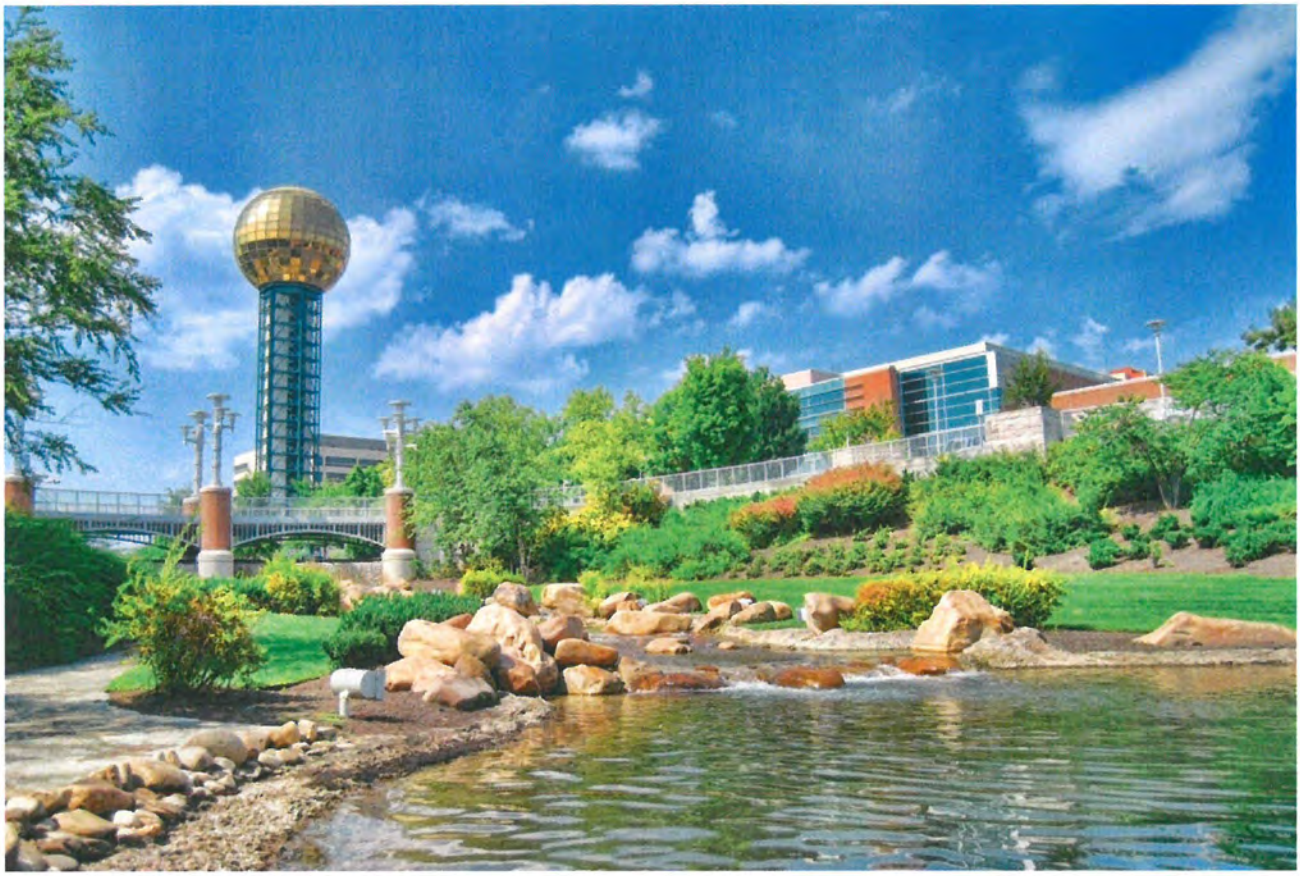
THE CITY OF KNOXVILLE
TENNESSEE

NPDES Permit Annual Report



National Pollutant Discharge Elimination System
Stormwater Discharge Permit TNS068055
July 1, 2016 - June 30, 2017

CITY OF KNOXVILLE

VL BH

Signature and Certification

NPDES STORMWATER PERMIT TNS068055
2016/2017 MUNICIPAL ANNUAL REPORT

FOR: City of Knoxville, Tennessee

Federal regulations, 40 CFR 122.22 (a) (3) and 122.22 (d), require the application and reports for the NPDES permit to be signed and certified as follows:

> *For a municipality, State, Federal, or other public facility, by either a principal executive officer or ranking elected official.*
>
> *"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 information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

Madeline Rogero — 12/20/17

Madeline Rogero
Mayor

Date

James R Hagerman — 12/14/17

James R. Hagerman, P.E.
Director of Engineering

Date

Approved as to form:

Charles W Swanson — 12-20-17

Charles W. Swanson
Law Director

Date

CITY OF KNOXVILLE

Engineering
James R. Hagerman, P.E.
Director of Engineering

December 26, 2017

Ms. Valerie McFall
Tennessee Department of Environmental and Conservation
Division of Water Resources
Knoxville Environmental Field Office
3711 Middlebrook Pike
Knoxville, TN 37921

RE: City of Knoxville, NPDES MS4 Permit # TNS068055
2016 – 2017 Annual Report

Dear Ms. McFall:

The City of Knoxville is pleased to submit the thirteenth annual report for the NPDES permit issued July 1, 2004. This annual report summarizes the NPDES activities during the twelve-month period of July 1, 2016 through June 30, 2017. The annual report was coordinated and prepared by the Engineering Department in conformance with the reporting requirements in the City's NPDES Permit Part VI.

If you have any questions or wish to discuss any of the NPDES Permit programs, please contact me by email at dhagerman@cityofknoxville.org or by phone at (865) 215-3251.

Sincerely,

David Hagerman, P.E., Stormwater Management

CC: Mr. Vojin Janjic

CITY OF KNOXVILLE

Engineering
James R. Hagerman, P.E.
Director of Engineering

December 26, 2017

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Tennessee Department of Environmental and Conservation
Division of Water Resources
Knoxville Environmental Field Office
3711 Middlebrook Pike
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Sincerely,

David Hagerman, P.E., Stormwater Management

CC: Mr. Vojin Janjic

City County Building • Room 480 • 400 Main Street • P.O. Box 1631 • Knoxville, Tennessee 37901
Office: 865-215-2148 • Fax: 865-215-2631
www.KnoxvilleTN.gov

CITY OF KNOXVILLE

Engineering
James R. Hagerman, P.E.
Director of Engineering

December 26, 2017

Mr. Vojin Janjic
Tennessee Department of Environmental and Conservation
Division of Water Resources Permits
William R. Snodgrass Tennessee Tower, 11th Floor
312 Rosa L. Parks Ave.
Nashville, TN 37243

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TABLE OF CONTENTS

1.0 INTRODUCTION

In 1996, the Tennessee Department of Environment and Conservation (TDEC), Division of Water Pollution Control first issued the City of Knoxville a Phase 1 National Pollutant Discharge Elimination System (NPDES) Individual Permit (TNS068055) for the discharge of stormwater from the municipal separate storm drain system (MS4). Stormwater from the City of Knoxville discharges directly to the Tennessee River and to major creeks that drain to the Tennessee River. Only a small portion of the MS4 runoff drains to sinkholes, ponds, and lakes throughout the area. The current permit was approved and made effective July 1, 2004 and expired June 30, 2009. In December 2008, City submitted a reapplication in December 2008 in the Year Four annual report. A revised reapplication was also included in the 2016 annual report.

The NPDES Permit requires an annual progress report for the Stormwater Management Program (SWMP) as outlined in the Part I and Part II applications. This annual report was completed in accordance with the reporting requirements of Part VI of the permit and will complete the requirements for the permit year from July 1, 2016 through June 30, 2017.

The Stormwater Division of the City of Knoxville Engineering Department coordinated preparation and submittal of the system-wide annual report. Information for the annual report has been provided by the Engineering Department, the Public Service Department, and the Solid Waste Management office. The Engineering Department has compiled the available information into the format outlined in Part VI of the current NPDES Permit.

2.0 CONTACTS LIST

David Hagerman, P.E., *(Primary Contact for City of Knoxville NPDES Related Issues)*
NPDES Stormwater Management (865) 215-3251 dhagerman@knoxvilletn.gov
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James R. Hagerman, P.E., Director
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Chad Weth, Director
Public Service Department (865) 215-2060 cweth@knoxvilletn.gov
P.O. Box 1631, Suite 467, 400 Main Street, Knoxville, TN 37901

3.0 STORMWATER MANAGEMENT PROGRAM (SWMP) EVALUATION

The objective of the City of Knoxville's SWMP is to protect the taxpayer's health, safety, and welfare through an economically viable comprehensive stormwater quality and quantity program. Although it is impossible to list all of the City's water quality accomplishments in this report, the City is proud to report some of the notable accomplishments related to the SWMP that occurred during the thirteenth year of this NPDES permit term.

- The City sponsored the 28th annual River Rescue that took place April 1, 2017. This event was coordinated by Ijam's Nature Center. The Spring 2017 River Rescue attracted over 700 volunteers who collected 11.5 tons of trash and 277 tires from the shores of the Tennessee River and its tributaries.

River Rescue

- The City coordinated with the Knox County Sheriff's Department volunteers to remove over 72 tons of trash and debris from the city's drainage systems. The volunteers donated over 1322 hours of labor in 19 locations, resulting in approximately $23,190 of savings to the City of Knoxville.

- To reduce pharmaceuticals in the river, the City participated in 5 unused medication collection events in 2016, resulting in a cumulative total of 21,575 pounds of medicine being disposed of properly, 6,097 pounds of packaging being recycled, and 1,727 mercury thermometers being exchanged since starting the program in 2009. This program is a collaborative effort between the City of Knoxville, Knox County, several utility companies, and local non-profits.

Medication collection at Food City

- In an effort to reduce sediment caused by rusted or failing culverts, approximately 2000 feet of deteriorating storm drain pipe were rehabilitated by using a cured in place liner pipe at eight different locations. This economic method reduces sediment in the stormwater by sealing the failed pipes without the disruption caused by collapse and eliminates the need for excavation.

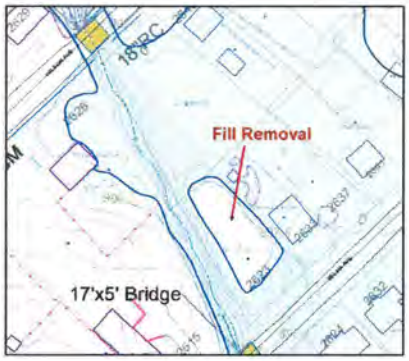
- To improve water quality and reduce chronic flooding on Elyria drive, the house, driveway, garage, and culverts were replaced with green infrastructure including grass swale and infiltration basin.

Infiltration trench at Elyria Drive

- The City hired S&ME Inc. to design stream restoration of approximately 200'of tributary to Goose Creek. This included creek realignment with a riffle-pool design, landscaping plan, and an exotic invasive control plan. The planting plan included native trees, live stakes, and a riparian seed mix. A bat habitation structure was also installed. The City implemented a mowing plan to protect the riparian buffer in an effort to increase the plant density and strengthen the stream bank against erosion.

- On Williams Creek, the City removed over 450 cubic yards of fill located within the floodway upstream from and adjacent to structures with chronic flooding.

- At Beaumont Avenue, the City installed an infiltration basin to reduce flooding in coordination with the adjacent school project.



Williams Creek sediment removal

Since the stormwater quality program officially started in 1996, the City has defined a baseline to compare future surface water improvements and/or degradations. Although the continuing improvements are incremental and difficult to measure quantitatively, many programs initiated since the inception of this program have undeniably improved surface water quality throughout the City. The long- term results are becoming more apparent each year. Many of the SWMP tasks were implemented beyond the minimum requirements when economically feasible.

Green Infrastructure at Beaumont Avenue

4.0 STORMWATER MANAGEMENT PROGRAM SUMMARY TABLE

SWMP activity summary tables for the last year of the NPDES permit program were compiled in accordance with the reporting requirements specified in Part VI(A)(2)(c) of the permit and are included on the following pages.

4.0 Stormwater Management Program Summary Table

MONITORING TASKS WET/DRY WEATHER	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Repeat High Parameter Sites	2 Outfalls repeated	Yes	2	Each outfall tested at least four times this year
Field Screening Industrial Outfalls	Visits to Industrial outfalls	Yes	72	Continued retesting outfalls from Industrial areas (four times)
Total Field Screening Outfalls	150 Outfalls	Yes	190	All field data sheets available for inspection. Outfalls tested four times this year. Summary in Appendix
Full Suite Stormwater Analysis (one station per year)	One Station / year	Yes	1 sample	Full Suite sample obtained at Williams Creek Monitoring Station.
Storm Samples at 5 monitoring stations	1 sample / quarter / 5 sites	Yes	20 samples	Summer: 5 samples, Fall: 5 samples, Winter: 5 samples, Spring: 5 samples
Ambient Samples at 5 monitoring stations	1 sample / quarter / 5 sites	Yes	20 samples	Summer: 5 samples, Fall: 5 samples, Winter: 5 samples, Spring: 5 samples
Storm Drain Televised	As Needed	Yes	6459 ft	Pipes are defined as sections between inlets, catch basins, junction boxes, or outlets.

STORMWATER MANAGEMENT & INDUSTRIAL PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Stormwater Quantity Requests for Service (Received / Resolved)	As Needed	Yes	756/662	Complaints are investigated as received and resolved as solutions or resources are available
Stormwater Quality Requests for Service (Received / Resolved)	As Needed	Yes	139/105	Complaints are investigated as received and resolved as solutions or resources are available
Special Pollution Abatement Permit Inspections	Annually	Yes	143	SPAP investigations.
Detention Pond Field Inspections	As Required	Yes	190	Field investigations.

4.0 Stormwater Management Program Summary Table

STRUCTURAL CONTROLS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Street Cleaning	Daily/Bi-Weekly	Yes	29,504 Miles	Daily for downtown streets. Frequency varies for other streets.
Litter Pick-up, Hand	As Needed	Yes	130,119 Bags	Routine Schedule
Catch Basin Cleaning and Repair	As Needed	Yes	1,259 Jobs	Per work order and requests
Ditching: Hand, Truck, & Track/Gradall	As Needed	Yes	7,998 Feet	Per work order and requests
Storm Drain Installation & Repair	As Needed	Yes	124 Jobs	Per work order and requests
Brush & Leaf Pick-up	Bi-Weekly	Yes	13,682 Loads	Bi-Weekly curb pick-up
Seed/Sod, ROW	As Needed	Yes	57 Jobs	Per work order and requests
Storm Drain Cleaning	As Needed	Yes	17,257 Feet	Per work order and requests
Grate Replacement	As Needed	Yes	66 Jobs	As Needed
Field Inventory & Inspection of On-Site Detention Facilities	Within 60 Months	Yes	As Needed	All new facilities are mapped after construction is complete. Existing facility's inventory is complete.
Creek Cleaning by Creek Restoration Crew	As Needed	Yes	7 Jobs	Creeks are inspected and cleaned on a routine schedule
Tree and Plant Planting	When Applicable	Yes	1270 trees	Trees were planted by the City's Service Department
Total Waste Recycled	As Brought In	Yes	33,799 tons	288 tons of paper, metal, plastic, glass, etc. and over 33,511 tons of yard wastes

4.0 Stormwater Management Program Summary Table

EDUCATIONAL PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Publicize Hotline Number (311)	Within 24 Months	Yes	Undetermined	Published in phone book, on road signs, pamphlets, radio PSA's, business cards, vehicles, etc.
River Rescue	Annual Event	Yes	1 day event	11.5 tons of trash and 277 tires removed by 700+ volunteers from 35 sites.
TN Association of Broadcasters	Ongoing	Yes	162	PSA's focused on urban water quality.
Storm Drain Marking (cast or decal)	As Needed or by volunteers	Yes	Undetermined	Both existing CB's marked with decals labeled "Dump No Waste-Drains to Waterway" & all new installs
Volunteer Creek Cleanups	Volunteers	Yes	10	A citizen based program that periodically hosts several creek cleanups in the spring and fall
Waterfest	Annual Event	Yes	1 Day Educational Event	A unique community event dedicated to educating citizens about water quality. Over 800 youths participated.
Pooper Scoopers	As Needed or by volunteers	Yes	120,000	Disposable dog waste containers were distributed to 48 different pooper scooper stations.

NEW DEVELOPMENT PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Residential/Commercial Inspections	As Required	Yes	6757	As Required
Final Inspections	As Required	Yes	187	As Required
Site Development Permits Reviewed	As Required	Yes	1627	As Required
Right of Way Permits Issued	As Required	Yes	56	As Required
As-Built Certificications Reviewed	As Required	Yes	157	As Required

5.0 NARRATIVE REPORT

The following narrative report is divided into the five main programs of the SWMP plus an additional section for specific Total Maximum Daily Load (TMDL) activities. The Phase 1 SWMP is described in the program element schedules listed in Part 2 of the permit application and Part IV of the permit. The main programs are listed as follows:

5.1 Residential and Commercial Program (RC).
5.2 Illicit Discharges and Improper Disposal Program (ILL).
5.3 Industrial and Related Facilities Program (IN).
5.4 Construction Site Runoff Program (CS).
5.5 Comprehensive Monitoring Program (MN).
5.6 TMDL Implementation and Activities.

Each of the above programs are further divided into separate program elements and related tasks that correspond to the Implementation Schedules listed in Part IV of the Permit and to the requirements listed in 40 CFR 122.26(d)(2)(iv). Each specific task is briefly discussed in accordance with the reporting guidelines outlined in Part VI of the NPDES Permit. Some sections of this report may be a paraphrased version of earlier reports when the particular task elements are ongoing.

5.1 RESIDENTIAL AND COMMERCIAL PROGRAM (RC)

Program of Structural and Source Controls for Reducing Pollutants to the Municipal Separate Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(A).

RC-1 Maintenance Activities for Structural Controls

SWMP Task: Continue Existing Maintenance Activities from Part 2 application

Status: Ongoing

The City's Public Service Department (PSD) currently performs maintenance of the municipal stormwater system using a database to track work tasks performed during the year. The database not only tracks labor categories (e.g., Equipment Operator) and labor hours devoted to each task, but also includes equipment type and costs. The PSD database produces summary reports for monthly and annual work production and costs. The database includes more than 80 task activities of which 18 are identified as relating directly or indirectly to stormwater management. Only a small portion of the stormwater conveyance system may be accessed by PSD, in areas located on public right-of-way (ROW) and city-held easements. The City generally assumes no responsibility for maintenance or improvements on private property even though crews may work in some of those areas to remove blockages, spills, and trash with permission or in emergencies.

Maintenance by the City within ROWs and easements is normally performed on an as-needed basis by the PSD, which has divided the City into six geographic maintenance zones. Approximately 75 percent of the storm drainage system maintenance work performed by the PSD is in response to direct calls from property owners, requests from the Engineering Department, and "311" calls. Under normal conditions, the PSD can respond to all complaints that are the responsibility of the City, as defined by the City's Stormwater and Street Ordinance (Ordinance). Other storm drainage system maintenance work is in response to maintenance needs detected by the PSD, such as repairing collapsed pipes, as well as routine duties relating to stormwater such as brush collection, leaf collection, street sweeping, and the cleaning of curb inlets. The Construction Division of the PSD performs non-routine storm drain maintenance and installation. The PSD logs all complaints by address and by category into a computerized database.

Vactor Combination Sewer Cleaner

The City has several multipurpose construction crews that perform storm drain installation. These crews are primarily responsible for installing stormwater infiltration Best Management Practices (BMPs), box culverts, and reinforced concrete pipe, as well as performing major repair to existing storm drains and building catch basins. These crews also provide emergency response in the event of flooding. A Storm Drain Maintenance Crew performs maintenance tasks such as: clearing culverts of debris, flushing storm drains, hand and mechanical ditching, and performing minor catch basin repair. The City owns a fleet of vehicles including two sizes of Vactor Combination Sewer Cleaners, a ditching machine, a variety of trucks, vacuum sweepers and many types of excavators.

SWMP Task: Develop Improved Stream Restoration and Channel Maintenance Program.

Status: Complete

Since the City's NPDES permit program began in 1996, many stream restoration projects have been completed along urban creeks throughout the city with the help of the Tennessee Stream Mitigation Program, TDEC, the Tennessee Valley Authority (TVA), the U.S. Army Corps of Engineers (USACE), the University of Tennessee, Knoxville (UTK), and the Community Action Committee (CAC) Americorps.

Since sediment, hydro-modification, and habitat alteration are the most common impairments in our urban creeks, the City will continue to focus on stream restoration projects where possible. Although these projects will certainly vary in scope, bio-stabilization techniques will be used instead of concrete or riprap. Whenever possible, the adjacent riparian zone will be enhanced with trees and native vegetation to provide cooling effects and help restore habitat.

The City will work with TDEC to obtain the appropriate Aquatic Resource Alteration Permit (ARAP) permits before work begins.

SWMP Task: Implement Improved Stream Restoration and Channel Maintenance Program.

Status: Ongoing

During this permit year, the City completed a flood mitigation project on Williams Creek and a stream restoration project on Goose Creek.

The City removed of over 450 cubic yards of fill located within the floodway at Selma Avenue to reduce flooding and allow improvement to the riparian buffer. The consolidated sediment was located upstream from and adjacent to structures with chronic flooding.

A stream restoration project was designed on Goose Creek that included creek realignment with a riffle-pool design. The project included a landscaping plan with an exotic invasive control plan and a planting plan with native trees, live stakes, and a riparian seed mix, as well as a bat habitation structure. A plan to prevent mowing to the edge of the stream was implemented in an effort to increase the plant density and strengthen the stream bank against erosion.

Sims Road stream restoration (before)

Sims Road stream restoration (after)

SWMP Task: Implement Structural Controls To Prevent Floating Discharges to the TN River.

Status: Ongoing

Since the summer of 1999, the City has coordinated with various agencies and area businesses to reduce the amount of floating pollution entering the river from the urban creeks. The City studied and implemented various solutions. Short-term solutions have included increasing the frequency of maintenance at the mouths of the major creeks, adding more trash receptacles at bus stops, and increasing public awareness. Long-term solutions include installing Harbor Boom temporary skimmers on major creeks and requiring treatment devices at areas with a disproportionate amount of stormwater pollution (hotspots).

During the first permit term, the City donated a new boat and hundreds of feet of trash skimmers which have helped Ijams to collect litter and debris along the riverfront in the downtown area. In addition, the City has contracted with Ijams to maintain a "Litter Free Zone" from the South Knoxville Bridge to the Alcoa Highway Bridge. Although the focus of this initiative has largely been to reduce unsightly trash from entering the river, the floating trash skimmers at the mouths of the creeks have effectively detained many oil/fuel spills until remediation personnel could respond. In this permit year, Ijams Nature Center employees spent 2,155 hours working in the No Trash Zone. We were assisted by volunteers spending 62 hours. We removed 246 bags of trash, 660 logs and 44 miscellaneous large objects. The main areas of concern were the KUB Water Intake at the Whittaker Water Treatment Plant and the Trash Booms at the mouths of First, Second and Third Creeks.

SWMP Task: Require Standard Maintenance Agreement for On-site Facilities.

Status: Ongoing

Since 1997, permanent maintenance agreements and/or covenants have been required for all new stormwater detention facilities and special pollution abatement devices (e.g., oil/water separators and catch basin inserts). A covenant is defined in Section 22.5-34 of the Ordinance as a legal document entitled "Covenant for Permanent Maintenance of Stormwater Facilities," which replaced the original "agreement" referred to in the Part II application and Part IV of the permit. A covenant does not require the Mayor's signature or Council approval, and the end result for water quality protection and flood control is the same. Covenants are recorded in the office of the Knox County Register of Deeds.

In the case of a lessee, Section 22.5-5 allows the City to require a Performance and Indemnity Agreement along with a surety bond or letter of credit to assure the stormwater facilities will be maintained and removed, if necessary, at the end of the lease. This is a provision to allow some property owners the ability to share the responsibility of maintenance with the lessee who will use the land and create the need for the stormwater facility.

The City will retain the right to inspect the stormwater facilities to insure they are properly maintained; however, the responsibility for the maintenance of stormwater facilities will remain with the property owner unless legally transferred to another person or entity by a properly recorded legal agreement. If the property owner does not maintain the facility properly, the City may authorize the maintenance to be completed and place a lien against the property for double the cost. To ensure access to the facility, a traversable access easement is recorded on the plat.

SWMP Task: Require Routine / Major maintenance of BMP facilities. Status: Ongoing

All stormwater facilities constructed since 1997 are required to be maintained according to the detailed agreement or covenant. These agreements and covenants are discussed in the previous section above and also in the Ordinance Sections 22.5-5 and 22.5-34. At a minimum, woody vegetation must be cut annually and sediment must be removed as necessary from

detention ponds to maintain proper function of the facility. The standard maintenance requirements for large underground facilities (e.g., detention or oil/water separators) include a minimum of quarterly visual inspections and annual maintenance. Smaller BMPs, such as catch basin inserts, must be inspected at least monthly and maintained quarterly. The City is currently developing ordinance clarification that will better define property owner responsibility and ensure maintenance on all critical BMPs without covenants.

The City has designated a full time employee to inspect stormwater detention basins and to notify property owners of any maintenance needs. During this permit year the City inspected 189 detention ponds. Sediment from the maintenance of detention/water quality ponds, treatment devices, or from stream restoration activities must be removed from the stormwater facility and disposed properly in a landfill classified for such material or used as fill outside the stormwater drainage system. The City does not propose to duplicate TDEC's efforts to regulate contaminated sediments from any stormwater management sources.

RC-2 Planning for New Development

SWMP Task: Review Stormwater and Street Ordinance to evaluate possible improvements to existing water quality and quantity requirements for new development. Status: Complete

The City of Knoxville revised the Stormwater and Street Ordinance in 2005 and in 2013. The ordinance may be accessed at www.knoxvilletn.gov/engineering. A brief summary of the current development requirements for stormwater detention and water quality control is included in the following paragraphs.

Stormwater detention is required for the following categories of development:

(1) All road construction exceeding one-half (1/2) acre of impervious area;

(2) All commercial, industrial, educational, institutional and recreational developments of one (1) acre or more of disturbed area;

(3) Large single-family or duplex residential developments of five (5) acres or more of disturbed area or five (5) lots or more;

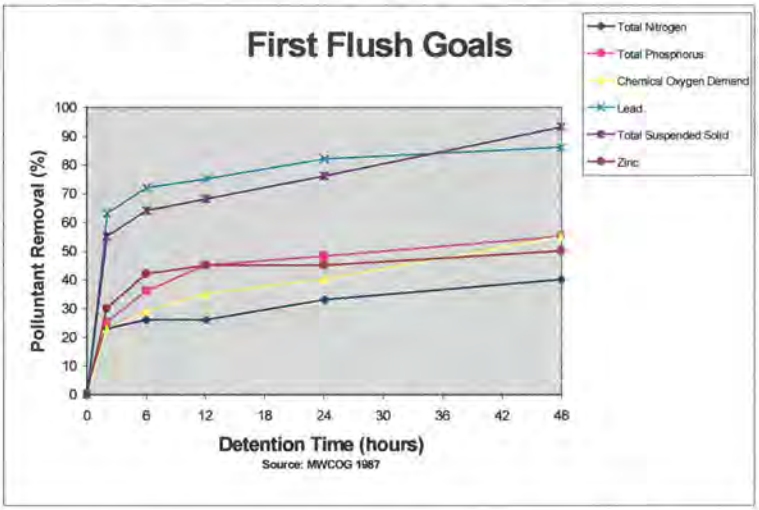
(4) Any site development which contains one-half (1/2) acre or more of additional impervious area.

