

Executive Summary

On December 10, 2010, the City of Chattanooga was issued its second National Pollutant Discharge Elimination System (NPDES) permit by the Tennessee Department of Environment and Conservation. As required by permit TNS068063, the City Water Quality Program has developed, is in the process of implementing and is enforcing its Stormwater Management Program as detailed in the following Stormwater Management Plan (Plan).

The Plan provides a guide by which the Water Quality Management Program implements necessary activities to protect water quality and to satisfy the appropriate water quality requirements of the Clean Water Act. Included in the Plan is information for each of the program elements identified in permit TNS068063. The Water Quality Manager, or designee, is the responsible party to oversee compliance with the Plan.

This Plan document is broken into specific program elements including:

- Education and Involvement Plan
- Hot Areas Plan
- Illicit Discharge Detection and Elimination Plan
- MS4 Mapping Plan
- Field Screening Plan
- Limiting Sanitary Sewer Seepage Plan
- Construction
- Post Construction Best Management Plan
- Plans Review
- MS4 Maintenance Activity Plan
- Municipal Stormwater Management Plan
- Standards and Schedules for the Design of New City of Chattanooga Flood Management Projects
- PHF Permit Plan
- Contractor Requirements and Oversight
- Industrial Stormwater Management Plan
- Revised Comprehensive Monitoring Plan
- Enforcement Response Plan

City of Chattanooga Water Quality Program

Education & Involvement Plan



NDPES PERMIT # TN0068063

February 2013

Authorized By
Mounir Y. Minkara, Ph.D., P.E.

Revision

Date

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3	Dec, 1, 2011
4	June 1, 2012
5	July 1, 2012
6	August 1, 2012
7	November 1, 2012
	February 6, 2013

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APPROVALS AND CONCURRENCES

Approvals: This is to certify that we have reviewed this document and approve of its contents.

Signature


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2-7-13
Date

List of Revisions

Date	Plan Section	Revision Type (major or minor)	Revision Description
7/1/2011	3.2.1	Major	Added Hot Area Plan Text
7/1/2011	Appendix A	Minor	Added Hot Area 3 to Ancillary Educational Programs & Activities Schedule
7/1/2011	Table of Contents	Minor	Adjust per revisions
12/1/2011	Ancillary Educational Programs and Activities	Minor	Add 11/10/2011 to Level I EPSC Course Table
6/1/2012	Ancillary Educational Programs and Activities	Minor	Add 5/3/2012 to Level I EPSC Course Table
7/1/2012	Ancillary Educational Programs and Activities	Major	Added Watershed Academy Text
7/1/2012	Appendix A	Minor	Added Watershed Academy to Ancillary Educational Programs & Activities Schedule
7/1/2012	Table of Contents	Minor	Adjust per revisions
8/1/2012	Ancillary Educational Programs and Activities	Major	Added Water Quality Curriculum Text
8/1/2012	Appendix A	Minor	Added Water Quality Curriculum Workshops to Ancillary Educational Programs & Activities Schedule
8/1/2012	Table of Contents	Minor	Adjust per revisions
11/1/2012	Ancillary Educational Programs and Activities	Major	Added 2012 SESWA Conference and Tour Text
11/1/2012	Appendix A	Minor	Added 2012 SESWA Tour to Ancillary Educational Programs & Activities Schedule
11/1/2012	Table of Contents	Minor	Adjust per revisions
2/6/2013	Ancillary Educational Programs and Activities	Minor	Edit Water Quality Curriculum Workshops text to be inclusive with Project Wet Workshops
2/6/2013	Ancillary Educational Programs and Activities	Minor	Added URL for Watershed Academy

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Introduction

The City of Chattanooga Water Quality Program developed this Education Plan to highlight programs and activities by which the requirements of the permit will be met.

I. Public Education/ Outreach & Involvement

Because established regulations eliminate only a relatively small amount of pollutants related to stormwater runoff, Education & Outreach are an essential part of the Water Quality Program.

Permit Action Items

[3.2.1 Public Education and Outreach]

The permittee shall continue to implement its public education and outreach program. The focus of the program shall continue to be on impacts of stormwater discharges to water bodies and the steps that the public can take to reduce pollutants in stormwater runoff. The program must target specific pollutants and sources that may cause or contribute to impairment. For example, in certain areas known as hot areas, the permittee must focus education and outreach on those particular pollutants of concern. Some educational programs can lend themselves to water quality improvements. Permittee is encouraged to pursue those programs and document related or expected water quality improvements. The plan must outline how the permittee will target illicit discharges; pesticides, herbicides, and fertilizer applicators; and construction site operators (e.g., brochures, signage, and community events, etc.). The permittee shall track and maintain records of public education and outreach activities. A summary of this information shall be included in the annual report.

To meet the requirements of **3.2.1**, the WQP will continue to implement the existing Public Education/Outreach Program and will:

1. Pursue programs/activities targeting ‘hot areas’ & associated pollution sources such as Illicit Discharges, PHF Applicators, and Construction Site Operators

- Illicit Discharges: See [3.2.3: Illicit Discharge Detection and Elimination](#)
- The WQP will continue to use existing [educational materials](#) to inform PHF applicators on proper application procedures to keep pollution runoff to a minimum.
For details on educating *municipal* PHF applicators, see [3.2.6.5: Pesticide, Herbicide, and Fertilizer Application and Management](#).
- Construction Site Operators: See [3.2.4: Construction Site Operator Education & Public Involvement](#).
- The WQP has developed a [Hot Area Plan](#), which will focus on industrial and commercial sites. Like areas (those with the same primary pollutant) may be targeted simultaneously. Education efforts will be geared toward these specific pollutant sources and will include a combination of distributed educational materials and [Ancillary Educational Programs & Activities](#).

2. Conduct and document results from monitoring events and field screening at numerous locations within the delineated Hot Areas. Data gathered during present & future monitoring activities may then be analyzed so that expected and actual WQ improvements can be compared.

3. Track & maintain records of all public education & outreach activities in a WQP maintained ledger which can be included in the Annual Report.

[3.2.2 Public Involvement/Participation]

The permittee shall continue to implement its public participation program of its SWMP and shall detail the elements of its program in the plan (e.g., stream clean-up events, storm drain stenciling, etc.). The plan shall facilitate opportunities and include for public notice of program participation opportunities, participation in local stormwater management workgroups, recruiting education volunteers, riparian plantings or stream clean-up events, and in programs such as illicit discharge identification and elimination (e.g. storm drain marking program). The

plan should provide for the public notice requirements for each type of public participation activity, which may vary under the specific circumstances (e.g. publication in a newspaper, web site notification, etc.).

The permittee may develop a website that includes information that will inform stakeholders of actions that will result in behavior changes that will improve water quality, provide a press release or advertisement of activities to local cable networks, radio stations and/or newspapers, or other alternate method that provides an effective equivalent.

The permittee shall track and maintain records of public involvement and participation activities. A summary of this information shall be included in the annual report.

Per the requirements and suggestions of section **3.2.2**, the City shall continue the implementation of the existing Public Involvement and Participation Program and will:

1. Host and/or participate in a variety of programs and events which are further discussed in [Ancillary Educational Programs & Activities](#).
2. Maintain open lines of communication with the public via **public reporting mechanisms** such as:
 - 311- “One Call to City Hall”: Easy access to city-wide services via phone (3-1-1) & internet (<http://www.chattanooga.gov/mayors-office/information-services/311>)
 - WQ Webpage:
<http://www.chattanooga.gov/waterquality>
 - Access to up-to-date information on WQ activities & contacts
 - Direct link to 311
 - Public Meetings:
WQ representatives educate residents on watershed-specific water quality issues and the services provided by the WQP
 - District Townhall Meetings
 - Neighborhood Association Meetings
3. Track & maintain records of all public involvement and participation activities in a WQP maintained ledger, which can be included in the Annual Report.

[3.2.3 Illicit Discharge Detection and Elimination]

The permittee shall develop a mechanism for the public to report (e.g., via hotline or website), suspected illicit discharges. The permittee shall specify within the ERP the timeframe for complaint investigation. Documented illicit discharges shall be eliminated as soon as possible, following the timeframes and procedures outlined in the plan. ...The permittee shall identify in the plan opportunities for interagency coordination of hazardous waste or material spills response and cleanup. The permittee must coordinate with the TEMA (Tennessee Emergency Management Agency), local county emergency management agency, local fire departments and other agencies that respond to accidents and spill incidents with potential stream impacts. The permittee shall coordinate with these agencies to develop a program that minimizes the potential for their response to spills of chemicals or hazardous materials to cause pollutants to enter waters of the state.

As required in **3.2.3**, the WQP will:

1. Educate the public on the effects of stormwater pollution associated with illicit discharges & improper disposal of waste by:
 - Distributing [educational materials](#) to private & commercial property owners regarding specific pollution sources on an as-needed basis. This information shall accompany enforcement or educational letters issued to said property owners.
 - Labeling Storm drain markers: See [3.2.6.1: Separate Storm Sewer System Maintenance Activities](#)
 - Developing PSAs: See [Ancillary Educational Programs & Activities](#)

- Maintaining and updating a WQ Webpage
 - Participating in Various Community Events: See [Ancillary Educational Programs & Activities](#)
2. Utilizing existing means for public reporting of suspected illicit discharges (see “[public reporting mechanisms](#)”)
 3. Coordinating with necessary agencies for hazardous waste or material spills response and cleanup
 - Fire Department
 - Environmental Remediation Firms
 - TEMA

Further information on the Illicit Discharge program may be found in the [IDDE Plan](#).

[3.2.4 Construction Site Stormwater Runoff Control]

The permittee shall continue to implement and enforce its existing construction site stormwater runoff control program, including detailing the following elements in the plan: 1) A description of requirements for structural and non-structural BMPs, 2) procedures for identifying priorities for inspecting construction sites and enforcing control measures which consider, for example, the nature of construction activity and the characteristics of soils and receiving water quality; and 3) educational and training measures for construction site operators...

...Procedures for managing public input on projects: The permittee must have mechanisms for public access to information on projects and receiving and considering comments from the public on those projects. It is recommended that the permittee uses the world wide web for facilitating public involvement.

3.2.4.1 Construction Site Operator Education & Public Involvement)

The permittee must develop and distribute educational materials to construction site operators by considering the following:

- a. *Each year of the permit, the permittee must either provide information on existing training opportunities or co-sponsor with other agencies training for construction operators on control measure selection, installation, implementation, and maintenance as well as overall program compliance.*
- b. *The permittee must develop or utilize existing outreach tools (i.e. brochures, posters, website, plan notes, manuals etc.) aimed at educating construction operators on appropriate selection, installation, implementation, and maintenance of stormwater controls, as well as overall program compliance.*
- c. *The permittee must make available appropriate outreach materials to construction operators who will be disturbing land within the MS4 boundary. The permittees’ contact information and website must be included in these materials.*
- d. *The permittee must include information on appropriate selection, installation, implementation, and maintenance of controls, as well as overall program compliance, on the permittee’s existing website.*

The permittee must adopt and implement procedures for receipt and consideration of information submitted by the public regarding construction projects. This includes, but is not limited to, the public reporting mechanisms described in 3.2.2 above. The permittee must provide public notice for all public projects (owned by the permittee) that have planned disturbance greater than or equal to an acre. It is recommended that the permittee hold public meetings for all public projects (owned by the permittee) that have generated significant public interest.

As required by sections 3.2.4 and 3.2.4.1 of the permit, the Water Quality Program, in coordination with the Land Development Office, will:

1. Co-host (along with Hamilton County’s WQP) the TNEPSC course.
Additional information can be found in [Ancillary Educational Programs & Activities](#).

2. Post Notice of Land Disturbing signs at active construction sites, which include the following information:
 - Permit Number & Date
 - Applicant Name
 - Contractor Name
 - Total Disturbed Acreage
 - Project Start & Completion & Stabilization Completion Dates

Provide additional information on these projects through the local 311 service.

3. Utilize and make available existing [educational materials](#) aimed at informing construction operators who will be disturbing land within the MS4 boundary on appropriate selection, installation, implementation and maintenance of control measures, as well as overall program compliance.

[3.2.6.1 Separate Storm Sewer System Maintenance Activities]
(3.2.6.1.3 Catch basin labeling)

The permittee must develop a plan to ensure that each catch basin includes a legible stormwater awareness message (e.g., a label, stencil, marker, or pre-cast message such as “drains to the creek” or “only rain in the drain”). The permittee must include timeframes in the plan for marking new structures, existing structures with no labels and re-labeling structures where the message has become illegible or is missing.

(3.2.6.1.5 Proper management and disposal of oil and toxic materials)

The permittees shall effectively prohibit the discharge or disposal of used motor vehicle fluids and household hazardous wastes and other toxic materials into the MS4. To satisfy the requirements of this item, the permittees shall educate the public on the correct disposal of these wastes.

In compliance with Sections **3.2.6.1.3** and **3.2.6.1.5**, the WQP, in coordination with Engineering staff, will:

1. Label all accessible catch basins within City limits with a stormwater awareness message. Those catchbasins that have been previously labeled, but whose labels have become illegible will be relabeled.
 - The Municipal Preventative Maintenance Program will be responsible for labeling the majority of catchbasins.
 - Select areas will be reserved to host Educational Activities which will include catchbasin labeling.
2. Ensure proper waste disposal methods are conveyed by means of [educational materials](#), [Ancillary Educational Programs & Activities](#), the website, and via 311.

[3.2.6.7 Monitor and Control Industrial, Commercial and High Risk Runoff]

... The Permittee shall work with its industries to prevent contamination of stormwater runoff. The permittee must accomplish this by providing guidance materials, conducting workshops, reviewing stormwater pollution prevention plans and providing technical assistance. The permittee must retain records that document its work with these industries.

In compliance with section **3.2.6.7**, the WQP will work with area industries to reduce stormwater pollution by providing [educational materials](#), on-site consultation during scheduled industrial inspections, and SWPP reviews. The Water Quality Program will provide additional guidance at the industries' request.

Ancillary Educational Programs & Activities

In cooperation with various institutions, (school-age groups, colleges and universities, neighborhood groups, civic organizations, non-profit/profit Organizations, etc) the Water Quality Program works to educate the public on critical water quality management issues.

- In an effort to reach all parts of our community, the WQP will participate in radio-aired **Public Service Announcements**. These PSAs introduce the importance of Best Management Practices in reducing the quantity and improving the quality of stormwater runoff. Some of these ideas include: using less or non-toxic household cleaners, using lawn/garden chemicals sparingly, properly disposing of household wastes, recycling when possible, properly maintaining septic systems, and capturing/ reusing rainwater via rain barrels or rain gardens.
- The Water Quality Program will host and co-host a variety of content-specific **Workshops/Courses**, some of which may be attended by municipal staff as well.
 1. The *Level I EPSC Course* and the *Level I Refresher* courses are sponsored by TDEC, TDOT, and UT's Water Resources Research Center and Biosystems Engineering & Soil Science program. These courses target contractors, developers, inspection and enforcement personnel, plan preparers, reviewers, designers and engineers. Additional information is available @ <http://www.tnepsc.org/>, which is also referenced on the City's website.

Course	Date	City's Contribution
Level I Refresher	November 10, 2011	Education Materials: BMPs for Home Repair & Remodeling (brochure), BMPs for Utilities (brochure), EPA's When it Rains it Drains (brochure), Healthy Chattanooga Creeks and Streams (brochure), TN Construction Guide to Cleaner Water (brochure), Construction Dos & Don'ts (brochure)
Level I	May 3, 2012	Education Materials: BMPs for Home Repair & Remodeling (brochure), BMPs for Utilities (brochure), EPA's When it Rains it Drains (brochure), Healthy Chattanooga Creeks and Streams (brochure), TN Construction Guide to Cleaner Water (brochure), Construction Dos & Don'ts (brochure)

2. The WQP will work with *Chattanooga State, Technical Community College's Environmental Science Lab Class* in a field session that demonstrates some of the Water Quality Program's activities including:
 - IDDE Program/ Emergency Response
 - SCORE Program (Stream Assessments)
 - Benthics Sampling
3. In coordination with Hamilton County WQP, the City of Chattanooga WQP will host Project Wet Workshops, which will serve as the dissemination of pertinent *Water Quality Curriculum* content. These workshops will also serve as an introduction for educators to the Water Quality curriculum & train them for integration of the WQ Curriculum into existing, State required curriculum.
4. In addition to delivering a presentation at the 2012 Annual SESWA Conference on The *Chattanooga Green Infrastructure Initiative*, the WQ Program will also provide a representative to serve as a tour guide to local facilities that are area leaders in implementing green infrastructure and sustainable practices.

- The WQP participates in various **Community Festivals/ Events** each year in an attempt to reach parts of our community that may have been missed during other educational endeavors. At each of these events, [educational materials](#) are distributed. Information on the WQP's general duties and other upcoming events may also be shared. Some of these events include:
 - Tri-State Homeshow
 - Riverbend Festival
 - Hamilton County Fair
 - Outdoor Chattanooga Expo
 - Eco Expo
 - Chattanooga Parks & Rec. Kidz Camp
 - TN Federation of Garden Clubs Annual Convention
 - Environmental Holidays/Celebrations
 - Earth Day
 - World Water Day
 - Arbor Day
 - National Drinking Water Week
 - TN River Rescue
 - Career Fairs/ Days (UTC, Chattanooga St., Hamilton Co. Schools)

- The WQP received a 319 grant to fund the development of an online **Watershed Academy**, which focuses on the Lower Tennessee River Watershed. Contracted by the WQP, Chattanooga State Technical Community College is designing the Watershed Academy to educate contractors, teachers, and other community leaders by means of audience-specific information to promote awareness of issues associated with water quality management within the Lower TN River Watershed. The site (<http://www.lwrtnriverws.info/index.htm>) is referenced on the City's webpage in the education section.
- In coordination with (TVA, Hamilton County WQP, Hamilton County Department of Education, and several private schools), the WQP is currently developing a **Water Quality Curriculum**, to be worked into existing curriculum for elementary, middle, and high school students. The primary incentive for including this curriculum is a reduction in water quality fees. A large portion of the curriculum will be based on Project Wet lesson plans; therefore each educator must receive 'certification' under Project Wet.

See Appendix A for Educational Programs & Activities Schedule

See Appendix C for Public Education Materials

II. In-House/ Municipal Training

In addition to educating & informing the public on critical water quality issues, the Water Quality Program will maintain a knowledgeable staff by conducting annual in-house training sessions pertinent to associated field activities.

[3.2.3.2 Illicit Discharge Education & Training]

The permittee must continue to implement a training and education program for all municipal field staff that, as part of their normal job responsibilities, administer the illicit discharge and illicit connection detection program, and shall also detail the components of its program in the plan. Contact information, including the procedure for reporting an illicit discharge, must be included in the permittee's fleet vehicles that are used by field staff. Training program documents must be available for review by the permitting authority.

By no later than 6 months following the effective date of this permit, the permittee must train all staff identified in paragraph above on the identification of an illicit discharge or connection, and on the proper procedures for reporting and responding to the illicit discharge or connection. Follow-up training must be provided as needed to address changes in procedures, techniques, or staffing. The permittee must document and maintain records of the training provided and the staff trained.

Per the requirements of section **3.2.3.2**, the WQP will continue implementation of a training and education program for identifying, reporting and responding to incidents of illicit discharges and connections by:

1. Providing [training](#) and [educational materials](#) to field staff on proper IDDE procedures as part of their normal job responsibilities, including:
 - Water Quality Staff
 - City Wide Services Supervisors
 - Parks & Recreation Supervisors
2. Working with the payroll department on distributing with paychecks an educational document developed by the WQP ("[Illicit Discharge Awareness Information](#)") specifically for municipal field staff on proper Illicit Discharge procedures.
3. Providing follow-up training to reflect procedural, technical and/or staffing changes on an as-needed basis.
4. Making available for review all training documents.

[3.2.4 Construction Site Stormwater Runoff Control]

MS4 staff training: Inspectors must maintain certification under the [Tennessee Fundamentals of Erosion Prevention and Sediment Control, Level 1](#). Site plan reviewers must receive a certificate of completion from the [Tennessee Erosion Prevention and Sediment Control Design Course, Level 2](#). It is recommended that MS4 staff receive training under both courses.

In coordination with the Land Development Office, the WQP will ensure that all appropriate field staff maintain proper certification in EPSC.

[3.2.6 Pollution Prevention/Good Housekeeping for Municipal Operations]

The permittee must develop and implement an operation and maintenance program that has the ultimate goal of preventing or reducing pollutant runoff from municipal operations.

The program must include employee training to prevent and reduce stormwater pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and stormwater system maintenance...

As required in section 3.2.6, the WQP will ensure that appropriate TNEPSC Level I, IDDE, and/or PHF training is provided to applicable municipal field staff.

[3.2.6.5 Pesticide, Herbicide, and Fertilizer Application and Management]

The permittee must develop a program in the plan to evaluate the materials used and activities performed on municipally owned public spaces such as parks, golf courses, easements, public rights of way, and other open spaces for pollution prevention opportunities...

...The permittee must include in the plan the following appropriate practices to minimize landscaping-related pollutant generation:

1. Educational activities, permits, certifications, and other measures for municipal applicators.
2. Integrated pest management measures that rely on non-chemical solutions, including:
 - Use of native plants
 - Keeping clippings and leaves away from waterways and out of the street using mulching, composting
 - Limiting application of pesticides and fertilizers if precipitation is forecasted within 24 hours or as specified in label instructions
 - Limiting or replacing pesticide use (e.g., manual weed and insect removal)
 - Limiting or eliminating the use of fertilizers, or, if necessary, prohibiting application within 5 feet of pavement, 25 feet of a storm drain inlet, or 50 feet of a waterbody
 - Reducing mowing of grass to allow for greater pollutant removal, but not jeopardizing motorist safety
3. Schedules for chemical application that minimize the discharge of such constituents due to irrigation and expected precipitation.
4. The collection and proper disposal of unused pesticides, herbicides, and fertilizers.

As required by section 3.2.6.5, the WQP will educate municipal PHF applicators on proper practices to minimize landscaping-related pollutant generation by providing [educational materials](#) and [training](#) discussing these required elements:

1. Integrated Pest Management (IPM) practices.
2. Appropriate scheduling for chemical application so as to minimize the runoff of pollutants due to irrigation and expected precipitation.
3. Proper procedures for collection and proper disposal of unused pesticides, herbicides and fertilizers.

In addition, the WQP has developed a [PHF Plan](#), which specifies proper operations and procedures as related to the application of pesticides, herbicides and fertilizers by both the public and municipal employees. The details of this plan will be integrated into the training provided to municipal employees.

[3.2.6.7 Monitor and Control Industrial, Commercial and High Risk Runoff]

...

Inspections

The permittee shall inspect all industrial, commercial and high risk runoff facilities at least once every three years. The permittee shall establish and follow procedures for these routine inspections. In addition to the routine inspections, the MS4s shall establish and follow procedures for inspections in response to illicit discharges, improper disposal, water quality monitoring or complaints. These procedures shall also include timely re-inspection for those facilities to verify that corrective actions have been taken.

The procedures for both routine and non-routine inspections must include a manual and checklist for inspectors. The inspection procedures must recognize and coordinate with existing programs, namely SARA Title III inspections performed by the Chattanooga Fire Department, pretreatment inspections performed by the Chattanooga Waste Resource Division, and NPDES inspections performed by Tennessee Department of Environment and Conservation. These procedures must include a manual and checklist for inspectors. The permittee must conduct and document inspector training annually....

In compliance with section **3.2.6.7**, the WQP will conduct and document annual in-house [training](#) on Monitoring and Controlling Industrial, Commercial and High Risk Runoff.

See Appendix B for In-House/ Municipal Training Schedule

See Appendix D for In-House Education Materials

At the very least, an annual meeting will be held to evaluate the effectiveness of each non-structural BMP, during which input from all participating staff, as well as other individuals and organizations who have participated in education and outreach endeavors, will be considered for needed program changes.

