



# Illicit Discharge Detection and Elimination

*A Guidance Manual for  
Program Development and Technical Assessments*

by the  
Center for  
Watershed Protection

and  
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University of Alabama

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# Notice

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Figure Number	Source
2 . . . . .	Snohomish County, WA
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8 . . . . .	Dr. Robert Pitt, University of Alabama
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18. . . . .	Horsley Whitten
28 (fire hydrant) . . . . .	Fort Worth DEM
34 (highly turbid discharge) . . . . .	Rachel Calabro, Massachusetts Department of Environmental Protection
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34 (paint) . . . . .	Dr. Robert Pitt
34 (Toronto industrial spill). . . . .	Dr. Robert Pitt
34 (blood) . . . . .	Fort Worth DEM
34 (failing septic). . . . .	Snohomish County, WA
34 (construction site). . . . .	Don Green, Franklin, TN
34 (discharge of rinse water). . . . .	Rachel Calabro
35 (natural foam). . . . .	Snohomish County, WA
35 (high severity suds). . . . .	Fort Worth DEM
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## Foreword

A number of past projects have found that dry-weather flows discharging from storm drainage systems can contribute significant pollutant loadings to receiving waters. If these loadings are ignored (by only considering wet-weather stormwater runoff, for example), little improvement in receiving water conditions may occur. Illicit dry-weather flows originate from many sources. The most important sources typically include sanitary wastewater or industrial and commercial pollutant entries, failing septic tank systems, and vehicle maintenance activities.

Provisions of the Clean Water Act (1987) require National Pollutant Discharge Elimination System (NPDES) permits for storm water discharges. Section 402 (p)(3)(B)(ii) requires that permits for municipal separate storm sewers shall include a requirement to effectively prohibit problematic non-storm water discharges into storm sewers. Emphasis is placed on the elimination of inappropriate connections to urban storm drains. This requires affected agencies to identify and locate sources of non-storm water discharges into storm drains so they may institute appropriate actions for their elimination.

This Manual is intended to provide support and guidance, primarily to Phase II NPDES MS4 communities, for the establishment of Illicit Discharge Detection and Elimination (IDDE) programs and the design and procedures of local investigations of non-

storm water entries into storm drainage systems. It also has application for Phase I communities looking to modify existing programs and community groups such as watershed organizations that are interested in providing reconnaissance and public awareness services to communities as part of watershed restoration activities.

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Some references in the document pertain to work conducted during this project. This internal support information was developed as work tasks were completed and research findings were developed. In some cases, memoranda or technical support documents were prepared. Most of these documents are in “draft” form and have not been published. As a result, they should be considered supplemental and preliminary information that is not intended for widespread citation or distribution. In the References section, these documents are identified as “IDDE project support material” at the end of each citation. Interested readers can access these documents through the website link to the project archive and support information.



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# Introduction

An up-to-date and comprehensive manual on techniques to detect and correct discharges in municipal storm drains has been unavailable until now. This has been a major obstacle for both Phase I and Phase II National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) communities that must have programs in place that detect, eliminate, and prevent illicit discharges to the storm drain system. Smaller Phase II communities, in particular, need simple but effective program guidance to comply with permits issued by the Environmental Protection Agency (EPA) and states. This manual provides communities with guidance on establishing and implementing an effective Illicit Discharge Detection and Elimination (IDDE) program.

Studies have shown that dry weather flows from the storm drain system may contribute a larger annual discharge mass for some pollutants than wet weather storm water flows (EPA, 1983 and Duke, 1997). Detecting and eliminating these illicit discharges involves complex detective work, which makes it hard to establish a rigid prescription to “hunt down” and correct all illicit connections. Frequently, there is no single approach to take, but rather a variety of ways to get from detection to elimination. Local knowledge and available resources can play significant roles in determining which path to take. At the very least, communities need to systematically understand and characterize their stream, conveyance, and storm sewer infrastructure systems. When illicit discharges are identified, they need to be removed. The process is ongoing

and the effectiveness of a program should improve with time. In fact, well-coordinated IDDE programs can benefit from and contribute to other community-wide water resources-based programs, such as public education, storm water management, stream restoration, and pollution prevention.

This manual incorporates the experience of more than 20 Phase I communities that were surveyed about their practices, levels of program effort, and lessons learned (CWP, 2002). These communities took many different approaches to solve the IDDE problem, and provided great insights on common obstacles, setting realistic expectations and getting a hard job done right. Many of the IDDE methods presented in this manual were first developed and tested in many Phase I communities. Specific techniques applied in a community should be adapted to local conditions, such as dominant discharge types, land use, and generating sites.

Designed with a broad audience in mind, including agency heads, program managers, field technicians and water quality analysts, this manual is primarily focused on providing the thousands of Phase II communities that are now in the process of developing IDDE programs with guidance for the development and implementation of their own programs. The manual has been organized to address the broad range of administrative and technical considerations involved with setting up an effective IDDE program. The first 10 chapters of the Manual focus on “big picture” considerations needed to successfully get an IDDE program off

the ground. The final four chapters provide detailed technical information on the methods to screen, characterize and remove illicit discharges in MS4 communities. These chapters present the state-of-the-practice on specific monitoring techniques and protocols.

