Muddy Fork of Beargrass Creek near Mockingbird Valley Road

3.4

Middle Fork of Beargrass Creek Watershed

The Middle Fork of Beargrass Creek is one of the three streams that join to form the larger Beargrass Creek watershed. The small streams that eventually form the Middle Fork of Beargrass Creek originate in Middletown and Douglass Hills, and flow west across Saint Matthews before joining the South Fork of Beargrass Creek near Irish Hill. The South Fork then joins with the Muddy Fork to become Beargrass Creek near the intersection of Interstates 71 and 64. Prominent features of this watershed include Cherokee Park, Seneca Park and Cave Hill Cemetery. A portion of this part of Louisville is currently served by combined sewers.

Watershed Assessment

The health of the aquatic communities at the three Middle Fork sites was variable over time and between sites. Since 1999, the fish communities showed significant improvement from "poor" to "good" at the furthest upstream Browns Lane site and from "poor" to "fair" at the mid-watershed Old Cannons Lane. Fish communities were consistently "poor" at the Lexington Road site. The aquatic insect communities at all three sites generally were classified as "poor" or "fair" and generally the same or declining. The stream habitat conditions were generally "good" at the three sites since 2005 and generally improving at the two upstream sites. The algal community at the upstream Browns Lane site was rated in "fair" condition in 2013, the Old Cannons Lane site was in "good" condition, and the downstream Lexington Road site was rated "excellent" in 2013. Browns Lane showed some decline in the condition of the algal community over time.

Some of the highest bacterial concentrations are found in the Beargrass Creek sites, especially in the lower parts of the watersheds. For fecal coliform bacteria, the period of record medians (the middle values) of the monthly geomeans for all three sites were above the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variable but usually above the standard, with no apparent trend over time. For the three years of data of *E. coli* bacteria, most of the monthly geomeans at the sites were above the recreational standard of 130 colonies/100ml.

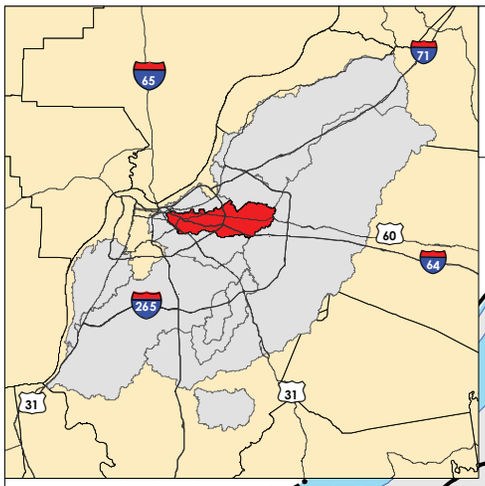
The Lexington Road site had the highest number of samples in the upper third for total Kjeldahl nitrogen, total suspended solids, and phosphorus, but lower nitrate numbers than all other Middle Fork sites. Total phosphorus, total Kjeldahl nitrogen, and total suspended solids all increased from upstream (Browns Lane) to downstream (Lexington Road), whereas, nitrate decreased from upstream to downstream. Nutrient and total suspended solids levels in these sites generally are average or in the lower grouping compared to other LTMN sites.

More recent wet weather event sampling data confirms the historical data that trace metals are not a large issue of concern in these LTMN streams.

Dissolved oxygen conditions were "good" and water temperature criteria were met 100 percent of the time at the Old Cannons Lane site, except for occasional excursions in 2010 and 2012. Dissolved oxygen conditions were "poor to fair" and water temperature criteria (no more than 31.7°C (89.1°F)) were met 97.2 percent of the time or more at the Lexington Road site, with occasional excursions most years. Periodic hot days and low stream flows can cause an exceedance of the dissolved oxygen or temperature criteria. The presence of the many parks, which provide natural areas to absorb runoff from developed areas as well as tree cover, probably help buffer this watershed to some degree from the otherwise significant urban influences (urban area above 70 percent).

Big Rock in Cherokee Park along the Middle Fork of Beargrass Creek after two inches of rain

MIDDLE FORK OF BEARGRASS CREEK WATERSHED WATER QUALITY STATUS AND TRENDS



Watershed Area Shown In Red

Ohio River

Beargrass Creek

Middle Fork of Beargrass Creek

South Fork of Beargrass Creek

JEFFERSON COUNTY

Middle Fork of Beargrass Cr at Lexington Rd
(24.8 square miles and 73 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	—	↓	—	—	↑	—	A	~

Middle Fork of Beargrass Creek at Browns Lane
(15.2 square miles and 73 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	—	↓	↑	ND	ND	A	~

Middle Fork of Beargrass Cr at Old Cannons Ln
(18.9 square miles and 76 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	—	↓	—	↑	—	—	A	~

N

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

RATINGS KEY

TREND
- ↑ Improving
- ↓ Declining
- ~ Varies
- — No Change
- ND No Data

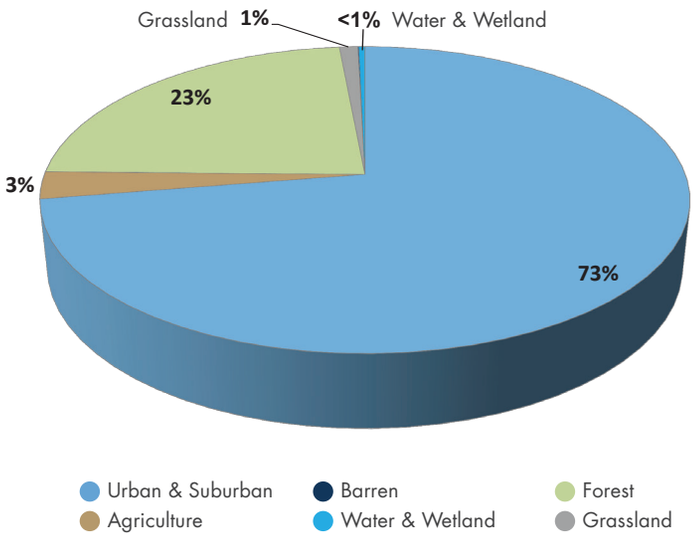
STATUS
- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria

Background and Land Use

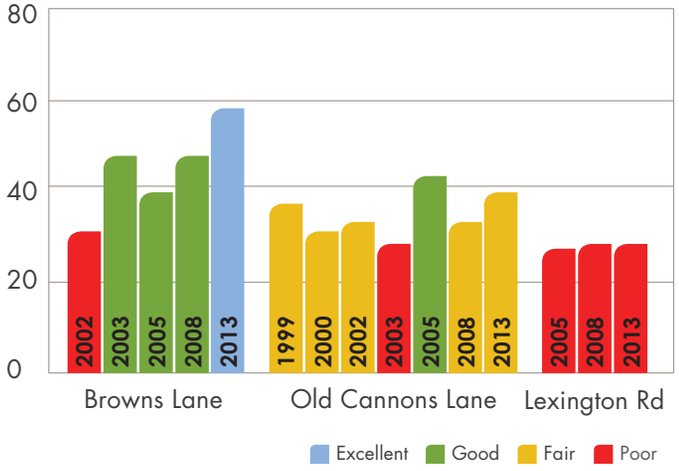
There are just over 25 square miles of land in the Middle Fork of Beargrass Creek Watershed. MSD monitors three stream sites in the watershed: at Old Cannons Lane, at Browns Lane and at Lexington Road. There are 15.2 square miles of land draining to the Browns Lane site; 18.9 square miles to the Old Cannons Lane site and 24.8 square miles to the Lexington Road site.

The land use associated with each monitoring site, like the entire watershed, is mostly developed for urban and suburban uses. Portions of the watershed classified as forest include Cherokee Park and Seneca Park. However, this area of Louisville is densely developed, and some of the areas classified as forested in the western part of the watershed are actually tree-covered developed areas. There is a small area of agricultural land in the middle part of the watershed. Impervious surfaces such as roads, rooftops and driveways cover about 23 percent of this watershed.

Land Use Upstream of Middle Fork of Beargrass Creek at Lexington Road



Condition of the Fish Communities in the Middle Fork of Beargrass Creek Watersheds



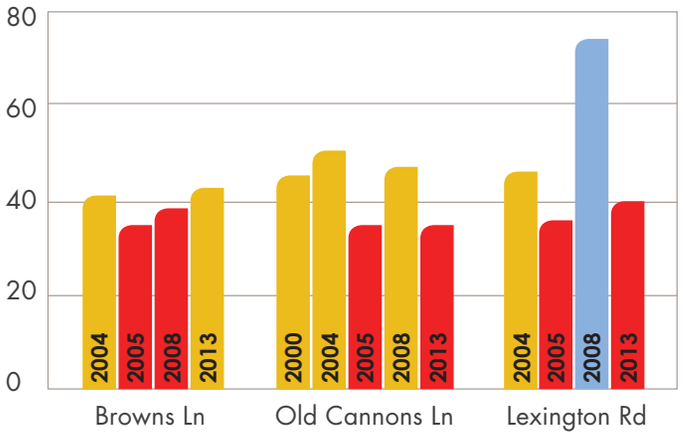
Monitoring Findings

MSD monitored the fish communities in the Middle Fork watershed since 1999. The fish communities at the Browns Lane site improved from "fair" in 2002 to "excellent" in 2013. Since 1999, fish communities at Old Cannons Lane were variable but generally "fair". The fish communities were "poor" at the most downstream Lexington Road site since 2005.

MSD monitored aquatic insect communities at the Old Cannons Lane site since 2000 and at the other three sites since 2004. The aquatic insect communities at the Browns Lane, Old Cannons Lane, and Lexington Road sites have been variably "poor" to "fair" except for an "excellent" in 2008 at Lexington Road.

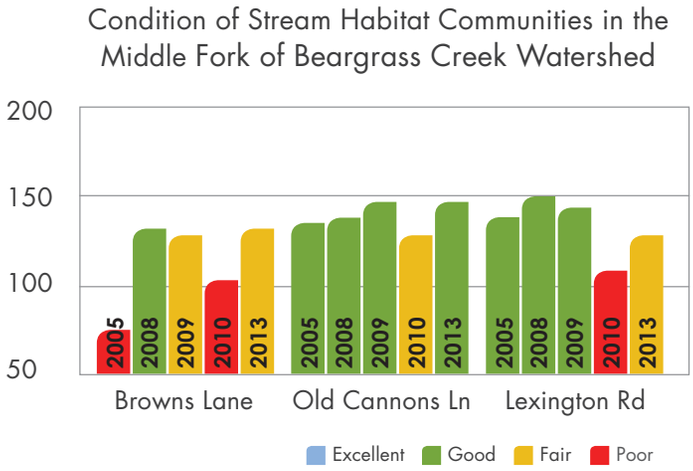
MSD has assessed stream habitat when fish and aquatic insects were sampled since 2005. The aquatic habitat at Browns Lane was "poor" in 2005 and variably improving to "fair" in 2013, generally "good" at Old Cannons Lane, and declining from "good" in 2005 to "fair" in 2013 at the Lexington Road site. Similar to many urban streams, the habitat assessment noted a lack of trees and other protective vegetation along stream banks, and unstable stream beds or stream banks.

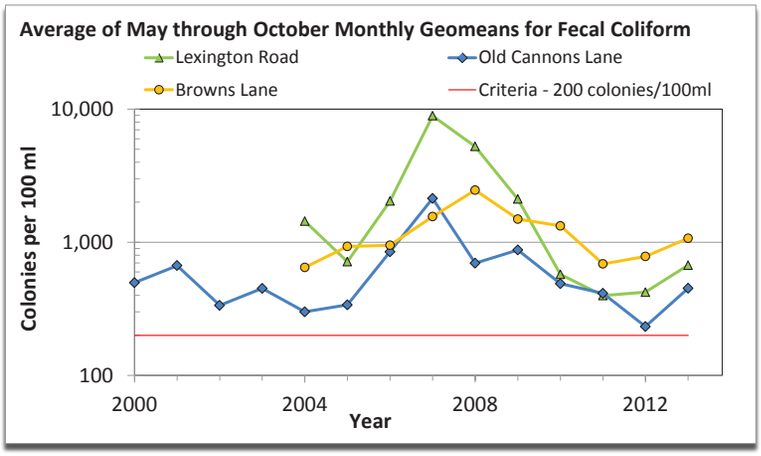
Condition of the Aquatic Insect Communities in the Middle Fork of Beargrass Creek Watersheds



Since 2000, MSD has monitored fecal coliform bacteria three to five times a month during the recreational season (April-October). *E. coli* bacteria were collected similarly but only since 2011. The monthly geometric means (geomeans) of bacteria concentrations were calculated and compared to the recreational contact standard for each type.

For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. The period of record medians of the monthly geomeans for all three sites were above the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variable but usually above the standard (not shown), with no apparent trend over the period of record. There was a tendency, however, for

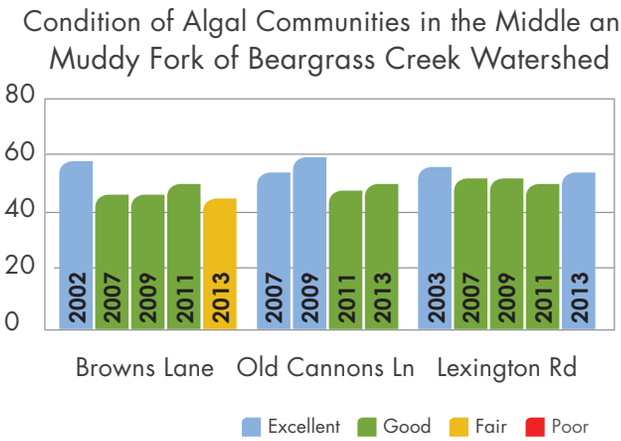




higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season. For the three years of data collection of *E. coli* bacteria (not shown), most all of the monthly geomeans at the sites were above the recreational standard of 130 colonies/100ml.

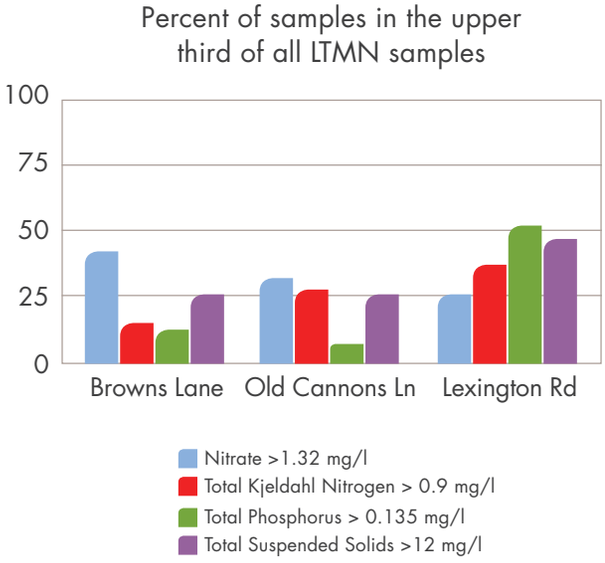
MSD has monitored benthic algal communities, largely diatoms, in the Middle Fork watershed since 2002. Using a Diatom Bioassessment Index (DBI), the upstream Browns Lane site was rated "excellent" in 2002 and then declined to "fair" condition in 2013. The Old Cannons Lane site was rated "excellent" in 2007 and 2009 but then declined to "good" condition in 2011 and 2013. The downstream Lexington Road site was rated "excellent" in 2003, declined to "good" condition in 2007 to 2011, and was "excellent" again in 2013. Two of the sites showed some decline in the condition of their algal communities over the period of study.

MSD monitored the concentrations of nutrients (nitrogen and phosphorus) in streams and total suspended solids periodically from 2000 to 2005 and on a quarterly basis since 2005 at the three sites in the Middle Fork of Beargrass Creek watershed. The percent of samples taken at these sites which fall into the upper third of all samples were calculated as a comparison to other streams in the watershed and throughout the area.



The Lexington Road site had the greatest number of total suspended solids, total Kjeldahl nitrogen, and total phosphorus samples in the upper third of all LTMN samples and the lowest number of nitrate samples compared to the other sites. The Browns Lane site had the highest number of nitrate samples in the upper third. Total phosphorus was significantly lower at both the Browns Lane and Old Cannons Lane sites than the downstream Lexington Road site. Nutrient and total suspended solids levels in these sites are average or in the lower grouping compared to other LTMN sites.

MSD monitored concentrations of trace metals in streams periodically from 2000 to 2005 and on a quarterly basis since 2005. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The ALCs were exceeded for cadmium in nine samples, copper in 11 samples, for lead in 11 samples, and zinc in two samples.



A student spends the afternoon at Big Rock in Cherokee Park along the Middle Fork of Beargrass Creek

MSD and the US Geological Survey continuously monitor streamflow, dissolved oxygen, and water temperature on the Middle Fork of Beargrass Creek at Old Cannons Lane (USGS gage 03293000) and at Lexington Road (USGS gage 03293500). Stream flow has been monitored at Old Cannons Lane since 1944 and at Lexington Road since 2003.

Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than four parts per million (as an instantaneous standard) or five parts per million (as a mean daily standard) are what is deemed necessary. Water temperatures in excess of 31.7°C (89°F) are very stressful on the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen. In general, extended periods of low stream flows also can cause stress on aquatic communities.

Dissolved oxygen conditions were "good" (criteria met more than 93.5 percent of the time) at the Old Cannons Lane site over the last six years. Occasional excursions of low dissolved oxygen likely were a result of very low stream flows on very warm days or some other transient factor. Dissolved oxygen conditions were "poor to fair" (72 to 87.7 percent) at Lexington Road, a site with significant combined sewer inflows upstream.

Water temperature criteria at the Old Cannons Lane site were met 100 percent of the time over the last six years, except for occasional excursions in 2012. Water temperature criteria at the Lexington Road site were met at least 97.2 percent of the time over the last six years, with occasional excursions most years. Periodic hot days and low stream flows are common in the summer and occasionally cause an exceedance of the criteria.

The Middle Fork of Beargrass Creek is one of the most diverse watersheds in Jefferson County. The upper areas are primarily suburban, with residential neighborhoods and large shopping centers. Combined sewers, carrying both stormwater and sanitary waste, serve the lower area. The watershed contains two significant public parks, Cherokee and Seneca, along with Cave Hill cemetery, the largest cemetery in the city.

Beargrass Creek

3.5

South Fork of Beargrass Creek Watershed

The South Fork of Beargrass Creek is one of the three streams that join to form the larger Beargrass Creek Watershed. The small streams that eventually form the South Fork of Beargrass Creek originate in Jeffersontown and Hurstbourne Acres. The South Fork of Beargrass Creek flows west across Buechel and Audubon Park before joining the Middle Fork of Beargrass Creek near Irish Hill. The South Fork then joins with the Muddy Fork to become Beargrass Creek near the intersection of Interstates 71 and 64. Streams in this watershed were straightened and several miles have been enclosed in concrete channels in the past to reduce flooding.


South Fork of Beargrass Creek near Eastern Parkway

Watershed Assessment

The health of the aquatic communities in the three South Fork sites was variable over time and between sites. The fish communities at the Trevilian Way and Brownsboro Road sites were rated "fair" in 2013 and were "very poor" at the Schiller Avenue Ramp. Only the Brownsboro Road site has shown improvement in the fish community over time. The aquatic insect communities at the three sites were "poor" in 2013 but improving some over time. Algal conditions at the upstream Trevilian Way site were "excellent" in 2013 and unchanged. Algal conditions at the Schiller Avenue Ramp site were "fair" in 2013 and generally declining. Algal community conditions at the Brownsboro Road site were rated "good" in 2013 but declining over time, perhaps a result of heavy tree cover.

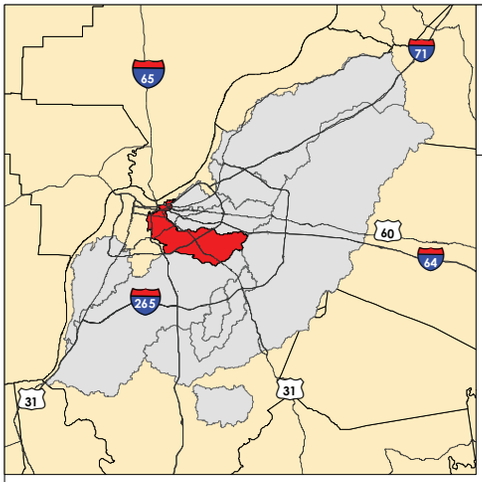
Stream habitat conditions were "poor" in 2013 for the two upstream sites and "good" at the Brownsboro Road site. Stream habitat at Trevilian Way and Schiller Avenue Ramp was affected by many of the issues that affect urban streams: altered stream channels, concrete lined or unstable banks, silt and sediment accumulation, and lack of shallow rocky riffles and slow deep pools. These habitat issues also affect the Brownsboro Road site, but less severely in that the stream bed there has a substantial rocky substrate, not concrete or sediment laden.

