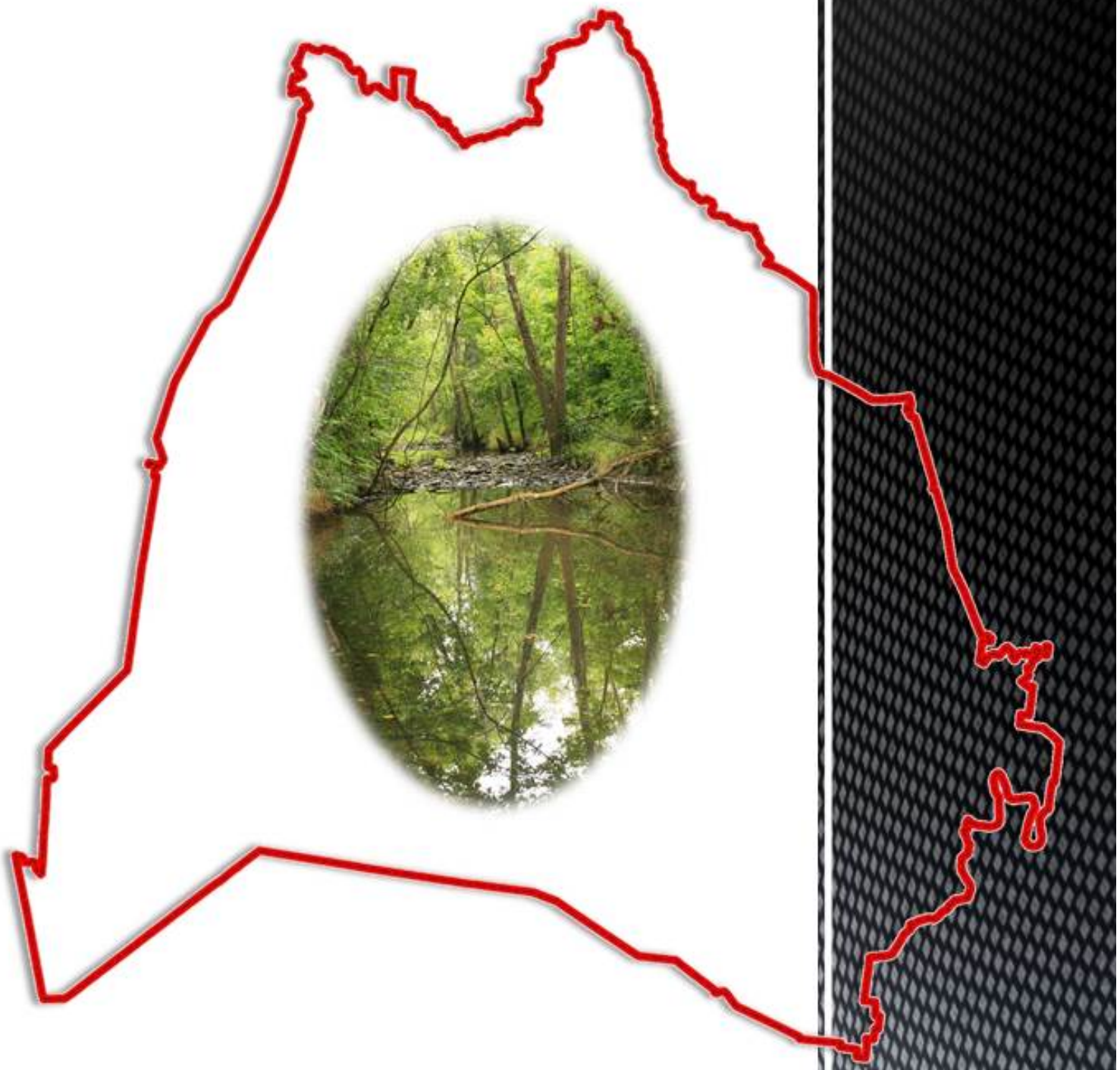
Metro Nashville/Davidson County
Annual MS4 Report
Permit TNS068047



METRO WATER SERVICES

December 2018
Reporting Period:
July 1, 2017 - June 30, 2018

Megan Barry
Mayor

METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY

DEPARTMENT OF WATER AND SEWERAGE SERVICES
STORMWATER DIVISION
NPDES OFFICE
1607 COUNTY HOSPITAL ROAD
NASHVILLE, TN 37218

November 29, 2016

Tisha Calabrese-Benton, Director
Tennessee Department of Environment & Conservation - Division of Water Resources
William R. Snodgrass Tennessee Tower
Attention: Compliance Review
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243

RE: **NPDES Permit No. TNS068047**
Metro Nashville/Davidson County
Permit Cycle Three, Year Five Annual Report

Dear Director:

Per the provisions of Section 5.7 of the Metro Nashville/Davidson County MS4 NPDES permit (TNS068047), I hereby authorize Michael Hunt as my duly authorized representative to submit reports and other information as required per NPDES Permit TNS068047.

I do so by virtue of Mr. Hunt's position as the MS4 Permit Program Manager for Metro Nashville/Davidson County, Metro Water Services - Stormwater's NPDES Office, which oversees Metro's MS4 permit compliance activities.

I further state that Mr. Hunt has apprised me of the contents of the Permit Cycle Three, Year Five Annual Report.

Sincerely,

Scott Potter
Metro Water Services, Director

cc: Paul Higgins, TDEC DWS; Central Office Permitting
April Grippo, TDEC WPC; Nashville Environmental Assistance Center
Tom Palko, Assistant Director; Metro Water Services Stormwater Division
Michael Hunt, Metro Water Services Stormwater Division NPDES Office

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1.0 Introduction

The Metropolitan Government of Nashville Davidson County (Metro) was issued the third cycle of the Municipal Separate Storm Sewer System (MS4) permit effective February 1, 2012. Under this permit, the reporting period for each permit year coincides with Metro's Fiscal Year (FY) (July 1st through June 30th). The reporting period for this report will be referred to as Fiscal Year 2018 (FY18), which represents the period between July 1, 2017 through June 30, 2018.

Each year, there are numerous individuals within different Metro Departments that work toward achieving overall MS4 permit compliance. As a measure to ensure permit compliance within the various facets of Metro government, the National Pollutant Discharge Elimination System Section (NPDES) was created to oversee all MS4 permit compliance activities. NPDES is a section within the Metro Water Services (MWS) Stormwater Division and is responsible for performing specific MS4 permit requirements such as public education activities, illicit discharge investigations, runoff/discharge sampling, construction site inspections, field screening inspections, industrial inspections, etc. In addition, the NPDES is responsible for coordinating with various other Metro Departments to ensure permit compliance measures are being followed on a Metro-wide basis.

The following table is a list of certain individuals that have contributed directly to specific to MS4 permit compliance activities/information during FY18. Any inquiries regarding information represented in this report should be directed to the MWS Stormwater NPDES Office (Attn: Josh Hayes) at 1607 County Hospital Rd, Building A, Nashville, Tennessee, 37218, Phone: 615-880-2420, Email: Josh.Hayes@Nashville.gov.

Table 1 - Contact List

Name	Agency	Position/Responsibility
Scott Potter	Metro Water Services	Director
Tom Palko	Metro Water Services	Assistant Director, Stormwater Division
Sonia Allman	Metro Water Services	Manager of Strategic Communications
Julie Berbiglia	Metro Water Services	Public Education Specialist
Jennifer Harrman	Metro Water Services	New Media Specialist
Ricky Swift	Metro Water Services	Program Manager, Stormwater Maintenance Section
Casey Cooper	Metro Water Services	Project Manager, Stormwater Maintenance Section
Hal Balthrop	Metro Water Services	Assistant Director, Development Services Division
Kimberly Hayes	Metro Water Services	Engineer, Development Services Division, Single Family
Michael Hunt	Metro Water Services	Program Manager, Stormwater NPDES Section
Bonnye Holt	Metro Water Services	Office Support Specialist, Stormwater NPDES Section
Howard Jackson	Metro Water Services	Office Support Specialist, Stormwater NPDES Permit Group
Dale Binder	Metro Water Services	Construction Inspection Manager, Stormwater NPDES Section
Shawn Herman	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Katherine O'Hara	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Denice Johns	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Donald Erves	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Ken Tranter	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Leigh Nelson	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Lynda Kelly	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Rebecca Dohn	Metro Water Services	Special Projects Manager, Stormwater NPDES Section
Josh Hayes	Metro Water Services	Permit Group Manager, Stormwater NPDES Section
Mary Bruce	Metro Water Services	Watershed Group Manager, Stormwater NPDES Section
Jane Wilson	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Kalee Hotchkiss	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Liz Stienstraw	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Beth Wilson	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Aujuah Jackson	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Jessica Bell	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Veronica Logue	Metro Water Services	Watershed Group Inspector, Stormwater NPDES Section
Stephanie Petty	Metro Water Services	Watershed Group Inspector, Stormwater NPDES Section
Naomi Rotramel	Metro Water Services	Urban Forester/Arborist
Carol Edwards	Metro Water Services	Soil Conservationist
Sharon Smith	Department of Public Works	Solid Waste Division
Donna Ryman	Department of Public Works	Solid Waste Division
Clayton Hand	Department of Public Works	Engineer, Solid Waste Division
Phillip Jones	Department of Public Works	Assistant Director of the Street Services Division
Ernie Kurgan	Department of Public Works	Street Services Division
Will Robinson	Department of Public Works	Street Services Division
Wade Hill/Jon Michael	Codes Department	Chief Plans Reviewer
Anita McCaig	Metro Planning Department	Planner
Christopher Michie	Metro Health Department	Septic System Oversight
Steve Crosier	Metro Health Department	Restaurant Inspection
Greg Ballard	Metro Water Services	Program Manager, Overflow Abatement
Matt Lott	Metro Water Services	Program Manager, System Services Overflow Response
Rebecca Ratz	Metro Parks Department	Parks and Recreation Planning Division
Tim Netsch	Metro Parks Department	Assistant Director
Jerry Terfinko	Metro Parks Department	Maintenance Division
Ted Taylor	Metro Water Services	Laboratory Superintendent
Andy Welch	Metro Water Services	Program Manager, Pre-treatment/FOG
Anna Kuoppamaki	Metro Water Services	GIS Analyst, Stormwater Master Planning Section

Note: There are many other personnel that contribute to the overall MS4 compliance program not listed on this table (i.e. Engineers in MWS Development Services, Various Maintenance Workers, etc.).

The following list is a description of commonly used acronyms throughout the document:

303(d)	State's List of Non-attainment Waterways (Water Quality Criteria for Use Classifications)
BMP	Best Management Practice
CCTV	Closed Circuit Televising
CSS	Combined Sewer System
CWN	Clean Water Nashville Program
EMC	Event Mean Concentration
EPA	Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
FY18	Fiscal Year 2018
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System software
LA	Load Allocations for Streams with Approved TMDLs
LID	Low Impact Development
MEP	Maximum Extent Practicable
MDPW	Metro Department of Public Works
Metro	Metro Nashville Davidson County Government
MNPR	Metro Nashville Parks and Recreation
MNPS	Metro Nashville Public Schools
MS4	Municipal Separate Storm Sewer System
MWS	Metro Water Services
NOV	Notice of Violation
NON	Notice of Noncompliance
NPDES	National Pollutant Discharge Elimination System Section within MWS Stormwater Division
O&M	Operations and Maintenance
OEM	Mayor's Office of Emergency Management
PIE	Public Information/Education Plan
RMCP	Ready Mix Concrete Plant
RMP	Runoff Management Plan
SCM	Stormwater Control Measure (Post-Construction Stormwater Treatment)
SOP	Standard Operating Procedure
SSD	System Services Division
SWMC	Stormwater Management Committee
SWMM	Stormwater Management Manual
SWMP	Stormwater Management Plan
SWO	Stop Work Order
TAB	Tennessee Association of Broadcaster's Public Education Program
TDEC	Tennessee Department of Environment and Conservation
TMDL	Total Maximum Daily Load of Pollutants Allowed within Streams
TMSP	Tennessee Multi-Sector Permit for Industrial Stormwater Discharges
TMI	Tennessee Macroinvertebrate Index
TSS	Total Suspended Solids
WIES	Watershed Improvement Evaluation System
WLA	Waste Load Allocation

1.1 Objective of the Program

The objective of the Stormwater Management Program is to implement specific pollution prevention programs designed to improve the quality of Metro's water resources to the Maximum Extent Practicable (MEP), particularly as it relates to improving the quality of discharges from Metro's MS4. This leads to an overall goal of maintaining MS4 permit compliance, while simultaneously achieving water quality improvements in every Metro stream reach, including those listed on the Tennessee Department of Environment and Conservation's (TDEC's) 303(d) list of impaired streams. It is Metro's long-term goal to reduce pollutant loadings from the MS4 as much as possible so as to remove a majority of the streams from the 303(d) list that are indicated as being impaired by MS4 runoff. As Metro maintains compliance with the current MS4 permit requirements, it is important to evaluate the success of the major pollution prevention programs that have been implemented in the first 3 permit cycles. Over the first 3 permit cycles, Metro has made great strides to improve stormwater runoff from construction sites, industrial sites, commercial sites, residential sites, and Metro roadways/properties. Overall, the implementation of these control programs has worked to significantly reduce and minimize pollutants from entering the MS4 drainage system and the receiving streams.

1.2 Major Stormwater Pollution Findings

Each year there are fewer and fewer major discoveries of pollution to the MS4 drainage system. This can be largely attributed to the long-term implementation of core pollution prevention programs described further in this document. As Metro's MS4 program further matures, a renewed focus has been shifted to addressing the long-term inspection and maintenance of post-construction Stormwater Control Measures (SCMs). Moving forward, some of the more notable findings will likely include improperly maintained SCMs. The paragraphs below describe some of the more notable findings impacting water quality of the MS4 and Metro streams during FY18.

1.2.1 Private Sanitary Sewer Failure

While performing a sanitary sewer rehabilitation, a contractor for the MWS Clean Water Nashville Overflow Abatement program notified NPDES of an overflowing sanitary sewer service line clean-out. NPDES responded and observed a persistent small amount of raw sewage overflowing into Gibson Creek. Upon further investigation, it was determined that a residential sanitary sewer service was not properly connected to the sewer main. MWS then directed its contractor to work with the property owner to correct the issue while the sewer rehabilitation work was under progress. While the duration of this sanitary sewer discharge is not fully known, it is believed that the discharge was occurring for several months to a year. Through this investigation and follow-up, the discharge of raw sanitary sewage to Gibson Creek was eliminated.

Photographs of the Private Sanitary Sewer Failure

1.2.2 Oil Drums Washing into Creek

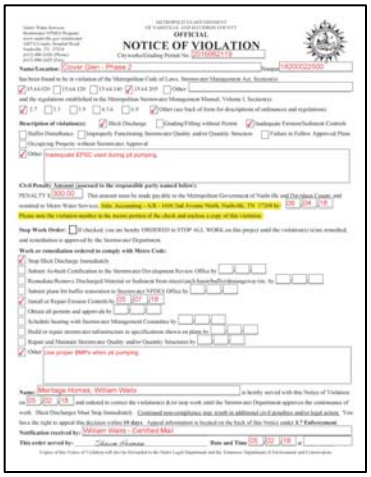
NPDES was notified by the Office of Emergency Management (OEM) about drums of oil and other unknown chemicals that had washed into a creek during the heavy rains associated with Hurricane Harvey. NPDES Responded on several occasions, including on the weekend after the flood waters had retreated. NPDES inspected the entire property with a local farmer and located several dozen 55 gallon drums with unknown contents. While many of the drums were empty, there were a few that appeared to have an unknown substance leaking. NPDES coordinated with a representative from the Environmental Protection Agency (EPA), who had a contractor perform of the clean-up and removal of the drums.



Photographs of the Polymer Spill onto the MS4

1.2.3 Construction Violation

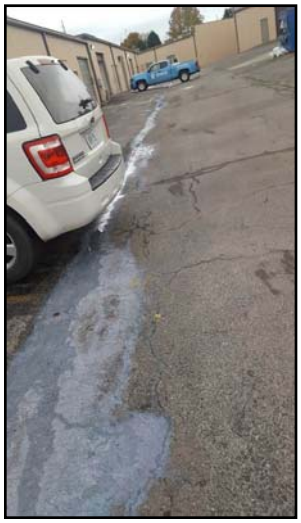
During normal a routine grading permit inspection, an NPDES inspector observed a observed a muddy discharge from the construction site to a nearby tributary. Upon closer inspection, it was determined that the site was using inadequate Erosion Prevention and Sediment Control (EPSC) practices while pumping water from a pit. The NPDES inspector directed site personnel to immediately stop pumping until better controls could be instituted to filter the muddy pit water. The NPDES Office issued a Notice of Violation (NOV) to the site with an assessed administrative penalty of $300. As a result of the enforcement, the site instituted better controls to filter the pump water that prevented the muddy discharge into the nearby tributary.

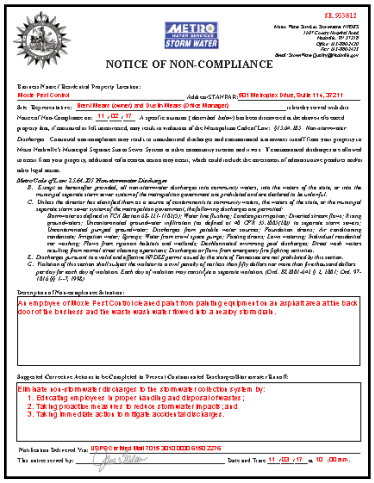

NOTICE OF VIOLATION

Grading Permit Violation Pictures and Resulting Enforcement

1.2.4 Improper Discharge of Wash Water

NPDES received a complaint from an area citizen about a neighboring business dumping chemicals and wash water into a parking lot storm drain. Upon further investigation, NPDES was able to determine that employees from a local industry cleaned paint from painting equipment and discharged it onto the parking lot and into a private storm drain. Fortunately, the wash water was not found in the downstream MS4 and/or community waters, but due to the likelihood of this material washing down to the MS4 and/or community waters during a storm event, NPDES issued a Notice of Noncompliance to the site requiring them to educate all employees on the proper disposal of wastes and directed them to clean-up the discharged wash water to prevent it from draining further downstream. No further complaints were reported to NPDES after the initial NON was issued.



NOTICE OF NON-COMPLIANCE

Discharge of Wash Water from Local Industry

1.3 Major Stormwater Management Program Accomplishments and Highlights

1.3.1 MWS Stormwater Division

The MWS Stormwater Division has continued to facilitate major accomplishments in the development of the overall Stormwater Management Program. Particular accomplishments performed in recent years are listed below:

SWMP Implementation/Updates:

In FY18, NPDES continued to implement Metro's MS4 Storm Water Management Plan (SWMP) that was developed during previous permit reporting periods. The SWMP, as required by the current MS4 permit, is a formal document that provides a comprehensive narrative description of Metro's overall Stormwater Management Program. The SWMP describes Metro's methods of achieving each MS4 permit-required activity. The SWMP is an internal program document that is reviewed routinely to determine if improvements or updates are needed. During FY18, the SWMP was reviewed and some minor updates were included as a supplemental appendix to the SWMP, which are also attached included in Attachment D of this document. The overall SWMP will be completely revised to reflect changes in the overall program once a new MS4 permit is issued.

Please note that Metro's permit cycle ended on January 31, 2017, but is currently administratively extended until such time as the permit is reissued by TDEC. With the pending issuance of the 4th iteration of Metro's MS4 permit, Metro believes some changes can be made to improve the efficiency of pollution prevention programs. Attachment B includes several communications submitted to TDEC detailing proposed changes to the Stormwater Management Program, which NPDES is currently implementing during the transition period between permits. NPDES met with TDEC on November 16, 2017 to discuss these changes and TDEC approved of testing out the slight MS4 program modifications during the transition period. On March 30, 2018, NPDES submitted a follow-up letter to TDEC explaining how the modifications have been beneficial to the program.

Public Education:
In FY18, NPDES and other departments continued an aggressive approach to public education/involvement activities by implementing various actions detailed in the Public Involvement/Education (PIE) plan. Through the more than 20 years of public education activities, there is undoubtedly an observable increase in general awareness of stormwater issues. NPDES will continue to build upon the successes of the public education programs and will always look for new outreach opportunities. The below paragraphs highlight some of the specific public education activities that were conducted during FY18:

- Post-Construction Stormwater Control Measure Inspection and Maintenance Training
  During this reporting period, NPDES continued to coordinate with the Tennessee Stormwater Management Training Program to assist in implementing the state-wide post-construction SCM Inspection and Maintenance Training/Certification Program. The class is designed to provide foundational knowledge for professionals that wish to be certified to perform inspection and maintenance functions of various types of SCMs (i.e. detention ponds, water quality units, bioretention basins, and pervious pavement). By the end of FY18, 115 individuals have been trained and certified to inspect and maintain SCMs.

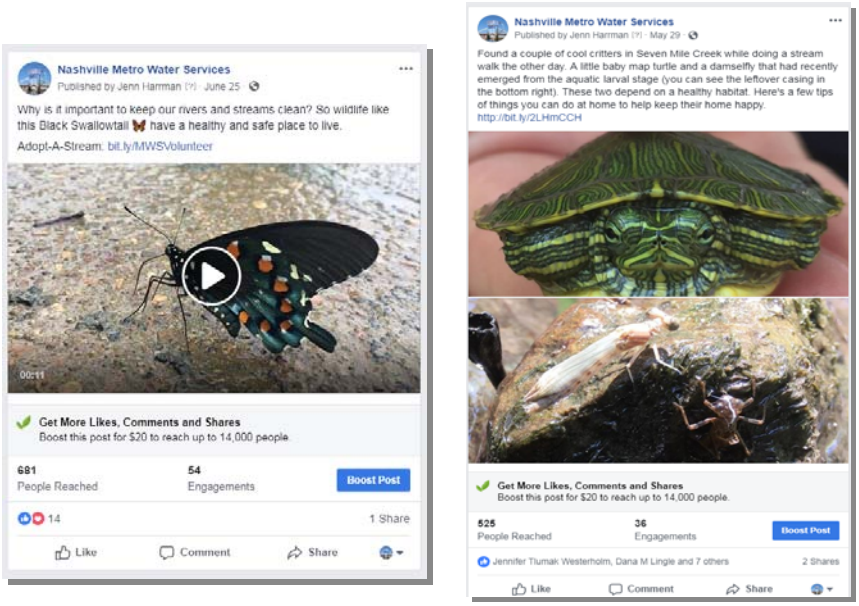
  NPDES also hosted an internal workshop with all large Metro departments during FY18 to discuss inspection and maintenance responsibilities for each department. Over 25 internal Metro stakeholders attended the workshop to learn about proper inspection and maintenance of Metro-owned SCMs.

- Urban Runoff 5K
  During FY18, MWS continued to partner with TDEC and the Tennessee Stormwater Association (TNSA) to host the Urban Runoff 5K. The event was a family-oriented run/walk through Nashville's Shelby Park that highlighted several stormwater-friendly, green infrastructure projects. The actual route took runners/walkers through a forested wetland area, riparian buffer area, and past the Nature Center building, which has a green roof, rain chains, and a rain garden. Public education signage was present throughout the route to explain the benefits of trees and other green features on reducing impacts to stormwater runoff. In addition to the actual race, several local organizations and government agencies hosted exhibitor booths as part of the Water Quality Festival that occurred during and after the race. Over 200 runners, volunteers and other "walk-ons" attended the 5K and Water Quality Festival.

Photos form the Urban Runoff 5K Hosted in FY18

- Social Media Post

  In FY18, MWS continued to expand stormwater messaging on its social media platform. MWS routinely updates Facebook and Twitter messages, which has proven to be an effective method in reaching the new generation, who get most of their news from the various social media platforms. A benefit to using social media to distribute public education messages is that actual audience sizes can be tabulated in terms of views. In FY18, MWS posted a total of 18 separate stormwater educational messages to social media that reached a total audience size of 21,041 individual views. Below are some of the social media posts from FY18. In addition to social media posts, MWS continued to update the traditional website with the latest stormwater educational materials. In FY18, the MWS NPDES program websites had 3,098 unique (non-Metro) page views.



Example Social Media Posts with Stormwater Messages in FY18

- Metro's Adopt-A-Stream Program

  For many years MWS has been coordinating with the Cumberland River Compact (CRC) to facilitate the Adopt-A-Stream program. The program provides an opportunity for local businesses, civic groups, watershed associations, churches, schools, etc. to work together in protecting and enhancing the watershed in which they live or work. Stream adoptions last for a period of 2 years and adopters are required to do at least one stream clean-up per year. During FY18, the CRC signed up 12 new adopters for 11.27 miles of stream. To date, there are over 37 active stream adoptions in the county, which have accounted for more than 3,170 cubic feet of trash removed from streams.

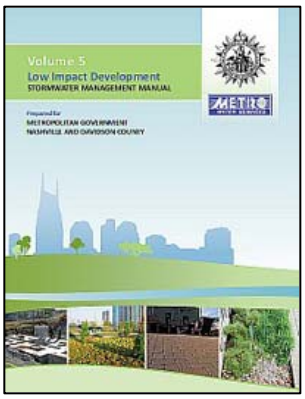
Floodplain Buyout Properties

Over the years, the MWS Stormwater floodplain buyout program has worked to restore floodplain storage and riparian habitat in various watersheds within the county. The MWS Stormwater Division has been participating in the Federal Emergency Management Agency (FEMA) home buyout program for more than 20 years. Since MWS began participating in the home buyout program, Metro has purchased over 366 floodplain properties (over 186 acres) in which structures and other impervious surfaces such as driveways have been removed. For the restored floodplain parcels, Metro has ceased mowing areas directly adjacent to streams, allowing riparian buffers to naturally reestablish. MWS Stormwater has also coordinated the plantings of hundreds of native trees and shrubs within many of these floodplain properties. Many of the buyout sites are adjoining parcels within the same floodplain, resulting in the restoration of large continuous tracks of riparian floodplain. Some of these floodplain properties also provide recreational value to local neighborhoods as they are now managed and protected by the Metro's Parks Department. During FY18, Vanderbilt University performed a study of the various benefits of the FEMA home buyout program to the community. A summary of the findings are included in Section 4 of this document.

Example Screen Capture of Floodplain Buyout Properties along Whites Creek

Stormwater LID Manual

The Low Impact Development (LID) Manual became the requirement for post construction water quality compliance path on February 1, 2016, as required by the runoff reduction requirement in Section 3.2.5 of Metro's MS4 Permit. MWS also developed a waiver process to allow projects with certain site limitations such as high water tables, shallow bedrock, etc. to use the previously allowed standard treatment practices to treat at a rate of 80% TSS removal efficiency. MWS realizes that in these certain cases, the old treatment would end up being a better option for both water quantity and quality. At the time of this report was being compiled, MWS had granted waivers to 150 sites since the LID requirements became mandatory.



Volume 5 and photos of some of the LID treatment practices promoted by Metro

Watershed Improvement Fund

During FY18, NPDES broke ground on the first project constructed for the sole purpose of improving the quality of stormwater runoff from a specific Metro property, that wasn't part of some other type of development. This project was funded by the Watershed Improvement Fund (WIF), which is a fund from within he Stormwater user fee funds that is dedicated to implementing proactive projects that are specifically designed to improve the quality of stormwater runoff in various watersheds. The projects implemented with WIF funds will include structural and non-structural controls, which may include some retrofits of previously developed properties.

The first WIF project was actually identified and designed in FY17. Through previous wet weather monitoring, NPDES determined that there were elevated levels of bacteria in runoff from one of Metro's community dog parks during storm events. Metro's Pitts Dog Park, located at 299 Tusculum Road, was found to have unique circumstances where all the runoff for the park routes directly to a defined ditch into the MS4 and, shortly thereafter, into the headwaters of Sorghum Branch. The elevated levels of bacteria represent a specific concern as Sorghum Branch is listed on the 303(d) list of impaired waterways for exceeding the pathogen levels recommended for recreational streams. In order to develop a project to minimize bacteria runoff from the dog park, NPDES hired a contractor to design a bioretention structure to retain/infiltrate/treat stormwater runoff from the dog park. NPDES coordinated with Metro Parks on finalizing the design as to not hinder operation of the park. The design was finalized in FY17 and NPDES commenced with construction during the Spring of FY18.

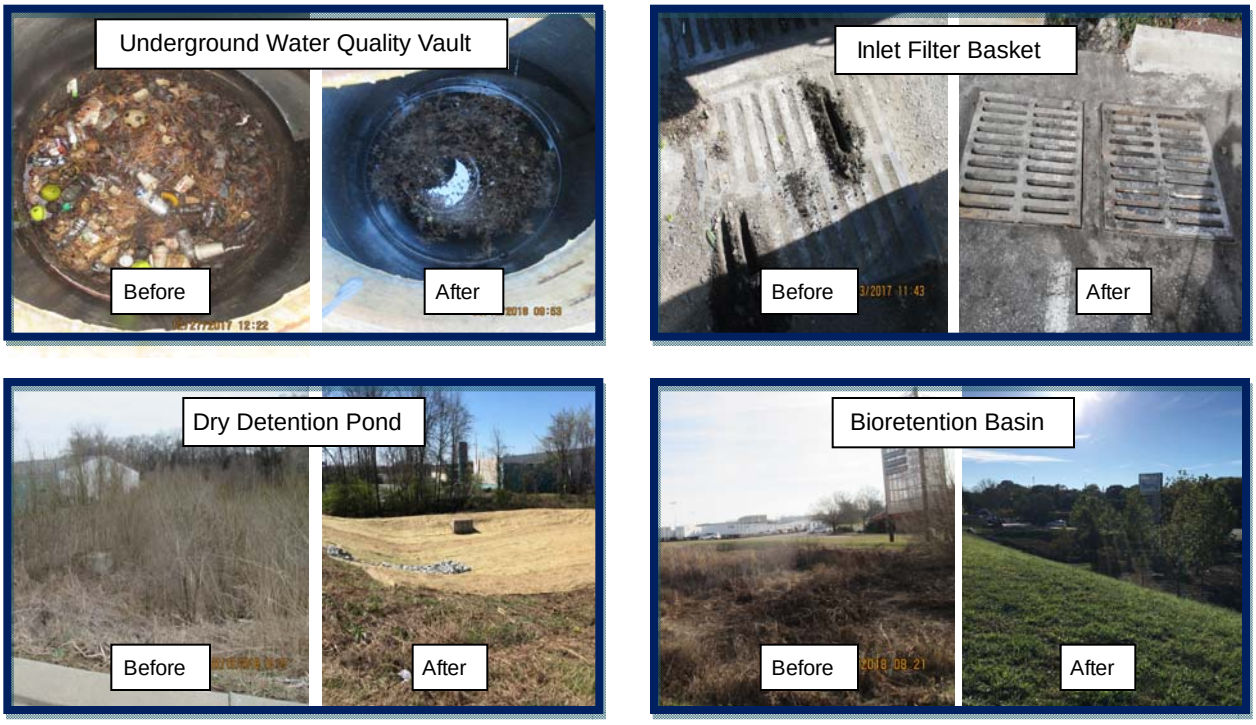
A large bioretention basin was successfully constructed at the base of the hill to infiltrate/treat stormwater runoff from the dog park located on top of the hill. The construction of the bioretention basin was completed in May of 2018. Metro will be pursuing the potential acquisition of monitoring equipment to evaluate the volume stormwater runoff and overall loading of bacteria that are being captured and/or treated by the structure.

Bioretention Installed to Retain/Treat Stormwater Runoff form Pitts Park

Stormwater Control Measure Oversight Program

At the time this report was compiled, Nashville had inventoried 4,931 post construction SCMs that have been built to treat stormwater runoff from the developed environment as required by grading permit regulations. These structures include older dry detention ponds and water quality vaults, as well as the new green features such as bioretention basins and pervious pavement. In the past, due to resources, NPDES could only dedicate part-time staff to reviewing and enforcing the long-term maintenance of the thousands of SCM structures. During FY18, however, NPDES was able to expand its program personnel to devote more resources to SCM inspection services. NPDES hired two Environmental Compliance Officers dedicated to proactively inspecting SCMs and following up with property owners regarding any maintenance issues. In addition, NPDES also hired Office Support Specialist to help oversee and document owner-submitted annual maintenance reports.

During the first year with additional SCM inspection personnel, NPDES performed over 1,200 inspections and/or re-inspections of SCM structures and distributed more than 300 notices to property owners informing them of the inspection results and any maintenance that is required. In addition, NPDES issued 16 Notices of Noncompliance to property owners that failed to respond to maintenance needs or have altered the function of SCM structures. NPDES has learned within the first year of increased inspections that the follow-up with residential SCM property owners to achieve proper maintenance can be challenging and time consuming. In FY19, NPDES plans to coordinate with the Metro Legal Department to determine the most effective method of requiring maintenance for residential SCMs in which Homeowners Associations are non-existent or have never been delegated responsibility. The inspection and follow-up with SCMs located on commercial or industrial-owned properties, however, has proven to be much more successful, which should directly translate to continually improving stormwater runoff from these facilities. Below are some before and after photographs of SCM structures that NPDES inspected and coordinated with the property owner to perform maintenance.



Before and After Pictures of SCM Maintenance Performed after NPDES Inspection and Follow-up

Moving Forward:

At the time this report was compiled in FY19, NPDES had already hired 2 additional Environmental Compliance Officers to assist with SCM inspections and follow-up. In FY19, NPDES expects to delineate the following personnel breakdown involving the expansion of the SCM oversight program.

Table 2 – FY19 NPDES SCM Oversight Program

Office Support Specialist 2	• Receiving, documenting owner-submitted annual inspection/maintenance reports. • Assist with distributing SCM owner education materials.
Environmental Compliance Officer 1	• SCM Enforcement Coordinator – To put together and distribute all NONs, NOVs, and coordinate with Metro Legal on unresolved SCM enforcement cases. • Coordinate SCM complaint responses. • Assist, as needed, on other SCM inspections/follow-up.
Environmental Compliance Officer 1	• Metro Department SCM Coordinator – To inspect and coordinate annually with all Metro departments on their property's SCM maintenance needs. • Responsible for SCM inspections and initial coordination with property owners in the downtown inner loop.
Environmental Compliance Officer 1	• Responsible for SCM inspections and initial coordination with property owners for the large geographic area east of Interstate 65 (excluding downtown inner loop). • Assists with SCM complaint investigations within same geographic area.
Environmental Compliance Officer 1	• Responsible for SCM inspections and initial coordination with property owners for the large geographic area west of Interstate 65 (excluding downtown inner loop). • Assists with SCM complaint investigations within same geographic area.

Urban Forestry Program and Soil and Water Conservation Programs within Stormwater

During FY18, NPDES broadened its technical resources to include a new Urban Forestry Program and the Davidson County Soil & Water Conservation Program. These are important programs to house within the NPDES program, as tree canopy coverage and soil conservation practices are some of the most important factors in protecting water resources within Metro Nashville.

Urban Forestry Program:

As part of the livable Nashville process, Metro has adopted a goal of planting 500,000 trees by 2050. This investment will protect air and water quality, reduce heat-wave impacts, improve public health, and save taxpayer dollars on heavy (grey) stormwater infrastructure. The Urban Forestry Program was established to strengthen Metro Nashville's capacity to maintain and preserve existing trees and enhancing coordination across departments on tree-related issues. As a component, Metro recently launched the Root Nashville program, which is a public-facing tree planting campaign that utilizes public-private partnership to plant/maintain trees and increase public awareness to the importance of trees. During FY19, Executive Order 40 was enacted, which established trees as a part of Nashville's critical infrastructure. In addition, NPDES implemented a new inventory system to track Metro's trees and maintenance needs, hired a company to inventory street trees and trees on Metro property, and coordinated an initial strategy to mitigate damage caused by the Emerald Ash Borer, which threatens to kill and estimated 5% of Metro's Urban Tree Canopy in the next five years. Moving forward, MWS will be leading the tree canopy campaign by example by planting 1,000 trees on MWS properties.

Davidson County Soil and Water Conservation:

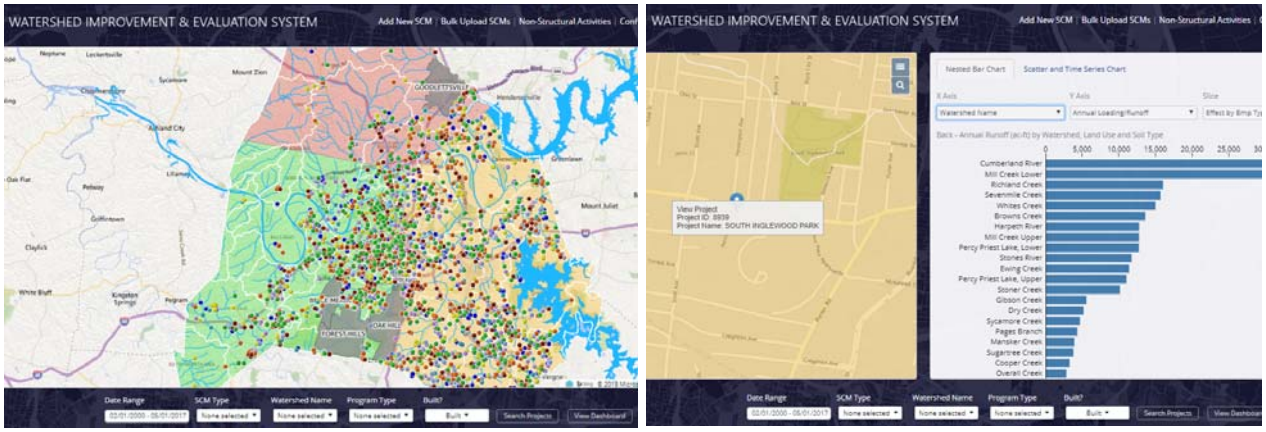
The Davidson County Soil Conservation District was established in 1946 as a subdivision of the state government. The mission of the Davidson County Soil Conservation District has been to provide conservation planning, education, information and technical assistance to landowners, groups and units of government so they can enhance and benefit from the proper management of our natural resources. At the start of FY19, Metro reorganized this program to be housed within the MWS Stormwater NPDES Office due to the common goals for the programs and operational efficiencies.

The Soil and Water Conservation Program is complimentary to the NPDES program as they perform various functions such as educating local landowners on soil and water conservation practices, livestock management processes that reduce impacts to water resources and local watersheds from certain landowner activities. In addition, the program also provides technical assistance to landowners on conservation techniques, specifically by offering cost share funds allocated from Tennessee Department of Agriculture and USDA/ NRCS for best management practices for Davidson County Watersheds. The Conservation programs reduce soil erosion, enhance water supply, improve water quality, increase wildlife habitat and reduce damages caused by floods and other natural disasters.

Watershed Improvement Evaluation System

For an MS4 program, one of the most important, but difficult tasks is to evaluate various programs effectiveness and quantify the benefits these programs have on to the MS4 and community waters. Some program elements produce hard data that can be analyzed and quantified, while other program elements are implemented without producing specific data or results that can be evaluated for effectiveness. For instance, it's much harder to evaluate a non-structural control such as public education programs verses the structural retrofitting projects (i.e. installation of structural stormwater controls that actually treat stormwater runoff from certain areas). In FY18, NPDES hired a contractor (Paradigm Environmental) to, not only calculate the seasonal pollutant loadings of the third permit cycle, but to also develop a database to assist with future tracking and calculating the pollutant loading reductions of implementation of various stormwater programs.

Throughout FY18, Paradigm Environmental completed the MS4 Pollutant Loading calculations, as required by the MS4 Permit, while also using these same formulas to build a web browser-based database called Davidson County Watershed Improvement & Evaluation System (WIES). WIES will calculate/estimate pollution removal efficiencies of both structural and non-structural MS4 programs so that MS4 managers are able to evaluate and allocate resources to the most efficient aspects of the programs. Once completed, NPDES will upload data each year and produce real numbers to report on pollutant loading reductions from various structural and non-structural program elements. When WIES is operational and all the data is uploaded, reports and graphs will be generated that will be included in future annual reports. WIES will also contain a dashboard platform that will allow a user to look at specific projects and view different graphed perspectives of the stormwater program element. Below are some screen shot examples of the draft WIES database.



Screenshots of the Draft WIES Database

TDEC Compliance Inspection of the Stormwater Construction Oversight Program

One of the best measures of evaluating a stormwater program is to be subjected to a review or audit from the program's regulator. During FY18, The Stormwater NPDES program successfully completed a Stormwater Compliance Evaluation Inspection from TDEC regulatory staff. The focus of the Compliance Evaluation Inspection was on Metro Nashville's programs to regulate construction stormwater runoff. During the compliance inspection, TDEC staff interviewed various MWS staff and departments that work together to educate developers and contractors on construction stormwater impacts, issue grading permits and single-family in-fill permits, review EPSC plans, inspect EPSC controls, and issue enforcements when controls fail. As part of their review, TDEC staff observed NPDES staff performing a routine grading permit inspection.

Overall, TDEC provided the following statement in response to the Stormwater Compliance Evaluation Inspection:

> "*The construction site stormwater runoff control program is well established, the staff is trained and certified, and the program implementation is compliant with the requirements of the NPDES Permit TNS068047.*"

The entire TDEC letter summarizing in the Stormwater Compliance Evaluation Inspection is included in Attachment B.

1.3.2 Other Metro Department Activities:

In addition to MWS Stormwater Division activities, many other Metro Departments perform critical roles in promoting improved stormwater quality runoff throughout Metro.

Metro Parks and Recreation Department

Metro Nashville Parks and Recreation Department (MNPR) has been a key player in improving Stormwater runoff and riparian habitat on Metro properties. Below are some of the major MNPR activities that have either been performed or are planned that serve to improve the quality of stormwater runoff:

Warner Park Stream Mitigation – Parks has partnered with Friends of Warner Park to work with the firm of Lord and Winter to evaluate and identify 10 stream segments within Percy and Edwin Warner Parks as potential mitigation projects. Currently, the Cumberland River Compact is reviewing these segments for potential funding for the mitigation.

Environmental Education Programs - Metro Parks Nature Centers have a direct and valuable positive impact on water quality and conservation through its environmental education programs, interpretive exhibits, green facilities, and watershed protection. Of the approximately 27,000 individuals who participated in nature center programs last year, as many as 10,000 received education and information directly related to water resources. Up to 142,000 more park visitors were exposed to water resources education through educational exhibits at the four Metro Parks nature centers. Each of these nature centers also feature amenities that conserve water resources and provide passive education opportunities to visitors. These include green roofs, water chains, rain barrels, teaching ponds, stream bank restoration areas, pervious paving materials, rain gardens and cisterns.

Dog Waste Pick-up On MNPR Property – During the reporting year, approximately 588,000 dog waste bags were distributed at MNPR properties. Based on the amount of dog waste bags distributed, it is estimated that approximately 129,600 pounds (64.8 tons) of dog waste were collected for proper disposal.

Mill Ridge Property – During the previous fiscal years, MNPR acquired several hundred acres of property in the southeastern portion of the county. This property, which is mostly old farm land, is rich with water resources as several tributaries to Hurricane Creek and Collins Creek are present throughout the parcels of land. NPDES began coordinating with MNPR on some potential stream/wetland enhancement projects on the property in previous permit years. In FY18, MNPR acquired an additional 60 acres of land that contain additional degraded headwater streams that may serve as potential stream mitigation projects in the future.

Parks Land Conservation - The majority of the Parks and Recreation Department's 14,000 plus acres and over 60 miles of greenway corridor have continued to be maintained in a natural condition, providing vitally important protection to our watersheds, including many critical headwater streams. Each year MNPR plants many trees on a variety of parks properties. .

Metro Nashville Planning Department

Nashville's Planning Department focuses on sustainable development as described in the Community Character Manual, which encourages sustainable development and preservation in Metro's fourteen community plans that guide future land use and infrastructure decisions. A foundational principle of the Community Character Manual is the commitment to create sustainable communities through sustainable development. Key strategies include actions to address each property's unique location and geographic features, while avoiding sensitive environmental features. This benefits the community by protecting water quality, as well as reducing the impact of development on surrounding infrastructure and the community through the use of best practices in stormwater and wastewater management. In addition, the Community Character Manual includes objectives of the EPA and Metro Nashville's Stormwater Management Program, such as incorporating green infrastructure, protecting steep slopes and headwater areas, minimizing and/or recovering floodplain loss, and retaining or re-creating natural stream buffers. The Community Character Manual also includes a section of general principles for Healthy & Complete Communities which highlights the importance of minimizing the impact of development on the natural environment, especially air and water quality, and of integrating green space in developments for preservation, recreation, and healthy lifestyles.

In 2015, the Planning Department completed the city's update to Nashville's General Plan, which was created with city-wide community involvement and input. The process is referred to as NashvilleNext and is the vision and priorities for Metro over the next 25 years. NashvilleNext includes a Growth & Preservation Concept Map that encourages additional development along the city's corridors and in mixed use centers, while preserving rural areas and areas of sensitive natural features.

Metro's natural resources are discussed in three of the seven elements of the NashvilleNext plan: Natural Resources & Hazard Adaptation; Health, Livability & the Built Environment; and Land Use, Transportation & Infrastructure. Each element discusses goals, policies and actions that guide Nashville's future. Relevant Element goals, policies and actions include:

- Conserve natural resources in order to mitigate floods and other natural hazards, ensure clean air and water, raise food locally, provide outdoor recreation, and preserve Nashville's culture and character.

- Invest in and increase Nashville's natural environment for beauty, biodiversity, recreation, food production, resiliency, and response to climate change through mitigation and adaptation strategies.
- Preserve Nashville's existing tree canopy, including urban trees, street trees and larger tracts of forested lands.
- Enjoy (all communities) equally high levels of environmental protection, equitable access to nature, and opportunities to improve their health and quality of life.
- Conserve and efficiently use land, energy, water, and resources while reducing waste and pollution.
- Establish a wide-ranging green education campaign that focuses on the "why" and "how" for water conservation, energy efficiency and reductions, recycling and waste reduction, natural resources preservation, and outdoor activity.
- Ensure all communities have access to parks, green areas, cultural amenities, and recreation opportunities that support mental and physical well-being.
- Optimize sewer, water, stormwater and other infrastructure within Nashville's centers and corridors to prepare for or coordinate with redevelopment. Use green infrastructure to reduce the need for upgrades and to improve streetscapes.
- Reduce the impact of construction on surrounding infrastructure and community through use of best practices in stormwater management, wastewater management, and reducing heat island effect and light pollution.
- Expand programs and institute more complete regulations to protect Nashville's sensitive environmental resources.

During 2018, the Planning Department worked on a small area plan for properties along West Trinity Lane. The study area included properties along the Cumberland River, Pages Branch, and other tributaries. Planners worked with the Parks Department to create a plan that calls for a primary Riverfront Greenway as properties develop/redevelop that would link various neighborhoods and green spaces within the area as well as preserve floodplain areas along the Cumberland River. The plan includes a secondary greenway along Pages Branch to connect the Cumberland River at Lock One Park with Brick Church Pike to the east.

Planners also worked on a small area study for properties along a portion of Lebanon Pike, south of the Cumberland River. The study area included properties along a section of Mill Creek. As properties develop/redevelop, the plan calls for a primary greenway along Mill Creek to enhance the creek as an environmental asset and to promote accessibility and connectivity for greenway users. The plan also calls for more accessible open space areas and a secondary greenway that connects to the Cumberland River Greenway system.

The Planning Department continues its collaboration with Metro Parks and Greenways and the Land Trust for Tennessee by identifying properties that would be good additions to Nashville's open space network. This includes properties that are important to preserve for headwater areas, for wildlife habitat, and for water management in flood-prone areas.

On a daily basis, the Planning Department meets with property owners and development professionals to discuss property ideas and projects. Planning staff discuss the importance of preserving sensitive environmental features and working within the natural features of each site and regarding them as community amenities, including features such as waterways, wet weather conveyances, drainage patterns, steep slopes, woodlands, riparian habitat, and mature trees. Where appropriate, Planning staff direct property owners and development professionals to continue those discussions with Metro Water Services and the Stormwater Division for additional guidance and ideas.

MWS Engineering Division

The MWS Engineering Division and the Clean Water Nashville (CWN) program overseeing the sanitary sewer systems have worked diligently to minimize the volume of unintentional discharges of sanitary sewer overflow material to the MS4 and community waterways. MWS has dramatically increased its involvement on projects to reduce overflows from both the Combined Sewer System (CSS) and the Separate Sewer System (SSS). Table 3 lists some of the major projects undertaken by the MWS OAP that have been completed for which serve to greatly reduce discharges of sanitary waste to stormwater drainage and streams. Table 4 provides a list of future projects that are planned to be completed in future reporting years.

MWS System Services Division

The Metro Water Services System Services Division (SSD) and its contractors continued to inspect and clean sewers to assess conditions and prevent potential overflows. In FY18 SSD and contractors inspected with Closed Circuit TV (CCTV) approximately 332,433 linear feet and cleaned approximately 196,219 linear feet of Metro sewer line. During FY18, SSD continuously reviewed information from CCTV sewer inspection reports that indicated sewer problems with grease or roots. In some instances letters were sent out to notify customers of roots or grease in their private service lines or main lines and recommend corrective actions to prevent private sewer overflows. The estimated/reported MWS sewer overflows for FY18 are depicted in Table 7H.5 within Section 3 of this report.