(5) Any redevelopment that meets any of the four criteria above.

When a stormwater quantity detention pond is required, the Engineer must design the pond to control the runoff from 1-year, 2-year, 5-year, 10-year, 25-year and 100-year return frequency 24-hour storm events. The design Engineer must submit calculations to show that the detention facility will control the post development as required and that the downstream system is adequate to convey the flow from a 10-year storm. Detention may be waived for

some developments discharging directly into the Tennessee or Holston River, or if the developer submits supporting hydrologic and hydraulic computations to show that detention is unnecessary. For areas of redevelopment, detention requirements may be waived if the downstream stormwater system is adequate to convey the 2-year and/or 10-year 24-hour storms. The Ordinance clearly states that a waiver of detention requirements "does not exempt the developer from providing the first flush and/or water quality requirements" (Section 22.5-23).

The standard management method for water quality control from new development and redevelopment includes first flush control outlets in the quantity pond or in a separate quality device. The quality pond must be designed to collect the first one-half inch of direct runoff from the contributing drainage basin or the first 4,500 cubic feet of stormwater runoff, whichever is greater, and attenuate that runoff during a minimum period of 24 hours to a maximum period of 48 hours. Alternate treatment methods are accepted if they provide equivalent or better pollutant removal efficiencies than the standard first flush detention ponds.



The target removal efficiencies for the first flush treatment were estimated from the research and chart provided by the Metropolitan Washington Council of Governments' 1987 report titled "Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs." The target removal efficiencies for a 24-hour detention are estimated as follows: Total Suspended Solids – 76%, Lead – 81%, Zinc – 47%, Total Phosphorus – 44%, COD – 40%, and Total Nitrogen – 33%. The first flush for a flow-through device is determined by the flow rate using the 1.5 inch/24-hour design storm. The City chose 24-hour attenuation of the first flush since the pollutant removal rates for detention longer than 24 hours did not increase significantly. The City is proposing a different management method in the NPDES permit application in the Appendix of the 2016 annual report.

In addition to first flush treatment, Section 22.5-37 of the Ordinance requires a Special Pollution Abatement Permit (SPAP) for certain land uses identified as "hotspots" or that contribute pollutants which would not be effectively removed by the standard first flush control. The SPAP requires the operator to submit the management and structural controls necessary to address the expected pollutants and sources of pollution from the site after development. The typical special pollution abatement requirement is to provide water quality treatment through a water quality BMP along with a management plan to keep the site free of

illicit discharges and pollution sources. Special land uses that need a SPAP include large parking lots; any type of vehicle maintenance, fueling, washing, and storage areas; scrap and recycling facilities; restaurants; grocery stores; animal housing facilities; and other areas with concentrated bacteria sources. Most of these land uses are expected to have a much higher potential for either floatable pollutants (e.g., oil, grease, hydrocarbons, trash) or soluble pollutants (e.g., bacteria, nutrients) that would not be collected in a standard first flush pond. As the City implements the requirements of the NPDES permit and as other TMDLs are issued, other land uses may be added to the SPAP program to control specific pollutants.

The pollution from common hotspots is typically caused by illicit dumping/discharges from employees and contractors or from an increased volume of vehicle traffic. The SPAP program has effectively reduced pollution in our waterways by requiring planning and education to prevent pollution before it occurs from these hotspot sources. This is more economical for the operator and the City since it reduces the need for enforcement, penalties, structural retrofits, and downstream remediation. Some businesses have reported that the pollution control requirements have paid for themselves by reducing other normal costs.

The current Ordinance requires a riparian buffer zone of 30 or 60 feet for a drainage area that is less than or greater than one square mile, respectively. The RBZ is measured from the top of the bank and extends perpendicularly for the length of the water body. The natural streamside buffer zone must be shown on the plat and maintained in a stable condition for the life of the development. The Ordinance does not allow any actively eroding creek banks to remain after development is complete. This may require the stream bank to be stabilized as part of the construction project. If stabilization is necessary, hard armor may only be used when bioengineering alternatives are not technologically feasible.

SWMP Task: Require "No Dumping" message cast into all curb irons and solid stormwater catch basin covers installed in new developments. Status: Complete

In January 2000, the City set a new standard to require a "No Dumping" message to be cast in all new curb irons, grates and solid stormwater manhole/junction box covers. The following year, the City included lids for stormwater treatment devices in this requirement. The message is an attempt to educate the public that the City's storm drain system is not a sewer for waste. When polluters are caught discharging or dumping pollutants into the storm drain, they often plead ignorance to the fact that the storm drain is directly connected to City waterways. Before setting the standard, the City contacted the major foundries to be sure they could manufacture the new irons and remain competitive in Knoxville. East Jordon Iron Works, NEENAH, John

"No Dumping" message

Bouchard & Sons, Acheson, and Deeter are the primary foundries that provide irons in Tennessee. Each of the foundries were able to provide the new pattern without any additional cost to the development community. This standard may be the most cost effective educational program in the City.

SWMP Task: Master planning for site location of regional BMP facilities for areas of new development. Status: Ongoing

Large development projects, including neighborhoods/residential or strategically located smaller developments are most suitable for siting regional BMPs. Regional BMPs would serve multiple upstream developments and typically have drainage areas ranging from 50 acres to several hundred acres. Since most development activity within the City is primarily "infill" that occurs on the limited number of remaining vacant parcels, there are limited opportunities for siting regional BMPs without impacting existing developments.

The City owns and maintains three regional detention facilities. Those facilities include the detention pond at the Acker Place development, the detention pond located at the Northwest Crossing shopping center on Clinton Highway, and the retention pond at Victor Ashe Park. However, private developers continue to build regional detention ponds for developments that have drainage areas up to 100 acres or more.

In 2005, the City partnered with Knox County to hire a consultant to review the stormwater ordinances for each agency and to develop a master plan and a Storm Water Management Model (SWMM) for First and Whites Creek. Although the initial project focused on flooding, it created a base model that was expanded to include water quality parameters and analysis for the watershed. This allows the identification of potential locations for regional detention. The full report for the quantity model has been completed, evaluating three locations of regional detention. One potential area for improvement is an existing online pond south of Adair Drive on a tributary to First Creek. The other two locations are located on Whites Creek immediately upstream of I-640 and at McCampbell Road. The City has a full time hydrologist who is leading the effort to replicate the model in other watersheds.

SWMP Task: Review, update, and maintain guidance criteria for BMPs on City web page (www.knoxvilletn.gov). Status: Ongoing

The City has a comprehensive BMP Manual that details guidance criteria describing acceptable types of BMPs, design standards, and maintenance requirements to meet the requirements of the Ordinance. Because maintenance of BMPs is critical to their long-term effectiveness in reducing pollutant loading from stormwater, the guidance criteria incorporate maintenance considerations with the design criteria to ensure that effective and maintainable BMPs are constructed in the City. The guidance criteria address the goals of the NPDES stormwater program by only allowing BMPs that are effective in reducing pollutants targeted by the NPDES stormwater regulations. The BMP Manual will continue to be updated at least annually as

needed and made available at www.knoxvilletn.gov/engineering.

RC-3 Maintenance Activities for Public Streets, Roads, and Highways

SWMP Task: Continue street maintenance activities outlined in the Part 2 application.

Status: Ongoing

Street cleaning is performed daily for the downtown streets and less frequently for all other streets throughout the City. Seven Elgin Megawind Multi-Purpose Sweeper Vacs are used in most service areas. An Elgin Whirlwind Sweeper Vac is used on state routes in the evenings. In the downtown areas where maneuverability is key, an Elgin Pelican Street Sweeper is used. The Megawind vacuum trucks are also used to vacuum debris from catch basins and remove leaves in the fall. Mowing in City ROW is typically performed on a two to four week schedule between the months of April and September.

SWMP Task: Maintain current de-icing program and study alternatives and improvements.

Status: Ongoing

Snow removal, anti-icing, and de-icing of roadways are performed by the PSD and are essential programs to ensure public safety. Sodium chloride stored undercover at the Loraine Street facility is mixed with liquid calcium chloride and applied to highways and streets by spreaders as necessary. Application of de-icing/anti-icing materials targets highways and major arteries first, and residential streets next. Priorities follow the adopted Major Roads Plan of the City of Knoxville. Because of the importance of maintaining public safety and public commerce, the City aggressively pursues its road clearing operations.

The Public Service Department regularly evaluates snow removal activities/resources and revises the Snow Removal Plan as needed. The City has been able to significantly reduce the quantity of de-icing materials used by improved equipment, forecasting, chemicals, and operator training. A brine mixing facility is used as a source of de-icing solution during dry weather as a preventative measure, which further reduces the overall quantity of materials needed for de-icing operations. The City will continue to look for opportunities to minimize the use of de-icing materials to reduce costs and protect the environment.

RC-4 Evaluation of Flood Management Projects

SWMP Task: Evaluate regional BMP facilities for water quality retrofit. Status: Ongoing

The City owns and maintains three regional detention facilities. These facilities include the detention pond adjacent to Middlebrook Pike and Weisgarber Road at the Acker Place development, the detention pond located at the Northwest Crossing shopping center on Clinton Highway, and the regional retention pond at Victor Ashe Park. Although the regional

basins were designed for flood control, the City found that it was possible to retrofit the sites to achieve additional water quality benefits as well. All ponds built since 1997 are required to comply with the water quality requirements for new development.

The City continues to advance water quality improvements at the Acker Place detention pond in the Fourth Creek Watershed. A large section of Fourth Creek was restored downstream of the pond in the first year of the permit. In 2008, the City made significant improvements to the pond to reduce sediment off-loading from stream bank erosion, establish a flood plain, re-meander the channel to a more natural state, and restore vegetation. The City is currently evaluating further water quality retrofits to this regional pond through a partnership with an adjacent property development.

The regional pond at Northwest Crossing on Clinton Highway serves the Wal-Mart, Lowe's, and the surrounding area. The City accepted the maintenance of this pond and immediately designed a water quality retrofit to reduce the pollution in the stormwater runoff. Three large Crystal Stream stormwater treatment devices serve to effectively remove large amounts of trash, sediment, hydrocarbons and organic material from the runoff and prevent the discharge of those pollutants into the receiving stream. Additional outlet improvements are being evaluated now.

The retention pond at Victor Ashe Park was designed and built with water quality in mind. Three CrystalStream stormwater treatment vaults improve the quality of the stormwater runoff from the contributing parking lots, park, and subdivisions.

Maintenance and inspection of the CrystalStream units has been contracted out to CrystalStream's service company to ensure proper function at the regional ponds in Victor Ashe Park and Northwest Crossing.

SWMP Task: Maintain existing GIS inventory of on-site BMP facilities. Status: Ongoing

When the NPDES permit program first started, the City implemented a systematic method to inventory the existing detention ponds by using a Geographic Information System (GIS) grid of the city. Field crews inspected drainage features in each map grid and recorded the detention facilities in the GIS with a circled D. Since all new development must be certified to confirm that constructed facilities were built as planned, all new stormwater facilities are properly recorded in the GIS after construction.

Engineering staff will continue to maintain and update the existing inventory of ponds, pipes, water quality facilities and other drainage features as part of an ongoing GIS maintenance program. The City has several positions which maintain and update the GIS program including stormwater technicians designated to inspect and map field conditions, GIS staff who edit field note corrections, and a dedicated technician who inspects and records maintenance data related to stormwater detention/retention facilities.

RC-5 Monitoring of Solid Waste Facilities

This program is described in the management section IN-3 for industrial facilities.

RC-6 Management Program for Pesticides, Herbicides, and Fertilizer

SWMP Task: Evaluate possible improvements to existing public education programs as part of the illicit connection and improper disposal program. Status: Ongoing

Public education programs for pesticides, herbicides, and fertilizer use have already been implemented in conjunction with City public education programs for collection and recycling of household hazardous waste (HHW). In addition to the solid waste and household hazardous waste informational programs, the City has developed a stormwater pollution program that includes helpful information regarding pesticide and fertilizer use. The Knoxville BMP Manual located at www.knoxvilletn.gov/engineering offers two BMPs for proper pesticide, herbicide, and fertilizer use and disposal. BMP AM-13 is targeted towards institutional and commercial applications while BMP RH-05 is directed towards residential and homeowner uses.

The HHW collection program, which includes collection of pesticide, herbicide, and fertilizer waste material, was officially implemented when the facility opened on April 22, 1997. More information about the HHW facility is included in the Illicit Discharges and Improper Disposal Program, Section ILL-6.

SWMP Task: Reevaluate effect of fertilizers as part of the City's ongoing monitoring program. Status: Ongoing

Pesticides, herbicides, and fertilizer used by the City are stored in a building at the Loraine Street Operations Center. This building is in compliance with all regulations regarding the storage of hazardous materials. The Horticulture and Grounds Maintenance section of the PSD is responsible for the application of pesticides, herbicides, and fertilizer. The herbicide "Roundup" is applied annually to City parks and ROWs to control unwanted weed growth. PSD personnel have been trained to apply the herbicide as needed. Fertilizer is only used for minor landscaping projects and stormwater runoff from these projects is not considered a threat to receiving water quality.

The City does not currently require registration by commercial applicators; however, commercial applicators must be licensed under State and Federal Regulations. There are no regulations restricting the use of these substances by individual landowners. A permanent household hazardous waste collection facility is open six days per week to collect all types of hazardous wastes including pesticides, herbicides, and fertilizer.

The control program for pesticide, herbicide, and fertilizer pollutants is difficult to define since their presence in urban runoff is not always evident. Current problems with pesticide, herbicide, and fertilizer pollutants are not believed to be significant, but are included as part of

the ongoing stormwater monitoring program. Pesticides, nutrients and other indicators of these pollutants are tested as part of the ongoing monitoring program described in Sections 5.5 and 6.0 of this report. To date, no significant traces of pesticides have been detected in the annual full-suite grab sample.

5.2 ILLICIT DISCHARGES AND IMPROPER DISPOSAL PROGRAM (ILL)

Program to Detect and Remove Illicit and Improper Discharges to the Municipal Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(B).

ILL-1 Ordinances

SWMP Task: Implement any new revisions to the Stormwater and Street ordinance.
Status: 12 Months

The Stormwater and Street Ordinance was developed to specifically prohibit non-stormwater discharges, increase penalties for illegal discharges, and to provide water quality regulations for new development. The first ordinance was effective June 20, 1997 and has been updated several times since then. The City is working to update the Ordinance in 2016. The current Ordinance is available at www.knoxvilletn.gov/engineering.

The Ordinance Section 22.5-52 specifically prohibits illicit discharges and illegal dumping to any portion of the MS4 or any area draining to the MS4. Illicit discharges are defined consistent with 40 CFR 122.26(b)(2) as any non-stormwater discharge to the MS4. Exemptions to the non-stormwater prohibition are listed in the ordinance in accordance with the list in 40 CFR 122.26(d)(2)(iv)(B)(1). This definition, along with the $5,000 penalty for violations, has formed the cornerstone of our successful enforcement program and will remain in place during this permit term.

ILL-2 Field Screening

SWMP Task: Perform follow-up analysis at all high-risk screening sites. Status: Ongoing

The Dry Weather Screening Program was developed and implemented during the first permit term to evaluate both randomly chosen outfalls and high-risk outfalls which were tested during the previous year. Each high-risk stormwater outfall is checked for flow after a period of dry weather. If flow is present, the discharge is tested with a Chemetrics colorimetric field test kit for the following parameters: phenols, ammonia, detergents, copper, and chlorine. Presence of odor, oil sheen, and surface scum are also recorded, along with measurements of turbidity, pH, color, temperature, and flow rate. If ammonia or chlorine is detected, the property owner and/or responsible utilities company is notified and the investigation continues until the source

of the discharge is located and eliminated. Outfall testing is repeated again between four and forty-eight hours after the first test. After a minimum of one month, this process is repeated for each outfall to complete a total of four tests per year.

Since the implementation of this program has successfully identified and eliminated many illegal dumps and illicit discharges, the City will continue to annually retest all sites that have high levels of parameters or signs of illegal dumping. Once an outfall has tested clean or dry during four site visits in a single year, it will only be retested if randomly selected from the list of inventoried outfalls. The number of high-risk outfalls that need to be retested each year will vary depending on the tested results of the previous year. However, the trend shows that the number continues to decrease as shown in the figure on the following page.

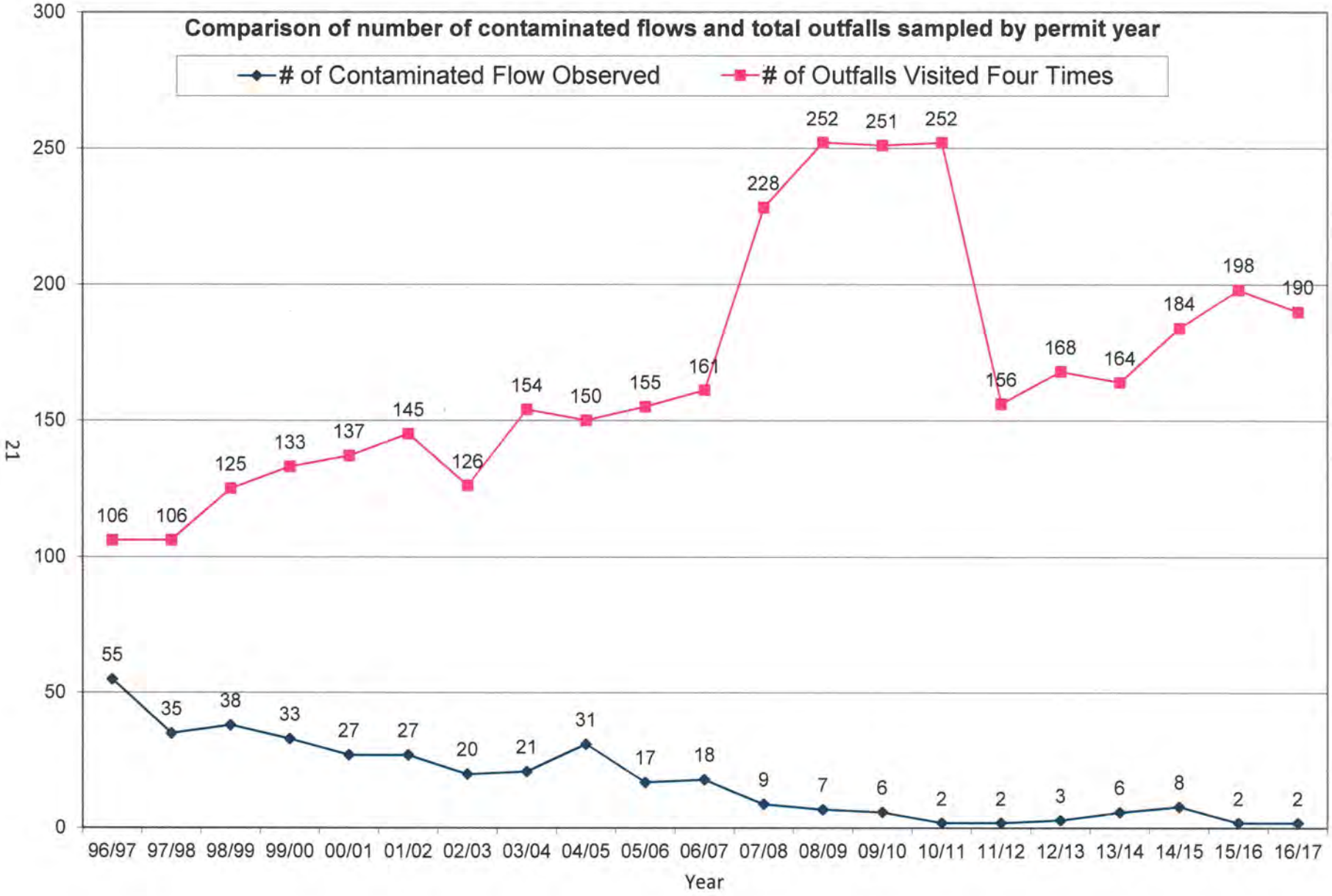
As required by Part VI (A)(2)(e)(ii) of the NPDES permit, the results of the dry weather screening that occurred during the last permit year are included in the Appendix of this report. Since the beginning of the program, approximately 14,150 outfall-screening visits have been conducted. The results from each of those visits are tabulated in the database by outfall identification number, testing date, and visit number.

SWMP Task: Investigate 150 field-screening sites four times per year. Status: Ongoing

To insure that all outfalls are eventually tested each permit cycle, the City will continue to monitor a minimum of 150 outfalls annually throughout the new permit term. Last year the City visited 190 outfalls four times each. The monitored outfalls consisted of the previous year's two high-risk outfall sites plus 188 randomly selected outfalls from the GIS outfall inventory. The randomly selected outfalls are generated primarily from industrial and commercial land uses that are new, have not been tested in the last five years, or have potential for high pollutant loads, as well as outfalls that have large drainage areas and/or highly concentrated development.

The Engineering Department has developed an outfall database to maintain the testing data and site information for each outfall in the inventory. This outfall database is linked to the GIS to allow data access geographically for a single point or by report/query functions for many outfalls at a time. By maintaining a history of each outfall, illicit discharge trends may become apparent and therefore resolved with education or enforcement.

The Dry Weather Screening Program has been one of the most successful programs in reducing illicit discharges since its inception in 1997, as seen by the trend line and number of contaminated discharges displayed in the figure on the following page. This program has resulted in over a 90 percent reduction in illicit discharges, including those from large and/or chronic polluters.


Comparison of number of contaminated flows and total outfalls sampled by permit year
# of Contaminated Flow Observed
# of Outfalls Visited Four Times
300
250
200
150
100
50
0
106 106 125 133 137 145 126 154 150 155 161 228 252 251 252 156 168 164 184 198 190
55 35 38 33 27 27 20 21 31 17 18 9 7 6 2 2 3 6 8 2 2
96/97 97/98 98/99 99/00 00/01 01/02 02/03 03/04 04/05 05/06 06/07 07/08 08/09 09/10 10/11 11/12 12/13 13/14 14/15 15/16 16/17
Year

ILL-3 Investigation of the Storm Drain System

SWMP Task: Implement procedures for mapping, field surveys and upstream source identification. Status: Ongoing

The procedures for mapping, field surveys and upstream source identification were developed and included in the Part 2 Application in Section 5.3.5. The City will continue to utilize these procedures to maintain the effectiveness of the Illicit Discharge and Illegal Dumping Program. During this year, there were no updates to report for this procedure. If the procedure is updated, it will be included in the following annual report.

SWMP Task: Evaluate and update enforcement procedures, policies, monitoring and inspections. Status: Ongoing

The schedule for this task appropriately coincided with the schedule for Ordinance updates. The existing enforcement procedures and policies have been effective and were last updated as part of the Enforcement Response Plan for the Qualifying Local Program (QLP) requirements in 2013.

Depending on the violation, a first-time offender is usually educated and asked to remediate the damage or correct the violation if possible. This is usually followed up with a letter to inform the violator of the City's expectations and to provide helpful BMPs to prevent future problems. More severe or repeated violations result in the issuance of a Notice of Violation (NOV). Copies of the NOV are distributed to the property owner or developer by certified mail and the Engineering Department's file. The NOV may order specific remedies and require the violator to submit reports and/or pollution prevention plans. Penalties, if any, are only issued after the NOV expires so the violation and remedies may be fully evaluated.

In the event that a penalty is assessed, a violator may appeal the penalty before the Environmental Appeals Board. The five volunteer members of the Environmental Appeals Board are appointed by the Mayor and consist of individuals with an expertise as follows:

1) One licensed professional engineer with three (3) years of engineering experience as a Professional Engineer;
2) One architect, engineer, landscape architect or surveyor with three (3) years of experience;
3) One representative of the development or industrial community;
4) One neighborhood representative; and
5) One member at large.

Board members serve a five-year term and may be re-appointed at the end of their term for one additional consecutive term. Members may be reappointed after skipping a term.

To help identify repeat violators, the City maintains an updated record of every NOV issued and a database for stormwater complaints. Follow-up monitoring and inspections are performed by the City and through self-inspections by industries. Enforcement actions resulting from the

Dry Weather Screening Program are carried out as defined within that program, as a minimum, and any outfall with significantly high levels of contamination is identified as an illicit connection/illegal dump source and tested four times a year, every year, until the outfall is dry or clean on four consecutive visits. Sources of pollution identified by other means will be monitored as needed or specified for the individual situation. Section 22.5-53 of the Ordinance requires immediate reporting of spills and illicit discharges and Section 22.5-54 allows the City to require additional monitoring.

SWMP Task: Inspect stormdrain system and update features on GIS. Status: Ongoing

The City is dedicated to maintaining and updating the existing inventory of ponds, pipes, water quality facilities and other drainage features as part of an ongoing GIS maintenance program. This task is implemented by a concerted effort within the Engineering Department. Three GIS staff members, as well as a Stormwater Engineer and two technicians are responsible for updates to the stormwater GIS layers as changes occur. All new developments require a development certification submitted by a design professional upon completion. The analyst in the Stormwater Division records the storm drain features from the development certifications into the GIS. Field personnel are instructed to log and report any discrepancies that are found between the maps and actual system in the field, and provide corrections to the editors so that mapping may be updated.

ILL-4 Spill Response Program

SWMP Task: Coordinate with Knoxville Emergency Response Team (KERT) and TDEC.
Status: Ongoing

The City of Knoxville Stormwater Division of the Engineering Department continues to coordinate with both the KERT and TDEC during emergency situations. Each agency has specific roles to play during an emergency event. When discharges enter the MS4, the City's Stormwater Quality Section assists with information gathering, investigations, GIS support, containment, remediation, follow-up monitoring, and enforcement when necessary.

The Knoxville-Knox County Emergency Management Agency (KEMA) and/or the Knoxville Fire Department (KFD) coordinate most major spills when they are called in to 911. KEMA also coordinates routine training and simulations for various situations throughout the year. Workshops are provided to simulate real scenarios and allow coordination of the field teams and the Emergency Operations Center (EOC). Engineering Department staff participate in the EOC while the KEMA, KFD, Knoxville Police Department, and Rural Metro units perform the field exercises.

The KFD and Engineering Department coordinate to respond to small spills and possible hazards as they are identified. The two groups will continue to work closely together to contain and remediate discharges in the street, stormdrain system, creeks or wherever necessary. The KFD maintains a fireboat downtown on the waterfront and a Hazardous

Materials truck in one fire hall to assist with spills and significant discharges into the river, creeks or storm drains.