For fecal coliform bacteria, the period of record medians (the middle values) of the monthly geomeans for the three sites were above the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variably above and below the standard, with no apparent trend over the period of record. For the three years of data collection of *E. coli* bacteria, most of the monthly geomeans at the three sites were above the recreational standard of 130 colonies/100ml. These and other Beargrass Creek watershed sites receive sewer overflows during rainfall events and have some of the highest bacterial concentrations in the LTMN.

Generally the number of nutrient and total suspended solids samples were average or relatively low at all sites in the South Fork watershed compared to other LTMN sites. The results indicate that both nitrate and total phosphorus increased from upstream to downstream in the South Fork. This could be due to sewer inflows, tributaries, or surface runoff from suburban and urban areas between these sites.

More recent wet weather event sampling data confirms the historical data findings that trace metals are not a large issue of concern in these LTMN streams. Despite having the largest portion of the exceedances observed in all LTMN sites (41 samples out of over 1,200 LTMN samples), exceedances were still relatively infrequent and not considered to be a large concern.

Dissolved oxygen conditions were "good" at the Trevilian Way and Schiller Avenue Ramp sites, but conditions were "poor to fair" at Brownsboro Road, a site with significant sewer inflows upstream. Water temperature criteria (no more than 31.7°C (89.1°F)) at all three sites were met 100 percent of the time most years over the last six years, except for occasional excursions in 2010 and 2012. Periodic hot days and low stream flows are common in the summer and occasionally cause an exceedance of both the dissolved oxygen and temperature criteria.



SOUTH FORK OF BEARGRASS CREEK WATERSHED WATER QUALITY STATUS AND TRENDS

CLARK COUNTY, INDIANA

JEFFERSON COUNTY

Ohio River

Beargrass Creek

Muddy Fork

Little Goose Creek

Goose Creek

Middle Fork Beargrass Creek

South Fork of Beargrass Creek

Fern Creek

South Fork Beargrass Creek at Brownsboro Rd
(51.5 square miles and 78 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	↓	↑	↓	—	A	~

South Fork Beargrass Cr at Schiller Ave Ramp
(22.8 square miles and 81 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↓	↑	↓	—	—	—	A	~

South Fork Beargrass Creek at Trevilian Way
(17.2 square miles and 85 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	—	↑	—	↑	—	—	A	~

N

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

TREND
- ↑ Improving
- ↓ Declining
- ~ Varies
- — No Change
- ND No Data

STATUS
- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria

RATINGS KEY

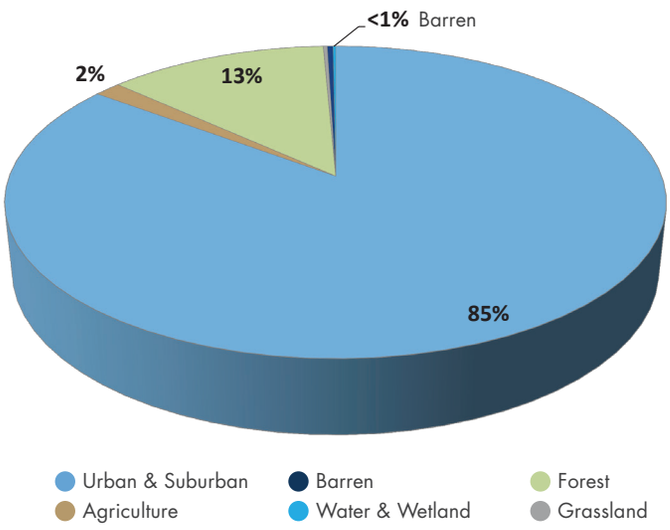
Background and Land Use

There are about 25 square miles of land in the entire South Fork of Beargrass Creek Watershed. MSD has been monitoring water quality in the South Fork of Beargrass Creek at the Trevilian Way site since 1999, at Schiller Avenue since 2000, and at Brownsboro Road since 2004.

In the upper part of the watershed, there are 17.2 square miles of land draining to the Trevilian Way site. At the lower end, 22.8 square miles of land are draining to the Schiller Avenue site and 51.5 square miles of land are draining to the Brownsboro Road site.

The land use associated with each monitoring site, like the entire watershed, is mostly developed for urban and suburban uses. Impervious areas, including roadways, rooftops and driveways cover 32 percent of the land draining to the Trevilian Way monitoring site. At the Brownsboro Road monitoring site, impervious surfaces cover 28 percent of the land area. A modest percentage of the land is forested and a very small amount of land is agricultural in the uppermost part of the watershed.

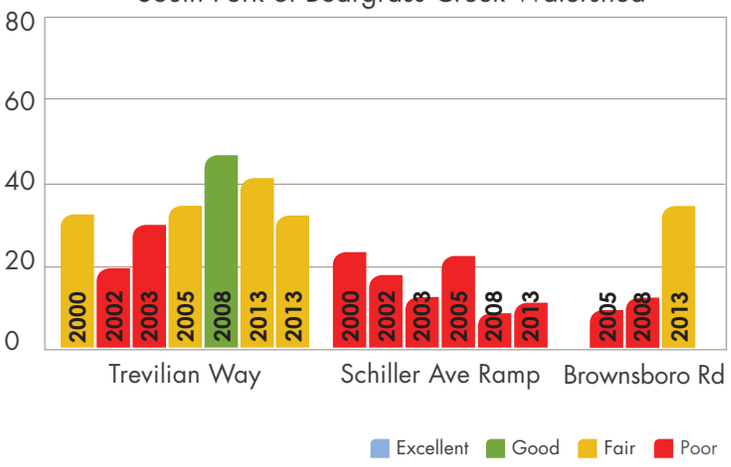
Land Use Upstream of South Fork of Beargrass Creek at Trevilian Way



Monitoring Findings

MSD has monitored fish communities in the South Fork of Beargrass Creek watershed since 1999. At Trevilian Way, the most upstream site, the fish communities variably were "poor to good" but have been "fair" since 2008. The Schiller Avenue Ramp site was "very poor" or "poor" throughout the sampling period, which is not surprising since the channel is concrete lined at that point. The Brownsboro Road site furthest downstream was sampled only since 2005 and was rated "very poor" until 2013, when the fish community improved to "fair".

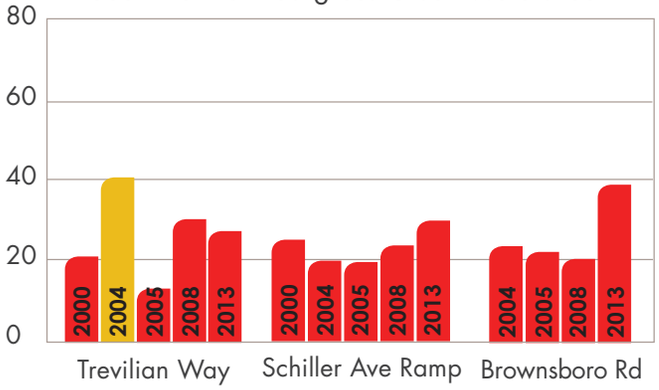
Condition of the Fish Communities in the South Fork of Beargrass Creek Watershed

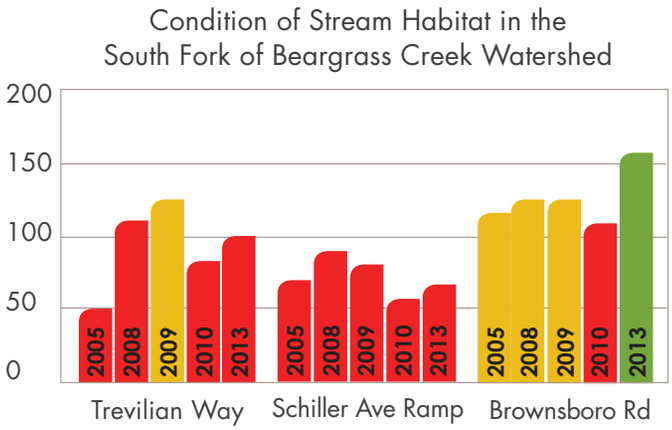


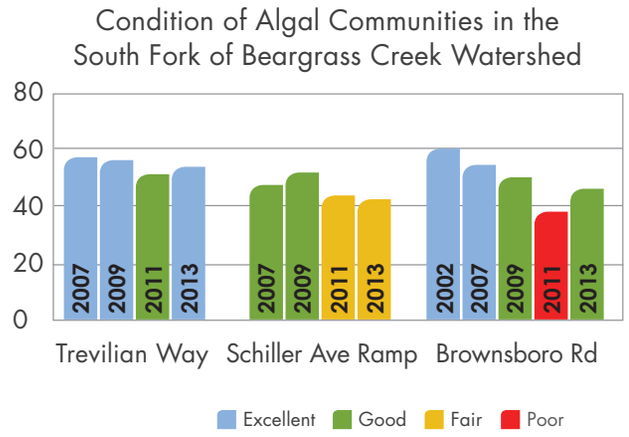
MSD monitored aquatic insect communities in the South Fork of Beargrass Creek watershed since 2000. The aquatic insect communities were found to be in "very poor" or "poor" condition throughout, except in 2004, when the Trevilian Way site was classified as "fair". The numerical indices at the three sites, however, actually show a slight improvement over time.

MSD has assessed stream habitat quality when fish and aquatic insects were sampled since 2005. Stream habitat conditions at the Trevilian Way and Schiller Avenue Ramp sites generally were "poor". At Trevilian Way, the stream has been channelized and has accumulations of silt and sediment, which cover habitat used by fish and aquatic insects. At the Schiller Avenue Ramp, the South Fork is a concrete lined channel lacking any likeness to a natural stream. In both of these sites, the stream lacks the variety of habitats typically found in good quality streams, including shallow rocky riffles and slow deep pools. These issues also affect the Brownsboro Road site, but stream habitat conditions at that site actually have improved from "poor" to "good" over time due to an abundance of tree cover and a cobble stream bed.

Condition of Aquatic Insect Communities in the South Fork of Beargrass Creek Watershed







MSD has monitored benthic algal communities, largely diatoms, at the downstream Brownsboro Road site since 2002. Using a Diatom Bioassessment Index (DBI), the site was rated "excellent" in 2002 and 2007 but declined to a "poor" condition in 2011 and back up to a "good" condition in 2013. Conditions at the Schiller Avenue Ramp site declined from a "good" condition in 2007 and 2009 to a "fair" condition in 2011 and 2013. Conditions of the algal communities at the upstream Trevilian Way site generally were "excellent".

Since 2000, MSD has monitored fecal coliform bacteria three to five times a month during the recreational season (April-October). *E. coli* bacteria were monitored similarly but only since 2011. The monthly geometric means (geomeans) of bacteria concentrations were calculated and compared to the recreational contact standard for each type.

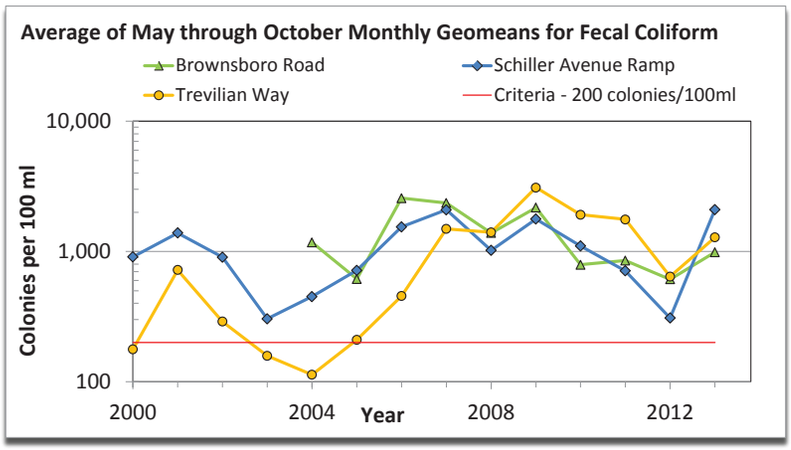
For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. The period of record medians (the middle values) of the monthly geomeans for all three sites were above the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variably above and below the standard (not shown), with no apparent trend over the period of record.

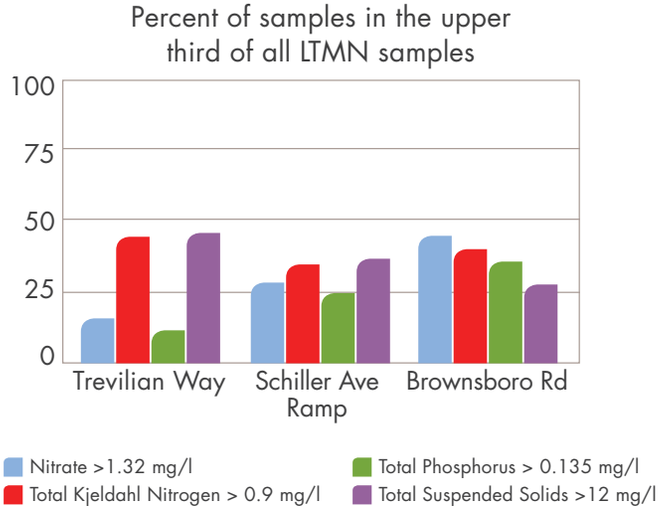
There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season.

For the three years of data collection of *E. coli* bacteria (not shown), most of the monthly geomeans at the three sites were above the recreational standard of 130 colonies/100ml.

MSD monitored the concentrations of nutrients (nitrogen and phosphorus) in streams and total suspended solids periodically from 2000 to 2005 and on a quarterly basis since 2005 at three sites in the South Fork of Beargrass Creek watershed. The percent of samples taken at these sites which fall into the upper third of all samples were calculated as a comparison to other streams in the watershed and throughout the area.

Generally all nutrient parameters were average or relatively low at all sites in the South Fork watershed compared to other Long Term Monitoring Network (LTMN) sites. The site on South Fork at Trevilian had the greatest number of total suspended solids and total Kjeldahl nitrogen samples in the upper third of all samples, but had relatively low nitrate and total phosphorus values. The site at Brownsboro Road had higher nitrate and total phosphorus than the other two sites in the watershed.





MSD monitored concentrations of trace metals in streams periodically from 2000 to 2005 and on a quarterly basis since 2005. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The acute ALC for total concentrations were exceeded for cadmium in 11 samples, for copper in 20 samples, for lead in nine samples, and for zinc in one sample.

MSD and the US Geological Survey continuously monitor streamflow, dissolved oxygen, and water temperature at two sites in the South Fork of Beargrass Creek watershed. Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than four parts per million (as an instantaneous standard) or five parts per million (as a mean daily standard) are what is deemed necessary. Water temperatures in excess of 31.7 °C (89.1 °F) are very stressful on the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen. In general, extended periods of low stream flows also can cause stress on aquatic communities.

Dissolved oxygen conditions were "good" (criteria met more than 90 percent of the time) at the Trevilian and Schiller Avenue Ramp sites for the last six years. Occasional excursions of low dissolved oxygen likely were a result of very low stream flows on very warm days or some other transient factor. Dissolved oxygen conditions were "poor to fair" (72 to 87.7 percent) at the Brownsboro Road site.

Water temperature criteria at all three sites were met 100 percent of the time most years over the last six years, except for occasional excursions in 2010 and 2012. Periodic hot days and low stream flows are common in the summer and occasionally cause an exceedance of the criteria.

MSD plans to construct a wet weather storage basin near Logan and Breckinridge Streets in 2015.

US GEOLOGICAL SURVEY - GAGING STATIONS

USGS GAGE NUMBER	STREAM NAME AND LOCATION OF FLOW GAGE	YEAR STARTED
03292500	South Fork of Beargrass Creek at Trevilian Way	1939
03292550	South Fork of Beargrass Creek at Winter Avenue	1998

A group of students paddles by MSD's Beargrass Creek Flood Pumping Station on a tour of the stream.

Beargrass Creek

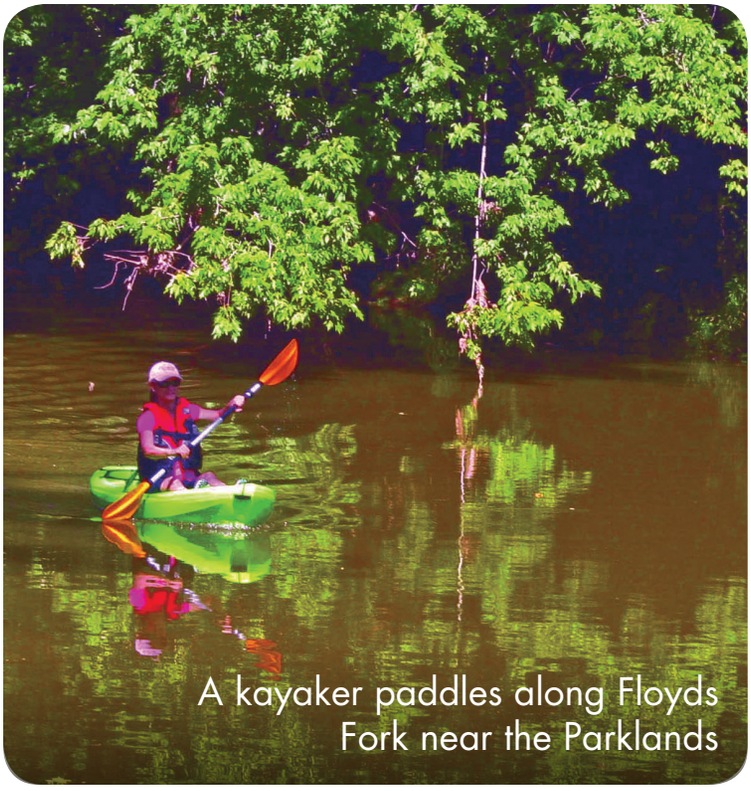
3.6

Floyds Fork Watershed

The small streams that form Floyds Fork originate in Oldham, Shelby, and Henry Counties. Floyds Fork flows south through Oldham, eastern Jefferson, and northern Bullitt Counties where it drains into the Salt River near Shepherdsville.

Watershed Assessment

Conditions of the fish communities in 2013 at the five sites in the Floyds Fork watershed ranged from "fair" at the two Chenoweth Run sites to "good" at the Ash Avenue site to "excellent" at the two downstream Floyds Fork sites. All sites showed significant improvement over time. The aquatic insect communities at all five sites were "fair" in 2013. Only Chenoweth Run at Ruckriegel Parkway and Floyds Fork at Ash Avenue have shown improvement in the insect communities over time. Conditions of the algal communities were "fair" at the Bardstown Road and Gellhaus Lane sites and "good" at the other three sites in 2013. Conditions of the algal communities have been improving since 2011 at all but Bardstown Road. Stream habitat conditions generally were "good" at all three Floyds Fork sites and at the Gellhaus Lane site. Chenoweth Run at Ruckriegel Parkway had a "fair" rating in 2013, but habitat appears to be improving at both Chenoweth Run sites.



A kayaker paddles along Floyds Fork near the Parklands

For fecal coliform bacteria, the period of record medians (the middle values) of the monthly geomeans at all three Floyds Fork sites and the Chenoweth Run at Gellhaus Lane site were below the recreational standard of 200 colonies/100ml, while the value was above the standard for the Ruckriegel Parkway site. Individual monthly geomeans were variably above and below the standard, with no apparent trend. For three years of data on *E. coli* bacteria, most of the monthly geomeans at the 5 sites were above the recreational standard of 130 colonies/100ml.

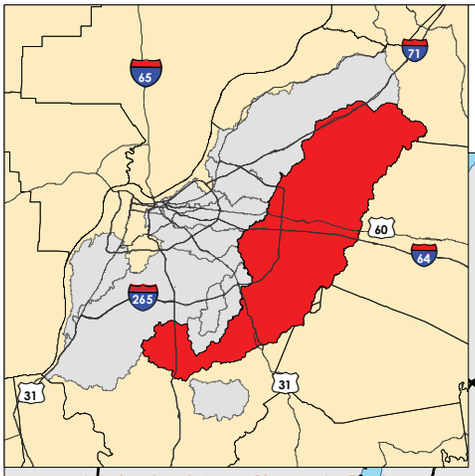
The five sites had some of the highest percentages of nutrient measurements in the top third of all 27 LTMN samples. Total suspended solids were not much of an issue in Chenoweth Run but were higher at all three sites on Floyds Fork. Nitrate and total Kjeldahl nitrogen were highest in the Chenoweth Run at Gellhaus Lane site.