In general, the content of this manual gets progressively more complex and technical toward the end. The basic organization of the manual is outlined below. The information is provided to help:

- Define important terminology and understand key illicit discharge concepts
- Conduct an audit to understand community needs and capabilities
- Establish adequate legal authority
- Develop a tracking system to map outfalls and document reported illicit discharges
- Conduct desktop analyses to prioritize targets for illicit discharge control
- Conduct rapid reconnaissance of the stream corridor to find problem outfalls
- Apply new analytical and field methods to find and fix illicit discharges
- Educate municipal employees and the public to prevent discharges
- Estimate costs to run a program and conduct specific investigations

**Chapter 1. The Basics of Illicit Discharges–**

The many different sources and generating sites that can produce illicit discharges are described in Chapter 1. The chapter also outlines key concepts and terminology needed to understand illicit discharges, why they cause water quality problems and the regulatory context for managing them.

**Chapter 2. Components of an Effective Illicit Discharge Program–** This chapter presents an overall framework to build an IDDE program, by outlining eight key components of good programs. Each of the following eight chapters is dedicated to a key program component. The first page of the program component chapters is notated with a puzzle icon labeled with the applicable program component number.

**Chapter 3. Audit Existing Resources and Programs–** This chapter provides guidance on evaluating existing resources, regulations, and ongoing activities in your community to better address illicit discharges.

**Chapter 4. Establish Responsibility, Authority and Tracking–** This chapter presents guidance on how to identify the local agency who will be responsible for administering the IDDE program, and how to establish the legal authority to control illicit discharges by adapting an existing ordinance or adopting a new one. The chapter also describes how to set up a program tracking system needed to document discharges and local actions to respond to them.

**Chapter 5. Desktop Assessment of Illicit Discharge Potential–** The fifth chapter describes desktop analyses to process available mapping data to quickly characterize and screen illicit discharge problems at the community and subwatershed scale. Key factors include water quality, land use, development age, sewer infrastructure and outfall density. Rapid screening techniques are presented to define where to begin searching for illicit discharge problems in your community.

**Chapter 6. Developing Program Goals and Implementation Strategies–**

Communities are required to establish and track measurable goals for their IDDE program under the NPDES MS4 permit program. This chapter recommends a series of potential program goals that can guide local efforts, as well as guidance on how to measure and track progress toward their achievement.

**Chapter 7. Searching for Illicit Discharge Problems in the Field**– This chapter briefly summarizes the major monitoring techniques to find illicit discharges, and discusses how to select the right combination of monitoring methods to incorporate into your local program.

**Chapter 8. Isolating and Fixing Individual Illicit Discharges**– The methods used to find and remove illicit discharges are briefly described in this chapter and include citizen hotlines and techniques to trace, locate and remove illicit discharge sources.

**Chapter 9. Preventing Illicit Discharges**– Prevention is a cost effective way to reduce pollution from illicit discharge. This chapter highlights a series of carrot and stick strategies to prevent illicit discharges.

**Chapter 10. IDDE Program Evaluation**– IDDE programs must continually evolve to changing local conditions. This chapter describes how to review and revisit program goals to determine if they are being met and to make any needed adjustments.

**Chapter 11. The Outfall Reconnaissance Inventory (ORI)**– The chapter presents detailed protocols to conduct rapid field screening of problem outfalls. The chapter also outlines the staff and equipment costs needed to conduct an ORI, and presents methods to organize, manage and interpret the data you collect.

**Chapter 12. Chemical Monitoring**– This chapter presents detailed guidance on the wide range of chemical monitoring options that can be used to identify the composition of illicit discharge flows. The chapter begins by describing different chemical indicators that have been used to identify illicit discharges, and presents guidance on how to collect samples for analysis. The chapter recommends a flow chart approach that utilizes four chemical indicators to distinguish the flow type. The chapter provides specific information on other analytical methods that can be used, as well as proper safety, handling, and disposal procedures. Simple and more sophisticated methods for interpreting monitoring data are discussed, along with comparative cost information.

**Chapter 13. Tracking Discharges to Their Source**– This chapter describes how to investigate storm drain systems to narrow and remove individual illicit discharges. These techniques include “trunk” investigations (e.g., video surveillance, damming, and infiltration and inflow studies) and on-site investigations (e.g., dye tests, smoke tests, and pollution prevention surveys). The pros and cons of each investigation technique are discussed, and comparative cost estimates are given.

**Chapter 14. Techniques to Fix Discharges**– This chapter provides tips on the best methods to repair or eliminate discharges. Specific advice is presented on how to identify responsible parties, develop pre-approved subcontractor lists, and estimate unit costs for typical repairs.

**Appendices**– Eleven technical appendices are provided at the end of the manual.

