

INFILTRATION/INFLOW TASK FORCE REPORT

A GUIDANCE DOCUMENT FOR MWRA
MEMBER SEWER COMMUNITIES
AND REGIONAL STAKEHOLDERS

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Executive Summary

This report is the product of the Infiltration/Inflow (I/I) Task Force. It has been developed through the cooperative efforts of the 43 Massachusetts Water Resources Authority (MWRA) member sewer communities, MWRA Advisory Board, The Wastewater Advisory Committee (WAC) to the MWRA, Charles River Watershed Association (CRWA), Fore River Watershed Association (FRWA), Mystic River Watershed Association (MRWA), Neponset River Watershed Association (NRWA), South Shore Chamber of Commerce (SSCC), Massachusetts Department of Environmental Protection (DEP), United States Environmental Protection Agency (EPA), and MWRA. The I/I Task Force recommends implementation of the regional I/I reduction goals and implementation strategies detailed in this report. The report outlines a regional I/I reduction plan with appropriate burdens and benefits for stakeholders. The report is intended to be a guidance document for use by local sewer communities, as well as other regional stakeholders, who may tailor appropriate aspects of the report recommendations to their unique situations.

Severe storms in October 1996 and June 1998 led to the unusual circumstance of numerous sanitary sewer overflows (SSOs) from local and MWRA collection systems. In the aftermath of these events, EPA and DEP began an aggressive effort to make MWRA regulate flows from community sewer systems. MWRA recommended cooperative efforts by local collection system operators, as well as regulators and environmental advocates, would be more effective than a prescriptive, enforcement based approach. In December 1998 and February 1999, MWRA organized South and North System I/I Workshops that were attended by over 200 participants. General consensus was reached at the workshops that a working group of all stakeholders should be established to identify and evaluate potential solutions and to seek consensus. As an outcome, the I/I Task Force was established in February 1999 to identify regional I/I reduction goals and associated strategies.

The I/I Task Force voted the following mission statement:

The I/I Task Force will develop goals and implementation strategies that will reduce Infiltration/Inflow to optimize local and regional sewer service. The Task Force will make recommendations for cooperative implementation of the goals and strategies by local communities, MWRA, DEP, EPA, and others.

Seven overall goals were identified and approved by the Task Force. They are as follows:

1. Eliminate All Sewer System Backups
2. Minimize, with a Long-Term Goal of Eliminating, Health and Environmental Impacts of Sewer System Overflows Related to I/I.
3. Remove All (and Prevent New) Inflow Sources From Separate Sanitary Systems.
4. Minimize System-Wide Infiltration.
5. Educate and Involve the Public.
6. Develop an Operation and Maintenance Program.
7. Improve Funding Mechanisms for Identifying and Removing I/I.

The first four goals are listed in order of higher to lower urgency. The Task Force recommends communities utilize available resources to eliminate and/or minimize human health threats and loss of property due to sewer system backups and overflows. As these issues are addressed, communities should go on to establish and maintain programs to remove inflow and infiltration sources tributary to sanitary sewers consistent with regional health and environmental priorities. Goals 5, 6, and 7 address critical issues of public education, operation and maintenance programs, and funding mechanisms. Because of their importance, recommended strategies to address these issues have been organized into individual goals.

Under each goal, an overview of the general discussion held by the Task Force is presented along with a list of specific implementation strategies. Each strategy details: (1) a recommended activity or action item; (2) who should be responsible to perform the activity; and (3) a recommended schedule for implementation.

On January 25, 2001, the I/I Task Force - by unanimous vote – approved and recommended for cooperative implementation the regional goals and strategies presented in this report.

The I/I Task Force recognizes the significant contributions of the many members and attendees listed in Section 2.0, who gave freely of their time over the past two years to develop this report. Special thanks are given to Jay Fink P.E., Utilities Director, City of Newton, for serving as Task Force Chairman. Mr. Fink provided strong leadership in guiding the Task Force to complete its mission. The Task Force is also grateful to the City of Newton for generously hosting the monthly meetings.

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1.0 BACKGROUND INFORMATION

1.1 Definition of I/I and Problem Description

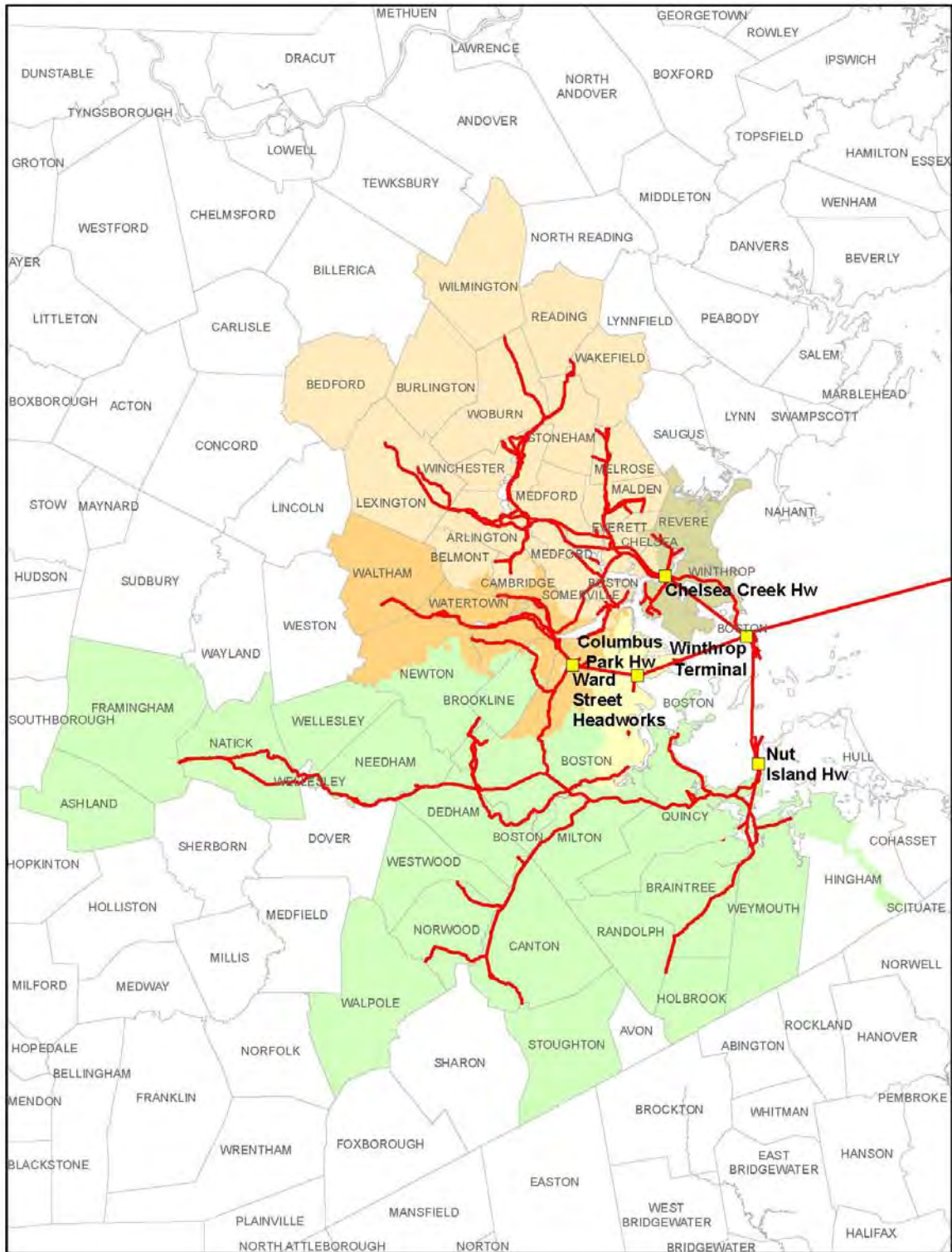
Infiltration/Inflow (I/I) is extraneous water entering the wastewater collection systems of both the MWRA and its contributing communities through a variety of sources. Infiltration is groundwater that enters the collection system through physical defects such as cracked pipes/manholes or deteriorated joints. Typically, many sewer pipes are below the surrounding groundwater table, therefore leakage into the sewer (infiltration) is a broad problem that is difficult and expensive to identify and remove. Inflow is extraneous flow entering the collection system through point sources. Inflow may be directly related to stormwater runoff from sources such as roof leaders, yard and area drains, sump pumps, manhole covers, cross connections from storm drains or catch basins, etc. Inflow may also be contributed from non-storm related point sources, such as leaking tide gates, cooling-water discharges, or drains from springs and swampy areas. Because inflow enters a collection system through point sources, it is generally easier and more cost-effective to identify and remove than infiltration.

High levels of I/I reduce pipeline capacity in the collection system that would otherwise be available to transmit sanitary flow. The result, during extreme storm events, may be sewer surcharging, back-up of sewage into homes and businesses, local overflows of untreated sewage, increased incidences and volumes of combined sewage overflows, as well as increased operating costs. I/I also results in the transport of groundwater and surface water out of the natural watershed, which may adversely impact groundwater and surface water resource areas. The design flow for the new Deer Island Treatment Facilities anticipated the reduction of 53 mgd of peak inflow from the MWRA's southern collection system. No assumptions of additional I/I reductions were made in the design flow estimates, nor were assumptions made that the I/I level over the 25-year planning period would increase, either from system growth or collection system deterioration. Since the existing systems will continue to deteriorate and system growth is likely, I/I reduction will be required in future years to maintain flows below the hydraulic capacity at Deer Island. In addition, MWRA's NPDES permit requires the 365 day running average dry day flow to not exceed 436 MGD.

The MWRA's regional collection system receives flow from 43 local communities (see Figures A and B). Figure A shows the MWRA service area and the interceptor system, as well as, the areas served by the five separate MWRA headworks facilities. All flow from the service area is tributary to the Deer Island Treatment Plant. Figure B presents growth of the sewerage service area from 1891 through present. The collection system encompasses about 240 miles of MWRA-owned interceptors, 5400 miles of publicly-owned community sewers, and 5000+ miles of private sewer service connections. These sewers are of varying size, shape, age, materials, depth, and condition but all contribute some quantity of I/I. The overall collection system is expanded every year while existing systems continue to deteriorate.

Almost all of the 43 member wastewater communities have "separate" sanitary and storm drainage systems. Separate sewer systems are sized to carry only sanitary flow and an allowance for an acceptable quantity of infiltration. Stormwater should be conveyed by a separate storm drainage system. If stormwater reaches a sanitary sewer, it is considered illegal inflow. In contrast, portions of several of the member communities sewer systems were built with the express purpose of receiving both sanitary sewage and stormwater, referred to as "combined" sewers (see Figure C). The construction of new combined sewers is no longer permitted.

Figure A
Map of MWRA Sewerage System Service Area



**Figure B:
Growth Of The MWRA Sewerage Service Area**

HIGHLIGHTS

The pie chart below shows the square miles of area added by each agency. The total is 500 square miles.

The Acts of 1889 created the Board of Met. Sewerage Commissioners after findings by the State Board of Health indicated a need for a regional sewer system.



The 4 parts of Hingham in the MWRA system are the North Sewer District, the high school, the junior high school, and Wompatuck State Park.




**Figure C:
Combined Sewer Systems**

HIGHLIGHTS

- Combined sewer systems are an interconnected system of sanitary sewers and storm drains.
- During storms, the added rain water exceeds the capacity of the pipes the excess exits the system through combined sewer overflows.
- Cambridge, Chelsea, almost all of Somerville and much of Boston have combined sewer systems.

LEGEND

-  CSO Communities (Cambridge, Chelsea, parts of Boston and Somerville)
-  Non CSO Communities



comprehensive/amls-rev/cs0ii

A review of flow data from CY91 through CY00 shows that the annual average daily wastewater flow contributed from the entire MWRA collection system varies, depending on annual precipitation, from about 335 to 425 mgd (see table below). I/I contributes about 55 to 65 percent of MWRA’s annual wastewater flow (approximately 185 to 275 mgd). Annual average daily sanitary flow (including residential, commercial, industrial, and institutional flow) accounts for about 150 mgd with little variation from year to year.

MWRA ANNUAL AVERAGE DAILY WASTEWATER FLOW (mgd)

	<u>Sanitary</u>	<u>Infiltration</u>	<u>Inflow</u>	<u>Total Flow</u>
Wet Year	150 (35%)	200 (47%)	75 (18%)	425 (100%)
Average Year	150 (40%)	180 (47%)	50 (13%)	380 (100%)
Dry year	150 (45%)	160 (47%)	25 (8%)	335 (100%)

Infiltration in the 43 member MWRA regional sewer service area accounts for almost half the annual average daily wastewater flow. Infiltration ranges from 500 to over 10,000 gallons-per-day per inch-diameter mile (gpd/idm) depending on groundwater levels and the physical condition of the collection system. For comparison, new sewer construction design allowance for infiltration is recommended at 250-500 gpd/idm (Guidelines for the Design of Wastewater Treatment Works, New England Interstate Water Pollution Control Commission – TR-16). Metcalf & Eddy’s text “Wastewater Engineering: Collection and Pumping of Wastewater”, suggests that infiltration rates for whole collection systems (including service connections) that are lower than 1500 gpd/idm are not usually excessive. DEP’s “Guidelines for Performing I/I Analyses” recommends (as a rule-of-thumb) sewer subsystems of about 20,000 linear feet that exhibit infiltration rates above 4000 gpd/idm be investigated for contributing potentially excessive infiltration.

Although infiltration accounts for a large volume of MWRA’s annual average daily flow (ADF), infiltration tends to increase and decrease gradually over the course of the year. Infiltration contributes significantly to peak flows, but it is the inflow during large storm events that can produce extreme flows leading to sewer system surcharging and SSOs.

As shown on the table above, inflow (on an annual basis) is relatively low compared to infiltration and sanitary flow. Inflow is characterized by a rapid increase in wastewater flow that occurs during and after a storm event. The inflow volume that enters a collection system typically depends on the magnitude and duration of a storm event, as well as related impacts such as snowmelt and storm tides. Figure D, reprinted from DEP’s “Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey”, presents a generic example of the effects of stormwater inflow. Inflow can increase local dry weather flow by two to five times (or more). To control peak flows, MWRA has a peak transport and treatment capacity of 1.2 billion gallons per day (more than 3 times the 380 mgd annual average flow) at the Deer Island Treatment Plant.

Figure E presents an example of MWRA wastewater flow component estimates for calendar year 2000. The graph shows monthly sanitary, infiltration, and inflow, as well as monthly rainfall. The calendar year 2000 flow pattern is representative of a typical year. Infiltration and inflow are highest in the spring when the groundwater table is high, soil is generally more saturated, and a lower percentage of stormwater can infiltrate the ground. Infiltration and inflow are lowest in the late summer when the groundwater table is low, soil is generally dry, and a high percentage of stormwater can infiltrate the ground and/or be lost through evapotranspiration.

Within the regional sewer system, peak flow conditions usually occur during significant storm events as a result of I/I. Few problems exist within the local and regional systems during dry weather or as a result of storm events below the “design” level storm. The sewer system “design” storm has been defined by DEP as a rainfall event with the following parameters: a one year return period, a six hour duration, a total volume of 1.72 inches of rain, and a peak one hour rainfall intensity of 0.87 inches. This is commonly referred to as a 1 year – 6 hour design storm.

During events that exceed the design storm, a variety of related problems can work together to overwhelm the local and regional sewer systems. High flow levels in streams and rivers can flood drainage outlets leading to drainage system failures. Street flooding and connections from cellar sump pumps can increase inflow to separate sewer systems making them act as combined systems. Figure F shows the impact of the June 1998 storm event (total rainfall of 7-9 inches) on the MWRA North Regional Sewer System. During and after the rainfall event, a large amount of stormwater inflow entered the collection system. The inflow gradually declined over a period of about two weeks. As a result of the June 1998 storm event, sanitary sewer overflows occurred from both the MWRA interceptor system and local collection systems. In addition, a small storm event began on June 29, 1998 (total rainfall of about two inches) that also contributed stormwater inflow to the collection system.