Removal of the Jeffersontown Water Quality Treatment Center effluent to Chenoweth Run in late 2015 should lead to much improved nutrient conditions, but as flows also will be reduced, only time will tell how the aquatic communities will respond. Continued water quality monitoring to document the changes is all that more important in this watershed.

The acute Aquatic Life Criteria was exceeded for cadmium in one sample at Gellhaus Lane and for copper in two samples (at Ruckriegel Parkway and at Old Taylorsville Road). The criteria for lead and zinc were not exceeded in any samples. More recent wet weather event sampling data confirms the historical data suggesting that trace metals are not an issue of concern in these LTMN streams.

Dissolved oxygen conditions were in the "good" range in both Chenoweth Run sites and the two downstream Floyds Fork sites, but conditions in the Ash Avenue site were in the "fair" range for two of the three years of record. It is not clear if the low dissolved oxygen readings were a result of very low stream flows or some other factor like fouling of the probe. Water temperature criteria (no more than 31.7°C (89.1°F)) were met 100 percent of the time at the Ruckriegel site and at least 97 percent of the time at the other four sites. Periodic hot days and low stream flows are common in the summer and occasionally cause an exceedance of the water temperature or dissolved oxygen criteria.

FLOYDS FORK WATERSHED
WATER QUALITY STATUS AND TRENDS



Watershed Area Shown In Red

CLARK COUNTY, INDIANA

Ohio River

OLDHAM COUNTY

HENRY COUNTY

SHELBY COUNTY

JEFFERSON COUNTY

SPENCER COUNTY

BULLITT COUNTY

NELSON COUNTY

Chenoweth Run

Floyds Fork

Salt River

42 71 265 60 264 31 64 65 44

Floyds Fork at Ash Avenue
(80 square miles and 9 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	—	—	—	—	—	A	~

Chenoweth Run at Ruckriegel Parkway
(5.47 square miles and 75 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	↓	↑	↑	—	A	~

Floyds Fork at Old Taylorsville Road
(138 square miles and 13 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	—	—	—	—	—	B	~

Chenoweth Run at Gellhaus Lane
(11.6 square miles and 52 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	—	↓	↑	—	—	A	~

Floyds Fork at Bardstown Road
(213 square miles and 14 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	↓	—	—	—	A	~

N

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

TREND
- ↑ Improving
- ↓ Declining
- ~ Varies
- — No Change
- ND No Data

STATUS
- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria

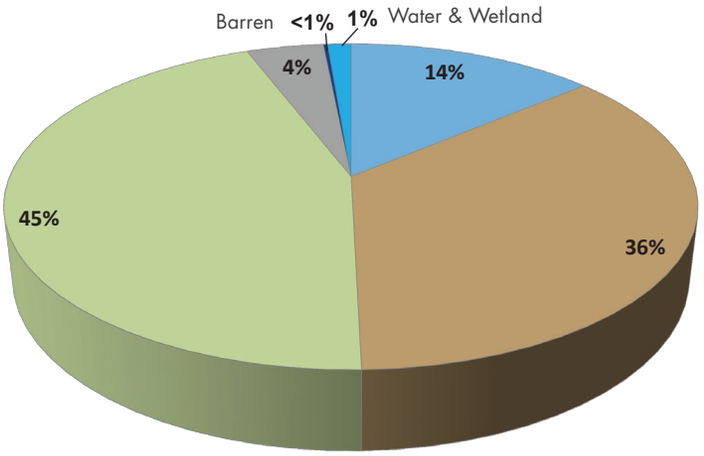
RATINGS KEY

Background and Land Use

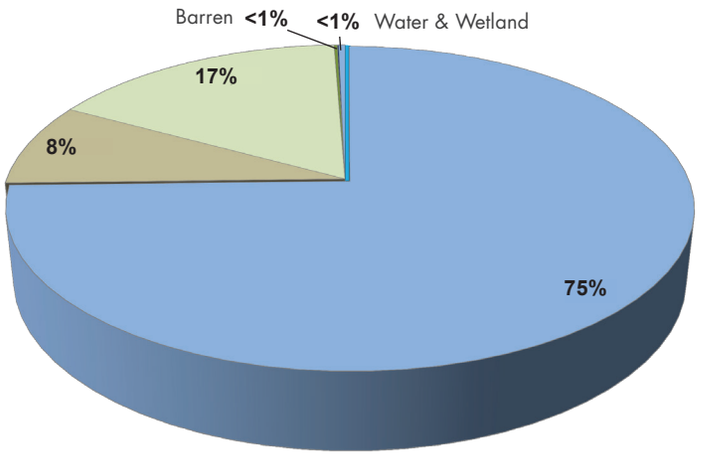
The Floyds Fork Water Quality Treatment Center was constructed by MSD to eliminate less efficient small package plants and septic systems from the most populated areas of the watershed. The Jeffersontown Wastewater Treatment Plant currently discharges treated effluent into Chenoweth Run, but the piping system to redirect these discharges to the Cedar Creek Wastewater Treatment Plant currently is under construction. A premier park system, The Parklands of Floyds Fork, is being developed along Floyds Fork (website at: *http://www.theparklands.org/*). Extensive tracts of land have been preserved and the system of five parks is providing a variety of opportunities for recreation and enjoyment of the stream and natural areas.

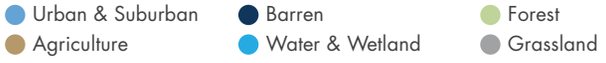
Currently, MSD monitors water quality and streamflow at five stream sites in the Floyds Fork watershed -- three sites on Floyds Fork and two on Chenoweth Run, a tributary that enters Floyds Fork from the west and upstream of the Bardstown Road site. There are 80, 138, and 213 square miles of land draining to Floyds Fork at the Ash Avenue, Old Taylorsville Road, and Bardstown Road sites, respectively. The land use for the three sites on Floyds Fork is mostly forest and agricultural. There also is a modest amount of land developed and developing for urban and suburban uses, mostly in the portions of the watersheds nearer to Louisville. Impervious area, including roadways, rooftops and driveways, is less than 4 percent in Floyds Fork. There are 5.5 and 11.6 square miles of land draining to Chenoweth Run at the Ruckriegel Parkway and Gellhaus Lane sites, respectively. Chenoweth Run drains land in Jeffersontown that is mostly urban and suburban. In contrast to Floyds Fork, the area draining to Chenoweth Run at Ruckriegel Parkway is over 33 percent impervious (75 percent urban and suburban), and the area draining to Gellhaus Lane is 21 percent impervious.

Land Use Upstream of Floyds Fork at Bardstown Road

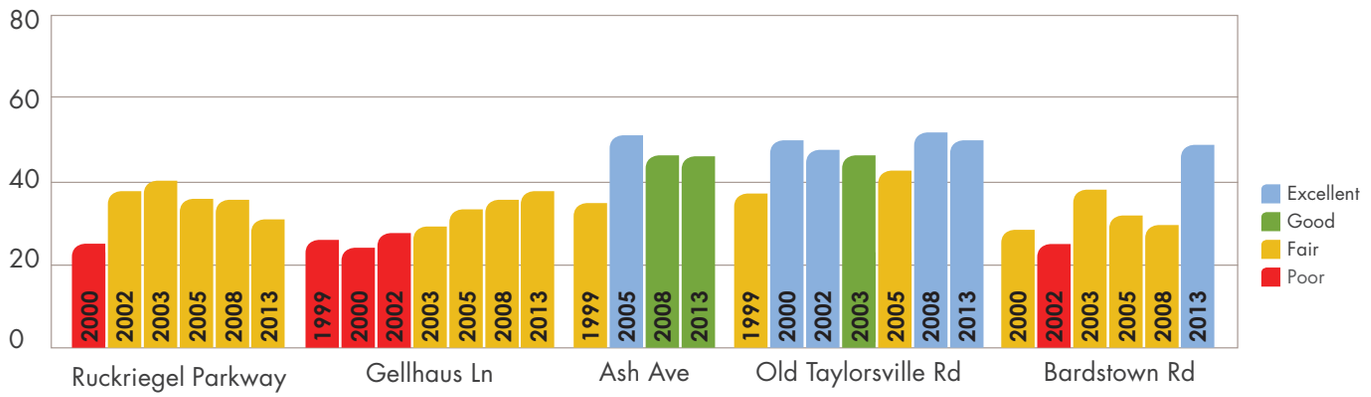


Land Use Upstream of Chenoweth Run at Ruckriegel Parkway





Condition of the Fish Communities in the Floyds Fork Watershed



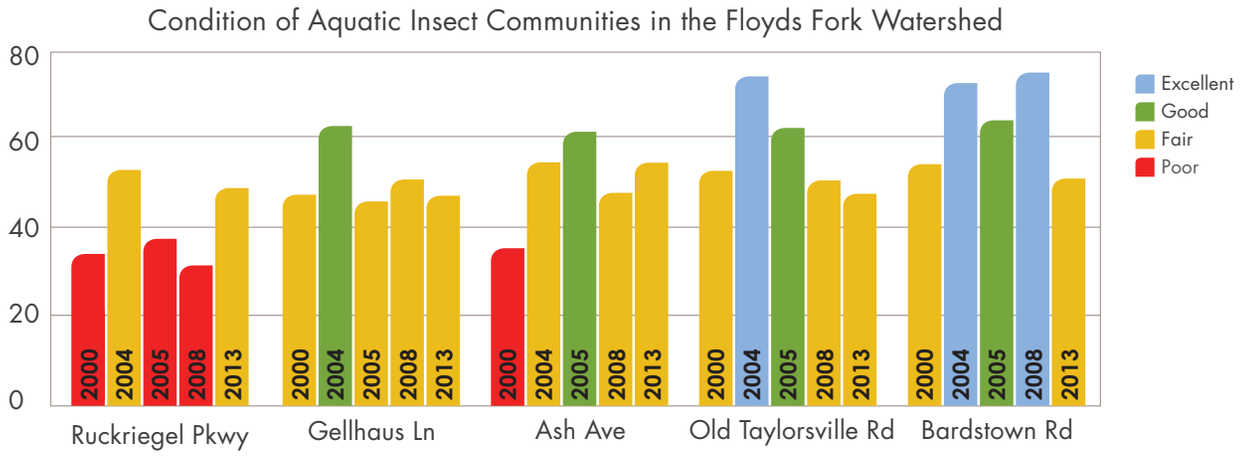
Monitoring Findings

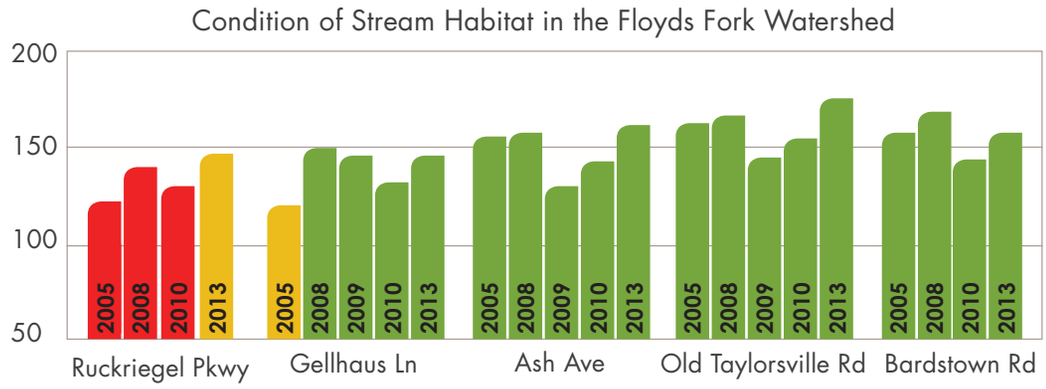
MSD has monitored the fish communities in the Floyds Fork watershed since 1999.The fish communities in Chenoweth Run at the Ruckriegel Parkway site are generally in "fair" condition, but the numerical indices have declined some since 2003. The Gellhaus Lane site has steadily improved from "poor" in 1999 to "fair" in 2013.

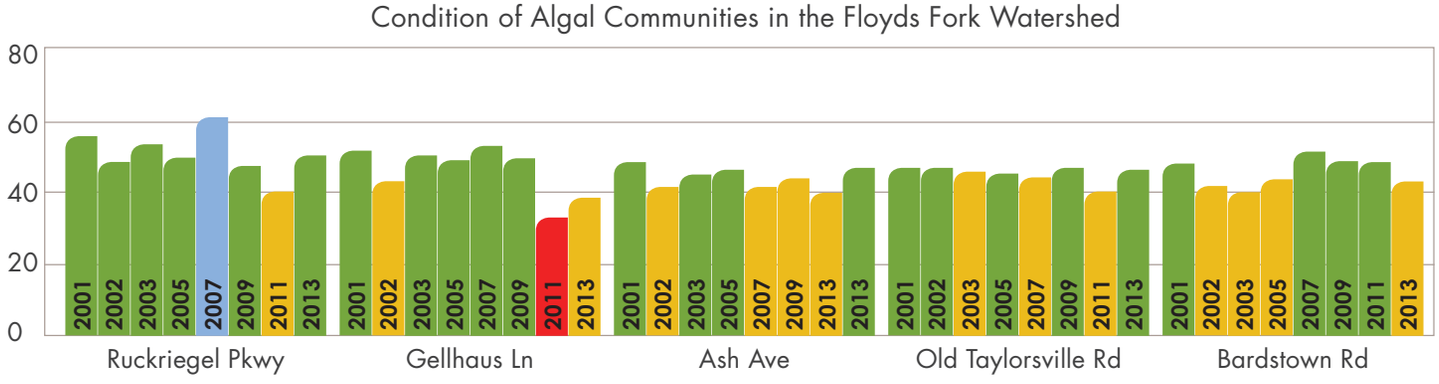
The Ash Avenue site has improved from "fair" in 1999 to "excellent" and "good" since 2005. The Old Taylorsville Road site has improved from "fair" in 1999 to "excellent" in 2008 and 2013. The Bardstown Road site has improved from "fair" in 2000 to "excellent" in 2013.

MSD has monitored aquatic insect communities at five sites in the Floyds Fork watershed since 2000. All sites were classified as "poor" or "fair" in 2000 and all are "fair" in 2013. At Ash Avenue, the aquatic insect communities had improved to "good" in 2005. At Old Taylorsville Road, the aquatic insect communities had improved to "excellent" in 2004. At Bardstown Road, the aquatic insect communities improved to "excellent" in 2004 and 2008. The aquatic insect communities at all 3 Floyds Fork sites have declined to "fair" in 2013.

The aquatic insect communities at Gellhaus Lane were "fair" and improved to "good" in 2008 but declined to "fair" since. Aquatic insect communities in Chenoweth Run at Ruckriegel Parkway had a "poor" rating and improved to "fair" in 2004 and 2013.







MSD assessed stream habitat in Floyds Fork since 2000. At the three Floyds Fork sites, stream habitat was "good" over that period. In Chenoweth Run at Gellhaus Lane, habitat also was generally "good". In Chenoweth Run at Ruckriegel Parkway, habitat was classified as "poor" in 2005 to 2010 but improved to "fair" in 2013. Sediment deposition, unstable banks and a general lack of trees and other protective bank vegetation were identified at Ruckriegel Parkway as limitations of habitat quality.

MSD has monitored benthic algal communities, largely diatoms, at five sites in the Floyds Fork watershed since 2001. All sites, classified using a Diatom Bioassessment Index (DBI), were rated "good" that year and all are "fair" or "good" in 2013.

The Chenoweth Run at Ruckriegel Parkway site had an "excellent" rating in 2007 and a "fair" rating in 2011, otherwise it has had "good" ratings. Early on conditions at Gellhaus Lane were generally "good" except in 2002 and then declined to "poor" and "fair" in 2011 and 2013, respectively. All three Floyds Fork sites have been variably "good" to "fair" since 2001.

MSD and USGS continuously monitor dissolved oxygen, water temperature, and streamflow at all 5 stream sites in the watershed. Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than five parts per million are what is deemed necessary. Water temperatures in excess of 31.7°C (89.1°F) also stress the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen.

More than half of the daily data was available for 2004 through 2006 at Ash Avenue, for all years between 2002 and 2008 at Old Taylorsville Road, and for 2003, 2007 and 2008 at Bardstown Road, indicating good and improving data quality. The percent of days when the average amount of dissolved oxygen in the water was above five parts per million increased from "poor" in 2004 to "fair" in 2005 and 2006 at Ash Avenue. Downstream at Old Taylorsville Road, the percent of days when dissolved oxygen conditions were above five parts per million improved steadily from "fair" to "good" between 2002 and 2008, but did not meet the 10% criteria to merit an improving trend. The percent of days when the average amount of dissolved oxygen in water was above five parts per million was consistently "good" for 2003, 2007 and 2008 in Floyds Fork at Bardstown Road.

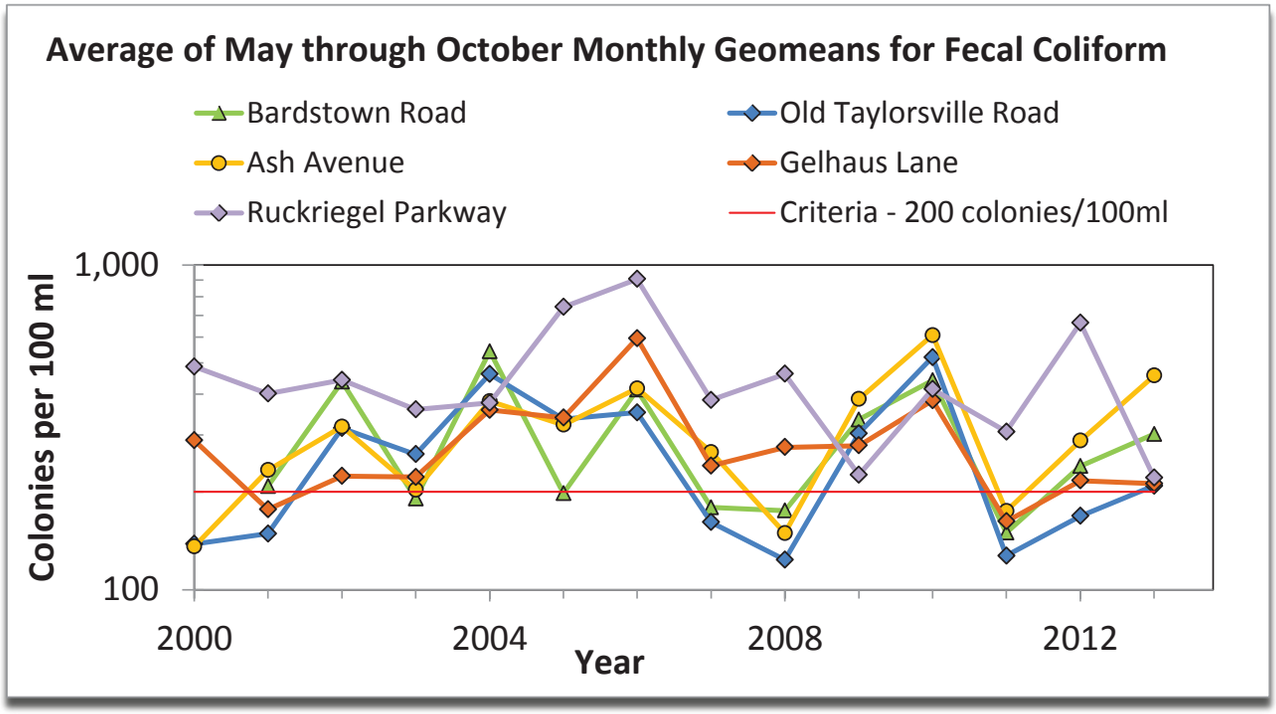
The Parklands at Floyds Fork has several spots for recreational activities like canoeing, kayaking and bike trails near the stream

In Chenoweth Run at Ruckriegel Parkway, more than half of the daily data was available for all years between 2002 and 2008, except 2003 and 2004. At Gellhaus Lane, more than half of the daily data was available between 2003 and 2008, except 2004 and 2006, indicating good data quality. At Ruckriegel Parkway, the percent of days when the average amount of dissolved oxygen in the water was above five parts per million declined from "good" in 2002 to "poor" in 2005, but improved to "good" by 2008. At Gellhaus Lane, the percent of days when dissolved oxygen conditions were above five parts per million was consistently "good" between 2003 and 2008.