When a responsible party is identified for a spill or hazardous discharge, the Engineering Department staff follows normal investigation and enforcement procedures to ensure containment and remediation at the violator's expense. The City's HAZMAT team will work to contain the spill until the responsible party takes over. The HAZMAT team will then report back to the station to be ready for the next emergency while Stormwater staff monitor the remediation of site until the stormdrain and creek are restored.

This year, Stormwater staff responded to assist the Fire Department with a variety of spills including vehicle accidents that lost fuel, illegal dumping, and discharges from permanent facilities. The Stormwater management staff monitors water quality and provides technical assistance and enforcement. The small releases from accidents and illegal dumping were contained by the Fire Department and Stormwater management staff. Stormwater staff and/or PSD personal will typically remove and dispose of the materials from small spills. Larger spills are referred to a private remediation company or the responsible party. Engineering staff will continue to closely coordinate with other emergency personnel by attending the monthly Local Emergency Planning Committee meetings and by maintaining a staff member on call after hours and on weekends to help respond to water quality emergencies.

ILL-5 Reporting of Illicit Discharges

SWMP Task: Maintain and monitor the "Water Quality Hotline" for public reporting.

Status: Ongoing

The objective of this task is to increase the public awareness of the City's role in water quality issues and to create a quick and anonymous method for citizens to report water quality concerns. The publicity of the hotline handled through a permanent 311 call center has already provided a consistent and convenient resource for concerned citizens. The City includes the 311 number in stormwater pollution prevention educational handouts such as magnets, brochures, presentations, business cards, and routine correspondence with residents.

The 311 Call Center has received a variety of calls including: industrial discharges, gray water discharges, broken laterals, commercial washing, and dumping by neighbors. The 311 number has been a popular and convenient method for callers to anonymously report problems that they have witnessed or created. Common calls are from neighbors or dissatisfied employees of polluters. This program has been very successful and will be continued throughout the permit term.

SWMP Task: Supplemental Public Education Programs. Status: Ongoing

River Rescue

The year 2017 was the 28th year for the River Rescue, which attracted more than 700 volunteers who collected 11.5 tons of trash and 277 tires from the shores of the Tennessee River. Ijams Water Quality Specialists plan for this event throughout the year by recruiting volunteers, surveying riverbank conditions, securing additional sponsors, and pinpointing areas in need of cleanup.

Adopt-A-Stream

The City of Knoxville has worked with Knox County and the Town of Farragut to administer the Adopt-A-Stream (AAS) program for 13 straight years. The City has provided the supervision and training in addition to gloves, trash bags, pitchforks, wheelbarrows, waders, and other tools for these activities.

University of Tennessee students on the 3rd Creek Greenway

Adopt-a-Watershed

Currently, fourteen area high schools and middle schools are participating in the Adopt-a-Watershed (AAW) program. The Americorp volunteers coordinate the program with the individual schools. This program has helped implement the goals of the NPDES program and to increase public awareness of water quality issues. The primary goals of the AAW program include:

- Characterizing the school's watershed using, at minimum, two AAW characterization tools (e.g., watershed inventory, watershed mapping, windshield survey, stream walk).
- Monitoring the school's watershed stream(s), conducting, at minimum, chemical testing twice and a biological (i.e., macroinvertebrate and/or fish) assessment once per year.
- Conducting at least one water quality improvement activity such as tree planting, creation of storm drain placards, stream cleanup, stream bank restoration, and presentations to school groups/community organizations on the "state of the watershed" as determined by the students' characterization/monitoring efforts.

The City worked with the schools to provide support such as information, solid waste support for cleanups, GIS maps, testing supplies, training, and grants.

City Employee Training

The City has two stormwater pollution prevention videos from Excal Visual to train City employees. The *Illicit Discharge Detection & Elimination* and *Rain Check* videos outline BMPs for stormwater pollution prevention and has been shown to the Public Service, Engineering,

and Fleet departments. To learn more about the videos, go to www.excalvisual.com. The City also participates in educational webinars, the Tennessee Stormwater Association (TNSA) symposium, and TDEC Erosion Prevention and Sediment Control (EPSC) certifications.

Public Displays and Presentations

Stormwater staff presented displays and informational materials at several public events including the Dogwood Arts Festival, The Neighborhood Conference, and Earth Day Celebration. Various environmental presentations were also made to citizens through groups such as the AAS and rain barrel workshops. A rain barrel was raffled off at The Neighborhood Conference at the Downtown Convention Center in 2016.

Educational Display at the Neighborhood Conference

ILL-6 Used Oil & Toxic Materials Program

SWMP Task: Continue coordination of Recycling Program. Status: Ongoing

The Solid Waste Division manages the City of Knoxville's recycling program. The entire annual report of these programs is included in the Appendix of this report. This program is an important part of the City's solid waste reduction efforts and will continue in the future.

SWMP Task: Maintain and Operate Household Hazardous Waste Facility. Status: Ongoing

When first opened in 1997, the City of Knoxville Household Hazardous Waste Facility was the first permanent HHW Collection Center in the State of Tennessee. The HHW Facility is open six days a week. The center accepts HHW from both Knoxville and Knox County residents. Knox County shares in the annual costs of operation. The capital expenditures associated with construction of this facility were partially paid for through a grant from the State of Tennessee. Activities at the center include:

- Diverting reusable products;
- Collecting, reusing, and solidifying latex paint;
- Collecting car batteries, oil, and antifreeze;
- Diverting selected acid and bases to wastewater treatment;
- Bulking flammable materials; and
- Packing miscellaneous HHW materials for safe shipment and disposal.

Upon entering the HHW Collection Center, customers pull into a covered drive-through unloading area, where technicians remove HHW from their vehicles. Material that is collected and is still usable is separated and made available for pickup by the public free of charge in a

"reuse area". Usable material includes containers that have never been opened or materials that have not yet exceeded their useful shelf life. The staff then processes materials that are not reusable; diverting selected acids and bases to the wastewater treatment facility, bulking flammable materials, lab packing, and solidifying latex paint. After materials are processed, they are packed into 55-gallon drums that are placed in one of two prefabricated storage units. Each of these units has a special fire suppression system, and drainage/spill containment systems. The hazardous materials are then stored in the units and held until sufficient quantities are collected. The HHW is operated by technicians trained to the 40-hour OSHA site worker level and managed by an on-site foreman and manager.

5.3 THE INDUSTRIAL AND RELATED FACILITIES PROGRAM (IN)

Program to Monitor and Control Runoff from TSD and Industrial Facilities Subject to SARA Title III, Section 313 requirements, 40 CFR 122.26(d)(2)(iv)(C).

IN-1 Ordinances

SWMP Task: Evaluate and implement revisions to the prohibitions and exemptions of non-stormwater discharges in the existing Stormwater and Street Ordinance. Status: Complete

The Stormwater and Street Ordinance was developed to specifically prohibit non-stormwater discharges, increase penalties for illegal discharges, and to provide water quality regulations for new and redevelopment. The latest version of the Ordinance was implemented in 2013 and may be accessed at www.knoxvilletn.gov/engineering.

Section 22.5-52 of the Ordinance specifically prohibits illicit discharges and illegal dumping to any portion of the MS4 or any area draining to the MS4. Illicit discharges are defined according to 40 CFR 122.26(b)(2) as any non-stormwater discharge to the MS4 that is not specifically exempted in 40 CFR 122.26(d)(2)(iv)(b). This definition, along with the $5,000 maximum penalty for violations, have formed the cornerstone of our successful enforcement program.

SWMP Task: Implement any new revisions to the Stormwater and Street Ordinance.
Status: 12 months

This task is discussed in the management Section ILL-1.

IN-2 Inspection Element

SWMP Task: Continue inspection program for non-permitted commercial facilities (e.g., car lots, restaurants, service stations, and grocery stores. Status: Ongoing

The City has identified many common discharges from facilities that were not required to be permitted under the TDEC multi-sector general stormwater permit or individual NPDES permit programs. Rather than spend limited resources attempting to duplicate the efforts of TDEC

and Environmental Protection Agency (EPA) by monitoring existing permitted facilities, the City added a Special Pollution Abatement Permit (SPAP) program for those specific land-uses that have proven to cause polluted runoff problems (hotspots). Section 22.5-37 of the Ordinance requires a SPAP on new development and redevelopment of projects for certain land uses. This program is used to eliminate gaps in the existing State and Federal permit programs through a local inspection program for otherwise non-permitted facilities.

The City has a dedicated Stormwater Technician to perform additional education and inspections for industry and certain commercial areas. The technician performs most of the industrial and commercial facility inspections on sites that currently have a SPAP. Other technicians also perform inspections as needed. A complete list of the SPAP facilities that were inspected during this permit year can be found in the Appendix.

Each of the SPAP facilities is required to have some type of structural stormwater treatment device (e.g., oil/water separators, catch basin insets, sand filters, grass swales) in addition to their pollution prevention management controls. During the SPAP inspection, the City typically reviews the facilities maintenance records, provides technical advice on proper maintenance scheduling, records the GPS coordinates of the stormwater treatment devices if needed, and updates the City's industrial and commercial facilities database. Inspection of the SPAP facilities occurs systematically to insure that the structural controls are maintained and the management controls are being followed.

Stormwater Quality compliance inspections for non-SPAP sites are conducted in direct response to specific complaints from citizens or tips from 311 calls. The City decides on a case-by-case basis whether this group of inspections will use education or enforcement to correct any problems found. In some cases, an existing facility that is not "new development" or undergoing "redevelopment" may be required to apply for a SPAP to correct violations.

The inspection program focuses on performing routine and/or random inspections on a variety of commercial sectors. The inspectors work with businesses to develop site-specific pollution prevention plans (SWPPPs), employee training, and structural modifications, if needed. The City's BMP manual has a wide assortment of information to assist a variety of businesses in developing their SWPPP. Since these businesses may not be regulated in a current permit program, many of the operators are not knowledgeable about how their actions impact water quality in area streams.

Section RC-2 of this report provides more details on the SPAP program.

SWMP Task: Collect and analyze Notices of Intent (NOIs) from Industrial Permit applicants.

Status: Ongoing

When NOIs are received from TDEC or directly from the private industry, the City reviews and evaluates the information for potential impacts to the municipal storm drain system. In the past, the NOIs have been instrumental in locating and removing discharges from local

industries. During inspections or enforcement actions with an industry, the City may verify that an NOI has been filed.

SWMP Task: Identify potential industrial discharges through Illicit Connection and Improper Disposal Program for both stormwater and non-stormwater discharges). Status: Ongoing

The Illicit Connection and Improper Disposal Program defined in the City's Part 2 NPDES stormwater permit application and in the previous section of this report, primarily addresses runoff from industrial facilities. A large portion of dry weather screening occurs from areas of industrial use or outfalls indicated by a "300" in the identification number. Illicit connections or improper disposal from industrial facilities that are discovered while inspecting the storm drain system under this program are recorded in the facility's file in the Work Manager Database. The City contacts the industrial facility directly, along with TDEC if necessary, to identify the problem and work on an appropriate solution. If enforcement action is necessary, the City will track the situation until the illicit connection is corrected, the illegal dumping stopped, or until the facility receives a valid NPDES permit for the discharge.

SWMP Task: Review and update inspection program as part of Pollution Prevention Plans for Municipal Industrial Facilities (MIFs). Status: Ongoing

The City has developed an inspection and pollution prevention program for municipal industrial facilities. Currently only five MIFs are operated in the City. These facilities include:

- The Solid Waste Management Facility (SWMF) on Elm Street,
- The fleet truck and heavy equipment garage on Loraine Street,
- The fleet and police garage at Prosser Road,
- The Knoxville Area Transit (KAT) bus station on Magnolia Avenue, and
- The KAT Station on Church Street.

Each facility is currently evaluated and inspected regularly by Stormwater staff and will continue to be inspected at least annually in the future. The KAT facility is the newest of the MIFs and was built using LEED standards including stormwater quality treatment devices for the runoff.

The inspection and monitoring program has been productive at all of the MIFs in the past. Structural and management BMPs have been installed to control pollution and improve the water quality of runoff from each facility. The SWMF has been retrofitted with structural controls to reduce the solids, sediment, hydrocarbons, and bacteria in the runoff from the paved areas. Additional water quality improvements have been constructed at the SWMF that include new grit/sediment sumps, floatables skimmers, grass swale, and low flow modifications to the detention pond.

IN-3 Monitoring Element

SWMP Task: Collect monitoring data from industrial stormwater dischargers and/or from TDEC. Assess impacts to the storm drain system. Status: Ongoing

As part of the NPDES Permit for stormwater discharges associated with industrial activity, applicants are required to monitor, at least bi-annually, representative stormwater outfalls identified in the facilities' SWPPPs. Applicants must monitor in accordance with TDEC Rule 1200-4-10-.04. The Stormwater and Street Ordinance authorizes the City to require additional monitoring from industries not covered under the TDEC programs whenever necessary. This will usually be required in conjunction with some enforcement action after a problem has been observed. The City maintains this information to assess the impact of the monitored discharges on the water quality of the storm drain system as the City receives the data.

If the City determines that additional data needs to be provided in the monitoring program for an industry (e.g., reports on additional parameters), requirements for an expanded program for subsequent monitoring events is coordinated with TDEC and/or the industrial discharger.

SWMP Task: Continue monitoring program at non-permitted commercial facilities using guidelines pursuant to 40 CFR 122.26(d)(2)(iv)(c)(2). Identify pollutants and sources and analyze the results from ongoing commercial monitoring program. Status: Ongoing

The City has developed a monitoring program to sample commercial hotspot sites that do not require TDEC or EPA Industrial NPDES permits. This monitoring program was implemented to play an important role in determining the future direction of the SPAP program and to verify the suitability and effectiveness of the SPAP runoff controls. Since 2006, the City has sampled commercial hotspots of various land uses such as grocery stores, restaurants, gas stations, large parking lots, car wash, auto repair, mulch facility, animal facility, grease recycling, homeless camps and multiple municipal industrial facilities. This data will further identify and regulate target pollutants by land use.

The City has monitored the effectiveness of a water quality BMP installed at the downstream termination of the Cumberland Avenue Corridor. The area was previously identified as significant pollutant source due to the urban nature of the drainage area. Multiple hot spots drain to this outfall at Third Creek where a problematic trash zone was identified and currently exists. The proximity to the University of Tennessee also creates a unique and chronic trash issue. Monitoring the outfall from this location effectively monitors the discharges of approximately thirty-five (35) hotspot locations. The City began construction of a capital improvement project along Cumberland Avenue that included installation of a regional water quality treatment device. Performance of the device will continue to be monitored over time to ensure optimal functionality. During the monitoring of the BMP, the type and volume of pollution were revealed to be much different than anticipated. Necessary structural alterations to the treatment unit have already been identified to improve performance.

The City has reviewed the monitoring program, developed a strategy for future direction and optimal use of resources to improve the SPAP program. Starting with Fiscal Year 2017/2018, the City will use this data to develop and implement a monitoring plan to sample pre- and post- flows from sites that are currently in the SPAP program as well as City owned MIF with water quality facilities to ensure that these devices are functioning as intended. Part of BMP monitoring includes visual inspection, which is included in SPAP inspections. Refer to the Appendix to view the SPAP inspection log. The information gathered from these inspections will be used to ensure that BMPs in the field are targeting the pollutants of concern and do not become a source of pollution themselves due to inadequate treatment or lack of maintenance.

In addition to the stormwater sampling above, all outfalls from industrial areas have been tested as part of the dry weather field-screening program to identify potential specific sources of the pollutants. Each year the City chooses random outfalls from industrial areas as the primary dry weather screening locations. These outfalls are tested with field screening kits using additional laboratory tests as necessary.

Additional monitoring and reports from Hazardous Waste Treatment Storage and Disposal Facilities and industrial facilities subject to SARA Title III, Section 313 may be required when a problem has occurred, when the City has reason to believe a pollution problem exists, when TDEC or EPA do not already require sufficient testing, or if the City is mandated to test and report those facilities. Legal authority to require reports is maintained under Section 22.5-54 of the Ordinance.

SWMP Task: Maintain adequate legal authority to require monitoring and reports from TSDs and Industrial facilities subject to SARA Title III, Section 313. Schedule: Ongoing

The Stormwater and Street Ordinance Section 22.5-54 states, *"The Director of Engineering may require any person engaging in any activity or owning any property, building or facility (including but not limited to a site of industrial activity) to undertake such reasonable monitoring of any discharge(s) to the stormwater system operated by the City and to furnish periodic reports of such discharges."* The City will maintain this legal authority to require monitoring from all facilities necessary when the Ordinance is updated in the next permit term. Additional monitoring may be required when a problem first occurs or still exists, when the City has reason to believe a pollution problem exists, when TDEC or EPA do not already require sufficient testing, or if the City is mandated to test and report those facilities.

SWMP Task: Evaluate and update the monitoring program for Municipal Industrial Facilities. Status: Annually

The City has implemented limited testing at these facilities including ambient monitoring, dry weather screening, and industrial stormwater inspections conducted by Stormwater staff. Initial monitoring inspections resulted in some of the structural modifications mentioned

above in Section IN-2 as well as updated management policies and procedures. The City evaluates the current monitoring at MIFs annually to test effectiveness of installed structural controls, using appropriate sampling frequency and laboratory analyses.

The Dry Weather Screening Program will continue to monitor the outfalls from all MIFs to insure that management controls are effective.

SWMP Task: Manage and Conduct Monitoring Program at MIFs. Status: Ongoing

Each year, the MIF sites are inspected at least once for non-stormwater flow in dry weather. If flow is observed, the normal dry weather screening parameters are analyzed, recorded, and investigated. In addition to the dry weather screening, grab samples are collected from storage/maintenance areas at the City's Loraine Street facility, the Solid Waste Management Facility, Prosser Road Police Garage, and the KAT bus station (see analysis results on p. 54).

MIF monitoring programs to test effectiveness of installed structural controls have taken place at the Loraine Street facility and the SWMF. Two vault-type stormwater treatment units were installed side-by-side at the Loraine Street facility for a full-scale BMP investigation project. Inflow and effluent samples were collected from each of the structural devices to determine the efficiency of each unit. After a significant amount of bacteria was found in the runoff at the SWMF, the City installed an Aqua-Swirl and Aqua-Filter system for sediment and bacteria removal. Monitoring results indicate significant removal rates for sediment and bacteria. Stormwater runoff from the SWMF is sampled annually as described in IN-3.

5.4 CONSTRUCTION SITE RUNOFF PROGRAM (CS)

Program to Implement and Maintain BMP Plans to Reduce Construction Site Runoff to the Municipal Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(D).

CS-1 Site Planning

SWMP Task: Requires construction sites greater than 10,000 sq. ft. to submit Erosion and Sediment (E&S) Control Plans. Status: Ongoing

The Ordinance specifically requires construction sites greater than 10,000 square feet to provide erosion prevention and sediment control (EPSC) plans in Section 22.5-27(j)(1) . The current Ordinance may be accessed at www.knoxvilletn.gov/engineering.

SWMP Task: Require Site Plans Submittals per the City of Knoxville BMP Manual.
Status: Ongoing

The Stormwater and Street Ordinance requires all EPSC plan submittals and all site development work to comply with the City's Land Development Manual (LDM) or the Tennessee Erosion and Sediment Control Handbook (whichever is more restrictive), current as of the date of the submission of the plans. The City will continue to maintain the requirement for compliance with the City's BMP manual or an equivalent BMP going forward.

SWMP Task: Review and update minimum criteria for plan review and checklists.
Status: Ongoing

The City is continuing to review and update specific procedures for construction site plans (including EPSC) review and approval. The procedures include an evaluation of plan completeness and overall BMP effectiveness. Construction site plan reviewers are certified under the Tennessee Erosion Prevention and Sediment Control Training Program for Construction Sites, Level 2 or equivalent. New plans reviewers are required to be certified in 12 months. The City has developed a list of minimum criteria to supplement the State checklist for various categories of site plans (residential, commercial, etc.). The City plans review staff uses the minimum criteria and checklists to insure consistency in the plan review process. The checklists are available at www.knoxvilletn.gov/engineering as part of the LDM.

SWMP Task: Require Pre-construction Assistance Meetings with Developers/Contractors for any project that requires a performance bond. Status: Ongoing

The City of Knoxville requires that a Pre-construction Assistance Meeting be scheduled with the contractor, and/or the developer, design engineer, and the City staff before a Site Development Permit is issued. This meeting is scheduled after the Site Development plans are ready for approval but before construction begins. The meeting ensures that all parties involved with the construction project are equally aware of the City's expectations. Topics

covered in the meeting may include:

- The Development Inspection Checklists,
- The Stormwater and Street Ordinance,
- The Engineering Department Enforcement Policy,
- Construction Best Management Practices,
- Inspection Schedules,
- State of Tennessee Erosion and Sediment Control Handbook,
- The City of Knoxville BMP manual,
- TDEC's ARAP,
- Construction General Permit (CGP) SWPPP,
- Special notes and considerations for the particular site, and
- Other important information relevant to the project.

The Pre-construction Assistance Meeting format will continue to be reviewed and updated throughout the permit term as new policies, procedures, BMPs, and other regulations necessitate. Since the assistance meetings have been successful at increasing compliance and reducing enforcement, they are an ongoing policy.

CS-2 BMP Requirements

SWMP Task: Require Construction BMPs from the City BMP manual or equivalent.

Status: Ongoing

The City is continuing to require, per Section 22.5-27 of the Ordinance, that all EPSC plans comply with either the City's BMP Manual or the Tennessee Erosion and Sediment Control Handbook (whichever is more restrictive), current as of the date of the submission of the plans. The requirement to use BMPs from the BMP Manual or TDEC manual applies to Utility, Single Family Residential (> 10,000 SF), Large Residential and Commercial Developments.

SWMP Task: Evaluate additional BMP requirements and design modifications. Maintain the updated BMP requirements on the City's web page. Status: Ongoing

Section 22.5-22 of the Ordinance authorizes the Engineering Department to develop a development design manual as the standard for which the Ordinance requirements are met. The guidance criteria in the manual describe acceptable types of BMPs, design standards, and maintenance requirements for BMPs to be used throughout the City to meet the requirements of the Ordinance. To ensure that effective post-development BMPs are constructed and maintained in the City, a standard maintenance covenant is required. The guidance criterion addresses the goals of the NPDES stormwater program by allowing only BMPs which are effective in reducing the targeted pollutants. The BMP Manual will continue to be updated at least annually as needed and made available at www.knoxvilletn.gov/engineering.

SWMP Task: Continue to require construction site Good Housekeeping practices.

Status: Ongoing

To ensure that construction sites are kept clean and orderly, and to minimize pollutants in stormwater runoff as a result of other construction activities, the City is continuing to require good housekeeping measures on all active construction sites. The good housekeeping practices included in the BMP Manual address the following considerations:

- Designated areas for construction equipment maintenance and repair,
- Prohibition of discharges of oil and grease into the MS4 or receiving waters,
- Designated areas for construction equipment washing to ensure washwater is discharged to a maintained temporary holding basin or sediment trapping device, Designated construction site entrances, exits, and staging areas for all site traffic,
- Provision of storage areas for construction materials and receptacles for liquids (solvents, paints, acids) and solids in accordance with manufacturers recommendations,
- Provision of adequate waste storage areas and ensuring that the locations for collection of waste materials do not receive concentrated runoff, and
- Provision of adequate sanitary facilities on construction sites in accordance with Health Department Regulations.

Good Housekeeping issues are reviewed with the contractor, engineer, and developer during the pre-construction assistance meeting.

CS-3 Inspection / Enforcement

SWMP Task: Maintain expanded inspections to include smaller construction sites (single family).

Status: Ongoing

The City of Knoxville includes single-family residential sites as part of new development construction inspections. The Engineering Department also has a staff person dedicated to triage plans review to focus primarily on small projects. The City is maintaining adequate personnel to allow for inspections on these smaller sites. Although the small sites do not require the same type of frequency of inspections as the larger sites, all small sites are inspected at some point in the construction process.

SWMP Task: Implement routine site inspections on commercial and large residential developments (e.g. rough grading, E&S control installation, final grading, and final stabilization.)

Status: Ongoing

The Engineering Department is continuing site inspections for large residential and commercial developments. Inspections are performed during rough grading, final grading, and at various other times during the construction process. Although the site inspections are not always

scheduled with the contractor or developer, City Stormwater staff may visit the construction sites approximately every three weeks or sooner if necessary. The time frame for some project inspections will vary due to the specific project. These inspections are performed to ensure compliance with the approved erosion and sediment control plan, good housekeeping measures, and the design plan.

For bonded projects, the developer is given a letter, which authorizes the installation of EPSC after the submitted site development plan is approved, but before the permit is issued. After the erosion prevention and sediment controls are in place, a licensed professional certifies that the installation has been completed according to the EPSC plan. The site development permit is issued after the Engineering Department receives the certification and all other items complete.

SWMP Task: Require post-construction Development Certifications from licensed design professionals before bond release to ensure the stormwater facilities are built as planned.

Status: Ongoing

The City requires all developments with a bond to submit to a post-construction Development Certification before the bond is released. A licensed Professional Engineer and Land Surveyor must certify that the roads and stormwater features (quality and quantity) comply with the approved plans. Some deviation from the permitted plan may be allowed during construction as long as the final project still meets the City's minimum requirements. If the final certified project does not meet the minimum requirements, further adjustments must be made before the entire bond is released to the developer. This program requires a second plan review by the Engineering Department after construction has finished to insure proper results in the field.

The Development Certification requires the following components when applicable:

- As-built drawings
- Complete detention calculations
- Roadway inspection reports
- Final site inspection in accordance with checklist
- Verification that all stormwater quantity and quality facilities are covered by Covenants for Permanent Maintenance of Stormwater Facilities
- Engineering certification or soil retaining calculations for critical retaining walls

This program has been successful and will be continued.

SWMP Task: Maintain enforcement procedures, policies, and follow-up monitoring/ inspections.

Status: Ongoing

During this permit year, 282 Notices of Violations were written for construction site runoff violations, 21 of those resulted in civil penalties totaling $34,590. The standard procedure

detailing enforcement remedies (e.g., issuance of NOVs, penalties, and the appeal process) may be found in management Section ILL-3 for illicit and improper discharges.

CS-4 Training Programs

SWMP Task: Co-Sponsor E&S Control Practice Seminars for all participants. Status: Annually

The City is continuing to promote and support the TDEC certification program in place of a separate competing erosion control workshop. Each year, the City sends inspectors and supervisors to the training program as needed to maintain current certifications. During FY 16-17, all the new inspectors received this training while some inspectors were retrained.

The City also cosponsored the TNSA East Tennessee Development Symposium for the development community on November 18-19, 2015. The two day event features local and national sponsors and speakers, showcasing the latest in Low Impact Development (LID), erosion prevention and sediment control, propriety stormwater controls, and local NPDES requirements.

