NOTE TO READERS:

The Administrator signed the following Notice of Proposed Rulemaking on January 4, 2001, and EPA has submitted it for publication in the *Federal Register*. While the Agency has taken steps to ensure the accuracy of this Internet version of the rule, it is not the official version of the rule for purposes of public comment. Please refer to the official version in a forthcoming *Federal Register* publication or on the Government Printing Office's Web Site. You can access the *Federal Register* at: http://www.access.gpo.gov/su_docs/aces/aces140.html. Once GPO publishes the official *Federal Register* version of the rule, EPA will provide a link to that version at its web site.

ENVIRONMENTAL PROTECTION AGENCY
40 CFR Parts 122 and 123
[FRL]
National Pollutant Discharge Elimination System (NPDES) Permit Requirements for Municipal Sanitary Sewer Collection Systems, Municipal Satellite Collection Systems, and Sanitary Sewer Overflows

AGENCY: Environmental Protection Agency (EPA)

ACTION: Proposed Rule

SUMMARY: EPA is proposing to clarify and expand National Pollutant Discharge Elimination System (NPDES) permit requirements for municipal sanitary sewer collection systems and sanitary sewer overflows (SSOs). Municipal sanitary sewer collection systems play a critical role in protecting human health and the environment. SSOs, which are releases of raw sewage, can result when these systems fail. The most immediate health risk associated with SSOs is exposure to disease-causing pathogens.

Today's proposal includes standard permit conditions addressing capacity, management, operation and maintenance (CMOM) requirements; a prohibition on discharges (with a framework for a defense for unavoidable discharges); and requirements for reporting, public notification, and recordkeeping for municipal sanitary sewer collection systems and SSOs.

The Agency also is proposing a regulatory framework for applying NPDES permit conditions, including applicable standard permit conditions, to municipal satellite collection systems. Municipal satellite collection systems are sanitary sewers owned or operated by a municipality that convey sewage or industrial wastewater to a publicly owned treatment works (POTW) that has a treatment plant owned or operated by a different municipality.

Implementation of this proposal would improve the capacity, management, operation and maintenance of municipal sanitary sewer collection systems and improve public notice for SSO events, which would:

$ Reduce health and environmental risks by reducing SSO occurrences and improving treatment facility performance; and

$ Protect the nation's collection system infrastructure by enhancing and maintaining system capacity, reducing equipment and operational failures and extending the life of its components.

DATES: Written comments on this proposed rule must be received or postmarked by **[insert date 120 days after date of publication in the FEDERAL REGISTER]**.

ADDRESSES: Commentors are requested to mail an original and three copies of their comments and enclosures (including references) to the W-00-08 Sanitary Sewer Overflows Comments Clerk, Water Docket (MC-4101), U.S. Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Ave., N.W., Washington, DC 20460. Comments delivered by hand or overnight courier should be sent to the Water Docket, Room EB-57 (East Tower basement), Waterside Mall, 401 M Street, S.W., Washington, DC 20460. Commentors who would like acknowledgment of their comments should include a self-addressed, stamped business-size envelope. No facsimiles (faxes) will be accepted.

EPA will also accept comments electronically. Comments should be addressed to the following Internet address: ow-docket@epamail.epa.gov Electronic comments must be submitted as an ASCII or WordPerfect file avoiding the use of special characters and any form of encryption. Electronic comments must be identified by the docket number W-00-08 and may be filed on-line at many Federal Depository Libraries. No confidential business information (CBI) should be sent via e-mail.

This document also has been placed on the Internet for public review and downloading from the Office of Wastewater Management home page at the following location: www.epa.gov/owm/sso.htm

The public may inspect the administrative record for the proposed rulemaking at EPA's Water Docket, Room EB-57 (East Tower basement), 401 M Street, SW, Washington, DC 20460. The record for this rulemaking has been established under docket number W-00-08 and includes supporting documentation. The public may inspect the administrative record between the hours of 9 a.m. and 4 p.m., Monday through Friday, excluding legal holidays. For access to these docket materials, please call (202) 260-3027 to schedule an appointment. As provided in 40 CFR Part 2, a reasonable fee may be charged for copying any material in the docket.

FOR FURTHER INFORMATION CONTACT: For questions about the substance of this proposed rule, contact Kevin Weiss (e-mail at weiss.kevin@epa.gov or phone at (202) 564-0742) at Office of Wastewater Management, U.S. Environmental Protection Agency (Mail Code 4203M), Ariel Rios Building, 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. To obtain a copy of the proposed rule, contact Sharie Centilla (e-mail at centilla.sharie@epa.gov or phone at (202) 564-0697) at Office of Wastewater Management, U.S. Environmental Protection Agency (Mail Code 4203M), Ariel Rios Building, 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

SUPPLEMENTARY INFORMATION:

Regulated Entities

Entities potentially regulated by this action include:

Category	Examples of regulated entities
Local governments	Owners or operators of publicly owned treatment works and municipal sanitary sewer collection systems Owners or operators of municipal satellite collection systems (including systems comprised of combined sewers or separate sewers)
State and tribal governments	Owners or operators of publicly owned treatment works and municipal sanitary sewer collection systems Owners or operators of municipal satellite collection systems (including systems comprised of combined sewers or separate sewers)

This table is not meant to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. Other types of entities not listed in the table could also be regulated. If you have questions about the applicability of this action to a particular entity, consult the person listed for substantive information in the preceding FOR FURTHER INFORMATION CONTACT section.

Acronyms Used

APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASIWPCA	Association of State and Interstate Water Pollution Control Administrators
CMOM	capacity, management, operation and maintenance
CSO	combined sewer overflow
EPA	Environmental Protection Agency
I/I	inflow and infiltration
MGD	million gallons per day
NASSCO	National Association of Sewer Service Companies
NRDC	Natural Resources Defense Council
NTTAA	National Technology Transfer and Advancement Act
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
POTW	publicly owned treatment works
RII	rainfall-induced infiltration
SBREFA	Small Business Regulatory Enforcement Fairness Act
SSO	sanitary sewer overflow
WEF	Water Environment Federation
WQBEL	water quality-based effluent limitation
WWTP	wastewater treatment plant

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I. BACKGROUND

A. President Clinton’s Directive

On May 29, 1999, President Clinton directed EPA to: "Improve protection of public health at our Nation’s beaches by developing, within one year, a strong national regulation to prevent the over 40,000 annual sanitary sewer overflows from contaminating our nation’s beaches and jeopardizing the health of our nation’s families. At a minimum, the program must raise the standard for sewage treatment to adequately protect public health and provide full information to communities about water quality problems and associated health risks caused by sanitary sewer overflows." Today’s proposed rule would clarify the national framework for reducing the environmental and public health impacts of SSOs and will help ensure protection of the nation’s investment in sewer infrastructure.

B. Why are Wastewater Collection Systems Important?

1. What Functions Do Wastewater Collection Systems Perform?

During the eighteenth and nineteenth centuries, people living in cities in the United States mostly used cesspools and privy vaults to dispose of household wastewater and sewage. Cesspools and privy vaults were essentially holes in the ground, often lined with stone and located close to residences. These systems were largely privately maintained, and removal of sewage and residuals was typically inefficient and labor intensive. Municipalities began to install sewerage systems in the late nineteenth century due to a combination of factors, including an increased awareness of the health risks of sewage, the availability of indoor plumbing and toilets (and the resulting need to dispose of increased volumes of wastewater), and increased urban populations. In contrast to the privy vault-cesspool system, sewerage systems were capital rather than labor intensive and required the construction of large public works. They were designed to operate passively, in a much less labor intensive manner than the older cesspool/privy vault system. Proponents of sewerage systems stressed municipalities should adopt sewerage systems for three main reasons: the capital and maintenance cost of sewerage systems would be less than the annual cost of cleaning the cesspool/privy vault system; sewerage systems resulted in greatly improved sanitary conditions; and because of improved sanitary conditions, cities with sewerage systems would attract population and industry and grow at a faster rate than those that did not.

Wastewater collection systems collect domestic sewage and other wastewater from homes and other buildings and convey it to wastewater sewage treatment plants for proper treatment and disposal. The collection and treatment of municipal sewage and wastewater is vital to the public health in our cities and towns. The proper functioning of wastewater systems is among the most important factors responsible for the general level of good health enjoyed in the United States. When these conveyance systems fail and release untreated sewage, however, they can pose risks to public health and the environment.

In addition, the efficiency of wastewater treatment at a wastewater treatment plant depends strongly on the performance of the collection system. When the structural integrity of a sanitary sewer collection system deteriorates, high volumes of infiltration (including rainfall-induced infiltration) and inflow can enter the collection system. High levels of inflow and infiltration (I/I) increase the hydraulic load on treatment plants, which can reduce treatment efficiency, lead to bypassing a portion of the treatment process, or in extreme situations make biological treatment facilities inoperable (e.g., wash out the biological organisms that treat the waste).

In the United States, municipalities historically have used two major types of sewer systems. One type, combined sewers, were designed to collect both sanitary sewage and storm water runoff in a single-pipe system. Sewer builders designed this type of sewer system to provide the primary means of surface drainage and drain precipitation flows away from streets, roofs, and other impervious surfaces. State and local authorities generally have not allowed the construction of new combined sewers since the first half of the 20th century. The other major type of domestic sewer design is sanitary sewers (also known as separate sanitary sewers). Sanitary sewers are not installed to collect large amounts of runoff from precipitation events or provide widespread drainage, although they typically are built with some allowance for higher flows that occur during storm events for handling minor and controllable amounts of I/I that enter the system. Developed areas that are served by sanitary sewers often also have a separate storm sewer system (or storm drains) to collect and convey runoff, street wash waters, and drainage.

2. What Does the Public Expect from Their Wastewater Collection Systems?

Most members of the general public take a well-operated wastewater collection system for granted, without being aware of its design and technical workings. However, in general, the public expects these systems to function effectively at a reasonable cost to rate payers. This means that sewage releases into homes, streets, streams, parks, beaches, or other areas where there is a reasonable potential for human exposure or environmental degradation are minimized. Where releases occur, the public expects to be notified of significant health risks, expects spills to be cleaned up as soon as possible, and expects steps to be taken to avoid future releases.

3. How Many Sanitary Sewer Collection Systems Are There in the United States?

Sanitary sewer collection systems are an extensive and valuable part of the nation's infrastructure. They serve about 150 million people in the United States -- roughly 55 percent of the nation's population. EPA estimates that there are about 500,000 miles of municipally owned pipes in publicly owned systems and probably another 500,000 miles of privately owned pipes that deliver wastewater into these systems. These systems serve an area of about 57,000 square miles.

The database used to develop the 1998 Clean Water Needs Survey identifies more than 19,000 municipal sanitary sewer collection systems. A relatively few larger systems serve a significant percentage of the population, while there are a great number of smaller systems. A description of the distribution of service population size among these systems is provided in section III.K of today's preamble. Of the more than 19,000 systems, about 4,800 are satellite collection systems that do not treat their own wastewater but rather contribute to a regional collection system that is owned or operated by a different entity.

Sewers owned by non-municipal entities, including privately owned sewers, make up a high percentage of the total sewer length of most sanitary sewer collection systems. Some portions or the entire length of lateral connections to buildings are generally owned by the building owner. Building laterals may feed into privately owned satellite collection systems that convey wastewater to a municipal collection system. Non-municipal satellite collection systems are associated with trailer parks, residential subdivisions, apartment complexes, commercial complexes such as shopping centers, industrial parks, college campuses, and military facilities.

The Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) estimates that about 25,000 NPDES permits have been issued for privately owned treatment plants. Each of these treatment plants is expected to have a privately owned collection system. EPA lacks data to estimate the number of privately owned collection systems that discharge their wastewater to municipal collection systems.

4. Early Municipal Collection Systems[1]

In the late 1800s and early 1900s, a number of municipalities began to

[1] For a more detailed discussion of the development of early sewer systems in the United States, see The Search for the Ultimate Sink: Urban Pollution in Historical Perspective, Tarr, J.A., University of Akron Press, 1996.

install public sewer systems to address health and aesthetic concerns association with the cesspools and privy vaults found in most cities. At the same time, many municipalities did not have well developed drainage systems, with storm water presenting flooding problems as well as sanitation and aesthetic concerns due to manure from horses and other animals and other poor sanitary conditions.

Municipalities installing sewerage systems faced a choice in the design of the system, with combined sewers (for both runoff and sanitary wastewater) or two separate conveyance systems (separate sanitary sewers and separate storm drains) being the two predominant options. Key factors in selecting between the combined sewer and sanitary sewer designs were that there was no European or American precedent of a successful separate system and engineers were reluctant to experiment with large capital works; and the relative cost of the system. Combined systems were less expensive for municipalities needing both sanitary and storm sewers while separate sanitary sewer collection systems were less expensive for municipalities that only needed a sewage collection system. At the time, many thought that both designs provided roughly equivalent health protection. This view was supported by an 1881 report to the National Board of Health that suggested that both sanitary sewers and combined sewers had equal sanitary value and recommended that the choice between systems should be based on local conditions and financial considerations. The assumption that sanitary and combined sewers had equal sanitary value was based on the theory that disposal of untreated sewage into waterways was safe.

In the 1860s and early 1870s a number of cities in the United States installed combined sewer systems. The first separate sanitary collection system was installed in the U.S. in the late 1870s. Early sanitary sewer systems provided for house sewage only and made no provisions for storm water, were accompanied by agricultural tiles laid in the same ditch as the sewer to provide drainage, used automatic flush tanks to clean the sewers and had no manholes. The earliest designs experienced problems with frequent stoppages, inadequate slopes, and because of connections of drains by householders, excess wet weather flows which forced municipalities to construct overflows and intercepting sewers. Later designs addressed some of these problems. However, it was not until early in the twentieth century that engineers fully recognized that an adequate storm water drainage system was necessary to protect the sanitary sewer system. Construction of separate sewers without storm sewers often resulted in excess storm and ground water entering the sanitary sewer. This excess water could lead to surcharging, basement backups, overflows at manholes and overwhelming the capacity of treatment plants.

Construction of sewerage systems by municipalities greatly improved local sanitary conditions and in many cases reduced illnesses. However, the disposal of wastewater created potential impacts on downstream communities. In early sewerage systems, treatment prior to discharge was only provided in a few special cases, usually where a city was not located on a potential receiving stream or river. Views on the safety of disposal of untreated sewage into waterways began to shift toward the end of the nineteenth century. Bacterial research during the 1880s and 1890s began to identify concerns. In addition, during the 1880s and 1890s, the rate of typhoid deaths rose in cities that withdrew their water supply downstream of discharging sewer systems. Bacterial analysis confirmed the link between sewage pollution in rivers and typhoid fever.

As the need for providing sewage treatment prior to discharge became recognized, the major design difference between sanitary sewer systems and combined sewer systems was highlighted. Due to significantly smaller volumes of wet weather flows, sanitary sewer systems simplified and lowered the cost of sewage pumping and treatment. By 1892, twenty-seven municipalities treated their sewage; of these twenty-six had separate systems. While combined sewers offered an efficient means of removing storm water and sewage, they made treatment and disposal more difficult. However, municipalities that had already built combined sewers often continued to utilize combined sewers and add to them. In part this was due to concerns that municipalities would be unable to keep runoff and drainage from private residences and businesses out of sanitary sewer systems[2]. Another factor that allowed continued utilization of combined sewers was the belief that emphasizing the treatment of drinking water would minimize the need to treat wastewater prior to discharge.

C. What are the Health and Environmental Risks of SSOs?

SSOs result in releases of raw sewage. The health and environmental risks attributed to SSOs vary depending on a number of factors including location and season (potential for public exposure), frequency, volume, the amount and type of pollutants present in the discharge, and the uses, conditions, and characteristics of the receiving waters. The most immediate health risks associated with SSOs to our waters and other areas with a potential for human contact are associated with exposure to bacteria, viruses, and other pathogens. Adverse health consequences can be more severe for children, the elderly, and those with weakened immune systems.

