

National Pollutant Discharge
Elimination System (NPDES)
Municipal Separate Storm Sewer System
(MS4) Permit MO-0130516
Eleventh Year Report
May 2015 - April 2016



Submitted by:
Kansas City, Missouri
KC Water
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October 2016

Table of Contents

ACRONYMS	iii
AUTHORITY	iv
CERTIFICATION	iv
WRITTEN NOTICE OF COMPLIANCE.....	v
CONTACT LIST	vi
Introduction.....	vii
SECTION 1. STORMWATER MANAGEMENT PROGRAM COMPONENTS	1
1.1 Address Post-Construction Discharge	1
1.2 Control Discharge from Roadways	3
1.3 Assess Impact of Flood Risk Management Projects on Water Quality Conditions.....	6
1.4 Control Pollutants in Runoff from Municipal Waste Management Facilities.....	9
1.5 Monitor and Control Pollutants from Industrial and High-Risk Runoff	10
1.6 Reduce the Discharge of Pesticides, Herbicides, and Fertilizers	14
1.7 Reduce Illicit Discharges, Spills, and Improper Disposal.....	15
1.8 Reduce Pollutants in Construction Site Runoff.....	19
SECTION 2. STORMWATER PUBLIC EDUCATION AND AWARENESS PROGRAM	22
SECTION 3. WATERSHED MONITORING PROGRAM	25
SECTION 4. OTHER PERMIT REPORTING REQUIREMENTS.....	37
4.1 Summary of Implementation Status.....	37
4.2 Proposed Changes	37
4.3 Program Effectiveness Evaluation Regarding Water Quality Improvement	37
4.4. Data Summary	41
4.5 Annual Expenditures.....	41
4.6 Activity Summaries; Inspection, Enforcement, and Public Education.....	41
4.7 Water Quality Degradation/Improvements	42
SECTION 5. FUTURE IMPLEMENTATION	46
SECTION 6. APPENDIXES	47
Appendix 1. Industrial & Other High-Risk Runoff Facilities Inventory Kansas City, Missouri.....	47
Appendix 2. 2015 KCMO Priority List of Industrial and Other High-Risk Runoff Facilities	52
Appendix 3. MARC 2015 Annual Report for Regional Water Quality Public Education Program	54

ACRONYMS

APWA	American Public Works Association
BMPs	Best Management Practices
BOD	Biochemical oxygen demand
BRWA	Blue River Watershed Association
CERC	Columbia Environmental Research Center
City	the City of Kansas City, Missouri
COD	Chemical oxygen demand
EMC	Event-mean concentration
GIS	Geographic Information System
HHW	Household Hazardous Waste
KCHD	Kansas City Health Department
KCWL	Kansas City Wildlands
LDD	Land Development Division
MARC	Mid-America Regional Council
MDNR	MO Department of Natural Resources
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollution Discharge Elimination System
OEQ	The Office of Environmental Quality
P&R	Parks and Recreation Department
PHFs	Pesticides, herbicides, and fertilizers
PWD	Public Works Department
STREAM	Students Teaching River Education Around the Metro
SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan
USGS	U.S. Geological Survey
WRDA	Water Resources and Development Act
WSD	Water Services Department

AUTHORITY

As required in Part VI, Sections D and E of Missouri State Operating permit No. MO-0130516, all reports required by the permit and other information requested by the Director shall be signed by:

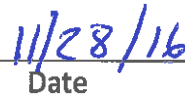
1. for a municipality, State, or other public agency: either a principal executive officer or ranking elected official.

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the 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 fines and imprisonment for knowing violations.



Terry Leeds, Director
Water Services Department
City of Kansas City, Missouri



Date

WRITTEN NOTICE OF COMPLIANCE

Part IV.B of the Missouri State Operating permit MO-0130516 requires that the City of Kansas City, Missouri provide written notice of compliance or noncompliance with the schedule for permit implementation. The City has, so far, submitted eleven reports covering the period from September 3, 2004 to April 30, 2015, to Missouri Department of Natural Resources. This current report covers the period of May 1, 2015 - April 30, 2016. It documents the status of implementing, to the maximum extent practicable, the components of the stormwater management programs that are established as permit conditions and addresses the progress of programs that were required to be implemented in this period. As detailed in the report, the City is in compliance with the schedule for all interim milestones and final deadlines as identified in the permit schedule (permit Part IV.A).

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Introduction

This report is submitted to the Missouri Department of Natural Resources (MDNR) by the City of Kansas City, Missouri (hereafter referred to as the City) pursuant to the conditions of the National Pollutant Discharge Elimination System (NPDES) Missouri State Operating permit MO-0130516 for discharges from its municipal separate storm sewer system (MS4). The five-year permit was issued on September 3, 2004 and expired on September 3, 2009. Prior to the expiration of the first permit term, the City timely submitted its renewal application in a timely manner and as such has continued to operate its separate storm sewer system under the expired permit conditions. This annual report provides an update on the permit activities conducted between May 1, 2015 and April 30, 2016.

This report consists of six sections.

1. **Stormwater Management Program Components.** Elements of the City's stormwater management program are summarized in this section. Objectives, program development, implementation status, and major achievements are discussed here.
2. **Public Education Program.** Public education is required in multiple stormwater management programs in the City's MS4 permit. This section discusses education activities, currently conducted or planned pursuant to permit requirements.
3. **Watershed Monitoring Program.** Monitoring water quality is a critical component in evaluating the effectiveness of the MS4 permit implementation. This section presents a summary of ongoing monitoring efforts performed in accordance with Part VI of the permit.
4. **Other Permit Reporting Requirements.** The City's MS4 permit mandates reporting elements that allow for the evaluation of permit implementation but are not specifically included in any of the previous sections. These elements include proposed changes to permit conditions, enforcement actions, identification of water quality improvement or degradation, and a fiscal analysis.
5. **Future Implementation.** This section discusses the future direction of stormwater management in the City.
6. **Appendixes.** This section includes detailed supporting documents that have been developed in compliance with the permit requirements and/or that are not required by the permit but show the City's efforts on stormwater pollution prevention and mitigation.

SECTION 1. STORMWATER MANAGEMENT PROGRAM COMPONENTS

1.1 Address Post-Construction Discharge from Areas of New Development and Significant Redevelopment

A. Permit Reference III.A-1a. (Status ongoing)

Water quality considerations for areas of new development and significant redevelopment

The activities performed under this program included:

- Revising the Kansas City Zoning and Development Code. The zoning and development code, replacing a code with sections dating back to 1926, was approved by Ordinance 081033 on May 21, 2009. No stormwater-related changes were made during the reporting period.
- New area plans addressing stormwater and sustainability. These two areas are not within the municipal separate storm sewer system. Table 1 provides the new area plans that the City Planning and Development department worked on that directly and specifically address stormwater and environmental sustainability.

Table 1. The new area plans addressing stormwater and sustainability

Area plan	Completion/ adoption date	Low-impact development (or redevelopment), stormwater-related vision/principle/recommendation
West Bottoms Streetscape Plan	2016 (draft)	Provide stormwater storage improvements that collectively form a highly visible example of urban renewal through green infrastructure investment (some separate storm sewer components have recently been installed)
Midtown Plaza Area Plan	2016 (approved)	Implement sustainable, green infrastructure solutions to achieve multiple benefits

Specific effort to address watershed development. The Watershed Planning Group of Water Services Department (WSD) continues its effort to address preservation of riparian buffer zone in a more stream-focused, watershed-based approach for First Creek and Second Creek as a component of comprehensive wet weather mapping throughout the City. The Group is generating a model incorporating multiple indices (e.g., erosion hazard zones, flow characteristics) to delineate appropriate riparian buffer width for each individual segment of the creek. The purpose is to estimate the extent of natural stream migration and morphology succession, develop stormwater management goals that maintain natural stream and watershed characteristics, and encourage smart land development that protects the City's riparian corridors and private properties while avoiding excessive restrictions on development.

B. Permit Ref. III.A-1.a.i (Status Ongoing)

Procedures for addressing water quality issues as part of the permitting process

The Land Development Division (LDD) of the City Planning and Development department continues to require developments' adherence to the adopted American Public Works Association (APWA) standards

and supplements, including the *Manual of Best Management Practices for Stormwater Quality* and compliance with stream buffer regulations during the initial planning stages of new development and redevelopment, and during the construction of the projects. These standards require developments to mitigate their impacts for post-construction above predevelopment conditions by including permanent water quality bests management practices (BMP), buffers, and maintenance requirements for all sites within the Municipal MS4. In addition, the WSD also provides BMP guidance during the plan review and approval process.

C. Permit Ref. III.A-1.a.ii (Status ongoing)

A description of review standards and a description of the site development review process for internal and external educational purposes (Table 2 below)

Table 2. Task summary associated with addressing post-construction discharge from new development and significant redevelopment.

Permit Ref.	Task	Activities
1a.	Incorporate water quality considerations for areas of new development and redevelopment. (1) in land use planning, subdivision approval, and site plan review and approval (2) in project review and approval for new development and significant redevelopment	<i>The Review Process</i>
		232 reviews of development applications
		420 reviews of construction projects
		33 BMPs facilities installed
		48 pre-application development assistance sessions with development stakeholders
1a.i & ii	Improve procedures for incorporating water quality concerns as part of the permitting process	38 BMPs easements reviewed
1a.ii.	Upgrade the site development review standards	21 Covenants for Maintenance reviewed
1a.ii.	Internal and external education on review standards and process	
1a.iii.	Set up minimum design criteria for structural BMPs	
1b.	Inspect and maintain post-construction BMPs	12 public detention (or retention) basins inspected and maintained, as needed
		65 private detention basins inspected (including 3 new ones)
		15.5 acres of green solution sites maintained

D. Permit Ref. A-1.b. (Status ongoing)

Operation and maintenance of post-construction BMPs

Regional BMPs. A design for the detention basin in the East Fork Creek sub-basin of the Line Creek watershed was completed in 2011. While the City is working on funding for the construction, the

Engineering Group of the Water Services Department and the Land Development Division (LDD) of the City Planning and Development Department are reevaluating the previous design and seeking more efficient options for site runoff source control.

Public BMPs. The Stormwater Maintenance group inspected and maintained the public detention basins at 6013 North Strathbury Road, 300 Chestnut Trafficway, 3913 North Kensington Road, Stillwell Avenue (construction completed in 2015), and Gardner Avenue (now a retention basin). The City owns, and the City's Board of Police Commissioners maintains, multiple detention basins at several Police department's patrol stations, which include Central, Metro, South, East Patrol, and Shoal Creek Stations.

In addition, the WSD continues to maintain city-owned green solution sites, allowing them to function at an optimal level. Currently, the department maintains a total of 15.5 acres of green solutions footprint, which include, but is not limited to, rain gardens, bio-retention cells, detention basins, and permeable pavements.

Private Water Quality BMPs. The Detention Basin Credit program is maintained by the WSD to encourage the use of detention basins. WSD conducted routine inspections for basins receiving the detention credit. See Table 2 for details.

For BMPs evaluation for development plans and BMP easements, see Table 2 for details.

1.2 Control Discharge from Roadways

A. Permit Ref. 111.A-2a. (Status ongoing)

Store and cover deicing chemicals to minimize the discharge of deicing salts to the municipal separate storm sewer system (MS4)

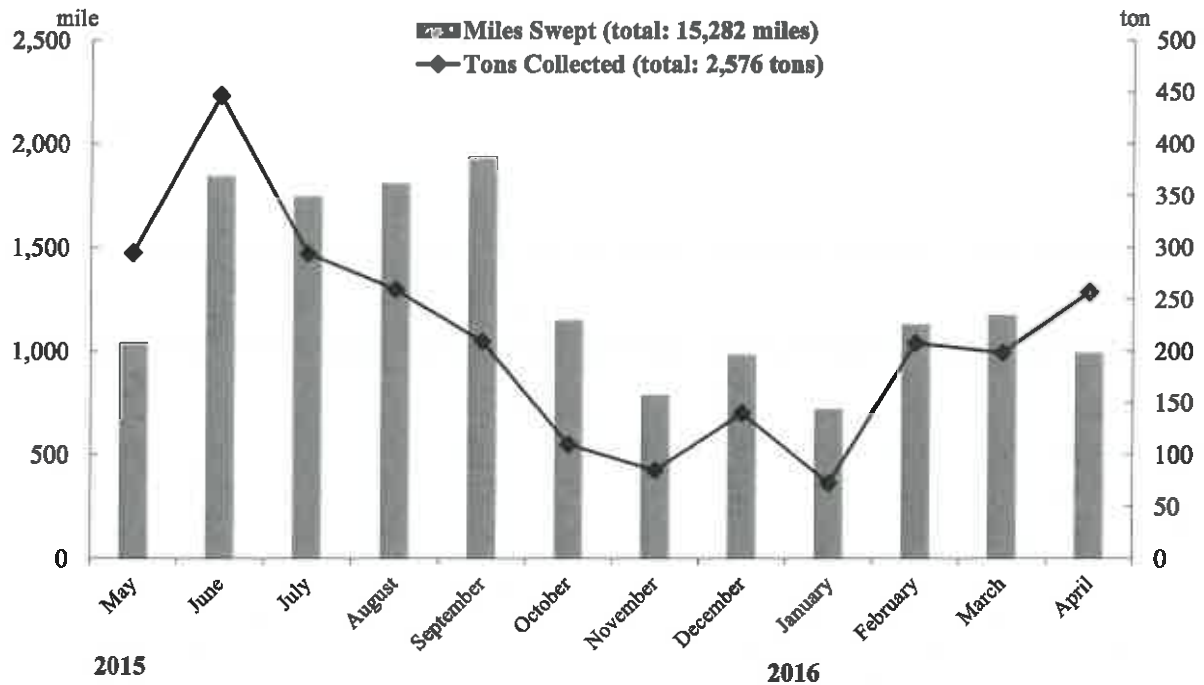
The City's Public Works Department (PWD) has deicing chemical and material storage facilities at each of its three districts and two outlying salt storage facilities. The facilities vary in size, and their storage capacities range from 6-12 thousand tons of materials. Rock salt is stored in dome structures at three of the locations. The domes were constructed on asphalt slabs and consist of wooden and concrete structural materials, capable of containing deicing chemicals during periods of extended storage. The two additional salt storage facilities are "Cover-All" buildings with ten-foot high concrete walls constructed on an asphalt slab. Salt brine and calcium chloride solutions are also used as deicing agents for the public streets, and both are stored in tanks. During the reporting period, the City used a total of 60,000 gallons of salt brine, 4,000 gallons of liquid calcium chloride, and 10,580 tons of salt to keep the City streets safe for cars and passengers.

B. Permit ref. III.A.2b (Status ongoing)

Effectively maintain public streets while considering water quality and watershed goals and objectives

Street Sweeping Program. The Stormwater Maintenance Division of the WSD operated the program Figure 1 (below) provides the performance measurements.

Figure 1. Monthly record of street sweeping for FY 2015/16



Other Trafficway/Right-Of-Way Maintenance. The City’s Parks & Recreation Department (P&R) maintains 12,000 acres of parkland in 220 parks, 40+ miles of interior roads, hundreds of parking lots, 135 miles of boulevards, parkways, and streets, and over 100 miles of trails and bikeways. Due to the isolation of much of the property in the park system, it is a prime target for illegal dumping activities. The department continued working with law enforcement personnel, neighborhood and community groups, other city departments, the City’s Illegal Dumping Task Force and other stakeholders in multifaceted effort to address the dumping problem. The most recent attempt to curb illegal dumping was the changes made to Cliff Drive. It is now a one-way road from west to east with only one entrance and one exit. This change not only encourages more pedestrian and bike traffic to help deter the dumping, but also allows Police Department an opportunity to patrol more closely.

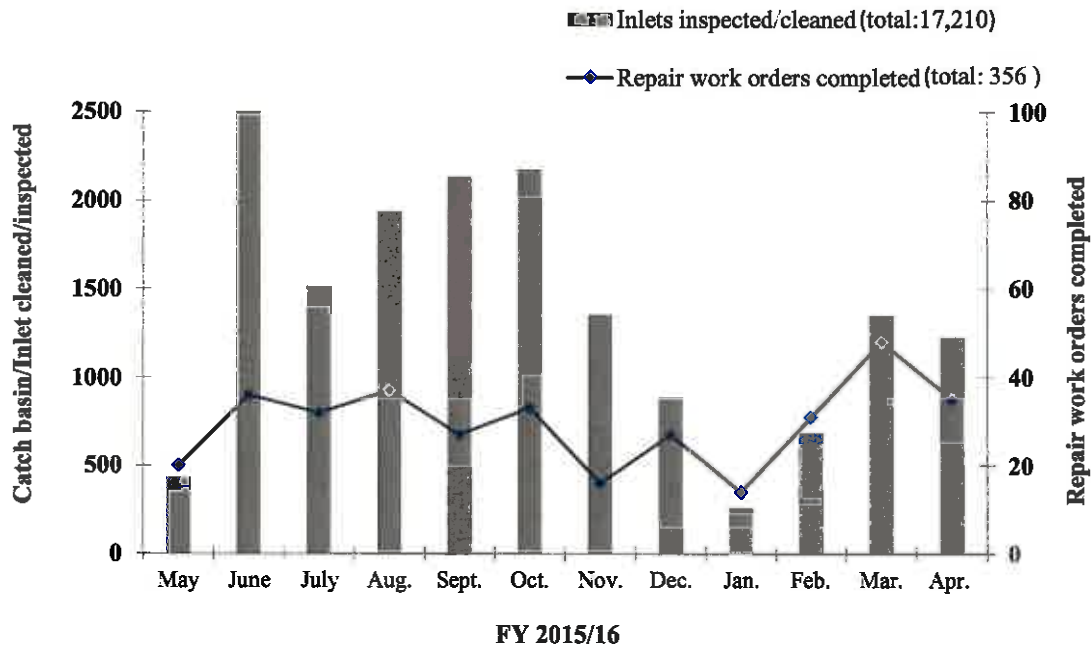
The Leaf and Brush Program. To prevent leaves and yard waste from getting into streets/catch basins, a total of 6,104 tons of yard waste was collected at three drop-off centers. In addition, 4,443 tons of yards waste was collected during the seasonal curbside collections during this reporting period.

C. Permit Ref. III.A.2c (Status Ongoing)
Storm sewer maintenance

Stormwater Maintenance Policy Implementation. The Stormwater Maintenance Division of WSD defines maintenance activities as cleaning, repair, and replacement of structures, including stormwater inlets, ditches, streams, channels, fences for channels, and detention basins. Scheduled inspection of inlets are on a three-year frequency. Priority inlets are cleaned more frequently. Inlets are primarily cleaned by the use of vacuum trucks to remove debris that could otherwise find its way to streams.