SWMP Task: Provide training for City plans review staff. Status: Ongoing

In an effort to fully train the Stormwater Management staff, the City has participated in several stormwater seminars around the region. Most staff members at the Engineer level will attend at least one, but typically more, seminars or training workshops annually. Typical seminars attended each year include: stormwater modeling, National Association of Flood and Stormwater Management Agencies (NAFSMA) conference, regulatory updates, erosion control certification, NPDES updates, ASCE seminars, software workshops, TNSA Stormwater Symposium, and others. All licensed engineers must complete at least twelve hours of professional development each year. In addition to the stormwater management seminars attended, the Engineering staff have sponsored, planned, and presented a series of workshops and seminars to better educate the staff and development community about the development and plans review processes. Some of the topics of the City-sponsored development process training sessions include:

- Technical Requirements of the Stormwater and Street Ordinance
- Construction Site Erosion and Sediment Control design and implementation
- Site Development Permit Review
- SPAP program
- Performance and Indemnity Agreements, Permanent Maintenance Covenants for Stormwater Facilities
- Plat Review Process and Procedures
- Development Certifications

The City is continuing to provide training to the Engineering staff by participating in seminars

locally and outside the city; in-house training by professional engineers; tuition reimbursement for university engineering classes; and cooperating with TDOT, TDEC, TVA, UTK, and other agencies to provide professional training for the staff. Training of the plans review and inspections staff is an ongoing program within the Engineering Department.

5.5 COMPREHENSIVE MONITORING PROGRAM (MN)

Program to Collect Quantitative Data to Determine the Impacts of Urban Stormwater on the Natural Environment, pursuant to 40 CFR 122.26(d)(2)(iii)(A).

MN-1 Seasonal Storm Event Monitoring

SWMP Task: Review and update the Standard Operating Procedures (SOP) for the seasonal sampling program. Status: Ongoing

The City continues to revise the SOP to keep it current and valid for the monitoring/sampling procedures, equipment, software, testing parameters, and site locations that are in use.

SWMP Task: Maintain at least five (5) automatic monitoring stations. Status: Ongoing

The five monitoring stations are currently located on First Creek (KAT), Love Creek, Williams Creek, Fourth Creek (Walden) and Third Creek. The specific locations are noted on the large inventory map in the Appendix of this report.

Each monitoring station consists of a tipping bucket rain gauge, automatic sampler with 24 individual bags, area velocity flow meter and network interface module. The intake line and flow sensors are installed in the low flow path for continuous monitoring of the following data: rainfall, total flow, flow rate, level and velocity. In addition to the above data, the Third Creek station collects the following data: specific conductance, conductivity, total dissolved solids, salinity, dissolved oxygen, temperature and pH.

SWMP Task: Collect twenty (20) flow-weighted composite storm samples annually.
Schedule: Ongoing

Each year, the automatic sampling stations collect twenty (20) flow-weighted composite storm samples. Each of the five monitoring stations collect four (4) storm samples each year with at least one storm sample per quarter to help distribute the sampling events seasonally.

After a qualifying rain event, a technician interrogates the sampler in the field via laptop or desktop computer and calculates the appropriate flow-weighted composite sample. Once the composite sample is prepared, it is packed on ice and transported to the laboratory by courier for analysis.

Each of the flow-weighted storm samples are analyzed for thirteen (13) routine parameters. Only pH is recorded in the field. The remaining routine parameters are analyzed and recorded in the laboratory in accordance with 40 CFR 122.26 and 40 CFR 136. The routine parameters tested in the laboratory are listed in Table 1-1.

Table 1-1. Routine Parameters for Laboratory Analysis

Total Suspended Solids (TSS)	Nitrate + Nitrite Nitrogen (as N)	Total Recoverable Lead
Total Dissolved Solids (TDS)	Total Nitrogen	Total Recoverable Zinc
Total Ammonia Nitrogen (as N)	Biochemical Oxygen Demand (BOD_5)	Ortho Phosphorus
Total Kjeldahl Nitrogen	Chemical Oxygen Demand (COD)	Total Phosphorus

SWMP Task: Collect five (5) wet weather bacteria samples. Schedule: Ongoing

Five bacteria samples were collected this year. One grab sample was collected manually at each monitoring station during a qualified storm event. The state lab always analyzed the samples for e coli. Fecal coliform is analyzed when they are capable.

SWMP Task: Collect five (5) full-suite grab samples (one/station/permit).

Schedule: Ongoing

Each year, one monitoring station is selected for a full-suite grab sample. The five stations are rotated throughout the permit term to allow one sample from each location. The full-suite sample was obtained from the Williams Creek location this year. In addition to the 13 routine parameters, the full-suite grab sample includes analysis for oil & grease and all the pollutants listed in Tables II & III of 40 CFR 122 Appendix D including: volatiles, pesticides, acids, base/neutrals, toxic metals, total phenol, and cyanide.

SWMP Task: Analyze results from ongoing monitoring program. Schedule: Complete

Sampling data were collected, evaluated, and analyzed by City staff as part of the ongoing seasonal monitoring program. The updated seasonal pollutant loading and event mean concentration for the major watersheds within the MS4 may be estimated from the City monitoring data and/or from other regional data, which may include:

- National Urban Runoff Program (NURP) study,
- United States Geological Society (USGS) Open-File Report 94-68 titled "Rainfall, Streamflow, and Water-Quality Data for Five Small Watersheds, Nashville, Tennessee, 1990-1992",
- USGS Water-Resources Investigations Report 95-4140,
- USGS Open-File Report 93-xxx titled "Stormwater Data for Knoxville, TN '91-'92, and
- Any available data from TVA, EPA, and the State of Tennessee.

The latest results of the analysis are included in the appendix for the year five annual report.

An estimate of the total annual runoff from each of the major watersheds within the City will be provided in each annual report (see Section 6.2.4 in this report). Due to ongoing annexations, watersheds or portions of watersheds may be added to this estimate as needed.

MN-2 Dry Weather Screening and Industrial/Commercial Site Monitoring

SWMP Task: Dry Weather Screening as described in ILL-2. Status: Annually

SWMP Task: Implement Commercial/Industrial Monitoring in IN-3. Status: Ongoing

The City has monitored runoff from commercial sites such as restaurants, automotive facilities, and large parking lots. The purpose of this monitoring is to determine the magnitude and variety of pollutants discharging from sites that have been targeted as pollution hotspots, which may be potentially regulated under the SPAP program to reduce pollution in City waterways. The list of SPAP land uses is presented in the current Ordinance.

MN-3 Ambient & Biological Monitoring

SWMP Task: Implement ongoing Ambient Sampling Program. Schedule: Ongoing

The City conducts a quarterly ambient sampling program in which at least twenty (20) ambient samples are collected each year at a rate of one sample per quarter from each of the five monitoring station locations.

The samples are collected manually by a single grab procedure. Each ambient sample collected is analyzed for the bacteria and 13 routine parameters listed in MN-1. Since all of the locations have some flow in ambient conditions, the samples can be retrieved at the same location as the storm event samples. This is an added convenience for direct comparison of storm event and ambient samples as well as allowing more options for collecting samples automatically.

SWMP Task: Continue the Biological Monitoring Program (IBI, RBP III and stream surveys).
Status: Ongoing

In 2013, the City was granted QLP status from TDEC. Under the finalized QLP incentives, Index of Biological Integrity (IBI) is no longer required. The City is required to perform visual stream assessments on streams listed for siltation. The biological monitoring program is now project site specific, to monitor local impacts of stream restoration projects.

MN-4 Training Programs

SWMP Task: Implement Monitoring Training Program for staff and/or volunteers.
Status: Ongoing

Ongoing training is necessary for staff and volunteers as part of sampling programs, stream walks, and the AAS program. All new staff, interns, and volunteers receive the appropriate training for their specific monitoring project as necessary.

5.6 TMDL IMPLEMENTATION AND ACTIVITIES

A TMDL Implementation Plan was approved by EPA on January 15, 2003 for the Fort Loudoun Lake Watershed (HUC 06010201) for the following creek systems: First Creek, Second Creek, Third Creek, Fourth Creek, and Goose Creek.

The City of Knoxville addressed the following bacteria sources and activities as required by the TMDL and permit.

Farm Animals — Schedule: Complete

At the end of year two, the City contracted the CAC Americorps Water Quality Team (AWQT) to begin a study of the potential bacteria impact of farm animals on the 303(d) streams in Knoxville. Using agricultural zoning maps and GIS, the AWQT started to field verify potential livestock sites. During year two and three, they checked each site for signs of livestock access and runoff to the creek as well as erosion caused by access. Five properties in the Third Creek watershed contained a total of 94 head of livestock, including horses and cattle. Grab samples were collected from upstream and downstream of the study sites and delivered to the State of Tennessee's Laboratory for bacteria analysis. The data was compiled and analyzed during year three but did not indicate that the livestock create a significant impact on the bacteria in the stream. In fact, two of the sampled sites showed a decrease in both fecal coliform and E. coli from the upstream sample to the downstream sample. A third property was sampled on three different dates with upstream and downstream samples. Only one of the downstream samples showed an increase in bacteria levels. The City may reevaluate the effect of livestock on urban streams in the future but at this time there is no evidence to indicate that livestock are a significant source of bacteria in Knoxville's streams. Due to codes and zoning, the properties that do contain livestock will likely shrink or be eliminated in the future.

Wild Birds — Schedule: Ongoing

During year one, the CAC AWQT volunteered to study the biological impact that waterfowl populations have on our local waterways. The City identified 56 possible waterfowl locations that could be either a source or sink for bacteria. The AWQT visited those locations in the fall and spring, counted the number of birds, and selectively sampled for ammonia. Six sites that had a large number of waterfowl or high concentrations ammonia were analyzed for fecal coliform and E. coli. Four sites were considered to be sources of bacterial pollution since they discharged to creeks and two were considered sinks since they had no outlet to waters. The results of the initial investigation were reported in year one.

The initial investigation reduced the original 56 possible locations down to only four sites that need to be analyzed for structural retrofit or some management control to reduce the bacteria levels entering the stream or river. Two sites enter the Tennessee River directly, the City is concentrating on analyzing, designing and implementing some mitigation measure for the remaining two sites, which discharge directly into 303(d) streams listed in the bacteria TMDLs.

The City also partners with Fountain City Lions Club to investigate ways to reduce waterfowl populations at the Fountain City Lake. The Lions Club maintains duck food vending machines that were installed to reduce the popular use of bread, which has been linked to unhealthy ducks and degraded water quality. This management practice will continue as part of the pond management program.

Domestic Pets — Status: Ongoing

The City partners with the IWL and Prestige Cleaners to encourage the use of pooper-scoopers in City parks and the Central Business Improvement District (CBID). A total of 48 pet waste bag dispensers are located within the City. Approximately 120,000 pooper-scoopers bags were restocked last year throughout the City, which helps to reduce pet waste downtown. Additional dispensers may be added in other parks in the future. The City has distributed pooper-scoopers to vet clinics, pet stores, and during public functions such as Bark-in-the-Park and Earth Fest. Posters are displayed at these functions to help educate the pet owners of their responsibility to manage their pet's waste. The City also has a pet waste ordinance (O-98-03) to require the owner or custodian of any pet to collect and remove all solid pet wastes from all areas within the CBID.

Pooper scooper bag dispenser

Outside Dumping of Animal Wastes — Status: Ongoing

In year one, the City investigated possible bacterial pollution sources from the Knoxville/Knox County animal shelter. The City helped the shelter personnel set up a maintenance schedule for quarterly inspections and annual cleanout of their Nutrient Baffle Box.

Fish/Bait Shops — Status: Complete

The City inspected Rea Springs Live Bait, Seymour Bait & Tackle, and Conservation Fisheries Inc. as possible sources of bacterial pollution. The effluent from Seymour Bait & Tackle and Conservation Fisheries Inc. discharged directly to a KUB sewer line. The effluent from Rea Springs Live Bait shop (now closed) discharged to a constructed wetland and then into First Creek. The City notified TDEC of the results of the bacterial sampling of the effluent entering First Creek, which were well below the threshold for human contact.

Private Leaking Laterals — Status: Ongoing

The City has continued to coordinate with KUB to identify and correct sanitary sewer discharges as necessary. A standard procedure has been developed to insure that each possible contamination source is investigated after a problem is identified during dry weather screening. When high ammonia or fecal coliform levels are detected in the MS4, KUB and City personnel cooperate to identify the contamination source through dye testing or manhole-by-

manhole testing. Once a source has been identified, KUB is responsible for correcting problems in the main sanitary sewer system while the City works with KUB and the private property owners to correct problems on private property. These coordinated inspections have identified private residences, industries, and businesses with plumbing or floor drains connected to the MS4 instead of the sanitary sewer system. This type of close coordination with all sewer utilities is essential for solving illicit discharges to the MS4 and will continue going forward.

A Memorandum of Understanding has clarified the cooperative roles and responsibilities of both the City and KUB with respect to the City's stormwater management program and compliance with the MS4 NPDES permit. A copy of the MOU was included in the appendix of the FY 03/04 annual report.

Human Wastes (Outdoor Elimination by Humans) Schedule: Completed

In year two, the City implemented a survey and inventory of homeless populations in Knoxville. The Engineering Department was able to add a few questions to the survey to determine how transients use the creeks while living outdoors. The results of the survey indicate that there is likely some impact on stream water quality by homeless people.

Dr. Nooe issued the following statement regarding his homeless study for the City of Knoxville: *"In the February, 2006, survey of homelessness, we had planned to examine use of creeks and streams by those persons living in outside locations. However, finding a limited number of persons in the six camps visited, the data are incomplete. There are several observations based on visits to camps and conversations with outreach workers that I can share. Homeless camps are scattered throughout the county. Many are located in or near center city, but others can be found in various sections such as west in the Cedar Bluff and Lovell Road area. There appear to be approximately 18-20 camps along creeks and streams, with an average of 4-6 persons staying in each camp. Occasionally, someone will use the water for bathing, but the most frequent use seems to be cooling food and beverages (tying the food in a plastic bag and suspending it in the water). We did not observe directly using the water for disposal of waste, but the proximity suggests possible runoff."*

Homeless camps along the densely concentrated area of Second Creek from the 1982 World's Fair Park to approximately Bernard Avenue had grown due to the location of assistance services downtown. Although populations and density vary, there were over 32 camps with over 60 inhabitants located in this area, predominantly in the RBZ. Water quality was directly impacted by these camps. Debris, trash, bank erosion, food waste, and human waste were prevalent along the impacted sections of creek. Bacteria samples taken within the camping corridor showed increased levels of E. coli and fecal coliform compared to samples taken upstream of the camping corridor.

Two major cleanup efforts were completed as a coordinated effort with the Railroad, TDEC, private businesses, and law enforcement. The first was in July 2015, and netted a total of 19 tons of debris and waste from the creek and creek banks. The second and more extensive

cleanup was in May 2016, and included removal of the homeless camps. During this cleanup effort over 200 tons of debris and waste was removed from the RBZ and creek banks. The RBZ was trimmed so that bush overgrowth was removed and would no longer obstruct campsites and/or make the RBZ attractive to the homeless as a campsite. Grown cover and canopy shading remain intact.

Illicit Connections to Storm Drain System — Status: Ongoing

The Illicit Connections and Illegal Dumping Program (ILL) is an ongoing program reported in Section 5.2 of this report.

6.0 MONITORING REPORTS SUMMARY

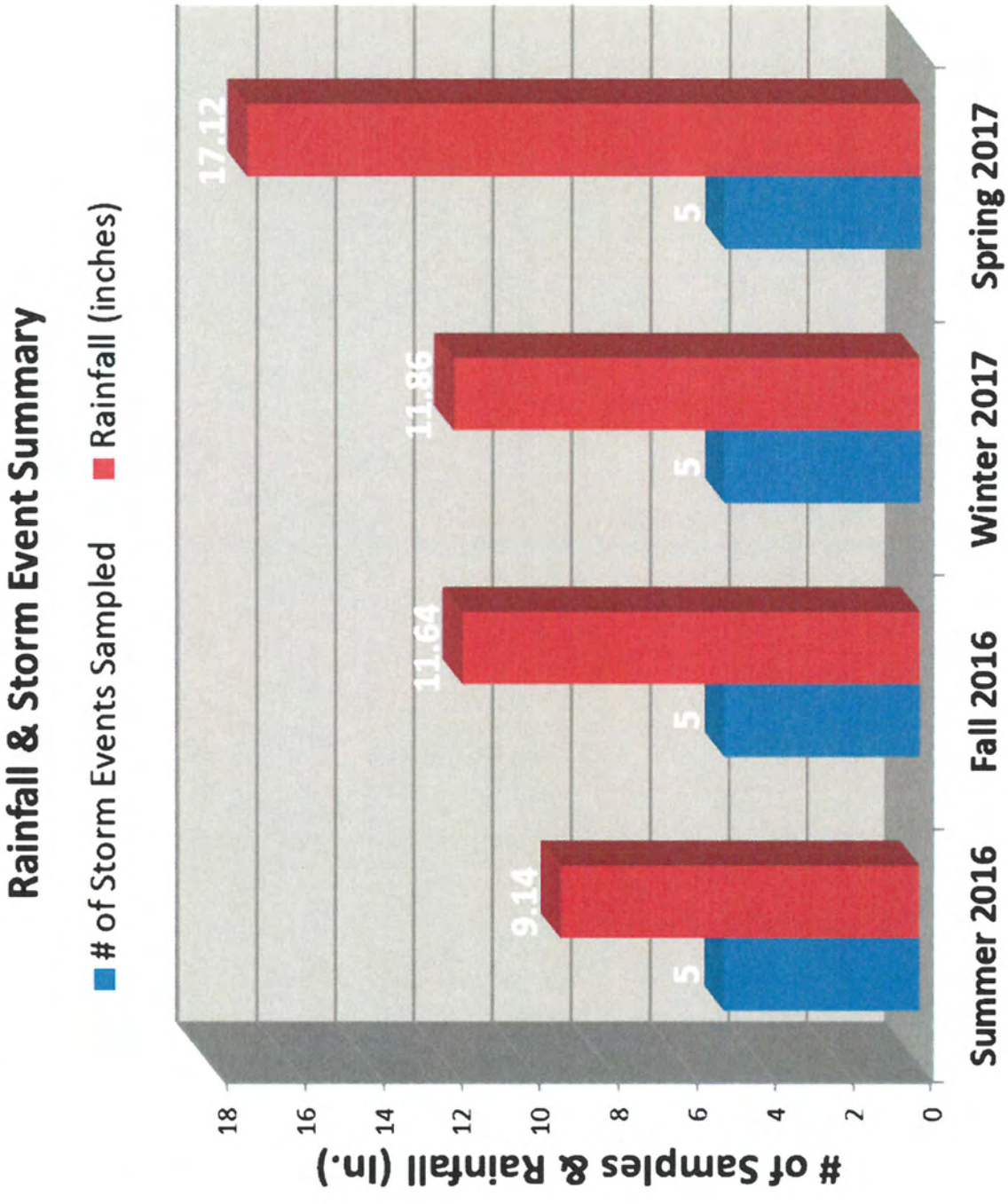
6.1 DRY-WEATHER SCREENING PROGRAM - NEW OUTFALL INVENTORY

During the past permit year, no outfalls were removed from the City's outfall inventory and eight outfalls were added. Outfalls are typically added as a result of re-development or annexations and removed as a result of drainage alterations. All updated outfalls are clearly marked on the inventory map located in the Appendix.

6.2 ONGOING STORMWATER MONITORING PROGRAM.

6.2.1 Area Rainfall Data & Storm Event Summary

During the July 1, 2016 to June 30, 2017 monitoring period, an average of 49.76 inches of rainfall was recorded and 20 storm events were sampled from the City's five ISCO monitoring stations. Section V of the current NPDES Permit requires a sampling frequency for routine wet-weather samples of one storm event per season per station. This requirement was met. The graph on the next page shows the relationship between the amounts of rainfall received and the number of storm events sampled per season. Monitoring data summaries for each of the sampling locations are included for TDEC's review on the following pages.


Rainfall & Storm Event Summary
# of Storm Events Sampled
Rainfall (inches)
# of Samples & Rainfall (In.)
0
2
4
6
8
10
12
14
16
18
5
9.14
5
11.64
5
11.86
5
17.12
Summer 2016
Fall 2016
Winter 2017
Spring 2017

6.2.2 Laboratory Analysis Summary

Laboratory Analysis Summary - Seasonal Storm Sampling Program

July 1, 2016 thru June 30, 2017

Site	Quarter	pH	Volume Sampled	Rainfall per Event	BOD	COD	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia nitrogen	Total Kjeldahl nitrogen	Total organic nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units			cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
KAT First Creek	Sum '16	7.0	**	**	ND	11	ND	318	0.78	ND	ND	ND	ND	ND	ND	0.037
	Fall '16	7.0	1,683,670	0.41	18.1	49	39	138	0.75	ND	0.65	0.65	ND	ND	0.21	0.414
	Wtr '17	7.0	6,498,490	0.40	14.5	47	81	193	1.25	ND	0.48	0.48	0.005	ND	ND	ND
	Spr '17	7.0	4,021,520	0.17	10.1	23	14	239	1.50	ND	0.40	0.40	ND	0.059	ND	ND
Average:		**7.0**	**4,067,893**	**0.33**	**14.2**	**32.6**	**44.5**	**222.0**	**1.07**	**ND**	**0.51**	**0.51**	**0.005**	**0.059**	**0.21**	**0.226**
Love Creek	Sum '16	7.0	4,581,370	0.09	53.0	104	386	168	0.31	ND	2.40	2.40	0.017	0.128	0.15	ND
	Fall '16	7.0	4,782,200	0.57	11.8	27	36	214	0.68	ND	0.49	0.49	ND	ND	0.17	4.240
	Wtr '17	7.0	13,283,400	0.41	10.6	29	13	231	1.17	ND	0.36	0.36	ND	ND	ND	ND
	Spr '17	7.0	**	**	ND	27	21	159	0.60	ND	0.36	0.36	ND	ND	ND	0.036
Average:		**7.0**	**7,548,990**	**0.36**	**25.1**	**46.7**	**113.9**	**193.0**	**0.69**	**ND**	**0.90**	**0.90**	**0.017**	**0.128**	**0.16**	**2.138**
Third Creek	Sum '16	8.0	3,274,030	0.24	10.6	45	76	20	ND	ND	0.42	0.42	0.019	0.107	0.13	ND
	Fall '16	7.0	817,657	0.67	12.0	18	78	157	0.97	ND	0.65	0.65	0.018	0.179	0.30	0.341
	Wtr '17	7.0	3,252,290	0.61	4.0	ND	116	168	0.79	ND	1.22	1.22	0.027	0.178	ND	ND
	Spr '17	7.0	1,269,870	0.16	ND	15	44	253	1.60	ND	0.44	0.44	0.008	0.079	ND	ND
Average:		**7.3**	**2,153,462**	**0.42**	**8.9**	**26.0**	**78.5**	**149.5**	**1.12**	**ND**	**0.68**	**0.68**	**0.018**	**0.136**	**0.21**	**0.341**
Walden Drive Fourth Creek	Sum '16	7.0	2,429,720	0.62	11.2	28	137	176	0.19	ND	0.42	0.42	0.01	0.12	0.12	ND
	Fall '16	7.0	**	**	ND	ND	ND	267	1.25	ND	0.47	0.47	ND	ND	ND	ND
	Wtr '17	7.0	1,768,650	0.64	42.3	72	62	134	0.97	ND	0.82	0.82	0.006	0.051	0.12	0.029
	Spr '17	7.0	828,483	0.31	22.7	52	57	147	0.77	ND	0.76	0.76	ND	0.055	ND	ND
Average:		**7.0**	**1,675,618**	**0.52**	**25.4**	**51.0**	**85.5**	**181.0**	**0.80**	**ND**	**0.62**	**0.62**	**0.008**	**0.076**	**0.12**	**0.029**
Williams Creek	Sum '16	7.0	**	**	ND	ND	ND	267	1.33	ND	ND	ND	ND	ND	ND	ND
	Fall '16	7.0	446,484	0.54	12.7	32	204	175	0.89	ND	0.72	0.72	0.029	0.111	0.51	0.983
	Wtr '17	7.0	837,530	0.58	3.8	11	112	222	1.22	ND	0.95	0.95	0.017	0.084	ND	ND
	Spr '17	7.0	947,350	0.41	8.1	28	204	144	0.88	ND	0.49	0.49	0.035	0.141	0.17	0.066
Average:		**7.0**	**743,788**	**0.51**	**8.2**	**23.5**	**173.3**	**202.0**	**1.08**	**ND**	**0.72**	**0.72**	**0.027**	**0.112**	**0.34**	**0.525**
National NURP Study Average					11.9	90.8	na	na	na	na	2.35	3.31	0.18	0.176	0.16	
*** Characteristics of Urban Stormwater Range**					1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 125	

Winter (Jan., Feb., and March); Spring (April, May, and June); Summer (July, Aug., and Sept.); Fall (Oct., Nov., and Dec.)