Figure D
 Example of the Effect of Stormwater Inflow from
 DEP I/I Guidelines

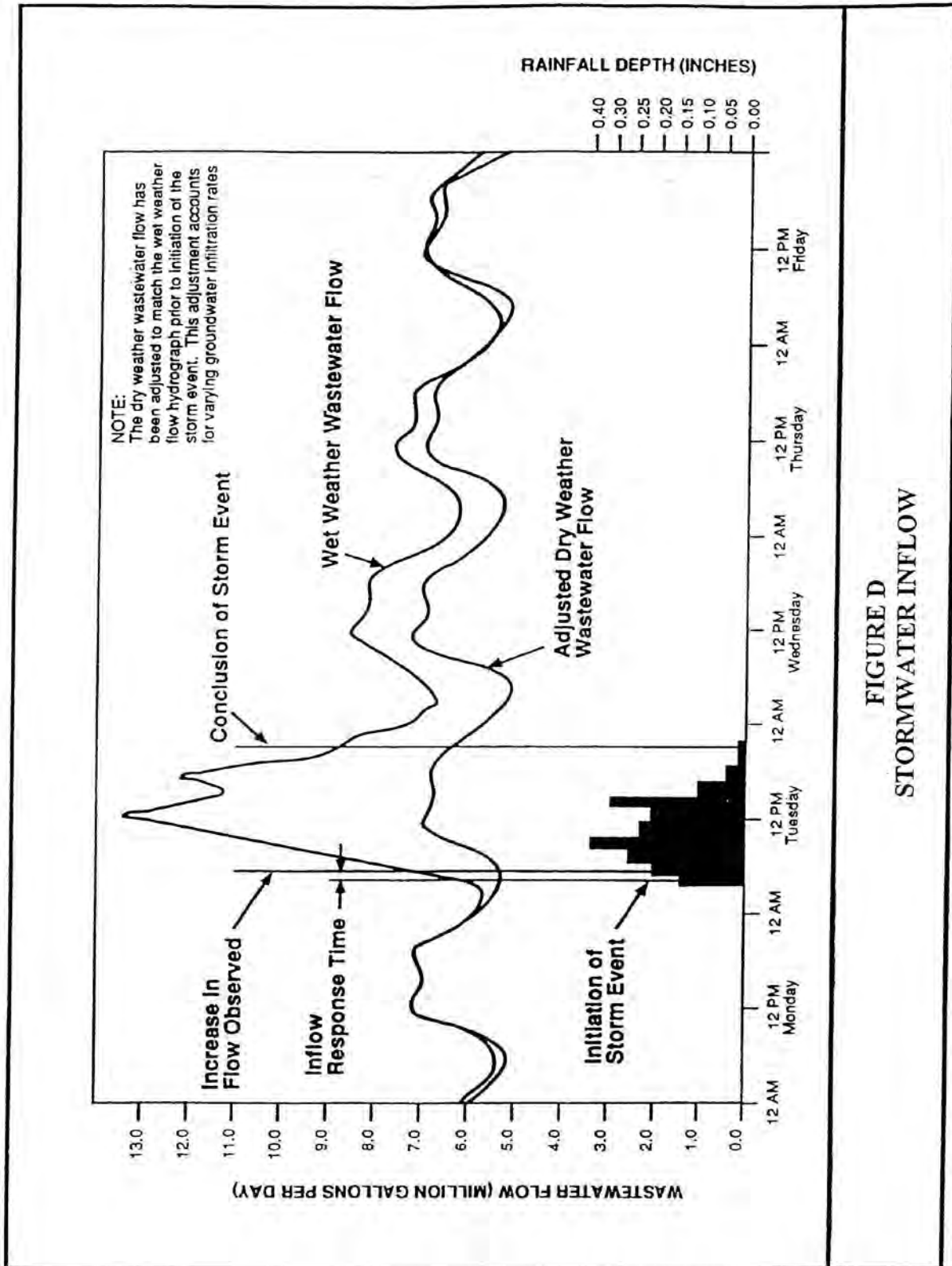


FIGURE D
 STORMWATER INFLOW

Figure E

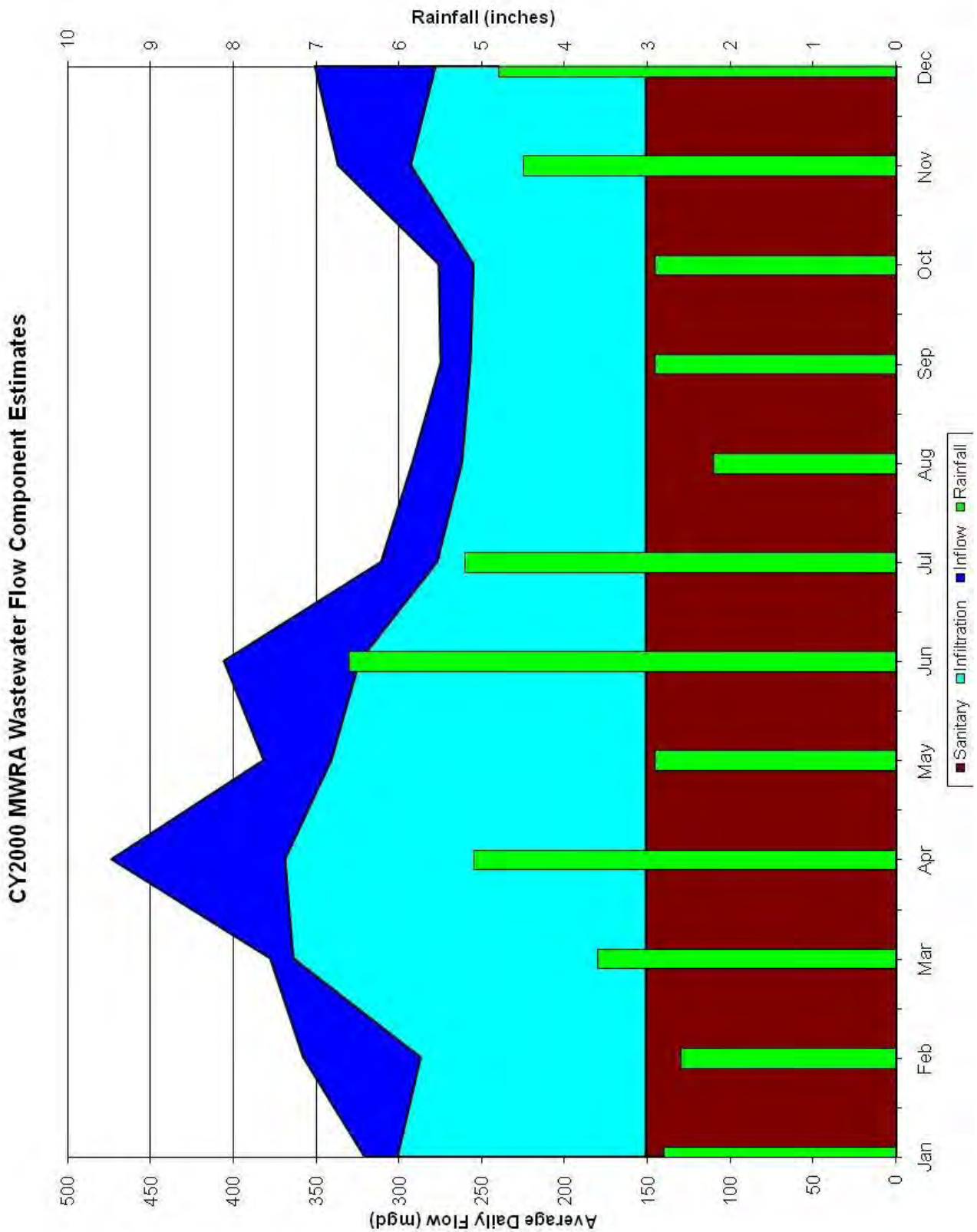
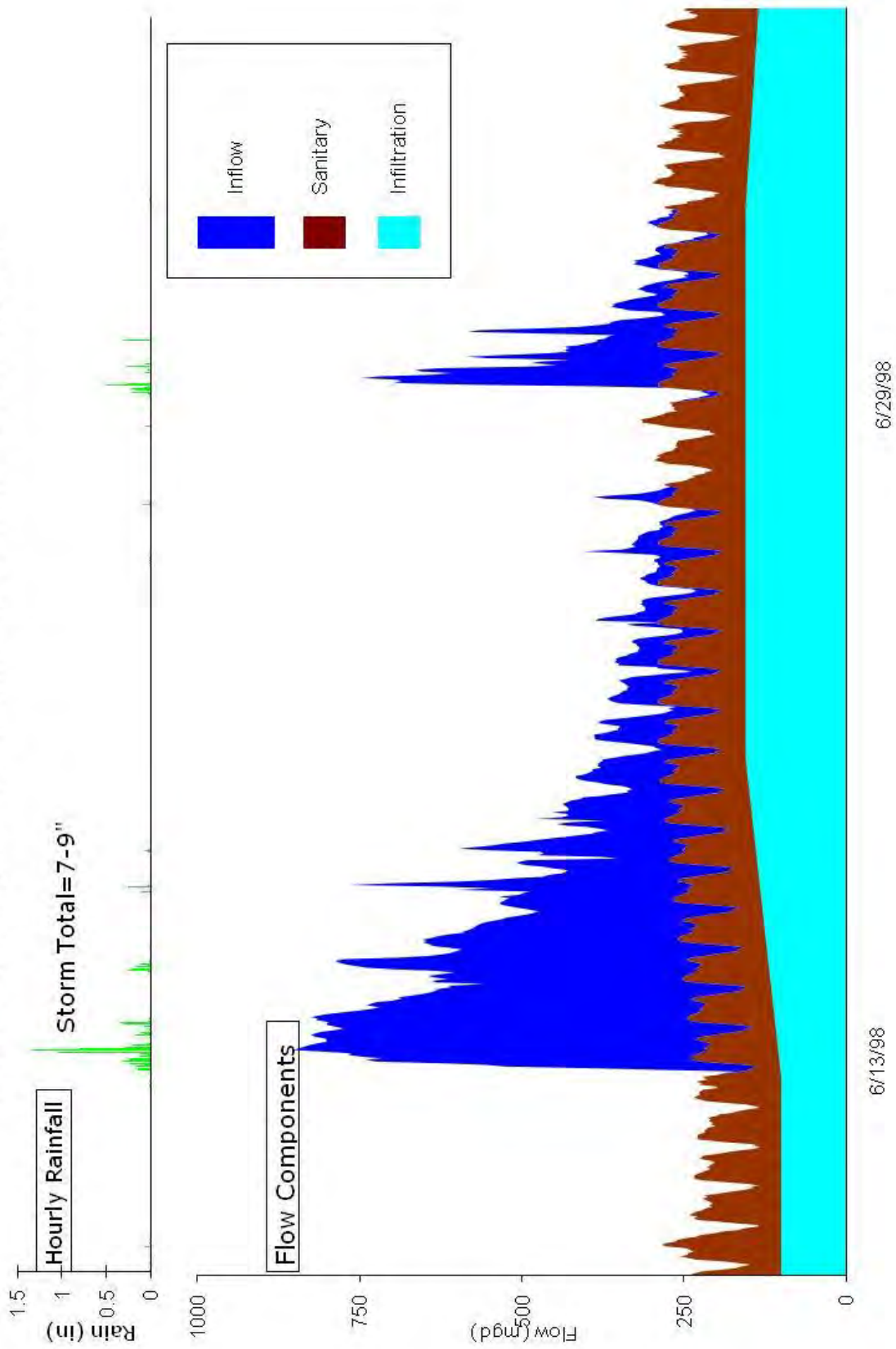


Figure F

Wet Weather Episodes in June 1998 in the North System



1.2 EPA and I/I

The Environmental Protection Agency (EPA) is responsible for implementing the federal Clean Water Act, which provides, among other items, that all point source discharges into waters of the United States are illegal unless authorized by a National Pollutant Discharge Elimination System (NPDES) permit. The Act also requires that discharges from publicly-owned treatment works (POTWs) achieve technology-based (secondary) and water quality based limits.

It is appropriate for EPA to include I/I control requirements in NPDES permits for sanitary sewer overflow abatement and extraneous flow reduction to POTWs facilitating permit limit compliance. These measures are appropriate since SSOs are illegal and an environmental hazard, and the reduction of I/I can lead to SSO abatement. The MWRA also is responsible for addressing I/I throughout the regional service area (MWRA and community collection systems). The MWRA has sought and obtained a waiver from the percent removal requirement ordinarily a part of the secondary treatment requirement. Such waivers are allowed for permittees only if they eliminate excessive I/I [See 40 CFR § 133.103(d)]. Finally, I/I control measures are justified in order to assure that the MWRA continues to meet the overall flow limit set forth in its NPDES Permit.

Detailed federal regulations regarding I/I control are found at 40 CFR Section 35. These regulations were promulgated pursuant to Title II of the Clean Water Act, which created a federal grant program to fund construction of publicly-owned treatment works. The I/I regulations required all applicants for design and construction grants to demonstrate that the collection system discharging into its treatment works was not subject to excessive inflow and infiltration. The requirements also included regulations for determining whether I/I was excessive. When Title II Construction Grants were phased out and replaced with the Title VI State Revolving Fund (SRF), the statute required that states continue I/I programs established in 40 CFR Section 35 as a condition of receiving a capitalization grant of its SRF from EPA.

SSOs are permit violations in sewer systems owned or operated by NPDES permittees. In satellite communities served by a district treatment facility, SSOs are a violation of the Clean Water Act subject to federal enforcement action. While non-NPDES communities are not specifically required to report overflows to EPA, the Agency strongly suggests that all overflows be reported orally within 24 hours with a follow-up written report summarizing the causes, effects, corrective measures, and provisions to prevent future occurrences. EPA has responded and will continue to respond to SSOs with administrative options ranging from information requests to formal enforcement orders or penalties. EPA reviews SSO causes, community reaction to events, environmental harm, maintenance history, and notification procedures in developing its response. EPA is also currently preparing SSO regulations for public review and comment (see <http://www.epa.gov/owm/rulmakef.htm>). The proposed SSO regulations contain a general prohibition on SSOs and require that owners of sewage collection systems:

- (i) provide proper operation and maintenance of its collection system;
- (ii) provide adequate capacity to convey base flows and peak flows for all parts of the collection system it owns or has operational control;
- (iii) take all feasible steps to stop and mitigate the impact of SSOs;

- (iv) provide permitting authority with 24-hour oral and 5-day written follow-up reports for any overflow that may imminently or substantially endanger human health;
- (v) prepare and maintain records regarding overflows and steps taken to abate and eliminate or control overflows;
- (vi) provide notification to the public in areas where overflows have a potential to affect human health; and
- (vii) develop a written summary of a Capacity, Management, Operation, and Maintenance (CMOM) program.

Since I/I is a significant percentage of both base and peak flows in most community sewage systems, a requirement to analyze their impacts on SSOs and minimize them to reduce and possibly eliminate SSOs is an important part of the proposed regulation.

1.3 DEP and I/I

The Massachusetts Department of Environmental Protection (DEP) is the statewide agency responsible for environmental regulation, as directed by the Massachusetts Clean Waters Act and other regulations. DEP has broad authority over sewage collection and treatment facilities, including regulatory responsibility for sewer surcharging and overflows caused by I/I. As a result of Federal Court actions (which ultimately led to creation of the MWRA), DEP applied its regulatory powers and issued 19 administrative orders (AOs) between 1984 and 1986 to MWRA service area communities in an effort to reduce excessive I/I. The AOs were issued to most of the MWRA Southern System communities and to two Northern System communities. These AOs required that specific schedules and corrective measures be implemented by the communities to reduce I/I quantities.

In order to assist communities (and regional agencies) in correcting I/I problems, the Commonwealth of Massachusetts (under Chapter 472 of the Acts of 1984) established a \$100 million fund to provide 90 percent State grants for I/I projects. DEP was charged with administration of these funds through 314 CMR 13.00, which established the policies and procedures for DEP to award grants for I/I rehabilitation projects. Each community desiring grant funding for I/I rehabilitation work was required to follow the project format detailed in DEP's "Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Surveys". As a result of DEP's action, approximately 75 percent of the 43 MWRA service area communities conducted I/I studies and Sewer System Evaluation Surveys to identify sources of I/I within their collection systems. However, not all projects progressed through rehabilitation construction. As of January 1990, all DEP grant programs, including the I/I grant program, had been consolidated into the State Revolving Fund (SRF). DEP used its regulatory power to require MWRA to "remove or cause to be removed" specific quantities of I/I in conjunction with each of the Authority's South System interceptor relief projects and the new Deer Island Treatment Plant project. These actions compelled the Authority to become an active participant in I/I reduction planning within the service area. This I/I reduction program came as a result of DEP's requirement that MWRA develop a hydraulic model of its South Sewage System, specifically its High Level Sewer. As a result of this model DEP and MWRA agreed, that as part of the Authority's South System Interceptor Replacement and Relief Program, MWRA would ensure the removal of at least 53 MGD of peak I/I from its South System. This requirement was

incorporated into a comprehensive I/I reduction program through an April 1991 Interagency Agreement between MWRA and DEP.

