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**Green City, Clean Waters**  
**Updated Nine Minimum Controls**  
**Report**

**Consent Order & Agreement**  
**Deliverable V**

**City of Philadelphia Combined Sewer Overflow Long Term Control Plan Update**

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**Submitted to**  
**The Commonwealth of Pennsylvania**  
**Department of Environmental Protection**

**By The Philadelphia Water Department**  
**Date June 1, 2013**

# Errata

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1. The errata submitted on August 7, 2014 include replacements to pages 7 and 15 of Section 1, Minimum Control No. 1 Review of Operation & Maintenance Programs.
2. The errata submitted on August 7, 2014 include replacements to pages 4 and 6 of Section 3, Minimum Control No. 3 Review and Modification of Pretreatment Programs.
3. The errata submitted on August 7, 2014 include replacements to page 1 of Section 5, Minimum Control No.5 Prohibiting CSO Discharges during Dry Weather.

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## **Appendix I**    Implementation of the Nine Minimum Controls, September 27, 1995

# Introduction

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On June, 1, 2011, the Commonwealth of Pennsylvania Department of Environmental Protection and the City of Philadelphia (City) entered into a Consent Order and Agreement (COA) that included approval of the City's Combined Sewer Overflow Long Term Control Plan Update and its supplements (LTCPU), as amended through negotiations. The approved Long Term Control Plan Update and its supplements, called the *Green City, Clean Waters* program, represent the City of Philadelphia's commitment towards meeting regulatory obligations while helping to revitalize the City. The Updated Nine Minimum Controls Report is a required deliverable under the Philadelphia Water Department's (Water Department) Consent Order and Agreement (COA). The COA describes the purpose of the Updated Nine Minimum Controls Report :

*"To support the LTCPU, the City will update the "Implementation of Nine Minimum Controls" document, which was originally submitted in September, 1995. The updated report should indicate how the City's activities are being carried out currently, and highlight how these activities may have changed as a result of new technology, new practice, or other circumstances."*

This documentation is not intended to replace the 1995 document *CSO Documentation: Implementation of the Nine Minimum Controls*, but instead supplements the original report with current status and new initiatives. The preparation of this report included a review of each of the Nine Minimum Controls to provide supplementary information and summarize implementation progress and significant accomplishments achieved since the original documentation of these measures. The 1995 document can be found in Appendix I of this report.

Since the preparation of *CSO Documentation: Implementation of the Nine Minimum Controls* in 1995, several changes have been made to improve the Water Department's Combined Sewer Overflow (CSO) program. In January 1997, as part of the requirements set forth in *Part C - Section M: Combined Sewer Overflow* of the City's NPDES permits, the Water Department submitted a Long Term Control Plan that detailed the City's approach to control CSOs through the use of the Nine Minimum Controls, capital improvement projects, and a commitment to watershed-based planning and management. *Green City, Clean Waters* expands on the 1997 Long Term Control Plan and utilizes green stormwater infrastructure in conjunction with selected water pollution control plant and collection system improvements to increase capture and reduce CSOs.

Through achieving compliance with the City's NPDES permit and implementation of the LTCPU, the Water Department continues a CSO control program that incorporates traditional and green stormwater infrastructure, as well the core elements of the Nine Minimum Controls. The implementation of the Nine Minimum Controls for CSO control continues to be a City-wide effort conducted and managed by the Water Department. To increase its efficiency, the Water Department has made modifications to its Nine Minimum Control program over the years, as documented in this report.

# Section 1

## Minimum Control No. 1

### Review of Operation & Maintenance Programs

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#### 1.1 Regulatory Context and Overview for Updated Documentation

##### 1.1.1 Regulatory Context

Federal and state combined sewer overflow (CSO) regulations require the Philadelphia Water Department (Water Department) to document its Operations and Maintenance programs for inspecting and maintaining the combined sewer system and its related facilities. These Operations and Maintenance programs and practices must comply with the requirements of the Water Department's National Pollutant Discharge Elimination System (NPDES) Permit and the United States Environmental Protection Agency (US EPA) National CSO Control Policy's "Nine Minimum Controls". The Nine Minimum Controls are identified in the CSO Control Policy as minimum technology-based controls that can be used to address CSO problems, and their effects on receiving water quality, without extensive engineering studies or significant construction costs, prior to the implementation of long-term control measures. Minimum Control No. 1 states that documentation of proper operation and regular maintenance programs for the sewer system and the combined sewer overflow discharge points must be submitted to the Pennsylvania Department of Environmental Protection.

For the purposes of the National CSO Control policy, a proper operation and maintenance program should include the following elements:

- The organizations and/or people responsible for various aspects of the Operations and Maintenance program
- The human and financial resources allocated to operation and maintenance activities
- Procedures for preparing and approving annual budgets for Operations and Maintenance of the combined sewer system and its related facilities
- Identification and documentation of the facilities that are critical to the performance of the combined sewer system
- Written procedures and schedules for routine, periodic maintenance of major equipment items and/or CSO diversion facilities and written procedures/protocols to assure that regular maintenance is provided
- Written procedures, including procurement procedures (if applicable), for responding to non-routine maintenance and/or emergency situations
- A process for periodic inspections of the facilities that are critical to the performance of the combined sewer system (as identified above)

- Policies, procedures, or protocol for training Operations and Maintenance personnel (new and existing employees)
- Process for periodic review and revision of the Operations and Maintenance program

The objective of this minimum control is to reduce the frequency and magnitude of CSOs through effective implementation of operating procedures and management practices to optimize performance of existing facilities and maintain appropriate records. The steps involved in implementing this minimum control include the following:

- Define the extent of the existing established Operations and Maintenance program
- Assess progress and efficiency of existing Operations and Maintenance program implementation
- Determine whether or not the existing program needs to be improved to satisfy the intent of the CSO policy
- Develop and implement the required activities so the deposition of solids or debris does not cause obstructions that could result in overflows.
- Develop and implement the required activities so that continuous dry weather activities do not occur
- Develop and implement the required Nine Minimum Control activities and improvements to address CSOs
- Document the Operations and Maintenance actions and report them to the Pennsylvania Department of Environmental Protection

### **1.1.2 Updating the Documentation for Minimum Control No. 1**

One of the requirements for Minimum Control No. 1 is to review the Operations & Maintenance program on a regular basis and make revisions and refinements as needed. The original documentation for Minimum Control No. 1 was submitted to the regulatory agencies in September 1995, and was subsequently approved. Since then, revisions have been made to further improve and update the process by which the Water Department combined sewer system and its related facilities are inspected, operated and maintained. A summary of the more significant revisions is provided in the bulleted list below. The Water Department is in the process of updating its strategic plan with the vision of becoming America's model urban water utility for the 21<sup>st</sup> century. A key element of this process is to evaluate the skills and staffing needed to meet the Water Department's current and future needs.

- The organizational structure and the number of Operations and Maintenance staff in each of the various Minimum Control No. 1 implementation units and groups has been revised to better meet current and anticipated future Operations and Maintenance needs.
- The Water Department conducts research to determine and recommend Operations and Maintenance procedures and schedules for the new green stormwater infrastructure facilities as they are completed and come online.

- A capital improvements program was completed so that all 16 of the wastewater pumping stations in the City of Philadelphia's (City) system have either dual power sources or emergency backup generators, thereby reducing potential station downtime.
- The Water Department's network of automated wastewater depth monitors was expanded to include all three sewer districts so that any abnormal flow conditions can be more expeditiously identified and associated Operations and Maintenance measures can be more proactively enacted.
- The equipment available to Operations and Maintenance crews has been expanded and updated, including additional Closed-Circuit Television (CCTV) inspection trucks to facilitate a greater quantity of sewer inspections, and the acquisition of more agile and maneuverable sewer cleaning equipment for improved access in tight places.
- A Sewer Assessment Program was initiated in 2002 and aims to inspect 120 miles of sewer per year, capture the inspection information in a standardized computer database, evaluate and analyze structural and Operations and Maintenance conditions, and apply a uniform protocol for prioritizing sewer repairs and/or replacements.
- Standardized US industry protocols and procedures (National Association of Sewer Service Companies – Pipeline Assessment and Certification Program) were implemented for coding the nature and severity of sewer defects and maintenance conditions, which allows inspectors and decision makers to speak the same language.
- In 1995, Illicit Discharge Detection and Elimination became a regulatory requirement under the City's first Municipal Separate Stormwater Sewer System permit. In 1998, the City signed a Consent Order and Agreement (COA) with the Pennsylvania Department of Environmental Protection establishing requirements for the Defective Laterals Program and many of the COA requirements for Illicit Discharge Detection and Elimination activities were incorporated into the City's updated 2005 Municipal Separate Storm Sewer System permit.
- To consolidate the multiple platforms formerly used by different units throughout the Water Department, the Cityworks<sup>®</sup> work order management system has been utilized to track and prioritize maintenance activities for the Water Department's street side assets (e.g.: sewers and storm inlets).

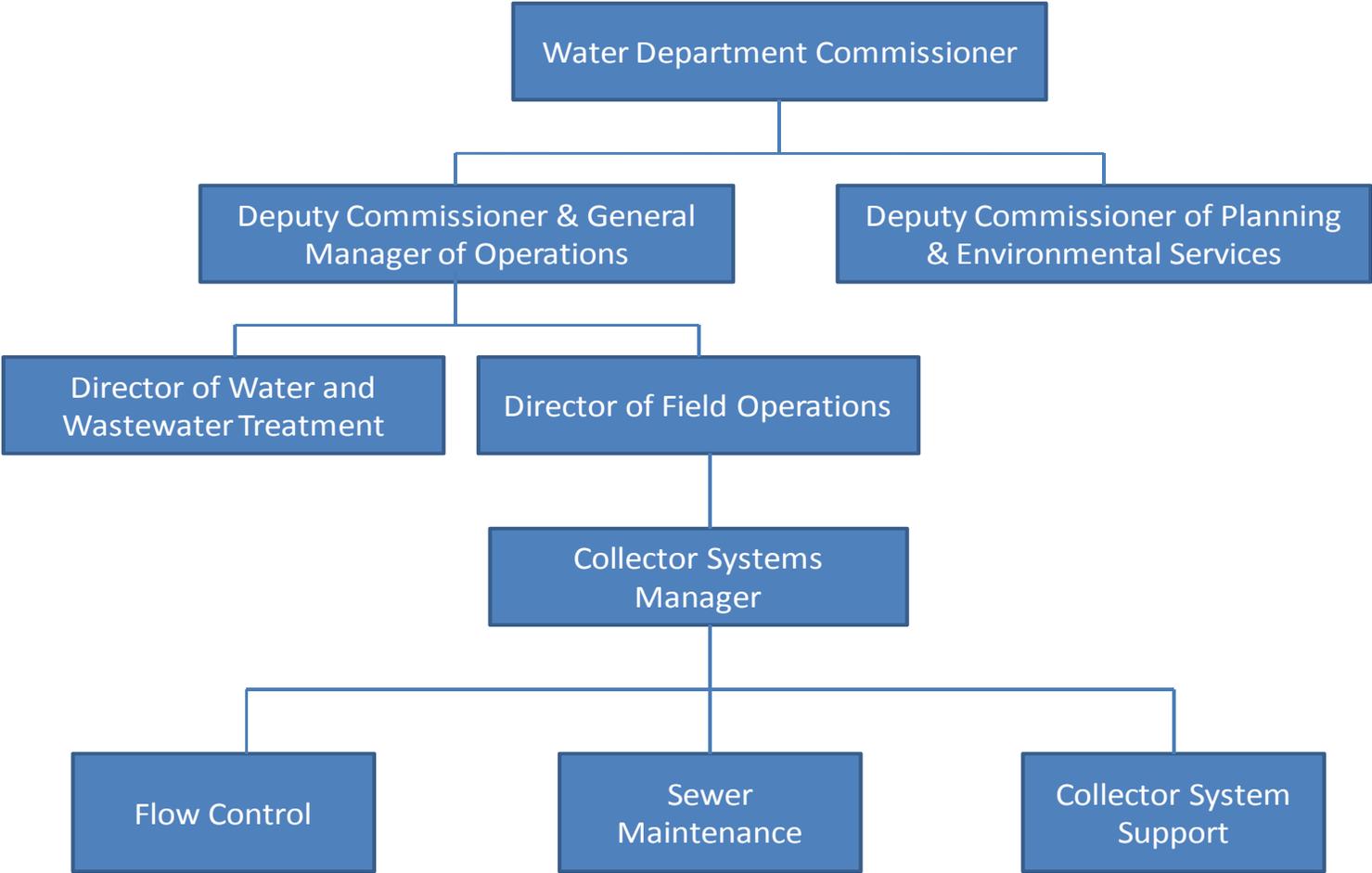
### **1.1.3 Organizational Structure of Water Department Personnel Responsible for Operations & Maintenance Activities**

The water and wastewater systems serving the City are owned by the City and are operated as a self-supporting enterprise fund utility. The Water Department was established by the Philadelphia Home Rule Charter, approved April 17, 1951 as one of the City's ten operating departments. The Water Department is responsible for the planning, construction, operation, and maintenance of the two systems; rate setting; budgeting and detailed cost accounting; and preparation of financial statements for the water and wastewater systems. The Water Department's primary mission focuses on providing a reliable supply of high quality drinking water for residential and community needs, as well as the effective management of wastewater and stormwater to enhance and sustain the region's watersheds and quality of life. The Water Department is currently organized into six major divisions: 1- Operations, 2- Engineering and

Construction, 3- Finance, 4- Human Resources, 5- Public Affairs, and 6- Planning and Environmental Services. There is also an Office of Compliance. Each division is divided into units and subunits responsible for carrying out specific functions.

The Water Department has a well-established and effective maintenance program that provides inspections, evaluations, cleaning, rehabilitation, and repairs to the various components of the collector system through ongoing and preventative maintenance. Operation and Maintenance of the collector system is the responsibility of the Collector Systems Unit. The Operation and Maintenance of new green stormwater infrastructure facilities is currently the responsibility of the Planning and Environmental Services Division utilizing contract maintenance. The division is also responsible for preparing the *Green Infrastructure Maintenance Manual*.

An organizational chart illustrating the chain-of-command and lines of communication between the Water Department Commissioner, the Collector Systems Manager and the Deputy Commissioner of Planning and Environmental Services is provided in Figure 1-1. The Collector Systems Unit is directed by the Chief Water Transport Operations Engineer and is comprised of three units: Flow Control, Sewer Maintenance, and Collector System Support. Each unit is directed by a superintendent who reports directly to the Engineer and described below.



**Figure 1-1: Organizational Chart of the Philadelphia Water Department as related to Operation and Maintenance of the NMCs**

### **Flow Control Unit**

The Flow Control Unit is responsible for the operation, inspection, cleaning, maintenance, and repair of wastewater and stormwater pumping stations, combined sewer regulator chambers, tide gate chambers, diversion chambers, siphon valves, and related wastewater control devices within the City. These chambers are located along the Delaware and Schuylkill Rivers and the Pennypack, Frankford, Tacony, and Cobbs Creeks. The Unit also responsible for the CSO Control and Monitoring System, wastewater metering chambers, City-wide rain gage network, CCTV inspection equipment maintenance, and the calibration and repair of confined space air monitors.

### **Sewer Maintenance Unit**

The Sewer Maintenance Unit is charged with the maintenance of the City-wide combined, sanitary, and stormwater systems and their appurtenant structures. Included in this category are all branch, interceptor, and main sewers; the maintenance of inlet laterals, inlets, and manholes; cleaning and repair of drainage ditches and outlets; and CSO outlets. In addition to repairing sewers, much of the unit's work involves cleaning and clearing choked sewers using high pressure jet machines, and rodder machines.

The Sewer Maintenance Unit also includes the Inlet Cleaning Group which is responsible for the inspection and cleaning of approximately 74,000 storm water inlets within the City. The group is also charged with the following additional responsibilities: retrieving and replacing inlet covers, installing original replacement covers, and installing locking covers; unclogging choked inlet traps and outlet piping so that inlets can take water; and alleviating flooded streets and intersections when hydrants are opened during fire-fighting operations.

The Sewer Maintenance Unit also includes the Waterways Restoration Team and the Defective Laterals Group.

### **Collector System Support Unit**

The Collector System Support Unit is primarily responsible for providing technical expertise to the operating units through engineering evaluations and studies, and is not responsible for Operations and Maintenance activities. The Unit works with other departmental units, various City agencies, and federal and state regulatory agencies on projects related to waste and stormwater collection. On an as-needed basis, Collector Support is requested to conduct engineering studies in order to resolve a problem that may be caused by age-related deterioration, past building practices, or new regulatory mandates. The Unit also conducts hydraulic analyses of the collector system by coordinating field, office, and technical resources. Since the Nine Minimum Controls are by definition activities that do not require extensive engineering studies, the unit has minimal involvement in Minimum Control No. 1 implementation.

### **Water and Wastewater Treatment Unit**

The Water and Wastewater Treatment Unit provides the treatment plant maintenance personnel needed for the operation and maintenance of the head-works and primary treatment facilities at each of the three Water Department wastewater treatment plants.

## Planning and Environmental Services Division

The Planning and Environmental Services Division is currently responsible for coordinating Operations and Maintenance for the green stormwater infrastructure facilities. The Operations and Maintenance activities for new green stormwater infrastructure facilities are currently implemented utilizing contract maintenance. The division is also responsible for the development of the *Green Infrastructure Maintenance Manual*. The manual will address the Operations and Maintenance needs for the full range of green stormwater infrastructure projects that have been, and are proposed to be, implemented by the Water Department as part of the *Green City, Clean Waters* program.

### 1.1.4 Facilities Critical to the Performance of the Combined Sewer System

A proper Operations and Maintenance program should identify and document the facilities that are critical to the performance of the combined sewer portions of the City's system. The organizational structure described in Section 1.1.3 provides for the Operation and Maintenance of the combined sewer system components that are considered to be "critical" to the performance of the City's sewer system. These components are documented and described in detail in the *System Inventory and Characterization Report and the Hydraulic Characterization Report* and summarized briefly below.

There are 16 wastewater pump stations that are critical to maintaining collector system flow to the treatment plants. Three additional pump stations introduce storm water flow into the combined sewer system and can affect the wet weather flow characteristics of downstream CSOs.

There are 175 combined sewer regulator chambers in the City's sewer system with regulator devices that control the diversion of wastewater flow to the interceptor system. These regulator chambers discharge through 158 NPDES permitted point sources. The chambers are critical to the performance of the system in that they control the frequency, duration and quantity of CSO discharges during wet weather.

There are 20 storm relief diversion chambers in the City's system with relief dams that allow excess flow during storm events to be diverted to storm relief sewers. These storm relief chambers constitute an additional 6 NPDES permitted point sources. The storm relief chambers are critical to the performance of the system in that they prevent the trunk lines from excessive surcharge conditions.

Tide gates are located and maintained at approximately half of the CSO regulator chambers in the City's system to prevent tidal inflow into the combined sewer system from the estuary receiving water body. Inflow from the receiving water body can adversely affect the combined sewer system and treatment facilities by reducing system capacities.

There are several key interceptor segments that field inspections have shown to be susceptible to the accumulation of solids. These accumulations are monitored and grit periodically removed to prevent an excessive loss of conveyance capacity which could result in increased CSO discharges.

There are several real time control facilities that are critical for regulating flow into and along the City's collector system. A network of automated computer controlled gates along the interceptors are connected to input data obtained from the network of wastewater depth monitors and respond accordingly. The automated facilities also include the R15 Rock Run inflatable dam, the automated crest gate at T14, and the State Road storage facility.

### **1.1.5 Procedure for Preparing & Approving the Annual Operating Budgets**

#### **Background Information**

The Water Department was established by Charter with the power and duty to operate, maintain, repair and improve the City's water and wastewater systems. The Charter requires the Water Department to fix and regulate rates and charges for potable water supply and for wastewater treatment service in accordance with standards established by City Council. Such standards must enable the City to realize revenues at least equal to operating expenses and debt service charges on any debt incurred or to be incurred for the water and wastewater systems, and proportionate charges for all services performed for the Water Department by all officers, departments, boards or commissions of the City. The Charter also authorizes the Water Department, with the approval of City Council, to enter into contracts for supplying wastewater treatment service to users outside the limits of the City.

The operations of the Water Department are budgeted for in the Water Fund, which is an enterprise fund of the City. The Water Fund is an accounting convention established pursuant to the Charter for the purpose of accounting for the assets, liabilities, revenues, expenses and rate covenant compliance on a legally enacted basis for the water and wastewater systems.

The Water Department was established by the Charter as one of the City's ten operating departments. As such, the Water Department reports to the Office of the Managing Director. The Water Department relies on other City departments and agencies for support of its operations. Four of these departments receive a direct appropriation from the Water Department's operating budget at the beginning of each fiscal year to fund the support services to be rendered to the Water Department in such fiscal year. These four departments are the Revenue Department (Water Revenue Bureau) for meter reading, billing and collection services; the Law Department for legal services; the Department of Public Property for the rental of office space; and the Office of Fleet management for vehicle acquisition and maintenance.

Thirteen City departments and agencies, including the Revenue Department and the Department of Public Property, provide additional services to the Water Department during the year for which they are paid at the close of each fiscal year. These additional services include purchasing of services, supplies and equipment by the Procurement Department; telephone and other communication services by the Public Property Department; street repairs by the Streets Department; disbursements and cash management by the Director of Finance; and auditing services by the Office of the City Controller.

## Operating Budget

Operating expenses consist of all costs deemed necessary and appropriate for the operation, maintenance, and administration of the water and wastewater systems during each year, including interdepartmental charges. Operating expenses include personnel services, purchased services including power, materials and supplies, equipment, fringe benefits, and indemnities.

The Water Department's finance division performs an analysis of the previous year's budget and compares it to actual expenditures. A breakdown by functional unit and object class within each unit is then used to adjust the proposed fiscal year's base budget items to reflect actual expenses incurred. Projections of human resource budget items are performed to reflect wage adjustments occurring through negotiated labor agreements.

The fiscal year of the City is defined by the period from July 1 through June 30. Budget preparation activities typically commence in the fall to allow sufficient time for the review and approval process. The superintendents of the Flow Control and Sewer Maintenance Units are each responsible for preparation of the annual operating budget for their respective unit. The superintendents first review the base budget prepared by Finance, to confirm accuracy and completeness. The superintendents then consult their front line supervisors to determine the specific labor and equipment needs and any new maintenance programs that would need funding through an increase package. The superintendents submit their completed annual operating budgets to the Chief Water Transport Operations Engineer who reviews them and makes any required revisions. The finalized draft annual operating budgets are then submitted to the Deputy Commissioner for review, revision, and approval.