In addition to pathogens, raw sewage may contain metals, synthetic chemicals (including endocrine system disruptors), nutrients, pesticides, and oils, which also can be detrimental to the health of humans and wildlife.

1. Human Health Risks

The need for effective sanitary wastewater removal and management has been clearly documented for over a century.[3] SSOs can release raw sewage to areas where they present high risks of human exposure, such as streets, private property, basements, and receiving waters used for drinking water, fishing and shellfishing, or contact recreation. Some SSOs can form puddles and muddy areas that can attract children or pets, while others may result in direct exposure to untreated wastewater via other pathways. Additional information on pathways for parasitic diseases to children is provided at www.cdc.gov/ncidod/dpd/parasiticpathways/kids/htm.

Although SSOs contain other pollutants, the major acute health risks of most untreated SSOs are pathogens. Major groups of disease-causing organisms or agents associated with untreated SSOs include: bacteria, viruses, protozoa, and helminths (intestinal worms). Table 1 shows examples of the pathogens in inadequately treated wastewater and the diseases they cause. These diseases range in severity from mild gastroenteritis (causing stomach cramps and diarrhea) to diseases that can be life-threatening, such as cholera, infectious hepatitis, dysentery, and severe gastroenteritis.

One study has indicated a growing consensus among researchers that elevated Giardia levels are due to introduction of sewage effluents, while elevated Cryptosporidium levels may be due to input from nonpoint sources such as agricultural or forested areas.[4] The study also indicates that there is a growing concern regarding Giardia sources about the adequacy of disinfection practices at wastewater treatment plants. The study observed that the highest Giardia levels were detected in rivers and creeks which in many cases also received sewage and industrial effluents.

2. Environmental Risks

SSOs, by themselves or in combination with other sources of pollution (e.g., POTWs, other point source effluents, runoff from farms, ranches, mines,

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[2] Cunningham, S.L., Combined versus Separate Sewers: Louisville's Good, But Thwarted Intentions, Spring 1999.

[3] See, "Sewerage and Land Drainage," Waring, 1889 and "The Search for the Ultimate Sink:Urban Pollution in Historical Perspective", Tarr, J.A.,1996.

[4] LeChevallier, Mark W., W. D. Norton, R. G. Lee, "Occurrence of Giardia and Cryptosporidium spp. in Surface Water Supplies," Applied and Environmental Microbiology, Sept. 1991, p. 2610-2616.

forests, and developed areas) may affect the quality and uses of waters of the United States. Adverse water quality impacts from SSOs may include changes to the physical characteristics and viability of aquatic habitats, causing fish kills. These impacts can cause adverse economic impacts such as beach closures, shellfish harvesting quarantines, increased risks and demands on drinking water sources, and impairment of people's ability to use waters for recreational purposes.

The National Water Quality Inventory, 1998 Report to Congress, required by section 305(b) of the Clean Water Act (CWA), shows that States have identified pollutant sources associated with urban development, including sewage treatment facilities and wet weather sources, as a leading cause of water quality impairment.[5] Given the close proximity of these discharges and the complex interrelation of the discharges, it is difficult to attribute impairment of urban waters to specific sources, particularly those occurring during wet weather (e.g., storm water, combined sewer overflows, SSOs). EPA's National Water Quality Inventory Report, using information provided by States, identifies the two categories "urban runoff/storm sewers" and "municipal point sources" as together making up the second-largest cause of impairment in lakes, rivers, and streams, and the largest cause of impairment in estuaries. The category "municipal point sources" used in the Water Quality Inventory does not distinguish between treatment plant discharges and collection system discharges (other than combined sewer overflows), and therefore does not allow an evaluation of impacts directly associated with SSOs. The Agency believes, however, that the performance of municipal treatment plants and collection systems are highly interrelated and efforts to address the municipal point source category typically should focus on both aspects. The Agency also believes that some sources identified in the "urban runoff/storm sewers" categories are adversely affected by SSOs.

In a different, more detailed 1998 survey conducted by the Natural Resources Defense Council, States identified sewage spills and overflows (including sewage overflows from combined sewers and sanitary sewers, malfunctioning sewage treatment plants and pump stations, sewage spills and sewer-line breaks) as the leading identified cause of beach closures and swimming advisories in the United States.[6]

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[5] National Water Quality Inventory, 1998 Report to Congress, EPA.

[6] Draft Pathogens and Swimming: Assessment of Beach Monitoring and Closure, Environomics, 1995, and Testing the Waters-A Guide to Water Quality at Vacation Beaches, Volume 9 - Natural Resources Defense Council, July 1999.

Table 1. Examples of Pathogens in Inadequately Treated Municipal Wastewater

	ORGANISM	DISEASE / SYMPTOMS
Bacteria	Vibrio cholerae	Cholera
	Salmonella spp.	Salmonellosis (food poisoning), typhoid fevers
	Shigella spp.	Bacillary dysentery
	Yersinia spp.	Acute gastroenteritis (including diarrhea, abdominal pain)
	Campylobacter jejuni	Gastroenteritis
	Escherichia coli (pathogenic strains)	Gastroenteritis
Viruses	Hepatitis A virus	Infectious hepatitis
	Polio virus	Poliomyelitis
	Coxsackievirus	Meningitis, pneumonia, hepatitis, fever, common colds, etc.
	Echovirus	Meningitis, paralysis, encephalitis, fever, common colds, diarrhea, etc.
	Rotavirus	Acute gastroenteritis with severe diarrhea
	Norwalk agents	Epidemic gastroenteritis with severe diarrhea
	Reovirus	Respiratory infections, gastroenteritis
Protozoa	Cryptosporidium	Gastroenteritis
	Entamoeba histolytica	Acute enteritis
	Giardia lambia	Giardiasis (including diarrhea, abdominal cramps, weight loss)
	Balantidium coli	Diarrhea and dysentery
	Toxoplasma gondii	Toxoplasmosis
Helminth Worms	Ascaris lumbricoides	Digestive and nutritional disturbances, abdominal pain, vomiting, restlessness
	Ascaris suum	Coughing, chest pain, and fever
	Trichuris trichiura	Abdominal pain, diarrhea, anemia, weight loss
	Toxocara canis	Fever, abdominal discomfort, muscle, aches, neurological symptoms
	Taenia saginata	Nervousness, insomnia, anorexia, abdominal pain, digestive disturbances
	Taenia solium	Nervousness, insomnia, anorexia, abdominal pain, digestive disturbances
	Necator americanus	Hookworm

	Hymenolepis nana	Taeniasis

D. Why is EPA Taking This Action?

As noted earlier, municipal sanitary sewer collection systems play a critical role in protecting human health and the environment in developed areas. SSOs, which are releases of raw sewage, can result when these systems fail. SSOs can pose health and environmental risks. The performance of municipal collection systems can also heavily influence the performance of sewage treatment plants.

Municipal sanitary sewer collection systems are an extensive, valuable, and complex part of the nation's infrastructure. EPA estimates that these systems would have a replacement value of $1 to 2 trillion. Another source estimates that wastewater treatment and collection systems represent about 10 - 15 percent of the total infrastructure value in the United States.[7] The collection system of a single large municipality can represent an investment worth billions of dollars. Many collection systems exhibit poor performance. Table 2 describes many of the underlying reasons for the poor performance of many of these systems. In summary, these reasons include:

(1) much of the nation's sanitary sewer infrastructure is old; some parts of this infrastructure date back over 100 years. A survey of 42 wastewater utilities indicated the age of components of collection systems ranged from new to 117 years, with an average age of 33 years.[8] During this time, a wide variety of materials, design and installation practices, and maintenance/repair procedures have been used, many of which are inferior to those available today;
(2) An aging infrastructure that has deteriorated with time;
(3) A history of inadequate investment in infrastructure maintenance and repair often associated with an "out-of-sight, out-of-mind" approach;
(4) Collection system performance depends on numerous variables and the location of problems (e.g., roots, debris) may change throughout a system;
(5) Failure to provide capacity to accommodate increased sewage delivery and treatment demand from increasing populations; and
(6) Institutional arrangements relating to the operation of sewers -- e.g., almost all building laterals in a municipal systems are privately owned; in many municipal systems, a high percentage of collector sewers are owned by private entities or municipal entities other than the entity operating the major interceptor sewers.

[7] Fragile Foundations: A Report on America's Public Works. Final Report to the President and Congress. National Council on Public Works Improvement. February 1988.

[8] Optimization of Collection System Maintenance Frequencies and System Performance, American Society of Civil Engineers, 1999.

Table 2. Major Practices and Factors That Have Contributed to Poor Sewer Performance and Deterioration

1 Accepted industry design standards often provide inadequate flow capacities for realistic levels of inflow and infiltration	6 Not enough scientific knowledge existed or was available to designers about potential damage from plant roots to pipe joints. Root growth is a principal cause of pipe damage that allows infiltration.
2 Older systems were made of pipes with short lengths and many joints. Manholes were made of brick and mortar. Materials and joints were susceptible to hydrogen sulfide corrosion. Improved materials, such as precast concrete manholes, did not become predominant products until the late 1960s.	7 The "out-of-sight, out-of-mind" nature of the wastewater collection system poses an inherent problem. Many collection systems are maintained by a public works department charged with street, sidewalk, storm drain, and sometimes water utility maintenance. Money is usually spent where the rate-payer can see the results.
3 Collection systems were not installed as designed. Problems are caused by faulty construction, poor inspection, and low-bid shortcuts.	8 Negligence and vandalism can be the source of collection system problems. Any material in a sewer will slow the flow and allow other solids to settle.
4 Sewers made of "permanent" material are only as permanent as the weakest joints. Earth movement, vibrations from traffic, settling of structures, and construction disturbance require flexible pipe material or joints that can maintain tightness.	9 Ditches in which sewers are installed have the bottoms sloping downhill to produce gravity flow. Water that enters a ditch may not easily seep out of the ditch where silt and clay soils have been compacted by heavy excavation equipment. Possible problems include ground-water infiltration into the sewer, flotation of the sewer, and structural failure of the sewer or joint.
5 Corrosion of sewer pipes, from either the trench bedding and backfill or the wastewater being transported by the collection system, was a factor neglected by many design engineers.	10 Poor records on stoppages or complaints from the public can result in an ineffective maintenance program

Source: California State University at Sacramento, 1993.

Note: The Agency is not suggesting that the factors listed in this table are necessarily a defense for non-compliance. See section IV of today's preamble.

The poor performance of many sanitary sewer systems and resulting potential health and environmental risks highlight the need to increase regulatory oversight of management, operation and maintenance of these systems. The Agency believes that the approach proposed today should provide a more efficient approach to controlling SSOs through better management, increased public notice and increased focus on system planning, which should:

- Reduce health and environmental risks by reducing SSO occurrences and improving treatment facility performance; and
- Provide added protection to the nation's collection system infrastructure by enhancing and maintaining system capacity,

reducing equipment and operational failures and extending the life of system components.

In addition, the Agency believes that given the nature of SSOs and the need to decrease the health risks associated with these events, increased public notification for SSO occurrences is necessary. Increased public notification also is expected to increase public support for funding improvements to collection systems. It also will enhance public involvement in the way collection systems are managed.

E. How Did EPA Consult with Stakeholders When Developing this Proposal?

EPA conducted a series of outreach activities to inform the public and obtain information for this rulemaking.

1. SSO Subcommittee of the Urban Wet Weather Flows Federal Advisory Committee

In 1994, a number of municipalities asked EPA to establish a Federal Advisory Committee (FAC) of key stakeholders to make recommendations on how the NPDES program should address SSOs. This request came soon after EPA had published the Combined Sewer Overflow Control Policy in 1994, which was designed to provide greater national clarity and consistency in the way NPDES requirements apply to combined sewer overflows (CSOs). In part, the municipalities indicated a desire for greater national clarity and consistency in the way NPDES requirements apply to SSOs. The municipalities indicated that they believed that eliminating all SSO discharges was technically infeasible, and, as a result, municipalities tasked with the responsibility of operating these systems could not comply with an absolute prohibition on SSOs. The municipalities suggested a need for a workable regulatory framework which allowed EPA and NPDES authorities to define compliance endpoints in a manner that was consistent with engineering realities and the health and environmental risks of SSOs.

EPA then convened a national "SSO policy dialogue" among a balanced group of representatives from key stakeholder organizations. EPA asked the individual stakeholders to provide input on how best to meet the SSO policy challenge. In 1995, EPA chartered an Urban Wet Weather Flows Federal Advisory Committee (FAC) with the goal of developing specific recommendations addressing cross-cutting wet weather issues and to improve the effectiveness of the Agency's efforts to address wet weather pollutant sources under the NPDES program. The Urban Wet Weather Flows Federal Advisory Committee reconvened the SSO policy dialogue group as its SSO Subcommittee. The membership of the SSO Subcommittee included representatives from the American Public Works Association, Association of Metropolitan Sewerage Agencies, Association of State and Interstate Water Pollution Control Administrators, Cahaba River Society, Citizens Campaign For The Environment, National Association of Attorneys General, National Association of Counties, National Center of Small Communities/National Association of Towns and Townships, National Environmental Health Association, National League of Cities, Natural Resources Defense Council, Texas Association of Metropolitan Sewerage Associations, Tri-TAC, EPA, and the Water Environment Federation.

In early meetings, some members of the Urban Wet Weather Committee raised concerns about duplication of effort between the Urban Wet Weather Flows Committee and the SSO Subcommittee. Urban Wet Weather Committee members identified specific issues they would address, as well as issues that the SSO Subcommittee should address. The Urban Wet Weather Committee requested that the SSO Subcommittee provide them with regular status reports, copies of work products, and meeting minutes.

The SSO Subcommittee held ten meetings between December 1994 and December 1996. EPA provided public notice in the Federal Register in accordance with FACA procedures and held meetings that were open to the public. During that time, the SSO Subcommittee identified and explored a number of highly complex issues and concerns. The Subcommittee developed a consensus document entitled "SSO Management Flow Chart," October 12, 1995 (see section I.I of this preamble). The Subcommittee presented this document to the Urban Wet Weather Flows Committee for comment. The Urban Wet Weather Flows Committee did not provide additional detailed comment on the document. The Flow Chart outlines the SSO Subcommittee's approach for planning SSO management strategies. Other areas of general agreement include:

- $ SSOs are undesirable and can result in health and environmental risks;
- $ Avoidable SSOs should be eliminated;
- $ Collection systems are an important part of the municipal infrastructure and should have proper operation and maintenance to prolong their lives and preserve their investment value; and
- $ EPA, States, and other regulatory agencies are responsible for having a regulatory framework for SSOs that is responsive to real world conditions.

In addition, the SSO Subcommittee developed a number of non-consensus documents, including the following: a series of issue papers; draft standard permit conditions for noncompliance reporting and a prohibition on SSOs; and a draft comprehensive guidance document. The SSO Subcommittee also reviewed a number of documents, including "Setting Priorities for Addressing SSOs - EPA Enforcement Management System Guidance, Chapter X" (EPA, March 7, 1996), and "U.S. EPA Region IV Guide for Conducting Evaluations of Municipal Wastewater Collection System Operation and Maintenance Management Programs" (EPA, October 1996). EPA and the Subcommittee updated the Urban Wet Weather Flows FAC on these activities.