Table 3 – MWS Engineering Projects to Reduce Sanitary Overflows

Type of Projects	# of Projects	Miles of Sanitary Lines	Money Spent	Watersheds Where Work was Performed
Annual Rehabilitation 2014 - Whites Creek Trunk Sewer: Design of this project to reduce inflow/infiltration (I/I) by rehabilitation of the trunk sewer along Whites Creek, began in October 2014 and was completed in May 2015. Construction began in January 2016 and was completed in November 2017.		7.80	$11,131,631	Whites Creek, Cumberland River
Cowan - Riverside Rehabilitation - Area 4 (Pages Branch): Design of this project to reduce I/I by rehabilitation of the collection system, began in January 2015 and was completed in August 2015, at which time the previously reported Cowan - Riverside Area 5 (Youngs Lane) project was merged into a single construction project. Construction of the combined project began in August 2016 and was completed in December 2017.		8.04	$5,656,480	Cumberland River, Pages Branch
Langford Farms - Madison Heights Rehabilitation: Design of this rehabilitation project to reduce I/I issues in the collection system was begun in February 2016 and completed in August 2016. Construction began in February 2017 and was completed in December 2017.		2.18	$1,810,861	Old Hickory Lake, Cumberland River
Smith Springs Rehabilititation - Area 2 (Castlegate): Design began in February 2016 for this project to reduce I/I related issues in the collection system. Design was completed in July 2016, and construction began in January 2017. Construction was substantially completed in June 2018		4.49	$3,445,973	Hamilton Creek (East Fork), Percy Priest Reservoir
Gibson Creek Rehabilitation - Area 1 (Dupont Avenue): Design of this project to address I/I issues in the collection system began in July 2015 and was completed in February 2016. Construction began in September 2016 and was completed in December 2017.		5.16	$4,775,711	North Fork Gibson Creek, Cumberland River
Annual Rehabilitation 2016 - South Hurricane Creek Rehabilitation: Design began in March 2016 on this project to address I/I related issues in the southern portion of the Hurricane Creek basin. Design was completed in December 2017. Construction began in May 2017 and was completed in February 2018.		5.74	$1,919,796	Holloway Branch, Hurricane Creek, Percy Priest Reservoir
Sewer Rehabilitation Projects in FY18	**6**	**33.41**	**$28,740,434**	
West Park WWPS and Equalization Basin: Design was initiated in May 2012 for this project, which will provides 21 MG of additional storage capacity at this site to reduce SSO events. The design was completed for this project in December 2014. Construction began in April 2015 and the facility became operationally complete in February 2018.			**$15,208,882**	Richland Creek, Cumberland River
Pump Station and Equalization Projects in FY 2018	**1**	**NA**	**$15,208,882**	
Brick Church Pike Pipe: Design was initiated in July 2013 for this project, which provides approximately 10,000 LF in parallel trunk sewer to increase conveyance to reduce overflows into Ewing Creek. Design was completed in April 2016. Construction began in August 2016 and was completed in February 2018.		2.17	$5,385,655	North Fork of Ewing Creek, Ewing Creek, Whites Creek, Cumberland River
Sewer Line Replacements in FY 2018	**1**	**2.17**	**$5,385,655**	
Total Completed Projects in FY 2018	**8**	**35.58**	**$49,334,971**	

Table 4 – Future MWS Engineering Projects to Reduce Sanitary Overflows

Project	Miles	Costs	Watersheds
Ewing Creek - Brick Church Equalization Facility: Design was initiated in August 2015 for this project, which will provide 10.6 MG of storage for wet weather events to reduce SSO events. Design was completed in October 2016, with construction starting in May 2017. Completion of construction is anticipated in FY 2019.		$10.14M	Ewing Creek, Whites Creek, Cumberland River
Davidson Branch WWPS and Equalization Facility: Design of this facility, which will provide a new WWPS for reliability and 6 MG of storage for wet weather flows to reduce SSO events, began in May 2015 and was completed on October 2016. Construction is dependent upon funding, which is anticipated to become available in FY 2020.		est. $23.4M	Davidson Branch, Cumberland River
Gibson Creek Equalization Facility: Design of this facility, which will provide 10 MG of storage capacity for wet weather flows to reduce SSO events, began in August 2016. Design was completed in December 2017 and construction is dependent on funding, which is anticipated to be provided in FY 2020.		est. $16.5M	Gibson Creek, Cumberland River
Central Wastewater Treatment Plant - Capacity Improvements and CSO Reduction: The design - build process for improvements to the CWWTP for Optimization, CSO reduction, and other improvements began with the selection of two teams for Planning and Design and engagement of a Construction Manager at Risk. Design began in June 2017 and will continue through several years, with various construction packages delivered to the CMAR for construction services.		est. $267M	Cumberland River
Annual Rehabilitation 2017 - Dry Creek: Design began in May 2017 for this project, which will reduce I/I related issues in the collection system. Design was completed in September 2017. Construction is dependent on funding, which is anticipated to be available in FY 2019.	4.92	est. $4.6M	Dry Creek, Cumberland River
Annual Rehabilitation 2017 - Shepherd Hills: Design began in May 2017 for this project, which will reduce I/I related issues in the collection system. Design was completed October 2017. Construction is dependent on funding, which is anticipated to be available in FY 2019.	5.49	est. $3.8M	Dry Creek, Cumberland River
Shelby Park Rehabilitation - Area 5 - Cooper Lane: Design began in June 2016 on this project, which will reduce I/I related issues in the collection system. Design was completed in December 2016. Construction began in August 2017 and is anticipated to be completed in FY 2019	9.88	$4.99M	Cooper Creek, Cumberland River
Shelby Park Rehabilitation - Area 6 - Shelby Trunk: Design began in February 2017 on this project, which will reduce I/I related issues in the trunk sewer located in the Shelby Park basin. Design was completed in December 2017 and construction is dependent on funding, which is anticipated to be available in FY 2019.	3.89	est. $10.25M	Cooper Creek, Cumberland River
Smith Springs Rehabilitation - Area 3 - Harbor Town: Design began in June 2017 for this project, which will reduce I/I related issues in the collection system. Design was completed in January 2018. Construction is dependent on funding, which is anticipated to be available in FY 2019.	5.30	est. $5.1M	Hamilton Creek (East Fork), Percy Priest Reservoir
Loves Branch Rehabilitation: Design began in October 2016 for this project, which will reduce I/I related issues in the collection system. Design was completed in June 2017. Construction began in December 2017 and is anticipated to be completed in FY 2019.	6.72	$4.74M	Loves Branch, Cumberland River
Hidden Acres Rehabilitation: Design began in October 2016 for this project, which will reduce I/I related issues in the collection system. Design was completed in June 2017. Construction began in April 2018 and is anticipated to be completed in FY 2019.	1.46	$1.61M	Cumberland River
Vandiver Rehabilitation: Design began in December 2016 for this project, which will reduce I/I related issues in the collection system. Design was completed in June 2017. Construction began in March 2018 and is anticipated to be completed in FY 2019.	5.80	$3.96M	Cumberland River
Hurricane Creek Pipe Improvements: Design of this project, to increase capacity and eliminate I/I issues within the existing trunk sewer, began in April 2016 and was completed in January 2018. Construction is anticipated to begin in FY 2020 dependent upon permit & easement acquisitions and funding availability.	2.29	est. $11M	Hurricane Creek, Percy Priest Reservoir
Sevenmile Creek Rehabilitation - Area 1: Design of this project to reduce I/I issues in the Mill Creek basin began in July 2018 and is anticipated to be completed in FY 2019. Construction will be scheduled pending design completion and funding approval.	7.80	est. $12.6M	Sevenmile Creek, Mill Creek, Cumberland River

2.0 MS4 Program Annual Report Form Required By TDEC

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
Enforcement and Compliance Section
L&C Annex, 6th Floor, 401 Church Street
Nashville, TN 37243
TNS068047
Municipal Separate Storm Sewer System (MS4) Annual Report

1. MS4 Information

Nashville/Davidson County Municipal Separate Storm Sewer System (No. TNS068047)
Name of MS4

Michael Hunt/Josh Hayes
Name of Contact Person

615-880-2420
Telephone (including area code)

1607 County Hospital Rd
Mailing Address

Nashville	TN	37218
City	**State**	**ZIP code**

What is the current population of your MS4? *Approximately 600,000+*

What is the reporting period for this annual report? *The reporting period for this Annual report is from 07/01/17 to 06/30/18, which is the 7th reporting period under the current permit. This Annual Report coincides with Metro's Fiscal Year 2018 (FY17) activities. This annual report period took place after the permit's expiration date, which has been administratively extended for Metro to continue to perform all MS4 Permit activities detailed within the permit.*

2. Protection of State or Federally Listed Species

A. Do any of the MS4 discharges or discharge-related activities likely jeopardize state or federally listed species ☐ Yes **X** No

B. Please attach the determination of the effect of the MS4 discharges on state or federally listed species per subpart *Endangered Species Assessment included in Attachment A.*

3. Water Quality Priorities

A. Does your MS4 discharge to waters listed as impaired on your state 303(d) list? **X** Yes ☐ No

B. If yes, identify each impaired water, the impairment(s), whether a TMDL has been approved by EPA for each, and whether the TMDL identifies your MS4 as a source of the impairment (See below Checklist). *The below list represents the 2018 list.*

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
East Fork Hamilton Creek (TN05130203-539-1000)	Habitat Alteration, Siltation	Yes X No	Yes X No
West Fork Hamilton Creek (TN05130203-539-1000)	Habitat Alteration, Siltation	Yes X No	Yes X No
Suggs Creek (TN05130203-232-1000)	Siltation, Nutrients	Yes X No	Yes X No
McCrory Creek (TN05130203-001-0150)	Alteration in stream-side or littoral veg. cover, Nitrite+Nitrate	X Yes No	X Yes No
McCrory Creek (TN05130203-001-0100)	*E. coli*, Alteration in stream-side or littoral veg. cover, Nitrite+Nitrate, Siltation	X Yes No	X Yes No
Unnamed Trib. to Stoners Creek (TN05130203-035-0400)	Siltation	X Yes No	X Yes No
Stoners Creek (TN05130203-035-1000)	*E. coli*, Siltation	X Yes No	X Yes No
Stoners Creek (TN05130203-035-2000)	*E. coli*	Yes X No	Yes X No
Stones River (TN05130203001-1000)	Low DO, Odor, Sulfides, Flow Alteration	Yes X No	Yes X No
Scotts Creek (TN051302 03-035-0100)	Total Phosphorus, Nitrate+Nitrite, Siltation	Yes X No	Yes X No
Dry Fork Creek (TN05130203-035-0300)	Siltation	Yes X No	Yes X No
West Branch Hurricane Creek (TN05130203-036-0200)	Nutrients, Siltation	X Yes No	X Yes No
Hurricane Creek (TN05130203-036-0100)	*E. coli*, Siltation, Nutrients,	X Yes No	X Yes No
Mill Creek (TN05130202-007-5000)	Siltation, Total Phosphorus, Low DO, *E. coli*	X Yes No	X Yes No
Pavillion Branch (TN05130202007-1500)	*E. coli*	X Yes No	X Yes No
Holt Creek (TN05130202-007-1100)	*E. coli*, Nitrate+Nitrite, Total Phosphorus	Yes X No	Yes X No
Owl Creek (TN05130202-007-0900)	Alteration in stream-side or littoral veg. cover, Siltation, Total Phosphorus	Yes X No	Yes X No
Indian Creek (TN05130202-007-0800)	*E. coli*, Total Phosphorus	Yes X No	Yes X No
Collins Creek (TN05130202-007-0600)	Alteration in stream-side or littoral veg. cover, Siltation	Yes X No	Yes X No

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
Whittemore Branch (TN05130202-007-1200)	*E. coli*, Habitat Alteration	Yes X No	Yes X No
Mill Creek (TN05130202-007-3000)	Siltation, Total Phosphorus, Low DO	Yes X No	Yes X No
Sorghum Branch (TN05130202-007-1300)	Habitat Alteration, Siltation, *E. coli*	Yes X No	Yes X No
Cathy Jo (TN05130202-007-1490)	*E. coli*, Nitrate+Nitrite, Total Phosphorus, Other Anthropogenic substrate alterations, Siltation	Yes X No	Yes X No
Shasta Branch (TN05130202-007-1410)	*E. coli*	X Yes No	X Yes No
Sevenmile Creek (TN05130202-007-1450)	*E. coli*, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Sevenmile Creek (TN05130202-007-1400)	*E. coli*, Other Anthropogenic Habitat Alteration, Total Phosphorus, Nitrite+Nitrate, Low DO	X Yes No	X Yes No
Finley Branch (TN05130202-007-0300)	*E. coli*, Other Anthropogenic Habitat Alteration, Total Phosphorus	X Yes No	X Yes No
Mill Creek (TN05130202-007-2000)	Siltation, Total Phosphorus, Low DO	Yes X No	Yes X No
Sims Branch (TN05130202-007-0150)	Other Anthropogenic Habitat Alteration, Low DO, Propylene Glycol	Yes X No	Yes X No
Sims Branch (TN05130202-007-0100)	*E. coli*, Other Anthropogenic Habitat Alteration, Total Phosphorus, Low DO	X Yes No	X Yes No
Mill Creek (TN05130202-007-1000)	*E. coli*, Siltation, Total Phosphorus, Low DO	X Yes No	X Yes No
Manskers Creek (TN05130202-220-2000)	*E. coli*, Siltation, Low DO	X Yes No	X Yes No
Walkers Creek (TN05130202-220-0200)	*E. coli*	X Yes No	X Yes No

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
Lumsley Fork (TN05130202-220-0100)	*E. coli*	X Yes No	X Yes No
Manskers Creek (TN05130202-220-1000)	*E. coli*, Siltation	X Yes No	X Yes No
Unnamed Trib. to Walkers Creek (TN05130202-220-1000)	Flow Alteration	Yes X No	Yes X No
West Fork Browns Creek (TN05130202-023-0300)	*E. coli*, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Middle Fork Browns Creek (TN05130202-023-0200)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
East Fork Browns Creek (TN05130202-023-0100)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, Oil & Grease	X Yes No	X Yes No
Browns Creek (TN05130202-023-2000)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, Oil & Grease	X Yes No	X Yes No
Browns Creek (TN05130202-023-1000)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, Oil & Grease	X Yes No	X Yes No
Richland Creek (TN05130202-314-3000)	Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, *E. Coli*	X Yes No	X Yes No
Vaughns Gap Branch (TN05130202-314-0750)	*E. coli*, Other Anthropogenic Habitat Alterations	X Yes No	X Yes No
Vaughns Gap Branch (TN05130202-314-0700)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Jocelyn Hollow Branch (TN05130202-314-0800)	*E. coli*, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Richland Creek (TN05130202-314-2000)	Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, *E. Coli*	X Yes No	X Yes No

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
Sugartree Creek (TN05130202-314-0400)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, Low DO	X Yes No	X Yes No
Bosley Springs Branch (TN05130202-314-0300)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Richland Creek (TN05130202-314-1000)	Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, *E. coli*	X Yes No	X Yes No
Cooper Creek (TN05130202-209-1000)	*E. coli*, Other Anthropogenic Habitat Alterations	X Yes No	X Yes No
Ewing Creek (TN05130202-010-0900)	*E. coli*, Other Anthropogenic Habitat Alterations	Yes X No	Yes X No
Drakes Branch (TN05130202-010-0200)	*E. coli*, siltation	X Yes No	X Yes No
Whites Creek (TN05130202-101-2000)	*E. coli*, Alteration in stream-side or littoral vegetative cover, Siltation	X Yes No	X Yes No
Whites Creek (TN05130202-010-1000)	Nutrients	X Yes No	X Yes No
Gibson Creek (TN05130202-212-1000)	Other Anthropogenic Habitat Alterations, Flow Alteration	Yes X No	Yes X No
Neelys Branch (TN05130202-212-0100)	*E. coli*	X Yes No	X Yes No
Dry Creek (TN05130202-027-2000)	Other Anthropogenic Habitat Alterations	Yes X No	Yes X No
Dry Creek (TN05130202-027-1000)	*E. coli*	X Yes No	X Yes No
Loves Branch (TN05130202-211-1000)	Other Anthropogenic Habitat Alterations	Yes X No	Yes X No
Pages Branch (TN05130202-202-1000)	*E. coli*	X Yes No	X Yes No
Davidson Branch (TN05130202-001T-0700)	*E. coli*	Yes X No	Yes X No

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
Unnamed Trib. to Cheatham Reservoir (TN05130202-001T-0700)	Iron, TDS	Yes X No	Yes X No
Cheatham Reservoir (TN05130202-001-3000)	*E. coli*	Yes X No	Yes X No
Overall Creek (TN05130202-001T-0900)	Siltation, Flow Alteration	Yes X No	Yes X No
Otter Creek (TN05130204-021-0100)	Total Phosphorus, Alteration in stream-side or littoral vegetative cover, Siltation, Flow Alteration	X Yes No	X Yes No
Little Harpeth River (TN05130204-021-1000)	Alteration in stream-side or littoral vegetative cover, Siltation, *E. coli*	X Yes No	X Yes No
Harpeth River (TN05130204-009-2000)	Total Phosphorus, Low DO	X Yes No	X Yes No
Trace Creek (TN05130204-009-0900)	Physical Substrate Habitat Alteration, Siltation	X Yes No	X Yes No
Flat Creek (TN05130204-009-0400)	Alteration in stream-side or littoral vegetative cover, Siltation	X Yes No	X Yes No
Unnamed Trib. to South Harpeth (TN05130204-010-0200)	Flow Alteration	Yes X No	Yes X No
Unnamed Trib. to South Harpeth (TN05130204-010-0300)	Alteration in stream-side or littoral vegetative cover	X Yes No	X Yes No
Harpeth River (TN05130204-009-3000)	Total Phosphorus, Low DO	X Yes No	X Yes No
Beech Creek (TN05130204-009-1100)	Alteration in stream-side or littoral vegetative cover, Siltation	X Yes No	X Yes No

C. What specific sources of these pollutants of concern are you targeting?

Pathogens (pet waste, sanitary sewer leaks), siltation (construction sites), oil & grease (industries/commercial sites), and nutrients (pet waste, sanitary sewer leaks, fertilizer application)

D. Do you have discharges to any Exceptional TN Waters (ETWs) or Outstanding National Resource Waters (ONRWs)?

X Yes ☐ No

A large portion of Metro drains to Mill Creek, which is listed as an ETW due to the presence of the federally endangered Nashville Crayfish (Orconectes shoupi). A portion of the Harpeth River in Davidson County is listed as a State Scenic Riverway.

E. Are you implementing additional specific provisions to ensure the continued integrity of ETWs or ONRWS located within your jurisdiction? X Yes ☐ No ☐ N/A

Specific public education activities have been implemented in the past for certain residential areas that drain to the Harpeth River and commercial/industrial areas that drain to Mill Creek. Nutrient and pathogen reduction education has been and will be focused on that area. The Stormwater Maintenance Sections and the MWS Sanitary Sewer Division have been trained on limiting in-creek excavation work within the Mill Creek watershed. Metro also implements a robust construction oversight program to prevent excess sediment from draining to these high valued waterways.

4. Public Education and Public Participation

A. Is your public education program targeting specific pollutants and sources of those pollutants? X Yes ☐ No

B. If yes, what are the specific causes, sources and/or pollutants addressed by your public education program?

Pathogens (pet waste), siltation (construction sites), nutrients (residential lawn maintenance & pet waste), and oil & grease (commercial/industrial facilities).

C. Note specific successful outcome(s) (NOT tasks, events, publications) fully or partially attributable to your public education program during this reporting period.

During the reporting period of FY18, NPDES performed many activities to increase public education and awareness for many diverse stormwater issues, all of which are detailed in Section 4 of this document. In particular, NPDES continued to expand the social media presence in order educate the new generation of customers about stormwater issues and pollution. Three main social media sources (Facebook, Twitter, and Instagram) were utilized to reach local citizens. Typical content of the posts focused on drawing the connection of storm drains to our local water resources to encourage the general public to work towards reducing pollution. Various types of visual media were used to depict the kinds of pollutants that can end up in our streams and how Metro residents can do their part to reduce it. Pollutants that were specifically targeted included lawn chemicals, cigarette butts, lawn wastes, pet waste, and general trash. In particular, during FY18, Metro issued various stormwater-related social media posts that reached over 21,000 different recipients. NPDES also continued to achieve specific public education outcomes by sending out email or mail-out notices to various audience groups (i.e. development community, specific neighborhoods, etc.), which reached over 1,608 recipients. The various notices included information about the proper management of construction sites, the proper use of chemicals (fertilizers, pesticides, etc.), the proper management of yard wastes such as grass clippings, leaves, and brush, and the proper management of pet waste.

NPDES also focused specifically during FY18 on revamping the website dealing with Post-Construction Stormwater Control Measures (SCMs). In particular, NPDES worked with the Planning Department to provide all of the mapped locations of SCMs on the Nashville Parcel viewer map application, which is available to the general public. Screenshots from the newly developed website are available in Section 4.0

X Yes ☐ No

D. Do you have an advisory committee or other body comprised of the public and other stakeholders that provides regular input on your stormwater program?

Metro has a Stormwater Management Committee (SWMC) that reviews cases where development/redevelopment activities are unable to meet specific provisions of the stormwater regulations and hears appeals of violation decisions by the Director's office. The members of the committee are appointed by the Mayor's office. The SWMC monthly meetings are televised on Metro's Local Channel 3 which provides visibility of Metro stormwater matters as well as public education.

E. Provide a summary of all public meetings required by the permit.

Metro has various agencies that perform projects involving public meetings. For example, the MWS Stormwater Remedial Maintenance Section holds meetings for certain large-scale maintenance projects on an as-needed basis. The Metro General Services Department holds various public meetings for large Metro Development activities. In addition, the Metro Planning Department provides numerous opportunities designed to receive feedback from the general public or other stakeholders on a routine basis. Over the past few years, the Planning Department has created several "Resource Teams" that are made up of various stakeholders from the private and public sector involved in advising the Planning Department on future development activities, much of which involves sustainable stormwater practices. Information on the resource teams and other community outreach activities can be found at the following website:

http://www.nashville.gov/Government/NashvilleNext/Resource-Teams.aspx

MWS Stormwater also specifically facilitates monthly meetings with the Stormwater Management Committee for sites appealing specific stormwater regulations. These meetings are available for the public to attend and comment, and are advertised on the internet and at the property in question with a standard public notification sign. During the reporting period, Metro Stormwater facilitated 12 separate SWMC meetings. More information about the SWMC process is available at the following website:

http://www.nashville.gov/Water-Services/Developers/Stormwater-Review/Variance-Appeal-Information/Meeting-Dates-Deadlines.aspx

5. Codes and Ordinances Review and Update

A. Is a completed copy of the EPA Water Quality Scorecard submitted with this report? *A copy of the scorecard was submitted in the FY12 annual report*. ☐ Yes X No

B. Include status of implementation of code, ordinance and/or policy revisions associated with permanent Stormwater management.

MWS Stormwater has already developed a new volume of the Stormwater Management Manual (SWMM) (Volume 5) dedicated to promoting/incentivizing the use of Low Impact Development (LID) techniques for post development stormwater management. A few years ago, Metro promoted/incentivized use of runoff reduction/100% pollution reduction practices, but still allowed development sites to utilize standard stormwater quality treatment practices of 80% total suspended solids (TSS) removal. In February of 2016, however, Metro revised the SWMM to require all development activities to pursue runoff reduction practices for stormwater quality treatment, unless certain site constraints were demonstrated to be present (i.e. high ground water table, clay soils, karst areas, brown fields, etc.). MWS Stormwater has developed a waiver process for sites that are requesting to revert to the standard water quality treatment practices. At the time this report was compiled, MWS had granted waivers to 150 sites since the LID requirements became mandatory. In the year following this Annual Report, the SWMM will be further revised to reflect updates and lessons learned on previously installed LID practices.

6. Construction

A. Do you have an ordinance or adopted policies stipulating:

Erosion and sediment control requirements?	X Yes	☐ No
Other construction waste control requirements?	X Yes	☐ No
Requirement to submit construction plans for review?	X Yes	☐ No
MS4 enforcement authority?	X Yes	☐ No
Have you developed written procedures for site plan review and approval?	X Yes	☐ No
Do the written procedures for site plan review and approval include an evaluation of plan completeness and overall BMP effectiveness?	X Yes	☐ No

Have you developed written procedures for managing public input on projects?	☐ Yes	X No
Metro Nashville manages public input in a variety of different ways throughout various departments. There are no written procedures for managing the public. Please refer to the above section on public engagement on stormwater development projects.	(See Notes)	
Have you developed written procedures for site inspection and enforcement?	X Yes	☐ No
Have all MS4 Inspectors maintained certification under the Tennessee Fundamentals of Erosion Prevention and Sediment Control, Level 1?	X Yes	☐ No
Have all MS4 site plan reviewers maintained certification under the Tennessee Fundamentals of Erosion Prevention and Sediment Control, Level 2?	X Yes	☐ No
Most of the engineers have taken the Level 2 training, however, the few that have not taken the training have Professional Engineer's (P.E) license, which also satisfies the MS4 permit requirement.		

B. How many active construction sites disturbing at least one acre were there in your jurisdiction this reporting period?

Refer to attached Table 6B.1. In FY18, there were 311 grading permits issued, while 264 grading permit sites were completed (signed-off). Not all of the Grading Permits were for sites over an acre (requiring a TDEC General Construction Stormwater Permit). All sites that grade over an acre are required to also obtain a grading permit and must have coverage under the State's General Construction Stormwater Permit prior to receiving a Metro Grading Permit. At the time this report was completed, there were 688 active grading permits as Metro requires permits for grading over 10,000 square feet.

C. How many of these active sites did you inspect this reporting period?

NPDES Section performed 7,277 construction-related inspections in FY18. The inspections were performed on Grading Permit sites under construction and complaint inspections of construction activity without permits. In addition, MWS Stormwater also provides oversight and guidance to small residential construction activities usually with total disturbed area of less than 10,000 square feet (not requiring a standard grading permit). Refer to the attached Table 6C.1 for small construction project oversight numbers.

D. On average, how many times each, or with what frequency, were these sites inspected (e.g., weekly, monthly, etc.)?	Monthly	
NPDES inspects all active construction sites at least once per month.		
E. Do you prioritize certain construction sites for more frequent inspections?	X Yes	☐ No
If Yes, based on what criteria?		

*All **active** permit sites are prioritized to receive inspections at least once per month. This meets and exceeds the permit requirement to perform monthly inspections of 303(d) listed siltation-impaired streams.*

7. Illicit Discharge Elimination

A. Have you completed a map of all known outfalls and receiving waters of your storm sewer system?	X Yes	☐ No
B. Have you completed a map of all known storm drain pipes of storm sewer system?	X Yes	☐ No

C. How many outfalls have you identified in your system?

Metro has undergone several iterations of mapping updates of Stormwater infrastructure into the Geographic Information System (GIS). During previous reporting periods, MWS Stormwater's contractor completed a project to re-delineate the outfall layer (grid by grid) with the focus of verifying "actual" MS4 permitted outfalls. While the focus was mapping MS4-permitted outfalls, NPDES also had the contractor create the following two outfall layers: 1)Sub-MS4 Outfalls – Outfalls within the MS4 system upstream of the discharge point to Waters of the State, but usually where two large systems combine; and 2) Private Outfalls – Point at which Stormwater from private properties drain to either Waters of the State or MS4. Currently there are 11,872 MS4-permitted Outfalls, 340 Sub-MS4 Outfalls, and 2,396 Private Outfalls mapped within Metro's GIS database. Please note that in determining the point at which MS4 outfalls drain to Waters of the State, NPDES had to assume the streams layer in GIS was an accurate representation of actual streams, even though the coverage is more of an estimate and has not been field-verified.

D. How many of these outfalls have been screened for dry weather discharges?

In FY18, NPDES received approval from TDEC to implement a new form of field screening, where up to three commercial and industrial properties were screened within ½ mile grids for potential stormwater runoff issues such as exposed grease, waste materials, sediment, etc. Prior to this change, NPDES inspectors were required to look only at infrastructure points for potential illicit discharges, which was very time consuming and produced very few results. Refer to Attachment B for complete coordination on modifications to the field screening program.

During FY18, NPDES screened 18 separate ½ mile grids for potential stormwater runoff issues, which included looking at 37 separate business practices. NPDES expects the number of stormwater grids and businesses screened to dramatically increase during FY19 as additional personnel are added to the program.

E. How many of these have been screened more than once?

None are required to be screened twice per our new permit, however, if a non-stormwater/"illicit" flow is suspected, NPDES initiates an IDDE investigation that is documented within the Cityworks database until the illicit discharge is eliminated.

F. What is your frequency for screening outfalls for illicit discharges?

All 2,047 ¼ mile commercial and industrial-zoned grids were screened by the end of Year 5 of the MS4 permit (January 31, 2017). This requirement is no longer in effect with the approved modification to this program element per the administrative extension agreement.

G. Do you have an ordinance that effectively prohibits illicit discharges? X Yes ☐ No

H. During this reporting period, how many illicit discharges/illegal connections have you discovered (or been reported to you)?

During FY18 field screening activities, there were no confirmed illicit discharges and/or water and sewer leaks found. All illicit discharges found during FY18 originated from reports from citizens of other Metro departments. In FY18, there were 4 confirmed illicit discharges in which NPDES issued a Notice of Violation and associated administrative penalty to the property owner to eliminate the discharge. In addition to the confirmed illicit discharges, NPDES initiated 120 separate water quality investigations during FY18, most of which, originated from citizen complaints. Refer to Table 7H.1 for a complete listing of the 120 IDDE investigations initiated during FY18. There were also 26 spill response investigations and 4 MWS sanitary sewer discharge investigations initiated by NPDES during the reporting period. (refer to Tables 7H.2 and 7H.3 respectively.) The Metro Health Department also responds to failing septic systems and issues notices and/or citations requiring failing septic systems to be abated. During the reporting period, the Health Department issued 22 notifications to property owners for failing septic systems. (refer to Table 7H.4)

I. Of those illicit discharges/illegal connections that have been discovered or reported, how many have been eliminated?

All illicit connections found during the reporting period were rectified swiftly and eliminated.

J. Do you have the authority to recover cost for addressing illicit discharges? ☐ Yes X No

We have appropriate language in our Code, but have never pursued the option. *(Not Currently)*

8. Stormwater Management for Municipal Operations

A. Have Stormwater pollution prevention plans (or an equivalent plan) been developed for Municipal operations:

NPDES developed a comprehensive Stormwater Management Plan (SWMP) in 2012, which was submitted in a previous annual report. The SWMP included site-specific Runoff Management Plans (RMPs) for key municipal Operations and Maintenance (O&M) facilities, which are plans equivalent to SWPPPs. Since the time the original SWMP and associated RMPs were developed, NPDES has developed additional RMPs for newly identified O&M facilities. Below is a list of current Metro operated O&M sites in which a SWPPP or RMP has been developed:

1. *Central Wastewater Treatment Plant*
2. *Dry Creek Wastewater Treatment Plant*
3. *Metro Fairgrounds Property*
4. *MWS Stormwater Maintenance Facility (County Hospital Road)*
5. *Metro Transit Authority (Nestor Street) Bus Maintenance Shop*
6. *Metro Nashville Public Schools Bus Maintenance Shop*
7. *Shelby Park Golf Course Maintenance Shop*
8. *Ted Rhodes Golf Course Maintenance Shop*
9. *Two Rivers Golf Course Maintenance Shop*
10. *Harpeth Hills Golf Course Maintenance Shop*
11. *Percy Warner Golf Course Maintenance Shop*
12. *McCabe Golf Course Maintenance Shop*
13. *Cedar Hill Park Maintenance Shop*
14. *Warner Park Golf Course*
15. *Public Works Maintenance Facility (5th Street)*
16. *Public Works West Maintenance Facility (Charlotte Avenue)*

All municipal parks, ball fields and other recreational facilities X Yes ☐ No

RMPs were developed for O&M facilities such as golf course and park maintenance facilities. RMPs were not developed for every ball field location.

All municipal turf grass/landscape management activities (*See Note Above*) X Yes ☐ No

All municipal vehicle fueling, operation and maintenance activities X Yes ☐ No

As per the MS4 Permit, RMPs were created for Municipal O&M facilities, some of which include fueling stations. Some fueling sites are stand-alone with no other maintenance operations present and RMPs were not necessary (although spill kits are at those locations).

All municipal maintenance yards All O&M facilities located within the MS4. X Yes ☐ No

All municipal waste handling and disposal areas X Yes ☐ No

SWPPPs were created for the Central Wastewater Treatment Plant and the Dry Creek Wastewater Treatment Plant as they retain a Tennessee Multi-Sector Permit for Industrial Stormwater runoff. Metro Nashville does not operate any waste transfer facilities or transfer stations, as it contracts those services out to private companies.

B. Are Stormwater inspections conducted at these facilities? X Yes ☐ No

Each O&M facility where the RMPs were implemented requires on-site personnel to perform weekly grounds inspections. NPDES personnel will also perform random audit inspections in the future to ensure each individual site is being maintained as designated in the RMP.

If Yes, at what frequency are inspections conducted? *See above answer*

C. Have standard operating procedures or BMPs been developed for all MS4 field activities? (e.g., road repairs, catch basin cleaning, landscape management, etc.) X Yes ☐ No

SOPs have been developed for most of the major O&M field activities. MWS posted all of the RMPs, individual water quality SOPs, and a general MS4 educational video to an internal Metro intranet web page for each O&M Department to train their own field staff.

D. Do you have a prioritization system for storm sewer system and permanent BMP inspections? X Yes ☐ No

In the first year of the permit, NPDES submitted a BMP Maintenance Verification Plan to TDEC that outlined a multipronged strategy to ensure permanent Stormwater Control Measures (SCMs) are being properly maintained. The strategy varies according to which set of Metro's regulations the SCMs were constructed under. The plan includes some inspections by NPDES personnel as well as requiring owner/operators to perform their own inspections/maintenance annually. Since the original SCM maintenance verification plan was submitted to TDEC, NPDES has re-evaluated this process and has determined to dedicate a greater amount of resources to ensuring the proper maintenance of these structures. NPDES found that there was very low participation in the owner self-inspection/reporting requirements for newly installed SCMs. In addition, NPDES discovered that some of the inspection and maintenance reports that were submitted were lacking in content.

During FY18, NPDES continued to expand resources dedicated to SCM inspection and maintenance oversight. In the beginning of FY18, NPDES hired 2 SCM inspectors and 1 administrative staffer to oversee SCM owner report submittals. By the end of FY18, NPDES received approval to hire and 2 additional SCM inspectors, which will bring the total number of SCM inspectors to 4. The new inspectors were hired in the beginning of FY19. Current and future organization of the SCM inspection and maintenance program is further explained in Section 1.3.1 of this document.

E. On average, how frequently are catch basins and other inline treatment systems inspected?

Varies depending on numbers of complaints or other maintenance tasks.

F. On average, how frequently are catch basins and other inline treatment systems cleaned out/maintained?

Frequency of cleanings depends on conditions. The Stormwater Maintenance Section has developed a rain route list of common stormwater infrastructure sites that clog with debris, leaves, gravel, and sediment on a frequent basis. Maintenance crews visit and clean out these sites and perform maintenance prior to many large rain events. Depicted within Table 8F.1 is a summary of some of the major routine maintenance activities performed on MS4 Stormwater infrastructure during FY18. It is estimated that approximately 199,111 cubic yards of material was removed from the MS4 ditches and culverts, approximately 271,197 pounds of material was removed from 30,133 inlets, and approximately 359,842 square feet of erosion control matting was deployed during the FY18 reporting period. In addition to performing routine maintenance and cleaning of stormwater infrastructure, the Stormwater Maintenance Section also operates a preventative maintenance program by aggressively sweeping public "curb and gutter" streets. MWS Stormwater prioritizes certain streets for sweeping activities based on the accumulation of material on the street. Refer to Table 8F.2 for street sweeping collection numbers in FY18.

In addition to the routine maintenance activities such as inlet and pipe cleaning, MWS Stormwater also performs various large projects to correct neighborhood flooding issues. In previous reporting periods, NPDES coordinated with the MWS Stormwater Remedial Maintenance Division to complete a water quality evaluation form for each large flood control project. As a result, engineers are being asked to consider use of green infrastructure or other low impact design techniques. Based on the water quality evaluation sheets submitted, NPDES was able to estimate that the large flood control projects designed during FY18 would provide the following benefits to water quality.

- *Removal of approximately 471 cubic yards of accumulated sediment,*
- *Planting of approximately 35 trees and shrubs, and*
- *Stabilization of 3,180 linear feet of redefined ditches.*

Illicit discharge detection and elimination X Yes ☐ No

If *Yes*, identify the number of municipal employees trained

Throughout FY17, there were a total of 18 NPDES staff members that had the adequate training and were capable of respond to illicit discharge concerns. Throughout the majority of FY18, the Permit Group section within NPDES had 5 people that were primarily dedicated to investigating and enforcing on illicit discharge issues. In addition to the primary on-call personnel, there were additionally 13 staff members within the NPDES office that could respond to complaints of illicit discharges. Note: NPDES has also worked with various O&M sections to properly identify and report illicit discharges. Also, please note that staff levels fluctuate each year, and in the start of FY19, NPDES hired an additional 2 employees that can respond to illicit discharge concerns.

Construction site stormwater runoff control X Yes ☐ No

If *Yes*, identify the number of municipal employees trained:

At the time this report was completed, there were 16 NPDES staff members that had adequate training (TDEC Level 1 EPSC Workshop) to respond to and inspect Stormwater runoff from construction activities. Eight of the employees are dedicated fulltime to inspecting development sites under construction. Note that staff levels fluctuate each year based on staff turnover. .

Permanent stormwater management in new development and redevelopment X Yes ☐ No

If *Yes*, identify the number of municipal employees trained

During FY18, there was an average of 8 engineers employed within the Stormwater Development and Review Section that have been through the TDEC Level II Design Principles for Erosion Prevention and Sediment Control for Construction Sites. Four of the engineers were fully dedicated to reviewing plans for grading permit sites.

Pollution prevention/good housekeeping for municipal operations X Yes ☐ No

If *Yes*, identify the number of municipal employees trained:

In a previous reporting period (FY16), NPDES coordinated with all Metro Departments to remind them of stormwater issues that may occur from normal maintenance activities. As mentioned above, NPDES coordinated a training workshop with all major Metro Departments in which 43 separate managers attended. During FY18, NPDES inspected and coordinated with some of the sites in which Runoff Management Plans were developed to determine if the sites were being managed properly. A few issues were noted and, over the next year, NPDES plans on inspecting several other sites for MS4 compliance. Also, during FY18, NPDES performed training with the MWS Stormwater Routine Maintenance section to make sure they were aware of SOPs in place to limit impacts to stormwater runoff from maintenance activities.

9. Permanent Stormwater Controls

A. Do you have an ordinance or other mechanism to require:

Site plan reviews of all new and re-development projects?	X Yes	☐ No
Maintenance of Stormwater management controls?	X Yes	☐ No
Retrofitting of existing BMPs with green infrastructure BMPs?	X Yes	☐ No

MWS Stormwater has compiled a new volume to the Stormwater Management Manual (SWMM). Volume 5 (also referred to as the LID Manual) provides specifications for development or redevelopment sites to follow in installing "green" stormwater control measures. The requirements with this manual became mandatory in February 2016 for new development or significant redevelopment.

B What is the threshold for new/redevelopment Stormwater plan review? (e.g., all projects, projects disturbing greater than one acre, etc.)

Metro actually has more stringent requirements for development than TDEC's Construction General Permit. All development of redevelopment sites grading more than 10,000 square feet must obtain a grading permit. In order to obtain a grading permit, engineered plans must be submitted to the Stormwater Development Review Section for review and approval per Metro's stormwater regulations. All developments increasing the impervious footprint are required to install permanent stormwater treatment measures for water quality and quantity per SWMM criteria.

C. Have you implemented and enforced performance standards for permanent Stormwater controls? X Yes ☐ No

D. Do these performance standards go beyond the requirements found in paragraph and require that pre-development hydrology be met for:

Flow volumes (New LID Manual deals with reductions in site runoff volumes)	X Yes	☐ No
Peak discharge rates	X Yes	☐ No
Discharge frequency	☐ Yes	X No
Flow duration	☐ Yes	X No

E. Please provide the URL/reference where all permanent Stormwater management standards can be found.

https://www.nashville.gov/Water-Services/Developers/Stormwater-Review/Stormwater-Management-Manual.aspx

F. How many development and redevelopment project plans were reviewed for this reporting period?

There were 3,293 plans submitted to the MWS Development Review Section during FY18. This number includes initial grading permit plans, re-submitted plans, as-built final submittals, etc. Refer to attached Table 9F.1 for the total number of plans reviewed by Stormwater Development Review staff in FY18.

G. How many development and redevelopment project plans were approved?

There were 1,415 plans approved during FY18. This number includes initial grading permit submittals, final as-built signoffs, etc. Refer to Table 9F.1 for a complete listing. A better reflection of actual new development projects approved for construction would be the number of grading permits issued. In FY18, there were 311 grading permits issued.

H. How many permanent Stormwater management practices/facilities were inspected?

There were approximately 1,200 inspections by NPDES staff during FY18. This is an estimate based on the number of properties inspected as we track our inspections within the database based on site. Most properties have multiple SCMs, therefore, when a property is inspected, several SCM structures often get inspected.

I. How many were found to have inadequate maintenance?

The 1,200 NPDES inspections conducted in FY18 of SCMs accounted for approximately 400 separate properties because on average, each site contains 3 SCM structures. Of the approximately 400 properties inspected for SCM maintenance, there were a total of 301 notices provided to sites specifying specific maintenance issues. These notice, include verbal notices in person or over the phone, formal letters, and/or emails. In addition, there were 16 sites that contained one or more structures that exhibited signs of structural damage and/or needed immediate maintenance. During FY18, all SCM inspections were tracked in an Access database, which limited the documentation capabilities. In the beginning FY19, NPDES transitioned to using the Cityworks permitting database to track inspections, follow-up notifications, etc. SCM reporting numbers will be much more precise during future permit years.

J. Of those, how many were notified and remedied within 30 days? (If window is different than 30 days, please specify)

While NPDES has numerous informal conversations with SCM owners about the maintenance status of their SCM(s), official Notices of Noncompliance (NONs) were submitted to SCM property owners when critical maintenance needs were observed. Performing the necessary maintenance on SCM takes time and not all of the SCMs in need of maintenance were remedied within 30 days. NPDES performs follow-up compliance inspections when a no response is received as a result of the NON.

K. How many enforcement actions were taken that address inadequate maintenance?

In FY18, 16 NONs were issued to property owners for SCM maintenance issues.

L. Do you use an electronic tool (e.g., GIS, database, spreadsheet) to track post-construction BMPs, inspections and maintenance?

The NPDES Section used a Microsoft Access database to track inspections. All SCM structures are also mapped with a GIS geodatabase. During FY18, NPDES posted all the mapped SCMs on the Metro Planning Parcel Viewer website for the general public to view as well. In the beginning FY19, NPDES transitioned to using the Cityworks permitting database to track inspections, follow-up notifications, etc. SCM reporting numbers will be much more precise during future permit years.

X Yes ☐ No

M. Do all municipal departments and/or staff (as relevant) have access to this tracking system? *All departments can access the locations of SCMs on the parcel viewer program.* ☐ Yes X No

N. Has the MS4 developed a program to allow for incentive standards for redeveloped sites? X Yes ☐ No

O. How many maintenance agreements has the MS4 approved during the reporting period?

Approximately 311, which is an assumed number based on the number of grading permits issued during FY18.

10. Industrial and High Risk Runoff

A. Has the MS4 developed and implemented a program to monitor and control pollutants in runoff from the following types of industrial and high risk facilities and activities:

Municipal landfills All municipally operated landfills in Metro were closed years ago. The Metro Department of Public Works, Division of Solid Waste oversees all closed landfills' associated groundwater monitoring.	X Yes	☐ No
Hazardous waste treatment, storage and disposal facilities	X Yes	☐ No
Industries subject to reporting requirements pursuant to SARA Title III section 313	X Yes	☐ No
Industrial facilities that the MS4 determines are contributing a substantial loading of pollutants to the municipal separate storm sewer system	X Yes	☐ No

B. Has the MS4 maintained a database of industrial and high risk facilities and activities in the City which includes the following types of industries:

- municipal landfills;
- hazardous waste treatment, storage and disposal facilities;
- industries subject to reporting requirements pursuant to SARA Title III, Section 313; and
- industrial and commercial facilities that the permittee determines are contributing a substantial loading of pollutants to the municipal separate storm sewer system.

During the first permit year, NPDES built a robust industrial inspection database that comprises the above categories of industrial properties. In addition to the above category of industrial sites (Metro is required to inspect), NPDES has also included within the database all of the industrial facilities with active Tennessee Multi-Sector Permits (TMSPs) for industrial Stormwater runoff, all facilities with active Ready Mix Concrete Permits (RMCPs), and all facilities with active individual NPDES permits to discharge process water. The database is a Microsoft Access database that is interactive with GIS. Please note that most TMSP or RMCP sites do not qualify as industrial facilities subject to SARA Title III, Section 313 reporting requirements and are not required to be inspected by Metro.

Those listed in 10 (A) above	X Yes ☐ No
Facilities covered by individual NPDES permits	X Yes ☐ No
Facilities covered under the TMSP	X Yes ☐ No
Facilities regulated by the pretreatment program; *NPDES has a Microsoft Excel spreadsheet list of Pre-treatment Program sites for reference purposes, but the sites are not entered into the Industrial Monitoring Microsoft Access database. The Pre-treatment Program notifies NPDES when they become aware of stormwater issues.*	X Yes ☐ No

C. Has the MS4 updated the database of industrial and high risk facilities and activities at least yearly? X Yes ☐ No

If yes, provide a listing of any additionally identified industrial and high-risk facilities and activities which discharge stormwater into the MS4:

Facility/Activity

Refer to the attached Table 10.C.1 for a listing of all the industrial facilities NPDES has inventoried into the database. As mentioned above, Metro also inventoried other industrial facilities such as TMSP and RMCP facilities, which are not required to be inspected within the three year period.

D. Has the MS4 developed and implemented procedures, including an inspector manual and checklist, for routine inspections of industrial and high-risk facilities and activities? X Yes ☐ No

NPDES has created a Standard Operating Procedure (SOP) for performing inspections of industrial facilities.

E. Is the MS4 performing these inspections at such a rate that all required industries will be inspected at least once every three years?

As per the MS4 permit, NPDES is required to inspect all SARA Title III, Section 313 industrial facilities once every 3 years. NPDES completed all of the inspections of facilities designated as having the SARA Title III, Section 313 and Treatment, Storage and Disposal (TSD) facilities by the end of the permit term (January 31, 2017). Following completion of these inspections, NPDES sent a letter to TDEC that addressed the planned modifications to inspections of industrial facilities during the transition period before the new permit is reissued. A copy of this letter can be found in Attachment B of this document. The new inspection focus during the transition period between permits will be based on the types of industrial facilities that typically have the most exposed materials that can pose a risk to stormwater runoff. TDEC approved the new approach and in FY18, NPDES started to focus inspections on facilities with more exposure. X Yes ☐ No

F. Provide a listing of inspections performed during this reporting year:

During FY18 NPDES inspected 22 industrial facilities. Refer to Table 10.F.1 for a list of Industrial Facilities that were inspected during FY18.

11. Enforcement

A. Identify which of the following types of enforcement actions you used during the reporting period, indicate the number of actions, the minimum measure (e.g., construction, illicit discharge, permanent stormwater control) or note those for which you do not have authority: *Please note that Stop Work Orders are included as part of the same Notice of Violation for construction sites.*

Action	Construction	Permanent Stormwater Controls	Illicit Discharge	Authority?
Notice of violation	75	0	4	X Yes ☐ No
Administrative Penalties	$27,975.00	$0	$1,250	X Yes ☐ No
Stop Work Orders	33	#	#	X Yes ☐ No
Civil penalties	#	#	#	☐ Yes X No
Criminal actions	#	#	#	☐ Yes X No
Administrative orders	#	#	#	X Yes ☐ No
Other:		16 Notices of Non Compliance	11 Notices of Non Compliance	X Yes ☐ No

B. Do you use an electronic tool (e.g., GIS, data base, spreadsheet) to track the locations, inspection results, and enforcement actions in your jurisdiction? X Yes ☐ No

C. What are the 3 most common types of violations documented during this reporting period?

Failure to maintain erosion prevention and sediment control measures, illicit discharges from construction and non-construction sites, and grading without applying for or receiving a Metro Grading Permit.

12. Program Resources

A. What was your annual expenditure to implement the requirements of your MS4 NPDES permit and SWMP this past fiscal year?

In FY18, NPDES, which oversees various MS4 compliance activities, operated under a budget of $2,171,800. The overall MWS Stormwater Division's budget, which includes NPDES, Development Services Review engineers, Stormwater Planning and Stormwater Maintenance, was $34,621,600. Please note that various other Metro Departments, while not included in this budget analysis, perform activities that contribute to MS4 permit compliance.

B. What is next fiscal year budget for implementing the requirements of your MS4 NPDES permit and SWMP?

The FY19 budget includes $2,951,200 dedicated to the Stormwater NPDES Section, while the overall Stormwater Department is operating under a budget of $24,170,600. Note: This number is less than FY18's Total Stormwater Budget amount due to some MWS Accounting changes relating to how Stormwater's budget is now tracked (certain Capital and Bond-related expenditures are now categorized differently). From a comparison perspective, the overall Stormwater Operating Budget for FY19 actually increased by approximately $3M over FY18.

C. Do you have an independent financing mechanism for your Stormwater program? X Yes ☐ No

D. If so, what is it/are they (e.g., Stormwater fees), and what is the annual revenue derived from this mechanism?

Source: Stormwater User Fee; Estimated Amount $34,275,000

E. How many full-time employees does your municipality devote to the Stormwater program (specifically for implementing the Stormwater program vs. municipal employees with other primary responsibilities that dovetail with Stormwater issues)?

The anticipated FY19 budgeted staff includes 116 employees (including 19 current vacancies).

F. Do you share program implementation responsibilities with any other entities? ☐ Yes X No

Entity	Activity/Task/Responsibility	Your Oversight/Accountability Mechanism

13. Evaluating/Measuring Progress

A. What indicators do you use to evaluate the overall effectiveness of your Stormwater Management Program, how long have you been tracking them, and at what frequency? Note that these are not measurable goals for individual BMPs or tasks, but large-scale or long-term metrics for the overall program, such as in-stream macroinvertebrate community indices, measures of effective impervious cover in the watershed, indicators of in-stream hydrologic stability, etc?

For around 10 years, the NPDES Watershed Group has been performing detailed sampling for TMDL streams throughout Metro, some of which is proactive and not required per the MS4 permit. The data collection has proven beneficial in identifying segments of streams where pollutants are elevated or within water quality standard criteria. Please refer to the attached Table 13A.1 (TMDL Sampling Data) for the complete quarterly sampling results for the FY18 reporting period. Please note that previous Annual Reports contained additional data for monitoring conducted during those reporting periods. NPDES performs various monitoring activities as prescribed by the MS4 Permit. The MS4 permit-required sampling (i.e. Wet Weather Monitoring, Ambient Sampling, and Benthic Sampling) was changed in the current iteration of the permit (See Attachment B). The NPDES Watershed Group routinely analyzes the sampling data to determine if negative trends are observed within any of the sampled tributaries. (refere to the E. coli trends analysis in Section 4) When negative trends are found, NPDES performs source tracking investigations. Whenever identifiable sources are not found, NPDES initiates targeted public education campaigns in those watersheds. The MS4 Permit-prescribed Ambient Sampling and Benthic Sampling data is summarized in Table 13A.3 and Table 13A.4 respectively. NPDES's Watershed Group collected approximately 247 water quality samples and performed visual stream assessments on approximately 143,000 linear feet of 303(d)-listed streams within FY18.

Over the years, NPDES has also looked at other non-analytical data to evaluate the program's effectiveness. Refer to Table 13A.2 (SWMP Quantifiable Statistics). Many of the functions such as IDDE efforts, public education, etc. NPDES performs do not easily translate into quantifiable loading reduction numbers. As an attempt to quantify pollutant loading reduction numbers from various sources, NPDES hired a contractor in FY18 to develop a database that will track loading reductions of structural and non-structural controls implemented as part of Metro's SWMP. This database will be known as the Watershed Improvement Evaluation System (WIES) and will be web-based, which will allow NPDES to track pollutant reduction efforts of current SWMP elements as well as potential benefits through program modifications.

In addition to pursuing development of a database that can actively track and analyze pollution reduction efforts of the SWMP, NPDES also conducted an internal review of many of the MS4 permit-prescribed programs to assess the effectiveness and efficiency. As a result of the review, NPDES detailed proposed revisions to some of the MS4 permit elements in the proposed application for reissuance of the MS4 permit and subsequent coordination with TDEC, which is also included in Attachment B.

B. Provide a summary of data (e.g., water quality information, performance data, modeling) collected in order to evaluate the performance of permanent Stormwater controls installed throughout the system. This evaluation may include a comparison of current and past permanent Stormwater control practices.

Please refer to the answer above and Section 3 of this document for a summary of various water quality data collected by NPDES during this reporting period. As mentioned above, a more comprehensive evaluation will be finalized as part of the development of the WIES database.

C. What environmental quality trends have you documented over the duration of your Stormwater program? (If you have reports or summaries, you can either attach them electronically, or provide the URL to where they may be found on the Web.) *As mentioned above, NPDES has noticed fewer and fewer illicit discharge findings over the years that can be contributed to a robust IDDE program and increased public awareness. In addition, there have been fewer notices of violations issued for construction site infractions. Middle Tennessee contractors have become acutely aware of Metro's construction site requirements and enforcement program and, therefore, have increasingly complied with our regulations. It has also been noted that many of the concerns from citizens usually involve relatively minor issues as compared to concerns reported in the beginning of the NPDES program.*

14. Stormwater Management Program Update

A. Describe any changes to the MS4 program, per Section 3.5 of the permit, during the reporting period including but not limited to:

Changes adding (but not subtracting or replacing) components, controls or other requirements.

During FY17, NPDES submitted a request to change the dry weather field screening, industrial monitoring, and wet weather sampling elements of the MS4 permit for the transition period between permit expiration and reissuance. NPDES also requested these items to be adjusted in the reissued permit as well. NPDES analyzed work hours per each task verses the benefit to the program in hopes of developing the most efficient and effective program possible. A summary of the proposed changes can be found in Attachment B. During FY18, NPDES met with TDEC and received authorization to pursue the new program modifications, as proposed, during the period when the permit is in administrative extension. .

Changes to replace an ineffective or unfeasible BMP.

Refer to above answer

Information (e.g., additional acreage, outfalls, BMPs) on program area expansion based on annexation or newly urbanized areas.

Just prior to the issuance of this cycle of the MS4 permit, the former satellite city of Lakewood voted to dissolve and become part of Metro Nashville and Davidson County. Upon that transition becoming official, NPDES field screened the commercial areas for potential illicit discharge connections, inventoried/added all of the Stormwater infrastructure into the GIS database, and began performing maintenance services for the newly annexed area.

Changes to the program as required by the division.

No major changes occurred during FY18. Some suggested amendments to the SWMP were conducted based on verbal comments received during TDEC's Compliance Inspection for construction Stormwater oversight.

15. Certification

This report must be signed by a ranking elected official or by a duly authorized representative of that person. See signatory requirements in subpart 5.7 of the permit.

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

Michael Hunt	Michael Hunt	12/12/18
Printed Name and Title	Signature	Date

3.0 Required MS4 Reporting Tables

List of Tables

Table 6B.1 – Grading Permit Projects Initiated/Completed within FY18

Year	Preconstruction Meetings	Grading Permits Issued	Permits Completed
Total FY03	257	198	102
Total FY04	305	270	159
Total FY05	284	271	220
Total FY06	296	252	196
Total FY07	251	239	188
Total FY08	222	165	205
Total FY09	148	109	238
Total FY10	146	121	117
Total FY11	130	135	131
Total FY12	152	142	153
Total FY13	167	138	133
Total FY14	249	318	159
Total FY15	292	276	259
Total FY16	268	254	217
Total FY17	297	262	203
Total FY18	331	311	264
Total	**3,795**	**3,461**	**2,944**

Table 6C.1 – Small Construction Site Oversight in FY18

New Infill Permits Issued	1,577
Follow up site visits for Infill Developments	3,254
NOVs Issued to Single Family Residential Development	65

Note: Midway through FY15, Metro passed new legislation establishing the new Infill Development Permits. Projects that create 800 to 15,000 square feet of additional net impervious area though new development, redevelopment, or rehabilitation of a residential structure in existing neighborhoods are required to obtain Infill Development Permits. As such, MWS Stormwater staff provides oversight to require stormwater controls to be installed to treat stormwater runoff during and after construction, which is above and beyond MS4 permit requirements. .