* The Characteristics of Urban Stormwater and National NURP Study Average data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS

** Grab sample taken due to equipment error. No flow or rainfall data for "grab" sample.

BDL: Results from lab procedures were below test detectable limits. Laboratory procedural limit values were used (in place of BDL) to determine averages for this report: BOD-3.33, COD-10, Ammonia-0.10, Nitrate-0.10, Organic Nitrogen-0.10, Oil & Grease-5.26, Ortho Phosphate-0.025, Total Phosphate-0.10, Kjeldahl-0.250, TDS-10, TSS-2.50, Lead-0.0050, Zinc-0.050

6.2.2 Laboratory Analysis Summary
First Creek Monitoring Station (KAT)

Quarter	Date	Type	pH	Volume Sampled	Rainfall amount	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	** E. Coli	** Fecal Colif.
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/ 100mL	cfu/ 100 mL
SUMMER 2016	9/29/16	G	7.0	**	**	ND	11	ND	318	0.78	ND	ND	ND	ND	ND	ND	0.0370		
FALL 2016	11/29/16	C	7.0	1,683,670	0.41	18.1	49.1	38.7	138	0.752	ND	0.651	0.651	ND	ND	0.208	0.4140		
WINTER 2017	2/7/17	C	7.0	6,498,490	0.40	14.5	47	80.5	193	1.25	ND	0.484	0.484	0.00542	ND	ND	ND		
SPRING 2017	5/24/17	C	7.0	4,021,520	0.17	10.1	23	14.4	239	1.50	ND	0.398	0.398	ND	0.059	ND	ND	>2420	>6000
Sample Average			**7.0**	**4,067,893**	**0.33**	**14.23**	**32.6**	**45**	**222**	**1.07**	**ND**	**0.51**	**0.51**	**0.00542**	**0.059**	**0.21**	**0.226**	**N/A**	**N/A**

National NURP Study Average	11.9	90.8	na	na	na	na	2.35	3.31	0.18	0.176	0.16
***Characteristics of Urban Stormwater Range**	1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10

** Grab sample taken due to equipment error. No flow or rainfall data for "grab" sample.

BDL: Results from lab procedures were below test detectable limits. Laboratory procedural limit values were used (in place of BDL) to determine averages for this report: BOD-3.33, COD-10, Ammonia-0.10, Nitrate-0.10, Organic Nitrogen-0.10, Oil & Grease-5.26, Ortho Phosphate-0.025, Total Phosphate-0.10, Kjeldahl-0.250, TDS-10, TSS-2.50, Lead-0.0050, Zinc-0.050

6.2.2 Laboratory Analysis Summary
Love Creek Monitoring Station

Quarter	Date	Type	pH	Volume Sampled	Rainfall amount	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	** E. Coli	** Fecal Colif.
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/ 100mL	cfu/ 100 mL
SUMMER 2016	8/17/16	C	7.0	4,581,370	0.09	53.0	104.0	386	168	0.313	ND	2.40	2.40	0.0166	0.128	0.145	ND		
FALL 2016	11/29/16	C	7.0	4,782,200	0.57	11.8	27	35.5	214	0.682	ND	0.494	0.494	ND	ND	0.170	4.24		
WINTER 2017	2/7/17	C	7.0	13,283,400	0.41	10.6	29	13.4	231	1.170	ND	0.355	0.355	ND	ND	ND	ND		
SPRING 2017	6/5/17	G	7.0	**	**	ND	27	20.6	159	0.595	ND	0.356	0.356	ND	ND	ND	0.036	2420	1500
Sample Average			**7.0**	**7,548,990**	**0.36**	**25.1**	**46.7**	**113.9**	**193**	**0.690**	**ND**	**0.901**	**0.901**	**0.0166**	**0.128**	**0.16**	**2.138**	**N/A**	**N/A**

National NURP Study Average	11.9	90.8	na	na	na	na	2.35	3.31	0.18	0.176	0.16
***Characteristics of Urban Stormwater Range**	1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

** Grab sample taken due to equipment error. No flow or rainfall data for "grab" sample.

BDL: Results from lab procedures were below test detectable limits. Laboratory procedural limit values were used (in place of BDL) to determine averages for this report: BOD-3.33, COD-10, Ammonia-0.10, Nitrate-0.10, Organic Nitrogen-0.10, Oil & Grease-5.26, Ortho Phosphate-0.025, Total Phosphate-0.10, Kjeldahl-0.250, TDS-10, TSS-2.50, Lead-0.0050, Zinc-0.050

6.2.2 Laboratory Analysis Summary
Third Creek Monitoring Station

Quarter	Date	Type	pH	Volume Sampled	Rainfall amount	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	** E. Coli	** Fecal Colif.
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/ 100mL	cfu/ 100 mL
SUMMER 2016	7/27/16	C	8.0	3,274,030	0.24	10.6	45.2	76.3	20	ND	ND	0.419	0.419	0.01850	0.107	0.13	ND		
FALL 2016	11/29/16	C	7.0	817,657	0.67	12.0	17.5	77.7	157	0.968	ND	0.648	0.648	0.0176	0.179	0.300	0.341		
WINTER 2017	3/1/17	C	7.0	3,252,290	0.61	4.0	ND	116.0	168	0.79	ND	1.220	1.220	0.02680	0.178	ND	ND		
SPRING 2017	5/24/17	C	7.0	1,269,870	0.16	ND	15.3	43.9	253	1.60	ND	0.442	0.442	0.00817	0.079	ND	ND	>2420	>6000
Sample Average			**7.3**	**2,153,462**	**0.42**	**8.87**	**26.0**	**78.5**	**150**	**1.12**	**ND**	**0.682**	**0.682**	**0.01777**	**0.136**	**0.21**	**0.341**	**N/A**	**N/A**

National NURP Study Average	11.9	90.8	na	na	na	na	2.35	3.31	0.18	0.176	0.16
***Characteristics of Urban Stormwater Range**	1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10

BDL: Results from lab procedures were below test detectable limits. Laboratory procedural limit values were used (in place of BDL) to determine averages for this report: BOD-3.33, COD-10, Ammonia-0.10, Nitrate-0.10, Organic Nitrogen-0.10, Oil & Grease-5.26, Ortho Phosphate-0.025, Total Phosphate-0.10, Kjeldahl-0.250, TDS-10, TSS-2.50, Lead-0.0050, Zinc-0.050

6.2.2 Laboratory Analysis Summary
Walden Drive Monitoring Station

Quarter	Date	Type	pH	Volume Sampled	Rainfall amount	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	** E. Coli	** Fecal Colif.
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/ 100mL	cfu/ 100 mL
SUMMER 2016	08/19/16	C	7.0	2,429,720	0.62	11.20	28.4	137	176	0.191	ND	0.421	0.421	0.0106	0.1230	0.119	ND		
FALL 2016	12/28/16	G	7.0	**	**	ND	ND	ND	267	1.250	ND	0.473	0.473	ND	ND	ND	ND		
WINTER 2017	03/28/17	C	7.0	1,768,650	0.64	42.30	72.3	62.3	134	0.972	ND	0.823	0.823	0.00587	0.05110	0.118	0.029		
SPRING 2017	06/05/17	C	7.0	828,483	0.31	22.70	52.4	57.2	147	0.772	ND	0.764	0.764	ND	0.0548	ND	ND	>2420	3,000
Sample Average			**7.0**	**1,675,618**	**0.52**	**25.4**	**51.0**	**85.5**	**181**	**0.796**	**ND**	**0.620**	**0.620**	**0.0082**	**0.07630**	**0.119**	**0.029**	**N/A**	**N/A**

National NURP Study Average	11.9	90.8	na	na	na	na	2.35	3.31	0.180	0.176	0.16
***Characteristics of Urban Stormwater Range**	1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10

** Grab sample taken due to equipment error. No flow or rainfall data for "grab" sample.

BDL: Results from lab procedures were below test detectable limits. Laboratory procedural limit values were used (in place of BDL) to determine averages for this report: BOD-3.33, COD-10, Ammonia-0.10, Nitrate-0.10, Organic Nitrogen-0.10, Oil & Grease-5.26, Ortho Phosphate-0.025, Total Phosphate-0.10, Kjeldahl-0.250, TDS-10, TSS-2.50, Lead-0.0050, Zinc-0.050

6.2.2 Laboratory Analysis Summary
Williams Creek Monitoring Station

Quarter	Date	Type	pH	Volume Sampled	Rainfall amount	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	** E. Coli	** Fecal Colif.
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/ 100mL	cfu/ 100 mL
SUMMER 2016	09/29/16	G	7.0	**	**	ND	ND	ND	267	1.330	ND	ND	ND	ND	ND	ND	ND		
FALL 2016	11/29/16	C	7.0	446,484	0.54	12.7	31.5	204	175	0.887	ND	0.718	0.718	0.0285	0.111	0.509	0.983		
WINTER 2017	03/01/17	C	7.0	837,530	0.58	3.8	11	112	222	1.22	ND	0.95	0.952	0.0166	0.0838	ND	ND		
SPRING 2017	05/25/17	C	7.0	947,350	0.41	8.1	28.0	204	144	0.88	ND	0.49	0.49	0.0352	0.141	0.171	0.0660	2,420	>6000
Sample Average			**7.0**	**743,788**	**0.51**	**8.2**	**23.5**	**173.3**	**202.0**	**1.08**	**ND**	**0.72**	**0.72**	**0.0268**	**0.112**	**0.34**	**0.525**	**N/A**	**N/A**

National NURP Study Average	11.9	90.8	na	na	na	na	2.35	3.31	0.18	0.176	0.16
***Characteristics of Urban Stormwater Range**	1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10

** Grab sample taken due to equipment error. No flow or rainfall data for "grab" sample.

BDL: Results from lab procedures were below test detectable limits. Laboratory procedural limit values were used (in place of BDL) to determine averages for this report: BOD-3.33, COD-10, Ammonia-0.10, Nitrate-0.10, Organic Nitrogen-0.10, Oil & Grease-5.26, Ortho Phosphate-0.025, Total Phosphate-0.10, Kjeldahl-0.250, TDS-10, TSS-2.50, Lead-0.0050, Zinc-0.050

6.2.2 Laboratory Analysis Summary

Municipal Wet Weather Sampling Results

Point Source Sample Site	Period/Unit	Date	Type	pH	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	Oil/ Grease	E. Coli	Fecal Colif.
	ANNUAL				mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	CFU/100ml	
KAT	Treated Outfall	2/28/17	G	6.0	66.3	220.0	34.0	110	0.430	2.79	7.610	4.820	0.00696	0.317	0.383	ND	38.0	***	***
Loraine Street Treatment Units	Pretreated	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
	East Suntree	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
	West Baysaver	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
Transfer Station	*Pretreated*	2/22/17	G	6.0	10.0	26.8	226.0	168	0.210	0.112	0.774	0.662	0.1590	0.732	0.383	0.1180	8.3	1,553	1,300
	Treated	2/22/17	G	6.0	20.5	48.8	330.0	230	0.276	0.103	0.896	0.793	0.1740	0.919	0.432	0.0350	10.00	1,733	1,300
	Catch Basin	2/22/17	G	7.0	ND	ND	14.4	205	0.159	0.289	0.896	0.607	0.0064	ND	0.173	0.0600	ND	1,414	800
Prosser Rd	Treated Outfall	2/28/17	G	6.0	ND	20.0	20.2	40	0.261	0.168	0.616	0.448	0.00659	0.183	ND	ND	ND	***	***
Average				**6.2**	**32.3**	**78.9**	**124.9**	**151**	**0.267**	**0.69**	**2.158**	**1.466**	**0.0706**	**0.538**	**0.343**	**0.0710**	**18.8**	**1567**	**1133**
National NURP Study Average					11.9	90.8	n/a	n/a	n/a	n/a	2.350	3.310	0.18	0.176	0.16				
***Characteristics of Urban Stormwater Range**					1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10				

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

** Loraine Street Treatment Units were not sampled. Three separate rain events were attempted but system was dry. Bypass due to construction of new buildings.

*** Microbiological testing not needed at these locations.

BDL: Results from lab procedures were below test detectable limits. Laboratory procedural limit values were used (in place of BDL) to determine averages for this report: BOD-3.33, COD-10, Ammonia-0.10, Nitrate-0.10, Organic Nitrogen-0.25, Oil & Grease-5.26, Ortho Phosphate-0.025, Total Phosphate-0.10, Kjeldahl-0.25, TDS-10, TSS-2.50, Lead-0.0050, Zinc-0.050

Microbiological analysis: Results greater than the detectable range are listed in italics – maximum E. coli value from lab is 2420 and maximum Fecal Colif is 6000.

6.2.2 Laboratory Analysis Summary

Seasonal Ambient Grab Samples 2016 - 2017

Summer 2016	Date	pH	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	E. Coli	Fecal Colif.
First Creek	07/25/16	8.0	ND	16.5	ND	289	0.98	ND	ND	ND	ND	ND	ND	ND	345	420
Love Creek	07/26/16	8.0	ND	10.7	3.3	330	0.96	ND	ND	ND	ND	ND	ND	ND	144	800
Third Creek	07/25/16	8.0	ND	66	ND	295	1.03	ND	ND	ND	ND	ND	ND	ND	101	102
Fourth Creek	07/25/16	8.0	5.6	14	ND	605	0.85	ND	ND	ND	ND	ND	ND	ND	236	360
Williams Creek	07/26/16	8.0	ND	12.5	ND	293	1.38	ND	ND	ND	ND	ND	ND	ND	461	470
Average		**8.0**	**5.6**	**23.8**	**3.3**	**362.4**	**1.0**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**257**	**430**

Fall 2016	Date	pH	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	E. Coli	Fecal Colif.
First Creek	10/19/16	7.0	ND	11.5	ND	259	0.739	ND	ND	ND	ND	ND	ND	0.155	261	X
Love Creek	10/19/16	7.0	ND	11.5	ND	286	2.160	ND	ND	ND	ND	ND	ND	0.473	152	X
	10/19/16	7.0	ND	10.3	ND	253	0.817	ND	ND	ND	ND	ND	ND	0.218	201	X
Fourth Creek	10/19/16	7.0	ND	12.6	ND	272	0.960	ND	ND	ND	ND	ND	ND	0.665	365	X
Williams Creek	10/19/16	7.0	ND	ND	ND	264	1.280	ND	ND	ND	ND	ND	0.107	10.1	579	X
Average		**7.0**	**ND**	**11**	**ND**	**267**	**1.191**	**ND**	**ND**	**ND**	**ND**	**ND**	**0.107**	**2.322**	**312**	**X**

Winter 2017	Date	pH	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	E. Coli	Fecal Colif.
First Creek	3/7/17	7.0	ND	ND	2.6	241	1.53	ND	ND	ND	ND	ND	ND	ND	613	X
Love Creek	3/6/17	7.0	ND	ND	ND	266	1.36	ND	ND	ND	ND	ND	0.135	ND	86	X
Third Creek	3/6/17	7.0	ND	ND	ND	234	1.56	ND	ND	ND	ND	ND	ND	ND	85	X
Fourth Creek	3/6/17	7.0	ND	ND	ND	250	1.23	ND	ND	ND	ND	ND	ND	ND	461	X
Williams Creek	3/7/17	7.0	ND	ND	ND	278	1.90	ND	ND	ND	ND	ND	ND	ND	88	X
Average		**7.0**	**ND**	**ND**	**2.6**	**253.8**	**1.5**	**ND**	**ND**	**ND**	**ND**	**ND**	**0.14**	**ND**	**267**	**X**

Spring 2017	Date	pH	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	E. Coli	Fecal Colif.
First Creek	5/11/17	7.0	ND	ND	3.60	287	1.720	ND	ND	0.140	ND	ND	ND	0.0310	461	250
Love Creek	5/11/17	7.0	ND	ND	ND	335	2.100	0.19	0.26	ND	ND	ND	ND	ND	365	250
Third Creek	5/11/17	7.0	ND	10.2	3.20	293	2.110	ND	ND	0.146	ND	ND	ND	ND	328	240
Fourth Creek	5/11/17	7.0	ND	ND	ND	277	1.540	ND	ND	0.127	ND	ND	ND	ND	1,986	1,600
Williams Creek	5/11/17	7.0	ND	ND	2.80	308	1.950	ND	ND	0.205	ND	ND	ND	ND	248	320
Average		**7.0**	**ND**	**10.2**	**3.20**	**300**	**1.884**	**0.19**	**0.26**	**0.155**	**ND**	**ND**	**ND**	**0.0310**	**677.6**	**532.0**

X = The State of Tennessee's Knoxville Regional Lab could not perform Fecal Coliform tests

BDL: Results from lab procedures were below test detectable limits. Laboratory procedural limit values were used (in place of BDL) to determine averages for this report: BOD-3.33, COD-10, Ammonia-0.10, Nitrate-0.10, Organic Nitrogen-0.10, Oil & Grease-5.26, Ortho Phosphate-0.025, Total Phosphate-0.10, Kjeldahl-0.250, TDS-10, TSS-2.50, Lead-0.0050, Zinc-0.050

6.2.3 Noncompliance

As noted in Section 6.2.2 tables, four grab samples were taken in lieu of composite samples due to equipment error. Also, the Loraine Street MIF was not sampled due to construction.

6.2.4 Estimated Runoff from Major Watersheds within the MS4 Area

Part VI (A)(2)(e)(i)(3) of the NPDES permit requires an estimate of the total volume of urban runoff discharged by the City of Knoxville for the year. This estimate is based on total rainfall for the year and the estimated imperviousness of different land uses. The total rainfall for the year was determined to be an average of the annual rainfall recorded during the year from the City's five stormwater monitoring stations located throughout the City and the National Weather Service's rain gage at the McGhee Tyson Airport. The average recorded annual rainfall amount was 49.76 inches.

To estimate the total runoff volume, the City utilized GIS to determine approximate areas for each watershed within the city limits along with the corresponding land uses. Each land use is assigned an approximated impervious percentage according to the Camp Dresser and McKee Watershed Management Model described in the Part 2 application, pages 4-14 to 4-18. It was assumed for each watershed that 95 percent of the rainfall from the impervious fraction, and 15 percent of the rainfall from the pervious fraction of each land use are converted to runoff. Therefore the impervious runoff coefficient and the pervious runoff coefficient are assumed to be 0.95 and 0.15, respectively. For example, based upon an average annual rainfall volume of 49.76 inches/year, the average annual runoff from a single-family residential land use (25% impervious) is 17.42 in/yr (49.76*[(0.15*0.75)+(0.95*0.25)]). The runoff coefficient for a single land use is the sum of the impervious percentage multiplied times the impervious runoff coefficient plus the pervious percentage multiplied by the pervious runoff coefficient. For the previous example, the average runoff coefficient for the single-family residential land use is 0.35 = [0.15*0.75]+[0.95*0.25]. For a watershed, the average runoff coefficient is an area weighted average of each land use runoff coefficients times the percentage of the area of each land use.

The runoff from the major watersheds within the MS4 area was estimated by a formula in Camp Dresser & McKee's Watershed Management Module shown below:

$$Q_i = P \times C_i \times A_i$$

where:

P = total precipitation (inches/year)
C = land use area weighted runoff coefficient = 0.15*Pervious% + 0.95*Impervious%
A = drainage area (acres) = acres x (43,560 ft^2/acre) = ft^2
Q = $\sum Qi$ = total runoff rate / 1,000,000 = Mgal
Q_{tot} = **37,643** million gallons for FY 15/16

Please find the analysis for the each watershed and for the entire city in the following table.

6.2.4 ESTIMATED RUNOFF FROM MAJOR WATERSHEDS WITHIN THE MS4

July 1, 2016 - June 30, 2017

Watershed	Agricul./ Forest/ Vacant, Public Parks	Vacant (>10)	Rural Res.	Single Family Res.	Private Rec., Public Land	Multi-Family Res., Church	Insti-tutional	Mining, Office/ Service	Manu-facturing/ Whole-sale	Commer., Trans./ Utility/ Commun.	Major Roads/ Hwys/ ROWs	Under Const	Not Loaded	Total Acres in Watershed	Acres in the City Limits	Est. % Imperv-ious	C Value	Total Rainfall during 15/16 (in./yr)	Total Runoff for 15/16 (Mgal/yr)
Baker Cr.	412	2	107	640	90	77	32	1	1	3	269	13	27	1,674	1,674	32	0.41	49.76	923
East Fork	313	0	10	475	302	78	73	31	195	235	584	33	180	2,509	2,509	53	0.57	49.76	1,942
First Cr.	724	0	300	3,152	544	501	110	157	127	556	1,412	51	116	7,750	7,750	44	0.50	49.76	5,226
Fourth Cr.	965	57	423	2,026	468	406	93	206	201	568	881	61	414	6,769	5,920	41	0.48	49.76	3,819
Goose Cr.	639	40	126	669	213	67	8	21	77	131	327	34	29	2,381	1,755	35	0.43	49.76	1,014
Grassy Cr.	2,230	176	561	610	215	24	0	14	31	95	211	39	95	4,301	433	17	0.29	49.76	167
Holston R.	2,362	69	371	1,222	417	45	5	2	219	33	805	32	50	5,632	2,455	28	0.37	49.76	1,232
Inman Br.	563	33	214	138	4	12	0	0	0	0	145	0	34	1,143	99	21	0.31	49.76	42
Knob Cr.	1,719	195	481	843	125	84	1	19	1	29	296	4	169	3,966	989	19	0.30	49.76	407
Knob Fork	1,659	26	398	675	182	56	5	93	6	124	257	19	252	3,752	823	22	0.33	49.76	364
Love Cr.	1,735	102	505	1,625	311	212	51	94	178	408	1,038	46	103	6,408	5,090	36	0.44	49.76	3,033
Second Cr.	443	0	90	1,281	346	247	29	107	140	542	1,161	35	82	4,503	4,498	53	0.57	49.76	3,471
Sinking Cr.	1,614	146	459	1,266	284	90	17	33	31	267	881	12	347	5,447	2,434	33	0.41	49.76	1,365
Swanpond Cr.	3,892	303	833	604	121	36	4	79	240	232	457	65	285	7,151	499	19	0.30	49.76	205
Ten Mile Cr.	1,879	0	638	3,421	165	895	55	115	58	615	1,500	24	641	10,006	3,921	38	0.45	49.76	2,387
Third Cr.	1,757	79	436	3,003	406	512	184	124	225	443	1,252	98	220	8,739	8,417	37	0.45	49.76	5,080
TN River	7,197	503	2,269	4,681	2,910	403	187	72	170	238	990	121	1,113	20,854	8,232	22	0.33	49.76	3,641
Toll Cr.	535	69	154	222	42	26	1	0	37	4	93	42	4	1,229	767	22	0.32	49.76	334
Turkey Cr.	3,353	235	603	2,693	264	343	121	104	91	442	1,161	68	738	10,216	1,677	29	0.38	49.76	871
Whites Cr.	2,733	154	782	1,298	575	59	31	11	49	126	608	51	578	7,055	1,634	23	0.34	49.76	744
Williams Cr.	358	11	47	561	46	96	125	17	10	61	276	3	30	1,641	1,605	37	0.45	49.76	976
Woods Cr.	1,220	106	281	371	0	26	0	2	140	43	261	1	157	2,608	143	23	0.33	49.76	65
Sink-East	1,226	0		728	9	17	0	17	3	27	0	0	0	2,027	91	12	0.24	49.76	30
Beaver Cr	21,174	0	0	21,230	1,292	845	4	259	283	712	0	160	0	45,959	162	16	0.28	49.76	61
Tuckahoe	4,293	0	0	1,829	18	14	0	8	2	1	0	4	0	6,169	229	8	0.22	49.76	67
Fr.Broad riv	8,954	0	0	2,744	73	40	24	24	497	117	0	166	0	12,639	551	11	0.24	49.76	178
COK Total	73,949	2,306	10,088	58,007	9,422	5,211	1,160	1,610	3,012	6,052	14,865	1,182	5,664	192,528	64,357				**37,643**

The runoff from the major watersheds within the MS4 area was estimated by a formula in Camp Dresser & Mckee's Watershed Management Module. $Q = P \times C \times A$

where, P = total precipitation (inches/year) = **49.76 in/yr** = 4.15 ft/yr

C = land use area weighted runoff coefficient = 0.15*pervious% + 0.95*Impervious%

A = drainage area (acres) = acres in watershed x (4.35E4 ft^2/acre) = A_i ft^2

Q_i = total runoff rate = sum of each watershed's Q_i

Total estimated runoff for Year Eleven = 37,643 Mgal

Approximate area and land use for each watershed was determined through the City's GIS. Total yearly rainfall amount was determined by averaging the amount of rain collected from the City's five monitoring stations located throughout the city (refer to map in Appendix E). Runoff coefficient (C) was calculated by adding 15 % of the pervious fraction to 95% of the impervious fraction in each watershed. This assumes that the fraction of rainfall producing runoff is 15% and 95% from pervious and impervious surfaces respectively. The summary of the runoff calculations are provided in the table above. Calculations for some of the watersheds were left out due to the insignificant amount of runoff that would be produced.

7.0 ASSESSMENT OF CONTROLS: ESTIMATED POLLUTANT LOADING REDUCTIONS FROM THE MS4

Since the NPDES permit was first issued in 1996, the City of Knoxville has developed and implemented all of the scheduled programs. The ongoing monitoring program and the dry weather-screening program were started during the 1996-1997 permit year. Each required program has been implemented annually since that time. Data has been collected, analyzed, and archived for future reference.

Quantitative estimates of pollutant loads and event mean concentrations (EMC) were reported as required in the fifth annual report for each permit term. The latest estimates have lower EMC values for BOD, COD, TSS, TKN, Pb and Zn. In addition, the lateest estimates have higher EMC values for Nitrate + Nitrite Nitrogen (as N) and Dissolved Phosphorus. However, as described in the Dry Weather Screening Program (ILL-2), noticeable reductions in contaminated outfalls have been observed since the program began.

Although testing data may not be available to substantiate the impact of all of the illicit discharges and illegal dumping problems, which have been resolved, the positive effect on water quality within the MS4 and Waters of the State is irrefutable. Many industries have removed illicit discharges, homeowners and utilities have replaced sections of leaking or broken sanitary sewers, the last known sections of the combined sewers were separated, unknown combined sewer systems have been located and planned for repair, creek restoration and cleanup activities are continuing, and many educational and volunteer programs have been sponsored, conducted, and/or coordinated to reduce dumping. From 2004 to 2016, the Knoxville Utilities Board completed over one-half billion dollars of sewer infrastructure improvements to reduce sewage overflows and exfiltration.

Structural controls for water quality include stormwater treatment facilities on most new development and significant redevelopment throughout the City since 1997. Covenants are in place to insure that these water quality facilities are maintained and/or replaced as needed. The City has installed stormwater treatment facilities at the following locations: the KAT bus facilities, Victor Ashe Park, Northwest Crossing regional detention pond, the Prosser Road garage, the Loraine Street Public Works facility, Cumberland Avenue strip, and the Solid Waste Transfer Station. Floating trash skimmers have been installed near the mouth of some major creeks to prevent floating pollutants from discharging to the river. Ijams Nature Center has been contracted to maintain and replace the skimmers as needed.

All of the programs implemented to improve water quality in the creeks and river throughout the City should provide some quantitative evidence of improvement in future years. This data will be reported as it becomes apparent.

8.0 SUMMARY OF MODIFICATIONS TO THE SWMP

The first NPDES MS4 permit cycle for the City of Knoxville (July 1, 1996 – June 30, 2004) established the NPDES program and provided a better understanding of the City's stormwater quality discharge status and trends as a basis for determining what measures are needed to manage and improve receiving water quality. The second permit cycle (July 1, 2004 – present) improved the program and prepared the City to once again propose a new permit with strategic new regulations and proactive responses to water quality impacts and trends.

The City's proposed a new program in 2015-2016 report for the third permit. Concurrent with the changes outlined in the permit reapplication, the City proposed to modify the existing SWMP in compliance with Part III (G)(2)(a) on page 8 of the most recent NPDES Permit. As SWMP modifications are developed and implemented, they will be reported as required in the subsequent annual report.

The permit reapplication included updated implementation schedules for each of the five major programs listed below, which incorporate changes in the program nomenclature. To better meet the City's goals of protecting water quality, some program tasks are proposed that were not included in the previous permits, while other program tasks have been replaced or deleted because they were completed, ineffective or outdated. Highlights of proposed modifications to the SWMP to maximize water quality-based outcomes include improvements in BMP tracking, promotion of green infrastructure, improved runoff reduction design requirements, an offsite mitigation bank, and improvements in monitoring program effectiveness. Where ever appropriate, the permit reapplication will update the original SWMP as described in the program element schedules listed in Part 2 of the first permit application and Part III of the current permit.

The proposed programs for the new permit include:

1. Permanent Stormwater Management of Source Controls (PC)
2. Illicit Discharges Detection and Elimination Program (IDDE)
3. The Industrial and Related Facilities Program (IN)
4. Construction Site Runoff Program (CS)
5. Comprehensive Monitoring Program (MN)

Each of the above programs were further divided into separate program elements and related tasks that correspond to the requirements listed in 40 CFR 122.26(d)(2)(iv) and will replace the Implementation Schedules listed in Part IV of the current Permit. Each specific task was briefly discussed in accordance with the reporting guidelines outlined in Part VI of the current NPDES Permit. All changes for the new permit term will be effective according to the agreed schedules approved by TDEC after the new permit is issued.