In 1997, EPA suspended discussions with the SSO Subcommittee to give the Agency time to make sufficient progress on resolving key issues and concerns raised during Subcommittee discussions. In May 1999, EPA distributed draft papers, describing draft standard permit conditions and policy approaches, to the SSO Subcommittee. The 1999 EPA approach was developed with an understanding of concerns and comments raised by the SSO Subcommittee, including the SSO management flow chart the Subcommittee had endorsed. The 1999 approach refined and elaborated on the Flow Chart, based on experience gained in EPA's Regional Offices by working with municipalities. EPA's Region 4 in particular had made extensive efforts to meet with municipalities within that Region to discuss sewer-related problems faced by municipalities and the use of comprehensive management system approaches to improve sewer system performance.

The SSO Subcommittee met an eleventh and twelfth time to discuss the draft papers July 28-29, 1999, and October 18-20, 1999. Although the July meeting led to a temporary collapse in discussions, the October meeting resulted in unanimous support for a framework to address SSOs. The Subcommittee supported, when taken as a whole and recognizing that they are interdependent, basic principles expressed in documents addressing suggested NPDES permit requirements for:

(1) Capacity, management, operation and maintenance ("CMOM") programs for municipal sanitary sewer collection systems;
(2) A prohibition on SSOs, which includes a framework for raising a defense for unavoidable discharges;
(3) Reporting, public notification, and recordkeeping requirements for municipal sanitary sewer collection systems and SSOs; and
(4) Remote treatment facilities (or peak excess flow treatment facilities).

In addition, the Subcommittee unanimously supported a set of principles for municipal satellite collection systems and watershed management, although members did not develop detailed language addressing these topics.

EPA is committed to reflecting the approach discussed with the SSO Subcommittee in today's proposed rule. The standard permit conditions proposed today are consistent with the principles unanimously supported by the SSO Subcommittee, with the following major exceptions:

(1) The SSO Subcommittee did not have an opportunity to review draft regulatory language addressing municipal satellite collection

systems.

(2) The SSO Subcommittee did not have an opportunity to review detailed language describing the watershed approach.

(3) The SSO Subcommittee did not review language defining the term "sanitary sewer overflow." EPA is proposing a definition of sanitary sewer overflow in today's proposed rule.

(4) During discussions with the SSO Subcommittee, EPA indicated that it would have additional discussions with representatives of small governments. The SSO Subcommittee did not review alternative requirements for small governments.

Given the one-year deadline associated with President Clinton's 1999 directive to develop regulations addressing SSOs, the Urban Wet Weather Committee did not meet again prior to publication of today's proposed rule to review the materials supported by the SSO Subcommittee. Under FACA, subcommittees created by parent committees do not operate independently of the parent committee unless separately chartered. The Agency will convene a meeting of the Urban Wet Weather Committee prior to promulgation of a final rule to provide an update on the rulemaking and to seek final recommendations.

2. Small Government Outreach Group

In the spring of 1999, EPA identified 21 potential participants for a Small Government Outreach Group to provide perspectives and concerns of small governments on potential NPDES requirements for municipal sanitary sewers and SSOs. Participants represented governments with populations less than 50,000 from various regions of the country. Of the 21 invited participants, 14 accepted; of these, 6 represented governments with a population of less than 10,000, 7 represented governments with a population of less than 25,000 but more than 10,000, and 8 represented governments with a population of less than 50,000 but more than 25,000. EPA distributed the same draft papers to the Small Government Outreach Group (draft standard permit conditions and policy approaches) as were distributed to the SSO Subcommittee. EPA held eight conference calls with the Small Government Outreach Group between July and November 1999 to discuss the draft standard permit conditions. Section VIII.C of today's preamble summarizes the major concerns and recommendations raised by representatives of the Small Government Outreach Group.

3. States

A number of authorized NPDES States participated in the internal EPA/State work group that developed the approach outlined in today's proposal. States were also represented on the SSO Subcommittee. In addition, the Agency asked the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) to circulate EPA's draft regulations to its members for additional comment. From this process, the Agency received comments from Florida, Vermont, South Carolina, and Nevada. States raised the following concerns:

1. Whether States would be given flexibility to use their existing requirements in lieu of the proposed requirements;
2. That the level of detail in EPA's draft regulations may limit flexibility in how the proposed requirement would be applied;
3. Timing issues associated with initial implementation of the proposed requirements;
4. The extent of reporting that would be required under the proposed regulation; and
5. Whether the approach sufficiently targeted priority municipalities.

Several States supported the general concepts behind the approach and elements to the draft provisions. Several States raised concerns that the draft capacity, management, operation and maintenance (CMOM) provision may be beyond the capability of most smaller municipalities. Several suggested that EPA consider targeting these requirements to municipalities with identified problems. One State indicated that the approach may damage its relationship with municipal permittees, which could in turn cause negative impacts in implementing environmental programs.

F. Ownership Issues Associated with Municipal Sanitary Sewer Collection Systems

Municipal sanitary sewer collections systems can be a widespread network of pipes and associated components (e.g., pump stations). A large number of public and private entities may own different pipes and other components of the entire municipal sanitary sewer collection system. Municipal sanitary sewer collection systems provide wastewater collection service to the community in which they are located. The customers of a municipal sanitary sewer system typically retain ownership of building laterals. In addition, commercial complexes, home owner associations, and other entities may retain ownership of collector sewers leading to the municipal sanitary sewer system. In some situations, the municipality that owns the collector sewers may not provide treatment of wastewater, but only convey its wastewater to a collection system that is owned and operated by a different municipal entity.

In this preamble, EPA refers to a municipality that owns and operates treatment plants that receive wastewater from the collection system of other municipal entities as a "regional system owner/operator." Regional system owner/operators who provide wastewater treatment often only operate a relatively small portion of the collection system (e.g., major interceptors, collector sewers in certain areas).

Municipal satellite collection systems discharge to a regional collection system that is owned and operated by an entity that is different from the owner and operator of the satellite system. Operators of municipal satellite collection systems typically do not operate a treatment plant for some or all drainage areas, but instead rely on the operator of the regional collection system to provide wastewater treatment and discharge the resulting effluent.

Portions of the collection system that are not directly owned by a regional municipal operator include:

- Municipal satellite collection systems - Some regional collection systems accept flows from municipal satellite collection systems that are owned and operated by a different municipal entity.
- Non-municipal collection systems - Private satellite collection systems are associated with a wide range of entities such as some trailer parks, residential subdivisions, apartment complexes, commercial complexes such as shopping centers, industrial parks, college campuses, and military facilities.
- Non-municipally owned building laterals - Non-municipally owned sewers make up a high percentage of the total sewer length of most sanitary sewer collection systems. Some portion or the entire length of lateral connections to buildings are generally owned by the building owner. Building laterals may feed into non-municipally owned satellite collection systems which convey wastewaters to a municipal collection system.

Ownership patterns often affect the amount of maintenance sewers receive. Typically, private building owners provide little maintenance of building laterals, other than to make sure that the lateral is not severely clogged or causing observable problems like sinkholes. Relatively severe infiltration may occur without any sign at the surface, and even if a building owner was somehow aware of infiltration in a lateral, the owner typically has little incentive to fix it. Municipalities participating in a WEF survey reported a wide range in the percentage of I/I in their systems that came from privately owned building laterals, from very little to 75 percent of the total I/I.[9]

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[9] Control of Infiltration and Inflow in Private Building Sewer Connections, WEF, 1999.

G. Summary of Existing System Performance

Based on available information, EPA can make the following generalizations about sanitary sewer collection systems in the United States:

- Sanitary sewer systems experience periodic failures.
- Collection system performance varies significantly from system to system.
- A significant number of systems have SSOs.
- NPDES authorities have provided different interpretations or placed different emphasis on existing regulatory provisions.
- The availability of information on sanitary sewer collection systems and SSOs is system-specific with the national picture being incomplete.

These generalizations are supported by major studies and national surveys (listed in Table 3) that provide information on the existing condition of sanitary sewer systems and the extent and nature of SSO problems. The surveys and case studies provide an understanding of sanitary sewer collection performance, the extent of SSO problems, and the need to address these problems. Additional information is available from a number of communities that have addressed problems with their sanitary sewer collection systems.

Table 3. Major Studies on U.S. Sanitary Sewer Collection Systems

Author/Conducting Agency	Title	Respondents	Date
Association of Metropolitan Sewerage Agencies (AMSA)	Sanitary Sewer Overflow (SSO) Survey	79 member municipalities	1994
Association of State and Interstate Water Pollution Control Administrators (ASIWPCA)	Sanitary Sewer Overflow (SSOs) Membership Survey Results	34 States (data for 38,950 wastewater collection systems)	1996
Urban Institute (UI)	Guide to Benchmarks of Urban Capital Condition	62 cities	1984
Water Pollution Control Federation (WPCF)	Problem Technologies and Design Deficiencies at Publicly Owned Treatment Works -- a Survey	1,003 treatment plants	1989
U.S. EPA	Sanitary Sewer Overflow Needs Report	60 municipalities	2000
U.S. EPA	1996 Clean Water Needs Survey Special Questions	377 municipalities	1996
Science Applications International Corporation (SAIC)	Comparative Updated Overflows Analysis for San Diego versus Comparable California Cities/Districts	6 municipalities	1991
Charlotte-Mecklenberg Utility Department	Benchmark ‘95: Wastewater Collection Agencies: An Analysis of Survey Data	18 municipalities	1995
Civil Engineering Research Foundation (CERF)	Meeting State and Local Public Work Needs - Problem Identification: A Report on Task 1 Activities	345 municipalities	1994
U.S. EPA	Rainfall Induced Infiltration Into Sewer Systems, Report to Congress	10 case studies	1990

American Society of Civil Engineers (ASCE)	Optimization of Collection System Maintenance Frequencies and System Performance	42 municipalities	1999
California State University at Sacramento (CSUS)	Collection Systems: Methods for Evaluating and Improving Performance	21 municipalities	1998
Water Environment Research Foundation (WERF)	Benchmarking Wastewater Operations-Collection, Treatment, and Biosolids Management, WERF, Project 96-CTS-5		1997
Water Environment Federation	Control of Infiltration and Inflow in Private Building Sewer Connections, Monograph, WEF,	316 municipalities	1999

1. Sanitary Sewer Systems Experience Periodic Failures

EPA estimates that there are at least 40,000 SSOs per year (excluding basement backups). Generalities regarding the occurrence of overflows include:

A 1984 Urban Institute study of urban infrastructure indicated that sewer backup rates tended to be the highest in the Northeast and in economically distressed municipalities, and are generally higher in communities with the oldest sewer systems. Sewer line break rates tend to be highest in the South and West, and are particularly associated with large, growing cities.

The Civil Engineering Research Foundation (CERF) estimates that approximately 75 percent of the nation’s sanitary sewer systems function at 50 percent of capacity or less. CERF also estimated that sewer pipeline stoppages and collapses are increasing at a rate of approximately 3 percent per year. Tree roots cause over 50 percent of the stoppages, while a combination of roots, corrosion, soil movements, and inadequate construction are the cause of most structural failures.

The State of Oklahoma has an extensive database on SSO occurrences. Over a two-year period, 350 of the 513 municipal sanitary sewer collection systems in Oklahoma reported at least one SSO. About 85 percent of these systems serve less than 10,000 population. About half of the SSOs occurred in 11 municipalities that reported over 100 SSOs each. An additional 43 municipalities reported 25 to 100 SSOs each. The database was used to develop a statewide estimate of 79 SSOs/year/1,000 miles of sewer.

Table 4 summarizes the results from four case studies of large municipal collection systems with extensive records on their SSOs (excluding basement backups).

Table 4. SSOs (excluding basement backups) from Four Large Municipalities

Parameter	City/Region			
	Louisville	Oakland	Charlotte	MD Suburbs/ Washington, DC
Miles of sewers maintained	1,534	1,500	2,445	4,600
Reporting period	1993–94	1993–94	1983–93	1990–94
Type of failure				
Blockages caused by oil and grease, roots, or solids	7	300	---	---
Hydraulic capacity exceeded	0	0	180	---
Pump station failures	25	0	4	---
Sewer breaks	12	600	---	---
Rainfall induced I/I	115	18	---	---
Total SSOs/year (excluding basement backups)	165	---	359	234*
Total SSOs/yr/1,000 miles (excluding basement backups)	**110**	**---**	**147**	**51**

*NOTE: Data do not include basement backups. MD Suburbs/Washington, DC reported an average of 592 basement backups per year, either caused by a problem outside the property line or high flows or surcharging in a sewer main.

2. Collection System Performance Varies Significantly from System to System

A number of studies have concluded that the performance of sanitary sewer collection systems varies significantly from system to system. Some of the highlights of these studies are:

- A 1995 comparison study done by the City of Charlotte, North Carolina, gathered data from 18 municipal wastewater collection agencies on the size and extent of their systems and system performance. Even when adjusted for system size differences and related factors, the data showed wide variation in system performance. For example, the number of main blockages per 100,000 population ranged from 1 to 1,807, with a median value of 24. The study suggests that variation may arise from differences in system characteristics not considered in the study, such as system age, design and soil conditions.
- A 1984 study by the Urban Institute found a wide range in performance of the 62 systems evaluated, with a few municipalities reporting annual rates of more than 3,000 sewer backups and 550 sewer breaks for every 1,000 miles of sewer. At the other end of the spectrum, some municipalities reported under 60 sewer backups and under 10 sewer breaks per year for every 1,000 miles of sewer.

In the 1984 Urban Institute study, local officials attributed high rates of sewer breaks and backups to a variety of factors: the location of pipe in trouble-prone areas, the pipe material, the size of pipes (smaller pipes back up and break more frequently), the construction methods and technology in practice at the date of installation, local soil conditions, and maintenance practices.
An EPA study compared overflows estimated to be over 1,000 gallons in six California municipalities. The results, summarized in Table 5, showed significant variation in performance across systems.
In ten case studies reviewed by EPA in 1990, peak wet weather flow ranged from 3.5 to 20 times the average dry weather flow.

3. A Significant Number of Systems Have SSOs
In 1996, States estimated that 29 percent of municipal sanitary sewer collection systems experience wet weather SSOs and 25 percent of POTWs served by sanitary sewer collection systems experience some degree of treatment problem during wet weather (ASIWPCA).
Of the 79 large municipalities responding to AMSA's 1994 survey, 65 percent have SSOs in wet weather.
25 States responded to an ASIWPCA survey on SSOs. They reported that 31 percent of municipal systems have at least an occasional dry weather SSO. The 25 States providing this information identified 1,962 SSOs annually (ASIWPCA).
In a 1989 Water Pollution Control Federation survey, 1,003 POTWs identified facility performance problems. Infiltration and inflow (I/I) was the most frequently cited problem, with 85 percent of

Table 5. Comparisons of SSOs Over 1,000 Gallons in Six Municipalities in California

Agency	Time Period	Months	Average Number of Overflows per month Over 1,000 gallons per 1,000 Sewer Miles	Monthly Average Overflow Volume [Gallon/1,000 Sewer Miles]
City of San Diego	1/87 – 5/90	41	7.5	123,000
City of Los Angeles	1/87 – 5/90	41	0.1	37,000
Los Angeles County	2/87 – 5/90	38	0.3	3,000
County Sanitation District of Los Angeles County	2/87 – 5/90	38	0.3	11,000
County Sanitation District of Orange County	5/87 – 5/90	37	0.6	51,000
Central Contra Costa Sanitary District	1/87 – 5/90	41	0.3	10,000

Note: Sanitation District sewers do not include small diameter collector sewers (street sewers) serving local agencies.

SOURCE: "Comparative Updated Overflow Analysis for San Diego versus Comparable California Cities/Districts" Science Applications International Corporation, 1991.

the facilities reporting I/I as a problem. I/I was cited as a major problem by 41 percent of the facilities (32 percent as a periodic problem and 9 percent as a continuous problem).

- In 1991, EPA Region VI's municipal wastewater pollution prevention program identified I/I as the major source of noncompliance and determined that wet weather SSOs and bypasses due to I/I were occurring in more than 50 percent of the 734 municipalities participating in the program.

