Chapter 1

Introduction

This Report to Congress presents U.S. Environmental Protection Agency's (EPA or "the Agency") most recent and comprehensive characterization of combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs), including the extent of human health and environmental impacts caused by CSOs and SSOs, the resources spent by municipalities to address these impacts, and the technologies used by municipalities to address these impacts. This report has been prepared in direct response to a congressional mandate established in December 2000 in the Consolidated Appropriations Act for Fiscal Year 2001, P.L. 106-554, which requires that:

> *Not later than 3 years after the date of enactment of this Act, the Administrator of the Environmental Protection Agency shall transmit to Congress a report summarizing–*
>
> *(A) the extent of human health and environmental impacts caused by municipal combined sewer overflows and sanitary sewer overflows, including the location of discharges causing such impacts, the volume of pollutants discharged, and the constituents discharged;*
>
> *(B) the resources spent by municipalities to address these impacts; and*
>
> *(C) an evaluation of the technologies used by municipalities to address these impacts.*

EPA prepared this report between March 2002 and July 2004. During this time, EPA developed a methodology; collected data from federal, state, and local sources; performed analyses; coordinated with stakeholders; and wrote this report. Data collection was completed in early fall 2003, and select analyses were updated in mid-2004. This report is the second Report to Congress required as part of P.L. 106-554. The first report was EPA's *Report to Congress–Implementation and Enforcement of the Combined Sewer Overflow Control Policy* (EPA 833-R-01-003).

P.L. 106-554 also requires EPA to develop and maintain a clearinghouse of technologies for addressing the impacts of CSO and SSO discharges.

In this chapter:

Typical CSO outfall discharge following a storm.

Photo: NJ Department of Environmental Protection

EPA expects that information provided in this Report to Congress will be the basis for the clearinghouse when it is developed.

1.1 What are CSOs and SSOs?

In the United States, two types of public sewer systems predominate: combined sewer systems (CSSs) and sanitary sewer systems (SSSs).

A CSS is a wastewater collection system owned by a municipality (as defined by Section 502(4) of the Clean Water Act) that conveys domestic, commercial, and industrial wastewater and storm water runoff through a single pipe system to a publicly-owned treatment works (POTW).

An SSS is a wastewater collection system owned by a municipality that conveys domestic, commercial, and industrial wastewater, and limited amounts of infiltrated groundwater and storm water to a POTW. Areas served by SSSs often have a municipal separate storm sewer system (MS4) to collect and convey runoff from rainfall and snowmelt.

1.1.1 CSOs

The term "CSO" refers to a discharge from a CSS at a point prior to the POTW treatment plant. CSOs generally occur in response to wet weather events; that is, during and following periods when rainfall or snowmelt drain to the CSS. Most CSSs are designed to discharge flows that exceed conveyance capacity directly to receiving waterbodies, such as rivers, streams, estuaries, and coastal waters.

CSSs can also back up into buildings, including private residences. When backups are caused by problems in the publicly owned portion of a CSS, they are considered unauthorized discharges.

CSO discharges include a mix of domestic, commercial, and industrial wastewater, and storm water runoff. As such, CSO discharges contain human, commercial, and industrial wastes as well as pollutants washed from streets, parking lots, and other surfaces. EPA's 1994 CSO Control Policy (59 FR 18688) provides a comprehensive national strategy to ensure municipalities, NPDES permitting authorities, water quality standards authorities, EPA, and the public to engage in a coordinated planning effort to achieve cost-effective CSO controls that ultimately meet the requirements of the Clean Water Act (EPA 1994a). The text of the CSO Control Policy is provided in Appendix A. In 2000, P.L. 106-554 amended the Clean Water Act by adding the following to Section 402:

> *(q)(1) Each permit, order, or decree issued pursuant to this Act after the date of enactment of this subsection for a discharge from a municipal combined storm and sanitary sewer shall conform to the CSO Control Policy signed by the Administrator on April 11, 1994.*

EPA's *Report to Congress–Implementation and Enforcement of the Combined Sewer Overflow Control Policy* identified CSSs in 32 states (including the District of Columbia) across nine EPA regions (EPA 2001a). As of July 2004, those 32 states had issued 828 permits to 746 communities.

1.1.2 SSOs

The term "SSO" refers to untreated or partially treated sewage releases from an SSS.

SSOs have a variety of causes, including, but not limited to, severe weather, blockages, line breaks, power failures, lapses in sewer system operation and maintenance, inadequate sewer design and construction, and vandalism. SSO discharges typically contain a mix of domestic, commercial, and industrial waste. SSOs can pose challenging public health and environmental issues when they occur.

SSOs include those overflows that reach waters of the United States, as well as overflows out of manholes and onto city streets, sidewalks, and other terrestrial locations. A limited number of municipalities have regular SSO discharges from fixed points within the sewer system. SSSs can back up into buildings, including private residences. When backups are caused by problems in the publicly-owned portion of an SSS, they are considered SSOs.