The Charter requires City Council to adopt a balanced operating budget for the fiscal year on or before May 31 of each year. The Mayor's operating budget is developed from proposed budgets submitted by the various departments of the City, including the Water Department. The Water Department typically begins preparation of its proposed operating budget in the fall of each fiscal year when all divisions were supplied with documentation to complete and return to the Finance Division reflecting their budgetary requests for the next fiscal year. For example, budget preparations for the Fiscal Year 2014 budget would begin in October 2012. The Water Department has developed and installed a computerized budgeting system to enable each division to prepare budget requests based on historical and current operating experience. Divisional budget proposals setting forth estimated obligations from the ensuing fiscal year and are submitted to the Finance Division by November of each year. Revenue estimates are prepared by the Water Revenue Bureau under the direction of the City's Finance Department and the Water Department. The Water Commissioner reviews all divisional budget proposals and the Water Revenue Bureau's budget with the assistance of the Finance Division and submits the Water Department's proposed budget to the City's Budget Bureau and the City's Managing Director in early January. The Mayor approves the Water Department's Operating Budget and incorporates it into his proposed budget to City Council in the latter part of January. City Council typically adopts the fiscal year budget by March.

The fiscal year 2013 budget for the Collector Systems Unit is summarized in Table 1-1.

**Table 1-1: Fiscal Year 2013 Budget for the Collector Systems Unit**

Budget Category	Sewer Maintenance Unit	Inlet Cleaning Group	Flow Control Unit	Collection System Support	Total
Personnel	\$9,412,000	\$4,360,000	\$4,077,000	\$747,000	\$18,596,000
Service Contracts, Parts, & Equipment	\$4,896,000	\$203,000	\$7,553,000	\$10,000	\$12,662,000
Total Budget	\$14,308,000	\$4,563,000	\$11,630,000	\$757,000	\$31,258,000

### 1.1.6 Overview of Documentation & Record Keeping

The Water Department's NPDES permit and the National CSO Control Policy's *Nine Minimum Controls* require the creation of complete and consistent record keeping and procedures for report development and archiving. A series of field reports and managerial summary reports have been developed, implemented, and archived by Water Department personnel. The intent and purpose for the documentation is summarized below:

- Document observed conditions and maintenance activities performed in the field;
- Summarize and monitor key operational parameters of the system;
- Supervise annual preventative maintenance schedules, chart maintenance progress; and
- Prepare required monthly and annual reports for regulatory agency review.

A major documentation initiative within the Water Department in recent years has been the development and implementation of a computer complaint and maintenance management system called Cityworks®. The new system is being phased in and will be used primarily by the Water Department's field units that work on street side assets associated with the conveyance and collector systems. The Water Department's Geographic Information System (GIS) will serve as the foundation of the system and Cityworks® will be able to handle service requests taken from the Public Affairs Call Center and internal work orders for system maintenance and repair. Cityworks® will eventually replace the individual systems currently used by each unit for the tracking and prioritization of infrastructure repairs, replacements and related projects, thus streamlining work, consolidating data into one location and reducing duplication of efforts.

This Minimum Control No. 1 report narrative will briefly describe the maintenance management system and the various supplemental reports used by Water Department field and managerial personnel. The descriptions include the name of the report, the person(s) who complete(s) the report, the information contained within the report, and how the report is used. For clarity the report description summaries have been grouped by the operational units that use the reports.

## 1.2 Flow Control Unit

### 1.2.1 Human Resources Allocated to O&M Activities

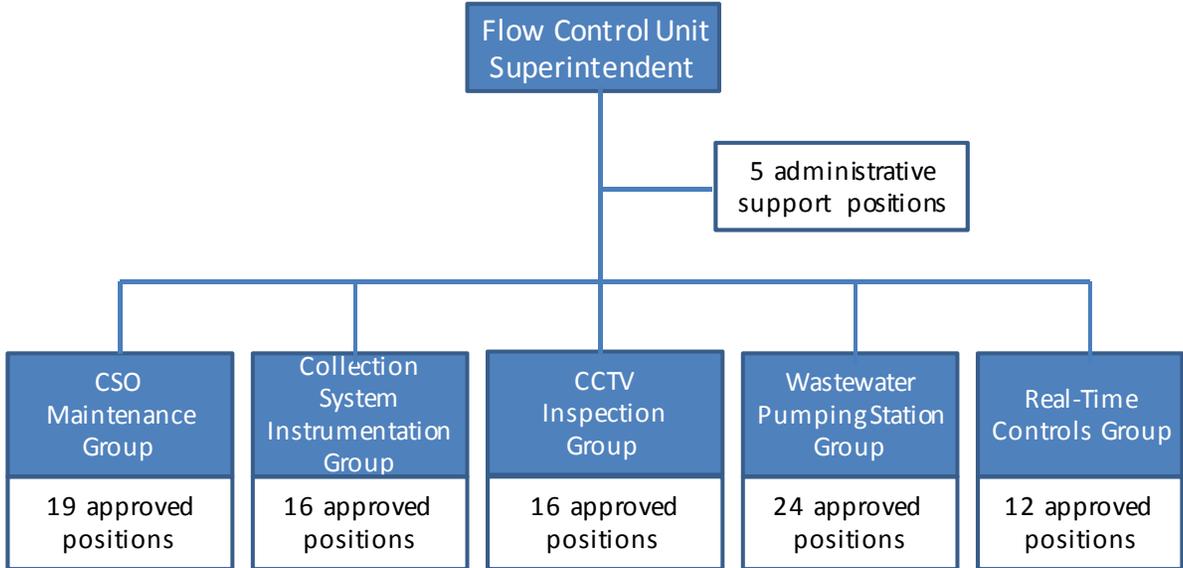
The Flow Control Unit's primary responsibility is the operation and maintenance of the CSO elements of the City's combined sewer system. The unit is headed by the Flow Control Superintendent and is divided into five operational groups.

- CSO Maintenance Group
- Collection System Instrumentation Group
- CCTV Inspection Group
- Wastewater Pumping Station Maintenance Group
- Real Time Controls Group

The operational groups are led by three Assistant Superintendents who report directly to the Flow Control Unit Superintendent. One of the Assistant Superintendents oversees the CSO Maintenance Group, the Collection System Instrumentation Group, and the CCTV Inspection Group. The second Assistant Superintendent oversees the Wastewater Pumping Station Maintenance Group, and the third Assistant Superintendent oversees the Real Time Controls Group. The Assistant Superintendents have supervisors and/or crew chiefs who oversee the daily activities of group personnel. The primary lines of communication for all CSO maintenance activities occur between the Flow Control Superintendent, the three Assistant Superintendents, and the supervisors and crew chiefs within the five operational groups. These managers have been delegated the responsibility and authority to produce the daily work schedules for the crews, oversee implementation quality, and insure that adequate documentation has been prepared and submitted to the Superintendent. A copy of the organizational chart illustrating the chain-of-command and lines of communication within the Flow Control Unit is provided in Figure 1-2.

#### CSO Maintenance Group

The CSO Maintenance Group is responsible for the combined sewer regulator chambers, storm relief diversion chambers, and back-water gates at CSO outfalls within the City's system. The CSO Maintenance Group presently has a work force of 19 approved staff positions. The group is supervised and managed by an Assistant Superintendent who reports directly to the Flow Control Unit Superintendent. The work force is organized into six crews, each comprised of three people; typically a Senior Interceptor Service Worker, an Interceptor Service Worker, and a Semi-Skilled Laborer. The Senior Interceptor Service Worker acts as the crew leader receiving the daily assignment sheet; directing the activities of the crew; inspecting the crew truck to insure that required tools, protective clothing, and safety equipment are accounted for; and preparing written inspection reports.



**Figure 1-2: Organizational Chart of the Flow Control Unit**

Each of the six crew leaders is assigned a specific district area to maintain which has helped the crews to develop a strong familiarity with the locations of the CSO control structures in their district area, special site-specific maintenance requirements, and specific problem areas needing special attention.

The Flow Control Unit is also responsible for the contracted seasonal operation of the skimming vessel.

### **Collection System Instrumentation Group**

The Collection System Instrumentation Group is responsible for maintaining and calibrating the automated monitoring and control equipment installed within the City's system. The CSO Instrumentation Group presently has a work force of 16 staff positions and is comprised of electronic technicians and instrument technicians. The group is jointly supervised and managed by an Electronic Equipment Crew chief and an Instrument Service Crew Chief who report directly to the Assistant Superintendent. Rather than forming fixed operating teams, the workers are assigned specific tasks and grouped into crews on a daily basis based upon specific maintenance needs. This organizational arrangement makes the group flexible and adaptable to changing maintenance needs.

### **CCTV Inspection Group**

The CCTV Inspection Group is responsible for providing the CCTV inspections needed to explore problem areas, ascertain and document sewer system defects, and provide the information needed to determine required Operations and Maintenance and/or rehabilitation measures. The CCTV Inspection Group currently has a work force of 16 approved staff positions and is comprised of electronic technicians and sewer maintenance inspectors. The group is supervised and managed by an Assistant Superintendent who reports directly to the Flow Control Unit Superintendent. To provide flexibility, the workers are assigned specific inspection tasks and grouped into crews on a daily basis based upon specific inspection needs. The group members have been trained and certified in the Pipeline Assessment and Certification Program of the National Association of Sewer Services Companies to provide standardization and quality assurance for the inspection methodologies that are employed and the digital inspection data that are collected

### **Wastewater Pumping Station Maintenance Group**

The Wastewater Pumping Station Maintenance Group is responsible for maintaining the 16 wastewater pump stations and three additional stormwater pump stations along the City's collector system. The pump station group presently has a work force of 24 approved staff positions. The group is jointly supervised and managed by a Process Machinery Group Leader, an Instrument Crew Chief and an Electrical Group Leader who report directly to the Assistant Superintendent. Like the Collection System Instrumentation Group and CCTV Inspection Group, the workers are assigned specific tasks and grouped into teams on a daily basis by the crew chiefs. This makes the group flexible and adaptable to day to day maintenance needs. The group is comprised of industrial process machinery mechanics, machinery and equipment mechanics, electricians, instrument technicians, and laborers. All technical disciplines required to maintain the pump stations are represented.

**Real Time Controls Group**

The Real Time Controls Group is responsible for maintaining the Water Department's real time control facilities, including computer controlled gates, inflatable dams, and storage facilities. The Real Time Controls Group currently has a work force of 12 approved staff positions. The group is supervised and managed by an Assistant Superintendent who reports directly to the Flow Control Unit Superintendent. The group is comprised of electricians, instrument technicians and laborers so that all technical disciplines required to maintain the real time control equipment are represented. The workers are assigned specific tasks and grouped into teams on a daily basis by the crew chiefs.

**1.2.2 Operating and Equipment Resources Allocated to Operations & Maintenance Activities**

The fiscal year of the Water Department is defined by the period from July 1 through June 30. Budget preparation activities typically commence in the fall to allow sufficient time for the review approval process as discussed in detail in Section 1.1.4. The Superintendent is responsible for the preparation of the annual budget for the Flow Control Unit. The Superintendent consults the three Assistant Superintendents to determine the specific labor and equipment needs or any special maintenance projects that would need funding. The superintendent submits the completed annual budget to the Chief Water Transport Operations Engineer who reviews the draft, makes any required revisions, and obtains required approvals.

The fiscal year 2013 budget for the Flow Control Unit is summarized in Table 1-2 below.

**Table 1-2: Fiscal year 2013 budget for the Flow Control Unit**

	Personnel	Service Contracts, Parts, & Equipment	Total
Total Budget	\$4,077,000	\$7,553,000	\$11,630,000

The more major equipment that is available to Flow Control Unit personnel for use in their Operations and Maintenance responsibilities is summarized briefly in Table 1-3 below.

**Table 1-3: Flow Control Unit Major Equipment Summary**

Equipment Item	Quantity
Vactor Unit	4
Boats	2
CCTV trucks	7
Utility Trucks	16
Transportation Vehicles	27
Crane	1
Generator	1

### 1.2.3 Procedure & Schedules for O&M Activities, CSO Maintenance Group

The CSO Maintenance Group is responsible operation, maintenance, inspection and cleaning of the 175 combined sewer regulating chambers, 89 tide gate chambers, 20 storm relief chambers, various siphons and related wastewater control devices throughout the collector system. The duties of the CSO Maintenance Group are divided into the following Operations and Maintenance activity categories conducted at each of the CSO control structures within the crews' assigned district areas:

- Conduct brief visual inspections of the regulator chambers, storm relief diversion chambers, and back-water prevention gates at frequent intervals
- Conduct detailed chamber and gate inspections and maintenance activities as assigned daily by the Assistant Superintendent
- Perform routine preventative maintenance on chamber and gate equipment on a regularly scheduled basis
- Perform comprehensive maintenance and repair on CSO control equipment on a regularly scheduled basis
- Remove accumulations and debris from the chamber regulators and gates as required
- Utilize the system-wide network of automated depth monitors and automated scheduling software to develop daily work orders, to track progress, and to verify the completion of required preventive maintenance for the structures and equipment

The primary vehicle for preventing dry weather CSOs in the City's system is the comprehensive maintenance program to inspect and service the combined sewer regulator chambers, storm relief diversion chambers, and backwater prevention (tide) gates. During or after a storm or snow-melt event, one of the maintenance crews and/or the vactor crew is scheduled to conduct visual inspections of targeted sites. The other crews are directed to the high priority areas within their assigned sewer districts, which are determined by the supervisors and lead crew workers either from automated monitor information, visual inspections, or historical experience.

It typically takes several days to complete the cycle of post-storm inspection and reactive maintenance activities at all the chambers and gates. All routine maintenance problems, such as obstructions caused by debris build-up, are corrected by the maintenance crews as they are discovered. Any atypical maintenance situations encountered are documented in a Maintenance Request Report, which is then submitted to the Assistant Superintendents and corrections are scheduled accordingly. The CSO Maintenance Group typically performs over 6,000 site inspections per year. Historical records indicate that most partial blockages are usually cleared within two hours of their being detected.

In all three of the Water Department's sewer districts (Northeast, Southeast, and Southwest), potential problem areas are also detected by automated depth monitors used to supplement and augment the visual inspections. The field monitors are interrogated daily via the central computer. The data is processed through computer software and corresponding graphical

summaries are then forwarded to the Interceptor Supervisors who prepare the daily work schedules for the maintenance crews. The supervisors review the graphical summaries and pass them on to the corresponding lead crew worker. The supervisors and lead crew workers look for any unusual flow conditions that would indicate the presence of a maintenance problem. At the time of the original September 1995 Minimum Control No. 1 documentation, the automated depth monitor network extended only within the Northeast Sewer District. The network has since been extended to the other two sewer district areas.

During extended dry weather periods, after storm-induced maintenance requirements have been completed the monthly, quarterly and annual cycles of preventive maintenance activities are continued. Detailed chamber inspections are assigned daily by the supervisors. The inspections include exercising the control gates and back-water gates, inspecting the slot regulators for obstructions, checking for equipment malfunctions, lubricating control devices, and other scheduled preventive maintenance measures. Any observed debris, sediment accumulations, or obstructions are broken up and removed, and any required equipment repairs or replacements are made. Computer-produced reports and spreadsheets are used to track preventative maintenance activities and to guide managers in the production of daily work schedules. All combined sewer regulator chambers and tide gates in the City's system are visually inspected at least four to five times per month however, select chambers may be inspected more frequently based on prior field experiences. More intensive and thorough preventive maintenance inspections are conducted on an annual schedule.

Comprehensive maintenance measures consist of a thorough scope of work performed on the regulating chamber equipment. The work includes measuring the equipment settings and making the necessary adjustments to bring the equipment into the manufacturer's specifications. The control equipment units are cleaned, lubricated, and exercised, and all equipment conditions are noted on inspection reports. Parts are inspected and replaced when they show signs of excessive wear.

A specialized vactor truck crew is reserved for maintaining the CSO structures. When chamber inspections reveal a problem, the vactor crew and equipment are used to clean grease and sediment accumulations from interceptor lines, CSO controls, and back-water gates and to clear debris accumulations from regulator chamber walls and floors. In addition, the crews are used to assist the pumping station maintenance group in cleaning screenings and debris from grates in siphons and pump stations, and providing grease removal for the pump stations.

The CSO Maintenance Group also has other specialized responsibilities such as monitoring grit levels at certain combined sewer locations. For example, the Somerset Interceptor grit chamber is cleaned at four month intervals. Similarly, the group performs specialized maintenance activities at the Central Schuylkill Pump Station. Crews inspect and clean the bar screens at the upstream side of the inverted siphon, remove grit from the siphon grit pockets, and remove any other observed debris accumulation.

## 1.2.4 Procedures & Schedules for Operations & Maintenance

### Activities, Collection System Instrumentation Group

The CSO Instrumentation Group is responsible for installing, maintaining and calibrating the automated monitoring and control equipment installed within the City's system. This equipment includes the network of depth monitors installed at CSO sites, the computer controlled CSO diversion and sluice gates, the network of billing meters for satellite municipal customers, the associated telemetry devices that relay the field data to the central computer, and the network of precipitation monitors. At the time the original 1995 Minimum Control No. 1 documentation was submitted, the network of depth sensors was limited to the Northeast sewer district. The monitoring network has since been expanded to include all three Water Department sewer districts (Northeast, Southeast and Southwest.) The duties of this group are divided into the following general descriptions of Operations and Maintenance activities conducted for the automated monitoring and control equipment:

- Perform on-site maintenance and repairs to equipment
- Perform regular on-site calibration of monitoring equipment
- Perform bench-work maintenance, repairs, and calibrations of equipment
- Maintain, interrogate and conduct Quality Assurance/Quality Control data reviews for the network of permanent meters at points of connection with satellite customer municipalities
- Install, maintain, and interrogate temporary level and flow monitors that are implemented internally and not delegated under a contract
- Utilize the automated scheduling software to develop daily work orders and to track progress and verify preventive maintenance and calibration are conducted for the equipment

The group is also responsible for the repair, calibration, and certification of the hazardous gas detection meters for the Water Department, as well as the installation of temporary flow and level monitors for various units in the Water Department.

Data from the various categories of monitoring sites is remotely downloaded on a daily basis. Any problems with the monitoring or control equipment are usually detected during the interpretation of the daily data conducted by the Instrument Services Crew Chief. In addition, warning sheets are produced by the central computer that detects inconsistencies with typical data acquisition parameters. Report summaries are produced and forwarded to the Electronic Equipment Crew Chief. Repair or recalibration of any anomalous data collection devices are scheduled when necessary.

Daily activities of the electronic and instrument technicians are directed and scheduled by their respective crew chiefs. Computer-produced reports and spreadsheets are used to track preventative maintenance activities and guide managers in the production of daily work schedules. Corrective maintenance and repairs are scheduled and conducted on an "as-needed" basis as equipment problems are discovered. Preventative maintenance and equipment calibrations are conducted on a periodic schedule. Monitoring equipment is inspected and

calibration coefficients are checked and adjusted on a regular basis to insure it performs to the manufacturer's specifications.

On-site maintenance and repairs are required to support the flow monitors, level sensors, rain gages, and the associated telemetry devices that relay the field data to the central computer. Debris, solids, oils, and grease can accumulate on the sensors and are removed on a regular basis during the routine calibrations. In addition, loose connections are tightened and corroded contact points are cleaned.

When a required repair cannot be implemented in the field, the equipment is replaced and the damaged equipment is returned to the instrument maintenance shop where specialized diagnostic equipment and tools are available for bench-work repair and maintenance. This equipment includes scopes and signal generators, digital and analog multimeters, current loop generators, and pneumatic calibrators. Once repaired, the instruments are thoroughly cleaned, inspected, and tested to insure that they will perform to the manufacturer's specifications.

All monitoring equipment is field tested and calibrated on a regular basis to insure that it remains in correct calibration. Flow depths are field measured to calibrate the pressure transducers and temporary test jigs are set up to calibrate the ultrasonic sensors. These field measurements are used to calculate the corresponding calibration coefficients and required adjustments are made.

The Water Department maintains an inventory of level only and level/velocity monitors that may be temporarily installed for special studies and investigations. The CSO Instrumentation Group installs, maintains, and interrogates these temporary monitors for the duration of the investigation.

### **1.2.5 Procedures & Schedules for Operations & Maintenance Activities, CCTV Inspection Group**

The CCTV Inspection group is responsible for providing the CCTV inspections needed to investigate known or suspected problem areas to identify the nature, extent and severity of sewer system defects so that a repair or replacement strategy can be developed and implemented. CCTV sewer inspections are also conducted to prioritize specific areas for sewer cleaning, judge the effectiveness of a completed sewer cleaning project, and obtain baseline information for comparisons over time. The CCTV crews support sewer repair and rehabilitation activities by providing the exact locations of pipe defects and facilitating the decision of where to excavate and uncover a pipe segment for repairs. The crews also support the post construction inspection program by videoing the sewer at the completion of all sewer work. Another function of the group is to work with the Sewer Maintenance Unit's Defective Laterals Group to identify defective lateral connections.

In 2002, the Water Department commenced the Sewer Assessment Program initiative with the goals of inspecting at least 120 miles of sewer per year, establishing priorities for sewer inspection requests, and ensuring that inspection documentation is consistent with established sewer system database conventions. The Sewer Assessment Program initiative is a systematic

methodology used by the CCTV Inspection Group to accomplish the following Operations and Maintenance responsibilities.

- Inspect and evaluate the sewers within the wastewater collection system
- Capture and analyze the resulting inspection information in computerized databases
- Apply a uniform protocol in prioritizing sewer segments for repair or replacement

The SINSPECT custom software package is currently used to prioritize and schedule sewer inspection requests.

To provide standardization for the inspection methodologies that are employed and the digital inspection data that are collected, CCTV Inspection Group members utilize protocol standards and procedures of the Pipeline Assessment and Certification Program of the National Association of Sewer Services Companies. The Pipeline Assessment and Certification Program is the US industry standard for coding the nature and severity of sewer defects, maintenance conditions, and construction features from CCTV inspection videos and allows inspectors and decision makers to speak the same language. The Pipeline Assessment and Certification Program will facilitate the Water Department's ability to more easily and accurately assess and compare the inspection data gathered over a multi-year period since the same coding definitions will be used.