DEP's Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey, ("guidelines") is the primary reference used by MWRA and local communities to define standards for performing I/I reduction projects. The guidelines were initially distributed by DEP in January 1987 and most recently revised in January 1993 through committee efforts that included local consultants and sewer contractors, as well as DEP and MWRA staff.

The guidelines provide detailed methodology for development of I/I Analysis and Sewer System Evaluation Surveys. An I/I Analysis is an initial study of a large sewered area (usually an entire community). During the analysis, the large sewered area is subdivided into a number of smaller sub-basins. Results from an I/I Analysis are prioritized lists of sub-basins that require additional study to identify either infiltration or inflow. Sub-basins are prioritized for their rate of infiltration based on gallons per day per inch-diameter mile (gpd/idm). Inch-diameter miles are the total miles of sewer multiplied by the average diameter (in inches) of sewer pipe. Both the length (miles) and size (diameter) of sewer pipe are relevant infiltration factors because a longer and larger pipe provides more opportunity for groundwater to infiltrate through pipe defects. It is common engineering practice to use the inch mile unit when comparing the severity of infiltration between communities with different size collection systems. As a rule-of-thumb, the guidelines suggest that additional investigations be conducted on all sub-basins with an infiltration rate above 4000 gpd/idm. Sub-basins are prioritized for their rate of inflow based on the increase in flow attributed to a storm event similar to the selected "design storm" (about 1.7 inches of rain in 6 hours). As a rule-of-thumb, the guidelines suggest that additional investigations be conducted on all sub-basins that account for not less than 80 percent of storm inflow.

A Sewer System Evaluation Survey (SSES) is a more detailed investigation of the sub-basins as prioritized and recommended for further study in the I/I Analysis. SSES Results are prioritized lists of specific recommendations to rehabilitate sewer defects for the elimination of infiltration or inflow. Prioritization of identified sewer defects is based on a cost-effectiveness evaluation to determine whether I/I in a system is "excessive".

Whether I/I is considered excessive is determined pursuant to DEP's standards for cost-effectiveness and value-effectiveness, as detailed in the guidelines. An I/I reduction project is considered cost-effective if the costs of removing infiltration or inflow by sewer system rehabilitation are less than the costs for transporting and treating I/I flow. The cost-effectiveness analysis can be somewhat complex because the present worth of both operation and maintenance and capital costs of increased sewerage facilities capacity are included, as well as a life cycle cost analysis of potential rehabilitation methods. If I/I removal is not cost-effective but is demonstrated to the satisfaction of DEP to result in significant technical, environmental, health or cost benefits, it is considered value-effective. I/I is termed "excessive" if it is either cost-effective or value-effective to remove.

During the last five years DEP, through its Northeast Regional Office, has enhanced its comprehensive I/I control strategies [including addressing SSOs, backups, and Operation, Maintenance and Replacement (OM&R)] for municipalities and regional sewer authorities/districts using a combination of enforcement, financial assistance, technical assistance and public education.

DEP is also moving forward with development of expanded Statewide OM&R Guidelines. In this regard, the New England Interstate Water Pollution Control Commission (NEIWPC) has agreed to coordinate this activity on a regional basis to allow for assessment and development of OM&R Guidelines that would be consistent throughout the NEIWPC region.

DEP believes that in order to obtain a comprehensive and consistent program to control I/I (and therefore SSOs and backups) in the MWRA Regional Sewer System, it will be necessary for MWRA to become more active in managing certain activities of its 43 members relative to extraneous flows entering the municipal systems. This will be critical to ensure that the hundreds of millions of dollars expended by MWRA's ratepayers, to upgrade both the MWRA and municipal interceptor systems to adequately and properly transport wastewater to Deer Island for treatment, function as planned/constructed.

DEP agrees with MWRA and its member communities that it is preferable for wastewater to be managed by those entities that directly operate the system that collects and transmits this wastewater. State regulatory agencies should only become involved when the regional and local entities do not meet their responsibilities. This is exactly why DEP believes that MWRA and its 43 members are the logical entities to oversee and manage the regional system, while DEP maintains its regulatory and enforcement functions.

DEP has the following four basic strategies in its "toolbox" for dealing with excessive I/I:

- (1) Use of Traditional Enforcement Action to deal with chronic sewer overflows and/or backups into residences, can, depending on the specific conditions, include a broad range of requirements, from public education to improved O&M, sewer moratoria and specific remedial construction projects.
- (2) Use of DEP's Watershed Approach to Manage Stressed Basin Conditions where excessive infiltration is contributing to adverse impacts to the water resources in the sewershed by reducing surface water baseflows, or impacting groundwater quantity/quality being used for public or private water supplies. DEP will work closely with the Massachusetts Environmental Policy Act Office (MEPA), Water Resources Commission's (WRC) Interbasin Transfer Act staff (if applicable), local watershed associations, water purveyors and other stakeholders to develop a specific remedial plan.
- (3) Use of Planning and Permitting Related to Treatment Capacity/System Expansion ("growth") where a municipality wishes to significantly expand its sewer system and/or add new large-water-users to its existing sewer system. DEP interactions would be through MEPA, DEP's Comprehensive Wastewater Management Planning (CWMP) Process (310 CMR 44.00) and its Sewer Extension Permit Program (314 CMR 7.00).
- (4) Use of State Revolving Fund (SRF) to assist municipalities and MWRA in performing planning activities, I/I and SSES assessments and remedial corrective actions.

1.4 MWRA and I/I

The MWRA is an independent state authority charged with the mission of management and modernization of the metropolitan area's regional sewerage collection and treatment systems and the improvement of water quality in Boston Harbor. The Authority was established by the Massachusetts Water Resources Act, Chapter 372 of the Commonwealth's Acts of 1984, otherwise known as the Enabling Act. This Act established the Authority's goals including: "reduction of infiltration and inflow for the service areas of the Authority...". The Enabling Act further provides that the Authority "shall also reasonably provide for abatement, reduction and prevention of infiltration and inflow of ground waters, surface waters or storm waters into the sewer system...". Additionally, the MWRA's National Pollutant Discharge Elimination System (NPDES) Permit and the Authority's acceptance of Federal construction grants under the Clean Water Act, requires the Authority to eliminate "excessive" I/I in the collection system (the definition of "excessive" is based on DEP's I/I Guidelines as detailed in the previous section).

Initial MWRA Efforts Toward I/I Reduction

The MWRA began its efforts towards eliminating excessive I/I with the promulgation on May 1, 1987 of its Sewer Use Rules & Regulations, 360 CMR 10.000 ["Sewer Rules"]. The Sewer Rules require that all new sewer systems and existing system replacements or extensions which discharge to the MWRA sewerage system be designed and built to minimize I/I, to the maximum extent possible. Additionally, the owner and/or operator of any sewerage system which discharges directly or indirectly to the Authority sewerage system is required to operate and maintain the system so as to eliminate I/I in quantities above that allowed by the Authority or other regulatory body. The Sewer Rules also specifically prohibit the following discharges to the MWRA sewerage system: groundwater, storm water, surface waters, roof or surface runoff, tidewater, subsurface drainage (except as allowed by construction site dewatering permit in a CSO area), non-contact cooling or industrial process waters and uncontaminated contact cooling or industrial process waters.

In May 1989, staff recommended the Board of Directors approve an I/I management approach that would establish MWRA as the lead agency regarding I/I issues for local service area communities. The Board voted to tentatively approve this approach pending execution of an Interagency Agreement with DEP. In February 1990, an I/I Task Force was formed to provide input into the development of the Authority's I/I reduction strategy and subsequent policy decisions. The Task Force included Public Works officials from eight local communities (BWSC, Canton, Everett, Needham, Quincy, Wellesley, Weymouth and Woburn), as well as Joseph Favaloro, Executive Director, MWRA Advisory Board. The Task Force provided community-based insights and valuable suggestions that were reflected in MWRA I/I reduction goals and strategies.

MWRA's 1990 I/I Reduction Policy

On August 1, 1990, the MWRA Board of Directors approved a regional I/I reduction strategy that established MWRA as the lead agency but focused on I/I reduction and sewer system rehabilitation projects within the 43 local sewer communities. The strategy incorporated sewer metering, flow-based rate parameters, local financial assistance, annual sewer system maintenance, gradual system inspection and repair, and community technical assistance. This management approach was intended to require relatively low capital investment by the Authority

and be more of a best management practices approach. The strategy was developed to meet specific short, mid and long-term goals which are outlined below.

Short-term goals were based on DEP required I/I reductions for the MWRA south sewer system relief projects. During project planning, MWRA and DEP agreed on minimum I/I reductions specific to the service areas of the individual projects and an overall practical minimum inflow reduction for the entire south collection system. Specific MWRA short-term I/I reduction goals included:

1. Removal of 5.7 mgd of I/I from the Wellesley Extension Sewer Replacement service area;
2. Removal of 4.86 mgd of I/I from the New Neponset Valley Relief Sewer service area;
3. Removal of 3.54 mgd of I/I downstream of the Hingham Pump Station; and
4. Development and initiation of a plan to remove 53 mgd of peak inflow from the entire south collection system.

Mid-term goals included (1) removal of 53 mgd of peak inflow from the south collection system and (2) development and implementation of a plan to remove excessive I/I in the regional collection system.

Long-term goals included the elimination of excessive I/I from the regional collection system and implementation of effective annual local and regional collection system maintenance programs. These programs will assure efficient operation and ongoing repair/replacement of the collection system. Sewer system rehabilitation projects are intended to offset collection system deterioration and to allow for future increases in residential, commercial, industrial and institutional flows. The definition of what I/I quantity would be considered "excessive" was to evolve as a component of the overall program, with input from service area communities and DEP. MWRA's long-term wastewater metering records were expected to provide regional uniformity in estimating I/I rates within each community.

The specific short and mid-term I/I reduction goals outlined above have been substantially completed and documented to DEP. Significant progress has been made to establish programs aimed at meeting the long-term goals. The Authority's 1990 I/I Reduction Policy includes six major strategy elements to effect I/I reduction and sewer system rehabilitation within the MWRA's 43 wastewater service area communities. Implementation of the regional I/I reduction program is being coordinated by the MWRA, but focuses on I/I reduction and sewer system rehabilitation projects undertaken by each of the 43 local sewer service area communities. A synopsis of the major elements of the regional I/I reduction strategy and an overview of the progress and achievements related to individual projects is provided below.

1. Operation and maintenance of the MWRA's wastewater metering system and use of the meter data to include a flow-based component within the Authority's wholesale rate methodology. Wastewater flow accounts for about 60 percent of the wholesale sewer charge, providing a strong incentive for communities to control flow into the regional collection system.
2. Minimum I/I reduction requirements.

1. The MWRA I/I Local Financial Assistance Program, which currently provides \$100.75 million in grant and interest-free loan funding for eligible local I/I reduction projects.
4. Each community is responsible for financing its own annual sewer system maintenance program, including I/I reduction and sewer system rehabilitation projects. Funding assistance may be obtained from the MWRA's I/I Local Financial Assistance Program, the MWRA's CSO System Optimization Plan (SOP) Funding Program, and/or DEP's SRF program.
5. MWRA Technical Assistance and Public Education programs, which support community efforts.
6. Interagency Agreement between DEP and MWRA which delegates to MWRA the authority to establish and enforce the requirements listed above, thus minimizing duplication of effort between the agencies.

Wastewater Metering Program and Wholesale Rate Methodology: The cornerstone of the MWRA's I/I reduction strategy is the use of flow data from the wastewater metering system in the Authority's revised wholesale sewer rate methodology which includes a flow-based component. The Authority's revised wholesale rate methodology was implemented for FY96 (as of July 1, 1995). The inclusion of both community average daily and peak month flows as components in the rate methodology provides a direct financial incentive for the communities to reduce wastewater flow.

To keep the local communities informed on their wastewater flow contributions and wholesale sewer charges throughout the year, the MWRA distributes a bi-monthly report providing information on flow data, flow share, and sewer charge impacts. Community wastewater flow data is also used to determine the approximate quantity of I/I within each local system. Although the estimated I/I component data is not used for rates, it is available to the member communities for their analyses.

Minimum I/I Reduction Requirements: During the design phase, the MWRA and DEP cooperatively established an I/I reduction requirement for each MWRA interceptor relief project. DEP approved the MWRA's I/I reduction plans for the Hingham Pump Station Rehabilitation project (August 1990), the Wellesley Extension Sewer Replacement project (January 1991) and the New Neponset Valley Relief Sewer project (February 1991). Each plan details I/I reduction measures that have been implemented by the MWRA and service area communities to meet the project requirements. The final I/I reduction plan update for each project was submitted on October 31, 1995. Each of these submittals identified that the minimum I/I reduction requirements had been achieved and that additional I/I efforts were ongoing.

The MWRA also implemented an inflow reduction plan to meet DEP's requirement for the elimination of 53 mgd of peak inflow in the Authority's South Collection System. The MWRA submitted to DEP (letter dated December 11, 1995) a final inflow reduction plan that also identified that the minimum inflow reduction requirement had been achieved for the Authority's South Collection System. Also noted in the inflow reduction plan were additional projects that were being performed.

MWRA Municipal Permits require each community to “... operate and maintain its sewerage system so as to provide routine preventative maintenance and adequate capital replacement designed to preclude interruption of service and maintain the physical integrity of the collection system, alleviate sanitary sewerage system overflows, and eliminate all inflow and infiltration considered excessive by MWRA or other agencies...”. The Authority has not included minimum quantitative I/I reduction requirements in service area community Municipal Permits. Since the Authority has expended significant resources for regional I/I reduction management and has had success working cooperatively with local communities; quantitative permit requirements have not been utilized.

Community Financing: I/I reduction and sewer system rehabilitation projects are, by their nature, primarily maintenance related. Although the Authority recognizes the need to stimulate endeavors in this area, it is clearly the long-term responsibility of each community to maintain and upgrade its own collection system. The dramatic increase in the cost of providing the required capacity and degree of wastewater treatment, both now and in the future, make flow reduction an ever-increasing priority.

I/I Local Financial Assistance Program: Under this program, \$100.75 million in MWRA funds has currently been budgeted to assist Authority service area communities in implementing local sewer system I/I reduction rehabilitation projects. The program provides grants and interest-free loans for eligible project costs. Through CY00, 42 of the 43 service area communities have participated and over \$63 million has been distributed to fund over 175 local I/I reduction projects. About 75% of funds have been expended on construction, with the remaining 25% funding planning, design, and engineering services during construction activities. Phase 3 of the program was approved in June 1998 increasing the overall budget from \$63.75 million to \$100.75 million. The grant/loan split was also revised, increasing the grant portion to 45% (up from 25%). The MWRA Advisory Board is considering a recommendation for an additional \$40 million in program funds for FY02.

MWRA’s I/I Local Financial Assistance Program uses DEP’s I/I guidelines as the primary reference; however, it is not required that I/I be demonstrated to be excessive for the local project to be eligible for funding. MWRA’s approach to maintenance on its own interceptor system includes scheduled internal inspection of the entire system, with rehabilitation recommendations based on structural integrity and engineering judgement. MWRA encourages communities to take a similar whole system maintenance approach to their locally-owned sewers. MWRA has also identified inflow reduction as a system priority. The purpose statement for the MWRA I/I Local Financial Assistance Program states, in part: “The priority of the MWRA I/I Local Financial Assistance Program is the reduction of storm related (and/or tidal) inflow to relieve hydraulic peaks in the collection and treatment systems, thereby reducing surcharging, raw sewage overflows and operational costs.” MWRA funds are also eligible for use on private property to remove sources of illegal inflow such as sump pumps, roof leaders, and foundation or driveway drains connected to the household plumbing.