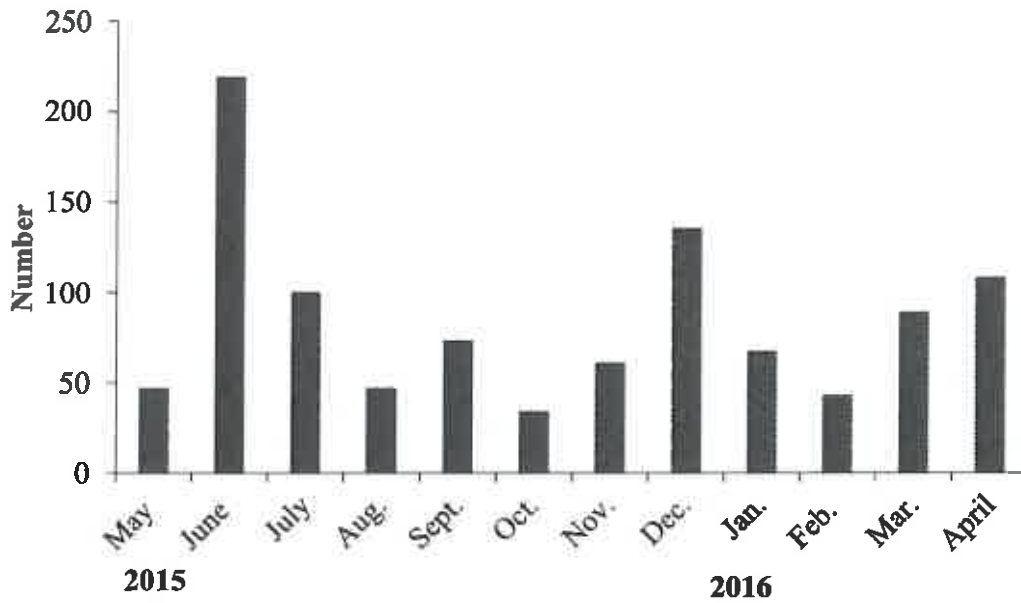
Stormwater Maintenance Group Accomplishments. The group inspected and cleaned, as needed, 17,210 storm inlets, and completed 356 repair work orders (Figure 2). This work is seasonally dependent. Additionally, the group strengthened its staffing resources and expertise to meet the maintenance demand related to the use of green infrastructure as an alternative to conventional stormwater concrete infrastructure.

Figure 2. Monthly record of storm sewer structure maintenance for FY 2015/16



Catch basin hotline. The City’s 3-1-1 Action Center serves as a central point of contact for City services, including catch basin or other stormwater concerns. During the reporting period, the City received 3,397 requests for service or maintenance of catch basins and other stormwater inlets (Figure 3).

Figure 3. Record of requests for services on catch basins/inlets through the City's 3-1-1- Action Center.



1.3 Assess Impact of Flood Risk Management Projects on Water Quality Conditions

A. Permit Ref. III.A.-3b (Status Ongoing)

Evaluate existing flood risk management projects for water quality retrofitting



Turkey Creek Flood Mitigation Project.

- Phase 3: Restored Channel

The final acceptance walk-through for Phase 3 restored channel work was performed in April 2016 and resulted in turnover to the Unified Government of Wyandotte County and Kansas City, Kansas for maintenance. The completed work should provide reduced sediment load and filtered runoff into the system after a stabilization period. The completed restored channel and 4.4 bridge relocation completed last reporting period should reduce energy scour in the upper portions of the channel and thereby reduce sediment and pollutant load downstream.

- Phase 1: Missouri Interceptor

A preconstruction meeting for the Phase 1 interceptor work was held in April 2016. A partnering meeting with the U. S. Army Corps of Engineers, the Unified Government of Wyandotte County and Kansas City, Kansas, and construction contractors was held in June 2016. The two-year project is scheduled to be completed by July 2018. The work of this phase will lower the channel bed at the farthest downstream end of the channel improvements and will construct the interceptor slot at this new low point for future construction work to extend the interceptor to the new point of collection. By lowering the channel, the area will benefit from all of the improvements made upstream that have been blocked by this downstream high spot. The lowered gradient will reduce backloading and high energy scour.

Blue River Channel Improvement. This project was authorized by Congress in 1970. Construction began in 1983. Construction was completed September 2015 with a vegetation warranty period ending September 2016. Constructions of the following were completed during this reporting period.

- Byram's Ford Restoration: As part of the environmental impacts mitigation plan for the Blue River Channel Improvement Project, the historical Byram's Ford area at the southern boundary of the project was restored to a *Civil War Era* condition. The contractor is to achieve these conditions by establishing good growth in some of the newly vegetated areas within a three-year warranty period. The City will continue to monitor the contractor's progress during the warranty period for acceptable growth. The warranty period will be terminated in September 2016.



- Blue River Final Access and Channel Transition: The environmental mitigation contract was awarded July 2014. The work that has been accomplished to date included maintenance access trails and maintenance access ramps that will assist in water quality benefits within the Blue River Corridor. The work was completed September 2015.
- Blue River Celebration: In honor of the completion of the project, a sequence of events took place in the month of April 2016. These events were designed to raise the public awareness of the Blue River as a natural resource to be conserved, protected, and managed. For more details, see [Section 2. Public Education and Awareness Program.](#)

Dodson Flood Damage Reduction Project. This project was authorized by Congress in the 1996 Water Resources and Development Act (WRDA). The Project Cooperation Agreement for construction of the project was signed in 2001. While work is continuing, there were no water quality retrofit activities to report in this reporting period.

Swope Park Industrial Park Levee/Floodwall. The plan for this project has been developed by the U.S. Army Corps of Engineers and was authorized in the 2007 WRDA. Construction began in 2011. Notice to proceed was issued for real estate acquisition to support the next construction package consisting of critical bank stabilization and initiating construction of the levee and east bridge approach. Bid documents are being prepared for a July or August 2016 release. When completed, the bank stabilization will protect the streambank and convey energy downstream. This will greatly reduce high energy scour and debris (trash and trees) transport further downstream.

The Kansas City's' (Seven) Levees. Phase 2 of the feasibility study began in 2007 for the Kaw Valley drainage district units of Armourdale, Kansas and the Central Industrial District in Kansas and Missouri. The feasibility study for Phase 2 was completed in 2014. The East Bottoms Levee Unit relief well construction was completed in this reporting period. The relief wells control underseepage of the levees during high water events. The relief wells mitigate the risk of levee failure due to underseepage. A levee failure would cause sediment and debris transport affecting water quality.

B. Permit Ref. III.A.3b (Status: Ongoing)
Evaluate new flood control projects

Brush Creek Improvements. A multi-purpose watershed approach is being used to consider opportunities for further flood damage reduction, environmental ecosystem restoration, water quality improvement and compatible recreation along the entire Bi-State Brush Creek Watershed. The Bi-State Brush Creek Feasibility Study is being prepared by the City and Johnson County, Kansas in conjunction with the Corps of Engineers and with facilitation assistance from MARC.

Through the Brush Creek Coordinating Committee and in conjunction with the Bi-State Brush Creek Feasibility Study, four action teams have been formed:

1. Environmental (E-Team)

Creating an environmental model of the entire watershed to evaluate the effectiveness of solutions to justify federal funding and optimize water quality benefits

2. Project Team

Formulating solutions for the State Line reach, the Bruce R. Watkins Drive reach, and, in Johnson County, Kansas BMP education

3. Watershed Management Plan Team

Facilitated by the EPA through its Urban Waters Initiative designation given to Kansas City, Missouri and 17 other communities – Drafting a Watershed Management Plan

4. Communications Team

Managing and disseminating information on the Brush Creek watershed and communicating ongoing projects and activities in the watershed. Also maintains the website www.brushcreekwatershed.com.

During this reporting period, the Bi-State Reach plan has been optimized and a Section 1135 Feasibility Report is planned to be completed in 2017 so as to transition the project into the Corps' Continuing Authorities Program. The Bi-State Reach plan is an ecosystem restoration project that includes flood risk reduction measures.

In addition, the City has been engaged in the following initiatives that will influence water quality efforts to be included in current and future flood control projects.

- Town Fork Creek Restoration. Project staff worked with the Army Corps of Engineers to complete a study that examined strategies to reduce and in some cases eliminate combined sewer overflows; the study was completed in 2016. Additional study scoping is currently underway to better promote water quality BMPs, and to further incorporate habitat restoration throughout the watershed.
- Blue River Maintenance. Project staff worked with Blue River Rescue Organization, General Services, and Stormwater Maintenance crews throughout the year to remove illegal dumping and invasive plants from within the Blue River Corridor.

Line Creek Study: An ongoing study with the Army Corps of Engineers continued to look at flood risk reduction measures and water quality improvements maximizing green infrastructure approaches.

1.4 Control Pollutants in Runoff from Municipal Waste Management Facilities

A. Permit Ref. III.A.4 (Status Ongoing)

Conduct periodic inspections for the closed landfills

The Office of Environmental Quality (OEQ) performs periodic inspections of the 87th Street site. During the reporting period, an inspection was performed on January 29, 2016. Visual observations during the inspection include evaluations for: (1) cap integrity and vegetative cover; (2) water ponding on the cap surface of the landfill; (3) fill material exposure; and (4) evaluate continued active seepage present at this landfill. The inspection results are documented and further investigations will be undertaken, if warranted.

B. Permit Ref. III.A.4 (Status Ongoing)

Site Construction Activities

WSD is performing upgrades on the wastewater pumping station located at the 87th Street site. The upgrade entails excavations into the fill area. The Solid Waste Management Program of the MDNR approved a work plan submitted by SCS Engineers on behalf of WSD, prior to the beginning of the excavation activities. OEQ will continue to perform periodic monitoring of the construction activities within the fill area, while the open excavation is present.

C. Permit Ref. III.A.4 (Status Ongoing)

Establish and Implement a Landfill Maintenance Program

All maintenance activities are geared toward maintaining the integrity of the 87th Street site cap and minimizing the infiltration of water into the interred waste. Maintenance program activities may include surface waste removal and cap maintenance.

Surface waste removal

- Annual removal of any waste materials that have been either illegally dumped onto the cap surface or were deposited by stormwater flowing from the adjacent stream onto the landfill property.
- These removed wastes will be documented and disposed of in an active, permitted landfill.

Cap maintenance

- Annual maintenance activities to the cap surface will consist of the repair of any areas of erosion, cap damage, subsidence, or depressions that directly affect the infiltration of water into the interred waste areas or runoff into adjacent stream.
- All areas determined to be in need of repair will be recorded and documented through GPS coordinates, and will be visited the following year during the annual OEQ inspection to determine if the repairs were successful.
- Only clean fill material will be used for these maintenance activities.

1.5 Monitor and Control Pollutants from Industrial and High-Risk Runoff

A. Permit Ref. III.A.5a (Status Ongoing)

Update The Inventory Of Potentially Significant Dischargers

At the end of this reporting period, the inventory of high-risk runoff facilities lists 194 facilities: 71 municipal-owned or operated facilities and 123 non-municipal facilities. Appendix 1, extracted from the inventory, provides a list of these facilities with their names, site addresses, and the watersheds where they are located.

B. Permit Ref III.A.5a-c

Implement The Inspection Program

See Table 3 (below) for details on the progress of the inspections.

Table 3. A summary of industrial and high-risk runoff facility programs

Permit Ref.	Task	Subtask	Status	Output	# of Activities (Listed by categories)
5a.	Update the inventory of potentially significant dischargers	Update the inventory	Completed	Appendix 1	<u>Inspections</u> 36 City-owned or operated facilities 40 Non-city-owned or operated facilities
5b.	Update and evaluate the priority list of high-risk runoff dischargers	(1) Update the list (2) Conduct field verification or inspection	Completed	Attachment 2	<u>General inspection covering stormwater</u> 329 City owned/operated sites ^a
	Maintain a GIS database of high-risk runoff dischargers	Update the GIS database	Ongoing	GIS layers/map	<u>Monitoring</u> 1 Event Sites ^b 2 Facilities implementing self-assessment 16 Facilities no-exposure certified
5c.	Continue the inspection program	(1) Inspect municipal facilities (2) Inspect private facilities	Ongoing	Inspection records and reports	
5d.	Implement the monitoring program	(1) Conduct the monitoring (2) Develop a self-assessment program for municipal facilities (3) Implement a self-assessment program for municipal facilities	Ongoing	Monitoring results	60
			Completed and reported previously		
			Ongoing	Stormwater no-exposure certificates Stormwater pollution prevention plans	20
	Conduct outreach	Target municipal facilities	Ongoing	Training sessions+	<u>Education</u> City employees took the Stormwater Self-assessment workshop and/or watched the educational DVD on stormwater pollution prevention

^a Some sites do not have outdoor operation

^b Multiple sampling efforts were made during the reporting period and only successful efforts in providing sufficient samples were included

C. Permit Ref. III.A.5d (Status Ongoing)
Evaluate The Priority List Of High-Risk Runoff Facilities

See appendix 2 for an updated priority list of high-risk runoff facilities.

D. Permit Ref. IIIA.5d (Status Ongoing)
Implement The Monitoring Plan For High-Risk Runoff Facilities

The Stormwater Services of the WSD has made the following progress:

- Continues to collect monitoring data from the facilities that hold state permits and are on the priority list (Appendix 2)

- Continues to conduct monitoring at the selected industrial area (see Table 4 for results)
- Implements the Stormwater Self-assessment Program. There are 16 facilities implementing the program.

E. Permit Ref. III.A.5e (Status Ongoing)
Alternative Certification

The City developed a “no exposure” certification as an alternative to monitoring for certain qualified facilities in 2007. During the reporting period, 60 facilities have the certification.

F. Permit Ref NA (Status Ongoing)
Geographical Information System (Gis) Mapping

The City continues to maintain its GIS database for the facilities in the Inventory and Priority List.

G. Permit Ref. NA (Status Ongoing)
Employee education and outreach

The City provided its employees with training on stormwater pollution prevention practices. See Table 3 for details.

Table 4. Data summary of stormwater monitoring at the selected industrial area

Parameter	Units	Detection (total: 2)	Minimum	Maximum	Range in stormwater runoff*	Number of exceedence
alkalinity	mg/L	2	41	53	NA	NA
biochemical oxygen demand	mg/L	2	4	8	3-21	0
chemical oxygen demand	mg/L	2	52	54	7-803	0
hardness	mg/L	2	74	76	27-580	0
ammonia	mg/L	0	ND	ND	ND-1.4	NA
phenols	mg/L	0	ND	ND	ND-0.08	NA
total suspended solids	mg/L	2	9	23	8-879	0
total dissolved solids	mg/L	2	32	36	22-4,940	0
total solids	mg/L	2	90	100	NA	NA
Ag-Dissolved	mg/L	0	ND	ND	ND-0.0053	NA
Al-Dissolved	mg/L	2	0.058	0.140	NA	NA
Cd-Dissolved	mg/L	0	ND	ND	ND-0.0017	NA
Cr-Dissolved	mg/L	2	0.001	0.001	ND-0.020	NA
Cu-Dissolved	mg/L	2	0.004	0.006	ND-0.025	NA
Ni-Dissolved	mg/L	2	0.001	0.001	ND-0.019	NA
Pb-Dissolved	mg/L	0	ND	ND	ND-0.064	NA
Zn-Dissolved	mg/L	2	0.014	0.025	ND-0.272	NA
Ag	mg/L	0	ND	ND	NA	NA
Al	mg/L	2	0.619	1.100	NA	NA
As	mg/L	2	0.002	0.003	NA	NA
Cd	mg/L	0	ND	ND	ND-0.002	NA
Cr	mg/L	2	0.002	0.003	ND-0.017	NA
Cu	mg/L	2	0.005	0.010	ND-0.027	NA
Fe	mg/L	2	0.588	0.828	NA	NA
Hg	mg/L	0	ND	ND	ND-0.0002	NA
Mg	mg/L	2	1.51	2.61	NA	NA
Mn	mg/L	2	0.021	0.028	NA	NA
Mo	mg/L	2	0.001	0.007	NA	NA
Ni	mg/L	2	0.002	0.002	ND-0.017	NA
Pb	mg/L	1	0.002	0.002	ND-0.061	NA
Zn	mg/L	2	0.024	0.064	0.01-0.448	0

* The ranges listed here were extracted from the ranges found for the stormwater runoff samples collected from representative residential, industrial, and commercial areas in the City from year 2005 to year 2008 per Part VI. Monitoring and Reporting Requirements in the MS4 permit.

1.6 Reduce the Discharge of Pesticides, Herbicides, and Fertilizers

A. Permit Ref. III.A.6.a (Status Ongoing)

Continue the public education program to promote the proper use, handling, storage, and disposal of pesticides, herbicides, and fertilizers (PHFs)

Activities that occurred during this reporting period included the following:

Participating in the regional Water Quality Public Education Program.

The City is a major sponsor for MARC's Water Quality public education program. In fall 2015, the program campaigns on the message native plants by distributing outdoor signage and using multiple communication channels.

Nature First program. The City's partners in restoration and management of natural areas include Bridging the Gap Kansas City, Kansas City Wildlands (KCWL), MDNR, GreenWorks, Blue River Watershed Association, and MDNR, as well as numerous neighborhood associations, park support groups, and private corporations. This year's achievements included rotational burning of prairie and glade habitats in Swope Park and Jerry Smith Park. KCWL's continued efforts to remove invasive honeysuckle in various locations and maintained a tool-lending shed for honeysuckle events led by community leaders on non-KCWL/Parks properties.

B. Permit Ref.: III.A.6.b

Implement BMPs to reduce the contribution of pollutants associated with the application, storage, and disposal of PHFs on City-owned property and right-of-ways

Activities included the following.

City Environmental Management System Program And Employee Training. The City continues to implement the program and provide its employees with relevant training, as presented in the previous reports.

City Facility Environmental Inspections. The City conducted 329 environmental inspections for the sites (list managed by OEQ) that are either owned or operated by the City during this reporting period.

Conditionally Exempt Small Quantity Generator Waste Disposal Program. The program is used to dispose unused or off-specification PHFs from the City's facilities. Heritage Environmental Services, which is contracted with the City, visits facilities on a monthly basis to remove these materials, as needed. The program is part of the City's overall Household Hazardous Waste (HHW) program and has been in place for nearly 15 years. This program has been part of the City's BMP effort regarding PHFs management for the City's properties.

BMPs on the City Golf Courses. The City continues to use environmental BMPs and procedures for its five golf courses: Hodge Park, Shoal Creek, Swope Memorial, Minor Park, and Heart of America. The contracted management teams from Kemper Sports and Orion Management Solutions continue to reduce pesticide and fertilizer usage at the above courses by:

- Maintaining a native buffer near water bodies and sensitive areas wherever possible

- Allowing the outer rough areas that were once mowed and irrigated at each course to return to their native habitats (approximately 15 to 20 acres)

In addition, Shoal Creek Golf Course is designated as a “Certified Audubon Sanctuary” through the International Audubon Cooperative Sanctuary Program for golf courses. This ecologically-based program promotes both responsible land management and conservation of natural resources.