## **1.2.6 Procedures & Schedules for Operations & Maintenance**

### **Activities, Wastewater Pumping Station Maintenance Group**

The preventative maintenance program is the primary vehicle for ensuring the uninterrupted conveyance of wastewater and stormwater at each of the Water Department pump stations. This responsibility has been assigned to the Wastewater Pumping Station Maintenance Group. The duties of the group are divided into the following general classifications of Operations and Maintenance activities conducted at each of the 16 wastewater and 3 stormwater pump stations located along the City's interceptor system.

- Provide routine preventive maintenance to the mechanical and electrical equipment
- Complete overhauls of mechanical and electrical equipment
- Conduct special investigations and prepare reports for predictive maintenance
- Utilize the automated scheduling software (PUMA system) to develop the daily work orders needed to implement the preventative maintenance program, track progress, and verify required preventive maintenance measures have been conducted for the equipment

Pump station problems are detected by remote sensors/alarm monitors that are interrogated daily via modem by the Maintenance scheduler. A remotely sensed alarm condition automatically produces a warning sheet that is transmitted directly to the supervisors for remedial action. The supervisors look for any unusual conditions that would indicate the presence of a maintenance problem. The Mechanical Group Leader schedules the daily activities of the equipment mechanics, the Electrical Group Leader prepares the daily schedules for the electricians, and the instrument technicians are directed by the Instrument Crew Chief.

Corrective maintenance activities are rarely required because of the effectiveness of the preventative maintenance program in preventing pump station equipment failures and service disruptions. Reactive maintenance comprises approximately 10 percent of all pump station maintenance activities while preventive maintenance represents approximately 90 percent of the total pump station maintenance effort. Any electrical or mechanical equipment problems detected by the automated remote sensors/alarm monitors are promptly scheduled for remediation by the appropriate maintenance crew. Special visual inspections are scheduled during predicted extreme storm events as a precautionary measure.

The preventive maintenance program is scheduled and performed in a series of monthly and annual cycles. The various work activities are assigned daily by the group managers. Computer-produced reports and spreadsheets are used to track preventative maintenance activities and guide managers in the production of daily work schedules. Routine preventative maintenance on mechanical equipment is scheduled and conducted on a monthly basis. Preventative maintenance on electrical equipment and pump station instruments is scheduled and conducted on a bi-monthly basis. All routine maintenance problems are corrected by the maintenance crews as they are discovered. Any serious or unusual maintenance problems are documented in a Maintenance Request Report which is submitted to the group managers and the required corrections are scheduled accordingly. The mechanical and electrical equipment in each of the pump units are completely overhauled on a rotating schedule. Goals are established to complete these equipment overhauls at a rate of ten pump units in a year. This goal has been met nine of the past ten years. The system-wide average frequency of equipment overhauls for any individual wastewater pump unit is approximately 2.8 years.

Routine preventive maintenance activities for the pump station mechanical equipment include inspections of the pumps, valves, buildings and grounds, and lubrication of motors and bearings. Daily maintenance activities include cleaning the bar screens and rakes and hosing down the sumps and stations. Preventive maintenance activities for the electrical equipment include inspecting and cleaning all panels and cubicles, and diagnostic tests such as motor current measurements, battery voltage and specific gravity measurements, and phase voltage readings. Infrared hot spot measurements are also taken. These measurements and readings are recorded on separate forms and submitted to the Flow Control Superintendent. Activities for preventive maintenance and calibration of the instruments include inspection and cleaning of the level and flow monitoring equipment, switches, and relays; checking the compressors and air hoses for the bubbler system; and verifying/adjusting the calibration coefficients for the monitored depths and flows.

Activities for overhauling the mechanical equipment include disassembling the pumps and carefully inspecting all the component parts (such as casing, shaft, impeller, gaskets, packing, bearings, etc.). Any worn or damaged parts are re-machined or replaced. Similarly, the valves, couplings, and seal rings are also thoroughly inspected and repaired/ replaced as required. Activities for overhauling the electrical equipment include a thorough inspection of the electrical motors used to run the pumps, compressors, and valves for worn or damaged parts. Worn bearings and brushes are replaced and electrical switchgears, relays, frequency drives, and transformers are checked.

Activities for special investigations and predictive maintenance include sampling and testing the oil filled transformers every three years to determine when oil filtering/changing is required or if replacement of the entire transformer will be necessary. All medium to large pump stations are scheduled for infrared thermography on a three year cycle. These tests compliment the bi-monthly infrared hot spot tests performed during preventative maintenance and give more detail. All pumps and motors are checked twice per year with a vibration meter. The intent is to track the long-term trends in vibration history and better predict when maintenance is required. Twice per year the instrument technicians test the pumps in order to verify that they are performing at their rated flow capacity. These tests are conducted in addition to the flow tests done in conjunction with equipment overhauls. Flow is determined using the well draw-down/time/inflow calculation which is the most accurate method for measuring pump capacity.

In addition to providing pumping station maintenance, the group is responsible for the operation and maintenance of the two sodium hypochlorite dosing stations that inject hypo into the Upper Schuylkill East Interceptor and the dosing station that injects hypo into the Bucks County force main. The group also fabricates and repairs bars screens, debris grills and other equipment for the collector system and performs major maintenance of the CSO mechanical regulators such as tide gates, overflow gates and Brown and Brown regulators.

### **1.2.7 Procedures & Schedules for Operations & Maintenance**

#### **Activities, Real Time Controls Group**

The Real Time Controls Group is responsible for the operation and maintenance of the real time control facilities within the City's system. These automated facilities are able to respond to input data obtained from a network of wastewater depth sensors and include the computer controlled gates along the interceptors, the R15 Rock Run inflatable dam, the automated crest gate at T14, and the State Road storage facility.

Potential problems with the real time control equipment, the supporting sensors, and the associated telemetry devices that relay the field data to the central computer are detected by remote sensors/alarm monitors. Corrective maintenance and repairs are scheduled and conducted on an "as-needed" basis as equipment problems are discovered. Preventative maintenance and equipment calibrations are conducted on a periodic schedule to keep the equipment functioning to performance specification requirements.

The real time control group electricians, instrument technicians, and laborers are assigned specific tasks and grouped into teams on a daily basis by the crew chiefs. Custom software is used by the supervisors to develop daily work orders, track progress, and verify preventive maintenance is completed for the equipment.

On-site maintenance and repairs are required to support the level sensors, control equipment and the associated telemetry devices that relay the field data to the central computer. Debris, solids, oils, and grease can accumulate on the sensors and are removed on a regular basis during the routine calibrations. In addition, loose connections are tightened and corroded contact points are cleaned.

When a required repair cannot be implemented in the field, the equipment is replaced and the damaged equipment is returned to the instrument maintenance shop where specialized diagnostic equipment and tools are available for bench-work repair and maintenance. Once repaired, the instruments are thoroughly cleaned, inspected, and tested to insure that they will perform to the manufacturer's specifications.

### **1.2.8 Procedures for Responding to Emergencies**

The Flow Control Unit is responsible for addressing emergency situations associated with the CSO regulators, pump stations, and real time control equipment, therefore one of the seven front line supervisors is placed on standby status on a rotating basis. The computer controlled chamber equipment automatically sends out an alarm in the event of equipment failure. The alarm triggers an automated beeper/pager message to the supervisor who is on call. Anomalies (such as dry weather discharges) reported by citizens would be relayed through the City's emergency desk to the supervisor on call. The designated front line supervisor would determine the needed response to mitigate the emergency and mobilize the required crews and equipment.

Similarly, the automated pump station equipment also sends out an alarm and triggers an automated beeper/pager message should a pump station fail. At the time the original 1995 Minimum Control No. 1 documentation was submitted, most pump station failures were caused by power outages. Only five of the sixteen wastewater pump stations were equipped with dual sources of power to provide emergency electrical service in the event of a power failure. In 1994 for example, 95 percent of the pump station down time hours and 95 percent of the pump station overflow volume was caused by fourteen power outages. Only five percent of the down time and overflow volume was caused by mechanical equipment failures. To significantly reduce the number of pump station emergencies, a project was implemented to provide dual sources of power or install emergency backup power generators at the eight wastewater pump stations that were single source.

To supplement the capabilities of the in-house crews, the Water Department has pump station electrical and mechanical equipment maintenance contracts in place with a 24-hour response requirement for emergency pump station maintenance. These maintenance contracts would be exercised should emergency maintenance needs ever exceed the in-house capabilities of the Water Department's Wastewater Pumping Station Maintenance Group. In addition, the Water Department has contracts to maintain an inventory of replacement parts and maintain performance certifications on the control gates. The contract also provides emergency repair services should emergency maintenance situations ever exceed the capability of the CSO Chamber Maintenance Group.

The Flow Control Superintendent may authorize expenditures up to \$500 in petty cash funds in the event of an emergency maintenance situation. For emergency expenditures that are not included in the approved annual budget, the Superintendent would submit an emergency order to the Chief Water Transport Operations Engineer of the Waste and Stormwater Collector Systems Section. The chief operations engineer would be responsible for getting the necessary approvals.

## 1.3 Sewer Maintenance Unit

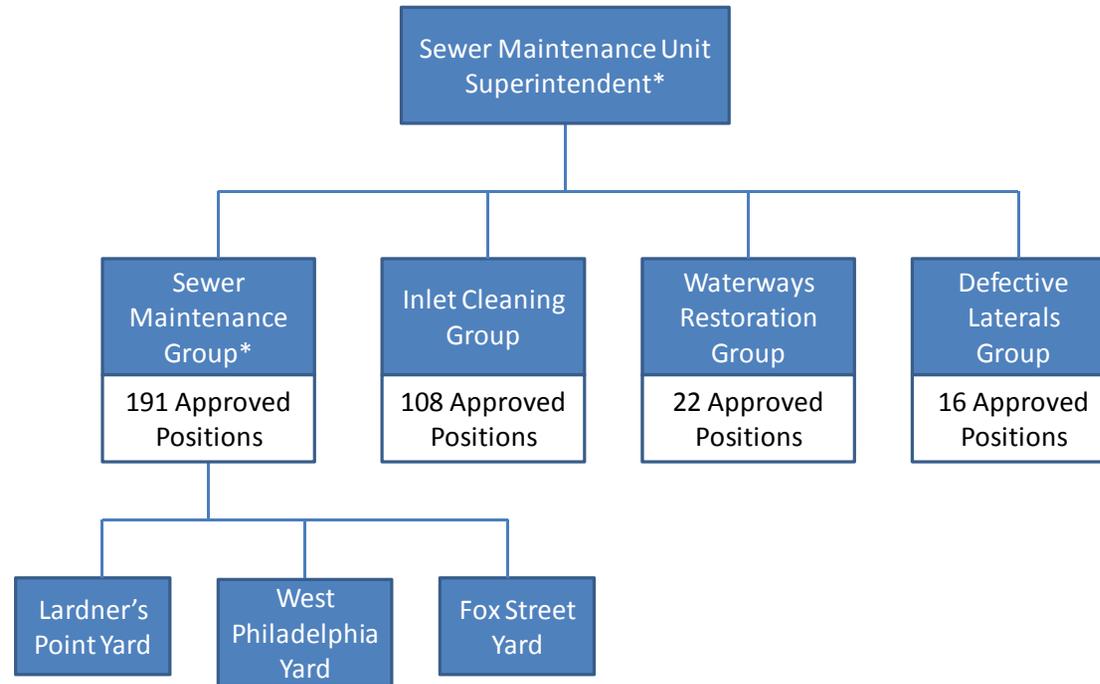
### 1.3.1 Human Resources Allocated to O&M Activities

The Sewer Maintenance Unit is responsible for the maintenance of the City-wide combined, sanitary, and stormwater collection systems and their appurtenant structures. The Sewer Maintenance Unit is responsible for the operation and maintenance of approximately 3,700 miles of sewers, 93,000 manholes, and over 74,000 stormwater inlets within the City of Philadelphia. Included in these responsibilities are all branch, interceptor, and main sewers; the maintenance of stormwater inlets, inlet laterals, and manholes; CSO outlets; cleaning and repair of drainage ditches and outlets. Much of the unit's work involves cleaning and clearing sewers using high pressure water jet machines, and rodder machines and using the combination clam-shell/dump truck vehicles and vactor vehicles for inlet cleaning. The Sewer Maintenance Unit is headed by the Sewer Maintenance Superintendent and is divided into four operational groups:

- Sewer Maintenance Group
- Inlet Cleaning Group
- Defective Laterals Group
- Waterways Restoration Group

When the September 1995 Minimum Control No. 1 documentation was submitted to the regulatory agencies, the Inlet Cleaning Unit was a separate operating unit under the Collector Systems Unit Manager. It was subsequently decided that greater efficiency and improved management and service could be provided by integrating the Inlet Cleaning Unit into the Sewer Maintenance Unit.

Each group is headed by a front line supervisor (assistant superintendent or supervisor) who reports directly to the superintendent. The primary lines of communication for all maintenance activities occur between the Sewer Maintenance Superintendent and the front line supervisors within the four groups. These supervisors have been delegated the responsibility and authority to produce the daily work schedules for the crews, oversee implementation quality, and insure that adequate documentation has been prepared and submitted to the superintendent. A copy of the organizational chart illustrating the chain-of-command and lines of communication within the Sewer Maintenance Unit is provided in Figure 1-3.



\* The title "Sewer Maintenance" is purposely used for both the overall Unit and for the Specific group that performs sewer cleaning/examination/excavation/repairs

**Figure 1-3: Organizational Chart of the Sewer Maintenance Unit**

### **Sewer Maintenance Group**

The Sewer Maintenance Group is responsible for the maintenance of the City-wide combined, sanitary, and stormwater systems and their appurtenant structures. Included in these responsibilities are all branch, interceptor, and main sewers, and CSO outlets. The Sewer Maintenance Group is presently has a work force of 213 approved staff positions. The group is supervised and managed by an Assistant Superintendent who reports directly to the Sewer Maintenance Unit Superintendent.

In order to ensure full City coverage and keep travel time to a minimum, the unit is organized and operated from three maintenance yard locations; one at Fox Street and Abbottsford Avenue (Fox Street Yard), a second at 50<sup>th</sup> Street and Paschall Avenue (West Philadelphia Yard.), and a third at Milnor and Robins Streets (Lardner's Point Yard). Each maintenance yard has a Sewer Maintenance Supervisor who reports directly to the Assistant Superintendent.

Each of the yard groups is a self-sufficient unit capable of responding to all sewer maintenance and rehabilitation needs. To make inter-department work referrals easier, the City is divided into six districts that are identical to the inlet cleaning and highway districts. Water Department personnel at each of the yards are organized into crews with specific duties and equipment necessary for the maintenance of the municipal sewer system.

To provide 24-hour coverage and required Operations and Maintenance services that are best implemented during off-peak hours, there are two second shift (night shift) Reset Crews, one second shift Inspection/Examination Crew, and one third shift (early morning) Inspection/Examination Crew at each of the three yard facility locations.

### **Inlet Cleaning Group**

The Inlet Cleaning Group is responsible for the inspection and cleaning of approximately 74,000 storm water inlets within the City. The Inlet Cleaning Group currently has a work force of 108 approved staff positions. The group is supervised and managed by an Assistant Superintendent who reports directly to the Sewer Maintenance Superintendent. Similar to the Sewer Maintenance Group, the work force is organized and operates from the six districts in the Water Department's service area in order to provide full City coverage and keep travel time to a minimum.

Each of the service district work groups is headed by a labor crew chief who reports directly to the Inlet Cleaning Group Assistant Superintendent. Work teams are formed around the inlet cleaning equipment. Combination clam-shell/dump truck vehicles, called combo units, are operated by a two person crew and are used to remove large quantities of accumulated debris and solids. The combo units and crews are assigned to specific geographic areas. The vector vehicles are operated by a three person crew and are used to remove more moderate quantities of debris and solids when combo units are not required. The vector units are rotated among the geographic areas on an as-needed basis.

A night crew group can operate throughout the six districts and is used to complete scheduled inlet cleaning that the day crews could not finish. The night crew group is comprised of five individual crews and supervised by a Labor Crew Chief.

### **Waterways Restoration Team**

The Waterways Restoration Team is responsible for removing large trash (cars, shopping carts, etc.) and other dumped debris from the 100 miles of stream systems that define City neighborhoods. The group also restores eroded stream banks and streambeds around exposed or threatened City sewer infrastructure. The Waterways Restoration Team performs stream cleanup work throughout the mainstem and tributaries of the Cobbs, Pennypack Poquessing, Tacony, and Wissahickon Creeks. The group also performs stream cleanup work along the banks of the non-tidal portions of the Schuylkill River and along the Manayunk Canal.

The Waterways Restoration Team currently has a work force of 22 approved staff positions. The group is supervised and managed by two Water Conveyance Supervisors who report directly to the Sewer Maintenance Unit Superintendent. These supervisors direct the activities of four crews, each comprised of a Crew Chief, a Heavy Equipment Operator, and Equipment Operator, and two Semi-Skilled Laborers.

### **Defective Laterals Group**

The Defective Laterals Group is responsible for the detection of defective laterals that cause sanitary wastewater to be carried to the local streams and rivers, as required by the City's NPDES Municipal Separate Sewer System Permit. The Plumbing Repair Programs Unit is responsible for abating the defective laterals that are detected. The Defective Laterals Group currently has a work force of 16 approved staff positions. The group is supervised and managed by a Water Conveyance Supervisor who reports directly to the Sewer Maintenance Unit Superintendent and is responsible for all aspects of the Unit.

There are two Field Representative Supervisors who are each responsible for two field crews. Each of the four field crews is led by a Sewer Maintenance Crew Chief/Science Technician and has two Utility Representatives. The crews are responsible for sampling stormwater outfalls and conducting trackdown investigations within sewersheds using dye and sampling tests. When defects are found, the property owner is notified and an abatement is scheduled with the Plumbing Repair Programs Unit. In addition to the supervisory and field staff, the Group has a Clerk Typist to provide general support. The Clerk Typist works with the Defective Laterals System database, maintains the record of water shutoff warnings and closures, and follows up with field staff. The Clerk typist also handles a variety of communications with customers, makes appointments, and follows up with delinquent customers.

## **1.3.2 Operating & Equipment Resources Allocated to Operations & Maintenance Activities**

The fiscal year of the Water Department is defined by the period from July 1 through June 30. Budget preparation activities commence in the fall to allow sufficient time for review and approval. The Superintendent is responsible for the preparation of the annual budget for the Sewer Maintenance Unit. The Superintendent consults the front line supervisors to determine the specific labor and equipment needs or any special maintenance projects that would need funding. The superintendent submits the completed annual budget to the Chief Water Transport Operations Engineer who reviews the draft, makes any required revisions, and obtains required approvals.

The fiscal year 2013 budget for the Sewer Maintenance Unit is summarized in Table 1-4 below.

**Table 1-4: Fiscal Year 2013 Budget for the Sewer Maintenance Unit**

Budget Category	Personnel	Service Contracts, Parts, & Equipment	Total
Total Budget	\$9,412,000	\$4,896,000	\$14,308,000

Major equipment that is used by Sewer Maintenance Unit personnel in their Operations and Maintenance responsibilities is summarized briefly in Table 1-5 below.

**Table 1-5: Sewer Maintenance Unit Major Equipment Summary**

Equipment Item	Quantity
Sewer Cleaning Machines	12
ToolCat	1
Mechanical Rodder Unit	1
Forklift	4
Backhoe	9
Bucket Machines	2
Tractor	1
Bobcat	1
Trailers	9
Compressors	10
Generators	2
Pumps	7
Message Boards	2
Arrow Boards	5
Crew/Utility Truck	22
Dump Truck	14
SUVs / Pick-up Trucks	40
Vans	8
Poztrack	1
Sweeper	1

### 1.3.3 Procedures & Schedules for Operations & Maintenance

#### Activities, Sewer Maintenance Group

The Water Department's program for interceptor inspection and maintenance is designed to prevent the excessive accumulation of grease, gravel, and/or sediment in the interceptor system which can decrease the conveyance capacity, cause hydraulic surcharging, or cause control mechanisms to fail. The majority of the maintenance activities conducted by the Sewer Maintenance Unit crews are corrective maintenance measures, and largely consists of flushing and cleaning sewers and storm inlets using high pressure and vacuum equipped trucks and combination clam-shell dump truck vehicles. Problem areas identified by inspections and referrals from other Water Department units, and identified via customer complaints are brought to the attention of the assistant superintendents and/or supervisors who schedule the required work with the labor crew chiefs of the corresponding geographic area. Daily work requirements are scheduled with the crew chiefs who organize the activities of the individual maintenance crews.

The trunk lines, interceptors, dry weather outlet pipes, and stormwater outlets are checked by the Flow Control Unit and any excessive accumulations are reported to the Sewer Maintenance Unit. Vactor/flusher crews are subsequently scheduled to remove the material and clean the lines.

The Sewer Maintenance Group is responsible for the maintenance of the City-wide combined, sanitary, and stormwater systems and their appurtenant structures. Included in these responsibilities are all branch, interceptor, and main sewers, and CSO outlets. In addition to repairing sewers, much of the unit's work involves cleaning and clearing choked sewers using high pressure water jet machines, and rodder machines.

Descriptions of these crews and their duties are as follows:

- **Inspection / Examination Crews:** These five-person crews are initially responsible for making above ground examination of sewers, manholes, inlets, and fresh air inlets. The crews are then responsible for making confined space entry examinations of sewers, laterals, inlet pipes, and cave-ins in branch sewers. They also pump water from basements that have become flooded from sewer back-ups.
- **Main Sewer Crew:** These crews specialize in confined entry and examining sewers that are larger than four feet in diameter. The employed technique is to begin examination where the sewer is four feet in diameter and following it downstream until it connects with the main interceptor sewer.
- **Reset Crews:** These crews repair and reset inlets and manholes, replace inlet and manhole castings, and repair sewers.
- **Vactor/Flusher Crews:** These crews are responsible for cleaning and opening choked sewers with high pressure water machines.
- **Excavation and Sewer Repair Crews:** These crews have the capability to conduct excavations to expose sewer pipes when they need repair and specialize in building manholes and performing point repairs to sewers.