Technical Assistance: The MWRA also provides a variety of technical assistance services to the local communities. Data from the wastewater metering system and subsequent engineering analyses help quantify I/I rates and assess specific problem areas in community collection systems. MWRA staff work cooperatively with community representatives and consultants to supply and evaluate metering data which maximizes use of both community and MWRA resources. The Authority also allocates a percentage of its sewer cleaning and internal television

inspection efforts towards work in the community-owned collection systems. These efforts help communities identify O&M problems and potential I/I rehabilitation projects.

The MWRA has initiated a periodic “technology transfer” mailing to member sewer communities. The intent is to distribute I/I reduction and sewer system rehabilitation technology information from both local and national projects that may be of interest to local collection system operators and managers.

Interagency Agreement Between DEP and MWRA: An Interagency Agreement concerning the conduct of an I/I Management Program for the MWRA sewerage service area was signed on April 29, 1991. The agreement was in effect for a term of 30 months, but was not renewed or extended. In February 1999, under an Administrative Consent Order (ACO-NE-99-1006) related to the Braintree/Weymouth Relief Facilities Project, the MWRA and DEP agreed to enter into a new Interagency Agreement on I/I issues to replace the 1991 Agreement. The new Interagency Agreement will take into account recommendations endorsed by the I/I Task Force, accepted by MWRA and approved by DEP. The new Interagency Agreement will specify how the MWRA and member communities will address sewer overflows, backups into residences and businesses, loss of groundwater/surface water in stressed basins, and how all parties can most effectively fulfill their responsibilities under the Clean Water Act (and other relevant statutes and regulations).

1.5 Communities and I/I

I/I reduction and sewer system rehabilitation projects are generally accepted as an integral part of a comprehensive sewer system operation and maintenance program. Each local community has, to varying degrees, an annual operation and maintenance program and a sewer system rehabilitation/replacement plan. While traditional maintenance projects can generally be funded locally, broad scale I/I reduction programs can be difficult to initiate without outside financial assistance.

Most MWRA member sewer communities began implementing I/I reduction programs during the 1980’s. Projects were almost exclusively funded through DEP’s 90 percent grant program. In 1990, when the DEP grant program was converted into the SRF (low interest loan only) program, community I/I reduction projects were severely impacted. Without funding assistance, few communities moved projects forward. With the advent of the MWRA I/I Local Financial Assistance Program in 1993, local communities again began investing in I/I reduction projects.

Through CY00, over \$63 million in I/I Local Financial Assistance program funds has been committed to finance more than 175 local I/I reduction and sewer system rehabilitation projects. Local projects typically include: planning and design activities, pipeline replacement, pipeline chemical sealing, sewer sliplining, sewer insitu/trenchless lining, spot repairs, manhole rehabilitation, catch basin disconnection, storm drain separation, service connection repair, sump pump and downspout disconnection, etc.

It must be recognized that community ratepayers not only fund their local collection system O&M, but also finance the majority of the cost of regional collection system improvements. In addition to the \$3.7 billion Boston Harbor Project, MWRA has expended over \$400 million on regional transport system improvements over the last ten years. The financial burden of these regional improvements is born by member communities.

I/I issues for sanitary sewers are inextricably related to the adequacy of natural and manmade drainage systems. Development of effective strategies to control I/I must include programs for management of stormwater drainage from public and private sources. However, local funding commitment for drainage improvements can be even more difficult than financing sewer projects. Adding to the regional infrastructure complexities, the responsibility for operation and maintenance of drainage and sewer systems are often institutionally separated.

1.6 Watershed Associations and I/I

The Charles River Watershed Association, Fore River Watershed Association, Mystic River Watershed Association and the Neponset River Watershed Association, are all private nonprofit organizations with the mission of protecting and restoring their respective river basins. These organizations collect data about their watersheds, develop natural resource goals and implementation plans, participate vigorously in permitting and regulatory decisions and work to secure for the public, the economic and cultural benefits of a protected environment. These organizations bring to the table an “on the ground” understanding of their watersheds which cuts across the geographic and jurisdictional boundaries of other Task Force members. During I/I Task Force discussions, the watershed groups have tried to represent the interests of the environmental community as a whole, as well as the compelling public interest in healthy and sustainable watersheds.

In each of these watersheds, the health of wastewater collection and treatment systems is the dominant factor in determining the health of watershed resources. Each watershed is degraded by sanitary sewer overflows, combined sewer overflows, interbasin water transfers, and the other consequences of an aging and badly deteriorated sewer collection system. Inflow is the driving force behind many damaging pollution discharges in our watersheds, while infiltration quietly drains away invaluable groundwater resources which might otherwise sustain water supplies, wetlands and aquatic life.

Watershed groups view Inflow and Infiltration as very different yet equally important problems. Each watershed is impacted by inflow or infiltration to varying degrees, such that one, the other, or both may be the most pressing problem in any one watershed or subwatershed. Much as there can be no O&M plan which is universally applicable to all MWRA communities, there can be no universal proscription that the control of inflow is more pressing than the control of infiltration. In developing a plan of action, the importance of each issue must be weighed against watershed goals to establish the strategy that will yield the greatest overall public benefit, using limited public and private resources as efficiently as possible.

Over the last five years, much of the effort of watershed groups has been dedicated to working with agency and municipal staff in the creation of an integrated approach to watershed decision making that addresses a range of issues including sewer system maintenance. This holistic watershed approach defies traditional “media specific” agency programs and simplistic one size fits all edicts, making it possible to craft watershed restoration strategies that recognize the inherent tradeoffs between issues like stormwater, point source discharges, water withdrawals and other factors. Watershed associations believe that this kind of approach represents the most promising way to address the tremendous challenge of renewing our aging sewer infrastructure.

However, this emphasis on a site-specific watershed approach does not translate into an acceptance that I/I or SSOs are inevitable. To the contrary, the watershed associations strenuously disagree with the “consensus” that SSOs are inevitable and the implied conclusions that discharging raw sewage into the environment is an effective means of reducing the long-term public health and environmental impacts created by a failure to maintain our infrastructure. Nor would the watershed associations agree that any SSO is unavoidable, that it has minor impacts or that it can be tolerated based on measures of cost-effectiveness. Furthermore, in spite of the “consensus” at the I/I workshops so many months ago, we believe that a more representative sample of sewer customers, and the American public, as expressed by the framers of the Federal Clean Water Act and through repeated public opinion surveys, would reject the proposition that unmitigated pollution of our waterways is acceptable.

There are compelling economic incentives to control and reduce I/I in each of our communities. Failure to maintain tight wastewater systems overloads the system as a whole and SSOs are the tangible demonstration that system capacity is being exceeded. If communities hope to avoid sewer connection moratoriums, environmental degradation and property devaluation they must live within the capacity of the wastewater system. Furthermore, failure to control I/I is a failure to avoid the enormous capital costs of unnecessary wastewater treatment and lost water supply capacity.

Working together, communities, the MWRA, regulators and the environmental community can make a compelling case for fully funding the public’s clean water goals, on both economic and environmental grounds. To garner this funding it is essential that the benefits of a healthy sewer system be quantified and conveyed to the public. It is also essential that the public be fully aware when the sewer system fails in the form of backups, overflows or interbasin transfers. The recommendations of the I/I Task Force will help to lift the shroud of secrecy that has traditionally surrounded these sewer failures, so that the public can better understand the seriousness of the problem and better support thoughtful solutions.

The watershed associations will continue to advocate for the MWRA, DEP, EPA and individual municipalities to live up to the goals of the Clean Water Act. The associations look forward to working with all the other members of the I/I Task Force to reach those goals through our own environmental monitoring, and constituency building efforts as well as through new partnerships that we hope will flow from the work of the Task Force.

2.0 CREATION OF THE I/I TASK FORCE

2.1 I/I Workshops

Severe storm events in October 1996 and June 1998 led to the unusual circumstance of numerous sanitary sewer overflows (SSOs) from community and MWRA collection systems. In the aftermath of these events, EPA/DEP began an aggressive effort to make MWRA regulate flows from community sewer systems. EPA/DEP proposed that MWRA establish and enforce numerical flow limits and/or numerical I/I reduction requirements for all member communities. EPA/DEP suggested that these measures could be required as part of the Braintree/Weymouth Administrative Consent Order and MWRA's Final NPDES Permit. In a letter to EPA/DEP, dated October 15, 1998, MWRA's Executive Director outlined the Authority's concerns regarding potential regulatory actions. In part, the letter stated:

“Instead of adding permit conditions or enforcement actions developed by regulatory staff without input from all stakeholders, MWRA suggests a concerted effort on the part of everyone at a federal, state and local level to define the problems and to develop appropriate solutions. We believe that a working group of all stakeholders must be established to identify and evaluate potential solutions and to seek consensus”.

MWRA believed a comprehensive approach, developed cooperatively by local collection system operators, as well as regulators and environmental advocates, would be more effective than a prescriptive, enforcement-based approach. In December 1998 and February 1999, MWRA organized separate South and North System I/I Workshops that were attended by over 200 participants. General workshop consensus seemed to be reached on several topics:

- A regional task force was determined to be the most effective way to move forward while allowing a broad range of stakeholders to be involved. This should be done quickly so momentum would not be lost.
- Sewer system overflows should never directly impact people/homeowners/businesses/ratepayers, even if minor negative environmental impacts must be sacrificed.
- Total elimination of sewer system overflows in the most severe storm events is an unattainable goal.
- Storm water drainage issues are key to understanding and reducing sewer system I/I.
- Goals for infiltration versus inflow should be separated; inflow reduction should be prioritized because, in most cases, it is inflow that directly leads to overflows.
- Public education and technology exchange must be increased.
- Collection system short and long term operation and maintenance practices should be targeted to help achieve I/I reduction.

2.2 I/I Task Force

As an outcome of the workshops, the I/I Task Force was established in February 1999 to identify regional I/I reduction goals and associated strategies. The make-up of voting members on the Task Force includes representatives from each of the 43 local sewer communities, the MWRA Advisory Board, the Wastewater Advisory Committee to the MWRA, the Charles, Fore, Mystic, and Neponset River Watershed Associations, the South Shore Chamber of Commerce, and MWRA staff. EPA and DEP staff were also active members but have declined to participate in Task Force voting.

Initially, representatives from fourteen local communities were selected to speak for all 43-member sewer communities. However, as a result of significant debate regarding I/I and SSO requirements added to MWRA's Final NPDES Permit, all 43-member sewer communities became voting members of the Task Force to ensure each had a voice in determining Task Force recommendations.

2.3 List of Task Force Members

I/I Task Force Voting Members:

Arlington represented by Mark Shea, Task Force Vice-Chair
Ashland represented by Joseph Celano
Bedford represented by Peter Churchill
Belmont represented by Tom Gatzunis
Braintree represented by Anthony Attardo
Brookline represented by Andrew Pappastergion
Burlington represented by Syamal Chaudhuri or Pete Peters
BWSC represented by John Sullivan
Cambridge represented by Owen O'Riordan
Canton represented by Ernest Williams
Chelsea represented by Andrew DeSantis
Dedham represented by Paul Keane
Everett represented by Angelo Acierno or Bill Maher
Framingham represented by Robert Angelo
Hingham represented by John Brandt
Holbrook represented by Tom Cummings
Lexington represented by Dan Vallee
Malden represented by Joseph Peluso
Medford represented by Laird Walsh
Melrose represented by Joseph Lynch
Milton represented by Katherine Dunphy
Natick represented by Charles Sisitsky
Needham represented by Richard Merson
Newton represented by Jay Fink, Task Force Chair
Norwood represented by John Carroll
Quincy represented by George Clark
Randolph represented by David Zecchini
Reading represented by Edward McIntire
Revere represented by Donald Goodwin

Somerville represented by F. Thom Donahue
Stoneham represented by Jeff Oxman
Stoughton represented by James Miller
Wakefield represented by Tom Hayes
Walpole represented by Richard Mattson
Waltham represented by David Savoy
Watertown represented by Gerald Mee
Wellesley represented by Stephen Fader or Joseph Duggan
Westwood represented by Dana Crockford or Tim Walsh
Weymouth represented by Brad Hayes
Wilmington represented by Michael Woods
Winchester represented by Ed Grant
Winthrop represented by Raymond Rice
Woburn represented by Fred Russell

Charles River Watershed Association represented by Mindy Roberts or Kathy Baskin
Fore River Watershed Association represented by Jeff Thayer
Mystic River Watershed Association represented by Grace Perez
Neponset River Watershed Association represented by Michele Barden or Ian Cooke

MWRA represented by Michael Hornbrook or Carl Leone

MWRA Advisory Board represented by Joseph Favaloro

South Shore Chamber of Commerce represented by Kevin Coen or Dean Rizzo

Wastewater Advisory Committee to MWRA represented by Susan Redlich or
Stephen Greene

Task Force Non-Voting Members:

DEP represented by Richard Chretien and Steven Lipman
EPA represented by Jay Brodin and Brian Pitt
MWRA represented by Lorraine Downey and Jon Szarek

Task Force Non-Voting Regular Meeting Attendees:

Roger Frymire, Cambridge resident
Larry Schafer, Newton resident

Stephen Cullen, MWRA staff
Kristen Hall, MWRA staff
John McLaughlin, MWRA staff

3.0 I/I TASK FORCE MISSION STATEMENT AND GOALS

3.1 Mission Statement

The I/I Task Force voted the following mission statement:

The I/I Task Force will develop goals and implementation strategies that will reduce Infiltration/Inflow to optimize local and regional sewer service. The Task Force will make recommendations for cooperative implementation of the goals and strategies by local communities, MWRA, DEP, EPA, and others.

3.2 Goals and Implementation Strategies

Seven overall goals were identified and approved by the Task Force. They are as follows:

1. Eliminate All Sewer System Backups
2. Minimize, with a Long-Term Goal of Eliminating, Health and Environmental Impacts of Sewer System Overflows Related to I/I.
3. Remove All (and Prevent New) Inflow Sources From Separate Sanitary Systems.
4. Minimize System-Wide Infiltration.
5. Educate and Involve the Public.
6. Develop an Operation and Maintenance Program.
7. Improve Funding Mechanisms for Identifying and Removing I/I.

The first four goals are listed in order of higher to lower priority. The Task Force recommends communities utilize available resources to eliminate and/or minimize human health threats and loss of property due to sewer system backups and overflows. After these issues are addressed, communities should establish and maintain programs to remove inflow sources and minimize infiltration tributary to sanitary sewers. Goals 5-7 address critical issues of public education, operation and maintenance programs, and funding mechanisms. Because of their importance, recommended strategies to address these issues have been organized into individual goals.

Under each goal, an overview of the general discussion held by the Task Force is presented along with a list of specific implementation strategies. Each strategy details: (1) a recommended activity or action item, (2) who should be responsible for performing the activity; and (3) a recommended implementation schedule.

3.3 Implementation Schedule

The implementation schedule recommended for each strategy is defined as short, mid, or long-term, as follows:

1. **Short-term:** Strategies defined as “short-term” are recommended to be completed as soon as possible, but not more than one to two years after distribution of this report.
2. **Mid-term:** Strategies defined as “mid-term” are recommended to be completed as soon as possible, but not more than two to four years after distribution of this report.
3. **Long-term:** Strategies defined as “long-term” are recommended to be completed as soon as possible, but not more than four to five years after distribution of this report.

4.0 GOAL 1: ELIMINATE ALL SEWER SYSTEM BACKUPS

Backups of wastewater into homes and other buildings cause serious public health threats and loss of property. Eliminating sewer system backups into homes and other buildings is recommended as the highest priority for all communities.

A sewer system “backup” is defined as wastewater entering a home or building through the existing plumbing. Backups can occur during extreme storm events when stormwater inflow overwhelms a sewer system causing sewer surcharging. If the elevation of wastewater in the sewer system rises high enough, backflow of wastewater into buildings may occur. Basement plumbing fixtures are particularly susceptible to backups. Backups can also be caused by blockages in building service connections or local sewers. Sewer blockages are a local maintenance concern and are not addressed under this goal.

The most important solution for the long-term elimination of sewer system backups is the reduction of stormwater inflow, which is addressed in Goal 3. Goal 1 deals with short-term actions that will identify and minimize human health threats and loss of property due to sewer system backups. Wastewater overflows through sewer manholes and outlet structures are defined separately as sewer system overflows and are addressed in Goal 2.