Table 7H.1 – Illicit Discharge Investigations Initiated during FY18

ID	Problem Address	Initiated By	Date Time Initiated
887047	1611 Springfield	HAYES, JOSH	7/4/2017 21:15
888055	7146 Commonwealth Circle	WILSON, ELIZABETH	7/6/2017 12:34
888979	20 Abington	HAYES, JOSH	7/10/2017 9:19
890056	1441 Pawnee Trail	WILSON, ELIZABETH	7/12/2017 7:50
890348	204 Cedarcreek Place	WILSON, ELIZABETH	7/12/2017 11:57
890602	Centennial	HAYES, JOSH	7/13/2017 8:17
891217	116 21st Ave North	WILSON, JANE	7/13/2017 20:11
891280	6641 Clearbrook	HAYES, JOSH	7/14/2017 8:21
895722	1660 Antioch Pike	WILSON, JANE	7/26/2017 10:33
897330	733 Battle Road	WILSON, JANE	7/31/2017 12:16
898599	2534 Jordan Ridge Drive	WILSON, ELIZABETH	8/3/2017 8:13
901377	7744 Porter House Drive	WILSON, JANE	8/9/2017 15:30
902096	Buena Vista & Rowan	HAYES, JOSH	8/11/2017 7:13
902339	625 Georgetown Drive	WILSON, ELIZABETH	8/11/2017 13:00
902349	2615 Powell Ave	WILSON, ELIZABETH	8/11/2017 13:06
903210	Sawyer Brown and Cedar Forest	HAYES, JOSH	8/15/2017 10:12
903224	4863 Shihmen	HAYES, JOSH	8/15/2017 10:38
904529	720 Old Hickory Blvd	WILSON, ELIZABETH	8/18/2017 9:02
904533	720 Old Hickory Blvd	WILSON, ELIZABETH	8/18/2017 9:06
904885	2329 Stratford Ave	WILSON, ELIZABETH	8/18/2017 13:34
907487	Paragon Mills Road	HAYES, JOSH	8/28/2017 7:09
908817	3533 Hermitage Industrial	HAYES, JOSH	8/30/2017 9:58
910421	2512 Fairfax Ave	HAYES, JOSH	9/5/2017 9:35
911631	Pennsylvania Ave	HAYES, JOSH	9/7/2017 9:07
911915	108 Cummings Ct.	WILSON, ELIZABETH	9/7/2017 13:12
912929	112 2nd Ave	WILSON, ELIZABETH	9/11/2017 8:01
913255	1604 County Hospital Road	WILSON, ELIZABETH	9/11/2017 12:42
913395	101 46th Ave N	WILSON, ELIZABETH	9/11/2017 15:11
914571	34 Foxhill Close	WILSON, JANE	9/14/2017 9:00
916231	2252 Edge O Lake Drive	WILSON, JANE	9/19/2017 7:09
916685	517 Gallatin Pike	WILSON, ELIZABETH	9/20/2017 7:17
918335	334 Binkley	JACKSON, HOWARD Y	9/25/2017 8:02
924273	OLD GLENROSE AVE	GARMON, MARY	10/9/2017 13:21
925884	1195 Wedgewood Ave	WILSON, JANE	10/12/2017 14:22
926085	606 Delaware Ave	WILSON, JANE	10/13/2017 8:44
929287	2500 Bransford Ave	HAYES, JOSH	10/23/2017 8:15

Table 7H.1 – Illicit Discharge Investigations Initiated during FY18 (Continued)

ID	Problem Address	Initiated By	Date Time Initiated
929600	2340 Gallatin Pike N	STIENSTRAW, ELIZABETH A	10/23/2017 12:32
931291	700 William Howard Place	WILSON, ELIZABETH	10/27/2017 8:59
932098	4632 Whites Creek Pike	WILSON, ELIZABETH	10/30/2017 15:28
932860	504 Forest Park Rd	STIENSTRAW, ELIZABETH A	11/1/2017 11:47
933118	3040 Cody Hill Road	WILSON, JANE	11/1/2017 16:11
933812	501 Metroplex Drive	WILSON, JANE	11/3/2017 9:44
934703	101 Guill Court	WILSON, JANE	11/7/2017 8:27
935364	4250 Little Marrowbone	JACKSON, HOWARD Y	11/8/2017 13:02
935383	3934 Crouch Dr	JACKSON, HOWARD Y	11/8/2017 13:21
936677	7020-7025 Still Spring Hollow	JACKSON, HOWARD Y	11/13/2017 12:22
946358	3208-3212 Whites Creek Pike	WILSON, JANE	12/15/2017 7:42
947003	1162 Antioch Pike	WILSON, ELIZABETH	12/18/2017 14:08
947292	3501 Murfreesboro Pike	PERRY, KALEE	12/19/2017 13:40
947560	3616 Gallatin Pike	WILSON, JANE	12/20/2017 12:26
947589	409 Cathy Jo circle	WILSON, JANE	12/20/2017 13:26
948039	2920 Hydes Ferry Pike	WILSON, JANE	12/21/2017 14:57
948070	5000 Linbar Drive #202	WILSON, JANE	12/21/2017 16:12
951438	1141 Bell Road	WILSON, ELIZABETH	1/8/2018 10:44
956902	315 Philfre Court	WILSON, JANE	1/25/2018 15:26
956971	501 Metroplex	JACKSON, HOWARD Y	1/26/2018 7:35
958023	1700 3rd Ave. N	WILSON, ELIZABETH	1/30/2018 8:47
958057	7436 George Gaines	HAYES, JOSH	1/30/2018 9:32
960761	5630 Hillview Drive	WILSON, JANE	2/7/2018 12:45
961677	2555 Woodberry Drive	WILSON, JANE	2/9/2018 12:10
961781	4216 Wallace Lane	WILSON, JANE	2/9/2018 14:37
963266	1920 Seminole Ave	WILSON, ELIZABETH	2/14/2018 13:28
963333	Lebanon Road	WILSON, JANE	2/14/2018 15:02
964289	Jay Court	WILSON, JANE	2/16/2018 13:30
965330	144 37th Ave N	HAYES, JOSH	2/21/2018 8:06
965478	Harding Road	WILSON, JANE	2/21/2018 11:04
966032	200 Evelyn Avenue	WILSON, JANE	2/22/2018 10:26
967445	1063 N Dupont Ave	WILSON, ELIZABETH	2/26/2018 11:49
969107	842 Percy Warner	HAYES, JOSH	3/1/2018 13:24
969470	4500 Harding Pike	WILSON, JANE	3/2/2018 9:44
970230	2054 Shaw Rd	JACKSON, HOWARD Y	3/5/2018 11:51

Table 7H.1 – Illicit Discharge Investigations Initiated during FY18 (Continued)

ID	Problem Address	Initiated By	Date Time Initiated
971744	2700 Heiman	HAYES, JOSH	3/8/2018 10:41
972265	2126 Abbott Martin Road	WILSON, JANE	3/9/2018 11:20
973094	1105 Glendale Lane	PERRY, KALEE	3/13/2018 8:15
973222	333 Gallatin Pike North	WILSON, JANE	3/13/2018 10:56
973937	7210 River Park Court	WILSON, ELIZABETH	3/15/2018 8:35
974782	1410 Gallatin Pike North	WILSON, JANE	3/18/2018 22:40
976054	326 E Old Hickory Blvd	STIENSTRAW, ELIZABETH A	3/21/2018 10:09
977046	1400 Gallatin Pike North	WILSON, JANE	3/23/2018 10:47
978178	Interstate 40 @ mm212	WILSON, JANE	3/27/2018 15:15
978942	301 Demonbreun St.	WILSON, ELIZABETH	3/29/2018 7:33
979417	361 Harding Place	HAYES, JOSH	3/30/2018 7:51
979761	1110 Brookmeade Drive	WILSON, JANE	3/30/2018 15:29
981094	1015 2nd Ave. N	WILSON, ELIZABETH	4/4/2018 13:39
982222	204 Hickory Street	WILSON, JANE	4/6/2018 16:19
982235	305 Broadway	WILSON, JANE	4/6/2018 16:30
984470	2500 Murfreesboro	HAYES, JOSH	4/13/2018 8:04
985238	3268 Vailview Drive	WILSON, ELIZABETH	4/16/2018 10:43
985546	127 Gallatin Pike North	WILSON, ELIZABETH	4/17/2018 8:16
986480	2540 Johnson Ridge Road	WILSON, ELIZABETH	4/18/2018 15:22
988230	23 Fern Ave	WILSON, ELIZABETH	4/24/2018 13:24
989857	8064 Mt Pisgah Road	WILSON, JANE	4/28/2018 17:01
993438	1304 Quail Ct E	WILSON, JANE	5/8/2018 13:38
996549	1088 Murfreesboro Pike	WILSON, JANE	5/16/2018 18:12
996858	4205 Hillsboro Pike	PERRY, KALEE	5/17/2018 12:34
996872	4653 Fanning Drive	WILSON, ELIZABETH	5/17/2018 12:55
996926	5375 Simpkins Rd	WILSON, ELIZABETH	5/17/2018 14:17
998060	104 5th Ave South	WILSON, ELIZABETH	5/21/2018 13:37
998077	2640 Elm Hill Pike	HAYES, JOSH	5/21/2018 13:48
998083	331 Dinwiddie Drive	WILSON, ELIZABETH	5/21/2018 13:51
1001212	104 Gupton ct	KELLEY, LYNDA Y	5/30/2018 14:14
1001258	1110 Brookmeade Drive	WILSON, JANE	5/30/2018 16:05
1001259	771 Burnette Road	WILSON, JANE	5/30/2018 16:10
1001622	305 Broadway	WILSON, JANE	5/31/2018 12:16
1001641	3100 Brandau Road	WILSON, JANE	5/31/2018 12:26
1001783	717 Lake Terrace	WILSON, JANE	5/31/2018 15:43
1001794	300 Rains Ave	WILSON, JANE	5/31/2018 16:02
1002177	624 Tree Line Court	WILSON, JANE	6/1/2018 13:09

Table 7H.1 – Illicit Discharge Investigations Initiated during FY18 (Continued)

ID	Problem Address	Initiated By	Date Time Initiated
1006065	2nd Ave South	HAYES, JOSH	6/12/2018 14:19
1006205	810 Ramsey Street	WILSON, JANE	6/13/2018 6:32
1007311	Stewarts Ferry Pike	WILSON, JANE	6/15/2018 8:39
1008584	4601 Murphy Road	WILSON, JANE	6/19/2018 11:46
1010143	460 Craighead Street	WILSON, JANE	6/22/2018 13:45
1010175	Feslers Lane	WILSON, JANE	6/22/2018 14:43
1010670	899 Kipling Drive	WILSON, ELIZABETH	6/25/2018 12:57
1011251	1901 Kimbark Drive	WILSON, ELIZABETH	6/26/2018 13:19
1011260	4601 Murphy Road	WILSON, ELIZABETH	6/26/2018 13:26
1011777	1021 Chateau Valley Court	WILSON, JANE	6/27/2018 15:07
1012084	Rosa L Parks at Mainstream Drive	WILSON, JANE	6/28/2018 9:23
1012647	1586 McGavock Pike	WILSON, JANE	6/29/2018 10:41

Table 7H.2 – Spill Response Investigations Initiated by NPDES during FY18

Problem Address	Initiated By	DateTimeInit
860 VISCO	BINDER, DALE	7/5/2017 6:25
sawyer Brown Road	HAYES, JOSH	7/6/2017 14:27
I440 westbound at MM 3 over 2	WILSON, JANE	7/13/2017 19:29
121 Duluth Ave, Nashville, TN	WILSON, ELIZABETH	7/27/2017 15:04
265 White Bridge Road	WILSON, ELIZABETH	8/4/2017 13:49
714 DUE WEST	BINDER, DALE	8/8/2017 7:31
325 Shady Creek Lane	WILSON, JANE	8/18/2017 17:09
2 Fairfield Ave	JACKSON, HOWARD Y	9/1/2017 10:49
4284 Bull Run Road	HAYES, JOSH	9/1/2017 14:20
1241 2nd Ave S	JACKSON, HOWARD Y	9/18/2017 10:34
5104 BAY OVERLOOK DR	OHARA, KATHERINE	10/2/2017 6:44
3824 BRICK CHURCH	BINDER, DALE	10/30/2017 12:00
7725 Highway 70 South	TRANTER, KENNETH	11/20/2017 6:53
2294 Lebanon Pike	WILSON, JANE	12/15/2017 9:03
401 Enos Reed Drive	WILSON, JANE	12/20/2017 12:00
5753 NOLENSVILLE	BINDER, DALE	1/22/2018 8:39
360 Murfreesboro Pike	WILSON, JANE	1/30/2018 15:26
107 GALLATIN AVE	BINDER, DALE	2/12/2018 12:16
2030 ROSA PARKS BLVD	BINDER, DALE	3/5/2018 10:22
710 Stewarts Ferry Pike	WILSON, JANE	3/8/2018 14:48
1520 GALLATIN PIKE	BINDER, DALE	3/12/2018 6:30
1401 HILDRETH	BINDER, DALE	3/12/2018 7:51
BRILEY PARKWAY MM 12	BINDER, DALE	4/25/2018 9:27
4191 NOLENSVILLE PIKE	BINDER, DALE	5/7/2018 6:03
1113 Old Hickory	HAYES, JOSH	5/15/2018 12:41
801 Briley Pkwy	WILSON, ELIZABETH	5/24/2018 14:50

Table 7H.3 – MWS Sewer Discharge Investigations Initiated by NPDES during FY18

RequestId	ProbAddress	InitiatedBy	DateTimeInit
895104	11 Vaughns Gap Road	WILSON, ELIZABETH	7/25/2017 14:59
905446	3201 Powell Ave	WILSON, ELIZABETH	8/22/2017 8:00
938650	209 Paragon Mills Road	WILSON, JANE	11/17/2017 12:34
938736	2530 Perimeter Place Drive	WILSON, JANE	11/17/2017 14:21

Table 7H.4 - Failing Septic System Investigations Performed by the Health Department in FY18

Map & Parcel	Date Received	Street Name	Job Description	Environmentalist	Date Investigated	Sewage on the Ground	Notice Issued	Date Abated
113-00-0 106.00	7/7/2017	7824 Old Charlotte Pike	Failure	Fellwock	7/10/2017	N	-	-
021-00-0 266.00	7/8/2017	5125 Rawlings Road	Failure	Fellwock	7/11/2017	Y	-	8/17/2017
025-00-0 048.00	7/10/2017	1146 Hitt Lane	Failure	Fellwock	7/11/2017	Y	-	11/13/2017
028-00-0 009.00	7/10/2017	5123 Marrowbone Lake Road	Failure	Fellwock	7/17/2017	N	-	-
014-00-0 072.00	7/20/2017	7135 Douglas Road	Failure	Fellwock	7/20/2017	Y	8/2/2017	8/16/2017
177-00-0 012.00	7/21/2017	13 Fox Vale Lane	Failure	Michie	7/26/2017	Y	-	-
015-14-0 036.00	7/24/2017	7515 Piper Court	Failure	Michie	7/28/2017	N	-	-
174-00-0 019.00	8/22/2017	5521 Cane Ridge Road	Failure	Fellwock	8/23/2017	Y	8/28/2017	1/19/2018
060-16-0 116.00	8/17/2017	2732 Jones Avenue	Failure	Fellwock	8/24/2017	Y	8/29/2017	-
008-00-0 160.00	9/25/2017	3845 Baxter Road	Failure	Fellwock	9/26/2017	N	-	-
032-00-0 038.00	10/3/2017	1361 Campbell Road	Failure	Fellwock	10/4/2017	N	-	-
032-00-0 169.00	10/3/2017	1365 Campbell Road	Failure	Fellwock	10/4/2017	N	-	-
032-00-0 177.00	10/6/2017	1456 Hunters Lane	Failure	Fellwock	10/6/2017	N	-	-
018-00-0 019.01	10/13/2017	749 Hitt Lane	Failure	Fellwock	10/13/2017	N	-	-
032-00-0 167.00	10/25/2017	1598 Hunters Lane	Failure	Fellwock	10/26/2017	Y	11/2/2017	-
017-00-0 162.00	10/27/2017	5167 Brick Church Pike	Failure	Fellwock	10/27/2017	N	-	-
021-00-0 160.00	10/23/2017	5011 Rawlings Road	Failure	Fellwock	10/27/2017	N	-	-
135-00-0 183.00	10/30/2017	3040 Ned Shelton Road	Failure	Fellwock	10/30/2017	N	-	-
087-00-0 064.00	10/30/2017	4271 Central Pike	Failure	Fellwock	10/31/2017	Y	11/2/2017	11/14/2017
039-00-0 176.00	11/6/2017	6346 Old Hickory Blvd	Failure	Fellwock	11/7/2017	N	-	-
127-13-0 023.00	11/17/2017	8405 Merrymount Drive	Failure	Fellwock	11/17/2017	N	-	-
163-00-0 048.00	11/28/2017	5032 Mt. View Road	Failure	Fellwock	11/28/2017	Y	12/17/2017	
158-00-0 096.00	11/28/2017	6231 Hillsboro Road	Failure	Fellwock	11/29/2017	N	-	-
013-00-0 021.00	12/6/2017	6970 Clarksville Pike	Failure	Fellwock	12/7/2017	N	-	-
039-00-0 205.00	12/12/2017	8435 Shellbark Drive	Failure	Fellwock	12/13/2017	N	-	-
168-00-0 043.00	12/12/2017	8268 Old Harding Pike	Failure	Fellwock	12/13/2017	Y	12/14/2017	6/12/2018
032-00-0 025.00	12/27/2017	4411 Jackson Road	Failure	Fellwock	12/27/2017	N	-	-
086-00-0 288.00	1/4/2018	4047 Dodson Chapel Road	Failure	Fellwock	1/4/2018	Y	-	1/25/2018
021-00-0 344.00	1/23/2018	5033 Rawlings Road	Failure	Fellwock	1/23/2018	N	-	-
037-00-0 071.00	1/17/2018	5596 Higdon Road	Failure	Fellwock	1/23/2018	Y	1/25/2018	4/6/2018
021-00-0 027.00	2/8/2017	6430 Clarksville Highway	Failure	Fellwock	2/8/2018	N	-	-

Table 7H.4 - Failing Septic System Investigations Performed by the Health Department in FY18 (Continued)

Map & Parcel	Date Received	Street Name	Job Description	Environmentalist	Date Investigated	Sewage on the Ground	Notice Issued	Date Abated
067-00-0 024.00	2/9/2018	5156 Ashland City Highway	Failure	Fellwock	2/9/2018	N	-	-
014-00-0 116.00	2/14/2018	6796 Clarksville Pike	Failure	Fellwock	2/15/2018	N	-	-
089-00-0 050.00	1/24/2018	7420 Lakeview Drive	Failure	Fellwock	2/15/2018	Y	-	6/7/2018
127-00-0 258.00	2/7/2018	8149 Charlotte Pike	Failure	Fellwock	2/15/2018	Y	2/26/2018	6/8/2018
187-00-0 059.00	2/14/2018	746 Battle Road	Failure	Fellwock	2/21/2018	Y	4/25/2018	
008-00-0 171.00	2/23/2018	3664 Baxter Road	Failure	Fellwock	2/26/2018	Y	3/1/2018	6/19/2018
015-00-0 206.00	2/28/2018	2922 Morgan Road	Failure	Fellwock	3/1/2018	Y	3/6/2018	3/29/2018
043-12-0 017.00	3/5/2018	150 Rio Vista Ave	Failure	Fellwock	3/5/2018	N	-	-
021-00-0 047.00	3/12/2018	4922 Rawlings Road	Failure	Fellwock	3/12/2018	Y	3/28/2018	
021-00-0 158.00	3/20/2018	5037 Rawlings Road	Failure	Fellwock	3/21/2018	N	-	-
127-13-0 019.00	3/16/2018	8421 Merrymount Drive	Failure	Fellwock	3/21/2018	Y	3/28/2018	
164-00-0 125.00	3/23/2018	3628 Murfreesboro Road	Failure	Fellwock	4/2/2018	Y	4/5/2018	
181-00-0 053.00	4/2/2018	6397 Pettus Road	Failure	Fellwock	4/4/2018	Y	4/27/2018	5/14/2018
011-00-0 150.00	4/5/2018	2968 Greer Road	Failure	Fellwock	4/5/2018	N	-	-
015-14-0 002.00	4/9/2018	3101 Union Hill Road	Failure	Fellwock	4/9/2018	N	-	-
126-02-0 001.00	4/6/2018	9074 Old Charlotte Pike	Failure	Fellwock	4/9/2018	N	-	-
009-00-0 027.00	4/12/2018	7656 Whites Creek Pike	Failure	Fellwock	4/12/2018	Y	4/16/2018	-
039-00-0 198.00	4/12/2018	3416 Shellbark Drive	Failure	Fellwock	4/13/2018	Y	4/17/2018	-
024-00-0 232.00	4/17/2018	786 Dry Creek Road	Failure	Fellwock	4/19/2018	Y	4/20/2018	-
032-00-0 047.00	4/16/2018	1340 Hunter Lane	Failure	Fellwock	4/19/2018	Y	4/23/2018	-
137-00-0 000.00	4/23/2018	2910 Hobson Pike	Failure	Fellwock	4/24/2018	Y	-	-
127-13-0 018.00	4/26/2018	8425 Merrymount Drive	Failure	Michie	5/2/2018	N	-	-
029-00-0 355.00	5/1/2018	5891 Eatons Creek Road	Failure	Michie	5/3/2018	N	-	-
085-00-0 025.00	5/14/2018	3100 & 3108 Brandau Road	Failure	Michie	5/16/2018	N	-	-
030-00-0 164.00	5/22/2018	5047 Seymour Hollow Road	Failure	Fellwock	5/22/2018	Y	5/25/2018	6/2/2018
049-00-0 304.00	5/22/2018	3496 Knight Drive	Failure	Fellwock	5/22/2018	N	-	-
168-00-0 083.00	5/17/2018	8975 Highway 100	Failure	Fellwock	5/24/2018	N	-	-
049-00-0 190.00	5/29/2018	3805 Whites Creek Pike	Failure	Fellwock	5/30/2018	N	-	
015-00-0 037.00	5/30/2018	7550 Wilkinson Road	Failure	Fellwock	5/31/2018	N	-	-
015-00-0 093.00	6/4/2018	2679 Morgan Road	Failure	Fellwock	6/8/2018	N	-	-
021-00-0 05.05	6/4/2018	7119 Bidwell Road	Failure	Fellwock	6/8/2018	Y	6/11/2018	-
127-00-0 161.00	6/22/2018	7434 Huntwick Trail	Failure	Fellwock	6/25/2018	Y	-	-

Table 7H.5 – MWS Estimated/Reported Sewage Overflows in FY18

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Total
Wet Weather Overflows - CSO Permitted	22	28	13	12	12	15	5	36	18	16	29	20	226
Wet Weather Overflows - sewer (non pumps)	4	4	22	0	13	12	2	32	15	6	3	2	115
Wet Weather Overflows - Pump Stations	2	14	12	1	22	25	0	70	19	23	4	1	193
Wet Weather Overflows SSO- TOTAL	6	18	34	1	35	37	2	102	34	29	7	3	308
Dry Weather Overflows - sewer (non-pumps)	6	6	3	7	9	12	11	5	5	5	6	3	78
Dry Weather Overflows - Pump Stations	0	0	1	0	1	0	0	0	1	0	0	0	3
Dry Weather Overflows - TOTAL	6	6	4	7	10	12	11	5	6	5	6	3	81
# of Overflows that Reached Creeks - Sewer	1	7	21	2	13	10	7	27	15	8	4	1	116
# of Overflows that Reached Creeks - Pump Stations (All)	2	14	13	1	23	25	0	70	20	23	4	1	196
# of Overflow Response Staff per sewer event	2	2	2	2	2	2	2	2	2	2	2	2	2
# of Sewer Vac Trucks per sewer event	1	1	1	1	1	1	1	1	1	1	1	1	1

*Note: Most of the dry-weather overflows involve a small level of clean-up performed by Department personnel. Most of the overflows that reach creeks occur during wet weather conditions.

Table 8F.1 - MWS Stormwater Maintenance Work Order Numbers for FY18

ITEM	FY 2018 TOTAL
Ditch Excavated/Repaired (Linear Feet)	91,004
Debris Removed - Ditch Exc. & Repair (cubic yards)	3,890
Debris Removed - General (cubic yards)	195,221
Inlets Cleaned	30,133
Inlets Repaired	13
Material Removed (lbs)	271,197
Walls/Headwalls Built	493
Walls/Headwalls Repaired	30
Cross Drains Cleaned	264
Cross Drains Replaced	12
Matting Used (square feet)	359,842
Driveway Pipes Cleaned	699
Driveway Pipes Replaced	221
Preventative Maintenance Hours	3,903
Rain Routes Hours	1,842

Note: (Some assumptions are used in the quantity estimates)
*All statistics are reported based on the actual finish date of the task(s), not the work order(s).
*All cubic yardage is computed from the loads reported for each truck size.
*Debris Removed' under Ditch Exc. & Repair is the total of all cubic yardage reported under work orders that had a *Redefine Ditch' task. 'Debris Removed' under Debris Removal (misc.) is the total of cubic yardage reported under all other work orders not counted in the first Debris Removal figure.
*Inlets Repaired number includes those that were replaced with "bike-friendly" grates.

Table 8F.2 - MWS Stormwater Contracted Street Sweeping Collection Numbers for FY18

	July	August	September	October	November	December	January	February	March	April	May	June	Total
Debris Collected (tons)	363.81	400.00	413.86	498.41	476.42	467.65	330.24	334.91	395.03	415.64	318.99	313.60	4,728.56
Miles of Street Swept	2,092.68	1,858.32	1,778.43	1,897.21	1,281.27	2,149.78	1,926.12	1,601.00	2,064.16	1,910.05	1,772.91	2,038.92	22,370.86

Table 9F.1 - Development and Review Section Plan Review Numbers for FY18

	July	August	September	October	November	December	January	February	March	April	May	June	Total
Number of Plan Submittals	196	271	244	321	359	312	286	287	240	272	268	237	3,293
Number of Plan Approvals	122	99	105	114	131	111	104	114	111	120	141	143	1,415

Note: This spreadsheet represents all plan submittals, re-submittals, including grading permit plans, plat reviews/approvals, as-built drawings etc. As of February 1, 2016, (prior to this reporting period) all new development and redevelopment sites seeking grading permits are required to utilize LID practices (one inch capture).

Table 10C.1 - Industrial Sites Inventoried within Metro's Database

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Summit Construction	1516 Ft. Negley Blvd.	No	No	No	10/18/2018
Hilltop Auto Salvage	2408 Dickerson Park	No	Yes	No	9/19/2018
Smyrna Ready Mix Concrete, 2nd Ave	1136 2nd Ave N	Yes	No	Yes	9/13/2018
Tradebe Treatment and Recycling of Nashville LLC.	450 Edenwold Road	No	No	No	8/30/2018
Smyrna Ready Mix (Hailey's Harbor, Inc.)	3730 Amy Lynn Dr	No	Yes	No	7/17/2018
MPLX Terminals LLC-Nashville (Marathon)	5 Main St	Yes	Yes	No	6/21/2018
Restone Quarry	711 Basswood Ave	No	No	Yes	5/10/2018
Smyrna Mix Concrete	6677 River Road Pike	No	No	Yes	5/4/2018
S&H Plating	817 Madison Industrial Road	Yes	Yes	No	4/19/2018
Warren Paint & Color Co	700 Wedgewood Ave	Yes	Yes	No	4/11/2018
Foley Products (Sherman-Dixie Concrete Industries, Inc.)	3641 Central Pike	Yes	No	Yes	4/9/2018
The Mulch Company	665 Vernon Ave	No	Yes	No	4/2/2018
Vaughn Manufacturing Co	757 Douglas Ave	No	Yes	No	3/26/2018
Delek Logistics LLC	90 Van Buren St	No	No	No	3/15/2018
Smyrna Ready Mix Concrete INC. - Visco Drive	1020 Visco Dr	Yes	No	Yes	2/27/2018
Pine Bluff Materials- Visco	1030 Visco Dr	No	Yes	No	2/23/2018
TREW Industrial Wheels Inc.	310 Wilhagan Rd	No	Yes	No	1/31/2018
Waste Management Truck Maintenance Facility/Garbage Transfer St	1428 Antioch Pike	No	Yes	No	1/19/2018
Greyhound Lines	709 5th Ave. South	No	Yes	No	1/10/2018
Florida Rock & Tank Lines	2921 Hydes Ferry Rd.	No	Yes	No	12/8/2017
Southern Services (Waste Management of Tennessee-Nashville)	4651 Amy Lynn Dr	No	Yes	No	11/30/2017
LKQ Pick Your Part Southeast LLC	2030 Lucas Lane		Yes		10/30/2017
West Nashville Auto Recycling Inc.	5604 Centennial Bv	No	Yes	No	10/24/2017
Waste Management C&D Recycle Center	3211 Franklin Limestone Rd	No	No	No	10/5/2017
Mid TN Recycling	3533 Hermitage Industrial Drive	No	Yes	No	9/6/2017
Southern Recycling (Metal Management Nashville, LLC)	1840 Linder Industrial Dr	No	Yes	No	7/27/2017
Stratas Foods (Supreme Oil Central, Inc.)	185 Spence Ln	No	Yes	No	7/25/2017
QRS River Hills Recycling Facility	630 Myatt Dr	No	Yes	No	6/9/2017
IMI Ready Mix - Cowan Street	1433 Cowan Ct	No	No	Yes	6/6/2017
North American Galvanizing Co.(AZZ Galvanizing)	200 32nd Ave N	Yes	Yes	No	6/5/2017
Siskin Steel	4040 Jordonia Station Road	No	Yes	No	5/31/2017
Pine Bluff Materials (formerly Hunter Marine)	6615 Robertson Ave.	No	No	No	5/2/2017
Nashville Ready Mix - Cowan Ct.	1436 Cowan Ct	Yes	Yes	Yes	1/27/2017
Nashville Ready Mix, Inc. Baptist World	1326 Baptist World Center Dr	No	Yes	Yes	1/27/2017
Innophos, Inc.	4600 Centennial Bv	Yes	Yes	No	1/24/2017
J B Weimar (RelaDyne)	7281 Centennial Blvd	Yes	Yes	No	1/9/2017
NASHVILLE CHEMICAL & EQUIPMENT CO INC	7001 Westbelt Dr	Yes	No	No	1/9/2017
Nashville Ready Mix West Nashville	5853 River Rd	Yes	No	Yes	12/30/2016
TWB Antioch	6050 Dana Way	Yes	No	No	11/9/2016
A. Schulman, Inc.	481 Allied Dr	Yes	Yes	No	11/9/2016
WHIRLPOOL CORP	1714 Heil Quaker Bv	Yes	No	No	11/9/2016
Five Star Foods (Cargil)	2621 Eugenia Ave	Yes	No	No	11/2/2016

Table 10C.1 - Industrial Sites Inventoried within Metro's Database (Continued)

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Superior Trim	511 Bridgeway Ave	Yes	No	No	10/26/2016
Ergon Terminaling, Inc. - Nashville	1114 Visco Dr	Yes	Yes	No	8/25/2016
Airgass Usa Llc	7236 Centennial	Yes	No	No	7/22/2016
Motiva Nashville Terminal	1717 61st Ave N	Yes	No	No	6/23/2016
Reddy Ice-Nashville	7261 Centennial Bv	Yes	No	No	6/17/2016
Purity Dairies	360 Murfreesboro Pike	Yes	Yes	No	6/3/2016
Rogers Group, Inc. (Reostone Quarry)	6514 Robertson Avenue	No	Yes	No	5/11/2016
Quickrete - Nashville	6614 Robertson Ave	No	Yes	No	4/27/2016
Imi Ready Mix- Robertson Road	6616 Robertson Ave	No	No	Yes	4/7/2016
Azko Nobel	20 Culvert Street	Yes	No	No	3/18/2016
Land O'lakes Purina Feed Llc - Nashville Tn	3601 Trousdale Dr	Yes	No	No	3/18/2016
Akzo Nobel Coatings Inc.	20 Culvert St	Yes	Yes	No	3/8/2016
Green Tree Processing (Onsite Environmental)	1421 Baptist World Center Drive	Yes	Yes	No	2/19/2016
Green Tree Processing (On-Site Environmental)	1501 Baptist World Center Dr	No	Yes	No	2/19/2016
Springs Global Us-Nashville Plant	7200 Cockrill Bend Blvd	Yes	Yes	No	2/5/2016
Harcros Chemicals Inc	1418 Poplar Ln	Yes	No	No	1/15/2016
Rogers Group (Whites Creek Asphalt Plant)	2827 Whites Creek Pike	No	Yes	No	9/30/2015
Psc Metals, Inc.	710 S 1st St	No	Yes	No	8/21/2015
Superior Solvents & Chemicals	518 Swinging Bridge Rd	Yes	No	No	1/5/2015
Parman Energy	7101 Cockrill Bend Bvld	No	No	No	11/24/2014
Nashville Wire Products	295 Driftwood St	Yes	No	No	7/18/2014
Exxon Mobil Pipeline Corp Nashville Terminal	1741 Ed Temple Blvd	Yes	No	No	7/8/2014
Lawson Ready Mix	5915 River Rd	Yes	No	Yes	6/19/2014
Triumph (Vought) Aircraft Industries Inc (Triumph)	1432 Vultee Blvd	Yes	No	No	6/16/2014
Carlex Nashville Glass Plant (Carlex)	7200 Centennial Bv	Yes	No	No	6/10/2014
E. I. Dupont De Nemours & Co., Inc. - Old Hickory	1002 Industrial Dr	Yes	Yes	No	5/29/2014
Fiberweb, Inc. (Polymer Group)	70 Old Hickory Blvd	Yes	Yes	No	5/29/2014
Country Delite Farms Llc (Suiza)	1401 Church St	Yes	No	No	5/22/2014
Marathon Petroleum Company Llc	930 Youngs Ln	Yes	Yes	No	5/16/2014
Marathon Petroleum Company, Llc - Bordeaux Terminal	2922 Hydes Ferry Rd	Yes	Yes	No	5/16/2014
Perfection Molders	213 Connell St	Yes	No	No	5/8/2014
U S Smokeless Tobacco Manufacturing Co	800 Harrison St	Yes	No	No	5/8/2014
Hennessy Industries	1601 J P Hennessy Dr	Yes	No	No	5/2/2014
Palm Commodities International, Inc Sales	1717 J P Hennessy Dr	Yes	No	No	4/30/2014
Marathon Terminal (Blanchard Terminal)	1409 51st Ave N	Yes	Yes	No	4/29/2014
Safety-Kleen Systems, Inc.	215 Whitsett Rd	Yes	Yes	No	4/23/2014
Cmc Rebar Nashville	851 Visco Dr	Yes	No	No	4/17/2014
Quad Graphics Nashville	2947 Brick Church Pike	Yes	No	No	4/15/2014
Cone Solvents Inc Nashville (Frontier Logistical Services)	1830 Linder Industrial Dr	Yes	No	No	4/1/2014
Ashland Distribution (Nexeo Solutions)	2315 Clifton Ave	Yes	Yes	No	3/13/2014
Bellar Auto Parts, Inc.	670 James Ave	No	Yes	No	2/18/2014
Cumberland Terminals, Inc.	7260 Centennial Bv	Yes	Yes	No	2/12/2014

Table 10C.1 - Industrial Sites Inventoried within Metro's Database (Continued)

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Greer Stop Nut	481 Mcnally Dr	Yes	Yes	No	2/5/2014
Peterbilt Motors Company	430 Myatt Dr	Yes	Yes	No	2/5/2014
POLAR TECHNOLOGY LLC (Hudson)	1360 Foster Ave	Yes	No	No	2/5/2014
Shrum Auto Salvage	1050 Old Buck Hill Road	No	Yes	No	3/21/2013
Dicaperl Minerals Corp. (Chemrock)	2601 Osage St	No	Yes	No	6/13/2012
River Hills MRF	2018 River Hills Drive				
3M	400 Swinging Bridge Road	No	Yes	No	
AAA Industries Inc.	3141 Ambrose Ave	No	Yes	No	
Abernathy Truck Salvage, Inc.	865 W Trinity Ln	No	Yes	No	
ABF Freight System, Inc. - Nashville	890 Visco Dr	No	Yes	No	
Advanced Composites (TN)	3050 Sidco Dr	No	Yes	No	
All Star Recycling	460a Craighead Street	No	No	No	
All State Auto Parts, Inc.	515 Nawakwa Trl	No	Yes	No	
Allied Systems Ltd - Nashville	741 Harding Pl	No	Yes	No	
Allied Waste	700 Murfreesboro Park	No	Yes	No	
American Airlines Fuel Storage Facility at BNA	929 Airport Service Road	No	No	No	
American Appliance Products - Madison	1129 Myatt Blvd	No	Yes	No	
Associated Wholesale Grocers	500 S Cartwright St	No	Yes	No	
ATI Metal Working Products	1 Teledyne Place	No	Yes	No	
Automotive Components Holdings, LLC Nashville Property	7200 Centennial Blvd	No	No	No	
Besway Systems Inc	305 Williams Ave	No	Yes	No	
BFI of Nashville	700 Murfreesboro Pike	No	Yes	No	
BNE Properties, Inc.	317 Arlington Ave	No	Yes	No	
Bridgestone Americas Tire Operations, LLC	1201 Bridgestone Parkway	No	No	No	
Central Pike Class IV Landfill	3530 Central Park	No	Yes	No	
Cherokee Marine Terminal	520 Cowan St	No	Yes	No	
Circle Delivery Service, Inc.	125 Caden Dr	No	Yes	No	
Clopay Advanced Printing	555 Harding Industrial Dr	No	Yes	No	
Clopay Plastics Products	463 Harding Industrial Dr	No	Yes	No	
Coca-Cola Bottling Co. of Nashville	407 Craighead Street	No	Yes	No	
CSX Intermodal, Inc - Nashville Terminal	3086 Sidco Dr	No	Yes	No	
Cummings Signs Arch. and Banking Div.	4560 Trousdale Dr	No	Yes	No	
D & R Motors & Recycling	616 Durrett Dr	No	Yes	No	
Dixie Wire	5901 California Avenue	No	Yes	No	
Dry Creek Wastewater Treatment Plant	1600 2nd Ave N	No	Yes	No	
Earthgrains Banking Co., Inc (Sara Lee Bakery)	2407 Franklin Pike	No	Yes	No	
Embraer Aircraft Maintenance Services, Inc.	50 Airways Blvd	No	Yes	No	
Essex Plastics Midwest, LLC D.B.A. Flexol Packaging Corp.	1105 Visco Dr	No	Yes	No	
Fed Ex Ground - Nashville Knight Rd	3301 Knight Dr	No	Yes	No	
Federal Express - BNAA	1931 Air Lane Dr	No	Yes	No	
First Response, Inc.	1411 Dickerson Pike	No	Yes	No	
Firstexpress Inc.	1135 Freightliner Dr	No	Yes	No	
Flex Sol Packaging Corp.	1105 Visco Drive	No	Yes	No	
Four Lane Auto Salvage Inc.	400 W Trinity Ln	No	Yes	No	
FTEC, Inc. (Palfleet Truck)	1801 Lebanon Park	No	Yes	No	

Table 10C.1 - Industrial Sites Inventoried within Metro's Database (Continued)

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
GAF Materials Corp.	970 Fiber Glass Rd	No	Yes	No	
Grooms Engines	611 4th Ave S	No	Yes	No	
Hamilton Machine Co Inc	464 Woodycrest Ave	No	Yes	No	
Harpeth Valley Utility District	5910 River Road	No	No	No	
HMA Contractors Asphalt Plant #1	820 Ezell Pike	No	Yes	No	
Howard Baer, Inc.	1301 Foster Ave	No	Yes	No	
John Bouchard & Sons Co	1024 Harrison St	No	Yes	No	
John C. Tune Airport	110 Tune Airport Dr	No	Yes	No	
John W. McDougall Co., Inc.	3731 Amy Lynn Dr	No	Yes	No	
Jones Brothers, LLC	129 Bush Rd	No	Yes	No	
Kohl & Madden Plant #1	404 Harding Ind Dr	No	Yes	No	
Lee Brick and Block	3201 Franklin Limestone Rd	No	Yes	No	
Lojac Danley Plant	3185 Franklin Limestone Rd	No	Yes	No	
Lojac Downtown Plant	500 Cowan St	No	Yes	No	
LoJac Hermitage Asphalt Plant	3552 Hermitage Industrial Dr	No	Yes	No	
LoJac Nashville River Road Plant	4404 River Rd	No	Yes	No	
Lone Star Industries, Inc. d/b/a Buzzi Unicem USA - Nashville	1702 2nd Ave N	No	Yes	No	
M & W Transportation Co., Inc.	101 Terminal Ct	No	Yes	No	
Magellan Nashville I Terminal	1609 63rd Ave N	No	Yes	No	
Magellan Terminals Holdings LP	1441 51st Ave N	No	Yes	No	
Metro Nashville Airport Authority	1 Terminal Drive	No	No	No	
Metro Nashville District Energy System	90 Peabody St	No	Yes	No	
Metro Salvage, Inc.	1975 Springfield Hwy	No	Yes	No	
Mid-South Wire	1070 Visco Dr	No	Yes	No	
Milan Express Co., Inc. - Nashville	825 Visco Dr	No	Yes	No	
Music City Processing	1629 Elm Hill Pike	No	No	No	
N & S Inc.	361 Herron Dr	No	Yes	No	
Nashville Central STP	1600 2nd Ave N	No	Yes	No	
Nashville Machine Company	530 Woodycrest Ave	No	Yes	No	
Nashville Machine Elevator Inc	510 Interstate Blvd S	No	Yes	No	
Nashville Recycling Co	10 Van Buren St	No	Yes	No	
Nashville VMF	707 Chestnut St	No	Yes	No	
Nashville Wilbert Burial Vault Co.	432 Woodycrest Ave	No	Yes	No	
Nashville Wire Products	1604 County Hospital Rd	No	Yes	No	
Neely's Bend Inc.	1327 Neelys Bend Rd	No	Yes	No	
Paulo Products Company	3206 Ambrose Ave	No	Yes	No	
Pepsi Bottling Group	715 Thompson Ln	No	Yes	No	
PlastiCycle	5801 Centennial Blvd	No	Yes	No	
Portland Express, Inc.	531 Woodycrest Ave	No	Yes	No	
Precision Fabrics Group, Inc	530 Myatt Drive	No	No	No	
Pull-A-Part, LLC	7114 Centennial Boulevard	No	Yes	No	
Quality Plating	71 Fesslers Ln	No	Yes	No	
Radiant Technologies	1845 Elm Hill Park	No	Yes	No	
River Cement Sales Co dba Buzzi Unicem USA	1818 Cement Plant Rd	No	Yes	No	
Rivergate Auto Parts, Inc.	1471 Gallatin Pike	No	Yes	No	
Rogers Manufacturing Company	110 Transit Avenue	No	Yes	No	

Table 10C.1 - Industrial Sites Inventoried within Metro's Database (Continued)

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Rolling Frito-Lay Sales, LP - Nashville DC	130 Spence Ln	No	Yes	No	
Sadler Bros Trucking & Leasing Company, Inc.	436 Enos Reed Dr	No	Yes	No	
Schreiber Foods, Inc.	4350 Hurricane Creek Blvd	No	Yes	No	
Sequatchie Concrete Service, Inc.	306 Cowan St	No	Yes	No	
Servitech Industries, Inc.	550 Brick Church Park Dr	No	Yes	No	
Smitty's Auto Parts	1609 Bell Rd	No	Yes	No	
Smurfit-Stone Container -- Nashville	707 19th Ave N	No	Yes	No	
Smyrna Ready Mix	3040 Brandau Rd	No	No	Yes	
Southeastern Freight Lines, Inc.	4141 Murfreesboro Park	No	Yes	No	
Southland Brick and Block	686 Franklin Limestone Rd	No	Yes	No	
Star Transportation	1125 Foster Ave	No	Yes	No	
Steel Summit Tennessee	1718 J P Hennessy Dr	No	Yes	No	
Techno-Aide, Inc.	7117 Centennial Bv	No	Yes	No	
Tennessee Air National Guard	240 Knapp Blvd	No	Yes	No	
Tennessee Commercial Warehouse - Nashville	22 Stanley St	No	Yes	No	
Tennessee Imports Auto Salvage	326 Oriel Ave	No	Yes	No	
TRANSFLO Terminal Services, Inc. (Nashville)	426 Chestnut St	No	Yes	No	
Truck Center, Inc.	518 Hagan St	No	Yes	No	
Truck Shine	332 Wilhagan Rd	No	Yes	No	
United Parcel Service - Nashville Massman Dr.	705 Massman Dr	No	Yes	No	
United Parcel Service - Nashville Whites Creek Pike	3205 Whites Creek Park	No	Yes	No	
United Parcel Service - TCI	7525 Hickory Hills Ct	No	Yes	No	
USF Holland, Inc.	500 Oakbluff Ln	No	Yes	No	
VF Imagewear, Inc.	554 Hickory Hl	No	Yes	No	
Vietti Foods Company, Inc.	636 Southgate Ave	No	Yes	No	
Vintage Millworks Inc	525 Merritt Ave	No	Yes	No	
Vulcan Quarry - Hermitage	5301 Old Hickory Blvd	No	No	No	
Wikoff Color Corporation	214 Omonhundro Place	No	Yes	No	

Table 10F.1 - Industrial Sites Inspected during FY18

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
MPLX Terminals LLC-Nashville (Marathon)	5 Main St	Yes	Yes	No	6/21/2018
Restone Quarry	711 Basswood Ave	No	No	Yes	5/10/2018
Smyrna Mix Concrete	6677 River Road Pike	No	No	Yes	5/4/2018
S&H Plating	817 Madison Industrial Road	Yes	Yes	No	4/19/2018
Warren Paint & Color Co	700 Wedgewood Ave	Yes	Yes	No	4/11/2018
Foley Products (Sherman-Dixie Concrete Industries, Inc.)	3641 Central Pike	Yes	No	Yes	4/9/2018
The Mulch Company	665 Vernon Ave	No	Yes	No	4/2/2018
Vaughn Manufacturing Co	757 Douglas Ave	No	Yes	No	3/26/2018
Delek Logistics LLC	90 Van Buren St	No	No	No	3/15/2018
Smyrna Ready Mix Concrete INC. - Visco Drive	1020 Visco Dr	Yes	No	Yes	2/27/2018
Pine Bluff Materials- Visco	1030 Visco Dr	No	Yes	No	2/23/2018
TREW Industrial Wheels Inc.	310 Wilhagan Rd	No	Yes	No	1/31/2018
Waste Management Truck Maintenance Facility/Garbage Transfer St	1428 Antioch Pike	No	Yes	No	1/19/2018
Greyhound Lines	709 5th Ave. South	No	Yes	No	1/10/2018
Florida Rock & Tank Lines	2921 Hydes Ferry Rd.	No	Yes	No	12/8/2017
Southern Services (Waste Management of Tennessee-Nashville)	4651 Amy Lynn Dr	No	Yes	No	11/30/2017
LKQ Pick Your Part Southeast LLC	2030 Lucas Lane	No	Yes	No	10/30/2017
West Nashville Auto Recycling Inc.	5604 Centennial Bv	No	Yes	No	10/24/2017
Waste Management C&D Recycle Center	3211 Franklin Limestone Rd	No	No	No	10/5/2017
Mid TN Recycling	3533 Hermitage Industrial Drive	No	Yes	No	9/6/2017
Southern Recycling (Metal Management Nashville, LLC)	1840 Linder Industrial Dr	No	Yes	No	7/27/2017
Stratas Foods (Supreme Oil Central, Inc.)	185 Spence Ln	No	Yes	No	7/25/2017

Table 13A.1 – TMDL Monitoring Data for FY18

Date	Time	Site Name	Samplers	DO	DO	Conductivity	Temp.	pH	Flow	E. coli
			(initials)	%	mg/L	uS	Celsius		cfs	mpn
7/19/2017	10:34	Cooper	VL SP	96.8	8.8	496	19.9	6.84	0.209	105
8/1/2017	13:51	Cooper	VL SP	110	9.7	496	20	7.55	0.696	313
8/10/2017	14:30	Cooper	VL SP	99.6	9.09	507	19.8	7.23	0.201	273.3
8/14/2017	9:56	Cooper	VL SP	92.9	8.65	508	18.7	7.67	0.672	290.9
8/21/2017	9:44	Cooper	VL	96.2	8.87	510	19.2	8.1	2.240	235.9
8/22/2017	9:49	Cooper	VL SP	92.9	8.49	480	19.6	8.08	0.263	209.8
9/28/2017	10:28	Cooper	MB ES KP	95.4	8.86	508	18.9	7.87		172.3
10/19/2017	10:03	Cooper	SP/EAS	90.5	9.04	367	15.4	8.25		172.2
11/15/2017	9:37	Cooper	VL SP	76.8	7.69	521	15.1	8.24		275.5
12/13/2017	11:37	Cooper	MB SP	91	9.88	418	11.5	8.28		135.4
1/31/2018	10:44	Cooper	MB SP	111.5	11.38	856	14.3	7.98		52.9
2/21/2018	8:37	Cooper	MB SP	121.2	12.07	452	15.7	7.38		69.1
3/23/2018	9:11	Cooper	VL SP	97.4	9.83	433	14.1	8.14		98.8
4/19/2018	9:43	Cooper	MB VL	100.7	10.49	450	13.7	7.63		47.4
5/14/2018	10:06	Cooper	VL SP	100.6	9.69	430.9	17.3	8.02		248.1
6/14/2018	9:48	Cooper	MB SP				17.9	7.98		178.5
7/19/2017	9:18	Drakes	VL SP	78.2	6.64	593	22.9	6.53	0.857	325.5
8/1/2017	12:34	Drakes	VL SP	80	6.8	635	22.5	7.26	0.244	209.9
8/10/2017	12:41	Drakes	MB	89.1	7.56	633	23.5	7.98	1.613	435.2
8/14/2017	8:30	Drakes	VL SP	80.8	7.01	616	22.4	7.24	0.584	2419.6
8/21/2017	7:59	Drakes	MB VL	73.2	6.23	704	22.3	8.15	0.229	61.3
8/21/2017	7:59	Drakes (duplicate)								77.6
8/22/2017	8:26	Drakes	VL SP	75.8	6.54	608	22.9	8.14	0.130	579.4
9/28/2017	9:12	Drakes	MB ES KP	67.1	5.99	628	20.9	7.73		129.1
10/19/2017	8:43	Drakes	SP/EAS	86.6	9.08	549	12.9	8.17		166.4
12/13/2017	12:22	Drakes	VL	89.8	10.04	565	3.7	8.12		7.5
1/31/2018	9:31	Drakes	MB SP	108.2	13.01	529	7.3	7.8		44.1
2/21/2018	7:26	Drakes	MB SP	101.8	10.26	483	14.7	8.03		224.7
3/23/2018	8:13	Drakes	VL SP	102.8	11.57	516	10.1	8		98.8
4/19/2018	9:22	Drakes	SP	105.6	11.43	479	11.6	8.17		82.3
5/14/2018	9:10	Drakes	VL SP	93.1	8.54	534	18	7.99		307.6
5/14/2018	9:10	Drakes (duplicate)	VL SP							325.5
6/14/2018	8:28	Drakes	MB SP	87.5	7.87	549	21.2	8.01		816.4
11/15/2017	8:34	Drakes	VL SP	95.6	10.29	624	11.9	8.5		43.5
7/20/2017	11:10	Dry	VL SP	104.9	8.63	552	25.3	7.08	4.307	980.4
8/10/2017	12:52	Dry	VL SP	103.7	8.57	748	24.8	7.45	9.419	108.1
8/14/2017	10:38	Dry	VL SP	97.2	8.12	553	24	7.84	2.738	1732.9
8/21/2017	10:24	Dry	VL	95.1	7.81	868	25.3	8.13	1.351	141.4
8/22/2017	10:35	Dry	VL SP	94.9	7.68	523	25.9	8.1	0.629	105.8
9/28/2017	9:27	Dry	VL SP	85	7.58	547	20.9	7.93		40.4
10/19/2017	9:09	Dry	VL/KP	86.8	8.83	526	14.6	7.84		56.8
11/15/2017	9:01	Dry	MB	105.9	11.6	518	11.2	8.15		70.3
11/15/2017	9:01	Dry (duplicate)								83.6
12/13/2017	11:05	Dry	MB SP	109.8	13.7	578	5.8	8.59		2
1/31/2018	10:45	Dry	VL	107.9	13.26	523	7.4	8.65		57.1
2/21/2018	8:25	Dry	VL	101.2	10.39	455	14.2	8.26		172.5
3/23/2018	9:48	Dry	VL SP	112.5	12.73	502	9.9	8.64		98.5
4/19/2018	10:15	Dry	MB VL	108.7	12.14	477	10.5	8.29		151.5
8/2/2017	9:05	Dry	VL SP	99.09	8.15	450	25	7.12	0.870	178
5/14/2018	9:20	Dry	MB SGP	102.1	9.61	492	18.3	7.96		648.8
6/14/2018	9:46	Dry	VL SGP	94.6	8.31	443.4	21.8	8.05		185
7/19/2017	9:55	Ewing	VL SP	99.1	8.16	598	25.6	6.42	7.671	96
8/1/2017	13:11	Ewing	VL SP	162	12.2	599	29.4	7.06	1.004	7.2
8/10/2017	13:20	Ewing	MB	112.1	9.15	1135	25.8	8.07	7.084	126.8
8/14/2017	9:08	Ewing	VL SP	77.2	6.49	758	23.9	7.44	3.357	387.3
8/21/2017	9:18	Ewing	VL	75	6.43	740	24.9	8.2	7.851	378.4
8/22/2017	9:03	Ewing	VL SP	88.3	7.54	1071	25.2	8.11	1.349	228.2
9/28/2017	9:50	Ewing	MB ES KP	93	8.02	590	22.4	8.05		231

Table 13A.1 – TMDL Monitoring Data for FY18 (Continued)

Date	Time	Site Name	Samplers	DO	DO	Conductivity	Temp.	pH	Flow	E. coli
			(initials)	%	mg/L	uS	Celsius		cfs	mpn
10/19/2017	9:34	Ewing	SP/EAS	97.9	9.73	752	15.7	8.15		30.9
11/15/2017	9:03	Ewing	VL SP	99.8	11.39	809	9.4	8.57		80.1
12/13/2017	12:12	Ewing	MB SP	117.8	14.7	887	5.8	8.8		4.1
1/31/2018	10:09	Ewing	MB SP	117.2	14.85	555	5.3	8.33		33.2
2/21/2018	8:03	Ewing	MB SP	116.8	11.75	624	15.3	8.2		248.9
3/23/2018	8:38	Ewing	VL SP	96.4	11.26	543	9.6	8.55		98.5
3/23/2018	8:38	Ewing (duplicate)								77.6
4/19/2018	9:41	Ewing	SP	107.2	11.59	383.2	11.8	8.45		127.4
5/14/2018	9:32	Ewing	VL SP	92.4	8.24	627	21.1	8.14		104.6
6/14/2018	9:05	Ewing	MB SP				24.2	8.02		151.5
7/20/2017	11:50	Lumsley	VL SP	125.3	10.28	429	25.1	8.03	1.423	201.4
8/2/2017	10:00	Lumsley	VL SP	148	12.2	371	24.5	8.27	1.676	190.4
8/10/2017	13:34	Lumsley	VL SP							70.8
8/14/2017	11:33	Lumsley	VL SP	114.7	9.62	397	23.6	7.86	2.863	360.9
8/21/2017	10:51	Lumsley	VL	141.6	11.24	407	27.7	8.59	0.208	74.3
8/22/2017	11:11	Lumsley	VL SP	129.9	10.45	378	28.1	8.65	0.191	2419.6
9/28/2017	10:16	Lumsley	VL SP	108.8	9.94	450	19.6	8.35		52.8
10/19/2017	9:49	Lumsley	VL/SP	105	11.6	437	11	8.41		77.1
11/15/2017	9:38	Lumsley	MB	116.6	13.33	417.6	9.4	8.54		88.4
12/13/2017	10:02	Lumsley	MB	103.1	14.94	461	10.3	8.69		10.9
1/31/2018	9:36	Lumsley	VL	117.5	14.78	394.7	5.5	8.83		135.4
1/31/2018	9:36	Lumsley (duplicate)								172.5
2/21/2018	8:15	Lumsley	VL	103.3	10.67	339.2	13.9	8.4		129.1
3/23/2018	9:02	Lumsley	MB	128.4	15.27	406.9	7.8	8.41		547.5
4/19/2018	10:35	Lumsley	MB VL	117.5	13.27	361.2	9.9	8.38		104.6
5/14/2018	9:56	Lumsley	MB SGP	116	10.83	415.3	18.5	8.16		145.5
6/14/2018	9:06	Lumsley	VL SGP	107	9.36	375.9	21.9	8.34		261.3
8/14/2017	11:17	Manskers 1	VL SP	88.3	7.39	490	24.1	7.69	13.524	579.4
10/19/2017	9:30	Manskers 1	VL/KP	67.4	7.08	421	13	7.65		298.7
3/23/2018	9:45	Manskers 1	MB	123.7	14.49	359.1	8.3	8.32		290.9
9/28/2017	10:42	Manskers 2	VL SP	75.9	6.7	468	21.2	7.87		44.3
10/19/2017	10:14	Manskers 2	VL/KP	80.5	8.4	488	13.5	7.92		14.8
7/20/2017	11:23	Manskers 1	VL SP	100.2	8	475	26.1	7.56	1.200	79.5
8/2/2017	9:31	Manskers 1	VL SP	96.5	8.07	448	23.7	7.26	4.990	93.4
8/10/2017	13:18	Manskers 1	VL SP	120.8	9.8	634	25.9	7.74	10.883	727
8/22/2017	10:56	Manskers 1	Vl SP	96.9	7.79	448	26.6	8.11	1.678	85.4
8/30/2017	12:40	Manskers 1	VL MB	110.9	9.33	446	23.8	8.05	3.049	109
9/28/2017	9:46	Manskers 1	VL SP	82.2	7.34	504	20.8	8.08		111.8
11/15/2017	9:20	Manskers 1	MB	102.9	11.07	462	9.7	7.85		54.8
12/13/2017	10:16	Manskers 1	VL SP	114.4	15.1	466	2.7	8.62		19.9
1/31/2018	10:25	Manskers 1	VL	112.4	15.25	401.6	5.8	8.76		39.7
2/21/2018	7:51	Manskers 1	VL	100.5	10.44	406	14.2	8.38		120.1
4/5/2018	9:41	Manskers 1	MB VL SP	118.6	13.83	424.3	8.6	8.37		238.2
6/14/2018	8:44	Manskers 1	VL SGP	84	7.23	403.6	22.8	7.77		148.3
7/20/2017	12:27	Manskers 2	VL SP	104.8	8.63	412	25.3	7.68	5.717	193.5
8/2/2017	10:31	Manskers 2	VL SP	90.6	7.46	428	23.8	7.36	1.143	64.6
8/10/2017	13:55	Manskers 2	VL SP	104.2	8.56	410	25.2	7.34	3.756	436.6
8/14/2017	12:10	Manskers 2	VL SP	84.4	6.97	428	23.8	7.51	2.707	71.2
8/21/2017	11:17	Manskers 2	VL	79.3	6.52	459	25.4	7.99	0.343	54.6
8/22/2017	11:39	Manskers 2	Vl SP	92.5	7.5	412	26	7.95	0.265	47.3
11/15/2017	10:04	Manskers 2	MB	109.8	12.29	405.6	10.3	8.04		19.7
12/13/2017	10:33	Manskers 2	MB	116.3	15.52	394	2.9	8.48		21.3
1/31/2018	9:57	Manskers 2	VL	117.6	14.72	341	5.7	8.6		27.9
3/23/2018	9:28	Manskers 2	MB	116.3	13.58	291.2	8.6	8.37		88.4
4/19/2018	10:58	Manskers 2	MB VL	112	12.6	306.3	10.1	8.2		83.6
5/14/2018	10:28	Manskers 2	MB SGP	112.2	10.45	365	18.7	7.91		157.6
6/14/2018	9:25	Manskers 2	Vl SGP	82.7	7.28	405.7	21.9	7.87		1986.3

Table 13A.1 – TMDL Monitoring Data for FY18 (Continued)

Date	Time	Site Name	Samplers	DO	DO	Conductivity	Temp.	pH	Flow	E. coli
			(initials)	%	mg/L	uS	Celsius		cfs	mpn
7/20/2017	10:45	Neelys	VL SP	89	7.3	589	25.2	7.6	2.087	770.1
7/20/2017	10:45	Neelys (duplicate)								866.4
8/2/2017	8:43	Neelys	VL SP	87.7	7.4	521	23.2	7.35	0.981	152.9
8/10/2017	12:34	Neelys	VL SP	91	7.57	712	24.4	7.06	1.827	488.4
8/14/2017	10:21	Neelys	VL SP	82.6	7.09	591	23.4	7.73	1.022	>2419.6
8/21/2017	10:08	Neelys	VL	91.1	7.59	627	24.5	8.32	0.632	218.7
8/22/2017	10:10	Neelys	VL SP	91.7	7.61	576	24.6	8.3	0.935	152.9
9/11/2017	14:30	Neelys	VL SP	92	8.45	503	19.3	8.38	1.037	157.6
9/18/2017	11:00	Neelys	MB SP	90	7.8	600	22.3	8.28	2.951	110
9/19/2017	10:35	Neelys	MB SP	88.7	7.75	606	22	8.2	2.099	290.9
9/28/2017	9:10	Neelys	VL SP	79.2	7.13	625	20.7	8.03		248.9
9/28/2017	9:10	Neelys (duplicate)								185
10/19/2017	8:51	Neelys	VL/KP	92.1	9.48	584	14	8.1		104.6
10/19/2017	9:30	Neelys (duplicate)	VL/KP	93	9.57	584	14	8.1		86.2
11/15/2017	10:04	Neelys	VL SP	104	10.77	563	12.1	8.69		107.1
12/13/2017	11:19	Neelys	MB SP	112.93	10.55	420	6.5	8.58		93.2
1/31/2018	11:01	Neelys	MB SP	107	12.17	458	9.6	8.55		206.4
2/21/2018	8:42	Neelys	VL	103.2	10.69	560	13.5	8.62		248.1
3/23/2018	9:31	Neelys	VL SP	113	12.65	387	10.9	8.62		344.8
4/19/2018	10:00	Neelys	MB VL	103.3	11.26	546	11.3	8.27		387.3
4/19/2018	10:00	Neelys (duplicate)								387.3
5/14/2018	11:12	Neelys	MB SGP	96.6	8.82	543	20	8.28		365.4
6/14/2018	10:15	Neelys	VL SGP	94.1	8.21	449.3	22	8.29		816.4
7/19/2017	10:10	Pages	VL SP	79.9	6.87	708	22.7	6.73	1.574	307.6
8/1/2017	13:31	Pages	VL SP	98	8.4	686	22.5	7.45	2.367	110
8/10/2017	12:01	Pages	VL SP	99.8	8.65	823	21.9	6.84	3.357	365.4
8/10/2017	12:01	Pages (duplicate)								228.2
8/14/2017	9:25	Pages	VL SP	79	6.89	772	21.7	7.61	1.620	488.4
8/21/2017	8:38	Pages	MB VL	85.4	7.48	726	21.7	8.14	0.424	63.8
8/22/2017	9:19	Pages	VL SP	88.5	7.56	684	22.7	8.15		73.3
9/28/2017	10:05	Pages	MB ES KP	83	7.56	739	20.1	7.99		51.2
10/19/2017	10:29	Pages	SP/EAS	93	9.32	626	15	8.28		45.9
11/15/2017	9:16	Pages	VL SP	94.2	9.73	727	13.9	8.45		42.6
12/13/2017	11:54	Pages	MB SP	104.3	11.68	603	10.1	8.47		98.8
1/31/2018	10:25	Pages	MB SP	107.7	11.74	562	11.4	8.3		42.8
2/21/2018	8:21	Pages	MB SP	131.9	13.2	647	15.3	7.87		261.3
3/23/2018	8:53	Pages	VL SP	105.6	11.32	360	12.2	8.34		78
4/19/2018	9:25	Pages	MB VL	106.2	11.39	634	12.1	7.97		111.2
5/14/2018	9:50	Pages	VL SP	98.2	9.29	426.1	17.6	8.08		270
6/14/2018	9:22	Pages	MB SP				19.7	8.06		325.5
7/20/2017	12:09	Walkers	VL SP	85	6.98	424	24.8	7.67		135.4
8/2/2017	10:12	Walkers	VL SP	89	7.4	393	23.3	7.73	3.817	106.7
8/10/2017	13:45	Walkers	VL SP	104.8	8.63	411	24.9	7.74	2.670	75.4
8/14/2017	11:45	Walkers	VL SP	82.3	7.06	402	23.2	7.69	5.753	98.7
8/21/2017	11:00	Walkers	VL	87.6	7.04	456	24.9	7.72	2.841	27.5
8/22/2017	11:23	Walkers	VL SP	72.3	5.9	391	25.5	8	0.539	298.7
9/28/2017	10:26	Walkers	VL SP	83.9	7.58	436	20.6	8.02		38.6
10/19/2017	10:00	Walkers	VL/KP	83.6	8.97	358	12.3	7.69		52.8
11/15/2017	9:50	Walkers	MB	104.3	11.93	410.5	9.4	8.02		55.4
12/13/2017	10:20	Walkers	MB	94.9	13.2	397	1.4	8.71		27.9
1/31/2018	9:47	Walkers	VL	116.9	8.85	365.8	5.5	8.85		16
3/23/2018	9:15	Walkers	MB	118	13.87	348.1	8.2	8.14		69.7
4/19/2018	10:44	Walkers	MB VL	109.5	12.4	344.6	10	8.19		85.7
6/14/2018	9:15	Walkers	VL SGP	86.7	7.62	392.5	21.7	7.84		177
5/14/2018	10:07	Walkers	MB SGP	109.5	10.22	385.6	18.5	7.92		27.2
7/19/2017	9:36	Whites 2	VL SP	92.4	7.7	522	24.5	6.64	23.213	61.2