MSD and the USGS monitor flow at all five sites in the Floyds Fork watershed. In September 2005, stream flows were below normal at the three sites on Floyds Fork when fish and aquatic insect samples were collected. In August 2005, stream flows in Floyds Fork were average. In Chenoweth Run, stream flows were average in September 2005, when fish and aquatic insect samples were collected. In August, stream flows in Chenoweth Run also were above average. In 2008, conditions throughout the watershed were drier, with below normal stream flows for two to three months prior to the sampling event in October throughout the watershed. In general, low stream flows can cause stress on fish and aquatic insects.

From 2000 to 2013, MSD monitored fecal coliform bacteria three to five times a month during the recreational season (April-October) at all five sites in the Floyds Fork watershed. E *coli* bacteria, a method more specific to bacteria that live in the guts of warm-blooded animals, were collected similarly only since 2011. The monthly geomeans of bacteria concentrations in stream waters were calculated for both bacterial types and compared to the recreational contact standard for each.

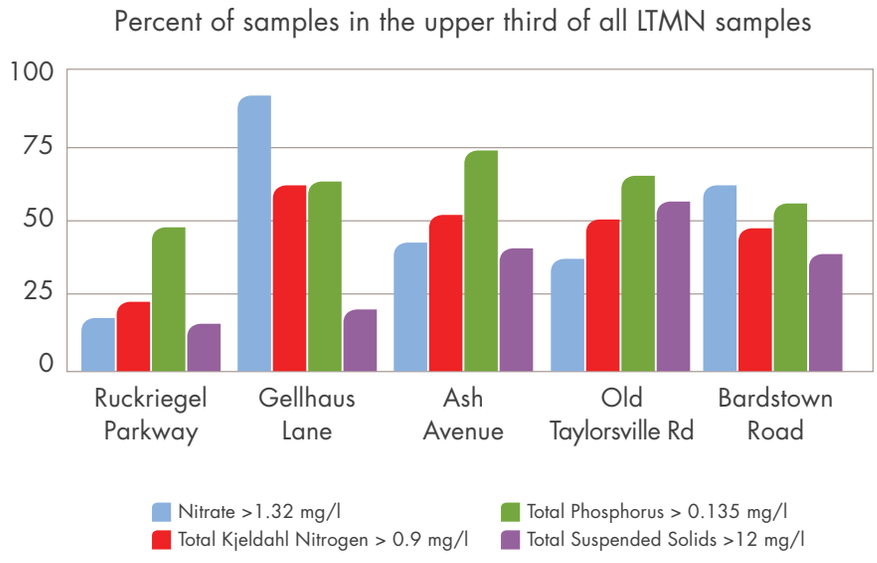
For the 14 years of data collection on fecal coliform bacteria (2000-2013), the medians of the monthly geomeans at all three of the Floyds Fork sites and the Chenoweth Run at Gellhaus Lane site were below the recreational standard of 200 colonies/100ml, whereas, the 14 year median for Chenoweth Run at Ruckreigel Parkway was above the standard. For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. Individual monthly geomeans were variably above and below the standard (not shown), with no apparent trend over the 14 year period. There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season. For the three years of data collection of E *coli* bacteria (not shown), most all of the monthly geomeans for E *coli* at the 5 sites were above the recreational standard of 130 colonies/100ml.



MSD monitored the concentrations of nutrients (nitrogen and phosphorus) and total suspended solids in streams periodically from 2000 to 2005 and, more consistently on a quarterly basis since 2005 at all five sites in the Floyds Fork watershed. The breakpoint concentration between the upper third and lower two thirds of all samples at all 27 MSD sites collected since 2005 were calculated for each of these constituents. The percent of samples above these breakpoints (shown next to the constituent on the graph) for each of the five sites is indicative of how they relate to other streams in the Metro area.

Components of total nitrogen (nitrate and total Kjeldahl nitrogen) were highest at the Chenoweth Run at Gellhaus Lane site. Total phosphorus was highest at the Floyds Fork at the Ash Avenue site. Total suspended solids were not much of an issue in Chenoweth Run and were highest in the Old Taylorsville Road site on Floyds Fork.

MSD monitored concentrations of trace metals in streams periodically from 2000 to 2005 and on a quarterly basis since 2005 at all five sites in the Floyds Fork watershed. About 200 samples were collected for trace elements at the five sites. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The acute ALC for total concentrations of lead and zinc were not exceeded in any samples at any of the five sites. Criteria were exceeded for cadmium in one sample and for copper in two samples.



USGS MONITORS FLOW AT FIVE SITES IN THE FLOYDS FORK WATERSHED		
USGS GAGE NUMBER	**STREAM NAME AND LOCATION OF FLOW GAGE**	**YEAR STARTED**
03297900	Floyds Fork at Ash Avenue	1991
03298000	Floyds Fork at Old Taylorsville Road	1944
03298200	Floyds Fork at Bardstown Road	2001
03298135	Chenoweth Run at Ruckriegel Parkway	1999
03298150	Chenoweth Run at Gellhaus Lane	1996

Floyds Fork

MSD will eliminate the Jeffersontown Water Quality Treatment Center in 2015.

Chenoweth Run near Ruckriegel Parkway

3.7

Cedar Creeks/Pennsylvania Run Watersheds

The small streams that eventually form Cedar Creek in Jefferson County originate in the Fern Creek area and flow south. Cedar Creek empties into Floyds Fork in Bullitt County east of Shepherdsville. The Cedar Creek Wastewater Treatment Center discharges treated wastewater into Cedar Creek. This facility was constructed in 1995 and was expanded to have the capacity to treat 7.5 million gallons per day of wastewater in 2003. The small streams that eventually form the other Cedar Creek in Bullitt County originate in the Cedar Grove area. It flows north and empties into the Salt River east of Shepherdsville. Pennsylvania Run originates in the Highview area and flows south through the 46 acre McNeely Lake and empties into Cedar Creek east of Zoneton.

Watershed Assessment

The health of the aquatic communities in the three watersheds was variable over time and between sites. The fish, insect, and algal communities and stream habitat at Cedar Creek in Bullitt County, one of the least urban watersheds in the LTMN, were all in "good to excellent" health in 2013 and generally improving over time. The Thixton Lane and Pennsylvania Run sites are 37 and 39 percent urban, respectively, mid-range for LTMN sites. The fish and insect communities and stream habitat in Pennsylvania Run were in "fair" condition in 2013 and the algal community was in "good" status in 2013, but all three communities and aquatic insects generally were improving over time. The fish communities and stream habitat in Thixton Lane site were in "good" condition in 2013 and the insect and algal communities were in "poor" and "fair" status, respectively, but generally staying the same over time.

Stream reaches at the two Cedar Creek sites have stable banks, and the stream beds were only slightly degraded by some silt and sediment deposition. At the Pennsylvania Run site, the stream banks have some stability problems and the stream lacks shallow, rocky riffles. None of the three stream channels appear to have been straightened or otherwise altered.

For fecal coliform bacteria, the period of record medians (the middle values) of the monthly geomeans for both Cedar Creek sites were below the recreational standard of 200 colonies/100ml, whereas, the period of record median for Pennsylvania Run was above the standard. Individual monthly geomeans were variably above and below the standard, with no apparent trend over the period of record. For the 3 years of data of *E coli* bacteria, most of the monthly geomeans at the three sites were above the recreational standard of 130 colonies/100ml.

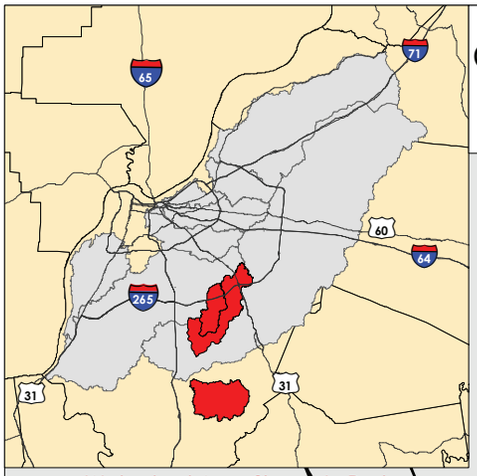
It is unclear why the Pennsylvania Run site had so many more samples in the upper third for total phosphorus (89 percent, one of the highest of LTMN sites) compared to the neighboring Thixton Lane site (8 percent) with similar land use. Both total phosphorus and total suspended solids were of little concern at the Thixton Lane site even though this site receives treated wastewater. Both sites had high percentages of samples in the upper third for nitrate and total Kjeldahl nitrogen; in fact, the Thixton Lane is the highest of LTMN sites for nitrate.

The Cedar Creek site in Bullitt County had relatively low numbers of samples in the upper third for all nutrients and total suspended solids. Compared to other LTMN sites, the Bullitt County watershed has a higher percentage of forested land and very little urban and suburban land use. For these particular parameters, the forest character provides a buffer for surface runoff and fewer sources for excess nutrients to enter the stream.

More recent wet weather event sampling data confirms the historical data that trace metals are not a large issue of concern in the LTMN streams.

Dissolved oxygen conditions at the Thixton Lane and Bullitt County sites reflect 'good' conditions for the last six years, whereas, conditions at the Pennsylvania Run site reflect "poor to good" conditions and "fair" more recently. Water temperature criteria (no more than 31.7°C (89.1°F)) were met 100 percent of the time at the two Cedar Creek sites, with excursions above the criteria at the Bullitt County site only in 2007 and 2012. Periodic hot days and low stream flows occasionally cause exceedances of both criteria; more frequent exceedances of dissolved oxygen at the Pennsylvania Run site likely also reflect some other transient factor(s).

CEDAR CREEKS AND PENNSYLVANIA RUN WATERSHEDS WATER QUALITY STATUS AND TRENDS



Watershed Area Shown In Red

JEFFERSON COUNTY

BULLITT COUNTY

SPENCER COUNTY

NELSON COUNTY

Mc Neely Lake

Pennsylvania Run

Cedar Creek

Floyds Fork

Salt River

RIDGE RD

CEDAR GROVE RD

Cedar Creek at Thixton Lane
(6.4 square miles and 37 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	—	—	↑	—	—	B	~

Pennsylvania Run at Mount Washington Road
(11.1 square miles and 39 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	↑	↑	↓	—	A	~

Cedar Creek at State Road 1442
(12.1 square miles and 6 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	↑	—	—	—	B	~

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

RATINGS KEY

TREND
- ↑ Improving
- ↓ Declining
- ~ Varies
- — No Change
- ND No Data

STATUS
- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria

Background and Land Use

There are 11.1 and 6.4 square miles of land draining to the Cedar Creek at Thixton Road and Pennsylvania Run sites, respectively. The land includes urban, agriculture and forested areas. Small areas are classified as grassland. About 10 and 9 percent, respectively, of these watersheds is covered by impervious surfaces such as roads, rooftops and driveways.

The small streams that eventually form the other Cedar Creek originate in the Cedar Grove area of Bullitt County. Cedar Creek flows north and empties into the Salt River east of Shepherdsville. This site is located outside of the urban influences of Louisville and provides a basis for comparison of water quality conditions in a less urbanized watershed to the more urbanized sites in the Louisville Metro area.

There are 12.1 square miles of land draining to the Cedar Creek in Bullitt County site. This land is mostly forested, with significant amounts of agriculture and grasslands. A relatively small percentage of the land has been developed for urban and suburban uses. Impervious area covers only 0.2 percent of this watershed.

MSD has been monitoring water quality and stream flow in Cedar Creek at Thixton Road and Pennsylvania Run sites since 1999 and at Cedar Creek at State Highway 1442 (Bullitt County) since 2002.

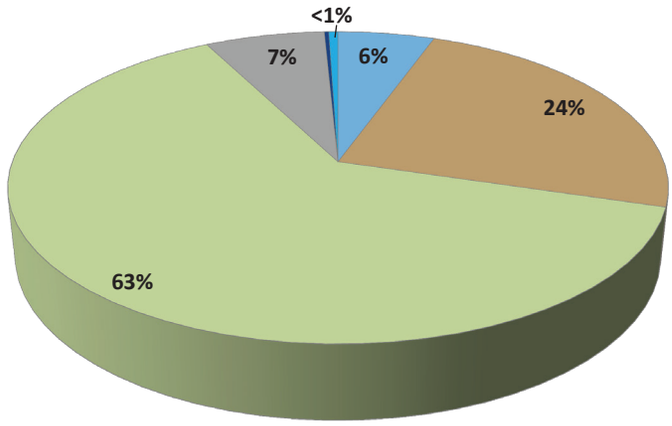
Monitoring Findings

MSD monitored fish communities at the Thixton Lane and Pennsylvania Run at Mount Washington Road sites since 1999 and at the State Road 1442 site in Bullitt County since 2002. Fish community results were variably "fair/poor" to "excellent" at the Thixton Lane and Pennsylvania Run sites and were "good" and "fair" in 2013, respectively. The fish communities in State Road 1442 were classified as "good" to "excellent" and appear to have steadily improved since 2002.

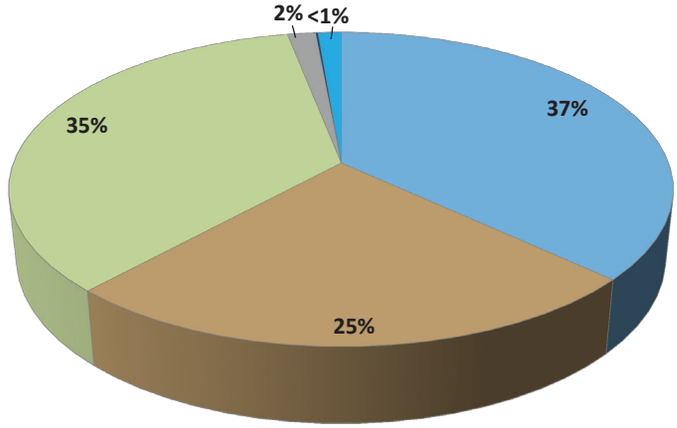
MSD has monitored aquatic insect communities at the Thixton Lane and Pennsylvania Run at Mount Washington Road sites since 2000. The aquatic insect communities have been variably "fair" to "poor", and currently are in "poor" and "fair" condition, respectively. The aquatic insect communities in Cedar Creek at State Road 1442 were classified as "fair" in 2004 and improved to "good" currently.

MSD has assessed stream habitat since 2005 at all three sites when fish and aquatic insects were sampled. Except for 2008, habitat quality at the two Cedar Creek sites generally were "good", meaning that both streams provide good habitat for fish and aquatic insect communities. These streams have stable banks and the stream beds were only slightly degraded by some silt and sediment deposition. The stream channels do not appear to have been straightened or otherwise altered.

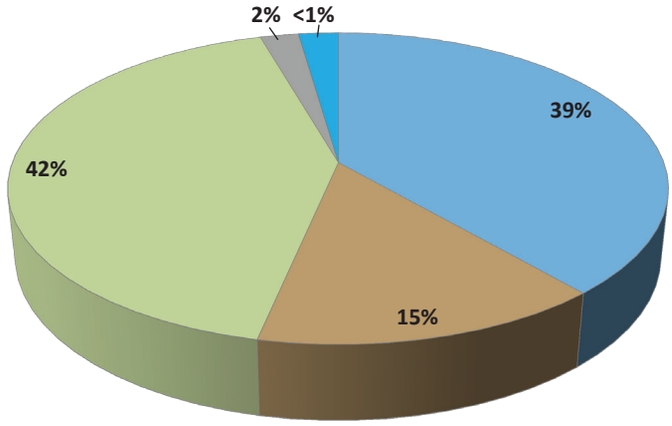
Land Use Upstream of Cedar Creek at State Highway 1442 (Bullitt County)

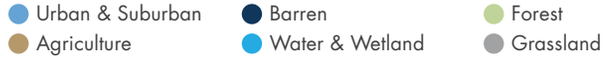


Land Use Upstream of Cedar Creek at Thixton Lane

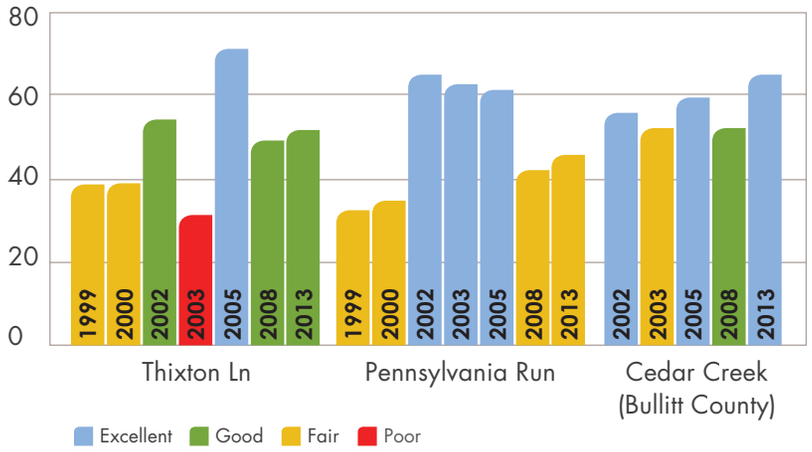


Land Use Upstream of Pennsylvania Run at Mount Washington Road

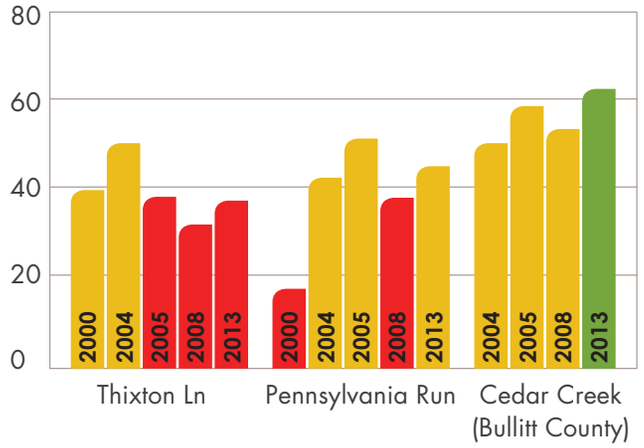




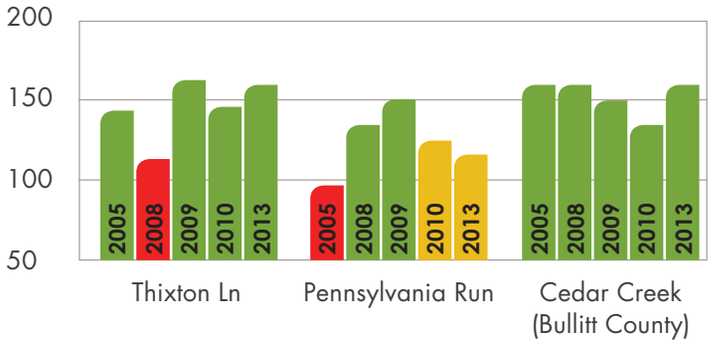
Condition of the Fish Communities in the Cedar Creek and Pennsylvania Run Watersheds



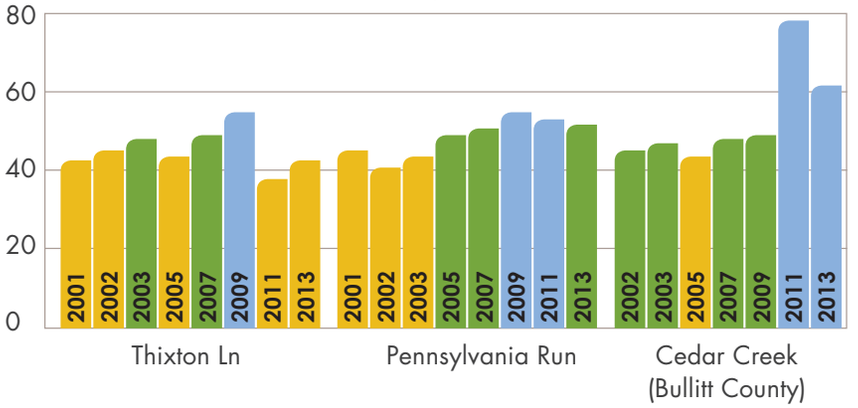
Condition of the Aquatic Insect Communities in the Cedar Creek and Pennsylvania Run Watersheds



Condition of the Stream Habitat in the Cedar Creek and Pennsylvania Run Watersheds



Condition of Algal Communities in the Cedar Creek and Pennsylvania Run Watersheds

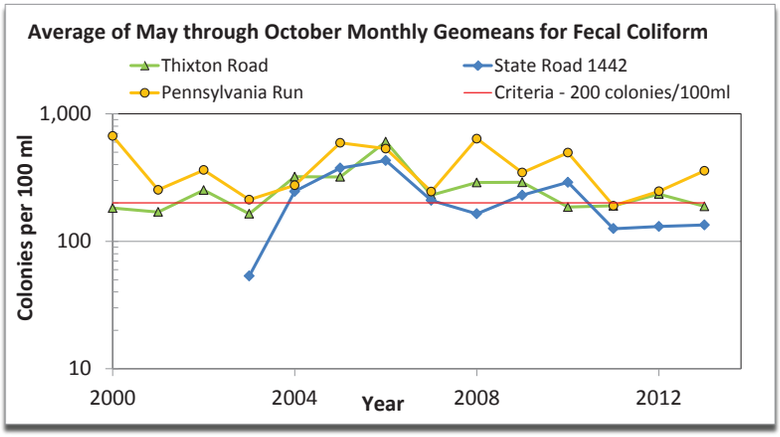


At the Pennsylvania Run site, habitat quality was variably "poor" to "good" and has declined since 2009 to "fair" currently, but has improved over the long term. The stream banks have some stability problems and the stream lacks shallow, rocky riffles that provide good habitat for aquatic insects and fish. The stream channel does not appear to have been straightened or otherwise altered.