4. The Availability of Information on Sanitary Sewer Collection Systems and SSOs is System-Specific and the National Picture is Incomplete.

Although national surveys and studies have collected information on sanitary sewer collection systems and SSOs, national information on the status of collection systems and the extent of SSO problems remains limited and many municipalities are unaware of the overall extent of SSO problems in their own systems:

- In 1994, 40 percent of the municipalities participating in the AMSA survey reported that they did not have information on the annual number of SSOs in their systems. Half of the respondents did not know the SSO volume discharged and 87 percent have not characterized the pollutant characteristics of SSOs.
- States report that compliance with NPDES reporting requirements for SSOs is mixed, with poor reporting in some categories. Only 30 percent of the States responding to the ASIWPCA survey estimate that all or nearly all of their municipal permittees comply with SSO reporting requirements, with a corresponding figure of 22 percent of States for their private sector permittees. Further, 18 percent of States thought that less than 50 percent of their municipal permittees are in compliance with SSO reporting requirements.
- Municipalities have indicated that the lack of available and reliable information, as well as a lack of uniform definitions, have made characterization of their collection systems difficult and inaccurate[10].

H. What are the Major Causes of SSOs?

The factors that cause SSOs vary significantly from community to community. This section outlines some of the more common causes of SSOs and factors that affect sanitary sewer system performance, including the number and volume of SSOs. For the purpose of this discussion, major causes of SSOs are grouped into the following general categories:

- Peak flows that exceed system capacity
- Blockages
- Structural, mechanical or electrical failure
- Third party actions or activities

These categories are not exclusive because SSOs can be caused by a complex combination of factors. For example, partial blockages caused by debris, sediment, oil and grease, or roots can reduce the effective capacity of a pipe and cause an overflow during peak flow conditions.

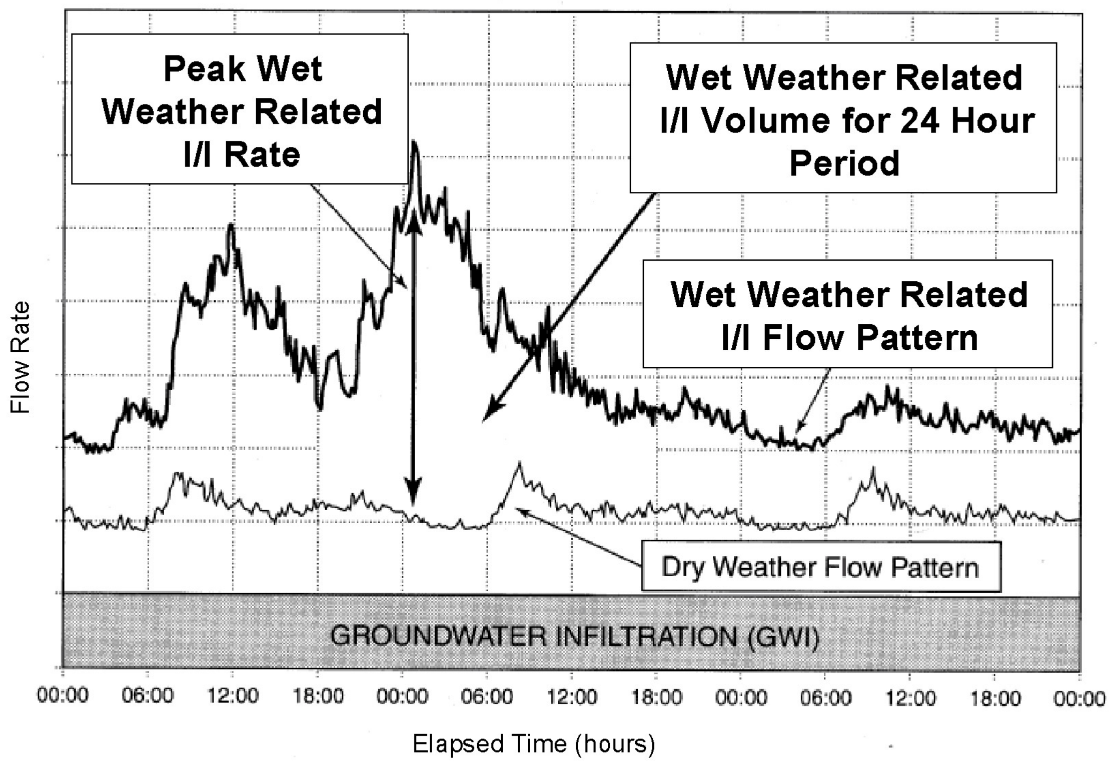
1. Peak Flows in Sanitary Sewers

a. What Causes Peak Flows in Sanitary Sewers?

Flows in sanitary sewer collection systems can be described in terms of major components such as baseflow (or dry weather flow), inflow, and infiltration. "Baseflow" describes the wastewater that a sanitary sewer system is intended to convey and includes wastewater from residences and commercial, institutional, and industrial establishments. Sanitary sewers are not installed to collect infiltration and inflow (I/I), although I/I enters sanitary sewers because they are not watertight. For sanitary sewers that receive significant levels of I/I,

[10] Guide to Benchmarks of Urban Capital Condition, Urban Institute, 1984.

peak flow conditions typically occur during wet weather conditions. Figure 1 shows how flows in a sewer system with significant I/I can respond to a wet weather event.



Source: WEF, 1999

Figure 1. Reaction of a Typical Sewer System to a Wet Weather Event

Inflow generally refers to water other than wastewater -- typically precipitation like rain or snowmelt -- that enters a sewer system through a direct connection to the sewer.[11] Inflow connections to sanitary sewers generally are not supposed to be authorized. Many inflow connections are the result of third parties' "tapping" into a sanitary sewer line without the knowledge or consent of the municipal sewerage authority. Other inflow sources were legal connections at the time of installation. The volume of inflow in a sanitary sewer typically depends on the magnitude and duration of storm events (or related phenomena, such as snow melt), as well as other variables. Therefore, inflow is often characterized by a rapid increase in volume that occurs during and immediately after a storm event.

Infiltration generally refers to other water that enters a sewer system through defects in the sewer.[12] Infiltration can be long-term seepage of water into a sewer system from the water table. In some systems, however, the flow characteristics of infiltration can resemble those of inflow -- i.e., there is a rapid increase in flow during and immediately after a rainfall event, due, for example, to rapidly rising ground water. This phenomenon is sometimes referred to as rainfall-induced infiltration (RII).

Two parameters are usually used to characterize peak flow in sanitary sewer collection systems. An instantaneous peak flow rate is often used to determine the appropriate design size for pump stations, interceptors, and other equipment that must handle wet-weather surges. A short-term average, such as the peak daily flow, is often used to determine the appropriate design size for equalization basins or other flow storage devices.

Almost all sewer systems exhibit some level of increased wet weather flow due to I/I. The amount of I/I in a system varies throughout the system and from storm to storm. EPA reviewed ten case studies of municipalities with significant I/I problems and found peak wet weather flows that ranged from 3.5 to 20 times the average dry weather flow (U.S. EPA, 1990).

Problems with data in the technical literature on sanitary sewer performance have arisen due to the complexity of the relationship between peak wet weather flows in sanitary sewers and the intensity and duration of rainfall, as well as other factors. This has led to confusion and misreporting of peak flow values. For example, I/I flows are often presented without discussion as to whether reported flows are an average of different measurements taken over a range of conditions or are tied to a specific set of conditions such as a storm event of specific magnitude and intensity . In other cases, simplifying assumptions are made, such as basing estimates of peak flow on a limited amount of data (e.g., one year) or assuming one value to describe all rainfall events and other conditions. The lack of specificity in data makes comparisons difficult (EPA, 1999).

b. What Factors Affect Peak Flows in Sanitary Sewers?

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[11] Inflow is defined in EPA's Construction Grants regulations at 40 CFR 35.2005(b)(21) as water other than wastewater that enters a sewer system (including sewer service connections) from sources such as, but not limited to, roof leaders, cellar drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm waters, surface runoff, street wash waters, or drainage. Inflow does not include, and is distinguished from, infiltration. Other, non-regulatory definitions of inflow found in the technical literature are similar to this with some variation as whether specific sources are included.

[12] Infiltration is currently defined in EPA's Construction Grants regulations at 40 CFR 35.2005(b)(20) 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. Other, non-regulatory definitions of infiltration found in the technical literature are similar to this with some variation as whether specific sources are included.

The amount of I/I entering a sanitary sewer system depends on rainfall and a complex set of other variables, such as surface water height, ground water height, condition of system components (e.g., joints, pipes, laterals, and manhole frames and covers), antecedent soil moisture, size of sewershed, drainage of soils, and the existence of improper connections.[13] About 70 percent of the over 300 municipalities reporting in a 1999 WEF survey indicated that surface water fluctuations (related to wet weather events) and ground water fluctuations have an effect on I/I in their sanitary sewer collection systems. The relationship between peak flows and these variables is system-specific and often event-specific. It probably changes with time for a given system as components of the system deteriorate with time, rehabilitation projects are undertaken, and the system expands. There is also uncertainty in characterizing peak flows and predicting how a collection system will respond under various conditions (EPA, 2000).

c. Why Must Peak Flows be Addressed to Avoid Overflows?

Peak flows in sanitary sewers can result in overflows when the flows exceed the capacity of a component of the collection system. Capacity problems typically arise when:

(1) Additional hookups have occurred that exceed the design of the collection system;
(2) The effective capacity of system components is significantly less than the design capacity of those components; and
(3) Actual I/I levels exceed projected levels used in system design.

Capacity limitations may result from undersized trunk and interceptor sewers, pump stations or force mains. Trunk sewers, pump stations, and treatment facilities are typically sized to accommodate projected future growth within reasonable periods. Capacity problems may occur if new hook-ups exceed the allowance for projected growth or if commercial, institutional, or industrial customers increase their wastewater contributions beyond anticipated levels.

Sewer design capacity may be lost to partial blockages caused by solid deposits, debris, sediment, grease or roots. Structural deficiencies (e.g., not meeting minimum velocity requirements, structural abnormalities) and inadequate sewer cleaning can contribute to the formation of partial blockages in sewers. Similarly, pumps often lose capacity with time. Pump capacity loss can be greatly accelerated by lack of proper maintenance.

1. Infiltration and Inflow

Sanitary sewers typically provide some capacity for I/I. For new sewers, this capacity is typically based on a peaking factor that is multiplied by estimates of the baseflow at build out levels. Peaking factors for new sanitary sewers typically range from 2 to 6. Minimum velocity requirements, which are intended to limit deposition of solids in pipes that can lead to loss of capacity and hydrogen sulfide production, are also factored in. Historically, due to a combination of factors such as pipe and manhole materials, number of pipe joints, overly optimistic expectations of the ability to remove I/I, and lack of preventive maintenance, many sanitary sewers have experienced I/I levels that were greater than what were originally expected when sized (Merrill and Butler, 1994). Also, I/I projections often have not accounted for the manner in which I/I volumes depend on rainfall and other conditions.

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[13] See "Handbook: Sewer System Infrastructure Analysis and Rehabilitation," EPA, 1991, which indicates that inflow and RII are strongly related to the characteristics of the rainfall events causing the flows and discusses that infiltration is dependent on rainfall. Rainfall Induced Infiltration into Sewer Systems: Report to Congress, EPA, August 1990 ("EPA guidelines acknowledged that both infiltration and inflow are affected by rainfall"); Existing Sewer Evaluation & Rehabilitation, WEF Manual of Practice FD-6; ASCE Manual and Report on Engineering Practice no. 62, 1994 ("In many areas of the U.S., the combination of snow melt and rainfall may induce maximum I/I"); Operation and Maintenance of Wastewater Collection Systems, a Field Study Training Program, fourth edition, California State University, Sacramento, 1993 ("Precipitation runoff is usually highly correlated with inflow").

Peak flows depend on a number of variables in a complex way. In addition, accuracy is limited when monitoring peak flows, with considerable inaccuracy arising when measuring peak flow in surcharged sanitary sewers.[14]

The effectiveness of I/I removal efforts is system-specific. In 1973, EPA thought that from 70 to 100 percent of the I/I in a sanitary sewer collection system could be removed through cost-effective sewer system rehabilitation.[15] Later information indicated that sewer rehabilitation is far less effective than had been expected and that even large expenditures for the correction of I/I sometimes produced only a small reduction in infiltration. By 1989, EPA revised its estimate of I/I removal by cost-effective sewer rehabilitation to 40 percent of the estimated infiltration.[16] The Agency also recognized that the correction of excessive infiltration is likely to be unsuccessful in certain circumstances.[17] While the technology and procedures associated with measuring and removing I/I continue to improve, the success of specific I/I removal projects depends on an extremely complex set of variables. This indicates that I/I removal is but one component of a comprehensive capacity management program, and that such a program needs to accommodate the variability in the success of I/I removal.

Experience with I/I work has highlighted the need to address the following concerns during I/I removal efforts:

- $ The success of I/I removal efforts can be significantly limited if such efforts do not address private lateral connections to buildings. Many municipalities have hesitated to address private laterals due to institutional and technical problems.
- Peak flows must be correctly characterized. Infiltration may be incorrectly identified as inflow when RII enters the sewer system through defects, but produces a peak flow response similar to that of inflow from direct connections.[18] A correlation between measured rainfall and RII entering a particular system is almost impossible without many years of historical data.
- Ground water migration affects the effectiveness of I/I removal. Correction of a specific infiltration source may not result in a corresponding reduction in the infiltration rate where ground water migration occurs. Traditional approaches to identifying the cost effectiveness of sewer system rehabilitation that evaluate each inflow source or sewer defect on an individual basis may overestimate the amount of flow reduction by failing to account for the migration of water into pipe defects that remain unrepaired.[19]
- $ Ground water that was precluded from entering main pipes prior to I/I removal efforts can enter the system after major sources of I/I have been repaired.
- The relationship between monitored flows and I/I from source defects may overestimate I/I removal. Metering programs may not

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[14] See “One Technique for Estimating Inflow with Surcharging Conditions,” Nogaj and Hollenbeck, Journal Water Pollution Control Federation, 53, 491 (1981).

[15] See 54 FR 4225, January 27, 1989.

[16] See “Evaluation of Infiltration/Inflow Program, Final Report,” February 1981, U.S. EPA, EPA-68-01-4913. The Report notes that many sewer rehabilitation programs eliminated from 0 to 30 percent of I/I flows despite typical engineers’ predictions of 60 to 90 percent I/I removal.

[17] See 54 FR 4225, January 27, 1989.

[18] See “Rainfall Induced Infiltration into Sewer Systems - Report to Congress,” EPA, 1990, 430-90-005.

[19] See “Rainfall Induced Infiltration into Sewer Systems - Report to Congress,” EPA, 1990, 430-90-005.

have accounted for peak flows that bypass the treatment facility or that overflow from the system itself.

2. Blockages

Deposition and blockages may occur from introducing improper materials into sewers, and from introduction of grease, grit, roots, or other debris. The potential for blockages can increase in sewers having flat slopes that reduce flow velocities or other structural defects. A detailed five-year review of backups and overflows in the Washington Suburban Sanitary Commission system (WSSC, 1995) attributed 74 percent of sewer system blockages to foreign material in the system, structural defects causing excessive deposition, or grease and root blockages.

3. Structural, Mechanical or Electrical Failure

A wide range of structural, mechanical or electrical failures occurs in sanitary sewer collection systems. Examples include cracks or holes in pipes caused by corrosion or external forces and loss of electricity to pump stations. A continuous maintenance effort, including an inspection program, should reduce the occurrence of overflows. Ready access to replacement parts and backup equipment supports rapid response to those SSOs that do occur.