BMPs at the City’s Parks. P&R crews continue to maintain, improve, and protect thousands of acres of land that provide wildlife habitat and contribute to reducing stormwater runoff and water pollution throughout the City. These properties include over 6,500 acres protected as woodlands throughout the park system; over 150 acres in the reduced mowing program; over 290 acres of natural areas on 36 sites, consisting of restored and remnant prairies, glades, butterfly gardens, bioswales, and rain gardens. In all these areas, taller grasses, deep-rooted native plants and increased tree cover act to provide wildlife habitat, slow down and filter water runoff, and increase infiltration into the soils. Additionally, wetlands are protected near the Lake of the Woods in Swope Park. A new rain garden was completed at 48th and Topping, and in cooperation with community partners, native gardens were planned for installation in Loose Park.

BMPs on the City’s Lakes. P&R continued to inspect and treat, as necessary, the City lakes following the same procedure as described previously.

BMPs for Mosquito Control On Public Properties. The Health Department (HD) purchases larvicide (a 90-day briquette) as chemical control each year for distribution on City-owned property. The Health Department does some larviciding on City-owned properties, but this occurs only on a complaint basis.

BMPs on Right-of-Ways. P&R maintains > 40miles of park roads, hundreds of parking lots, 2,008-acres and 135 miles of boulevards, parkways, and streets. Except in the effort to save the healthiest Ash trees from the Emerald Ash Borer, the department does not use pesticides in these rights-of-ways. Herbicides and fertilizers are used sparingly and only as needed on specific areas which require a higher level of maintenance.

1.7 Reduce Illicit Discharges, Spills, and Improper Disposal

A. Permit Ref. III.A.7a (Status Completed)

Develop a city ordinance to prohibit illicit discharges to MS4

The City’s ordinance for Stormwater Discharge Control Regulation was adopted in 2007. No substantive revisions were made to the ordinance during this reporting period.

B. Permit Ref III.A.7a & d (Status Completed))

Implement a procedure for illicit discharge investigation and enforcement

The procedure for illicit discharge investigation and enforcement was developed in 2006. During the reporting period, 13 incidents of illicit discharge or illegal connection were reported and all were resolved.

C. Permit Ref. III.A.7b & c (Status Ongoing)

Identify priority areas and continue field screening program

During this reporting period, the City screened 199 outfalls, primarily in the watersheds north of the Missouri River.

D. Permit Ref. III.A.7d & f (Status Ongoing)
Prevent illicit discharge and improper disposal

Table 5 (below) provides a summary of several waste management programs that encourage proper disposal and prevent and address illegal dumping. In addition to this progress, the following program is of particular note.

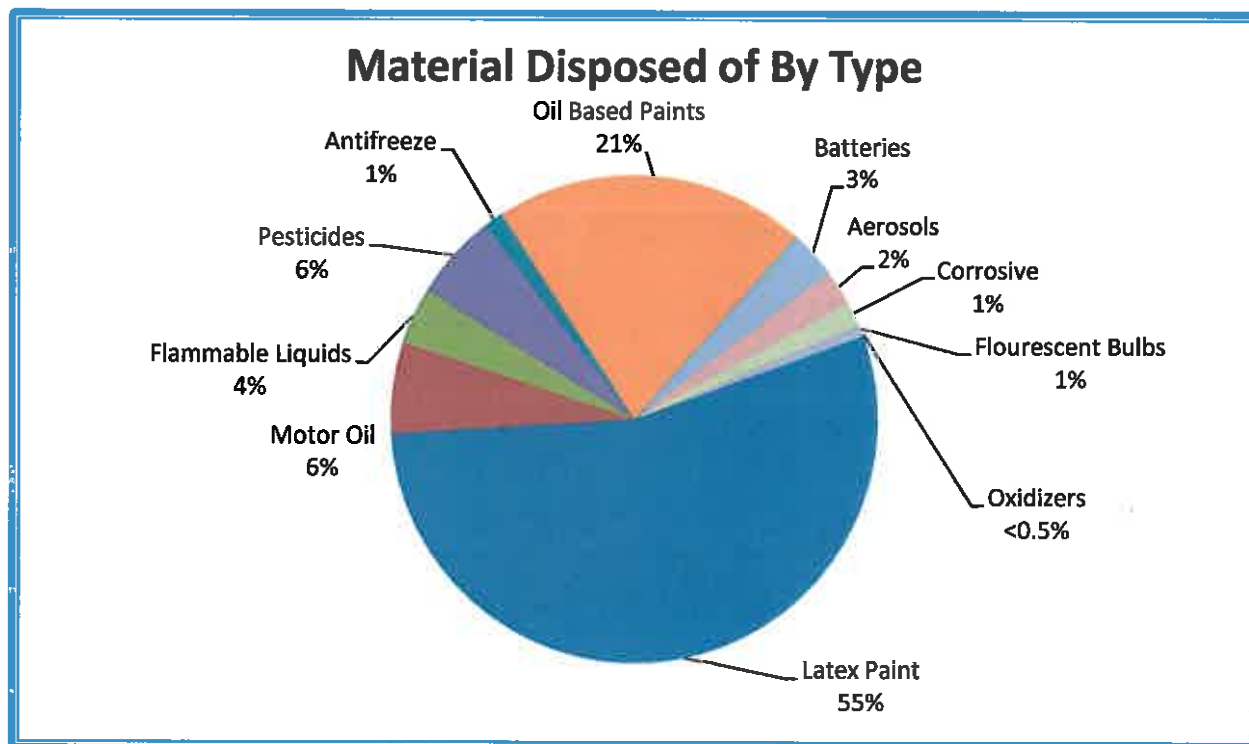
Table 5. Achievements through comprehensive waste management programs

Quantity		Total
KC Recycles (FY 2015/16)		
741 tons	Community recycling drop-off centers	
19,467 tons	Curbside recycling	20,495 tons
287 tons	Organics collection	
Bulky Items Collection (FY 2015/16)		
4,983 tons	bulky items	4,983 tons
Leaves and Brush Collection (FY 2015/16)		
6,104 tons	Drop-off site	
4,643 tons	Curbside	10,747 tons
Illegal Dumping Cleanup (FY 2015/16)		
3,244 tons	Material collected	3,244 tons
Neighborhood Cleanup Assistance (FY 2015/16)		
176	Participating home associations	
712 tons	Cleanup waste	
262 tons	Leaf and brush collected	974 tons
10,661	Tires collected or received at drop-off centers	
403	Dumpsters placed	
4,260	Blue Bags delivered*	
Household Hazardous Waste (January thru December 2015)		
999,801 lbs.	HHW Facility	8,886 vehicles delivering
351,076 lbs.	Mobile Outreach	3,012 vehicles delivering
105,756 lbs.	Swap Shop	\$26,018 saved
		1,350,877 lbs. ~675 tons
Blue River Rescue (April 2016)		
65 tons	Trash	
864	Volunteers	
2.5 acres	Honeysuckle removed	
500	Trees planted	
1,106	Tires collected	

* Blue bags are distributed by the City to participating homes associations

The Household Hazardous Waste (HHW) Management Program managed by WSD, consists of three subprograms: drop-off, Swap Shop, and mobile collection events. The HHW program services 64 communities from the 5 counties of the regional solid waste management district. During the reporting period, the HHW program collected 1,350,877 pounds of materials from both its collection sites and 12 mobile events (See Table 5, Figure 4, and Figure 5, for program achievements).

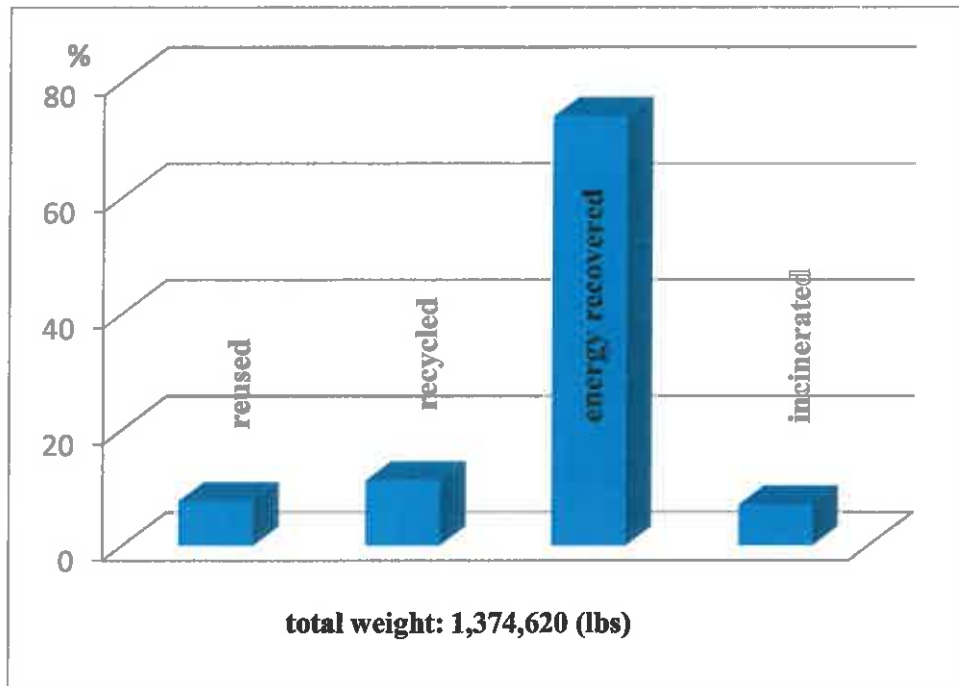
Figure 4. Material by type disposed of by the HHW facility in calendar year 2015
(Provided by R. Fort, KCMO HHW Program Manager)



Notes.

Total weight of the materials disposed of (not collected) is 1,249,929 lbs.
Total weight counts only the materials that were disposed of and shipped out.

Figure 5. Distribution of material managed by HHW facility in 2015 (calendar year)



E. Permit Ref. III.A.7e (Status Ongoing)
Spill Prevention, Containment, and Response

The Fire Department responded to a total of 363 incidents called in for fluid cleanup (342) or hazardous materials (21) during the reporting period. Note that hazardous material-related incidents referred here may not necessarily be about liquid spills (e.g., chemical odors emitted from structures). Also note the total number does not include incidents that may have fluids spilled but were classified as a higher level of calls (emergency calls for injuries in vehicular accidents, etc.)

F. Permit Ref. III.A.7 (Status Ongoing)
The Sanitary Sewer Maintenance Program

Because some of the projects for the engineering division span different fiscal years, project managers can only estimate their numbers, as reflected in Table 6.

Table 6. Sanitary sewers maintenance performance for FY 15/16

Engineering Division					
Sewers, televised	Sewers, cleaned	Manholes rehabilitated/installed	Sewer line rehabilitated/replaced		
152 miles	83	210	14 miles		
Wastewater Maintenance Division					
Sewers, televised	Sewers, cleaned	Public sewers repaired	Private sewers repaired	Manholes repaired	Stoppages opened
177 miles	404 miles	197	407	208	180

G. Permit Ref. NA
GIS Mapping Effort

The WSD’s GIS mapping group and Stormwater Utility Division continue to maintain its GIS databases to assist in the program tracking repair/replacement and maintenance of storm sewer system assets, to support stormwater billing, and to support the illicit discharge screening process (Table 7). The groups update the database with the information supplied by field inspection crews, engineering as-built drawings from construction projects, and the latest orthophoto map product.

Table 7. Stormwater features in the GIS database

	Stormwater inlets	Paved ditch	Detention basin	Swale
City owned	45,378	269	304	64
Privately owned (with City easement)	9,314	26	14	1
Ownership to be determined	78	1	0	0
Abandoned	8	0	0	0
MODOT –State owned	123	1	0	0
TOTALS	54,900	297	318	65

Data as of 5/3/2016

1.8 Reduce Pollutants in Construction Site Runoff

A. Permit Ref. III.A.8a (Status Completed)
Erosion And Sediment Control Ordinance Review and Update

No updates have been made since the last reporting period.

B. Permit Ref. III.A.8b (Status Ongoing)
Maintaining An Inventory of Active Construction Sites

Private development sites (≥ 1 acre). The City continued to use the KIVA system to track active private development construction sites. During this report period, there were 75 new site disturbance permits issued, 97 closed, and 121 active site disturbance permits.

City construction projects (≥ 1 acre). The WSD tracks projects (≥ 1 acre) that are constructed by City departments under the City’s general operating permit. There were 36 projects recorded as less than 90 percent complete during the reporting period.

C. Permit Ref. III.A.8c (Status Ongoing)
Inspection of Construction Sites

The City’s inspections for sediment and erosion control-related issues are handled as follows.

Private construction projects. The LDD in the City Planning and Development Department is responsible for inspection of site disturbance activities (≥ 1 acre). During this report period, the LDD inspection staff documented a full year of biweekly compliance monitoring and documentation was incorporated into the KIVA permit tracking system. Inspection comments in KIVA are available to the public through the KIVANET web site. LDD conducted 1,529 inspections of site disturbance activities on private development projects during this reporting period.

For privately-funded construction projects (< 1 acre), the Division of Inspections in the City Planning & Development Department conducted 6,174 erosion control inspections.

City-funded construction projects. These projects are regulated under the State's General Operating permit MO-R100006. WSD conducts monthly oversight inspections to ensure compliance with the sediment and erosion control requirements. The inspection review includes verification of an active, up-to-date SWPPP for each site, an updated site plan, weekly inspection reports including items noted for correction and the noted correction, and the inspection log. A total of 275 inspections were conducted.

D. Permit Ref. III.A.8d (Status Ongoing)

Providing Inspector Training and Outreach to the Construction Industry

The City provided both in-house and contracted trainings on sediment and erosion control to its construction field inspectors, project managers, environmental staff, and pertinent management personnel. Table 8 summarizes the training provided to the City employees and outside groups.

Table 8. A summary of education and outreach on erosion and sediment control

Employee Education				
Training Providers	Content	2015 Dates	Avg. # Attendees per session	Work background of attendees
City Planning and Development	KCMO Supplements to APWA Standards 2100, 2600, 5100, 5600, BMP Manual, erosion sediment control drawings, and the stream buffer ordinance	Weekly training throughout the year	8	Plan reviewers and LDD inspectors
	General requirements for inspection procedure	Fall 2015 Spring 2016	6	Field inspectors
Stormwater One (online)	Qualified Preparer of SWPP Recertification	2/18/2016	2	Environmental officers
Division of Investigations, City Planning and Development	KCMO Supplements to APWA Standards 5100, Section 10.03.7.3 - Sediment (Silt) Fence of Erosion and Sediment Control Specifications by MDNR	Monthly (7/2015 thru 1/2016) 6 Total	1	Permit compliance inspector
OEQ / WSD	Refresher course for sediment and erosion control policies and practices	June 11, 2015	15	Field inspectors, field crew, & project managers from applicable departments

E. Permit Ref III.A.8e (Status Ongoing)
Enforcement of the City's Construction Site Runoff Program

The City inspection staff followed established protocols for escalated enforcement actions or steps. For private construction projects (≥ 1 acre) managed by the LDD, inspection results were placed in KIVA. Certified letters were sent to responsible parties stating deficiencies, and performance requirements for compliance and included days allowed for resolution. Citations were issued when compliance issues were not resolved in a timely manner.

During the reporting period, the LDD inspection staff notified contractors of more than 550 deficiencies, indicating modifications necessary for compliance, providing orders to complete the work, or defaulting on the developer's bonds when necessary.

For projects < 1 acre, the Division of Investigations conducted 127 investigations, sent 56 notices of violation, wrote 9 tickets, and issued 2 stop-work orders.

SECTION 2. STORMWATER PUBLIC EDUCATION AND AWARENESS PROGRAM

Stormwater public education is a key element of many of the programs conducted by the City and is required under the MS4 permit. To facilitate its implementation and to underscore its significance, the City has extracted the public education requirements from individual programs throughout the permit, and has consolidated them into this Stormwater Public Education and Awareness program. However, each stormwater management program required by the permit still addresses its own technical training (such as construction inspector training), but is able to use this program as a resource for its outreach and educational requirements and needs.

Internal Education

WSD hosted the following seminars or training sessions for its employees.

- Stream Bank Assessment and Stabilization (10/16/2015)
- Wet Weather Treatment Technologies (12/11/2015)

Public Education and Outreach

See the Table below.

Table 9. A summary of public education and outreach efforts

Programs/Partnerships	Achievement during the report period
Blue River Celebration Month	<ul style="list-style-type: none"> • April 2016 marked the culmination of the Blue River Channel Project, a nearly 50-year and over \$300-million improvement project to protect homes and businesses from flooding along the lower Blue River. • The U.S. Army Corps of Engineers and the City worked in partnership with the support from local communities to accomplish the project and the final celebration. • The activities for celebration included a series of events: History Day, Education Day, Business Day, and a final celebration day. Education day was held at the Kansas City Zoo in partnership with 10 nonprofit organizations, providing 10 educational booths about water quality, stewardship, and recreation on the Blue River. Over 1000 visitors were educated about stormwater runoff and its effects on water quality and aquatic life.
KC Green	<ul style="list-style-type: none"> • The City's KC Green Team and WSD partnered to host a booth on Sustainability at the Second annual Boulevardia Festival in June 2015. Over 100 attendees visited the booth to play Stormwater Plinko and learn about water quality in Kansas City. • The KC Green Team hosted the "Hard to Recycle Item" event on November 14, 2015. The event allowed residents to get rid of items (such as, batteries, glass, electronics, etc.) that cannot be recycled curbside through the City's regular services to help prevent illegal dumping. Over 600 residents participated.
Water Education for Kansas City (WE KC Program)	<ul style="list-style-type: none"> • The program facilitated eight litter pickups and four watershed education events, reaching a total of 875 students.

Programs/Partnerships	Achievement during the report period
Stormwater: From KC to the Sea	<ul style="list-style-type: none"> • This stormwater curriculum was taught to 135 different classes, reaching a total of 3,114 students in three different school districts. • The curriculum won multiple awards.
Stormwater Plinko	<ul style="list-style-type: none"> • Stormwater Plinko, an educational tool, was played at 7 outreach events, reaching over 1,100 people.
Stormwater Manhole Competition	<ul style="list-style-type: none"> • The winning design featured the message “THINK! Protect Your Water, Protect Our Home” and various aquatic creatures. • Seventy-five covers of the winning design were installed at strategic locations to convey the educational message to the public.
The Regional Water Quality Public Education Program (Mid America Regional Council)	<ul style="list-style-type: none"> • The WSD continues to be a leading stakeholder for this program. • The primary media campaigns in 2015 focused on native plants and preventing litter. The native plant campaign received 4,181,914 total gross impressions through online ads and social media, and the preventing litter campaign received 957,572 total gross impressions through billboards, print media, and digital media. • The program hosted a 1.5 day training on the Installation and Maintenance of Stormwater Treatment BMPs in November 2015, with 40 participants of landscapers, subcontractors and general contractors. • Program facilitated 6 stormwater-/watershed-related webinars in 2015. • The program continued to distribute brochures educating the public about native plants, pet waste disposal, lawn care, and stormwater. A total of 7,855 brochures and 1,132 giveaways were distributed. • For more details, go to http://www.marc.org/Environment/Water-Resources/pdfs/WQEC Annual Rpts/Water Quality Ed Program AnnualReport 2015-web.aspx
Project Blue River Rescue	<ul style="list-style-type: none"> • Several City departments continued to provide facilities, equipment, expertise, staff, and funding to facilitate this annual regional event. • The 2016 event drew 864 volunteers, with 500 trees planted, 2.5 acre of honeysuckle removed, 65 tons of trash removed, and 1106 tires collected.
Big Muddy Cleanup	<ul style="list-style-type: none"> • Water Services provided funding and staff to the Healthy Rivers Partnership to assist with the Big Muddy Cleanup at La Benite Park in October 2, 2015. • The event drew 186 volunteers, with four tons of trash, 23 tires, and one ton of scrap metal collected along 11 miles bank of the Missouri River.
Blue River Watershed Association	<ul style="list-style-type: none"> • The WSD continued to support the association’s TRUE (Teaching Rivers in an Urban Environment) Blue Program by providing staff to mentor four groups of students as they collected water quality data in local streams. • The WSD assisted with the association’s STREAM (Students Teaching River Education around the Metro) program by providing staff to be student mentors and tour guides throughout the project. The program is funded by the EPA Urban Waters program.