Appendix A

Ancillary Educational Programs & Activities Schedule

Non-Structural BMP	Permit Cycle				
	Year 1	Year 2	Year 3	Year 4	Year 5
Workshops/ Courses	Level I TNEPSC- Annually				
	Annual Chattanooga State ESC Lab Class				
		SESWA- Green Infrastructure Initiative- Chattanooga Facilities Tour			
	WQ Curriculum Development		Water Quality Curriculum/Project Wet Workshop		
Community Festivals	Various Community Festivals				
Website	Redesign Existing Website		Update content Quarterly or as needed		
PSAs	Annual Airings				
Public Meetings	District Townhall Meetings- As Needed Neighborhood Association Meetings- As Needed Stormwater Board Meetings- Monthly				
WQ Meetings	Effectiveness Evaluations- Annually & As Needed				
Catchbasin Labeling	Planning/ Implementation				
Hot Areas		Hot Area #3 Survey			

Appendix B

In-House/ Municipal Training Schedule

Non-Structural BMP	Permit Cycle				
	Year 1	Year 2	Year 3	Year 4	Year 5
Illicit Discharge Training	Distribution of educational materials to applicable field staff	Follow-up training: Annually for WQ staff, As Needed for other municipal staff			
	Training Workshop for City Wide Services and Parks & Recreation Supervisors				
PHF Training	Distribution of educational materials to applicable field staff		Distribution of educational materials to applicable field staff		Distribution of educational materials to applicable field staff
	Training workshop for applicable field staff		Training workshop for applicable field staff		Training workshop for applicable field staff
Industrial Inspections Training	Annual training for applicable WQ field staff				
Level I/II EPSC	Applicable WQ field staff will maintain appropriate certification				
Stormwater Controls Inspection Training	Inspection Training for Applicable Field Staff		Inspection Training for Applicable Field Staff		Inspection Training for Applicable Field Staff

Appendix C

Public Education Materials

Topic	Target Audience	Materials	Purpose
Construction Activities	Utility Companies	BMPs for Utilities	Educate utility companies on water quality concerns as related to controlling site runoff of sediment and other pollutants during excavation/ utility work.
	Construction Site Operators, Contractors	City of Chattanooga/ Hamilton County/ Town of Signal Mountain BMP Manual	Educate construction site operators, contractors, etc, on control measure selection, installation, implementation, and maintenance as well as locally implemented, federally-mandated Stormwater Programs, local ordinances, and overall program compliance
		Erosion Control Structural Practices	Educate construction site operators, contractors, etc, on control measure selection, installation, implementation, and maintenance as well as overall program compliance
	All involved parties	PSAs	Educate all involved parties on water quality concerns associated with construction activities.
General Water Quality	General Public	Healthy Chattanooga	Educate public on general water quality concerns
	General Public	Water Quality Webpage	Educate public on general water quality concerns
	General Public	Watershed Flyers	Educate public on general watershed info, as well as water quality concerns specific to the watershed in which they reside
		PSAs	Educate public on general water quality concerns
IDDE	Service Station Owner/Operators	BMPs for Service Stations	Educate service station owner/operators on water quality concerns as related to automotive maintenance & associated fluids, spill concerns, and proper employee training

	Auto Dealers	Car Washing for Auto Dealers	Educate automotive dealers on water quality concerns as related to washing vehicles and proper employee training
IDDE	Fundraiser Hosts	Car Washing for Fundraising	Educate groups or individuals hosting fundraisers on water quality concerns as related to washing vehicles
	General Public	Car Washing for Home Owners	Educate public on water quality concerns as related to washing vehicles
		Pet Waste & Water Quality	Educate public on water quality concerns as related to pollution associated with pet waste
		Sanitary Sewer Lateral Assessment Program	Educate public on Sanitary Sewer Lateral Assessment Program (SLAP)/ smoketesting
		PSAs	Educate public on general water quality concerns
Industrial Operations	Industrial Facilities	Industrial Stormwater Monitoring	Educate Industry Owner/Operators on water quality concerns as related to Industrial Facility stormwater runoff, as well as proper monitoring procedures
LID	General Public	Downspout Disconnect	Educate home & business owners on water quality concerns as related to excess water in the stormwater system, as well as proper procedures for disconnecting downspouts
		Rain Barrels	Educate public on water quality concerns as related to excess stormwater runoff, benefits of rainbarrels, as well as procedures in making a rainbarrel
		Rain Gardens	Educate public on water quality concerns as related to excess stormwater runoff, benefits of raingardens, as well as plant selection for use in raingardens

Appendix D

In-House Education Materials

Topic	Materials	Purpose
Construction Activities	Erosion Control Structural Practices	Educate municipal employees on control measure selection, installation, implementation, and maintenance as well as overall program compliance
	City of Chattanooga/ Hamilton County/ Town of Signal Mountain BMP Manual	Educate municipal employees on control measure selection, installation, implementation, and maintenance as well as locally implemented, federally-mandated Stormwater Programs, local ordinances, and overall program compliance
Industrial Activities	Industrial Inspections PowerPoint	Educate municipal employees on proper industrial inspection procedures & enforcement protocol.
	Industrial Inspections SOP	
IDDE	Illicit Discharge Awareness Information	Educate municipal employees on proper inspection & reporting procedures regarding illicit discharges and connections.
	IDDE Training PowerPoint	Educate municipal employees on proper inspection & reporting procedures as well as enforcement protocol regarding illicit discharges and connections.
	IDDE SOP	
PHF		
General/ Feedback	Water Quality Survey	The Water Quality Survey is an attempt to gain a better understanding of the current knowledge held by a particular group regarding the watershed in which they work or reside.

City of Chattanooga Water Quality Program

“Hot Areas” Action Plan



NDPES PERMIT # TN0068063

February 2013

Authorized By:

Revision

Date

1
2

June 6, 2011
January 23, 2012
February 6, 2013

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Date

City of Chattanooga –Water Quality Program Hot Areas Action Plan

Definition and Rationale of “Hot Areas”

Hot area means an area where land use or activities generate highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater. Examples might include operations producing concrete or asphalt, auto repair shops, auto supply shops, large commercial parking areas and restaurants.

The Water Quality Program (WQP) designates “Hot Areas” based on data of tracking chronic illicit discharges in areas prescribed under land uses that encompass these activities operations producing concrete or asphalt, auto repair shops, auto supply shops, large commercial parking areas and restaurants. Within GIS, the WQP is able to pinpoint “hot areas” based on the concentration or density of illicit discharges within watershed from the criteria based in definition of “hot areas”.

Under the designation based on land use criteria (density of residential, commercial, and industrial) and the referenced activities, the WQP has established ten hot areas within the City of Chattanooga, as identified in Table 1 below. Each “Hot Area” is numbered and is calculated based on the density of land uses and acreage of each hot area.

Table 1. Identification of Hot Areas within the City of Chattanooga; see appendix for reference maps.

Density:	%Residential	%Commercial	%Industrial	Acreage
Hot Area #1	0%	20%	80%	1928
Hot Area #2	65%	20%	15%	2767
Hot Area #3	0%	40%	60%	230
Hot Area #4	0%	25%	75%	296
Hot Area #5	0%	1%	99%	224
Hot Area #6	80%	15%	5%	1939
Hot Area #7	5%	95%	0%	280
Hot Area #8	5%	65%	30%	967
Hot Area #9	5%	95%	0%	268
Hot Area #10	2%	98%	0%	674

Educational Plan for Addressing Hot Areas

Section 3.2.1 of National Pollution Discharge Elimination Permit Number TN0068063 requires the City of Chattanooga to develop an action plan that addresses the following elements:

The permittee shall continue to implement its public education and outreach program. The focus of the program shall continue to be on impacts of stormwater discharges to water bodies and the steps that the public can take to reduce pollutants in stormwater runoff. The program must target specific pollutants and sources that may cause or contribute to impairment. For example, in certain areas known as [hot areas](#), the permittee must focus education and outreach on those particular pollutants of concern.¹

¹ See 40 C.F.R. § 122.26(d)(2)(iv)(A)(6), 40 C.F.R. § 122.26(d)(2)(iv)(B)(5, 6), and 40 C.F.R. § 122.26(d)(2)(iv)(D)(4)

The WQP will focus on the hot areas by addressing the causes of chronic illicit discharges. By analyzing the causes, the WQP will promote the awareness of the affects of water pollution through the means of public signs, educational seminars, and informative brochures in a sub-watershed approach. To gauge the effectiveness of educational approach, the WQP will monitor the frequency of illicit discharge to determine if there is trend in declining recidivisms for illicit discharges in the “hot areas” after the educational seminars have been conducted.

Enforcement Protocol for Violations in the “Hot Areas”

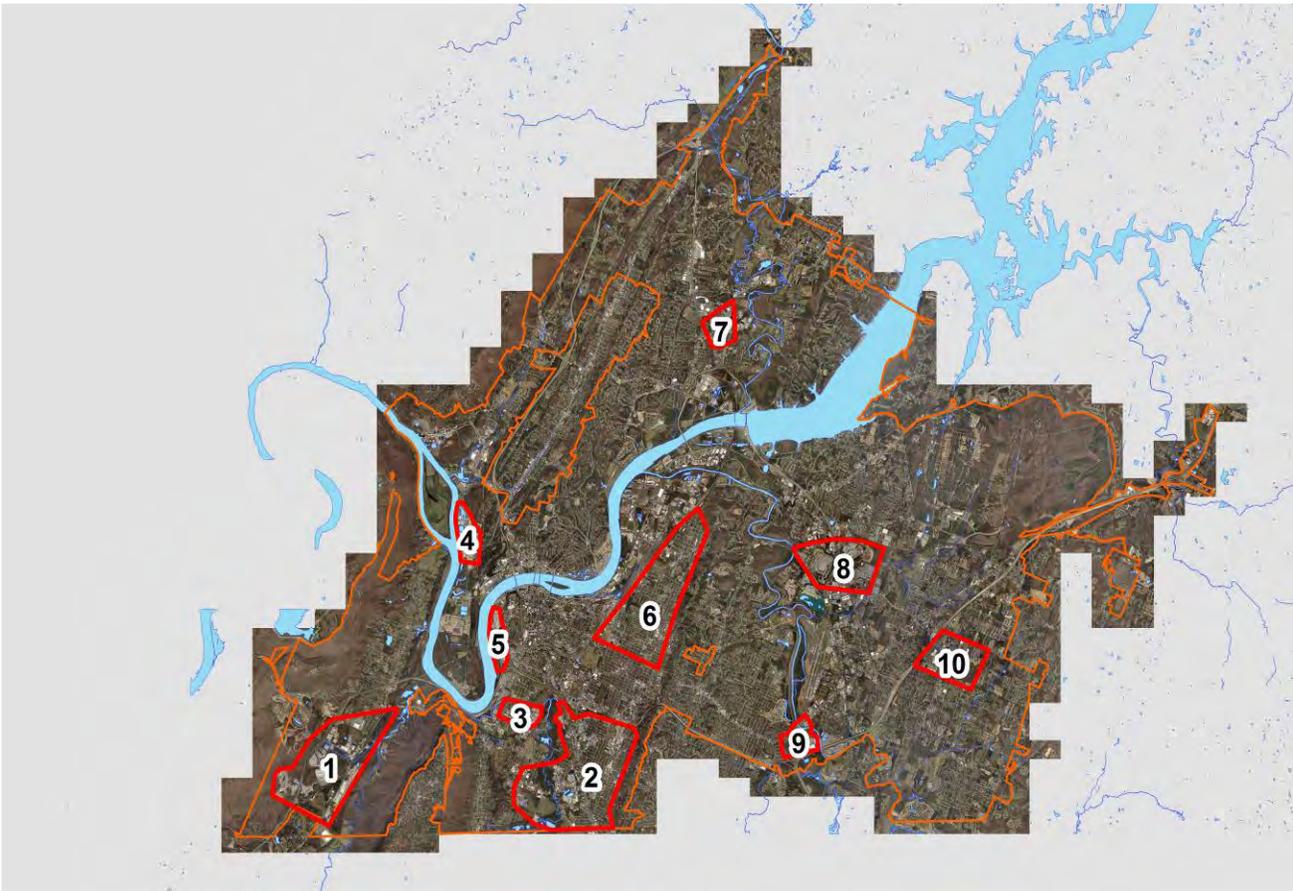
Section 3.2.3 of the current Permit states:

The permittee must be able, by ordinance or other regulatory mechanism, to prohibit contamination of stormwater runoff from hot areas. The ordinance must allow for penalties as specified in TCA 68-221-1106.

Hot Area Permit Cycle Milestones

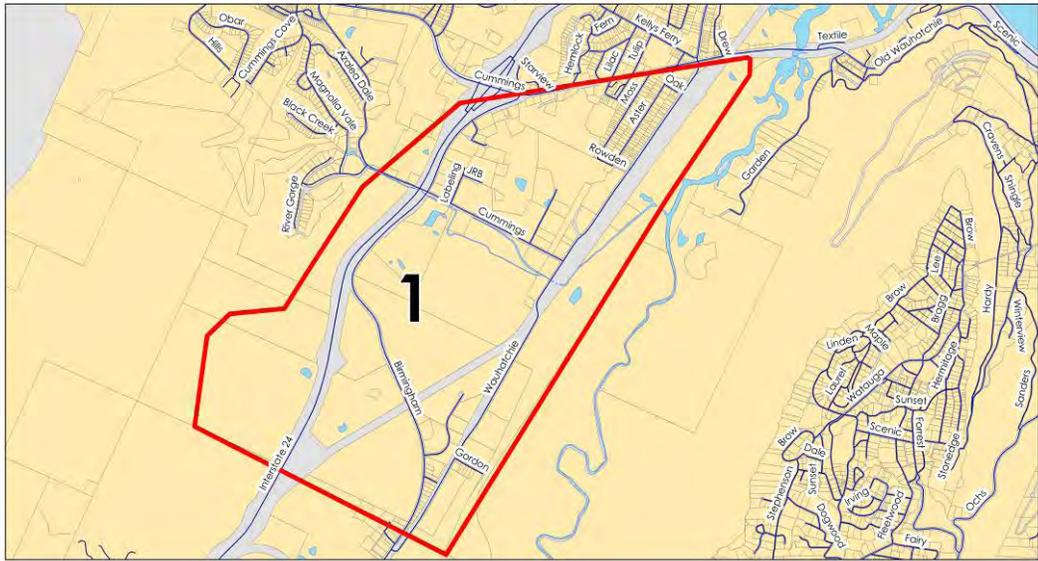
PERMIT YEAR				
2011	2012	2013	2014	2015
Mass Mailing to pilot area		Mass Mailing to selected areas	Mass Mailing to selected areas	Evaluate other potential Hot Areas
Continue to revise Hot Areas Program				

Appendix



Overall City of Chattanooga Hot Area Map

City of Chattanooga Water Quality Program
Hot Area #1

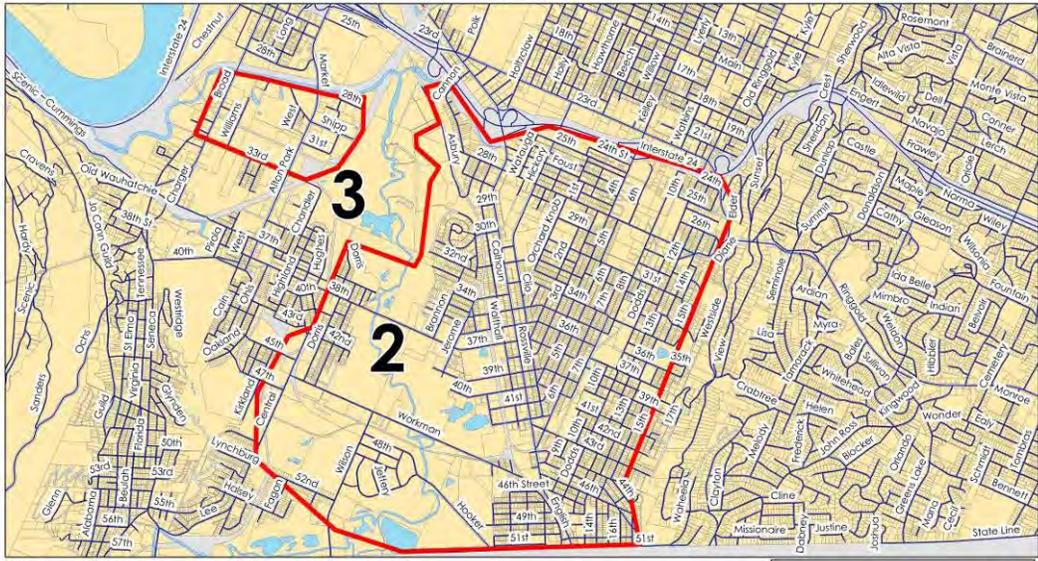


Description: Area is within the Lookout Creek Watershed-industrial/commercial landuse



Hot Area #1

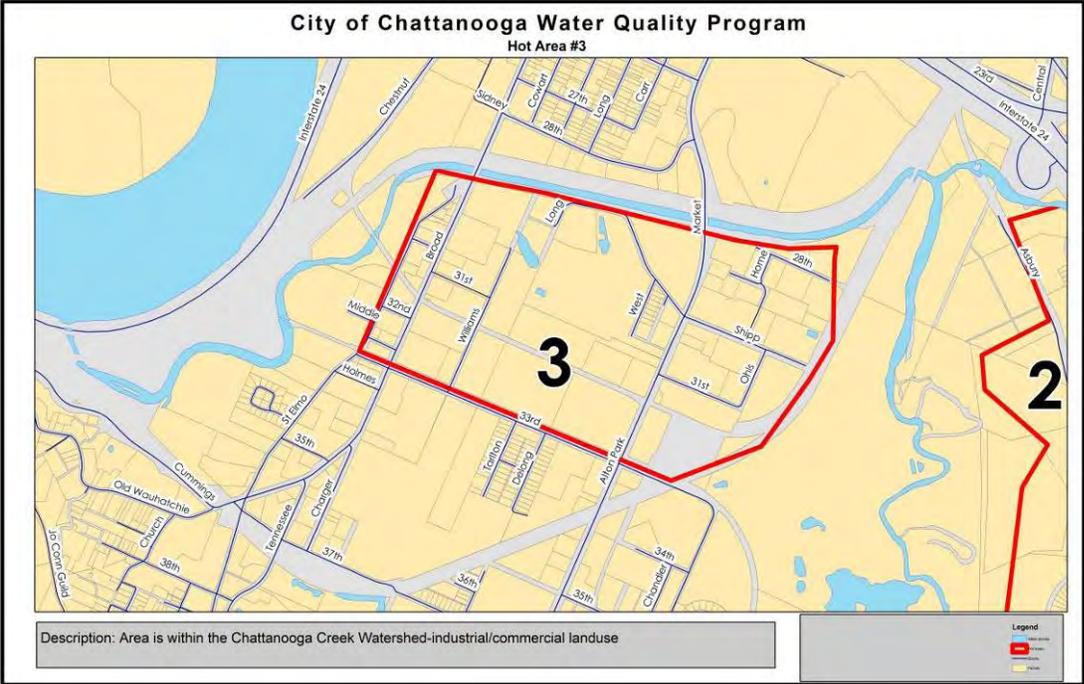
City of Chattanooga Water Quality Program
Hot Area #2



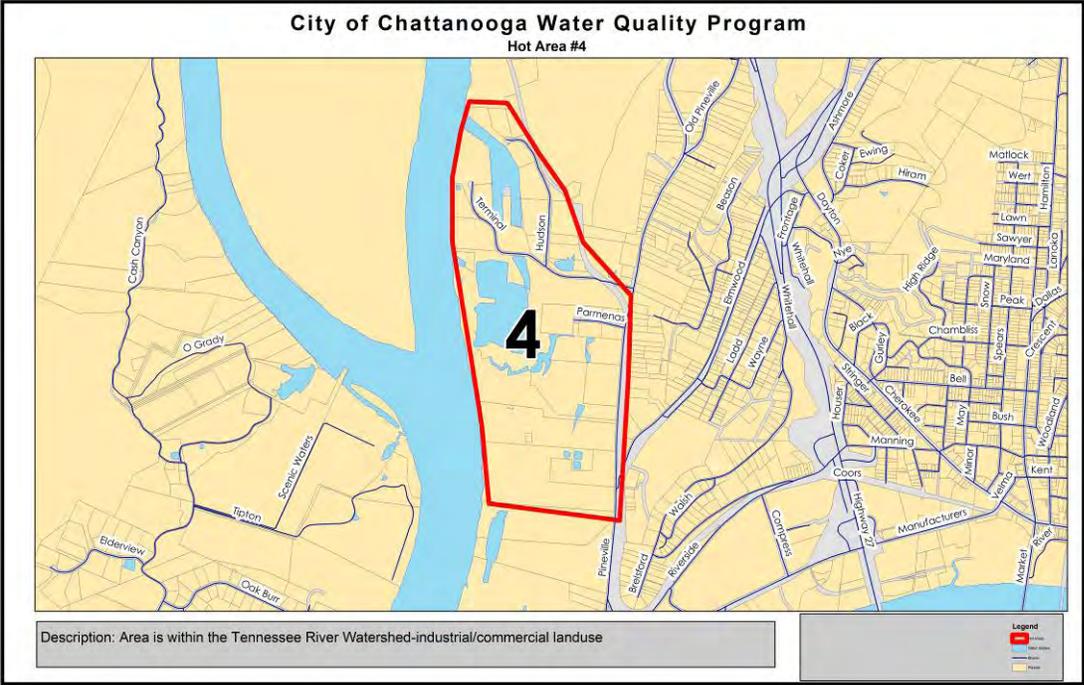
Description: Area is within the Chattanooga Creek Watershed-residential/industrial/commercial landuse



Hot Area #2



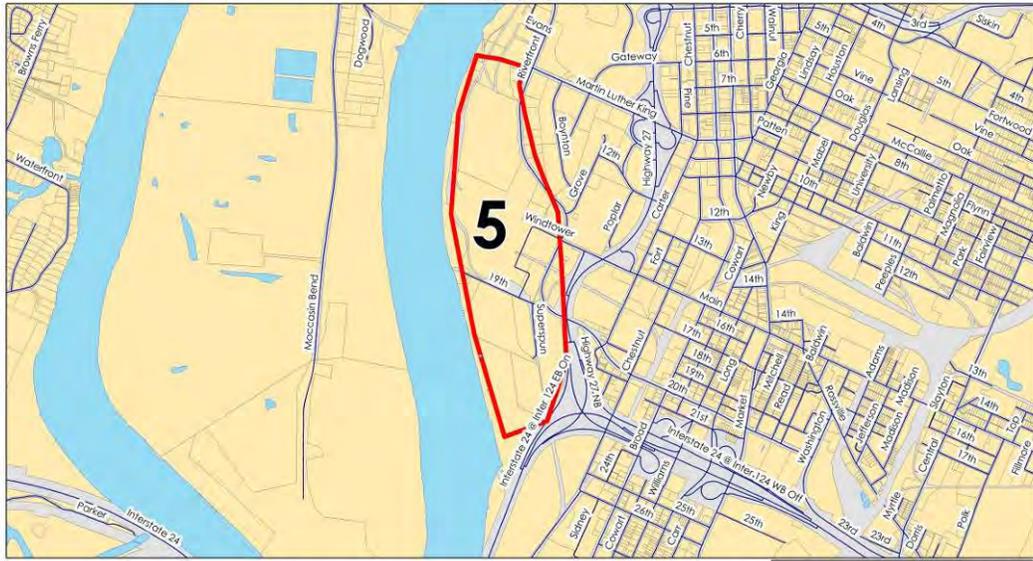
Hot Area #3



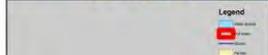
Hot Area #4

City of Chattanooga Water Quality Program

Hot Area #5



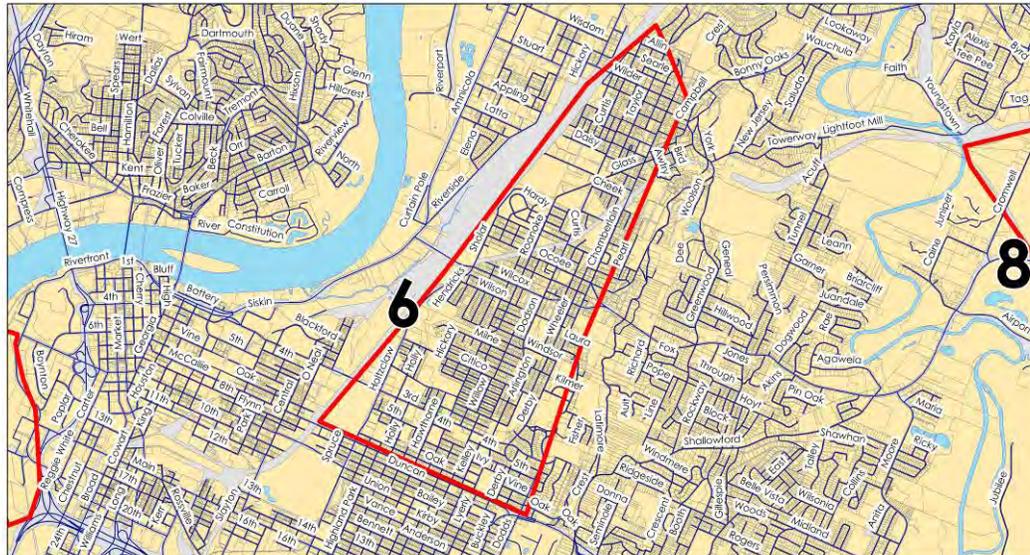
Description: Area is within the Tennessee River Watershed-industrial/commercial landuse