Table 13A.1 – TMDL Monitoring Data for FY18 (Continued)

Date	Time	Site Name	Samplers	DO	DO	Conductivity	Temp.	pH	Flow	E. coli
			(initials)	%	mg/L	uS	Celsius		cfs	mpn
8/1/2017	12:54	Whites 2	VL SP	128.1	10.5	442.6	25.1	7.01	10.222	8.5
8/14/2017	8:52	Whites 2	VL SP	75.7	6.37	527	23.4	7.23	3.717	143.9
8/21/2017	8:20	Whites 2	MB VL	78.5	6.62	699	23.7	7.92		53.7
8/22/2017	8:47	Whites 2	VL SP	74.1	6.2	497	24.2	7.87	0.661	45
8/28/2017	6:33	Whites 2	MB	62.4	5.55	567	21.7	7.69		143.9
9/28/2017	9:34	Whites 2	MB ES KP	90.6	7.94	499	21.8	7.88		117.8
10/19/2017	9:09	Whites 2	SP/EAS	94.7	9.84	789	13.5	8.06		50.4
11/15/2017	8:50	Whites 2	VL SP	101.4	11.6	507	9.4	8.88		67.6
12/13/2017	9:42	Whites 2	VL SP	117.5	15.61	494	3.5	8.03		29.2
1/31/2018	9:51	Whites 2	MB SP	117.5	14.81	443.2	5.6	8.15		36.2
2/21/2018	7:44	Whites 2	MB SP	125.7	12.92	437.2	14.5	8.05		238.2
3/23/2018	8:25	Whites 2	VL SP	103.4	11.77	374	9.6	8.58		60.5
4/5/2018	8:58	Whites 2	MB VL SP	116	13.38	407.8	9	8.38		101.2
6/14/2018	8:50	Whites 2	MB SP				23.1	8.01		191.8

Table 13A.2 - SWMP Quantifiable Statistics

Categories	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
Recycled Oil (tons)	17.82	20.27	26.88	35.38	36.4	35.32	36.52	28.15	33	23.31	18.85	32.73	29.95
Recycled Glass (tons)	1,107.05	1,116.52	1,607.48	2,110.05	1,866.14	2,207.29	2,160.19	2,199.85	2,136.16	1,654.97	2,264.46	2,339.31	2,582.55
Total Brush Collection (tons)	30,498.85	30,269.40	27,785.25	30,972.21	29,456.10	38,634.89	32,795.37	28,486.59	27,178.37	21,014.68	26,742.01	31,893.67	25,932.64
Total Waste Collected (tons)	150,972.54	152,430.24	153,266.01	149,474.79	151,425.06	151,501.17	148,297.40	151,131.01	153,795.70	155,738.78	163,340.77	162,884.18	165,720.90
# of Water Quality Complaints (non-construction) Investigations Initiated in Database	287	156	135	133	139	138	122	131	114	99	100	107	120
# of Construction Stormwater-Related Inspections	5,721	6,552	6,327	6,160	5,079	5,457	5,843	5,170	6,064	6,082	6,684	6,787	7,277
# of Grading Permits Issued	252	239	165	109	121	135	142	138	318	276	254	262	311
# of Engineered Plans Submitted to Stormwater Development and Review	1,427	1,505	1,970	1,600	1,367	1,319	1,525	1,791	1,813	2,572	3,034	3,636	3,293
# of Construction Plans Approved or Declared No Permit Needed by Stormwater Development and Review	507	619	871	687	506	559	1,174	1,411	1,360	1,998	1,450	1,419	1,415
# of Stormwater Enforcements (NOVs and SWOs)	283	190	342	188	123	148	94	96	168	128	116	159	112

Table 13A.3 – Ambient Monitoring Data for the FY18 Reporting Period

Date	Site Name	Time	Samplers (initials)	DO	DO	Cond.	Temp.	pH	Flow	E. coli	BOD5	COD	NH3	TKN	NO3+NO2	Diss. P	Total P	Lead	Zinc	Cr	Cu	Nickel	O and G	TSS	TDS
				%	mg/L	uS	C		ft3/sec	mpn	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L
9/11/2017	Manskers 1	9:04	VL/MGB	92.7	8.84	449	17.6	7.99	9.029	313	6	ND	ND	0.31	0.692	0.06	0.06	ND	ND	ND	ND	ND	ND	1	284
9/19/2017	Whites 2	9:00	MB SP	92.9	8.27	506	21.6	8.05	13.771	125.9	ND	ND	ND	0.1	0.34	0.23	0.23	ND	ND	ND	ND	ND	ND	ND	329
9/19/2017	Trip Blank	7:36	MB SP	---	---	---	---	---	---	<1	3	ND	ND	ND	ND	0.08	ND	ND	ND	ND	ND	ND	ND	ND	ND
12/13/2017	Whites 2	9:42	VL SP	117.5	15.61	494	3.5	8.03	15.2	29.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	310
12/13/2017	Manskers 1	10:16	VL SP	114.4	15.1	466	2.7	8.62	**	19.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	281
12/13/2017	Manskers 1 (duplicate)	10:16	VL SP	---	---	---	---	---	---	40.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	283
4/5/2018	Whites 2	8:58	MB VL SP	116	13.38	407.8	9	8.38	87.4	101.2	ND	ND	*	0.22	0.493	0.07	0.08	ND	ND	ND	ND	ND	ND	4	275
4/5/2018	Manskers 1	9:41	MB VL SP	118.6	13.83	424.3	8.6	8.37	114.403	238.2	ND	ND	*	0.2	0.47	0.04	0.04	ND	ND	ND	ND	ND	ND	5	227
5/9/2018	Manskers 1	9:00	KP/SP	103.5	10.4	378.3	15.3	8.26	20.430	261.3	ND	47	ND	0.21	0.487	0.02	0.06	ND	5.264	ND	ND	ND	ND	3	263
5/9/2018	Whites 2	8:42	MB/VL	105.4	10.57	415.4	15.2	8.06	23.0	214.3	ND	ND	ND	0.23	0.38	0.06	0.09	ND	ND	ND	ND	ND	ND	ND	346
5/9/2018	Field Blank	8:42		---	---	---	---	---	---	<1	ND	ND	ND	ND	ND	*	*	ND	ND	2.581	ND	ND	ND	ND	*

* Lab Error

** Flow Meter Malfunction

ND Non-Detect

Table 13A.4 – Benthic Monitoring Data for TMDL Streams during FY18 Reporting Period

Station ID	Site Name	Date	Time	Collection	Habitat Score	TMI
MANSK002.9DA	Manskers 1	9/11/2017	904	SQKICK	159	30
EWING000.8DA	Ewing Creek	9/8/2017	944	SQKICK	132	34
WHITE005.7DA	Whites Creek 2	9/19/2017	900	SQKICK	167	22
COOPE001.6DA	Cooper Creek	9/26/2017	936	SQKICK	138	32
DRAKE000.2DA	Drakes Branch	9/22/2017	859	SQKICK	140	22
DRYCR001.2DA	Dry Creek	10/3/2017	1000	SQKICK	107	18
OVERA000.6DA	Overall Creek	10/5/2017	830	SQKICK	102	14
MANSK005.8DA	Manskers 2	10/18/2017	906	SQKICK	115	28
GIBSO001.3DA	Gibson Creek	10/28/2017	917	SQKICK	118	20
LOVES000.4DA	Loves Branch-Duplicate	10/26/2017	1010	SQKICK	154	28
LOVES000.4DA	Loves Branch	10/26/2017	1010	SQKICK	155	28
MANSK002.9DA	Manskers 1	4/5/2018	1000	SQKICK	148	26
WHITE005.7DA	Whites Creek 2	5/9/2018	0842	SQKICK	149	26
WHITE005.7DA	Whites Creek 2	5/9/2018	0842	SQKICK	157	28
WBHUR000.1DA	W. Branch Hurricane	5/15/2018	0924	SQKICK	135	32
STONE00.9DA	Stoners Creek	5/6/2018	0958	SQKICK	155	32
COLLI002.8DA	Collins Creek	6/11/2018	1011	SQKICK	128	16

4.0 Supporting Program Data

The following is supplemental data that supports Metro Nashville's MS4 Permit Compliance:

Metro Nashville's Mayor's Office Press Release on the Tree Canopy Executive Order

OFFICE of MAYOR
MEGAN BARRY

FOR IMMEDIATE RELEASE
CONTACT: Sean Braisted (615) 862-6461

Mayor Megan Barry Takes Executive Action to Preserve, Grow Nashville's Tree Canopy
New Urban Forestry Manager to coordinate Metro agencies around tree-related activities

NASHVILLE, Tenn. (February 13, 2018) – Mayor Megan Barry has signed Executive Order No. 40, recognizing trees as a public utility, establishing new guidelines to govern Metro's planting and maintenance of trees, and appointing a new Urban Forestry Program Manager to lead and coordinate Metro tree-related activities. These steps to protect and grow the countywide tree canopy will help the city achieve its long-term sustainability goals, such as protecting air and water quality, improving public health, and saving taxpayer dollars on stormwater projects.

"As we grow, we must remember to protect the natural assets that make Nashville a great place to call home," said Mayor Megan Barry. "The urban forest cleans the air we breathe and the water we drink, moderates flooding and extreme heat events, and improves mental health—among many other benefits. Trees therefore deserve consideration in the same class as other essential, basic utility infrastructure."

The Urban Forestry Program Manager – a position housed in the Stormwater Division of Metro Water Services – will routinely report directly to the Mayor on progress made toward maintaining and growing Nashville's tree canopy. As outlined in the Executive Order, the Forestry Manager will be responsible for:

- Ensuring the Metropolitan Government leads by example, increasing its own minimum requirements for tree preservation and planting to be more stringent than those required of private development;
- Establishing a Metro Tree Working Group to coordinate and provide updates on tree-related policy and initiatives;
- Formalizing maintenance standards, including the regular tracking of tree removals and replanting opportunities throughout the county;
- Organizing updates to the countywide Urban Tree Canopy assessment no less frequently than every five years.

"Urban trees can lower concentrations of air pollution by 10-35 percent, reduce the energy demand for indoor air conditioning by up to half, provide excellent homes for urban wildlife, reduce summer air temperatures by up to 4 degrees, and filter harmful chemicals out of our drinking water," said Mekayle Houghton of the Cumberland River Compact, who chaired compilation of the Natural Resources recommendations for Mayor Barry's Livable Nashville effort. "Our subcommittee therefore felt strongly that strategies related to a healthy urban forest should be a cornerstone to any updates to Metro's sustainability strategy."

Metro Nashville's Mayor's Office Press Release on the Tree Canopy Executive Order (Continued)

The Executive Order also directs applicable departments to ensure full compliance with Metro's tree-related policies and regulations, while providing flexibility and predictability for developers to donate toward replanting new trees where tree density requirements cannot be reasonably met.

"We're proud to respond to Mayor Barry's call to host Metro's new Urban Forestry Program Manager within our Stormwater Division," said Water Services Director Scott Potter. "Trees are the best stormwater management tool we have: Just one tree can absorb around 1,000 gallons of water waste, thus saving significant dollars when compared to the cost of building conventional 'gray' stormwater infrastructure, such as pipes and large storage tanks."

Nashville has relatively high tree-canopy coverage (47 percent as of the last assessment) when compared to the national average, but trails many of its peer cities; and coverage within the city is not uniform. The recent development boom has placed significant pressure on the urban tree canopy, so Mayor Barry's Livable Nashville sustainability plan has set an umbrella goal of 50 percent countywide tree-canopy coverage by the year 2050 — an approximate addition of 500,000 net new trees. Developing an urban forestry program was also a key recommendation from private-sector developers via the Urban Land Institute of Nashville's *Gear Up 2020* report, submitted to Mayor Barry in mid-2016.

More information on canopy goals specific to areas of Davidson County that lack adequate tree coverage can be found in Metro's Urban Forestry Master Plan:
http://www.nashville.gov/Portals/0/SiteContent/pw/docs/beautification/Trees/UFLMP.pdf

Read Executive Order #40 at: http://www.nashville.gov/Metro-Clerk/Legal-Resources/Executive-Orders/Mayor-Megan-Barry/mb040.aspx

Press release available online at: http://www.nashville.gov/News-Media/News-Article/ID/7226/Mayor-Megan-Barry-Takes-Executive-Action-to-Preserve-Grow-Nashvilles-Tree-Canopy.aspx

Photos credited to Belmont University.

About Metro's new Urban Forestry Program Manager: Naomi Rotramel comes to Nashville from the Montgomery County Parks Department in Maryland, where she managed high-risk tree operations and public outreach associated with the Emerald Ash Borer infestation on 36,000 acres of parkland and 418 parks. Prior to this role, she was a GIS tree-inventory specialist and field supervisor with the Davey Resource Group, inspecting over 400,000 trees across North America and helping more than 30 municipalities build tree inventories to manage their urban forests. She holds a B.S. in Botany and an M.S. in Forestry from the University of Washington at Seattle, as well as professional certifications as an Arborist and Tree Risk Assessment Qualifier, and has published research on forest soils in the *Journal of Forest Ecology and Management*.

News Article on Mayor's Tree Canopy Executive Order

Barry strengthens tree protections on Nashville's city-owned properties

Mike Reicher, USA TODAY NETWORK – Tennessee Published 5:12 p.m. CT Feb. 12, 2018 | **Updated 6:20 p.m. CT Feb. 13, 2018**

(Photo: Joey Garrison / The Tennessean)

Nashville Mayor Megan Barry signed an executive order Tuesday that adds protections for trees on city-owned property, instructs city agencies to enforce tree standards, and restructures the government's urban forestry staff.

The efforts come as Nashville grows rapidly and its trees lose ground to new real estate developments (/story/news/2017/10/26/nashvilles-trees-fall-development-city-officials-try-measure-loss/801082001/). Advocates estimate that Davidson County is hemorrhaging more than 50,000 trees a year.

"Nashville's recent development boom has placed significant pressure on the 'urban tree canopy,'" the mayor's office said in a news release.

Barry's order (http://www.nashville.gov/Metro-Clerk/Legal-Resources/Executive-Orders/Mayor-Megan-Barry/mb040.aspx) frames the city's trees as a public asset — like a sewer or electrical system — that needs to be maintained. The "urban tree canopy is a utility that improves air quality, manages stormwater, supports public health, provides economic benefits, and increases quality of life for Nashville residents," it says.

The executive order requires officials to review major tree-removal projects on city land ahead of time, and to preserve or replace trees when possible. The review would be triggered when plans call for the removal of any tree greater than 30 inches in diameter at chest height, or a group of trees that adds up to more than 100 inches in diameter.

While the order doesn't lay out specific guidelines for preservation and replacements, it instructs officials to develop standards that are stricter than those in place for the private sector.

Fort Negley removal exposed communications breakdown

Tree advocates say these changes are a response to the destruction (/story/news/local/davidson%20/2016/12/02/fort-negley-tree-removal-exposes-communications-breakdown/94823144/) of hundreds of trees at Fort Negley, a city-owned park, in 2016. The tree removal — which seemed to surprise almost everyone — exposed a breakdown in communications. Parks Department officials didn't notify the mayor's office or the park's primary nonprofit support group.

"Something like a Fort Negley is not going to happen again," said Carolyn Sorenson, executive director of the Nashville Tree Foundation, a separate nonprofit group. "We are very encouraged. We can be more effective as a nonprofit when the city leads by example."

Advocates have complained that the city hasn't been enforcing the tree standards it has on the books. Builders and developers have been knocking down trees without planting the required replacements. The Codes Department is ostensibly tasked with overseeing tree replacement and protection.

Barry's order emphasizes enforcement: "During the permitting process for any development or construction, trees shall be a major consideration in the review of a grading or building permit application and the issuance of occupancy permits."

The order also streamlines some of the city's tree staffing and communications. It empowers the urban forestry program manager to coordinate among city agency heads and to directly advise the mayor.

News Article on Mayor's Tree Canopy Executive Order (Continued)

Metro Nashville hired Naomi Rotramel for the position of urban forestry program manager. *(Photo: Metro Nashville)*

The city hired Naomi Rotramel for this newly-created position. She last worked at the Montgomery County Parks Department in Maryland where she managed an emerald ash borer infestation on 36,000 acres of parkland, according to Nashville officials. The Codes Department has two additional urban foresters. Rotramel will be based in Metro Water Services.

Barry signed the executive order Tuesday at a bookstore on the Belmont University Campus. During a recent construction project, the store protected a 70-foot historic elm tree.

Reach Mike Reicher at mreicher@tennessean.com or 615-259-8228 and on Twitter @mreicher.

Read or Share this story: http://www.tennessean.com/story/news/2018/02/12/barry-strengthens-tree-protections-nashvilles-city-owned-properties/330427002/

MWS Social Media Post about the Tree Canopy Executive Order

Metro Water Services @NashvilleMWS · 2h

.@MetroNashville announced Executive Order 40 to preserve and grow urban trees, which can capture 1,000 gal of stormwater annually and are a critical component of managing stormwater and water quality. #LivableNashville nashville.gov/News-Media/New...

Various Stats Tracked for the Water Quality Improvement Project with the Cumberland River Compact

	Current Project			Past Project	Total of Both Projects
Data as of: 8/31/2018	3/1/15-Present (2/28/20)			3/1/15	3/12/09-Present (2/28/20)
Partnership Progress Summary Table	**W-QIP**			**SEP**	**Total**
	W-QIP	**Current**	**%**	**SEP**	**Completed to date**
SEP Goal Criteria	**Goal**	**# Done**	**Done**	**Total**	
Facilitate 50 rain gardens being built/yr for 5 years	250	234	94%	300	534
Facilitate planting of 12,500 trees 1/2" or greater	12,500	20,992	168%	12,486	33,478
Educate 10,000 Davidson County residents about green infrastructure	12,500	35,828	287%	69,115	104,943
Recreation Opportunities on the River	12,500	15,746	126%	NA	15,746
Facilitate the adoption of at least 25 stream segments	25	43	172%	16	59
Remove impermeable pavement (reporting square footage removed)	NA	3,000	NA	0	3,000
start date = 3/1/2015 end date = 2/28/2020					

Study of the Benefits of Metro's Floodplain Buyout Program Performed by Vanderbilt University

CREATING RESILIENT AND SUSTAINABLE COMMUNITIES THROUGH FLOOD MITIGATION EFFORTS – A LOOK AT THE METRO NASHVILLE HOME BUYOUT PROGRAM

Katherine Nelson and Janey Camp
Vanderbilt University

Following the 2010 Nashville flood, Metro Nashville Government (Metro) implemented several key recovery, mitigation, and adaptation strategies that propelled the community to quicker recovery. However, Nashville didn't just return to its former pre-disaster state. Instead, it took measures to ensure that it would be less vulnerable to extreme flood events by purchasing flood-damaged residential properties to convert to greenspace. However, few realize that Metro had active flood mitigation and adaptation programs prior to 2010. These pro-active buyout activities and development restrictions[1] in high-risk flood areas had already begun the process of making Nashville more resilient and sustainable.

While many recognize the inherent benefit of reducing high-risk areas and replacing them with such spaces, quantification of those benefits has not yet been evaluated in detail at the local level. Often, the benefit-cost ratio associated with flood mitigation efforts are claimed to be 4:1 or more recently, 6:1 (i.e., one dollar invested in mitigation leads to six dollars of benefit as reduced damages, etc.)[2]. However, this is a national average based upon a 75-year horizon and may not necessarily hold true at the local level, especially with a thriving housing market such as Nashville has seen in recent years. The study described below provides in-depth evaluation of the home buyout program to assess the value of damages and losses avoided during the 2010 flood and expected avoided damages and losses over the next 75 years as well as potential secondary benefits. Cost-benefit analysis for a 75-year time horizon was also performed to justify replication of the buyout program in other areas of the Nashville community and beyond. Finally, the damages losses avoided during the 2010 flood due to development restrictions in high-risk flood areas was also evaluated.

Existing data on prior buyouts as well as proposed buyout properties from MWS along with local parcel data from Metro, U.S. Census data, and other high resolution datasets were obtained and used in applied spatial modeling and FEMA damage and loss algorithms, in an effort to develop a comprehensive business case for the buyout program and flood-plain development restrictions. In the study, four scenarios were considered for evaluation with a key focus on the flood in May 2010 which had significant impacts to the Nashville community and also served as a catalyst to expand the previously existing buyout program[3]. The scenarios considered were as follows:

- Scenario 1: Included all buyouts that took place between 2005 and 2010.
- Scenario 2: Assumed that no buyouts had taken place between 2005 and 2010.
- Scenario 3: Considered that all buyouts completed by 2017 were completed prior to 2010.
- Scenario 4: Homes currently under consideration for future buyouts as of June were considered to have been bought out prior to 2010.

[1] Nashville has a fairly proactive and aggressive freeboard requirement which was established in 1979 that requires new development in the 100 year floodplain to have a finished floor elevation four feet above base flood elevation.
[2] NIBS. 2017. "Natural Hazard Mitigation Saves: 2017 Interim Report." National Institute of Building Sciences Multihazard Mitigation Council, December 2017.
[3] Note: Several properties were purchased prior to the 2010 flood with FEMA and local mitigation funds, but only buyouts supported primarily by FEMA funds were considered in this evaluation. For properties purchased with FEMA mitigation funds, Metro only pays 12.5% of the total costs for acquisition, abatement, and demolition of the properties.

April 2018

Study of the Benefits of Metro's Floodplain Buyout Program Performed by Vanderbilt University (Continued)

For each scenario, analysis was performed using the R statistical package and geographic information systems (GIS) software. The analysis focused on estimating damages that would have resulted under 2010 flood levels for each scenario, the amount of impervious area removed and reduction in runoff due to less impervious area, amount of public greenspace created through acquisition of the properties, etc. By comparing Scenarios 1, 3, and 4 with Scenario 2 the expected value of avoided damages and relative benefits were estimated for the buyout program expansion.

Table 1: Summary of Value Provided by Buyout Activity Between 2005 and 2010 (Scenario 1)

Total Estimated Direct Damages of the May 2010 Flood	$3.5 B
Direct Flood Damages Avoided	$5.87 M
Expansion of Naturally Vegetated Greenspace	4 acres
Reduction in Stormwater Runoff (for a 100 year storm event)	197,000 gal.
Value of Runoff Reductions	$1.39 M
Benefit-Cost Ratio	3:1

As shown in Table 1 the expected value provided by buyouts conducted between 2005 and 2010 in terms of actual damages avoided during the May 2010 flood is about $5.87 M. This dollar value refers to structural and contents damages for 33 bought-out properties and additional monetary losses from temporary relocation of property residents and labor costs related to clean-up and rebuilding efforts. We estimate that for every dollar spent on buyouts prior to 2010 about 80 cents in damages during the May2010 floods was avoided. Over a 75 year time horizon a 3:1 benefit-cost ratio for the buyout of these homes is expected. (More information can be obtained in the full report.)

In comparison, the expected value, in terms of damaged and losses avoided during the May 2010 flood, given the hypothetical scenario where all of the homes bought out by 2017 and all the homes currently under consideration for future buyouts are considered to have been bought out prior to 2010, is about $50 M. In this scenario for every dollar that would have been spent on buyouts an expected dollar in flood damages during the May 2010 floods would have been avoided. In addition, in this scenario about 398 homes and an estimated 980 residents of those homes would have not been exposed to or damaged by, the May 2010 floods. The long-term benefit-cost ratio for this scenario is about 4:1. This scenario highlights the relative advantages provided by pro-active adoption of an expanded buyout program.

Table 2: Summary of Expected Value Provided by Expansion of the Buyout Program (Scenario 4)

Direct Flood Damages Avoided	$50 M
Persons Removed from Harm's Way	980
Expansion of Naturally Vegetated Greenspace	51 acres
Reduction in Stormwater Runoff (for a 100 year storm event)	2.1 M gal.
Value of Runoff Reductions	$14.7 M
Benefit-Cost Ratio[3]	4:1

In total, buyout program activities through the year 2016 removed about 314 properties from high-risk flood areas (at a cost of about $39 M and at an estimated long-term benefit cost ratio of at least 4:1) and also created about 195 acres of publicly-owned greenspace in the Metro area. In addition, the study found that without the four-foot freeboard requirement in place since 1979, increased inundation of structures with reported flood damage during 2010 would have resulted in about $2.2 B in additional damages across the county.

Overall, the buyout program seems to be well worth the investment with a positive reduction in damages and benefit to the community far outweighing the costs. On average, each home bought-out is expected to provide between $500,000 to $700,000 of value in damages avoided over a 75-year time horizon. Similarly, the freeboard requirement is doing just what was intended, preventing damages for properties. This business case can be used

2

April 2018

Study of the Benefits of Metro's Floodplain Buyout Program Performed by Vanderbilt University (Continued)

to aid the decision-making processes by providing an assessment of direct and indirect costs associated with mitigation/adaptation efforts already implemented, and estimates of future costs and/or savings associated with different scenarios of adaptation implementation.

Example Summary Report from the TNSA "TAB" Public Education Program – Public Service Announcements (MWS contributing partner via TNSA)

Tennessee Stormwater Association
Tennessee Association of Broadcasters Public Education Program
Summary Report - November, 2017

Station (s)	City	Region	Units		Total
WUCT	Algood / Cookeville	Middle	14	$	64.00
WMPS	Bartlett	West	18	$	900.00
WBXE FM	Baxter / Cookeville	Middle	10	$	60.00
WMOD FM	Bolivar	West	35	$	262.50
WRKM	Carthage	Middle	3	$	24.00
WUCZ FM	Carthage	Middle	2	$	20.00
WDEF FM	Chattanooga	East	7	$	315.00
WDOD FM	Chattanooga	East	7	$	315.00
OTLW HD	Clarksville	Middle	7	$	105.00
WCVQ FM	Clarksville	Middle	6	$	180.00
WCVQ HD 2- SUNNY	Clarksville	Middle	10	$	150.00
WKFN	Clarksville	Middle	6	$	180.00
WRND FM	Clarksville	Middle	5	$	150.00
WVVR FM	Clarksville	Middle	4	$	120.00
WZZP FM	Clarksville	Middle	5	$	150.00
WYSH AM	Clinton	East	30	$	300.00
WCRV	Collierville / Memphis	West	3	$	66.00
WKOM FM	Columbia	Middle	30	$	247.50
WKRM	Columbia	Middle	30	$	232.50
WGSQ FM	Cookeville	Middle	4	$	180.00
WHUB	Cookeville	Middle	2	$	30.00
WKSW FM	Cookeville	Middle	5	$	125.00
WPTN AM / FM	Cookeville	Middle	7	$	98.00
WKBL	Covington	West	60	$	900.00
WKBQ FM	Covington	West	60	$	1,500.00
WAEW AM / FM	Crossville	Middle	6	$	90.00
WCSV	Crossville	Middle	6	$	90.00
WOWF FM	Crossville	Middle	6	$	240.00
WPBX	Crossville	Middle	5	$	150.00
WASL FM	Dyersburg	West	291	$	2,910.00
WTRO AM	Dyersburg	West	281	$	2,810.00
WEKR	Fayetteville	Middle	60	$	600.00
WYTM FM	Fayetteville	Middle	60	$	600.00
WMRO	Gallatin	Middle	7	$	49.00
WQZQ AM / FM	Goodlettsville / Nashville	Middle	17	$	425.00
WMYL FM	Halls Crossroads	East	30	$	600.00
WDXI	Jackson	West	20	$	120.00
WMXX	Jackson	West	20	$	120.00
WKPT AM / FM	Kingsport	East	15	$	150.00
WRZK FM	Kingsport	East	20	$	300.00
WTFM FM	Kingsport	East	15	$	825.00
WCYQ FM	Knoxville	East	2	$	70.00
WKHT FM	Knoxville	East	2	$	60.00
WNOX FM	Knoxville	East	2	$	50.00
WWST FM	Knoxville	East	2	$	80.00
WBUZ FM	LaVergne / Nashville	Middle	17	$	1,700.00
WBUZ FM-D3	LaVergne / Nashville	Middle	18	$	450.00
WANT FM	Lebanon	Middle	11	$	154.00
WJJM	Lewisburg	Middle	10	$	88.50
WJJM FM	Lewisburg	Middle	10	$	66.50

Example Summary Report from the TNSA Public Education Program – Public Service Announcements (MWS contributing partner via TNSA) (Continued)

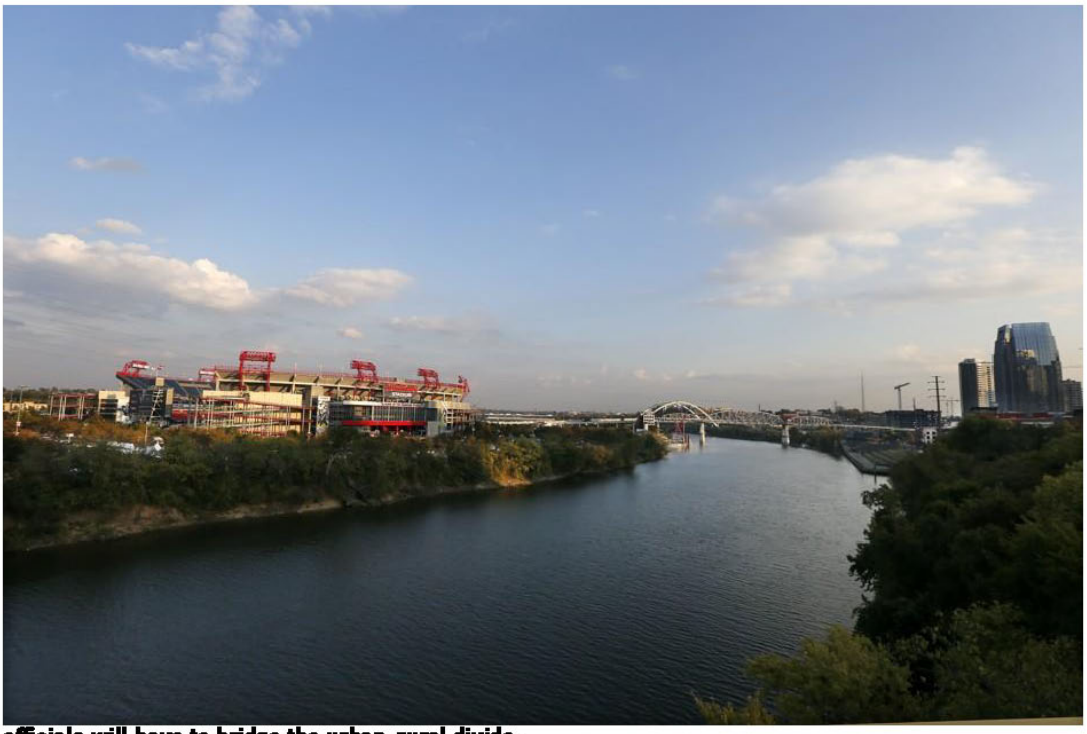
WZLT	Lexington TN	West	60	$	540.00
WLIV	Livingston	Middle	11	$	60.50
WLIV FM	Livingston	Middle	11	$	99.00
WLQK FM	Livingston / Cookeville	Middle	5	$	30.00
WCMT	Martin	West	118	$	1,416.00
WCMT FM	Martin	West	135	$	1,620.00
WCDZ FM	Martin/Dresden	West	28	$	336.00
WHDM AM / FM	McKenzie	West	15	$	60.00
WAKI	McMinnville	Middle	6	$	30.00
WBMC	McMinnville	Middle	6	$	48.00
WOWC FM	McMinnville	Middle	6	$	72.00
WTRZ FM	McMinnville	Middle	6	$	60.00
IDIA AM	Memphis	West	8	$	80.00
IEGR FM	Memphis	West	8	$	80.00
IHAL FM	Memphis	West	8	$	80.00
IHRK FM	Memphis	West	8	$	80.00
IREC	Memphis	West	8	$	80.00
KJMS FM	Memphis	West	4	$	400.00
KWNW FM	Memphis	West	8	$	520.00
RJMS FM	Memphis	West	8	$	80.00
RWNW FM	Memphis	West	8	$	80.00
WDIA	Memphis	West	8	$	560.00
WEGR FM	Memphis	West	7	$	560.00
WHAL FM	Memphis	West	7	$	560.00
WHBQ AM	Memphis	West	18	$	900.00
WHRK FM	Memphis	West	4	$	400.00
WLFP	Memphis	West	8	$	80.00
WLOK	Memphis	West	4	$	160.00
WMC	Memphis	West	3	$	30.00
WMC FM	Memphis	West	13	$	130.00
WMFS	Memphis	West	7	$	70.00
WREC	Memphis	West	8	$	640.00
WRVR FM	Memphis	West	21	$	210.00
WKXD FM	Monterey / Cookeville	Middle	1	$	6.00
WCRK FM	Morristown	East	7	$	112.00
WMTN	Morristown	East	15	$	180.00
BNRQ	Nashville	Middle	2	$	150.00
BSIX	Nashville	Middle	2	$	150.00
WCJK FM	Nashville	Middle	73	$	5,475.00
WCRT	Nashville	Middle	3	$	39.00
WECV FM	Nashville	Middle	3	$	57.00
WGFX FM	Nashville	Middle	7	$	525.00
WJXA FM	Nashville	Middle	73	$	8,212.50
WKDF FM	Nashville	Middle	2	$	300.00
WLAC	Nashville	Middle	3	$	225.00
WNRQ FM	Nashville	Middle	1	$	75.00
WQQK FM	Nashville	Middle	8	$	160.00
WSM FM	Nashville	Middle	5	$	100.00
WWTN FM	Nashville	Middle	7	$	140.00
WLIK	Newport	East	11	$	88.00
WAKQ FM	Paris	West	5	$	20.00
WLZK FM	Paris	West	15	$	60.00
WMUF FM	Paris	West	18	$	72.00
WRQR AM / FM	Paris	West	14	$	56.00
WTPR AM / FM	Paris	West	6	$	24.00

Example Summary Report from the TNSA Public Education Program – Public Service Announcements (MWS contributing partner via TNSA) (Continued)

WBFG	Parkers Crossroads	West	60	$	600.00
WPRT FM	Peagram / Nashville	Middle	17	$	1,700.00
WPRT FM-D2	Peagram / Nashville	Middle	18	$	450.00
WKWX FM	Savannah	West	90	$	450.00
WORM	Savannah	West	20	$	120.00
WORM FM	Savannah/ Clifton	West	20	$	120.00
WXOQ	Selmer/Bolivar	West	20	$	120.00
WUUQ FM	South Pittsburg / Chattanooga	East	7	$	315.00
WSMT	Sparta	Middle	6	$	120.00
WTZX	Sparta	Middle	6	$	24.00
WTNV FM	Tiptonville / Dyersville	West	271	$	2,710.00
WGOC	Tri-Cities	East	6	$	240.00
WJCW	Tri-Cities	East	4	$	160.00
WKOS	Tri-Cities	East	6	$	240.00
WQUT	Tri-Cities	East	5	$	200.00
WXSM	Tri-Cities	East	5	$	200.00
KYTN FM	Union City	West	30	$	450.00
WENK	Union City	West	9	$	90.00
WQAK FM	Union City	West	30	$	450.00
WWKF	Union City	West	9	$	90.00
TOTALS:			**2806**	**$**	**54,699.50**

Online News Article about Nashville's Programs to Reduce Flooding

CITYLAB
www.citylab.com



officials will have to bridge the urban-rural divide.

When the remnants of Hurricane Harvey pushed north earlier this month, it rained nine inches in one day in Bordeaux-Whites Creek, a neighborhood in northern Nashville, Tennessee. The creek itself, which winds through a lower-income community, rose 13 feet, prompting officials to order residents to evacuate. Some left their homes, others stayed put. The dangerous event received little fanfare—in this area of the city, flooding is nothing new.

Exacerbated by the effects of climate change, flooding is becoming more intense and common even in inland states like Tennessee. Nashville has been working to mitigate that risk since an historic flood in 2010, when 13 inches fell during a 36-hour period and the Cumberland River crested at 51 feet in downtown. After Harvey blew through Nashville, the call for action is even stronger, leading the mayor to push for a flood wall system to protect the city's downtown tourist hub.

Online News Article about Nashville's Programs to Reduce Flooding (Continued)

With a steady influx of new residents and millions of visitors every year, developers are scrambling to keep up with Nashville's rapid growth. There's a sense of urgency to protect the city's growing tourist economy, but many people are worried the flood wall is just a quick fix, leaving out communities in floodplains like Bordeaux-Whites Creek that have struggled to deal with chronic flooding and stormwater problems.

"We have 100 years' worth of decisions we're trying to go back and confront, and at the same time with climate change, the predictability of the weather is less certain. We can't really predict what the consequences are going to be precisely for our city," says David Briley, vice mayor of Nashville.

Online News Article about Nashville's Programs to Reduce Flooding (Continued)

The flood that changed the city

"Nashville is a water-rich city," says Sonia Allman, communications manager at Metro Water Services and a Nashville native. The Cumberland River winds through the city, and hundreds of creeks, wetlands, and streams crisscross middle Tennessee's hills and valleys. "It's a true benefit to us, but we are susceptible to flooding—especially flash flooding," Allman says.

Tennessee's major cities have warmed by around 2 degrees Fahrenheit since 1950, and extreme rainfall events in the Southeast have become more intense. On average, it floods every 10 days in Tennessee, according to Pew Research. When the flash flood struck in 2010, 26 people died in middle Tennessee and western Kentucky. Nearly 11,000 properties in Davidson County, where Nashville is located, were destroyed; the city had $2 billion in private property damage and $120 million in public infrastructure damage.

Opryland Hotel, Grand Ole Opry, and Opry Mills mall were flooded in 2010. (MJ Mascilli Jr/Reuters)

Up until the 1980s, Allman says, there were hardly any regulations on how close to waterways people could build homes and businesses, or how high up those strucutres had to be. Nashville has gotten much more progressive in its building codes over time, but after the flood, the city took more direct action, requiring homes to be built four feet above the base flood elevation. The city ramped up flood protection programs and obtained more funding from the federal government to buy out homes in the floodplains rather than spending money to repair and rebuild them after storm events.

Online News Article about Nashville's Programs to Reduce Flooding (Continued)

To date, the city has bought out 261 homes, demolished them, and turned the lots into green spaces, such as parks, community gardens, and fields. This year, Nashville has its sights on acquiring 89 more homes.

Many of the lower-lying areas are low-income, Allman says. When the homes are bought out, however, the city's hands are off of it, and it's up to the residents to find a new place to live—something that's becoming increasingly difficult in this rapidly growing region.

"As people are coming and areas change, [flooding education] has to be the constant. We can't forget and become complacent."

A good chunk of the people who now live in the Music City weren't there to witness the devastation of the 2010 flooding. At that time, about 600,000 people lived in Nashville. By 2016, that number had spiked to 660,000—and it's still climbing. According to census data, from 2015 to 2016, the city grew by 100 people per day. The 14-county Nashville region now has more than 1.8 million people.

Some of these newcomers are applying to build along waterways or in flood plains, or canceling their flood insurance, even though city officials repeatedly notify them about the risks. "People think it's safe from flooding here—like if you move to Louisiana, okay, it will flood, but in Nashville it doesn't," Allman says. "As people are coming and areas change, [flooding education] has to be the constant. We can't forget and become complacent, because it could happen at any time."

Online News Article about Nashville's Programs to Reduce Flooding (Continued)

Finding a comprehensive solution

Local elected officials, nonprofits, businesses, and residents have been working on a comprehensive plan to address flooding in the region. The largest aspect is the mayor's latest proposal for $125 million flood wall and protection system, which includes a 2,100-foot-long flood wall that would protect the heart of downtown—where some of the worst of the flooding occurred in 2010—and a pumping station that could release water back into the Cumberland River and other waterways in the region, relieving some of the pressure on stormwater infrastructure throughout the city.

Mayor Megan Barry, who was elected in 2015, brought up the project for a vote this month after Hurricane Harvey hit Texas. "This is a critically important piece of infrastructure for the future of Nashville from an economic standpoint and from a cultural and residential perspective," she says.

But the project has been shot down twice in Metro Council in the last few years, since many members were opposed to spending so much money downtown instead of first addressing chronic flooding in other parts of the city, like Whites Creek. Some residents and experts also worry that the water pumped out of downtown will flood other areas of the city instead, like the popular neighborhood of East Nashville, on the opposite side of the river, or other communities downstream. (Meanwhile, Allman says Metro Water Services has done several studies that show that won't happen.)

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LORENA O'NEIL
SEP 2, 2015

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NATHANAEL JOHNSON
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If the council does approve it this year, Barry says it would still be another six months to finish designing the protection system before construction began. If the council votes the plan down, it means back to the drawing board, Briley says. "If we want to have mitigated risk, it's about a comprehensive decision on how we develop and preserve open space," he says. "But a persistent commitment to doing that regionally would be just as important in terms of preventing flooding in [the] region as opposed to doing any sort of single construction project."

Online News Article about Nashville's Programs to Reduce Flooding (Continued)

Each time a community in the watershed builds a new suburban neighborhood, or adds development properties, or paves a road, it potentially raises the risk of flooding in other parts of the region. Just 30 miles outside Nashville are many rural communities and thousands of acres of farmland—and many of them rely on the Cumberland River. Mitigating development and flood risks in the region requires these communities to work together with the city.

Tackling the problems in these nearby communities and suburbs is just as important as solving issues downtown, Briley says—but it's a slow process because of the urban-rural divide in Tennessee.

"It's a risk-management issue, so we don't feel like it's necessary to put a climate label on it."

A solution requires communicating the risks of climate change to a diverse array of communities—urban and rural, progressive and conservative—and acknowledging that the answers may look different for various places. For instance, Sumner County, a growing area north of Nashville, has experienced heavy precipitation in the last few years that has led to frequent flooding, says Gwen Griffith, program director for the Cumberland River Compact. Since 2010, Griffith has helped create climate adaptation and resilience courses and plans for rural communities in Sumner County and 38 other rural areas in the U.S. The Cumberland River Compact does risk-assessment studies on communities before working to plan and address climate-change impacts. But because places like Sumner County are so conservative, Griffith says the organization has to be careful about how it sends its message—which means avoiding too much talk of climate change right off the bat.

"We understand that this should not be a political issue, so we don't approach it as such," says Griffith. "It's a risk-management issue, so we don't feel like it's necessary to put a climate label on it, which gets [better] responses."

In Nashville, however, the message of climate change does resonate. During her tenure, Mayor Barry has created a Livable Nashville Committee, which works to reduce emissions, pollution, and waste. In June, she appointed a chief resilience officer to plan climate resilience strategies throughout the city. The local government has also created a database that the Army Corps of Engineers, U.S. Geological Survey, and Metro Water Services can access to better understand what areas are likely to flood. There's also a website residents can visit to access emergency information and learn about possible flooding events.

Online News Article about Nashville's Programs to Reduce Flooding (Continued)

Metro Water Services is also working on a plan to update Nashville's stormwater infrastructure: Earlier this year, the council approved a plan to hike water bills to address the city's aging rain drainage system, which has $207 million backlog of stormwater projects.

There will be many tests of these resilience strategies in the future, especially as Americans living on the coasts in places like Florida and Louisiana move to inland metro centers like Nashville: By 2100, the city could see nearly 53,000 new transplants fleeing rising seas. "Every generation is called upon to meet challenges, and [climate change] is ours," says Dodd Galbreath, professor of sustainability at Lipscomb University in Nashville, who is also on the Livable Nashville Committee. "It's kind of a catch-22. We can't wall off everything and pump everything—there isn't enough money in the world to manage the water. So at some point, we have to work with nature, and that is the place where Nashville finds itself now."

About the Author

Lyndsey Gilpin

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Lyndsey Gilpin is a journalist based in Louisville, Kentucky. Her work has appeared in *Harper's*, *High Country News*, *The Washington Post*, *The Atlantic*, *Outside*, and more. She is the editor of *Southerly*, a weekly newsletter about ecology and culture in the American South.

MWS PIO Public Education Program Activities during FY18

Metro Water Services Programs & Activities

Report Dates: From 7/1/17 to 6/30/18

532 Programs/Activities **11672 Students** **628 Adults**

ActivityType: **202 Programs/Activities**

TOTAL Teacher led activity	202 Programs/Activities	4782 Students	Adults
Videos: Splash-Water and Sewer, and The Journey of Your Water	**202 Programs/Activities**	**4782 Students**	**Adults**
8/15/2017	Glendale Elementary	4	80	4th grade
8/22/2017	Harpeth Valley Elementary	7	189	4th grade
8/30/2017	Inglewood Elementary	4	100	3rd and 4h grade
8/31/2017	Donelson Christian Academy	3	60	4th grade
9/12/2017	Cumberland Elementary	4	100	4th grade
9/20/2017	Granbery Elementary	4	100	4th grade
9/21/2017	Granbery Elementary	2	50	4th grade
9/22/2017	Robert E. Lillard Elem. @ Kings Lane	4	80	4th grade
9/25/2017	Jere Baxter Middle School Special Education classroom	1	4	middle school
9/26/2017	Pennington Elem.	3	75	4th grade
9/27/2017	Percy Priest Elem.	5	125	4th grade
9/29/2017	David Lipscomb Middle School	5	72	5th grade
10/2/2017	Carter-Lawrence Elementary Magnet	3	75	4th grade
10/4/2017	Shwab Elem.	3	75	4th grade
10/17/2017	Jackson, Andrew Elementary	5	125	4th grade
10/20/2017	Cotton, Hattie Elementary	3	60	4th grade
10/27/2017	Westmeade Elem.	4	100	4th grade
10/30/2017	Gower Elementary	6	150	4th grade
10/31/2017	Green, Julia Elementary	2	50	4th grade
11/2/2017	Green, Julia Elementary	2	50	4th grade
11/3/2017	Lakeview Elem. Design Center	5	125	4th grade
11/6/2017	Hermitage Elementary	3	69	4th grade
11/16/2017	Dupont Elementary	3	75	4th grade
11/17/2017	Tulip Grove Elem.	5	125	4th grade
11/27/2017	Warner Elem. Enhanced Option	4	80	4th grade

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MWS PIO Public Education Program Activities during FY18 (Continued)

11/28/2017	Una Elem.	4	100	4th grade
11/29/2017	Una Elem.	3	75	4th grade
12/4/2017	Glenview Elementary	5	105	4th grade
12/5/2017	Glenn Elementary Enhanced Option	2	50	4th grade
12/8/2017	David Lipscomb Elementary School	4	80	3rd grade
12/11/2017	Moss, J.E. Elementary	7	175	4th grade
12/12/2017	Crieve Hall Elementary	2	50	4th grade
12/13/2017	Crieve Hall Elementary	2	50	4th grade
1/23/2018	Fall-Hamilton Elementary Enhanced Option	3	75	4th grade
1/24/2018	Maxwell Elementary School	3	75	4th grade
1/25/2018	McGavock Elem.	3	60	4th grade
1/26/2018	Tom Joy Elem.	4	80	4th grade
1/29/2018	Haywood Elementary	5	125	4th grade
2/2/2018	Ruby Major Elem.	3	75	4th grade
2/5/2018	Ruby Major Elem.	2	50	4th grade
2/6/2018	Tusculum Elem.	4	100	4th grade
2/7/2018	Tusculum Elem.	4	100	4th grade
2/8/2018	Old Center Elem.	3	63	4th grade
2/9/2018	Amqui Elementary	5	106	4th grade
2/23/2018	Shayne Elem.	3	75	4th grade
2/26/2018	Waverly-Belmont Elementary School	2	42	4th grade
2/27/2018	Waverly-Belmont Elementary School	2	42	4th grade
3/5/2018	Napier Elem. Enhanced Option	2	60	4th grade
3/6/2018	Mt. View Elem.	3	75	4th grade
3/7/2018	Mt. View Elem.	3	75	4th grade
3/8/2018	Cole Elementary	3	75	4th grade
3/9/2018	Cole Elementary	3	75	4th grade
3/22/2018	Stratton Elem.	5	125	4th grade
3/26/2018	Hickman Elementary	4	100	4th grade
3/27/2018	Sylvan Park Elem. Paideia Design Ctr.	4	100	4th grade
4/23/2018	Green, Julia Elementary	6	150	4th grade
ActivityType:	**Afterschool Program**		**37**	**Programs/Activities**
TOTAL	**classroom program**	**37 Programs/Activities**	**749 Students**	**Adults**

Monday, August 27, 2018 **Page 2 of 11**

MWS PIO Public Education Program Activities during FY18 (Continued)

Build A Water System	12 Programs/Activities		265 Students	Adults
7/18/2017	Library: Watkins Park Branch	1	30 middle school	
9/18/2017	Brick Church Middle after school program	1	25 middle school	
9/20/2017	Antioch Middle after school program	1	25 middle school	
9/27/2017	Special Group After School Program, Nations Ministry Center	1	30 middle school	
9/28/2017	Special Group after school program, Nations Ministry Center	1	30 middle school	
10/3/2017	Community Center: Coleman Community Center after school program	1	15 middle school	
10/5/2017	Dupont Hadley Middle After School Program - CASE	1	20 middle school	
10/24/2017	Madison Middle School After School Program	1	20 Middle School	
10/26/2017	Dupont Tyler Middle after school program	1	20 middle school	
11/7/2017	Donelson Middle after school program	1	20 middle school	
11/9/2017	Special Group after school program for CASE	1	20 middle school	
2/22/2018	Special Group NAZA East Park Community Center	1	10 middle school	
Stormwater Control Measures	**4 Programs/Activities**		**82 Students**	**Adults**
2/12/2018	Thurgood Marshall Middle School	1	25 Middle school	
2/13/2018	Community Center: West park	1	15 middle school	
3/21/2018	Antioch Middle	1	20 middle school	
6/20/2018	Special Group NAZA summer engineering program at Glencliff HS	1	22 9th and 10th grade	
Water and Wastewater Enviroscape (after school)	**18 Programs/Activities**		**337 Students**	**Adults**
9/5/2017	Madison Middle School After School program	1	20 middle school	
9/6/2017	Antioch Middle after school program	1	25 middle school	
9/7/2017	Special Group After School progrm, Beech Creek Ministries Center for Imagination	2	20 middle school	

MWS PIO Public Education Program Activities during FY18 (Continued)

9/12/2017	Community Center: Coleman Community Center after school program	1	15	middle school
9/19/2017	John Early Middle Paideia Magnet after school program	1	25	middle school
10/4/2017	Dupont Hadley Middle After School Program - CASE	1	20	middle school
10/25/2017	Dupont Tyler Middle	1	20	Middle School
11/2/2017	Community Center: West park After School Program	1	10	middle school
11/6/2017	Donelson Middle after school program	1	20	middle school
11/8/2017	Special Group Aftger School Program for CASE	1	20	middle school
11/15/2017	Dupont Tyler Middle YMCA Z after school program	1	22	middle school
11/30/2017	Special Group East Park Community Center after school program	1	20	middle school
2/14/2018	Apollo Middle	1	20	middle school
2/27/2018	Dupont Tyler Middle	1	20	middle school
3/20/2018	Margaret Allen Middle	1	20	middle school
4/25/2018	YMCA YCAP program	2	40	middle school
Water Fun & Games (afterschool)	**3 Programs/Activities**		**65 Students**	**Adults**
12/7/2017	Special Group McCabe Community Center after school program	1	20	elementary school
12/11/2017	Special Group McCabe Community Center after school program	1	20	elementary school
3/1/2018	Smith Springs Elementary School	1	25	elementary school
ActivityType: Classroom Program			**227 Programs/Activities**	
TOTAL Classroom Program	**227 Programs/Activities**		**5586 Students**	**Adults**
Career Fair	**4 Programs/Activities**		**80 Students**	**Adults**
5/16/2018	Lakeview Elem. Design Center Jenn Harrman	4	80	elementary
Enviroscape	**7 Programs/Activities**		**175 Students**	**Adults**
1/30/2018	Hume Fogg High Magnet	2	50	9th grade
1/31/2018	Hume Fogg High Magnet	2	50	9th grade
5/8/2018	Donelson Middle	3	75	5th grade

MWS PIO Public Education Program Activities during FY18 (Continued)

The Water Cycle & Me	209 Programs/Activities		5136 Students	Adults
7/6/2017	Special Group summer camp	1	20	elementary
7/13/2017	Special Group Owls Hill summer camp	1	20	elementary
7/20/2017	Special Group Owls Hill summer camp	1	20	elementary
7/27/2017	Special Group Owls Hill summer camp	1	20	elementary
8/15/2017	Glendale Elementary	4	80	4th grade
8/22/2017	Harpeth Valley Elementary	3	189	4th grade
8/23/2017	Special Group Madison Campus School, Seventh Day Adventist	3	75	elementary and middle school
8/30/2017	Inglewood Elementary	4	100	3rd and 4th grade
8/31/2017	Donelson Christian Academy	3	60	4th grade
9/12/2017	Cumberland Elementary	4	100	4th grade
9/20/2017	Granbery Elementary	4	100	4th grade
9/21/2017	Granbery Elementary	2	50	4th grade
9/22/2017	Robert E. Lillard Elem. @ Kings Lane	4	80	4th grade
9/25/2017	Jere Baxter Middle School Special Education classroom	1	4	middle school
9/26/2017	Pennington Elem.	3	75	4th grade
9/27/2017	Percy Priest Elem.	5	125	4th grade
9/29/2017	David Lipscomb Middle School	5	72	5th grade
10/2/2017	Carter-Lawrence Elementary Magnet	3	75	4th grade
10/4/2017	Shwab Elem.	3	75	4th grade
10/17/2017	Jackson, Andrew Elementary	5	125	4th grade
10/20/2017	Cotton, Hattie Elementary	3	60	4th grade
10/27/2017	Westmeade Elem.	4	100	4th grade
10/30/2017	Gower Elementary	6	150	4th grade
10/31/2017	Green, Julia Elementary	2	50	4th grade
11/2/2017	Green, Julia Elementary	2	50	4th grade
11/3/2017	Lakeview Elem. Design Center	5	125	4th grade
11/6/2017	Hermitage Elementary	3	69	4th grade

MWS PIO Public Education Program Activities during FY18 (Continued)