Programs/Partnerships	Achievement during the report period
Stone Lion Puppet Theatre	<ul style="list-style-type: none"> • WSD provided funding for the Theatre’s puppets for the Planet Festivals. • The Theatre produced three events, which were held on September 19, 2015, December 6, 2015, and April 23, 2016. Each event had a performance stage aspect, hands-on art making/classes, community exhibitors, refreshments and roving arts entertainment all with a storm water education theme. Bug Bingo, Fishing for Litter, fish habitat puppets, roving water jugglers and talking fish took part alongside community environmental education partners. • A total of 186 community volunteers helped to put on these stormwater themed puppet shows reaching over an audience of 6,700.
Missouri Watershed Festival	<ul style="list-style-type: none"> • WSD partnered with the Little Blue River Watershed Coalition to assist with educational booths at the Festival at Lakeside Nature Center on Oct. 2, 2015. • A total of 376 students participated in the event and were educated about the water cycle, watersheds, stormwater pollution, and aquatic invertebrates as indicators of water quality.
Teacher Resource Day	<ul style="list-style-type: none"> • WSD participated in this event hosted by Science Pioneers on February 6, 2016. The event allows K-12 teachers to learn about hands-on learning opportunities for their students. • WSD gave out information on the KC to the Sea curriculum and the WE KC water quality education program.

SECTION 3. WATERSHED MONITORING PROGRAM

A. *Permit Ref. VI.A.1 (Status Completed)*

Implement a representative stormwater discharge monitoring plan

The WSD's Laboratory continued to conduct the monitoring, which included field sampling, field measurements of basic water quality parameters, and laboratory testing for physicochemical and microbiological parameters. All field sampling/measurements, sample handling, laboratory analysis, and data validation, as well as quality assurance and quality control, follow SOPs for the MS4 stormwater discharge monitoring program developed by the department's laboratory. Grab samples were collected using a stainless steel bucket or by filling the containers directly from the outfall. Composite samples were collected using ISCO Avalanche Portable Refrigerated Samplers for the first three hours of the discharge (12 aliquots taken every 15 minutes).

The WSD maintains records of the sampling events as follows.

Description of Sampling

1. Location and collection time
2. Sample collection
3. Field test results
4. Staff who collected samples (chain-of-custody forms)

Storm Event Data

1. Date and duration of the storm events sampled
2. Rainfall data
3. Duration between storm event sampled and the end of the previous measurable storm event
4. Estimate of the total volume of the discharge sampled

QA/QC review and clarification:

1. A single database containing field-test results and laboratory results.

Sampling events occurred from June 2015 to April 2016. Table 9 (below) includes the number of storm events sampled at each site as well as the ranges of rainfall at these sites. The precipitation for all sampling events ranged from 0.14 inch to more than 2.1 inches (Figure 6, below). Runoff from the sampled storm events at the sampling sites ranged from 7,800 to 464,900 cubic feet and was estimated based on the storm magnitude and the size and land use of the drainage areas.

Grab samples were collected during the first two hours of the discharge. These samples were used for the field testing of temperature, dissolved oxygen and pH, as well as the laboratory analysis of total phenols, oil and grease, fecal coliform, *E.coli*, total coliform, and turbidity. Time-based composite samples were used for the analysis of over 100 physicochemical parameters that include more than 60 semi-volatile organic compounds, 26 organochlorine compounds of pesticides and PCBs (polychlorinated biphenyl), 8 metals (dissolved and/or total), 6 nutrients, four common anions, in addition to eight other conventional water quality parameters (e.g., oxygen-related or solid-related).

Table 9. A summary of sampled storm event characteristics

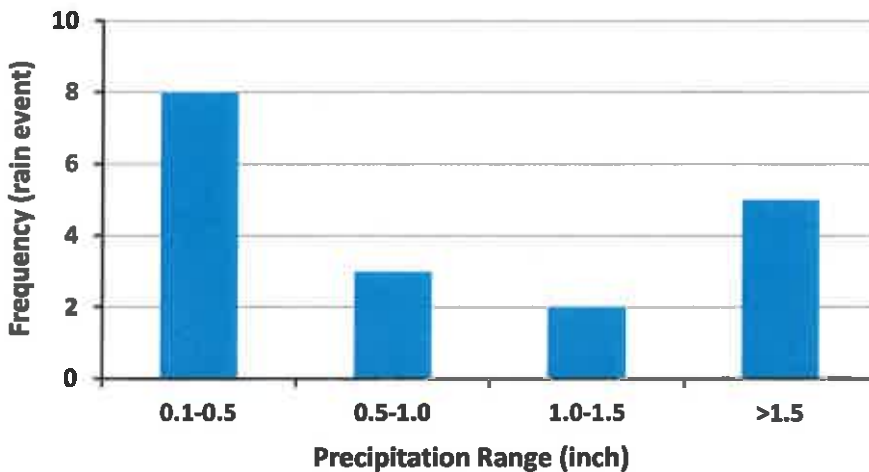
Site ID	Location	Storms Sampled (#)	Rainfall Range (in) ^a	Range of Runoff (est. cubic feet) ^b
#801	SE 50th Terr. & Sterling	3	0.15-1.51	46,200-464,900
#802	SE Wyandotte & 135 th St.	3	0.43-1.56	23,300-84,700
#803	NW 107 Terr. & Pomona	3	0.28-2.07	52,300-386,600
#804	49 th St & N. Highland	2 ^c	0.38-1.28	20,000-67,500
#805	133 rd St. & Inverness	4	0.14-1.78	7,800-99,600
#806	Barry Rd. & I-29	3	0.27-0.55	35,300-71,900

a Rainfall data obtained from rain gauges installed at individual sampling stations

b Runoff volume estimated based on rainfall, drainage area, and runoff coefficient (volume = rainfall x drainage area x runoff coefficient). Runoff coefficients (land-use dependent) are cited from *Civil Engineers Reference Manual*, 9th edition, pg. A-45.

c. Field crew were only able to identify two qualifiable storm events for sample collection at this site during the reporting period.

Figure 6. Precipitation range and distribution of sampled storm events frequency



B. Permit Ref. VIA.1 (Status Completed)
Summary of Storm Event Data

Tables 10 and 11 present a summary of the data characterizing stormwater discharges for each land-use type. The range of event-mean concentration (EMC) is described, as well as average EMC according to the land-use category. For the purpose of this report, the concentration of a constituent in an individual grab or time-based composite sample is considered as an estimate of the EMC of this constituent in the runoff for a particular storm event tested. The land-use average EMC is the average of EMCs of a constituent in the runoff for all storm events sampled for a specific land-use category.

Table 12 presents the estimated loading results for the monitored storm events. The pollutant loading is defined as the mass of a constituent contained in stormwater runoff that is transported to the receiving water during a storm event. For the purpose of this reporting, it is estimated by multiplying the flow volume and the EMC of a parameter per event.

Below is an analysis of the monitoring results.

- Of the four pesticides that were required to be monitored under the permit (*i.e.*, α -BHC, DDT, methoxychlor, and dieldrin), none was detected at any of the six designated sites.
- Of more than 60 semi-volatile organic compounds analyzed, three were detected in one or more samples:
 - 2-methylnaphthalene (#805 commercial)
 - Di(2-ethylhexyl)phthalate at every site of each land use category
 - Phenol (#803 industrial)
- Metals were detected in every sample
 - Chromium, copper and zinc in both dissolved and total recoverable forms
 - Nickel in total recoverable form
- Lead and nickel in dissolved form were also frequently detected across all three land uses.
- There was no detection of mercury, nor cadmium or silver in either the dissolved form or total recoverable form.
- The levels of the following nutrient parameters were higher in residential and industrial areas than those in commercial areas:
 - phosphorus in both total and dissolved forms
 - nitrogen as nitrite and nitrate
 - nitrogen, total Kjeldahl
- No significant difference was identified among different land uses for solid-related parameters or COD and BOD
- The commercial runoff samples, in general, had lower EMCs for *E. coli* and fecal coliform than those residential and industrial runoff samples.
- No significant difference in the runoff samples between the different land uses was observed for the parameters other than those mentioned above.

Table 10. Stormwater discharge summary characterization by land use category (continued on next page)

Constituent	Units	Residential		Commercial		Industrial		Result Count	Detect Count	MDL**
		EMC Range	Avg.*	EMC Range	Avg.*	EMC Range	Avg.*			
Ammonia	mg/L	ND-0.330	0.15	ND-0.548	0.26	ND-0.770	0.31	18	9	0.13
Conductivity (Lab)	µS/cm	91-496	292	28-482	229	109-448	219	18	18	NA
Dissolved oxygen	mg/L	6.6-9.1	7.9	5.9-11.2	8.5	6.4-10.1	8.6	18	18	NA
pH	S.U.	8.0-9.0	8.3	7.6-8.6	8.1	7.4-8.6	8.0	18	18	NA
Total Alkalinity	mg/L	64-140	97	27-75	45	32-61	52	18	18	NA
Total Hardness	mg/L	104-198	146	36-190	90	50-150	84	18	18	NA
Chemical Oxygen Demand	mg/L	52-89	67	24-65	38	9-83	46	18	18	6.25
Biochemical Oxygen Demand (5-day)	mg/L	9-20	13	5-14	9	ND-15	8	18	17	2
Turbidity (Lab)	NTU	22-34	30	6-32	21	33-280	119	18	18	0.011
Total Solids	mg/L	240-430	338	80-730	274	240-600	358	18	18	1
Total Dissolved Solids	mg/L	62-360	236	40-710	225	96-360	179	18	18	1
Total Suspended Solids	mg/L	15-130	55	14-51	28	41-290	124	18	18	1
Volatile Suspended Solids	%	18-47	26	32-59	40	13-30	22	18	18	NA
Nitrate+Nitrite	mg/L	0.408-2.130	1.048	0.134-0.388	0.235	0.242-0.636	0.448	18	18	0.027
Nitrogen, total Kjeldahl	mg/L	1.87-7.03	3.30	1.10-4.06	1.98	ND-7.03	2.68	18	17	0.283
Oil & Grease	mg/L	ND	NA	ND-3.4	2.0	ND-2.5	1.2	18	6	1.4
Phenols	mg/L	ND	NA	ND	NA	ND	NA	18	0	0.002
Phosphorus, total	mg/L	0.23-0.57	0.36	0.05-1.13	0.26	0.12-0.87	0.44	18	18	0.016
Phosphorus, dissolved	mg/L	0.14-0.26	0.20	0.05-0.80	0.19	0.10-0.67	0.25	18	18	0.016
Fecal Coliform	cfu/100 mL	1,553-220,000	59,336	211-14,136	2,881	1,576-23,300	12,432	18	18	NA
E. Coli	MPN/100 mL	4,106-198,630	73,306	279-8,664	2,284	3,578-30,500	11,385	18	18	1
Cadmium, dissolved	mg/L	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	18	0	0.00011
Chromium, dissolved	mg/L	0.002-0.005	0.003	0.001-0.007	0.003	0.001-0.003	0.002	18	18	0.00026
Copper, dissolved	mg/L	0.002-0.005	0.003	0.005-0.010	0.007	0.003-0.005	0.004	18	18	0.00053

City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516
 Eleventh Year Report (May 1, 2015-April 30, 2016)

Constituent	Units	Residential		Commercial		Industrial		Result Count	Detect Count	MDL**
		EMC Range	Avg.*	EMC Range	Avg.*	EMC Range	Avg.*			
Lead, dissolved	mg/L	ND-0.005	0.002	ND-0.005	0.003	ND-0.005	0.003	18	11	0.00214
Nickel, dissolved	mg/L	0.001	0.001	ND-0.001	0.001	0.001-0.002	0.001	18	16	0.0004
Silver, dissolved	mg/L	0.00037	0.0004	0.00037	0.0004	0.00037	0.0004	18	0	0.00074
Zinc, dissolved	mg/L	0.005-0.012	0.008	0.015-0.028	0.022	0.009-0.034	0.023	18	18	0.00016
Cadmium, total	mg/L	ND	0.0001	ND	0.0001	ND	0.001	18	0	0.00011
Chromium, total	mg/L	0.004-0.007	0.005	0.002-0.009	0.005	0.004-0.007	0.005	18	18	0.00026
Copper, total	mg/L	0.004-0.007	0.005	0.007-0.038	0.014	0.005-0.017	0.009	18	18	0.00053
Mercury, total	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	18	0	0.000025
Lead, total	mg/L	0.004-0.008	0.006	ND-0.007	0.004	0.003-0.008	0.005	18	16	0.00214
Nickel, total	mg/L	0.002-0.005	0.003	0.001-0.002	0.001	0.002-0.006	0.004	18	18	0.0004
Silver, total	mg/L	0.00037	0.0004	0.00037	0.0004	0.00037	0.0004	18	0	0.00074
Zinc, total	mg/L	0.021-0.044	0.028	0.034-0.110	0.057	0.063-0.118	0.087	18	18	0.00016
Semi volatile organic compounds and pesticides (detected)										
Phenol	µg/L	ND	0.39	ND	0.39	ND-18	3.3	18	1	0.78
Di(2-ethylhexyl)phthalate	µg/L	ND-13.6	3.7	ND-10.6	5.1	ND-5.5	2.7	18	12	0.84
2-Methylnaphthalene	µg/L	ND	0.65	ND-4.48	1.20	ND	0.65	18	1	1.3

*The average is calculated based on the detected values and half of the detection limits for those under their detection limits.

**MDL: Method Detection Limit.

ND: the concentration of a specific parameter is below its detection limit.

Table 11. A summary of stormwater discharge characterization (selected pesticides & semi-volatile organic compounds)

Constituent	Result Count	Detect Count	MDL*
Pesticides			
a-BHC	18	0	0.47
4,4'-DDE	18	0	0.62
4,4'-DDT	18	0	0.72
Methoxychlor	18	0	0.68
Dieldrin	18	0	0.62
Semi-volatile organics			
1,2,4-Trichlorobenzene	18	0	0.87
1,2-Dichlorobenzene	18	0	0.94
1,2-Diphenylhydrazine	18	0	0.8
1,3-Dichlorobenzene	18	0	0.58
1,4-Dichlorobenzene	18	0	0.58
2,4,5-Trichlorophenol	18	0	1.7
2,4,6-Trichlorophenol	18	0	1.8
2,4-Dichlorophenol	18	0	2.3
2,4-Dimethylphenol	18	0	1.8
2,4-Dinitrophenol	18	0	2.8
2,4-Dinitrotoluene	18	0	1.4
2,6-Dinitrotoluene	18	0	1.2
2-Chloronaphthalene	18	0	0.69
2-Chlorophenol	18	0	2.4
2-Methylnaphthalene	18	1	1.3
2-Methylphenol(o-Cresol)	18	0	1.6
2-Nitroaniline	18	0	2
2-Nitrophenol	18	0	1.9
4-Chloroaniline	18	0	2.5
4-Chlorophenyl phenyl ether	18	0	0.9
4-Methylphenol	18	0	1.3
4-Nitrophenol	18	0	0.96
Acenaphthene	18	0	0.82
Acenaphthylene	18	0	1.1
Anthracene	18	0	0.74
Benzo(a) anthracene	18	0	1.3
Benzidine	18	0	1.6
Benzo(a) pyrene	18	0	1.5
Benzo(b) fluoranthene	18	0	1.9
Benzo(ghi) perylene	18	0	1.2
Benzo(k) fluoranthene	18	0	1.9
Butyl benzyl phthalate	18	0	1.3
Carbazole	18	0	1.8
Chrysene	18	0	1.3
Di(2-ethylhexyl)phthalate	18	12	0.84
Di-n-butyl phthalate	18	0	1.1
Di-n-octyl phthalate	18	0	0.74
Dibenz(a,h)anthracene	18	0	1.7
Diethyl phthalate	18	0	0.99
Dimethyl phthalate	18	0	1.4
Fluorene	18	0	1.1
Fluoranthene	18	0	1.2
Hexachlorobenzene	18	0	0.91
Hexachlorobutadiene	18	0	0.7
Hexachlorocyclopentadiene	18	0	0.33
Hexachloroethane	18	0	0.77
Indeno(1,2,3-cd) pyrene	18	0	1.6
Isophorone	18	0	1.5
N-Nitrosodi-n-propylamine	18	0	1.4
Naphthalene	18	0	1
Nitrobenzene	18	0	1.4
Pentachlorophenol	18	0	3.4
Phenanthrene	18	0	1.2
Phenol	18	1	0.78
Pyrene	18	0	1.2
bis(2-chloroethoxy)methane	18	0	1.3
bis(2-Chloroisopropyl)ether	18	0	1

***MDL: method detection limit**

Table 12. Estimated pollutant loadings per outfall per rain event by land use category (conventional, inorganic, bacterial parameters)

Continues on the next page

Constituent	Units	Residential			Commercial			Industrial		
		Range	Average	Range	Average	Range	Average	Range	Average	
Ammonia	kg	0.01-0.9	0.4	0.03-1.4	0.4	0.04-1.2	0.7			
Total Hardness	kg	102-1,658	539	8-200	131	54-810	262			
Chemical Oxygen Demand	kg	29-1,053	312	6-133	67	16-908	216			
Biochemical Oxygen Demand (5-day)	kg	6-263	71	3-28	13	1-77	25			
Total Alkalinity	kg	65-1,171	376	8-141	69	37-350	147			
Total Solids	kg	243-4,869	1,435	35-730	359	158-4,925	1,350			
Total Dissolved Solids	kg	118-3,290	986	26-710	283	119-1,423	517			
Total Suspended Solids	kg	20-816	242	8-104	37	53-3,174	685			
Volatile Suspended Solids	1E+04 kg	13-276	95	10-154	66	20-142	59			
Nitrite+ Nitrate	kg	0.23-14.6	4.6	0.03-0.76	0.40	0.16-7.0	1.8			
Nitrogen, total Kjeldahl	kg	1.19-44.80	14.03	0.35-11.46	3.70	0.09-76.93	16.13			
Oil & Grease	kg	0.40 -9.21	2.97	0.32-6.67	2.93	1.04-19.70	4.59			
Phenols	kg	0.0006-0.0131	0.004	0.0002-0.0028	0.002	0.0007-0.0110	0.002			
Phosphorus, total dissolved	kg	159-5,133	1,556	46-2,300	436	178-26,063	1,772			
Fecal Coliform	1E+06 cfu	8,793-3,184,513	1,465,626	1,454-277,332	57,067	23,334-2,046,649	513,146			
E. Coli	1E+06 MPN	23,248-7,673,049	2,576,291	974-169,977	42,638	23,601-3,338,117	690,203			