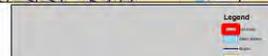
Hot Area #5

City of Chattanooga Water Quality Program

Hot Area #6

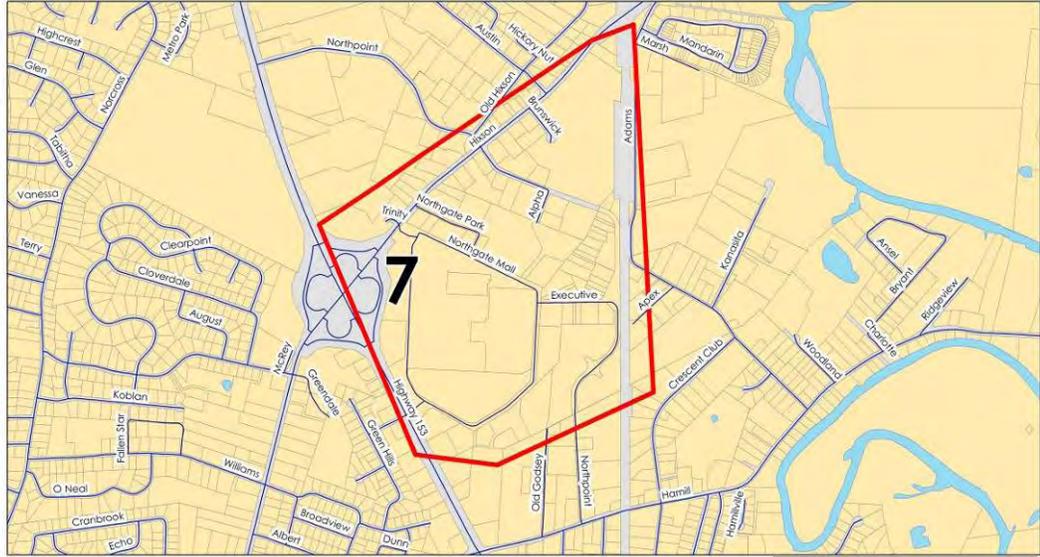


Description: Area is within the Citico Creek Watershed-residential/industrial/commercial landuse



Hot Area #6

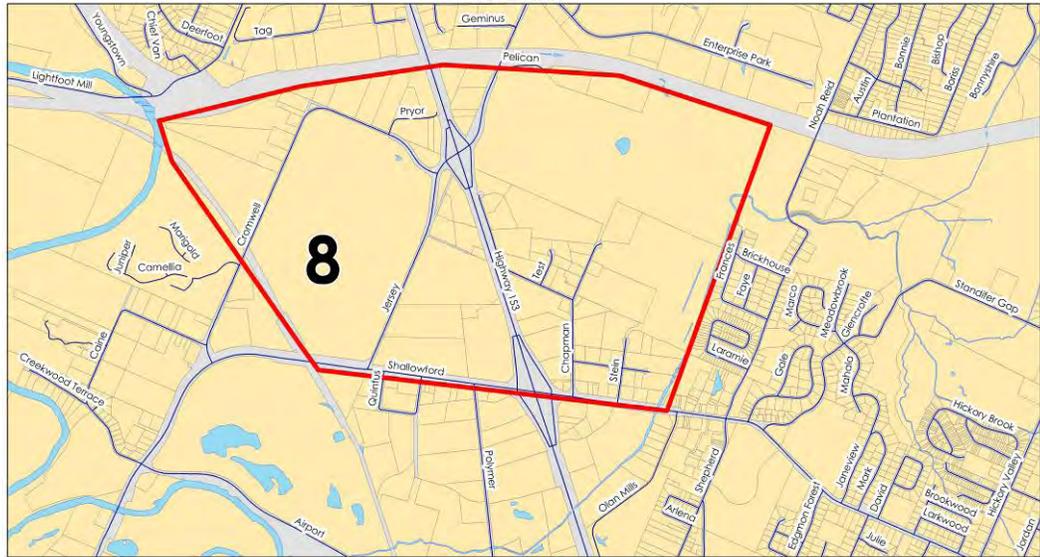
City of Chattanooga Water Quality Program
Hot Area #7



Description: Area is within the North Chickamauga Watershed-commercial landuse (Northgate Mall)

Hot Area #7

City of Chattanooga Water Quality Program
Hot Area #8



Description: Area is within the South Chickamauga Watershed-industrial/commercial landuse

Hot Area #8

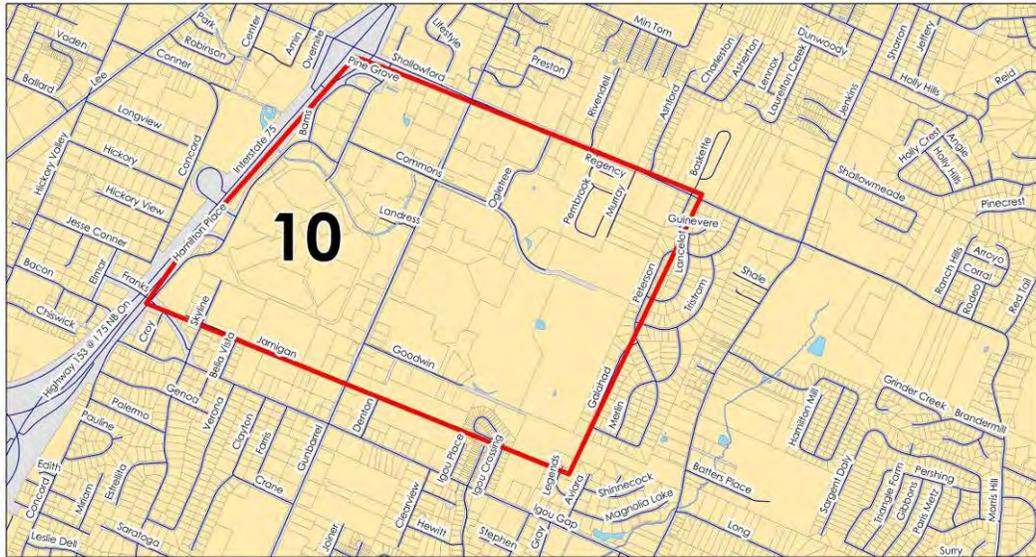
City of Chattanooga Water Quality Program
Hot Area #9



Description: Area is within the South Chickamauga Watershed-commercial landuse (Eastgate Mall)

Hot Area #9

City of Chattanooga Water Quality Program
Hot Area #10



Description: Area is within the South Chickamauga Watershed-commercial landuse (Hamilton Place Mall)

Hot Area #10

**City of Chattanooga
Illicit Discharge Detection and Elimination
Water Quality Plan Element
MS4 NPDES Permit TNS068063**



February 2013

Authorized By:	Revision	Date
<i>Mounir Y. Minkara, Ph.D., P.E., CPSWQ</i>	1	June 16, 2011 February 5, 2013

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2-7-13

List of Revisions

Date	Specific Section of Page	Revision Type (major or minor)	Revision Description
2/5/13	Introduction	Minor	Added introduction section
2/5/13	Sec. 3.2.3	Minor	“Through the City of Chattanooga’s (City)” removed and “requires the City” replaced
2/5/13	Spill Response	Minor	Removed “Marion Environmental, HEPACO, etc.”
2/5/13	Spill Response	Minor	“,” added after “objective” and “goal”
2/5/13	Spill Response	Minor	“City of Chattanooga” replaced by “City”
2/5/13	Spill Response	Minor	Verbiage revised to improve flow
2/5/13	Enforcement Protocol	Minor	“will develop” replaced by “has been developed”
2/5/13	Enforcement Protocol	Minor	“An Enforcement Response Plan will be completed in conjunction with the City code review’ removed.
2/5/13	Enforcement Protocol	Minor	“will be” replaced by “has been”

Introduction

The purpose of this document is to provide guidance regarding the implementation of the City of Chattanooga's (City) illicit discharge detection and elimination (IDDE) program. The IDDE program encompasses a variety of techniques to identify and eliminate illicit discharges. Elements of the IDDE program include Citizen Requests (through the City's 311 system and the web site), stream inspections (through the SCORE program), field screening, and monitoring.

Section 3.2.3. Illicit Discharge Detection and Elimination

“The permittee shall develop, implement and enforce an illicit discharge detection and elimination program. The permittee shall continue to implement the existing illicit discharge detection and elimination program.”

National Pollutant Discharge Elimination System (NPDES) Permit No. TNS068063, requires the City to develop and implement a program to identify and eliminate all illicit discharges from its Municipal Separate Storm Sewer System (MS4). An illicit discharge is defined at 40 CFR §122.26(b)(2) and refers to *“any discharge to a municipal separate storm sewer that is not entirely composed of stormwater, except discharges authorized under an NPDES permit (other than the NPDES permit for discharges from the MS4) and discharges resulting from fire fighting activities.”*

Under Section 1.5.2 of the aforementioned NPDES Permit, the following non-stormwater discharges are authorized and have been determined by the Tennessee Department of Environment and Conservation, Division of Water Pollution Control (Division) as non substantial contributors of pollutants to the MS4:

- Water line flushing
- Landscape irrigation
- Diverted stream flows
- Uncontaminated ground water infiltration (infiltration is defined as water other than wastewater, that enters as sewer system, including sewer service connections and foundation drains, from the ground through such means as defective pipes, pipe joints, connections, or manholes. Infiltration does not include, and is distinguished from inflow.)
- Uncontaminated pumped ground water
- Discharges from potable water sources
- Air conditioning condensate
- Irrigation water
- Springs
- Water from crawl space pumps
- Footing drains
- Lawn watering
- Individual residential car washing
- Flows from riparian habitats and wetlands
- Dechlorinated swimming pool drains
- Street wash water
- Discharges of flows from fire fighting activities

Illicit discharges are non-stormwater discharges that contribute to pollutant loadings in receiving streams. Non-stormwater discharges can contribute to high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria. Pollutants have contributed to the degradation of

many of the nation's waterways. An effective illicit discharge detection and elimination program is required to identify and eliminate sources of pollutant discharge from the MS4s.

Since issuance of the initial NPDES permit (1989), the City has developed a program to identify and eliminate sources of illicit discharges. Throughout the program's tenure, a variety of activities specifically focusing on illicit discharge detection and elimination has been implemented (Appendix A – IDDE SOP). The City of Chattanooga's illicit discharge program includes *inspection, enforcement, and ordinances*.

Illicit Discharge Inspection

As part of the City's ongoing IDDE program numerous inspection techniques are deployed to identify potential sources of illicit discharges within the jurisdictional boundary. Specific inspection techniques include:

- Visual inspections;
- Dye testing;
- Televising/Video inspection;
- Smoke testing;
- Indicator monitoring; and
- Optical brightener monitoring.

Additional elements of the City's IDDE program include the field screening program (Appendix B – Field Screening SOP), the Stream Corridor Evaluation (Appendix C – SCORE SOP) program and the Sanitary Sewer Lateral Assessment Program (SLAP) (Appendix D – SLAP SOP).

The City of Chattanooga has developed a mechanism for the public to report suspected illicit discharges - **Citizen Service Request (311)**. Water Quality staff investigate all requests involving "water pollution" and take action directly related to the type of issue involved.

Spill Response:

The Water Quality Program (WQP) has developed a mechanism to "*investigate and analyze the types and causes of spills.*" The purpose for the City of Chattanooga WQP Spill Response Staff is to assist all agencies (Fire, Police, etc.) involved in the clean up and site remediation process of any hazardous materials discharged/spilled that could impact local watersheds, streams, the City stormwater drainage system, and other water features. The responsibilities of the WQP Staff are to serve as the "subject matter expert" in areas of environmental risks and hazards and to provide information needed to all agencies involved to contain and confine the spilled materials and clean the site.

The WQP has a minimum of two (2) trained staff that are available for emergency response on a 24-hour/7-day per week basis (one as a primary contact and the second as an alternate). All responders from the City WQP are required to have 40 Hour OSHA HAZWOPER training and must complete an annual refresher HAZWOPER course consisting of a minimum of 8 hours training and will maintain written certification of such training.

Once the spill is contained, the site clean up/remediation process will begin as necessary. The site remediation will be performed by a licensed Environmental Remediation Contractor, the City of Chattanooga Fire Department or the City Wide Services Division of Public Works. The primary responsibility of the WQP Responder is to ensure proper and satisfactory remediation of the spill site. The

WQP Responder will document work performed by the cleanup contractor from the start of the process until the end and ensure the site is satisfactorily remediated.

The major objective, or goal, of the City's Water Quality Spill Response Program is to work efficiently with all agencies involved in emergency response to minimize the impacts that "accidental discharges" have on the environment. Communications with local agencies are key factors to pinpointing and remediating all spills in a timely matter.

Enforcement Protocol

An essential element of the Illicit Discharge Detection and Elimination program element is enforcement. The City has developed an Enforcement Response Plan that provides guidance for enforcement actions. Currently, the City is utilizing a tiered enforcement protocol that is based on the type of activity. Enforcement, pursuant to the discovery of an illicit discharge, is time dependent based on the level of enforcement action.

The City of Chattanooga Water Quality Program/Land Development Office Stormwater Management Enforcement Protocol as Adopted November 18, 2004 and amended June 30, 2005; December 19, 2005; April 17, 2006; and April 16, 2007. The protocol establishes the following enforcement activities associated with illicit discharges:

Illicit Discharges (Non-residential, Non-accidental)

- (a) *First Offense* – Notice of Violation issued to responsible party for non-stormwater discharge.
- (b) *Second Offense* – Issuance of Civil Penalty against responsible party of up to \$1,000.00
- (c) *Each Additional Offense* – Issuance of Civil Penalty against responsible party of up to \$2,500.00.
- (d) *Additional damages consisting of City expenses for monitoring, sampling, enforcement and the cost of the City expenses or contracted services to clean up illicit discharge will be based on to violator starting with the first offense. Additional damages to include other items such as loss of income for not properly using sanitary sewer system.*
- (e) *An illicit discharge properly reported as Accidental Discharges as required by Section 31-343 will be classified as Accidental Releases and not subject to enforcement as an illicit discharge. However, the responsible party may be held liable to damage to the City.*

Illicit Discharges (Residential Wastewater Discharge)

- (a) *First Offense* – Issuance of Notice of Violation and Compliance Order to stop illicit discharge within 10-days.
- (b) *Failure to comply with Compliance Order* – Issuance of Court Citation Unlawful Act, Misdemeanor. An additional request should be made to Neighborhood Services asking for condemnation of the residential unit.

Illicit Discharges (Residential Other than Wastewater Discharge)

- (a) *First Offense* – Enforcement action based on individual action. Examples: Deliberate dumping of pesticide, used motor oil or other hazardous or dangerous chemical into storm drainage system would result in issuance of Civil Penalty including damages, raking leaves into drainage system may result in written or verbal warning.

Afore referenced enforcement protocols will be revised as the City reviews all Codes and implements appropriate changes. With the issuance of the new MS4 NPDES Permit additional enforcement will be required in areas designated as "hot" in an attempt to address identified water quality issues within the designated areas.

The Enforcement Response Plan was completed and submitted during the 2011-2012 permit year.

Illicit Discharge Detection and Elimination Milestones

Permit Year				
2011	2012	2013	2014	2015
	Complete Enforcement Response Plan			
On-Going	On-Going	On-Going	On-Going	On-Going

Appendix A

Illicit Discharge Detection and Elimination Standard Operating Procedures

City of Chattanooga Water Quality Management



Illicit Discharge Detection and Elimination Standard Operating Procedures (SOP)

PW-SWQ-SOP 05

Revised May 10, 2011

Authorized By:	Revision	Date
Mounir Y. Minkara, Ph.D., P.E.		10/ 14 /09
Water Quality Manager	1	05/10/11
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Water Quality Manager

5-9-11

 Date

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Introduction

Illicit discharges are untreated, non-storm water, discharges that add to pollutant loadings in receiving streams. Untreated discharges can contribute to high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria. Pollutants have contributed to the degradation of many of the nation’s waterways and an illicit discharge detection and elimination program is required to identify and eliminate sources of pollutant discharge from the MS4s.

The City of Chattanooga’s Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit No. TNS068063 requires development and implementation of a program “to detect and remove (or require the discharger to the MS4 to remove) illicit discharges and improper disposal into the storm sewer system”. The purpose of Illicit Discharge Detection and Elimination (IDDE) program is to identify and mitigate non-stormwater discharges into the MS4 system. The City of Chattanooga’s illicit discharge program includes *inspection, enforcement and ordinances*.

This guide is to serve as a performance standard by which all Water Quality employees conduct activities associated with illicit discharge and improper disposal. All revisions to this document shall be recorded as “Revision” and be subject to appropriate peer review. All revisions from the Illicit Discharge Detection and Elimination Standard Operating Procedures (SOP) (2009) are documented in Table 1.

Table 1. Record of Revisions

Date	Specific Section or Page	Revision Type (major or minor)	Revision Description
5/10/11	Introduction	Minor	Substitution of the word “contribute” with the word “add”.
5/10/11	Introduction	Major	Addition of the “Notice of Revisions Record” Table.
5/10/11	Illicit Discharge Definition	Minor	Clarification of “illicit discharge” definition.
5/10/11	Types of Authorized Discharges	Minor	Section title changed to “Types of Authorized Discharges”
5/10/11	Types of Authorized Discharges	Minor	“Uncontaminated ground water infiltration” defined by new NPDES Permit
5/10/11	Appendix	Minor	Addition of IDDE Field Guide

Employee Training, Health and Safety

The employee(s) shall become familiarized with the protocols outlined in this SOP. Water Quality staff shall have a basic working knowledge of:

- Illicit Discharge Detection and Elimination (IDDE) techniques
- Record keeping procedures
- Working knowledge of City of Chattanooga ordinances and enforcement protocols

On a yearly basis the Water Quality Manager, or representative, shall review this document to ensure continuing applicability and shall train employees with regards to proper inspection techniques.

Illicit discharges occur in a variety of areas and under varying circumstances. As a result of the innate hazard potentials, special attention should be paid with regards to employee safety. General safety equipment and protocol shall include:

- Fully equipped first aid kit
- Radio or cell phone
- List of emergency contact names and numbers
- Safety/traffic vests
- Proper footwear (i.e. hiking or rubber boots)
- Use of hazard lights on roadside/shoulder

Illicit Discharge – Defined

For the purpose of this document, the term “illicit discharge”, is defined “as any discharge to the municipal separate storm sewer system that is not composed entirely of stormwater, except for discharges allowed under an NPDES permit These non-stormwater discharges occur due to illegal connections to the storm drain system from commercial/residential establishments. As a result of these illicit connections, contaminated wastewater enters into storm drains or directly into local water ways without receiving treatment from a wastewater treatment plant.”

The Center for Watershed Protection’s Illicit Detection and Elimination: A Guidance Manual (2004) further defines an “illicit discharge”:

- Is a storm drain that has measurable flow during dry weather containing pollutants and/or pathogens.
- Each illicit discharge has a unique frequency, composition, and mode of entry into the MS4 system.

- Illicit discharges are frequently caused when the sewage disposal system interacts with the storm drain system. There are a variety of monitoring techniques (such as smoke testing, dye testing, and optical brightener analysis) that can be used to locate and eliminate illegal sanitary connections.
- Illicit discharges of pollutants are produced from specific source areas. Knowledge of potential illicit discharge generating sites can be used to locate non-sanitary illicit discharges.

Types/Sources of Illicit Discharges

There are a variety of different types of discharges, as well as sources from which the discharges may originate. Typically each discharge can be categorized as either direct or indirect. A *direct discharge* is one in which an individual or facility purposely and illegally dumps or drains any “non-stormwater” material (used motor oil, etc.) directly into a stormdrain or catch basin. An *indirect discharge* is one in which a failing system (sewer/septic, grease disposal, etc.) leads to a discharge which eventually makes its way into the stormwater system.

In addition to the mechanism that illicit discharges may enter the MS4 system, the frequency of the discharge provides clues to source identification. Illicit discharges can be separated into three (3) categories based on the frequency of the discharge: transitory, intermittent, and continuous discharge.

1. **Transitory Illicit Discharges:** are typically one-time events. Transitory illicit discharges typically result from spills, illegal dumping, and line breaks. These types of discharges are often the most difficult to track back to the source. Methods for reducing this type of discharge include public education and utilization of the city’s service request system (311).
2. **Intermittent Illicit Discharges:** are typically discharges that occur occasionally. An intermittent illicit discharge occurs over a short period of time such as several hours per day, or a few days per year. These types of discharges are often the result of activities such as illegal discharge of waste into water bodies or land, or washing (ie: pressure washing) of exterior areas. These types of discharges are most likely to be discovered and traced to the source.
3. **Continuous Illicit Discharges:** are typically direct connections into the MS4 system. Continuous illicit discharges are most often the result of an illegal connection from a commercial or industrial facility, a direct connection from a sanitary sewer system, or from a malfunctioning septic system. These types of discharges are the easiest to find and eliminate. Elimination of continuous illicit discharges provides the greatest impact as they are constant pollutant loading sources to a water body.

Land use plays a pivotal role in both the types and frequency of illicit discharges (see Tables 2 & 3).

Table 2: Land uses, likely source locations, and activities that can produce *Transitory* or *Intermittent* Illicit Discharges

Land Use	Likely Source Locations	Condition/Activity that Produces Discharge
<i>Residential</i>	Apartments Multi-family Single Family Detached	Car washing Driveway cleaning Dumping/spills Lawn/Landscape watering Septic system maintenance Swimming pool discharges Laundry wastewater Improper plumbing (floor drains)
<i>Commercial</i>	Car dealers/rental cars co Car washes Commercial laundry Gas stations/auto repair shops Marinas Nurseries/garden centers Restaurants	Pressure washing Dumping/spills Landscape watering Outdoor fluid storage Vehicle fueling Vehicle maintenance/repair Vehicle washing Grease traps Dumpsters
<i>Industrial</i>	Construction Distribution centers Food processing Printing Chemical manufacturing	Industrial process water or rinse water Load and un-loading area wash-downs Outdoor material storage
<i>Municipal</i>	Airports Landfills Maintenance/fleet storage area Streets and highways	Pressure washing Dumps/spills Vehicle fueling Vehicle washing Vehicle maintenance/repair Emergency response

Source: IDDE: *A Guidance Manual for Municipalities in the State of Ohio, 2006*

Table 3: Land uses, likely source locations and activities that can produce *Continuous* Illicit Discharges

Land Use	Condition or Activity Producing Discharge
<i>Residential</i>	Failing septic tanks Sanitary connection into the storm drainage system Failed sanitary service lines
<i>Commercial/Industrial</i>	Failed sanitary service lines Process water connections to the storm drainage system
<i>Municipal</i>	Sanitary inflow/infiltration Sanitary connections into the storm drainage system

Mode of Entry

Illicit discharges can also be classified based on how they enter the storm water drainage system. The most typical mode of entry is either via direct or indirect entry. A **direct discharge** is one in which the discharge is directly connected to the storm drainage system via a pipe or some type of conveyance system. Direct entry usually occurs when there is some type of a cross-connection. An **indirect discharge** is one in which the discharge occurs outside of the drainage system and enters the system via overland flow to a storm drainage system or through infiltration.