- **Pre-Inspection Crews:** These crews are responsible for conducting initial inspections of smaller diameter sewers utilizing a pole camera and making initial assessments of sewer conditions and Operations and Maintenance needs.

The Sewer Maintenance Group utilizes automated scheduling software to develop daily work orders and track progress. At the time the 1995 Nine Minimum Control documentation was submitted, the Water Department was utilizing the Sewer Maintenance Operations Information System, a computer based complaint and work order handling system developed by the Water Department's Collector Systems Division. In November 2010, the Sewer Maintenance Unit began the process of transitioning to the new Cityworks system from the Sewer Maintenance Operations Information System. The Cityworks computer system automatically assigns each complaint to a yard and Sewer Maintenance Supervisor.

The Maintenance Supervisors receive a work list of complaints within their geographic areas. Every day, the supervisors print out the work orders from the work management system and make decisions on which crews would be assigned the individual service requests. The Maintenance Supervisor places the tickets onto the clipboard carried by each of the maintenance crews out on the street. The crews perform the work requested on each ticket in the order they were given. When finished with a work order request, the crews mark off the parts of the ticket which describe their observations, actions, materials used, etc., and sign the ticket.

At the end of the day, clipboards are collected from the crews and the completed Operations and Maintenance tasks and other pertinent information is entered into the central computer to revise the current status of each work order ticket. For service requests that could not be completed by the assigned crew, assistance is requested from other groups or Units, and the referrals are logged into the computer for scheduling subsequent corrective measures.

The 1995 NMC documentation for the Sewer Maintenance Group included the Drainage Right-of-Way Crews who were responsible to clean and maintain drainage rights-of-way by removing debris, dead trees, and weeds that accumulate in these areas. This responsibility has been subsequently transferred to the Philadelphia Department of Parks and Recreation.

### **1.3.4 Procedures & Schedules for O&M Activities,**

#### **Inlet Cleaning Group**

The Inlet Cleaning Group is responsible for the inspection and cleaning of approximately 74,000 storm water inlets within the City. Over 90 percent of the maintenance activities are planned. The rest are complaint driven. Customer complaints are received through the 24-hour Customer Affairs Hotline and logged into the computer based complaint and work order handling system by a data support clerk. The Inlet Cleaning Group was the first field operations unit to implement the new Cityworks system. The transition began in November 2010 and by the end of 2011 the Cityworks system was being utilized for 100% of the work assignments and data collection. The computer produces daily work order lists sorted by district area. These automated lists are given to the crew chiefs who schedule the daily activities of the combo unit and vactor unit crews within their assigned district areas.

The Inlet Cleaning Group is also charged with the following responsibilities:

- Unclog choked inlet traps, inlet mouths, grates and outlet piping to allow the inlets to convey stormwater
- Retrieve and install inlet covers, and installing replacement covers for inlets that were missing or damaged
- Install locks and chaining inlet covers to prevent theft.
- Alleviate flooded streets and intersections from open hydrants, water main breaks, rain and snow storms, and other weather related flooding
- Respond to citizen reports of flooding that are taken from Customer Information, Customer Service, and the City's new 311 hotline system
- Maintain a list of "hot spots" throughout the City which are prone to flooding during larger storm events and dispatching crews to clean these areas prior to the predicted storm's arrival

The Cityworks computer system automatically assigns each complaint or referral to a sewer district and Inlet Cleaning Supervisor who assigns Crew numbers to each work list task. The crews perform the work requested, and the completed Operations and Maintenance activities and other pertinent observations and actions are entered into the central computer. Any referrals indicated by the crews are logged into the computer for scheduling subsequent corrective measures.

In order to insure the efficient operation of the City's inlets and connecting sewers, it is necessary to work with various units of the Water Department as well as other City agencies. For example, communication and cooperation is maintained with the Sewer Maintenance Unit since the functions of the two units are interrelated. The unit is also called upon frequently by the Police Department to perform searches of inlets for law enforcement reasons.

### **1.3.5 Procedures & Schedules for O&M Activities, Waterways Restoration Team**

The Waterways Restoration Team is not directly responsible for the Operation and Maintenance of the combined sewer system. However the group is responsible for restoring eroded stream banks and streambeds around exposed or threatened City sewer infrastructure. The group also is responsible for the maintenance of drainage rights-of-way and lands and for removing large trash (cars, shopping carts, etc.) and other dumped debris from the 100 miles of stream systems that define City neighborhoods.

Typical tasks for the Waterways Restoration Team include the following.

- **Watershed Assessments:** Waterways Restoration Team watershed assessments include visual inspections of the banks of Cobbs, Wissahickon, Pennypack, Poquessing and Tacony Creeks and are completed once per year. This field survey work involves the inspection of stream segments (working upstream to downstream) to check for evidence of exposed or damaged infrastructure, and chronic pollution sources. The inspections also include visual investigations for evidence of dry weather sewer overflows along

Cobbs and Tacony Creek. These assessments also support the implementation of the completed watershed management plans for these stream systems.

- **Debris and Trash Removal:** The removal of trash and large debris from City waterways is one of the most basic tasks of the Waterways Restoration Team. In addition to satisfying one of the primary goals of the Clean Water Act--ensuring that streams and rivers are clean and beautiful--it enhances public stewardship as people value waterways and parks that are aesthetically pleasing and odor-free. Public willingness to pay for the protection of waterways is intricately linked to the recognition that these waterways are being maintained and valued by the City.
- **Sanitary Discharge Clean-Ups:** The Waterways Restoration Team is recruited to clean up after any sanitary discharges to City streams or parks.
- **Property Restoration Repair:** The Waterways Restoration Team is recruited to restore natural areas on public and private land impacted by water main breaks.
- **General Maintenance:** General maintenance responsibilities include the fish ladder, Water Department plunge pool and stream bank restoration projects, and other Water Department land-based stormwater management facilities.

The Waterways Restoration Team is also responsible for the following Operations and Maintenance activities.

- Operation of the Water Department Floatables Pontoon Boat in spring/summer/fall
- Restoration projects such as plunge pool removals and stream restorations
- Inspection of intake walls
- Woody debris removal

### **1.3.6 Procedures & Schedules for Operations & Maintenance Activities, Defective Laterals Group**

The Defective Laterals Group is responsible for conducting the field investigations necessary to identify and locate defective sewer service lateral connections to separate sanitary sewer systems. Defective lateral connections allow wastewater to migrate into the stormwater system and discharge into local streams and rivers. The crews are responsible for conducting dye and sampling tests in the field, interpreting the results, and identifying faulty lateral connections.

In 1995, Illicit Discharge Detection and Elimination became a regulatory requirement under the City's first Municipal Separate Stormwater Sewer System permit. Subsequently in 1998, the City signed a COA with the Pennsylvania Department of Environmental Protection establishing requirements for the Defective Laterals Program. Many of the COA requirements for Illicit Discharge Detection and Elimination activities were incorporated into the City's updated 2005 Municipal Separate Storm Sewer System permit.

- **Field Screening:** Proceeding upstream from an identified problematic storm outfall, the crews open the storm sewer manholes successively on dry weather days and look for the presence of flow. These observations are continued upstream along specified sewer lines and stop whenever storm manholes no longer exhibit flow or wetness. The field screening is continued along other tributary sewers and eventually through the outfall's tributary sewershed.
- **Manual Dye Testing:** Once field screening is completed, the crews conduct dye tests from the fresh air inlets along the streets of a sewershed suspected of containing defective laterals. Green dye is placed in the storm fresh air inlet and red dye is placed in the sanitary fresh air inlet. If the dye testing indicates the presence of a lateral defect, or if the results are inconclusive, the dye testing crews have the authority to enter a property and test one fixture. The unit gains property access by knocking, calling and sending letters to alert the affected properties. Once property access is granted, a confirmation dye test is done on an inside fixture and the crews look for the emergence of dye in the storm and sanitary sewers. Dye testing results in the following observations: the structure has proper sanitary and storm lateral connections, the structure has probable cross connections between the sanitary and storm laterals, or the results are inconclusive. The results of the dye testing are entered into the Defective Lateral System database, and the information is reviewed by the Plumbing Repairs Unit to confirm the identification of structures with defective lateral connections and to implement needed repairs.
- **Camera Assisted Dye Testing:** If the dye testing activities yield inconclusive results, the crews request further cooperation of the property owners for testing additional fixtures. If these additional tests also provide inconclusive results, the crews may request assistance from the CCTV inspection crew to complete the investigations. In a camera assisted dye test, the dye testing crews conduct the field investigations so the emergence of dye is observed by a CCTV camera positioned in the sewer in front of the lateral connection for the property.
- **Data Entry and Coordination with Customers:** The Clerk Typist enters dye testing observations and results into the Defective Laterals System database. The clerk also handles a variety of communications with the homeowners, makes appointments, and follows-up with field staff.

### **1.3.7 Procedures & Schedules for Operations & Maintenance Activities, Green Infrastructure Maintenance Group**

#### **Green Infrastructure Maintenance Group**

The Planning and Environmental Services Division is currently coordinating Operations and Maintenance for publicly initiated stormwater management practices through the use of a maintenance contract. The Green Infrastructure Maintenance Group prepared the *Green Infrastructure Maintenance Manual Development Process Plan* submitted June 1, 2012 and approved by the Pennsylvania Department of Environmental Protection on November 15, 2012. The Planning and Environmental Services Division will develop *The Green Infrastructure*

*Maintenance Manual* and submit this required deliverable before June 1, 2014. The manual will address Operations and Maintenance requirements for the full range of green stormwater infrastructure projects that have been, and are proposed to be, implemented by the Water Department as part of the *Green City, Clean Waters* program.

### **1.3.8 Procedures for Responding to Emergencies**

#### **Sewer Maintenance Group**

The Sewer Maintenance Group is responsible for handling emergency situations associated with the collector system such as a line collapse or failure. The Sewer Maintenance group has a night crew comprised of ten people under the direction of a crew chief. The night crew typically works from four o'clock p.m. to twelve o'clock midnight. A standby supervisor for each of the three geographic yard areas is on call on a rotating basis. When a supervisor receives an emergency call, required labor resources are determined, and a list of workers is called to assemble the needed crew or crews. Supervisors who are on call have take-home privileges with Water Department maintenance vehicles to enable them to respond directly to an emergency call.

The Sewer Maintenance Superintendent may authorize expenditures up to \$500 in petty cash funds in the event of an emergency maintenance situation. For emergency expenditures that are not included in the approved annual budget, the supervisor would submit an emergency order to the Chief Water Transport Operations Engineer of the Waste and Stormwater Collector Systems Section. The chief operations engineer would be responsible for getting the necessary approvals.

#### **Inlet Cleaning Group**

The Inlet Cleaning Group provides service 24-hours a day, seven days a week, responding to emergency cleaning needs at night, weekends, holidays, or whenever they might occur. Stormwater inlet emergency situations (such as street flooding from a blocked inlet) are typically reported by City residents to the 24-hour Customer Affairs Hot-Line. The information is transferred to the Water Department Emergency Desk where the nature of the emergency is determined. The Emergency Desk dispatcher addresses the urgency of the situation and either notifies the appropriate crew chief for immediate action or defers action to the following day. A standby supervisor is on call on a six week rotating schedule.

Routine night-time maintenance is provided by the night crew. The Inlet Cleaning Group night crew supplements the day crews and typically works from eleven o'clock p.m. to seven o'clock a.m. and on weekends. The night crew is comprised of ten people under the leadership of the crew chief.

#### **Waterways Restoration Team**

The Waterways Restoration Team is not typically needed to provide emergency service, but could be responsible for initial support as a first responder in emergency situations associated with streambeds. Should stream debris cause localized surface flooding, or excessive erosion from a severe storm event jeopardize the integrity of City sewer infrastructure, one of the two Water Conveyance Supervisors would be notified and decisions would be made as to what resources would need to be dispatched.

The Sewer Maintenance Unit Superintendent may authorize expenditures up to \$500 in petty cash funds in the event of an emergency maintenance situation. For emergency expenditures that are not included in the approved annual budget, the supervisor would submit an emergency order to the Chief Water Transport Operations Engineer of the Waste and Stormwater Collector Systems Section.

### **Defective Laterals Group**

The Defective Laterals Group would not have a need to respond to emergency situations, given the scope and nature of the services they provide.

## **1.4 Green Stormwater Infrastructure Maintenance**

The Planning and Environmental Services Division coordinates operation and maintenance services for the publicly initiated green stormwater infrastructure. Required Operations and Maintenance activities for these facilities are currently implemented utilizing maintenance contracts. Water Department personnel oversee the maintenance contracts and verify that the Operations and Maintenance services are being implemented. The Collector Systems' Sewer Maintenance Unit performs special maintenance work on these facilities that falls outside the scope of the service contract. The design and Operations and Maintenance guidance from this work is shared throughout the Water Department and serves to enhance the sustainability of the Department's green stormwater infrastructure.

The Planning and Environmental Services Division is currently responsible for preparing the *Green Infrastructure Maintenance Manual*, which according to the COA is to be completed and submitted by June 2014. The *Green Infrastructure Maintenance Manual Development Process Plan* was completed in June 2012 and describes the process and tasks for developing the maintenance manual. The manual will address Operations and Maintenance requirements for the full range of green stormwater infrastructure techniques that have been, and are proposed to be, implemented by the Water Department as part of the *Green City, Clean Waters* program.

## **1.5 Documentation and Record Keeping**

This section of the Minimum Control No. 1 report narrative documents and briefly describes the maintenance management systems and the various reports that are used by Water Department field and managerial personnel for Operations and Maintenance activities. The documentation includes descriptions of the work order and data management systems used by the various units and groups who provide Operations and Maintenance services for combined sewer systems. The documentation also includes descriptions of the various reports used by the units and groups, including the name of the report, the person(s) who complete(s) the report, the information contained within the report, and how the report is used. For clarity the report description summaries have been grouped by the operational units that use the reports.

### 1.5.1 Overview of Documentation and Record Keeping

The Water Department's NPDES permit and the National CSO Control Policy's *Nine Minimum Controls* require that complete and consistent record keeping and procedures for report development and archiving are properly developed. A series of field reports and managerial summary reports have been developed, implemented, and archived by Water Department personnel. The intent and purpose for the documentation is summarized below:

- Document observed conditions and maintenance activities performed in the field;
- Summarize and monitor key operational parameters of the system;
- Supervise annual preventative maintenance schedules, chart maintenance progress; and
- Prepare required monthly and annual reports for regulatory agency review.

The updated Minimum Control No. 1 report narrative will briefly describe the various reports that are used by Water Department field and managerial personnel to provide field data input into the automated systems and to summarize and chart operation and maintenance progress. The descriptions include the name of the report, the person(s) who complete(s) the report, the information contained within the report, and how the report is used. For clarity the report description summaries have been grouped by the operational units that use the reports.

Customized scheduling software packages are currently used by the various Water Department units and groups to prioritize and schedule sewer inspection and Operations and Maintenance activities. The software packages also track and report completed inspection and Operations and Maintenance activities. It is presently envisioned that in the future, many of the units and groups will migrate from their current systems to the Cityworks® work order management system.

A major documentation initiative within the Water Department in recent years has been the development and implementation of a customer complaint and maintenance management system called Cityworks® (a product of Azteca, Inc.) The new system is being phased in and will be used primarily by the Water Department's field units that work on street side assets associated with the conveyance and collector systems such as hydrants, water and sewer mains, and storm inlets. The Water Department's GIS will serve as the foundation of the system and Cityworks will be able to handle both service requests taken from the Public Affairs Call Center and work orders for system maintenance and repair. It is currently envisioned to replace the individual systems currently used by the various units and groups for developing work orders and tracking infrastructure repairs, replacements and related projects, thus streamlining work, consolidating data into one location and reducing duplication of efforts. Some units have made the transition, and others are still in the transition process. Over the next several years, a key initiative for the Water Department will be to train employees on the new system and fully utilize the various software features to enhance operational performance and planning.

## 1.5.2 Documentation for the Flow Control Unit

The various work groups within the Flow Control Unit currently use custom software packages with PUMA being used for the pumping stations. The software packages are used to prioritize Operations and Maintenance activities, develop daily work orders, track and report completed inspection and Operations and Maintenance activities, and verify that required preventive maintenance measures have been implemented.

The CCTV Inspection Group currently uses the custom SINSPECT program to prioritize and schedule sewer inspection requests and document their findings.

Because of specialized needs of the following four groups, and because the facilities they maintain are not necessarily located along conventional street addresses, it is currently envisioned that the CSO Maintenance Group, Wastewater Pumping Station Group, Instrumentation Group, and Real Time Control Group would migrate to the Maximo system. Maximo is an enterprise level, facility asset-based work order management system. It has the advantages of not being street oriented, and being able to be configured to any multi-layered database.

### CSO Maintenance Group

The following field data forms have been developed for and are utilized by field personnel in the CSO Maintenance Group to provide field data input into the automated systems. Copies of typical examples are included in Appendix A-2, Section I-A of the original 1995 NMC document (Appendix I).

- **Somerset Grit Chamber Debris Removal Report**  
 Prepared by: Lead worker in the CSO Maintenance Crew  
 Reviewed by: Superintendent of Flow Control  
 Purpose: Used to keep track of the rate of grit buildup, removal dates, and quantities at the Somerset grit chamber. Ensures that the grit is being monitored and removed according to a four month schedule.
  
- **CSO Regulator PM / Inspection Report**  
 Prepared by: Lead worker on the CSO Maintenance Crew  
 Reviewed by: Supervisors and Superintendent of Flow Control Unit  
 Purpose: Documents the conditions and settings for each type of regulator. It is used to ensure that proper regulator settings are maintained and that system changes are documented. The report also documents the preventative maintenance which is performed on a yearly basis. A customized report for each individual regulator structure is presently being developed.

- **Tide Gate Preventative Maintenance Report**  
Prepared by: Lead worker on the CSO Maintenance Crew  
Reviewed by: Supervisors and Superintendent of Flow Control Unit  
Purpose: To document the conditions of the tide gates and surrounding structures at the CSO sites. Preventative maintenance is scheduled at each tide gate once a year.
  
- **CSO Dry Weather Discharge Report**  
Prepared by: Lead worker on the CSO Maintenance Crew  
Reviewed by: Flow Control Supervisors and Collector System Support Personnel  
Purpose: To document all occasions of dry weather discharges observed by the CSO Maintenance Crews. The cause, time and duration is recorded and it elicits suggestions from the front line workers for the prevention of similar occurrences.
  
- **Flow Control Daily Work Report - Used by all Flow Control Unit groups**  
Prepared by: Lead workers in each CSO Maintenance Crew  
Reviewed by: The maintenance scheduler who keys the information into the database  
Purpose: To maintain a current computerized record of all CSO maintenance performed at each of the Flow Control sites.
  
- **Daily Work Sheet Database Entry Listing - Used by all Flow Control Unit groups**  
(Reverse side of the Flow Control Daily Work Report listed above)  
Prepared by: Lead workers in each CSO Maintenance Crew to assign codes to the Daily Work Sheets  
Reviewed by: The lead workers who assign the codes to Daily Work Sheets  
Purpose: To ensure that proper site and job codes are recorded on the forms which insures the completeness and accuracy of the data base information.

The following reports have been developed for and are utilized by the Flow Control Unit Superintendent to summarize and chart CSO Maintenance Group progress. Copies of example reports are included in Appendix A-2, Section II-A of the original 1995 NMC document (Appendix I).

- **CSO Quarterly Inspection / Discharge Report**  
Prepared by: Flow Control Supervisors in the CSO Maintenance Group  
Reviewed by: Flow Control Superintendent  
Purpose: Tallies the number of site inspections for the month and the chambers that received preventative maintenance. The report totals the inspections from the workers' daily work sheets. It is then used to compile the Regulating Chamber Monthly Inspection Totals Report.

- **Regulating Chamber Quarterly Inspection Totals**  
Prepared by: Flow Control Superintendent  
Reviewed by: Manager of Collector System and Collector System Support Personnel  
Purpose: To track CSO site inspections and discharges by location for the fiscal year. It is used to track patterns of discharges as well as ensuring that adequate inspection frequency is maintained for all CSO sites.
  
- **CSO Inspections Totals**  
Prepared by: Flow Control Superintendent  
Reviewed by: Manager of Collector System and Collector System Support Personnel  
Purpose: To track CSO site inspections and discharges by collector system, for the past eight fiscal years. It is used to compare inspection and discharge frequencies over a period of time. It is a key indicator of the effectiveness of the CSO chamber maintenance program.
  
- **Annual Report Blockages / Inspection Trend Report**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Superintendent and other managers  
Purpose: To trend the number of CSO inspections, blockages corrected before a discharge developed and the number of actual discharges observed. It is useful to quickly compare current activities to previous years performance.
  
- **Collector System CSO Alterations Record**  
Prepared by: Superintendent of Flow Control  
Reviewed by: CSO Program Coordinator and Manager of Collector System  
Purpose: To document the date and reason for any modifications made to the collector system or CSO control structures by Flow Control personnel.
  
- **Site Control Diagram**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Hydrologic and hydraulic modeling teams  
Purpose: To confirm and document the configuration of specific portions of the collector system or CSO control facilities
  
- **Quarterly CSO Status Report**  
Prepared by: Dry Weather Status Report (Part 1) completed by Flow Control Unit Superintendent. Wet Weather Status Report (Part 2) completed by Collector System Support Group. Together they make the monthly CSO Status Report submitted to Pennsylvania Department of Environmental Protection and US EPA Region III.  
Reviewed by: CSO Program Coordinator, Manager of Collector System, Pennsylvania Department of Environmental Protection, and US EPA Region III.  
Purpose: Documents the date, time, duration, and location of known CSO discharges as

well as the associated rainfall and cause of the discharge. Used to meet NPDES permit requirement to submit monthly reports of CSO discharges to Pennsylvania Department of Environmental Protection and US EPA Region III.

### **Wastewater Pumping Station Maintenance Group**

The following field data forms have been developed for and are utilized by field personnel in the Wastewater Pumping Station Maintenance Group to provide field data input into the automated systems. Copies of typical examples of these reports are provided in Appendix A-2, Section I-B of the original 1995 NMC document (Appendix I).

- **Wastewater Pumping Maintenance Request**  
Prepared by: Lead workers and supervisors in Wastewater Pumping Station Maintenance Group  
Reviewed by: Maintenance Scheduler, Supervisors and Superintendent  
Purpose: Initiates a maintenance request to appropriate trades workers from the pump station monitor interrogations or conditions observed during routine station inspections.
  