11/16/2017	Dupont Elementary	3	75	4th grade
11/17/2017	Tulip Grove Elem.	3	125	4th grade
11/27/2017	Warner Elem. Enhanced Option	4	80	4th grade
11/28/2017	Una Elem.	4	100	4th grade
11/29/2017	Una Elem.	3	75	4th grade
12/4/2017	Glenview Elementary	5	105	4th grade
12/5/2017	Glenn Elementary Enhanced Option	2	50	4th grade
12/8/2017	David Lipscomb Elementary School	4	80	3rd grade
12/11/2017	Moss, J.E. Elementary	4	175	4th grade
12/12/2017	Crieve Hall Elementary	2	50	4th grade
12/13/2017	Crieve Hall Elementary	2	50	4th grade
1/23/2018	Fall-Hamilton Elementary Enhanced Option	3	75	4th grade
1/24/2018	Maxwell Elementary School	3	75	4th grade
1/25/2018	McGavock Elem.	3	60	4th grade
1/26/2018	Tom Joy Elem.	4	80	4th grade
1/29/2018	Haywood Elementary	5	125	4th grade
1/31/2018	Special Group after school program for EL family night	2	40	1st - 5th grades
2/2/2018	Ruby Major Elem.	3	75	4th grade
2/5/2018	Ruby Major Elem.	2	50	4th grade
2/6/2018	Tusculum Elem.	4	100	4th grade
2/7/2018	Tusculum Elem.	4	100	4th grade
2/8/2018	Old Center Elem.	3	63	4th grade
2/9/2018	Amqui Elementary	5	106	4th grade
2/23/2018	Shayne Elem.	3	75	4th grade
2/26/2018	Waverly-Belmont Elementary School	2	42	4th grade
2/27/2018	Waverly-Belmont Elementary School	2	42	4th grade
3/5/2018	Napier Elem. Enhanced Option	2	60	4th grade
3/6/2018	Mt. View Elem.	3	75	4th grade
3/7/2018	Mt. View Elem.	3	75	4th grade
3/8/2018	Cole Elementary	3	75	4th grade
3/9/2018	Cole Elementary	3	75	4th grade
3/22/2018	Stratton Elem.	5	125	4th grade

MWS PIO Public Education Program Activities during FY18 (Continued)

3/26/2018	Hickman Elementary	4	100	4th grade
3/27/2018	Sylvan Park Elem. Paideia Design Ctr.	4	100	4th grade
4/16/2018	Akiva School	1	10	2nd grade
4/23/2018	Green, Julia Elementary	3	150	4th grade
6/5/2018	Special Group Summer Camp program - Camp GROW	1	12	elementary
6/7/2018	Special Group Interns did program, Summer Camp-Owl's Hill	1	15	elementary
6/12/2018	Special Group interns did program, summer camp - Camp GROW	1	12	elementary
6/14/2018	Special Group Interns did program, summer camp - Owl's Hill	1	15	elementary
6/15/2018	Martha O'Bryan Center	2	60	elementary
6/21/2018	Special Group Interns did program, summer camp - Owl's Hill	1	15	elementary
6/26/2018	Special Group Interns did program, summer camp - Camp GROW	1	10	elementary
6/28/2018	Special Group Interns did program, summer camp - Owl's Hill	1	10	elementary
Water and Wastewater EnviroScape	**6 Programs/Activities**		**180 Students**	**Adults**
4/30/2018	Croft Middle Design Center	4	120	6th grade
5/3/2018	Croft Middle Design Center	2	60	6th grade
Water Fun & Games	**1 Programs/Activities**		**15 Students**	**Adults**
7/5/2017	Special Group Interns presented program to summer camp group at KRH while older kids toured	1	15	elementary
ActivityType: Community Outreach Event			**16 Programs/Activities**	
TOTAL Booth	**2 Programs/Activities**		**Students**	**Adults**
Booth/Table	**2 Programs/Activities**		**Students**	**Adults**
7/14/2017	Special Event High School Intern Celebration - interns staffed booth	1		
9/15/2017	Special Event Park(ing) Day - water and wastewater treatment mini-golf activity	1		
9/30/2017	Special Event Neighborhood Celebration at Elizabeth Park			
TOTAL Community Outreach Event	**1 Programs/Activities**		**Students**	**Adults**
Water & Booth	**1 Programs/Activities**		**Students**	**Adults**
10/7/2017	Special Event Jockey box and water and wastewater min-golf	1		

MWS PIO Public Education Program Activities during FY187 (Continued)

TOTAL Event		**6 Programs/Activities**		**73 Students**	**100 Adults**
Special Event		**5 Programs/Activities**		**73 Students**	**100 Adults**
7/26/2017	Teachers MNPS Prof Dev Day - promoted school programs and tours	1			25
9/28/2017	Cumberland River Compact Jenn Harrman, River Talk: Sheep on Metro Center Levee	1			25
10/12/2017	Special Event 2 Schools participate in Imagine a Day Without Water by providing artwork		73	4th and 5th grade	
10/13/2017	Special Group Presentation at Southeast Stormwater Association Conference	1			50
11/16/2017	Special Group ASCE/EWRI Conference - SCM post-construction oversight presentation	1			
12/2/2017	Special Event Nashville Gas Christmas Parade	1			
Splash Mascot Appearance		**1 Programs/Activities**		**Students**	**Adults**
2/15/2018	Belmont University Basketball game	1			
TOTAL Provide Water		**7 Programs/Activities**		**Students**	**Adults**
Jockey Box		**2 Programs/Activities**		**Students**	**Adults**
7/30/2017	Cumberland River Compact Water fest	1			
9/9/2017	Wine on the River	1			
Water Fountain		**4 Programs/Activities**		**Students**	**Adults**
7/4/2017	Hot Chicken Festival	1			
7/29/2017	Brewers Festival	1			
9/8/2017	State Fair Multi Day Event 9/8-9/17	1			
4/21/2018	Earth Day Festival	1			
Water Truck		**1 Programs/Activities**		**Students**	**Adults**
9/9/2017	Dragon Boat & River Festival	1			
ActivityType: Community Presentation				**3 Programs/Activities**	
TOTAL Program		**2 Programs/Activities**		**15 Students**	**75 Adults**
Wise Watering		**2 Programs/Activities**		**15 Students**	**75 Adults**
3/15/2018	Master Gardeners water pollution prevention and backflow prevention for gardeners	1			75
6/11/2018	Jr. Master Gardeners pollution prevention and backflow prevention for gardeners	1	15	middle school	
TOTAL Workshop		**1 Programs/Activities**		**Students**	**140 Adults**

MWS PIO Public Education Program Activities during FY18 (Continued)

TDEC Level One Erosion Control Workshop		**1 Programs/Activities**		**Students**	**140 Adults**
9/16/2017	TDEC	1			140
ActivityType: Tour			**47 Programs/Activities**		
TOTAL Tour: Biosolids		**8 Programs/Activities**		**64 Students**	**70 Adults**
Biosolids Facility Tour: Adults		**3 Programs/Activities**		**Students**	**66 Adults**
9/14/2017	Belmont University Environmental Science Class	1		college seniors	26
4/4/2018	Belmont University Environmental Science Class	1			20
4/5/2018	Belmont University Environmental Science Class	1			20
Biosolids Facility Tour: Students		**5 Programs/Activities**		**64 Students**	**4 Adults**
7/11/2017	Special Group MWS high school interns	1	4	high school	
8/17/2017	Special Group MWS college interns	1			4
10/16/2017	Vanderbilt School of Science & Math (High Schoo	1	30	9th grade	
10/23/2017	Nashville School of the Arts AP Environmental Science Class	1	18	11th & 12th grade	
11/7/2017	Goodpasture Christian School	1	12	high school	
TOTAL Tour: MWS Facilities		**1 Programs/Activities**		**Students**	**1 Adults**
Facilities Tour		**1 Programs/Activities**		**Students**	**1 Adults**
9/29/2017	Special Group CM-elect Antoinette Lee	1			1
TOTAL Tour: WTP		**21 Programs/Activities**		**253 Students**	**125 Adults**
K.R. Harrington Tour: Adults		**7 Programs/Activities**		**Students**	**125 Adults**
8/3/2017	Special Group MWS college interns	1			4
9/29/2017	Special Group Metro Public Health Dept. staf, exam prep	1			7
11/9/2017	Belmont University Biology class	1			26
11/15/2017	Belmont University Biology class	1			26
2/14/2018	Belmont University Environmental Science Class	1			24
2/15/2018	Belmont University Environmental Science Class	1			24

MWS PIO Public Education Program Activities during FY18 (Continued)

4/16/2018	University: TSU Environmental Health Class	1			14
K.R. Harrington Tour: Students	**13 Programs/Activities**		**238 Students**		**Adults**
7/5/2017	Special Group summer camp group	1	15	middle school	
10/16/2017	Vanderbilt School of Science & Math (High Schoo	1	30	9th grade	
10/24/2017	Hillsboro High	1	13	High School	
10/26/2017	Nashville School of the Arts AP Environmental Science Class	1	18	High School	
10/28/2017	GirlScouts Wonders of Water Program	1	10	4th grade	
11/15/2017	Special Group Madison Campus School garden club students	1	15	middle school	
11/30/2017	Goodpasture Christian School	1	12	high school	
2/28/2018	Home School Group	1	15	middle school	
3/2/2018	Howe, Cora Elementary Work based learning program	1	10	9th - 12th grade	
4/11/2018	Martin Luther King Magnet	2	50	high school	
4/12/2018	Martin Luther King Magnet	2	50	high school	
Omohundro Tour: Students	**1 Programs/Activities**		**15 Students**		**Adults**
10/26/2017	Maplewood High With Stansell Electric, PENCIL Partner for School	1	15	10th graded	
TOTAL Tour: WWTP	**17 Programs/Activities**		**150 Students**		**117 Adults**
White's Creek Tour: Adults	**5 Programs/Activities**		**Students**		**76 Adults**
7/31/2017	Special Group MWS college interns	1			4
4/4/2018	Belmont University Environmental Science class	1			15
4/5/2018	Belmont University Environmental Science Class	1			20
4/17/2018	Belmont University	1			18
4/18/2018	Belmont University	1			19
Whites Creek Tour: Students	**12 Programs/Activities**		**150 Students**		**41 Adults**
7/7/2017	Special Group NAZA Summerzone Program	1	22	high school	
9/14/2017	Belmont University Environmental Science class	1		college seniors	26

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MWS PIO Public Education Program Activities during FY18 (Continued)

10/16/2017	Vanderbilt School of Science & Math (High Schoo	1	30	9th grade	
10/17/2017	Special Group Beech Creek After School Program	1		middle school students	15
10/23/2017	Nashville School of the Arts AP Environmental Science Class	1	18	11th & 12th	
10/24/2017	Hillsboro High	1	13	High School	
10/25/2017	Goodpasture Christian School	1	12	High School	
2/21/2018	Montgomery Bell Academy	1	11	12th grade	
3/16/2018	Howe, Cora Elementary work based learning program	1	10	9th - 12th grade	
4/5/2018	Montgomery Bell Academy	2	25	12th grade	
4/24/2018	Harpeth Hall	1	9	12th grade	

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NPDES Public Education Events/Presentations during FY18

Date	Event	Education Type	Audience Number / Drains Marked	Audience	Target Audience/Pollutant
7/6/2017	Commonwealth Education	Brochure/Door Hanger Distribution	6	Residents on Commonwealth Circle	General Stormwater Pollution
3/16/2018	Collinsworth Road Door Hanger Distribution	Brochure/Door Hanger Distribution	4	Residents on Collinsworth Road	General Stormwater Pollution
3/18/2018	Door Hangers on Ewing Drive	Brochure/Door Hanger Distribution	4	Businesses on Ewing Drive	Leaves/Brush/Trash Dumping
6/27/2018	Oil leaking from parked vehicle	Brochure/Door Hanger Distribution	6	Residential	Maintenance Activities
Brochure/Door Hanger Total			**20**		
7/12/2017	Storm Drain Marking at Cedar creek Drive	Drain Stenciling/Marking	8	Residents along Cedar creek Drive and Place	General Stormwater Pollution
Storm Drain Stenciling Total			**8**		
8/26/2017	Nashville Urban Runoff 5K and Water Quality Festival	Citywide Event	350		General Stormwater Pollution
5/19/2018	Rain Barrel Pickup Event	Citywide Event	500	Rain Barrel Customers	General Stormwater Pollution
7/30/2017	CRC Waterfest	Citywide Event	300	Attendees at Waterfest	General Stormwater Pollution
9/9/2017	Dragon Boat Festival	Citywide Event	250	Dragon Boat Festival Attendees	General Stormwater Pollution
2/15/2018	Belmont Basketball Event	Citywide Event	60	Families attending Community Night	General Stormwater Pollution
3/1/2018	Nashville Lawn and Garden Show	Citywide Event	550	Lawn and Garden Show Attendees	General Stormwater Pollution
4/12/2018	Nashville State Community College Spring Fling/Earth Day	Citywide Event	40	Students at Nashville State Community College	General Stormwater Pollution
4/20/2018	Party for the Planet-Nashville Zoo	Citywide Event	100	Party for the Planet Attendees	General Stormwater Pollution
4/21/2018	Nashville Earth Day Festival	Citywide Event	600	Earth Day Festival Attendees	General Stormwater Pollution
4/23/2018	Lipscomb University Earth Day	Citywide Event	25	Students at Lipscomb University	General Stormwater Pollution
Citywide Public Education Event Total			**2,775**		
10/20/2017	Lawn Waste Mail Out	Mail-out	291	Vosswood Neighborhood	Leaves/Brush/Trash Dumping
11/27/2017	Yard Waste Removal Post Card	Mail-out	208	Local Residents	Leaves/Brush/Trash Dumping
1/3/2018	Yard Waste Post Card Mail-Out	Mail-out	12	Residents on Hogan Rd.	Leaves/Brush/Trash Dumping
4/18/2018	Email notice	Mail-out	189	Grading permit related - Development Community	Construction/Development Education
4/18/2018	Email notice	Mail-out	863	Grading permit related - Development Community	Construction/Development Education
6/20/2018	Fieldcrest Neighborhood Mail Out	Mail-out	36	Fieldcrest Residents	Leaves/Brush/Trash Dumping
6/22/2018	Oil Disposal Letter	Mail-out	9	Wildview Drive Residents	Oil and Grease
Mail-outs/Email Education Total			**1,608**		

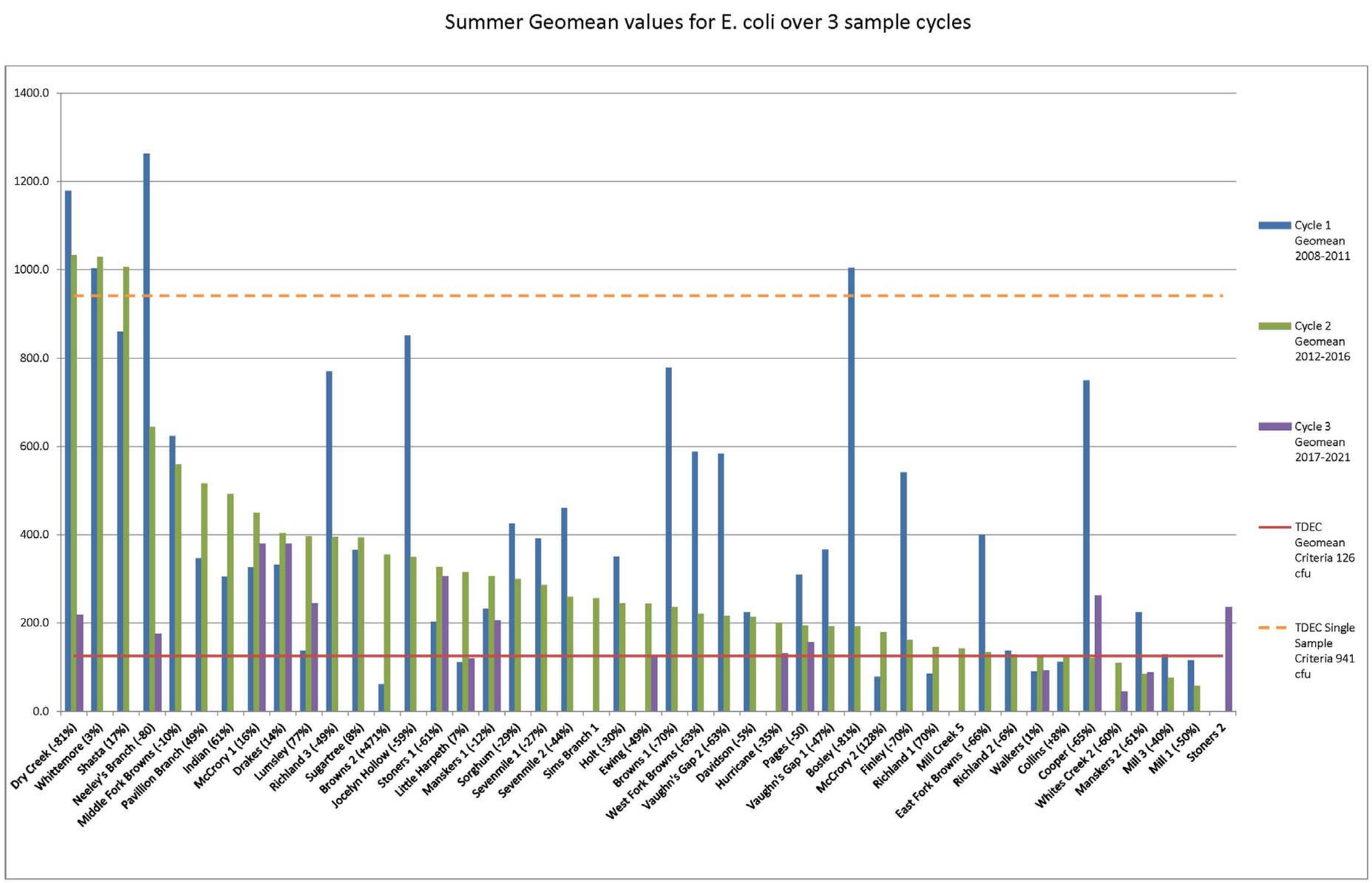
NPDES Public Education Events/Presentations during FY18 (Continued)

Date	*Event*	Education Type	Audience Number / Drains Marked	Audience	Target Audience/Pollutant
1/30/2018	Stormwater Maintenance Crews Training	Metro Employee MS4 Compliance	40	Metro Stormwater Maintenance Crews	MS4 Permit Compliance
2/7/2018	Stormwater Maintenance Crews Make Up Training	Metro Employee MS4 Compliance	15	Stormwater Maintenance Crews	MS4 Permit Compliance
2/15/2018	SCM Inspection & Maintenance - Internal Metro Stakeholder Meeting	Metro Employee MS4 Compliance	25	SCM Metro Stakeholders	MS4 Permit Compliance
7/26/2017	Bioretention Life after Construction Workshop	Presentation	12	MWS Development Services	SCM Inspection/Maintenance
9/6/2017	TDEC Level I Certification	Presentation	145	Prospective Level 1 EPSC Professionals	Construction/Development Education
10/13/2017	Southeast Stormwater Association Conference	Presentation	60	Professionals	Construction/Development Education
10/17/2017	TNSA New MS4 Orientation/Table Discussion	Presentation	10	New MS4s in TN	MS4 Permit Compliance
10/19/2017	TNSA Presentation	Presentation	25	Tennessee MS4s	MS4 Permit Compliance
10/19/2017	TNSA Dog Park Presentations	Presentation	20	Tennessee MS4s	MS4 Permit Compliance
11/7/2017	Operation & Maintenance of Stormwater Control Measures	Presentation	50	Conference Attendees	SCM Inspection/Maintenance
11/14/2017	TDEC UT SCM Certification Class	Presentation	15	Certification Class Attendees	SCM Inspection/Maintenance
3/28/2018	Davidson County Soil Conservation District Board Meeting	Presentation	10	Board Members	MS4 Permit Compliance
4/12/2018	AWRA Presentation	Presentation	75	AWRA Conference Attendees	SCM Inspection/Maintenance
5/4/2018	Pressure Washing Education Event	Presentation	at	Local Power Washing Companies	Pressure Washing
5/24/2018	CRC - River Talk	Presentation	40	Local MS4 Operators	SCM Inspection/Maintenance
5/31/2018	TDEC Level I Certification	Presentation	160	Prospective Level 1 EPSC Professionals	Construction/Development Education
10/14/2017	Cumberland River Compact Green Streets	Public/Group Meeting	50	Local Residents	General Stormwater Pollution
Presentation/Metro Training/Group Meetings Total			**752**		

NPDES Public Education Events/Presentations during FY18 (Continued)

Date	Event	Education Type	Audience Number / Drains Marked	Audience	Target Audience/Pollutant
7/1/2017	SM Campaign Post - Scoop the Poop	Social Media Post	830	Twitter/Facebook	Pet Waste
7/5/2017	SM Campaign Post - AAD	Social Media Post	234	Twitter	General Stormwater Pollution
7/5/2017	SM Campaign Post - AAD	Social Media Post	234	Twitter	General Stormwater Pollution
7/12/2017	Regular SM Editorial Calendar	Social Media Post	193	Twitter	Leaves/Brush/Trash Dumping
10/31/2017	Regular SM Editorial Calendar	Social Media Post	480	Twitter/Instagram	General Stormwater Pollution
11/5/2017	Targeted SM Post - rain	Social Media Post	359	Twitter Followers	General Stormwater Pollution
11/9/2017	Regular SM Editorial Calendar	Social Media Post	973	Facebook/Twitter Followers	General Stormwater Pollution
11/18/2017	Regular SM Editorial Calendar	Social Media Post	1,081	Facebook/Twitter Followers	Leaves/Brush/Trash Dumping
11/26/2017	Regular SM Editorial Calendar	Social Media Post	4,174	Twitter/Facebook Followers	Leaves/Brush/Trash Dumping
2/16/2018	Regular SM Editorial Calendar	Social Media Post	387	Twitter Users	Fertilizer/Pesticides
2/20/2018	Regular SM Editorial Calendar	Social Media Post	351	Twitter users	General Stormwater Pollution
3/16/2018	Regular SM Editorial Calendar	Social Media Post	1,275	Twitter and Facebook Users	Leaves/Brush/Trash Dumping
3/23/2018	Regular SM Editorial Calendar	Social Media Post	462	Twitter and Instagram Users	Pet Waste
3/23/2018	Regular SM Editorial Calendar	Social Media Post	715	Facebook Twitter Instagram Users	Pet Waste
4/3/2018	Regular SM Editorial Calendar	Social Media Post	5,551	Facebook/Twitter users	General Stormwater Pollution
4/16/2018	Regular SM Editorial Calendar	Social Media Post	1,658	Facebook/Twitter users	General Stormwater Pollution
4/17/2018	Regular SM Editorial Calendar	Social Media Post	679	Twitter users	Pet Waste
5/14/2018	Targeted SM Post - River Talk	Social Media Post	1,405	Facebook/Twitter users	SCM Inspection/Maintenance
All Education Total			**31,367**		

NPDES Watershed Group Sampling Data Analysis of E. coli Trends within Davidson County Watersheds



Metro Department of Public Works Waste Collection During FY18

	July	August	September	October	November	December	January	February	March	April	May	June	Total
Recycling													
Curbside Recycling/In-house Recycling/Recycling Dumpsters													
Mixed Recyclables	**967.54**	**957.46**	**1,166.58**	**996.09**	**976.94**	**1,110.64**	**1,027.85**	**1,084.93**	**998.03**	**1,118.17**	**1,012.94**	**1,162.16**	**12,579.33**
Household Hazardous Waste Facility													
Oil	3.52	2.74	1.2	2.32	3.62	0	0	0.8	2.6	3.22	4.47	5.06	29.55
Anti-Freeze	1.66	1.14	0.9	1.26	1.34	0	1.12	2.3	0.62	0.94	2.7	0.4	14.38
Electronics	0	26.5	12.57	16.54	13.38	23.6	0	0	5.39	0	3.08	41.24	142.30
Batteries	0	0	0	0	0	0	0	0	0	0	0	0	-
Tanks	0	0	0	0	0	0	0	0	0	0	0	0	-
Clean Harbors	0	11.05	1.12	1.48	0	0.72	0	9.92	0	1.47	17.44	6.64	49.84
Monthly Totals	**5.18**	**41.43**	**15.79**	**21.6**	**18.34**	**24.32**	**1.12**	**13.02**	**8.61**	**5.63**	**27.69**	**53.34**	**236.07**
Drop Off Recycling Centers & Convenience Centers													
Carpet/Carpet Pad	12.41	2.19	2.92	11.68	2.19	13.14	4.38	3.65	3.65	4.38	4.38	-	64.97
Mixed Recyclables	16.19	15.44	13.94	20.34	16.63	21.06	20.98	16.73	16.27	22.89	22.07	31.66	234.20
Aluminum & Tin	-	-	-	-	-	-	-	-	-	-	-	-	-
Glass	203.48	198.85	186.71	187.38	190.60	187.03	224.04	210.15	251.23	261.06	264.80	217.22	2,582.55
Mixed Paper	148.26	144.87	146.34	164.58	174.72	164.36	175.67	138.63	148.65	154.27	165.46	140.56	1,866.37
OCC	284.02	263.32	232.85	220.44	222.89	261.81	248.02	208.00	241.20	264.67	268.27	256.77	2,972.26
Plastic	51.06	48.01	42.55	48.32	52.58	41.56	52.65	40.93	41.99	48.41	53.99	49.04	571.09
Plastic Bottles & Metal Cans	31.81	31.15	29.33	29.56	28.87	25.36	32.95	27.17	28.73	35.58	39.19	36.08	375.78
Scrap Metal	56.18	69.88	44.29	52.06	37.94	42.45	32.88	46.43	92.47	64.90	83.92	87.13	710.53
Tires	-	581.01	877.67	596.29	317.67	1,038.95	328.80	790.77	455.50	671.82	122.20	1,679.85	7,460.53
Monthly Totals	**803.41**	**1,354.72**	**1,576.60**	**1,330.65**	**1,044.09**	**1,795.72**	**1,120.37**	**1,482.46**	**1,279.69**	**1,527.98**	**1,024.28**	**2,498.31**	**16,838.28**
Waste Collection													
Total Metro Public Works Trash Collection	3,513.55	4,302.27	3,802.52	3,767.23	4,059.13	3,556.69	3,435.66	3,493.74	3,845.66	3,984.75	4,311.33	3,916.60	45,989.13
Total Convenience Center Trash	1,790.58	1,736.10	1,651.28	1,656.53	1,703.28	1,649.17	1,524.79	1,549.94	2,317.28	2,365.08	2,548.65	2,545.92	23,038.60
Contracted Residential	7,560.61	8,756.56	8,046.39	7,412.55	8,437.83	7,532.25	7,935.64	7,250.27	8,283.90	7,783.08	9,317.75	8,376.34	96,693.17
Monthly Totals	**12,864.74**	**14,794.93**	**13,500.19**	**12,836.31**	**14,200.24**	**12,738.11**	**12,896.09**	**12,293.95**	**14,446.84**	**14,132.91**	**16,177.73**	**14,838.86**	**165,720.90**
Brush Collection													
Unground -- Metro	2,360.68	2,268.66	2,237.86	1,933.74	1,979.58	1,706.74	1,472.41	1,300.40	1,799.26	1,712.61	2,010.93	2,294.69	23,077.56
Unground -- Metro Citizens	188.74	164.39	241.56	176.06	194.85	119.23	93.81	100.69	172.85	162.32	206.01	216.33	2,036.84
Unground -- Parks	75.65	31.83	48.70	58.15	17.87	13.42	27.40	32.80	36.14	30.32	55.75	108.46	536.49
Ground -- Board of Education	28.06	19.99	13.87	6.02	2.41	16.85	5.30	12.28	5.91	7.67	43.52	31.79	193.67
Ground -- Library	0.57	2.09	-	0.61	0.70	2.19	1.73	2.83	1.54	0.84	3.05	3.10	19.25
Ground--Sheriff	5.29	3.41	-	7.66	41.93	5.55	-	-	2.00	-	-	-	65.84
Ground--Water	2.80	-	0.19	-	-	-	-	-	-	-	-	-	2.99
Leaves	-	-	-	-	-	-	-	-	-	-	-	-	-
Monthly Totals	**2,661.79**	**2,490.37**	**2,542.18**	**2,182.24**	**2,237.34**	**1,863.98**	**1,600.65**	**1,449.00**	**2,017.70**	**1,913.76**	**2,319.26**	**2,654.37**	**25,932.64**

Metro Department of Public Works Hazardous Spills Responses During FY18

ID	Date	Notified	Location	Situation	Arrived	Actions	Departed	Agencies
1878	6/15/2018	9:22	2944 Nautilus Dr	Hydraulic Spill On Road	9:44	Covered With Approx. 400 Lbs. Spill Gone And Cleaned Up	11:01	PW
1871	5/24/2018	9:00	4821 Manassas Dr.	50 Gal. Hydraulic Fluid Spill On Road	9:44	Used 600 Lbs. Absorbent For Clean Up	11:15	PW
1869	5/16/2018	9:00	3308 Valley Brook Place	Hydraulic Spill On Road From Trash Truck PW Solid Waste	9:45	Put Down 500 Lbs. Absorbent Spill Gone	12:00	PW
1868	5/14/2018	11:15	21st. Ave S And Vlair Blvd. 21 Ave. S And Blair Blvd.	15 Gal. Cooking Oil Spilled Off Truck On Road	11:30	Covered With 1600 Lbs. Absorbent	13:51	PW
1854	1/24/2018	11:30	5242 Edmondson Pk	Hydraulic Spill In Parking Lot Of Apt. Approx. 50 Gal	11:49	Covered And Cleaned Up With 800 Lbs. Spill Gone	14:00	PW
1853	1/4/2018	13:15	3945 Atkins Dr	15 Gallons Of Hydraulic Fluid Spill On Road	13:29	Covered With Spreader Truck 700 Lbs. Absorbent	14:10	PW
1852	1/4/2018	9:15	Elimington Park	Hydraulic Oil Spill	9:40	300 Lbs. Of Absorbent	11:30	PW
1849	12/18/2017	11:30	217 Dinwiddie Dr	Oil Spill In The Intersection	12:10	Applied 500 Lbs. Absorbent Using Spreader Truck	14:00	PW
1843	11/14/2017	8:08	3600 Hillsboro Pk	Approx. 30 Gallons Hydraulic Oil Spilled On Road In Apartment Complex	8:44	Covered With Approx. 800 Lbs. Spill Gone	12:09	PW
1841	10/29/2017	5:00	18th & West End	Diesel Fuel Spill	5:25	Applied Absorbent 20 Lbs.	9:00	PW
1836	9/26/2017	12:30	S 5th @ Shelby	Diesel Spill Unknown Amount	12:45	Covered With 200 Lbs. Spill Gone	13:10	FD/PD/PW
1824	8/31/2017	12:54	23rd @ Elliston Place	5 Gallons Oil Spill On Road	13:00	Covered With 400 Lbs. Spill Gone	13:45	PW
1817	8/3/2017	10:59	3219 Meade Av	Hydraulic Spill Approx. 10 Gal	10:59	Covered With 150 Lbs. Spill Gone	11:26	PW
1815	7/31/2017	11:10	21st Av S @ Wedgewood	30 Gallons Transmission Fluid Spilled On Roadway	11:21	Used 200 Lbs. Of Spill Gone , Covered By Hand	13:09	PD/FD/PW
1812	7/28/2017	20:30	5242 Edmonson Pk	Hydraulic Oil Spill Approx. 40 Gallons	21:00	Covered With 600 Lbs. Spill Gone And Swept Up	2:00	PW
1810	7/20/2017	10:30	316 Broadway St	Cooking Oil Spill From Grease Trap	10:50	Pressure Washed Side Walk And Took Car Of Alley	13:30	PD / PW/ DTP
1804	7/6/2017	16:51	Wedgewood Ave @ Acklen Ave	Unknown Amount Oil Spill On Road	17:02	Covered With 100lbs Absorbent	17:28	PW,PD
1803	7/5/2017	17:06	Union Hill Rd @ Ridgewood Rd	Oil Spill On Road	17:45	Covered With Approx. 500 Lbs. Spill Gone Used The Spreader Truck	19:58	FD / PW

Metro Department of Public Works Deicing Activities During FY18

	July	August	September	October	November	December	January	February	March	April	May	June	Total
Amount of salt/brine applied to Roadways (tons)	0	0	0	0	0	0	4,025.37	0	0	0	0	0	**4,025.37**

NPDES Training Session with Stormwater Routine Maintenance Crews During FY18

NPDES Training Session Stormwater Routine Maintenance Crews Sign-in Sheet

Employee Stormwater Training Sign-in Sheet
January 30, 2018

Metro Facility Name	Year of the Training	Supervisor Performing Training
Stormwater Maintenance	2018	Beth Wilson, Josh Hayes
Employee Name	**Employee Signature**	**Date Trained**
Vencent Gaddes	Vincent R Gaddes	1-30-18
James W. Madden	James W. Madden	1-30-18
Larry Williams	Larry Williams	1-30-18
Daniel Canfield	Daniel Canfield	1-30-18
Bobby Phillips	Bobby Phillips	1-30-18
RICHARD HOLLAND	Richard Holland	1-30-18
Donald Thompson	Donald Thompson	1-30-18
Anthony Ball	Anthony Ball	1-30-18
Ronnie Brownlow	Ronnie Brownlow	1-30-18
Jason Dedmon	Jason Dedmon	1/30/18
Allan Young	Allan Young	1-30-18
Josh Flemis		1-30-18
Anthony Wasson	Anthony Wasson	1/30/18
CHARLES BROOKS	C. Brooks	1-30-18
Teryl Lymon	Teryl Lymon	1-30-18
Corey Johnson		1-30-18
Willie Wilson	Willie Wilson	1-30-18
Keith Paglan	Keith Paglan	1-30-18
Hakeem Eldridge	Hakeem Eldridge	1-30-18
Claudelle Tate		1-30-18
dennis wood	Dennis Wood	1-30-18

NPDES Training Session Stormwater Routine Maintenance Crews Sign-in Sheet (Continued)

Employee Stormwater Training Sign-in Sheet
January 30, 2018

Metro Facility Name	Year of the Training	Supervisor Performing Training
Stormwater Maintenance	2018	Beth Wilson, Josh Hayes
Employee Name	**Employee Signature**	**Date Trained**
Chris Davis		1-30-18
		1/30/18
John Madden		1/30/18

NPDES Training Session Stormwater Routine Maintenance Crews Sign-in Sheet (Continued)

Employee Stormwater Training Sign-in Sheet

~~January 30, 2018~~ February 7th, 2018

Metro Facility Name	Year of the Training	Supervisor Performing Training
Stormwater Maintenance	2018	Beth Wilson, Josh Hayes
Employee Name	**Employee Signature**	**Date Trained**
Robbie Smith	R S	2-7-18
Renee C. Jackson	Renee C. Jackson	02/07/18
Mickey Jackson	Mickey Jackson	2-7-18
CHAD DIEHL		2-7-18
Tyler Wortham		2-7-18
Randal Moore		2-7-18
Joseph P Fedun	Joseph P Fedun	2/7/18
Fracelli		2/7/18
Sandra Derrick		2-7-18
JEFFERY HOWELL		2-7-18

ATTACHMENT A – Protected Species Report

Metro Nashville Municipal Separate Storm Sewer System Permit
Federal or State-Protected Species Impact assessment

(Reporting Period 07/01/17– 06/30/18)

Reviewed and Updated:
October, 2018

Introduction:
As per the Municipal Separate Storm Sewer System (MS4) permit, Metro Nashville is required to perform an annual assessment of potential Stormwater impacts to federal and state-protected aquatic species known to exist within Metro Nashville Davidson County (Metro). In order to perform the assessment, the Metro Water Services (MWS) Stormwater NPDES Section downloaded a list of aquatic species located within Davidson County. In order to assess potential impacts to rare species, the list of rare aquatic species was analyzed and broken into specific habitat categories. Table 1 details the list of rare aquatic species that have been known to occur within Davidson County. According to the Tennessee Department of Conservation (TDEC) Natural Heritage Program (NHP), Rare Species Inventory Program there are 19 rare or protected aquatic species that have known to occur or have historically occurred within Davidson County.

Only five of the 19 rare aquatic species have a federal protection status, all of which are listed as "Endangered", while remaining 14 of the rare aquatic species have been listed by the state of Tennessee with one of the following legal protection status:

- "D" Deemed in Need of Management,
- "E" Endangered,
- "T" Threatened, and
- Rare, Not State Listed

Typical Habitat Requirements:
While the 19 species may require specific habitat conditions, the general type of aquatic habitat can be broken into three main categories:

- Large River/Lake – The Cumberland River is the only large river system within Davidson County. The Cumberland River has portions of two impoundments (Cheatham Lake and Old Hickory Lake) within Davidson County. Due to the dilution factor, Nashville's Stormwater runoff would have negligible effects of the water quality/habitat of the Cumberland River.
- Small Streams to Small/Medium Rivers – This particular habitat represents all of the smaller headwater streams, creeks and small rivers that drain into the Cumberland River. The small streams/rivers are more susceptible to impacts from Stormwater runoff from the MS4.
- Ponds/Wetlands/Springs – This particular habitat describes floodplain wetlands, farm ponds and springheads located throughout the county, which would have the potential of being impacted by MS4 runoff.

Table 1 – List of Rare Aquatic Species for Davidson County Tennessee – FY18

General Aquatic Resource	Type	Scientific Name	Common Name	Global Rank	Fed. Status	St. Status	Habitat	State Rank
Small Headwater Streams to Small/Medium Rivers	Invertebrate Animal	*Sphalloplana buchanani*	A Cave Obligate Planarian	G1G2	No Status	Rare, Not State Listed	Aquatic cave obligate; northern Central Basin; Davidson County; taxonomy poorly understood.	S1
	Vertebrate Animal	*Ambystoma barbouri*	Streamside Salamander	G4	No Status	D	Seasonally ephemeral karst streams; middle Tennessee.	S2
	Vertebrate Animal	*Cryptobranchus alleganiensis*	Hellbender	G3G4	No Status	D	Rocky, clear creeks and rivers with large shelter rocks.	S3
	Vertebrate Animal	*Etheostoma luteovinctum*	Redband Darter	G4	No Status	D	Limestone streams; Nashville Basin & portions of Highland Rim.	S4
	Vertebrate Animal	*Etheostoma microlepidum*	Smallscale Darter	G2G3	No Status	D	Small rivers, in deep, strongly flowing riffles with gravel, boulder, and coarse rubble substrates; Cumberland River drainage.	S2
	Vertebrate Animal	*Percina phoxocephala*	Slenderhead Darter	G5	No Status	D	Small-large rivers with moderate gradient in shoal areas with moderate-swift currents; portions of Tenn. & Cumb. river watersheds.	S3
	Invertebrate Animal	*Orconectes shoupi*	Nashville Crayfish	G1G2	LE	E	1st-order & larger streams, generally with bedrock bottom, under slab rock; endemic to Mill Creek watershed; Davidson & William. cos.	S1S2
	Invertebrate Animal	*Epioblasma florentina walkeri*	Tan Riffleshell	G1T1	LE	E	Found in river headwaters, in riffles and shoals in sand and gravel substrates; Tennessee & Cumberland river systems.	S1
	Invertebrate Animal	*Simpsonaias ambigua*	Salamander Mussel	G3	No Status	Rare, Not State Listed	In sand or silt under large, flat stones in areas of swift current; occurred historically in E Fk Stones R; 2005 obs in lower Duck R.	S1
	Invertebrate Animal	*Lithasia duttoniana*	Helmet Rocksnail	G2Q	No Status	Rare, Not State Listed	Rocky substrates in riffle systems; bedrock in flowing water below main section of riffles; Duck River (TN River system).	S2
Large Riverine Systems/Lakes	Vertebrate Animal	*Haliaeetus leucocephalus*	Bald Eagle	G5	No Status	D	Areas close to large bodies of water; roosts in sheltered sites in winter; communal roost sites common.	S3
	Vertebrate Animal	*Acipenser fulvescens*	Lake Sturgeon	G3G4	No Status	E	Bottoms of large, clean rivers and lakes.	S1
	Vertebrate Animal	*Carpiodes velifer*	Highfin Carpsucker	G4G5	No Status	D	Large rivers, mostly in Tennessee River drainage.	S2S3
	Vertebrate Animal	*Cycleptus elongatus*	Blue Sucker	G3G4	No Status	T	Swift waters over firm substrates in big rivers.	S2
	Vertebrate Animal	*Macrochelys temminckii*	Alligator Snapping Turtle	G3G4	No Status	D	Slow moving, deep water of rivers, sloughs, oxbows, swamps, and lakes; middle and west Tennessee; obscure.	S2S3
	Invertebrate Animal	*Epioblasma brevidens*	Cumberlandian Combshell	G1	LE	E	Large creeks to large rivers, in coarse sand or mixtures of gravel, cobble, or rocks; Tennessee & Cumberland river systems.	S1
	Invertebrate Animal	*Lampsilis abrupta*	Pink Mucket	G2	LE	E	Generally a large river species, preferring sand-gravel or rocky substrates with mod-strong currents; Tennessee & Cumberland river systems.	S2
	Invertebrate Animal	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	LE	E	Large rivers in sand-gravel-cobble substrates in riffles and shoals in deep flowing water; Cumberland & Tennessee river systems.	S1
Ponds/Wetlands/Springs	Vascular Plant	*Ranunculus aquatilis var. diffusus*	White Water-buttercup	G5T5	No Status	E	Ponds And Streams	S1

Potential Impacts from MS4 Runoff:
Rare species that inhabit smaller streams and rivers, ponds, wetlands, and springs would be the most vulnerable to potential impacts from MS4 runoff. Impacts from MS4 runoff includes:

- Increased sediment loads smothering natural stream substrate;
- Increased nutrient runoff that cause sporadic algal blooms and accompanying reductions in available oxygen;
- Increased levels of toxic chemicals such as pesticides, oils, etc.;
- General loss of habitat from development activities.

Metro Nashville's Measures to Prevent Impacts to Aquatic Rare Species:
Metro Nashville's MS4 program deploys a simple technique to protect against impacts to rare aquatic species: "*Protect all of Nashville's Aquatic Habitat*". In order to protect Nashville's aquatic habitat, a three-prong approach is in place:

1. Control Future Development –
    a) Establish local regulations that prevent future development from destroying aquatic habitat.
    b) Monitor runoff during construction to prevent the destruction of aquatic habitat
    c) Enforce on developments that violate local construction regulations that could lead to the further destruction of aquatic resources.
2. Control the quality of Stormwater runoff from existing properties
    a) Establish local regulations that prevent the discharging of pollutants to waterways
    b) Monitor existing properties to ensure pollutants are not being discharged to the waterways.
    c) Enforce on properties/individuals that violate local water pollution laws that could potentially impact aquatic habitat.
3. Monitor the overall water quality and health of Nashville's streams
    a) Analytical sampling of certain water quality parameters
    b) Rotating biological surveys of Davidson County streams.

Controlling Future Development
Metro Nashville has established strict regulations protecting aquatic resources from impacts associated with development activities. All development or redevelopment activities that are over 10,000 square feet in overall footprint or involve more than 100 cubic yards of fill are required to obtain grading permits from the Metro Water Services (MWS) Stormwater Division. In order to obtain a grading permit from MWS, engineered plans have to be developed that illustrate how Stormwater runoff will be managed during and after development. Strict erosion and sediment control measures are required at all grading permit properties during construction. In order to ensure that erosion and sediment controls are maintained throughout construction, NPDES has six inspectors that inspect grading permit site construction control measures.

Metro Nashville also requires protection from impacts to aquatic resources after the construction phase of projects by requiring grading permit properties to install permanent Stormwater treatment measures that are designed to treat/address both the volume and quality of runoff from the property.

In addition to requiring development or redevelopment activities to obtain permits and treat Stormwater runoff, Metro Nashville was also one of the first municipalities in the state to establish no-disturb buffers along streams and other water resources within Metro Nashville, Davidson County. Development activities that demonstrate a hardship requiring some impacts to the no-disturb riparian buffer (i.e. for a bridge crossing, etc.) are required to go through a strict variance appeal process. Variance requests for stream crossing or other direct impacts to water resources are not granted unless any necessary TDEC Aquatic Resource Alteration Permits

(ARAPs) or Section 404 permits from the U.S. Army Corps of Engineers (USACOE) are obtained, which cannot be issued if protected species are impacted.

Controlling the Quality of Stormwater Runoff from Existing Properties

Metro Nashville has the following specific ordinance in place that prevents the discharge of pollutants to storm drains or community waters:

15.64.205 - Non-Stormwater discharges.

A. Definitions.

"Community waters" means any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wetland, wells and other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the Metropolitan Government of Nashville and Davidson County.

"Contaminant" means any physical, chemical, biological or radiological substance or matter.

"Director" means the Director of the Metropolitan Government of Nashville and Davidson County's Department of Water and Sewerage Services, or his designee.

"Discharge" means any substance disposed, deposited, spilled, poured, injected, seeped, dumped, leaked, or placed by any means, intentionally or unintentionally, into community waters, the waters of the state, or any area draining directly or indirectly into the municipal Stormwater system of the metropolitan government.

"Metropolitan government" means the Metropolitan Government of Nashville and Davidson County.

"Municipal separate storm sewer system of the metropolitan government" means a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, and storm drains) designed or used for collecting or conveying Stormwater; provided, however, that sanitary and combined sewers are not included in the definition of the municipal separate storm sewer system.

"Non-Stormwater discharge" means any discharge to the municipal separate storm sewer system except as permitted by subsection C of this section.

"Waters of the state" means any water, surface or underground, lying within or forming a part of the boundaries of the Metropolitan Government of Nashville and Davidson County, over which the Tennessee Department of Environment and Conservation exercises primary control with respect to Stormwater permits.

B. Except as hereinafter provided, all non-Stormwater discharges into community waters, into the waters of the state, or into the municipal separate storm sewer system of the metropolitan government are prohibited and are declared to be unlawful.

C. Unless the director has identified them as a source of contaminants to community waters, the waters of the state, or the municipal separate storm sewer system of the metropolitan government, the following discharges are permitted:

1. Stormwater as defined in TCA Section 68-221-1102(5);
2. Water line flushing;

3. Landscape irrigation;
4. Diverted stream flows;
5. Rising ground waters;
6. Uncontaminated groundwater infiltration (as defined at 40 CFR 35.2005(20)) to separate storm sewers;
7. Uncontaminated pumped groundwater;
8. Discharges from potable water sources;
9. Foundation drains;
10. Air conditioning condensate;
11. Irrigation water;
12. Springs;
13. Water from crawl space pumps;
14. Footing drains;
15. Lawn watering;
16. Individual residential car washing;
17. Flows from riparian habitats and wetlands;
18. Dechlorinated swimming pool discharges;
19. Street wash waters resulting from normal street cleaning operations;
20. Discharges or flows from emergency firefighting activities.

D. The director, with the approval of the mayor, shall have authority to implement this section by appropriate regulations. Such regulations may include but are not limited to provisions for inspection of points of origin of known or suspected non-permitted discharges by appropriate personnel of the metropolitan government.
E. Discharges pursuant to a valid and effective NPDES permit issued by the State of Tennessee are not prohibited by this section.
F. The provisions of this section, including subsection C of this section, shall not apply to sanitary or combined sewers, which are governed by Chapter 15.40 of the Metropolitan Code of Laws.
G. Violation of this section shall subject the violator to a civil penalty of not less than fifty dollars nor more than five thousand dollars per day for each day of violation. Each day of violation may constitute a separate violation.

NPDES issues enforcement notices and administrative penalties to existing facilities found to be in violation of the above non-Stormwater discharge code.

In addition to controlling polluted runoff from construction activity, NPDES implements various other pollution prevention programs:

- Industrial Inspection/Monitoring Program
- Proactive Field Screening/Illicit Discharge Detection Elimination Program
- Pollution Reporting Hotline
- Sewer Leak Detection Program (Using Thermography Technology)
- Post-Construction Stormwater Treatment BMP inspection/maintenance verification program
- Public Involvement/Education

<u>Monitoring the Overall Water Quality and Health of Nashville's Streams</u>
NPDES performs intense monitoring of Metro Nashville, Davidson County streams. In previous years, Dr. Steve Winesett of the NPDES Division retained a permit/certification from the USFWS/TWRA to perform surveys within the Mill Creek watershed (home to the endangered Nashville Crayfish). Since his departure, Veronica Mullen (NPDES) has obtained the proper certification. The following programs involve field assessments of streams:

- Ambient Sampling - Seasonal water quality samples are taken and analyzed for potential pollutants. Various streams are sampled each year on a rotating basis.
- TMDL Monitoring – Quarterly flow weighted samples are collected and analyzed for bacterial and TSS of various/rotating stream segments in which TMDLs have been developed.
- Visual Stream Assessments – All State-listed 303(d) stream segments with MS4 outfalls are visually inspected on a 5 year cycle.
- Benthic Surveys – Seasonal benthic surveys are performed on various streams each year. The benthic sampling coincides with the same stream rotation schedule as the ambient sampling.

If abnormalities are found in any of the above monitoring results, individual investigations are initiated to find and eliminate potential sources of pollution.

Conclusion:
Metro Nashville's MS4 program has taken substantial steps to protect aquatic resources within Metro Nashville, Davidson County. By virtue of protecting the Nashville's water resources, critical habitat required for aquatic species has also been preserved/ protected. During this permit year, there have not been any known discharges form the MS4 that have caused the destruction of a rare species or their critical habitat.

ATTACHMENT B – Coordination with TDEC on MS4 Compliance During Administrative Extension Period of MS4 Permit

MEGAN BARRY
MAYOR

METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY

DEPARTMENT OF WATER AND SEWERAGE SERVICES
STORMWATER DIVISION
NPDES OFFICE
1607 COUNTY HOSPITAL ROAD
Nashville, Tennessee 37218

January 31, 2017

Re: Nashville Phase 1 MS4 Permit Reissuance – TNS068047

Vojin Janjic | Manager, Water-Based Systems
Division of Water Resources
William R. Snodgrass Tennessee Tower, 11th Floor
312 Rosa L. Parks Ave, Nashville, TN 37243

Dear Mr. Janjic,

We are writing you to request specific clarification on the permit reissuance process for the Metropolitan Government of Nashville, Davidson County (Metro) Municipal Separate Storm Sewer System, which expires as of today, January 31, 2017. As we approach this reissuance process and period between expired permit and reissued permit, it is our intentions to propose the following path going forward to ensure MS4 Permit compliance is maintained throughout the transition period and to ensure coordination occurs between the Division and key Metro staff to incorporate changes to specific terms and conditions of the MS4 permit.

Transition Period:
As you are aware, most of the specific requirements of the MS4 permit are ongoing and do not have certain deadlines by which to be completed. Among these, include programs such as administering stormwater management regulations requirements for post-construction stormwater controls, overseeing a vigorous inspection and oversight program for construction activities, performing public education/public involvement activities, ensuring municipal maintenance operations are not impacting stormwater runoff, and implementation of various Illicit Discharged Detection and Elimination (IDDE) programs. Metro proposes to continue these ongoing programs as prescribed in the existing active permit until the new permit becomes effective.

There are some MS4 permit requirements, however, that list specific target dates or timeframes for the activities to be completed per Metro's active permit. Specific requirements within the MS4 permit that have declared deadlines are listed below:

- ***Dry Weather Outfall Screening***
  - *Screen one outfall within every ¼ mile commercial/industrial grid once per permit term.*
- ***Industrial Inspection/Monitoring Program***
  - *Inspect industrial high risk sites as identified by the MS4 permit (i.e. SARA Title 3, TSD sites, etc.) once every 3 years.*
- ***Post Construction Stormwater Control Measure (SCM) Inspection and Maintenance Oversight Program***
  - *Implement permittee-defined program by the end of year 5.*
- ***Various MS4 Permit-Prescribed Monitoring Activities.***
  - *Sampling programs (i.e. wet weather, ambient, visual stream assessments, etc.) prescribed in the permit to be completed on a 5 year permit term.*

It is our understanding through conversations with TDEC staff, that it may be late 2017 or possibly even next year, before our MS4 permit is reissued. With that said, we would like to propose the following compliance activities to be performed in the transition period.

- ***Dry Weather Outfall Screening***
  - *Test our newly proposed field screening protocol (i.e. screen 3 business/industrial sites for site management/housekeeping procedures in each ¼ commercial/industrial-zoned grid.) Transition period goal would be to screen at least 50 grids each year prior to the new permit being issued.*
- ***Industrial Inspection/Monitoring Program***
  - *Re-inspect only industrial sites in which issues were noted during the original inspections and/or those involved with compliant investigations. Identify and perform inspections on industrial facilities (not required to be inspected by the original MS4 permit (i.e. auto salvage lots, ready-mix facilities, etc. not identified as SARA Title 3 or TSD facilities)). A list of industrial facilities to be inspected would be sent to the TDEC Nashville Field Office. Goal would be to inspect 10 industrial facilities each year.*
- ***Post Construction Stormwater Control Measure (SCM) Inspection and Maintenance Oversight Program***
  - *Continue to respond to citizen complaints of SCM structures not being maintained properly. In addition, would inspect and enforce (if necessary) on at least 50 SCM structures per year. Currently and during the transition period, Metro will continue to build its SCM Inspection & Maintenance oversight process.*
- ***Various MS4 Permit-Prescribed Monitoring Activities.***
  - *Discontinue the following sampling activities until the new MS4 permit is issued:*
    - *Wet Weather Homogenous Land Use Sampling*
    - *Wet Weather SCM Discharge Grab Sampling*
    - *Wet Weather Industrial Sampling (1 TMSP/RMCP site per year).*

- *Continue routine ambient monitoring/sampling programs (ambient chemical/bacteriological sampling and visual stream assessments) as well as any site-specific sampling as required in the course of routine investigations. The MWS Stormwater NPDES Watershed Group would coordinate with TDEC Nashville Field Office staff on monitoring schedules (which watersheds they will be monitoring during the transition period).*

New Permit Coordination

As stated above, Metro is requesting coordination on developing specific terms and conditions of the reissued MS4 permit in an ongoing effort to improve our permit compliance activities. In particular there are several program activities that Metro is interested in modifying to make more efficient and effective. Some of these proposed changes would involve changes to MS4 permit requirements as well, if implemented. Specific changes Metro are requesting to individually listed permit requirements were included in Metro's most recent Annual Report submittal (see attachment). Metro is requesting specific meetings to be arranged between appropriate TDEC permit writer staff and MWS Stormwater NPDES personnel so that these proposed changes can be explored and discussed.

Sincerely,

Michael Hunt
Metro Water Services, Stormwater, NPDES
Program Manager

Encl. - Nashville Phase 1 MS4 Permit Application Section of MS4 Annual Report

CC:

April Grippo – TDEC Nashville Field Office
Jennifer Dodd – TDEC Central Office
John Leffew – TDEC Nashville Field Office

DAVID BRILEY
MAYOR

METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY

DEPARTMENT OF WATER AND SEWERAGE SERVICES
STORMWATER DIVISION
NPDES OFFICE
1607 COUNTY HOSPITAL ROAD
Nashville, Tennessee 37218

March 30, 2018

Re: Nashville Phase 1 MS4 Permit Reissuance – TNS068047

Vojin Janjic | Manager, Water-Based Systems
Division of Water Resources
William R. Snodgrass Tennessee Tower, 11th Floor
312 Rosa L. Parks Ave, Nashville, TN 37243

Dear Mr. Janjic,

We are writing you to provide an update to the Metropolitan Government of Nashville, Davidson County (Metro) Municipal Separate Storm Sewer System (MS4) permit compliance activities. As you are aware, Metro's MS4 permit expired on January 31, 2017 and prior to the expiration, Metro submitted several requests to alter specific permit compliance activities (See Attached letter dated January 31, 2017. As a follow-up to proposed MS4 permit compliance activities, Metro hosted a meeting with Jennifer Dodd and Karina Bynum from the Tennessee Department of Environment and Conservation to discuss the proposed changes. As a result of the meeting, TDEC provided positive feedback to the changes and requested Metro to provide an update on the proposed changes in the first quarter of 2018. The following paragraphs describe some of the already observed benefits to changes to MS4 permit compliance activities that were implemented during this transition period between permits. .

Summary Transition Period MS4 Compliance Changes:
The majority of the MS4 permit compliance programs have continued without adjustment as these activities are considered as ongoing within the MS4 permit. There are a few activities that were required to be completed by year 5 of the permit, which were completed, but Metro found to be very beneficial in identifying and eliminating stormwater pollution. As such, Metro proposed changes to the following programs:

If you need assistance or an accommodation, please contact Metro Water Services, at 615-862-4862, 1600 Second Avenue North, Nashville, Tennessee 37208.