Examples of types of illicit discharges by mode of entry

1. **Sanitary waste** is commonly observed on private property originating from a cleanout or broken sanitary service line; this includes both residences that are connected to the City's sewer infrastructure as well as those still using septic tanks. Anything that may be washed down the sink or flushed down the toilet is considered sanitary discharge. *Laundry wastewater* is another type of sanitary discharge, as effluent from washing machines is discharged into the sewer system. Blockages and broken cleanouts on private service lines are examples of *indirect discharge*.



Sanitary discharge from clean-out



Discharge of laundry wastewater into storm system via curb line

2. **Sanitary Sewer Overflows** often occur during or after intense rain events. Points of infiltration allow stormwater to enter the sanitary sewer system, which is not designed to handle flow of this measure. Additionally, oil/grease, debris, and other objects frequently make their way into the sanitary sewer system (either by accident or intentionally). These blockages displace wastewater, often leading to an overflow. A sanitary sewer overflow is another example of an *indirect discharge*.



Examples of Sanitary Sewer Overflows

3. **Spills/Emergency Response** occur when an unexpected event results in a non-storm water discharge. There are a variety of activities that result in a spill, including traffic accident or accidental release. Spills/emergency response is most often an example of an *indirect discharge* as the pollutant migrates to a storm drain rather than directly discharging into the system.



Examples of a spill resulting from an emergency response

4. **Intentional Releases** often result in a *direct discharge* into the storm drainage system. Sometimes illicit discharges are directly poured into the storm water drainage system, resulting in direct contamination of the receiving stream.



Examples of direct discharges due to intentional releases

Types of Authorized Discharges

Not all non-storm water discharges are considered illicit discharges. Following is a list of non-storm water discharges that are permitted under the City of Chattanooga's NPDES permit number TNS068063.

- Water line flushing;
- Landscape irrigation;
- Diverted stream flows;
- Rising ground waters;
- Uncontaminated ground water infiltration (infiltration is defined as water other than wastewater that enters a sewer system, including sewer service connections and foundation drains, from the ground through such means as defective pipes, pipe joints, connections, or manholes. Infiltration does not include, and is distinguished from, inflow);
- Uncontaminated pumped ground water;
- Discharges from potable water sources;
- Footing drains;
- Air conditioning condensate;
- Irrigation water;
- Springs;
- Water from crawl space pumps;
- Footing drains;

- Individual residential car washing;
- Flows from riparian habitats and wetlands;
- Dechlorinated swimming pool discharges;
- Street wash water
- Discharges or flows from emergency fire fighting activities.

Illicit Discharge Source Tracking

The City of Chattanooga has identified and mapped the entire storm drainage infrastructure within its judicial boundaries. All data has been stored and maintained on Geographical Information System (GIS) and is updated as needed. Infrastructure mapping is a critical element in the illicit discharge detection and elimination tool box. Infrastructure mapping provides a mechanism by which Water Quality investigators can trace illicit discharges to their source.

Tracing Techniques

Visual inspections – If an illicit discharge has been detected (either through field screening or complaint investigation), then “backtracking” is the primary technique used to locate the source of the discharge. “Backtracking” involves visual inspection from the initial detection location. The investigator works their way “upstream” from the location, raising manholes or walking the channel until either flow is no longer observed or the source of the discharge has been identified. Key inspection annotations include:

- Presence of flow
- Odors
- Color
- Stains or deposits within the structure
- Presence of oil sheen, foam, floatable solids
- Positive analysis of Chlorine, Ammonia, or Detergents

Dye testing – dye testing is an effective method to positively identify the source of many illicit discharges (especially compromised sanitary infrastructure). Most dye testing requires permission and entrance into a private residence. Dye tests are usually conducted by pouring the dye into sinks, toilets, clean-outs, etc. and then monitoring the storm water system to see if dye appears. This technique is most effective in determining direct connections.

Televising/Video Inspection – is a more expensive and labor intensive technique to locate either infiltration or connection into the City’s system. Most video inspection is conducted by Moccasin Bend Waste Resource Division (WRD) and is used to locate compromises with the City’s sanitary infrastructure.

Smoke testing – is conducted most frequently in cooperation with WRD. Smoke testing is a method used to locate significant areas where inflow and infiltration (I&I) is expected. Smoke testing involves public notification and extensive record keeping. The City of Chattanooga has developed an on-going program aimed at canvassing the entire city to identify and eliminate possible sources of I&I due to residential connections. For further information refer to the Sewer Lateral Assessment Program (SLAP) standard operating procedure.

Indicator monitoring/sampling – is conducted when a dry weather flow has been identified, but the actual pollutant has not been determined. Examples of indicator sampling include:

- Chlorine – presence indicates source is associated with potable water (i.e.: water leak);
- Ammonia – presence indicates source is associated with sanitary wastewater;
- Detergents – presence indicates source is associated with sanitary wastewater or industrial wastewater;
- *E. coli* – elevated levels indicate source is associated with sanitary wastewater.

Optical brightener monitoring – is conducted by strategically installing, unbleached cotton pads, along storm water infrastructure. Detergents contain optical brighteners and if the cotton pads pick up highly concentrated levels of detergents, then they fluoresce in the presence of a black light. Optical brightener monitoring is done to determine if sanitary wastewater is entering the MS4 system.

Eliminating Illicit Discharges

Once the source of the illicit discharge has been identified, Water Quality staff must take action to eliminate the discharge. There are three primary mechanisms available to eliminate illicit discharges:

- Enforcement;
- Notification/Public Education;
- Internal Coordination

Enforcement – The City of Chattanooga has developed and approved policy and procedures associated with enforcement activity (*City of Chattanooga Water Quality/Land Development Office Stormwater Management Enforcement Protocol Adopted November 18, 2004, Amended April 16, 2007*). The Enforcement Protocol provides clear guidance regarding enforcement options available to eliminate illicit discharges.

Notification/Public Education – The City of Chattanooga maintains an avenue by which the public can report any illicit discharge or illegal dumping (**311**). In addition to the

public reporting mechanism, the Water Quality program maintains a web-site that provides links to a number of public education/outreach resources:

(http://www.chattanooga.gov/Public_Works/70_Outreach&Education.htm)

Additional public outreach programs include:

- Storm drain stenciling program;
- Proposed Web-Based Watershed Academy;
- Public event participation (ie: Home Show, Riverbend, etc.);
- Household Hazardous Waste Program;
- Recycling Program.

Internal Coordination – The Water Quality group coordinates with WRD, the Land Development Office, City Wide Services and the Chattanooga Fire Department to eliminate illicit discharges associated with municipal activities. The Water Quality Supervisor serves as the liaison to coordinate interdepartmental communication.

Documentation

Water Quality staff must appropriately document all activities associated with illicit discharge detection and elimination. Documentation consists of:

- Inspection – consisting of photo documentation and completion of the Illicit Discharge Inspection Report (Appendix);
- Quality Assurance/Quality Control – photos and inspection report are reviewed by the Water Quality Supervisor (or designated representative) for accuracy and completeness;
- Data Management – documentation is imported into the appropriate service request (311), folder in the shared file ([Illicit Discharges](#)) and GIS. Any enforcement action will result in submittal of a letter and subsequent inspection activity. A copy of each enforcement letter is provided to the Tennessee Department of Environment and Conservation Chattanooga Field Office.

References

Center for Watershed Protection & Pitt, R. (2004). Illicit discharge detection and elimination: a guidance manual for program development and technical assessments.

Cuyahoga County Board of Health & Stark, H. (2006). Illicit discharge detection and elimination manual: A guidance manual for municipalities in the State of Ohio.

Appendix I

Illicit Discharge Inspection Report

Date entered: GIS _____ CSR _____ Scanned _____ Spreadsheet _____
 QA/QC Reviewer: _____ Date Reviewed: _____ Filed _____

Illicit Discharge Inspection Report



City of Chattanooga
 Water Quality Program
 1250 Market Street, Suite 2100
 Chattanooga, Tennessee 37402
 (423) 643-5877 Fax (423) 643-5862
SWM@mail.chattanooga.gov

Location of Discharge:

Address _____ SR# _____

Date _____ Watershed _____

Source of Illicit Discharge:

<p><u>Sanitary Wastewater:</u></p> <input type="checkbox"/> Broken Service Line <input type="checkbox"/> Sewer Cleanout <input type="checkbox"/> Septic Tank <input type="checkbox"/> Laundry Wastewater <input type="checkbox"/> Sewer Overflow <p><u>Household:</u></p> <input type="checkbox"/> Paints / Rinse Water <input type="checkbox"/> Cleaner <input type="checkbox"/> Swimming Pool Water <p><u>Food Service:</u></p> <input type="checkbox"/> Cooking Oil <input type="checkbox"/> Grease	<p><u>Automotive Fluids / Fuel / Washing:</u></p> <input type="checkbox"/> Oil <input type="checkbox"/> Antifreeze <input type="checkbox"/> Transmission <input type="checkbox"/> Gasoline <input type="checkbox"/> Diesel <input type="checkbox"/> Wash Water (Detergent / Construction) <p><u>Other:</u></p> <input type="checkbox"/> Pesticides/Herbicides <input type="checkbox"/> Fertilizer <input type="checkbox"/> Illicit Connection to Storm Drain <input type="checkbox"/> Illegal Dumping to Storm Drain <input type="checkbox"/> Water Leak <input type="checkbox"/>
--	--

Inspection Type: Initial / Follow-up / Final

Letter Type: Notification / WW / NOV / NOV & Civil Penalty / None

Land Use: Commercial / Residential / Other: _____

Found By: FS / SCORE / Smoke Test / 311 / City Emp: WQ or Other / Other: _____

Comments: _____

Inspector(s): _____ **Photos? Yes** **No**

Appendix II

Illicit Discharge Detection and Elimination Field Guide

Illicit Discharge Detection and Elimination Field Guide

An **illicit discharge** is defined by the US EPA's Phase II Storm Water Regulations as "any discharge to an MS4 (Municipal Separate Storm Sewer System) that is not composed entirely of storm water..." with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from fire-fighting activities. Illicit discharges are considered "illicit" because MS4s are not designed to accept, process, or discharge such non-storm water wastes.



Illicit Discharge Testing Procedure

1. Go to site.
2. Put on flashers, put out cones, and put on orange vest (if needed)
3. Locate the outfall.
4. Gather equipment.
5. Take a picture of the outfall.
6. Make visual observations about the pipe, its condition, and the water flowing out of the pipe including color, odor, turbidity, and floatables.
7. If water sample will be collected, put on gloves.
8. Collect a water sample in a lab supplied bottle for lab analysis or sanitized container for on sight testing.
9. Put sample for lab in cooler with ice, or for on sight testing, rinse test tubes/meters with the water to be tested.
10. Run water quality tests on sample (see back of Field Guide for possible parameters and the testing supplies section for specific test kits).
11. Measure the flow rate using the appropriate sized bucket/container
12. Rinse probes with distilled water.
13. Complete necessary paperwork.
14. Check to make sure all equipment is collected before leaving the site.

MS4 means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)

- (i) Owned or operated by a State, city, township, county, district, association, or other public body (created by or pursuant to State law) including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, that discharges into waters of the state;
- (ii) Designed or used for collecting or conveying storm water;
- (iii) Which is not a combined sewer; and
- (iv) Which is not part of a Publicly Owned Treatment Works

Stormwater testing supplies

- | | |
|--|---|
| <input type="checkbox"/> Conductivity Meter | <input type="checkbox"/> Distilled Water |
| <input type="checkbox"/> pH Meter | <input type="checkbox"/> Flashlight |
| <input type="checkbox"/> Nitrate Test Kit | <input type="checkbox"/> GPS Unit |
| <input type="checkbox"/> Phosphate Test Kit | <input type="checkbox"/> Tape Measure |
| <input type="checkbox"/> Camera | <input type="checkbox"/> Cones |
| <input type="checkbox"/> Latex Gloves | <input type="checkbox"/> Safety Vest |
| <input type="checkbox"/> Hand Cleaner | <input type="checkbox"/> Boots |
| <input type="checkbox"/> Wet Wipes | <input type="checkbox"/> One Gallon Bucket |
| <input type="checkbox"/> First Aid Supplies | <input type="checkbox"/> One Pint Container |
| <input type="checkbox"/> Bug Repellent | <input type="checkbox"/> Lab Bottles |
| <input type="checkbox"/> Poison Ivy Cleanser | <input type="checkbox"/> Clipboard |
| <input type="checkbox"/> Poison Ivy Repellent | |
| <input type="checkbox"/> Writing Utensils | |
| <input type="checkbox"/> Maps | |
| <input type="checkbox"/> Storm Water Forms | |
| <input type="checkbox"/> Unopened 100 mL sample bottles | |
| <input type="checkbox"/> Extendable Water Sampling Pole w/bottle | |

Key Observations:

- Presence of Flow
- Odors
- Colors/Clarity
- Stains/Deposits on the bottom of the stormwater structure
- Oil Sheen, scum or foam on standing water

Know the Difference??



Iron Bacteria



Diesel Fuel

Water Quality Test Parameters and Uses

Water Quality Test

Use of Water Quality Test

- | | |
|--|--|
| 1. Conductivity..... | Indicator of dissolved solids |
| 2. Bacteria (Fecal coliform, <i>E. Coli</i>)..... | Indicates presence of sanitary wastewater |
| 3. Ammonia..... | May indicate presence of sanitary wastewater |
| 4. Surfactants..... | Indicates presence of detergents (laundry and car washing) |
| 5. pH..... | May indicate commercial or industrial discharge |
| 6. Temperature..... | May indicate industrial cooling/sanitary wastewater |
| 7. Phosphate..... | High levels indicate presence of sewage and fertilizers |
| 8. Nitrate..... | May indicate presence of fertilizers |
| 9. Dissolved Oxygen..... | Low levels may indicate presence of sewage |
| 10. Hardness..... | Distinguishes between treated and untreated water |
| 11. Total Chlorine..... | Indicator of inflow from potable water source |
| 12. Fluoride..... | Indicator of inflow from potable water source |
| 13. Potassium..... | High levels may indicate presence of sanitary wastewater |
| 14. Optical Brighteners..... | Indicates presence of laundry detergents |
| 15. Salinity..... | May indicate commercial or industrial discharge |

Outfall Material:



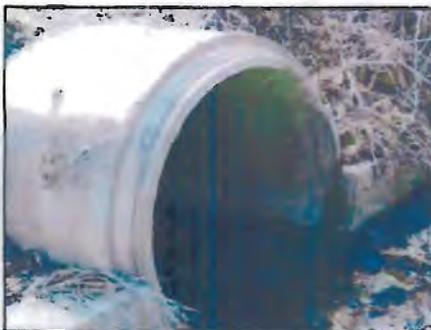
High Density Polyethylene (HDPE)



Vitrified Clay Pipe (VCP)



Corrugated Metal Pipe (CMP)



Reinforced Concrete Pipe (RCP)



Polyvinyl Chloride (PVC)



Ductile Iron Pipe (DIP)

Appendix B

Field Screening Standard Operating Procedures

City of Chattanooga Water Quality Program



Field Screening Standard Operating Procedure (SOP)

April 6, 2011

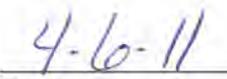
<u>Authorized By:</u>	<u>Revision</u>	<u>Date</u>
Mounir Y. Minkara, Ph.D., P.E. Water Quality Manager Water Quality Program Engineering Department of Public Works City of Chattanooga	1	4/6/11

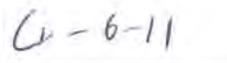
1250 Market Street, Suite 2100
Development Resource Center
Chattanooga, TN 37402-2713

Phone (423) 643-5877
Fax (423) 643-5862
ChattanoogaWQ@mail.chattanooga.gov

APPROVALS AND CONCURRENCES

Approvals: This is to certify that we have reviewed this document and approve of its contents.

	
Signature	Date
Rebecca E. Robinson, CPESC, CPSWQ Water Quality Supervisor	

	
Signature	Date
Mounir Y. Minkara, Ph.D., P.E. Water Quality Manager	

PURPOSE

The purpose of this document is to provide Standard Operating Procedures (SOP) for dry weather field screening activities.

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each parameter indicates. 9

INTRODUCTION

The City of Chattanooga Municipal Separate Storm Sewer System is required under its National Pollutant Discharge Elimination System Permit (TNS068063) under Section 3.2.3.3 “to continue to implement and make necessary improvements to its ongoing program to determine whether non-stormwater entries are present in the storm drainage system, and to identify locations and sources of non-stormwater.”

This document will serve as a standard operating procedure (SOP) for the activities associated with the field screening program within the City of Chattanooga Water Quality Program. The specific methods regarding the conducting of this ongoing program are defined within this document, only for the term of the current permit. The field screening component is mandated and directed by 40 CFR 122.

Any revisions to this document shall be recorded as “Revision” and be subject to appropriate peer review. All revisions, from the City of Chattanooga Field Screening Standard Operating Procedure (SOP) (2009), are documented in Table 1.

Table 1. Revisions

Date	Specific Section or Page	Revision Type (major or minor)	Revision Description
04/06/11	Authorization	Major	Introduction of “Approvals and Concurrences” along with signatures.
04/06/11	4	Minor	Addition of “Proper Procedures Regarding Tracing Events” added to Employee Training, Health, and Safety.
04/06/11	6	Minor	Addition of “tote” to Equipment list.
04/06/11	7	Major	Addition of grid matrix method added to “Procedures” section.
04/06/11	8	Major	Description of how field screening points are selected added to the “Procedures” section.
04/06/11	8	Major	Revised Field Sheet

EMPLOYEE TRAINING, HEALTH, AND SAFETY

The employee shall become familiarized with the protocols outlined in this SOP. The field team shall have a basic working knowledge of:

- Outfall identification numbering
- Sample collection procedures, equipment cleaning, and equipment application for wadeable and non-wadeable surface water collection
- Sample record completion (i.e. chain of custody, labeling, etc.)
- Sample handling procedures
- Cartographic tools
- Bacteriological analysis
- Quality Assurance/Quality Control procedures
- Proper procedures regarding tracing events

As needed, the Water Quality Manager, or representative, shall review this document to ensure continuing applicability and shall train employees with regards to proper monitoring protocol.

Monitoring activities present a variety of potentially hazardous situations. As a result of the innate hazard potentials, special attention should be paid with regards to employee safety. General safety equipment and protocol shall include:

- Fully equipped first aid kit
- Flashlight
- Duct tape
- List of emergency contacts
- Cell phone
- Disinfectant
- Insect repellent
- Life vest
- Reflective safety vest
- Waders
- Steel-toed boots

EQUIPMENT

The following equipment is needed to perform field screening:

- Eureka Manta Multi-Probes
- Hanna Hand-Held Test Instruments (pH, conductivity, dissolved oxygen)
- Phosphate Test Kit
- Chlorine Test Kit
- Copper Test Kit
- Ammonia Test Kit
- Sulfide Test Kit
- Detergent Test Kit
- Phenol Test Kit
- Field Screening Form
- Illicit Discharge Form
- Chain of Custody Form
- Camera
- Spare Camera Batteries
- Map
- Tape Measure
- Tracing Dye
- Latex Gloves
- *E. coli* Bottles
- Waste Disposal Bag
- Backpack
- Tote

PROCEDURE

Requirements for sampling

Field screening is considered a dry-weather monitoring procedure. Therefore, there must be less than 0.25 inches of rainfall for a consecutive 72-hour period before field screening is allowed. Field screening sites must be investigated twice in a 24-hour period with a minimum of four hours between each inspection, so there must also be the time available to perform the two inspections before day's end.

Procedures

A field screening site is determined by utilizing existing maps or GIS. Using GIS, a quarter mile grid layer was placed over the county's industrial areas and heavy commercial areas. A half-mile grid layer was placed over all other areas of the county (heavy residential, light residential, agricultural, light commercial). Within each grid a field screening site was selected for future testing. (Site selection was based on the following criteria: if an outfall is located within the grid, the outfall is selected as the field screening point, if no outfall is present then a point within the MS4 system is selected). A map layout of the site and the upstream drainage area is printed and used for locating the site and, if need be, tracing any identified illicit discharges upstream. Once at the site, the field screening form is completely and legibly filled out. For reference, the field screening form is located in Appendix A.

Field Sheet

Section one of the field sheet records site characteristics and investigator information. The "*E. coli* Collected" section is determined by the results of the chemical testing which is addressed below. The "Sample Location Narrative" box is for recording location information that would be useful for someone else trying to locate the site or to identify changes that have taken place between investigations. The photos also aid in this act.

When inspecting an outfall, the presence of flow is the primary recordable trait, as all other measurements are dependent on the presence/absence of flow. If flow is not present, then only measurements of the outfall/or location identified by a grid map needs to be made. If flow is present, then the investigators record the outfall/grid point measurements as well as the flow rate. Flow rate is measured by following the instructions on the sheet. Flow rate is calculated by using a formula (usually done in the office).

For sites with flow, the physical parameters of the discharge are measured using the proper meter/s (Hanna hand-helds or Eureka Manta multi-probes). A duplicate measurement is taken for all parameters, except the CHEM-et Test Kits. In between readings the instrument is removed from the water and the probe is rinsed with deionized water. The average of the two readings is recorded. Chemical characteristics are

measured using the appropriate test kits. If both phosphate AND ammonia are detected, then the investigators take an *E. coli* sample, fill out a chain of custody form, and take the sample to the testing laboratory. If any chemical analysis exceeds the minimum concentration on the comparator, then a tracing event must take place. Water quality test parameters along with their possible source indicators are shown in Table 1. The tracing event involves using the GIS map associated with that particular outfall/grid point to search upstream of the outfall/grid point to detect the presence of the positive concentration of the chemical parameter, in case of an illicit discharge. If an illicit discharge is found an Illicit Discharge Inspection Report (IDIR) is filled out and submitted to the supervisor. Any unusual measurements from the meters or the test kits are noted in the comments box of section three of the field sheet. If the meters fail the drift check, a “n” is placed beside the appropriate chemical parameter section on the field sheet. Visual assessment of the site is made and any physical characteristics of the flow or the outfall are recorded in sections four and five respectively.

Table 2. A brief summary of the water quality parameters used and possible implication each parameter indicates.

Water Quality Test Parameters and Source Indicators		
Water Quality Test	Use of Water Quality Test	Possible Source
Conductivity	Indicator of dissolved solids Range of 150-800 um/cm	Potable water Industrial waste water Construction activity
Ammonia	High levels can indicate sanitary wastewater	Broken municipal sewer line Illicit connection of service line
Chlorine	Indicates inflow of a potable water source	Broken water line Irrigation
Phosphate	Can indicate sanitary wastewater	Broken municipal sewer line Illicit connection of service line Vehicle washing with detergent
Detergents	Can indicate sanitary wastewater	Broken municipal sewer line Illicit connection of service line Vehicle washing with detergent Use of foam for fire suppression

Source: Table modified from IDDE: *A Guidance Manual for Municipalities in the State of Ohio*, July, 2006.