I. Management Issues

1. Overview of Approaches to Address SSO Problems

The technical literature identifies several approaches to rehabilitating or remediating municipal sanitary sewer collection systems to control SSOs. While industry guidance suggests different variations, remediation efforts typically involve a comprehensive set of measures that are based on a multiple phased approach to planning and implementation. More recently, efforts have been made to integrate evaluations of improvements to management systems into remediation evaluations. An overview of some of the major approaches is provided below.

a. WEF/ASCE Approach

The Water Environment Federation and the American Society of Civil Engineers recommend a four phased integrated approach to rehabilitation of sewer systems (see "Existing Sewer Evaluation & Rehabilitation," WEF MOP FD-6, ASCE Report No. 62, 1994):

- Phase 1 - Planning Investigation;
- Phase 2 - Assessing the System I/I conditions, structural conditions, and hydraulics;
- Phase 3 - Developing the System Usage Plan; and
- Phase 4 - Implementing the System Usage Plan).

The approach is outlined in Figure 2.

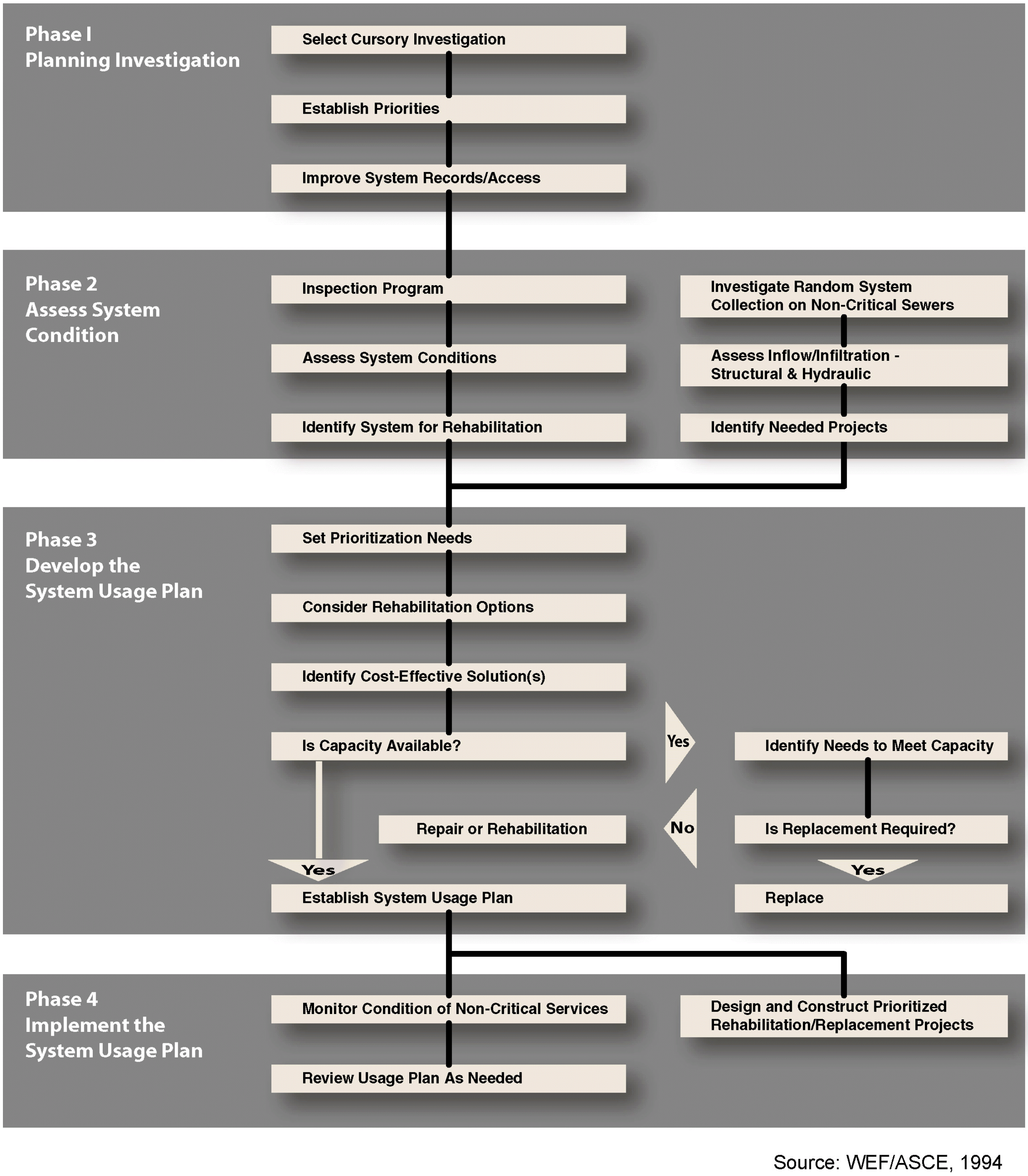


Figure 2. WEF/ASCE Four-Phased Integrated Approach to Rehabilitation of Sewer Systems

b. EPA 1991 Approach to Infrastructure Analysis and Rehabilitation
The "Handbook-Sewer System Infrastructure Analysis and

Rehabilitation," EPA 1991, provides guidance on the evaluation and rehabilitation of existing sewers, including guidance on conducting sewer system evaluations under the construction grants program. The guidance document describes a multiple phase approach that includes:

- A preliminary sewer system analysis,
- An I/I analysis,
- A sewer system evaluation survey,
- Corrosion analysis and control, and
- Sewer system rehabilitation.

Under the construction grants program, if an I/I analysis demonstrates the existence or possible existence of excessive I/I, a sewer system evaluation survey (SSES) was required. A SSES is a systematic examination of the sewer system to determine, for each source of I/I, the specific location, estimated flow rates, and the most cost-effective method of rehabilitation. The SSES compares the cost of rehabilitation to remove sources of I/I with the cost of transporting the I/I to a treatment facility and providing treatment.

c. SSO Subcommittee Approach

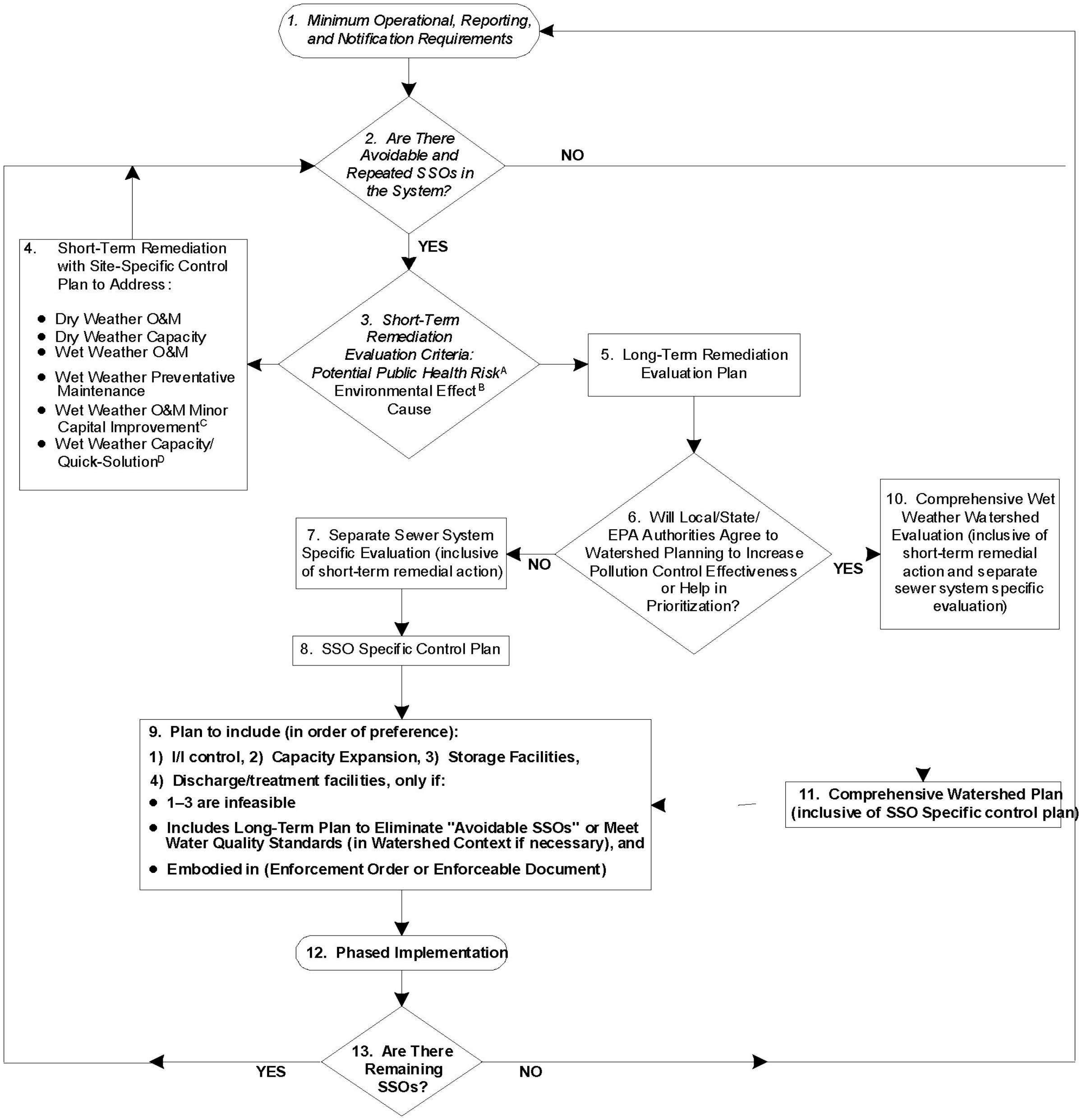
The SSO Subcommittee developed a consensus approach to strategic planning to address SSOs, as shown in the SSO management flow chart in Figure 3. Major features include:

! An expectation that all municipal operators of collection system meet minimum operational, reporting and notification requirements which are tiered based on system performance;

! A prioritization process that focuses efforts on SSOs that are avoidable and recognizes that some SSOs are beyond the reasonable control of the operator;

! A screening process to evaluate whether specific SSOs must be addressed immediately in a short-term remediation plan or in a comprehensive remediation plan;

! When minimum requirements are in place, the opportunity to address some SSO controls in a comprehensive watershed plan. Where watershed alternatives are appropriate, SSO controls could be coordinated with management programs for sanitary sewers, municipal separate storm sewers, combined sewers, wet and dry weather flows at sewage treatment plants, or other water pollution control efforts.



A Includes basement backups and SSOs in high public access areas.
B Includes fish or wildlife kills and significant water quality or wetland degradation.
C For example, monitoring equipment upgrades, pumps, computer programs, repair/replacement of broken manholes or pipes.
D For example, known system "bottlenecks," pumps needing replacement, and/or needs for additional staff.

► **Watershed Planning Track will be addressed by Urban Wet Weather Flows Advisory Committee in consultation with the SSO Subcommittee.**

Note: SSO refers to an overflow event, not an SSO structure.

Figure 3. SSO Management Flow Chart

2. Overview of Key Participants’ Roles in Sewer System Management

Key participants in sewer system management should include:

Operators - Operators of municipal and private collection systems are responsible for operating and maintaining the portion of the collection system within their jurisdictions and for any discharges from their collection systems. This responsibility would include complying with requirements to report SSOs to the NPDES authority and other appropriate health and environmental authorities, and implementing public notification requirements.

Local governments - Elected officials may be involved in approval of major undertakings and/or funding efforts. Elected officials typically have a role in demonstrating to constituencies the value of allocating resources for these programs. This may involve showing the benefits of the effort such as human health improvements, enhancement of greenways, or water-related activities, as well as the costs of the effort. The public typically will not support expenditures for projects that are not seen as cost-effective.

NPDES authorities - NPDES authorities must provide an appropriate regulatory framework that ensures compliance with the Clean Water Act. The NPDES authority establishes requirements, identifies compliance problems based on information from operator reports and other sources, and provides appropriate oversight in addressing compliance problems.

Public - Members of the public are the primary customers of sewerage services, users of water resources impaired by overflows, and providers of most sources of funding. The public is at risk when sewer systems fail and the public can provide information about system failures. The public is a key stakeholder group that should have an opportunity to identify concerns and expectations regarding operation and costs of collection systems, public health risks, and habitat and water quality impairment.

Public health officials - Public health officials have a key role in identifying the health risks associated with SSOs, providing public notification, and developing responses to SSO events.

Other affected entities - A number of other entities may be affected by a given SSO event or otherwise have a role in responding to an SSO event, including drinking water suppliers, beach monitoring authorities, facilities (such as food processors) with downstream intakes, local fire departments and police departments.

3. What is EPA's Overall Approach to Watershed-Based Planning?

EPA encourages the use of a watershed approach to prioritize actions to achieve environmental improvements, promote pollution prevention, and meet other important community goals. Under a watershed approach, local stakeholders coordinate in the development of a comprehensive watershed plan that provides for collection of environmentally relevant data and provides the basis for identifying appropriate regulatory and non-regulatory actions to be implemented to improve water quality. A watershed approach does not provide any additional liability protection or change the legal status of discharges to waters of the United States. Watershed plans can be considered, however, when developing enforcement schedules for bringing unauthorized discharges into compliance with the CWA.

A watershed approach to controlling wet weather discharges has the potential to improve the basis for water quality management decisions, provide an equitable and cost-effective allocation of responsibility among dischargers, and, in so doing, should deliver the same or greater levels of environmental improvement sooner and at a cost savings. A watershed approach would emphasize the role of local stakeholders in identifying water quality priorities and increase the opportunity for using risk-based approaches to environmental protection.

Several EPA documents explain the principles of watershed-based water quality planning. EPA's NPDES Watershed Strategy (March, 1994) outlines national objectives and implementation activities for integrating NPDES program functions into a broad watershed approach and provides support for development of State-wide basin management approaches. The Watershed Framework (May, 1996) describes EPA's expectations for State and Tribal implementation of watershed approaches. The 1998 Clean Water Action Plan has, at its core, an emphasis on local watershed planning. It calls upon State, Federal, and local agencies, watershed-based organizations, and the public to identify watersheds most in need of restoration and to cooperate in the development of watershed restoration action strategies and implementation of these strategies.

Additional information is provided in the 1998 draft Watershed Alternative for the Management of Wet Weather Flows, which was developed with substantial agreement by the Urban Wet Weather Federal Advisory Committee (see www.epa.gov/owm/unpolwg.pdf). The draft Watershed Alternative describes key components of a stakeholder-based approach to watershed planning. This document encourages use of watershed approaches to achieve environmental improvements. The draft Watershed Alternative describes a process for identifying key watershed stakeholders (i.e., parties with a direct financial, environmental, or regulatory interest, including unregulated entities), reaching agreement on pursuing a watershed alternative, developing a watershed plan, coordinating the collection of necessary data on pollutant sources and impacts, and fulfilling responsibilities under the watershed plan by carrying out regulatory and non-regulatory requirements. The draft Watershed Alternative document describes certain inherent flexibility to such an approach, such as more equitable allocation of responsibilities, coordination of monitoring, market-based approaches, and enhanced stakeholder and public involvement. The document also describes potential regulatory flexibility that NPDES authorities could provide, such as compliance schedules to achieve water quality-based requirements, streamlined monitoring requirements, and synchronization of permit issuance on a basin-wide basis.

a. Could Municipalities Incorporate Watershed-Based Concepts into Capital Planning for Sanitary Sewer Collection Systems?

In today’s proposed rule, EPA is exploring how to support capital investments in sanitary sewer collection systems that are consistent with and support broader watershed planning objectives. Many municipalities are well positioned to coordinate with other watershed stakeholders in the development of long-term remediation plans addressing needs and deficiencies in storm water and wastewater infrastructure, including sanitary sewer collection systems. Municipalities may find it advantageous to take a leadership role in local watershed planning, particularly where municipal discharges contribute heavily to water quality impacts or where a municipality has substantial data, resources, or incentive to take a leadership role.

b. How Would the Watershed Alternative Work?