In general, the I/I Task Force agreed that backups are site-specific problems, and homeowners should be responsible for protecting their own property. The Task Force discussed the pros and cons of a mandatory versus voluntary backflow prevention program. It was agreed that public/regional resources should be targeted toward record keeping and defining problem areas, as well as educating property owners about sewer system functions and the potential for backups. Significant public funds should not be expended for a regional backflow prevention device program, although it may be appropriate for individual communities to consider funding backflow prevention programs for problem subsystems.

Knowledge about where and how frequently sewer system backups occur can help a community target sewer maintenance activities, design and implement a backflow prevention program for a problem subsystem, and/or plan for system improvements. The information can also be used by homeowners to decide whether to install backflow prevention devices, remove or valve off basement fixtures, and/or take similar preventative measures. While local DPWs often know which neighborhoods are most prone to backups, these areas probably have not been formally delineated. Backup location data is often incomplete for several reasons: lack of centralized record-keeping in each community, disincentives for homeowners to report backups (such as not wanting the local Board of Health to enter their homes or concern about property values), and/or lack of knowledge on the part of building owners that community officials would want to know about the problem.

The installation of backflow prevention devices can provide benefit to individual properties, but they should not be viewed as a cure-all. The devices must be maintained to work properly. If maintained, backflow prevention devices can provide homeowners with effective protection against backups, especially when the design capacity of a sewer system is exceeded in extreme storm events. Installation of backflow prevention devices in one building or one area may have the effect of transferring backup problems to other buildings or other areas. They are ineffective in situations where sewer systems overflow or are ruptured causing wastewater to enter private property through overland flooding. The State plumbing code requires backwater valves be

installed in situations where the plumbing inspector determines that fixtures are subject to reverse flow or backpressure. Coordination between plumbing inspectors and public works personnel and review of records documenting previous problem areas could help plumbing inspectors decide where to require backflow prevention devices for new construction and rehabilitation projects. For existing buildings, public education can be targeted to property owners in areas most at risk. Periodically, or before/after an extreme storm event, public education materials could be distributed to homeowners by mail. In addition, outreach to home inspectors, plumbers, and first-time homebuyers may heighten awareness about the issue. Public Education issues are consolidated under Goal 5.

4.1 Strategy A. Uniform Reporting and Centralized Tracking of Sewer System Backups

- A-1. *Recommended Strategy:* Each community should designate a sewer system information coordinator to collect and keep all records of backups. This information should be shared with and/or forwarded to responsible community, DEP and MWRA officials. This strategy has an ongoing schedule that should be initiated in the short-term.
- A-2. *Recommended Strategy:* DEP and MWRA should work together to develop a uniform format for use by communities for reporting wastewater backup information. A representative group of communities should be consulted for review. DEP and MWRA should work together to develop a system to record the information reported by communities into a usable database format. This database should have the capability to be linked to GIS mapping and the information should be made available to communities, MWRA, DEP, EPA, watershed groups, the general public, etc. upon appropriate request. This strategy has an ongoing schedule that should be initiated in the short-term.

4.2 Strategy B. Inform Appropriate Stakeholders About Sewer System Backups and Backflow Prevention Devices

- B-1. *Recommended Strategy:* A program to educate and involve the public should be developed. This program is detailed under Goal 5.
- B-2. *Recommended Strategy:* DEP should develop generic information about how sewers function, why backups can occur, steps property owners can take to protect themselves from backups, how backflow prevention devices work, and what sorts of connections are illegal. The MWRA and a representative group of communities should be consulted for review. This strategy should be completed in the short to mid-term.
- B-3. *Recommended Strategy:* Communities should make information developed by DEP (from Strategy B-2), as well as other public education materials developed under Goal 5, available to affected parties. This strategy should be completed in the mid-term.

- B-4. *Recommended Strategy:* DEP, MWRA, and the Task Force should inform local plumbing inspectors of the regional priority of eliminating sewer system backups. Plumbing inspectors should be requested to work more closely with local DPW staff to identify sewer system backup problem areas and locations where backflow prevention devices may be required. This strategy should be completed in the short-term.
- B-5. *Recommended Strategy:* Communities should inform plumbing inspectors that information indicating buildings where previous backups have occurred is, or will be, available from the community or DEP. DEP, MWRA, or community staff should provide technical assistance to the plumbing inspector to interpret the available information. This strategy should be completed in the short to mid-term.
- B-6. *Recommended Strategy:* DEP should sponsor legislation or otherwise initiate a statewide regulation requiring information (detailing the operation of sewer systems and home/building plumbing) be distributed to home buyers at the time of property sale (if connected to sewers). Alternatively, this information should be distributed when a property is connected to a community sewer (i.e., a new building connection or conversion of a septic system to public sewer hook-up). This strategy should be completed in the long-term.

4.3 Strategy C. Prioritize Areas At Risk for Backups and Evaluate Improvements to Local and Regional Infrastructure

- C-1. *Recommended Strategy:* Once a central information database is established (see Strategy A-2), communities should periodically delineate areas which may be “at risk” for backups. Communities, with technical assistance from DEP and MWRA, should prioritize “at risk” areas and evaluate potential improvements to local infrastructure that may reduce the risk of sewer backups. Communities should coordinate with MWRA if impacts from the regional collection system are an issue. For areas where backups are known to be a chronic problem, this strategy should be completed in the short-term. For other areas of the collection system, this strategy should be completed in the mid to long-term.
- C-2. *Recommended Strategy:* Once a central information database is established (see Strategy A-2), MWRA should periodically delineate areas which may be “at risk” for backups which may be impacted by the regional collection system. MWRA should evaluate potential improvements to the regional collection system that may reduce the risk of sewer backups. This strategy should be completed in the mid to long-term.

5.0 GOAL2: MINIMIZE, WITH A LONG-TERM GOAL OF ELIMINATING, HEALTH AND ENVIRONMENTAL IMPACTS OF SEWER SYSTEM OVERFLOWS RELATED TO I/I

Wastewater overflows onto roadways, private and public property, and into wetlands and waterbodies threaten public health and the environment and cause property damage. Minimizing/eliminating the negative public health, environmental and property damage impacts associated with chronic sewer system overflows is the second highest priority after eliminating sewer system backups directly into buildings. The most important solution for the long-term elimination of sewer system overflows is the reduction of stormwater inflow, which is addressed in Goal 3. As a result of extreme storm events, it is assumed that some overflows are unavoidable, although the Task Force reached no consensus on the definition of an extreme storm event. Goal 2 strategies seek to minimize/eliminate the negative health and environmental impacts of sewer system overflows.

A sewer system “overflow” is defined as wastewater exiting a sewer system at manholes or other structures and flowing across roadways, private and public property, etc. Wastewater that overflows a sewer system generally flows into natural low areas such as basements, depressed yards, wetlands, waterbodies, or storm drainage systems. Overflows can occur during storm events when I/I overwhelms a sewer system causing pipes to surcharge. When the hydraulic grade line (top of wastewater flow) exceeds the ground elevation, an overflow can result. Overflows can also be caused by sewer blockages or pump station failures. These are local maintenance concerns and are not addressed under this goal, however they still must be dealt with by municipalities as part of a comprehensive program of sewer system O&M (see Goal 6).

In general, the I/I Task Force agreed that overflows are site-specific problems, and should be analyzed on a case-by-case basis. Overflow tracking has historically been a problem for the communities. Each community handles the tracking and reporting of overflows differently. Calls from homeowners come into a variety of locations, including the DPW, fire department, police department and others. Some chronic overflows may go unreported because homeowners no longer alert officials. DEP currently requires communities to report overflows within 24 hours by phone, and submit a written report within 5 days. DEP and MWRA are exploring the possibility of developing a computer database to store information on sewer system overflows and backups and make this information accessible for analysis.

Overflows may be less of a threat to public health and private property if they are located or relocated to a more appropriate (less sensitive) point in the system. Interim emergency overflow control points should be considered as part of an overall overflow elimination and mitigation plan for extreme events if their operation will eliminate sewer system backups into buildings and/or uncontrolled sewer system overflows which cause severe human and environmental impacts. The Task Force understands that it is unlikely for EPA, DEP or a watershed association to “approve” the relocation or construction of an emergency sewer system overflow. However, if the regulators and advocates can be convinced that, as an emergency/short-term solution, the new situation will cause less human health and environmental impacts than the existing situation, and that an effective I/I reduction program is in place, then enforcement actions should be minimized.

The Task Force agreed that wastewater treatment at overflow sites is generally not a feasible option. Sewer system overflows are governed by secondary treatment requirements, not best management practices like combined sewer overflows (CSOs). At emergency overflow locations, it would be difficult to keep equipment maintained and functioning properly in anticipation of an infrequent extreme storm event which may result in a sewer system overflow. In chlorinating an overflow, the negative effect on the environment is also a concern. Over-chlorination can adversely affect aquatic life, while under-chlorination does not eliminate the public health risk. The Task Force recommends that, at points where sewer system overflows are likely to occur, measures to mitigate human health and environmental impacts should be evaluated on a case-by-case basis.

5.1 Strategy A. Maximize Sewer System Capacity Through Operation and Maintenance Practices

- A-1. *Recommended Strategy:* The Task Force recommends each community implement a sewer system operation and maintenance program which will provide a reasonable level of service to local sewer users/ratepayers. Specific recommendations for development of an operation and maintenance program are detailed under Goal 6.

5.2 Strategy B. Uniform Reporting and Centralized Tracking of Sewer System Overflows

- B-1. *Recommended Strategy:* Each community should designate a sewer system information coordinator to collect and keep all records of sewer system overflows. This information should be shared with and/or forwarded to responsible community officials, EPA, DEP and MWRA. Future EPA regulations regarding SSO “Recordkeeping, Reporting and Public Notification” are expected to define and expand community reporting requirements. This strategy has an ongoing schedule that should be initiated in the short-term.
- B-2. *Recommended Strategy:* DEP and MWRA should work together to develop a uniform format for use by communities for reporting sewer system overflow information. A representative group of Task Force participants should be consulted for review. DEP and MWRA should work together to develop a system to record the information reported by communities into a usable database format. This database should have the capability to be linked to GIS mapping and the information should be made available to communities, MWRA, DEP, EPA, watershed groups, the general public, etc. upon request. This strategy has an ongoing schedule that should be initiated in the short-term.

5.3 Strategy C.

Assess Existing Overflows and Implement Measures to Eliminate and/or Minimize Negative Impacts

- C-1. *Recommended Strategy:* Each community (for local systems) and MWRA (for the regional system) should review and analyze the health and environmental impacts of its existing sewer system overflow sites. Overflow sites should be prioritized based on the frequency and duration of activations and the resulting health and environmental impacts, including: potential for human contact, impact to water supply, impact to shellfish beds or other economic resources, impact to animal or aquatic habitat, etc. This strategy should be completed in the short-term.
- C-2. *Recommended Strategy:* Utilizing the priority ranking recommended in Strategy C-1 above, as well as the system hydraulic analyses discussed under Goal 6, each community (for local systems) and MWRA (for the regional system), in conjunction with DEP and EPA, should evaluate the potential to eliminate each overflow. Appropriate I/I reduction and/or relief sewer projects that will eliminate (or minimize) sewer system overflows should be developed and fully evaluated. The evaluation portion of this strategy should be completed in the short to mid-term. Implementation of projects developed from the evaluation may span the short to long-term time frame.
- C-3. *Recommended Strategy:* For those overflows that are unlikely to be eliminated in the short-term (based on the evaluation recommended in Strategy C-2 above), each community (for local systems) and MWRA (for the regional system) should consider developing interim measures to relocate or otherwise mitigate the impact of existing overflows on human and natural resources (as described above). The priority ranking recommended in Strategy C-1 above should be utilized in development of interim mitigation measures. Interim mitigation measures may include but are not limited to: relocating and/or consolidating overflows in a manner that reduces human and environmental impacts, signage at and downstream of overflow sites, flow screening, netting technologies, underflow baffling, flow treatment, post discharge cleanup, treatment of discharge areas, odor control, etc. DEP, EPA and watershed associations should be notified of plans to implement interim mitigation measures for sewer system overflows. This strategy has an ongoing schedule that should be initiated in the short-term.

5.4 Strategy D.

Emergency Operation/Notification Plan for Sewer System Overflows

- D-1. *Recommended Strategy:* MWRA, in cooperation with member communities, should evaluate the feasibility of developing and operating an expanded emergency operation/notification system. Currently, the MWRA remotely monitors wastewater flow at key locations within the regional collection system before and during wet weather events. Interested communities are notified when sewer system depths reach critical levels. The Authority and member communities use this information to forecast problem areas, predict potential sewer system overflows and deploy work crews. An expansion of this type of

system may provide additional communities with useful information before and during wet weather events. The MWRA should evaluate whether this type of system can be used efficiently to provide information at the local level. This strategy should be completed in the mid-term.

- D-2. *Recommended Strategy:* DEP, in coordination with MWRA, should issue press releases prior to and during extreme wet weather events to notify the public of possible sewer system backups and overflow problems. A standardized format could be developed which includes a request that system users minimize non-essential water consumption activities. A standardized high sewer flow warning should be provided as a news release that would be distributed to local media/cable TV/etc. This strategy has an ongoing schedule that should be initiated in the short to mid-term.

5.5 Strategy E. Prioritize Areas at Risk for Overflows and Evaluate Improvements to Local and Regional Infrastructure

- E-1. *Recommended Strategy:* Once a central information database is established (see Strategy B-2), communities should periodically delineate areas which may be “at risk” for overflows. Communities, with technical assistance from DEP and MWRA, should prioritize “at risk” areas and evaluate potential improvements to local infrastructure that may reduce the risk of sewer overflows. Communities should coordinate with MWRA if impacts from the regional collection system are an issue. This strategy should be completed in the mid to long-term.
- E-2. *Recommended Strategy:* Once a central information database is established (see Strategy B-2), MWRA should periodically delineate areas which may be “at risk” for overflows that may be impacted by the regional collection system. MWRA should evaluate potential improvements to the regional collection system that may reduce the risk of sewer overflows. This strategy should be completed in the mid to long-term.

6.0 GOAL 3: REMOVE ALL (AND PREVENT NEW) INFLOW SOURCES FROM SEPARATE SANITARY SEWER SYSTEMS

Inflow is defined as stormwater (also river water or seawater) entering a sewer system through improper (illegal) connections. Inflow generally enters the sewer system from direct connections from both public and private sources.

Examples of public inflow sources include:

- Stormwater catchbasins connected to the sewer system rather than the drainage system;
- Sewer manhole covers which allow stormwater or flood waters to enter the sewer system through vent holes, pick holes, or poor connection to the manhole wall or corbel;
- Cross-connections between storm drain pipes and sanitary sewers;
- Sewer underdrain systems (intended to temporarily dewater a construction trench) that are connected to the sewer system; and
- Improperly maintained tide gates that allow seawater to enter the sewer system during high or extreme high tides.

Examples of private inflow sources include:

- Driveway or area drains connected to the sewer system rather than the drainage system;
- Roof drainage downspouts connected to home or building plumbing rather than discharging to a lawn or being connected to the drainage system;
- Basement sump pumps connected to home or building plumbing rather than discharging to a lawn or being connected to the drainage system;
- Building perimeter drains connected to the building plumbing rather than discharging to a lawn or being connected to the drainage system; and
- Cooling water discharges.

The Task Force recommends each community establish a written inflow removal program. The program is not intended for submittal to or approval by a regulatory agency, but is instead intended as documentation of an ongoing program which could be made available for review, if requested, by a regulatory agency or the general public. It should be noted, however, that review and/or implementation may be required by EPA/DEP through a regulatory enforcement action if chronic overflow or backup problems exist. It is recommended that the written program be an appropriate subset of the proposed “EPA Capacity, Management, Operation and Maintenance Programs for Municipal Sanitary Sewer Systems” (CMOM). The Task Force also agreed that all sources of inflow, public and private, should be removed as soon as possible, but no later than three years after identification for public sources and five years for private sources. If communities are not able to meet the recommended schedule, they should include, within their written inflow removal program, a justification for a longer remediation schedule. For unusual cases, a justification for non-removal of the sources in question may be appropriate.

In general, the Task Force recommends that the removal of public and private inflow sources receive higher priority over projects intended to remove or reduce groundwater infiltration. Most sewer system backups and sanitary sewer overflows (that are not the direct result of an O&M problem - sewer clog, pump station failure, etc.) are the direct result of excessive inflow entering the sanitary sewer system. Since sewer system backups and overflows pose a significant risk to public health and the environment, work necessary to eliminate existing or potential sources of inflow must be a high priority.