MSD has monitored benthic algal communities, largely diatoms, in the Thixton Lane and Pennsylvania Run sites since 2001, and at Cedar Creek (Bullitt County) since 2002. Using a Diatom Bioassessment Index (DBI), the sites were rated "fair" to "excellent" with "fair" conditions at Thixton Lane in 2011-13. Algal community conditions have steadily improved in the Bullitt County and Pennsylvania Run sites over time and are "excellent" and "good" in 2013, respectively.

Since 2000, MSD has monitored fecal coliform bacteria three to five times a month during the recreational season (April-October). *E coli* bacteria were collected similarly but only since 2011. The monthly geomeans of bacteria concentrations were calculated and compared to the recreational contact standard for each type.

For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. The period of record medians of the monthly geomeans for both Cedar Creek sites were below the recreational standard of 200 colonies/100ml, whereas, the period of record median for Pennsylvania Run was above the standard. Individual monthly geomeans were variably above and below the standard (not shown), with no apparent trend over the period of record. There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season.

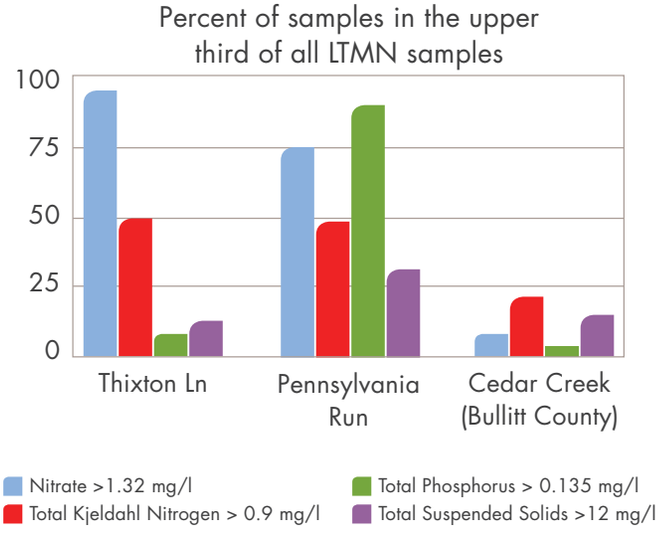


For the three years of data collection of *E. coli* bacteria (not shown), most all of the monthly geomeans at the three sites were above the recreational standard of 130 colonies/100ml.

MSD monitored the concentrations of nutrients (nitrogen and phosphorus) in streams and total suspended solids periodically from 2000 to 2005 and on a quarterly basis since 2005 at the three sites. The percent of samples taken at these sites which fall into the upper third of all samples were calculated as a comparison to other streams in the watershed and throughout the area.

The Thixton Lane site had the highest percentage of samples for nitrate in the upper third of all sites in the county while the Pennsylvania Run site had the fourth highest. The Pennsylvania Run site also had the second highest phosphorus percentage compared to all other sites in the county. About half of the TKN samples were in the upper third and TSS numbers were relatively low for the two sites, but neither are a major concern compared to nitrate and phosphorus. Due to its relatively undeveloped condition, the Cedar Creek site in Bullitt County had some of the lowest numbers of samples in the upper third of all samples for all nutrients and total suspended solids.

MSD monitored concentrations of trace metals in streams periodically from 2000 to 2005 and on a quarterly basis since 2005. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The acute ALC for total concentrations of cadmium, copper, lead, and zinc were not exceeded in any samples at any of the three sites.



MSD and the US Geological Survey continuously monitor streamflow, dissolved oxygen, and water temperature at all three sites. Streamflow has been monitored on Cedar Creek at Thixton Road (USGS gage number 03298250) since 1999, on Cedar Creek in Bullitt County (USGS gage number 03297800) since 2002, and on Pennsylvania Run (USGS gage number 03298300) since 1998.

Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than four or five parts per million are what is deemed necessary. Water temperatures in excess of 31.7°C (89.1°F) are very stressful on the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen. In general, extended periods of low stream flows also can cause stress on aquatic communities.

Dissolved oxygen criteria at the Thixton Road site were met 99.1 to 100 percent of the time and the Bullitt County site were met 91.7 to 100 percent; both reflecting 'good' conditions for the last six years. Occasional excursions of low dissolved oxygen likely were a result of very low stream flows on very warm days or some other transient factor. Dissolved oxygen criteria at the Pennsylvania Run site were met 66.7 to 94.3 percent of the time for the last six years, reflecting 'poor to good' conditions and "fair" more recently. These more frequent excursions of low dissolved oxygen likely were both a result of very low stream flows on very warm days and likely some other transient factor(s).

Water temperature criteria were met 100 percent of the time at the Cedar Creek at Thixton Road and Pennsylvania Run sites. Water temperature criteria were met 98.9 to 100 percent of the time at the Bullitt County site, with excursions above the criteria only in 2007 and 2012. Periodic hot days and low stream flows are common in the summer and occasionally cause an exceedance of the criteria.

MSD constructed the Cedar Creek Water Quality Treatment Center in 1995, in order to eliminate several small neighborhood package plants. The facility was expanded in 2003, and can now treat 7.5 million gallons of wastewater per day.

Cedar Creek near Thixton Lane

3.8

Pond Creek Watershed

The Pond Creek watershed drains about 126 square miles in southern and southwestern Louisville Metro area. Approximately 89 square miles are located in Jefferson County and 37 square miles are in Bullitt County. The Louisville International Airport and its associated large industrial complex, and Jefferson Memorial Forest are prominent features in this watershed.

Watershed Assessment

The health of the aquatic communities in the five sites was variable over time and between sites. The fish communities were most improved at the Northern Ditch and Brier Creek sites, both in "excellent" condition in 2013. The fish communities were "poor" or "very poor" at the Fern Creek, Manslick Road, Pendleton Road sites, but conditions have improved over time at the two upstream sites but declined at the Pendleton Road site. The aquatic insect communities at the five sites were rated "poor" to "fair" in 2013. Conditions have not improved any at the Fern Creek site, but have improved at the other four sites over the period of record. The algal community in the Fern Creek site was in "excellent" condition in 2013, having improved over time. The Northern Ditch, Manslick Road, and Pendleton Road sites were rated "poor" in 2013 and generally were the same or declining over time. Conditions of the algal communities in Brier Creek were "good" in 2013 but have generally declined over time.

Habitat quality has improved from "poor" to "fair" at the Fern Creek site and from "poor" to "good" at the Northern Ditch site. Good stream bed habitat is limited at the Fern Creek site by bedrock, but both growth of stream bank vegetation and development of a rocky substrate at the Northern Ditch site have improved habitat considerably. Habitat quality was "poor" in 2013 and has declined over time at both Pond Creek sites. Both of these sites have been channelized and have unstable, sediment laden stream beds and a general lack of rocky riffles, which provide important habitat for fish and aquatic insects. In Brier Creek, habitat quality improved from "poor" in 2005 to "good" in 2009, but has declined to "fair" since then. The stream in this location generally has unstable banks as well as shifting sediment deposits in the stream bed. This site has a very small drainage area and is affected by longer periods of low to zero stream flow.

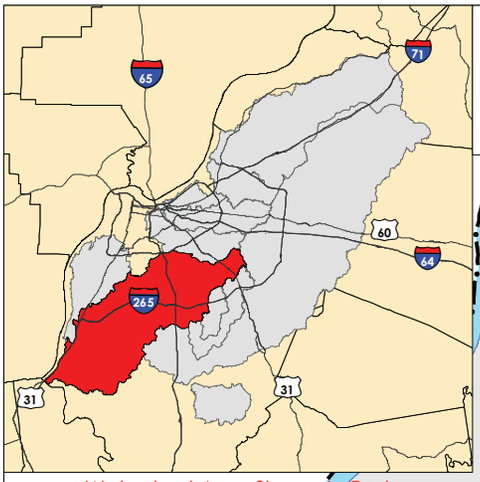
For fecal coliform bacteria, the period of record medians (the middle values) of the monthly geomeans for the Brier Creek, Northern Ditch, and Pendleton Road sites were below the recreational standard of 200 colonies/100ml, whereas, the period of record medians for the Fern Creek and Manslick Road sites were above the standard. Individual monthly geomeans were variably above and below the standard, with no apparent trend over time. There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season. For the three years of data of *E. coli* bacteria, most of the monthly geomeans at four of the sites were above the recreational standard of 130 colonies/100ml. Many of the Brier Creek monthly medians for *E. coli* were below the standard.

All sites except Fern Creek had very low numbers of nitrate samples in the upper third of all LTMN samples. Northern Ditch and Brier Creek sites had very low numbers for all nutrients and total suspended solids. Compared to all LTMN sites, Brier Creek had the lowest number of samples in the upper third of all samples for total Kjeldahl nitrogen and total phosphorus. The Northern Ditch site had the lowest number of samples in the upper third for total suspended solids (9 percent) compared to other LTMN sites, whereas, Pond Creek at Manslick Road had by far the highest number of samples in the upper third for total suspended solids (94 percent). Both Pond Creek sites had extremely low numbers of samples in the upper third for nitrate, with the lowest and second lowest numbers among all sites.

More recent wet weather event sampling data confirms the low occurrence of trace metals in the historical data. This strongly suggests that trace metals are not an issue of concern in these LTMN streams.

Dissolved oxygen conditions were in the "good" range in all but the Brier Creek site, which was in "fair" condition more recently. Water temperature criteria (no more than 31.7°C (89.1°F)) were met 100 percent of the time at the Brier Creek and Fern Creek sites; were in a "fair" range (between 91.7 and 99.7 percent) at the other three sites. Brier Creek and Fern Creek have very small drainage areas and are affected by longer periods of low to zero stream flow. Periodic hot days and low stream flows are common in the summer and occasionally can cause an exceedance of these criteria. Riparian tree cover can help minimize these excursions.

POND CREEK WATERSHED
WATER QUALITY STATUS AND TRENDS



Watershed Area Shown In Red

Fern Creek at Old Bardstown Road
(3.5 square miles and 60 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	–	↑	↑	–	–	A	~

Pond Creek at Manslick Road
(64 square miles and 58 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	–	↓	–	–	A	~

Northern Ditch at Preston Highway
(11.1 square miles and 62 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	↓	↑	–	–	B	~

Brier Creek at Bear Camp Road
(4.13 square miles and 1 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	↓	–	–	–	B	~

Pond Creek at Pendleton Road
(80.3 square miles and 60 percent urban)

2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↓	↑	↓	↓	–	–	B	~

Middle Fork Beargrass Creek
South Fork Beargrass Creek
JEFFERSON COUNTY
Fern Creek
Northern Ditch
Southern Ditch
HARRISON COUNTY, INDIANA
Ohio River
Floyds Fork
Brier Creek
Pond Creek
Salt River
Salt River
BULLITT COUNTY
NELSON COUNTY
HARDIN COUNTY
60
264
31
65
265
31

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

TREND
- ↑ Improving
- ↓ Declining
- ~ Varies
- No Change
- ND No Data

STATUS
- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria

RATINGS KEY

Background and Land Use

Small streams, which flow west out of the Jeffersontown and Fern Creek areas, join to form Fern Creek; and then becomes Northern Ditch downstream near Shepherdsville Road. Just to the south, small streams flow west out of Okolona and form Southern Ditch near Interstate-65. Southern joins Northern Ditch and forms Pond Creek near New Cut Road, where it flows west into the Salt River near West Point, Kentucky. Brier Creek is a small tributary draining into Pond Creek just south of Pendleton Road.

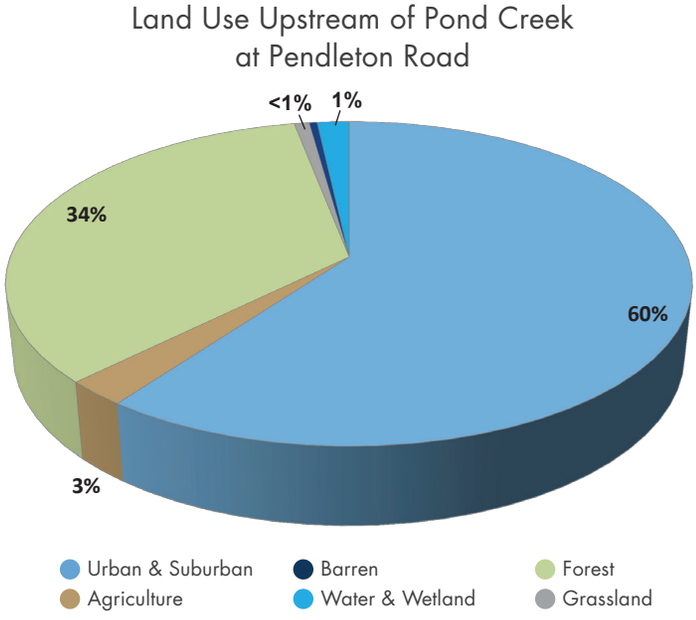
The relatively flat portion of the Pond Creek watershed was once a shallow lake, which gradually filled with silt and debris to form a flat plain with standing water and dense swamp vegetation. Parts of this area were known as the "wet woods" in the past.

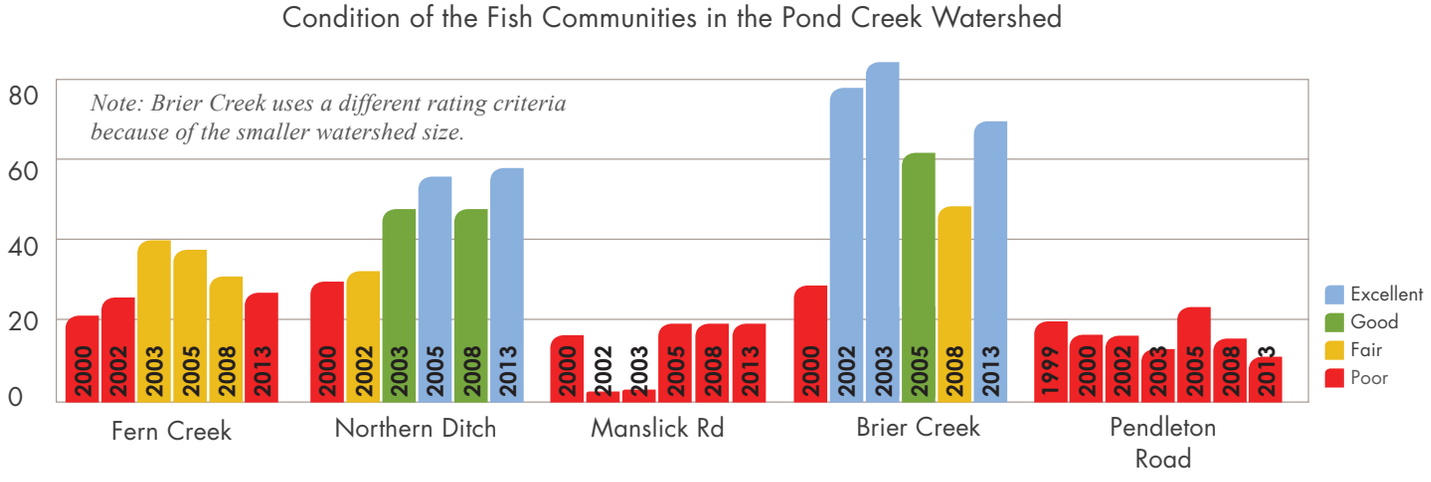
Starting in the 1850's, a system of man-made ditches was developed to reduce flooding and to increase the amount of land suitable for development, which continued to expand before and after World War II. Many of the streams in the Pond Creek watershed have been extensively channelized, and large flat areas are now drained by Northern Ditch and Southern Ditch.

MSD has been monitoring water quality and stream flow in this watershed since 1999 at five locations. The sites are listed here from upstream to downstream: Fern Creek at Old Bardstown Road, Northern Ditch at Preston Highway, Pond Creek at Manslick Road, Pond Creek at Pendleton Road, and Brier Creek at Bear Camp Road. The amount of land draining to each site in square miles is 3.50, 11.1, 64.0, 80.3, and 4.13, respectively.

The first four sites are similar in land use to Pond Creek at Pendleton Road, with 60 percent or more of the land in urban and suburban uses. The amount of impervious surfaces such as roads, rooftops and driveways, ranges from 16 percent to 24 percent. Forest ranges from 28 to 34 percent and agriculture ranges from 2 to 7 percent.

The land draining to Brier Creek is quite different from the other four sites. This small stream drains steep wooded areas southwest of Jefferson Memorial Forest. The watershed is largely undeveloped with 83 percent forest and 14 percent agriculture.





Monitoring Findings

MSD has monitored fish communities in the Pond Creek watershed since 1999. During this time, fish communities improved at the Northern Ditch site from "fair" to "excellent" in 2013. The fish communities vary widely in Brier Creek from "poor" to "excellent" but were "good' to "excellent" most years. The fish communities are consistently "poor" or "very poor" at the Manslick Road and Pendleton Road sites and "poor" to "fair" at the Fern Creek site.

MSD has monitored the aquatic insect communities in the Pond Creek watershed since 2000. The aquatic insect communities at the Northern Ditch site improved from "poor" to "fair" in 2013. At the Fern Creek site, conditions improved from "poor" in 2000 to "good" in 2004 and back to "poor" in 2008 and 2013. Conditions in Pond Creek at Pendleton Road and Manslick Road were variably "poor" to "fair". In Brier Creek, conditions improved from "poor" in 2000 to "good" in 2004 but have been "fair" since 2005.

MSD has assessed stream habitat quality when fish and aquatic insects were sampled since 2005. Habitat quality has improved from "poor" to "fair" at the Fern Creek site and from "poor" to "good" at the Northern Ditch site. Good stream bed habitat is limited at the Fern Creek site by bedrock, but both growth of stream bank vegetation and development of a rocky substrate at the Northern Ditch site have improved habitat considerably.

Habitat quality was "good" at the Manslick Road site in 2008 but has declined to "poor" since then. Habitat quality was consistently "poor" at the Pendleton Road site and declining. Both of these sites have been channelized and have unstable, sediment laden stream beds and a general lack of rocky riffles. These features provide important habitat for fish and aquatic insects.

In Brier Creek, habitat quality improved from "poor" in 2005 to "good" in 2009, but has declined to "fair" since then. Habitat in this location generally lacks trees and other large vegetation along the banks, resulting in unstable banks as well as shifting sediment deposits in the stream bed. This site has a very small drainage area, and is affected by longer periods of low to zero stream flow.

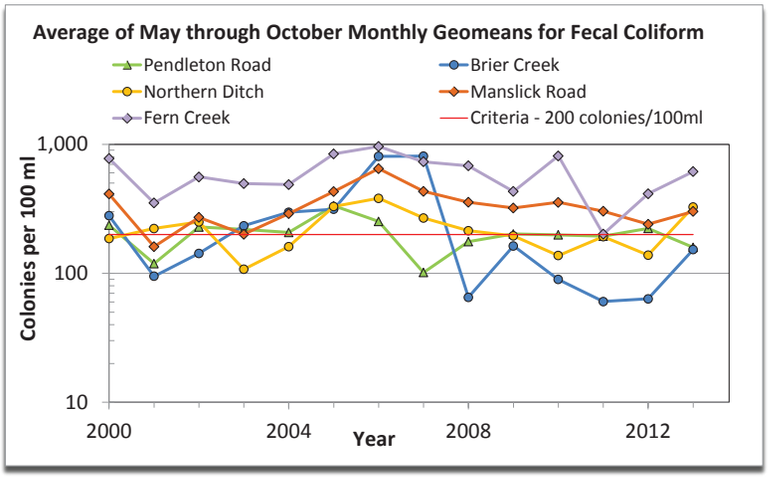
MSD has monitored benthic algal communities, largely diatoms, in the Pond Creek watershed since 2001. Using a Diatom Bioassessment Index (DBI), the rating in the Fern Creek site improved from "good" to "fair" prior to 2005 to "excellent" or "good" condition since then. The Northern Ditch site improved from "fair" prior to 2005, to "excellent" in 2007, but then declined to a "poor" condition by 2013. Conditions of the algal communities were variably "fair" or "good" at the Manslick Road and Pendleton Road sites before 2007, both improved to "excellent" and then declined to "poor" by 2013. Using a different rating for the smaller headwater site on Brier Creek, conditions of the algal communities were "excellent" in 2001 and 2002, and were variably "poor" to "good" since then.