9.0 FISCAL ANALYSIS

The Fiscal Analysis for this annual report lists the permit year budget sources and amounts along with estimates for the following permit year. Sources of funds are listed for each major program. Due to complexity, all of the support activities such as purchasing, payroll, legal support, information systems, fleet management, and human resources are not reflected in the table. Future funding sources may change if a stormwater utility fee is implemented.

Program Description	**Fund Source**	**Actual FY 16/17**	**Est. FY 17/18**
Solid Waste Recycling Program	Fund 230	$1,973,919	$2,210,250
Household Hazardous Waste Facility	Fund 230	$206,193	$210,000
Stormwater Mgmt Operating expenses	Fund 220	$2,473,124	$2,711,390
PSD – MS4 Maintenance	Fund 100	$3,183,189	$3,500,000
Ulster/Cavalier/Sims Stream Projects	Fund 401	$456,828	$0
2400 Cedar Lane Flood Evacuation	Fund 401	$0	$112,000
Williams Crk. – Selma/Lay Flood Management	Fund 401	$119,300	$0
Cumberland Avenue Streetscapes (*estimated)	Fund 401	$8,150,787*	$0
N. Central Avenue Streetscapes (*estimated)	Fund 401	$77,026*	$0
Marble Avenue Streetscapes (*estimated)	Fund 401	$464,185*	$0
700 Block of Gay St. Streetscapes (*estimated)	Fund 401	$638,753*	$0
Suttree Landing Park & Roadway (*estimated)	Fund 401	$2,083,625*	$0
Longwood CIPP	Fund 401	$0	$415,000
Banks Avenue Restoration	Fund 401	$47,545	$0
Neighborhood Drainage Projects	Fund 401	$1,761,557	$1,273,000
Fountain City Lake Improvements	Fund 401	$96,360	$500,000
CIPP for small CMP	Fund 401	$65,500	$0
Chilhowee Park CIPP	Fund 401	$118,960	$0
Total Estimated Stormwater Costs		$21,916,851*	$10,922,640

APPENDIX A

Dry Weather Screening Results Summary

List of outfalls tested during the permit year with status

Dry Weather Screening Data for 2017

Outfall / Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
00-100-0115																
2017	11/7/16	1	No													
2017	11/7/16	2	No													
2017	4/10/17	3	No													
2017	4/10/17	4	No													
00-100-0140																
2017	11/7/16	1	No													
2017	11/7/16	2	No													
2017	4/10/17	3	No													
2017	4/10/17	4	No													
00-400-0141																
2017	11/7/16	1	No													
2017	11/7/16	2	No													
2017	4/10/17	3	No													
2017	4/10/17	4	No													
00-200-0175																
2017	11/7/16	1	No													
2017	11/7/16	2	No													
2017	4/10/17	3	No													
2017	4/10/17	4	No													
00-100-0180																
2017	11/7/16	1	No													
2017	11/7/16	2	No													
2017	4/10/17	3	No													
2017	4/10/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
00-100-0185																
2017	11/8/16	1	No													
2017	11/8/16	2	No													
2017	3/17/17	3	No													
2017	3/17/17	4	No													
00-300-0230																
2017	11/8/16	1	No													
2017	11/8/16	2	No													
2017	3/17/17	3	No													
2017	3/17/17	4	No													
00-400-0233																
2017	11/8/16	1	No													
2017	11/8/16	2	No													
2017	3/17/17	3	No													
2017	3/17/17	4	No													
00-200-0235																
2017	11/8/16	1	No													
2017	11/8/16	2	No													
2017	3/17/17	3	No													
2017	3/17/17	4	No													
00-100-0236																
2017	11/18/16	1	No													
2017	11/18/16	2	No													
2017	3/17/17	3	No													
2017	3/17/17	4	No													
00-400-0364																
2017	11/10/16	1	No													
2017	11/10/16	2	No													
2017	3/16/17	3	No													
2017	3/16/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
00-300-0435																
2017	11/10/16	1	No													
2017	11/10/16	2	No													
2017	3/16/17	3	No													
2017	3/16/17	4	No													
00-300-0460																
2017	11/10/16	1	No													
2017	11/10/16	2	No													
2017	3/16/17	3	No													
2017	3/16/17	4	No													
00-300-0480																
2017	11/10/16	1	No													
2017	11/10/16	2	No													
2017	3/16/17	3	No													
2017	3/16/17	4	No													
00-500-0490																
2017	11/10/16	1	No													
2017	11/10/16	2	No													
2017	3/16/17	3	No													
2017	3/16/17	4	No													
01-400-0021																
2017	8/25/16	1	No													
2017	8/25/16	2	No													
2017	11/15/16	3	No													
2017	11/15/16	4	No													
01-300-0052																
2017	8/25/16	1	No													
2017	8/25/16	2	No													
2017	11/15/16	3	No													
2017	11/15/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
01-300-0055																
2017	8/25/16	1	No													
2017	8/25/16	2	No													
2017	11/15/16	3	No													
2017	11/15/16	4	No													
01-300-0060																
2017	8/25/16	1	No													
2017	8/25/16	2	No													
2017	11/15/16	3	No													
2017	11/15/16	4	No													
01-300-0085																
2017	8/25/16	1	No													
2017	8/25/16	2	No													
2017	11/15/16	3	No													
2017	11/15/16	4	No													
01-300-0090																
2017	8/25/16	1	No													
2017	8/25/16	2	No													
2017	11/15/16	3	No													
2017	11/15/16	4	No													
01-300-0095																
2017	8/26/16	1	No													
2017	8/26/16	2	No													
2017	11/16/16	3	No													
2017	11/16/16	4	No													
01-300-0097																
2017	8/26/16	1	No													
2017	8/26/16	2	No													
2017	11/16/16	3	No													
2017	11/16/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
01-300-0100																
2017	8/26/16	1	No													
2017	8/26/16	2	No													
2017	11/16/16	3	No													
2017	11/16/16	4	No													
01-300-0101																
2017	8/26/16	1	No													
2017	8/26/16	2	No													
2017	11/16/16	3	No													
2017	11/16/16	4	No													
01-300-0106																
2017	8/26/16	1	No													
2017	8/26/16	2	No													
2017	11/16/16	3	No													
2017	11/16/16	4	No													
01-300-0109																
2017	8/26/16	1	No													
2017	8/26/16	2	No													
2017	11/16/16	3	No													
2017	11/16/16	4	No													
01-300-0110																
2017	8/26/16	1	No													
2017	8/26/16	2	No													
2017	11/16/16	3	No													
2017	11/16/16	4	No													
01-300-0125																
2017	8/29/16	1	No													
2017	8/29/16	2	No													
2017	11/17/16	3	No													
2017	11/18/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
01-300-0145																
2017	8/29/16	1	No													
2017	8/29/16	2	No													
2017	11/17/16	3	No													
2017	11/18/16	4	No													
01-100-0175																
2017	8/29/16	1	No													
2017	8/29/16	2	No													
2017	11/17/16	3	No													
2017	11/18/16	4	No													
01-300-0200																
2017	8/30/16	1	No													
2017	8/30/16	2	No													
2017	11/22/16	3	No													
2017	11/23/16	4	No													
01-400-0257																
2017	8/30/16	1	No													
2017	8/30/16	2	No													
2017	11/22/16	3	No													
2017	11/23/16	4	No													
01-100-0308																
2017	8/30/16	1	No													
2017	8/30/16	2	No													
2017	11/22/16	3	No													
2017	11/23/16	4	No													
01-300-0395																
2017	8/30/16	1	No													
2017	8/30/16	2	No													
2017	11/22/16	3	No													
2017	11/23/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
01-400-0510																
2017	8/30/16	1	No													
2017	8/30/16	2	No													
2017	11/22/16	3	No													
2017	11/23/16	4	No													
01-100-0550																
2017	9/2/16	1	No													
2017	9/2/16	2	No													
2017	11/28/16	3	No													
2017	11/28/16	4	No													
01-500-0570																
2017	9/2/16	1	No													
2017	9/2/16	2	No													
2017	11/28/16	3	No													
2017	11/28/16	4	No													
01-400-0665																
2017	9/2/16	1	No													
2017	9/2/16	2	No													
2017	11/28/16	3	No													
2017	11/28/16	4	No													
01-100-0667																
2017	9/2/16	1	No													
2017	9/2/16	2	No													
2017	11/28/16	3	No													
2017	11/28/16	4	No													
01-500-0668																
2017	9/2/16	1	No													
2017	9/2/16	2	No													
2017	11/28/16	3	No													
2017	11/28/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
01-500-0710																
2017	9/2/16	1	No													
2017	9/2/16	2	No													
2017	11/28/16	3	No													
2017	11/28/16	4	No													
01-100-0855																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	12/9/16	3	No													
2017	12/9/16	4	No													
01-100-0860																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	12/9/16	3	No													
2017	12/9/16	4	No													
01-100-0875																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	12/9/16	3	No													
2017	12/9/16	4	No													
01-100-0905																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	12/9/16	3	No													
2017	12/9/16	4	No													
01-100-0907																
2017	9/6/16	1	No													
2017	9/6/16	2	No													
2017	12/9/16	3	No													
2017	12/9/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
01-300-0916																
2017	9/7/16	1	No													
2017	9/7/16	2	No													
2017	12/16/16	3	No													
2017	12/16/16	4	No													
01-300-0918																
2017	9/7/16	1	No													
2017	9/7/16	2	No													
2017	12/16/16	3	No													
2017	12/16/16	4	No													
01-100-0920																
2017	9/7/16	1	No													
2017	9/7/16	2	No													
2017	12/16/16	3	Yes	0.50	7.0	0	0	0	0	0		0		No	No	No
2017	12/16/16	4	Yes	0.50	7.0	0	0	0	0	0		0		No	No	No
02-400-0005																
2017	9/20/16	1	No													
2017	9/20/16	2	No													
2017	1/10/17	3	No													
2017	1/10/17	4	No													
02-100-0099																
2017	9/7/16	1	No													
2017	9/7/16	2	No													
2017	12/16/16	3	No													
2017	12/16/16	4	No													
02-100-0105																
2017	9/7/16	1	No													
2017	9/7/16	2	No													
2017	12/16/16	3	No													
2017	12/16/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
02-300-0166																
2017	9/8/16	1	No													
2017	9/8/16	2	No													
2017	12/21/16	3	No													
2017	12/21/16	4	No													
02-300-0167																
2017	9/8/16	1	No													
2017	9/8/16	2	No													
2017	12/21/16	3	No													
2017	12/21/16	4	No													
02-400-0168																
2017	9/8/16	1	No													
2017	9/8/16	2	No													
2017	12/21/16	3	No													
2017	12/21/16	4	No													
02-300-0175																
2017	9/8/16	1	No													
2017	9/8/16	2	No													
2017	12/21/16	3	No													
2017	12/21/16	4	No													
02-300-0180																
2017	9/8/16	1	No													
2017	9/8/16	2	No													
2017	12/21/16	3	No													
2017	12/21/16	4	No													
02-300-0181																
2017	9/8/16	1	No													
2017	9/8/16	2	No													
2017	12/21/16	3	No													
2017	12/21/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
02-200-0205																
2017	9/8/16	1	No													
2017	9/8/16	2	No													
2017	12/21/16	3	No													
2017	12/21/16	4	No													
02-300-0253																
2017	9/9/16	1	No													
2017	9/9/16	2	No													
2017	12/22/16	3	No													
2017	12/23/16	4	No													
02-300-0260																
2017	9/9/16	1	No													
2017	9/9/16	2	No													
2017	12/22/16	3	No													
2017	12/23/16	4	No													
02-100-0360																
2017	9/9/16	1	No													
2017	9/9/16	2	No													
2017	12/22/16	3	No													
2017	12/23/16	4	No													
02-300-0371																
2017	9/9/16	1	No													
2017	9/9/16	2	No													
2017	12/22/16	3	No													
2017	12/23/16	4	No													
02-100-0375																
2017	9/9/16	1	No													
2017	9/9/16	2	No													
2017	12/22/16	3	No													
2017	12/23/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
02-100-0390																
2017	9/13/16	1	No													
2017	9/14/16	2	No													
2017	1/5/17	3	No													
2017	1/6/17	4	No													
02-100-0395																
2017	9/13/16	1	No													
2017	9/14/16	2	No													
2017	1/5/17	3	No													
2017	1/6/17	4	No													
02-400-0420																
2017	9/13/16	1	No													
2017	9/14/16	2	No													
2017	1/5/17	3	No													
2017	1/5/17	4	No													
02-100-0465																
2017	9/13/16	1	No													
2017	9/14/16	2	No													
2017	1/5/17	3	No													
2017	1/6/17	4	No													
02-100-0480																
2017	9/13/16	1	No													
2017	9/14/16	2	No													
2017	1/5/17	3	No													
2017	1/6/17	4	No													
02-100-0495																
2017	9/13/16	1	No													
2017	9/14/16	2	No													
2017	1/5/17	3	No													
2017	1/6/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
02-100-0500																
2017	9/13/16	1	No													
2017	9/14/16	2	No													
2017	1/5/17	3	No													
2017	1/6/17	4	No													
02-100-0545																
2017	9/13/16	1	No													
2017	9/14/16	2	No													
2017	1/7/17	3	No													
2017	1/8/17	4	No													
03-300-0370																
2017	9/20/16	1	No													
2017	9/20/16	2	No													
2017	1/10/17	3	No													
2017	1/10/17	4	No													
03-100-0375																
2017	9/20/16	1	No													
2017	9/20/16	2	No													
2017	1/10/17	3	No													
2017	1/10/17	4	No													
03-200-0395																
2017	9/20/16	1	No													
2017	9/20/16	2	No													
2017	1/10/17	3	No													
2017	1/10/17	4	No													
03-300-0399																
2017	9/20/16	1	No													
2017	9/20/16	2	No													
2017	1/10/17	3	No													
2017	1/10/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
03-400-0401																
2017	9/20/16	1	No													
2017	9/20/16	2	No													
2017	1/10/17	3	No													
2017	1/10/17	4	No													
03-400-0402																
2017	9/20/16	1	No													
2017	9/20/16	1	No													
2017	9/20/16	2	No													
2017	9/20/16	2	No													
2017	1/10/17	3	No													
2017	1/10/17	3	No													
2017	1/10/17	4	No													
2017	1/10/17	4	No													
03-100-0403																
2017	9/20/16	1	No													
2017	9/20/16	1	No													
2017	9/20/16	2	No													
2017	9/20/16	2	No													
2017	1/10/17	3	No													
2017	1/10/17	3	No													
2017	1/10/17	4	No													
2017	1/10/17	4	No													
03-100-0408																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
03-300-0430																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-100-0435																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-100-0445																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-300-0460																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-100-0475																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-100-0490																
2017	9/21/16	1	No													
2017	9/21/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
03-100-0553																
2017	9/22/16	1	No													
2017	9/22/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-300-0629																
2017	9/22/16	1	No													
2017	9/23/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-300-0630																
2017	9/22/16	1	No													
2017	9/23/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-300-0631																
2017	9/22/16	1	No													
2017	9/23/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-300-0645																
2017	9/22/16	1	No													
2017	9/23/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													
03-500-0650																
2017	9/22/16	1	No													
2017	9/23/16	2	No													
2017	1/30/17	3	No													
2017	1/30/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
03-300-0655																
2017	9/26/16	1	No													
2017	9/26/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-300-0660																
2017	9/26/16	1	No													
2017	9/26/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-400-0735																
2017	9/26/16	1	No													
2017	9/26/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-400-0745																
2017	9/26/16	1	No													
2017	9/26/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-400-0760																
2017	9/26/16	1	No													
2017	9/26/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-100-0830																
2017	9/26/16	1	No													
2017	9/26/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
03-100-0845																
2017	9/26/16	1	No													
2017	9/26/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-100-0929																
2017	9/27/16	1	No													
2017	9/27/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-100-0931																
2017	9/27/16	1	No													
2017	9/27/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-100-0933																
2017	9/27/16	1	No													
2017	9/27/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-100-0960																
2017	9/27/16	1	No													
2017	9/27/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													
03-200-0965																
2017	9/27/16	1	No													
2017	9/27/16	2	No													
2017	1/31/17	3	No													
2017	1/31/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
04-100-0010																
2017	9/28/16	1	No													
2017	9/28/16	2	No													
2017	2/1/17	3	No													
2017	2/1/17	4	No													
04-100-0250																
2017	9/28/16	1	No													
2017	9/28/16	2	No													
2017	2/1/17	3	No													
2017	2/1/17	4	No													
04-300-0264																
2017	9/28/16	1	No													
2017	9/28/16	2	No													
2017	2/1/17	3	No													
2017	2/1/17	4	No													
04-300-0267																
2017	9/28/16	1	No													
2017	9/28/16	2	No													
2017	2/1/17	3	No													
2017	2/1/17	4	No													
04-200-0270																
2017	9/28/16	1	No													
2017	9/28/16	2	No													
2017	2/1/17	3	No													
2017	2/1/17	4	No													
04-300-0291																
2017	9/29/16	1	No													
2017	9/29/16	2	No													
2017	2/6/17	3	No													
2017	2/6/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
04-400-0300																
2017	9/29/16	1	No													
2017	9/29/16	2	No													
2017	2/6/17	3	No													
2017	2/6/17	4	No													
04-300-0308																
2017	9/29/16	1	No													
2017	9/29/16	2	No													
2017	2/6/17	3	No													
2017	2/6/17	4	No													
04-100-0325																
2017	9/29/16	1	No													
2017	9/29/16	2	No													
2017	2/6/17	3	No													
2017	2/6/17	4	No													
04-100-0326																
2017	9/29/16	1	No													
2017	9/29/16	2	No													
2017	2/6/17	3	No													
2017	2/6/17	4	No													
04-300-0337																
2017	9/30/16	1	No													
2017	9/30/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													
04-300-0352																
2017	9/30/16	1	No													
2017	9/30/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
04-300-0355																
2017	9/30/16	1	No													
2017	9/30/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													
04-300-0359																
2017	9/30/16	1	No													
2017	9/30/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													
04-300-0375																
2017	10/4/16	1	No													
2017	10/4/16	2	No													
2017	2/14/17	3	No													
2017	2/14/17	4	No													
04-300-0378																
2017	10/4/16	1	No													
2017	10/4/16	2	No													
2017	2/14/17	3	No													
2017	2/14/17	4	No													
05-500-0005																
2017	10/4/16	1	No													
2017	10/4/16	2	No													
2017	2/14/17	3	No													
2017	2/14/17	4	No													
05-400-0135																
2017	10/4/16	1	No													
2017	10/4/16	2	No													
2017	2/14/17	3	No													
2017	2/14/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
05-400-0150																
2017	10/4/16	1	No													
2017	10/4/16	2	No													
2017	2/14/17	3	No													
2017	2/14/17	4	No													
05-300-0185																
2017	10/5/16	1	No													
2017	10/5/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													
05-100-0200																
2017	10/5/16	1	No													
2017	10/5/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													
05-300-0220																
2017	10/5/16	1	No													
2017	10/5/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													
05-300-0222																
2017	10/5/16	1	No													
2017	10/5/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													
05-300-0240																
2017	10/5/16	1	No													
2017	10/5/16	2	No													
2017	2/13/17	3	No													
2017	2/13/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
06-100-0005																
2017	10/6/16	1	No													
2017	10/6/16	2	No													
2017	2/20/17	3	No													
2017	2/20/17	4	No													
06-100-0146																
2017	10/6/16	1	No													
2017	10/6/16	2	No													
2017	2/20/17	3	No													
2017	2/20/17	4	No													
06-200-0160																
2017	10/6/16	1	No													
2017	10/6/16	2	No													
2017	2/20/17	3	No													
2017	2/20/17	4	No													
06-100-0200																
2017	10/6/16	1	No													
2017	10/6/16	2	No													
2017	2/20/17	3	No													
2017	2/20/17	4	No													
07-500-0009																
2017	10/10/16	1	No													
2017	10/10/16	2	No													
2017	2/20/17	3	No													
2017	2/20/17	4	No													
08-200-0005																
2017	10/10/16	1	No													
2017	10/10/16	2	No													
2017	2/20/17	3	No													
2017	2/20/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
08-200-0010																
2017	10/11/16	1	No													
2017	10/11/16	2	No													
2017	2/21/17	3	No													
2017	2/21/17	4	No													
08-400-0050																
2017	10/11/16	1	No													
2017	10/11/16	2	No													
2017	2/21/17	3	No													
2017	2/21/17	4	No													
08-400-0060																
2017	10/23/16	1	No													
2017	10/23/16	2	No													
2017	1/13/17	3	No													
2017	1/13/17	4	No													
08-400-0085																
2017	10/11/16	1	No													
2017	10/11/16	2	No													
2017	2/21/17	3	No													
2017	2/21/17	4	No													
08-400-0095																
2017	10/11/16	1	No													
2017	10/11/16	2	No													
2017	2/21/17	3	No													
2017	2/21/17	4	No													
08-500-0120																
2017	10/11/16	1	No													
2017	10/11/16	2	No													
2017	2/21/17	3	No													
2017	2/21/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
08-500-0125																
2017	10/11/16	1	No													
2017	10/11/16	2	No													
2017	2/21/17	3	No													
2017	2/21/17	4	No													
10-500-0370																
2017	10/12/16	1	No													
2017	10/12/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													
10-500-0385																
2017	10/12/16	1	No													
2017	10/12/16	2	No													
2017	10/12/16	3	No													
2017	5/11/17	4	No													
10-300-0424																
2017	10/12/16	1	No													
2017	10/12/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													
10-500-0430																
2017	10/12/16	1	No													
2017	10/12/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													
10-100-0450																
2017	9/12/16	1	No													
2017	9/12/16	2	No													
2017	11/5/16	3	No													
2017	11/5/16	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
10-200-0470																
2017	10/12/16	1	No													
2017	10/12/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													
10-500-0566																
2017	10/17/16	1	No													
2017	10/17/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													
11-400-0597																
2017	9/12/16	1	No													
2017	9/12/16	2	No													
2017	11/16/16	3	No													
2017	11/16/16	4	No													
11-200-0600																
2017	10/17/16	1	No													
2017	10/17/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													
11-300-0612																
2017	10/17/16	1	No													
2017	10/17/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													
11-300-0615																
2017	10/17/16	1	No													
2017	10/17/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
11-500-0620																
2017	10/17/16	1	No													
2017	10/17/16	2	No													
2017	5/11/17	3	No													
2017	5/11/17	4	No													
12-500-0570																
2017	10/18/16	1	No													
2017	10/19/16	2	No													
2017	5/10/17	3	No													
2017	5/10/17	4	No													
12-500-0710																
2017	10/18/16	1	No													
2017	10/19/16	2	No													
2017	5/10/17	3	No													
2017	5/10/17	4	No													
12-500-0740																
2017	10/18/16	1	No													
2017	10/19/16	2	No													
2017	5/10/17	3	No													
2017	5/10/17	4	No													
12-300-0743																
2017	10/18/16	1	No													
2017	10/19/16	2	No													
2017	5/10/17	3	No													
2017	5/10/17	4	No													
12-300-0746																
2017	10/19/16	1	No													
2017	10/19/16	2	No													
2017	5/3/17	3	No													
2017	5/3/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
12-300-0747																
2017	10/19/16	1	No													
2017	10/19/16	2	No													
2017	5/3/17	3	No													
2017	5/3/17	4	No													
12-300-0749																
2017	10/19/16	1	No													
2017	10/19/16	2	No													
2017	5/3/17	3	No													
2017	5/3/17	4	No													
12-500-0750																
2017	10/19/16	1	No													
2017	10/19/16	2	No													
2017	5/3/17	3	No													
2017	5/3/17	4	No													
13-300-0140																
2017	10/24/16	1	No													
2017	10/24/16	2	No													
2017	5/2/17	3	No													
2017	5/2/17	4	No													
13-300-0147																
2017	10/24/16	1	No													
2017	10/24/16	2	No													
2017	5/2/17	3	No													
2017	5/2/17	4	No													
13-300-0150																
2017	10/24/16	1	No													
2017	10/24/16	2	No													
2017	5/2/17	3	No													
2017	5/2/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
13-300-0155																
2017	10/24/16	1	No													
2017	10/24/16	2	No													
2017	5/2/17	3	No													
2017	5/2/17	4	No													
13-300-0182																
2017	10/25/16	1	No													
2017	10/26/16	2	No													
2017	5/1/17	3	No													
2017	5/1/17	4	No													
13-300-0228																
2017	10/25/16	1	No													
2017	10/26/16	2	No													
2017	5/1/17	3	No													
2017	5/1/17	4	No													
13-300-0305																
2017	10/25/16	1	No													
2017	10/26/16	2	No													
2017	5/1/17	3	No													
2017	5/1/17	4	No													
18-100-0690																
2017	10/27/16	1	No													
2017	10/27/16	2	No													
2017	4/13/17	3	No													
2017	4/13/17	4	No													
18-100-0700																
2017	10/27/16	1	No													
2017	10/27/16	2	No													
2017	4/13/17	3	No													
2017	4/13/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
31-300-0515																
2017	10/25/16	1	No													
2017	10/25/16	2	No													
2017	4/13/17	3	No													
2017	4/13/17	4	No													
50-200-0055																
2017	10/28/16	1	No													
2017	10/28/16	2	No													
2017	4/12/17	3	No													
2017	4/12/17	4	No													
50-400-0115																
2017	10/28/16	1	No													
2017	10/28/16	2	No													
2017	4/12/17	3	No													
2017	4/12/17	4	No													
51-100-0900																
2017	10/31/16	1	No													
2017	10/31/16	2	No													
2017	4/11/17	3	No													
2017	4/11/17	4	No													
53-100-0030																
2017	10/31/16	1	No													
2017	10/31/16	2	No													
2017	4/11/17	3	No													
2017	4/11/17	4	No													
53-100-0085																
2017	10/31/16	1	Yes	2	7.0	0	0	0	0	0		0	0	No	No	No
2017	10/31/16	2	Yes	2	7.0	0	0	0	0	0		0	0	No	No	No
2017	4/11/17	3	Yes	2	7.0	0	0	0	0	0		0	0	No	No	No
2017	4/11/17	4	Yes	1	7.0	0	0	0	0	0		0	0	No	No	No

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
53-500-0120																
2017	10/31/16	1	No													
2017	10/31/16	2	No													
2017	4/11/17	3	No													
2017	4/11/17	4	No													
53-200-0125																
2017	10/31/16	1	No													
2017	10/31/16	2	No													
2017	4/11/17	3	No													
2017	4/11/17	4	No													
53-200-0132																
2017	11/1/16	1	No													
2017	11/1/16	2	No													
2017	3/6/17	3	No													
2017	3/6/17	4	No													
53-100-0133																
2017	11/1/16	1	No													
2017	11/1/16	2	No													
2017	3/6/17	3	No													
2017	3/6/17	4	No													
53-300-0188																
2017	11/1/16	1	No													
2017	11/1/16	2	No													
2017	3/6/17	3	No													
2017	3/6/17	4	No													
53-200-0200																
2017	11/1/16	1	No													
2017	11/1/16	2	No													
2017	3/6/17	3	No													
2017	3/6/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
55-100-0150																
2017	11/2/16	1	No													
2017	11/2/16	2	No													
2017	3/6/17	3	No													
2017	3/6/17	4	No													
56-100-0230																
2017	11/2/16	1	No													
2017	11/2/16	2	No													
2017	3/6/17	3	No													
2017	3/6/17	4	No													
79-200-0045																
2017	11/3/16	1	No													
2017	11/3/16	2	No													
2017	4/10/17	3	No													
2017	4/10/17	4	No													
79-500-0339																
2017	11/3/16	1	No													
2017	11/3/16	2	No													
2017	4/10/17	3	No													
2017	4/10/17	4	No													

Outfall Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
79-100-0365																
2017	11/3/16	1	No													
2017	11/3/16	2	No													
2017	4/10/17	3	No													
2017	4/10/17	4	No													

Shaded rows represent samples which contained eleveated levels for at least 1 sampled parameter.