The Task Force recognized that communities have made significant progress toward identification and removal of inflow from public sources. However, local projects to identify and remove inflow sources from private property are hindered on several fronts. Local technical staff often have difficulty convincing elected officials that the environmental benefits of private source inflow removal outweigh the potential local public outcry sometimes associated with inspection/enforcement on private property. Also, local sewer use ordinances sometimes lack effective and implementable measures for enforcement. The Task Force recommends increased statewide and regional efforts be made to highlight the problem of stormwater inflow from private sources and assist communities in enforcing illegal private sewer connection removal.

The Task Force also noted that separate sanitary sewer and storm drainage systems often act as one system, especially during extreme storm events. Planning, design, and construction of improvements to the two separate piping systems should be coordinated to achieve the maximum benefit from expenditure of limited resources. The net effect of potential positive (such as reduced interbasin transfer of stormwater) and negative (such as storm drainage water quality issues) impacts on the watershed should be fully considered when planning drainage improvements. The Task Force recommends communities consider the EPA's Phase 2 stormwater regulations when planning drainage improvements.

6.1 Strategy A. Community Inflow Identification and Removal Program (Planning, Design and Construction)

A-1. *Recommended Strategy:* Each community should establish a written inflow identification and removal program. This strategy has an ongoing schedule that should be initiated in the short to mid-term. The Task Force agreed that a "one-size-fits-all" program is not appropriate. However, each program should, at a minimum, consider the following elements:

- a. Sewer and drainage system mapping;
- b. Sewer and drainage system network database, (preferably electronic);
- c. Systematic documentation and reporting of sewer and drainage system problems, including sewer surcharging and SSOs;
- d. Periodic physical inspection of manholes and structures;
- e. Periodic internal inspection of sewer system pipelines;
- f. Water system blow-off review to ensure none are connected to sewer system;
- g. Physical inspection and recording of all new and/or modified connections;
- h. Identification of manholes in streets and/or cross-country areas which are likely to be subject to flooding/ponding;
- i. Wastewater flow metering to determine if mini-systems are subject to wet-weather peak flows due to inflow;

- j. Smoke testing for inflow sources and follow-up dye testing;
- k. Building inspections for inflow sources and follow-up dye testing;
- l. Prioritization of identified inflow sources and scheduled remediation;
- m. Public education on public/private sources of inflow and removal strategies;
- n. Enforcement strategies for private source inflow removal, including review of community legal authority for inspection and enforcement within local sewer regulations (see Goal 6, Strategy A-2);
- o. A policy to promote private/public inflow source removal during road reconstruction/repavement and other public works projects;
- p. Systematic scheduling and tracking of inflow rehabilitation projects;
- q. A tide gate inspection program which prioritizes inspection activities immediately after a storm activation occurs; and
- r. System physical inspections in areas subject to increased infiltration from high tide cycles.

A-2. *Recommended Strategy:* Communities should review available physical information pertinent to their sewer and drain systems. This review may help establish prioritization criteria for mini-system investigation. This strategy has an ongoing schedule that should be initiated in the short-term. Review items that should be considered include:

- a. Age of pipelines;
- b. Number, frequency and location of local overflows and backups;
- c. Overflows and backups occurring in neighboring communities downstream of local system;
- d. Proximity of sewers and manholes to waterbodies/wetlands;
- e. Sewage contamination in drains and waterbodies;
- f. Sump pumps/area drains known to exist from previous studies and/or local knowledge;
- g. Systems with underdrains, common sewer/drain manholes; and
- h. Areas of stormwater flooding.

A-3. *Recommended Strategy:* In general, each community should prioritize inflow removal versus infiltration removal. The Task Force agreed that prioritization of inflow removal over infiltration removal is an appropriate regional recommendation. However, in individual cases there may be exceptions when infiltration source removal should be a higher priority than inflow source removal. This may be critical in areas where infiltration can impact groundwater and surface water resource areas or within stressed watersheds. This strategy has an ongoing schedule that should be initiated in the short to mid-term.

A-4. *Recommended Strategy:* Each community should prioritize removal of public and private inflow sources that are upstream from, and potentially contribute to, known areas of sewer system backups and/or overflows. This strategy has an ongoing schedule that should be initiated in the short to mid-term.

A-5. *Recommended Strategy:* Each community should complete the remediation of all identified public sources of inflow as soon as possible, but no later than three years after identification. This strategy has an ongoing schedule.

A-6. *Recommended Strategy:* Remediation of all identified private inflow sources should be completed as soon as possible, but no later than five years after identification. The Task Force recognizes that the remediation of private inflow sources is the responsibility of the private home or building owner. However, each community has an obligation to enforce its sewer use regulations and work cooperatively with homeowners/ratepayers to accomplish this strategy. This strategy has an ongoing schedule.

6.2 Strategy B. Integrated Sewer/Storm Drain Improvements

B-1. *Recommended Strategy:* Each community should consider storm drainage system improvements as an integral part of its comprehensive inflow removal program. Drainage system improvements should be targeted to provide for inflow source removal from sanitary sewers. This strategy has an ongoing schedule that should be initiated in the mid to long-term.

6.3 Strategy C. Prioritize Identification and Removal of Inflow Sources on Private Property

C-1. *Recommended Strategy:* DEP, with assistance from MWRA, communities and local watershed groups, should investigate possibilities for a state-wide program to enforce private inflow source removal and should consider sponsoring legislation or otherwise initiate a state-wide regulation requiring certification that no inflow sources exist in a building at time of property sale (if connected to sewer). Actions under this strategy are closely tied to the potential success of the public education strategies detailed under Goal 5. If short and mid-term public education is successful, this strategy will become less critical. This strategy should be completed in the long-term.

7.0 GOAL 4: MINIMIZE SYSTEM-WIDE INFILTRATION

Infiltration is defined as groundwater entering a sewer system through defects in sewer pipes, service connections, manholes, and other structures. Infiltration occurs when sewer pipes and structures are below the groundwater table. Due to hydrostatic pressure, groundwater enters the sewer system at cracks, unsealed pipeline and manhole joints, deteriorated service connections, defects at plugged service stubs, etc. As the groundwater table rises (during periods of frequent and prolonged rain, or seasonally), infiltration increases because the hydrostatic pressure on existing leaks increases and more sewer system defects are submerged – creating additional leaks.

The Task Force recommends each community establish a written infiltration removal program (in coordination with the inflow removal program). The program is not intended for submittal to or approval by a regulatory agency, but is instead intended as ongoing program documentation which could be made available for review, if requested, by a regulatory agency or the general public. It is recommended that the written program be an appropriate subset of the proposed “EPA Capacity, Management, Operation and Maintenance Programs for Municipal Sanitary Sewer Systems” (CMOM). The Task Force also agreed that all sources of infiltration, public and private, should be evaluated for removal as soon as possible. The evaluation for removal of infiltration should consider at least the following items: public health impacts, environmental impacts, physical integrity of the collection system, contribution to backup and sewer system overflow areas, water resource area impacts, cost-effectiveness, value-effectiveness, and other community issues. If a community determines that certain infiltration sources merit removal, they should be placed on a prioritized list and removed as soon as possible, but no later than seven years after identification for public sources and five years for private sources. If communities are not able to meet the recommended rehabilitation schedule, they should include, within their written plan, a justification for a longer remediation schedule. For unusual cases, a justification for non-removal of the sources in question may be appropriate.

In general, the Task Force recommends that the removal of public and private infiltration sources receive lower priority than projects intended to remove or reduce stormwater inflow. Groundwater infiltration generally has less influence on sewer system backups and sanitary sewer overflows. Since sewer system backups and overflows pose a significant risk to public health and the environment, work necessary to eliminate existing or potential inflow sources must be a higher priority. While inflow should be targeted for removal first, communities must not ignore the impact infiltration has on their systems. Although, infiltration reduction associated with peak flows (generally during high groundwater conditions) has traditionally been the focus of DEP infiltration reduction guidance materials, the Task Force recognizes that infiltration is not only a sewer system overflow and capacity issue. Groundwater loss to sewers may have impacts on aquifer recharge, stream flow, wetlands and water levels in lakes and ponds. Groundwater infiltration into sewers reduces the amount of water available in a watershed.

The Task Force recommends that certain infiltration reduction strategies be implemented at a statewide or regional level for consistency across all communities and to maximize use of resources.

7.1 Strategy A.

Community Infiltration Identification and Removal Program (Planning, Design and Construction)

A-1. *Recommended Strategy:* Each community should establish a written infiltration identification and removal program. This strategy has an ongoing schedule that should be initiated in the short to mid-term. The Task Force agreed that a “one-size-fits-all” program is not appropriate, however, each program should, at a minimum, consider the following elements:

- a. Sewer system mapping;
- b. Sewer system database (preferably electronic);
- c. Sewer system delineation into mini-systems (subareas) for long-term tracking of flow rates;
- d. Physical inspection of manholes, headhouses and other structures and internal TV inspection of sewer system pipelines;
- e. Review of wastewater metering data compiled by MWRA;
- f. Permanent and/or temporary wastewater flow metering and manhole to manhole flow measurement (flow isolation);
- g. Analysis of flow data to estimate infiltration rates including review of nighttime minimum flow, rainfall-dependent infiltration, estimation of sanitary flow, etc.;
- h. Sewer line cleaning;
- i. Public education (this topic is expanded under Goal 5);
- j. Review/update of existing sewer use ordinance;
- k. Policy for leakage testing of new sewers and inspection of new service laterals;
- l. Systematic scheduling and tracking of infiltration rehabilitation projects;
- m. Post-rehabilitation inspection/review and identification of potential infiltration source migration; and
- n. A policy to promote private service lateral upgrades during road reconstruction/repavement and other public works projects;

A-2. *Recommended Strategy:* Communities should review available physical information pertinent to their sewer system. This review may help establish prioritization criteria for mini-system investigation. This strategy has an ongoing schedule that should be initiated in the short-term. Review items that should be considered include:

- a. Age of system (pipelines/manholes/structures);
- b. Pipeline and manhole construction material;
- c. Pipeline joint spacing and construction;
- d. Proximity of sewers to groundwater, waterbodies and water resource areas;
- e. Existence of construction underdrains;
- f. Existence of excessive silt in sewers which may indicate a pipeline failure;
- g. Infiltration rates;
- h. Occurrence of surcharging, backups, and/or overflows; and
- i. Sewage contamination in drains and waterbodies.

- A-3. *Recommended Strategy:* Each community should place all identified public and private sources of infiltration on a prioritized list. Those selected for remediation should be completed as soon as possible, but no later than seven years (for public sources) or five years (for private sources). This strategy has an ongoing schedule.
- A-4. *Recommended Strategy:* Each community should track all identified public and private sources of infiltration that are not selected for remediation and periodically reevaluate the sources for remediation. This strategy has an ongoing schedule that should be initiated in the short to mid-term.
- A-5. *Recommended Strategy:* Each community should emphasize infiltration removal that may impact groundwater and surface water resource areas. For additional guidance, the Task Force recommends communities coordinate their infiltration reduction efforts with appropriate EOEAs Watershed Teams, local watershed groups and the local conservation commission. These groups should help the community target areas where infiltration reduction will provide the most meaningful benefit for aquifer recharge, stream flow, wetlands and water levels in lakes and ponds. This strategy has an ongoing schedule that should be initiated in the mid to long-term.

7.2 Strategy B. State-Wide and/or Regional Infiltration Reduction Efforts

- B-1. *Recommended Strategy:* DEP should develop a minimum standard for inspection, testing and approval of all new public and private sewer mains and laterals utilizing pressure testing, vacuum testing or other appropriate technology. DEP should also develop a standard (non-quantitative, descriptive write-up) for inspection and approval of new private sewer service connections. This strategy should be completed in the mid-term.
- B-2. *Recommended Strategy:* DEP should initiate a statewide regulation requiring the standards developed under Strategy B-1 be implemented statewide. This strategy should be completed in the long-term.

8.0 GOAL 5: EDUCATE AND INVOLVE THE PUBLIC

The Task Force has identified educating and involving the public on I/I and SSO issues as a critical element for the successful implementation of each goal. Because of their importance, public education recommendations have been consolidated under Goal 5, rather than dispersed throughout the Task Force Report.

In general, the Task Force agreed that regional organizations or agencies (EPA, DEP, MWRA, Watershed Associations, etc) can provide a benefit (economy of scale) by producing and distributing public education materials such as educational brochures and “How-To” pamphlets. However, to be effective, public education programs must be directed by local officials and/or environmental groups who can discuss I/I reduction, backups and SSOs on a neighborhood-to-neighborhood level. At a minimum, local communities should make information available to homeowners which explains the negative impacts of private inflow sources, how illegal connections may cause sewer backups into homes, how to protect against sewer backups, what to do if a basement sump pump or roof/driveway drain is connected to house plumbing, etc. Regional organizations should support local community efforts.

The Task Force recommends targeted public education inflow removal programs be conducted as an integral part of larger local public works projects, such as: drain, sewer, or water main construction, road repavement projects, etc. Some communities have had success targeting public education/inflow reduction projects in neighborhoods or small sewer mini-systems (subareas). Minisystems are prioritized for private inflow reduction based on flow data or geographical basis, and completed periodically, as local resources allow.

8.1 Strategy A. Information/Technology Transfer Between EPA, DEP, MWRA, Regional Organizations, Communities and Local Groups

- A-1. *Recommended Strategy:* MWRA should act as a “clearinghouse” to collect and distribute information on I/I and SSO issues. Other groups, agencies, associations, community representatives, and local citizens wishing to disseminate information on I/I and SSO issues within the region should provide a copy to MWRA. MWRA staff should maintain a database of contacts with Federal, State and community officials, as well as, local associations and individuals that wish to stay informed. Summary mailings should be made periodically, possibly concurrent with the annual community I/I questionnaire developed to respond to the I/I reporting requirement in MWRA’s NPDES Permit. This strategy has an ongoing schedule that should be initiated in the short-term.

- A-2. *Recommended Strategy:* MWRA should develop and distribute a summary of previous information/technology distributions regarding I/I reduction and SSOs. The summary should be organized by topic and distributed to all regional stakeholders. It can be used as a tool to help reference previously distributed information. This strategy should be completed in the short-term.

- A-3. *Recommended Strategy:* DEP, MWRA and other regional organizations should organize periodic demonstration projects and/or workshops to bring together regulators, community representatives, vendors, environmental groups, consultants, contractors, etc. Workshops may cover topics such as: new or revised regulations, I/I reduction technologies, updates/progress on Task Force Report recommendations, etc. This strategy has an ongoing schedule.

8.2 Strategy B. Catalog Existing, Develop New and Distribute Public Education Material on I/I and SSO Issues and Involve the Public

- B-1. *Recommended Strategy:* MWRA should develop a summary of public education material such as local/regional billing inserts, Water Environment Federation (WEF) brochures, “How-To” pamphlets, etc. The summary should provide information on where to obtain the material. Public education materials should be posted on the MWRA and DEP internet sites. This strategy should be completed in the short-term.
- B-2. *Recommended Strategy:* MWRA, in coordination with DEP and other regional organizations, should develop informational materials that will educate the public on I/I and SSO issues. Information should be easy to follow and not too technical. “How-to” pamphlets that detail a step-by-step process for disconnecting private inflow sources should be developed for “do-it-yourself” homeowners. MWRA should work cooperatively with local officials to develop community specific information, especially regarding cost of service information. This strategy should be completed in the mid-term.
- B-3. *Recommended Strategy:* MWRA and/or DEP should assist communities in providing a link from the local DPW or community internet site to the MWRA and DEP internet sites. A link or reference to other regional bodies which are involved in sewer system issues (such as New England Water Environment Association, New England Interstate Water Pollution Control Commission, watershed associations, etc) is also recommended. This strategy should be completed in the mid-term.
- B-4. *Recommended Strategy:* MWRA should make copies of public education material available to communities and local associations. Communities and local associations should distribute public education materials through the most effective means that fit within their overall I/I reduction programs. Distribution methods may include:
- DPW informational newsletter as a billing insert;
 - I/I reduction information as a billing insert;
 - Description information in association newsletter;
 - Local newspaper write-up or other local media outlets;
 - Pamphlets provided at DPW/Town Hall;

- Pamphlets provided with plumbing permit;
- Pamphlets provided to realtors to distribute to new homeowners;

This strategy has an ongoing schedule that should be initiated in the short or mid-term.