- **Daily Station Report**  
Prepared by: Lead workers and supervisors in Wastewater Pumping Station Maintenance Group  
Reviewed by: Instrument Supervisor and Superintendent  
Purpose: To document all observed alarms, equipment outages, usage rates, and facility anomalies.
  
- **Instrumentation Monthly Preventative Maintenance Report**  
Prepared by: Lead worker in the Instrument Crew  
Reviewed by: Instrument Supervisor and Superintendent  
Purpose: To ensure that all pumping station controls are serviced and calibrated bi-monthly.
  
- **Vibration History Report**  
Prepared by: Lead worker in the Instrument Crew  
Reviewed by: Instrument Supervisor and Superintendent  
Purpose: To monitor the vibration of the rotating machinery twice per year or whenever a pump is placed back in service after an overhaul. This report, along with others, is a preliminary step in developing the predictive maintenance program.
  
- **Pump Flow Timings Record**  
Prepared by: Instrumentation Lead Worker  
Reviewed by: Supervisors and Superintendent  
Purpose: To accurately measure the pump capacity twice per year and after a pump

overhaul. This ensures that the pumps are operating at their rated capacity. It is used to schedule pump overhauls, determining suction problems (grit in wells) and calculate the station flow reports.

- **Pump Overhaul Report**  
Prepared by: Lead mechanic performing the equipment overhaul  
Reviewed by: Flow Control Superintendent and Supervisors  
Purpose: Documents the pump conditions found during overhaul and replacement parts that were used.
  
- **Motor Overhaul Report**  
Prepared by: Lead Industrial Electrician performing the equipment overhaul  
Reviewed by: Flow Control Superintendent and Supervisors  
Purpose: To document the motor conditions found during overhaul and replacement parts that were used.
  
- **Pump Station Monthly Mechanical Preventative Maintenance Report**  
Prepared by: Lead mechanic assigned to job.  
Reviewed by: Flow Control Mechanical Group Leader  
Purpose: To document the work performed and conditions found while performing the station maintenance. Station mechanical equipment is scheduled for preventative maintenance once per month.
  
- **Pump Station Monthly Electrical Preventative Maintenance Report**  
Prepared by: Lead Industrial Electrician performing work  
Reviewed by: Industrial Electrician Group Leader  
Purpose: To document the condition and work performed on a monthly electrical Preventative Maintenance. The amperage and infrared readings are part of the performance factors used in the Predictive Maintenance Program being developed.
  
- **Central Schuylkill Pump Station Daily Station Record**  
Prepared by: Central Schuylkill Pump Station Operators  
Reviewed by: Flow Control Supervisors and Superintendent  
Purpose: To document the pumps that are running, station flows, monitor readings, gate positions, and sewer levels. The automatic control log is used to document the activities associated with the new automatic control systems.
  
- **Flow Control Daily Work Report (used by all Flow Control Unit groups)**  
Prepared by: Lead workers in each Pump Station Maintenance Crew  
Reviewed by: The maintenance scheduler who keys the information into the database  
Purpose: To maintain a current computerized record of all CSO maintenance performed at each of the pump stations

- **Daily Work Sheet Database Entry Listing (used by all Flow Control Unit groups)**  
Prepared by: Lead workers in each Pump Station Maintenance Crew to assign codes to the Daily Work Sheets  
Reviewed by: The lead workers who assign the codes to Daily Work Sheets  
Purpose: To ensure that proper site and job codes are recorded on the forms which insures the completeness and accuracy of the data base information.

The following reports have been developed for and are utilized by the Flow Control Unit Supervisor to summarize and chart key operational parameters and Wastewater Pumping Station Maintenance Group progress. Copies of example reports are included in Appendix A-2, Section II-B of the original 1995 NMC document (Appendix I).

- **Dry Weather Discharge Report (Pump Stations)**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Pennsylvania Department of Environmental Protection  
Purpose: To report on any occurrences of dry weather discharges from the pumping stations.
- **Station Outage and Dry Weather Discharge Record**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Manager of Collector System and Collector System Support Personnel  
Purpose: To keep track of pump station outages and dry weather discharges. This report was useful in determining the need for a backup power source due to the frequency of discharges due to loss of power at the stations.
- **Pump Station Control Level Settings Report**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Instrumentation Crew Chief  
Purpose: To ensure that proper operating levels are maintained.
- **Monthly Pump Run Time Readings**  
Prepared by: Maintenance Scheduler  
Reviewed by: Supervisors  
Purpose: Tracks the run time hours on the main pump units. It is used to determine the pump overhaul schedule and to calculate the station flows for the monthly reports.
- **Year-to-Date Run Time Report**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Superintendent of Flow Control  
Purpose: To track changing patterns in pump hours over the previous months and years.

- **Main Pump Flow Capacity Test Report**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Superintendent of Flow Control  
Purpose: To track pump performance over time.
- **Pump Performance Report**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Superintendent of Flow Control  
Purpose: To compare pump performance to rated capacity and to generate the flow coefficients used in the pump station flow reports.
- **Record of Pump Performance Test**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Superintendent of Flow Control  
Purpose: To record the pump conditions and nameplate data when new pumps are accepted and installed at any pump stations. It is used for a baseline for the predictive maintenance program being developed.
- **Main Pump Unit Out of Service Hours Report**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Superintendent of Flow Control  
Purpose: Tracks all hours that a main pump unit is out of service for repairs for more than 4 hours. The database is used to compare percentage of breakdowns to preventative maintenance and to calculate the availability on the main pump units.
- **Main Pump Availability History Report**  
Prepared by: Superintendent of Flow Control  
Reviewed by: Superintendent of Flow Control  
Purpose: To compare the main pump availability over the years. This is a key indicator of how well a pump maintenance program is working.
- **Wastewater Pumping Fiscal Year Overhaul Schedule**  
Prepared by: Flow Control Superintendent and Supervisors  
Reviewed by: Flow Control Superintendent and Supervisors  
Purpose: To schedule main pump and auxiliary equipment overhauls. The units are scheduled by reviewing run time, pump flow capacity tests, and various other performance factors.

### **Collection System Instrumentation Group**

The following field data forms have been developed for and are utilized by field personnel in the Instrumentation Group to provide field data input into the automated systems. Copies of typical examples of these reports are provided in Appendix A-2, Section I-C of the original 1995 NMC document (Appendix I).

- **Ultrasonic Level and Pressure Sensor Level Monitor Site Calibration Report**  
Prepared by: Lead Technician performing the site calibration  
Reviewed by: Instrument and Electronic Equipment Crew Chief  
Purpose: To document the servicing and calibration of the level monitors in the system-wide CSO monitoring network. Calibrations are done once a year.
  
- **Computer Control Chamber Preventative Maintenance Report**  
Prepared by: Lead Technician performing the site maintenance  
Reviewed by: Instrument and Electronic Equipment Crew Chief  
Purpose: To document the work performed and the equipment conditions at the CSO computer control chambers. The work is scheduled on a monthly basis.
  
- **Township Metering Chamber Equipment Preventative Maintenance**  
Prepared by: Lead Technician performing the site maintenance  
Reviewed by: Instrument and Electronic Equipment Crew Chief  
Purpose: To document the work performed and equipment conditions at the Township metering chambers. The work is scheduled on a monthly basis.
  
- **Metering Chamber Calibration Record**  
Prepared by: Lead Technician in the CSO Instrumentation Maintenance Group  
Reviewed by: Instrument Crew Chief and Superintendent  
Purpose: To document the proper calibration of the flow meters at the Township Metering sites. The calibrations are performed twice per year.
  
- **Computer Control Chamber Calibration Record**  
Prepared by: Lead Technician performing the site calibration  
Reviewed by: Instrument Crew Chief and Superintendent  
Purpose: To document the work performed and the equipment calibrations at the CSO computer control chambers. The work is scheduled on a yearly basis.
  
- **Flow Control Daily Work Report (used by all Flow Control Unit groups)**  
Prepared by: Lead workers in each instrumentation group  
Reviewed by: The maintenance scheduler who keys information into database  
Purpose: To keep track of all maintenance performed at all monitoring and instrumentation sites

- **Daily Work Sheet Database Entry Listing (used by all Flow Control Unit groups)**  
Prepared by: Lead workers in the instrumentation group to assign codes to Daily Work Sheets  
Reviewed by: The lead workers who assign the codes to Daily Work Sheets  
Purpose: To ensure that proper site and job codes are recorded on the forms, and insure the completeness and accuracy of the data base information.

The following reports have been developed for and are utilized by Flow Control Superintendent for the CSO Instrumentation Group. Copies of example reports are included in Appendix A-2, Section II-C of the original 1995 NMC document (Appendix I).

- **Temporary Site Monitor Request**  
Prepared by: Requestor of the site monitor  
Reviewed by: Superintendent and monitor requestors  
Purpose: To document the temporary site monitors installed in the collector system.
- **Temporary Level / Flow Monitor Site Record**  
Prepared by: Instrument Crew Chief  
Reviewed by: Superintendent and CSO Project Coordinator  
Purpose: To document the status of the temporary monitors installed into the collector system.

### **1.5.3 Documentation for the Sewer Maintenance Unit**

The Inlet Cleaning Group was the first field operations unit to implement the new Cityworks scheduling software system. The transition began in November 2010 and by the end of 2011 the Cityworks system was being utilized for 100% of the work assignments and data collection. The new system works well with this group because the database is oriented by street locations and the stormwater inlets are located along public streets. The computer system produces daily work order lists sorted by the six district areas. These automated lists are given to the crew chiefs who schedule the daily activities of the Operations and Maintenance crews within their assigned district areas.

The Sewer Maintenance Group is in the process of transitioning from the Sewer Maintenance Operations Information System to the Cityworks system. The transition began in June 2012 when all new work order requests were entered into the Cityworks system.

The Defective Laterals Group currently uses the DLS computer program to document activities. The Waterways Restoration Team is not currently expected to transition to the Cityworks system. The stream channels and stream-side facilities they operate and maintain are typically not located along public streets and Cityworks is street location-oriented.

The majority of the data entry and work order documentation needs of the Inlet Cleaning Group and Sewer Maintenance Group are met with the implementation of Cityworks. The system handles input information from service requests taken from the Public Affairs Call Center and internal work orders for system maintenance and repair and enters it into the database. Daily

documentation and data input between the field crews and the Cityworks system is conducted through a clipboard system, so special reports are not needed. Every day, the supervisors print out the work orders from the work management system and decide which crews would be assigned the individual service requests. The supervisors place the tickets onto the clipboard carried by each of the maintenance crews, and the crews perform the work requested on each ticket in the order they were given. When finished with a work order request, the crews mark off the parts of the ticket which describe and document their observations, actions, materials used, etc., and sign the ticket. At the end of the day, clipboards are collected from the crews and the completed Operations and Maintenance tasks and other pertinent information is entered into the central computer to update the database information, revise the current status of each work order ticket, and track completed work.

As described above, the following report has been developed for utilization by the Supervisors and field personnel in the Sewer Maintenance Group:

- **Sewer Maintenance Work Order Tickets**
  - Prepared by:** Prepared from the automated Sewer Maintenance Operations Information System and/or Cityworks database and prioritized work order backlog lists and distributed by the Supervisors at each yard area to individual maintenance crews. Documentation for field information and completed Operations and Maintenance activities are completed by the lead crew worker on a maintenance crew as the work is completed.
  - Reviewed By:** Sewer Maintenance Assistant Superintendent and Maintenance Supervisors
  - Purpose:** Documents the work orders obtained from the Sewer Maintenance Operations Information System and/or Cityworks systems and the crew assigned to complete the associated maintenance work. Used to schedule maintenance crews, document and input pertinent field information, and track completed maintenance measures.

As described above, the following report has been developed for utilization by the Supervisors and field personnel in the Inlet Cleaning Group:

- **Inlet Cleaning Work Order Tickets**
  - Prepared by:** Prepared from the automated Cityworks database and prioritized work order backlog lists and distributed by the Supervisors at each yard area to individual maintenance crews. Documentation for field information and completed Operations and Maintenance activities are completed by the lead crew worker on a maintenance crew as the work is completed.
  - Reviewed By:** Inlet Cleaning Assistant Superintendent
  - Purpose:** Documents the work orders obtained from the Cityworks system and the crew assigned to complete the associated maintenance work. Used to schedule maintenance crews, document and input pertinent field information, and track completed maintenance measures.

The following report has been developed for utilization by the Supervisors and field personnel in the Waterways Restoration Group:

- **Waterways Restoration Work Order Tickets**  
Prepared by: Prepared from the automated Sewer Maintenance Operations Information System database and prioritized work order backlog lists and distributed by the two Water Conveyance Supervisors to individual maintenance crews. Documentation for field information and completed Operations and Maintenance activities are completed by the lead crew worker on a maintenance crew as the work is completed.  
Reviewed By: Water Conveyance Supervisor  
Purpose: Documents the work orders obtained from the Sewer Maintenance Operations Information System and the crew assigned to complete the associated maintenance work. Used to schedule maintenance crews, document and input pertinent field information, and track completed maintenance measures.

Copies of these reports are included in Appendix A-2, Section D of the original 1995 NMC document (Appendix I). Other sewer maintenance reports are used by the Unit but are not included in this report because they are not directly pertinent to the operation and maintenance of the combined sewer system.

The following reports have been developed for and are utilized by the Collector Systems Unit Manager and Sewer Maintenance Unit Superintendent to review Operations and Maintenance backlog and track the progress of Operations and Maintenance activities completed by the various Operations and Maintenance groups.

- **Backlog Report**  
Prepared by: Collector Systems Unit Manager and Sewer Maintenance Superintendent from the Cityworks database  
Reviewed By: Collector Systems Unit Manager and Sewer Maintenance Superintendent  
Purpose: Provides a snapshot report of backlogged Operations and Maintenance activities, for any designated period of time, which will be prioritized and schedules by the scheduling and work management software
- **Completed Work Report**  
Prepared by: Collector Systems Unit Manager and Sewer Maintenance Superintendent from the Cityworks database  
Reviewed By: Collector Systems Unit Manager and Sewer Maintenance Superintendent  
Purpose: Provides a snapshot report of completed activities for any designated facility or facilities

- **Flusher Report**  
Prepared by: Collector Systems Unit Manager and Sewer Maintenance Superintendent from the Cityworks database  
Reviewed By: Collector Systems Unit Manager and Sewer Maintenance Superintendent  
Purpose: Provides a sewer cleaning overview report, organized by crew/vehicle, documenting the crew time at each sewer site, the size and length of the pipe that was cleaned, and the total weight of the debris that was removed.
- **Inlet Cleaning Report**  
Prepared by: Collector Systems Unit Manager and Sewer Maintenance Superintendent from the Cityworks database  
Reviewed By: Collector Systems Unit Manager and Sewer Maintenance Superintendent  
Purpose: Provides an inlet cleaning overview report, organized by crew/vehicle for any desired period of time, documenting the inlets that were cleaned and the total weight of the debris that was removed.
- **Waterways Restoration Report**  
Prepared by: Collector Systems Unit Manager and Sewer Maintenance Superintendent from the Cityworks database  
Reviewed By: Collector Systems Unit Manager and Sewer Maintenance Superintendent  
Purpose: Provides a waterways restoration overview report, organized by crew/vehicle or stream, documenting the items and quantities that were pulled from the stream channel and banks.

## 1.6 Training of New & Existing Employees

A formal training program for all collector system personnel was developed and administered by the Training and Development Unit of the Water Department. Specific training programs have been developed for each department and position and consist of lectures, demonstrations, videos, practical exercises, and hands-on experience. Lead worker positions on the maintenance crews are available only after years of on the job training in a particular trade field. Training for the subordinate worker positions is provided according to the employee's job specialty and level of experience. An orientation video is available for new employees. The Water Department's training programs insure that personnel responsible for Operations and Maintenance activities are properly trained by a systematic and ongoing education program. Education programs typically include the following four elements:

- Informal Training
- Formal Training
- Specific Equipment Training
- Safety Training

A summary of available training programs and materials is provided in Appendix A-1 of the 1995 document CSO Documentation: **Implementation of the Nine Minimum Controls (Appendix I)**. Brief descriptions of the four education program elements are provided below.

### *Informal Training*

The group leaders within each department are responsible for deciding individual needs and providing training to broaden workers' knowledge in their field. Training sessions are scheduled on a bi-monthly basis and typically include videos from the Water Department's library of instructional videos.

### *Formal Training*

The Water Department's Training and Development Unit provides employees with formal training according to their job specialties and level of experience. The courses attended are determined by the worker's immediate supervisor and can be City-wide, divisional, or geared toward the employee's particular specialty.

### *Specific Equipment Training*

In addition to generic trades training, employees receive specific maintenance training on how to properly service the specific equipment they use in performing their jobs.

### *Safety Training*

The Water Department's Safety Office provides annual safety training classes in confined space entry and awareness, first aid, and CPR to assure that proper confined space entry procedures are understood and followed by all field personnel who made manhole entries. In addition, topics such as safe lifting practices, chemical handling, and eye protection are presented approximately four times a year.

## **1.7 Assessment of the Existing Program**

### **1.7.1 Process for Periodic Review & Revision of the Operations & Maintenance Program**

Existing Operations and Maintenance programs, including training and record keeping, are reviewed continuously. Once a week the unit superintendents are scheduled to meet individually with the Chief Water Transport Operations Engineer to discuss the effectiveness of the Operations and Maintenance programs, resolve any problems, and remove any barriers. Once a month, the unit superintendents are scheduled to meet collectively with the Operations Engineer, however due to workload restraints these meetings may occur instead with the individual unit managers. Program changes are made as necessary.

### 1.7.2 Proposed Revisions to the O&M Program

Current examples of future goals and proposed revisions to the Operations and Maintenance program are summarized below. The *Green Infrastructure Maintenance Manual* will address Operations and Maintenance requirements for the full range of green stormwater infrastructure projects that have been, and are proposed to be, implemented by the Water Department as part of the *Green City, Clean Waters* program.

- It is currently envisioned that the Flow Control Unit, CCTV Inspection Group will migrate from the current work order management system. Because of specialized needs of the other four Flow Control groups, and because the facilities they maintain are not necessarily located along conventional street addresses, it is currently envisioned that the CSO Maintenance Group, Wastewater Pumping Station Group, Instrumentation Group, and Real Time Control Group would migrate to the Maximo system. Maximo has the advantage of not being street oriented, and being able to be configured to any multi-layered database.
- It is currently envisioned that the rest of the Sewer Maintenance Unit groups will transition from the Sewer Maintenance Operations Information System to the Cityworks system with the exception of the Waterways Restoration Team and the Defective Laterals Group. The Inlet cleaning Group already completed the transition.
- Over the next several years, the Water Department will train employees on the new Cityworks and Maximo databases and work order management systems to enable Water Department staff to fully utilize the various software features and enhance operational performance and planning.

# Section 2

## Minimum Control No. 2

### Maximum Use of the Collection System for Storage

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This section provides supplemental information to the documentation for Minimum Control Measure No. 2– Maximum Use of the Collection System for Storage. Minimum Control Measure No. 2 is defined as: “...maximum use of the collection system for storage means making relatively simple modifications to your combined sewer system to enable it to store wet-weather flows until downstream sewers and treatment facilities can handle them.” The strategy identified as part of the 1995 document *CSO Documentation: Implementation of Nine Minimum Controls*(Appendix I) called for the continued implementation of the various approaches for in-system storage, evaluated the available storage in the combined sewer system, and proposed changes to the system to provide additional in-system storage. This documentation summarizes the original strategy, identifies changes in available in-system storage, and describes the operating and maintenance status of in-line storage projects identified as part of the Long Term Control Plan.

#### 2.1 Original In-System Storage Strategy

The Philadelphia Water Department (Water Department) has been evaluating, implementing, and modifying in-system storage in Philadelphia’s combined sewer system for many years. The Water Department’s in-system storage facilities range in complexity from static tide gates and overflow weir modifications, to multiple sluice gate structures controlled in real-time. The success of these facilities at reducing combined sewer flow discharges relies on continuous maintenance and inspection, and Section 1 of this documentation provides the Water Department’s current program for inspections and maintenance procedures to ensure continued operation of these facilities.

In order to support the implementation of in-system storage, the available static storage volumes within the combined trunk sewers upstream of each combined sewer overflow (CSO) location in the system were determined. Storage availability was determined by comparing the critical elevation (elevation at which overflow begins, typically the overflow weir elevation or tide elevation) to combined sewer invert elevations. In Appendix I the mean tide and mean high tide elevations were used to compute static storage volumes for both tidal conditions. The analysis also summarized the incremental storage that was potentially available if the critical elevation (overflow activation elevation) were modified with a nominal 1.0-foot increase. This information was used to screen the various regulator locations to identify the locations where the greatest increases in storage were realized by regulator modifications to increase the effective overflow elevation.

Another less complex means to allow available in-system storage capacity to be used for control of combined sewer overflows is to use the natural tidal variation at tidally affected outfalls to raise the wet weather water surface in the combined trunk sewer prior to overflow. Tidal gate installations in the outfall prevent tidal intrusion into the regulator and the overflow elevation is effectively raised from the overflow weir elevation to the tidal stage, causing additional flow to be stored in the system. The Water Department maintains tide gates at each of the 89 CSO locations which are tidally affected.

The seven computer controlled outfall/regulator gate facilities in the Northeast Drainage District use level monitors to control the position of the dry weather outlet gate and tide gate at each combined sewer overflow location. The tide gate is maintained in a closed position for as long as possible, and when opened it is maintained at the smallest possible opening allowed by a maximum water surface elevation. This operation retains as much flow as possible within the combined sewer system, minimizing the release of combined wastewater, and maximizing the use of in-system storage. The computer controlled outfall facilities apply real time control mechanisms, which optimize the use of storage to maximize flow delivery to the water pollution control plants. The Water Department's experience with the use of real time control facilities determined the approach was not feasible on a system wide basis as minimum control due to the combined sewer system's size.

An additional approach identified in Appendix I was to raise the overflow elevation by physically modifying the overflow structure, by raising the overflow weir. The specific locations were determined in conjunction with achieving the goals of Minimum Control Number 4. Modifications to increase in-system storage and increase hydraulic capacity were implemented incrementally and with caution, observing the performance of the system during several large rainfall events to evaluate the possibility of flooding problems before raising the weir further. The specific locations were documented in conjunction with Minimum Control No. 4's Modified Regulator Plan and summarized in the Water Department's 1996 and 1997 Annual Combined Sewer Overflow Status Reports.