When all measurements have been taken the overall outfall characterization is determined by assessing the likelihood of the presence of an illicit discharge. If less than two indicators are present, then the characterization is “unlikely”. A characterization of “potential” is given if there are two or more indicators present. If there are one or more indicators with a severity of three (from sections four and five), then a characterization of “suspect” is given to the outfall/grid point location. If the measurements clearly indicate an illicit discharge then the outfall is characterized as “obvious”.

Concerns not associated with illicit discharges are noted in section seven of the field sheet. Section eight is for additional comments and site sketches. Noting the generation of IDIR is also done in section eight.

Office Work

Upon returning to the office the field sheets are given to the reviewer to be verified. When the reviewer has signed off on the field sheets, then the data can be placed in the field screening database. The field investigators perform drift checks on all meters used to insure quality assurance of the data. The number of field screening sites checked is recorded on the office calendar. Site photos are downloaded, labeled, and placed in the appropriate folders. The GIS layer is updated. Field sheets are scanned and placed in the folder with the site pictures. The original field sheets are then filed.

APPENDIX

City of Chattanooga NPDES Stormwater Field Screening Data Sheet

All data should be printed legibly

Date entered: GIS _____ Database _____ Scanned _____ Filed _____
QA/QC Reviewer: _____ Date Reviewed: _____

Section 1: Background Data

Grid Map ID:	Watershed:
Date:	Investigators:
Time 1 st Sample:	Time 2 nd Sample:
E. Coli Collected: Yes _____ No _____	Form Completed by:
Ambient Air Temp : A.M. _____ P.M. _____	Days Since Last Rain:
Weather Conditions: A.M. _____ P.M. _____	Photos? Yes ___ or No ___
Land Use in Drainage Area (Check all that apply):	
Industrial _____	Open Space _____
Urban Residential _____	Institutional _____
Suburban Residential _____	Other: _____
Commercial _____	Known Industries _____
Sample Location Narrative:	

Section 2: Infrastructure Description:

Type	Material	Shape	Dimensions	Submerged
<input type="checkbox"/> Closed Pipe	<input type="checkbox"/> RCP <input type="checkbox"/> PVC <input type="checkbox"/> CMP <input type="checkbox"/> Steel <input type="checkbox"/> Concrete <input type="checkbox"/> Other: _____	<input type="checkbox"/> Circular <input type="checkbox"/> Single <input type="checkbox"/> Elliptical <input type="checkbox"/> Double <input type="checkbox"/> Box <input type="checkbox"/> Triple <input type="checkbox"/> Other <input type="checkbox"/> Other	Diameter:	In water: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully With Sediment: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully
<input type="checkbox"/> Open Channel	<input type="checkbox"/> Concrete <input type="checkbox"/> Earthen <input type="checkbox"/> Riprap <input type="checkbox"/> Other: _____	<input type="checkbox"/> Trapezoid <input type="checkbox"/> Parabolic <input type="checkbox"/> other: _____	Top Width: Bottom Width: Depth:	Sketch
<input type="checkbox"/> Culvert	<input type="checkbox"/> Concrete <input type="checkbox"/> Corr. Metal <input type="checkbox"/> Rock <input type="checkbox"/> Other	<input type="checkbox"/> Circular <input type="checkbox"/> Box <input type="checkbox"/> Arch <input type="checkbox"/> Parabolic <input type="checkbox"/> Other	Approx. Dimensions H _____ W _____	Sketch

Grid Map ID: _____

Instrument No. _____

DO _____

Cond. _____

pH _____

Multiprobe _____

Section 3: Chemical Characteristics

	Temp °C	Temp (Dup) °C	Temp (Ave)	pH	pH (Dup)	pH (Ave)	Conductivity
Sample 1							
Sample 2							
	Conductivity (Dup)	Conductivity (Ave)	DO	DO (Dup)	DO (Ave)	Comments:	
Sample 1							
Sample 2							

	PO ₄	Chlorine	Detergents	Phenol	Copper	NH ₃	H ₂ S
Sample 1							
Sample 2							

** Note: if any analysis exceeds to minimum concentration on the comparator, go upstream to locate possible source of discharge. If discharge is discovered complete an Illicit Discharge Inspection Report.*

Section 4: Physical Characteristics

Are there any physical indicators present in flow? yes no (if no, skip to Section 5)

Indicator	Check if Present	Description	Relative Severity Index (1-3)		
			1	2	3
Odor		<input type="checkbox"/> Sewage <input type="checkbox"/> Rancid/sour <input type="checkbox"/> Sulfide <input type="checkbox"/> Petroleum/gas Other: _____	<input type="checkbox"/> 1 Faint	<input type="checkbox"/> 2 Easily Detected	<input type="checkbox"/> 3 Noticeable from a distance
Color		<input type="checkbox"/> Clear <input type="checkbox"/> Brown <input type="checkbox"/> Gray <input type="checkbox"/> Green <input type="checkbox"/> Orange <input type="checkbox"/> Yellow <input type="checkbox"/> Red Other: _____	<input type="checkbox"/> 1 Faint	<input type="checkbox"/> 2 Visible in sample bottle	<input type="checkbox"/> 3 Visible in outfall flow
Turbidity		See severity	<input type="checkbox"/> 1 Slight cloudiness	<input type="checkbox"/> 2 Cloudy	<input type="checkbox"/> 3 Opaque
Floatables ~other than trash!		<input type="checkbox"/> Sewage (toilet paper, etc.) <input type="checkbox"/> Suds <input type="checkbox"/> Petroleum <input type="checkbox"/> Other: _____	<input type="checkbox"/> 1 Few/Slight; origin not obvious	<input type="checkbox"/> 2 Some; indicators of origin (e.g., possible oil sheen).	<input type="checkbox"/> 3 Some; origin clear (e.g., obvious oil sheen, sanitary materials.).

INDICATOR SCORE (total from above): _____

Section 5: Physical Characteristics for Both Flowing and Non-Flowing Outfalls

Are any physical indicators that are not related to flow present? yes no (if no skip to Section 6)

Indicator	Check if present	Description	Comments
Damage @ Outfall Area		<input type="checkbox"/> Cracking or Chipping <input type="checkbox"/> Corrosion	
Deposits/ Stains		<input type="checkbox"/> oily <input type="checkbox"/> Flow line <input type="checkbox"/> Paint other: _____	
Abnormal Vegetation in Channel or Outfall		<input type="checkbox"/> Excessive <input type="checkbox"/> Abnormal	
Poor pool quality		<input type="checkbox"/> Odors <input type="checkbox"/> Colors <input type="checkbox"/> Suds <input type="checkbox"/> Floatables <input type="checkbox"/> Excessive algae <input type="checkbox"/> Oil Sheen Other: _____	
Alga Growth		<input type="checkbox"/> Brown <input type="checkbox"/> Orange <input type="checkbox"/> Green Other: _____	

Appendix C

Stream Corridor Assessment (SCORE) Standard Operating Procedures

City of Chattanooga

Water Quality Program



Standard Operating Procedure

for

**STREAM CORRIDOR EVALUATION
(SCORE)**

April 2011

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TITLE & APPROVAL PAGE

Document Title Standard Operating Procedure for Stream Corridor Evaluation

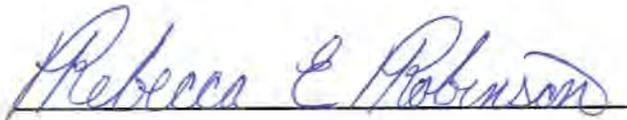
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Department of Public Works
Water Quality Program

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Purpose The purpose of this document is to provide standard operating procedures for conducting stream assessments for the City of Chattanooga. These procedures shall be followed by Water Quality employees during implementation of the SCORE program. This SOP will be reviewed annually and updated as needed.

Approvals This is to certify that we have reviewed this document and approve its contents.



Rebecca E. Robinson, CPESC, CPSWQ
Water Quality Supervisor

4-6-11

Date



Mounir Y. Minkara, Ph.D., P.E.
Water Quality Manager

4-6-11

Date

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NOTICE OF REVISIONS RECORD

Date	Specific Section or Page	Revision Type	Revision Description
02/28/11	i	minor	Changed title & title page format
02/28/11	ii	minor	Added table of contents
02/28/11	iii	major	Added title & approval page with signature lines
02/28/11	iv	minor	Added list of figures
02/28/11	v	major	Added notice of revisions record table
02/28/11	1	major	Added definitions section
02/28/11	4	major	Modified introduction section and included language from NPDES Permit TNS068063 (expiration date: 11-30-15)
02/28/11	4	minor	Changed miles of impaired streams from 85 to 95
02/28/11	5	minor	Added disposable gloves, waders, & temperature appropriate clothing to safety equipment list
02/28/11	6	minor	Updated equipment list & added the statement "Necessary equipment will vary per site"
02/28/11	6 & 17	major	Created a "wadeable" & "non-wadeable" field survey section
02/28/11	6-17	major	Rewrote field survey section to provide descriptive directions on filling out each section of the new datasheet
02/28/11	17	major	Added a data entry section
02/28/11	18	minor	Updated the references section
02/28/11	19	major	Added Appendix A for datasheets

DEFINITIONS

agricultural landuse- natural resources related activities: farming, logging, etc.

algae- a plant or plantlike organism that typically grows on slow moving or standing water that is exposed to high levels of sunlight and has a rich source of bacteria

AsFound- geodatabase of all catchbasins, streams, and stormwater conveyances within the City limits

bankfull- the level at which water just begins to overflow the banks on an unincised stream channel; the bankfull stage has an average recurrence interval of approximately 1.5 years (Leopold et al, 1964)

bare ground- surface of earth that is lacking any form of vegetation or man-made structure (concrete, building, etc.)

buffer- area adjacent to and parallel to the stream starting at the top of the stream bank

channelization- to straighten, deepen, or widen a channel

commercial landuse- shopping, retail (all commercial enterprises), goods (clothing, antiques, art, grocery, etc.), service (banks, shoe shine, copying, service station, dry cleaner, etc.), restaurant related, shopping center, shopping mall, stadiums, entertainment (night clubs, theaters), office (except Doctor's office), office park, office center, hotels, motels, day care, pre-school

culvert- a transverse drain used to carry water under a road or railway; if the combined width of all pipes/boxes is greater than 20 ft, then the culvert is considered a bridge (23 CFR 650 subpart C)

dominant buffer- buffer type with the highest percentage of the overall buffer.

illicit discharge- is defined at [40 CFR §122.26\(b\)\(2\)](#) and refers to any discharge to a municipal separate storm sewer that is not entirely composed of stormwater, except discharges authorized under an NPDES permit (other than the NPDES permit for discharges from the MS4) and discharges resulting from fire fighting activities.

impervious buffer- buffer which is covered by a surface that does not allow infiltration of water into the ground, but instead creates runoff or pooling on the surface.

in-channel pond- a pond that is intersected by a stream or creek causing the stream or creek to flow into and exit out of the pond.

industrial landuse- manufacturing (including quarrying, mining, and drilling), warehouse, wholesale distributor, storage facilities, self service warehouse, mini warehouse

institutional landuse- government, schools and colleges, religious facilities, cultural institutions (aquarium, IMAX, museums, clubs (VFW, Masonic, etc.)), health care related (hospitals, clinics, doctor's offices, assisted living facilities), cemeteries, emergency response and public safety (fire, police, EMS)

lawn/turf buffer- buffer which is covered by short grassy vegetation (≤ 12 in) that has been manicured or groomed

primary landuse- landuse type with the highest percentage of the overall landuse.

recreational landuse- public passive parks, public active parks (ballfields, playgrounds), participant restricted recreation (yacht clubs, YMCA, private golf courses, private recreation facilities), preservation, open space, and sanctuaries

residential landuse- single family, duplex, multi-family (3 or more units, condos, apartments), group home, dormitory, retirement home etc., mobile home, attached townhomes (1 unit per parcel)

riffles- a short, relatively shallow and coarse-bedded length of stream over which the stream flows at higher velocity and turbulence than it normally does. As a result of the higher velocity and turbulence, small ripples are frequently found. Riffles are usually caused by an increase in a stream bed's slope or an obstruction in the water.

rip-rap- rock or other material used to armor shorelines, streambeds, bridge abutments, pilings and other streambank structures against scour, water or ice erosion

rock and mortar- structures that are made from rock and concrete type materials used in building walls or protecting stream banks.

rock gabion- a woven galvanized wire basket sometimes lined with geotextiles and filled with rock, stacked or placed to form an erosion resistant structure

sheen- a glossy shine found on the surface of water that can indicate pollution

shrub buffer- buffer which is covered by shorter woody vegetation

tall grass buffer- buffer which is covered by tall (> 12 inches) thick grassy vegetation that has not been manicured or groomed

transportation landuse- general transportation (trucking, railroad yards, river ports, garages, delivery companies, airport), surface parking lots, private surface parking lots, parking garages

tree buffer- buffer which is covered by mature trees

uniform flow- when a stream segment loses habitat diversity due to flow and is limited to a single habitat type (i.e. riffle, run, or pool)

utility landuse- substations, utility companies, water towers, cell towers, sewer related

vacant landuse- vacant lot, vacant building, residential non-structure lot, boarded-up building

WPA ditch- Works Progress Administration project where stream conveyances were channelized and hardened in order to quickly carry water away from a site. WPA ditches typically have concrete bottoms with rock and mortar side walls. Headwalls will sometimes say WPA and have the year the channel was built.

INTRODUCTION

As part of on-going efforts to meet legislative criteria specified under the City of Chattanooga's (City) National Pollutant Discharge Elimination System (NPDES) Permit No. TNS068063, the City's Stream Corridor Evaluation (SCORE) program is utilized. Section 4.2 of the permit states that,

Visual Stream Surveys and Impairment Inventories must be performed on streams impaired for siltation, habitat alteration, and pathogens in order to identify and prioritize MS4 stream impairment sources. It is strongly recommended that visual stream surveys be performed throughout the entire HUC-12 sub watershed of a stream segment identified as being impaired. At a minimum, a visual stream survey must be performed immediately upstream and downstream of each MS4 outfall that discharges into an impaired stream segment.

Within the City, there are approximately 95 linear miles of stream listed by the Tennessee Department of Environment and Conservation (TDEC) as impaired due to the presence of one or any combination of the following: siltation, habitat alteration, and pathogens. The SCORE program provides a comprehensive and consistent approach to identify and evaluate stream channel stability, sediment loading, and in-stream habitat. It provides needed data to help both improve stream parameters and protect public and private infrastructure through improved management and maintenance/restoration decisions.

Stream corridor assessment programs are quantitative tools designed to provide a rapid assessment of the general physical condition of a stream system and to identify the location of a variety of common environmental problems within a stream's corridor (Yetman, 2001). The SCORE program records visually identifiable stream features through selection criteria choices that limit observer variability. Recordable information includes an overall score which measures stream degradation for each stream segment assessed. The overall score is a sum total from the following severity indices: in/near stream construction, channel alteration, barriers/blockages, outfalls, current erosion, canopy, and buffer.

This Standard Operating Procedure (SOP) is specific to the City's Water Quality Program (WQP) and is intended to assist the City in maintaining their compliance under the given NPDES permit. It provides specific operational direction for conducted all phases of the SCORE program.

EMPLOYEE TRAINING, HEALTH, AND SAFETY

The employee shall become familiarized with the protocols outlined in this SOP. The field team shall be comprised of at least two trained individuals. It is the responsibility of the field teams to ensure that all datasheets are completed properly and safety protocol has been followed.

On a yearly basis the Water Quality Manager, or representative, shall review this document to ensure continuing applicability and shall train employees with regards to proper protocol.

Stream assessments present a variety of potentially hazardous situations. As a result of the innate hazard potentials, special attention should be paid with regards to employee safety. General safety equipment and protocol shall include:

- ◆ Fully equipped first aid kit
- ◆ Disposable gloves
- ◆ List of emergency contact names and numbers
- ◆ Radio/Cell phone
- ◆ Soap/Disinfectant
- ◆ Bug spray
- ◆ Safety vest
- ◆ Boots/Waders
- ◆ Temperature appropriate clothing

PROCEDURES

Equipment

Prior to initiating a SCORE assessment, the field team shall compile all necessary gear. Necessary equipment will vary per site, but the following is a standardized list.

- ◆ Map of all stream segments to be assessed showing all of the following:
 - Location markers
 - Labeled SCORE segments with identifiable start & end points
 - AsFound (stream & stormwater conveyance)
 - Labeled outfalls
 - Sanitary sewer locations
 - Labeled parcels
- ◆ Clipboard
- ◆ Datasheets (Appendix A)
 - SCORE form
 - IDIR form
- ◆ Writing utensil
- ◆ Camera
- ◆ Extra batteries
- ◆ Dry erase board and dry erase marker
 - Mandatory for all outfall pictures
- ◆ Tape measure
- ◆ Watch
- ◆ Flow dye
- ◆ Densimeter
- ◆ SCORE SOP
- ◆ Backpack
- ◆ Machete
- ◆ Canoe or boat (for non-wadeable streams)
 - Paddles & Personal Floatation Devices
 - Tennessee Wildlife Resource Agency (TWRA) boat registration

Field Survey

Wadeable Streams

Stream assessments are performed from upstream to downstream. Datasheets (see Appendix A) should be filled out completely and legibly by the field crew conducting the stream evaluation. Upon the field crew reaching the start of the segment to be assessed, general site information should be recorded. This includes the date and time of the

assessment, field crew names/initials, weather conditions of the past 48 hours, and the segment location, length, and number. In addition, the segment should be noted as being wadable or non-wadable. Standard wadable stream segments are divided into 500 foot lengths, but can vary. Segment length and number can be determined with the SCORE geodatabase through the use of the City's Geographic Information System (GIS). Location datum can be the nearest parcel information or any visually identified markers seen while in the field.

Once general segment information is recorded, the field crew can proceed to fill out the datasheet in any order with the exception of the severity indices (In/Near Stream Construction, Channel alteration, Barriers/Blockages, Outfalls, Current Erosion, Canopy, and Buffer). These shall be left for the final scoring at the end of the segment.

The following metrics are measured during the stream assessment. Data collected on these metrics is referenced when the segment is scored for the severity indices.

1) Barriers/ Blockages

If a barrier or blockage is observed, then the location, type, and severity of the blockage are to be documented. It shall also be noted if the barrier/blockage is permanent. Presence of channel diversion, flow impediment, and impediment of fish movement are to be noted. If maintenance should be done on the channel to remove the blockage, then it shall be indicated it on the datasheet. Blockage types include trash, woody debris, beaver dams, man-made dams, pipes, and other hydrologic barriers. In some occasions a pipe or culvert may not cause the impediment of flow, but still impede fish movement. Figure one displays examples of each of the barrier/blockage types listed on the datasheet.

2) In/Near Stream Construction

Development or construction of land within 200 feet of the stream is to be documented. Location along the linear stream segment, as well as the horizontal distance from the stream, is to be estimated in feet. Presence and condition of the sites Best Management Practices (BMPs) are to be documented. Additional comments can be noted as necessary. Any illicit discharge concerns resulting from inadequate BMP's should be documented and reported to the Illicit Discharge Program and Land Development Office (LDO).

3) Landuse

There are nine Land Use categories to choose from: Vacant, Residential, Industrial, Commercial, Transportation, Utility, Institutional, Recreation, and Agricultural. The primary landuse for each bank is to be documented on the datasheet. Primary landuse is determined by the landuse type with the highest observed frequency throughout the length of the segment. Landuse choice should take into account a broader watershed perspective than buffer; it includes the entire drainage area of the contributing flow rather than the area immediately on the right or left bank. GIS maps may be helpful in determining landuse.



Figure 1 Examples of Barriers and Blockages. **A** – Beaver Dam, **B** – Man-made Dam, **C** – Culvert causing fish barrier, **D** – Woody Debris, **E** – Box Culvert causing fish barrier, **F** – Pipe

4) Buffer

Buffer width is estimated in feet and should include dominant buffer type on both sides of the channel. There are six buffer types: impervious, bare ground, lawn/turf, tall grass, shrubs, and trees. The dominant buffer type (or buffer type with greatest land area along the segment) for each corresponding bank is to be documented. The estimated average width of the dominant buffer type is to be documented for each bank, as well. For example, if shrubs are the dominant buffer type, then the estimated average buffer width for shrub buffer would be documented for its corresponding bank. Figure two displays images of each of the buffer types.

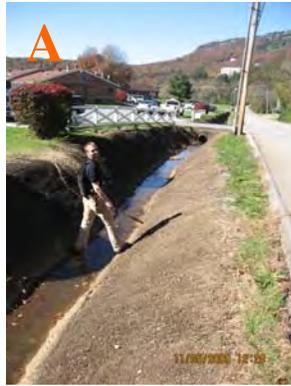


Figure 2 Examples of Buffer types. A – Impervious, B – Bare ground, C – Turf, D – Lawn, E – Tall grass, F – Shrubs, G – Trees, H – Trees

5) Canopy

Percent Canopy can be measured with a densiometer or can be visually estimated. Canopy measurements are taken at two locations along the segment that are considered to be representative samples. When using the densiometer the canopy score can range between zero and 96. The average of the two densiometer readings is multiplied by 1.04 to determine total percentage. For the visual estimation method, estimate the canopy cover at two representative locations along the segment, envisioning full leaf-out. Aerial photography may be used in addition. If there is a significant change in canopy between the start and end of segment, then changes are to be noted in the comments section and can be taken into account during the final canopy estimation.

6) Flow Conditions

Flow conditions include: level of flow, transparency of water, and the presence of algae, odors, sheens, trash, riffles, and abnormal color. Figure three shows examples of some of these conditions. Presence/absence of these conditions is to be documented on the datasheet. If an abnormal color is visible, then note the color in the comments section. Level of flow is to be recorded as either dry, trickle, moderate, or substantial. These measurements are site specific, since flow is considered substantial when the water is at/over the channel's bankfull elevation. Flow condition information is oftentimes beneficial to locating illicit discharges. Additional comments can be noted as necessary.



Figure 3 Examples of Flow Conditions. A – Algae, B – Sheen, C – Trash, D – Riffles

7) Channel Alterations

Possible channel alterations include: channelization (i.e. deepening, straightening, and/or widening), rip-rap/rock gabion, concrete/rock and mortar, culvert/pipe structure, uniform flow, in-channel pond, and impoundment. An “other” column is available for unique alterations. Comments can be noted as necessary. When the presence of any of the above alterations is observed, the observer is to estimate the percentage of the overall segment that the specific alteration is affecting. For example, if 100’ of a 500’ segment has been piped, then the observer would record 20% beside culvert/pipe. Document if the channel is suspected of being a Works Progress Administration (WPA) ditch. Figure four displays the three types of channelization and figure five shows the additional alteration options.



Figure 4 Examples of Channelization. A – Deepened, B – Straightened, C – Widened



Figure 5 Examples of Channel Alterations. A – Rip-Rap, B – Rock Gabions, C – Culvert/Pipe, D – Uniform Flow, E – In-Channel Pond, F – Impoundment, G – Concrete, H – Rock and Mortar

8) Channel Dimensions and Substrate

Cross sectional measurements of the channel should be taken at the start and middle off the segment. Measurements are recorded in inches and include top width, bottom width, and depth of channel. There are five substrate types: concrete/rock and mortar, bedrock, cobble, gravel, and fine sediments. Figure six displays examples of these substrate choices. Observers are to estimate and document the dominate substrate.



Figure 6 Examples of Substrate. A – Concrete, B – Rock and Mortar, C – Bedrock, D – Cobble, E – Gravel, F – Fine Sediments

9) Erosion

Dominant erosion processes shall be documented during the first 3rd, second 3rd, and last 3rd (or start, middle, end respectively) of the segment. The location of the process along the segment is to be noted as well as if it is on the left bank, right bank, or both. Each erosion process recorded will have a severity rating of minor, moderate, or severe. Additional comments may be noted for each instance of recorded erosion. The pool of erosion process to be drawn from includes the following: bed scour, bank scour, under-cutting, head-cutting, slumping, and other. Figure seven shows examples of each of these choices.