The 1998 Watershed Alternative for the Management of Wet Weather Flows proposes a process through which the NPDES permit authority and involved stakeholders would participate in a comprehensive watershed planning and implementation process, identifying water quality and environmental problems through a comprehensive watershed assessment. This framework encourages coordination of a number of programs to improve water quality in a more efficient and effective fashion. The watershed alternative would neither create new regulatory requirements nor diminish any existing regulatory requirements. Rather, it is intended to improve water quality management decisions and help in the selection of appropriate regulatory mechanisms.

The first step in the watershed planning process outlined in the 1998 draft Watershed Alternative involves identification of stakeholders who can contribute significantly to the implementation of coordinated periodic management activities, who are significantly impacted by water quality problems, who are required to undertake control measures because of legal or regulatory requirements, or who oversee implementation of such requirements. This process would include satellite municipalities whose collection systems significantly contribute to wet weather problems; owners of agricultural, industrial, or other pollutant sources outside the urban area that contribute to impairment; and members of the public.

Under the approach outlined in the draft Watershed Alternative, each regulated stakeholder would be required to implement appropriate minimum measures without delay. The parties to the watershed planning process would coordinate to assess the sources of impairment in the watershed and the degree to which sources contribute to impairment. If the assessment indicates the need for pollution controls beyond minimum measures, the parties should agree on recommendations for allocation of water quality management responsibilities based on sources' relative contributions to impairment. The watershed plan should identify recommendations for final and interim goals, including recommendations to NPDES authorities for establishing or adjusting enforceable requirements. Responsibilities for funding for both planning and remediation projects should be defined. When allowed under State law and consistent with any applicable total maximum daily load (TMDL), the NPDES authority could agree to phase additional water quality regulatory requirements to accommodate the planning process and to synchronize requirements such as monitoring among participants. Special consideration would be warranted for sensitive and high-exposure areas such as beaches and drinking water supplies. Watershed plans can be taken into account when developing enforcement schedules for bringing unauthorized or unpermitted discharges into compliance with the CWA, but watershed plans (including the planning process) are not a bar to enforcement actions.

4. Asset Management

Increasingly, utilities are beginning to be managed like businesses by using techniques such as asset management planning to manage their collection system (WEF, 1999). An asset management plan is a framework to bring all the key components of running a utility into a strategic business plan that provides a means to protect, maintain, or improve the asset value of a collection system with planned maintenance and repair based on predicted deterioration of the system. In either a private or public utility, key information is needed to manage cost through asset management planning (WEF, 1999), including: current conditions and performance of assets; current operating costs; current financial position including revenues, balance sheet, and cash flow; required and anticipated future levels of service; and methods of measuring and monitoring performance of the system.

The goal of capital asset management is to efficiently protect, maintain, or improve the value of the collection system while providing the level of service desired. Capital asset management attempts to meet these goals by accurately projecting future costs. Cost projections should address the following factors:

- Determining existing conditions;
- Setting future goals;
- Attaining future goals; and
- Tracking progress.

5. Governmental Accounting Standards Board Statement 34

In June 1999, the Governmental Accounting Standards Board (GASB), which sets financial accounting and reporting standards for State and local governments issued Statement 34 which is entitled "Basic Financial Statements--and Management's Discussion and Analysis--for State and Local Governments." This standard contains changes to current financial accounting and reporting standards for State and local governments. Statement 34 is intended to make financial reporting for State and local governments more comprehensive and easier for the public to use and understand.

The new standard includes a provision that is used in the GASB standards for the first time that State and local governments either record and report depreciation on all long-lived assets, including infrastructure assets such as water and wastewater infrastructure; or use a modified approach of reporting infrastructure assets outside the basic financial statements as necessary supplementary information. In order to meet the criteria of the modified approach, State and local governments are to meet the following conditions:

$ use an asset management system that has an up-to-date inventory of eligible infrastructure assets;
$ perform condition assessments of eligible infrastructure assets and summarize the results using a measurement scale;
$ estimate each year the annual amount to maintain and preserve the eligible infrastructure assets at the condition level established and disclosed by the government; and
$ document that the eligible infrastructure assets are being preserved approximately at (or above) a condition level established and disclosed by the government.

Statement 34 provides an example of how infrastructure assets might be reported using supplementary information. The example provides that to meet the GASB standard using supplementary information, governments are to present the following schedules, derived from the asset management system, for all eligible infrastructure assets that are reported using the modified approach:

a. the assessed condition of eligible infrastructure assets, performed at least every three years, for the three most recent complete condition assessments, with the dates of the assessment;
b. the estimated annual amount, calculated at the beginning of the fiscal year, to maintain and preserve eligible infrastructure assets at the condition level established and disclosed by the government compared with the amounts actually expensed for each of the past five reporting periods.

The following disclosures should accompany the schedules:

i. The measurement scale and the basis for the condition measurement used to assess and report condition.
ii. The condition level at which the government intends to preserve its eligible infrastructure assets reported using the modified approach;
iii. Factors that significantly affect trends in the information reported in the schedules, including any changes in the measurement scale, the basis for the condition measurement, or the condition assessment methods used during the periods covered by the schedules. If there is a change in the condition level at which the government intends to preserve eligible infrastructure assets, an estimate of the effect of the change on the estimated annual amount to maintain and preserve those assets for the current period should also be disclosed.

J. Evaluating the Performance of Sanitary Sewer Systems

EPA believes the number of SSOs can be substantially reduced through improved sewer system management, operation and maintenance. Figure 4 shows the results of using different maintenance frequencies on a sanitary sewer system. For this study, conducted in Sacramento County, the wastewater collection system was divided into two sections and analyzed for development of a preventive maintenance schedule. One of the sections was cleaned every one to two years, while the other was cleaned every three to six years. As Figure 4 shows, the portion of the system on a more frequent one-to-two-year cleaning schedule experienced a noticeable reduction in the number of stoppages (from 384 in 1974 to 107 in 1984). By contrast, the portion of the system cleaned every three to six years experienced an increase in the number of stoppages over the same time (CSUS, 1993).

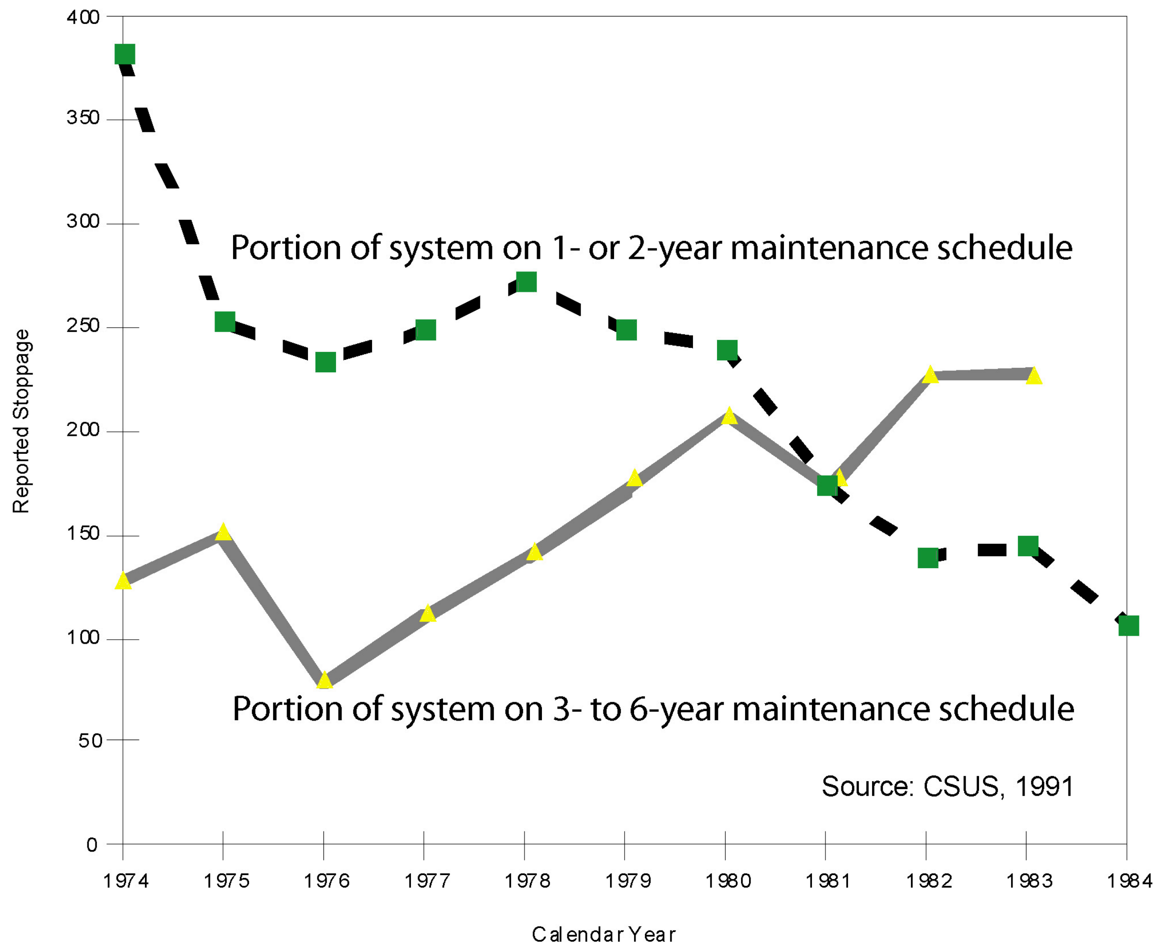
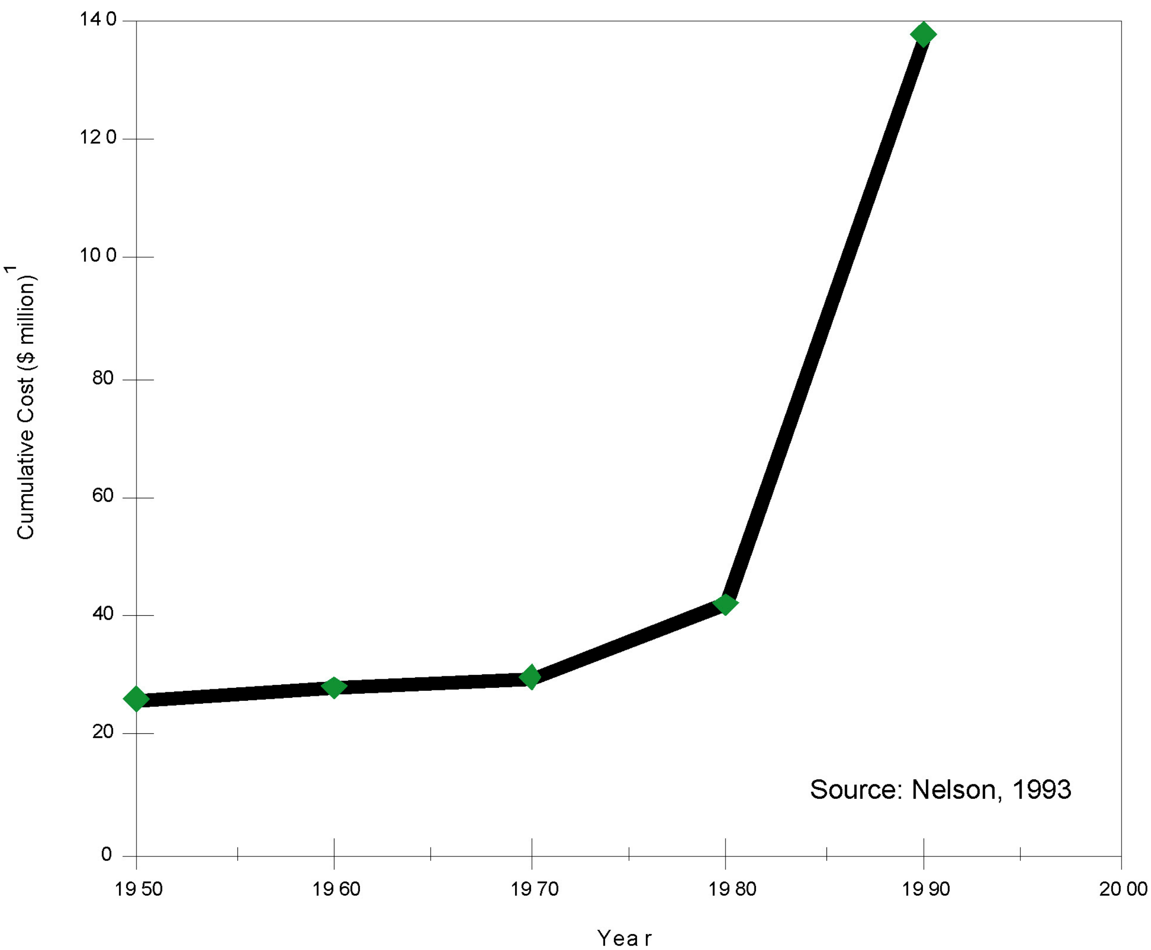


Figure 4. Trends in Number of Stoppages in Sacramento County

This general trend is also evident from the 1984 Urban Institute study. That study collected data from 22 cities on the number of sewer backups per 1,000 miles of sanitary sewers and the percentage of the system cleaned by the city, for each year from 1978 to 1980. The study concluded that "in nearly every case, the cities that clean a high percentage of their sewer systems have lower backup rates. At the same time, the cities with the highest backup rates appear to be doing the least cleaning." (UI, 1984)

Another survey of nine cities and three wastewater districts in Kansas indicated consistently increasing levels of operation and maintenance expenditures beginning in approximately 1970, as shown in Figure 5 (Nelson, 1993). The survey indicated that the maintenance needs of the systems generally varied depending on their size, age, accessibility, topography, and city objectives. The preventive maintenance tasks performed in the cities included flow monitoring, manhole inspection, smoke or dye testing, television inspection, and private sewer system inspections. The survey indicated that approximately 50 percent of the sewer length and 68 percent of the manholes in the systems had been inspected in the previous 25 years. The communities also estimated they had rehabilitated 37 percent of their manholes, sewer lines, relief sewers, and private sector connections. Reviewers of the Kansas survey found that annual inspection and maintenance frequencies of 6 percent and 10 percent of the system per year, respectively, appear to be cost-effective.



[1]Costs were adjusted to reflect inflation.

Figure 5. O&M Expenditure Trends for 12 Communities

Fayetteville, Arkansas instituted a comprehensive program to improve the performance of its 420-mile collection system beginning in 1990. Data on identified SSO occurrences were reported from 1989 through 1997 and showed a continuous reduction of identified events attributable to implementation of the comprehensive program (see Table 6)[20].

Table 6 - Identified SSO events in Fayetteville, Arkansas

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Number of SSOs identified per year	545	348	216	184	161	123	111	145	103

1. Evaluation Tools

Performance measures and performance indicators play an important role in evaluating collection system performance and the implementation of capacity management, operation and maintenance programs. Potential performance measures and indicators for sanitary sewer collection systems identified are shown in Table 7.

[20] Jurgens, "The Complete SSO Elimination Program," Proceedings of the Water Environment Federation 71st Annual Conference & Exposition, 1998.

Table 7. Potential performance indicators

Input measures	$ Per capita costs $ Number of employee hours
Output measures	$ Length of pipe maintained $ Number of service calls completed $ Percentage of length maintained repaired this year $ Percentage of length maintained needing repair $ Length of new sewer constructed $ Number of new services connected
Outcomes	$ Number of stoppages per 100 miles of pipe $ Average service response time $ Number of complaints
Ecological/Human health/ resource use	$ Shellfish bed closures $ Benthic Organism index $ Biological diversity index $ Beach closures $ Recreational activities $ Commercial activities

Sources: Wastewater Collection Systems Management, 5th edition, WEF MOP#7, 1999

Approaches to Combined Sewer Overflow Program Development: A CSO Assessment Report, AMSA, 1994.