## **2.2 Status of Proposed In-system Storage Implementation**

### **2.2.1 Status of Available In-System Storage Volumes**

Available static storage volumes have been modified or updated for a few locations from the Appendix I. The available static storage volumes have been summarized for each identified location in Table 2-1. These tables indicate storage volumes available during both mean tide and mean high tide conditions. The additional storage volumes available due to tidal variation at gate-protected tidal outfalls have been incorporated into the lumped storage parameter used in the models of the combined sewer system.

**Table 2-1: Updated Storage Volumes**

Site Id	Interceptor	Mean Tide	Mean High Tide
		Total Storage (Gal)	Total Storage (Gal)
D_7	Upper Delaware Low Level	93,512	715,368
D_45	Lower Delaware Low Level	1,271,060	2,077,176
D_67	Lower Delaware Low Level	34,373	550,013
C_17	Cobbs Creek High Level	46,452	46,452
Indian Creek	Cobbs Creek High Level	158,596	158,596
Main Relief	n/a	1,031,366	1,031,366

### 2.2.2 Tide Gate Inspection and Maintenance

As discussed in Appendix I significant in-system storage volumes are provided at the tidally affected outfalls, especially during higher tidal cycles. A program was developed based on that documentation and the *System Inventory and Characterization Report* to install tide gates, or other backflow prevention structures, at regulators having an emergency overflow weir above the outfall tide gate. This program, completed in June 1999, protects all openings up to 1.5 feet City Datum and results in significant sewer inflow reductions. As part of this Minimum Control, the Water Department continues to inspect and maintain the tide gates in good working order at each of the 89 tidally affected outfall locations.

Although not affected by tidal fluctuations in the receiving water, it is possible for regulators at elevations above the tidal stages to be subjected to backflows from the smaller streams during periods of high streamflows. In order to protect these regulators from potential inflow, the Water Department has installed tide gates or other backflow prevention structures at these regulators as backflows are identified. As with tide gates, these structures prevent in-system storage and combined sewer flow capture capacities from being affected by inflow from the receiving stream. As part of this Minimum Control the Water Department continues to inspect and maintain the backflow prevention structures in good working order. Currently, projects to install gates on outfalls along the Cobbs and Tacony Creeks are in development. As part of this Minimum Control, the Water Department continues to inspect and maintain the backflow prevention structures in good working order.

### **2.2.3 Diversion Dam Installation Status**

As discussed in Appendix I, additional in-system storage volume could be added and hydraulic capacity increased through the addition of diversion dams to slot regulators where a dam was not present. Although these slot regulators generally did not bypass during dry-weather, the absence of a diversion dam at the downstream side of the orifice opening rendered these sites more susceptible to dry weather overflow. The addition of a dam not only provides a greater factor of safety in preventing dry weather overflows, but also provides greater hydraulic head on the orifice, increasing the flow into the interceptor sewers and in some cases potentially increasing the maximum hydraulic gradient in the interceptor sewer prior to overflow. The net effect of these improvements has been better protection against dry-weather overflows and better capture of combined flows in the interceptor during wet weather.

The flow maximization plan detailed in Minimum Control No. 4 included the addition of dams at these locations. Appendix I recommended 57 locations for the addition of a diversion dam; 40 locations in the Southwest Drainage District, 15 locations in the Northeast Drainage District and 2 locations in the Southeast Drainage District. Raising the overflow weir elevation at all 57 sites was deemed feasible, increasing both the hydraulic capacity of the regulators and the available in-system storage. These were completely implemented by the submission of the Water Department's 1997 Annual Combined Sewer Overflow Status Report. As part of the Minimum Controls the maintenance and inspection of these structures is continued, and protocols are discussed in Minimum Control No. 1.

## **2.3 Operation and Maintenance of In-Line Collection System Storage Projects Identified in the Long Term Control Plan**

### **2.3.1 Operation and Maintenance of Main Relief Sewer Storage**

The Main Relief Inflatable Dam storage project was identified as part of the CSO control program and completed in May 2007. Under this Minimum Control, the Water Department continues to maintain and monitor this in-line collection system storage site. This project reduces the combined sewer overflows into the Schuylkill River through utilization of the available in-system storage volume. The Main Relief Sewer provides flood relief to combined sewer areas in all three of the Water Department's drainage districts (Northeast, Southeast and Southwest). The relief sewer discharges to the Schuylkill River at Fairmount Park, a highly visible recreational area.

In March 2009, during the annual preventative maintenance inspection, large sections of the rubber fabric along the perimeter showed signs of stress tears up to one third of the material depth exposing the reinforcing fabric. Numerous deep gashes on the outside rubber surface were also found at those times which were probably due to sharp debris cutting into the rubber material when inflated.

Due to this unsafe condition, the inflatable dam is now inflated to 1 psi, which is roughly 80% of the sewer diameter. It was hoped that the inflatable dam manufacturer would give the Water

Department guidance on repairing or replacing the rubber material but they no longer support or manufacture this product.

Following a major storm in October 2011, the inflatable dam was found to be no longer operational. A static 7.5 ft dam currently exists in place of the rubber dam and functions as the in-system storage and volume control method.

### **2.3.2 Operation and Maintenance of Tacony Creek Park T-14 Overflow Pipe Storage**

The T-14 trunk sewer system conveys combined sewage from the largest combined sewershed in the Water Department collection system. Combined sewer outfall T-14, a 21' by 24' sewer, discharges into the Tacony Creek during periods of moderate to heavy rainfall. T-14 has a volume of approximately 10 million gallons and as part of the CSO control program, a control structure in the sewer was identified to use as much of this storage as possible. Installation of a crest gate helps to retain flow within the sewer. The gate reduces combined sewer overflow to the creek by utilizing the outfall pipe for in-system storage. This control technology provides an additional margin of protection against dry weather overflows while maintaining flood protection for upstream communities. The crest gate retains the stored flow in the relief sewer and a new connector pipe drains the stored flow to the nearby interceptor.

The operational acceptance testing was considered complete and the system was placed into service in November 2011 as part of the CSO control program. At present the system is in manual operation and is currently under evaluation to determine optimum control operation and gate configuration. The facility is maintained and monitored in accordance with real time control standard operating procedures. The operation and maintenance of the Tacony Creek Park T-14 Overflow Pipe Storage project will be incorporated as part of this Minimum Control.

### **2.3.3 Operation and Maintenance of Rock Run Relief R-15 Overflow Pipe Storage**

The Rock Run Relief Sewer provides flood relief to combined sewer areas upstream of regulator T-8 in the Northeast Drainage District. Combined sewer overflow discharges into the Tacony Creek at the Rock Run Relief Sewer outfall, an 11' by 14' sewer, during periods of moderate or greater rainfall. The CSO control program identified the installation of an inflatable dam in the Rock Run Relief Sewer to allow for utilization of in-system storage to retain combined sewer flows during a majority of these wet weather events. The inflatable dam stores combined sewer flows in the relief sewer until storm inflows have subsided and capacity exists in the Tacony Interceptor for conveyance of combined sewer flows to the Northeast Water Pollution Control Plant. This control technology provides an additional margin of protection against dry weather overflows while maintaining flood protection for upstream areas.

Several alternative control logics for the inflatable dam operation and drain-down gate were investigated to develop a logic that minimized the risks of flooding, increased Rock Run Relief storage utilization, and eliminated adverse affects of the project at other CSO regulators on the Tacony Creek.

The system was placed into service once operational acceptance testing was considered complete in August 2010, as part of the CSO control program. The Water Department is incrementally increasing the level controls to observe the operation of the automatic equipment under actual storm conditions. Due to concerns about safely operating the inflatable dam, the dam's opening has been reduced to 15 feet which is roughly 50% of the sewer diameter. The Water Department is currently evaluating modifications to the upstream diversion structure to convey additional flows to this facility, maximizing the storage capabilities. The facility is maintained and monitored in accordance with real time control standard operating procedures. The operation and maintenance of Rock Run Relief R-15 Overflow Pipe Storage project will be incorporated as part of this Minimum Control.

# Section 3

## Minimum Control No. 3

### Review and Modification of Pretreatment Programs

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#### 3.1 General

Minimum Control No. 3 requires the examination of industrial pretreatment programs and the development of program modifications as appropriate to reduce the environmental impact of combined sewer overflows (CSOs). Through the implementation of Control No. 3, the United States Environmental Protection Agency (US EPA) expects the control of "non-domestic discharges" to the combined sewer, which calls for limitations on the ability of industrial and commercial locations (restaurants, gas stations, etc.) to discharge wastewater. The overall objective of this minimum control is to effectively implement and optimize pretreatment programs as appropriate for minimizing CSO impacts from industrial facilities for the long term.

Wastewater from homes, commercial buildings, and industrial facilities is transported via collection system to the Water Pollution Control Plants to treat typical biodegradable wastes, such as household waste commercial waste, and industrial waste. The Philadelphia Water Department's (Water Department) pretreatment program reduces the potential negative impact to the water quality of on rivers and streams by treating wastewater before it is discharged to one of the City's three Water Pollution Control Plants. As pretreatment programs are a national requirement of the US EPA, the Water Department has the regulatory authority to require non-domestic dischargers to comply with pretreatment and ensure the goals of the Clean Water Act are attained.

#### 3.2 The Philadelphia Water Department's Industrial Pretreatment Program

The Water Department's US EPA-mandated pretreatment program is administered by the Industrial Waste Unit, which regulates industrial discharges that may be detrimental to the wastewater treatment processes. Industrial Waste Unit enforces regulations that establish specific load limitations for discharges to the system in order to:

- To prevent any damage to City sewer system and wastewater treatment plants,
- minimize health and the safety risks for City workers, and

- prevent the discharge of any harmful substances to the rivers, streams and other water resources.

To accomplish this, Industrial Waste Unit issues a number of permits to regulate discharges to the City's sewers. They issue the four types of permits regulating industrial discharges to the City sewer. These permits are a part of the Water Department's pretreatment program, regulating industrial wastewater discharges to the City's sewers and wastewater treatment plants, and are as follows:

- **Significant Industrial User Wastewater Discharge Permit**- This permit specify monitoring and reporting requirements for significant industrial users to demonstrate compliance with applicable local, state, and federal regulations.
- **Groundwater Discharge Permit** - This permit must be obtained prior to discharge for any project that will be discharging groundwater or accumulated stormwater from a project site to a City sanitary sewer.
- **Hauled Wastewater Discharge Permit** - This permit must be obtained by any discharger seeking to collect and transport septage waste to the City's Southwest Water Pollution Control Plant for disposal.
- **Manhole Pumpout Permit** - This permit must be obtained by all City of Philadelphia utilities routinely discharging wastewater from underground infrastructure pumpouts to the City sanitary sewer system.

The pretreatment program is primarily executed through the Significant Industrial User Wastewater Discharge Permit which specifies the monitoring, sampling, and reporting requirements for Significant Industrial Users. The implementation of the Significant Industrial User permit program enables the Water Department to monitor and enforce the requirements for discharging wastewater to the City's sewer system. The Significant Industrial Users contributing to the system meets US EPA's definition of non-domestic users, defined in Section 3.2.1. As part of the Water Department's program, the size and nature of their process discharges are evaluated to determine which users have the greatest non-domestic impact on the Water Pollution Control Plants and potential water quality impacts from CSOs.

### **3.2.1 Significant Industrial Users**

Significant Industrial Users are wastewater system users that:

- are subject to any National Categorical Pretreatment Standard;
- discharge an average of 25,000 gallons per day or more of process wastewater to the system or contribute a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the treatment plant;

- or are found by the City, Pennsylvania Department of Environmental Protection, or US EPA to have a reasonable potential, either alone or in conjunction with other discharges, to adversely affect the system.

The Water Department monitors and enforces the pretreatment requirements for SIUs through site-specific permits in both the separate and combined sewer systems.

The City currently issues a total of 120 permits for Significant Industrial Users that contribute to our collection system. A current listing of Significant Industrial Users issued by the City and their classification/sewer drainage district is provided in Table 3-1. Significant Industrial Users are classified as either Categorical or Non-Categorical. Categorical Significant Industrial Users are those who perform a categorically regulated process as stipulated in the federal regulations and have numerical limits as well as other reporting requirements. Non-Categorical Significant Industrial Users are subject to the same federal reporting requirements, but are not subject to categorical pretreatment standards. In Philadelphia, there are 95 nondomestic dischargers classified as Significant Industrial Users. In addition, there are 25 Significant Industrial Users that are located outside of Philadelphia, but have process flows conveyed through the City's sewer system.

Significant Industrial Users that discharge process wastewater are required to periodically monitor their industrial process wastewater or process flow and develop spill prevention plans. All permitted Significant Industrial Users are subject to required facility inspections by the Industrial Waste Unit staff at least once a year. The Significant Industrial Users must provide a semi-annual report of their facility that includes process flow and wastewater sample results, or certification of zero discharge. They must also notify the Water Department of any noncompliance. Depending on the type of noncompliance, the Industrial Waste Unit can undertake a number of enforcement actions; they include issuance of Notices of Violation , public notification of significant noncompliance , administrative orders (compliance schedules and consent orders), and fines. The Industrial Waste Unit keeps detailed records of instances of Significant Industrial Users non-compliance. The records demonstrate that the majority of the permitted Significant Industrial Users meet their requirements.

**Table 3-1: Current Listing of Significant Industrial Users Served by the City**

District	Company	Location	Classification	Sewer Type
SW	Hydrol Chemical	Yeadon	Categorical	Non-Contributing
SW	McNeil Consumer Healthcare	Fort Washington	Categorical	Non-Contributing
SW	Multiflex Plating Company	Collingdale	Categorical	Non-Contributing
SW	PaperWorks Industries, Inc.	Philadelphia	Categorical	Non-Contributing
SW	Peacock Laboratories	Philadelphia	Categorical	Combined
SW	Penn Fishing Tackle Mfg. Co.	Philadelphia	Categorical	Combined
SW	Philadelphia Energy Solutions Refining and Marketing, LLC	Philadelphia	Categorical	Combined
SW	Philadelphia Gas Works	Philadelphia	Categorical	Combined
SW	Precious Metals Plating, Inc.	Glenolden	Categorical	Non-Contributing
SW	Starlite Industries, Inc.	Rosemont	Categorical	Non-Contributing
SW	Sun Chemical	Philadelphia	Categorical	Separate
SW	Veolia Energy Philadelphia	Philadelphia	Categorical	Combined
SW	Astra Foods, Inc.	Upper Darby	Non-Categorical	Non-Contributing
SW	Cintas Corporation	Philadelphia	Non-Categorical	Combined
SW	CSX Transportation, Inc.	Philadelphia	Non-Categorical	Combined
SW	G.J. Littlewood & Son, Inc.	Philadelphia	Non-Categorical	Separate
SW	LSG Sky Chefs	Philadelphia	Non-Categorical	Separate
SW	National Railroad Passenger Corp.	Philadelphia	Non-Categorical	Combined
SW	Philadelphia Energy Solutions Refining and Marketing LLC	Philadelphia	Non-Categorical	Separate
SW	Plains Products Terminals, LLC	Philadelphia	Non-Categorical	Non-Contributing
SW	Richards-Apex Inc.	Philadelphia	Non-Categorical	Non-Contributing
SW	Servisair LLC	Lester	Non-Categorical	Non-Contributing
SW	Sunoco – Darby Creek Tank Farm	Darby	Non-Categorical	Non-Contributing
SW	United Parcel Service	Philadelphia	Non-Categorical	Non-Contributing
SW	Vincent Giordano	Philadelphia	Non-Categorical	Combined
NE	Abbey Color Incorporated	Philadelphia	Categorical	Combined
NE	Advance Technologies	Philadelphia	Categorical	Combined
NE	AECO, Inc.	Philadelphia	Categorical	Separate
NE	AgustaWestland Philadelphia Corp.	Philadelphia	Categorical	Separate
NE	Allied Tube & Conduit Corporation	Philadelphia	Categorical	Non-Contributing
NE	Brenner Aerostructure, LLC	Bensalem	Categorical	Non-Contributing
NE	C W Industries	Southampton	Categorical	Non-Contributing
NE	C. Lever Colors, Inc.	Bensalem	Categorical	Non-Contributing
NE	Cardone Industries, Inc.	Philadelphia	Categorical	Combined
NE	CatalentPharma Solutions	Philadelphia	Categorical	Separate
NE	Computer Components Corporation	Philadelphia	Categorical	Separate
NE	Curtiss Laboratories	Bensalem	Categorical	Non-Contributing
NE	Custom Powder Coatings, Inc.	Philadelphia	Categorical	Separate
NE	DELAUVAU, LLC	Philadelphia	Categorical	Non-Contributing
NE	DGM Custom Polishing & Finishing Corp.	Philadelphia	Categorical	Combined
NE	Frankford Plating Inc.	Philadelphia	Categorical	Combined

District	Company	Location	Classification	Sewer Type
NE	Garfield Refining Company	Philadelphia	Categorical	Combined
NE	Gill Powder Coating	Bensalem	Categorical	Non-Contributing
NE	Henshell Corporation	Philadelphia	Categorical	Combined
NE	Hillock Anodizing, Inc.	Philadelphia	Categorical	Combined
NE	Hillock Anodizing, Inc.	Philadelphia	Categorical	Combined
NE	Honeywell Resins & Chemicals, LLC	Philadelphia	Categorical	Combined
NE	J.P. Cerini Technologies, Inc.	Philadelphia	Categorical	Combined
NE	James Abbott, Inc.	Philadelphia	Categorical	Combined
NE	Lannett Company, Inc.	Philadelphia	Categorical	Separate
NE	Lannett Company, Inc.	Philadelphia	Categorical	Separate
NE	Martin/F. Weber	Philadelphia	Categorical	Separate
NE	Max Levy Autograph, Inc.	Philadelphia	Categorical	Separate
NE	Medical Products Laboratories	Philadelphia	Categorical	Separate
NE	MedImmune LLC	Philadelphia	Categorical	Separate
NE	Metlab/Potero	Wyndmoor	Categorical	Non-Contributing
NE	Model Finishing Co., Inc.	Philadelphia	Categorical	Combined
NE	Mutual Pharmaceutical Co.	Philadelphia	Categorical	Combined
NE	NEL Metal Restorations	Philadelphia	Categorical	Combined
NE	Newman & Company, Inc.	Philadelphia	Categorical	Combined
NE	PChem Associates, Inc.	Bensalem	Categorical	Non-Contributing
NE	Petroleum Recycling Corporation	Philadelphia	Categorical	Combined
NE	Philadelphia Rust-Proof Company, Inc.	Philadelphia	Categorical	Combined
NE	PolySat, Inc.	Philadelphia	Categorical	Combined
NE	Premier Medical (MFG)	Philadelphia	Categorical	Separate
NE	Purolite Company	Philadelphia	Categorical	Combined
NE	Qualawash Holdings, LLC	Bensalem	Categorical	Non-Contributing
NE	Regal International Leathers, Ltd	Philadelphia	Categorical	Combined
NE	SPD Technologies	Philadelphia	Categorical	Separate
NE	SPS Technologies	Jenkintown	Categorical	Non-Contributing
NE	Thermacore, Inc.	Langhorne	Categorical	Non-Contributing
NE	UCT Specialties, Inc.	Bristol	Categorical	Non-Contributing
NE	United Color Manufacturing	Philadelphia	Categorical	Combined
NE	Vibroplating, Inc.	Bensalem	Categorical	Non-Contributing
NE	Arway Apron and Uniform Rental	Philadelphia	Non-Categorical	Combined
NE	Barnell, Inc.	Philadelphia	Non-Categorical	Combined
NE	Bethayres Reclamation Corp.	Huntington Valley	Non-Categorical	Non-Contributing
NE	BlackGold Biofuels	Philadelphia	Non-Categorical	Combined
NE	Caledonian Dye Works, Inc.	Philadelphia	Non-Categorical	Combined
NE	Cintas Corporation	Philadelphia	Non-Categorical	Separate
NE	Clean Rental Services, Inc.	Philadelphia	Non-Categorical	Combined
NE	Coca-Cola Refreshments USA, Inc.	Philadelphia	Non-Categorical	Combined
NE	David Michael & Co., Inc.	Philadelphia	Non-Categorical	Separate
NE	Dickler Chemical Laboratories, Inc.	Philadelphia	Non-Categorical	Combined
NE	Dietz & Watson, Inc.	Philadelphia	Non-Categorical	Non-Contributing
NE	Domestic Uniform Rental	Philadelphia	Non-Categorical	Combined

District	Company	Location	Classification	Sewer Type
NE	Fleetwash, Inc.	Bensalem	Non-Categorical	Non-Contributing
NE	GE Betz	Treose	Non-Categorical	Non-Contributing
NE	GE International Inc.	Philadelphia	Non-Categorical	Combined
NE	HP Hood, LLC	Philadelphia	Non-Categorical	Non-Contributing
NE	Kinder-Morgan Liquid Terminals	Philadelphia	Non-Categorical	Non-Contributing
NE	Michel's Bakery, Inc.	Philadelphia	Non-Categorical	Combined
NE	Mondelez Global LLC – Philadelphia	Philadelphia	Non-Categorical	Non-Contributing
NE	Mrs. Ressler's Food Products	Philadelphia	Non-Categorical	Combined
NE	N. Jonas & Co., Inc.	Bensalem	Non-Categorical	Non-Contributing
NE	Neatsfoot Oil Corporation	Philadelphia	Non-Categorical	Combined
NE	Northeast Donut Shops Management Corp.	Philadelphia	Non-Categorical	Combined
NE	Pepsi Beverages Company	Philadelphia	Non-Categorical	Separate
NE	Perfecseal, Inc.	Philadelphia	Non-Categorical	Separate
NE	Philadelphia Cheesesteak Co.	Philadelphia	Non-Categorical	Combined
NE	Philadelphia Pre-Cooked Steak Co.	Philadelphia	Non-Categorical	Combined
NE	Siemens Industry, Inc.	Fallsington	Non-Categorical	Non-Contributing
NE	Sweet Ovations, LLC	Philadelphia	Non-Categorical	Non-Contributing
NE	Wayne Mills Corp.	Philadelphia	Non-Categorical	Combined
NE	William H. Cooper's Sons, Inc.	Philadelphia	Non-Categorical	Combined
SE	A & R Transport, Inc.	Philadelphia	Categorical	Combined
SE	Ashland Chemical Company	Philadelphia	Categorical	Combined
SE	Department of the Treasury, U.S. Mint	Philadelphia	Categorical	Combined
SE	Inolex Chemical Company	Philadelphia	Categorical	Combined
SE	JAWS, INC	Philadelphia	Categorical	Combined
SE	Murray Greene & Sons	Philadelphia	Categorical	Combined
SE	Naval Foundry & Propeller Center	Philadelphia	Categorical	Non-Contributing
SE	PECO Energy, Oregon Ave. Shop	Philadelphia	Categorical	Non-Contributing
SE	Simons Brothers	Philadelphia	Categorical	Combined
SE	Wade Technology, Inc.	Philadelphia	Categorical	Combined
SE	Columbia Silk Dyeing Co., Inc.	Philadelphia	Non-Categorical	Combined
SE	Leatex Chemical Company	Philadelphia	Non-Categorical	Combined
SE	National Chemical Laboratories, Inc.	Philadelphia	Non-Categorical	Combined
SE	Tasty Baking Co.	Philadelphia	Non-Categorical	Non-Contributing
SE	WuXiAppTec Incorporated	Philadelphia	Non-Categorical	Non-Contributing

**Note:** The *Non-Contributing* designation under the *Sewer Type* Field may be misleading. The *Sewer Type* Field indicates Stormwater Sewer type and does not signify that facilities do not contribute to PWD's system. In fact, all companies listed in this table are regulated under pretreatment regulations because they contribute process flows to PWD's wastewater system.