- ***Dry Weather Outfall Screening***

  Previous MS4 Permit Requirements

  - *Screen one outfall within every 1/4 mile commercial/industrial grid once per permit term.*

  New More Efficient Proposed Field Screening Program

  - *Screen 3 business/industrial sites for site management/housekeeping procedures in each ¼ commercial/industrial-zoned grid.) Transition period goal would be to screen at least 50 grids each year prior to the new permit being issued.*

  Initial Findings:

  - *This process has proven to be much more effective than looking specifically at outfalls. In the few months of testing, several poor site management practices have been found such as improper management of dumpster pads and grease recycling bins. This has allowed Metro to be more effective and proactive in talking with these businesses to educate them on proper site management issues to prevent these exposed materials from washing off to the MS4 during a rain event. It is important to note that while we are looking at business practices within grids, we still spot check stormwater infrastructure to see if there is any suspicious dry weather, potentially "illicit discharge" flow.*

  Adjustments Made to New Approach

  - *The only adjustment made was going from screening 3 businesses within a ¼ mile grid to screening 3 businesses within a ½ mile grid. Upon implementing, we quickly realized that ¼ mile grids were too limiting and in many cases did not encompass multiple parcels that could be screened.*

- ***Industrial Inspection/Monitoring Program***

  Previous MS4 Permit Requirements

  - *Inspect industrial high risk sites as identified by the MS4 permit (i.e. SARA Title 3, TSD sites, etc.) once every 3 years.*

  New More Efficient Proposed Industrial Inspectino Program

  - *Re-inspect only industrial sites in which issues were noted during the original inspections and/or those involved with compliant investigations. Identify and perform inspections on industrial facilities (not required to be inspected by the original MS4 permit (i.e. auto salvage lots, ready-mix facilities, etc. not identified as SARA Title 3 or TSD facilities)). A list of industrial facilities to be inspected would be sent to the TDEC Nashville Field Office. Goal would be to inspect 10 industrial facilities each year.*

  Initial Findings:

  - *This process has proven to be much more effective as we have been able, during this transition period, to focus resources on industrial activities that have the highest potential for stormwater pollution such as Ready Mix Concrete facilities, chrome-plating facilities, etc. This new approach has allowed us to prioritize inspections and coordinate with TDEC field office staff as needed to perform co-inspections.*

Adjustments Made to New Approach
- *There are no proposed refinements to the new approach.*

- ***Post Construction Stormwater Control Measure (SCM) Inspection and Maintenance Oversight Program***

Previous MS4 Permit Requirements
- *Implement permittee-defined program by the end of year 5.*

New More Efficient Proposed SCM Inspection and Maintenance Oversight Program
- *Continue to respond to citizen complaints of SCM structures not being maintained properly. In addition, would inspect and enforce (if necessary) on at least 50 SCM structures per year. Currently and during the transition period, Metro will continue to build its SCM Inspection & Maintenance oversight process.*

Initial Findings:
- *Metros NPDES program has vastly expanded resources dedicated to ensuring post construction SCMs are being properly inspected and maintained. As it currently stands, Metro inspects an average of 75 SCM structures each month, which is well above the pace that we originally proposed. This new approach of focusing on NPDES program inspection findings and following-up with property owners on the proper maintenance has proven very beneficial to achieving maintenance on Post-Construction SCMs.*

Adjustments Made to New Approach
- *Metro is constantly evaluating the inspection and report documentation process and will continue to adjust the program, as necessary, to achieve the highest efficiency to ensure post-construction SCM structures are maintained properly.*

- ***Various MS4 Permit-Prescribed Monitoring Activities.***

Previous MS4 Permit Monitoring Requirements
- *Sampling programs (i.e. wet weather, ambient, visual stream assessments, etc.) prescribed in the permit to be completed on a 5 year permit term.*

New More Efficient Proposed MS4 Permit Monitoring Program
- *Discontinue the following sampling activities until the new MS4 permit is issued:*
  - *Wet Weather Homogenous Land Use Sampling*
  - *Wet Weather SCM Discharge Grab Sampling*
  - *Wet Weather Industrial Sampling (1 TMSP/RMCP site per year).*
- *Continue routine ambient monitoring/sampling programs (ambient chemical/bacteriological sampling and visual stream assessments) as well as any site-specific sampling as required in the course of routine investigations. The MWS Stormwater NPDES Watershed Group would coordinate with TDEC Nashville Field Office staff on monitoring schedules (which watersheds they will be monitoring during the transition period).*

Initial Findings:
- *Elimination of the wet weather monitoring has allowed for more resources to be spent on assessing streams for various impairments. Eight biological assessments have been performed on streams that Metro hadn't previously assessed. This provides a more comprehensive and up to date watershed assessment countywide and will additionally provide TDEC with more data than they would otherwise be able to collect. In addition to the biological assessment, nutrient samples are collected at the same time.*

- *Monitoring of 2 projects has been initiated and a total of 8 samples have been collected. Both of the projects are located on Cathy Jo Branch. One of the projects is a dam removal and the other is a retrofit to a stormwater outfall that reduced sheer flow during storm events. Samples were collected before work began and will continue in order to show the effectiveness of the projects.*
- *There have been 2 investigations within the past year as a result of our regular monitoring. Both of these investigations concluded that repairs needed to be made to sewers and thus we are preventing long term discharges to nearby streams.*

Adjustments Made to New Approach

- *There have not been adjustments made to the new approach. Projects are continually being considered for monitoring in order to show project effectiveness.*

Metro is requesting specific meetings to be arranged between appropriate TDEC permit writer staff and MWS Stormwater NPDES personnel so that these proposed changes can be explored and discussed.

Sincerely,

Michael Hunt
Metro Water Services, Stormwater, NPDES
Program Manager

Encl. - January 31, 2018 Letter to TDEC of Proposed Changes to MS4 Permit Compliance Activities. Attachment C of Year 5 MS4 Annual Report

CC:

April Grippo – TDEC Nashville Field Office
Jennifer Dodd – TDEC Central Office
Karina Bynum - TDEC Central Office
John Leffew – TDEC Nashville Field Office

Hayes, Joshua (WS)

From: Hunt, Michael (WS)
Sent: Friday, March 30, 2018 2:02 PM
To: 'Karina Bynum'
Cc: 'Jennifer Dodd'; 'Ann Morbitt'; 'Wade Murphy'; 'Robert Karesh'; 'Jimmy R. Smith'; 'April Grippo'; 'Bill Murph'; 'John Leffew'; Hayes, Joshua (WS); Dohn, Rebecca (WS); Bruce, Mary (WS); Binder, Dale (WS)
Subject: RE: 16NOV17 Meeting Follow-up
Attachments: Permit Re-issuance and Transition Period_TDEC_Update_Final.pdf

Good afternoon Karina:

Per your email below, find the requested info attached (red text on pages 2-4 of attached pdf). If you have any questions, don't hesitate to let us know.

Thanks, Michael

From: Karina Bynum [mailto:Karina.Bynum@tn.gov] **Sent:** Friday, November 17, 2017 9:44 AM **To:** Hunt, Michael (WS); Hayes, Joshua (WS); Dohn, Rebecca (WS); Bruce, Mary (WS); Binder, Dale (WS) **Cc:** Jennifer Dodd; Ann Morbitt; Wade Murphy; Robert Karesh; Jimmy R. Smith; April Grippo; Bill Murph; John Leffew **Subject:** 16NOV17 Meeting Follow up

Hello Michael,

Thank you for the invitation to meet and discuss the program update you send us on January 31, 2017, regarding the Transition Period for Metro's Stormwater Program. It was very helpful to hear from your staff about the program adjustments specified in the letter and to discuss the monitoring your program is undertaking. As you conclude the year of gathering information during the transition period, please compile your findings and send them to us in the first quarter of the year 2018. Please give us about a month to review and then reach out to us to schedule a meeting to discuss your findings.

Thank you,

TN Department of Environment & Conservation

Karina Bynum, Ph.D., P. E. |Integrated Water Resources Engineer

Division of Water Resources

1221 South Willow Avenue, Cookeville, TN 38506

p. 931 - 520 - 6688

karina.bynum@tn.gov

tn.gov/environment

From: Hunt, Michael (WS) <Michael.Hunt@nashville.gov>
Sent: Tuesday, November 14, 2017 3:06 PM
To: Karina Bynum
Subject: letter....

***** This is an EXTERNAL email. Please exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email. - STS-Security*****

Michael Hunt CSM, CPMSM, CPSWQ, CFM
Program Manager
Metro Water Services - Storm Water Div.- NPDES Office
1607 A County Hospital Road
Nashville, TN 37218
Phone: (615) 880-2420
http://www.nashville.gov/stormwater/
If you see water pollution in Metro Nashville, call (615) 313-PURE or (615) 880-2420 or email stormwaterquality@nashville.gov

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
Nashville Environmental Field Office
711 R.S. Gass Boulevard
Nashville, TN 37216
Phone 615-687-7000 Statewide 1-888-891-8332 Fax 615-687-7078

May 31, 2018

Mr. Scott Potter
Director of Metro Water Services
1600 2nd Avenue North
Nashville, TN 37208

Certified Mail Receipt
7014 2870 0001 3600 2906

RE: Compliance Evaluation Inspection
Nashville/Davidson County Municipal Separate Storm Sewer System (MS4)
NPDES Permit Tracking Number TNS068047, Davidson County

Dear Mr. Potter:

On May 16, 2018, Karina Bynum, John Leffew and Ann Morbitt with the Division of Water Resources (division) met with Michael Hunt, Rebecca Dohn, Joshua Hayes, Dale Binder, Steve Mishu and Shawn Herman with Metro Water Services to perform a routine Compliance Evaluation Inspection. The inspection included a review of regulatory mechanisms, records, procedures and other documents related to the construction site stormwater runoff control program required under the NPDES Permit TNS068047 for Discharges from the MS4 owned and operated by the Metropolitan Government of Nashville (Metro).

The construction site stormwater runoff control program is well established, the staff is trained and certified, and the program implementation is compliant with the requirements of the NPDES Permit TNS068047. The division greatly appreciates the time and commitment from your staff in their preparation before and participation during the inspection. Their availability and knowledge of the program ensured it was conducted in an efficient manner.

Permit Review
The NPDES Permit TNS068047 for stormwater discharges from Metro MS4 was issued and became effective on February 1, 2012. The permit expired on January 31, 2018, and has been administratively extended until a new permit is issued.

Records Review
The MS4 permit requires Metro to continue to implement and enforce its existing construction site stormwater runoff control program. The implementation of the following required elements was reviewed:

- Regulatory mechanisms requiring erosion prevention and sediment control for land disturbance greater than one (1) acre or less than one (1) acre if part of a larger common plan

of development are published in the Volume 1 of the *Metro's Stormwater Management Manual*.

- An inventory of all construction sites is provided in the City Works tracking system. All active sites are identified as priority sites and pre-construction meetings for all priority sites are held.
- Education of construction site operators is provided during certification classes for Erosion Protection Sediment Control (EPSC) professionals that are held in the Nashville region. Pre-construction meetings for all priority sites assure EPSC Level 1 is held by on-site operators.
- Control of waste materials is addressed in the stormwater management plan and is required in Volume 1 of the *Metro's Stormwater Management Manual* (section 6.10.8).
- Site plan review and approval procedures are coordinated with the plans review group. Qualified staff reviews plans. The review includes approval of the EPSC design and water quality buffers.
- Site inspections are conducted monthly for all priority sites. Enforcement procedures and all required sanctions are identified in the Enforcement Response Plan (Appendix D of the Stormwater Management Plan) and are outlined in the regulatory mechanisms published in the Volume 1 of the *Metro's Stormwater Management Manual*.
- Public input may be provided by phone, web page or public notice announcements.

Construction Site Visit
Site inspection procedures were evaluated by performing a site visit at the Magnolia Farms Subdivision construction site (TNR241924 and TNR242096). The stormwater program inspector, Shawn Herman, demonstrated a good working knowledge of erosion prevention and sediment control practices, and performed a comprehensive inspection with appropriate documentation and on-site communication.

Again, we would like to thank Mr. Hunt and his staff for the assistance and courtesy extended to us during our inspection. If you have any questions or need additional information, please contact John Leffew at the Nashville Environmental Field Office by email at john.leffew@tn.gov or by telephone at (615) 687-7106, or you may contact me by email at april.grippo@tn.gov or by telephone at 615-687- 7018.

Sincerely,

April Grippo
Environmental Manager
Division of Water Resources
Nashville Environmental Field Office

e-cc: Mr. Michael Hunt, Michael.Hunt@nashville.gov - Metro Water Services
Mr. John Leffew, john.leffew@tn.gov- DWR Nashville EFO
Ms. Ann Morbitt, ann.morbitt@tn.gov – DWR statewide
Ms. Karina Bynum, karina.bynum@tn.gov – DWR statewide
Ms. Jessica Murphy, jessica.murphy@tn.gov – DWR Compliance and Enforcement

ATTACHMENT C – MS4 Seasonal Pollutant Loading Memo

MEGAN BARRY
MAYOR

METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY

DEPARTMENT OF WATER AND SEWERAGE SERVICES
STORMWATER DIVISION
NPDES OFFICE
1607 COUNTY HOSPITAL ROAD
Nashville, Tennessee 37218

March 5, 2018

Re: Nashville Phase 1 MS4 Permit Reissuance – TNS068047

Vojin Janjic | Manager, Water-Based Systems
Division of Water Resources
William R. Snodgrass Tennessee Tower, 11th Floor
312 Rosa L. Parks Ave, Nashville, TN 37243

Dear Mr. Janjic,

This communication is in regards to supplemental documentation supporting the annual report for Metro Nashville's Phase 1 MS4 Permit that was submitted to the Tennessee Department of Environment and Conservation on December 13, 2017. As stated in section 3.3.2 or the MS4 permit, Metro Nashville is to:

> "*…provide the seasonal pollutant load (SPL) and the event mean concentration (EMC) for all parameters listed in Table 2, except pH, for each wet weather site. The permittee should document the method used to calculate SPL and EMC. The SPL and EMC should be included in the Annual Report for the fifth year of the permit.*"

Metro Water Services (MWS) hired a consultant (Paradigm Environmental) to analyze Metro Nashville's wet weather sampling data for purpose of deriving EMCs and SPL estimates. At the time the annual report was submitted, Paradigm Environmental had just completed the analysis of wet weather data to determine EMC values to be utilized within the SPL calculations and a summary of the EMC calculations was included as an attachment to the report. The SPL calculations themselves had not been fully completed and MWS stated within the annual report that a supplemental document summarizing the SPL calculations would be submitted. Attached to this letter is the completed SPL calculations/estimates for the current MS4 permit term. If you have any questions, please feel free to contact myself or Josh Hayes at 615-880-2420.

Sincerely,

Michael Hunt
Metro Water Services, Stormwater, NPDES
Program Manager

Encl. - MWS Seasonal Pollutant Loading Memo

CC:
April Grippo – TDEC Nashville Field Office;
Jennifer Dodd – TDEC Central Office;
Bill Murph - TDEC Nashville Field Office
John Leffew – TDEC Nashville Field Office

If you need assistance or an accommodation, please contact Metro Water Services, at 615-862-4862, 1600 Second Avenue North, Nashville, Tennessee 37208.

To:	Metro Water Services Stormwater – NPDES Program
From:	Paradigm Environmental
Date:	2/22/2018
Re:	Seasonal Pollutant Loading Estimates for Nashville Watersheds

The purpose of this memorandum is to develop calculation methods and present the results of a Seasonal Pollutant Load (SPL) analysis for watersheds in Metropolitan Nashville and Davidson County, Tennessee (Metro Nashville). Metro Nashville is served by a large Municipal Separate Storm Sewer System (MS4), which is regulated by a National Pollutant Discharge Elimination System Permit (MS4 Permit) and managed by Metro Nashville Water Services (MWS). Under the current MS4 Permit, MWS must generate SPL estimates for MS4 jurisdictional areas, per Section 3.3.1, as follows:

> *"The permittee should provide the seasonal pollutant load (SPL) and the event mean concentration (EMC) for all parameters listed in Table 2, except pH, for each wet weather site. The permittee should document the method used to calculate SPL and EMC. The SPL and EMC should be included in the Annual Report for the fifth year of the permit."*

This memo presents the SPL analysis for baseline conditions, prior to implementation of structural control measures. The results presented herein build upon a previous memo that calculated event mean concentrations (EMCs) for primary land uses in the region based on multiple years of MWS wet weather outfall monitoring data (MWS 2017). This memorandum is organized into the following sections, which generally correspond to the SPL calculation steps:

- Overview of approach (**Section 1**)
- Rainfall data analysis and identification of a representative average rainfall year (**Section 2**)
- Rainfall-runoff analysis to estimate average annual runoff volumes (**Section 3**)
- GIS data analysis to estimate land use area distribution by MS4 watersheds (**Section 4**)
- SPL estimation and summary tables by land use and MS4 watersheds (**Section 5**)
- Appendices containing detailed tables (**Appendix A and C**) and heat maps (**Appendix B**)

A subsequent memo will estimate the effectiveness / pollutant load reduction of existing and potential future structural and non-structural control measures. The results and calculation methodology of all three (3) memos will provide important inputs for a web-based system that will track MS4 program effectiveness over time and allow for automated generation of SPL outputs.

1 OVERVIEW OF APPROACH

The SPL analysis requirements of the MS4 Permit are based on annual average conditions. Metro Nashville has been organized into 35 watersheds and SPL estimates are presented for each. The representative average year (July 2016 – June 2017) was selected through rainfall analysis; a fiscal period (July 1 to June 30) was used to align with MS4 annual reporting. Three representative rain gages are used to capture rainfall variability across the region. SPL estimates are based on unit runoff volume and pollutant loading from the primary land use-soil type combinations in each watershed. Unit runoff volumes by land use are estimated using an existing hydrologic model, and loads were estimated by multiplying unit runoff volumes by the EMCs for each pollutant measured by MWS outfall monitoring. To leverage the EMC datasets, the SPLs were generated by binning annual runoff into first-flush volume and post-first flush / remaining volumes for each land use category.

The following equation outputs an SPL estimate for a single pollutant for an MS4 watershed:

$$SPL = \sum_{n=1}^{5} \left(EMC\_FF\_LUC_n \times FFV\_LUC_n + EMC\_1HR\_LUC_n \times (TAV\_LUC_n - FFV_{LUC_n})\right),$$

where:

n = land use category index (i.e., commercial, industrial, residential, transportation, and open space)

$EMC\_FF\_LUC_n$ = median observed concentration value of all first-flush samples from the land use category n (or, if there is no statistical difference between FF and 1-HR samples, then the median concentration of all samples is used)

FFV_LUC_n = first-flush volume of runoff for all the storms in the average year from the land use category n

$EMC\_1HR\_LUC_n$ = median observed concentration value of all 1-hour samples from the land use category n (or, if there is no statistical difference between FF and 1-HR samples, then the median concentration of all samples is used)

TAV_LUC_n = total annual volume of runoff in the average year from the land use category n (note: the term in parentheses, the difference in total runoff volume and first flush runoff volume, is the "remaining" runoff volume)

The following sections describe the methodology and results for the analyses conducted to populate the parameters of the SPL equation.

2 RAINFALL DATA ANALYSIS

Rainfall analysis is an important element of SPL estimates, as it is used to [1] evaluate the range of rainfall conditions captured by pollutant monitoring, [2] define the representative average year for annualized estimates, [3] identify representative rainfall gages that capture precipitation variability across the Davidson County (the county), and [4] select the rainfall time series used to generate annual average runoff estimates.

The rainfall analysis began with evaluation of available gages and datasets, including their period of record, temporal resolution (hourly vs daily) and evaluation of data quality control. Of the regional gages in the National Climatic Data Center (NCDC) network, the Nashville International Airport rainfall gage (WBAN:13897, "Nashville Airport gage") had the highest data quality and was the only

gage for which hourly data were available over a long-term record. As such, rainfall data from the Nashville Airport gage are summarized for this analysis, augmented by two other gages to capture east-to-west and north-to-south rainfall variability, as described below.

2.1 Regional Rainfall Patterns and Rain Gage Selection

Climate in the Nashville Metro region is characterized as humid subtropical, with hot, humid summers and generally mild winters. During the most recent MS4 permit cycle (February 1, 2012 to January 31, 2017), monthly average annual rainfall was 48.6 inches, with an annual average of 8 dry days between storm events.

Regional rainfall is characterized by generally wetter winter months and drier late summer to early fall months. Summary statistics of monthly and annual rainfall at the Nashville Airport gage for the most recent 5-year MS4 permit cycle (2/1/2012 – 1/31/2017) are displayed in **Table 2-1**. The number of consecutive dry days between measurable precipitation from May through October is higher on average (10 days) than November through April (7 days). To minimize the influence of trace rainfall values on the statistics, any day with less than 0.05 inches of measurable rainfall was considered a dry day. Average dry days were derived by first calculating the number of antecedent dry days for each day and then averaging the maximum dry days by month for the period of record. During this reporting cycle, the month of July experienced the most rainfall, which was mainly attributable to 3 specific days with rainfall greater than 1 inch. On average, every month had one day with at least 1 inch of rainfall. The wettest year was 2015 (50.8 inches) and the driest year was 2016 (43.9 inches). The wettest day was 4/27/2013 (3.3 inches). The driest continuous stretch of time was the 30-day period ending 10/2/2014, which could be a potential critical condition for certain water quality constituents in the future.

Table 2-1. Rainfall summary statistics at the Nashville International Airport (WBAN:13897)

Period	Mean[2]	Dry Days[2]	High		Low		1-Day Maximum		Average No. Rain Days[1,2]			
			(in.)	Year	(in.)	Year	(in.)	Date	≥0.01	≥0.10	≥0.50	≥1.00
Feb	3.9	7	5.1	2014	2.6	2013	2.4	2/21/2015	11	7	3	1
Mar	4.1	6	4.4	2014	3.1	2012	2.0	3/2/2014	12	7	3	1
Apr	5.0	6	7.6	2013	1.1	2016	3.3	4/27/2013	11	8	3	1
May	3.0	10	4.0	2012	2.4	2016	1.6	5/13/2012	10	6	2	1
Jun	3.7	8	5.7	2014	0.3	2012	2.0	6/24/2016	11	7	3	1
Jul	6.1	9	8.4	2012	2.4	2014	1.9	7/4/2013	12	8	4	3
Aug	4.1	7	6.4	2016	2.0	2013	1.7	8/30/2014	12	7	3	1
Sep	2.9	13	5.6	2012	0.2	2014	2.0	9/17/2012	7	5	2	1
Oct	3.9	12	8.4	2014	0.4	2016	2.6	10/10/2014	9	6	2	1
Nov	2.8	9	4.8	2015	1.4	2012	1.8	11/29/2015	8	5	2	1
Dec	5.6	8	8.0	2013	3.2	2014	2.9	12/5/2013	13	9	5	1
Jan	3.5	8	7.1	2012	2.2	2015	1.8	1/13/2013	10	6	3	1
Annual	**48.6**	**8**	**50.8**	**2015**	**43.9**	**2016**	**3.3**	**4/27/2013**	**126**	**81**	**35**	**13**

Data Source: Global Historical Climatology Network. Period of record: 2/1/2012 – 1/31/2017.
1: Average number of rainfall days with a rainfall total greater than or equal to the depth (inches) shown.
2: Relative Color Gradient: Rainfall depth/distribution and average consecutive dry days. Darker is higher.

2.2 Pollutant Sampling Dates vs. Rainfall Distribution

Wet weather outfall sampling was conducted by MWS between April 2012 and January 2017. Water quality samples were collected on 25 days during that period at five different land use-specific monitoring sites. Rainfall depth for the 25 sample dates relative to the long-term historical record (1/1996 - 9/2017) at the Airport are displayed in **Figure 2-1**. The figure shows that the selected sampling dates were well distributed across the long-term record of percentile rainfall depths, with 6 days reporting more than 1 inch of rainfall. This distribution suggests that the sampled events are representative of a wide range of wet-weather conditions. The distribution of the sample days by month and rainfall magnitude, along with the maximum number of consecutive dry days by month are displayed in **Table 2-2.**

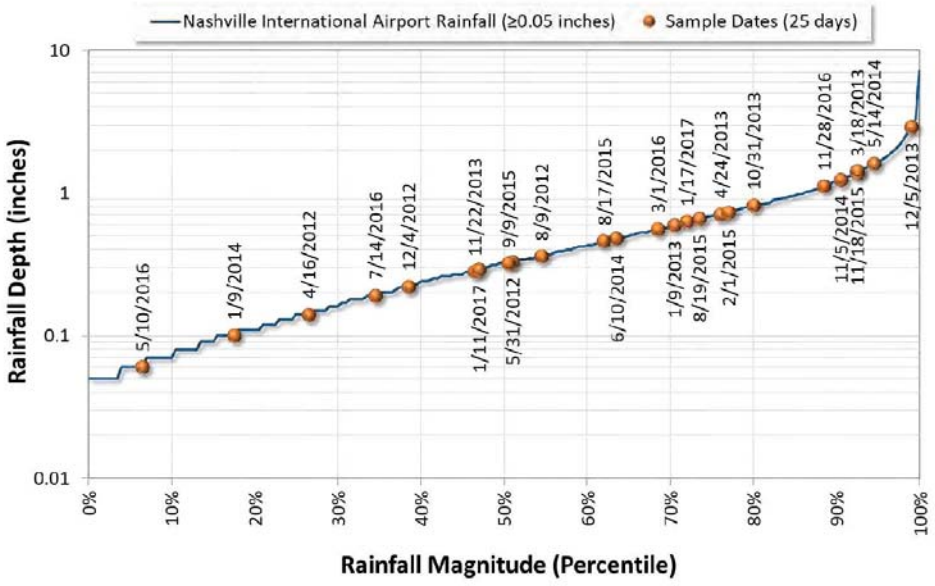


Figure 2-1. Wet-weather sampling dates vs. the long-term rainfall record at Nashville International Airport.

Table 2-2. Sample date distribution vs. wet/dry conditions at the Nashville International Airport (WBAN:13897)

Period	Average Conditions		Maximum Dry Days		No. Sample Days with Rainfall				
	Rainfall (in.)	Dry Days	Days	End Date	≥0.01	≥0.10	≥0.50	≥1.00	≥1.00
Feb	3.9	7	19	2/1/2014	0	0	1	0	**1**
Mar	4.1	6	10	3/23/2016	0	0	1	1	**2**
Apr	5.0	6	14	4/20/2016	0	1	1	0	**2**
May	3.0	10	19	5/14/2015	1	1	0	1	**3**
Jun	3.7	8	18	6/29/2012	0	1	0	0	**1**
Jul	6.1	9	25	7/6/2012	0	1	0	0	**1**
Aug	4.1	7	10	8/6/2014	0	2	1	0	**3**
Sep	2.9	13	27	9/29/2014	0	1	0	0	**1**
Oct	3.9	12	30	10/2/2014	0	0	1	0	**1**
Nov	2.8	9	29	11/18/2016	0	1	0	3	**4**
Dec	5.6	8	12	12/13/2015	0	1	0	1	**2**
Jan	3.5	8	17	1/30/2014	0	2	2	0	**4**
Annual	**48.6**	**8**	**30**	**10/2/2014**	**1**	**11**	**7**	**6**	**25**

Data Source: Global Historical Climatology Network. Period of record: 2/1/2012 – 1/31/2017.
1: Color gradient: maximum consecutive dry days and sample days by month and rainfall. Darker is higher

2.3 Identifying a Representative Average Year

Metro Nashville's annual reporting year aligns with the fiscal year, July 1 to June 30. Twenty years of the historical rainfall record were summarized by reporting year for both annual-average rainfall and storm distribution by rainfall magnitude, as summarized in **Table 2-3**. As shown in the two colored columns, each of the 20-years in the historical record were compared against annual-average rainfall and storm distribution for (1) the most recent MS4 permit cycle average and (2) the 20-year long-term average. Of the 20 years in the historical record, the analysis showed that the most recent reporting year, 2016 (7/1/2016-6/30/2017), was the most representative (i.e., the best year to define as an average year) in terms of both rainfall volume and storm distribution. In other words, year 2016 had the least difference in annual average rainfall relative to the most recent MS4 permit cycle, as well as the most similar annual average storm distribution. For the annualized SPL estimates, year 2016 will be used to represent average annual conditions.

Table 2-3. Identifying an average rainfall year at Nashville International Airport (WBAN:13897)

Starting Year (7/1 - 6/30)	Rainfall (inches)	Abs. Mean Difference (in.)[1]		Number of Rain Days per Year:			
		Permit Cycle	20-Years	≥0.01	≥0.10	≥0.50	≥1.00
1997	57.7	9.1	8.1	135	88	35	18
1998	44.5	4.2	5.1	127	82	28	8
1999	42.0	6.6	7.6	106	67	27	15
2000	43.1	5.5	6.5	111	64	30	13
2001	50.0	1.4	0.5	117	81	31	13
2002	63.1	14.5	13.6	139	93	39	15
2003	55.8	7.2	6.2	132	92	38	16
2004	50.8	2.2	1.3	121	81	32	15
2005	39.9	8.7	9.6	111	70	26	10
2006	38.1	10.5	11.4	100	67	30	8
2007	47.6	1.0	1.9	114	72	33	12
2008	47.8	0.8	1.7	112	72	32	11
2009	65.7	17.1	16.1	124	83	39	15
2010	53.2	4.6	3.6	117	74	37	19
2011	41.0	7.7	8.6	111	75	30	9
2012	56.6	8.0	7.0	135	88	42	19
2013	53.5	4.9	4.0	131	84	33	12
2014	47.4	1.2	2.1	122	80	34	12
2015	45.3	3.3	4.2	127	81	34	12
2016[2]	**48.1**	**0.5**	**1.4**	**125**	**87**	**33**	**13**
Permit-Cycle Average (2/1/2012 - 1/31/2017):	**48.6**	**0.0**	**--**	**126**	**81**	**35**	**13**
20-Year Average (7/1/1997 - 6/30/2017):	**49.6**	**--**	**0.0**	**121**	**79**	**33**	**13**

Data Source: Global Historical Climatology Network. Period of record: 7/1/1997 – 6/30/2017.
1: Color gradient: absolute rainfall difference relative to long-term average conditions. Darker is higher difference.
2: Reporting year 2016 (7/1/2016 – 6/30/2017) is the most representative average year by volume and distribution.

2.4 Selecting Representative Rainfall Gages

To assist with evaluating spatial rainfall variation and selecting representative gages for the load reduction analysis, information from the Parameter-elevation Regressions on Independent Slopes Model (PRISM) was evaluated. Developed and maintained by the PRISM Climate Group at Oregon State University (http://prism.oregonstate.edu), PRISM provides gridded estimates of event-based climate parameters including precipitation, temperature, and dew point (DiLuzio et al., 2008). PRISM provides a spatially-refined climatological coverage for the lower 48 contiguous United States at a 4-km spatial resolution. The algorithm uses observed point data, a digital elevation model, and other spatial datasets to capture meteorological influences such as elevation differences, rain shadows, temperature inversions, and other complex climatic regimes (Daly et. al, 2002; Gibson et al. 2002). PRISM data for the region were downloaded and summarized for both the most recent permit cycle (2/1/2012-1/31/2017) and the identified representative reporting year (6/1/2016 – 7/31/2017).

A statistical comparison of mean rainfall variability according to PRISM showed no significant difference in the region; however, visual assessment suggests that dividing the county into three "precipitation zones" would capture spatial variability of rainfall in the county. Three of the highest-quality NCDC gages – those located at Belle Meade, Goodlettsville, and Nashville Airport – were selected and used to represent three precipitation zones (**Figure 2-2**). The locations of the three (3) NCDC gages were used as a basis for developing Thiessen polygons that divide the county into three precipitation zones. A summary of average annual rainfall by zone, for both the recent MS4 permit cycle and the average year, is displayed in **Table 2-4**.

To generate the rainfall time series for each precipitation zone, the data from the three (3) gages were combined. The Nashville Airport gage had the highest data quality and it was the only gage with available hourly data; as such, the Airport gage was used as the primary gage while the other two gages were used to develop weighting factors to capture east-to-west and north-to-south rainfall variability. The timeseries from each PRISM grid were area-weighted using the intersecting proportions of the Thiessen polygons with the PRISM grid cells shown in **Figure 2-2** to develop representative disaggregated hourly timeseries for each of the three precipitation zones.

Table 2-4. Average rainfall by zone for most recent permit cycle and average reporting year

Zone	Representative Gage	Average Rainfall (inches/year)	
		Permit Cycle (2/1/2012 – 1/31/2017)	Average Year (7/1/2016 – 6/30/2017)
1	Belle Meade 3.1 N, TN	52.0	50.0
2	Goodlettsville 7 WNW, TN	54.6	58.3
3	Nashville International Airport, TN	50.7	50.4

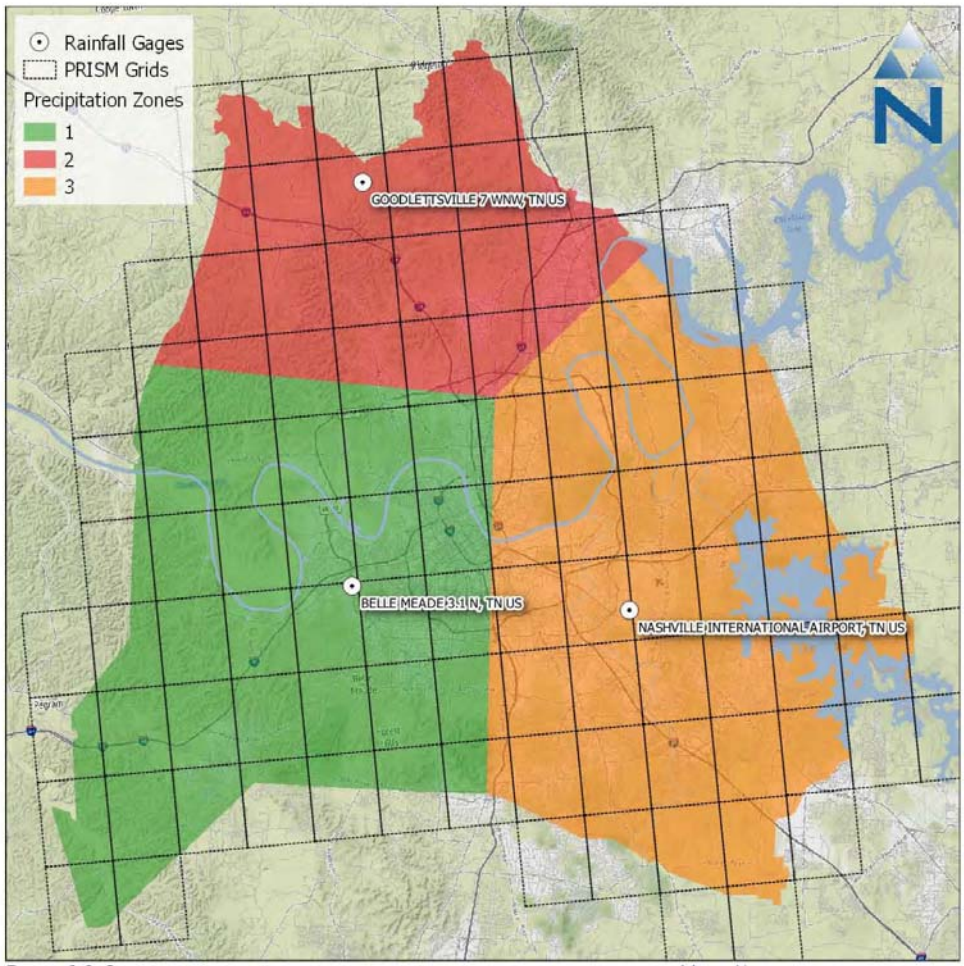


Figure 2-2. Selected representative rainfall gages and precipitation zones for Metro Nashville.

3 RAINFALL-RUNOFF ANALYSIS

A rainfall-runoff analysis was performed to generate a timeseries of hourly flow data to represent land use response to varying amounts of rainfall across the three (3) precipitation zones in Metro Nashville. An existing calibrated rainfall-runoff model was used to determine annual runoff volumes by land use and the portion of runoff that corresponds to first flush. The existing model is a Loading Simulation Program C++ (LSPC) model developed for the Richland Creek Watershed (Tetra Tech 2014), which was also leveraged for the Richland Creek Watershed Management Plan (MWS, 2016). The model includes algorithms that simulate watershed processes such as hydrology, sediment erosion, and water quality. Key elements of the LSPC model development process, which could also be leveraged for

SPL estimates, were 1) representation of land uses, 2) representation of weather, and 3) calibration to demonstrate model performance.

The existing Richland Creek LSPC hydrology model was run for the average year (July 2016 – June 2017) with hourly time steps for each rainfall zone. Most soils in Davidson County are B and C soils, however, A and D soils were added to the model to provide a more comprehensive coverage on a parcel-by-parcel scale. The following steps were performed to estimate the first flush runoff volume (in./yr) and the remaining (post 1-hour) runoff volume (in./yr) from impervious and pervious land surfaces for each rainfall zone:

- Created hourly rainfall and potential evapotranspiration timeseries for the average year
- Added soil type A and D to the existing Richland Creek LSPC model
- Simulated LSPC hydrology model for the average year
- Generated model output hourly flow timeseries on unit-area (i.e., 1 acre) basis from the five (5) land cover types: impervious, pervious soil type A, pervious soil type B, pervious soil type C, and pervious soil type D land segments
- Processed the LSPC-simulated hourly runoff timeseries to estimate the total runoff volume from the first-flush and remaining (post 1-hour) duration from all the storms in the average year. Storms were separated by 6 hours, meaning, any rainfall that occurred after a 6-hour dry period was counted as a new storm event

The unit-area runoff volumes are shown in **Table 3-1** for each land cover type (impervious, pervious A, pervious B, pervious C, and pervious D). The runoff volumes are separated into annual first flush volume (FFV) and remaining volume (RV), which can be assigned to the first-flush and 1-hr EMCs measured by MWS. These unit-area volumes are the main building blocks used to estimate the runoff volume component of SPL estimates.

Table 3-1. Unit-area runoff volume (FFV[1] and RV[2]) by land cover type for the average year

Land Cover	Precipitation Zone 1		Precipitation Zone 2		Precipitation Zone 3	
	FFV[1] (in./yr)	RV[2] (in./yr)	FFV[1] (in./yr)	RV[2] (in./yr)	FFV[1] (in./yr)	RV[2] (in./yr)
Soil type A	0.001	0.030	0.001	0.071	0.001	0.029
Soil type B	0.005	0.259	0.009	0.548	0.004	0.260
Soil type C	0.013	0.584	0.023	1.103	0.008	0.575
Soil type D	0.658	6.179	0.915	7.880	0.590	5.895
Impervious	8.478	41.235	9.340	43.424	8.584	40.429

1: FFV: First flush volume (first hour runoff from all the storms in the representative year)
2: RV: Remaining volume (post first hour runoff from all the storms in the representative year, or total annual runoff volume minus the FFV)

4 GIS DATA ANALYSIS

GIS analysis was performed to map the unit-area runoff volumes (for impervious surfaces and soil types A, B, C and D) to land uses in Metro Nashville and to estimate the area distribution of these land covers for each MS4 watershed. The following subsections provide detailed descriptions of GIS analysis performed on land use, impervious cover, and soil datasets in Nashville. Each dataset is outlined in **Table 4-1** with data sources and layer descriptions. These datasets were analyzed and ultimately reclassified into 5 land cover types and 5 land use categories to aid in estimating the area distribution within each MS4 watershed.

Table 4-1. Summary of input datasets detailing data source and type

GIS Layer	Data Source (Reference)	Description
Davidson Watersheds	MWS[1]	polygon layer
Satellite Cities	MWS[1]	polygon layer
Parcel Land Uses	MWS[1]	polygon layer
Imperviousness	MWS[1]	polygon layer
Percent Imperviousness	NLCD[2] (Xian et al. 2011)	2011 – 30m resolution grid
Soil Survey Geographic Database (SSURGO)	USDA[3] (NRCS 2016)	2016 polygon layer

Data Sources: 1: MWS: Metro Water Services of Nashville and Davidson County
2: NLCD: National Land Cover Database
3: USDA: United States Department of Agriculture

4.1 MS4 Watersheds

There are 35 MS4 watersheds within Metro Nashville. MS4 watersheds were overlaid with Satellite Cities and state/federal areas, which were excluded from the MS4 watershed analysis. Three combined sewer system (CSS) watersheds located in the county were also excluded. The excluded areas for SPL estimation are highlighted in **Figure 4-1**. The MS4 jurisdictional areas and non-jurisdictional areas (i.e., Satellite Cities and state/federal areas) in Davidson County are displayed in **Table 4-1**. Tennessee Department of Transportation (TDOT) also has jurisdictional area / rights-of-way (ROW) in Metro Nashville, which are managed under a separate MS4 permit. For future applications, the TDOT ROW will be excluded – for this memo, the TDOT roads are included in the transportation category. Similarly, Tennessee State University (TSU) will be excluded in the future because that area is managed under a separate MS4 Permit. TSU boundary is located in Cumberland River watershed.

MS4 watershed boundaries were also overlaid with rainfall zones shown in **Figure 2-2** to map each watershed to a representative rainfall zones. If multiple rainfall zone boundaries intersected with a watershed boundary, the zone with the greatest area in the watershed was assigned. The rainfall zone mapping table is shown in **Table A-1 (Appendix A)**. The detailed area breakdown by individual MS4 watershed is shown in **Table A-2 (Appendix A)**.

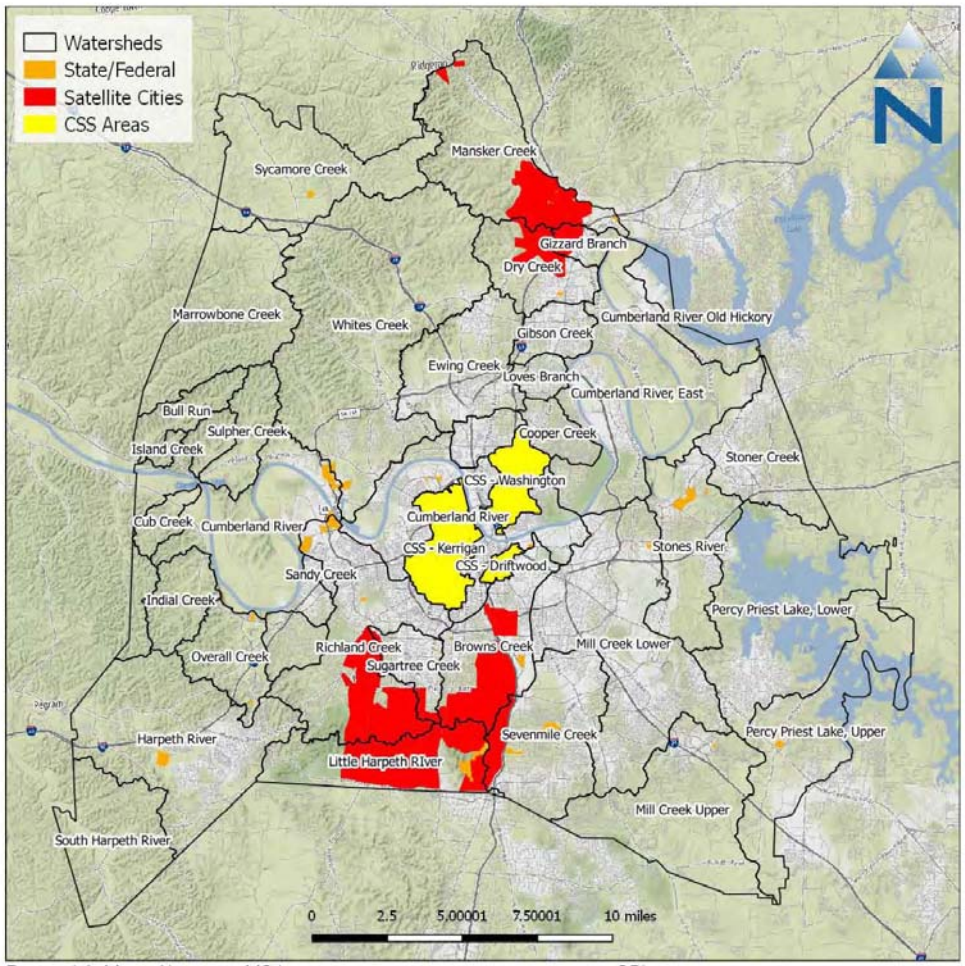


Figure 4-1. Metro Nashville MS4 watersheds and areas excluded from SPL estimates.

Table 4-2. MS4 and Excluded Area distribution in Metro Nashville

Jurisdictions	Area (acres)	Percent
MS4 Watersheds[1]	292,781	87.7%
Satellite Cities	17,587	5.3%
State/Federal Areas	1,452	0.5%
Combined Sewer System Watersheds	7,707	2.3%
Waterbodies	14,195	4.2%
Total:	333,722	100.0%

1 – These areas include TDOT ROW. For future applications, TDOT ROW and the Tennessee State University may be excluded as non-jurisdictional areas.

4.2 Land Use Reclassification

Wet weather outfall sampling by MWS was conducted at five (5) different sites with each site representing a single homogeneous land use – commercial, industrial, open space, residential, and transportation. For SPL estimates, all land uses in Metro Nashville were mapped to one of these five (5) land use types. **Table 4-3** shows the land use area distribution for MS4 jurisdiction.

The GIS dataset provided by MWS included thousands of land parcels classified into 99 different land use categories. For the SPL estimate, each category was reclassified into the five (5) MS4 land uses (commercial, industrial, residential, transportation, and open space) using QGIS. Those parcels labeled as "NULL" were mostly categorized into the "Residential" land use category, and some spot-checks were performed to re-classify parcels that appeared to be incorrectly labeled (i.e. the Nashville Airport was reclassified into "Industrial" instead of "Other"). Road footprints were generally represented as holes in the MWS parcel layer, which were converted into the transportation category. The water bodies were also overlaid to the parcel layer to create a final land use layer, shown in **Figure 4-2**. The final layer includes the State/Federal and waterbodies so that those areas can be mapped with MS4 watersheds to identify the area distribution in each subwatershed boundary. When estimating the SPL estimate (Section 5), the state/federal areas and waterbodies were excluded from the analysis.

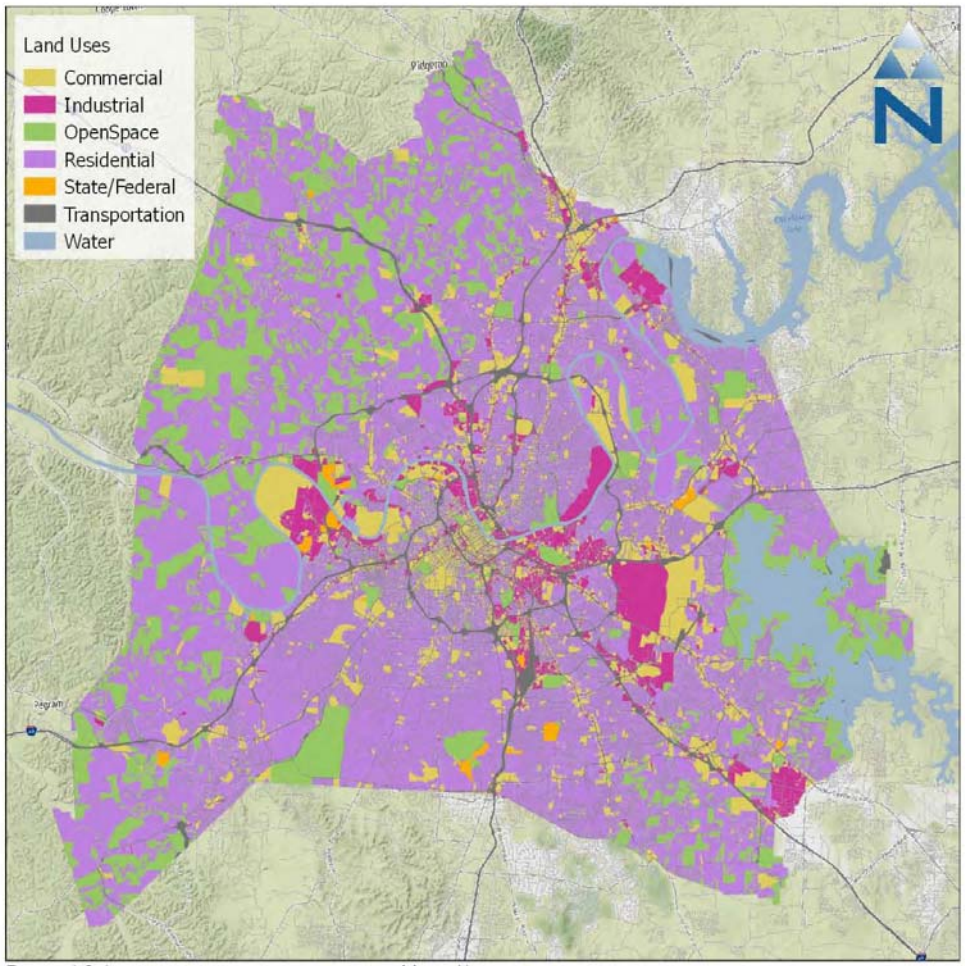


Figure 4-2. Land use reclassification map for Metro Nashville.

Table 4-3. Summary of non-excluded land use area distribution in Metro Nashville [1]

Land Use Categories	Area[1] (acres)	Percent
Commercial	27,409	9.4%
Industrial	15,562	5.3%
Open Space	56,143	19.2%
Transportation	25,594	8.7%
Residential	168,073	57.4%
Total:	292,781	100.0%

1: Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, state/federal areas, CSS watersheds). For future applications, TDOT right-of-way (ROW) and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

4.3 Percent Impervious Cover

Multiresolution Land Characteristics Consortium (MRLC) 2011 publishes a developed impervious cover dataset as a companion to the National Land Use Cover Database (NLCD) land cover. This dataset is also provided as a raster with a 30-meter grid resolution. Impervious cover is expressed in each raster pixel as a percentage of total area ranging from 0 to 100 percent. The NLCD 2011 percent imperviousness raster data were used as the base layer with overlaid 2016 impervious cover received from MWS and road data from the final processed land use layer. **Figure 4-3** shows the final processed impervious cover dataset for Metro Nashville.

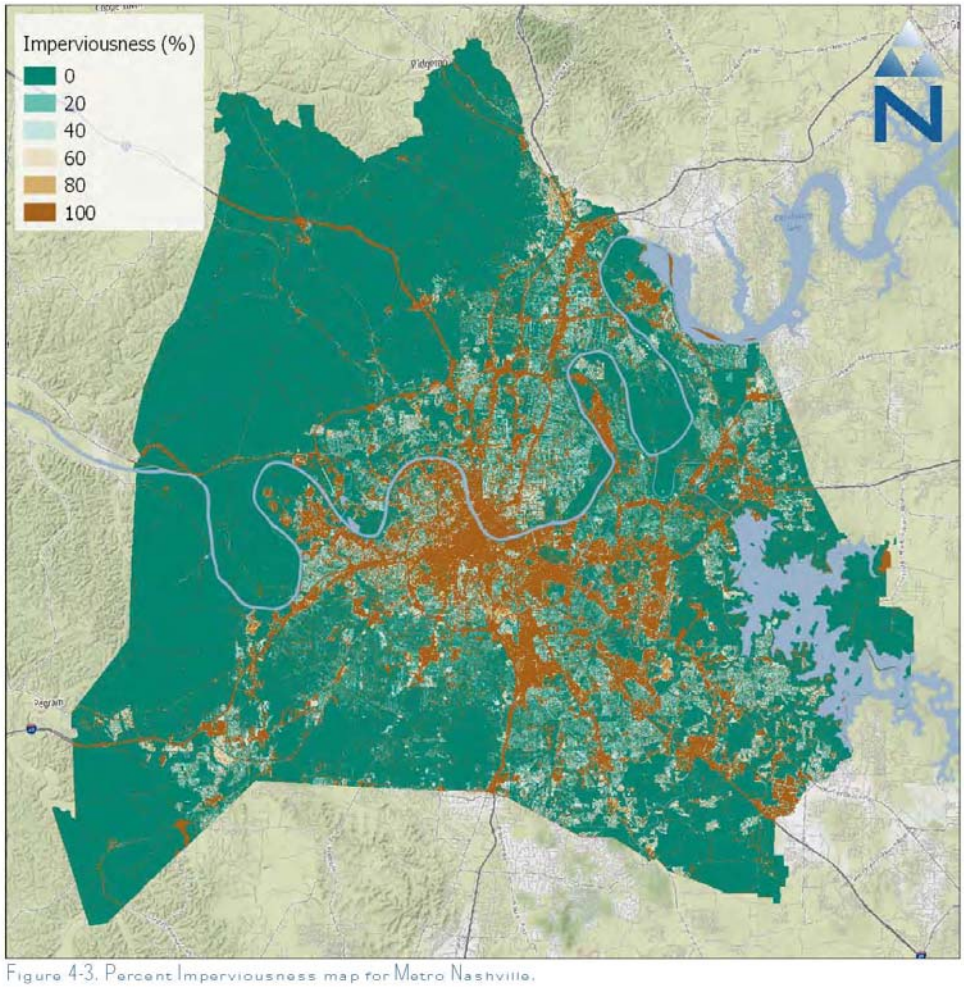


Figure 4-3. Percent Imperviousness map for Metro Nashville.

4.4 Hydrologic Soil Groups

Soil data for the MS4 watersheds were obtained from the 2014 Soil Survey Geographic Database (SSURGO) published by the Natural Resource Conservation Service (NRCS). There are four primary hydrologic soil groups (HSGs) used to characterize soil runoff potential. Group A generally has the lowest runoff potential whereas Group D has the highest runoff potential. SSURGO soils database is composed of a GIS polygon layer of map units and a linked database with multiple layers of soil properties. Soil characteristics of each hydrologic soil group are described in **Table 4-4**, while **Table 4-5** shows the area distribution of land cover categories from the pervious and impervious portions of the MS4 watersheds. **Figure 4-4** presents the spatial distribution of SSURGO hydrologic soil groups for Metro Nashville.

The dominant soil group in Metro Nashville is Group B, containing moderately well to well-drained silt loams and loams. Group C is the next most common soil group in the county, containing sandy clay loam that typically has low infiltration rates.

Table 4-4. NRCS hydrologic soil group descriptions

Hydrologic Soil Group	Description
A	Sand, Loamy Sand, or Sandy Loam
B	Silt, Silt Loam or Loam
C	Sandy Clay Loam
D	Clay Loam, Silty Clay Loam, Sandy Clay, Silty Clay, or Clay

Data Source: Natural Resource Conservation Service (NRCS), Technical Release 55 (TR-55)

Table 4-5. Summary of land cover area distribution in MS4 watersheds for Davidson County [1]

Land Cover Categories	Area[1] (acres)	Percent
Soil type A	5	0.0%
Soil type B	131,457	44.9%
Soil type C	79,720	27.2%
Soil type D	15,075	5.1%
Impervious	66,524	22.7%
Total:	292,781	100.0%

1: Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, state/federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

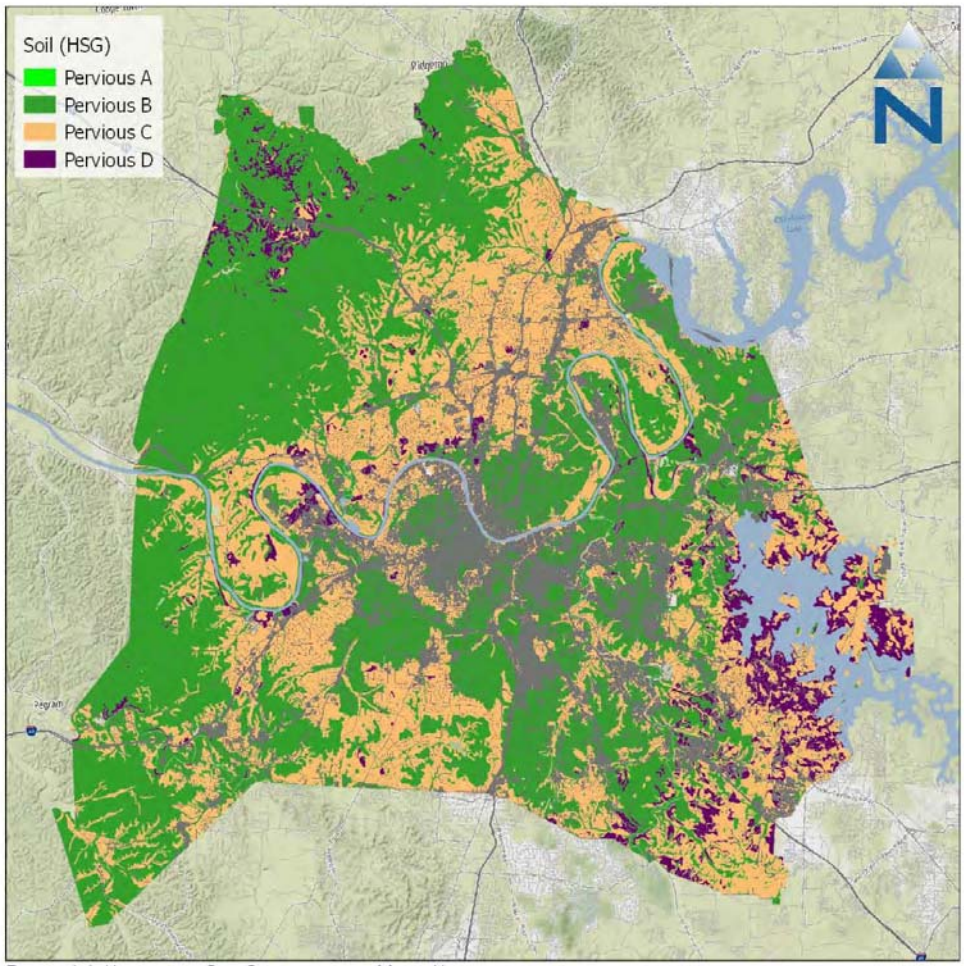


Figure 4-4. Hydrologic Soil Group map for Metro Nashville.