Figure 7 Examples of Erosion. A – Bed Scour, B – Bank Scour, C – Under-cutting, D – Head-cutting, E – Slumping

10) Outfalls

All outfalls observed during assessments are to be documented on the datasheet. At a minimum, observers are to complete the following fields for each outfall: Outfall ID, Type, and Condition. Outfall ID is obtained through GIS. Types of outfalls include Reinforced Concrete Pipe (RCP), Corrugated Metal Pipe (CMP), Poly Vinyl Chloride (PVC), Earthen Channel (E), and Concrete Channel (C). If the outfall type can not be determined, then “unknown (U)” shall be recorded. An outfall’s condition may be recorded as good, fair, poor, severe, or unknown. Figure eight shows examples of the types of outfalls that may be recorded. If the condition is fair, poor, or severe, then documenting the structural problem is required. Structural problems include channel erosion, broken/cracked/corroded pipe, and presence of flow line, excessive vegetation, and sediment deposition. An “other” option is included for atypical problems. Outfalls that are found in the field, but are not on the map are to be recorded as “unmapped.” Unmapped outfalls are turned over to the City GIS staff for updating the AsFound geodatabase. If an outfall is on the map, but the observers are unable to locate it in the field, then it shall be recorded as “undefined.” Undefined outfalls may be unrecognizable sheet flow or may have been incorrectly recorded by AsFound field crews. Undefined outfalls are turned over to the City GIS staff for updating the AsFound geodatabase. The presence of flow is to be documented, as well. A 50 ft upstream and downstream visual inspection of the receiving channel is to be performed at each outfall. If a downstream change is present due to the outfall, then this should be described in the outfall’s comment section.

11) Severity Indices

Severity Indices include the following: In/Near Stream Construction, Channel Alteration, Barriers/Blockages, Outfalls, Current Erosion, Canopy, and Buffer. The severity indices section of the SCORE datasheet is used in generating a score for each of the above categories, as well as an overall total score that is given to the specific stream segment that is being assessed. The observer is to use the measurements taken throughout the stream assessment to score each category. Categories are given a score ranging from one to five with one being the best and five being the worst. The “Buffer” score is obtained by scoring each bank individually and then taking the average, rounding to the nearest integer. The total score of a specific stream segment is the sum of the seven categories from above. Total scores range from seven to 35. Scores ranging from 7-13 are considered minor, 14-24 moderate, and 25-35 severe.

12) Illicit Discharge

If no illicit discharge is detected, then the observer should indicate that an Illicit Discharge Inspection Report, or IDIR (see Appendix A), was not filled out. If an illicit discharge or possible illicit discharge is observed during a stream assessment, then the observer is to document the findings on the datasheet, as well on an IDIR. The observer should indicate the location of the discharge and try to visually identify the substance, odor, color, and possible source along with any other helpful information in the comments section of the SCORE datasheet. Pictures of the illicit discharge should be taken.



Figure 8 Examples of Outfall Types. A – PVC pipe, B – Concrete Channel, C – Earthen Channel, D – CMP, E – RCP

Non-Wadeable Streams

For non-wadeable streams, observers are to use the same datasheet that is used for wadeable channels. Standard non-wadeable stream segments are broken into 2,000 ft segments. Datasheets should be filled out completely with exception of channel dimensions and dominant substrate. In larger non-wadeable channels, retrieving accurate data for channel dimensions and substrate is difficult. Therefore, data on these measurements will not be mandatory. Estimates of channel dimensions and substrate are acceptable, but “estimation” should be circled in the comments section. Channel bottom and top widths can be estimated via GIS prior to field surveying with verification on site. As visual stream surveys are indeed a snapshot of stream corridor condition, a one-time aerial photo with high resolution ($\leq 5\text{m}$) will serve the purpose of channel dimensions when estimating with GIS.

It may be difficult to estimate canopy cover on wide streams by looking up through the canopy. Thus, an attempt should be made to estimate the portion of the shaded water surface area for the whole reach. Time of year, time of day, and weather can affect your observation of shading. Therefore, the relative amount of shade is estimated by assuming that the sun is directly overhead and the vegetation is in full leaf-out. Alternatively, use aerial photographs taken during full leaf-out. The following rough guidelines for percent shade may be used when determining stream surface exposure to the sun:

90 – 100%	stream surface not exposed
70 – 90%	surface slightly exposed or exposed only in patches
40 – 70%	surface exposed, but banks not exposed
20 - 40%	surface exposed and banks exposed at times
0 – 20%	surface and banks exposed

Data Entry

Upon returning to the office, the field crew shall download the pictures and place them in the appropriate folder labeled with the segment number. Pictures should be labeled with the segment number and date at a minimum. The GIS geodatabase should be updated with the date of the assessment and the scores from the severity indices. Before further data entry takes place, the datasheet is to be reviewed by the water quality supervisor or authorized representative for quality control purposes. After the datasheet is signed and dated by the reviewer the SCORE database can be updated, the datasheet can be scanned and the electronic copy placed with the pictures, and the hard copy datasheet can be filed. Each of these activities will be dated on the datasheet.

REFERENCES

“EPA Administered Permit Programs: The National Pollutant Discharge Elimination System,” Title 40 Code of Federal Regulations, Pt 122.

Leopold, L. B., M. Gordon Wolman, and John P. Miller. (1964). Fluvial Processes in Geomorphology. New York: Dover Publications, Inc.

“National Bridge Inspection Standards,” Title 23 Code of Federal Regulations, Pt 650.

Yetman, K.T. (2001). Stream Corridor Assessment Survey SCA Survey Protocols. Watershed Restoration Division Chesapeake and Coastal Watershed Services, Maryland Department of Natural Resources, Annapolis, MD.

APPENDIX A

Stream Corridor Evaluation Data Sheet

Reviewer:			Date:		
Date Entered	GIS:	Database:	Scanned:	Filed:	

Date:	Segment Number:
Time:	Segment Length:
Team:	Wadeable: Yes / No
Weather Past 48 hrs Dry L. Rain H. Rain Snow	Location:

Barriers/Blockages

Type: Trash (T), Woody Debris (WD), Beaver Dam (BD), Man-Made Dam (MD), Pipe (P), Other (O) / **Severity:** Minor (Mn), Moderate (Md), Severe (S)

Blockage	Location	Type	Severity	Permanent	Channel Diversion	Impedes Flow	Impedes Fish	Maintenance Needed
1								
2								
3								

Comments:

In/Near Stream Construction

Site	Location	BMP Present	Failing	< 100'	100'-200'
1					
2					

Comments:

Landuse

Type: Vacant, Residential, Industrial, Commercial, Transportation, Utility, Institutional, Recreation, Agricultural

Primary Land Use	LB:	RB:
-------------------------	-----	-----

Buffer

Buffer Types: Impervious (I), Bare Ground (BG), Lawn/Turf (L), Tall Grass (TG), Shrub (S), Trees (T)

Dominant Buffer Type	LB:	RB:
Dominant Buffer Width	LB: <15' 15-50' >50'	RB: <15' 15-50' >50'

Canopy

Percent Canopy (with Densimeter or visual estimation measuring/envisioning full leaf out – aerial photography may be used in addition)

First Measurement	US:	DS:	RB:	LB:	Total:	Average	x 1.04 =
Second Measurement	US:	DS:	RB:	LB:	Total:		

Comments: **Estimated** Yes / No

Flow Conditions

Flow: Dry Trickle Moderate Substantial	Transparency: Clear Slightly Cloudy Cloudy Opaque
--	---

Algae: Yes / No	Odor: Yes / No	Sheen: Yes / No	Trash: Yes / No	Riffles: Yes / No	Abnormal Color Yes / No
Comments:					

Channel Alterations

Deepened ≈ _____ %	Rip-Rap/Rock Gabion ≈ _____ %	Uniform Flow ≈ _____ %	Possible WPA Yes / No
Straightened ≈ _____ %	Concrete/Rock & Mortar ≈ _____ %	In-Channel Pond ≈ _____ %	
Widened ≈ _____ %	Culvert/Pipe ≈ _____ %	Impoundment ≈ _____ %	
Other ≈ _____ % (Describe: _____) Comments:			

Channel Dimensions & Substrate

Channel Measurement at Start (in)	Top Width:	Bottom Width:	Depth:	Estimated Yes / No		
Channel Measurement at Middle (in)	Top Width:	Bottom Width:	Depth:	Estimated Yes / No		
Dominate Substrate	Concrete	Bedrock	Cobble	Gravel	Fine Sediments	Unknown

Comments:

Stream Corridor Evaluation Data Sheet

Erosion

Process: Bed Scour (BDS), Bank Scour (BKS), Under-Cutting (UC), Head-Cutting (HC), Slumping (S), Other (O)

Location	Dominant Process	LB	RB	Minor	Moderate	Severe	Comments
Start							
Middle							
End							

Outfalls

Type: RCP, CMP, PVC, Earthen (E), Concrete (C), Unknown (U) / **Condition:** Good (G), Fair (F), Poor (P), Severe (S), Unknown (U)

Problem: Erosion (E), Broken (B), Cracked (C), Corrosion (CRS), Flow Line (FL), Excessive Vegetation (EV), Sediment Deposition (SD), Other (O)

Outfall ID	Type	Condition	Problem	Unmapped	Undefined	Discharge	DS Change	Comments

Comments:

Severity Indices (1 Minor to 5 Severe)

In/Near Stream Construction	1	2	3	4	5
1 No construction activities within 200 ft of channel					
3 Activities 100 – 200 ft from bank, but with adequate sediment BMP's					
5 Activities < 100 ft from bank with no sediment BMP's					
Channel Alteration	1	2	3	4	5
1 Natural earthen channel with sediment bottom; no structures present					
3 Current or past alteration on ≥ 25% and < 50% of the segment					
5 Current or past alteration on ≥ 75% of the segment					
Barriers/Blockages	1	2	3	4	5
1 No diversions or structures limiting stream flow or fish movement					
3 Small or temporary structures impeding flow; noticeable channel diversion					
5 Permanent structures prevent flow and/or fish movement; channel diverted					
Outfalls	1	2	3	4	5
1 No outfall present or an outfall in good condition; discharge with no odor or discoloration					
3 Outfall in poor condition; moderately damaged, could collapse/crack, or has deposit stains					
5 Outfall in severe condition; severely damaged or shows signs of illicit discharge					
Current Erosion	1	2	3	4	5
1 Banks are stable and protected by vegetation and/or roots; natural erosion patterns present					
3 Moderate erosion is characteristic of the segment					
5 Severe erosion is characteristic of the segment; long reaches of active erosion and/or mass wasting on any portion of the segment					
Canopy	1	2	3	4	5
1 Canopy is > 80%					
3 Canopy is between 40% - 60%					
5 Canopy is < 20%					

Buffer (score LB & RB separately and record the average – round up to nearest integer)

Buffer Width	Impervious/Bare	Turf/Lawn	Tall Grass	Shrub	Trees	Average Score <hr style="width: 50%; margin: 0 auto;"/>
< 15'	5	5	4	3	2	
15-50'	5	4	3	2	1	
> 50'	5	3	2	1	1	

Total Score: _____ **Minor = 7-13** **Moderate = 14-24** **Severe = 25-35**

Illicit Discharge

IDI Report Yes / No	Comments:
-------------------------------	------------------

Date entered: GIS _____ CSR _____ Scanned _____ Spreadsheet _____
 QA/QC Reviewer: _____ Date Reviewed: _____ Filed _____

Illicit Discharge Inspection Report



City of Chattanooga
 Water Quality Program
 1250 Market Street, Suite 2100
 Chattanooga, Tennessee 37402
 (423) 643-5877 Fax (423) 643-5862
SWM@mail.chattanooga.gov

Location of Discharge:

Address _____ SR# _____
 Date _____ Watershed _____

Source of Illicit Discharge:

<u>Sanitary Wastewater:</u>	<u>Automotive Fluids / Fuel / Washing:</u>
<input type="checkbox"/> Broken Service Line	<input type="checkbox"/> Oil
<input type="checkbox"/> Sewer Cleanout	<input type="checkbox"/> Antifreeze
<input type="checkbox"/> Septic Tank	<input type="checkbox"/> Transmission
<input type="checkbox"/> Laundry Wastewater	<input type="checkbox"/> Gasoline
<input type="checkbox"/> Sewer Overflow	<input type="checkbox"/> Diesel
	<input type="checkbox"/> Wash Water (Detergent / Construction)
<u>Household:</u>	
<input type="checkbox"/> Paints / Rinse Water	<u>Other:</u>
<input type="checkbox"/> Cleaner	<input type="checkbox"/> Pesticides/Herbicides
<input type="checkbox"/> Swimming Pool Water	<input type="checkbox"/> Fertilizer
	<input type="checkbox"/> Illicit Connection to Storm Drain
<u>Food Service:</u>	<input type="checkbox"/> Illegal Dumping to Storm Drain
<input type="checkbox"/> Cooking Oil	<input type="checkbox"/> Water Leak
<input type="checkbox"/> Grease	<input type="checkbox"/>

Inspection Type: Initial / Follow-up / Final
Letter Type: Notification / WW / NOV / NOV & Civil Penalty / None
Land Use: Commercial / Residential / Other: _____
Found By: FS / SCORE / Smoke Test / 311 / City Emp: WQ or Other / Other: _____

Comments: _____

Inspector(s): _____ Photos? Yes No

Appendix D

Sewer Lateral Assessment Program (SLAP) Standard Operating Procedures

City of Chattanooga Water Quality Program

MS4 MAPPING PLAN



NDPES PERMIT # TN0068063

February 2013

Authorized By:

Revision

Date

Mounir Y. Minkara, Ph.D., P.E.

June 8, 2011

1

February 6, 2013

Water Quality Manager
Water Quality Program
City of Chattanooga-Engineering
Department of Public Works

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APPROVALS AND CONCURRENCES

Approvals: This is to certify that we have reviewed this document and approve of its contents.



Signature

Mounir Y. Minkara, Ph.D., P.E.
Water Quality Manager

2-7-13

Date

City of Chattanooga MS4 Mapping Plan

Section 3.2.3.1 of National Pollution Discharge Elimination Permit Number TN0068063 requires the City of Chattanooga to develop a plan that addresses the following elements:

The permittee must maintain an up-to-date and accurate storm sewer system map that shows the location of all known outfalls where the municipal storm sewer system discharges into waters of the state. The system map shall also identify known conveyances crossing the permittee's corporate boundary. The storm sewer system map must be available onsite for review by the permitting authority. The storm sewer system map must show the following, at a minimum:

- *The location of all known MS4 outfalls and drainage areas contributing to those outfalls that are operated by the permittee, and that discharge within the permittee's jurisdiction to a receiving water;*
- *The location (and name, where known to the permittee) of all waters receiving discharges from those major outfall pipes. Each mapped outfall must be given an individual alphanumeric identifier, which must be noted on the map. When possible, the outfalls must be located using a geographic position system (GPS) and photographs should be taken to provide baseline information and track operation & maintenance needs over time.*
- *Inputs into the storm sewer system, such as the inlets, catch basins, drop structures or other defined contributing points to the storm sewer system serving that outfall.*
- *The location and condition of major structural controls (retention basins, detention basins, major infiltration devices, etc.)*
- *General direction of stormwater flow.*
- *Hot areas identified under section **Error! Reference source not found.**;*
- *Monitoring locations identified under subparts **Error! Reference source not found.** and **Error! Reference source not found.***

Storm Water Drainage System Inventory

The storm water drainage system inventory (As-Found) collection began on August 17, 2004 by City personnel. There were 5 crews of two workers in the initial collection. This initial inventory was to later be used by the consultants for reference. The pilot study, or phase I and II, was performed by 3 different consultants in the Chattanooga Creek and Dobbs Branch watersheds. Review of the pilot study determined that using a single consultant would be more cost effective and provide more accurate and consistent data. Earthworx, LLC was awarded the contract on August 22, 2006 and has provided the As-Found data for the rest of the City's watersheds. All storm water structures and conveyances were collected using survey grade GPS if possible, but only sub meter accuracy was required on pipes less than 36''. Despite only sub meter accuracy required on pipes less than 36'' in diameter, most structures that size were collected at (survey grade) Horizontal: 0.1 ± foot (3cm) Vertical: 0.1 ± foot (3cm).

The completed As-Found (in GIS format) was received by TDEC September 10, 2008. At this point, all stormwater only systems were complete and contained accurate information. There were no maintenance logs found by the city that show discrepancies in the data. The Phase I and II area will be gone back over by Earthworx, so the same proprietary QA/QC methods can be implied to the whole dataset for consistency. The CSS/CSO portion of the City's As-Found project is primarily in the downtown area with the exception of a small area in North Chattanooga.

Base layers that are mapped within the geometric network include conveyances (Figure 1), catch basins (Figure 2), and any detention/retention structures (Figure 3).

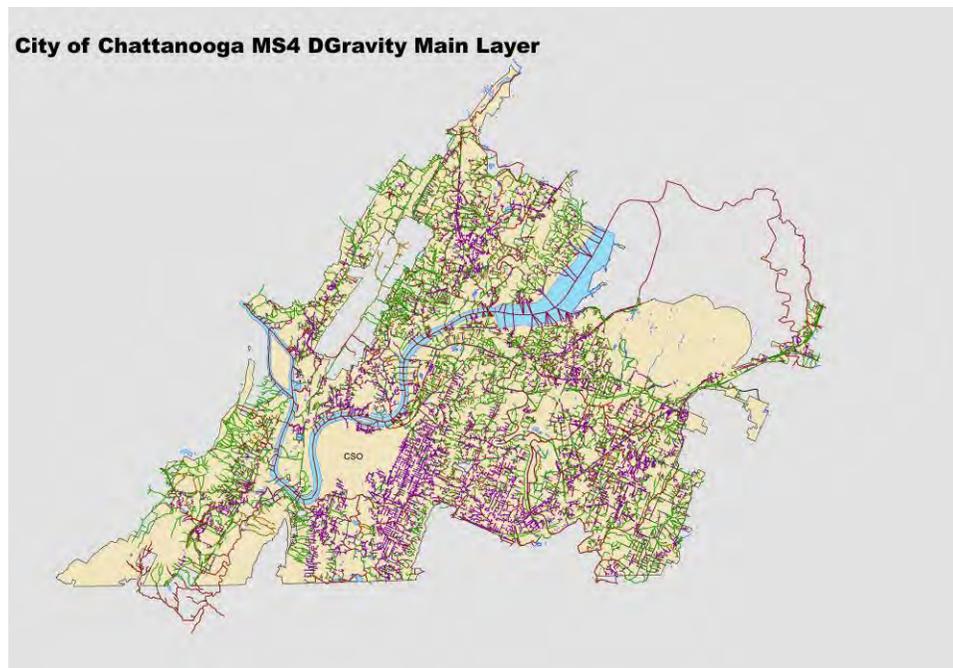


Figure 1. Map of structural conveyances within the City of Chattanooga.

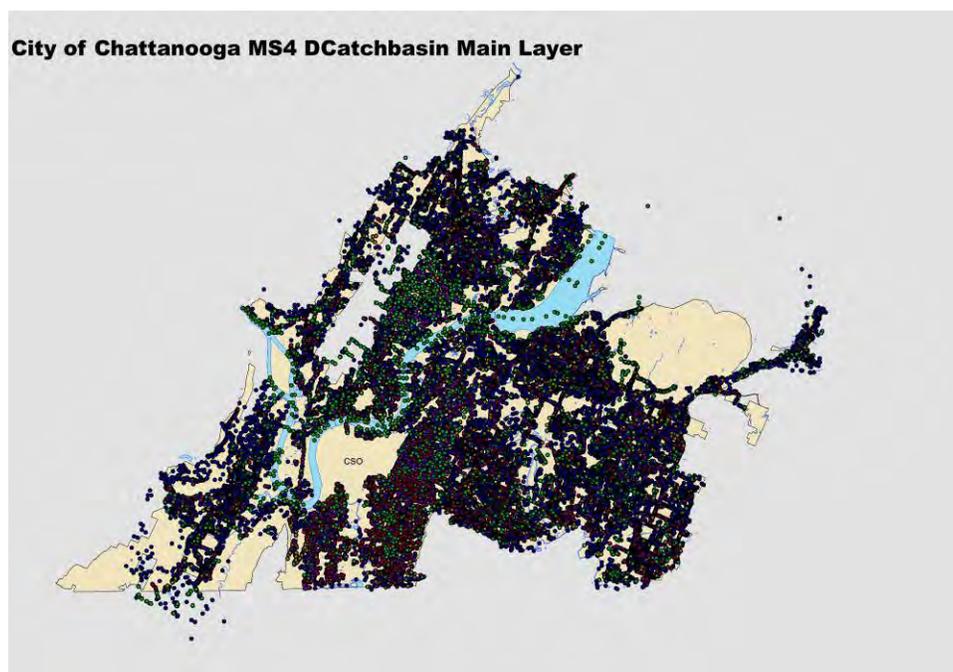


Figure 2. Map of catch basins within the City of Chattanooga.

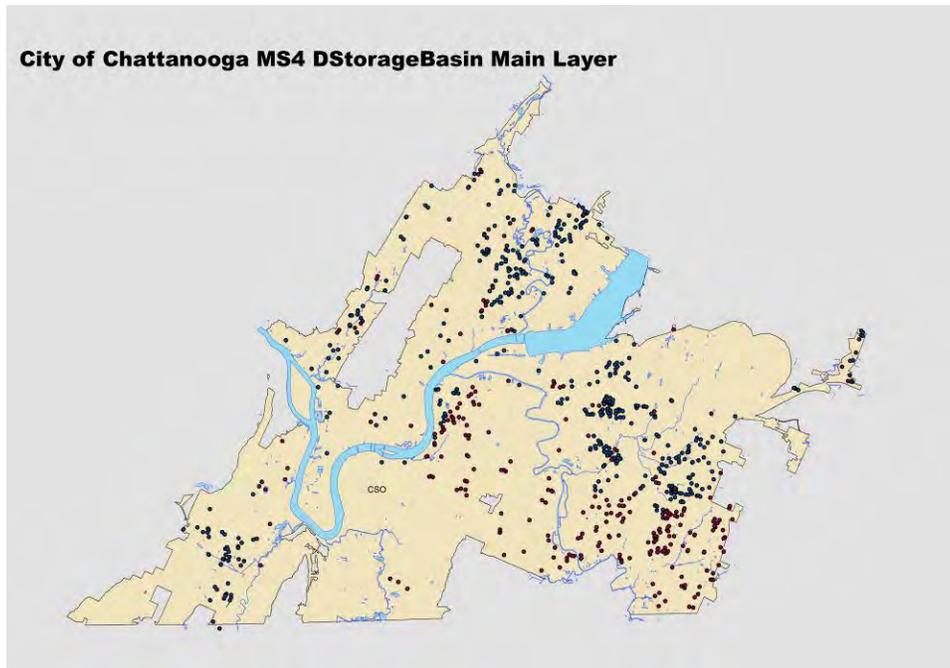


Figure 3. Map of detention and/or retention structures within the City of Chattanooga.

Outfalls

As defined in section of the City NPDES MS4 Permit, an outfall is a point source where a municipal separate storm sewer discharges to waters of the State of Tennessee. As-Found data includes waters of the State of Tennessee and all conveyances flowing into these waters. Therefore, upon receipt of the As-Found data on September 10, 2008 TDEC was provided with the locations of all known outfalls in the City of Chattanooga. See Figure 4 below for an example of outfall determination.