2. ASCE Performance Rating

Performance ratings use measures of system performance to provide a quantitative basis for characterizing municipal utility performance. ASCE has developed one such rating, which is based on six performance measures:

$ Pipe failures in failures per mile per year;
$ Sanitary sewer overflows;
$ Customer complaints on performance of the collection system;
$ Pump station failures
$ Peak hour flow/average annual daily flows and
$ Peak monthly flow / average annual daily flows

The approach provides a statistical basis for combining the six performance indicators into one performance rating. ASCE believes that the performance rating can also be used to provide guidance for optimizing collection system maintenance frequencies and improving system performance.

K. What are the Estimated Costs of Addressing Existing SSO Problems?

EPA provides national estimates of the cost of projects eligible for State Revolving Fund (SRF) funding under the CWA in the Clean Water Needs Survey. The 1996 Clean Water Needs Survey Report to Congress (CWNS), EPA, September 1997, the most recent Needs report, did not provide separate need estimates for addressing SSO problems in municipal sanitary sewer collection systems. Although the needs associated with controlling SSOs are not identified separately in the CWNS report, many costs associated with addressing SSOs overlap with categories of needs identified in the CWNS report. These include:

$ Category IIIA, which identifies needs associated with infiltration and inflow correction. The 1996 CWNS report identified $3.3 billion in category IIIA needs; and
$ Category IIIB, which identifies needs associated with sewer replacement and sewer rehabilitation. The 1996 CWNS needs report identified $7.0 billion in category IIIB needs.

In addition, some portion of category I (secondary treatment), category IVA (new collector sewers and category IVB (new interceptor sewers) may be related to addressing SSO concerns. However, EPA believes that the needs estimates in categories that are potentially related to SSOs underestimate the total costs associated with preventing SSOs for the following reasons:

$ Many municipalities have not fully investigated their SSOs or costed out the measures necessary to correct them;
$ Some municipalities have not submitted documented needs for SSO correction measures such as I/I measures or sewer rehabilitation/replacement because these types of projects have traditionally been given lower priority in federal funding requests; and
$ Some of the costs of addressing SSOs do not require capital (e.g., operations and maintenance) and are not eligible for funding under the SRF program.

EPA has prepared a draft supplementary estimate of the costs of addressing SSO problems in municipal sanitary sewer collection systems in draft - Sanitary Sewer Overflow (SSO) Needs Report, EPA, May, 2000. The costs estimated in the SSO needs study are distinct from and do not reflect the incremental costs associated with implementing today’s proposal that are estimated in the economic analysis accompanying the proposal. Rather, the costs in the needs study are associated with longstanding reinvestment needs that have not yet been addressed. The incremental costs associated with implementing today’s proposal are discussed separately in sections VII and VIII of today’s preamble. However, as a practical matter, EPA recognizes that the proposed rule, once finalized, may accelerate investment in collection system improvements and maintenance.

The SSO Needs Report provided estimates of the costs associated with addressing two categories of SSO problems in municipal sanitary sewer collection systems: SSOs caused by wet weather conditions; and SSOs caused by other factors such as blockages, structural, mechanical, or electrical failure; or third party actions.

The estimated needs associated with addressing SSOs caused by wet weather are based on modeling comprehensive programs that could include providing storage, equalization and/or treatment capacity, and reduced inflow and infiltration (I/I). The estimated needs were shown to be dependent upon modeled performance level. Cost information from 60 communities was used to calibrate the model producing the estimates. Due to limitations in the modeling approach and calibration information, needs estimates could only be provided for a limited number of performance levels up to an overflow frequency of one wet-weather overflow every 5 years. The performance levels used in the SSO Needs Report do not correspond to the performance levels required to comply with existing requirements or today's proposal. Rather, EPA is proposing in today's notice that wet weather performance levels for sanitary sewer collection systems be evaluated on a case-by-case basis using two criteria: severe natural conditions and no feasible alternatives (see Section IV.E of today's notice). However, the cost estimates in Table 8 can give a rough idea and point of comparison of the order of reinvestment needs for municipal sanitary sewers. Table 8 provides cost estimates for controlling SSOs caused by wet weather. These estimated costs were assumed to be one-time costs. The table indicates that the costs are high and the incremental cost for reducing wet weather SSOs increase significantly beyond the one system-level overflow per year frequency.

Table 8. Estimated One-Time Cost of Reducing SSOs Caused by Wet Weather

Control Objective (number of system-level wet weather overflows per year)	Total Estimated National Cost	Incremental National Cost per Overflow per Year Reduced
5	$27.6 billion	-
1	$56.3 billion	$7.2 billion
0.5	$70.0 billion	$27.4 billion
0.2	$87.3 billion	$57.6 billion

The SSO Needs Report also provides estimates of the costs for a modified control strategy for the three percent of municipal sanitary sewer collection systems with the highest per capita costs serving a population of 5,000 or more. The modified control strategy includes expanding collection system and treatment plant capacity, reducing peak flows and a limited number of controlled discharges (up to 5 per year) of effluent treated with high-efficiency clarification and disinfection. The costs of a control strategy which allowes such treatment is about half the costs of a control strategy without such discharges.

The draft SSO Needs Report also provides estimates of costs of reducing SSOs caused by conditions other than wet weather. These would include SSOs caused by blockages or structural, mechanical or electrical failures. In general, these types of SSOs would be addressed by improved collection system management, operation and maintenance to restore the structural integrity of the system and reduce the potential for blockages. The draft report estimates that these costs would be an additional $1.5 billion per year nationwide.

The total estimated cost of addressing SSOs caused by wet weather conditions and SSOs caused by other conditions in the manner discussed above ranged from $4.1 to $9.8 billion per year nationally, or for households served by sanitary sewer collection systems, an average household expenditure of about $75 to $160 per year.

The model and accompanying analysis used for estimating these costs was designed to estimate national costs and the results should not be used to reach any conclusions about individual systems. Actual costs are expected to vary significantly from system to system. Again, these costs do not represent new costs associated with the proposed regulations in today’s notice.

EPA has also estimated the benefits associated with eliminating all SSOs in a draft report entitled Benefits of Measures to Abate SSOs, EPA, 2000. As with the costs in the draft SSO Needs Report, EPA, 2000, the total benefits estimated in this report do not represent benefits associated with implementing today’s proposal. However, EPA believes that the improved planning and management envisioned in today’s proposal will result in fewer overflows. As a practical matter, once finalized, the proposed requirements in today’s notice, may also accelerate investment in collection system upgrade and maintenance and may therefore lead to realization of some of these benefits sooner than would otherwise be the case. A share of these benefits, which was estimated based on the planning and management aspects of today’s proposal, were allocated to the incremental benefits of today’s proposal. A detailed discussion of the cost-benefit analysis for today’s proposal is provided in Section VII of today’s notice.

The draft report entitled Benefits of Measures to Abate SSOs estimates the total monetized benefits of eliminating all SSOs to range from $1.07 billion to $6.07 billion. This includes $0.94 billion to $5.3 billion in water quality related benefits, and $130 million to $752 million in system benefits from long-term reductions in capital and operation and maintenance costs stemming from better management and planning. It should be noted that the end point of the analysis in the draft report entitled Benefits of Measures to Abate SSOs is the elimination of SSOs, which is different from the end point of the draft SSO Needs Report. It should also be noted that some categories of benefits have not been monetized. These factors limit the ability to directly compare cost and benefit estimates provided in the draft SSO Benefits and draft SSO Needs reports.

Categories of benefits that have not been monetized or are incomplete

Several potentially important categories of benefits associated with SSO control have not been monetized. In addition, the estimated monetized benefit for some categories may only address a portion of the total benefit. When sufficient data and/or methodologies become available, the monetized benefits associated with these benefits categories may add significantly to the existing total of monetized benefits.

Non-monetized Benefits:

Potential benefits associated with avoided illnesses from contaminated drinking water were not estimated in the analysis supporting this proposal. The role of SSOs in contaminating drinking water supplies is not always visible or clearly understood. Thus, contamination may go unidentified, or unreported. EPA notes that surface water supplies of drinking water are subject to filtration and disinfection regulatory requirements intended to protect consumers from pathogens.

Another category of benefits from SSO abatement that EPA has not monetized is avoided aesthetic impacts on marine beaches and coastal recreation areas. EPA believes that tourists and people who live near marine beaches would assign some value to an improvement in marine water quality beyond that which has already been monetized in EPA’s beach closure and swimming benefits analyses. EPA is unaware of any study that attempts to estimate these aesthetic values which, in light of the importance of coastal tourism, as well as the proportion of the U.S. population that lives near or visits the coast, could be significant.

A third non-monetized benefits category is the benefit of avoiding the aesthetic and other impacts of SSOs on land. EPA estimates address the benefits of avoiding SSO that reach surface waters or that result in basement backups. However, the Agency does not have a means for quantifying the benefits of avoiding SSOs that occur in streets, residential areas, and green spaces without a discharge to waters of the United States. EPA’s benefits analysis assumes that 5 percent of SSO events fall into this category.

Additional benefit categories that have not be monetized include reduced drinking water treatment costs for either home units or for municipal suppliers responding to known SSO events, enhanced freshwater commercial fishing, improved health of marine ecosystems, and enhanced marine water recreational shellfishing.

Categories with Incomplete Benefits Estimates

EPA requests comments on data to support monetized estimates of benefits for:

$ Basement backups: EPA only had data on clean up costs for damage from basement backups. Basement backups also cause additional losses that have not been quantified: property damage, damage to intangibles, loss of use of flooded basements, aesthetic damages, damage to low-lying lawns and landscaping, and reductions in property values.

$ "Systems benefits,"or long-term savings in maintenance, repair and rehabilitation costs that collection systems will accrue as a result of the significant increase in maintenance spending projected as necessary to abate SSOs. EPA has estimated these benefits at $120 million to $638 million annually. EPA requests data from case studies and other sources that could support improved estimates of system benefits, or long-term savings in maintenance, repair and rehabilitation costs that collection systems will accrue as a result of the increase in maintenance spending projected as necessary to abate SSOs.

$ The set of freshwater benefits estimated in the analysis accompanying today’s proposal does not specifically account for the relative importance of SSOs as a source of pollution in urban areas. The draft study uses Mitchell and Carson's contingent valuation study, which does not allow a parsing of the Mitchell and Carson willingness to pay estimates between urban and non-urban waters. Mitchell and Carson did ask survey respondents to divide their willingness to pay estimates between in-state and out-of-state waters and EPA used this distinction in its analyses. Since the majority of the nation's population lives in urban areas, EPA believes the bulk of the nation's willingness-to-pay for local water quality improvement may be focused on urban waters. Since the great majority of sanitary sewer infrastructure is used for urban development, urban waters are the waters most frequently impaired by SSOs. A benefits estimation approach that assigned a higher share of the public's willingness to pay to urban waters would likely provide a higher benefits estimate than the method EPA used in the draft report Benefits of Measures to Abate SSOs. However, neither sufficient contingent valuation studies nor water quality data specific to urban and non-urban areas were available to adjust for this concern or to determine if such an adjustment would have a significant impact on benefits estimates.

EPA requests comment on the costs estimated in the draft SSO Needs Report and the methodologies used to estimate them, and on the benefits identified in the draft report entitled Benefits of Measures to Abate SSOs, and the methodologies used to estimate them. EPA also requests any data that commenters could provide that would help refine these costs and benefit estimates, including data on the number and volume of SSOs annually, on the percentage of these SSOs that reach waters of the United States, and on rates of infiltration and inflow in sanitary sewers under various conditions and the effectiveness of measures to prevent infiltration and inflow.

EPA also requests comment on several specific methodological issues related to the draft report entitled Benefits of Measures to Abate SSOs. In that report, EPA used State 305(b) data to identify waters impaired by either municipal point sources (MPS) or urban runoff/storm sewers (UR/SS), two sources of impairment likely to be associated with SSOs. In order to estimate the share of impairment from these two sources attributable to SSOs, EPA estimated the loadings of various pollutants (BOD, nutrients, pathogens, and TSS) that reach waters of the US through SSOs and compared these with the loadings of pollutants reaching waters of the US through permitted discharges from POTWs and urban runoff generally. This required estimating total flow and dilution factors for both wet and dry weather SSOs.

For wet weather SSOs, EPA assumed in the upper bound estimate, based on the model developed for the SSO Needs Report, that total wet weather SSO flow equals about 5.4 percent of total POTW flow, and that SSO wet weather discharges contain about 20 percent raw sewage. This implies that about one percent of total sewage flow through the collection system escapes as wet weather SSOs. Data on this parameter are limited. EPA has identified data from Greenville, SC, which indicate that total wet weather SSO flow equals about one percent of total system flow, and Los Angeles, CA, which indicate that total wet weather SSO flow equals about 0.02 percent of total system flow. EPA believes the LA percentage is an outlier and has based its lower bound estimate on the Greenville data only. Using the dilution factor of 20 percent sewage implies that approximately 0.2 percent of total sewage flow through the collection system escapes as wet weather SSOs in the lower bound estimate.

To estimate dry weather flows, EPA started with the model assumption that dry weather flows equal about 25 percent of wet weather flows and are composed 100 percent of raw sewage. This would imply that about 1.4 percent of total sewage flow through the collection system escapes as dry weather SSOs. EPA has limited data on the percent of sewage in collection systems that escape during dry weather. EPA identified data from Los Angeles, CA that indicate that about 0.00033 percent of total sewage flow through the collection system escapes as dry weather SSOs. Taking these data and the model assumptions into account, EPA assumed that 0.66 percent of total sewage flow through the collection system escapes as dry weather SSOs. This is the midpoint between the model assumption and the percentage from LA, which, as with wet weather flow, EPA believes is an outlier.

The implication of these assumptions is that about 0.9 to 1.7 percent of total sewage flow through the collection system escapes as wet and dry weather SSOs. It should be noted that this estimate is intended to reflect a broad national average. Individual systems may be higher or lower than these numbers. The above data reflect identified SSO events. However, the Agency is aware that sewage exfiltrates from most collection systems. While it is difficult to quantify sewer exfiltration, the Agency notes that one study found exfiltration to infiltration ratios for sanitary sewers to be between 1.5 to 1 and 14 to 1[21]. Exfiltration has the potential to impact surface water quality, depending on site-specific factors such as hydraulic connections between sewer trenches and storm sewers, the hydraulic connection between ground water and surface waters and the proximity of sewers to surface waters. EPA requests comment on its estimates of wet and dry weather SSO flows and associated dilution factors, and on its methodology for estimating them. EPA also requests data on the volume and sewage concentration of both wet and dry weather SSOs, and on the relationship of these flows to total sewage flow through the collection system.

A second methodological issue involves the procedure for attributing impairment to various source categories based on State 305(b) data. This is necessary to estimate the percentage of impairment that would be eliminated by controlling particular sources, in this case SSOs. These data generally identified sources qualitatively as either "major", "moderate," or "minor" sources of impairment for a given water body. Many water bodies have multiple sources of impairment listed, while others have none. Water bodies that list some source of impairment usually list multiple sources. To estimate the share of impairment attributable to MPS and UR/SS, EPA assumed in the upper bound that if one of these categories was listed as a major source, then 100 percent of the impairment should be attributed to that source (even if other major, moderate, and/or minor sources were listed), while if one of these sources was listed as a moderate source, then 30 percent of the impairment should be attributed to that source. No impairment was attributed if the source was listed only as a minor source. In the lower bound, EPA assumed that if a source was listed as major, 50 percent of impairment should be attributed to that source. No impairment was attributed if the source was listed as either moderate or minor. EPA requests comment on this methodology.