SSOs that reach waters of the United States are point source discharges, and, like other point source discharges from municipal SSSs, are prohibited unless authorized by an National Pollutant Discharge Elimination System (NPDES) permit. Moreover, SSOs, including those that do not reach waters of the United States, may be indicative of improper operation and maintenance of the sewer system, and thus may violate NPDES permit conditions. EPA has focused on SSO problems with compliance assistance and enforcement activities in accordance with the *Compliance and Enforcement Strategy Addressing Combined Sewer Overflows and Sanitary Sewer Overflows*, issued April 27, 2000 (EPA 2000b). In addition, EPA is evaluating options for improving NPDES permit requirements for SSOs and municipal SSSs.

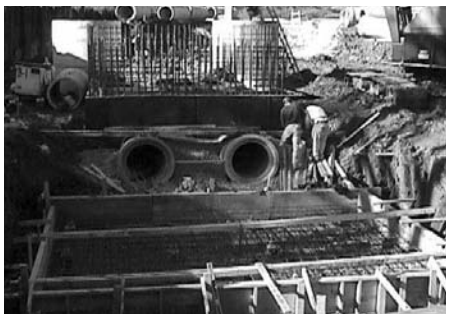
EPA's *2000 Clean Watersheds Needs Survey Report to Congress* reported 15,582 municipal SSSs providing wastewater collection, conveyance, and treatment are presently operating within the 50 states and the District of Columbia (EPA 2003b). EPA also identified an additional 4,846 satellite SSSs providing only collection and conveyance. Not all of these hold NPDES permits (EPA 2003b). If not properly maintained, satellite systems have the potential to have an SSO or to cause an SSO in downsewer systems.

Since the passage of the Clean Water Act in 1972, all levels of government have made substantial investments in the nation's wastewater infrastructure.

Photo: City of Chicago

1.2 How is this Report Organized?

The purpose of this report is to respond to Congress with a current characterization of the volume, frequency, and location of CSOs and SSOs, the extent of human health and environmental impacts caused by CSOs and SSOs, the resources spent by municipalities to address these impacts, and the technologies used to address these impacts. The report contains 10 chapters; the content and purpose of which are summarized below.



Sewer separation is one of the most often used CSO controls. The separation project shown here is underway in Louisville, Kentucky.

Photo: Louisville-Jefferson County Metropolitan Sewer District

Chapter 2 summarizes the history of regulatory efforts to control CSOs and SSOs. It describes federal water pollution control legislation, paying particular attention to Clean Water Act requirements for secondary treatment and pretreatment, the Construction Grants Program, and amendments to the Clean Water Act made by P.L. 106-554.

Chapter 3 describes the methodology used to develop this Report to Congress. In order to report on impacts, resources spent to address impacts, and the technologies applied to control CSOs and SSOs, EPA designed and implemented a comprehensive approach to gather the necessary data and information. This effort included an extensive literature search, site visits to EPA regional offices and states, interviews with state and local officials, an experts workshop, and outreach to stakeholders.

Chapter 4 characterizes the pollutants present in CSO and SSO discharges and identifies other watershed sources of these pollutants. This chapter describes the universe of CSS and SSS permittees under the NPDES program. The chapter also summarizes information on the volume, frequency, and location of CSOs and SSOs, as well as the most common causes of SSOs.

Chapter 5 describes the types of environmental impacts attributable to CSO and SSO discharges in terms of water quality standards violations and lost uses (i.e., closures of shellfish beds and beaches). This chapter also discusses the extent of environmental impacts caused or contributed to by CSO and SSO discharges. National data are used to describe the extent of environmental impacts. State and local data are used to illustrate site-specific examples of impacts.

Chapter 6 describes waterborne diseases and other potential human health impacts associated with exposure to the pollutants found in CSO and SSO discharges. The chapter summarizes mechanisms at the federal, state, and local levels for reporting and tracking these impacts. In addition, the chapter describes different techniques used to communicate the risk associated with exposure to CSO and SSO discharges and how these risks can be minimized or prevented.

Chapter 7 summarizes federal and state activities to regulate CSOs and SSOs to minimize impacts associated with discharges. The chapter reports on the issuance of permits and other enforceable orders requiring control of CSOs or elimination of SSOs. This chapter also summarizes technical assistance provided by federal and state governments to assist municipalities in controlling CSOs and SSOs.

Chapter 8 surveys the technologies most widely used to control CSO and SSO discharges, including: operation and maintenance practices, sewer system controls, storage facilities, treatment technologies, and low-impact development techniques. The chapter also describes effective combinations of technologies as well as emerging practices that show particular promise in the control of CSOs and SSOs.

Chapter 9 provides information on the resources spent by municipalities to control CSO and SSO discharges, including a discussion of the national investment in wastewater infrastructure. Specific information from select municipalities on expenditures related to CSO and SSO control is presented. The chapter summarizes projected financial needs for municipalities to meet current regulatory requirements for CSO and SSO control and discusses available sources of funding to address impacts of CSOs and SSOs.

Chapter 10 summarizes report findings and key considerations for EPA in shaping future regulations and program activities aimed at CSO and SSO control.