Oracle - Dry Weather Screening Data

Elevated readings have been underlined.

Below is a listing of sample parameters and their elevated reading criteria:

pH	< 6.5 or > 9 su
Chlorine	> 0.2 ppm
Copper	>= 0.1 ppm
Phenol	>= 0.1 ppm
Detergents	> 0.25 ppm
Ammonia	>= 1 ppm
Fecal Sample	>= 200 mpn/100 ml

Dry Weather Screening - Sample Events for 2017

Outfall Name	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
00-100-0115	DRY	11/7/2016	11/7/2016	4/10/2017	4/10/2017
00-100-0140	DRY	11/7/2016	11/7/2016	4/10/2017	4/10/2017
00-400-0141	DRY	11/7/2016	11/7/2016	4/10/2017	4/10/2017
00-200-0175	DRY	11/7/2016	11/7/2016	4/10/2017	4/10/2017
00-100-0180	DRY	11/7/2016	11/7/2016	4/10/2017	4/10/2017
00-100-0185	DRY	11/8/2016	11/8/2016	3/17/2017	3/17/2017
00-300-0230	DRY	11/8/2016	11/8/2016	3/17/2017	3/17/2017
00-200-0235	DRY	11/8/2016	11/8/2016	3/17/2017	3/17/2017
00-100-0236	DRY	11/18/2016	11/18/2016	3/17/2017	3/17/2017
00-400-0370	DRY				
00-300-0435	DRY	11/10/2016	11/10/2016	3/16/2017	3/16/2017
00-300-0460	DRY	11/10/2016	11/10/2016	3/16/2017	3/16/2017
00-300-0480	DRY	11/10/2016	11/10/2016	3/16/2017	3/16/2017
00-500-0490	DRY	11/10/2016	11/10/2016	3/16/2017	3/16/2017
01-400-0021	DRY	8/25/2016	8/25/2016	11/15/2016	11/15/2016
01-300-0052	DRY	8/25/2016	8/25/2016	11/15/2016	11/15/2016
01-300-0055	DRY	8/25/2016	8/25/2016	11/15/2016	11/15/2016
01-300-0060	DRY	8/25/2016	8/25/2016	11/15/2016	11/15/2016
01-300-0085	DRY	8/25/2016	8/25/2016	11/15/2016	11/15/2016
01-300-0090	DRY	8/25/2016	8/25/2016	11/15/2016	11/15/2016
01-300-0095	DRY	8/26/2016	8/26/2016	11/16/2016	11/16/2016
01-300-0097	DRY	8/26/2016	8/26/2016	11/16/2016	11/16/2016
01-300-0100	DRY	8/26/2016	8/26/2016	11/16/2016	11/16/2016
01-300-0101	DRY	8/26/2016	8/26/2016	11/16/2016	11/16/2016
01-300-0106	DRY	8/26/2016	8/26/2016	11/16/2016	11/16/2016

Outfall Name	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
01-300-0109	DRY	8/26/2016	8/26/2016	11/16/2016	11/16/2016
01-300-0110	DRY	8/26/2016	8/26/2016	11/16/2016	11/16/2016
01-300-0112	DRY				
01-300-0125	DRY	8/29/2016	8/29/2016	11/17/2016	11/18/2016
01-300-0145	DRY	8/29/2016	8/29/2016	11/17/2016	11/18/2016
01-100-0175	DRY	8/29/2016	8/29/2016	11/17/2016	11/18/2016
01-300-0200	DRY	8/30/2016	8/30/2016	11/22/2016	11/23/2016
01-400-0257	DRY	8/30/2016	8/30/2016	11/22/2016	11/23/2016
01-100-0308	DRY	8/30/2016	8/30/2016	11/22/2016	11/23/2016
01-300-0395	DRY	8/30/2016	8/30/2016	11/22/2016	11/23/2016
01-400-0510	DRY	8/30/2016	8/30/2016	11/22/2016	11/23/2016
01-100-0550	DRY	9/2/2016	9/2/2016	11/28/2016	11/28/2016
01-500-0570	DRY	9/2/2016	9/2/2016	11/28/2016	11/28/2016
01-400-0665	DRY	9/2/2016	9/2/2016	11/28/2016	11/28/2016
01-100-0667	DRY	9/2/2016	9/2/2016	11/28/2016	11/28/2016
01-500-0668	DRY	9/2/2016	9/2/2016	11/28/2016	11/28/2016
01-500-0710	DRY	9/2/2016	9/2/2016	11/28/2016	11/28/2016
01-100-0855	DRY	9/21/2016	9/21/2016	12/9/2016	12/9/2016
01-100-0860	DRY	9/21/2016	9/21/2016	12/9/2016	12/9/2016
01-100-0875	DRY	9/21/2016	9/21/2016	12/9/2016	12/9/2016
01-100-0905	DRY	9/21/2016	9/21/2016	12/9/2016	12/9/2016
01-100-0907	DRY	9/6/2016	9/6/2016	12/9/2016	12/9/2016
01-300-0916	DRY	9/7/2016	9/7/2016	12/16/2016	12/16/2016
01-300-0918	DRY	9/7/2016	9/7/2016	12/16/2016	12/16/2016
01-100-0920	DRY	9/7/2016	9/7/2016	12/16/2016	12/16/2016
02-400-0005	DRY	9/20/2016	9/20/2016	1/10/2017	1/10/2017
02-100-0099	DRY	9/7/2016	9/7/2016	12/16/2016	12/16/2016
02-100-0105	DRY	9/7/2016	9/7/2016	12/16/2016	12/16/2016

Outfall Name	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
02-300-0166	DRY	9/8/2016	9/8/2016	12/21/2016	12/21/2016
02-300-0167	DRY	9/8/2016	9/8/2016	12/21/2016	12/21/2016
02-400-0168	DRY	9/8/2016	9/8/2016	12/21/2016	12/21/2016
02-300-0175	DRY	9/8/2016	9/8/2016	12/21/2016	12/21/2016
02-300-0180	DRY	9/8/2016	9/8/2016	12/21/2016	12/21/2016
02-300-0181	DRY	9/8/2016	9/8/2016	12/21/2016	12/21/2016
02-200-0205	DRY	9/8/2016	9/8/2016	12/21/2016	12/21/2016
02-300-0253	DRY	9/9/2016	9/9/2016	12/22/2016	12/23/2016
02-300-0260	DRY	9/9/2016	9/9/2016	12/22/2016	12/23/2016
02-100-0360	DRY	9/9/2016	9/9/2016	12/22/2016	12/23/2016
02-300-0371	DRY	9/9/2016	9/9/2016	12/22/2016	12/23/2016
02-100-0375	DRY	9/9/2016	9/9/2016	12/22/2016	12/23/2016
02-100-0390	DRY	9/13/2016	9/14/2016	1/5/2017	1/6/2017
02-100-0395	DRY	9/13/2016	9/14/2016	1/5/2017	1/6/2017
02-400-0420	DRY	9/13/2016	9/14/2016	1/5/2017	1/5/2017
02-100-0465	DRY	9/13/2016	9/14/2016	1/5/2017	1/6/2017
02-100-0480	DRY	9/13/2016	9/14/2016	1/5/2017	1/6/2017
02-100-0495	DRY	9/13/2016	9/14/2016	1/5/2017	1/6/2017
02-100-0500	DRY	9/13/2016	9/14/2016	1/5/2017	1/6/2017
03-300-0370	DRY	9/20/2016	9/20/2016	1/10/2017	1/10/2017
03-100-0375	DRY	9/20/2016	9/20/2016	1/10/2017	1/10/2017
03-200-0395	DRY	9/20/2016	9/20/2016	1/10/2017	1/10/2017
03-300-0399	DRY	9/20/2016	9/20/2016	1/10/2017	1/10/2017
03-400-0401	DRY	9/20/2016	9/20/2016	1/10/2017	1/10/2017
03-400-0402	DRY	9/20/2016	9/20/2016	9/20/2016	9/20/2016
		9/20/2016	9/20/2016	9/20/2016	9/20/2016
03-100-0403	DRY	9/20/2016	9/20/2016	9/20/2016	9/20/2016
		9/20/2016	9/20/2016	9/20/2016	9/20/2016

Outfall Name	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
03-100-0408	DRY	9/21/2016	9/21/2016	1/30/2017	1/30/2017
03-300-0430	DRY	9/21/2016	9/21/2016	1/30/2017	1/30/2017
03-100-0435	DRY	9/21/2016	9/21/2016	1/30/2017	1/30/2017
03-100-0445	DRY	9/21/2016	9/21/2016	1/30/2017	1/30/2017
03-300-0460	DRY	9/21/2016	9/21/2016	1/30/2017	1/30/2017
03-100-0475	DRY	9/21/2016	9/21/2016	1/30/2017	1/30/2017
03-100-0490	DRY	9/21/2016	9/21/2016	1/30/2017	1/30/2017
03-100-0553	DRY	9/22/2016	9/22/2016	1/30/2017	1/30/2017
03-300-0629	DRY	9/22/2016	9/23/2016	1/30/2017	1/30/2017
03-300-0630	DRY	9/22/2016	9/23/2016	1/30/2017	1/30/2017
03-300-0631	DRY	9/22/2016	9/23/2016	1/30/2017	1/30/2017
03-300-0645	DRY	9/22/2016	9/23/2016	1/30/2017	1/30/2017
03-500-0650	DRY	9/22/2016	9/23/2016	1/30/2017	1/30/2017
03-300-0655	DRY	9/26/2016	9/26/2016	1/31/2017	1/31/2017
03-300-0660	DRY	9/26/2016	9/26/2016	1/31/2017	1/31/2017
03-400-0735	DRY	9/26/2016	9/26/2016	1/31/2017	1/31/2017
03-400-0745	DRY	9/26/2016	9/26/2016	1/31/2017	1/31/2017
03-400-0760	DRY	9/26/2016	9/26/2016	1/31/2017	1/31/2017
03-100-0830	DRY	9/26/2016	9/26/2016	1/31/2017	1/31/2017
03-100-0845	DRY	9/26/2016	9/26/2016	1/31/2017	1/31/2017
03-100-0929	DRY	9/27/2016	9/27/2016	1/31/2017	1/31/2017
03-100-0931	DRY	9/27/2016	9/27/2016	1/31/2017	1/31/2017
03-100-0933	DRY	9/27/2016	9/27/2016	1/31/2017	1/31/2017
03-100-0960	DRY	9/27/2016	9/27/2016	1/31/2017	1/31/2017
03-200-0965	DRY	9/27/2016	9/27/2016	1/31/2017	1/31/2017
04-100-0010	DRY	9/28/2016	9/28/2016	2/1/2017	2/1/2017
04-100-0250	DRY	9/28/2016	9/28/2016	2/1/2017	2/1/2017
04-300-0264	DRY	9/28/2016	9/28/2016	2/1/2017	2/1/2017

Outfall Name	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
04-300-0267	DRY	9/28/2016	9/28/2016	2/1/2017	2/1/2017
04-200-0270	DRY	9/28/2016	9/28/2016	2/1/2017	2/1/2017
04-300-0291	DRY	9/29/2016	9/29/2016	2/6/2017	2/6/2017
04-400-0300	DRY	9/29/2016	9/29/2016	2/6/2017	2/6/2017
04-300-0308	DRY	9/29/2016	9/29/2016	2/6/2017	2/6/2017
04-100-0325	DRY	9/29/2016	9/29/2016	2/6/2017	2/6/2017
04-100-0326	DRY	9/29/2016	9/29/2016	2/6/2017	2/6/2017
04-300-0337	DRY	9/30/2016	9/30/2016	2/13/2017	2/13/2017
04-300-0352	DRY	9/30/2016	9/30/2016	2/13/2017	2/13/2017
04-300-0355	DRY	9/30/2016	9/30/2016	2/13/2017	2/13/2017
04-300-0359	DRY	9/30/2016	9/30/2016	2/13/2017	2/13/2017
04-300-0375	DRY	10/4/2016	10/4/2016	2/14/2017	2/14/2017
04-300-0378	DRY	10/4/2016	10/4/2016	2/14/2017	2/14/2017
05-500-0005	DRY	10/4/2016	10/4/2016	2/14/2017	2/14/2017
05-400-0135	DRY	10/4/2016	10/4/2016	2/14/2017	2/14/2017
05-400-0150	DRY	10/4/2016	10/4/2016	2/14/2017	2/14/2017
05-300-0185	DRY	10/5/2016	10/5/2016	2/13/2017	2/13/2017
05-100-0200	DRY	10/5/2016	10/5/2016	2/13/2017	2/13/2017
05-300-0220	DRY	10/5/2016	10/5/2016	2/13/2017	2/13/2017
05-300-0222	DRY	10/5/2016	10/5/2016	2/13/2017	2/13/2017
05-300-0240	DRY	10/5/2016	10/5/2016	2/13/2017	2/13/2017
06-100-0005	DRY	10/6/2016	10/6/2016	2/20/2017	2/20/2017
06-100-0146	DRY	10/6/2016	10/6/2016	2/20/2017	2/20/2017
06-200-0160	DRY	10/6/2016	10/6/2016	2/20/2017	2/20/2017
06-100-0200	DRY	10/6/2016	10/6/2016	2/20/2017	2/20/2017
07-500-0009	DRY	10/10/2016	10/10/2016	2/20/2017	2/20/2017
08-200-0005	DRY	10/10/2016	10/10/2016	2/20/2017	2/20/2017
08-200-0010	DRY	10/11/2016	10/11/2016	2/21/2017	2/21/2017

Outfall Name	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
08-400-0050	DRY	10/11/2016	10/11/2016	2/21/2017	2/21/2017
08-400-0060	DRY	10/23/2016	10/23/2016	1/13/2017	1/13/2017
08-400-0085	DRY	10/11/2016	10/11/2016	2/21/2017	2/21/2017
08-400-0095	DRY	10/11/2016	10/11/2016	2/21/2017	2/21/2017
08-500-0120	DRY	10/11/2016	10/11/2016	2/21/2017	2/21/2017
08-500-0125	DRY	10/11/2016	10/11/2016	2/21/2017	2/21/2017
10-500-0370	DRY	10/12/2016	10/12/2016	5/11/2017	5/11/2017
10-500-0385	DRY	10/12/2016	10/12/2016	10/12/2016	5/11/2017
10-300-0424	DRY	10/12/2016	10/12/2016	5/11/2017	5/11/2017
10-500-0430	DRY	10/12/2016	10/12/2016	5/11/2017	5/11/2017
10-100-0450	DRY	9/12/2016	9/12/2016	11/5/2016	11/5/2016
10-200-0470	DRY	10/12/2016	10/12/2016	5/11/2017	5/11/2017
10-500-0566	DRY	10/17/2016	10/17/2016	5/11/2017	5/11/2017
11-400-0597	DRY	9/12/2016	9/12/2016	11/16/2016	11/16/2016
11-200-0600	DRY	10/17/2016	10/17/2016	5/11/2017	5/11/2017
11-300-0612	DRY	10/17/2016	10/17/2016	5/11/2017	5/11/2017
11-300-0615	DRY	10/17/2016	10/17/2016	5/11/2017	5/11/2017
11-500-0620	DRY	10/17/2016	10/17/2016	5/11/2017	5/11/2017
12-500-0570	DRY	10/18/2016	10/19/2016	5/10/2017	5/10/2017
12-500-0710	DRY	10/18/2016	10/19/2016	5/10/2017	5/10/2017
12-500-0740	DRY	10/18/2016	10/19/2016	5/10/2017	5/10/2017
12-300-0743	DRY	10/18/2016	10/19/2016	5/10/2017	5/10/2017
12-300-0746	DRY	10/19/2016	10/19/2016	5/3/2017	5/3/2017
12-300-0747	DRY	10/19/2016	10/19/2016	5/3/2017	5/3/2017
12-300-0749	DRY	10/19/2016	10/19/2016	5/3/2017	5/3/2017
12-500-0750	DRY	10/19/2016	10/19/2016	5/3/2017	5/3/2017
13-300-0140	DRY	10/24/2016	10/24/2016	5/2/2017	5/2/2017
13-300-0147	DRY	10/24/2016	10/24/2016	5/2/2017	5/2/2017

Outfall Name	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
13-300-0150	DRY	10/24/2016	10/24/2016	5/2/2017	5/2/2017
13-300-0155	DRY	10/24/2016	10/24/2016	5/2/2017	5/2/2017
13-300-0182	DRY	10/25/2016	10/26/2016	5/1/2017	5/1/2017
13-300-0226	DRY	10/25/2016	10/26/2016	5/1/2017	5/1/2017
13-300-0228	DRY	10/25/2016	10/26/2016	5/1/2017	5/1/2017
13-300-0305	DRY	10/25/2016	10/26/2016	5/1/2017	5/1/2017
18-100-0690	DRY	10/27/2016	10/27/2016	4/13/2017	4/13/2017
18-100-0700	DRY	10/27/2016	10/27/2016	4/13/2017	4/13/2017
31-300-0515	DRY	10/25/2016	10/25/2016	4/13/2017	4/13/2017
50-200-0055	DRY	10/28/2016	10/28/2016	4/12/2017	4/12/2017
50-400-0115	DRY	10/28/2016	10/28/2016	4/12/2017	4/12/2017
51-100-0900	DRY	10/31/2016	10/31/2016	4/11/2017	4/11/2017
53-100-0030	DRY	10/31/2016	10/31/2016	4/11/2017	4/11/2017
53-500-0120	DRY	10/31/2016	10/31/2016	4/11/2017	4/11/2017
53-200-0125	DRY	10/31/2016	10/31/2016	4/11/2017	4/11/2017
53-200-0132	DRY	11/1/2016	11/1/2016	3/6/2017	3/6/2017
53-100-0133	DRY	11/1/2016	11/1/2016	3/6/2017	3/6/2017
53-300-0188	DRY	11/1/2016	11/1/2016	3/6/2017	3/6/2017
53-200-0200	DRY	11/1/2016	11/1/2016	3/6/2017	3/6/2017
55-100-0150	DRY	11/2/2016	11/2/2016	3/6/2017	3/6/2017
56-100-0230	DRY	11/2/2016	11/2/2016	3/6/2017	3/6/2017
79-200-0045	DRY	11/3/2016	11/3/2016	4/10/2017	4/10/2017
79-500-0339	DRY	11/3/2016	11/3/2016	4/10/2017	4/10/2017
79-100-0365	DRY	11/3/2016	11/3/2016	4/10/2017	4/10/2017

TYPE CODE	COUNT
100	**57**
200	**16**
300	**72**
400	**25**
500	**20**

APPENDIX B

City of Knoxville Solid Waste Office 2016 Annual Report

Public Service Department
Solid Waste Division
2016 Annual Report

CITY OF KNOXVILLE

MAYOR MADELINE ROGERO

Public Works
David Brace, Senior Director

Public Service Department
Chad Weth, Director

INTRODUCTION

2016 was a landmark year for the Solid Waste Office! Several of our major contracts were approaching their expiration, and we have been very busy making updates and improvements to our solid waste systems while saving the City millions of dollars in operating costs. This was all on top of managing day to day activities, and continuing outreach and education efforts regarding responsible solid waste management principles. These are a few highlights from 2016:

- Negotiated a new yard waste contract with Nature's Best Organics for significant cost savings to the City of Knoxville. The new contract features 3 locations (east, central, and west).
- Negotiated a new residential garbage collection contract resulting in a nearly $2 million dollar annual savings to the City. The new contract is based on standardized 95 gallon carts to all eligible households. These carts were purchased and distributed throughout December for use in January.
- Purchased an additional 2,000 recycling carts to address the waiting list, with approval from City Council to purchase an additional 6,000 recycling carts as the curbside recycling program grows.
- Targeted communications to the recycling community to remove glass from single-stream recycling in efforts to keep our successful recycling program sustainable.
- Continued outreach events such as EarthFest, used medication collection events, community meetings, etc.
- Co-organized and participated in 5 unused medication take back events in 2016, resulting in a cumulative total of 21,575 pounds of medicine being disposed of properly, 6,097 pounds of packaging being recycled, and 1,727 mercury thermometers being exchanged since starting the program in 2009. This program is a collaborative effort between the City of Knoxville, Knox County, several utility companies, and local non-profits.
- Attended 30+ neighborhood meetings in November to discuss upcoming changes to the City's Solid Waste Program.
- The Central Business Improvement District (CBID) continues to expand as development continues to flourish; downtown residents are provided with trash and recycling services as part of their tax base, and commercial (restaurants, retailers, businesses) pay a subscription fee for those services. The City Public Service Department continues to provide a clean and safe environment for residential, commercial, and visitors to the area even with the increased use associated with a booming downtown.

I. RECYCLING

The City continues to expand it's curbside recycling program, and got approval from City Council to purchase up to an additional 8,000 recycling containers. The City will batch rollout curbside recycling receptacles as enrollment increases, as the logistics of cart delivery and incorporated new addresses into the recycling collection routes allow.

The City also continues to offer 5 recycling drop-off recycling centers where the public can separate and recycle a number of commodities. Even as the curbside program expands for eligible households, there are a number of users from other situations (ineligible multi-unit dwellings, small commercial operations) that continue to utilize the drop off centers.

II. MUNICIPAL SOLID WASTE (MSW)

The City's long term contract with Waste Connections expired on December 31, 2016, marking the end of long terms trash collection contract. With a new contract dependent on standardized garbage carts, the City rolled out 95 gallon wheeled garbage carts to all eligible households in December 2016 and January 2017. The City sill offers backdoor trash services to those with a verified medical or age necessity. Current collection costs per this contract are:

Jan. - Dec. 16 Curbside Collection	$6.90 / house/month	57,348 residents
Jan. - Dec. 16 Backdoor Collection	$6.90 / house/month	2,654 residents

All household garbage (including that collected at the Solid Waste Management Facility) is disposed of at the Chestnut Ridge Landfill operated by Waste Management. The City is currently in a new 10-year contract with Waste Management that expires in 2020. Contract prices change in October of each year based on the CPI.

Oct. '15 - Sep. '16	$21.72 / ton
Oct. '16 - Sep. '17	$21.90/ ton

III. YARD WASTE COLLECTION / MULCHING

Yard waste was taken to Shamrock Organic Products through September 2016. It was recycled into mulch and soil products or taken as fuel to a paper plant in Tennessee. On October 1, the City entered into a new contract with Nature's Best Organics. The contract has a base term of 5 years with the potential for three 5 year extensions. The new contract also includes 3 disposal sites, located at 8707 Joe Daniels Road, 6323 Rutledge Pike, and 2601 Middlebrook Pike, with varied tipping rates at each facility. Costs for disposal in 2016 are as follows:

Jan. 16—Oct 16	$28.82 / ton
Oct 16 - Nov 17	$18.84-$23.84/ton

IV. SOLID WASTE MANAGEMENT FACILITY

Transfer Station

The design of the Public Service Department, Solid Waste Division Transfer Station encourages separation of C&D from municipal solid waste. This allows for the City to save money by sending C&D waste to a Class III landfill and for compliance with the State of Tennessee mandate for a reduction in the volume of waste placed in Class I landfills.