### **Pretreatment Program Database Management System - LINKO**

The Industrial Waste Unit currently uses a database management system called LINKO to input and track Significant Industrial User monitoring data, inspections, violations, enforcement actions and significant noncompliance determinations to assist in the management the pretreatment program to ensure Significant Industrial Users are complying with federal regulations. In addition to these functions, LINKO also enables the Industrial Waste Unit to generate permits, Significant Noncompliance and Notice of Violation documents, and the Industrial Waste Unit annual report using data stored within the database.

LINKO is the fourth industrial user tracking database the Industrial Waste Unit has utilized in the last 25 years. As new database technologies have become available, the complexity of services provided has increased. The Industrial Waste Unit's first database, first used in the late 1980s, only had the capability of tracking of facility inspections. In the early 1990s this database was updated to allow storage of industrial user compliance data. Further system capabilities were achieved in the mid-1990s when the Industrial Waste Unit purchased its first database program developed by an outside vendor. This system tracked industrial user monitoring data, violations, enforcement actions and significant noncompliance determinations. The Industrial Waste Unit began using its current database, LINKO, in 2008.

### **Pretreatment Program Reporting**

Following every calendar year, the Industrial Waste Unit develops an annual report of its pretreatment program activities pertaining to all permitted Significant Industrial Users in and outside of Philadelphia for the previous reporting year that is submitted to the Pennsylvania Department of Environmental Protection and the US EPA in month of March. This report lists permitted Significant Industrial Users, sampling and inspection activities, noncompliance and enforcement actions taken during the previous year. Details of specific violations and enforcement actions are also provided.

### **General Permit Evaluation**

The Significant Industrial User Wastewater Discharge Permits are site- specific permits which require additional administrative needs in comparison to the general permits. The Water Department conducted an analysis on the issuance of general permits for industrial dischargers and concluded that there would be no additional benefit over the site-specific permits that are currently issued. To enact the use of general permits would require a large number of regulatory changes, including changes to the City's Wastewater Control Regulations, the US EPA approval process, and promulgation into City Law. These regulatory changes are unnecessary, as the current site-specific permits regulate all wastewater discharged from the permitted facility, which includes contaminated stormwater (i.e. rainfall contaminated by products, by-products, waste products, or other materials). Additionally all Significant Industrial Users are required to monitor their flow to the sewer system.

### Industrial Waste Unit Inspection Form Update

When appropriate, the Industrial Waste Unit attempts to incorporate new programs and initiatives into existing forms and procedures. With codification of the Philadelphia Stormwater Management Regulations in 2006, the Industrial Waste Unit updated its Industrial Waste Inspection Forms to include a stormwater management component to be completed during pretreatment program site inspections. The form also includes a section on CSO which identifies which CSO outfall the industrial facility contributes to, facility type, the frequency of process flows, and the ability to control discharges during wet weather. The inspection form now includes sections on:

- water usage,
- storage of raw materials and chemicals ,
- universal/non-hazardous/hazardous waste generation and disposal,
- spill/slug control,
- solvent/toxic organic management plan,
- production processes,
- pretreatment systems,
- boilers and cooling towers,
- transformers, capacitors and polychlorinated biphenyls (PCBs),
- CSO,
- and stormwater.

### 3.2.2 Process Flow Assessment

An assessment of the process flow quantities and associated pollutant contributions of Significant Industrial Users, originally completed for the 1995 document *CSO Documentation: Implementation of Nine Minimum Controls*, was conducted again in 2011 in preparation of NPDES permit renewal to determine the relative potential significance of non-domestic discharges on water quality. The assessment included all Significant Industrial Users (120) in the Philadelphia area and their associated industrial process flows, total flows (include sanitary, non-contact cooling water) and evaluated their relative contribution to the City's total dry weather wastewater flows to each of the three Water Pollution Control Plants. The results demonstrate that the relative contribution of industrial flows from the Significant Industrial Users to the total dry weather flow to the City's system is very small. A summary of the flow sources at each of the three plants and the percent contribution of Significant Industrial Users is provided in Table 3-2.

**Table 3-2: Permitted Industrial Flow Contributions by Plant**

Water Pollution Control Plant	No. of SIU	Average Dry Weather Plant Flow (MGD)	Total Flow from SIUs (gpd)	Process Flow from SIUs (gpd)	% Contribution of Total Flow	% Contribution Process Flow
NE	80	189	3,266,563	2,633,040	1.73	1.39
SE	15	90	354,980	253,890	0.39	0.28
SW	25	182	1,980,900	1,816,425	1.09	1.00
Total	120			Average	3.21	2.67

### 3.3 Other Efforts to Support the Pretreatment Program

Although Significant Industrial Users contribute a relatively small amount of industrial to the total dry weather flow in the City's system, the Water Department remains proactively engaged in initiating opportunities or efforts that support the goals and initiatives of the Pretreatment Program as described below.

#### 3.3.1 Pollutant Minimization Plan for PCBs

The Water Department developed a PCB Pollutant Minimization Plan covering each of the three Water Pollution Control Plants in September of 2005 to set forth a more stringent protocol for identifying sources of PCBs and prevent further discharges. The plan was developed following the addition of pollutant minimization plan requirements for point and non-point discharges of PCBs in the Delaware Estuary by the Delaware River Basin Commission.

The plan identified the Water Department's known and potential sources of PCBs in order to determine whether additional pollutant minimization measures were needed. The identification of these sources supports the City's Pretreatment Program's goals of monitoring industrial discharges that may be detrimental to the wastewater treatment processes or receiving waters. The Water Department's objective in conducting these trackdown efforts was to identify significant sources of PCBs discharged into our sewer system and then, in cooperation with our regulators, determine and implement procedures to minimize or eliminate those discharges.

##### Known Sources

When the plan was published in 2005, there were six known sources of PCBs in the Water Department's collection system. All sources were located at the City's three Drinking Water Treatment Plants within the Schuylkill and Delaware River Watersheds, at both the intakes of the plants as well as the discharge points for spent ferric chloride. Ferric chloride is used as a treatment coagulant at the Water treatment plants and its by-product contains PCBs. Upstream contributors and industry users are reducing their transmission of PCBs to the Schuylkill and Delaware Rivers at the intakes through their own Pollutant Minimization Plans, better containment measures, and product retrofits that contain less or no PCBs. Additionally, in 2008 the Water Department switched its ferric chloride suppliers from the DuPont Company to Kemira, and analytical sample results indicate a 95% reduction of PCBs compared to DuPont's product.

##### Potential Sources

From 2006 to 2011, the Water Department implemented an investigation of potential sources of PCBs focused initially on sites with PCBs stored in equipment, and later included any locations that may have contained PCB material, equipment, processes, soil area, or facilities. This effort involved compiling an inventory of PCB-containing equipment and information from the following agencies: Philadelphia Fire Department, Philadelphia Department of Public Health, US EPA, Pennsylvania Department of Environmental Protection, the Delaware River Basin Commission, Partnership for the Delaware Estuary and PECO. This culminated in a list of 399 sites potentially housing PCB devices, with many sites containing several devices.

Following these investigations, the Water Department discovered that of the 399 records on the original listing created in 2005, only 344 were legitimate sources, 65 records were removed due to blanks, duplications, or addresses could not be located. As seen in the Table 3-3 below, of the 344 confirmed sites, 224 occur in the combined sewer area, 289 facilities are still operating, and 150 sites have equipment still in use. During the investigation, the types of equipment that were observed were transformers, capacitors, regulators, undercars for SEPTA trains, and light/power equipment.

The results of the investigation demonstrated that a significant number of these sites are either no longer in operation, or have implemented some pollutant control measures such as the installation of PCB discharge prevention systems or retrofilling transformers. This investigation highlighted the industry's proactive attempts to preventing and reducing PCB discharges. The City will continue to evaluate how City-wide PCB concentrations can be reduced.

**Table 3-3: Potential PCB Investigation Summary**

		# of Sites
Investigation Results	Original Record Count	399
	Duplicate Records	45
	Not Found/No Access	10
	Actual Records	344
Sewer Type	Combined	224
	Separate (MS4)	89
	Non-Contributing	21
	Storm Sewer Only	10
Facility Status	Operating	289
	Closed	38
	Abandoned or Unknown	17
<b>PCB containing Equipment Summary</b>		
Equipment Type Status	In Use	150
	Off Site	177
	Out of Service	98
	Disconnected	92
	Unknown	13
Equipment Type	Transformer	549
	Capacitor	159
	Regulator	9
	Undercar	26
	Retrofilled	35
	Light & Power	1

Please note: the Equipment Status and Type do not match the count of actual records provided that some sites have numerous types of equipment at varying stage.

### **Sewer System Trackdown**

The PCB Pollutant Minimization Plan detailed the sewer system trackdown efforts conducted in 2001, 2002, and 2005. This involved wet weather sampling for PCBs at the plants and in the interceptor. The sources identified in this trackdown were assigned GIS coordinates and visited by the Industrial Waste Unit and evaluated for potential minimization strategies. The PCB Pollutant Minimization Plan requires samples of the effluent of the water pollution control plants be collected once every two years and analyzed for PCBs using Method 1668A to observe the reductions in the total PCB concentration over time to evaluate program success. To meet this requirement, the Water Department conducts four annual effluent sampling events (two wet weather and two dry weather) for PCBs at each of its water pollution control plants.

### **In-Stream PCB Sampling**

In-stream PCB sampling was conducted in 2009 to supplement the PCB research initiated by the Delaware River Basin Commission that established the Stage 1 Total Maximum Daily Loads for total PCB for Zones 2-5 of the Delaware River Estuary. The samples collected for this research were analyzed under the same protocol as the research established by the Delaware River Basin Commission. The data from these samples were provided to the Delaware River Basin Commission which were used to develop a report entitled “Water Quality Model for Carbon and PCB Homologs for Zones 2-6 of the Delaware River Estuary” in May 2011. A copy of this report can be found on the Delaware River Basin Commission’s website at [http://www.nj.gov/drbc/library/documents/PCBhomolog\\_model-rpt0511.pdf](http://www.nj.gov/drbc/library/documents/PCBhomolog_model-rpt0511.pdf).

### **3.3.2 SARA Title III Inspections**

The City maintains an entity called the Philadelphia Local Emergency Planning Committee (PLEPC) who is tasked with meeting the responsibilities of Superfund Amendments and Reauthorization Act (SARA) Title III. The provisions under SARA Title III also known as the Emergency Planning and Community Right-to-Know Act (EPCRA) requires states to promote outreach of local emergency preparedness programs by organizing, analyzing and disseminating information on hazardous chemicals, and receiving reports (Tier II) from the regulated community. The PLEPC has delegated the Philadelphia Fire Department to inspect the SARA Title III facilities to ensure that information mentioned within their Tier II report is accurate. This includes a visual on-site inspection, verifying the facility has a Preparedness Prevention Contingency plan and reviewing any other information contained within the Tier II report. These inspections and Tier II report reviews are a secondary method of ensuring these industries are complying with local regulations, as many of these SARA Title III facilities are also Significant Industrial Users.

### **3.3.3 Industrial Waste Unit Website**

The Industrial Waste Unit Website is an important resource to the public and industries served by the Water Department. It provides access to information on different City permitting requirements and programs and publications that may benefit or impact industrial users such as the surcharge program and *The Pretreatment Times*. This website plays a valuable role in the

Pretreatment Program. The Industrial Waste Unit Website can be accessed at:

<http://www.phila.gov/water/IWU.html>

### **Pretreatment Program Regulations & Requirements**

The Industrial Waste Unit has developed a list of pretreatment guidelines that can be a great reference for its industrial users. Included are the categories of pretreatment, information on grease interceptors, required treatment of lint, plaster, hair, acidic and basic waste, information for automotive centers, and other miscellaneous activities. The guidelines provide specific requirements for each activity listed, as well as approved systems of handling industrial wastes.

These guidelines can be accessed at:

[http://www.phila.gov/water/IWU\\_PDFs/Pretreatment\\_Guideli.pdf](http://www.phila.gov/water/IWU_PDFs/Pretreatment_Guideli.pdf)

### **Surcharge Program**

The surcharge program was developed by the Water Department to recover costs of treating wastewater that exceeds the characteristics of normal household wastewater. The Industrial Waste Unit administers the City's surcharge program to applicable industrial users through routine wastewater sampling. Surcharge billing is based on the Biochemical Oxygen Demand and the total suspended solids. The surcharge program ensures regular contact with a number of facilities discharging high strength wastewater that may not require permitting as SIUs. The familiarity with these facilities has allowed rapid wastewater discharge permit issuance to some surchargeable facilities that have caused collector system problems for the City.

### **Pretreatment Times**

The Industrial Waste Unit also issues a semi-annual newsletter, *The Pretreatment Times*, to all the significant industrial users and copies of these the newsletters are also available on the Industrial Waste Unit website. *The Pretreatment Times* addresses various topics of concern for permitted significant industrial facilities, including: reminders of important approaching deadlines, suggestions of practices to assist with achieving permit compliance, as well as updates on activities undertaken by the Industrial Waste Unit and the Water Department. The Pretreatment Times also annually awards certificates of compliance to industries that have achieved 100% compliance with their wastewater discharge permits during the previous calendar year.

# Section 4

## Minimum Control No. 4

### Maximize Flow to the Water Pollution Control Plants

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This section provides supplemental information to the documentation for Minimum Control Measure No. 4– Maximizing Flows to the Water Pollution Control Plants. Minimum Control Measure No. 4 is defined as “...maximizing flow to the publicly owned treatment works means making simple modifications to your combined sewer system and treatment plant to enable as much wet weather flow as possible to reach the treatment plant and receive treatment. The secondary capacity of the treatment plant should be maximized, and all flows exceeding the capacity of secondary treatment should receive a minimum of primary treatment (and disinfection, when necessary).”

The overall objective of this minimum control is to reduce the frequency, duration, and volume of combined sewer overflows by maximizing flows to the publicly owned treatment works through simple modifications to the combined sewer system and treatment plant. This documentation summarizes the original strategy, highlights changes to the original strategy, and discusses the flow optimization strategy to facilitate the implementation of the *Green City, Clean Waters* program.

#### 4.1 Original Flow Maximization Strategy

Maximization of flow to the Water Pollution Control Plants involved examining both the water pollution control plants and the system of regulators and interceptor sewers that deliver flow to them. Maximum use of the collection and treatment facilities for combined sewer overflow reduction is achieved when the maximum hydraulic capacity of the collection system is made available to capture combined sewer flows during wet weather, and when the treatment facilities are capable of processing wet weather flows under the existing discharge permits. The *System Hydraulic Characterization Report* defined the baseline for the assessment of conveyance capacities in the system for the 1995 document *CSO Documentation: Implementation of Nine Minimum Controls* (Appendix I). This analysis determined that the regulator structures generally limited the capacity of the existing system to capture wet weather flow. The flow maximization strategy evaluations in the *CSO Documentation: Implementation of Nine Minimum Controls* focused on identifying modifications to the collection system that resulted in higher rates of combined sewer flow capture, established wet weather water pollution control plant operating protocols that maximized pollutant removal within permit limitations, and defined an implementation plan for staging the proposed modifications to maximize the benefits of increased flow capture

## 4.2 Flow Conveyance Strategy

The 1995 document *CSO Documentation: Implementation of Nine Minimum Controls* (Appendix I) identified a basic strategy of flow maximization, the Modified Regulator Plan, to deliver more flow to the Water Pollution Control Plants more frequently to enable greater pollutant removals. The projected flow increase associated with the Modified Regulator Plan was completely implemented by the submission of the Philadelphia Water Department's (Water Department) 1997 Annual Combined Sewer Overflow Status Report. The original plan has been modified since then as the impacts of modifications were evaluated with respect to cost, Water Pollution Control Plant permit limits, and flow management issues. For example, changes were made to minimize flow reversals at CSO regulators due to higher interceptor hydraulic grade lines during wet weather events while ensuring overall system capture performance. The results of the hydraulic modeling of the interceptor sewers with the regulator modifications indicate that significantly higher rates of flow are delivered to the Water Pollution Control Plants more frequently than pre-Nine Minimum Control documentation. These modifications reflect an improved understanding of the collection system dynamics as identified throughout the ongoing modeling work, but no additional capture is expected to result on a system-wide basis without capital improvements.

## 4.3 Maximization of Wet Weather Treatment at the Water Pollution Control Plants

The *CSO Documentation: Implementation of Nine Minimum Controls* (Appendix I) concluded that each of the Water Pollution Control Plants employs all reasonable methods to treat maximum wet weather flows within the requirements of the respective discharge permits. Each plant had established operating procedures for wet weather conditions and was able to adjust plant and unit process capabilities to treat increased wet weather flows from conveyance modifications identified in the Modified Regulator Plan.

Minimum Control No. 4 also discussed the performance of stress testing to determine the ability of each water pollution control plant to operate acceptably at incremental increases in wet weather flows and to estimate the effect on the water pollution control plant's compliance with its permit requirements. The final reports for each plant were completed in 2001 and the recommendations were considered as part of the development of *Green City, Clean Waters* program. The expansion or confirmation of wet weather treatment capacity at all three of the Water Department's water pollution control plants was recommended.

The Facility Concept Plans for these two plants will provide additional information about water pollution control plant enhancements.

## 4.4 Flow Conveyance Strategy for the Implementation of *Green City, Clean Waters*

The flow conveyance strategy identified in the *CSO Documentation: Implementation of Nine Minimum Controls* is complete and any modifications reflect an improved understanding of the collection system dynamics through modeling and system maintenance. However, during the conduct of continuing analyses for the implementation of the *Green City, Clean Waters* plan, new insights evolved into the nature of and the opportunities for controlling sewer overflows. The proposed approach has its origins in both a fundamental design requirement for the use of green stormwater infrastructure in combined sewage overflow control and the objective Minimum Control No. 4, flow maximization. The analysis and implementation of this strategy is part of the CSO control program and the operation and maintenance of any modified regulators' being incorporated into the Nine Minimum Controls.

### 4.4.1 Balancing CSO Regulator Wet Weather Treatment Capacities

The *Green City, Clean Waters* plan for combined sewage overflow control relies upon land-based stormwater management practices. These practices are intended to control stormwater runoff near the source through infiltration, evapotranspiration, decentralized storage, and slow release to the combined sewer system, for conveyance to treatment facilities. For the slow release of stormwater detained in green stormwater infrastructure to be effective in reducing overflow volume and duration, there must be sufficient treatment capacity at the regulator to admit the cumulative slowly released stormwater flows from all management practices in the entire sewershed. This requires regulator treatment capacities in wet weather to be balanced sufficiently, on a unit drainage area basis, among all the regulators located within each of the three Water Pollution Control Plant drainage areas to allow for the balanced treatment of slow releases from all management practices in all of the sewersheds contributing to the interceptor systems.

In the course of developing the City's approach to using green stormwater infrastructure to control sewer overflows, hydrologic and hydraulic modeling-based analyses revealed that the wastewater treatment plants provide a unit area treatment rate for combined sewage flows in wet weather equal to 0.05 cubic feet per acre of impervious cover that directly drains to the collection system. Further, the *Green City, Clean Waters* plan firmly established the seminal concept that the efficient implementation of green stormwater infrastructure as an overflow control does not lend itself to special targeting of different levels of implementation in different sewersheds. The only realistic and practical approach to implementing green stormwater infrastructure within the combined-sewered areas of the City is to treat all areas equally in seeking opportunities for implementation. As a result, the Water Department's combined sewer system-wide design standard for all green stormwater management facilities located in the public right of way and incorporate storage and slow-release, is set at 0.05 cubic feet per second (or less) per acre of tributary impervious area draining directly to the control facility. Therefore, the balancing of the wet weather treatment rates provided by the treatment plants equally across the collection system for all regulating chambers, to the extent technically and

economically feasible, is a fundamental design assumption underlying the successful implementation of the City's CSO control plan.

#### **4.4.2 Collection System Modification Technologies**

The Water Department is performing analyses for a broad range of interceptor and trunk sewer improvement alternatives designed to increase wet weather flow delivery to the Water Pollution Control Plant in a balanced manner. Modifications to consider include:

- Regulator orifice enlargement
- Regulator connector pipe enlargement / replacement
- Existing regulator overflow weir elevation raised
- Regulator overflow weir elevation raised through chamber reconstruction and/or weir expansion

These regulator modifications fall into two primary categories: increasing regulator orifice and connector pipe capacities, and increasing overflow weir elevations.

The collection system modifications are not considered part of the implementation of this minimum control, as they require substantial engineering analysis to determine the appropriate combination of regulator chamber changes and will require, in some cases, significant construction to implement. The inspection, maintenance and continued operation of any collection system modifications will be incorporated as part of the Nine Minimum Controls.