City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516
 Eleventh Year Report (May 1, 2015-April 30, 2016)

Constituent	Units	Residential		Commercial		Industrial	
		Range	Average	Range	Average	Range	Average
Cadmium, dissolved	g	0.03-0.72	0.2	0.01-0.16	0.09	0.04-0.60	0.19
Chromium, dissolved	g	1.7-39	14	0.4-10.2	4.9	1.3-10.9	5.3
Copper, dissolved	g	2.6-52.6	14.5	2.2-28.2	10.9	3.30-32.8	10.9
Lead, dissolved	g	1.4-14.1	5.8	0.7-6.1	3.4	2.0-11.7	6.5
Nickel, dissolved	g	0.6-13.2	4.2	0.1-2.8	1.2	0.7-10.9	3.8
Silver, dissolved	g	0.2-4.9	1.6	0.1-1.0	0.6	0.2-4.1	1.3
Zinc, dissolved	g	6.5-92.1	30.0	6.0-62.0	34.7	18.5-98.5	56.4
Cadmium, total	g	0.03-0.72	0.2	0.01-0.16	0.1	0.04-0.60	0.2
Chromium, total	g	2.3-65.8	21.6	0.7-16.3	7.3	4.6-54.7	17.1
Copper, total	g	3.4-65.8	21.0	4.6-33.8	16.3	7.4-87.6	30.0
Mercury, total	g	0.01-0.16	0.05	0.00-0.04	0.02	0.01-0.14	0.04
Lead, total	g	4.5-52.6	19.3	0.9-10.2	4.7	4.6-32.8	14.6
Nickel, total	g	1.7-26.3	9.7	0.4-4.1	2.2	2.0-54.7	14.4
Silver, total	g	0.2-4.9	1.6	0.1-1.0	0.6	0.2-4.1	1.3
Zinc, total	g	14-382	120	22-157	76	73-876	285
Semi volatile organic compounds and pesticides (detected)							
Phenol	g	0.22-5.13	1.66	0.09-1.10	0.62	0.26-197.00	33.5
Di(2-ethylhexyl)phthalate	g	0.24-27.64	10.26	0.42-27.72	7.76	0.62-16.42	7.5
2-Methynaphthalene	g	0.368-8.554	2.758	0.144-8.789	2.105	0.429-7.114	2.2

The calculation is based on the detected values and half of the detection limits for those under their detection limits.

. **Permit Ref. VI.B (Status Completed)**
Implement an ambient monitoring action plan

The following progress was made on this program during the reporting period.

Completed field sampling and laboratory analysis

The Stormwater Services Division completed three sampling events during the reporting period. The events occurred in August 2015, February 2016, and April 2016, respectively. The streams evaluated include East Fork Shoal Creek, Line Creek, Round Grove Creek, North Brush Creek, Fishing River, Brush Creek, Hickman Mill Creek, Little Blue River, Searcy Creek, and Buckeye Creek. One stream outside of the City limit, Prairie Creek in Platte County Missouri, was also sampled for comparison. All sampling sites are shown in Figure 7, except Prairie Creek. The Division also did partial sampling at four of the stream sites (Hickman Mill Creek, Little Blue River, Searcy Creek, and Buckeye Creek) in November 2015.

Sampling activity at each site usually consisted of both field (in-stream) measurements and grab sample collection. An YSI Pro DSS Sampling System was used in field measurement, which includes temperature, dissolved oxygen, pH, conductivity, and turbidity. Stream water samples were collected and handled in accordance with the *Kansas City, Missouri In-stream Ambient Monitoring Program* document (submitted in the MS4 First Year Report, 2006) and the *Quality Assurance Project Plan* (submitted in the MS4 Third Year Report, 2008). Samples were analyzed by the WSD Laboratory. Sample analysis included general water quality parameters (e.g., ammonia, alkalinity), seven metals (total and dissolved forms), mercury, and three bacteria indicators. Additionally, samples collected in April 2016 were also analyzed for more than 50 semi-volatile organic compounds and 26 organochlorine compounds.

Data summary

To evaluate the water quality of the sampled streams, Table 13 provides a statistical summary of physico-chemical and microbial data and a comparison made between the analytic results and the Missouri State Water Quality Criteria for Designated Uses. Since all the streams that are monitored in the program and that are within the City limits currently have the same use designation that includes livestock and wildlife watering, protection of aquatic life, and whole body contact recreation (B) (Both North Brush Creek and Little Blue River are also designated for secondary contact recreation), the available most stringent criteria among the designated uses were used to simplify the comparison.

For nonorganic-chemical parameters, all of the results are within the criteria ranges. For microbial parameters, the values are lower than the criteria. For every organic analyte (semi-volatile organic compounds and organochlorine compounds), the valid results of all of the samples were below individual detection limits and, thus, the data are not presented in Table 13.

City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516
Eleventh Year Report (May 1, 2015-April 30, 2016)

Table 13. A summary of physicochemical data for the streams monitored in dry weather

Parameter	Unit	Detection limit	Total number	Number of detection	Frequency of detection (%)	Minimum ¹	Maximum ¹	Median ¹	Criteria ²
Air Temperature	°C	NA	35	35	100	6.5	27.3	16.6	
Water Temperature	°C	NA	36	36	100	4.8	29.4	14.6	32
Conductivity	ms/cm	NA	36	36	100	19	3718	863	
Dissolved Oxygen	mg/L	NA	36	36	100	5.3	14.4	10.0	5
pH	S.U.	NA	36	36	100	7.1	9.0	8.0	
Turbidity	NTU(Lab)	NA	36	36	100	0.4	20.4	3.65	
Alkalinity, total	mg/L	0	36	36	100	112	300	209.5	
Biochemical oxygen demand 5-day	mg/L	2	36	20	56	2	43	2.5	
Cl	mg/L	0.014	36	36	100	24.2	385	81.55	
Chemical oxygen demand	mg/L	6.25	36	36	100	7	172	16	
<i>E. Coli.</i>	MPN/100mL	10	36	33	92	10	1178	134	1134 ³
Fecal coliform	CFU/100mL	NA	34	28	82	10	7701	149	1800 ³
Total coliform	MPN/100mL	10	36	35	97	148	38400	2482	
Na	mg/L	0.232	36	36	100	19.2	235	50	
Ammonia	mg/L	0.13	36	8	22	0.111	2.088	0.18	1.3-32.8 ⁴ 0.1-9.2 ⁵
Hardness, total	mg/L	NA	36	36	100	94	690	255	
Nitrite	mg/L	0.011	36	25	69	0.019	0.489	0.048	
Nitrate	mg/L	0.016	36	33	92	0.015	1.60	0.384	10 ⁶
Total Kjeldahl Nitrogen	mg/L	0.283	36	36	100	0.6	8.347	1.95	
Oil & Grease	mg/L	NA	36	4	11	1.4	2.9	1.6	10
Phenols	mg/L	0.002	36	0	0	ND	ND	NA	
Phosphorus, dissolved	mg/L	0.016	36	25	69	0.016	0.24	0.06	
Phosphorus, total	mg/L	0.016	36	33	92	0.02	0.29	0.1	
Total dissolved solids	mg/L	1	36	36	100	170	1300	380	
Total solids	mg/L	1	36	36	100	290	1700	515	
Total suspended solids	mg/L	1	36	36	100	2	47	12	
Volatile suspended solids	%	NA	36	36	100	5	76	27	
Ag-dissolved	mg/L	0.000744	36	0	0	ND	ND	NA	0.002-0.0156
Cd-dissolved	mg/L	0.00011	36	0	0	ND	ND	NA	0.0002-0.00005
Cr-dissolved	mg/L	0.00026	36	36	100	0.002	0.005	0.004	
Cu-dissolved	mg/L	0.00053	36	27	75	0.001	0.006	0.002	0.007-0.020
Ni-dissolved	mg/L	0.0004	36	15	42	0.001	0.002	0.001	0.041-0.113
Pb-dissolved	mg/L	0.00184	36	29	81	0.002	0.005	0.003	0.004-0.007
Zn-dissolved	mg/L	0.00016	36	30	83	0.001	0.018	0.007	0.092-0.255
Ag	mg/L	0.000744	36	0	0	ND	ND	NA	
Cd	mg/L	0.00011	36	0	0	ND	ND	NA	
Cr	mg/L	0.00026	36	36	100	0.002	0.006	0.004	
Cu	mg/L	0.00053	36	28	78	0.001	0.046	0.002	
Hg	mg/L	0.000025	36	0	0	ND	ND	NA	0.0024 ⁷
Ni	mg/L	0.0004	36	31	86	0.001	0.004	0.001	
Pb	mg/L	0.00184	36	31	86	0.002	0.006	0.004	
Zn	mg/L	0.00016	36	36	100	0.001	0.189	0.006	

¹ For those parameters that were detected in one or more samples, the minimum refers to the minimum value of the detected results. The median refers to the median value of the detected results, except geometric mean for bacterium criteria.

² Criteria listed here are cited from MDNR's criteria for protection of aquatic life unless annotated otherwise. For metals, chronic criteria are used unless annotated otherwise. A blank space is used if the criterion is not available or applicable to ambient stream samples.

³ Criteria for whole body contact recreation-WBC(B)

⁴ Acute criteria for cool & warm-water fisheries for pH values between 7.1 and 9.0

⁵ Chronic criteria for early life stages present for pH values between 7.1 and 9.0 and temperature between 4.8° C and 29.4° C

⁶ Criteria for drinking water supply and groundwater

⁷ Acute criteria

D. Permit Ref. VI.C.1 & 2

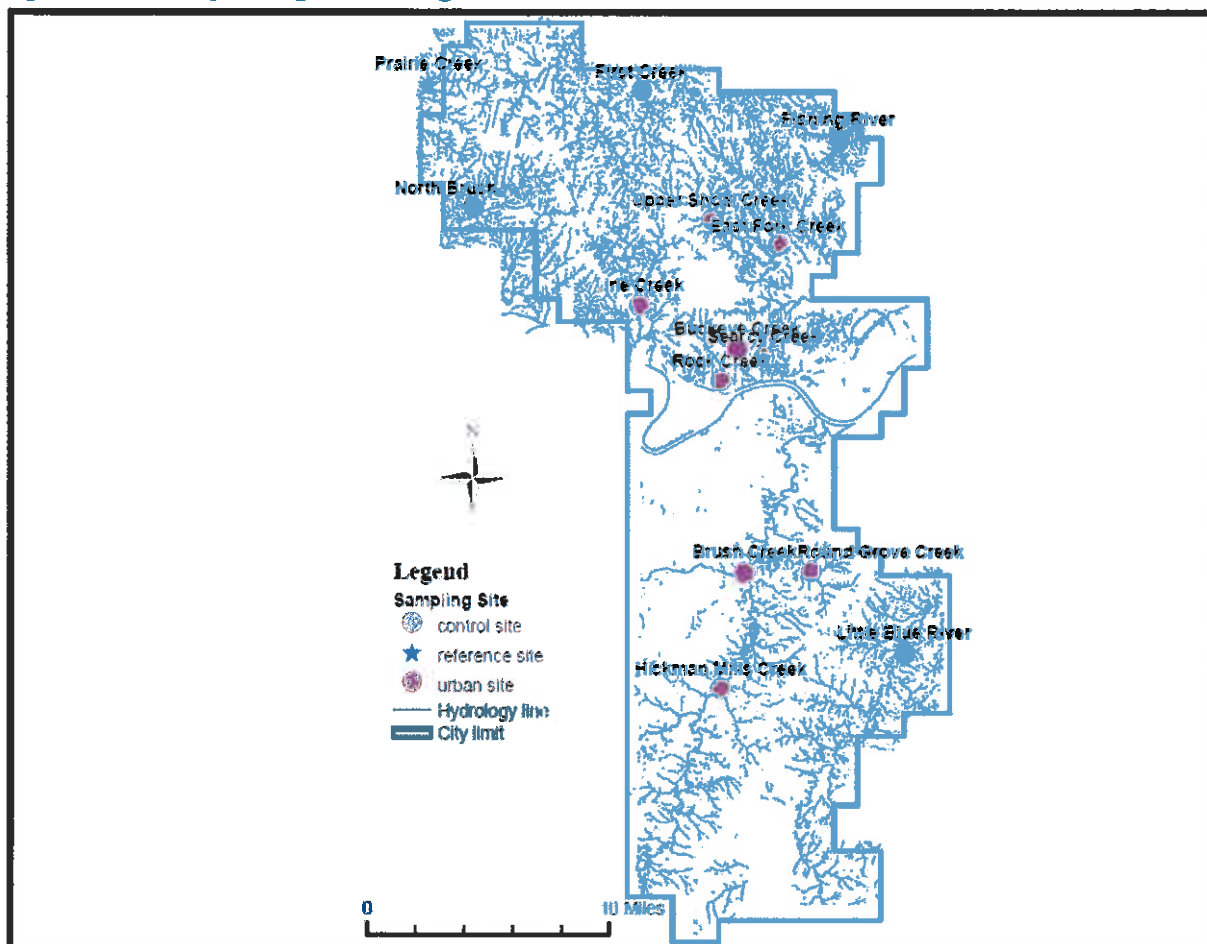
Conduct Biological Assessment

During the reporting period, one round of sampling was conducted in April 2016 with support from the Columbia Environmental Research Center (CERC) of U.S. Geological Survey (USGS). In addition, samples collected during previous sampling events were being analyzed by the CERC lab, and data were compiled for an in-depth analysis.

Streams

The streams selected for both habitat assessment and macro-invertebrate sampling were: seven urban stream reaches - East Fork Shoal Creek, Line Creek, Round Grove Creek, Brush Creek, Hickman Mill Creek (referred as Hart Grove Creek in the tables and graphs), Searcy Creek, and Buckeye Creek; three control stream reaches - North Brush Creek, Fishing River and Little Blue River, as well as a reference stream reach (outside of the City limits) – Prairie Creek in Platte County, MO (Figure 7).

Figure 7. Sites of biological testing



Field

This part included macro-invertebrate collection. Sample collection for water quality was performed within two weeks of the macro-invertebrate collection. The details of field methodology and laboratory results are presented in the section on stream ambient monitoring program. Macroinvertebrate collection was performed in accordance with the Division's Kansas City, Missouri Biological Sampling Program plan (submitted in the MS4 First Year Report, 2006) and relevant state standard operating procedures by the MDNR Air and Land Protection Division's Environmental Services Program (*i.e.*, Semi-quantitative Macroinvertebrate Stream Bioassessment Project procedure [MDNR 2010]; Stream Habitat Assessment Project Procedure [MDNR 2010]).

Laboratory work

Benthic macroinvertebrates collected in Spring 2015 were being processed at the CERC laboratory, which included laboratory treatment, sorting, microscope slide mounting, and taxonomic identifications. Operations were conducted according to the State's Protocol Taxonomic Levels for Macroinvertebrate Identifications (MDNR 2010). Appropriate quality control procedures were implemented.

Data analysis

Data analysis was in progress during this reporting period.

SECTION 4. OTHER PERMIT REPORTING REQUIREMENTS

4.1 Summary of Implementation Status

The Stormwater Management Plan (SWMP) is being implemented and the status of each program element has been described in each individual program section of this report. All the required components are proceeding in accordance with the City's permit requirements.

4.2 Proposed Changes

During the past fiscal year's permit implementation, no significant change of SWMP has been identified or anticipated. If any major changes are anticipated or occur in the future, the City will send written notification to MDNR's Water Pollution Control Program Permits section for approval, following the procedures as described in Part III.G. in the permit.

4.3 Program Effectiveness Evaluation Regarding Water Quality Improvement

The following presents an overall assessment of the City's Stormwater Management Programs, based on major outcomes of the relevant programs.

The City is enforcing its new zoning and development code in its planning and development processes:

- The code advances conservation principles by directing new development away from waterways and by preserving stream buffers.
- The enforcement of this code will generate a profound environmental impact in preventing future stream degradation.
- The City continues its effort to address preservation of riparian buffer zones in a more stream-focused, watershed-based approach for First Creek and Second Creek.

Level of maintenance services for roadways and storm sewer systems remain:

- The City continues to operate and maintain these public infrastructure systems in a manner that is required by the permit.
- The City continues to maintain and improve the ancillary functions, such as GIS mapping, to facilitate its maintenance services.
- The City continues to maintain green solution sites (rain gardens, bio-retention cells, etc.) allowing them to function at optimal level.

Water quality protection is incorporated into flood damage reduction projects:

- Water quality protection is an important element in flood risk management projects. The City uses applicable green infrastructure in designing and constructing new projects

Inspection frequency has increased while activities and programs are still aimed at promoting awareness of stormwater pollutants in industrial and commercial runoff:

- The City has increased the inspection frequency for high-risk-runoff facilities.
- Education and outreach continues to play an important role in the City's overall efforts to address stormwater issues among the industrial communities.

Pesticide usage has been kept at a minimum level:

- The City's 218 parks are maintained free of insecticides.
- The City continues to maintain native prairies and wetlands.
- BMP efforts taken on or adjacent to the City-owned golf courses continue to enhance wildlife habitats and reduce the need for watering and fertilizers.

There continues to be a significant effort to reduce stormwater pollution:

- A number of programs hosted or supported by various City departments serve to reduce nonpoint source pollutants.
- The nature of these programs ranges from City-wide to localized hot spots, and from routine maintenance to individually scheduled events.
- These programs address various pollutants, from daily household solid waste, hazardous waste, to sewage leaks and pharmaceutical products, which can all potentially end up in urban runoff or affect stormwater quality.

Construction site runoff control has been recognized as an important practice:

- The City continues to use standard procedures for land disturbance inspections and to provide a standard template of the Stormwater Pollution Prevention Plan for construction or grading projects disturbing one or more acres.
- The City continues to host training sessions to educate relevant staff on this subject.