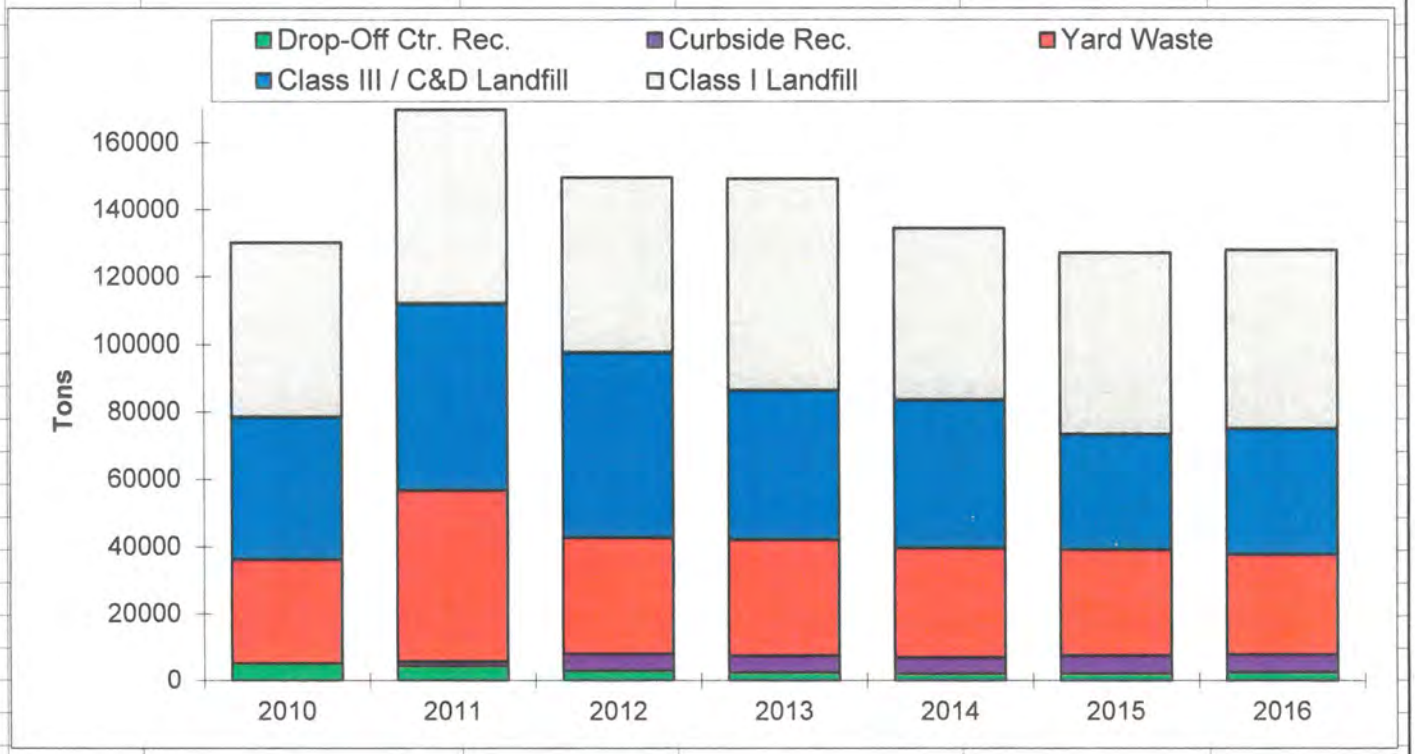
Jan. 16-Dec.16 $16.72/ton

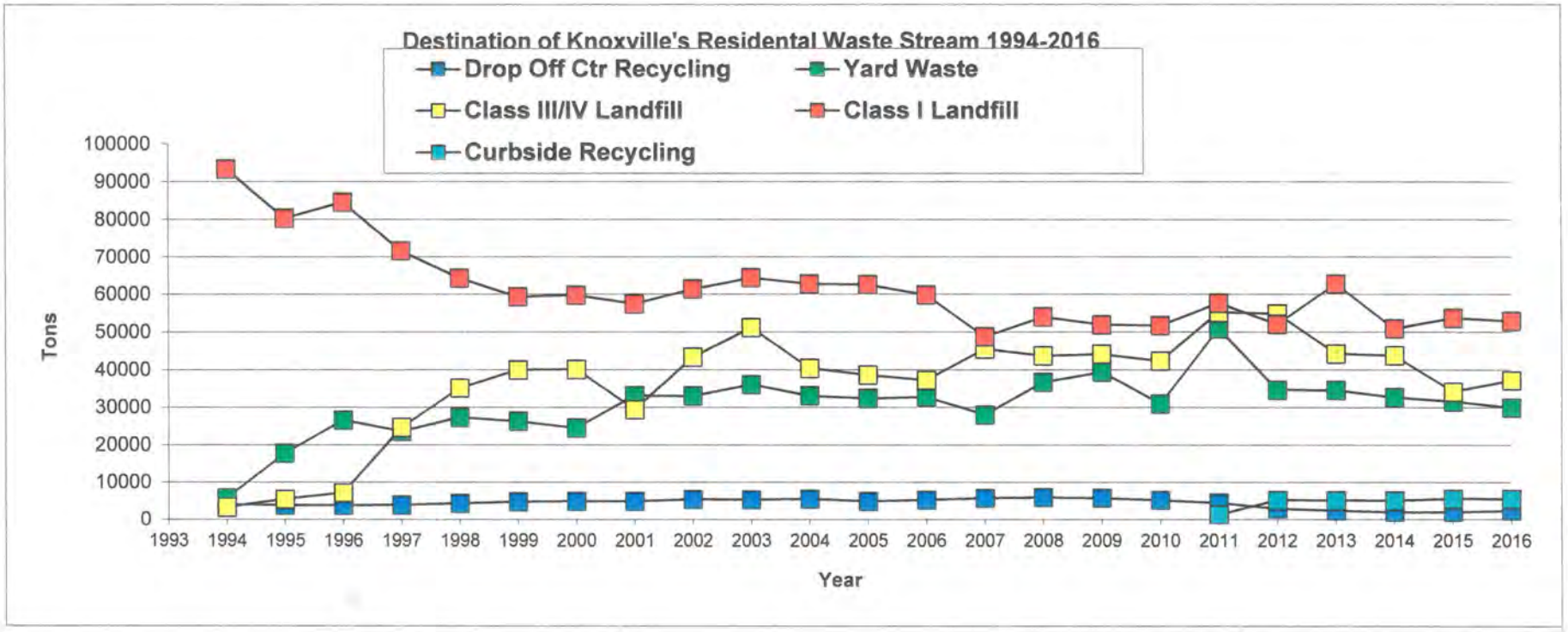
Household Hazardous Waste (HHW) Collection Center

Staffed by Public Service Department Solid Waste Management Facility employees, the HHW Facility is operated by the City with equal funding for operating and disposal costs from Knox County and the City of Knoxville. All City and County residents are permitted to use the facility. In 2016, this facility processed 153 tons of HHW.

More information on the City's Public Service Department, Solid Waste Division and Sustainability Office can be found at the City's website at: http://www.knoxvilletn.gov/.

	Drop-Off Ctr. Rec.	Curbside Rec.	Yard Waste	Class III / C&D Land	Class I Landfill
2010	5183.87	0	30991.11	42363.67	51674.53
2011	4459.85	1314.82	50891.46	55230.89	57677.52
2012	2893.67	5198.18	34641.25	54839.96	52052.03
2013	2369.03	5166.44	34592.73	44265.22	62796.04
2014	1950.29	5083.34	32692.04	43815.95	50890.35
2015	2002.53	5586.37	31591.34	34205.82	53726.65
2016	2333.33	5533.93	29964.3	37203.99	52920.41




Destination of Knoxville's Residental Waste Stream 1994-2016
Drop Off Ctr Recycling
Yard Waste
Class III/IV Landfill
Class I Landfill
Curbside Recycling
Tons
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year

Annual Report 2016 Drop Off Centers	Goodwill Magnolia & Alice	Goodwill 225 Moody Av.	Kroger 4440 Western Av.	Goodwill 341 Parkvillage	Downtown 227 Willow Av.	Drop Off Center Totals	Curbside Recycling City Wide Totals	Totals
Aluminum	2800 lbs	5340 lbs	7160 lbs	39380 lbs	5960 lbs	60640.00 lbs	56736 lbs	58.69 tons
Steel	5800 lbs	11760 lbs	13100 lbs	34520 lbs	7120 lbs	72300.00 lbs	170208 lbs	121.25 tons
Plastics	65440 lbs	101220 lbs	114220 lbs	371940 lbs	41600 lbs	694420.00 lbs	737565 lbs	715.99 tons
Clear Glass	13163 lbs	33993 lbs	37376 lbs	117455 lbs	22335 lbs	224321.33 lbs	530997 lbs	377.66 tons
Brown Glass	13163 lbs	33993 lbs	37375 lbs	117455 lbs	22335 lbs	224321.00 lbs	530997 lbs	377.66 tons
Green Glass	13163 lbs	33993 lbs	37375 lbs	117455 lbs	22335 lbs	224321.33 lbs	530997 lbs	377.66 tons
Newspaper	89960 lbs	208300 lbs	86080 lbs	349220 lbs	38490 lbs	772050.00 lbs	3404142 lbs	2088.10 tons
Mixed Paper	119300 lbs	186460 lbs	232193 lbs	802894 lbs	110010 lbs	1450857.00 lbs	3404142 lbs	2427.50 tons
Cardboard	79900 lbs	107440 lbs	221220 lbs	454910 lbs	79950 lbs	943420.00 lbs	1702071 lbs	1322.75 tons
Drop Off Center Totals	201.34 tons	361.25 tons	393.05 tons	1,202.61 tons	175.07 tons	2,333.33 tons	5,533.93 tons	7,867.25 tons

KPD / Lorain St.	48.72 tons
Cardboard Down Town	121.30 tons
Downtown Curbside	361.87 tons

Goodwill Lease Containers	248.11 tons

Ball Park Carpet	151.64 tons

	Leaves	Brush	Total
Mulching Site	4759.66 tons	25204.64 tons	29964.30 tons

	Scrap Metal	Rec. Tir.	HHW REC.	HHW Divert.	C&D for Class III	Compacted	Computers	Tires	Total
Transfer Station	394.47 tons	0.00 tons	50.78 tons	19.85 tons	22259.72 tons	10483.55 tons	16.81 tons	100.35 tons	33,325.53 tons

12.55 lakeshore

	Household Trash	Misc. Trash	Total
Landfill Class I	42392.05 tons	44.81 tons	52,920.41 tons

	Transfer Station	Construction	Codes	Total
Landfill Class III	22259.72 tons	11599.44 tons	3344.83 tons	37,203.99 tons

Total Waste Recycled	39,173.96 tons
Total Waste Diverted, Class III & Rec.	76,397.80 tons
Total Waste Landfilled, Class I	63,403.96 tons
Total Wastestream	139,801.76 tons

Recycling	28.02%
Diversion	54.65%
** Recycling*	

* Yard Waste Not Included
w/ just residential trash

APPENDIX C

Table of SPAP Facility Inspections

Commerical and Industrial Facilities Inspected During 2016-2017

Permit Number	Project Name	Address	Street Name	Inspection Date	Inspector	Water Quality Device
14-079	Pilot Food Mart #334	412	N Cedar Bluff Rd	11/14/2016	Dynamis, Inc.	Catch Basin Inserts
04-004	Pilot Food Mart-187	100	Merchant Drive	11/16/2016	Dynamis Inc.	Catch Basin Inserts
12-030	Pilot Food Mart #215	410	Merchants Drive	11/16/2016	Dynamis Inc.	Flow Guard-Plus Filtration inserts
12-029	Pilot Food Mart #119	2518	N Broadway	12/02/2016	Dynamis, Inc.	Catch Basin Inserts
12-031	Pilot Food Mart #217	4800	N Broadway	12/02/2016	Dynamis Inc.	media filtration inserts
12-038	Pilot Food Mart #166	4603	Chapman	12/05/2016	Dynamis Inc.	catch basin inserts
14-081	Pilot Food Mart #105	206	Walker Springs Rd	12/16/2016	Dynamis, Inc.	Catch Basin Inserts
14-007	CarMax #7241	11225	Parkside Drive	12/20/2016	David Harris	Aqua-Swirl AS-9
10-019	Waffle House	103	Stekoia Lane	12/22/2016	J. Shubzda	Catch Basin Inserts
10-041	Skyy Bar	415	S Gay Street	12/22/2016	J. Shubzda	Managerial Controls
16-034	The Crown & Goose	123	S. Central Street	12/22/2016	J. Shubzda	Managerial Controls
16-058	Skybox Mirage Bar and Grill	415	S. Gay Street	12/22/2016	J. Shubzda	Managerial Controls
12-037	Pilot Food Mart #158	405	Lovell Rd	12/28/2016	Dynamis Inc.	Fossil Filter Flo Guard
12-023	Pilot	5216	N. Middlebrook Pike	12/29/2016	Dynamis Inc.	Ultra Drain Guards Plus Sediment & Oil Insert
12-028	Pilot Food Mart #138	136	N Northshore Dr	12/30/2016	Dynamis, Inc.	Catch Basin Inserts
13-003	Sam's Club #6572-03-Knoxville East	2920	Knoxville Center Drive	12/30/2016	Restoration + Recovery	Aqua Swirl, 3 units
13-031	United Rentals	5417	N Middlebrook Pike	01/12/2017	Gemini Properties	Catch Basin Inserts
17-024	Food City Gas-N-Go Western Avenue	5801	Western Avenue	01/16/2017	Spatco	CDS Unit
14-054	Gas-N-Go at Food City South Grove	7644	Mountain Grove Road	01/20/2017	Spatco	Suntree GISB 32-32-24-SB 2 ea, N. end of Prop
15-087	First Watch Restaurant	6474	Kingston Pike	01/30/2017	J. Shubzda	Catch Basin Inserts, and Flume guard
08-014	Aldi, Inc	2801	Schaad Road	02/01/2017	J. Shubzda	Kristar Flow Guard Plus
10-004	Roosters Bar and Grill	7585	S Northshore Drive	02/02/2017	J. Shubzda	Catch Basin Insert
10-013	Taste of Thai	8926	Town & Country Circle	02/02/2017	J. Shubzda	Suntree Vault
13-047	Viet Tase	213	N Peters Road	02/02/2017	J. Shubzda	Managerial Controls
14-091	Aldi @ Homberg Place	5214	Kingston Pike	02/02/2017	J. Shubzda	Suntree Vault
17-022	Taste of Thai	8926	Town & Country Circle	02/02/2017	J. Shubzda	Suntree Vault
11-060	Instant Auto LLC	6258	Clinton Highway	02/05/2017	J. Shubzda	Catch Basin Insert
14-055	Gas-N-Go at Food City Loves Creek	2712	Loves Creek Road	02/05/2017	Spatco	oil/water separator
16-128	Instant Auto	6258	Clinton Highway	02/05/2017	J. Shubzda	Flexstorm CB Inserts
17-048	Food City #685 and Gas-N-Go #685	4805	N. Broadway	02/07/2017	Spatco	CDS Unit
13-044	Gas & Go at Food City	5078	Clinton Highway	02/09/2017	Southern Pump & Tank	Triton T-Dam 12 Filters
14-053	Food City Western Avenue	1919	Leslie Avenue	02/09/2017	Southern Pump & Tank	Suntree Vault unit
04-011	Connor Seafood	10915	Turkey Drive	02/15/2017	J. Shubzda	Catch Basin Inserts
05-003	Mimi's Café	10945	Parkside Drive	02/15/2017	J. Shubzda	Grease Catcher System & Suntree CB
10-031	Wasabi Grill and Sushi Buffett	4009	Chapman Hwy	02/15/2017	J. Shubzda	Managerial Controls
12-061	Kimberly Clark Parking	451	Goodys Lane	02/15/2017	J. Shubzda	Replaced by 13-024
13-017	South College Northern Parking Lot	400	Goodys Lane	02/15/2017	J. Shubzda	Suntree catch basin inserts
13-024	South College/Kimberly Clark Pkg	451	Goody's Lane	02/15/2017	J. Shubzda	Suntree Catch Basin Inserts
16-076	Walmart Supercenter #2065	8445	Walbrook Drive	02/16/2017	J. Shubzda	CDS Unit
13-009	Kimberly Clark Eastern Parking Lot	440	Goody's Lane	02/17/2017	J. Shubzda	Catch Basin Inserts
14-063	Bojangles	3801	Western Avenue	02/20/2017	J. Shubzda	5 Suntree Catch Basin Inserts
14-115	Bojangles	3817	N Broadway	02/20/2017	J. Shubzda	Suntree Vault
15-017	Bojangle's Restaurant	3817	N Broadway	02/20/2017	J. Shubzda	Suntree Vault
12-003	Melinda's Country Kitchen	465	Park 40 North Blvd	02/21/2017	J. Shubzda	Managerial Controls
12-006	Rumorz	1820	Cumberland Ave	02/21/2017	J. Shubzda	Managerial Controls
12-063	Subway #46545 (Chapman)	4400	Chapman Hwy	02/21/2017	J. Shubzda	Catch basin insert

Commerical and Industrial Facilities Inspected During 2016-2017

Permit Number	Project Name	Address	Street Name	Inspection Date	Inspector	Water Quality Device
16-045	Subway Restaurant	4400	Chapman Highway	02/21/2017	J. Shubzda	Catch basin inserts
03-012	Earthfare and Shops	10921	Parkside Dr	02/22/2017	J. Shubzda	3 Catch basin inserts
05-009	Starbucks Coffee Company	116	Merchant Drive	02/22/2017	J. Shubzda	4 Suntree catch basin inserts
06-035	Starbucks - Emory Rd.	401	E Emory Rd	02/22/2017	J. Shubzda	Suntree Technologies
10-025	Earth Fare, Inc. #400	10903	Parkside Drive	02/22/2017	US Tanks	3 Catch basin inserts
11-061	Hewgley US Army Reserve Ctr	1334	Weisgarber Rd	02/23/2017	J. Shubzda	Catch Basin Inserts
14-088	Hooters	5005	Central Ave Pike	02/23/2017	J. Shubzda	Catch basin Inserts
06-017	NEFF Rental	1808	Sanderson Rd	02/24/2017	J. Shubzda	(Drainpac Brand) Drain insert
08-023	The Half Barrel	1829	Cumberland Ave	02/24/2017	J. Shubzda	Management Controls
09-054	Ryder LC-0159	5951	Middlebrook Pike	02/24/2017	J. Shubzda	2 Catch Basin Inserts
14-045	Storage Pro Sutherland	3033	Sutherland Avenue	02/27/2017	J. Shubzda	Catch Basin Inserts
11-040	NTB	8088	Kingston Pike	03/02/2017	J. Shubzda	Catch Basin Insert and Infiltration Pits
12-025	Sonic-Walker Springs	8475	Kingston Pike	03/02/2017	J. Shubzda	Catch Basin Insert
14-072	Bearden Station	6610	Kingston Pike	03/02/2017	J. Shubzda	Catch Basin Inserts
17-030	Bearden Hill Field House	6600	Kingston Pike	03/02/2017	J. Shubzda	Managerial controls
07-012	Maaco Paint Center/Stephen's Auto Body	6130	Western Ave	03/08/2017	J. Shubzda	Suntree GISB-1-24-24-25
11-035	Chick-Fil-A	4942	Homberg Dr	03/14/2017	J. Shubzda	Catch Basin Inserts
11-028	Shalimar Restaurant	823	Melrose Place	03/15/2017	J. Shubzda	Managerial controls
12-010	Sysco Knoxville	900	Tennessee Ave	03/29/2017	J. Shubzda	Large Suntree
12-026	Bojangles	5916	Middlebrook Pike	03/29/2017	J. Shubzda	Catch Basin Inserts
14-013	Niro's Gyros Corp.	1823	Cumberland Avenue	03/29/2017	J. Shubzda	Managerial controls
16-023	Texas Roadhouse at Turkey Creek	11001	Turkey Drive	04/02/2017	Ian Leach	Suntree Catch Basin Inserts
14-034	Popeye's	4801	Clinton Hwy	04/04/2017	J. Shubzda	Infiltration basins
17-025	Aldi, Inc. #10	2801	Schaad Road	04/04/2017	Dennis Burnett	4 Catch basin inserts
16-066	Polish-Masters Certified Detail Specialists	207	Center Park Drive, Suite 2170	04/05/2017	J. Shubzda	Managerial Controls
14-074	Clayton Body Shop	4601	Clinton Hwy	04/11/2017	Kiven Greer	3 Catch Basin Inserts
11-030	Deli Ray's	7337	Chapman Hwy	04/12/2017	J. Shubzda	Managerial Controls
15-069	Downtown Grill and Brewery	424	S. Gay Street	04/12/2017	J. Shubzda	Managerial Controls
14-056	Cedar Springs Presbyterian Church	9132	Kingston Pike	04/15/2017	Stormwater Solutions	Catch Basin Inserts
16-052	Cook Out Cumberland Avenue	2135	Cumberland Avenue	04/17/2017	J. Shubzda	Catch basin inserts
16-053	Cook Out Kingston Pike	6920	Kingston Pike	04/17/2017	J. Shubzda	Caych basin inserts
14-082	Marathon Petroleum Company LLC	2601	Knott Road	04/18/2017	J. Shubzda	Manigerial Controls
15-072	Golden Wok	9255	Kingston Pike	04/18/2017	J. Shubzda	Vault Unit, Master planned
14-030	Tennessee RV Sales & Service	835	Huckleberry Springs Road	04/19/2017	J. Shubzda	Catch Basin Inserts
14-046	Kitts Café	4620	Greenway Drive	04/19/2017	J. Shubzda	Catch Basin Inserts
15-002	Lee Travel Center #1398	7405	Strawberry Plains Pike	04/19/2017	J. Shubzda	oil/water separator
17-009	Chuy's Restaurant	9235	Kingston Pike	04/19/2017	J. Shubzda	Contact Vault
14-067	Knoxville Harley Davidson	5800	Clinton Hwy	04/20/2017	J. Shubzda	Suntree GISB 24-24-25 & NSBB 3-8-84
15-024	Magellan Terminals Holdings, LP	4801	North Middlebrook	04/20/2017	J. Shubzda	Two sump with socks
14-086	Blue Slip Winery	300	W Depot Ave	04/26/2017	J. Shubzda	Raised dumpster pad and spill kit
13-015	McDonalds Remodel - Broadway	3120	N Broadway	05/02/2017	J. Shubzda	Suntree CBI and Flume guard
13-018	Shamrock Organic Products	2501	Ailor Ave	05/02/2017	J. Shubzda	Catch Basin Insert
16-019	Amigos & Beer Mexican Grill	5020	Washington Pike	05/02/2017	J. Shubzda	Suntree GISB
16-111	Suburban Plaza	8025	Kingston Pike	05/08/2017	Turn Key	Catch Basin Inserts
14-065	US Post Office Parking Expansion	1237	East Weisgarber Rd	05/17/2017	Safety-Kleen	CDS Unit
14-010	Kingston Corner Lot #2 Retail Shop	9159	Kingston Pike	05/19/2017	Safety Kleen	Aqua-Swirl
14-077	Larosa's	9169	Kingston Pike	05/19/2017	Safety-Kleen	Aqua-swirl
12-017	Ted Russell Nissan	8565	Kingston Pike	05/31/2017	J. Shubzda	Catch Basin Inserts

Commerical and Industrial Facilities Inspected During 2016-2017

Permit Number	Project Name	House Number	Street Name	Latest Inspection D	Inspector	Water Quality Device
10-032	Carleo's	117	S Central Street	07/01/2016	J. Shubzda	Managerial Controls
16-010	Sam's Club Store #8256	8435	Walbrook Drive	07/06/2016	J. Shubzda	CDS Unit
15-022	Kroger Fuel Center #531	4409	Chapman Highway	07/12/2016	Storm System Services	Crystal Stream
11-032	Kroger Store GA 684	135	N Cedar Bluff Road	07/13/2016	Storm System Services	Vaults and Catch Basin Inserts
07-019	Emerald Building #1, Quick Lube	7240	Saddlerack St	08/09/2016	J. Shubzda	2 catch basin inserts
16-097	Fraley and Schilling Inc.	7240	Saddlerack St.	08/09/2016	J. Shubzda	Catch Basin Inserts
07-024	Broadway Carwash	5622	N Broadway	08/25/2016	J. Shubzda	Suntree Inserts
13-045	A Retail Store	616	Dutch Valley Drive	08/25/2016	J. Shubzda	Contect Swirl unit
16-104	Broadway Carwash	5622	N. Broadway	08/25/2016	J. Shubzda	Suntree Catch Basin Inserts
13-023	Kroger Fuel Center 848	4948	Kingston Pike	08/31/2016	Storm System Services	CDS Unit
16-062	Academy Sports & Outfitters #142	145	Moss Grove Blvd	09/15/2016	J. Shubzda	Suntree Vault unit
12-008	Mexican Restaurant	6409	Chapman Hwy	09/16/2016	J. Shubzda	Managerial Controls
16-005	Reily Foods Co./JFG Coffee	3434	Mynatt Avenue	09/17/2016	J. Shubzda	Grassy swale
16-015	Reily Foods Co.	3434	Mynatt Avenue	09/17/2016	J. Shubzda	Downspout filters
11-049	Suburban Plaza	8025	Kingston Pike	09/19/2016	Turn Key Plumbing	Flex Storm and Flume guard
11-039	Weigel's Mabry Hood / Dutchtown	950	Mabry Hood Rd	09/22/2016	J. Shubzda	Catch Basin Inserts
11-041	Tio Conejo Market	4412	N Broadway St Ste C1	09/22/2016	J. Shubzda	Managerial Controls
07-001	Chick-Fil-A Kingston Overlook	9646	Kingston Pike	09/23/2016	J. Shubzda	Catch Basin Inserts
08-003	Sequatchie Concrete Service	2145	Sutherland Ave	09/23/2016	J. Shubzda	Infiltration Pond
10-011	Hibachi Grill & Buffett	9645	Kingston Pike	09/23/2016	J. Shubzda	2 Catch Basin Inserts, Suntree
11-044	Weigel's Western Ave and Palmetto	5621	Western Ave	09/23/2016	J. Shubzda	Catch Basin Inserts
12-004	Just 1 More Bar and Grille	9355	Kingston Pike Ste 5	09/23/2016	J. Shubzda	Catch Basin Inserts
12-071	Harper Fiat	10049	Kingston Pike	09/23/2016	J. Shubzda	Snout
14-032	Historic Sherrill House	9320	Kingston Pike	09/23/2016	J. Shubzda	Suntree CB insert
15-063	Cummin Terminals, Inc.	5100	N Middlebrook Pike	09/23/2016	J. Shubzda	Aqua Swirl - AS-7
15-084	Sherrill Hill Historic House	9320	Kingston Pike	09/23/2016	J. Shubzda	Suntree Insert
14-059	Amberleigh Bluff	350	Amberleigh Bluff Way	09/25/2016	J. Shubzda	Suntree Vault unit
11-042	Heritage Crystal Clean LLC	2300	Sycamore Dr	09/27/2016	J. Shubzda	Grass swale
16-099	Cummins Terminals Inc.	4715	N Middlebrook Pike	09/30/2016	J. Shubzda	Aquaswirl
14-005	Bojangle's	9101	Kingston Pike	10/03/2016	Dynamis, Inc.	AquaShield AS-4
09-020	Asia Café	6714	Central Ave Pike #B	10/19/2016	J. Shubzda	Managerial Controls
11-057	Sharp Auto & Repair	4754	Western Avenue	10/28/2016	J. Shubzda	Managerial Controls
12-036	Pilot Food Mart #111	1826	Western Ave	10/28/2016	Dynamis, Inc.	Catch Basin Inserts
14-080	Pilot Food Mart #244	2218	Cumberland Ave	10/28/2016	Dynamis, Inc.	Catch Basin Inserts
16-106	Pilot Food Mart #277	400	E Emory Rd	10/28/2016	Dynamis, Inc.	4 Suntree Catch Basin Inserts
11-054	Free Service Tire	1525	N Cherry St.	10/31/2016	J. Shubzda	Catch Basin Inserts
13-046	Holland's Chicken & Fixen	3017	E Magnolia Avenue	10/31/2016	J. Shubzda	Managerial Controls
16-112	Free Service Tire	1525	N. Cherry Street	10/31/2016	J. Shubzda	Catch Basin Inserts
14-100	Flapjack's Pancake Cabin	603	E Emory Rd, Suite 101	11/02/2016	J. Shubzda	Catch Basin Inserts
15-045	Kroger Store U-670	240	E Emory Rd	11/02/2016	J. Shubzda	Two Aqua-Swirl Units
16-004	Shops at Emory Road/Salsarita's	570	E Emory Rd	11/02/2016	J. Shubzda	Suntree Vault
16-057	Salsarita's	570	E Emory Rd	11/02/2016	J. Shubzda	Suntree Vault
07-023	McDonalds-Magnolia	2501	E Magnolia Ave.	11/03/2016	J. Shubzda	Suntree Vault unit
10-050	McDonald's	1720	W Cumberland Ave	11/03/2016	J. Shubzda	Catch Basin Inserts
11-045	McDonalds - Merchants Dr	322	Merchants Dr	11/03/2016	J. Shubzda	Catch Basin Inserts
11-047	McDonalds Strawberry Plains	7402	Strawberry Plains Pike	11/03/2016	J. Shubzda	Catch Basin Inserts and Flume Guards
11-051	McDonalds - 5055 N. Broadway	5055	N Broadway	11/03/2016	J. Shubzda	CB Inserts and Flume guards
13-035	McDonalds Chapman Hwy	2505	Chapman Highway	11/03/2016	J. Shubzda	Catch Basin Inserts
16-114	McDonald's	322	Merchant Drive	11/03/2016	J. Shubzda	Catch Basin Inserts

APPENDIX D

NPDES Permit Program Inventory Map

(Attached separately)