- B-5. *Recommended Strategy:* Communities should target distribution of public education material prior to and during projects to remove private inflow sources and rehabilitate/replace sewer service connections as an integral part of larger local public works projects. For projects that involve excavation (such as drain, sewer, or water main construction, or roadway repavement) homes and businesses along the route of the project should be targeted for inflow source disconnection. This will allow for connection of sump pumps and private drains to the local storm drain system prior to final paving of roadways. Sewer service connections along the route of construction should be inspected and rehabilitated/replaced as needed as part of the project. This strategy has an ongoing schedule.
- B-6. *Recommended Strategy:* MWRA, DEP, local communities and other stakeholders should consider sponsoring and/or developing “How-To” workshops that could be conducted in conjunction with local home improvement centers. These businesses sell many of the materials needed for homeowners to make do-it-yourself removal improvements. This strategy should be completed in the long-term.
- B-7. *Recommended Strategy:* Communities, with technical assistance from MWRA, should use local cable stations to provide residents with information on I/I reduction, SSOs and backups. This may be most effective before and after large storms when information can be linked directly to local problems. This strategy should be completed in the mid to long-term.

8.3 Strategy C. Incorporate I/I and SSO Reduction Materials into School Education Programs

- C-1. *Recommended Strategy:* MWRA should integrate information on I/I and SSO issues into existing MWRA school education materials, as appropriate. This strategy has an ongoing schedule that should be initiated in the mid-term.

9.0 GOAL 6: DEVELOP AN OPERATION AND MAINTENANCE PROGRAM

The Task Force has identified development of an operation and maintenance (O&M) program for each collection system as a critical element for the successful implementation of each goal. Because of their importance, recommendations on O&M activities have been consolidated under Goal 6, rather than dispersed throughout the Task Force Report.

In general, the Task Force agreed that standard O&M activities should be recommended as a guideline for communities to follow. Implementation of an O&M program is intended to provide a reasonable level of service to local sewer users/ratepayers. The Task Force recognizes that a one-size-fits-all O&M program is unrealistic. Since each community has limited resources, they must be allowed the flexibility of deciding what O&M activities and special projects are of highest priority based on the unique characteristics of their own collection system. Under the strategies outlined below, the Task Force has provided a list of O&M activities that should be considered in the development of each community specific O&M plan. Items identified with an asterisk (*) were considered critical by the Task Force and are highly recommended to be included under every community's O&M program.

The Task Force anticipates that this goal's recommendations are consistent with many of the Operation and Maintenance requirements that will be proposed by EPA under the "Capacity, Management, Operation and Maintenance (CMOM) Program". This will be a very important document for all stakeholders to review, understand, and comment on.

DEP is also moving forward with development of expanded Statewide OM&R Guidelines. In this regard, the New England Interstate Water Pollution Control Commission (NEIWPCC) has agreed to coordinate this activity on a regional basis. This will allow for consistent assessment and development of OM&R Guidelines throughout the NEIWPCC region.

9.1 Strategy A. System Management

A-1. *Recommended Strategy:* In order to properly operate and maintain their collection system, each community should have a system management plan in place. This strategy has an ongoing schedule that should be initiated in the short-term. Communities should consider the following issues when developing their plans:

- * a. Certification of collection system personnel;
- * b. Comprehensive safety training program for collection system personnel;
- c. Staffing plan development;
- d. Periodical review of existing local sewer use regulations;
- e. Designation of a sewer system information coordinator to collect data, keep records, fulfill reporting requirements and work with regulators and regional/local interest groups (as discussed in Goals 1 and 2);
- f. Based on technical assistance from DEP and MWRA, establish minimum requirements for acceptance testing of new sewer construction within local Sewer Use Regulations;

- g. Establish public education/outreach programs to educate homeowners and businesses(see Goal 5);
 - h. Participation in local and/or regional workshops that bring together communities/watershed groups/regulators/consultants/contractors, etc.;
 - i. The full cost of funding O&M programs should be disclosed to local ratepayers. If all costs are not recovered through the retail rate structure, costs recovered through other methods (taxes, industrial fees, development fees, etc.) should be identified; and
 - j. Establish local sewer connection permit and recordkeeping program that tracks flow projections in sewer subsystem.
- A-2. *Recommended Strategy:* EPA, DEP and MWRA should assist communities in reviewing existing local Sewer Use Regulations and make recommendations for improvements. This may be most effectively accomplished through formation of a committee representing a cross-section of sewer system stakeholders. This strategy should be completed in the mid-term.
- A-3. *Recommended Strategy:* The MWRA should review its existing community permit process (Municipal Permits, Industrial Permits, etc) and consider concerns expressed by communities that better coordination could improve system management. In particular, the need for expanded coordination during emergencies and emergency contact list development were recommended. This strategy should be completed in the mid-term.

9.2 Strategy B. System Description

- B-1. *Recommended Strategy:* In order to properly operate and maintain its collection system, each community should develop a system description. This strategy should be completed in the mid-term. Communities should consider the following items:
- * a. Sewer system mapping (electronic/digitized format is highly recommended);
 - b. Sewer system inventory and electronic database including items such as sewer age, material, size, slope, condition, etc;
 - c. Inventory/location of industrial users;
 - d. Drainage/catch basin and storm outfall inventory;
 - e. Water distribution system inventory;
 - f. System overlap with water resources areas, wetlands, waterways; and
 - g. Location of system surcharging, overflows and capacity limitations.

9.3 Strategy C. Planning

- C-1. *Recommended Strategy:* In order to properly operate and maintain its collection system, each community should consider, at a minimum, the planning issues noted below. This strategy has an ongoing schedule that should be initiated in the short to mid-term.

- * a. Development of an emergency plan for Sewer System blockages and/or overflows. The plan should address issues of emergency construction, sewer repair, by-pass pumping, public health issues, public notification, etc.;
- * b. Development of emergency plans for each collection system facility (such as pumping stations) to address power outages, mechanical failures, blockages and/or overflows. The plan should address issues of emergency construction, mechanical repair, stand-by power, by-pass pumping, public health issues, public notification, etc.;
- c. Local and regional sewer system facilities planning is an increasingly complex issue. Communities planning sewer system rehabilitation, replacement, relief, and/or expansion projects may be required to comply with a variety of regulations and/or obtain numerous permits, including:
 - Massachusetts Environmental Policy Act (MEPA) Environmental Notification Form (ENF) or Environmental Impact Report (EIR);
 - Comprehensive Wastewater Management Plan;
 - Water Resources Commission Interbasin Transfer Permit;
 - DEP Sewer Extension/Connection Permit; and
 - MWRA Direct Connection Permit.

Some of these items, such as the WRC Interbasin Transfer Permit, require a significant amount of work be completed at the time of application. With these issues in mind, the Task Force recommends local communities develop and implement a wastewater management plan. Communities should be aware of the significant cost and time constraints of these requirements.

- d. Develop a multi-year plan, often referred to as a Capital Improvement Plan (CIP), for sewer system rehabilitation, repair, and/or replacement projects. The plan should include project schedules and cost estimates. Projects should be ranked by priority based on issues such as:
 - Public health and safety;
 - Pipeline/manhole structural integrity;
 - I/I rates and potential flow reduction;
 - Potential to reduce or eliminate sewer surcharging or SSOs;
 - Environmental impacts;
 - Coordination with other projects.

New projects should be inserted into the listing based on the priority ranking system.

- e. Develop a hydraulic model including the critical elements of the sewer collection system. Hydraulic modeling is an effective tool for identifying system deficiencies and establishing system capacity limitations. It is

recommended that modeling efforts be coordinated with the MWRA, which maintains a dynamic model of the regional interceptor system.

9.4 Strategy D. Operations

D-1. *Recommended Strategy:* Each community should establish an operations plan in order to properly operate and maintain its collection system. This strategy has an ongoing schedule that should be initiated in the short-term. During development of the operations plan, the following items should be considered:

- a. Identify chronic problem areas, surcharging, overflow locations, areas of backups, choke points, etc;
- b. Review flow metering and/or instantaneous flow measurements to track inflow, infiltration, sanitary flows and confirm available capacity;
- c. Perform smoke testing to identify illegal cross connections, such as catch basins connected to the sewer system, common sewer/drain manholes, roof drains, area drains connected to the sewer, etc;
- d. Review service connections from Internal TV tapes to identify unpermitted or illegal connections;
- e. Perform public building inspections for illegal connections (drains, sump pumps, etc);
- f. Perform sewer and water system cross-checking to identify and remove water system blow-offs connected to the sewer system;
- g. Develop and staff an emergency operations center; and
- h. Monitor water use records by sewer subsystem.

9.5 Strategy E. Preventative Maintenance

E-1. *Recommended Strategy:* Each community should have a preventative maintenance plan in order to properly operate and maintain its collection system. This strategy has an ongoing schedule that should be initiated in the short-term. Communities should consider the following items when developing their preventative maintenance plan:

- * a. Record keeping;
- * b. Frequent inspection at chronic problem sites;
- * c. Periodic sewer system inspection, including;
 - Manholes and structures,
 - TV inspection of pipelines,
 - Locating manhole covers and structures subject to inflow due to ponding;
 - Locating buried manholes;
 - Locating sewers with flat slopes subject to excessive sediment buildup;
 - Known hydraulic deficiencies;
 - Areas of chronic grease and root problems; and
 - Areas subject to extremely high groundwater table;

- * d. System cleaning (pipelines, structures, siphons, root control);
- e. Replacement of worn frames/covers;
- f. Raise frames/covers during road repaving;
- g. Sewer rehabilitation of a portion of the system, including:
manholes, structures and pipelines
- h. Maintenance of pump stations and other facilities;
- i. Monitor equipment/parts inventory and make appropriate purchases ;
- j. Hydrogen Sulfide and odor monitoring/control appropriate to
system needs;
- k. Coordination with DEP/MWRA/other communities/watershed groups/etc.
during implementation of preventative maintenance activities; and
- l. Establish spare parts inventory.

9.6 Strategy F. Reactive Maintenance

F-1. *Recommended Strategy:* Each community should establish a reactive maintenance plan to properly operate and maintain its collection system. This strategy has an ongoing schedule that should be initiated in the short-term. Communities should consider the following items when developing their reactive maintenance plans:

- * a. Record keeping and reporting;
- * b. Respond to emergency calls;
- * c. Remove sewer blockages;
- * d. System inspection during extreme events, sewer system overflows,
sewer backups, etc;
- e. Emergency repair of collapsed sewers or structures;
- f. Emergency replacement of broken frames/covers;
- g. Implementation of emergency operation and maintenance plans;
- h. Coordination with DEP/MWRA/other communities/watershed groups/etc.
during emergencies.

F-2. *Recommended Strategy:* MWRA should continue to provide community assistance, as available, for reactive maintenance issues during emergencies, such as: sewer cleaning, internal television inspection, by-pass pumping, sewer metering, public notification assistance, coordination with regulatory agencies, etc. This strategy has an ongoing schedule.

9.7 Strategy G. Statewide Operation And Maintenance Standards

G-1. *Recommended Strategy:* DEP should update the 1989 Guidelines for Performing O&M on Collection Systems. DEP should organize a work group of appropriate stakeholders (MWRA, community representatives, watershed groups, etc) to review/ update the 1989 O&M Guidelines. EPA's proposed regulations on Capacity, Management, Operation and Maintenance (CMOM) should be used as a reference during development of the new statewide sewer system O&M Guidelines. This strategy should be completed in the mid-term.

10.0 GOAL 7: IMPROVE FUNDING MECHANISMS FOR IDENTIFYING AND REMOVING I/I

The Task Force has identified the need to improve funding mechanisms for identifying and removing I/I as a critical element for the successful implementation of each goal. Because of their importance, recommendations on funding mechanisms have been consolidated under Goal 7, rather than dispersed throughout the Task Force Report.

In general, the Task Force agreed that communities should be responsible for funding annual O&M of their collection systems. Long-term planning and annual funding for sewer rehabilitation and replacement are integral parts of a successful O&M program. Through local and regional funding only, it is likely that long-term deterioration of the regional collection system can be offset so that current levels of I/I do not increase. A minor decrease in regional I/I and minimization of sewer system overflows during design level storm events are reasonable goals. However, without additional funds over and above that available at the local and regional level, it is extremely unlikely that existing regional I/I rates will be significantly reduced. Additionally, sewer system overflows will likely continue to occur during extreme storm events (larger than design events) and periods of prolonged rainfall/flooding.

The Task Force also agreed that a significant commitment of Federal and State funds is required to reduce current I/I levels and minimize sewer system overflow potential. DEP has emphasized regional I/I reduction and sewer system overflow minimization through local and regional Administrative Consent Orders. Together EPA and DEP have expanded regional I/I and SSO reduction requirements contained within MWRA's NPDES Permit. This emphasis on regional sewer system issues should be complemented with State and Federal funds to finance local and regional projects.

A significant new federal mandate, the EPA's "Capacity, Management, Operation and Maintenance (CMOM) Program" is being drafted. This new regulation will greatly expand current sewer system operation and maintenance requirements. It is unclear how local and regional collection system operators will fund these new requirements. The Task Force recommends Federal and State funding be mandated so that the full burden of these new regulations do not fall on local ratepayers. Without additional funds to pay for new requirements, it is likely that funding of existing I/I and SSO reduction programs will need to be reallocated.

The Task Force discussed the need for State funding of infrastructure projects to match State mandates for environmental policies such as EPA's Charles River 2005 Initiative and WRC's Interbasin Transfer Permit requirements. The Task Force also discussed the need to hold down the cost of infrastructure rehabilitation to help meet the Governor's executive order to minimize sprawl, as well as, the Executive Office of Environmental Affairs' (EOEA) efforts to minimize buildout. High ratepayer costs for existing sewer repair may cause the movement of people and businesses to less expensive, undeveloped areas. Increased State funding for sewer system rehabilitation may be justified by decreased demand for State funding for new road, sewer and water infrastructure. Because sprawl also threatens regional water quality and supply, air quality, and open space, it is good public policy to provide funding for rehabilitation of existing sewer systems.

Task Force recommendations regarding local, state, and federal funding levels are echoed by the recently released suggestions from the “MWRA Five-Year Report Panel”. The report from this independent citizen’s group includes numerous proposals, including the two presented below that deal directly with infrastructure projects.

- *MWRA and its constituents must step up efforts to secure federal water/sewer infrastructure funding. Since inception, federal earmarked grants to support the Boston Harbor Project have exceeded one billion dollars. Federal funding, coupled with debt service assistance from the Commonwealth, have helped hold down rate increases. In the future, however, because specifically earmarked funds will be more challenging to obtain, broader federal support for water/sewer infrastructure projects must be developed to help communities across the country. Debt service assistance at the state level will also become more difficult.*
- *Local and state government and the MWRA must continuously address the municipal infrastructure needs of MWRA’s member communities. The prominence of MWRA in public attention should not obscure that the need for good water and sewer services in communities served by MWRA’s wholesale systems also depends on the quality of facilities and services in the local systems that are operated and maintained by the MWRA service area communities themselves.*

10.1 Strategy A: Local Funding

- A-1. *Recommended Strategy:* Local communities should provide an adequate level of annual funding to implement a sewer system operation and maintenance program (as detailed under Goal 6) which will provide a reasonable level of sewer service. This strategy has an ongoing schedule that should be initiated in the short-term.
- A-2. *Recommended Strategy:* Local communities should develop and implement a long-term plan to reasonably fund I/I reduction, sewer system rehabilitation and SSO mitigation/elimination projects. The level of community funding must be balanced against other local funding requirements. Communities should take full advantage of all grant and loan programs available for sewer system projects that target I/I reduction. This strategy has an ongoing schedule that should be initiated in the mid to long-term.
- A-3. *Recommended Strategy:* Local communities should consider developing a program to fund I/I reduction work on private property. This work should target priority areas subject to sewer system back-ups and/or overflows and where I/I reduction work on private property may be more cost effective than public sector pipeline rehabilitation. This strategy has an ongoing schedule that should be initiated in the short to mid-term.
- A-4. *Recommended Strategy:* Communities should consider requiring private developers mitigate new sanitary flows to the local sewer systems. Mitigation may be accomplished through completion of projects that reduce I/I to at least offset new sanitary flows or payment of fees that the community will use to offset the new flows. This strategy has an ongoing schedule that should be initiated in the short to mid-term.