Public education and outreach efforts continue to grow:

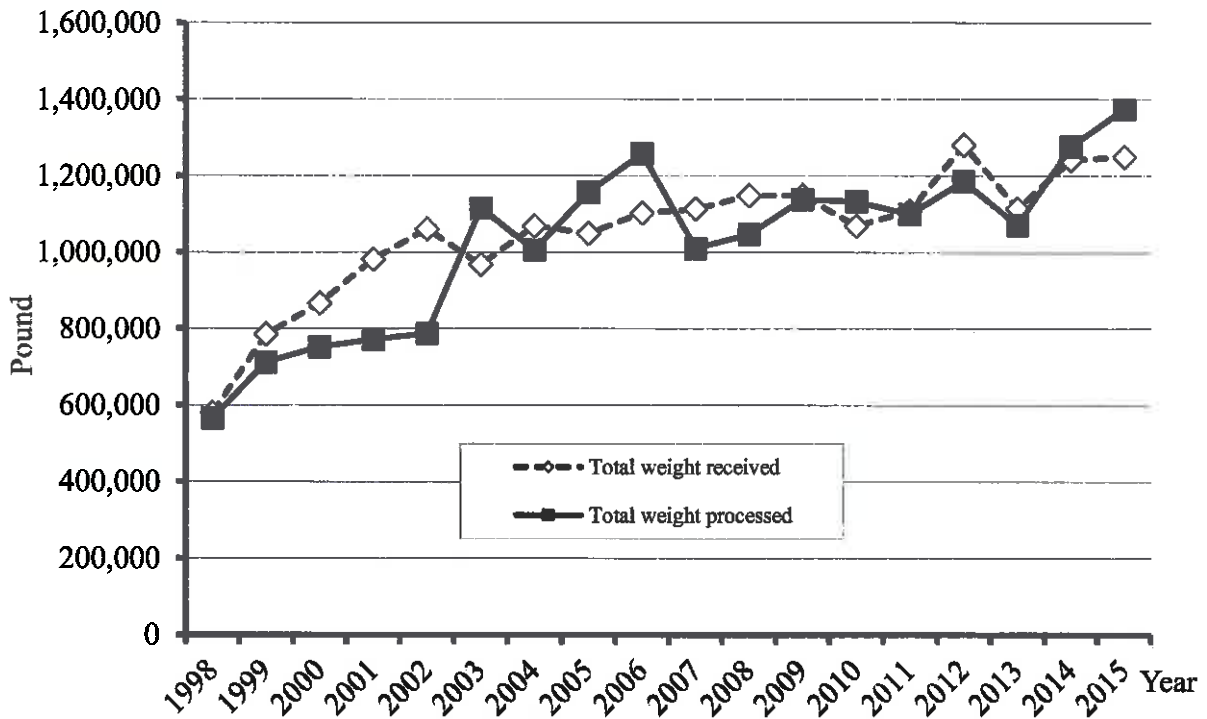
- The City continues to operate a number of programs (such as, *Stormwater: from KC to the Sea*; *KC Green's Hard to Recycle Items*), in which public education and outreach plays an important role.
- The City continues to develop new programs and projects to enhance the education messages. For example, the City held the Stormwater Manhole Design Competition and adopted the winning design featuring the water-protection message.
- The City continues to use a variety of communication approaches, such as City staff going to school classrooms to teach stormwater curriculum; hosting the manhole design competition and installing the winning design at strategic locations to impress the public. The City also supported and/or participated in the activities of various organizations to provide public education.



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- The City continues to maintain an extensive partnership with different organizations on a number of programs for public educational purposes. These programs and their organizations include Community Recycling by Bridging the Gap; the Blue River Watershed Association, and the Water Quality Education program by MARC.

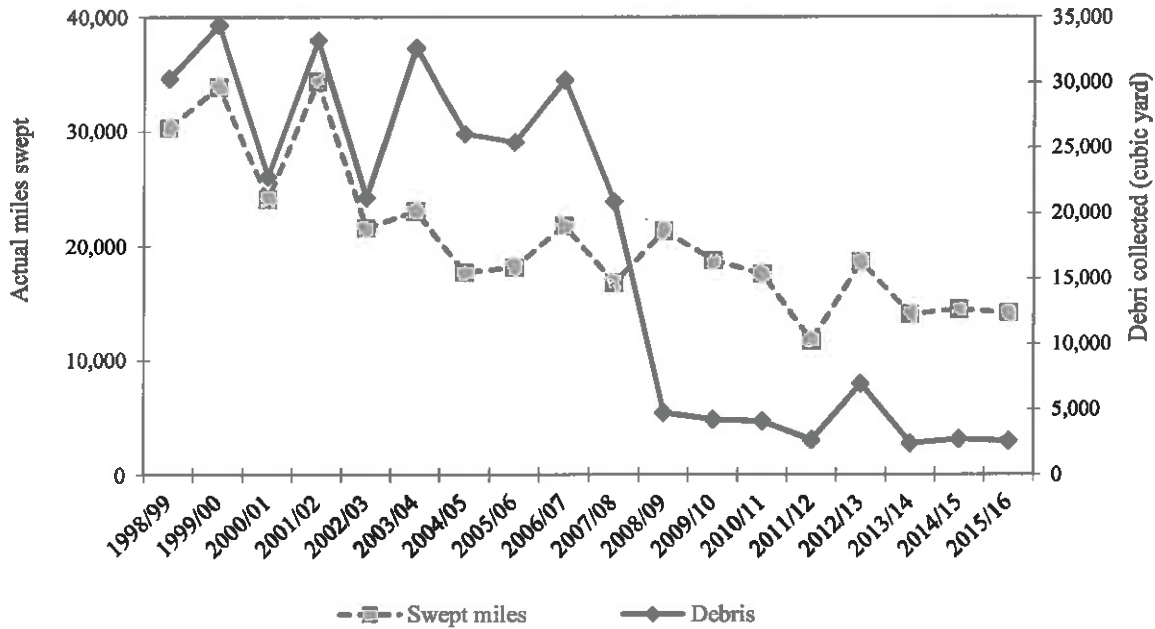
The above-mentioned major outcomes can further be measured by some indirect indicators. Figure 9 shows the annual quantity of materials that the regional HHW Collection program received and processed from 1998 to 2015. The program continues to divert HHW away from the landfills, streams, and storm sewers.

Figure 9. Yearly comparison of regional HHW collection program (1998-2015)



In addition to routine street sweeping performed by the WSD (Figure 10), the City's other departments/divisions utilize and enhance other existing programs or other methods to curb urban nonpoint source pollution to maintain a cleaner environment. Examples of these programs include but are not limited to, city-wide curbside and community recycling; KC Recycles, HHW, and the leaf and brush collection program. Figures 11 and 12 illustrate some of the achievements made by the Solid Waste Division with Public Works from 2004 to 2015.

Figure 10. Street Sweeping Program 1998-2016



Note

Fig. 10. Prior to 2008, the program used to cover residential, arterial/boulevards, and downtown streets; and the debris collected was tracked by cubic yard. Since 2008, cleaning downtown streets has been supplemented with Kansas City Downtown Council’s cleanup efforts. Additionally, the program was shifted from Public Works to the Water Services Department in 2008, and actual waste weight is tracked by tonnage instead of by cubic yard used previously. A conversion factor of 1.67 was used to convert tonnage to cubic yards for data comparison.

Figure 11. Bulky items collection and illegal dumping cleanup 2004-2016

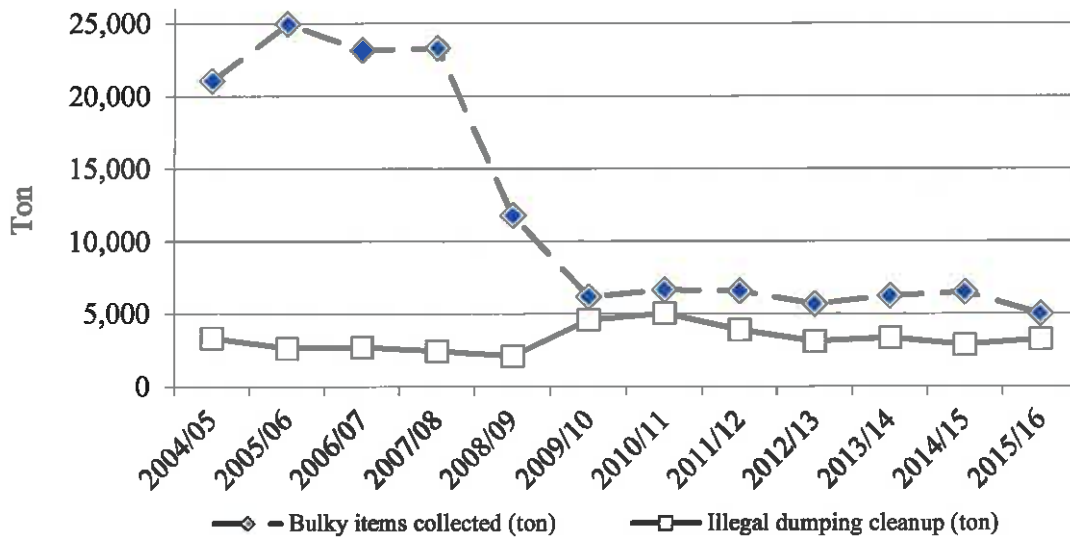
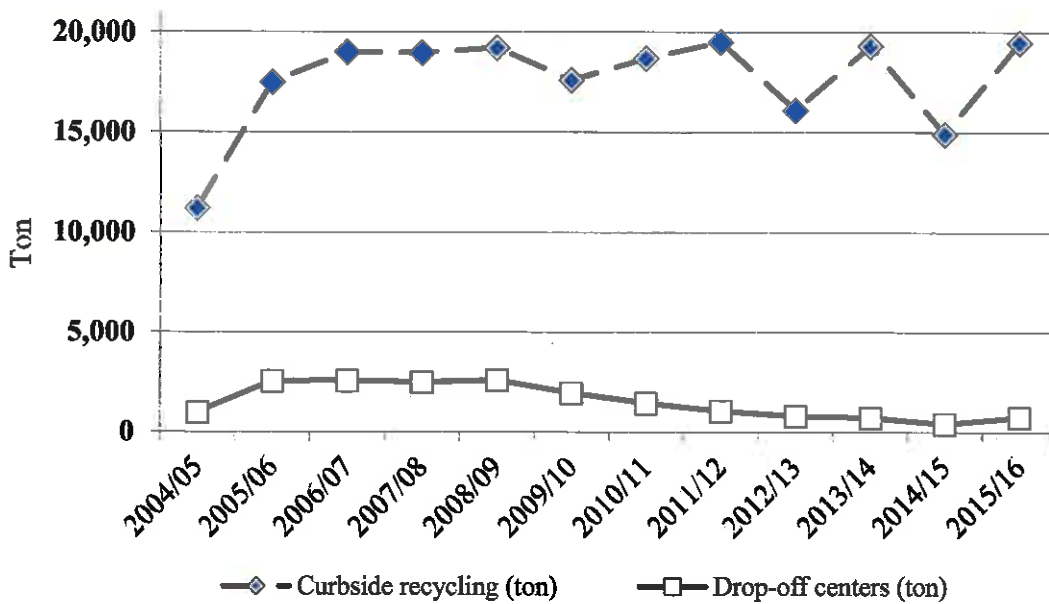


Figure 12. 2004-2016 KC Recycle program



4.4. Data Summary

The monitoring results for representative stormwater discharges, ambient monitoring and bio-assessment programs for receiving streams have been summarized in Section 3. Watershed Monitoring Program.

4.5 Annual Expenditures

Table 15 provides a breakdown of the cost for the programs/activities that can be associated with stormwater management.

4.6 Activity Summaries; Inspection, Enforcement, and Public Education

Table 16 summarizes the enforcement, inspection, and public education activities that are relevant to stormwater issues.

4.7 Water Quality Degradation/Improvements

The trend analysis of bio-assessment data collected in the previous years was presented in the previous report. The objective of these evaluations is to capture the temporal trend of the quality of stormwater and receiving streams, as well as to assess the impact of the City's SWMPs on water quality. The following activities (during fiscal year 2015/16 unless otherwise specified) are expected to have a positive impact on the City's surface water quality.

- Over one million pounds of household hazardous waste was collected, recycled, and properly disposed of in 2015.
- Over 700 tons of material was recovered by community drop-off recycling centers, 19,467 tons of material was recovered by curbside, as well as 287 tons of organics collected during FY 2015/16.
- A total of 6,104 tons of leaf and brush was collected from the drop-off centers; 4,600 tons were collected from residential curbside.
- More than 1,529 sediment/erosion control inspections were conducted for private development that disturbed areas more than one acre;
- Over 14,000 miles of streets were swept and over 2,500 tons of litter was removed from streets;
- A total of 17,180 cleanings of storm inlets were completed.

As a result of these efforts, a significant amount of materials and waste did not get into the storm drainage system reducing pollution in our local waterways.

Table 15. Overall budget for programs/activities supporting stormwater management effort in FY '15/16 and projection for FY '16/17

Program/Service	Funding Source	FY 15/16 (Actual \$)	FY 16/17 (Adopted \$)
Direct Cost (Activities conducted to ensure compliance with the Permit)			
Permit administration – Stormwater Utility Division	Stormwater Fund	\$402,612 ¹	\$405,000 ¹
MS4 assistance	Stormwater Fund	0	0
Ambient monitoring	Stormwater Fund	13,075	30,000
Biological monitoring	Stormwater Fund	36,679 ²	69,546 ²
Industrial monitoring	Stormwater Fund	1,240	5,000
BMPs in Flood Damage Reduction Projects	Multi Funds ³	0	500,000
BMPs in drainage improvement projects	PIAC Fund ³	210,819	1,090,000
Landfill monitoring and control measures	General Fund	0	0
Stormwater discharge monitoring	Stormwater Fund	9,369	75,000
Stormwater public education	Stormwater Fund	61,128 ²	100,000 ²
Indirect Cost (Activities conducted to help with stormwater pollution prevention effort)			
Leaf & brush drop-off site operation and maintenance	General Fund	473,818	573,425
Leaf & brush collection (curbside)	Stormwater Fund	362,516	710,000
Bulky item collection	General Fund	1,567,948	1,500,301
Catch Basin Replacement program	Stormwater Funds,	451,741 ²	500,000 ²
Stormwater Maintenance	Stormwater Fund	7,739,677	10,156,547
Deicing, snow/ice program	Motor Fuel Tax and General Fund	2,632,063	2,750,000
Household hazardous waste program	Wastewater & Stormwater Fund	456,821	821,104
Illegal dumping abatement	General Fund	1,888,642	2,067,229
KC Recycles (Recycle First) program	General Fund	4,589,732	4,180,962
Land development inspection	Fee Supported	1,611,600	2,108,758
Flood risk management features maintenance	Stormwater Fund	61,571 ²	100,000 ²
Neighborhood Cleanup Assistance program	General Fund	300,999	270,092
Property acquisition/demolition/clean-up for flood control	PIAC Fund ²	6,150	392,000
Special Sewer Connection & Septic Tank Disconnection program	Wastewater Fund	0	0
HazMat Team (spill prevention and control)	Cigarette Tax	4,231,621	3,828,703
TOTAL		\$27,109,819	\$32,233,667

**City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516
Eleventh Year Report (May 1, 2015-April 30, 2016)**

¹ The amount only covers staff within the Stormwater Utility Division and Industrial Waste Division (after September 2015) of WSD at the level of both management and administration of the programs directly related to the permit. These programs are: ambient monitoring, biological monitoring, development plan review for stormwater control and BMPs, high-risk runoff facility inspection/monitoring, illicit discharge investigation, land disturbance inspection for City projects, stormwater discharge monitoring, stormwater public education, permit renewal effort, along with the management of the permit in general. fringe benefit (35%) is also included. the cost of City staff from other divisions and/or other departments supporting the above programs or managing other MS4 programs (*e.g.*, illegal dumping investigation, landfill inspection/monitoring, Construction site runoff control at private development sites) is not included.

² The listed expenses only include new purchases and/or contract amounts. It does not cover either the cost of staff developing/managing/implementing/assisting this program and their associated training, or the additional cost of the existing City resources utilized (*e.g.*, vehicles, computers, software programs including Arc/Map).

³ Multi funds include PIAC funds (the Sales Tax through Public Improvements Advisory Committee), Energy & Water Approp to Army Corps of Engineers, and Johnson County, Kansas – Stormwater (SMAC).

Table 16. Activity summary

ENFORCEMENT ACTIONS				
Sediment and erosion control				
> 1 acre (Inspection) >550 site deficiencies				
≤ 1 acre (Complaint-driven investigation)				
56 Letters on site deficiency	9 Tickets written		2 Stop work orders	
123 Illegal dumping summons; 93 dispositions				
INSPECTIONS				
Public detention basin: >5		Private detention basin: 65		
Catch basin/Inlet: 17,180		Outfall: 199		
Missouri River levee: 11.5 miles*5 times		Blue River levee: 3.5 miles*5 times		
Municipal facility: 36		Private facility: 40		
TV sanitary sewer line: 329 miles				
Active construction site (erosion & sediment control)				
City projects	Private development			
≥ 1 acre	≤ 1 acre	≤ 1 acre (Complaint-driven)	> 1 acre	
275 ^a	6174	127 (investigation)	>1,529	
PUBLIC EDUCATION AND OUTREACH				
City efforts: Programs/Activities				
WE KC		Stormwater Plinko		Stormwater Manhole Competition
Litter pick-up events	Students	Events played at	Participants	Installation of new manholes
8	875	7	>1,100	75
Regional Effort 1. Partnering In Blue River Celebration - Education Day (Event)				
Educational booth			Visitor	
10			>1,000	
Regional Effort 2. Partnering In Blue River Rescue Program				
Area (honeysuckle removed)	Volunteer number	Trash removed	Trees planted	
2.5 acre	864	65 tons	500	
Regional Effort 3. Lead Sponsoring Water Quality Public Education Program				
Brochures distributed		Giveaway	Grant issued	
7,855		1,132	7 projects/\$20,000	
Stop Littering & Native Plants			Webinars	
5,139,486 Gross impressions (estimated)			6	

SECTION 5. FUTURE IMPLEMENTATION

During the reporting period, a review of the tenth permit year's implementation of the City's MS4 permit was conducted. The City's first five-year permit term expired in 2009. The City has continued to operate its storm sewer system per the requirements listed in the expired permit. The following listing presents the City's vision for the near future regarding the permit activities for better managing stormwater, protecting natural resources, and ensuring full compliance with the permit conditions.

Continue to evaluate and improve relevant policies

- Enhance/update the existing policies and operating procedures, where applicable, by incorporating and promoting stormwater protection elements
- Establish strategic stormwater-related practices. For example, the City is targeting both municipal-owned or -operated, as well as privately-owned or operated facilities for greater utilization of the *Stormwater Self-assessment* program
- Investigate funding opportunities available to address funding levels needed to provide a more robust overall stormwater management system

Improve the existing services by

- Improve the database of stormwater infrastructure and assets
- Improve the GIS mapping

Enhance public education and outreach by better utilizing the dedicated water-quality outreach specialist and communication staff and resources

Evaluate and improve the stormwater management programs

- Evaluate the programs' progress against the pre-determined goals and objectives
- Improve departmental maintenance capabilities for green infrastructure

In summary, the City's goals are not only to comply with the state and federal regulations but also to reduce stormwater pollution and improve stormwater runoff quality.