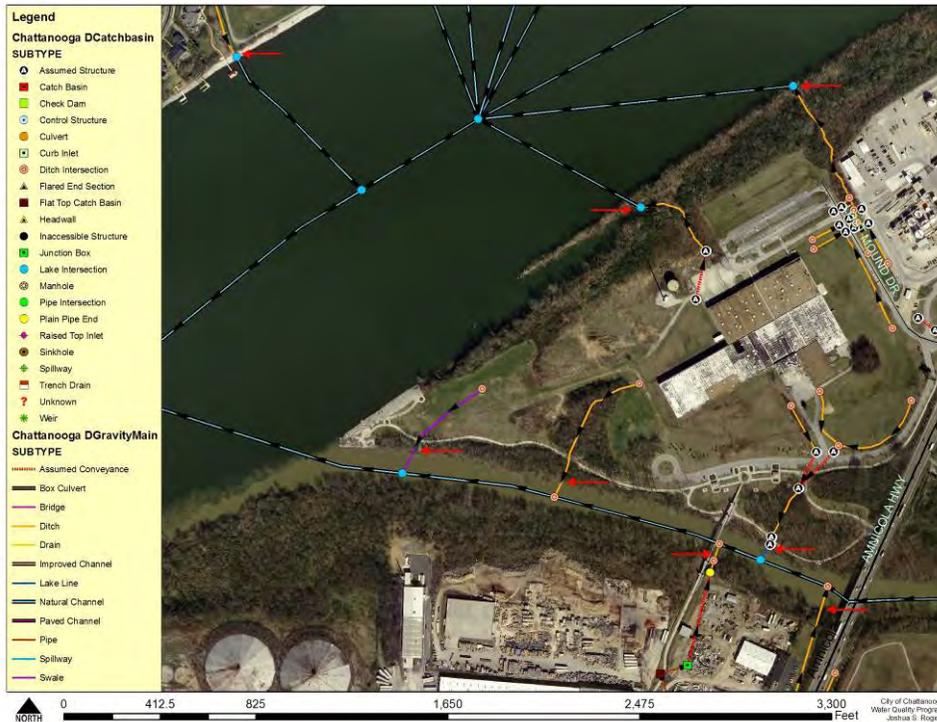


Figure 4. Example of outfall determination. The map displays As-Found data overlaid on orthoimagery of South Chickamauga Creek flowing into the Tennessee River. Red arrows show the location of outfalls to the waters of the state. There are three that flow directly to the Tennessee River and five that flow into South Chickamauga Creek.

From December 2008 to July 2009 the City differentiated all major outfalls from all known outfalls identified from the As-Found data. The process utilized ArcHydro Tools version 1.3 Final for ArcGIS 9.2/9.3 (submitted 1/16/09). This program was downloaded from ESRI Support System's Hydro Data Model. ArcHydro utilizes the tools of the Spatial Analyst extension for ArcView, a digital elevation model (DEM), and a known stormwater conveyance for the area being processed. The most recent DEMs for the City were collected during 2006. These DEMs were collected at a 5 foot cell size (or 25 ft²) with elevation data accurate to 6 inches. The TDEC 2008 Overall Use shapefile (downloaded from <http://www.tn.gov/environment/wpc/publications/>) and WPA channels within the City were used to define Waters of the State. The City's stormwater conveyance layer, As-Found, was used to identify all conveyance locations, types, and sizes. All outfalls were geographically marked within GIS at the intersection of all As-Found data and Waters of the State. Watersheds greater than or equal to 1 acre were delineated for all outfalls. By using the Hamilton County Regional Planning Agency's 2008 landuse file, pipe dimensions, and delineated watershed sizes, major outfalls were determined based on the criteria set forth in 40 CFR 122.26 (b)(5).

Parties Responsible For Maintaining MS4 GIS Layer

In 2005, the City of Chattanooga established a geometric network thru Geographical Information Systems (GIS) of the entire MS4 within the city's limits. Following the inventory of the stormwater structures, the City of Chattanooga has contracted parties for the responsibility of verifying these structures using GPS survey grade equipment. The Technical Information Center (TIC) updates and makes corrections to this network periodically based on the submittal of "As Built" drawings (electronically from the Land Development Office) and in-field GIS verifications using GPS equipment. The outfall mapping effort will

be ongoing as new development and redevelopment result in the construction of new outfalls to the stormwater drainage system

Measurable Goals

Ongoing efforts will include, at a minimum, yearly map updates from “as-built” plans, as well as physical inspections every four years of new or redeveloped areas of the system. Periodic additional updates to capture outfalls from new developments or newly permitted industrial dischargers will be conducted as needed.

Conduct GIS map updates at least annually and conduct physical re-inspections of new or redeveloped areas every four years.

PERMIT YEAR				
2011	2012	2013	2014	2015
Physical inspections every four years of new or redeveloped areas of the system.				
Yearly map updates from “as-built” plans				
GIS map updates annually				
Periodic additional updates to capture outfalls from new developments or newly permitted industrial dischargers				

**City of Chattanooga
Field Screening
Water Quality Plan Element
MS4 NPDES Permit TNS068063**



February 2013

<u>Authorized By:</u>	<u>Revision</u>	<u>Date</u>
Mounir Y. Minkara, Ph.D., P.E., CPSWQ	1	June 6, 2011 February 6, 2013

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Signature

Mounir Y. Minkara, Ph.D., P.E., CPSWQ
Water Quality Manager

2-7-13
Date

Table of Revisions

Date	Specific Section of Page	Revision Type (major or minor)	Revision Description
2/6/13	Introduction	Minor	Introduction section added
2/6/13	Appendix	Major	Field Screening SOP added

Introduction

The City of Chattanooga (City) Water Quality Program implements a continuous field screening program in fulfillment of requirements specified in National Pollutant Discharge Elimination System (NPDES) Permit TNS0608063. Objectives of the field screening program are to identify illicit discharges entering the Municipal Separate Storm Sewer System (MS4). All illicit discharges discovered through the field screening program are investigated and mitigated.

Section 3.2.2.3 of NPDES Permit TNS068063 states that:

The permittee shall continue to implement and make necessary improvements to its ongoing program to determine whether non-stormwater entries are present in the storm drainage system, and to identify locations and sources of non-stormwater. ;

Section 3.3.6 of NPDES Permit TNS068063 states that:

The city must inspect all cells identified in the grid system that contain a segment of the storm sewer system during the life of the permit. Any illicit discharges observed during inspection must be sampled for the purpose of source tracking.

With issuance of the second NPDES permit, the City's Water Quality Program modified the field screening program to better reflect the City's MS4 system. Field screening protocols were changed to include inspection of field screening points within a grid system (Appendix – Field Screening SOP).

Field screening involves testing chemical characteristics such as temperature, pH, conductivity, dissolved oxygen, phosphates, chlorine, detergents, phenol, copper, ammonia, and hydrogen sulfide. Ammonia, phosphates, and chlorine are common elements found in sanitary waste; the testing for these chemical parameters will be performed to indicate the possible presence of a sanitary waste leak. A tracing event will take place when any chemical has a concentration higher than the minimum concentration shown on its test comparator. Physical parameters such as odor, color, turbidity, floatables, damage at outfall/grid area, deposits/stains at the outfall/grid area, abnormal vegetation in channel or outfall/grid area, poor pool quality, and algae growth is recorded as well. The physical parameters odor, color, turbidity, and floatables are scored on a relative severity index. This index ranges from faint to highly noticeable, and is scored as a 1, 2, or 3.

Data recorded from each field screening site will be scored and characterized to measure the likelihood of the presence of an illicit discharge. The overall site characterization, or likelihood of the presence of an illicit discharge, is categorized at unlikely, suspect, potential, or obvious. An unlikely characterization will be described as having less than 2 of the chemical or physical indicators described above, which means the site has a low potential of the presence of an illicit discharge. Potential characterization will be described as having the presence of two or more indicators, which means the site could have the potential of the presence of an illicit discharge if the positive parameters were to increase in concentration. Suspect characterization will be described as having the presence of one or more indicators with a severity of three or more indicators, which in turn will cause it to have a high potential of the occurrence of an illicit discharge. An obvious characterization will be the observable and unmistakable presence of an illicit discharge.

Since field screening can only take place after a 72 hour dry-period, its activities are weather dependant. When weather is permitting field screening activities will be performed when the staff is available. The entire City of Chattanooga Water Quality Staff is responsible for the Field Screening Program.

Upon the 1st completion term of all grid points, areas yielding positive chemical parameters, illicit discharges, spills, and citizen’s complaints will be prioritized to be tested again to ensure the previous problems were corrected.

Land Use Categories	System	Frequency
Industrial	0.25-mile grid	Twice per Permit Term
Heavy Commercial	0.25-mile grid	Twice per Permit Term
All Other Land Uses	0.5-mile grid	Twice per Permit Term

BMP	Description	Measurable Goal				
		Year 1	Year 2	Year 3	Year 4	Year 5
Field Screening Training	Regular Field Screening Program training for Water Quality Staff	WQ staff trained	WQ staff trained	WQ staff trained	WQ staff trained	WQ staff trained
Field Screening	Perform site inspections for all outfalls/grid point locations that are identified within the grid system	All 578 grid point locations inspected twice in permit term				

Interim Milestones

Year 1	Year 2	Year 3	Year 4	Year 5
Hiring Staff		Completing Full FS Cycle		
Updating FS SOP		Evaluating FS Program		

Appendix

Field Screening Standard Operating Procedures

City of Chattanooga Water Quality Program



Field Screening Standard Operating Procedure (SOP)

April 6, 2011

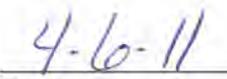
<u>Authorized By:</u>	<u>Revision</u>	<u>Date</u>
Mounir Y. Minkara, Ph.D., P.E. Water Quality Manager Water Quality Program Engineering Department of Public Works City of Chattanooga	1	4/6/11

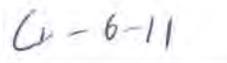
1250 Market Street, Suite 2100
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APPROVALS AND CONCURRENCES

Approvals: This is to certify that we have reviewed this document and approve of its contents.

	
Signature	Date
Rebecca E. Robinson, CPESC, CPSWQ Water Quality Supervisor	

	
Signature	Date
Mounir Y. Minkara, Ph.D., P.E. Water Quality Manager	

PURPOSE

The purpose of this document is to provide Standard Operating Procedures (SOP) for dry weather field screening activities.

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INTRODUCTION

The City of Chattanooga Municipal Separate Storm Sewer System is required under its National Pollutant Discharge Elimination System Permit (TNS068063) under Section 3.2.3.3 *“to continue to implement and make necessary improvements to its ongoing program to determine whether non-stormwater entries are present in the storm drainage system, and to identify locations and sources of non-stormwater.”*

This document will serve as a standard operating procedure (SOP) for the activities associated with the field screening program within the City of Chattanooga Water Quality Program. The specific methods regarding the conducting of this ongoing program are defined within this document, only for the term of the current permit. The field screening component is mandated and directed by 40 CFR 122.

Any revisions to this document shall be recorded as “Revision” and be subject to appropriate peer review. All revisions, from the City of Chattanooga Field Screening Standard Operating Procedure (SOP) (2009), are documented in Table 1.

Table 1. Revisions

Date	Specific Section or Page	Revision Type (major or minor)	Revision Description
04/06/11	Authorization	Major	Introduction of “Approvals and Concurrences” along with signatures.
04/06/11	4	Minor	Addition of “Proper Procedures Regarding Tracing Events” added to Employee Training, Health, and Safety.
04/06/11	6	Minor	Addition of “tote” to Equipment list.
04/06/11	7	Major	Addition of grid matrix method added to “Procedures” section.
04/06/11	8	Major	Description of how field screening points are selected added to the “Procedures” section.
04/06/11	8	Major	Revised Field Sheet

EMPLOYEE TRAINING, HEALTH, AND SAFETY

The employee shall become familiarized with the protocols outlined in this SOP. The field team shall have a basic working knowledge of:

- Outfall identification numbering
- Sample collection procedures, equipment cleaning, and equipment application for wadeable and non-wadeable surface water collection
- Sample record completion (i.e. chain of custody, labeling, etc.)
- Sample handling procedures
- Cartographic tools
- Bacteriological analysis
- Quality Assurance/Quality Control procedures
- Proper procedures regarding tracing events

As needed, the Water Quality Manager, or representative, shall review this document to ensure continuing applicability and shall train employees with regards to proper monitoring protocol.

Monitoring activities present a variety of potentially hazardous situations. As a result of the innate hazard potentials, special attention should be paid with regards to employee safety. General safety equipment and protocol shall include:

- Fully equipped first aid kit
- Flashlight
- Duct tape
- List of emergency contacts
- Cell phone
- Disinfectant
- Insect repellent
- Life vest
- Reflective safety vest
- Waders
- Steel-toed boots

EQUIPMENT

The following equipment is needed to perform field screening:

- Eureka Manta Multi-Probes
- Hanna Hand-Held Test Instruments (pH, conductivity, dissolved oxygen)
- Phosphate Test Kit
- Chlorine Test Kit
- Copper Test Kit
- Ammonia Test Kit
- Sulfide Test Kit
- Detergent Test Kit
- Phenol Test Kit
- Field Screening Form
- Illicit Discharge Form
- Chain of Custody Form
- Camera
- Spare Camera Batteries
- Map
- Tape Measure
- Tracing Dye
- Latex Gloves
- *E. coli* Bottles
- Waste Disposal Bag
- Backpack
- Tote

PROCEDURE

Requirements for sampling

Field screening is considered a dry-weather monitoring procedure. Therefore, there must be less than 0.25 inches of rainfall for a consecutive 72-hour period before field screening is allowed. Field screening sites must be investigated twice in a 24-hour period with a minimum of four hours between each inspection, so there must also be the time available to perform the two inspections before day's end.

Procedures

A field screening site is determined by utilizing existing maps or GIS. Using GIS, a quarter mile grid layer was placed over the county's industrial areas and heavy commercial areas. A half-mile grid layer was placed over all other areas of the county (heavy residential, light residential, agricultural, light commercial). Within each grid a field screening site was selected for future testing. (Site selection was based on the following criteria: if an outfall is located within the grid, the outfall is selected as the field screening point, if no outfall is present then a point within the MS4 system is selected). A map layout of the site and the upstream drainage area is printed and used for locating the site and, if need be, tracing any identified illicit discharges upstream. Once at the site, the field screening form is completely and legibly filled out. For reference, the field screening form is located in Appendix A.

Field Sheet

Section one of the field sheet records site characteristics and investigator information. The "*E. coli* Collected" section is determined by the results of the chemical testing which is addressed below. The "Sample Location Narrative" box is for recording location information that would be useful for someone else trying to locate the site or to identify changes that have taken place between investigations. The photos also aid in this act.

When inspecting an outfall, the presence of flow is the primary recordable trait, as all other measurements are dependent on the presence/absence of flow. If flow is not present, then only measurements of the outfall/or location identified by a grid map needs to be made. If flow is present, then the investigators record the outfall/grid point measurements as well as the flow rate. Flow rate is measured by following the instructions on the sheet. Flow rate is calculated by using a formula (usually done in the office).

For sites with flow, the physical parameters of the discharge are measured using the proper meter/s (Hanna hand-helds or Eureka Manta multi-probes). A duplicate measurement is taken for all parameters, except the CHEM-et Test Kits. In between readings the instrument is removed from the water and the probe is rinsed with deionized water. The average of the two readings is recorded. Chemical characteristics are

measured using the appropriate test kits. If both phosphate AND ammonia are detected, then the investigators take an *E. coli* sample, fill out a chain of custody form, and take the sample to the testing laboratory. If any chemical analysis exceeds the minimum concentration on the comparator, then a tracing event must take place. Water quality test parameters along with their possible source indicators are shown in Table 1. The tracing event involves using the GIS map associated with that particular outfall/grid point to search upstream of the outfall/grid point to detect the presence of the positive concentration of the chemical parameter, in case of an illicit discharge. If an illicit discharge is found an Illicit Discharge Inspection Report (IDIR) is filled out and submitted to the supervisor. Any unusual measurements from the meters or the test kits are noted in the comments box of section three of the field sheet. If the meters fail the drift check, a “n” is placed beside the appropriate chemical parameter section on the field sheet. Visual assessment of the site is made and any physical characteristics of the flow or the outfall are recorded in sections four and five respectively.

Table 2. A brief summary of the water quality parameters used and possible implication each parameter indicates.

Water Quality Test Parameters and Source Indicators		
Water Quality Test	Use of Water Quality Test	Possible Source
Conductivity	Indicator of dissolved solids Range of 150-800 um/cm	Potable water Industrial waste water Construction activity
Ammonia	High levels can indicate sanitary wastewater	Broken municipal sewer line Illicit connection of service line
Chlorine	Indicates inflow of a potable water source	Broken water line Irrigation
Phosphate	Can indicate sanitary wastewater	Broken municipal sewer line Illicit connection of service line Vehicle washing with detergent
Detergents	Can indicate sanitary wastewater	Broken municipal sewer line Illicit connection of service line Vehicle washing with detergent Use of foam for fire suppression

Source: Table modified from IDDE: *A Guidance Manual for Municipalities in the State of Ohio*, July, 2006.

When all measurements have been taken the overall outfall characterization is determined by assessing the likelihood of the presence of an illicit discharge. If less than two indicators are present, then the characterization is “unlikely”. A characterization of “potential” is given if there are two or more indicators present. If there are one or more indicators with a severity of three (from sections four and five), then a characterization of “suspect” is given to the outfall/grid point location. If the measurements clearly indicate an illicit discharge then the outfall is characterized as “obvious”.

Concerns not associated with illicit discharges are noted in section seven of the field sheet. Section eight is for additional comments and site sketches. Noting the generation of IDIR is also done in section eight.

Office Work

Upon returning to the office the field sheets are given to the reviewer to be verified. When the reviewer has signed off on the field sheets, then the data can be placed in the field screening database. The field investigators perform drift checks on all meters used to insure quality assurance of the data. The number of field screening sites checked is recorded on the office calendar. Site photos are downloaded, labeled, and placed in the appropriate folders. The GIS layer is updated. Field sheets are scanned and placed in the folder with the site pictures. The original field sheets are then filed.

APPENDIX

City of Chattanooga NPDES Stormwater Field Screening Data Sheet

All data should be printed legibly

Date entered: GIS _____ Database _____ Scanned _____ Filed _____
QA/QC Reviewer: _____ Date Reviewed: _____

Section 1: Background Data

Grid Map ID:	Watershed:
Date:	Investigators:
Time 1 st Sample:	Time 2 nd Sample:
E. Coli Collected: Yes _____ No _____	Form Completed by:
Ambient Air Temp : A.M. _____ P.M. _____	Days Since Last Rain:
Weather Conditions: A.M. _____ P.M. _____	Photos? Yes ___ or No ___
Land Use in Drainage Area (Check all that apply):	
Industrial _____	Open Space _____
Urban Residential _____	Institutional _____
Suburban Residential _____	Other: _____
Commercial _____	Known Industries _____
Sample Location Narrative:	

Section 2: Infrastructure Description:

Type	Material	Shape	Dimensions	Submerged
<input type="checkbox"/> Closed Pipe	<input type="checkbox"/> RCP <input type="checkbox"/> PVC <input type="checkbox"/> CMP <input type="checkbox"/> Steel <input type="checkbox"/> Concrete <input type="checkbox"/> Other: _____	<input type="checkbox"/> Circular <input type="checkbox"/> Single <input type="checkbox"/> Elliptical <input type="checkbox"/> Double <input type="checkbox"/> Box <input type="checkbox"/> Triple <input type="checkbox"/> Other <input type="checkbox"/> Other	Diameter:	In water: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully With Sediment: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully
<input type="checkbox"/> Open Channel	<input type="checkbox"/> Concrete <input type="checkbox"/> Earthen <input type="checkbox"/> Riprap <input type="checkbox"/> Other: _____	<input type="checkbox"/> Trapezoid <input type="checkbox"/> Parabolic <input type="checkbox"/> other: _____	Top Width: Bottom Width: Depth:	Sketch
<input type="checkbox"/> Culvert	<input type="checkbox"/> Concrete <input type="checkbox"/> Corr. Metal <input type="checkbox"/> Rock <input type="checkbox"/> Other	<input type="checkbox"/> Circular <input type="checkbox"/> Box <input type="checkbox"/> Arch <input type="checkbox"/> Parabolic <input type="checkbox"/> Other	Approx. Dimensions H _____ W _____	Sketch

Grid Map ID: _____

Instrument No. _____

DO _____

Cond. _____

pH _____

Multiprobe _____

Section 3: Chemical Characteristics

	Temp °C	Temp (Dup) °C	Temp (Ave)	pH	pH (Dup)	pH (Ave)	Conductivity
Sample 1							
Sample 2							
	Conductivity (Dup)	Conductivity (Ave)	DO	DO (Dup)	DO (Ave)	Comments:	
Sample 1							
Sample 2							

	PO ₄	Chlorine	Detergents	Phenol	Copper	NH ₃	H ₂ S
Sample 1							
Sample 2							

** Note: if any analysis exceeds to minimum concentration on the comparator, go upstream to locate possible source of discharge. If discharge is discovered complete an Illicit Discharge Inspection Report.*

Section 4: Physical Characteristics

Are there any physical indicators present in flow? yes no (if no, skip to Section 5)

Indicator	Check if Present	Description	Relative Severity Index (1-3)		
			1	2	3
Odor		<input type="checkbox"/> Sewage <input type="checkbox"/> Rancid/sour <input type="checkbox"/> Sulfide <input type="checkbox"/> Petroleum/gas Other: _____	<input type="checkbox"/> 1 Faint	<input type="checkbox"/> 2 Easily Detected	<input type="checkbox"/> 3 Noticeable from a distance
Color		<input type="checkbox"/> Clear <input type="checkbox"/> Brown <input type="checkbox"/> Gray <input type="checkbox"/> Green <input type="checkbox"/> Orange <input type="checkbox"/> Yellow <input type="checkbox"/> Red Other: _____	<input type="checkbox"/> 1 Faint	<input type="checkbox"/> 2 Visible in sample bottle	<input type="checkbox"/> 3 Visible in outfall flow
Turbidity		See severity	<input type="checkbox"/> 1 Slight cloudiness	<input type="checkbox"/> 2 Cloudy	<input type="checkbox"/> 3 Opaque
Floatables ~other than trash!		<input type="checkbox"/> Sewage (toilet paper, etc.) <input type="checkbox"/> Suds <input type="checkbox"/> Petroleum <input type="checkbox"/> Other: _____	<input type="checkbox"/> 1 Few/Slight; origin not obvious	<input type="checkbox"/> 2 Some; indicators of origin (e.g., possible oil sheen).	<input type="checkbox"/> 3 Some; origin clear (e.g., obvious oil sheen, sanitary materials.).

INDICATOR SCORE (total from above): _____

Section 5: Physical Characteristics for Both Flowing and Non-Flowing Outfalls

Are any physical indicators that are not related to flow present? yes no (if no skip to Section 6)

Indicator	Check if present	Description	Comments
Damage @ Outfall Area		<input type="checkbox"/> Cracking or Chipping <input type="checkbox"/> Corrosion	
Deposits/ Stains		<input type="checkbox"/> oily <input type="checkbox"/> Flow line <input type="checkbox"/> Paint other: _____	
Abnormal Vegetation in Channel or Outfall		<input type="checkbox"/> Excessive <input type="checkbox"/> Abnormal	
Poor pool quality		<input type="checkbox"/> Odors <input type="checkbox"/> Colors <input type="checkbox"/> Suds <input type="checkbox"/> Floatables <input type="checkbox"/> Excessive algae <input type="checkbox"/> Oil Sheen Other: _____	
Alga Growth		<input type="checkbox"/> Brown <input type="checkbox"/> Orange <input type="checkbox"/> Green Other: _____	

City of Chattanooga Water Quality Program

Limiting Sanitary Sewer Seepage Plan



NDPES PERMIT # TN0068063

February 2013

Authorized By

Mounir Y. Minkara, Ph.D., P.E.