A third methodological issue involves the estimation of health benefits from reduced pathogen concentrations at swimming beaches. In estimating this benefit, EPA assumed the average marine beach had levels of 4.55 enterococci per 100 ml based on the mean of over 14,000 observations. EPA’s marine recreational water quality criterion for enterococci is 35 counts per 100 ml. EPA assumed the average fresh water beach had levels of 35.61 E. coli based on the mean of 426 observations. EPA’s fresh water recreational water quality criterion for E. coli is 126 per 100 ml. In general, these beaches have indicator pathogen counts below the recreational swimming water quality criteria established by EPA and are therefore considered swimmable, but these counts may still contribute a risk of illness. To the extent that elimination of SSOs further reduces these counts, there will be an associated reduction in swimming related illnesses. EPA estimates that there would be a reduction of 1.8 million to 3.5 million cases per year of swimming related illnesses if all SSOs were eliminated, and that the monetized value of this reduction in illnesses would be $0.5 billion to $4.08 billion, which corresponds to 54 to 67 percent of the total benefits from eliminating SSOs estimated in the draft report entitled <u>Benefits of Measures to Abate SSOs</u>. The methodology for deriving these estimates is briefly summarized below.

Based on a dose-response function from Cabelli and Dufour (1983), EPA calculated a dose response function for gastrointestinal (GI) illness stemming from exposure to indicator pathogens at swimming beaches. EPA estimated that for each GI related illness associated with pathogen exposure during swimming, there are from 1.5 to 2.5 non-GI

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[21] <u>Results of the Evaluation of Groundwater Impacts of Sewer Exfiltration</u>, Engineering-Science, EPA contract no 68-03-3431, February 1989.

illnesses also associated with swimming, and that for illnesses (both GI and non-GI) contracted by swimmers directly, there is a 20-30 percent secondary spread to other household members. EPA then used its estimate of the proportion of impairment in State 305(b) reports that stems from SSOs as a proxy for the proportion of pathogens at non-impaired swimming beaches that would be reduced if SSOs were eliminated. This yields an estimate that elimination of SSOs would result in 0.7 million to 1 million fewer GI related illnesses and 1 million to 2.5 million fewer non-GI related illnesses nationally per year. Finally, these reduced illnesses were valued using a range of $375 to $2,000 per case for GI related illnesses, and $244 to $700 per case for non-GI related illnesses. For the GI related illnesses, this range comes from a range of studies, using the midpoint of those studies as the high end estimate in order to account for uncertainty. For the non-GI related illnesses, this range is derived starting from the average valuation of symptom days from Tolley (1992), as shown in Table 9.

TABLE 9. Monetary Value Estimates of Acute or Short-Term Health Effects

Health Effect	Value Estimate for Acute or Short-Term Morbidity (in 1991 Dollars/Day) Low	Medium	High
Headache	25	65	145
Earache	30	55	75
Eye irritation	25	55	130
Sinus	25	45	80
Throat	10	35	55
Asthma	30	45	130
Severe rash	45	80	115

In the high end estimate, the values for some symptoms are then increased by a factor of 2.9 to reflect EPA's recommended figure of $5.8 million for the valuation of a statistical life, which is based on a range of studies rather than the $2.0 million used by Tolley. Finally, the resulting range of values for a symptom day are multiplied by a range of symptom durations of 2.5 to 7 days. The 7 day upper bound is based on data from Fleisher, and Kay, et al (1998), but is higher than the average reported by them in order to account for the possibility of additional severe health effects (e.g., sequela) beyond the listed symptoms. The 2.5 day lower bound is the average of a generally lower set of duration estimates from Cheung, et al (1990), as shown in Table 10.

TABLE 10. Duration of Non-Gastrointestinal Illnesses Among Swimmers in Days

	Fleisher, Kay et al (1998)		Cheung, et al (1990)
	Mean	Median	Mean
AFRI/respiratory	5.7	5	3.5
Ear	8.1	6	1.5
Eye	4.5	3.5	2.9
Skin	N.A.	N.A	4.0
Fever	N.A	N.A	4.2
Average Duration	**6.1**	**N/A**	**2.5**

A more detailed discussion of this methodology can be found in the draft report entitled Benefits of Measures to Abate SSOs. EPA requests comment on this methodology and the resulting estimates.

L. How Does the State Revolving Fund Apply to Municipal Sanitary Sewer Projects?

The CWA established a State Revolving Fund (SRF) to provide low-cost loans for wastewater projects. SRF funds may be used for major, and some minor, replacements of sanitary sewer collection system components. General guidelines include:

$ Major replacements, reconstruction or substitutions necessary to correct system failures are eligible for SRF funds; and

$ Minor replacements C such as obtaining and installing equipment, accessories, or appurtenances during the useful life of the treatment works necessary to maintain the capacity and performance for which such works are designed and constructed C are generally eligible for SRF funds. POTWs that began construction before October 1, 1994, with EPA grant funds must pay for minor replacements, however.

M. What Key Terms Are Used in This Proposed Rule?

The following definitions of key terms used in today's proposed rule are provided to assist the reader. The Agency requests comments on these definitions.

(1) Combined Sewer - A sewer that is designed as both a sanitary sewer and a storm sewer (see 40 CFR 35.2005(b)(11)).

(2) Inflow - Water other than wastewater that enters a sewer system (including sewer service connections) from sources such as, but not limited to, roof leaders, cellar drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm water, surface runoff, street wash waters, or drainage. (see 40 CFR 35.2005(b)(20)).

(3) Infiltration - 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. (see 40 CFR 35.2005(b)(20)).

(4) Municipality - A city, town, borough, county, parish, district, association or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian Tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA (see 40 CFR 122.2)

(5) Rainfall-induced infiltration (RII) - The portion of infiltration flows (flows coming from infiltration sources) that enters the sewerage system during and immediately after rainfall events. Rainfall-induced infiltration does not include inflow.

(6) Regional collection system - A collection system that accepts wastewater from satellite collection systems.

(7) Sanitary sewer - A conduit intended to carry liquid and water carried wastes from residences, commercial buildings, industrial plants and institutions together with minor quantities of ground, storm and surface waters that are not admitted intentionally. (See 40 CFR 35.2005(b)(37).)

(8) Sanitary Sewer Overflow (SSO) - An overflow, spill, release, or diversion of wastewater from a sanitary sewer system. SSOs do not include combined sewer overflows (CSOs) or other discharges from the combined portions of a combined sewer system. SSOs include:

   (A) Overflows or releases of wastewater that reach waters of the United States;

   (B) Overflows or releases of wastewater that do not reach waters of the U.S.;

(C) Wastewater backups into buildings that are caused by blockages or flow conditions in a sanitary sewer other than a building lateral. Wastewater backups into buildings caused by a blockage or other malfunction of a building lateral that is privately owned are not SSOs.

(9) <u>Satellite collection system</u> - A collection system that is owned or operated by one entity that discharges to a regional collection system that is owned or operated by a different entity. Satellite collection systems depend on a separate entity for wastewater treatment and discharge.

II. OVERVIEW OF TODAY'S PROPOSAL

A. What Types of Requirements is EPA Proposing?

Today's proposed rule would establish: (1) three standard permit conditions for inclusion in NPDES permits for publicly owned treatment works (POTWs) and municipal sanitary sewer collection systems; and (2) a framework under the NPDES permit program for regulating municipal satellite collection systems.

1. What would the Proposed Standard Permit Conditions Address?

EPA is proposing three standard permit conditions for inclusion in NPDES permits for publicly owned treatment works (POTWs) and municipal sanitary sewer collection systems. The proposed standard permit conditions would address:

- Capacity, management, operation and maintenance requirements for municipal sanitary sewer collection systems (proposed 40 CFR 122.42(e));
- A prohibition on discharges to waters of the United States that occur prior to a publicly owned treatment works (POTW) treatment facility, which includes a framework for raising a defense for unavoidable discharges (proposed 40 CFR 122.42(f)); and
- Reporting, public notification and recordkeeping requirements for discharges from a municipal sanitary sewer collection system (proposed 40 CFR 122.42(g)).

These proposed standard permit conditions would derive from CWA sections 304(i), 308, and 402(a), and were developed from existing standard permit conditions to specifically address municipal systems and discharges.

2. Which NPDES Permits Would Have to Include the Proposed Standard Permit Conditions When Finalized?

Under today's proposal, NPDES authorities would be required to include the three proposed standard permit conditions in permits for POTWs that are served by municipal sanitary sewers, and in permits for municipal sanitary sewer collection systems. The Agency estimates that there are about 19,000 municipal entities that own and/or operate sanitary sewer collection systems. This estimate includes about 4,800 municipal satellite collection systems. Table 13 estimates the distribution of service population of sanitary sewer collection systems.

3. How Would Today's Proposal Expand NPDES Permit Coverage?

The Agency is proposing a framework under the NPDES permit program for regulating municipal satellite collection systems to reduce the likelihood of SSOs from these systems. Municipal satellite collection systems are collection systems owned or operated by one entity that discharges to a regional collection system that is owned or operated by a different entity. EPA is proposing that an NPDES permit must require the implementation of standard permit conditions throughout the entire municipal collection system, including the municipal satellite portions. Under the proposed approach, NPDES authorities would have flexibility in determining which entity C the satellite system or the regional system that operates the POTW treatment plant C would have responsibility for development and implementation of a CMOM program within the municipal satellite system.

Today's proposal would expand the scope of the NPDES program by clarifying that owners or operators of municipal satellite collection systems that convey wastewater to a POTW treatment which in turn discharges pursuant to an NPDES permit, are required to obtain NPDES permit coverage unless the NPDES permit for the POTW treatment plant that receives flows from the municipal satellite collection system requires the implementation of permit conditions throughout the municipal satellite collection system. Today's proposal would define municipal satellite collection systems to include certain collection systems that convey municipal sewage or industrial waste to a POTW treatment facility that has an NPDES permit or is required to apply for a permit under 40 CFR 122.21(a). Municipal satellite collection systems can be composed of either sanitary sewers or combined sewers, or a combination of both types of sewers. Section V.D.2 provides additional discussion regarding the scope of this proposal.

4. When Would These Provisions Become Effective?

EPA is proposing standard NPDES permit conditions specifically tailored for POTWs and municipal sanitary sewer collection systems. These standard permit conditions would be implemented through permits. In other words, permittees would be responsible for complying with the standard permit conditions when incorporated into their permits. Before that time, permittees must comply with existing permit conditions, including existing standard permit conditions.

Permittees are required to comply with new permit conditions when the permit becomes effective, unless the permit establishes alternative dates. The timing for implementing CMOM program requirements is discussed in more detail in section III.L of today's preamble.

The proposed permit framework for municipal satellite collection systems, when finalized, would establish appropriate time frames for submitting permit applications.

B. Toolbox

The SSO Subcommittee identified the need for EPA to work with technical trade organizations (such as the Water Environment Federation, Water Environment Research Foundation, American Public Works Association, American Society of Civil Engineers and others), States and local governments to develop a range of "tools" for use in implementing today's proposed rule. This "toolbox" would help municipalities and States implement requirements in an effective and cost-efficient manner. EPA intends to provide a description of the toolbox on the SSO page of the OWM Internet site (http://www.epa.gov/owm/). The toolbox would include: fact sheets; guidance documents; an information clearinghouse; training and outreach efforts; sample overflow emergency response plans; sample self-audit reports; sample model ordinances for the necessary legal authorities; technical research; compliance monitoring and assistance tools; and descriptions of available funding resources. The toolbox site also would include ongoing development of draft guidance for NPDES inspectors for evaluating capacity, management, operation and maintenance (CMOM) programs at wastewater treatment plants and in collection systems. EPA is also considering developing guidance on: developing CMOM program summaries, developing a system evaluation and capacity assurance plan, and performing CMOM program audits.

EPA requests recommendations on specific items in the toolbox, along with suggestions on the most appropriate ways to share information, including the use of specific information-sharing mechanisms.

C. Definition of Sanitary Sewer Overflow

In the technical literature and elsewhere, there appears to be considerable variation with regard to what constitutes an SSO. In particular, different understandings exist as to whether backups in buildings and other overflows that do not result in a discharge to waters of the United States should be considered SSOs. The Agency believes that confusion in the definition of an SSO could lead to significant variation in the way that SSOs are reported.

EPA believes that a clear definition of an SSO is critical to effective and equitable program implementation. EPA is proposing a definition of sanitary sewer overflow as part of the proposed standard permit condition for reporting, public notification, and recordkeeping.

The proposed definition would identify the following classes of overflows or releases as SSOs:

(A) overflows or releases of wastewater that reach waters of the

United States;

(B) overflows or releases of wastewater that do not reach waters of the U.S.;

(C) wastewater backups into buildings that are caused by blockages or flow conditions in a sanitary sewer other than a building lateral. Wastewater backups into buildings caused by a blockage or other malfunction of a building lateral that is privately owned is not a sanitary sewer overflow.

Wastewater backups into buildings caused by a blockage or other malfunction of a building lateral would be excluded from the definition of SSOs because such backups generally are not considered to be the responsibility of the municipality that owns and operates a municipal sanitary sewer collection system. The Agency believes that an SSO caused by a problem in a building lateral can be distinguished from an SSO caused by flow conditions in a collector sewer by the volume of wastewater that backs up into the building. The volume of a backup associated with a building lateral problem should be less than the volume of water used in the building during the time the backup was occurring. Further, the Agency believes that line investigations usually will not be necessary to make this type of problem identification. The Agency requests comment on the technical difficulties in distinguishing between backups caused by building laterals and backups caused by flow conditions in the collector sewer.

Under today’s proposed definition, EPA does not intend for controlled management of flows that remain within the collection system, such as pumping wastewater into a tanker truck, or from one sewer to another to allow maintenance or repair activities, to be considered an SSO. The Agency requests comment on whether the proposed definition clearly excludes these situations, or whether such actions could be mistakenly considered a diversion and an SSO. The Agency requests specific examples of practices where such problems may arise.

The Agency notes that the proposed prohibition standard permit condition and the proposed reporting, public notification, and recordkeeping standard permit condition would apply to different classes of SSOs. For example, the proposed prohibition only applies to those SSOs that discharge to waters of the United States. The proposed reporting, public notification, and recordkeeping standard permit condition is tiered, with different proposed requirements applying to different classes of SSOs. The specific scope of these proposed standard permit conditions is discussed in greater detail in Sections IV and V of today’s preamble.

Some collection systems are comprised of both sanitary and combined sewers. Today’s proposed definition would clarify that SSOs do not include combined sewer overflows (CSOs) or other discharges from the combined portions of a combined sewer system.

D. NPDES State Programs

EPA is proposing: (1) a framework at 40 CFR 122.38 for expanding NPDES permit coverage to municipal satellite collection systems; and (2) standard permit conditions at Section 122.42. After EPA takes final action, both of these changes would be applicable to authorized NPDES State programs.

Section 123.25 provides that NPDES State programs would need to have legal authority to implement specific provisions of the NPDES regulation. EPA is proposing changes to 123.25 to clarify that, when finalized, the proposed framework at 122.38 to expand NPDES permit coverage to municipal satellite collection systems would be applicable to State NPDES programs. Because existing 123.25(a)(13) applies standard permit conditions at 122.42 to State NPDES programs, additional modification of 123.25 would not be necessary to clarify that the three standard permit conditions proposed in today’s proposed rule apply to State NPDES programs when finalized.

After EPA has taken final action on the proposal, States with authorized NPDES programs would have to evaluate whether revisions to their NPDES programs were necessary. Under Section 123.62, which establishes procedures for any necessary NPDES State program revisions, authorized States must revise their NPDES programs within 1 year, or within 2 years if statutory changes are necessary.