SECTION 6. APPENDIXES

Appendix 1. Industrial & Other High-Risk Runoff Facilities Inventory Kansas City, Missouri 2015

	Non-Municipal Facilities	Activity Address	Watershed
1	A Luster Metal Finishing-Division of Brady Enterprises	1019 West 24th St.	Turkey Creek
2	ABF Terminal - 003 Kansas City	4209 Gardner Ave.	NEID*
3	Advantage Powersports (formerly Kawasaki)	6401 NW Barry Rd.	Line Creek
4	All Star Auto Parts	6101 E 32nd St.	Blue River
5	Allied Aviation Service Company	217 Bern St.	Todd Creek
6	Avenue Auto Wrecking	2500 E Manchester Trfw.	Blue River
7	AZZ Galvanizing (formerly Rogers Galvanizing Co., No Am Galvanizing Co.)	7700 E 12th St.	Blue River
8	Bartlett Grain Company, L.P.(KCT Elevator)	5801 Birmingham Rd.	Searcy Creek
9	Batliner Paper Stock Company	2501 E Front St.	Missouri River
10	Bayer Cropscience	8400 Hawthorn Rd.	NEID*
11	Blount International KCDC	10331 NW Transcon	N. Brush Creek
12	Blount-Kansas City	4840 E 12th St.	Turkey Creek
13	Boulevard Brewing Company	2501 Southwest Blvd.	Turkey Creek
14	Brenntag Mid- South Inc.	5200 Still Well Ave.	NEID*
15	C&H Auto and Truck Salvage	7604 E Truman Rd.	Blue River
16	Calvert's Express	1501 Main St	Gooseneck Creek
17	Car Wash	6006 Troost Ave.	Brush Creek
18	Cargill Inc.- Biodiesel Plant	2309 E Front St	NEID*
19	Cargill Inc.- Soybean Processing Plant	2306 Rochester	NEID*
20	Cargill Inc./Choteau Elevator	4801 NE Birmingham Rd.	Buckeye Creek
21	Carter Waters Corporation	2440 W Pennway St.	Turkey Creek
22	Carter Waters Corporation	3750 N Skiles Rd.	Randolph Creek
23	Catalent Pharma Solutions Inc. (formerly Quintiles Inc.)	10245 Hickman Mills Dr.	Hickman Mills Creek
24	Century Concrete, Inc. (formerly Fordyce Concrete Co., Inc., Randolph Facility)	3700 North Skiles Rd.	Randolph Creek
25	Charles Paint Research Inc.	2401 E. 85th St.	Blue River
26	Clay & Bailey	6401 E 40th St.	Blue River
27	Cook Brothers Insulation Inc.	1405 Saint Louis Ave.	CID**
28	Crunch Time Auto Salvage	7900 E 17th St.	Blue River
29	CTB Grain Systems (prev. Brock Grain & Feed)	7400 East 13th St.	Blue River
30	D&D Detail	3701 E 12th St.	Goose Neck
31	Dayton Superior Corporation (formerly Zea Corporation)	3101 Gardner Ave.	NEID*
32	Don's Mobile Welding	7000 E US 40 Hwy.	Blue River
33	Economy Auto Salvage	3139 Stadium Dr.	Blue River
35	Elite Trucking	900 N Indiana	NEID*
36	Environmental Specialists, Incorporated	3001 E 83rd St.	Blue River
37	Environmental Specialists, Incorporated	7300 E 63rd St.	Blue River
38	Fordyce Concrete Company Inc.-63rd St. Facility	5810 E, 63rd St.	Blue River
39	Fresh Del Monte Produce Inc.	6311 Deramus Ave.	NEID*
40	Gateway Packaging Company	5910 Winner Rd.	Blue River

City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516
Eleventh Year Report (May 1, 2015-April 30, 2016)

	Non-Municipal Facilities	Activity Address	Watershed
41	General Mills Operations Inc.	2917 Guinotte Ave.	NEID*
42	Gerdau Ameristeel	1301 N Chouteau Tfwy	NEID*
43	Hallmark Cards Inc.	2501 McGee	Turkey Creek
44	Hansen Mueller(KCS Elevator)	1031 N Topping	NEID*
45	Harley-Davidson Motor Group Comp.	11401 N Congress Ave.	Second Creek
46	Hawthorn Generating Facility (Kansas City Power & Light)	8700 Front St.	NEID*
47	HazMat Inc. (formerly Waste Express)	6300 Stadium Dr.	Blue River
48	Heritage Environmental Service	8525 NE 38th St.	Randolph Creek
49	Hiles Plating Company	2028 Broadway	Turkey Creek
50	Import Auto Salvage	4120 Winchester Ave.	Blue River
51	Jackson Plating & Polishing, Inc.	2641 Jackson	Blue River
52	Jay Wolfe Acura	1029 W 103rd St.	Indian Creek
53	Joe's Mobile Truck & Trailer Repair	3040 Manchester Tfwy	Blue River
54	Kansas City Screw Products Inc.	2908 Truman Rd.	Blue River
55	Kauffman Stadium	One Royal Way	Round Grove Creek
56	KC Southern Railway - Knoche Yard	3651 East Front St.	NEID*
57	KC Streetcar Authority Maintenance Facility (Singleton Yard)	3rd St. and Holmes	CID**
58	Koch Materials Company (Vance Brother)	4915 Chelsea St.	Brush Creek
59	LabConco Corporation	8811 Prospect	Blue River
60	LaFarge North America Inc.	3101 East 85th St.	Blue River
61	Langley Recycling, Inc.	3557 Stadium Dr.	Blue River
62	Little Will's Auto Salvage	7910 E 17th St.	Blue River
63	Lowe's Home Improvement	8601 N. Boardwalk Ave.	Second Creek
64	Lowe's Home Improvement	1700 W, 133rd St.	Blue River
65	Mallin Brothers Company Inc.	3211 Gardner Ave.	NEID*
66	Mark One Electric Company, Inc.	1001 Forest Ave., 921 Forest Ave.	Blue River
67	Martin Foundry Company	1510 Crystal Ave.	Blue River
68	Material Recovery & Transfer LLC	4020 Winchester Ave.	Round Grove Creek
69	Metals Protection Plating (MPP) Corporation	2800 East Truman Rd.	Blue River
71	Mid America Car Inc. - Locomotive	1523 N. Monroe	NEID*
72	Midway Ford Truck Center Corporation	7601 Northeast 38th St.	Randolph Creek
73	Midwest Locomotive, Inc.	6817 Stadium Dr.	Blue River
74	Midwest Scrap management	8116 Wilson Rd.	Blue River
75	Mile Rail LLC(formerly Compass Big Blue LLC)	8116 Wilson Rd.	Blue River
76	Miller Material Company	2405 East 85th St.	Blue River
77	Missouri Dept. of Transportation- District 4 General Services	9101 E 40th Ter.	Round Grove Creek
78	Missouri Dept. of Transportation-Motorist Assistance	3505 E 18th St.	Gooseneck Creek
79	Missouri Plating Company	7001 East 13th St.	Blue River
80	Mondi Bags USA, LLC (formerly Graphic Pkg Int'l, Inc., Stone Container Corp.)	3244 Gardner Ave.	NEID*
81	Monier Life Tile LLC	12600 East 98th St.	Little Blue River
82	Nitto Denko Automotive, Missouri, Inc. (formerly Permacel Kansas City Inc.)	8485 Prospect Ave.	Blue River
83	NKC Transportation	3811 Gardner Ave.	NEID*

City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516
Eleventh Year Report (May 1, 2015-April 30, 2016)

	Non-Municipal Facilities	Activity Address	Watershed
84	Nostrum	1800 N Topping Ave	NEID*
85	Ortho Mattress, Inc.	6301 NW Barry Rd.	Second Creek
86	PathFinder Systems, Inc.	6301 Deramus Ave.	NEID*
87	Paulo Products Company	4827 Chelsea Ave.	Brush Creek
88	PBI Gordon Corporation	1217 W 12th St.	Turkey Creek
89	Penny's Concrete, Inc.- Parvin Road Plant	8601 NE 38th St.	Randolph Creek
90	Performance Roof Systems Inc.(Derbigum)	4821 Chelsea Ave.	Brush Creek
91	Permacel Kansas City	3900 Empire Rd.	NEID*
92	Pick-n-Pull - Kansas City (Self-Service Auto Parts Store)	8012 E Truman Road	Blue River
93	Porter's Auto Salvage	3231 Stadium Dr.	Blue River
94	Quality Finishing Industries Inc.	7615 East 17th St.	Blue River
95	Research Medical Center	2316 East Meyer Blvd.	Town Fork Creek
96	Roberts Dairy Company (formerly Prairie Farms)	3805 South Emanuel Cleaver Blvd.	Brush Creek
97	Rotadyne Roll Group	2035 Washington St.	Turkey Creek
98	Sanofi-Aventis U.S. (formerly Aventis Pharmaceuticals)	10236 Marion Park Dr.	Hickman Mills Creek
99	Southeast Sanitary Landfill L.L.C.	8301 Indiana Ave.	Blue River
100	Speaco Foods, Inc.(formerly Mizkan)	2400 Nicholson Ave.	NEID*
101	Stericycle Environmental Solution (formerly Philip Services Corp)	716 Mulberry St.	CID**
102	Stones & Bricks Inc.	6701 E 40 Hwy	Blue River
103	Summit Machine Products Inc.	7101 E. 13th St.	Blue River
104	Superior Metal Treating & Equipment	2540 Indiana Ave	Blue River
105	T & E Service	4980 Stillwell Ave.	NEID*
107	Thoroughbred Ford	8501 N. Boardwalk Ave.	Second Creek
108	Transmission Auto	8021 Prospect Ave.	Blue River
109	Trigen-KC Grand Avenue Station (formerly Veolia Energy)	115 Grand Ave.	NEID*
110	Truman Medical Center	2301 Holmes St.	Turkey Creek
111	Union Pacific Railroad	6400 Martin	NEID*
112	Univar USA Inc.- Kansas City (formerly Vopak USA Inc.)	2000 Guinotte Ave.	NEID*
113	University of Missouri-Kansas City	5100 Rockhill Rd.	Brush Creek
114	U-Pick-it	7700 Winner Rd.	Blue River
115	US Plating & Surface Finishing	1341 Montgall Ave.	Blue River
116	USC Technologies	1300 NW Briarcliff Pkwy	Line Creek
117	VA Medical Center	4801 Linwood Blvd.	Blue River
118	Vance Brothers Inc.	5201 Brighton	Blue River
119	W.R. Meadows of Kansas City	3111 E 17th St.	Turkey Creek
120	Walker Towel & Uniform	2601 Truman Rd.	Blue River
121	Walmart	1701 W, 133rd St.	Blue River
122	Walmart Supercenter	8551 N Boardwalk Ave.	Second Creek
123	Yellow Transportation (KCM)	3500 Booth St.	Blue River

*NEID: Northeast Industrial District

**CID: Central Industrial District

City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516
Eleventh Year Report (May 1, 2015-April 30, 2016)

	Municipal Facilities	Activity Address	Watershed
1	Habitat ReStore	4703 Deramus	NEID*
2	KCMO American Royal Arena Complex	1800 Genessee	CID**
3	KCMO Animal Control Kennel	4400 Raytown Rd.	Round Grove Creek
4	KCMO Birmingham Wastewater Treatment Plant	10801 NE 28th St.	Birmingham Bottom
5	KCMO Blue River Golf Academy	7501 Blue River Rd.	Blue River
6	KCMO Blue River Secondary Wastewater Treatment Plant	7300 Hawthorne Rd.	NEID*
7	KCMO Blue River Wastewater Treatment Plant	7600 Front St.	NEID*
8	KCMO Buckeye Maintenance Facility	5001 Birmingham	Searcy Creek
9	KCMO Central Patrol	1200 E Linwood	Turkey Creek
10	KCMO City Tow Lot	7750 Front St.	Missouri River
11	KCMO Communication Center	1111 Locust St	Turkey Creek
12	KCMO Crime Laboratory	6633 Troost Ave.	Town Fork Creek
14	KCMO East Patrol	5301 E 27th St.	Blue River
15	KCMO Fire Dept. - MAST Headquarter	6750 Eastwood Tfwy	Blue River
16	KCMO Fire Marshall's Office	635 Woodland Ave.	Blue River
17	KCMO Fire Station 10	1505 E 9th St.	Blue River
18	KCMO Fire Station 18	3211 Indiana Ave.	Brush Creek
19	KCMO Fire Station 19	550 W 43rd St	Brush Creek
20	KCMO Fire Station 23	4777 Independence Ave.	Blue River
21	KCMO Fire Station 35	3200 Clever II	Brush Creek
22	KCMO Fire Station 36	9903 Holmes	Indian Creek
23	KCMO Fire Training Academy	5130 Deramus	NEID* III
24	KCMO Fishing River WWTP	10600 NE 118th St.	Fishing River
25	KCMO Fleet Maintenance	1901 Brooklyn	Turkey Creek
26	KCMO Fleet Operations	5215 E. 27th St.	Blue River
27	KCMO Habitat Restore	4701 Deramus	Missouri River
28	KCMO Helicopter Unit	4601 Eastern	Round Grove Creek
29	KCMO Hodge Golf Course	7000 NE Barry Rd.	East Fork Creek
30	KCMO Holmes Annex	1525 Holmes	Turkey Creek
31	KCMO KCI Airport	125 Paris St.	Todd Creek
32	KCMO Kemper Arena	1800 Genessee	CID**
33	KCMO Lakeside Nature Center	4701 E Gregory Rd	Blue River
34	KCMO Leaf & Brush Drop off site	I-470 & Raytown Rd.	Little Blue River
35	KCMO Maintenance facility	1800 Prospect	Turkey Creek
36	KCMO Metro Patrol	7601 Prospect	Blue River
37	KCMO Minor Golf Course	11215 Holmes Rd	Blue River
38	KCMO Municipal Service Center	5300 Municipal Ave.	NEID*
39	KCMO North Patrol	1001 NW Barry Rd.	Line Creek
40	KCMO Nursery	5400 E. Gregory Ave.	Blue River
41	KCMO Pacaar Building & Lot	1301 NE Chouteau Tfwy	NEID*
42	KCMO Parks District 2	1520 West 9th St.	Turkey Creek
43	KCMO Parks District 3	6901 Elmwood Ave.	Blue River
44	KCMO Pistol Range	6900 Coal Mine Rd.	Round Grove Creek
45	KCMO Police Dept.- Headquarter	1125 Locust St.	Turkey Creek

City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516
Eleventh Year Report (May 1, 2015-April 30, 2016)

	Municipal Facilities	Activity Address	Watershed
47	KCMO Police Dept.- South Patrol Station	9701 Marion Park Dr. (11109 Hickman Mills Dr.)	Hickman Mills Creek
48	KCMO Police Dept.-new Training Academy	6885 NE Pleasant Valley	Shoal Creek
49	KCMO Police Gym	1801 White	Blue River
50	KCMO Police Training Academy-Agnes Annex	1328 Agnes	Blue River
51	KCMO Public Works District 1	2400 NE Russell Rd.	Rock Creek
52	KCMO Public Works District 2	5300 Municipal Ave.	NEID*
53	KCMO Public Works District 3	4725 Coal Mine Rd.	Blue River
54	KCMO Recycling Center	4703 Deramus	NEID*
55	KCMO Regional Household Hazardous Waste Facility	4707 Deramus Ave.	NEID*
56	KCMO Rocky Branch WWTP	500 NE 132nd St.	Rocky Branch
57	KCMO Ruskin Maintenance	11231 Bennington	Hickman Mills Creek
58	KCMO Salt storage Facility, District 1	11660 N. Main Street	First Creek
59	KCMO Services Station	1245 Prospect	Blue River
60	KCMO Shoal Creek Golf Course	8905 N Shoal Creek Parkway	Shoal Creek
61	KCMO Shoal Creek Patrol Division/Police Academy	6801 NE Pleasant Valley Rd.	Shoal Creek
62	KCMO Solid Waste Headquarters	1815 N. Chouteau	NEID*
63	KCMO Stanley Palmer Engineering Center	4721 Coal Mine Rd.	Blue River
64	KCMO Starlight Theater	4600 Starlight Rd.	Blue River
65	KCMO Swope Memorial Golf Course	6900 Swope Memorial Dr.	Blue River
66	KCMO Swope Park Off-Leash Area	E. of Elmwood, Gregory Blvd	Blue River
67	KCMO Todd Creek Wastewater Treatment Plant	7600 NW 144th St.	Todd Creek
68	KCMO Traffic Operations	5310 Municipal Ave.	NEID*
69	KCMO Water Treatment Plant	1 NW Briarcliff	Line Creek Rock Creek
70	KCMO Westside Wastewater Treatment Plant	1849 Woodsweather Rd.	CID**
71	KCMO Zoo	6900 Zoo Dr.	Blue River