4.5 Area Distribution Analysis

Using the reclassified datasets for land use and soil categories, area distribution of each land use-soil-imperviousness combination by MS4 watershed was estimated using raster operations in QGIS.

These steps were performed to estimate area distribution:

- Re-project all GIS layers into USA Contiguous Albers Equal Area Conic projected coordinate system (EPSG-102003) to ensure proper overlay and accurate area calculations
- Clip all GIS layers to Davidson County extent to ensure data overlay to the same spatial extent
- Convert all vector GIS layers into raster grids, resampled to a 10-meter resolution (i.e., 10-meter pixel width by 10-meter pixel height)
- Intersect all input spatial layers and tabulate area distribution for each of the unique combinations of land cover and land use categories by MS4 watershed boundaries

Table 4-6 summarizes the land use area by each land cover category in Metro Nashville. The area distribution for each individual MS4 watershed is shown in **Table A-3** (**Appendix A**).

Table 4-6. Land use area distribution by land cover categories for Metro Nashville [1]

Land Use Categories	Land Cover Categories				
	Soil Type A (acres)	Soil Type B (acres)	Soil Type C (acres)	Soil Type D (acres)	Impervious (acres)
Commercial	0	6,827	7,087	968	12,527
Industrial	0	2,459	2,732	430	9,941
Open Space	3	34,207	14,377	5,296	2,260
Transportation	0	0	0	0	25,594
Residential	2	87,964	55,524	8,381	16,202

Note: waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

5 SEASONAL POLLUTANT LOAD ESTIMATES

The rainfall, runoff and GIS analyses in the previous sections were used to generate SPL estimates. SPL estimates for each MS4 watershed were built upon three (3) components:

1. Unit-area runoff volumes by land cover type and rainfall zone (**Table 3-1**);
2. Area distribution for each land use, with breakdown by soil type and impervious areas (**Table A-3** in Appendix A); and
3. EMC concentrations for each pollutant by sample type and land use category (MWS 2017):

The SPL estimates are presented in a series of figures and tables. **Table 5-1** shows SPL estimates for all of Metro Nashville. The pollutant load export rates (load per acre) are presented for each MS4 watershed using heat spatial maps in **Appendix B**, which visually represent the highest loading watersheds for each pollutant. The annual pollutant loads by land use categories for individual MS4 watersheds are presented in **Appendix C**. Detailed SPL formulas are presented on the next page.

Table 5-1. Average annual pollutant loads by land use categories across Metro Nashville[1]

Pollutant	Land Use				
	Commercial	Industrial	Open Space	Residential	Transportation
E. coli (10^12xMPN/yr)	223.46	286.21	431.12	9,523.56	85.12
Biological Oxygen Demand (ton/yr)	827.59	226.67	41.94	559.37	572.73
Chemical Oxygen Demand (ton/yr)	6,302.25	1,530.53	773.60	4,269.86	6,792.43
Total Ammonia (ton/yr)	19.30	5.09	1.56	8.50	22.72
Total Kjeldahl Nitrogen (ton/yr)	66.59	29.58	12.25	105.03	51.16
Nitrate + Nitrite (ton/yr)	20.56	14.19	6.77	24.30	33.44
Total Nitrogen (ton/yr)	87.66	41.04	18.01	139.68	88.12
Dissolved Phosphorous (ton/yr)	8.02	6.46	9.49	85.86	9.97
Total Phosphorous (ton/yr)	24.26	11.32	15.77	123.39	28.33
Total Lead (ton/yr)	0.19	0.08	0.02	0.13	0.30
Total Nickel (ton/yr)	0.36	0.28	0.10	0.53	0.72
Total Zinc (ton/yr)	7.93	1.88	0.26	5.68	5.17
Total Chromium (ton/yr)	0.16	0.05	0.04	0.10	0.30
Total Copper (ton/yr)	0.99	0.15	0.08	0.48	1.11
Oil & Grease (ton/yr)	258.24	58.26	63.84	42.46	327.80
Total Suspended Solids (ton/yr)	1,862.22	517.37	445.87	1,174.31	2,694.01
Total Dissolved Solids (ton/yr)	6,750.05	3,423.94	4,200.80	12,185.03	11,955.25

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

In simple form, the SPL estimate can be expressed as follows:

SPL = EMCs (*concentration*) x Unit Runoff Volumes (*volume per unit area*) x Land Use Areas (*area*)

The unit-area runoff volumes (**Table 3-1**) were multiplied by the land cover areas (impervious surfaces and different soil types) within each land use category to estimate the annual runoff volume for each MS4 watershed. The annual runoff volumes were further multiplied by the pollutant EMC (FF and 1-HR) for corresponding land use category to estimate the SPL for each MS4 watershed. Note the EMC concentrations were organized into three bins for each pollutant-land use combination: first flush (FF), 1-hour (1HR) and All samples (MWS 2017). If there were statistically-significant differences between FF and 1HR concentrations, then distinct first-flush and 1-hour EMCs were used for the SPL estimates; otherwise the EMC for the combined All dataset was used.

In more detail, the following formula outputs an SPL estimate for an MS4 watershed:

$$SPL = \sum_{n=1}^{5} \left(EMC\_FF\_LUC_n \times FFV\_LUC_n + EMC\_1HR\_LUC_n \times (TAV\_LUC_n - FFV_{LUC_n})\right),$$

where:

n = land use category index (i.e., commercial, industrial, residential, transportation, and open space)

$EMC\_FF\_LUC_n$ = median observed concentration value of all first-flush samples from the land use category n (or, if there is no statistical difference between FF and 1-HR samples, then the median concentration of all samples is used)

FFV_LUC_n = first-flush volume of runoff for all the storms in the average year from the land use category n

$EMC\_1HR\_LUC_n$ = median observed concentration value of all 1-hour samples from the land use category n (or, if there is no statistical difference between FF and 1-HR samples, then the median concentration of all samples is used)

TAV_LUC_n = total annual volume of runoff in the average year from the land use category n (note: the difference in total runoff volume and first flush runoff volume is the "remaining" runoff volume)

As described in Section 4.5 (see **Table A-3** in Appendix A), land use areas are combinations of impervious surfaces and different soil types. The runoff volume of first-flush for a given land use category can be expressed as:

$$FFV\_LUC_n = \sum_{i=1}^{5} (FFV\_SCC_i \times AREA\_SCC_i) \ ,$$

where:

i = land cover category index (i.e., impervious, soil type A, soil type B, soil type C, and soil type D)

FFV_SCC_i = unit-area runoff volume of first-flush from all the storms in the average year from the soil cover category i

$AREA\_SCC_i$ = total area of the soil cover category i under the land use category n

Similarly, the total annual volume of runoff for a given land use category can be expressed as:

$$TAV\_LUC_n = \sum_{i=1}^{5} (TAV\_SCC_i \times AREA\_SCC_i) \ ,$$

where:

TAV_SCC_i = unit-area total annual runoff volume in the average year from the land cover category i

6 CONCLUSIONS

This memo presents a methodology for estimating the average annual loading of 17 pollutants for 35 watersheds in Metro Nashville. These SPL estimates are built-upon defensible building blocks of unit-area runoff volumes by land cover type, which were generated by a calibrated continuous simulation model, and pollutant EMCs, which were generated through years of wet weather outfall monitoring by MWS. The methodology presented here can be readily automated using a web-based system. The envisioned web system will have simple web forms where the outputs generated from this analysis can be input directly and updated over time. Updates over time could include adjustments as land use distributions change. Furthermore, MWS may elect to consider additional conditions beyond the average year, such as wet years or 1-inch rainfall events.

It is important to note that the SPL estimates presented here are baseline conditions, prior to implementation of structural control measures or enhanced non-structural MS4 control measures. The EMCs account for existing baseline non-structural MS4 programs (those programs were being implemented over the course of the outfall monitoring), but EMCs could potentially be further reduced by program enhancements. The runoff volumes do not account for retention or treatment by structural control measures. A subsequent memo will estimate the effectiveness / pollutant load reduction of existing and potential future structural and non-structural control measures. The web system will allow MWS to upload the location, types and size of structural control measures, and the SPLs will be adjusted/reduced to account for their effectiveness. Similarly, the web system will allow MWS to adjust the intensity level of non-structural programs (if applicable), and the SPLs will be adjusted accordingly. Overall, the SPL estimates and projected effectiveness of MS4 programs are important to public messaging and decision-making as MWS's MS4 program evolves over time.

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APPENDIX A: SUMMARY TABLES FOR SPL ESTIMATES

Table A-1. Precipitation zone mapping for MS4 watersheds in Davidson County

MS4 Watershed	Rainfall Zone
Back Creek	1
Browns Creek	3
Bull Run Creek	1
Cooper Creek	3
Cub Creek	1
Cumberland River	3
Davidson Branch	1
Dry Creek	2
Ewing Creek	2
Gibson Creek	2
Gizzard Branch	2
Harpeth River	1
Indian Creek	1
Island Creek	1
Little Harpeth River	1
Loves Branch	3
Mansker Creek	2
Marrowbone Creek	2
Mill Creek Lower	3
Mill Creek Upper	3
Overall Creek	1
Pages Branch	1
Percy Priest Lake, Lower	3
Percy Priest Lake, Upper	3
Pond Creek	1
Richland Creek	1
Sevenmile Creek	3
South Harpeth River, Lower	1
Stoner Creek	3
Stones River	3
Sugartree Creek	1
Sulpher Creek	1
Sycamore Creek	2
Whites Creek	2
Sandy Creek	1

Table A-2. MS4 watersheds in Metro Nashville and excluded areas for SPL estimates

MS4 Watershed	Satellite Cities Area (acres)	State/Federal Area (acres)	MS4 Jurisdictional Area (acres)
Back Creek	0	0	1,600
Browns Creek	3,269	62	5,465
Bull Run Creek	0	0	2,931
Cooper Creek	0	0	2,358
Cub Creek	0	0	1,580
Cumberland River	0	246	46,084
Davidson Branch	0	0	2,378
Dry Creek	1,172	16	4,408
Ewing Creek	0	0	8,872
Gibson Creek	0	2	2,762
Gizzard Branch	563	0	882
Harpeth River	0	122	17,633
Indian Creek	0	0	3,896
Island Creek	0	0	530
Little Harpeth River	4,618	82	3,955
Loves Branch	0	0	1,468
Mansker Creek	2,678	15	10,319
Marrowbone Creek	0	1	12,105
Mill Creek Lower	0	30	19,985
Mill Creek Upper	0	7	14,421
Overall Creek	0	33	4,876
Pages Branch	0	0	2,070
Percy Priest Lake, Lower	0	0	12,075
Percy Priest Lake, Upper	0	40	10,923
Pond Creek	0	0	1,713
Richland Creek	3,900	251	10,551
Sevenmile Creek	908	232	9,837
South Harpeth River, Lower	0	0	9,225
Stoner Creek	0	3	7,441
Stones River	0	187	8,832
Sugartree Creek	478	2	2,577
Sulpher Creek	0	0	3,864
Sycamore Creek	0	33	12,988
Whites Creek	0	86	31,662
Sandy Creek	0	0	517

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table A-3. Area distribution by non-excluded land cover category for MS4 watersheds in Metro Nashville

MS4 Watershed	Land Use Categories	Land Cover Categories				
		Soil Type A (acre)	Soil Type B (acre)	Soil Type C (acre)	Soil Type D (acre)	Impervious (acre)
Back Creek	Commercial	0	0	0	0	0
	Industrial	0	0	0	0	0
	Open Space	0	243.30	11.79	0	0.50
	Transportation	0	0	0	0	19.30
	Residential	0	1,230.03	91.20	0	3.65
Browns Creek	Commercial	0	99.72	29.95	0	561.83
	Industrial	0	54.56	34.00	0	937.15
	Open Space	0	157.35	20.22	0	167.77
	Transportation	0	0	0	0	1,392.98
	Residential	0	1,285.46	367.21	0	357.23
Bull Run Creek	Commercial	0	18.66	0	0	0.49
	Industrial	0	0	0	0	0
	Open Space	0	1,103.13	8.89	0	2.72
	Transportation	0	0	0	0	84.51
	Residential	0	1,657.62	34.01	0	21.43
Cooper Creek	Commercial	0	33.49	34.16	0	131.32
	Industrial	0	61.50	38.95	0	36.90
	Open Space	0	0	4.66	0	3.77
	Transportation	0	0	0	0	353.36
	Residential	0	1,026.04	367.21	0	267.02
Cub Creek	Commercial	0	1.24	5.73	0.07	1.71
	Industrial	0	0	0	0	0
	Open Space	0	305.20	20.88	0	1.68
	Transportation	0	0	0	0	19.10
	Residential	0	799.63	422.54	0	2.16
Cumberland River	Commercial	0	1,938.51	2,131.47	108.91	3,044.11
	Industrial	0	727.32	1,257.11	253.39	2,522.66
	Open Space	0	2,950.34	2,090.04	168.82	552.16
	Transportation	0	0	0	0	4,200.27
	Residential	0	11,347.58	9,195.21	861.92	2,734.47
Davidson Branch	Commercial	0	17.64	66.48	10.17	103.32
	Industrial	0	2.59	21.24	0.12	10.22
	Open Space	0	1.14	27.66	19.08	8.59
	Transportation	0	0	0	0	302.33
	Residential	0	179.39	1,483.64	32.58	92.16
Dry Creek	Commercial	0	41.92	135.45	0	205.37
	Industrial	0	38.81	50.31	0.12	261.44
	Open Space	0	209.53	396.93	0	30.11

MS4 Watershed	Land Use Categories	Land Cover Categories				
		Soil Type A (acre)	Soil Type B (acre)	Soil Type C (acre)	Soil Type D (acre)	Impervious (acre)
	Transportation	0	0	0	0	412.00
	Residential	0	544.55	1,830.18	0	251.29
Ewing Creek	Commercial	0	106.77	482.59	11.57	427.42
	Industrial	0	74.08	163.00	3.29	350.67
	Open Space	0	317.85	506.85	8.92	67.74
	Transportation	0	0	0	0	1,161.94
	Residential	0	835.43	3,721.27	67.25	565.01
Gibson Creek	Commercial	0	1.84	113.18	18.21	345.59
	Industrial	0	0.63	4.79	0	67.20
	Open Space	0	0	23.07	0	10.42
	Transportation	0	0	0	0	411.38
	Residential	0	72.04	1,244.85	21.94	426.37
Gizzard Branch	Commercial	0	0.67	26.66	0	225.41
	Industrial	0	0.33	21.79	0	57.50
	Open Space	0	0	0	0	0
	Transportation	0	0	0	0	111.77
	Residential	0	17.56	331.14	8.72	80.49
Harpeth River	Commercial	0	326.88	268.21	15.58	382.24
	Industrial	0	14.97	1.02	0	24.70
	Open Space	0	2,492.01	520.71	81.69	76.08
	Transportation	0	0	0	0	1,459.08
	Residential	0	7,868.22	2,824.98	136.87	1,139.47
Indian Creek	Commercial	0	25.29	5.11	0	2.66
	Industrial	0	0	0	0	0
	Open Space	0	1,125.35	218.90	3.98	4.50
	Transportation	0	0	0	0	38.10
	Residential	0	1,755.11	658.43	48.41	9.88
Island Creek	Commercial	0	0	0	0	0
	Industrial	0	0	0	0	0
	Open Space	0	284.16	0	0	0.53
	Transportation	0	0	0	0	43.10
	Residential	0	201.13	0	0	0.60
Little Harpeth River	Commercial	0	88.43	27.50	0	123.17
	Industrial	0	0	0.52	0	8.95
	Open Space	0	919.27	906.92	0	96.22
	Transportation	0	0	0	0	232.11
	Residential	0	801.47	634.33	0.43	115.50
Loves Branch	Commercial	0	8.78	28.46	0.22	92.00
	Industrial	0	0.45	0	0	23.12
	Open Space	0	109.85	22.17	0	67.47
	Transportation	0	0	0	0	299.59

MS4 Watershed	Land Use Categories	Land Cover Categories				
		Soil Type A (acre)	Soil Type B (acre)	Soil Type C (acre)	Soil Type D (acre)	Impervious (acre)
	Residential	0	249.07	426.55	3.04	137.53
Mansker Creek	Commercial	0	17.78	31.81	0	77.80
	Industrial	0	23.41	26.28	0	97.14
	Open Space	0	2,001.26	551.39	1.04	62.47
	Transportation	0	0	0	0	437.72
	Residential	1.43	4,616.43	2,199.35	55.12	118.33
Marrowbone Creek	Commercial	0	619.85	7.63	13.26	28.47
	Industrial	0	6.60	0	6.05	9.81
	Open Space	0	5,009.12	58.41	220.97	35.19
	Transportation	0	0	0	0	214.22
	Residential	0	5,152.60	76.53	579.21	66.98
Mill Creek Lower	Commercial	0	638.80	250.80	29.97	1,770.09
	Industrial	0	1,012.80	459.24	12.24	2,755.92
	Open Space	0	425.88	126.07	33.20	50.73
	Transportation	0	0	0	0	2,909.52
	Residential	0	4,948.04	2,207.82	360.66	1,992.84
Mill Creek Upper	Commercial	0	273.16	437.90	203.25	471.58
	Industrial	0	32.62	37.91	42.29	188.97
	Open Space	0	854.23	1,055.14	450.89	44.69
	Transportation	0	0	0	0	1,086.13
	Residential	0	3,041.46	3,941.41	1,212.92	1,046.43
Overall Creek	Commercial	0	54.25	111.72	8.95	108.02
	Industrial	0	17.97	113.10	0.51	66.91
	Open Space	0	516.25	229.04	27.61	11.66
	Transportation	0	0	0	0	289.24
	Residential	0	1,784.08	1,286.37	37.84	212.51
Pages Branch	Commercial	0	49.23	114.18	53.90	244.16
	Industrial	0	14.17	67.43	23.49	192.78
	Open Space	0	0.17	28.73	2.22	3.50
	Transportation	0	0	0	0	352.62
	Residential	0	181.60	403.10	85.53	253.08
Percy Priest Lake, Lower	Commercial	0	73.54	188.48	63.11	262.09
	Industrial	0	2.92	2.39	1.15	31.28
	Open Space	0	381.04	1,730.03	2,310.37	295.65
	Transportation	0	0	0	0	1,095.34
	Residential	0	523.95	2,795.93	1,409.49	908.12
Percy Priest Lake, Upper	Commercial	0	109.66	509.28	103.74	239.52
	Industrial	0	56.02	237.06	75.94	699.00
	Open Space	0	139.06	1,642.04	1,374.11	169.28
	Transportation	0	0	0	0	762.32
	Residential	0	277.88	2,755.60	1,334.74	437.78

MS4 Watershed	Land Use Categories	Land Cover Categories				
		Soil Type A (acre)	Soil Type B (acre)	Soil Type C (acre)	Soil Type D (acre)	Impervious (acre)
Pond Creek	Commercial	0	1.80	0	0	0.49
	Industrial	0	0	0	0	0
	Open Space	0	677.13	0	0	2.41
	Transportation	0	0	0	0	22.88
	Residential	0	987.75	0	0	20.91
Richland Creek	Commercial	0	307.62	169.12	0	835.80
	Industrial	0	83.04	29.83	6.22	469.07
	Open Space	0	552.75	375.97	0	89.53
	Transportation	0	0	0	0	1,645.20
	Residential	0	2,673.58	2,405.06	0	907.71
Sevenmile Creek	Commercial	0	216.91	70.77	6.63	677.92
	Industrial	0	10.00	5.85	0	258.41
	Open Space	0	124.47	43.72	0	92.61
	Transportation	0	0	0	0	1,464.62
	Residential	0	4,046.16	1,398.86	16.79	1,403.30
South Harpeth River, Lower	Commercial	0	10.86	33.21	0	5.15
	Industrial	0	9.64	2.41	0	1.49
	Open Space	0	2,453.28	617.16	0.47	54.90
	Transportation	0	0	0	0	179.13
	Residential	0.20	4,497.60	1,302.68	0.52	55.90
Stoner Creek	Commercial	0	219.88	103.91	18.70	483.49
	Industrial	0	32.07	21.90	1.09	126.98
	Open Space	0	33.51	16.90	0.07	4.37
	Transportation	0	0	0	0	953.11
	Residential	0	2,348.49	1,845.30	336.83	894.83
Stones River	Commercial	0	814.45	1,041.15	213.88	842.99
	Industrial	0	67.51	12.91	3.11	476.12
	Open Space	0	133.80	190.73	44.99	57.11
	Transportation	0	0	0	0	983.55
	Residential	0	2,068.65	1,210.10	203.40	467.68
Sugartree Creek	Commercial	0	10.19	37.92	0	294.95
	Industrial	0	0	0.01	0	3.23
	Open Space	0	0	0	0	0
	Transportation	0	0	0	0	306.93
	Residential	0	833.38	771.60	13.00	305.64
Sulpher Creek	Commercial	0	1.74	12.87	0	9.48
	Industrial	0	2.81	4.85	0	6.77
	Open Space	0	937.97	539.64	1.16	10.87
	Transportation	0	0	0	0	125.75
	Residential	0	1,724.05	448.17	7.34	30.48
Sycamore Creek	Commercial	0	201.82	3.42	19.64	64.23

MS4 Watershed	Land Use Categories	Land Cover Categories				
		Soil Type A (acre)	Soil Type B (acre)	Soil Type C (acre)	Soil Type D (acre)	Impervious (acre)
	Industrial	0	1.67	6.19	1.34	4.04
	Open Space	2.79	3,066.11	255.09	418.06	52.74
	Transportation	0	0	0	0	488.06
	Residential	0.96	6,726.69	358.30	1,204.12	112.85
Whites Creek	Commercial	0	489.03	588.99	68.32	432.45
	Industrial	0	106.71	110.86	0.05	231.34
	Open Space	0	6,682.41	2,137.21	128.53	132.31
	Transportation	0	0	0	0	1,630.97
	Residential	0	11,563.11	6,345.00	341.79	672.69
Sandy Creek	Commercial	0	6.45	18.62	0	31.89
	Industrial	0	3.49	1.29	0	20.77
	Open Space	0	0	0	0	0
	Transportation	0	0	0	0	105.86
	Residential	0	98.12	139.79	0.73	89.72

For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

APPENDIX B: SUMMARY MAPS OF SPL ESTIMATES

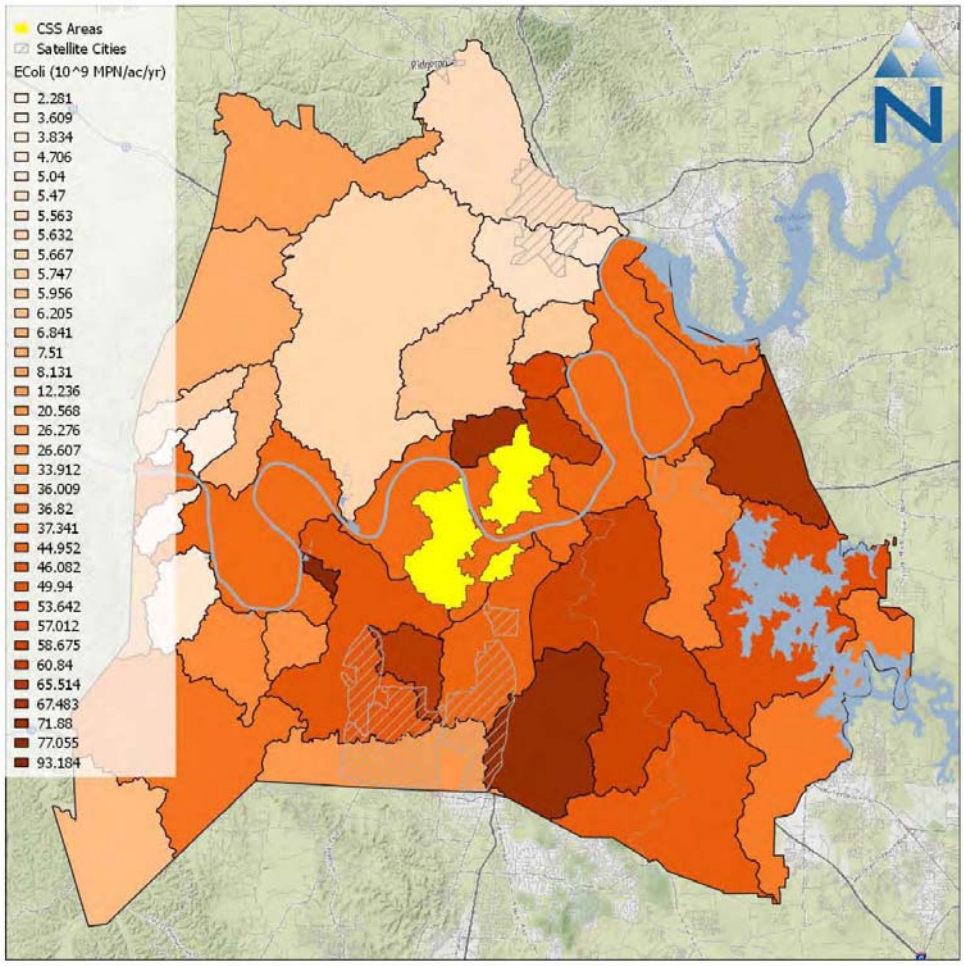

Figure B-1. *E. coli* loading export rate (10^9xMPN/acre/year) map for MS4 watersheds in Davidson County.