Revision

1

Date

June 13, 2011

Feb 6, 2013

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Limiting Sanitary Sewer Seepage

Section 3.2.3.4 of NPDES Permit Number TNS068063 requires the City of Chattanooga to develop an action plan that addresses the limitation of sanitary sewer seepage into the stormwater system and community waters. This plan will highlight programs and activities by which this requirement will be met.

[3.2.3.4 Limitation of Sanitary Sewer Seepage]

The permittee shall continue to develop and implement a program to reduce and eliminate the inflow, infiltration and discharge of sanitary sewage into the stormwater system and community waters. Corrective actions must follow an order of priority, as described in the plan. Field screening procedures, as described in 3.2.3.3, shall include tests to indicate the presence of any sanitary wastes. The locations of known sanitary sewer leaks to storm sewer shall be included in the Annual Report.

I. Sewer Lateral Assessment Program: SLAP

The fundamental objectives of the Sewer Lateral Assessment Program are: to ***identify*** potential sources of *illicit sanitary sewer discharge* into the Municipal Separate Storm Sewer System (MS4) and *stormwater inflow and infiltration (I/I)* into the Interceptor Sewer System (ISS), to thoroughly ***document*** discovered anomalies, to ***notify*** the responsible party/ property owner of the discovered anomalies, to ***enforce*** the repair of faulty sewer lateral lines, and to ***educate*** the public on program activities & preventative measures .

A. Identifying potential sources of illicit sanitary sewer discharges and stormwater inflow & infiltration

The Water Quality Program works with Waste Resources Division (WRD) to conduct smoke-testing throughout the City.

1. Liquid “smoke” (Hydrotreated Middle Distillate) is blown through the main sanitary sewer trunk line at a centrally located manhole.
2. Ground crews canvas the area looking for smoke emissions in areas other than through the sanitary vent lines of buildings. Smoke emitting from areas such as the ground, side walks, retaining walls, broken/ missing cleanout caps, foundations, etc. are quantified as *anomalies*.
3. When possible, broken/ missing cleanout caps are repaired/ replaced on site.

B. Documenting discovered anomalies

1. All anomalies are marked with water-soluble surveying paint, and documented in the field both by data sheets and photographs.
2. All data are later entered into an Access[®] database and a GIS geodatabase

C. Notifying responsible party of discovered anomalies

To notify property owners of the discovered anomalies, three separate types of notification letters are generated based on land use:

1. *Owners of rental properties* receive notification letters requiring repairs.

2. *Owners of self-occupied properties* are issued letters providing information regarding financial assistance for repairs to faulty sewer lateral lines through the Community Development Block Grant (CDBG).
3. *Owners of properties with anomalies corrected on site* are issued letters showing anomalies both before and after repairs.

D. Enforcing repairs of faulty sewer lines

Follow-up investigations are conducted to verify that anomalies have been repaired.

1. *Proper* repairs are documented in the Access[®] database, and GIS geodatabase.
2. Non-compliance with the *Notification Letters* results in issuance of *Written Warnings* and subsequent *Notice of Violation* (NOVs) letters. Property owners who fail to properly respond to previous notices are issued *Compliance Orders*, followed by *Court Citations*. Further details of enforcement can be found in the **Enforcement Response Plan** (ERP).

E. Educating the public

SLAP includes an educational component which consists of educational brochures and monthly educational meetings.

1. *All* property owners that are issued Notification and Cap Replacement letters receive a SLAP educational factsheet, a brochure containing specific facts and figures for the watershed in which the property lies, and a *Healthy Chattanooga* brochure, which contains general housekeeping measures.
2. Each property owner of *self-occupied properties* receives the same materials listed above and is also invited to attend an educational meeting. At these meetings the entirety of the program is explained and information on CDBG/City funding opportunities is provided. ([links to education materials](#))

II. Field Screening Procedures

Field screening is a supplemental element of the City's IDDE program, for the purpose of detecting illicit discharges and improper disposal into the City's stormwater system. Ammonia, phosphates, and chlorine are common elements found in sanitary waste; the testing for these chemical parameters is performed to indicate the possible presence of sanitary sewer leaks. (See [Field Screening Plan](#))

When enforcing the elimination of illicit discharges, the Water Quality program follows the guidelines of the Enforcement Response Plan, a component of the [IDDE Plan](#).

III. Mapping Sanitary Sewer Leaks

During heavy rain events, it is common for stormwater to enter the sanitary sewer system, thereby exceeding its capacity. In addition, debris, grease, or other various materials often cause blockages in sewer mains. As a result, there is great potential for *Sanitary Sewer Overflows* (SSOs) of considerable magnitude. The location of these events, along with illicit discharges of sanitary sewage will be reported annually.

City of Chattanooga Water Quality Program

Construction Site Stormwater Runoff Control Plan



NDPES PERMIT # TN0068063

February 2013

Authorized By

Mounir Y. Minkara, Ph.D., P.E.

Revision

1

Date

August 24, 2011

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3.2.4 Construction Site Stormwater Runoff Control

The goal of the Construction Stormwater management program is to implement planning procedures and enforcement mechanisms to reduce stormwater impacts resulting from areas of new development and significant redevelopment. To meet this line item, the City of Chattanooga/Public Works has a specialized office (the Land Development Office) that provides developers with both plans review and site inspection services.

Section 3.2.4 Construction Site Stormwater Runoff Control

The permittee shall continue to implement and enforce its existing construction site stormwater runoff control program, including detailing the following elements in the plan¹: 1) A description of requirements for structural and non-structural BMPs, 2) procedures for identifying priorities for inspecting construction sites and enforcing control measures which consider, for example, the nature of construction activity and the characteristics of soils and receiving water quality; and 3) educational and training measures for construction site operators. The permittee must have any updates to the program completed within 24 months of the effective date of the current Tennessee Construction General Permit.

Program Elements

Part 1 above.

In 2008, the City of Chattanooga, along with Hamilton County and the Town of Signal Mountain, published and promoted a BMP manual for public review. As a largely technical document, the manual provides descriptions of and requirements for structural and non-structural BMPs. The manual covers the application of structural BMPs for construction activity and property development. Such topics include filter berms, filter socks, sediment traps, silt fences, riprap, and detention basins. The Manual goes on to include Low Impact Design BMPs such as rain gardens, green roofs, and buffer strips. Non structural BMPs address stormwater runoff by integrating site design and planning techniques that preserve natural systems and hydrologic functions, protect open spaces, as well as conserve wetlands and stream corridors on a site. Nonstructural BMPs include: Cluster development, Minimize soil compaction, Minimize total disturbed area, Protect natural flow pathways, Protect riparian buffers, Protect sensitive areas, Reduce impervious surfaces, and Stormwater disconnection.

Presently, Chattanooga City Code Section 31-311(b)(4) states that to reduce the "first flush" pollutant load, "facilities shall be designed to capture the design storm in a detention or retention pond and achieve a ninety-six (96) hours drawdown time of the first three quarters (3/4) of an inch of the runoff". As part of developing the Runoff Reduction Standards requirement (3.2.5.2), the City will be updating the BMP manual to include Green Infrastructure practices and tools for engineers and landscape architects to comply with the requirements. The manual will be updated by May 2013, 24 months after the CGP was reissued. Such updates will also require that the first inch of rainfall must be 100% managed with no discharge to surface waters, following Permit Section 3.2.5.2. This will be complete by December 1, 2013.

¹ See 40 C.F.R. § 122.26(d)(2)(iv)(D)

Part 2 above.

Following Chattanooga City Code Sec. 31-320, all land disturbing activities will be in compliance with current City sediment and erosion control measures. Such measures will be verified via initial and frequent site inspections. Construction inspections are conducted in accordance with City of Chattanooga Stormwater Management *Erosion and Sediment Inspector Manual* August 31, 2004 and *Construction Site inspection Standard Operating Procedures* January 31, 2005. During the site inspection, it is the responsibility of the Soil Engineering Specialist/Inspector to insure that all structural site erosion controls (BMPs) have been installed according to the approved plans. These internal documents will be revised and updated as necessary.

Site inspections are conducted on a routine basis throughout the duration of land-disturbing activity. Inspections are scheduled based on project phase (i.e., during heavy grading activity more frequent inspections are required, once interior building activity has begun less frequent inspections are required). When prioritizing construction sites, consideration is given to: How recently the permits were issued, Frequency of construction activity, Proximity to sensitive habitat, Public concern, Site terrain and Soil Characteristics, Nature of project, Duration of project, and Intensity of project schedule.

Part 3 above.

The City of Chattanooga distributes educational materials aimed at informing construction operators who will be disturbing land within the MS4 boundary on appropriate selection, installation, implementation and maintenance of control measures, as well as overall program requirements. Materials here refer to items such as brochures, letters, and other tangible products. Such materials will be dispersed throughout the building permit application process. Materials will also continue to be distributed at educational events specific to construction activities and land disturbances. Applicable events will include the TN Chapter of the American Planning Association Meetings, Tri-State Homebuilders Association Home Show, and other local and/or regional relevant expositions.

In addition to educational materials, program staff have and will continue to host training events and workshops identifying and promoting local regulations, acceptable lines of products, low impact designs, and sustainable growth. The City of Chattanooga will continue to co-host the Level I Tennessee Erosion Prevention and Sediment Control Training and Certification Program for Construction Sites. This one-day training targets contractors, developers, inspection and enforcement personnel, plan preparers, reviewers, designers and engineers. All events and material distribution will coincide with the Education Plan for Construction Activities.

BMP	Description	Measurable Goal				
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Establish BMP requirements	Implement a program requiring erosion and sediment controls at construction sites and regulatory mechanisms providing for sanctions to ensure compliance.	Continue to implement program and enforce ordinance	Continue to implement program and enforce ordinance	Continue to implement program and enforce ordinance	Update City Code to match CGP requirement	Continue to implement program and enforce ordinance
Inspect Land Disturbance Activities	Establish procedures for site inspection and enforcement of control measure requirements. The procedures will include prioritizing areas of inspections based on local criteria.	Continue Land Disturbance Inspections and Enforcement throughout City jurisdiction, as needed.				
Develop and Implement educational and training measures for construction site operators	Provide educational and training materials for construction site operators.	Provide annual erosion and sediment control training for developers and contractors. Continue to provide education materials to contractors.				

In addition to the Permit language above, the City of Chattanooga will address the following line items:

The permittee must maintain an inventory of all active public and private construction sites that result in a total land disturbance as defined in this section.

The City of Chattanooga uses an ACCELA database management interface to track permits and plans that have been submitted for review. This system includes specific inputs for the stormwater site plan, including the size of the site, whether it has a state- or EPA-issued NPDES construction permit, and the review status of the stormwater site plan. The system also tracks information on inspection and enforcement actions related to that site and identifies the construction site operator. This database will be available for review.

The permittee must require that operators control wastes such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site to avoid adverse impacts to water quality.

Any site plan reviewed by the City of Chattanooga must describe the type of construction site waste found at the site (such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste) and how that waste will be controlled to minimize adverse impacts to water quality. For example, concrete washout and trash storage areas shall be clearly labeled on the plan and should be located away from water bodies and catch basin inlets.

The permittee procedures must include an evaluation of plan completeness and overall BMP effectiveness.

Plans are and will be reviewed for compliance with city water quality and land disturbance requirements including, but not limited to, measures that:

1. Minimize Clearing and Grading
2. Protect Waterways
3. Phase Construction to Limit Soil Exposure
4. Stabilize Exposed Soils
5. Protect Steep Slopes and Cuts.
6. Perimeter Controls to Filter Sediments
7. Sediment Settling Controls
8. Post Construction Water Quality Measures
9. Control Waste at the Construction Site
10. Inspect and Maintain BMPs

The permittee must have mechanisms for public access to information on projects and receiving and considering comments from the public on those projects. It is recommended that the permittee uses the world wide web for facilitating public involvement.

The City complies with TORA (Tennessee Open Records Act) to provide information upon request on select land disturbance projects. Additionally, Land disturbing (blue) signs are issued and posted at sites that have a land disturbing permit. These signs are used for identification and for public information about the construction site. Additionally, the City supported 311 call system allows for immediate public comment and concerns. This system also generates reports and work orders for inspector follow-up. Such tools and policies will continue to be employed to disperse information on construction projects.

The permittee must have procedures in place for its inspectors to evaluate construction site compliance. The ERP must include specific enforcement steps to ensure construction sites are in compliance with the MS4's program.

As noted above, construction inspections will continue to be conducted in accordance with City of Chattanooga Stormwater Management *Erosion and Sediment Inspector Manual* August 31, 2004 and *Construction Site Inspection Standard Operating Procedures* January 31, 2005. During the routine site inspections, all structural site erosion controls (BMPs) will be visually inspected to ensure that they have been installed according to the approved plans.

A typical inspection will evaluate and confirm the following elements:

1. Erosion and sediment control measures in the approved plan have been properly installed and maintained.
2. Erosion is being controlled.
3. Off-site sedimentation is being prevented.
4. No turbidity in adjacent streams is being generated.

In response to the enforcement requirement, the City of Chattanooga passed Ordinance Number 9942 establishing city regulation and enforcement oversight regarding stormwater management. Sections 31-344-346 of Ordinance Number 9942 define the administrative enforcement remedies available to the Stormwater Manager to assure its compliance. The reader is deferred to the specific City Ordinance at <http://www.chattanooga.gov/cd-enforcementprotocol.pdf>

Inspectors must maintain certification under the Tennessee Fundamentals of Erosion Prevention and Sediment Control, Level 1. Site plan reviewers must receive a certificate of completion from the

Tennessee Erosion Prevention and Sediment Control Design Course, Level 2. It is recommended that MS4 staff receive training under both courses.

Water Quality and Land Development staff actively seek and attend professional development opportunities as they relate to the sediment and erosion control, water quality, water quantity, construction regulations, industrial pre-treatment regulations, data management, data analysis, and administrative fields. Presently all staff in these divisions are certified under Level 1 and will continue to stay current as recertification is needed. Several staff in these divisions, including all site inspectors and plans reviewers are certified under Level 2. All certification documentation is and will be available for review.

City of Chattanooga Water Quality Program

Permanent Stormwater Management in New Development and Redevelopment



NDPES PERMIT # TN0068063

February 6, 2013

Authorized By:

Revision

Date

1

June 13, 2011

February 6, 2013

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2-7-13

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Permanent Stormwater Management in New Development and Redevelopment

Program Background

The goal of the Post-Construction Stormwater management program is to implement planning procedures and enforcement mechanisms to reduce stormwater impacts resulting from areas of new development and significant redevelopment.

Section 3.2.5.1 Permit Requirements

The permittee must develop, implement, and enforce controls to reduce the discharge of pollutants from the MS4 which receive discharges from areas of new development and significant redevelopment that disturbs greater than or equal to one acre. This includes projects less than one acre that are part of a larger common plan of development or sale, which discharge into the MS4. The program must ensure that controls are in place that would prevent or minimize water quality impacts. This includes:

- 1) *Develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs) appropriate for Chattanooga.*
- 2) *Develop and implement a set of requirements to establish, protect and maintain water quality buffer along all streams at new development and redevelopment projects.*
- 3) *Use an Ordinance or other regulatory mechanism to address permanent runoff from new development and redevelopment projects. The City's ordinance must allow for penalties as specified in TCA 68-221-1106.*
- 4) *Develop a strategy to ensure adequate long-term operation and maintenance of permanent BMPs.*

Program Elements

Part 1 above. *Develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs) appropriate for Chattanooga.*

- Existing City of Chattanooga Code requires that new developments and significant redevelopments incorporate stormwater management BMPs onsite in order to reduce the impacts associated with stormwater runoff generated at the site.
- City Code requires a Pollution Prevention Plan, which may require the facility to implement structural and non-structural BMPs, from any existing Industrial, Commercial, Institutional, and multi-family or group facility. In addition, City Code requires that all new Industrial, Commercial, Institutional, and multi-family or group facilities obtain a Chattanooga Stormwater Discharge Permit prior to the construction of the facility. This includes reducing the “first flush” pollutant load by requiring all detention ponds to achieve a 96 hour draw down time for the first three quarters (3/4) inch of runoff. Also, a grit trap or oil separator is required upstream of any detention or retention pond.
- The City co-published a BMP manual that sets forth minimum design criteria applicable to the local environment and regulatory standards.
- The City has developed a BMP Credit program to incentivize on-site structural and non-structural BMPs.

PERMIT YEAR				
2011	2012	2013	2014	2015

Review Code and BMP Manual	Develop Code that addresses new requirements for Volume Reduction	Implement New Standards and Revise BMP Manual to reflect new requirements
Continue to revise BMP Credit Program as Needs Arise		

Part 2 above. *Develop and implement a set of requirements to establish, protect and maintain water quality buffer along all streams at new development and redevelopment projects.*

- The City will begin evaluation of the requirements to establish, protect and maintain water quality buffer for new construction and significant redevelopment in the first permit year.
- Current progress towards establishing and maintaining water quality buffer can be found within the BMP credit program.

PERMIT YEAR				
2011	2012	2013	2014	2015
Begin evaluation of the water quality buffer requirement	Con't. evaluation of the water quality buffer requirement	Develop new standards for water quality buffer		Implement New Standards
Continue to address and revise water quality buffer requirements within the BMP Credit process				

Part 3 above. *Use an Ordinance or other regulatory mechanism to address permanent runoff from new development and redevelopment projects. The City's ordinance must allow for penalties as specified in TCA 68-221-1106.*

- Existing City Code (Sections 31.310 & 31.311) requires that the first flush be treated and that off-site discharges will be computed for the 25 year return frequency and Soil Conservation Service (SCS Type II) design.
- Current Penalties are defined under City Code section 31-346 and the current enforcement protocol ([link](#)).
- The Revisions for Volume Reductions will be met under the New Standards Revision (See Section 2).

PERMIT YEAR				
2011	2012	2013	2014	2015

Review existing enforcement actions	Amend existing Code to reflect necessary permit requirements	Implement New Enforcement Actions
-------------------------------------	--	-----------------------------------

Part 4 above. *Develop a strategy to ensure adequate long-term operation and maintenance of permanent BMPs.*

- Update current Database for tracking/monitoring existing and new BMPs within first year of permit (See Section 3.2.5.5).
- Updated the existing maintenance agreement form (See Section 3.2.5.8)
- Develop owner/operator inspections within the third and fourth permit year (See Section 3.2.5.7).
- Continuing post-construction BMP inspections

PERMIT YEAR				
2011	2012	2013	2014	2015
Update existing BMP tracking database Update maintenance agreement form		Developing owner/operator inspections process		Implement owner/operator inspections
Continue New and Existing BMP Inspections				

Section 3.2.5.5 Maintenance Agreements

All stormwater BMPs, including BMPs used at mitigation projects, installed and implemented to meet the performance standards of subsection 3.2.5.2 must be maintained in perpetuity. The permittee must ensure the long-term maintenance of these stormwater BMPs through a local ordinance or other enforcement policy. This policy must include, at a minimum, the following:

- 1) *Owner(s) or Operator(s) are required to develop and implement a maintenance agreement addressing any maintenance requirements for any BMPs, including off-site mitigation. The agreement must allow the permittee, or its designee. To conduct inspections of the stormwater BMPs and also to account for transfer of responsibility in leases and/or deeds.*
- 2) *Inadequacies within the agreement will be noted and the permittee will promptly notify the BMP owner or operator of any deficiencies. The BMP owner must initiate corrective action within 30 days of the notice.*
- 3) *The agreement must allow the permittee, or its designee, to perform necessary maintenance or corrective actions neglected by the property owner/operator, and bill or recoup costs from the property owner/ operator when the owner/operator has not performed the necessary maintenance within 30 days of notification by the permittee or its designee.*
- 4) *Where practices are on Public property or within public rights-of-way the MS4 must document that appropriate maintenance have been completed.*
- 5) *All modified or relocated BMPs must be maintained pursuant to the requirements of this section.*

Parts 1-5 above. Develop a BMP maintenance agreement for owner operators that will address the maintenance requirements set forth in Section 3.2.5.5, including offsite mitigation.

- In 2006 the City adopted a maintenance agreement under City Code Section 31-311(b).
- April/May 2011 updated existing Long-Term Inspection and Maintenance Plan to accommodate all requirements set forth in Section 3.2.5.5 (include copy in Appendix)

PERMIT YEAR				
2011	2012	2013	2014	2015
Updated Existing Long-Term Inspection and Maintenance Plan	-----Completed-----			

Section 3.2.5.5.1 Verification of Maintenance Responsibilities

The permittee must require that the property owners or operators of any sites subject to the performance standards in sub-section 3.2.5.2 provide verification of maintenance for the approved stormwater BMPs used to comply with the performance standards. The City has chosen, based on applicability, the following:

- 1) The owner/operators signed statement accepting responsibility for maintenance with a provision for transferring maintenance responsibility if the property is legally transferred to any other party.
- 2) Any other legally enforceable agreement that assigns permanent responsibility for the maintenance of runoff reduction and pollutant reduction stormwater BMPs, including, but not limited to a BMP permit tracking system developed by the permittee.

Part 1 above. The owner/operators signed statement accepting responsibility for maintenance with a provision for transferring maintenance responsibility if the property is legally transferred to any other party.

- The Long-Term Maintenance Agreement that is defined under Section 3.2.5.5 will set forth the owner/operator responsibility for maintenance and provides a provision for those properties that are legally transferred. (see Long-Term Maintenance Agreement include copy in Appendix)

Part 2 above. Any other legally enforceable agreement that assigns permanent responsibility for the maintenance of runoff reduction and pollutant reduction stormwater BMPs, including, but not limited to a BMP permit tracking system developed by the permittee.

- The City is developing a BMP Database and Tracking Tool that will track responsible parties as well as the requirements in sections 3.2.5.1 Part 4 and 3.2.5.5.

Section 3.2.5.7 Owner/Operator Inspections

The owner/operator shall perform routine annual inspections to ensure that the BMPs are properly functioning. These inspections shall be conducted by a person familiar with the control measures implemented at a site. Owners or operators shall maintain documentation of these inspections.

The owner/operator shall have comprehensive inspections conducted of all stormwater management facilities and practices once every 5 years, at a minimum. Such inspections must be conducted by either a professional engineer or landscape architect. Complete inspection reports for these five year inspections shall include:

- 1) *Facility type,*
- 2) *Inspection date,*
- 3) *Latitude and Longitude and nearest street address,*
- 4) *BMP owner information (e.g. name, address, phone number, fax, and email),*
- 5) *A description of BMP condition including: vegetation and soils; inlet and outlet channels and structures; embankments, slopes, and safety benches; spillways, weirs, and other control structures; and any sediment and debris accumulation,*
- 6) *Photographic documentation of BMPs, and*
- 7) *Specific maintenance items or violations that need to be corrected by the BMP owner along with deadlines and reinspection dates.*

Parts 1-7 above. Owner/Operator Inspections

- These will be implemented with the new Volume Reduction Standards

PERMIT YEAR				
2011	2012	2013	2014	2015
Developing Standards Reviewing Owner/Operator Inspection procedure		Implementing Owner/Operator Inspections		Complete

Section 3.2.5.8 BMP Maintenance

Through a local ordinance or other enforceable policy the permittee shall outline in the plan a program for enforcing proper BMP operation and maintenance. The plan shall require, at a minimum:

- 1) *BMP owners to maintain, and promptly repair as necessary, all structural BMPs.*
- 2) *Where practices are on public property or within public rights-of-way the permittee must document, e.g. with photo's, maintenance logs, contractor invoices, and in the tracking system, that appropriate maintenance and/or repairs have been made.*

Part 1 above. BMP owners to maintain, and promptly repair as necessary, all structural BMPs.

- This will be met by means of the Long-term Inspection and Maintenance Plan outlined in Section 3.2.5.5.

Part 2 above. Where practices are on public property or within public rights-of-way the permittee must document, e.g. with photo's, maintenance logs, contractor invoices, and in the tracking system, that appropriate maintenance and/or repairs have been made.

- This will be met by means of the BMP Tracking Tool (section 3.2.5.1 Part 4 and 3.2.5.5) that will be used for both public and private BMP tracking.