*NEID: Northeast Industrial District; **CID: Central Industrial District

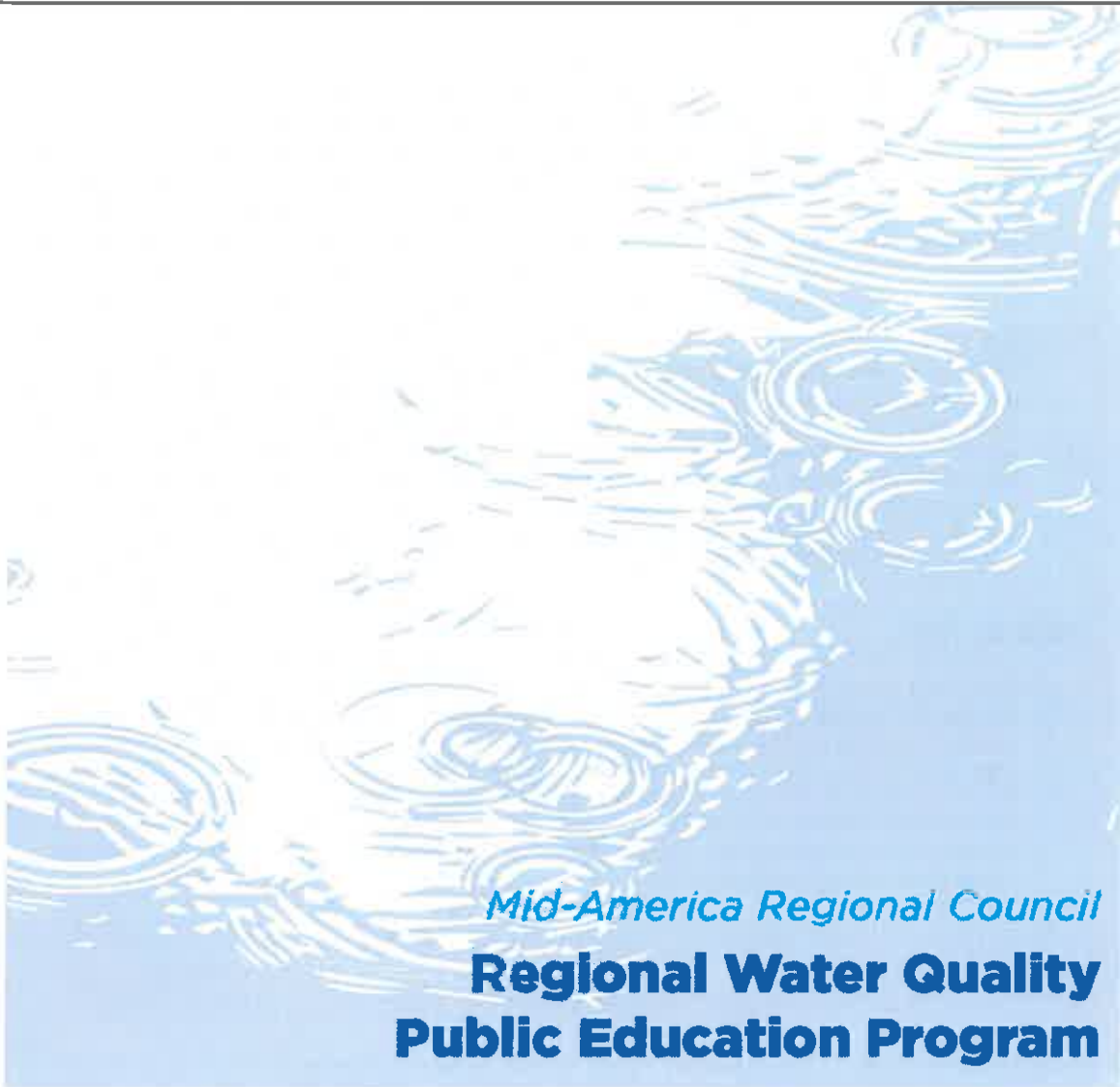
Appendix 2. 2015 Kansas City, Missouri Priority List of Industrial and Other High-Risk Runoff Facilities

ORGANIZATION	ACTIVITY ADDRESS	WATERSHED	MS4 / CSO	STATE PERMIT	STATE STORMWATER No Exposure Certification	EVALUATED	MONITORING DATA RECEIVED
Sanofi-Aventis U.S. (Aventis Pharmaceuticals Inc.)	10236 Marion Park Ave	Hickman Mills Creek	MS4	MO0111180	No	Yes	Yes
Heritage Environmental Service	8525 NE 38th St	Randolph Creek	MS4	MO0125512	No	Yes	Yes
Clay & Bailey	6401 E 40th St	Blue River	MS4	MOR203297	No	Yes	Yes
Century Concrete, Inc., Skiles Facility (formerly Fordyce Concrete Company Inc. Randolph Facility)	3700 N Skiles Rd.	Randolph Creek	MS4	MOG490266	No	Yes	Yes
Bayer Cropscience	8400 Hawthorn Rd.	NEID	MS4	MO-0002526	No	Yes	Not applicable
Penny's Concrete, Inc. (Parvin Road Plant)	8601 NE 38th St.	Randolph Creek	MS4	MO-G490966	No	Yes	Yes
KC Southern Railway (Knoche Yard)	3651 E Front St.	NEID	MS4	MO-0115703	No	Yes	Yes
The industrial area south of Worlds of Fun		Randolph Creek	MS4	Not applicable	Not applicable	Monitored by the City	

MS4: municipal separate storm sewer system; CSO: combined sewer system

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**APPENDIX 3. MARC 2015 Annual Report for Regional Water Quality
Public Education Program**



Mid-America Regional Council
**Regional Water Quality
Public Education Program**



Clean Water. Healthy Life.

2015
ANNUAL
REPORT

CLEAN WATER. HEALTHY LIFE

Regional Water Quality Public Education Program Annual Report, January–December 2015

COMMITTEE HISTORY

Since 2005, MARC has convened a committee of representatives from local governments and environmental organizations to develop a regional watershed public education program. The committee was formed in response to numerous requests from local governments to use a cooperative approach to water quality public education and to meet federal NPDES Phase I/II regulatory requirements. The committee's efforts have provided a firm foundation for its goal of educating the public about actions they can take to reduce non-point source (NPS) pollution.

PROGRAM DETAILS

The Regional Water Quality Public Education Program uses a comprehensive approach to raise public awareness about watershed issues and water quality in the Kansas City region. Its long-term water quality public education strategy capitalizes on momentum created by past water quality awareness efforts and community initiatives such as the Kansas Healthy Yards and Communities program and the committee's biennial public attitude survey. Each year, the program identifies specific water quality issues to address through its biannual public outreach campaigns; however, the structure is flexible enough to promote additional messages when opportunities arise. Campaigns encompass varying levels of support and outreach methods, as explained below.

PROGRAM FOCUS

During the past 12 years, the public education program has addressed several top NPS pollution issues facing the Kansas City region. The program's theme — "Clean Water. Healthy Life." — focuses on changing behavior throughout the region in order to improve water quality, community health and quality of life. Each year the Regional Water Quality Education Committee (WOEC), with MARC staff support, develops an NPS pollution-focused message that supports the program's theme and determines the most effective means to disseminate the message. The committee's education and outreach activities vary each year but typically consist of a media campaign, a mini-grant program, training, and education and outreach materials. This year, the program has identified and participated in stormwater management and training opportunities.

2015 PROGRAM ACCOMPLISHMENTS

Media Campaigns

In 2015, the public outreach campaign continued to target residents and homeowners, focusing on two topics of importance to water quality: reducing litter and encouraging the use of native plants. Campaigns typically include a variety of elements such as paid advertising, earned media, printed materials and other activities. MARC staff helps the committee with strategic planning for media campaigns, including message development, writing, graphic design and advertising purchases.

Stop Littering

The anti-litter campaign was designed to educate the public about how litter on the ground ends up in our region's streams and waters, untreated. The campaign's second phase in 2015 also targeted young adults and smokers, encouraging them to stop littering by raising awareness that cigarette butts are litter and should be disposed of properly. In addition to motivating people to stop littering, the campaign elements directed people to visit a Stop Littering web page to get more information and connect to resources that can equip them to help keep the community litter-free. MARC provided HTML emails with the anti-litter message for committee members to distribute through their own channels. A companion giveaway of automobile litter bags rounded out the campaign.

Medium	Number of Ad Placements	Estimated Gross Impressions
Indoor	46	Unknown*
Online	8	672,527
Print	6	285,000
Total	60	957,572+

**Actual impressions were significantly higher; Union Indoor Advertising does not estimate impressions.*

Native Plants

The committee's fall media campaign encouraged homeowners in the greater Kansas City area to choose native plant species for their yards and gardens. Messaging was developed with inspiration from the Blue Thumb program founded in Minnesota. Advertising targeted homeowners, neighborhood associations, gardeners/landscapers and those interested in green living. The campaign's goals were to educate

CAMPAIGN ELEMENTS
"Stop Littering"



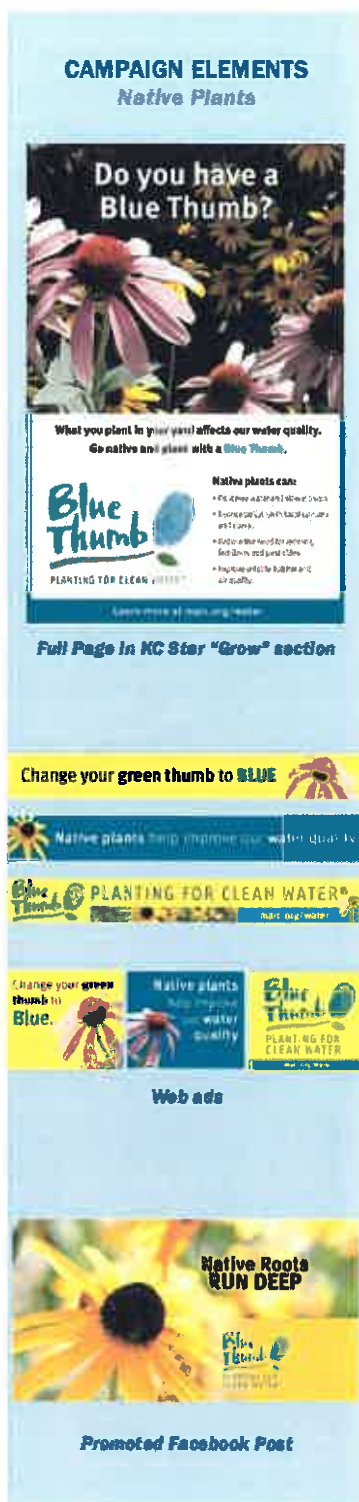
Print Advertisement



Promoted Facebook Post



Indoor Poster



audiences about the water quality benefits associated with the use of native plants, and to drive traffic to a website landing page for more information. Using a highly targeted media mix, the native plants campaign had strong results, with a cost per thousand impressions of \$8.85, and an above-average click-through rate for the digital advertising mix.

Medium	Number of Ad Placements	Estimated Gross Impressions
Online	30	2,168,914
Print	10	1,960,000
Radio	30	58,000
Total	70	4,181,914

Blue Thumb – Planting for Clean Water Program

In 2015, the WQEC joined the Blue Thumb – Planting for Clean Water program. This award-winning collaborative program was founded by Rice Creek Watershed District in Minnesota. The Blue Thumb program encourages homeowners to use native plants, rain gardens and other best management practices to reduce runoff from home landscaping and improve water quality. The program helps partners present a unified public education message and provides access to tools and information for communities to plant effectively for clean water.

GRANT PROGRAMS

Each year, the committee offers funding opportunities to local nonprofit and educational organizations for education and outreach events related to reducing stormwater runoff and improving water quality in area creeks and streams. Proposals undergo a competitive selection process and are evaluated by a grant selection subcommittee. The Water Quality Education Committee budgeted \$20,000 for grant awards in 2015, with a cap of \$5,000 per proposal. The following seven proposals were chosen for funding:

Missouri River Relief (\$1,000)

Missouri River Relief expanded its educational offerings with a pilot program of classroom presentations for middle- and high-school students, a watershed learning festival and a “Day on the River” program. The education events finished with a Big Muddy River Clean-up for people of all ages on Oct. 3, 2015. Students, parents and area residents went on the river to witness the highly visible effects of stormwater runoff and non-point source pollution in the riverscape. Debris removal was a part of the river clean-up.

South Grand River Watershed Alliance (SGRWA) (\$2,475)

The SGRWA partnered with Raymore Parks and Recreation, the city of Raymore, and the Missouri Department of Conservation to provide public education about the adverse impacts of stormwater

runoff and water pollution. Two demonstration landscape features were installed to mitigate the effects of runoff. SGRWA also purchased a mixture of native prairie forbs and grass seed for a prairie planting; a diverse selection of native shrubs and trees for streamside planting; and installed an informative sign.

StoneLion Puppet Theatre (\$4,000)

StoneLion Puppet Theatre conducted a two-part program: first, educating the public about the adverse effects of stormwater runoff and water pollution; and second, promoting policies and management practices that help reduce stormwater runoff and water pollution. Part one used a curriculum called “Stormwater in the Classroom.” Part two included a stormwater demonstration project and neighborhood tour called “Reducing Runoff in Rosedale.”

West 39th Street Community Improvement District (\$3,525)

In 2015, the organization’s Stormwater & Native Landscaping Initiative was adjusted to incorporate requests made by the community. Building on the successes of a hands-on workshop held in 2014, the CID hosted a public forum that focused on four topics: reduction of water use through native plant selection; preventing stormdrain debris and common stormwater runoff issues; best management practices with native species; and beautification through maintenance.

Ivanhoe Neighborhood Council (\$3,500)

Ivanhoe Neighborhood Council restored its existing rain garden using a unique, diverse and culturally relevant approach. The Toni & Zora memory garden will help improve air and water quality; reduce excess water runoff; recharge ground water; foster grass-roots, neighborhood-level educational outreach; increase access to fresh food; and offer positive economic impact on a small scale.

Blue River Watershed Association (\$2,750)

The Blue River Watershed Association and its partner organizations will conduct a “Revolving Green Around the Blue” restoration event in spring 2016. This public event has multidimensional goals, including habitat restoration for a section of the Blue River in the Conservation Opportunities Area (COA); emphasizing stream quality, good forest management practices and watershed health; promoting awareness, understanding and appreciation for Missouri’s natural resources; recruiting new outdoor users; and attracting and engaging new partners while strengthening existing partnerships.

Friends of the Kaw, Inc. (\$2,750)

Friends of the Kaw managed and facilitated two educational cleanup floats on the Kansas River, and prepared and implemented a water quality educational activity called “WQ Hydrocaching” (a geocaching activity) for area adults, families and groups.



TRAININGS

Webcasts

The committee hosted six webinars in 2015:

- "Using Illicit Discharge Programs to Monitor Bacteria," Feb. 18, 2015
- "The Runoff Reduction Method & Its Applications," March 18, 2015
- "Green Infrastructure & Green Jobs," May 20, 2015
- "Multi-Sector & Industrial Stormwater Permits," June 10, 2015
- "What to Do About Trashy Watersheds," Sept. 16, 2015
- "Checking in on Post-Construction Stormwater Management," Nov. 18, 2015

Stormwater Training

The WQEC hosted *Installation and Maintenance of Stormwater Treatment Best Management Practices* in November 2015. The one-and-a-half-day training course covered a broad range of topics geared toward landscapers, subcontractors and general contractors currently working with stormwater treatment BMPs and those wishing to gain experience with those systems. The training was held at the Anita B. Gorman Discovery Center and attracted 40 participants.

The training featured internationally renowned North Carolina State University instructors William F. Hunt III, Ph.D., P.E., and Bill Lord. Hunt is a professor and extension specialist in North Carolina State University's Department of Biological and Agricultural Engineering. Lord is an area environmental agent with the North Carolina Cooperative Extension Service.

PRINTED MATERIALS

Native Plants and Rain Gardens

- Continued to distribute *How to Build Your Own Rain Garden* and *Know Your Roots* brochures.
- Continued to distribute rain gauges designed with native species landscapes as promotional giveaway items.
- Redesigned and distributed *Do Not Mow/Native Planting* signage for BMPs.
- Ordered customized seed packets of a hardy, native biennial (for highest rate of growing success).

Pet Waste

- Distributed *Pick Up After Your Pet* waterproof signage to local municipalities.
- Continued distribution of *Pick Up After Your Pet* brochures.
- Distributed portable, refillable pet waste bag dispensers with *Pick Up After Your Pet* message as promotional giveaway items.

Lawn Care

- Continued to distribute *Build Your Own Rain Barrel*, *Redirect or Disconnect Your Downspout*, *Know Your Soil*, *Making and Using Compost*, and *Use Lawn Chemicals Wisely* brochures.



Brochure Translations

- Continued to use existing supply of Spanish-language brochures.

General Stormwater Education

- Updated the design for the Stormdrain Inlet Markers for local municipalities.
- Updated the design for the *Stormdrain Stewardship* and *Know Your Watershed* brochures.
- Continued to distribute *Keep Sediment Out of Our Water*, *Know Your Watershed*, *Protect Our Streams*, and *Stormdrain Stewardship* brochures.

Item	Quantity
Brochures	7855
Giveaways	1132
Total	8987

ADDITIONAL WORK

Sponsorships

The WOEC sponsored events that promoted the awareness of water quality issues:

2015 Sustainable Success Stories — Mid-America Regional Council honored local projects as 2015 Sustainable Success Stories. The 2015 awards highlighted a cross-section of sustainability efforts, with a focus on green infrastructure projects and initiatives, such as stormwater management, natural resource conservation and restoration, model policies and design approaches, community engagement, and urban forestry.

The honorees, selected by a panel of local judges, include:

- Antioch Urban Growers, Kansas City, Missouri.
- Avenue of Life Mattress Recycling Initiative, Kansas City, Missouri, and Kansas City, Kansas.
- Composting Program at Johnson County Community College, Overland Park, Kansas.
- Swope Campus Parking Lot and Sustainable Stormwater Improvements, Kansas City, Missouri Water Services.
- Legacy Park, Lee's Summit, Missouri.
- The Rozarks Urban Nature Trail System, Kansas City, Kansas.



Instructor Bill Lord giving tour of onsite BMPs

PROMOTIONAL ITEMS



Imprinted Auto Trash Bag



Seed Packets



Waterplaces: 100 works on paper by Lynn Benson
Photo by EG Schempf

Sponsorships continued

Waterplaces: 100 works on paper by Lynn Benson — This exhibit displayed 47 feet of vellum reflecting “water places” around the world. On Nov. 5, 2015 an artist lecture and panel discussion held at the Kansas City Design Center focused on water issues. The WOEC sponsored this event along with Kansas City Design Center, and members of the committee served as panelists.

Streamlining Communications

An email listserv was established to aid internal committee communications, allowing members to share news with and ask questions of the entire group. A photo and campaign materials “server” was also created, allowing members to access and use MARC’s water quality-related photos in their own outreach and communication efforts. The email listserv and Dropbox “server” are maintained and hosted by MARC staff.

Art Requests in 2015

Shared “Know your Roots” illustration, comparing roots of native plants with non-native plants, with the government of Lincoln County, Missouri. This popular illustration has been requested by numerous organizations across the Midwest over the last decade.

FUNDING

In January 2015, MARC submitted a program funding request to local governments for \$166,000. During the course of the year, 29 local governments supported the program. Participating governments are listed below.

PARTICIPATING GOVERNMENTS

Belton, Missouri	Overland Park, Kansas **
Blue Springs, Missouri	North Kansas City, Missouri
Clay County, Missouri	Gladstone, Missouri
Excelsior Springs, Missouri	Independence, Missouri
Peculiar, Missouri	Jackson County, Missouri
Platte County, Missouri	Johnson County, Kansas *
Kansas City, Missouri	Raymore, Missouri
Lake Lotawana, Missouri	Raytown, Missouri
Lake Waukomis, Missouri	Sugar Creek, Missouri
Liberty, Missouri	Weatherby Lake, Missouri
Lenexa, Kansas **	Unified Government of Wyandotte County /
Lee's Summit, Missouri	Kansas City, Kansas**

**(Contributes for all Johnson County cities and unincorporated areas)*

*** (Contributes additional funding above standard per capita rate)*

WQEC COMMITTEE CO-CHAIRS

Nico Cantenero, Water Quality Specialist,
City of Overland Park
Overland Park, Kansas

Lara Isch, Water Quality Educator
KC Water Services,
Kansas City, Missouri

MARC STAFF

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Alecia Kates, Water Quality Planner
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Nordia Epps, Public Affairs
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Caitlin Dix, Environmental Planning Intern

CONTACT

To learn more about the MARC Regional Water Quality Education Committee, contact Alecia Kates at akates@marc.org or 816-701-8233



Clean Water. Healthy Life.
www.marc.org/water