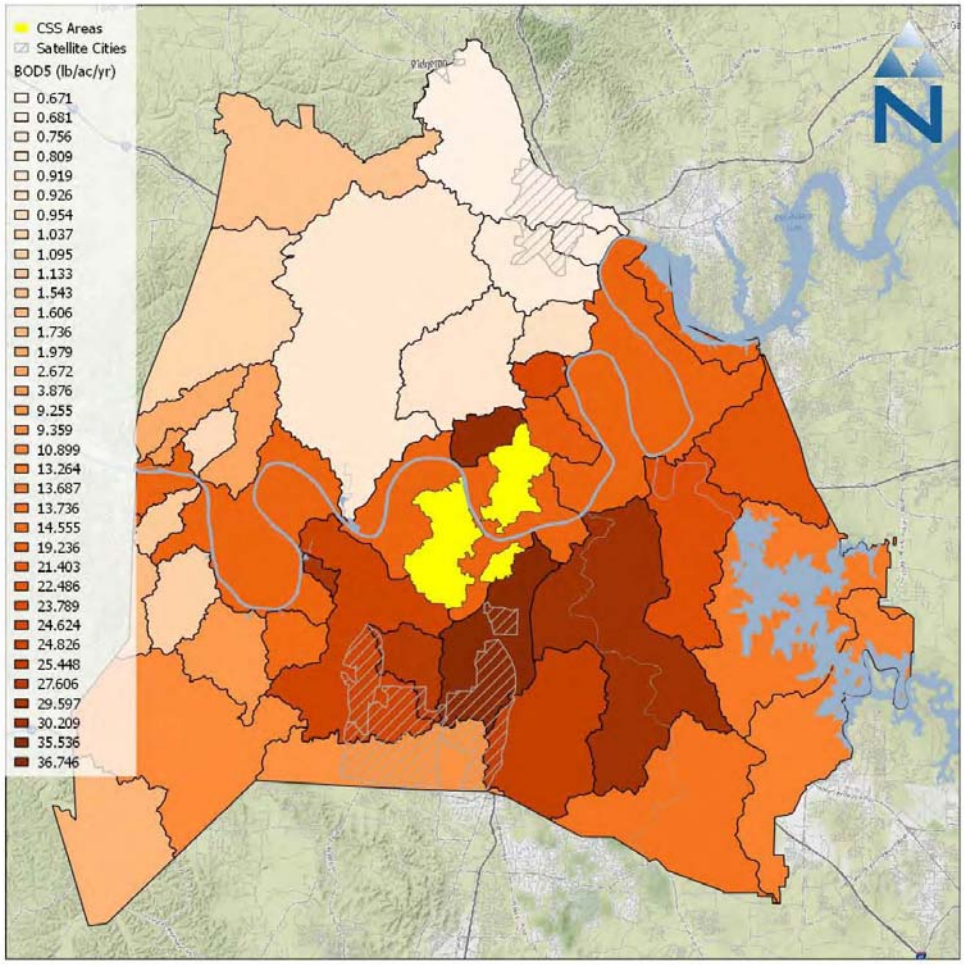

Figure B-2. BOD5 loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

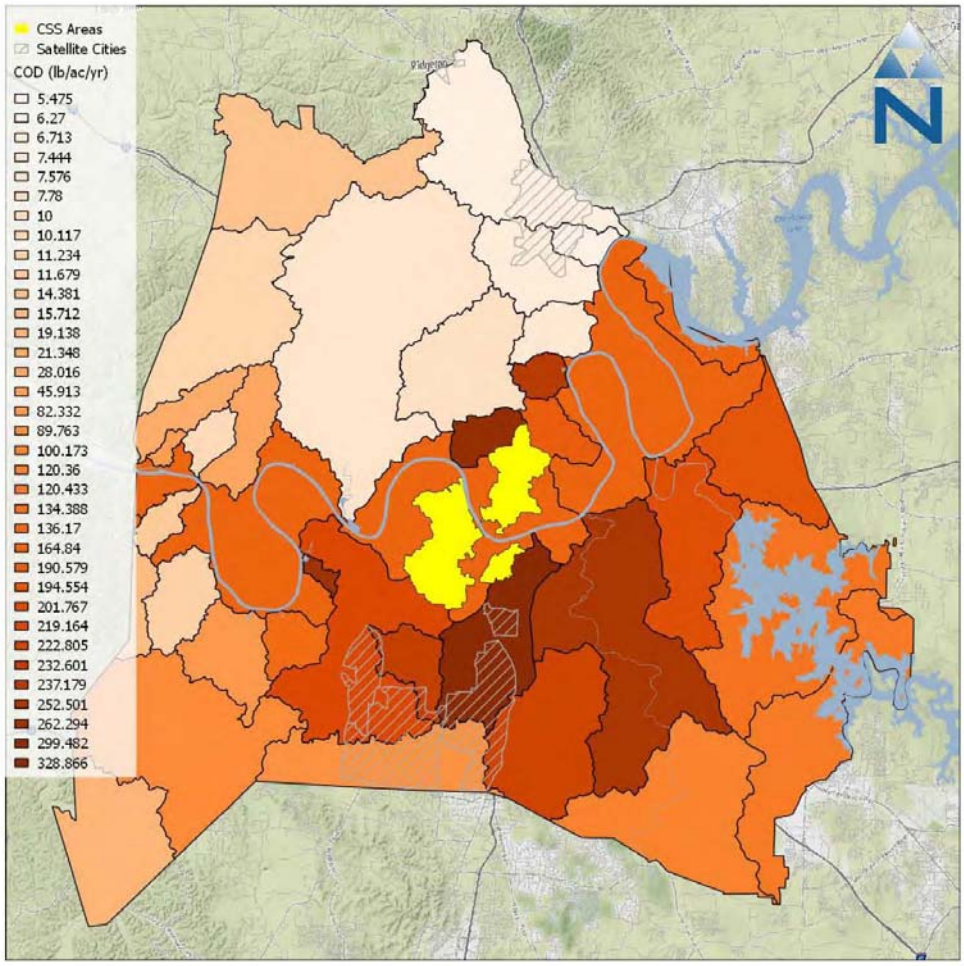

Figure B-3. COD loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

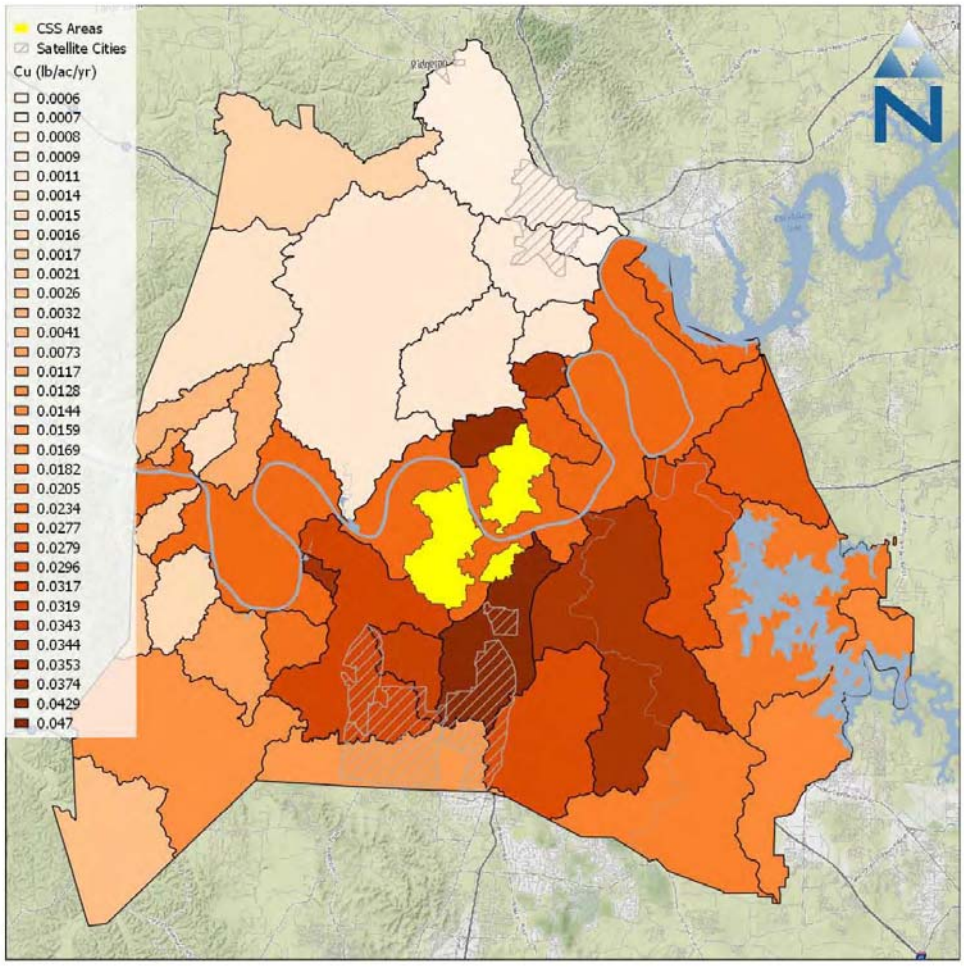

Figure B-4. Cu Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

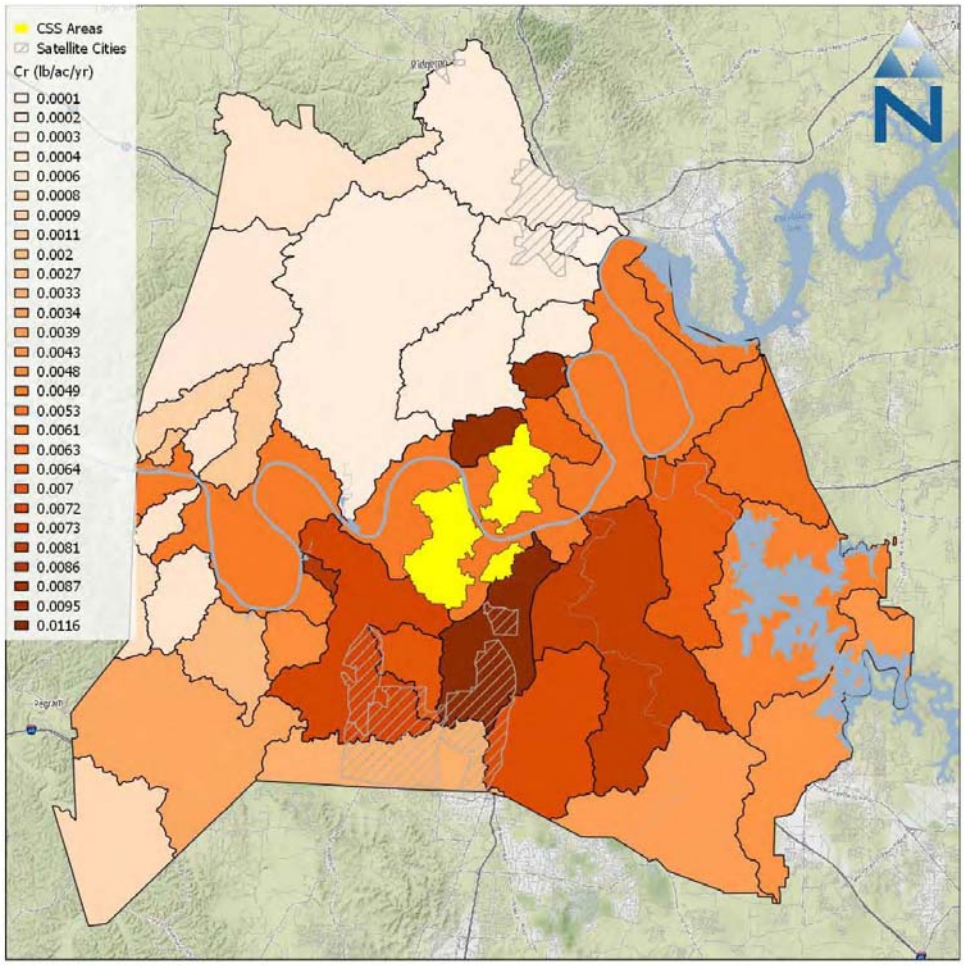

Figure B-5. Cr Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

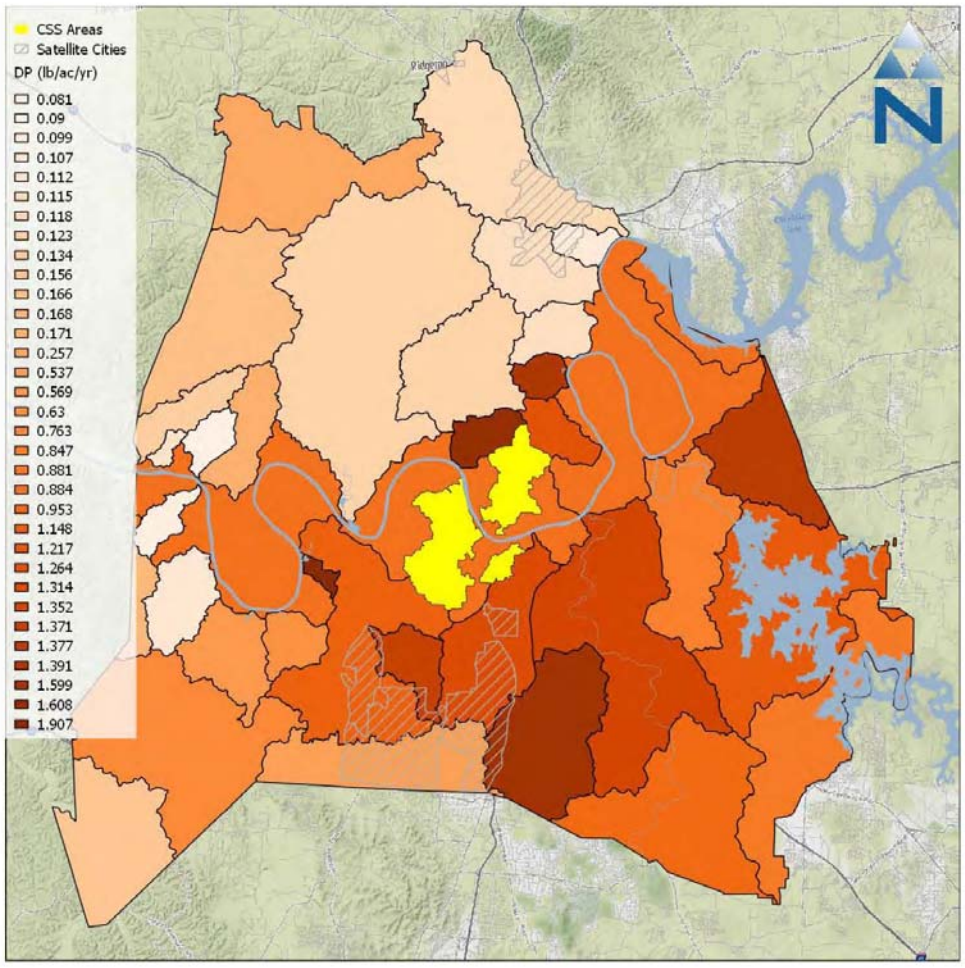

Figure B-6. DP Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

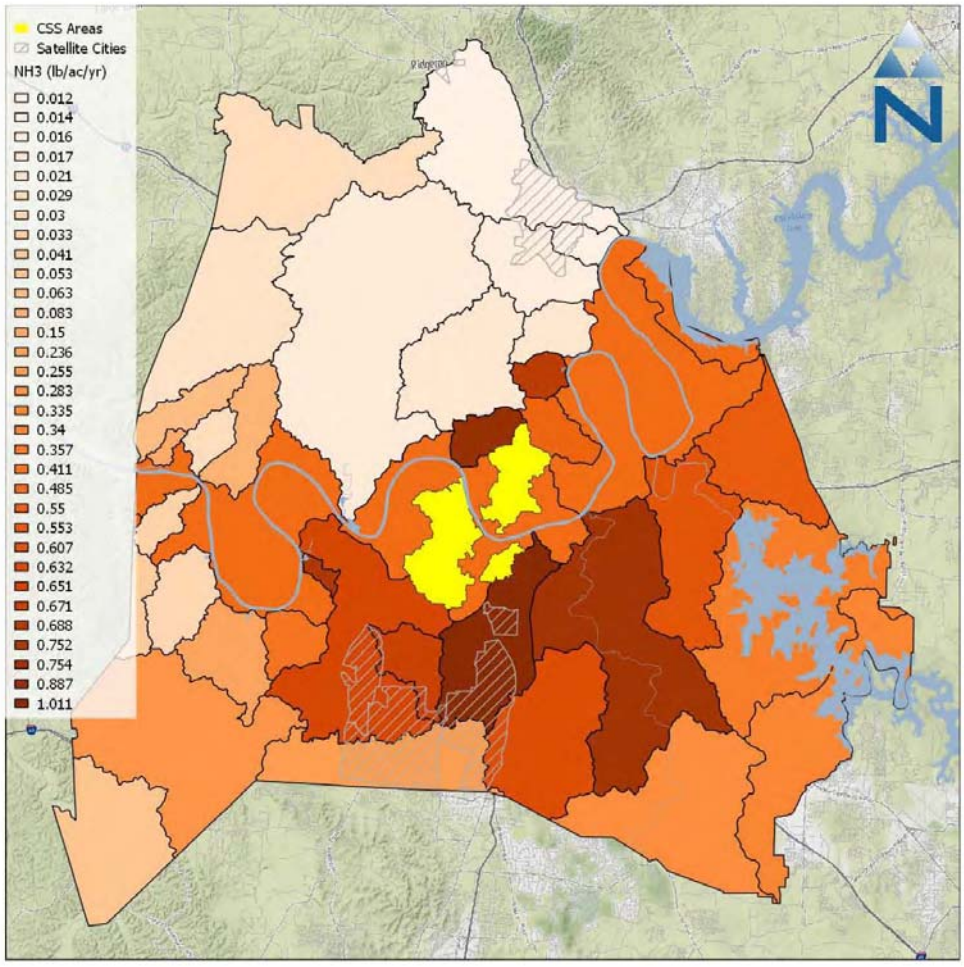

Figure B-7. NH3 Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

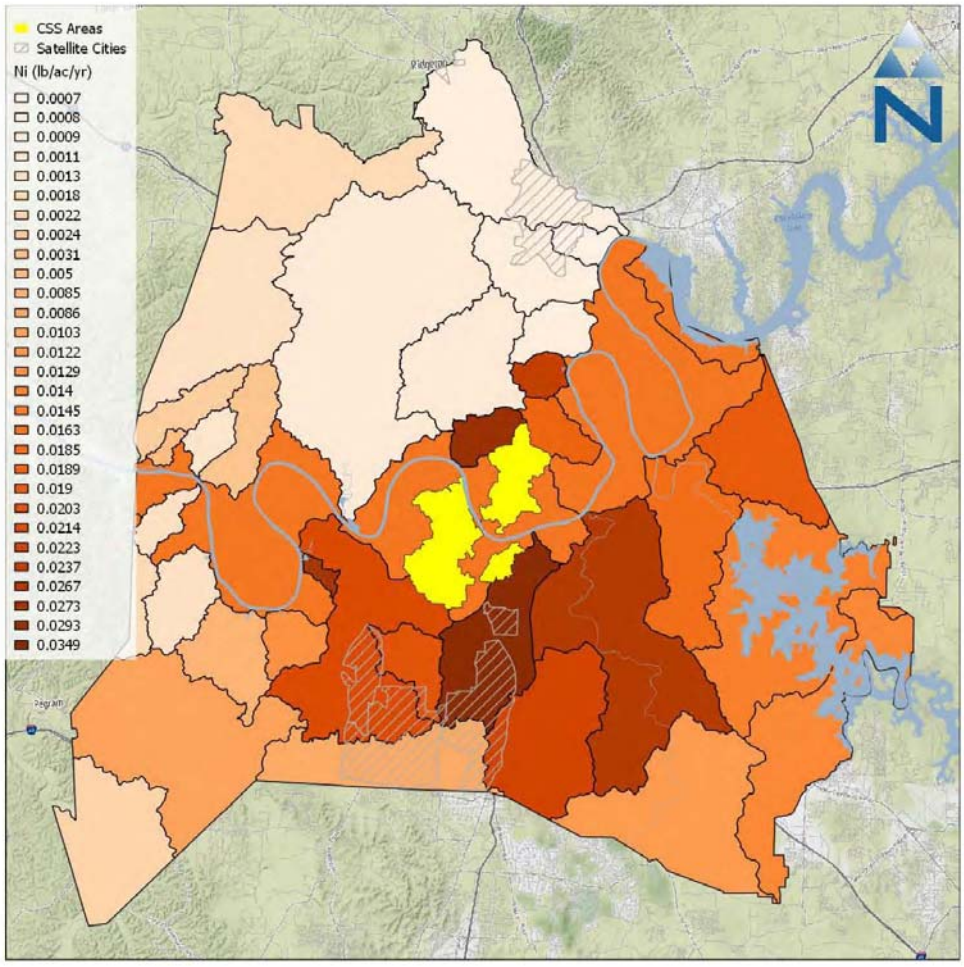

Figure B-8. Ni Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

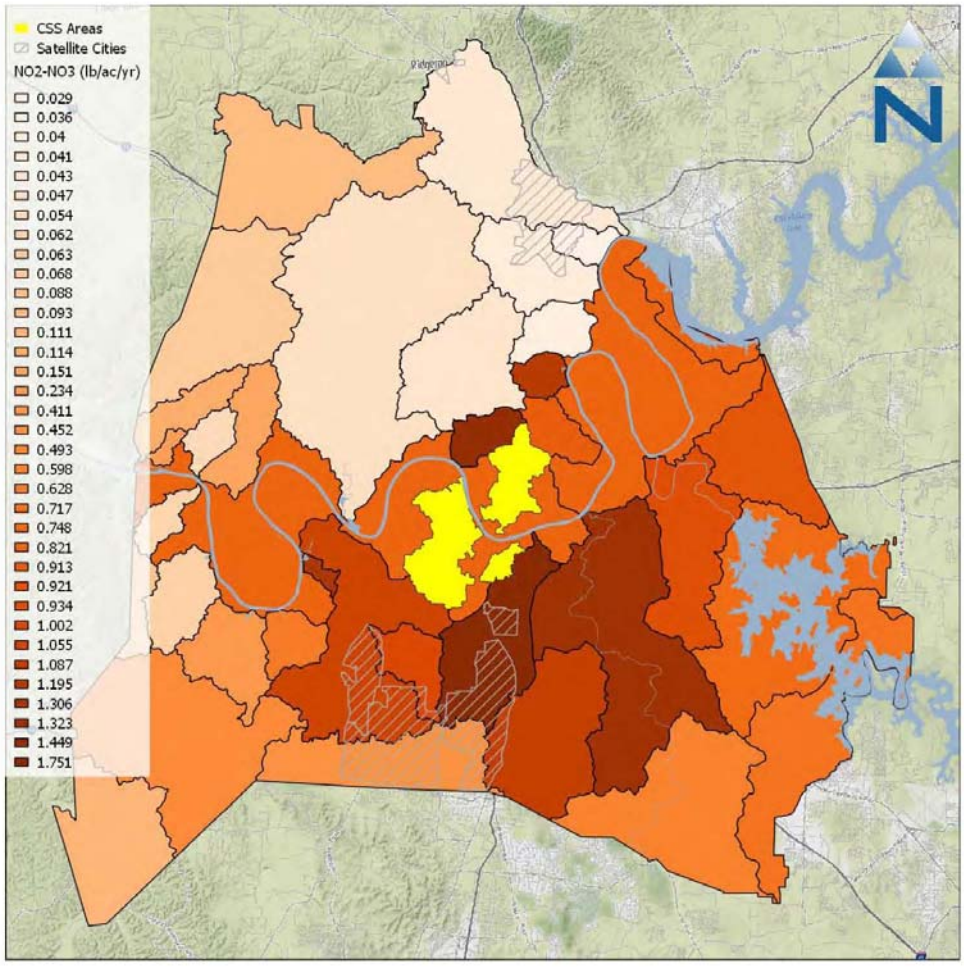

Figure B-9. NO2 – NO3 Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

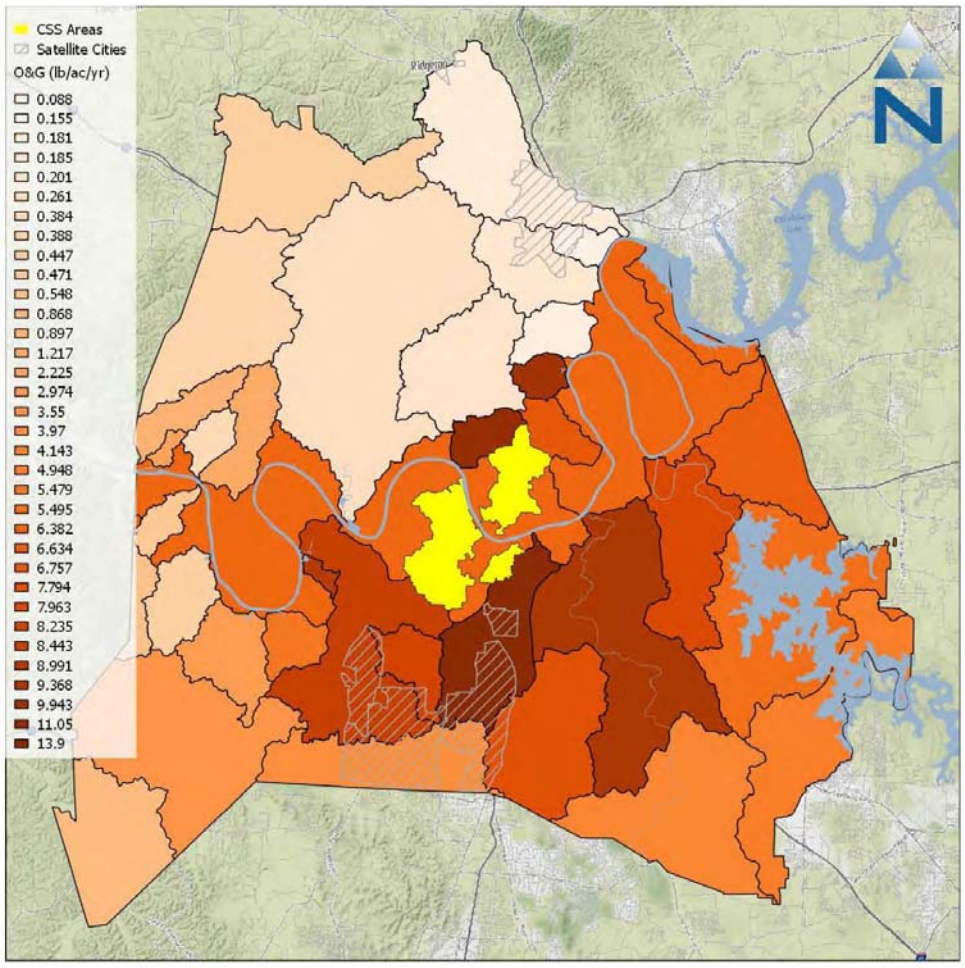

Figure B-10. Oil and Grease Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

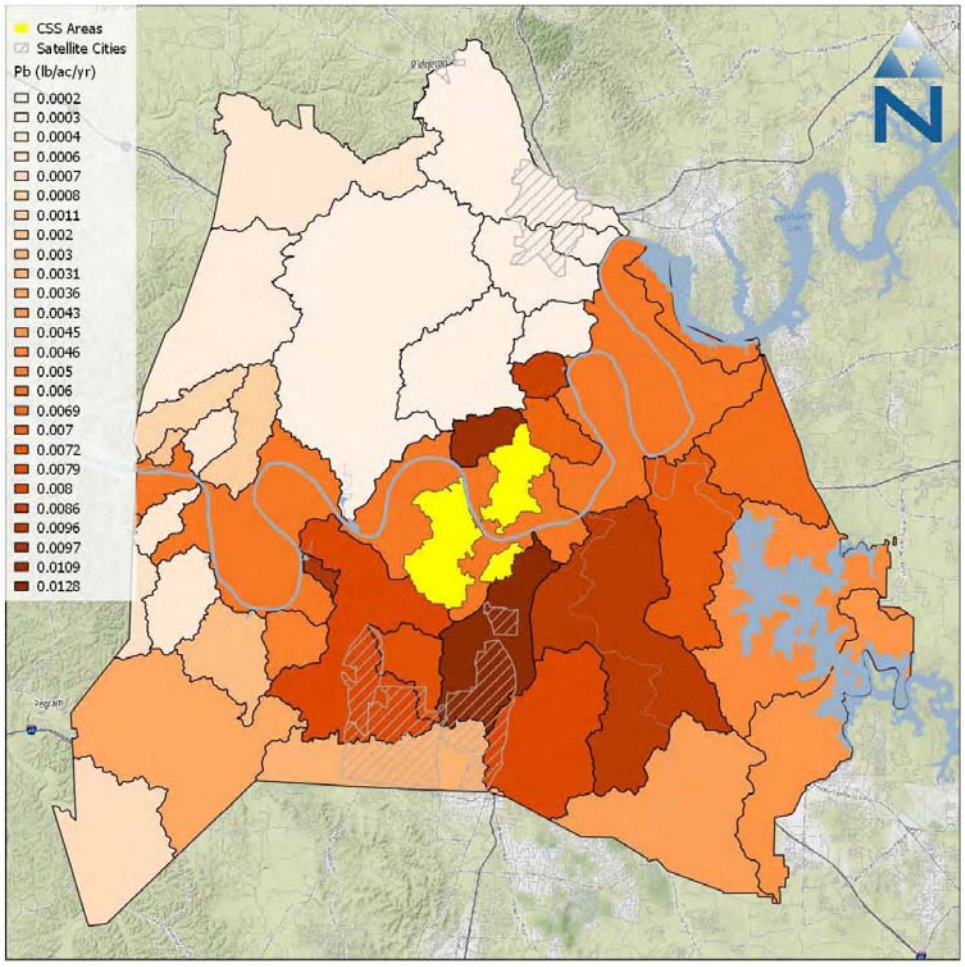

Figure B-11. Pb Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

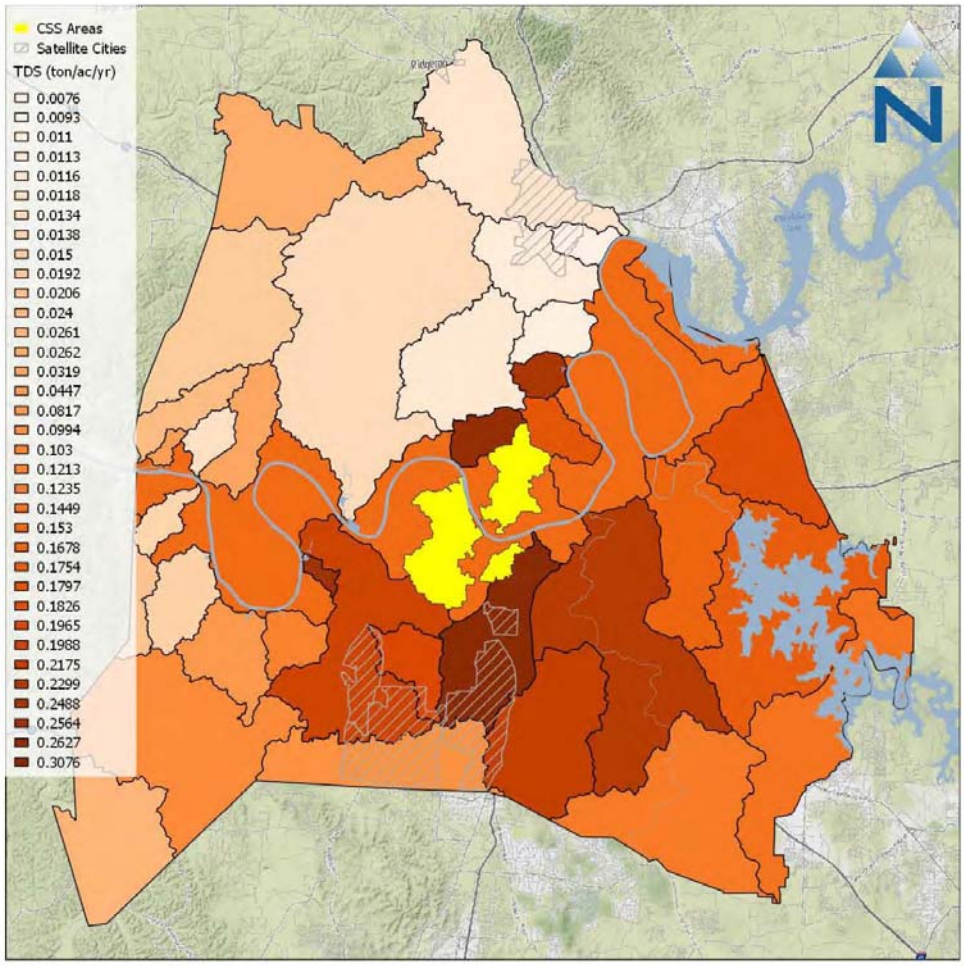

Figure B-12. TDS Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

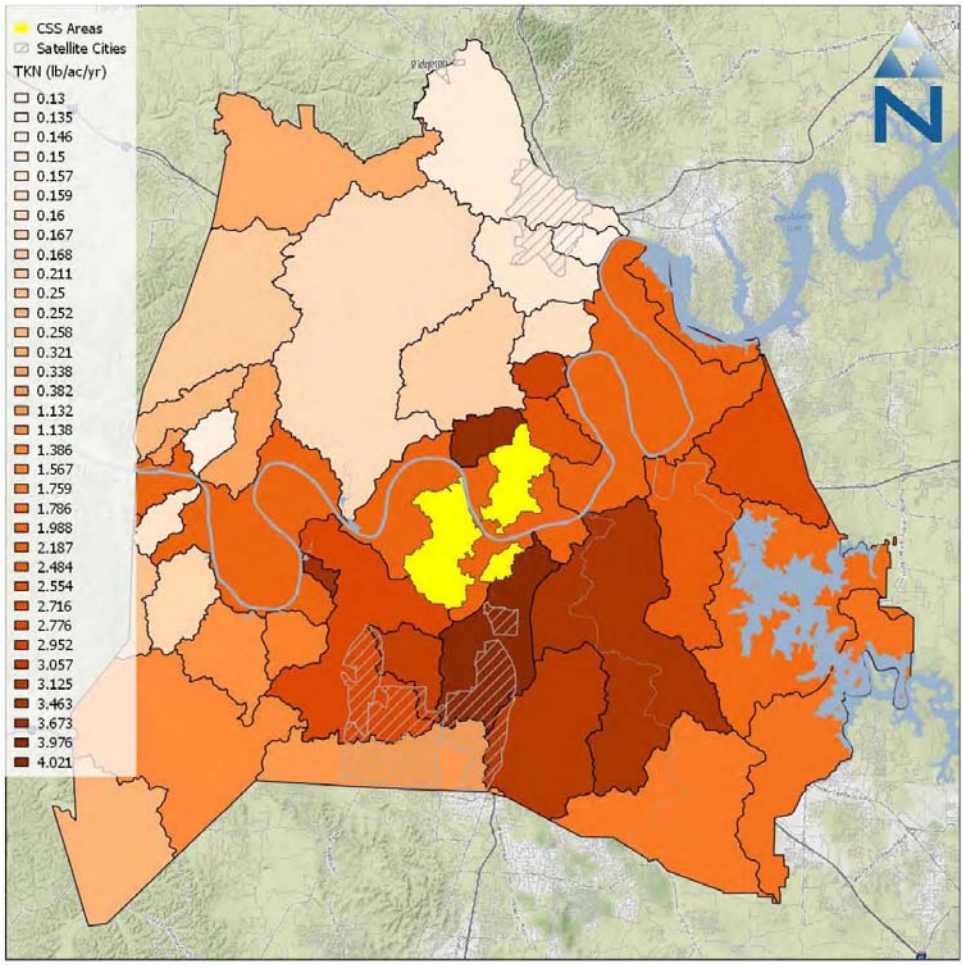

Figure B-13. TKN Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

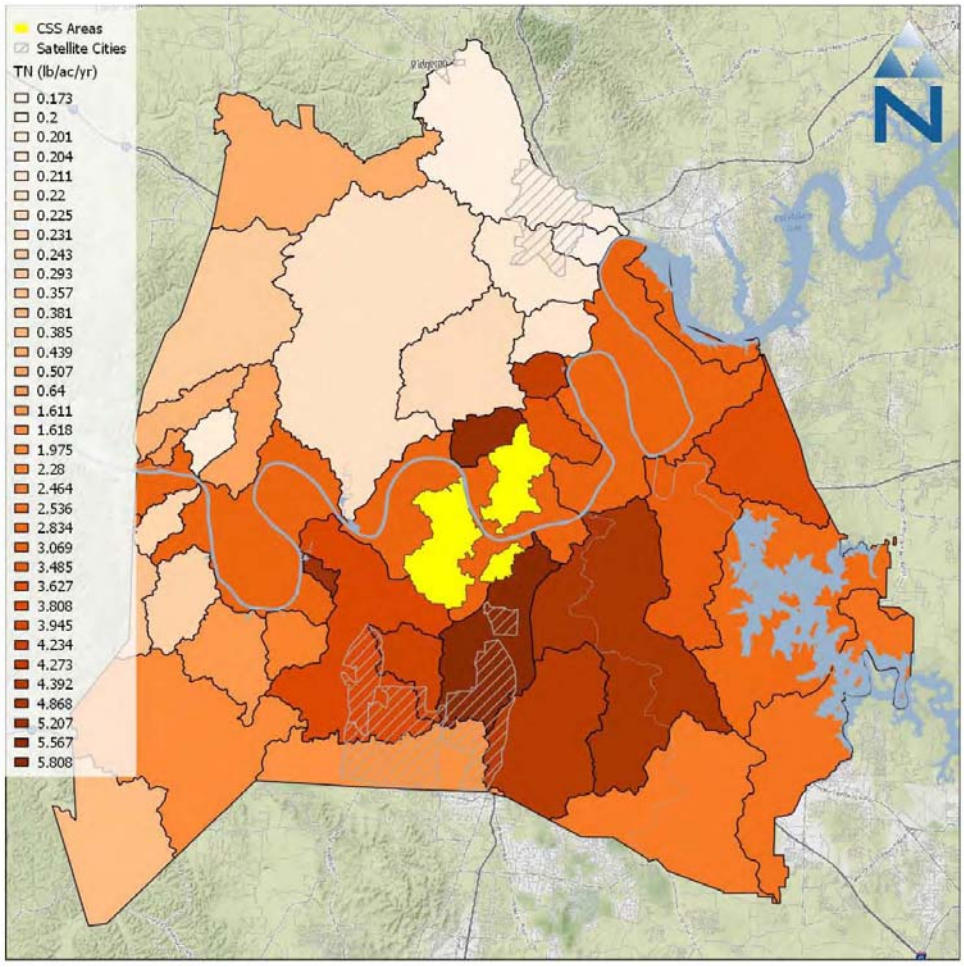

Figure B-14. TN Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

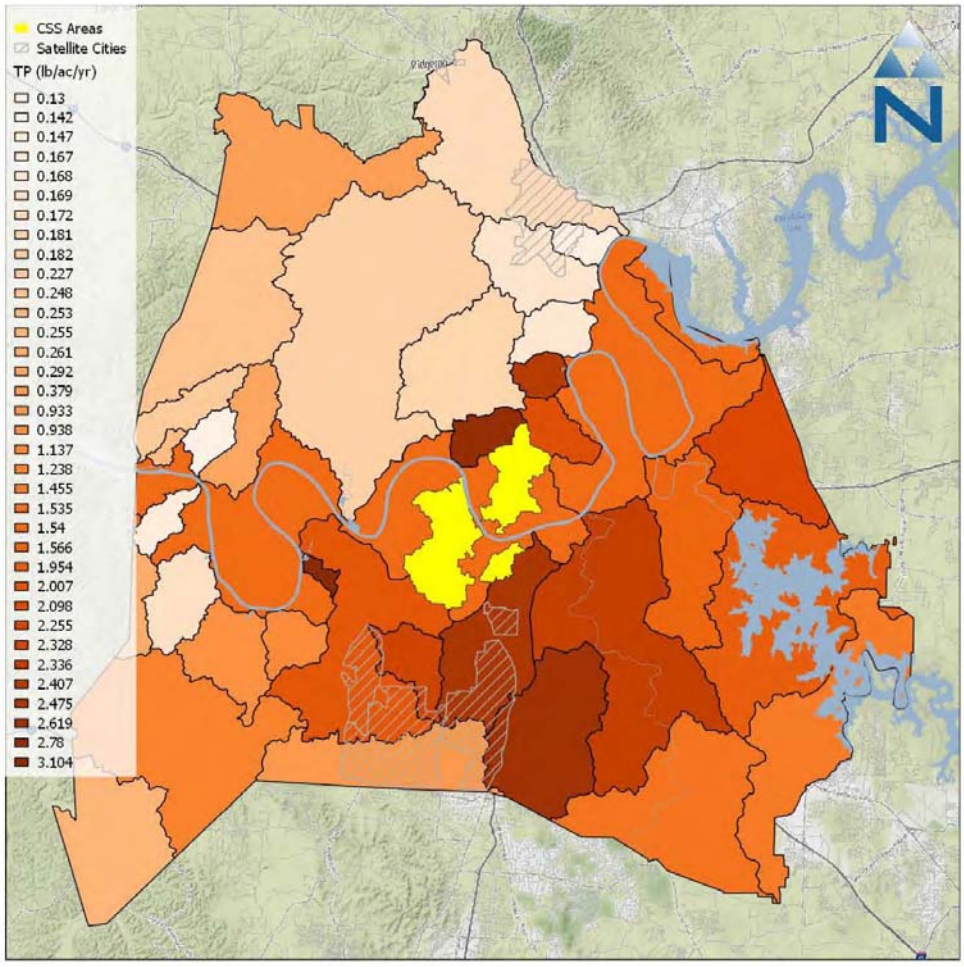

Figure B-15. TP Pollutant loading export rate (pound/acre/year) map for MS4 watersheds in Davidson County.

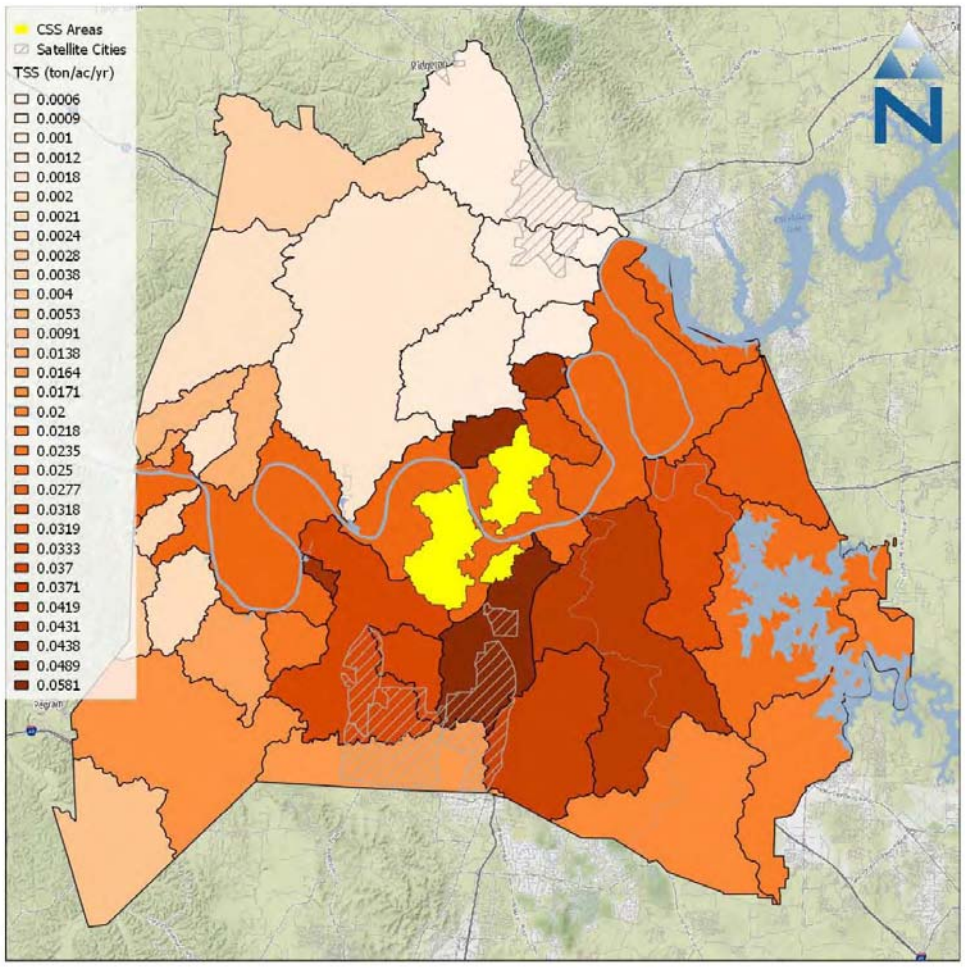

Figure B-16. TSS Pollutant loading export rate (ton/acre/year) map for MS4 watersheds in Davidson County.

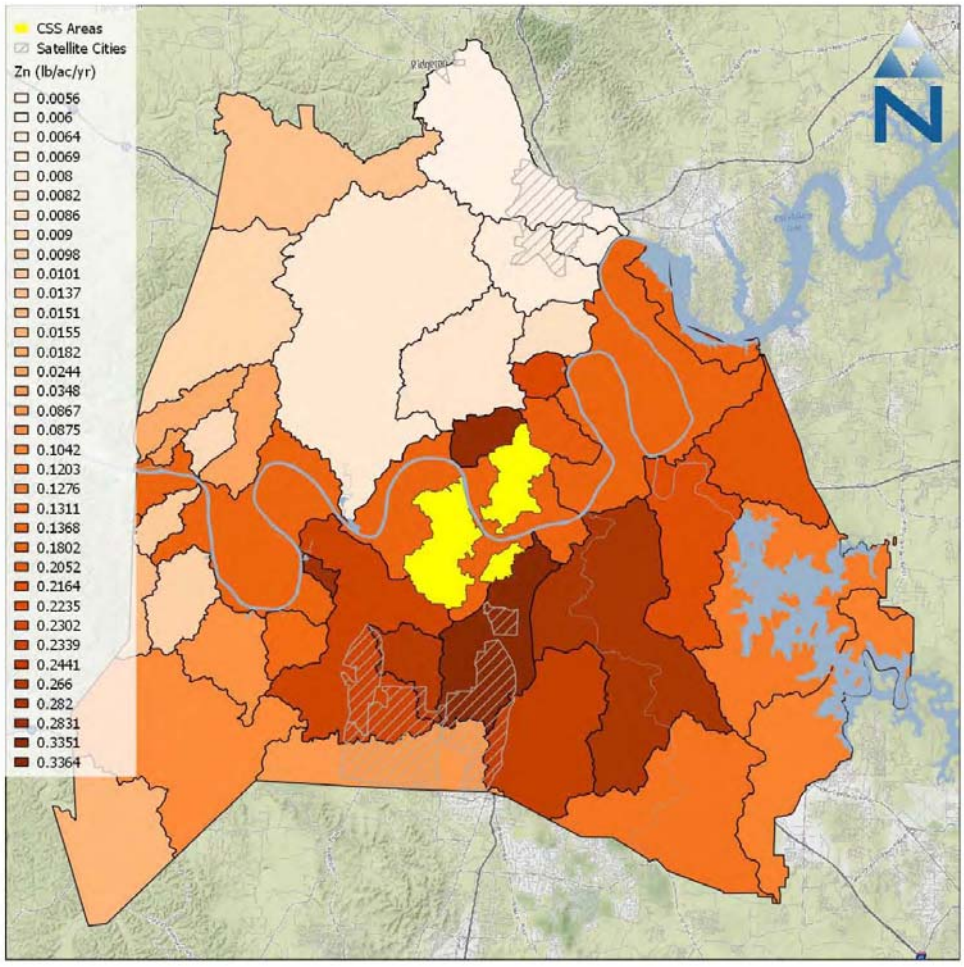

Figure B-17. Zn Pollutant loading export rate (ton/acre/year) map for MS4 watersheds in Davidson County.

APPENDIX C: WATERSHED ANNUAL POLLUTANT LOADS

Table C-1. *E. coli* pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (10^9 x MPN/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	238	5,472	64	5,774
Browns Creek	9,679	26,442	20,582	184,423	4,554	245,680
Bull Run Creek	10	0	1,073	15,248	280	16,612
Cooper Creek	2,269	1,065	466	138,530	1,155	143,484
Cub Creek	31	0	438	5,525	63	6,058
Cumberland River	53,266	72,688	74,997	1,506,146	13,732	1,720,829
Davidson Branch	1,847	302	1,429	57,915	1,001	62,494
Dry Creek	3,865	7,976	5,353	158,367	1,451	177,011
Ewing Creek	8,169	10,790	10,944	355,644	4,092	389,638
Gibson Creek	6,499	2,041	1,431	246,067	1,449	257,488
Gizzard Branch	4,182	1,759	0	47,909	394	54,243
Harpeth River	6,811	711	13,202	623,677	4,832	649,233
Indian Creek	50	0	1,687	16,470	126	18,333
Island Creek	0	0	252	813	143	1,208
Little Harpeth River	2,167	257	13,845	64,304	769	81,342
Loves Branch	1,590	652	8,328	72,162	979	83,711
Mansker Creek	1,456	2,972	12,536	116,954	1,541	135,460
Marrowbone Creek	701	331	16,553	114,947	754	133,286
Mill Creek Lower	30,631	78,079	7,181	1,047,191	9,512	1,172,594
Mill Creek Upper	8,711	5,512	14,812	631,962	3,551	664,547
Overall Creek	1,940	1,965	2,589	122,284	958	129,736
Pages Branch	4,431	5,650	513	137,022	1,168	148,784
Percy Priest Lake, Lower	4,704	888	76,063	562,479	3,581	647,715
Percy Priest Lake, Upper	4,485	20,099	45,271	320,984	2,492	393,332
Pond Creek	9	0	741	13,105	76	13,931
Richland Creek	14,675	13,497	11,990	481,285	5,448	526,894
Sandy Creek	562	597	0	46,641	351	48,150
Sevenmile Creek	11,712	7,289	11,434	722,767	4,788	757,990
South Harpeth River, Lower	99	45	9,321	47,181	593	57,238
Stoner Creek	8,404	3,597	580	486,470	3,116	502,167
Stones River	15,308	13,451	8,051	259,485	3,216	299,511
Sugartree Creek	5,164	93	0	162,546	1,016	168,819
Sulpher Creek	169	196	2,780	22,872	416	26,434
Sycamore Creek	1,294	134	21,026	205,667	1,719	229,840
Whites Creek	8,566	7,129	35,413	523,041	5,743	579,893

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation. Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-2. BOD_5 pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	45	625	856	1,526
Browns Creek	71,723	41,962	4,077	21,749	61,319	200,830
Bull Run Creek	77	0	202	1,774	3,749	5,802
Cooper Creek	16,814	1,681	92	16,333	15,555	50,476
Cub Creek	233	0	84	627	847	1,790
Cumberland River	394,599	114,994	14,770	177,230	184,896	886,489
Davidson Branch	13,676	473	280	6,775	13,413	34,617
Dry Creek	28,640	12,678	1,042	18,581	19,575	80,516
Ewing Creek	60,515	17,122	2,143	41,749	55,207	176,737
Gibson Creek	48,164	3,247	283	28,992	19,546	100,232
Gizzard Branch	30,993	2,794	0	5,638	5,310	44,735
Harpeth River	50,421	1,120	2,569	73,330	64,731	192,171
Indian Creek	371	0	319	1,888	1,690	4,267
Island Creek	0	0	47	93	1,912	2,052
Little Harpeth River	16,048	405	2,712	7,552	10,297	37,014
Loves Branch	11,780	1,035	1,649	8,504	13,188	36,156
Mansker Creek	10,793	4,721	2,424	13,521	20,798	52,257
Marrowbone Creek	5,171	522	3,148	13,281	10,178	32,298
Mill Creek Lower	226,965	123,806	1,412	123,456	128,077	603,716
Mill Creek Upper	64,492	8,711	2,849	74,221	47,811	198,085
Overall Creek	14,362	3,084	500	14,349	12,832	45,126
Pages Branch	32,797	8,885	101	16,130	15,644	73,556
Percy Priest Lake, Lower	34,841	1,408	14,749	66,053	48,217	165,268
Percy Priest Lake, Upper	33,198	31,814	8,766	37,552	33,557	144,887
Pond Creek	65	0	141	1,532	1,015	2,752
Richland Creek	108,666	21,270	2,359	56,649	72,988	261,932
Sandy Creek	4,162	940	0	5,495	4,696	15,293
Sevenmile Creek	86,781	11,568	2,264	85,249	64,472	250,335
South Harpeth River, Lower	728	70	1,809	5,459	7,947	16,013
Stoner Creek	62,264	5,705	114	57,290	41,956	167,329
Stones River	113,352	21,342	1,585	30,534	43,296	210,108
Sugartree Creek	38,242	146	0	19,132	13,617	71,137
Sulpher Creek	1,249	309	530	2,657	5,579	10,324
Sycamore Creek	9,581	211	4,038	23,789	23,189	60,808
Whites Creek	63,427	11,308	6,785	60,959	77,492	219,972

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-3. COD pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	813	5,015	10,169	15,998
Browns Creek	546,428	283,338	75,679	164,858	727,088	1,797,391
Bull Run Creek	586	0	3,684	13,780	44,529	62,579
Cooper Creek	128,091	11,354	1,711	123,858	184,442	449,456
Cub Creek	1,769	0	1,529	5,090	10,065	18,452
Cumberland River	3,005,338	776,489	273,588	1,348,727	2,192,394	7,596,536
Davidson Branch	104,084	3,196	5,172	52,106	159,304	323,862
Dry Creek	218,181	85,602	19,215	142,142	231,958	697,098
Ewing Creek	460,876	115,615	39,614	319,079	654,180	1,589,364
Gibson Creek	366,966	21,926	5,249	220,127	231,611	845,879
Gizzard Branch	236,191	18,865	0	42,900	62,925	360,880
Harpeth River	383,729	7,564	47,375	558,848	768,811	1,766,328
Indian Creek	2,818	0	5,812	15,055	20,077	43,763
Island Creek	0	0	860	744	22,707	24,312
Little Harpeth River	122,162	2,732	50,130	57,670	122,300	354,995
Loves Branch	89,740	6,987	30,603	64,544	156,376	348,250
Mansker Creek	82,233	31,876	44,608	106,192	246,441	511,349
Marrowbone Creek	39,201	3,523	57,573	104,423	120,605	325,325
Mill Creek Lower	1,729,014	835,976	26,149	936,332	1,518,665	5,046,136
Mill Creek Upper	490,847	58,823	52,335	566,777	566,920	1,735,703
Overall Creek	109,288	20,829	9,188	109,748	152,403	401,455
Pages Branch	249,575	59,998	1,862	122,664	185,800	619,900
Percy Priest Lake, Lower	265,279	9,505	271,702	504,505	571,731	1,622,722
Percy Priest Lake, Upper	252,588	214,821	161,410	288,764	397,904	1,315,487
Pond Creek	497	0	2,567	11,800	12,057	26,920
Richland Creek	827,228	143,627	43,673	430,889	866,880	2,312,297
Sandy Creek	31,678	6,350	0	41,726	55,779	135,533
Sevenmile Creek	661,117	78,111	42,016	646,011	764,479	2,191,733
South Harpeth River, Lower	5,534	476	33,330	42,815	94,384	176,539
Stoner Creek	474,292	38,519	2,117	435,344	497,490	1,447,762
Stones River	862,833	144,106	29,349	232,363	513,380	1,782,032
Sugartree Creek	291,138	986	0	145,526	161,725	599,375
Sulpher Creek	9,504	2,087	9,713	20,689	66,260	108,253
Sycamore Creek	72,920	1,426	74,122	186,672	274,780	609,920
Whites Creek	482,785	76,356	124,458	471,944	918,248	2,073,792

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-4. NH_3 pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	2	10	34	46
Browns Creek	1,674	942	151	329	2,431	5,527
Bull Run Creek	2	0	8	27	150	186
Cooper Creek	392	38	3	247	617	1,298
Cub Creek	5	0	3	10	34	52
Cumberland River	9,206	2,586	547	2,690	7,329	22,357
Davidson Branch	319	11	10	103	535	978
Dry Creek	668	284	39	283	774	2,048
Ewing Creek	1,412	384	79	635	2,183	4,694
Gibson Creek	1,124	73	10	439	773	2,420
Gizzard Branch	724	63	0	86	210	1,082
Harpeth River	1,175	25	95	1,114	2,581	4,991
Indian Creek	9	0	12	29	67	117
Island Creek	0	0	2	1	76	79
Little Harpeth River	374	9	100	115	411	1,009
Loves Branch	275	23	61	129	523	1,011
Mansker Creek	252	106	90	209	822	1,479
Marrowbone Creek	120	12	117	206	402	857
Mill Creek Lower	5,297	2,780	52	1,870	5,077	15,077
Mill Creek Upper	1,503	196	106	1,129	1,895	4,829
Overall Creek	335	70	19	218	512	1,153
Pages Branch	764	200	4	245	624	1,837
Percy Priest Lake, Lower	812	32	547	1,005	1,911	4,307
Percy Priest Lake, Upper	773	715	325	574	1,330	3,717
Pond Creek	2	0	5	23	40	71
Richland Creek	2,533	479	87	859	2,911	6,870
Sandy Creek	97	21	0	83	187	389
Sevenmile Creek	2,026	260	84	1,290	2,556	6,215
South Harpeth River, Lower	17	2	67	84	317	487
Stoner Creek	1,453	128	4	869	1,663	4,117
Stones River	2,642	479	59	463	1,716	5,359
Sugartree Creek	892	3	0	290	543	1,728
Sulpher Creek	29	7	20	41	222	319
Sycamore Creek	223	5	150	368	917	1,663
Whites Creek	1,478	254	252	935	3,064	5,984

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-5. TKN pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	12	128	76	217
Browns Creek	5,776	5,471	1,217	4,034	5,480	21,978
Bull Run Creek	6	0	57	343	334	740
Cooper Creek	1,354	220	28	3,032	1,390	6,023
Cub Creek	19	0	24	131	75	249
Cumberland River	31,759	15,013	4,379	33,101	16,523	100,774
Davidson Branch	1,099	62	82	1,289	1,194	3,726
Dry Creek	2,306	1,652	304	3,502	1,752	9,517
Ewing Creek	4,870	2,232	631	7,856	4,941	20,531
Gibson Creek	3,880	423	84	5,393	1,749	11,530
Gizzard Branch	2,498	364	0	1,053	475	4,390
Harpeth River	4,052	146	750	13,730	5,762	24,440
Indian Creek	30	0	90	382	150	652
Island Creek	0	0	13	19	170	202
Little Harpeth River	1,290	53	798	1,419	917	4,477
Loves Branch	949	135	492	1,581	1,178	4,335
Mansker Creek	869	615	702	2,667	1,861	6,715
Marrowbone Creek	412	68	893	2,624	911	4,909
Mill Creek Lower	18,276	16,147	418	22,922	11,445	69,208
Mill Creek Upper	5,183	1,138	820	13,946	4,272	25,360
Overall Creek	1,154	404	144	2,704	1,142	5,548
Pages Branch	2,635	1,163	30	3,009	1,392	8,229
Percy Priest Lake, Lower	2,802	184	4,289	12,416	4,309	24,000
Percy Priest Lake, Upper	2,666	4,152	2,545	7,142	2,999	19,504
Pond Creek	5	0	40	292	90	428
Richland Creek	8,737	2,781	698	10,571	6,497	29,285
Sandy Creek	335	123	0	1,022	418	1,898
Sevenmile Creek	6,988	1,508	676	15,805	5,761	30,738
South Harpeth River, Lower	58	9	527	1,074	707	2,376
Stoner Creek	5,013	744	34	10,673	3,749	20,213
Stones River	9,113	2,783	469	5,703	3,869	21,937
Sugartree Creek	3,075	19	0	3,570	1,212	7,877
Sulpher Creek	100	40	151	516	497	1,305
Sycamore Creek	770	28	1,160	4,685	2,076	8,718
Whites Creek	5,099	1,475	1,944	11,730	6,936	27,183

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-6. $NO_2 + NO_3$ pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	8	28	50	86
Browns Creek	1,786	2,624	641	940	3,580	9,572
Bull Run Creek	2	0	34	78	219	333
Cooper Creek	419	105	15	706	908	2,153
Cub Creek	6	0	14	28	50	98
Cumberland River	9,809	7,203	2,341	7,683	10,795	37,832
Davidson Branch	338	30	45	296	785	1,493
Dry Creek	713	792	168	808	1,142	3,624
Ewing Creek	1,504	1,071	343	1,815	3,221	7,953
Gibson Creek	1,200	203	45	1,255	1,140	3,843
Gizzard Branch	773	175	0	244	310	1,502
Harpeth River	1,248	70	415	3,182	3,786	8,701
Indian Creek	9	0	54	85	99	246
Island Creek	0	0	8	4	112	124
Little Harpeth River	398	25	433	328	602	1,787
Loves Branch	293	65	259	368	770	1,755
Mansker Creek	269	295	395	599	1,213	2,771
Marrowbone Creek	125	33	525	589	594	1,866
Mill Creek Lower	5,650	7,746	224	5,339	7,477	26,438
Mill Creek Upper	1,596	546	468	3,225	2,791	8,627
Overall Creek	355	194	82	624	751	2,006
Pages Branch	811	558	16	699	915	2,999
Percy Priest Lake, Lower	865	88	2,392	2,871	2,815	9,031
Percy Priest Lake, Upper	820	1,992	1,425	1,640	1,959	7,836
Pond Creek	2	0	24	67	59	152
Richland Creek	2,693	1,335	375	2,455	4,269	11,127
Sandy Creek	103	59	0	238	275	675
Sevenmile Creek	2,161	723	356	3,685	3,764	10,689
South Harpeth River, Lower	18	4	293	242	465	1,022
Stoner Creek	1,549	357	18	2,481	2,449	6,855
Stones River	2,808	1,335	251	1,324	2,528	8,246
Sugartree Creek	948	9	0	829	796	2,583
Sulpher Creek	31	19	88	117	326	582
Sycamore Creek	237	13	664	1,054	1,353	3,321
Whites Creek	1,571	707	1,120	2,675	4,521	10,594

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-7. TN pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	19	170	131	321
Browns Creek	7,610	7,591	1,742	5,364	9,439	31,746
Bull Run Creek	8	0	88	457	575	1,128
Cooper Creek	1,783	305	39	4,031	2,394	8,554
Cub Creek	25	0	36	174	130	365
Cumberland River	41,819	20,832	6,322	44,019	28,461	141,452
Davidson Branch	1,446	86	120	1,714	2,058	5,424
Dry Creek	3,038	2,292	447	4,658	3,017	13,452
Ewing Creek	6,412	3,097	919	10,448	8,510	29,386
Gibson Creek	5,111	587	121	7,172	3,013	16,004
Gizzard Branch	3,292	505	0	1,400	819	6,015
Harpeth River	5,329	203	1,103	18,259	9,930	34,825
Indian Creek	39	0	138	509	259	945
Island Creek	0	0	20	25	293	339
Little Harpeth River	1,698	73	1,162	1,887	1,580	6,400
Loves Branch	1,250	187	705	2,102	2,030	6,274
Mansker Creek	1,145	854	1,042	3,548	3,206	9,796
Marrowbone Creek	539	95	1,360	3,492	1,569	7,055
Mill Creek Lower	24,074	22,404	605	30,480	19,715	97,277
Mill Creek Upper	6,818	1,579	1,227	18,547	7,360	35,530
Overall Creek	1,517	561	215	3,596	1,968	7,857
Pages Branch	3,465	1,614	43	4,001	2,400	11,523
Percy Priest Lake, Lower	3,688	255	6,339	16,512	7,422	34,216
Percy Priest Lake, Upper	3,506	5,762	3,769	9,499	5,166	27,701
Pond Creek	7	0	61	389	156	612
Richland Creek	11,496	3,860	1,010	14,058	11,197	41,621
Sandy Creek	440	171	0	1,360	720	2,691
Sevenmile Creek	9,206	2,093	968	21,016	9,924	43,206
South Harpeth River, Lower	77	13	777	1,429	1,219	3,515
Stoner Creek	6,602	1,032	49	14,193	6,458	28,335
Stones River	11,989	3,861	678	7,584	6,665	30,777
Sugartree Creek	4,047	26	0	4,748	2,089	10,910
Sulpher Creek	132	56	229	687	856	1,960
Sycamore Creek	1,013	38	1,740	6,234	3,575	12,599
Whites Creek	6,708	2,046	2,925	15,605	11,945	39,229

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-8. DP pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	10	104	15	129
Browns Creek	695	1,194	931	3,298	1,066	7,184
Bull Run Creek	1	0	45	281	66	392
Cooper Creek	163	48	21	2,479	271	2,981
Cub Creek	2	0	19	107	15	143
Cumberland River	3,822	3,278	3,363	27,060	3,216	40,740
Davidson Branch	133	14	64	1,053	235	1,498
Dry Creek	277	360	236	2,863	340	4,076
Ewing Creek	586	487	486	6,422	958	8,940
Gibson Creek	466	92	65	4,409	339	5,371
Gizzard Branch	300	79	0	861	92	1,332
Harpeth River	489	32	581	11,224	1,132	13,458
Indian Creek	4	0	71	312	30	416
Island Creek	0	0	10	15	33	59
Little Harpeth River	156	12	616	1,160	180	2,123
Loves Branch	114	29	377	1,292	229	2,042
Mansker Creek	105	134	547	2,179	361	3,325
Marrowbone Creek	50	15	703	2,144	177	3,089
Mill Creek Lower	2,198	3,524	321	18,739	2,227	27,010
Mill Creek Upper	625	248	641	11,400	832	13,746
Overall Creek	139	88	113	2,210	224	2,775
Pages Branch	318	254	23	2,460	274	3,329
Percy Priest Lake, Lower	338	40	3,331	10,149	839	14,696
Percy Priest Lake, Upper	322	907	1,978	5,838	584	9,628
Pond Creek	1	0	31	239	18	289
Richland Creek	1,053	608	537	8,642	1,277	12,116
Sandy Creek	40	27	0	836	82	985
Sevenmile Creek	840	329	517	12,921	1,121	15,729
South Harpeth River, Lower	7	2	409	878	139	1,434
Stoner Creek	603	162	26	8,725	730	10,246
Stones River	1,099	607	361	4,662	753	7,481
Sugartree Creek	371	4	0	2,919	238	3,532
Sulpher Creek	12	9	119	422	98	659
Sycamore Creek	93	6	907	3,828	402	5,236
Whites Creek	615	322	1,522	9,587	1,345	13,391

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-9. TP pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	17	149	42	208
Browns Creek	2,104	2,096	1,545	4,746	3,033	13,526
Bull Run Creek	2	0	75	402	186	665
Cooper Creek	493	84	35	3,567	769	4,948
Cub Creek	7	0	31	152	42	232
Cumberland River	11,570	5,745	5,584	38,913	9,147	70,959
Davidson Branch	400	24	106	1,512	664	2,705
Dry Creek	840	633	392	4,112	968	6,946
Ewing Creek	1,774	855	808	9,227	2,731	15,396
Gibson Creek	1,413	162	107	6,343	967	8,993
Gizzard Branch	910	140	0	1,238	263	2,550
Harpeth River	1,476	56	966	16,136	3,203	21,837
Indian Creek	11	0	118	445	84	658
Island Creek	0	0	17	22	95	134
Little Harpeth River	470	20	1,023	1,667	510	3,689
Loves Branch	346	52	625	1,860	652	3,534
Mansker Creek	317	236	909	3,115	1,029	5,605
Marrowbone Creek	150	26	1,172	3,065	503	4,916
Mill Creek Lower	6,658	6,185	534	26,966	6,336	46,678
Mill Creek Upper	1,888	435	1,066	16,383	2,365	22,138
Overall Creek	420	154	187	3,175	635	4,572
Pages Branch	960	444	38	3,538	774	5,754
Percy Priest Lake, Lower	1,021	70	5,539	14,584	2,385	23,600
Percy Priest Lake, Upper	971	1,589	3,290	8,378	1,660	15,889
Pond Creek	2	0	52	343	50	447
Richland Creek	3,183	1,063	891	12,429	3,611	21,177
Sandy Creek	122	47	0	1,202	232	1,604
Sevenmile Creek	2,546	578	858	18,596	3,189	25,767
South Harpeth River, Lower	21	4	679	1,255	393	2,352
Stoner Creek	1,826	285	43	12,551	2,076	16,780
Stones River	3,320	1,066	599	6,704	2,142	13,831
Sugartree Creek	1,120	7	0	4,198	674	5,999
Sulpher Creek	37	15	198	604	276	1,130
Sycamore Creek	281	11	1,510	5,473	1,147	8,421
Whites Creek	1,857	565	2,535	13,741	3,833	22,531

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-10. Pb pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	0	0	0	1
Browns Creek	16	15	2	5	32	70
Bull Run Creek	0	0	0	0	2	2
Cooper Creek	4	1	0	4	8	16
Cub Creek	0	0	0	0	0	1
Cumberland River	89	40	7	43	96	274
Davidson Branch	3	0	0	2	7	12
Dry Creek	6	4	0	4	10	26
Ewing Creek	14	6	1	10	29	59
Gibson Creek	11	1	0	7	10	29
Gizzard Branch	7	1	0	1	3	12
Harpeth River	11	0	1	18	34	64
Indian Creek	0	0	0	0	1	2
Island Creek	0	0	0	0	1	1
Little Harpeth River	4	0	1	2	5	12
Loves Branch	3	0	1	2	7	13
Mansker Creek	2	2	1	3	11	19
Marrowbone Creek	1	0	1	3	5	11
Mill Creek Lower	51	43	1	30	66	191
Mill Creek Upper	14	3	1	18	25	62
Overall Creek	3	1	0	3	7	15
Pages Branch	7	3	0	4	8	23
Percy Priest Lake, Lower	8	0	7	16	25	56
Percy Priest Lake, Upper	7	11	4	9	17	49
Pond Creek	0	0	0	0	1	1
Richland Creek	24	7	1	14	38	85
Sandy Creek	1	0	0	1	2	5
Sevenmile Creek	20	4	1	21	33	79
South Harpeth River, Lower	0	0	1	1	4	6
Stoner Creek	14	2	0	14	22	52
Stones River	25	7	1	7	22	63
Sugartree Creek	9	0	0	5	7	20
Sulpher Creek	0	0	0	1	3	4
Sycamore Creek	2	0	2	6	12	22
Whites Creek	14	4	3	15	40	76

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-11. N_i pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	0	1	1	2
Browns Creek	31	52	9	20	77	191
Bull Run Creek	0	0	0	2	5	7
Cooper Creek	7	2	0	15	20	45
Cub Creek	0	0	0	1	1	2
Cumberland River	172	143	34	168	233	750
Davidson Branch	6	1	1	7	17	31
Dry Creek	12	16	2	18	25	73
Ewing Creek	26	21	5	40	69	162
Gibson Creek	21	4	1	27	25	78
Gizzard Branch	14	3	0	5	7	29
Harpeth River	22	1	6	70	82	181
Indian Creek	0	0	1	2	2	5
Island Creek	0	0	0	0	2	3
Little Harpeth River	7	1	6	7	13	34
Loves Branch	5	1	4	8	17	35
Mansker Creek	5	6	6	13	26	56
Marrowbone Creek	2	1	8	13	13	36
Mill Creek Lower	99	154	3	116	162	534
Mill Creek Upper	28	11	7	71	60	177
Overall Creek	6	4	1	14	16	41
Pages Branch	14	11	0	15	20	61
Percy Priest Lake, Lower	15	2	35	63	61	175
Percy Priest Lake, Upper	14	40	21	36	42	153
Pond Creek	0	0	0	1	1	3
Richland Creek	47	27	5	54	93	225
Sandy Creek	2	1	0	5	6	14
Sevenmile Creek	38	14	5	80	81	219
South Harpeth River, Lower	0	0	4	5	10	20
Stoner Creek	27	7	0	54	53	141
Stones River	49	26	4	29	55	163
Sugartree Creek	17	0	0	18	17	52
Sulpher Creek	1	0	1	3	7	12
Sycamore Creek	4	0	10	23	29	67
Whites Creek	28	14	16	59	98	214

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-12. Zn pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	0	6	8	14
Browns Creek	688	348	25	223	554	1,838
Bull Run Creek	1	0	1	17	34	53
Cooper Creek	161	14	1	168	141	484
Cub Creek	2	0	1	6	8	16
Cumberland River	3,781	954	91	1,808	1,670	8,304
Davidson Branch	131	4	2	68	121	325
Dry Creek	275	105	6	188	177	751
Ewing Creek	580	142	13	423	499	1,656
Gibson Creek	462	27	2	297	177	964
Gizzard Branch	298	23	0	58	48	426
Harpeth River	482	9	16	746	584	1,838
Indian Creek	4	0	2	18	15	38
Island Creek	0	0	0	1	17	18
Little Harpeth River	154	3	17	77	93	343
Loves Branch	113	9	10	87	119	338
Mansker Creek	104	39	15	130	188	476
Marrowbone Creek	49	4	19	128	92	292
Mill Creek Lower	2,176	1,027	9	1,267	1,157	5,636
Mill Creek Upper	617	72	17	753	432	1,891
Overall Creek	137	26	3	145	116	427
Pages Branch	313	74	1	165	141	694
Percy Priest Lake, Lower	334	12	90	670	436	1,541
Percy Priest Lake, Upper	317	264	54	376	303	1,314
Pond Creek	1	0	1	15	9	26
Richland Creek	1,040	176	14	578	659	2,468
Sandy Creek	40	8	0	56	42	146
Sevenmile Creek	832	96	14	876	582	2,401
South Harpeth River, Lower	7	1	11	53	72	143
Stoner Creek	597	47	1	586	379	1,610
Stones River	1,084	177	10	312	391	1,974
Sugartree Creek	366	1	0	195	123	685
Sulpher Creek	12	3	3	26	50	94
Sycamore Creek	92	2	25	229	210	557
Whites Creek	607	94	41	603	700	2,045

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-13. Cr pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	0	0	0	1
Browns Creek	14	9	4	4	32	64
Bull Run Creek	0	0	0	0	2	2
Cooper Creek	3	0	0	3	8	15
Cub Creek	0	0	0	0	0	1
Cumberland River	77	25	16	31	96	246
Davidson Branch	3	0	0	1	7	11
Dry Creek	6	3	1	3	10	23
Ewing Creek	12	4	2	7	29	54
Gibson Creek	9	1	0	5	10	26
Gizzard Branch	6	1	0	1	3	10
Harpeth River	10	0	3	13	34	60
Indian Creek	0	0	0	0	1	2
Island Creek	0	0	0	0	1	1
Little Harpeth River	3	0	3	1	5	13
Loves Branch	2	0	2	2	7	13
Mansker Creek	2	1	3	2	11	19
Marrowbone Creek	1	0	3	2	5	12
Mill Creek Lower	45	27	2	22	67	162
Mill Creek Upper	13	2	3	13	25	56
Overall Creek	3	1	1	3	7	13
Pages Branch	6	2	0	3	8	20
Percy Priest Lake, Lower	7	0	16	12	25	60
Percy Priest Lake, Upper	7	7	9	7	18	47
Pond Creek	0	0	0	0	1	1
Richland Creek	21	5	3	10	38	77
Sandy Creek	1	0	0	1	2	4
Sevenmile Creek	17	3	2	15	34	71
South Harpeth River, Lower	0	0	2	1	4	7
Stoner Creek	12	1	0	10	22	46
Stones River	22	5	2	5	23	57
Sugartree Creek	8	0	0	3	7	18
Sulpher Creek	0	0	1	0	3	4
Sycamore Creek	2	0	4	4	12	22
Whites Creek	12	2	7	11	40	73

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-14. Cu pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	0	1	2	2
Browns Creek	86	27	8	18	118	257
Bull Run Creek	0	0	0	2	7	9
Cooper Creek	20	1	0	14	30	65
Cub Creek	0	0	0	1	2	3
Cumberland River	471	74	27	151	357	1,080
Davidson Branch	16	0	1	6	26	49
Dry Creek	34	8	2	16	38	98
Ewing Creek	72	11	4	36	107	229
Gibson Creek	58	2	1	25	38	123
Gizzard Branch	37	2	0	5	10	54
Harpeth River	60	1	5	63	125	253
Indian Creek	0	0	1	2	3	6
Island Creek	0	0	0	0	4	4
Little Harpeth River	19	0	5	6	20	51
Loves Branch	14	1	3	7	25	50
Mansker Creek	13	3	5	12	40	72
Marrowbone Creek	6	0	6	12	20	44
Mill Creek Lower	271	79	3	105	247	705
Mill Creek Upper	77	6	5	63	92	244
Overall Creek	17	2	1	12	25	57
Pages Branch	39	6	0	14	30	89
Percy Priest Lake, Lower	42	1	28	56	93	220
Percy Priest Lake, Upper	39	20	17	32	65	173
Pond Creek	0	0	0	1	2	4
Richland Creek	129	14	4	48	141	337
Sandy Creek	5	1	0	5	9	19
Sevenmile Creek	104	7	4	72	125	312
South Harpeth River, Lower	1	0	3	5	15	24
Stoner Creek	74	4	0	49	81	208
Stones River	135	14	3	26	84	261
Sugartree Creek	46	0	0	16	26	88
Sulpher Creek	1	0	1	2	11	16
Sycamore Creek	11	0	8	21	45	85
Whites Creek	76	7	13	53	150	298

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-15. O&G pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (lb/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	70	54	491	615
Browns Creek	22,369	10,773	6,122	1,620	35,087	75,971
Bull Run Creek	24	0	315	141	2,150	2,631
Cooper Creek	5,244	433	139	1,218	8,901	15,934
Cub Creek	73	0	129	56	486	743
Cumberland River	123,110	29,582	22,276	13,342	105,798	294,108
Davidson Branch	4,270	122	424	525	7,691	13,032
Dry Creek	8,933	3,251	1,585	1,418	11,191	26,379
Ewing Creek	18,881	4,396	3,246	3,179	31,562	61,264
Gibson Creek	15,020	832	426	2,169	11,175	29,622
Gizzard Branch	9,663	717	0	424	3,036	13,840
Harpeth River	15,743	289	3,910	5,542	37,119	62,602
Indian Creek	116	0	496	160	969	1,742
Island Creek	0	0	74	8	1,096	1,178
Little Harpeth River	5,010	104	4,107	574	5,905	15,699
Loves Branch	3,674	266	2,477	636	7,546	14,599
Mansker Creek	3,366	1,211	3,707	1,106	11,890	21,280
Marrowbone Creek	1,621	135	4,875	1,089	5,819	13,539
Mill Creek Lower	70,792	31,802	2,132	9,209	73,286	187,222
Mill Creek Upper	20,136	2,242	4,374	5,639	27,358	59,749
Overall Creek	4,485	798	765	1,095	7,358	14,501
Pages Branch	10,242	2,295	152	1,212	8,970	22,871
Percy Priest Lake, Lower	10,874	362	22,507	5,021	27,590	66,353
Percy Priest Lake, Upper	10,368	8,181	13,391	2,907	19,202	54,049
Pond Creek	20	0	218	119	582	940
Richland Creek	33,920	5,485	3,560	4,259	41,853	89,078
Sandy Creek	1,299	242	0	411	2,693	4,646
Sevenmile Creek	27,067	2,970	3,401	6,345	36,891	76,673
South Harpeth River, Lower	228	18	2,759	445	4,557	8,006
Stoner Creek	19,422	1,465	172	4,296	24,007	49,363
Stones River	35,385	5,480	2,391	2,299	24,774	70,329
Sugartree Creek	11,936	38	0	1,438	7,808	21,220
Sulpher Creek	390	80	819	212	3,199	4,701
Sycamore Creek	2,991	55	6,207	1,941	13,257	24,451
Whites Creek	19,801	2,904	10,448	4,803	44,303	82,259

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-16. TSS pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (ton/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	0	1	2	3
Browns Creek	81	48	22	23	144	318
Bull Run Creek	0	0	1	2	9	12
Cooper Creek	19	2	0	17	37	75
Cub Creek	0	0	0	1	2	3
Cumberland River	444	131	78	187	435	1,276
Davidson Branch	15	1	1	7	32	56
Dry Creek	32	14	6	19	46	118
Ewing Creek	68	20	11	44	130	273
Gibson Creek	54	4	2	31	46	136
Gizzard Branch	35	3	0	6	12	57
Harpeth River	57	1	14	77	152	301
Indian Creek	0	0	2	2	4	8
Island Creek	0	0	0	0	4	5
Little Harpeth River	18	0	14	8	24	65
Loves Branch	13	1	9	9	31	63
Mansker Creek	12	5	13	13	49	93
Marrowbone Creek	6	1	17	13	24	60
Mill Creek Lower	256	141	7	131	301	837
Mill Creek Upper	72	10	15	78	112	288
Overall Creek	16	4	3	15	30	67
Pages Branch	37	10	1	17	37	101
Percy Priest Lake, Lower	39	2	78	69	113	302
Percy Priest Lake, Upper	37	36	47	39	79	238
Pond Creek	0	0	1	2	2	5
Richland Creek	122	24	13	60	172	390
Sandy Creek	5	1	0	6	11	23
Sevenmile Creek	98	13	12	91	152	365
South Harpeth River, Lower	1	0	10	5	19	35
Stoner Creek	70	7	1	61	99	237
Stones River	127	24	8	32	102	294
Sugartree Creek	43	0	0	20	32	95
Sulpher Creek	1	0	3	3	13	20
Sycamore Creek	11	0	21	24	55	111
Whites Creek	71	13	36	62	182	365

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

Table C-17. TDS pollutant annual load by land use category for MS4 watersheds in Davidson County

MS4 Watershed	Land Use Category[1]					Total Load (ton/yr)
	COM	IND	OPEN	RES	TRANS	
Back Creek	0	0	2	8	9	19
Browns Creek	293	317	198	234	640	1,681
Bull Run Creek	0	0	11	20	39	70
Cooper Creek	69	13	4	176	162	424
Cub Creek	1	0	4	8	9	22
Cumberland River	1,610	869	725	1,918	1,929	7,052
Davidson Branch	56	4	14	75	141	289
Dry Creek	117	96	52	203	204	672
Ewing Creek	247	129	106	456	575	1,513
Gibson Creek	197	24	14	312	203	751
Gizzard Branch	127	21	0	61	55	264
Harpeth River	205	8	129	796	679	1,817
Indian Creek	1	0	17	22	18	58
Island Creek	0	0	3	1	20	24
Little Harpeth River	65	3	134	82	108	393
Loves Branch	48	8	80	92	138	365
Mansker Creek	44	36	123	156	216	575
Marrowbone Creek	21	4	163	154	106	447
Mill Creek Lower	928	935	70	1,327	1,336	4,595
Mill Creek Upper	262	66	145	809	499	1,781
Overall Creek	58	23	25	157	135	399
Pages Branch	133	67	5	174	164	544
Percy Priest Lake, Lower	142	11	743	720	503	2,118
Percy Priest Lake, Upper	135	240	442	415	350	1,583
Pond Creek	0	0	7	17	11	35
Richland Creek	442	161	116	613	765	2,097
Sandy Creek	17	7	0	59	49	133
Sevenmile Creek	355	87	110	915	672	2,139
South Harpeth River, Lower	3	1	91	63	83	241
Stoner Creek	254	43	6	618	438	1,359
Stones River	461	161	78	330	452	1,482
Sugartree Creek	156	1	0	207	143	506
Sulpher Creek	5	2	27	30	58	123
Sycamore Creek	39	2	206	274	241	762
Whites Creek	258	85	348	683	807	2,181

1: COM – commercial, IND – industrial, OPEN – open space, RES – residential, and TRANS – transportation

Waterbodies and non-MS4 jurisdictional areas are excluded (i.e., Satellite Cities, State/Federal areas, CSS watersheds). For future applications, TDOT ROW and the Tennessee State University will be excluded as well, since they are managed under separate MS4 permits.

ATTACHMENT D – UPDATES TO THE SWMP

- **Supplemental Updates to the SWMP based on verbal comments from TDEC during a May 16, 2018 Compliance Inspection**
    - Specifically list that Erosion Prevention and Sediment Control (EPSC) is required for each site
    - Provide a Flow Chart detailing Staff Assignments to specific permit duties.
    - Describe how EPSC issues are handled for sites part of a larger common development in which is 75% built out and the Grading Permit is signed-off

Supplemental Updates to the SWMP based on verbal comments from TDEC during a May 16, 2018 Compliance Inspection

The Stormwater Management Plan (SWMP) will be completely updated once the new permit is issued. Until then, a supplemental appendix has been added to the SWMP to address minor updates to specific sections of the SWMP. Below are some of the excerpts from the Appendix.

1. ***TDEC Suggestion - Specifically list that Erosion Prevention and Sediment Control (EPSC) is required for each site.***

- **The following narrative will be added to Section 3.4.2 Bullet Item D.**

  Metro requires all grading permit sites to have a designated professional that has received the TN EPSC Level 1 training that will inspect the site twice a week and ensure all EPSC controls are maintained.

2. ***TDEC Suggestion – The MS4 should delineate specific permit assignments of staff within the SWMP.***

- **The following table will be added to Section 1 of the SWMP**

Major MS4 Compliance Task	MWS Departments Involved	Specific Personnel Involved (Inspectors and Engineers)
Public Education/ Public Involvement	• MWS Strategic Communications Department • Stormwater NPDES	• Sonia Allman, Jennifer Harman, Julie Berbiglia • Josh Hayes, Liz Stienstraw, Kalee Perry, Jessica Bell, Aujuah Jackson, Rebecca Dohn, Mary Bruce, Veronica Logue, Stephanie Petty, Dale Binder
Illicit Discharge Detection and Elimination	• Stormwater NPDES	• Josh Hayes, Dale Binder, Liz Stienstraw, Kalee Perry, Aujuah Jackson, Jessica Bell, Mary Bruce, Veronica Logue, Stephanie Petty, 2 Vacant Positions
Construction Stormwater Oversight	• MWS Development Services • Stormwater NPDES	• Steve Mishu, Christian Thompson, Jennifer Knauf, Eli Anderson, Courtney Larson, Gabriel Moore, Paisley Morotta, Logan Boman, Kimberly Hayes, David Johnson, Jimmy Fitzgerald. • Dale Binder, Shawn Herman, Denice Johns, Katherine O'Hara, Lynda Kelly, Donald Erves, Ken Tranter, Leigh Nelson
Permanent Stormwater Control Measures Oversight of Inspection and maintenance	• Stormwater NPDES	• Josh Hayes, Liz Stienstraw, Kalee Perry, Howard Jackson, Aujuah Jackson, Jessica Bel, 2 Vacant Positions
Other Pollution Prevention Programs (Industrial Inspection, Field Screening, Metro O&M Oversight	• Stormwater NPDES	• Josh Hayes, Liz Stienstraw, Aujuah Jackson, Jessica Bell, 2 Vacant Positions
Water Quality Monitoring	• Stormwater NPDES	• Mary Bruce, Veronica Logue, Stephanie Petty

3. ***<u>TDEC Suggestion</u> – Describe how EPSC issues are handled for sites part of a larger common development in which is 75% built out and the Grading Permit closed.***

- **The following narrative will be added to Section 3.4.2 of the SWMP:**

  Metro has created a new infill stormwater permit that provides oversight to single family residential construction for properties that are demolishing and rebuilding residences and expanding the net impervious footprint by 800 to 15,000 square feet. The infill permit requires applicants to submit plans that depict EPSC measures that will be utilized during construction. Metro performs routine inspections on these properties to ensure the controls are being maintained. In addition to infill properties, when homes are being construction on vacant individual lots after the grading permit was completed for the larger common development (subdivision), Metro also ensures the homebuilder is aware of the proper EPSC measures prior to signing off on the building permit.