Since 2000, MSD has monitored fecal coliform bacteria three to five times a month during the recreational season (April-October). *E. coli* bacteria were collected similarly but only since 2011. The monthly geometric means (geomeans) of bacteria concentrations were calculated and compared to the recreational contact standard for each type.

For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. The period of record medians (the middle value) of the monthly geomeans for the Brier Creek, Northern Ditch, and Pendleton Road sites were below the recreational standard of 200 colonies/100ml, whereas, the period of record medians for the Fern Creek and Manslick Road were above the standard. Individual monthly geomeans were variably above and below the standard (not shown), with no apparent trend over the period of record. There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season.

For the three years of data collection of *E. coli* bacteria (not shown), most of the monthly geomeans at four of the sites were above the recreational standard of 130 colonies/100ml. Many of the Brier Creek monthly medians for *E. coli* were below the standard.

MSD monitored the concentrations of nutrients (nitrogen and phosphorus) in streams and total suspended solids periodically from 2000 to 2005 and on a quarterly basis since 2005 at five sites in the Pond Creek watershed. The percent of samples taken at these sites which fall into the upper third of all samples collected in the Long Term Monitoring Network (LTMN) sites were calculated as a comparison to other streams in the watershed and the Metro area.

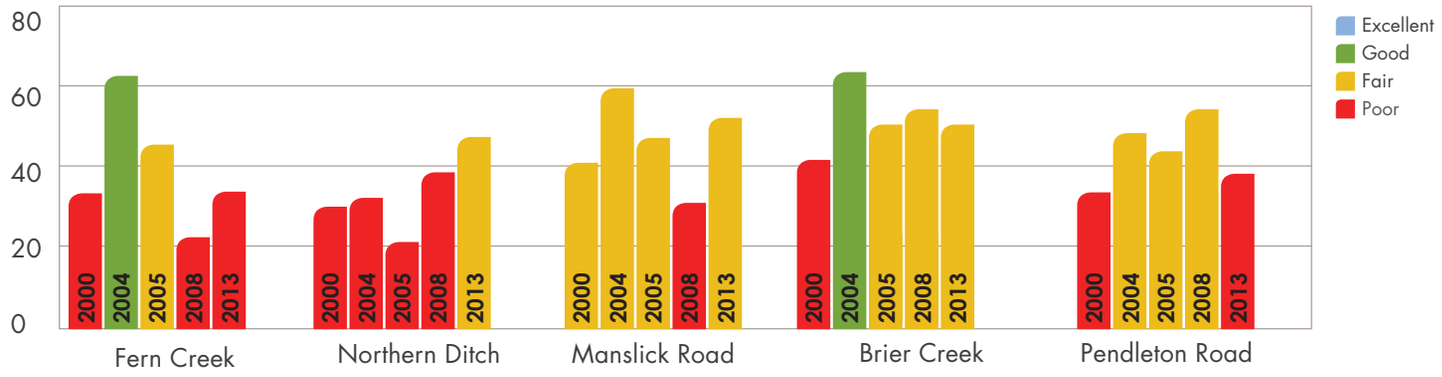


All sites except Fern Creek had very low numbers of nitrate samples in the upper third of all samples. Northern Ditch and Brier Creek sites had very low numbers for all nutrients and total suspended solids. Compared to all sites across the county, Brier Creek had the lowest number of samples in the upper third of all samples for total Kjeldahl nitrogen and total phosphorus. The Northern Ditch site had the lowest number of samples in the upper third for total suspended solids compared to all other sites in the county. Both Pond Creek sites had extremely low numbers of samples in the upper third for nitrate, with the lowest and second lowest numbers among all sites.

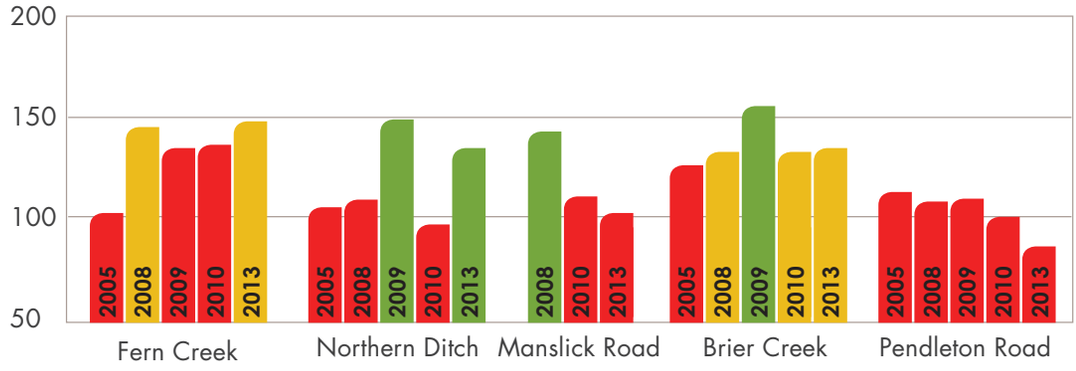
MSD monitored concentrations of trace metals in streams periodically from 2000 to 2005 and on a quarterly basis since 2005. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The acute ALC for total concentrations of cadmium and lead were not exceeded in any samples at any of the five sites. The ALCs, however, were exceeded for copper in one sample, and for zinc in one sample.

MSD and the US Geological Survey continuously monitor streamflow, dissolved oxygen, and water temperature at the five sites in the Pond Creek watershed. Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than four parts per million (as an instantaneous standard) or five parts per million (as a mean daily standard) are what is deemed necessary. Water temperatures in excess of 31.7°C (89.1°F) are very stressful on aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen. In general, extended periods of low stream flows also can cause stress on aquatic communities.

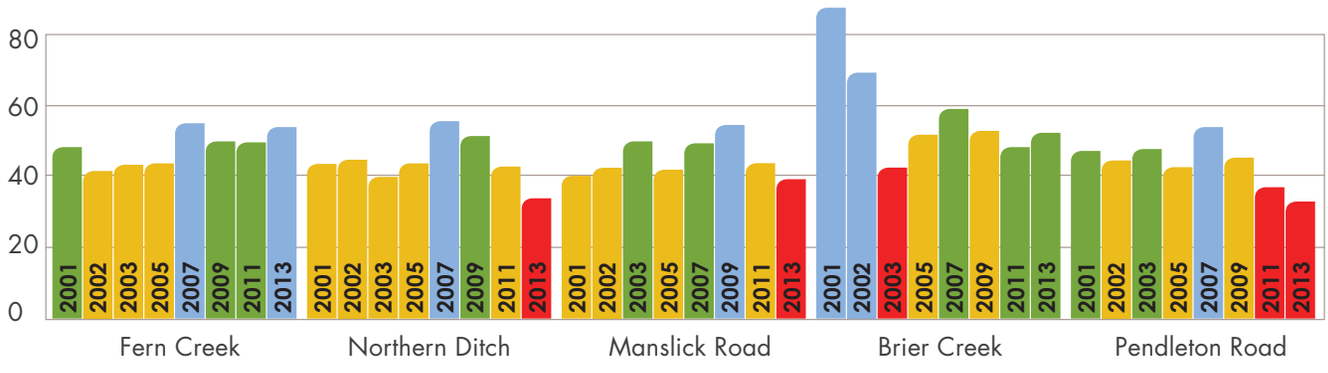
Condition of the Aquatic Insect Communities in the Pond Creek Watershed



Condition of the Stream Habitat in the Pond Creek Watershed

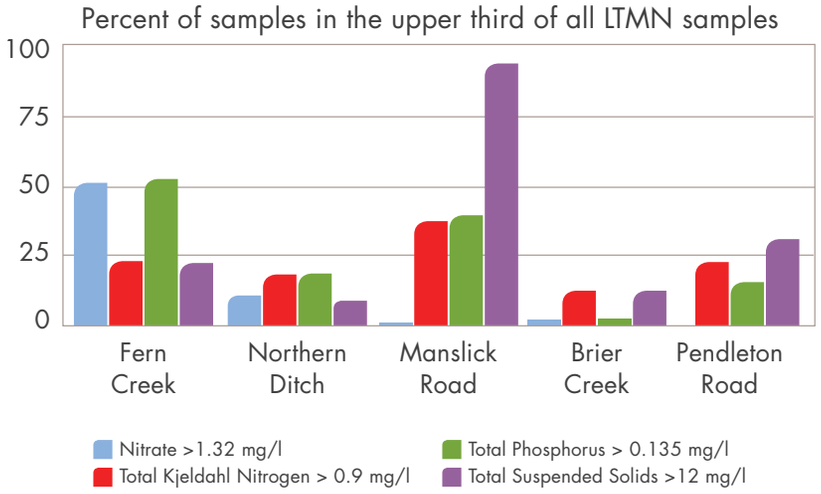


Condition of the Algal Communities in the Pond Creek Watershed



The percent of days when the average amount of dissolved oxygen in the water was above five parts per million was in the "good" range in the Fern Creek, Northern Ditch, and Pond Creek at Manslick Road sites. In both Brier Creek and Pond Creek at Pendleton Road, the dissolved oxygen conditions were in the "fair" range most years. It is not clear if the low dissolved oxygen readings were a result of very low stream flows or some other factor.

Water temperature criteria were met 100 percent of the time over the last six years at the Brier Creek and Fern Creek sites and at least 92 percent of the time each year with ratings of "fair" to "good" at both Pond Creek sites. Criteria at the Northern Ditch site were rated "fair" to "good" except for a "poor" rating in 2010. Periodic hot days and low stream flows are common in the summer and occasionally can cause an exceedance of the criteria. Riparian tree cover can help minimize these excursions.



Northern Ditch

Northern Ditch is an example of a stream that has been severely altered as a result of urban development. As the city was developed, the stream was re-routed and straightened in order to convey stormwater out of the area more quickly and to reduce flooding. Trees and vegetation along the stream were removed as part of the construction effort, and while the project did improve drainage in the area, the health of the stream suffered. However, since the MSD Long Term Monitoring Network program was initiated, the biological monitoring results have indicated a general increase in stream health.

Stream quality based on the conditions of the fish communities are assessed using the Kentucky Index of Biotic Integrity (KIBI). It uses multiple indicators of the types and numbers of fish (known as metrics) and combines them to come up with an overall score for the section of stream where fish are collected. The KIBI results are presented in a narrative rating (excellent, good, fair, poor, or very poor), which corresponds to a range of KIBI scores. For more information on the factors used to determine the KIBI, please refer to the Biological Assessment section on page 10.

As the chart on page 59 shows, the fish KIBI score for Northern Ditch has trended upward since the first assessment in 2000, when conditions were "Poor", to where it currently is in "Excellent" condition.

Similar to fish assessments, aquatic insect communities also are assessed using the Kentucky Macroinvertebrate Bioassessment Index (MBI), also based on multiple factors (metrics) of the types and numbers of insects. The MBI results are presented in a narrative rating (excellent, good, fair, poor, or very poor), which corresponds to a range of MBI scores. For more information on the factors used to determine the MBI, please refer to the Biological Assessment section on page 10. The second chart also shows a general upward trend for the MBI at Northern Ditch. While not as dramatic as the KIBI score, the current MBI score now falls in the "Fair" range.

Over the years, the stream has evolved within its existing straightened channel to form small meanders and riffle/run/pool complexes. Woody vegetation is developing along the once treeless, steep sides of the channel. The trees are providing shade, which decreases water temperatures in the stream, and the habitat is more varied both allowing colonization of less tolerant fish and insects. These factors, along with improved storm water and pollution management, have most likely played an integral role in improving the overall integrity of Northern Ditch.

Creek chub is a species of minnow that can grow to 10 inches and is tolerant to a wide variety of water conditions.

The diet of the colorful longear sunfish generally includes aquatic insects and small fish.

3.9

Mill Creek Watershed

The Mill Creek watershed drains about 34 square miles in western Louisville, near the Ohio River. The northern part of the watershed includes streams that drain to the Mill Creek Cutoff, which flows directly into the Ohio River near Shively. The southern part of the watershed flows south through Pleasure Ridge Park and then into the Ohio River near Watson Lane. Many of the streams in this watershed have been straightened or channelized in the past to reduce flooding.

Watershed Assessment

Fish community conditions at the Mill Creek Cutoff site have improved from "poor" to "fair" since 2000. At Orell Road, fish communities were variably "poor" or "fair" early on, but have steadily declined to "poor" since 2000. The aquatic insect communities varied from "very poor" to "poor" at the Mill Creek Cutoff site. At Orell Road, aquatic insect communities were classified in "fair" condition throughout the sampling period.

Stream habitat at both sites was in "poor" condition in 2013 and appears to be declining over time at the Orell Road site. These sites are located in straight man-made channels that lack rocky riffles and tree lined banks. These features provide important habitat for fish and aquatic insects. The less than optimal stream habitat and the natural effects of low stream flow may have stressed aquatic communities at the two sites. The man-made channels that lack rocky riffles and tree lined banks actually could favor algal growth. Both sites were rated variably "fair" to "excellent" over time and in a "good" condition in 2013.

For fecal coliform bacteria, the period of record medians (the middle values) of the monthly geomeans for both sites were below the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variably above and below the standard, with no apparent trend over the period of record. For the three years of data of *E. coli* bacteria, most of the monthly geomeans at the two sites were above the recreational standard of 130 colonies/100ml.

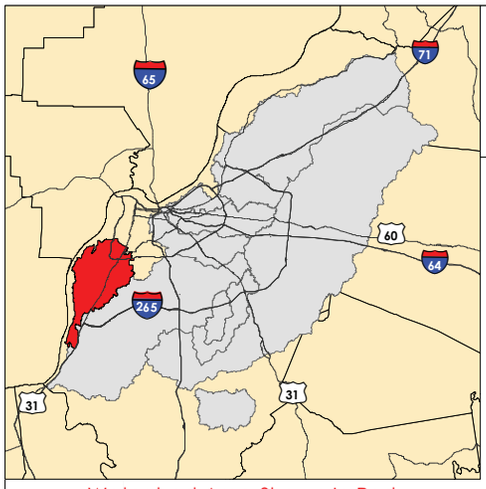
Both sites had very low numbers of nitrate in the upper third of all samples compared to other LTMN sites. The values for total Kjeldahl nitrogen, total phosphorus, and total suspended solids were similar between the two sites and about average for LTMN sites.

More recent wet weather event sampling data confirms the historical data at these sites that trace metals are not a large issue of concern in these LTMN streams.

Dissolved oxygen criteria improved from 'fair' condition in 2007 and 2008 to "good" condition at the Orell Road site and water temperature criteria (no more than 31.7°C (89.1°F)) were met 100 percent of the time. The Mill Creek Cutoff site had no data. Periodic hot days and low stream flows are common in the summer and occasionally can cause an exceedance of these criteria, but that is not usually the case at this site.

Derek R. Guthrie Water Quality Treatment Center

MILL CREEK WATERSHED
WATER QUALITY STATUS AND TRENDS



Watershed Area Shown In Red

FLOYD COUNTY, INDIANA

HARRISON COUNTY, INDIANA

JEFFERSON COUNTY

BULLITT COUNTY

Ohio River

Mill Creek Cutoff

Mill Creek

Mill Creek

264

60

31

265

Mill Creek Cutoff at Old Cane Run Road (24.4 square miles and 86 percent urban)								
2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	↑	↑	↑	—	ND	ND	B	~

Mill Creek at Orell Road (13.5 square miles and 69 percent urban)								
2013 Status	Fish	Insects	Algae	Habitat	D.Oxygen	W.Temp.	F.Coliform	Nutrients
Trend	—	—	↑	↓	↑	—	B	~

N

Legend

- Monitoring Site
- Sewage Treatment Plant (Operated by MSD)
- Sewage Treatment Plant (Operated by Other Agency)
- Stream
- Road
- County Boundary
- Watershed Boundary
- Lake

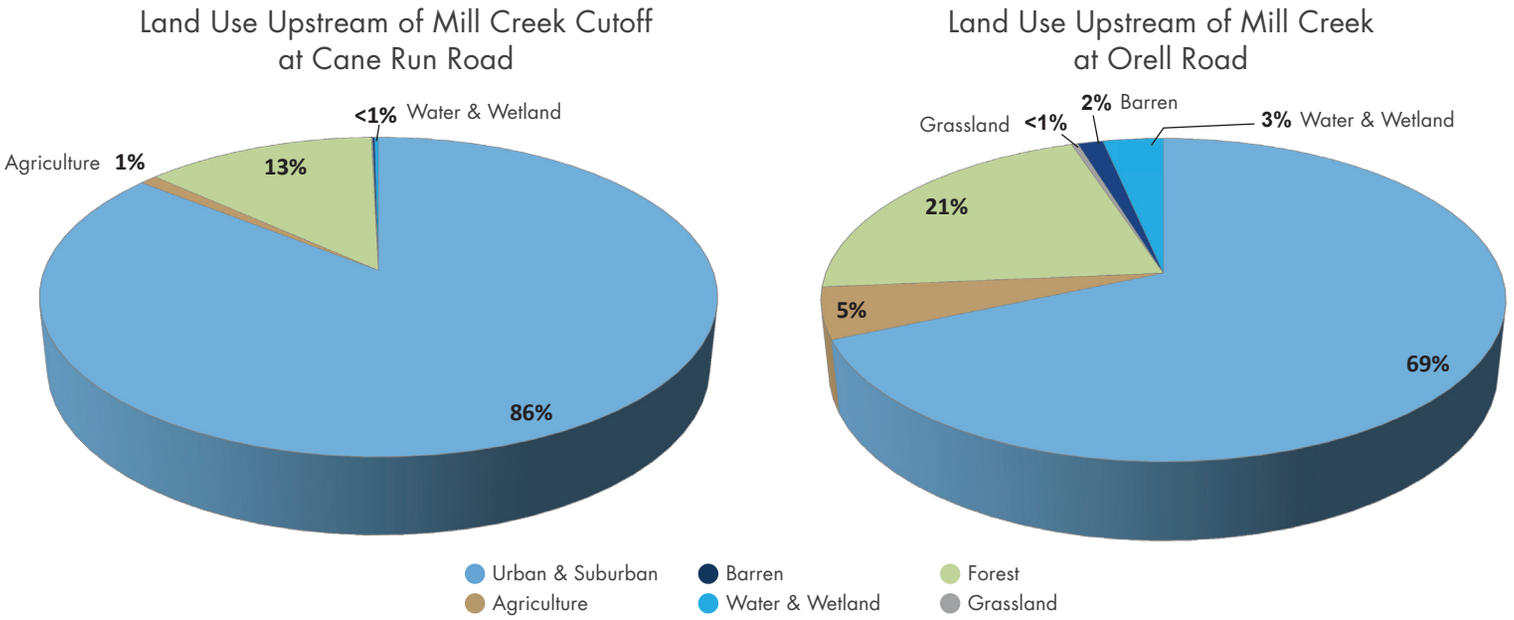
RATINGS KEY

TREND

- ↑ Improving
- ↓ Declining
- ~ Varies
- — No Change
- ND No Data

STATUS

- Excellent
- Good
- Fair
- Poor / Very Poor
- A Long Term Median Above the Criteria
- B Long Term Median Below the Criteria



Background and Land Use

MSD has been monitoring water quality at two sites in this watershed since 1999; on Mill Creek Cutoff at Old Cane Run Road and on Mill Creek at Orell Road. There are 24.4 square miles of land draining to the Mill Creek Cutoff site and 13.5 square miles of land draining to the Orell Road site. Both of these watersheds are highly urbanized, with some forest and very little agriculture. Approximately 38 and 21 percent of the land draining to the Mill Creek Cutoff and Orell Road sites, respectively, is covered by impervious surfaces such as roads, rooftops and driveways.