10.2 Strategy B: Regional Funding

- B-1. *Recommended Strategy:* MWRA, in coordination with the MWRA Advisory Board, should continue to fund the I/I Local Financial Assistance Program to provide grants and loans to member sewer communities. The MWRA and Advisory Board should review technical aspects of the I/I Local Financial Assistance Program to assure that administrative costs are minimized.
- B-2. *Recommended Strategy:* MWRA, in coordination with the MWRA Advisory Board, should continue to provide assistance to member communities for sewer system operation and maintenance services which may provide regional cost savings. Examples of past community assistance provided by MWRA staff include: emergency assistance, bypass pumping, internal TV inspection, sewer cleaning, flow metering, engineering technical assistance, etc. The MWRA, in coordination with the MWRA Advisory Board, should also consider expansion of community assistance programs to include task order contracts that provide an overall (regional) cost savings through economics of scale. These programs may include reimbursement payments from communities for work contracted directly by MWRA or negotiation of unit price contracts to be utilized directly by communities. This strategy has an ongoing schedule.

10.3 Strategy C: State Funding

- C-1. *Recommended Strategy:* DEP, in coordination with the Massachusetts Water Pollution Abatement Trust and all statewide stakeholders, should initiate state legislation to significantly increase the total funding available under the SRF program and provide not less than thirty-five percent grant funding for all local and regional projects initiated to meet the requirements of the Clean Water Act and other Federal and State water pollution control regulations. This strategy should be completed in the long-term.
- C-2. *Recommended Strategy:* DEP, in coordination with the Massachusetts Water Pollution Abatement Trust, should initiate state regulation changes (or sponsor legislation, if required) to provide significant set-aside parameters within the SRF program (recommended at twenty-five percent) to fund I/I reduction, sewer system rehabilitation, and/or SSO elimination projects. This strategy should be completed in the mid to long-term.
- C-3. *Recommended Strategy:* DEP should review and consider revising the project priority point system used for the State Revolving Fund (SRF) program to provide higher priority and increased funding for sewer and drainage projects which will reduce inflow, eliminate sewer backups, or minimize sewer system overflows. This strategy should be completed in the mid-term.

- C-4. *Recommended Strategy:* DEP, in coordination with other state agencies, should provide grant and/or loan funding to private property owners for I/I removal work on private property. This program could be modeled after the septic system betterment program offered through local Health Boards to assist in implementation of the State's Title V regulations. This strategy should be completed in the mid-term.
- C-5. *Recommended Strategy:* MWRA, in coordination with the MWRA Advisory Board, should act as a clearinghouse to inform regional stakeholders about the progress of efforts to increase State funding. Regional stakeholders should be advised on the most appropriate time for providing input and lobbying effort. This strategy has an ongoing schedule.

10.4 Strategy D: Federal Funding

- D-1. *Recommended Strategy:* All stakeholders should support existing efforts by the Association of Metropolitan Sewerage Agencies (AMSA) and other national organizations to increase Federal funding levels for I/I reduction, sewer system rehabilitation, and SSO elimination projects (through an amendment to the Clean Water Act and/or other legislation). The Task Force recommends all stakeholders seek federal grant funding of not less than fifty-five percent of project costs. This strategy has an ongoing schedule.
- D-2. *Recommended Strategy:* MWRA, in coordination with the MWRA Advisory Board, should act as a clearinghouse to inform regional stakeholders about the progress of efforts to increase Federal funding. Regional stakeholders should be advised on the most appropriate time for providing input and lobbying effort. This strategy has an ongoing schedule.

11.0 APPENDIX

11.1 Written Comments

Written comments from the following are attached:

Department of Environmental Protection
United States Environmental Protection Agency
Charles, Fore, Mystic, and Neponset River Watershed Associations
Town of Norwood
Town of Weymouth
Joseph Duggan, Framingham Resident
Lawrence Schafer, Newton Resident

11.2 List of Reference Material

1. DEP Guidelines for Performing I/I Analyses and Sewer System Evaluation Survey (January 1993)

This guidance document details DEP's recommended methodology for conducting I/I analyses and phase 1 and phase 2 sewer system evaluation surveys. The guidelines are mandatory for those communities seeking financial assistance for I/I projects under the state revolving fund (SRF). For other projects, the guidelines are recommended by DEP and MWRA. Copies can be obtained from DEP Boston (617-292-5500), DEP North Regional Office (978-661-7600), or from the MWRA Community Support Program (Carl Leone at 617-788-4356 or E-mail at Carl.Leone@mwra.state.ma.us).

2. DEP Guidelines for Performing Operations and Maintenance on Collection Systems (August 1989)

This guidance document details DEP's recommended methodology for conducting effective operation and maintenance of collection systems. The DEP is preparing to update these guidelines beginning in 2001. Copies can be obtained from DEP Boston (617-292-5500), DEP North Regional Office (978-661-7600), or from the MWRA Community Support Program (Carl Leone at 617-788-4356 or E-mail at Carl.Leone@mwra.state.ma.us).

3. DEP Sewer System Extension and Connection Permit Program (314 CMR 7.00)

This Code of Massachusetts Regulation (CMR) establishes the program whereby sewer system extension and connections are regulated and permitted by DEP to insure proper operation of wastewater treatment facilities and sewer systems within Massachusetts. Copies can be purchased on-line from the state bookstore at www.state.ma.us/sec/spr/sprcat/Agencies/314.htm.

4. DEP Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Discharges (314 CMR 12.00)

This Code of Massachusetts Regulation (CMR) has been established by DEP to insure proper operation and maintenance of wastewater treatment facilities and sewer systems within Massachusetts. Copies can be purchased on-line from the state bookstore at www.state.ma.us/sec/spr/sprcat/Agencies/314.htm.

5. EPA Draft Proposed SSO Rules

This Code of Federal Regulation (CFR) has been drafted by EPA to establish three standard permit conditions for inclusion in the NPDES permits for POTWs and municipal sanitary sewer collection systems and a framework under the NPDES permit program for regulating municipal satellite collection systems. The proposed regulations include:

- Capacity, management, operation and maintenance (CMOM) requirements;
- Prohibition of SSO discharges; and,
- SSO reporting, public notification and recordkeeping requirements.

The draft proposed SSO Rule can be obtained from EPA's web site at www.epa.gov/owm/rulmakef.htm. When Federal review is complete, the proposed SSO Rules will be published in the Federal Register to solicit public review and comments.

6. **EPA Handbook – Sewer System Infrastructure Analysis and Rehabilitation (EPA/625/6-91/030, October 1991)**
This EPA handbook provides guidance on the evaluation and rehabilitation of existing sewers through presentation of typical problems, procedures and methods for rehabilitation, case study information, budgetary costs, advantages and disadvantages of rehabilitation techniques, and application of these techniques and materials/equipment used in rehabilitation. This publication is available on-line from EPA at [www.epa.gov.ttnrmrl/625/6-91/030.htm](http://www.epa.gov/ttnrmrl/625/6-91/030.htm).
7. **Massachusetts Uniform State Plumbing Code (248 CMR 2.00)**
This Code of Massachusetts Regulation (CMR) establishes rules and regulations relative to the construction, alteration, repair and inspection of plumbing which are reasonable, uniform, and based on generally accepted standards of plumbing practice. This publication is available on-line at www.state.ma.us/reg/boards/pl/cmr.htm
8. **MWRA I/I Local Financial Assistance Program – Phase 3 Program Guidelines**
This guidance document details MWRA’s policies for distribution of grants and interest-free loans under the I/I Local Financial Assistance Program. Copies can be obtained from the MWRA Community Support Program (Carl Leone at 617-788-4356 or E-mail at Carl.Leone@mwra.state.ma.us).
9. **MWRA National Pollutant Discharge Elimination System (NPDES) Permit**
In compliance with the federal Clean Water Act, this permit authorizes MWRA to discharge treated effluent from the Deer Island Treatment Facility to receiving waters in Massachusetts Bay and from various CSO outfalls in accordance with effluent limitations, monitoring requirements, and other conditions set forth in the permit. EPA and DEP are co-permittees. Copies can be obtained from the MWRA Community Support Program (Carl Leone at 617-788-4356 or E-mail at Carl.Leone@mwra.state.ma.us).
10. **MWRA Sewer Use Regulations (360 CMR 10.000)**
This Code of Massachusetts Regulation (CMR) establishes the rules and regulations of the MWRA governing the discharge of sewage, drainage, substances, and wastes into any sewer under the control of the MWRA, or into any sewer tributary thereto. The rules and regulations are intended to protect the public health, safety and welfare and the environment and ensure proper and safe operation of the MWRA’s wastewater treatment facilities by regulating the direct and indirect discharge of wastewater and pollutants to the MWRA’s sewerage system. Copies can be purchased from the state bookstore on-line at www.state.ma.us/sec/spr/sprcat/Agencies/360.htm.
11. **Metcalf & Eddy Wastewater Engineering: Collection and Pumping of Wastewater (1981)**
This engineering textbook is an excellent reference tool for wastewater collection, hydraulics, flow measurement, sewer planning and design, wastewater flow pumping, I/I reduction, and sewer system rehabilitation. It includes an entire chapter devoted to infiltration and inflow. A new edition is expected to be released in October 2001, and will be available from Metcalf & Eddy.

- 12. TR-16 Guidelines for the Design of Wastewater Treatment Works (1998)**
This document provides guidance in the design of and preparation of plans and specifications for wastewater treatment works. The document was prepared by the Technical Advisory Board of the New England Interstate Water Pollution Control Commission. Copies can be purchased from the New England Interstate Water Pollution Control Commission at (978) 323-7929.
- 13. WPCF/ASCE Design and Construction of Sanitary and Storm Sewers, WPCF MOP9, ASCE Manual 37 (1986)**
This engineering textbook is an excellent reference tool for wastewater collection, hydraulics, and sewer/storm drain planning and design. It includes sections on I/I contributions and leakage/exfiltration testing. This text was prepared by a joint committee of the American Society of Civil Engineers and the Water Environment Federation. It is available from WEF on-line at www.wef.org.
- 14. WEF/ASCE Existing Sewer Evaluation Rehabilitation, WEF MOP-FD-6, ASCE Manual 62 (1994)**
This engineering textbook is an excellent reference tool for I/I reduction planning, sewer system evaluation, and rehabilitation of existing sewers. This text was prepared jointly by the American Society of Civil Engineers and the Water Environment Federation. This publication can be purchased from the WEF on-line at www.wef.org/applications/publications/detail.cfm?PubID=104 Order No. MF2006WW.

11.3 Definition of Terms

Backup – Wastewater entering a building or home through the existing plumbing sometimes occurring in severe wet weather, when infiltration and inflow fill sewer pipes beyond their design capacity. Backups can also be caused by blockages in building service connections or local sewers.

Clean Water Act – Comprehensive, national legislation for water pollution control, first enacted by Congress in 1972 and subsequently added to by amendment. Sets national standards for the pollution reductions and limits that must be achieved by public wastewater treatment plants. Also sets national objectives for the waterways throughout the country to be “fishable and swimmable”.

Combined Sewer – A sewer intended to serve as both a sanitary sewer and storm drain.

Combined Sewer Overflow (CSO) – 1. A structure in a combined sewer system that, by design, releases stormwater and wastewater into receiving waters in order to avoid sewer system backups. 2. The discharge of combined stormwater and wastewater into a receiving water from a CSO structure.

Design Storm – Defined by DEP as a rainfall event with the following parameters: a one year return period, six hour duration, total volume of 1.72 inches of rain, and peak one hour rainfall intensity of 0.87 inches.

Dry Weather Flow – Total wastewater flow occurring during a period of extended dry weather (no precipitation). Flow components include sanitary flow and infiltration.

Enabling Act – Act of the Commonwealth of Massachusetts (Chapter 372/1984) establishing the Massachusetts Water Resources Authority as an independent State authority.

Evapotranspiration – The total water removed from an area by evaporation (soil, snow, and water surfaces) and transpiration (plants).

Excessive I/I – The quantity of infiltration or inflow which can be shown to be cost-effective to remove from the sewer collection system.

Force Main – A sewer pipe where flow moves under pressure created by mechanical force from a pump station.

Gravity Sewer – A sewer pipe where flow moves due to the natural force of gravity.

Headworks – Sewer facilities for the preliminary treatment of wastewater that remove grit and screenings.

Inch-Miles – The products of sewer diameter (in inches) times the sewer length (in miles).

Infiltration – Extraneous water entering a sewer system from the ground through sources such as deflection pipes, pipe joints, connections, and manhole walls. Infiltration does not include, and is distinguished from, inflow.

Inflow – Extraneous water discharged into a sewer system from sources such as sump pumps, roof leaders, cellar drains, foundation drains, surface drains, drains from springs and swampy areas, manhole covers, catch basins, cross-connections from storm drains, cooling water discharges, tide gates, etc. Inflow does not include, and is distinguished from, infiltration.

Interceptor – Large regional sewer that collects and transports wastewater from smaller local sewers.

Massachusetts Environmental Policy Act (MEPA) – State law enacted in 1972 requiring all agencies, departments, boards, commissions and authorities (including MWRA) to evaluate the environmental impact of their projects or activities. The law states that all practical means and measures to minimize damage to the environment must be addressed.

National Pollutant Discharge Elimination System (NPDES) – Provision of the Clean Water Act that requires a permit in order for wastewater or industrial treatment plants to discharge pollutants into receiving waters.

Overflow – The spilling over of untreated wastewater from the collection system.

Sanitary Flow – The component of wastewater that includes domestic, commercial, institutional, and industrial sewage flow. Specifically excludes infiltration/inflow.

Sanitary Sewer – A sewer intended to carry only sanitary flow while excluding stormwater.

Sanitary Sewer Overflow (SSO) – The spilling over of untreated wastewater from the collection system.

Sewer Service Connection – The sewer pipe from a building to the public sewer.

Storm Drain – A drain (or sewer) intended to carry only storm water, surface runoff, street wash water, and drainage. Specifically intended to exclude sanitary flow.

Surcharge – When the sewer flow exceeds the hydraulic carrying capacity of the sewer line causing the wastewater flow depth to rise above the crown of the pipe.

Tide Gate – A structure that permits the discharge of wastewater to a receiving water when flow in a combined sewer rises above the level of the receiving water. It prevents river or harbor water from entering the sewer system (inflow) when the level of the receiving water rises above the level of flow in the combined sewer.

Wastewater – The entire flow carried by sewers including: sanitary flow, infiltration and inflow.

Wet Weather Flow – Total wastewater flow occurring during and immediately after a storm event. Flow components include sanitary flow, infiltration and inflow.

11.4 Acronyms

ACO	Administration Consent Order
ADF	Average Daily Flow
AMSA	Association of Metropolitan Sewerage Agencies
AO	Administrative Order
CFR	Code of Federal Regulations
CIP	Capital Improvement Plan
CMOM	Capacity, Management, Operation and Maintenance
CMR	Code of Massachusetts Regulations
CRWA	Charles River Watershed Association
CSO	Combined Sewer Overflow
CWMP	Comprehensive Wastewater Management Plan
CY	Calendar Year
DEP	Massachusetts Department of Environmental Protection
DPW	Department of Public Works
EIR	Environmental Impact Report
ENF	Environmental Notification Form
EOEA	Executive Office of Environmental Affairs
EPA	United States Environmental Protection Agency
FRWA	Fore River Watershed Association
FY	Fiscal Year
GIS	Geographic Information Systems
gpd/idm	Gallons-per-day per inch-diameter mile
H ₂ S	Hydrogen Sulfide
I/I	Infiltration/Inflow
MEPA	Massachusetts Environmental Policy Act
mgd	Million gallons per day
MRWA	Mystic River Watershed Association
MWRA	Massachusetts Water Resources Authority
NEIWPCC	New England Interstate Water Pollution Control Commission
NPDES	National Pollutant Discharge Elimination System
NRWA	Neponset River Watershed Association
O&M	Operation and Maintenance
OM&R	Operation, Maintenance and Replacement
POTW	Publicly Owned Treatment Works
SRF	State Revolving Fund
SSCC	South Shore Chamber of Commerce
SSES	Sewer System Evaluation Survey
SSO	Sanitary Sewer Overflow
TV	Television
WAC	Wastewater Advisory Committee to the MWRA
WEF	Water Environment Federation (formerly Water Pollution Control Federation)
WPCF	Water Pollution Control Federation
WRC	Water Resources Commission