Monitoring Findings

MSD has monitored fish communities at the two sites since 1999. During this time, ratings have improved from "poor" to "fair" at the Mill Creek Cutoff site. At Orell Road, fish communities were variably "poor" or "fair" early on, but have steadily declined to "poor" since 2000.

MSD has monitored aquatic insect communities at the two sites since 2000. The aquatic insect communities improved slightly from "very poor" to "poor" at the Mill Creek Cutoff site. At Orell Road, aquatic insect communities were classified in "fair" condition throughout the sampling period.

MSD has assessed stream habitat quality when fish and aquatic insects were sampled since 2005. Except for 2008, habitat quality at the Mill Creek Cutoff site was "poor". This site is located in a straight man-made channel that lacks rocky riffles and tree lined banks that provide habitat for fish and aquatic insects.

Habitat quality at the Orell Road site was "fair" prior to 2008 and declined to a "poor" condition since 2009. Mill Creek at this site also consists of a man-made channel, so it lacks a mix of rocky riffles and deep, slow pools. These features provide important habitat for fish and aquatic insects. The site also has sediment deposition that is affecting stream habitat quality.

MSD has monitored benthic algal communities, largely diatoms, at the two sites in the Mill Creek watershed since 2001. Using a Diatom Bioassessment Index (DBI), both sites were rated variably "fair" to "excellent" and both are in a "good" condition in 2013.

Since 2000, MSD has monitored fecal coliform bacteria three to five times a month during the recreational season (April-October). *E. coli* bacteria were collected similarly but only since 2011. The monthly geometric means (geomeans) of bacteria concentrations were calculated and compared to the recreational contact standard for each type.

For fecal coliform bacteria, the recreational contact season runs from May 1 through October 31 each year. The period of record medians (the middle values) of the monthly geomeans for both sites were below the recreational standard of 200 colonies/100ml. Individual monthly geomeans were variably above and below the standard (not shown), with no apparent trend over the period of record. There was a tendency, however, for higher monthly geomeans earlier in the recreational season than later in the season for some years, which could be related to lower stream flows later in the season.

For the three years of data collection of *E. coli* bacteria (not shown), most of the monthly geomeans at the two sites were above the recreational standard of 130 colonies/100ml. MSD monitored the concentrations of nutrients (nitrogen and phosphorus) in streams and total suspended solids periodically from 2000 to 2005 and on a quarterly basis since 2005 at two sites in the Mill Creek watershed. The percent of samples taken at these sites which fall into the upper third of all samples were calculated as a comparison to other streams in the watershed and throughout the area.

Both sites had very low numbers of nitrate in the upper third of all samples compared to other sites in the county. The values for total Kjeldahl nitrogen, total phosphorus, and total suspended solids were similar between the two sites, with all parameters slightly higher at the Mill Creek Cutoff site compared to the Orell Road site.

MSD monitored concentrations of trace metals in streams

periodically from 2000 to 2005 and on a quarterly basis since 2005. For those metals with criteria, total metal concentrations in stream samples were compared to the acute Aquatic Life Criteria (ALC) for each metal. The ALCs were exceeded for cadmium in 10 samples, copper in 10 samples, for lead in one sample, and zinc in one sample.

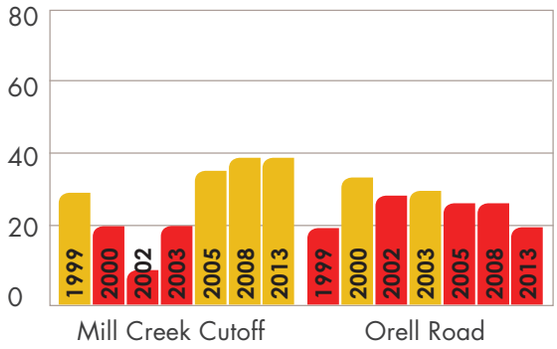
MSD and the US Geological Survey continuously monitor streamflow, dissolved oxygen, and water temperature on Mill Creek at Orell Road. Streamflow has been monitored at the Orell Road site (USGS gage number 03294570) since 1999 and at the Mill Creek Cutoff site (USGS gage number 03294550) since 1988.

Fish and aquatic insects need dissolved oxygen to breathe, and amounts greater than four parts per million (as an instantaneous standard) or five parts per million (as a mean daily standard) are what is deemed necessary. Water temperatures in excess of 31.7°C (89.1°F) are very stressful on the aquatic communities both by increasing metabolism and respiration, and by lowering the capacity of water to actually hold dissolved oxygen. In general, extended periods of low stream flows also can cause stress on aquatic communities.

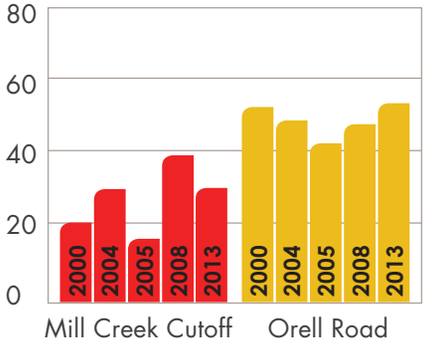
Dissolved oxygen criteria improved from 'fair' condition in 2007 and 2008 to "good" condition at the Orell Road site since then. Occasional excursions of low dissolved oxygen likely were a result of very low stream flows on very warm days or some other transient factor.

Water temperature criteria were met 100 percent of the time since 2006 at the Orell Road site. Periodic hot days and low stream flows are common in the summer and occasionally can cause an exceedance of the criteria, but that was not the case at this site.

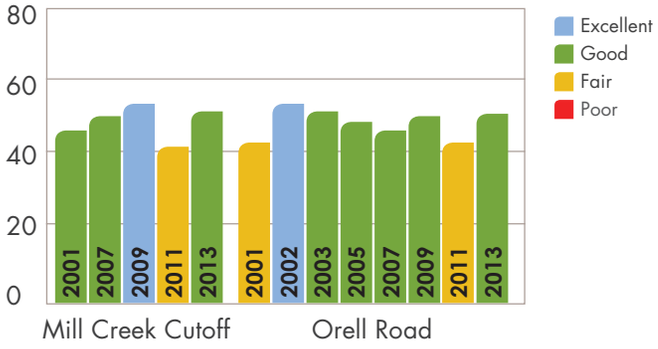
Condition of the Fish Communities in the Mill Creek Watershed



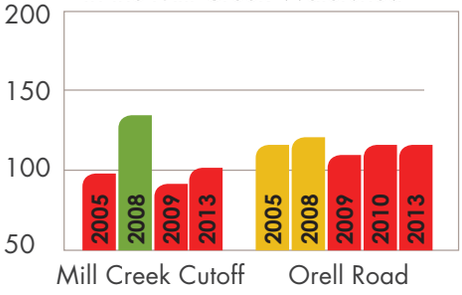
Condition of the Aquatic Insect Communities in the Mill Creek Watershed

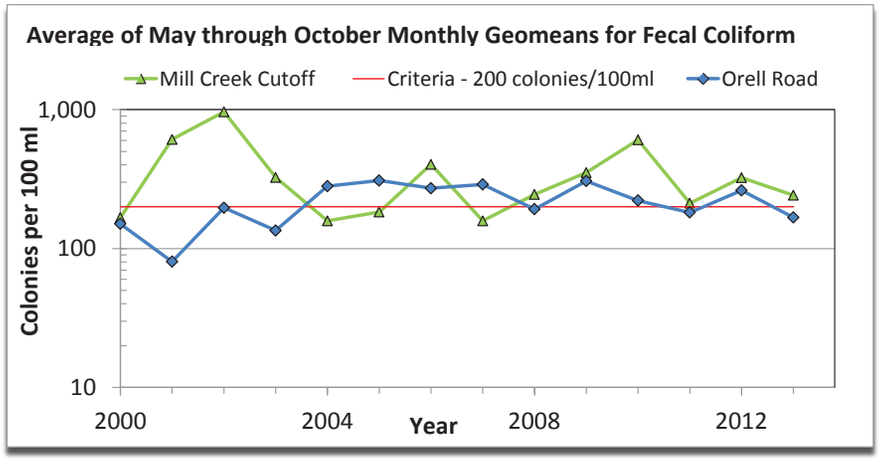


Condition of the Algal Communities in the Mill Creek Watershed

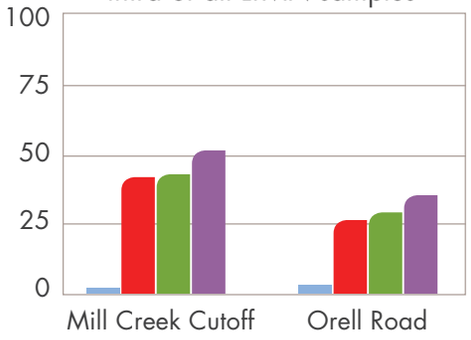


Condition of the Stream Habitat in the Mill Creek Watershed





Percent of samples in the upper third of all LTMN samples

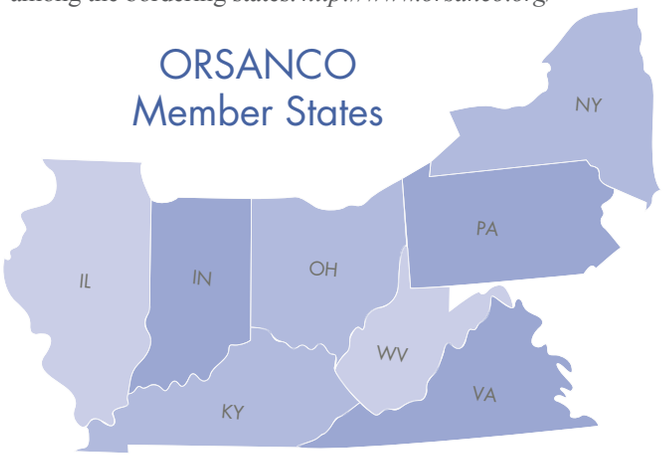


Nitrate >1.32 mg/l
Total Phosphorus > 0.135 mg/l
Total Kjeldahl Nitrogen > 0.9 mg/l
Total Suspended Solids >12 mg/l

Ohio River Watershed

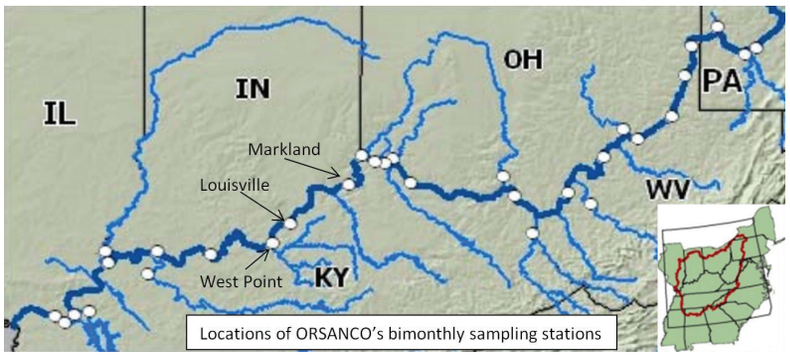
The Ohio River is one of the nation's great natural resources. The river not only provides drinking water for over five million people, but serves as a warm water habitat for aquatic life, provides numerous recreational opportunities, is used as a major transportation route, and is a source of water for the manufacturing and power industries. The Ohio River begins in Pittsburgh, Pennsylvania at the confluence of the Allegheny and Monongahela Rivers and flows southwesterly for 981 miles, joining the Mississippi River near Cairo, Illinois. For the stretch of river near Louisville, it forms the state boundaries between Indiana to the north and Kentucky to the south.

The Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate agency charged with abating existing pollution in the Ohio River basin and preventing future degradation of its waters. ORSANCO was created in 1948 with the signing of the Ohio River Valley Water Sanitation Compact among the bordering states. *http://www.orsanco.org/*



ORSANCO's Bimonthly Monitoring Program, in existence since 1975, is comprised of 31 monitoring sites; 17 locations on the main stem of the Ohio River and 14 points near the mouth of major tributaries. The Bimonthly Sampling Program currently collects six samples per year, every other month, down from a monthly frequency that ended in 1992. ORSANCO also operates a recreational contact monitoring program for bacteria where samples are taken five times per month for the entire recreational season.


A young volunteer collects trash during the annual Ohio River Sweep



Locations of ORSANCO's bimonthly sampling stations

Every two years, ORSANCO completes an assessment of conditions of Ohio River water quality and the ability to which the river supports each of its four designated uses; warm water aquatic life, public water supply, contact recreation, and fish consumption. ORSANCO's 2012 assessment (their 305b Report) indicates that, for the reach of the Ohio River in the vicinity of Louisville, both the aquatic life and public water supply uses are being met. As indicated by concentrations of bacteria in their river surveys, the use of the Ohio River for contact recreation is impaired and a plan for remediation is in progress. The entire 981 miles of the Ohio River is designated as impaired for the fish consumption use, caused by PCBs and dioxin.

http://www.orsanco.org/images/stories/files/publications/305b/docs/2012/2012ohioriver305breport.pdf

ORSANCO has analyzed the trends in various water quality measures at Ohio River sampling sites from 1990 to 2007. At the three Ohio River sites near Louisville (see figure), concentrations of nitrogen compounds, total suspended solids, iron, and zinc in the river are declining or staying the same. Concentrations of total phosphorus and chloride, however, are increasing over time.

TRENDS IN CONCENTRATIONS AT THREE OHIO RIVER SITES NEAR LOUISVILLE FROM 1990 TO 2007

OHIO RIVER SITE	AMMONIA-NITROGEN	NITRATE NITROGEN	TOTAL PHOSPHORUS	TOTAL SUSPENDED SOLIDS	IRON	ZINC	CHLORIDE
Markland	–	DEC	INC	DEC	DEC	DEC	INC
Louisville	dec	–	INC	–	–	DEC	–
West Point	–	–	INC	–	DEC	DEC	INC

Key: INC = significantly strong increasing trend, DEC = significantly strong decreasing trend, dec = less significant decreasing trend, and – = no trend found

http://www.orsanco.org/images/stories/files/publications/trendsreport/2008trendsanalysis.pdf

The overall fish community health in the Ohio River has been improving, but the entire 981 miles of the river is designated as "impaired" for the consumption of fish, caused by PCBs and dioxin.

ORSANCO also has conducted fish surveys to evaluate the Ohio River since 1957. Various measures of the condition of the fish communities have increased over time indicating an improvement in the overall fish community health. For example, the percentage of pollution tolerant fish species in the Ohio River has declined since 1957 and the fish surveys indicate increasing numbers of pollution intolerant and native species. The McAlpine Lock and Dam pool survey, the portion of the river above and in the Louisville Metro area, indicates that the fish community is in good health.

http://www.orsanco.org/images/stories/files/publications/biological/usingfishtoevaluate.pdf

Summary and Conclusions

The Louisville and Jefferson County Metropolitan Sewer District (MSD) in cooperation with the United States Geological Survey (USGS) operates a Long-Term Monitoring Network (LTMN) to collect physical, chemical and biological data about streams in the Metro Area. MSD collects the water quality and biological data and USGS collects stream flow. This Synthesis Report is focused on the conditions of fish, aquatic insects, benthic algae, stream habitat, bacteria, nutrients (nitrogen and phosphorus compounds), total suspended solids, trace metals, stream flow, dissolved oxygen, and water temperature of the streams in our community, and whether or not measures of these components are improving. The data collected at the 27 LTMN sites since 1999 helps us make decisions about where to focus our attention and tells us how we're doing in our mission to improve water quality in the region. This report augments a previous MSD report: "State of the Streams, 2011 Water Quality Synthesis Report" (available in the library section at *http://msdprojectwin.org*).

The health of aquatic communities in streams of the Metro Area can be compromised by one or more factors that commonly affect urban and suburban streams. Significant and rapid runoff from impervious areas often leads to stream bank erosion due to increases in the percentage of rainfall that becomes runoff (more frequent flushing). More rapid runoff can also cause scouring of stream beds and deposition of sediment that covers habitat needed by fish and other aquatic organisms. Channel modifications such as straightening and shoring up the bank with concrete or large stones leads to limited amounts of rock riffle habitat and insufficient protective tree cover along the banks, both of which are needed for healthy aquatic communities. Occasional periods of very low flow, high temperatures, or low dissolved oxygen infrequently contribute to lower than desired observed health of aquatic communities.

In addition to the typical urban effects, a major impact on stream quality in the older urban areas of Louisville is related to the presence of combined sewer systems that release sewage and stormwater during larger rainfall events. The lower parts of the South and Middle Forks of Beargrass Creek are affected by combined and sanitary sewer overflows, and their aquatic communities are usually rated as in "poor to very poor" condition. Very high concentrations of bacteria also were observed in these watersheds. These are being mitigated by extensive projects to eliminate or reduce the frequency and volume of overflows.

The aquatic communities in watersheds with impervious area greater than 20 percent have shown variable responses to the effects of development depending, in part, on the presence of healthy stream habitat. Parts of the Beargrass Creek (Muddy, Middle, and South Forks) watershed have poor habitat and generally poor to very poor conditions of their aquatic communities. Some watersheds, like Pond Creek and Mill Creek, have considerable amounts of man-made channels without the healthy mix of rocky riffles and tree covered banks. As a result, the aquatic communities generally are in "poor to fair" condition and they are declining at some sites. Northern Ditch is an exception in that the conditions of the aquatic communities are showing significant improvement, perhaps in part, due to channel stabilization projects.

Streams that run on bedrock, like Cedar Creek, Fern Creek, and Pennsylvania Run, to some extent lack the variety of in-stream habitat types such as deep pools and rocky riffles that provide good habitat for fish and aquatic insect communities. As a result, their aquatic communities are in "poor to good" condition but for other reasons they are still showing improvement.

The predominance of forested and agricultural land in less developed watersheds, like Harrods Creek, Floyds Fork, Brier Creek, and Cedar Creek (Bullitt County), helps slow down and absorb runoff during rain events. As such, healthier stream habitat conditions in these systems were found to be supporting healthier aquatic communities, even in Floyds Fork despite it having some of the highest nutrient levels in the county.

Measures of aquatic community health in 2013 indicate that for fish, algae, and stream habitat, over half of the sites were in "good to excellent" condition, whereas, for aquatic insects most sites were in "poor to fair" status. The cooler than normal stream temperatures during 2013 sampling likely resulted in lower than normal observed aquatic insect health. Trends in fish, aquatic insect, and stream habitat health indicate that over half of the sites were improving. The algal communities at most sites had no trend or were declining.

The "fair to poor" habitat conditions of about half of the streams can be attributed to historic stream channelization and straightening along with the loss of rock riffles, bends, vegetative bank protection, and the now less stable banks and narrow to nonexistent riparian corridors. Some consideration for using well-planned stream restoration techniques and riparian tree plantings might greatly improve conditions for fish and insects in streams with poorer habitat conditions.

Data in 2013 for fecal coliform bacteria indicate that 17 of the LTMN sites had an average monthly geometric mean (geomean) higher than the recreational contact criteria of 200 colonies per 100ml. For the period of record from 2000 to 2013, the median of all monthly fecal coliform geomeans indicates that 14 sites were above the criteria and 13 sites were below the criteria. The lower parts of the South and Middle Forks of Beargrass Creek had the highest concentrations of bacteria. These impacts are being mitigated by extensive projects to eliminate or reduce the frequency and volume of sewer system overflows during larger rainfall events.

Dissolved oxygen data in 2013 indicate that 19 sites were in "good" status, four were "fair", and only one site was in "poor" status (South Fork of Beargrass Creek at Brownsboro Road). Trends in the historical data (2007-2012) indicate that dissolved oxygen conditions at two sites were declining (Pennsylvania Run and the Brownsboro Road site), 18 sites had no trend, and at four sites conditions were improving. Water temperature conditions in 2013 indicate that half of the sites met the criteria (not greater than 31.7°C (89.1°F)) 100 percent of the time and half met the criteria at least 90 percent of the time. There were no measurable trends in water temperature data. Periodic hot days and low stream flows occasionally can cause an exceedance of dissolved oxygen or temperature criteria. The presence of significant tree cover at many sites and potential for groundwater influence at some sites probably helps buffer these measurements to some degree from otherwise significant urban influences.

The levels of nutrients (nitrate, total Kjeldahl nitrogen, and total phosphorus) and total suspended solids in each site were compared to all samples at 27 LTMN sites collected since 2005. Using a natural break in the data, seven to eight sites had the highest number of samples in the upper third of all LTMN samples for these nutrients. Those sites are mainly east or south of the city (Floyds Fork, Chenoweth Run, Cedar Creek, Pennsylvania Run, Fern Creek, and Little Goose Creek) and have more agricultural or suburban land use types, generally with higher use of fertilizers on crops and lawns. The 12 or 13 sites that had the lowest number of samples in the upper third of all LTMN samples for nutrients are mainly north (Harrods Creek and Goose Creek) or southwest of the city (Pond Creek, Mill Creek, and Cedar Creek-Bullitt). Six to seven sites were mid-range and largely urban.

In its un-ionized form, ammonia can be toxic to fish and other aquatic organisms. MSD collected samples for total ammonia since 2000 at 25 LTMN sites. For a comparison to the Kentucky water quality criterion, the un-ionized form of ammonia was calculated using water temperature and pH data with equations from the State's water quality standards 401 KAR 10:031. One sample each at Chenoweth Run at Gellhaus Lane in 2007 and 2008 were above the calculated un-ionized ammonia criterion. The source of these two higher ammonia concentrations is not known. Concentrations of un-ionized ammonia were below the criterion of 0.05 mg/l in all other samples at the 25 sites with available data since 2006, suggesting that un-ionized ammonia currently is not an issue at LTMN sites. Data on pH were not always available prior to 2006, but total ammonia nitrogen concentrations were judged high enough to likely have exceeded the un-ionized ammonia criteria in fifteen samples at four sites in 2001 and two sites in 2004, all in the Beargrass Creek watershed.

The picture of total suspended solids is a little different. Pond Creek at Manslick Road is very dominant with 94 percent of its samples in the upper third of all LTMN total suspended solids samples. It is suspected that the banks and sediment-laden stream bed in this channelized system are highly erodible and that even small rises in flow can lead to higher suspended solids. Sites on Little Goose Creek, Mill Creek, and Floyds Fork follow next, but were well behind in percent of samples in the upper third of all LTMN samples. Otherwise, the rest of the sites do not seem to have much of a problem with suspended solids.

Of more than 1,230 total samples collected for each trace metal at LTMN sites since 1999, copper had the most exceedances with 45 at 12 sites, cadmium had 31 exceedances at 9 sites, lead had 21 exceedances at 7 sites, and zinc had 5 exceedances at 4 sites. In summary, 73 percent of the metal exceedances were in the Beargrass Creek watershed and 22 percent were in the Mill Creek watershed. Otherwise, other exceedances were singular occurrences at six other sites. The relatively few exceedances of Aquatic Life Criteria in the historical data would indicate that trace metals are not a large issue of concern in LTMN streams.

Of the 1,427 LTMN samples for biochemical oxygen demand (BOD) and 911 samples for chemical oxygen demand (COD) detections were below 10 mg/l in 95 and 50 percent of the samples, respectively. The highest concentrations of BOD, about 5 to 10 mg/l on average, were found in the three sites on the South Fork of Beargrass Creek, and these were two to four times on average more than any other sites. The South Fork BODs likely were derived from sewer overflows. BOD and COD at each site were not correlated. The higher concentrations of COD were found at sites that likely had higher concentrations of dissolved and particulate organic carbon, which is derived from the natural decay of organic materials like leaves and other organic detritus or from dissolved iron (ferrous) compounds in poorly oxygenated ground water inflows or both. In fact, the highest COD (maximum of 238 mg/l and an average of 21 mg/l) was found in Cedar Creek, Bullitt County, which is a largely forested and undeveloped watershed.

The analysis of the historical LTMN data suggests that, in about half of the streams, bacteria continues to be an issue, and that "fair" to "poor" habitat quality significantly affected the observed health of fish and aquatic insect communities. The natural effects of drought conditions likely contributed to lower aquatic health status in some streams in some years as well. The effects of lower dissolved oxygen and higher temperature conditions are much more subtle and probably limited to a few sites for short periods. For example, below normal stream flows prior to and during the 2005 and 2008 sampling events likely affected observed health in aquatic insect and fish communities, affecting the aquatic insects more than fish. The cooler than normal stream temperatures during sampling likely affected the observed health of the aquatic insect communities in 2013. One of the values of a long-term network like the LTMN is the ability to identify these naturally induced fluctuations in water quality as well.

State of the Streams

Summary of the Status and Trends in Stream Water Quality from 1999 to 2013 for the MSD Long Term Monitoring Network

MSD Site Name	Percent of Watershed that is Urban	Percent of Watershed that is Impervious	Drainage Area (square miles)	Average Streamflow 1999-2013 (cubic feet per second per square mile)	Fish Status (2013)	Fish KIBI Trend (oldest to 2013)	Aquatic Insect Status (2013)	Aquatic Insect MBI Trend (oldest to 2013)	Algal Status (2013)	Algal DBI Trend (oldest to 2013)	Stream Habitat Status (2013)	Stream Habitat Trend (2005 to 2013)
Harrods Creek at Covered Bridge Road	9	1	70.3	1.88	Good	-2%	Fair	-37%	Excellent	8%	Good	6%
Wolf Pen Branch at 8111 Wolf Pen Branch Road	24	7	2.08	No gage	Fair	-41%	Poor	-25%	Fair	-2%	Good	24%
Goose Creek at Old Westport Road	53	11	6.00	1.66	Good	23%	Fair	-1%	Excellent	24%	Good	39%
Goose Creek at US 42	49	10	10.1	1.45	Excellent	18%	Poor	-33%	Good	-15%	Good	8%
Little Goose Creek at US 42	66	18	5.82	2.19	Good	77%	Fair	3%	Excellent	-3%	Good	21%
Muddy Fork of Beargrass Creek at Mockingbird Valley Road	46	9	6.20	1.59	Good	9%	Poor	36%	Fair	-27%	Poor	22%
Middle Fork of Beargrass Creek at Browns Lane	73	24	15.2	No gage	Excellent	61%	Fair	5%	Fair	-24%	Fair	49%
Middle Fork of Beargrass Creek at Old Cannons Lane	76	24	18.9	1.61	Fair	8%	Poor	-26%	Good	-9%	Good	9%
Middle Fork of Beargrass Creek at Lexington Road	73	22	24.8	1.53	Poor	4%	Poor	-13%	Excellent	-3%	Fair	-7%
South Fork Beargrass Creek at Trevilian Way	85	32	17.2	1.62	Fair	0%	Poor	25%	Excellent	-5%	Poor	53%
South Fork Beargrass Creek at Schiller Avenue Ramp	81	30	22.8	1.59	Very Poor	-77%	Poor	22%	Fair	-11%	Poor	-4%
South Fork Beargrass Creek at Brownsboro Road	78	28	51.5	1.56	Fair	137%	Poor	59%	Good	-25%	Good	31%
Floyds Fork at Ash Avenue	9	1	80.0	1.70	Good	24%	Fair	38%	Good	-4%	Good	3%
Floyds Fork at Old Taylorsville Road	13	3	138	1.66	Excellent	28%	Fair	-8%	Good	-1%	Good	7%
Floyds Fork at Bardstown Road	14	4	213	1.65	Excellent	58%	Fair	-5%	Fair	-10%	Good	-1%
Chenoweth Run at Ruckriegel Parkway	75	33	5.47	1.99	Fair	18%	Fair	32%	Good	-10%	Fair	16%
Chenoweth Run at Gellhaus Lane	52	21	11.6	2.34	Fair	39%	Fair	-4%	Fair	-25%	Good	18%
Cedar Creek at Thixton Lane	37	10	6.40	3.40	Good	28%	Poor	-6%	Fair	2%	Good	12%
Pennsylvania Run at Mount Washington Road	39	9	11.1	0.95	Fair	27%	Fair	74%	Good	13%	Fair	16%
Cedar Creek at State Road 1442 Bullitt County	6	0.2	12.1	1.66	Excellent	17%	Good	22%	Excellent	29%	Good	0%
Fern Creek at Old Bardstown Road	60	17	3.50	2.00	Poor	19%	Poor	1%	Excellent	12%	Fair	34%
Northern Ditch at Preston Highway	62	17	11.1	1.80	Excellent	62%	Fair	49%	Poor	-23%	Good	23%
Pond Creek at Manslick Road	58	25	64.0	1.57	Poor	53%	Fair	25%	Poor	-3%	Poor	-34%
Pond Creek at Pendleton Road	60	21	80.3	1.74	Very Poor	-55%	Poor	11%	Poor	-34%	Poor	-28%
Brier Creek at Bear Camp Road	1	0.05	4.13	1.39	Excellent	68%	Fair	18%	Good	-60%	Fair	7%
Mill Creek Cutoff at Old Cane Run Road	86	38	24.4	0.65	Fair	32%	Poor	36%	Good	10%	Poor	5%
Mill Creek at Orell Road	69	21	13.5	1.70	Poor	0%	Fair	1%	Good	15%	Poor	-13%

Fecal Coliform in colonies/100ml		Percent of Time Dissolved Oxygen Criteria Met (2012)		Percent of Time Water Temperature Criteria Met (2012)	Water Temperature Trend (2007 to 2012)	Ranking Based on the Percent of Samples in the Upper Third of All Sites (red shading is in the higest percent, green is in the lowest percent, and yellow is in between)				Short Name	MSD Site Number
Average Monthly Geomean (2013)	Median of All Monthly Geomeans (oldest to 2013)	5 mg/l Daily Criteria	Trend (2007 to 2012)			Nitrate > 1.32 mg/l	Total Kjeldahl Nitrogen > 0.9 mg/l	Total Phosphorus > 0.135 mg/l	Total Suspended Solids > 12 mg/l		
152	131	100%	12%	98.6%	-1%	8%	23%	9%	24%	Harrods Creek	EHCHC001
478	281	No Data	No Data	No Data	No Data	26%	21%	3%	27%	Wolf Pen Branch	EHCWP001
345	280	98%	-1%	100.0%	0%	22%	24%	13%	15%	Old Westport Road	EGCGC001
256	278	99%	-1%	100.0%	0%	48%	24%	33%	22%	US 42	EGCGC002
182	240	100%	0%	100.0%	0%	79%	62%	31%	62%	Little Goose Creek	EGCLG001
393	376	98%	-2%	100.0%	0%	37%	17%	30%	29%	Mockingbird Valley Road	EMUMU001
1073	921	No Data	No Data	No Data	No Data	43%	15%	13%	27%	Browns Lane	EMIMI009
451	374	99%	-1%	99.7%	0%	33%	29%	7%	26%	Old Cannons Lane	EMIMI002
672	912	83%	14%	98.6%	-1%	24%	38%	53%	48%	Lexington Road	EMIMI010
1284	434	93%	3%	100.0%	0%	16%	44%	12%	46%	Trevilian Way	ESFSF001
2094	633	95%	-5%	99.7%	0%	28%	35%	25%	37%	Schiller Avenue Ramp	ESFSF002
986	846	62%	-29%	99.7%	0%	45%	40%	36%	28%	Brownsboro Road	ESFSF006
456	203	90%	-6%	100.0%	2%	43%	52%	74%	41%	Ash Avenue	EFFFF001
209	169	100%	5%	97.8%	-2%	60%	50%	65%	57%	Old Taylorsville Rd	EFFFF003
301	200	98%	-1%	99.7%	1%	62%	48%	56%	39%	Bardstown Road	EFFFF002
221	334	99%	23%	100.0%	0%	17%	23%	48%	16%	Ruckriegel Parkway	EFFCR002
212	219	100%	1%	97.2%	-2%	92%	62%	91%	20%	Gellhaus Lane	EFFCR001
188	219	100%	1%	100.0%	0%	94%	49%	8%	13%	Thixton Lane	ECCCC001
357	305	80%	-17%	100.0%	0%	74%	48%	89%	31%	Mt. Washington Road	EPRPR001
134	146	92%	-4%	98.9%	-1%	9%	21%	4%	15%	State Road 1442	ECBCB001
615	462	100%	7%	100.0%	0%	52%	23%	53%	23%	Fern Creek	EPCFC001
326	173	97%	-4%	91.7%	-9%	11%	18%	19%	9%	Northern Ditch	EPCND001
302	271	93%	-2%	92.9%	-4%	1%	37%	40%	94%	Manslick Road	EPCPC001
159	154	91%	-6%	99.7%	0%	0%	23%	16%	31%	Pendleton Road	EPCPC002
153	131	82%	8%	100.0%	0%	2%	13%	3%	13%	Brier Creek	EPCBC001
242	186	No Data	No Data	No Data	No Data	2%	41%	42%	51%	Mill Creek Cutoff	EMCMX001
167	151	99%	13%	100.0%	0%	3%	25%	29%	35%	Orell Road	EMCMC001

Important Terms

Aquatic Insects: Aquatic insects, also known as benthic macroinvertebrates, are small animals (bugs) that can be seen with the naked eye, live on the bottom of streams and lakes, and don't have a backbone. They are often the immature aquatic forms of insects that live on land as adults, and they are an important food source for fish and other aquatic organisms.

Benthic Algae: The small green plant-like organisms that live on the rocks and other materials on the bottoms of streams are called benthic algae. Benthic algae have limited mobility, growing in areas suitable for their survival for weeks to months. They are particularly responsive to stream nutrient concentrations, sunlight, and the effects of sedimentation. Many algae types (especially diatoms, green algae, and blue-green algae) are an important food source for many fish and aquatic insects.

Biological Indices: Various methods used in this report to assess water quality by applying measures (metrics) of biological communities to derive a narrative rating of "good', "fair", or "poor" condition of the aquatic communities in a stream. A number of metrics are used, including the total number and diversity of species, tolerance to pollution, and other assessments. This report used data on the fish, aquatic insect, algae, and stream habitat communities to rate each stream.

Dissolved oxygen: Dissolved oxygen is the oxygen that is freely available in water, and that is vital to fish and other aquatic life and for the prevention of odors. Dissolved oxygen levels are considered an important indicator of a water body's ability to support desirable aquatic life. Dissolved oxygen levels fluctuate seasonally and over a 24- hour period. They also vary with water temperature and altitude (elevation). Water at the same temperature holds less oxygen at higher altitudes and cold water holds more oxygen than warm water.

Erosion: Erosion is when soil, silt, sand, rock and other particles are removed from unprotected land surfaces or stream banks usually by flowing water (runoff and stream flow) and are deposited downstream as sediment (mud, silt, sand, and gravel). Sediment becomes problematic when it covers rocks and other stream habitat needed by fish and other aquatic life.

Floodplain: A floodplain, or flood plain, is the flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current.

Geomeans: the geometric mean (geomean) is a way of averaging a set of numbers by using the product of their values, as opposed to the arithmetic mean, which uses their sum. The geometric mean is defined as the nth root of the product of n numbers. It is used in this report to compute a value of multiple samples of bacteria for comparison with a standard value or criteria.

Impervious Surface: An impervious surface is any surface that is covered by materials that block the infiltration of water into the ground or soil. Impervious surfaces include roads, sidewalks, driveways, parking lots, and rooftops. Compacted soils (including some lawns) can also behave like impervious surfaces.

Indicator Bacteria: Bacteria and viruses that live in the water and on the bottom of streams are both natural and beneficial conditions in healthy streams. Bacteria and viruses in wastewater inflows and runoff from urban surfaces can lead to less healthy conditions, especially if they contain untreated animal or human waste. There are two types of bacteria that are used to indicate whether streams are clean or polluted, getting better or worse. Fecal coliform bacteria are one type more generally indicative of the presence of some kind of fecal material. The other type, *E. coli* bacteria, is more indicative of the presence of fecal material from the gut of warm blooded animals, including humans. Both types have established criteria mainly related to body contact recreation by humans.

Nutrients: The primary nutrients in streams are nitrogen and phosphorus compounds carried in runoff and other inflows. They are important for the growth and health of aquatic organisms. In excess, however, they can lead to nuisance growths of algae and low dissolved oxygen. Nitrate nitrogen is largely in a dissolved form, derived from fertilizers and wastewaters. The other compounds are both in dissolved and particulate forms. Total Kjeldahl is a measure of both ammonia and organic nitrogen carried with sediment runoff and wastewater inflows. Total phosphorus is particularly important for algal growth and also is delivered to the stream with sediment runoff and wastewater inflows.

Riffle: A riffle is a short, steeper, relatively shallow and coarse-bedded length of stream over which the stream flows at a faster velocity and higher turbulence than in a pooled reach of a stream. Riffles are usually caused by an increase in a stream bed's slope or an obstruction (rocks, logs, etc.) in the flow. Riffles typically increase dissolved oxygen and provide high quality aquatic habitat.

Riparian zone or area: A riparian zone is the area of land at and near the stream interface. Riparian zones, when well vegetated, have a significant role in stream bank stabilization, soil conservation, filtration of chemicals and sediment in runoff, and in providing shade and food (organic material).

Runoff: Runoff is the portion of rain, snow melt, or irrigation water that arrives in streams, rivers, lakes, ponds, drains or sewers.

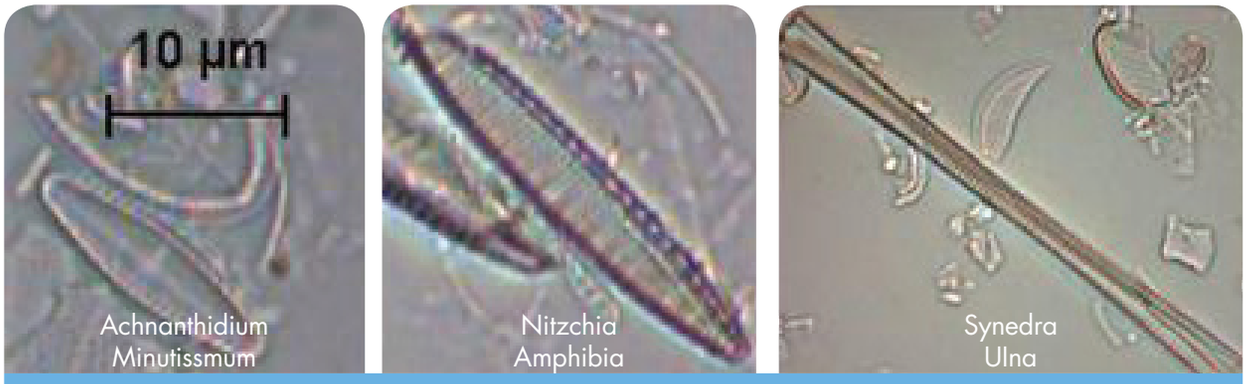
Stream Flow: Stream flow is the volume of water flowing past a point in a fixed unit of time. Stream flow is often expressed in cubic feet per second (ft^3/ sec).

Stream habitat: Stream habitat is the underwater environment that is used as a living space by fish, aquatic insects, other plants and animals. Vegetation near the channel also is important for quality habitat. Streams that have a variety of habitats, with shallow and deep areas, fast and slow water, and places with rocks, gravel, woody debris, tree covered banks, and shade are characteristics of good habitats.

Total Suspended Solids: Total suspended solids in streams are indicative of the amount of sediment washing off watershed surfaces and from erosion of stream banks. Sediment carried in higher flows, when deposited downstream, can reduce the quality of aquatic habitat and negatively affect aquatic communities.

Trace Metals: Various metals carried in trace amounts in runoff and other inflows. They are both in dissolved and particulate forms and in higher concentrations can affect the health of aquatic organisms. Criteria exist for the more important metals.

Watershed: The area of land where all the water drains to a particular stream or location along a stream. The boundary of a watershed is formed by the highest elevations surrounding the stream. A rain drop of water falling outside the watershed boundary will drain to another watershed. Small watersheds join together to form larger watersheds. A major river, such as the Ohio River, will encompass many smaller watersheds.



Three of the more common diatom species that were collected from algae tiles in 2013 at sites with "excellent" ratings.

67,668 catch basins...

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On rainy days, rainwater—and anything else that is on the streets—flows into the storm drains, also known as catch basins. If they are clogged with leaves and debris, water can quickly flood the street. This localized flooding can result in hazardous conditions.

We salute the 98 powerful people in MSD Drainage and Flood Protection, who collectively work around the clock seven days a week—every day of the year. They do their best to keep our community safe from flooding.

You can see that, with 67,668 basins, we could use your help. Just a few minutes of your time can help prevent street flooding in your neighborhood. Rake leaves and debris away from the basins, and dispose of such debris properly. If basins are still clogged, **contact MSD Customer Relations—at 502-587-0603**—to receive assistance.

Together, we can achieve clean, safe waterways
for a healthy and vibrant community.

MSD
Metropolitan Sewer District

Providing Exceptional Wastewater, Drainage and Flood Protection Services for Our Community

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- Paper towels
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We salute the 125 powerful people in MSD Wastewater Treatment, who collectively work 24/7/365.

They do their best to help us achieve clean, safe waterways for a healthy and vibrant community.

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This 2014 Water Quality Synthesis Report was prepared by MSD and Stantec Consulting Services, Inc.

Stantec