# Section 5

## Minimum Control No. 5

### Prohibiting CSO Discharges during Dry Weather

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#### 5.1 Introduction

This section provides supplemental information to the 1995 document *CSO Documentation: Implementation of Nine Minimum Controls* (Appendix I) for Minimum Control Measure No. 5—elimination of combined sewer overflows (CSOs) during dry weather; it includes any measures to ensure that the combined sewer system does not overflow during dry weather flow conditions. One of the goals of the Philadelphia Water Department’s (Water Department) CSO control program is to prevent dry weather discharges. Dry weather discharges at CSO outfalls can occur in any combined sewer system on either a chronic (i.e., regular or even frequent) basis or on a random basis (i.e., as a result of unusual conditions, or equipment malfunction). They are often the result of numerous site-specific conditions, including clogging by natural and manmade debris, construction activity, structural failure of the regulator, or hydraulic overloading by an unusual discharge of flow to the combined sewer system. Chronic dry weather discharges can and should be prevented from occurring at all CSO outfalls. Responding to any reports and determining the cause of dry weather discharges occurring within the sewer system is a priority for the Water Department. Often, random dry weather discharges cannot be prevented, and instead are promptly identified and abated. The Water Department has not observed any outfalls which have chronic discharges but analysis is conducted via hydrologic and hydraulic modeling to ensure chronic overflows are not occurring.

#### 5.2 The Water Department's Approach to Preventing Dry Weather Discharges

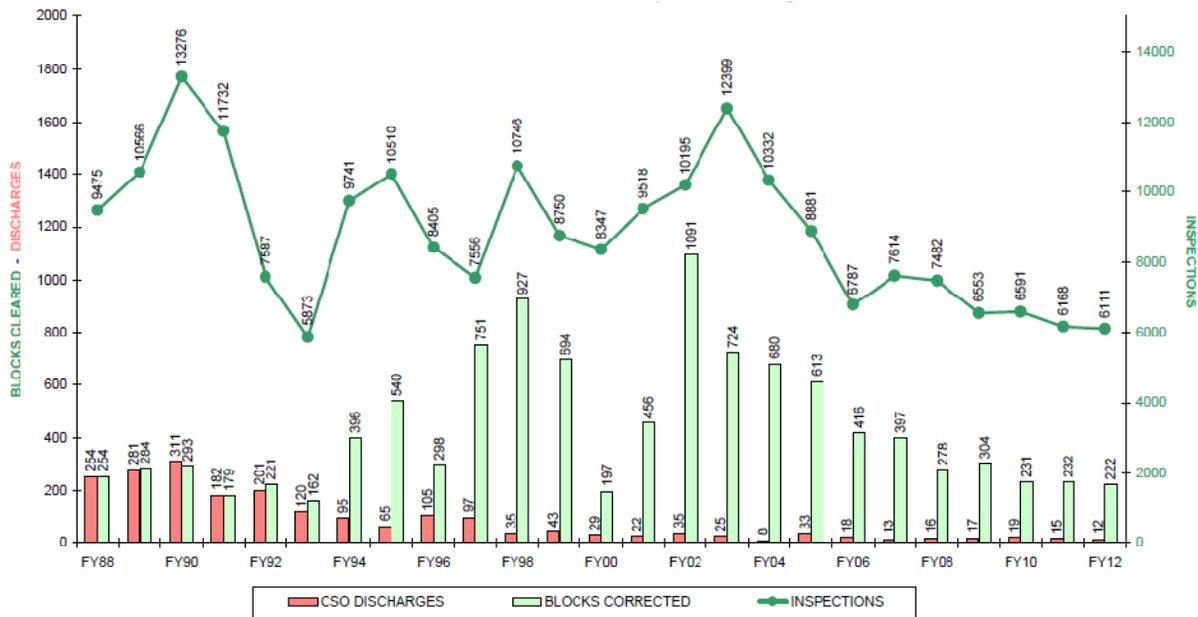
As documented in Section 1, the Water Department performs regular inspections and maintenance of the CSO regulators and other infrastructure throughout the City. These programs ensure that sediment accumulations and/or blockages are identified and corrected immediately to avoid dry weather overflows.

##### 5.2.1 CSO Outfall and Regulator Inspections and Maintenance

The Water Department maintains 175 combined sewer regulator chambers with regulator devices that control the diversion of wastewater flow to the interceptor system and 20 storm relief diversion chambers that allow excess flow during storm events to be diverted to storm relief sewers. These regulator chambers discharge through 164 NPDES permitted point sources which make up the Water Department's CSO outfalls. The maintenance of the chambers are

critical to the performance of the system in that they control the frequency, duration and quantity of CSO discharges. The Water Department has documented a correlation between the number of CSO regulator inspections and the number of blockages observed (Figure 5-1), and as such, the maintenance program emphasizes frequent site visits aimed at clearing minor blockages before they develop into dry weather discharges. All combined sewer regulator chambers in the City's system are visually inspected at least four times per month. In addition, the Water Department's maintenance group utilizes a remote monitoring network system daily to identify any locations in the collection system showing abnormal flow patterns. By using the monitoring network system in this manner, the crews are able to correct many partial blockages before they become a dry weather discharge.

In response to the CSO compliance inspection performed by the Pennsylvania Department of Environmental Protection in November 2002, the Water Department improved its follow-up response to sites experiencing a dry weather discharge with the institution of a next day follow-up inspection policy at affected sites, which currently still exists.



**Figure 5-1: Comparison of CSO Inspections vs. Blocks Corrected**

### 5.2.2 Tide Gate Inspection and Maintenance Program

Eighty-nine (89) Tide gates are located and maintained at approximately half of the CSO regulator chambers in the City's system and prevent tidal inflow into the combined sewer system from the estuary receiving water body. The maintenance of the gates are critical to the performance of the system because inflow from the receiving water body can adversely affect the combined sewer system and treatment facilities by reducing system capacities thereby potentially causing dry weather discharges. For this reason, the Water Department is committed to visually inspect tide gates at least four to five times per month.

### 5.2.3 Grit Chamber Maintenance

The Water Department regularly monitors the grit levels to observe accumulation at certain combined sewer locations in order to prevent dry weather discharge. Crews often inspect and clean the bar screens at the upstream side of the inverted siphon, remove grit from the siphon grit pockets, and remove any other observed debris accumulation. Like tide gates, these chambers are critical to the performance of the system because they can also reduce system capacities if they aren't functioning properly.

#### Somerset Grit Chamber Cleanings

The Water Department regularly monitors the sediment accumulation in the grit trap at the origin of the Somerset Intercepting Sewer and in locations downstream to determine appropriate cleaning intervals for the grit trap and downstream interceptor. Driven by the Water Department's monitoring program, the grit basin is cleaned periodically and debris quantities tracked to further refine the frequency of cleaning necessary to maintain adequate capacity. The grit chamber is measured several times a month to monitor the amount of grit accumulating.

#### Central Schuylkill Pumping Station Grit Pocket Cleanings

Similarly, the Water Department performs specialized maintenance activities at the Central Schuylkill Pump Station. The grit chambers at the Central Schuylkill Pump Station are normally cleaned four times a year in order to ensure proper functionality of the site.

### 5.2.4 Maintenance of CSO Monitoring Network

The Water Department maintains an extensive monitoring network throughout the combined sewer system including rain gages, depth sensors, pump stations and metering chambers at connections from all adjacent outlying communities. This network provides data that is obtained at various increments (e.g. real-time, daily, weekly, etc.) and is transmitted to the Flow Control servers at intervals throughout the day to maximize sewer system performance. The monitoring network is crucial to ensuring proper sewer system operation, design, and planning. It is used to implement Water Department programs including those that support CSO control.

#### Sewer-System Monitoring Network

Maintaining the sewer system monitoring network is imperative to ensuring the information used to validate the Water Department's hydrologic and hydraulic models is accurate. The hydrologic and hydraulic models are used to verify that the collection system performs as designed. The Water Department continues to maintain a monitoring network of 283 permanent sites, often used to measure flow and water level at regulating structures, hydraulic control points, and interceptors. A large subset of these sites are at points of connection from suburban customers along the perimeter of the City in order to determine the impact on our sewer system. The flow information is primarily used for hydrologic and hydraulic modeling purposes to plan and analyze alternatives for improvements to the sewer system, which often impacts the CSO control program. The Water Department also has a portable flow monitoring

program that can be installed in areas of interest such as infiltration and inflow studies, flooding analyses, and calibration of the City's hydrologic and hydraulic models of the collections system.

### **Other Hydrologic Monitoring Network**

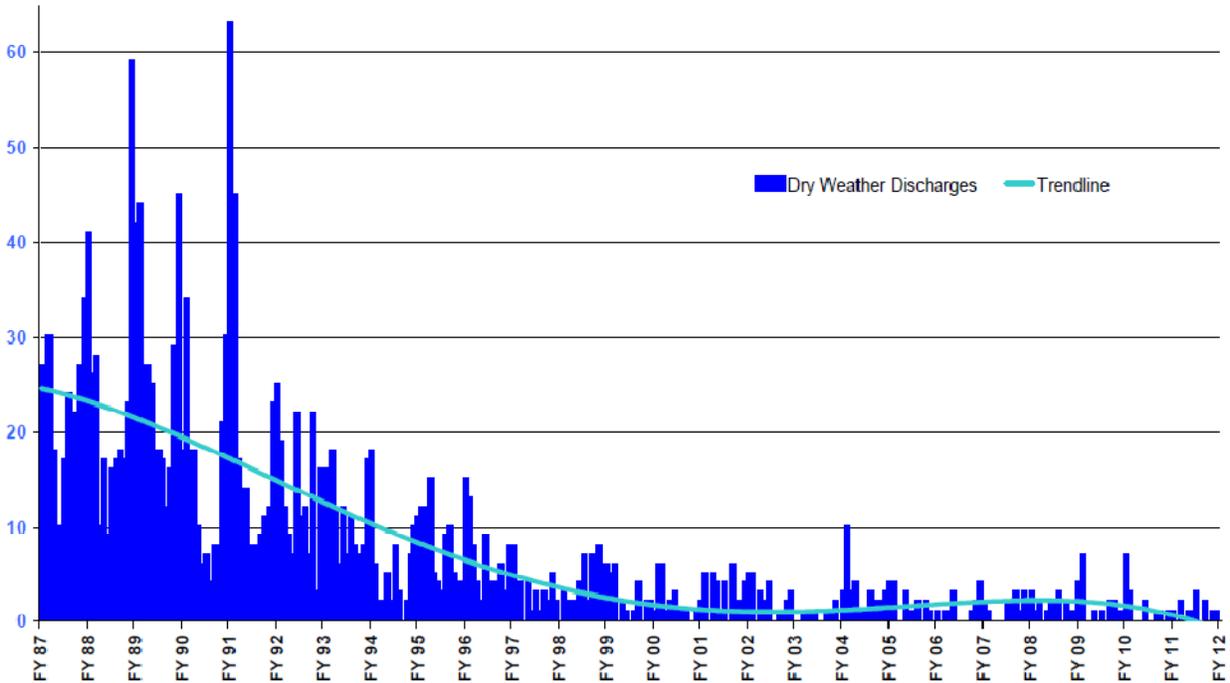
The Water Department maintains a network consisting of 35 tipping-bucket rain gages located throughout the City and surrounding areas that record rainfall depths. Monitoring activities and data collection at these gage sites are maintained under the *Comprehensive Monitoring Plan* and inform compliance with this Minimum Control. The Water Department rain gage network was established in 1990, and the data is reliable from 1990 – present. The raw 2.5-minute tipping-bucket rain gage data are extracted from a link to the Water Department Collector System's recording telemetry unit database which collects data directly via automatic telephone polling of the gages. This system was updated in 2010 to a TELOG system which uses cellular-based telemetry and improved enterprise data management software. Additional information regarding the rain gage network is available in Section 5 of the *Comprehensive Monitoring Plan*.

### **5.2.5 Random Overflows**

The Water Department tracks random overflows or discharges that occur within the sewer system. These discharges usually occur as a result of clogging by unusual debris in the sewer, structural failure of the regulator, or hydraulic overloading by an unusual discharge of flow by a sewer system user. These dry weather discharges are promptly eliminated by cleaning, repair, and/or identification and elimination of any excessive flow and/or debris sources. When possible, the Water Department investigates the reason for these discharges and researches methods to prevent future overflows from occurring. The occurrence of these overflows and other discharges are monitored frequently and reported in several reports which is described in detail in Section 9 of this report which discusses the Water Department's implementation of Minimum Control No. 9 – Monitoring of CSO impacts and Efficacy of CSO control.

## **5.3 Declines in Dry Weather Discharges**

The Water Department has observed a noticeable decline in dry weather discharges over the past 25 years (Figure 5-2). This decline is demonstrative of the progress that the Water Department's initiatives and programs to improve the City's sewer system have made in reducing the frequency of dry weather discharges. The maintenance of the City's CSO regulators, storm relief chambers, tide gates, grit chambers and monitoring network are the reason for this decline and are essential to continued success. Other control measures contributing to this success are discussed throughout this report, such as maximizing the use of our collection system (Sections 2 & 4) and promoting pollution prevention (Section 7). Although progress has been achieved, the Water Department will strive to further reduce dry weather discharges through continued evaluation of potential improvements.



**Figure 5-2: PWD Dry Weather Discharges Over Years**

# Section 6

## Minimum Control No. 6

### Control of the Discharge of Solids and Floatables in CSOs

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The control of floatables and solids in combined sewer overflow (CSO) discharges addresses aesthetic quality concerns of the receiving waters. The ultimate goal of Minimum Control No. 6 is, where feasible, to reduce if not eliminate, by relatively simple means, the discharge of floatables and coarse solids from CSOs to the receiving waters. The effectiveness of the minimum controls and the evaluation of the potential need for other methods to more effectively control the discharge of solids and floatables from CSOs were addressed in the Long Term Control Plan, and in the continuing planning process as documented each year in the Combined Sewer Management Program Annual Report found within the CSO NPDES Permits. The Long Term Control Plan and the associated updates have addressed the need to control the discharge of solids and floatables, the degrees of control that are necessary, and identified the controls required to address floatables and solids in the receiving waters.

The NPDES permits in Philadelphia require the Philadelphia Water Department (Water Department) to acknowledge and consider the available methods for solids and floatables control. There are various technologies that can be used to control solids and floatables entering the receiving waters from CSOs. These technologies range from simple devices that remove the material from the CSO flow stream to devices that remove the floatables from the receiving water after they are discharged. Control practices also include efforts to prevent the extraneous solids and floatables from entering the combined sewer system. The methods utilized by the Water Department to address floatables and solids are described in this section.

In addition, this section summarizes the environmental sensitivity analysis conducted on the area receiving waters and their directly adjacent lands. The sensitive area analysis was performed as part of the Long Term Control Plan Update (LTCPU) and documented in detail in Appendix E of the Consent Order and Agreement (COA).

#### 6.1 Status of Floatables and Solids Control Measures

Floatables and solids control measures consist of non-structural and structural technologies. Non-structural technologies include combined sewer system maintenance procedures such as sewer flushing, street sweeping, and inlet cleaning. Public education, land use planning and zoning, and ordinances are also considered non-structural technologies implemented to reduce solids and floatables entering the combined sewer system. These technologies are included as part of the Pollution Prevention Program Section (Minimum Control No. 7), and therefore will not be discussed further in this Section.

Structural controls typically consist of abatement devices constructed near the point of discharge. Technologies used to for removing solids and floatables from CSOs include:

- Inlet Cleaning
- Outfall Debris Grills
- Waterways Restoration Team Efforts
- Floatables Removal Vessels

These controls and their application in Philadelphia are described in this section.

### 6.1.1 Inlet Cleaning

The Water Department's principal method to minimize the potential discharge of solids and floatables is its Inlet Cleaning program. Philadelphia reports that most of the City's approximately 74,000 inlets basins currently connected to the sewer system are trapped inlets that effectively prevent litter, debris and floatables from being carried through the sewer system either to the treatment plants or to a discharge point in the receiving waters. The Inlet Cleaning Unit's primary responsibility is the inspection and cleaning of active stormwater inlets within the City. This number is lower than what was reported in the 1995 document *CSO Documentation: Implementation of Nine Minimum Controls* due to the consolidation of older inlets. This unit is also charged with the responsibility for the following areas:

- retrieving and installing inlet covers,
- installing original replacement covers that are missing,
- installing locking covers,
- unclogging choked inlet traps and outlet pipes so that inlets can take water,
- alleviating flooded streets and intersections.

Specialized inlet cleaning equipment is used to ensure the efficient and effective operation of the City's inlets and connecting stormwater sewers, and cooperation between various Water Department units, other government agencies, and the private sector is necessary.

The most recent reporting year for the City showed 92,037 inlets were inspected and 81,239 inlets were cleaned. The average amount of debris removed from each cleaned inlet was 297.3lbs.

### 6.1.2 Repair and Rehabilitation of Outfall Debris Grills

Debris grills are maintained regularly at sites where the tide introduces large floating debris into the outfall conduit. This debris can then become lodged in a tide gate thus causing sewer inflow to occur. Additionally, these debris grills provide entry restriction and some degree of floatables control. The most recent reporting year for the entire City indicated 28 debris grill inspections and cleanings were completed.

### **6.1.3 Waterways Restoration Team**

The Water Department's Waterways Restoration Team is a multi-crew staff dedicated to removing large trash – cars, shopping carts, and other short dumped debris - from the 100 miles of stream systems that define the City's neighborhoods. The Waterways Restoration Team performs in-stream cleanup work throughout the City, including the Cobbs and Tacony Creeks within the combined sewer area. The most recent reporting year for the entire City documented the Waterways Restoration Team's removal of 741 tons of debris, including 14 vehicles, 1,256 tires and 50 shopping carts from the City's waterways.

### **6.1.4 Operation and Maintenance of Floatables Removal Vessels**

#### **Skimming Vessel**

The Water Department operates and maintains a large skimming vessel to perform general debris collection and removal on the tidal portions of the Delaware and Schuylkill Rivers. The vessel is a 39-ft, front loading, single hull, shallow draft, debris skimming vessel with a hydraulically controlled grated bucket and a 5.6 cubic yard on-board capacity, which was purchased as part of the CSO Control Program. The vessel operates approximately five days per week, 8 months of the year. The vessel's main purpose is to maneuver throughout the tidal portions of the rivers and skim floating debris onto the deck of the vessel for removal from the receiving water. The vessel is also used to clean up for public relations events like the Schuylkill Regatta, where it is then put on display for public viewing. During the most recent reporting year the skimming vessel collected 36.12 tons of debris.

#### **Pontoon Boat**

The Water Department also operates and maintains a pontoon vessel that is used on the Upper Schuylkill, Lower Schuylkill, and Delaware Rivers within Philadelphia to retrieve floating trash and debris from the waterways within the service area. The debris is hand netted from the water surface by employees standing on the vessel deck. The hand nets are emptied into ten 44-gallon debris containers on the deck and the containers are offloaded by hand. The pontoon vessel can be utilized in the tight spaces found in marinas, among piers, and in near shore areas. During the most recent reporting year the pontoon boat removed a total of 4.1 cubic yards of recyclable material, including bottles, plastic and paper, and 2.9 cubic yards of mixed trash.

## **6.2 Application of Sensitive Area Criteria to City of Philadelphia Combined Sewer Overflow Receiving Waters**

As explained in the LTCPU, no portions of the City's CSO receiving waters meet the National CSO Control Policy's definition of sensitive areas. It is the Water Department's position that the City's CSO receiving waters should be regarded with no single geographic area more sensitive than another. The Water Department's program treats all waterways as equally important and equally sensitive to discharges. Therefore the goal of the CSO control program is to reduce pollutant loading from CSOs to provide equal protection for all the waterways. Complete documentation of the City of Philadelphia's application of the sensitive area criteria is located in Document #6 of Appendix E of the COA with the Pennsylvania Department of Environmental Protection, Supplemental Documentation in support of the City of Philadelphia's CSO LTCPU.

# Section 7

## Minimum Control No. 7

### Pollution Prevention Programs

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#### 7.1 General

Minimum Control Measure No. 7 - Pollution Prevention, is intended to keep contaminants from entering the combined sewer system and thus receiving waters via combined sewer overflows (CSOs). Pollution prevention programs can help to reduce the amount of contaminants and floatables that enter the combined sewer system. Such measures include street sweeping, catch basin cleaning, litter control, public education, and more. Philadelphia has implemented a number of pollution prevention programs and established City ordinances that address these concerns. This section presents an overview of the City's existing pollution prevention methods.

#### 7.2 Existing Programs and Ordinances

Most of the City ordinances related to this minimum control are housekeeping practices that help to prohibit litter and debris from actually being deposited on the streets and within the watershed area. These include litter control, hazardous waste collection, illegal dumping policies and enforcement, bulk refuse disposal practices, and recycling programs. If these pollutant parameters eventually accumulate within the watershed, the City administers a street sweeping program and practices regular maintenance of catch basins to reduce the amount of pollutants entering the combined system and ultimately, the receiving water.

##### 7.2.1 Litter Control

The City of Philadelphia has comprehensive ordinances and prevention programs regarding litter control. Their specifications and requirements are outlined in Title 10, Chapter 700 of the Philadelphia Code. These efforts educate the public on proper litter disposal into trash receptacles, controls on handbills and posters, and requirements for maintenance of private property to avoid unsightly conditions.

##### 7.2.1.1 Preventative Litter Control Initiatives

###### BigBelly™ Program

To assist in litter control, the City placed trash containers where the greatest accumulation of litter occurs: the downtown area and at most public parks. However, it became evident that at some locations, the trash containers were filling up quickly and often overflowed. Furthermore, recyclable items were mixed in with the regular waste due to the lack of separate receptacles. To address this issue, the City investigated potential solutions, eventually deciding on the BigBelly™ program. BigBelly™ trash bins are solar-powered trash compactors that take up no

more sidewalk space than a regular outdoor trash container, but automatically compact the trash as it is thrown in, giving them more capacity.

In 2008, the City installed 470 BigBelly™ trash bins in Center City. The conversion from wire baskets to BigBellies reduced the required amount of collections and crews to maintain street trash containers. In 2009 and 2010, with funding from both the state and the City's Commerce Department, 220 additional BigBelly™ units were installed. Of these additions, 100 were equipped with recycling bins. By the end of 2011, 900 of the City's solar-powered trash bins were standalone units located beyond Center City, located at street corners of surrounding neighborhoods.

### **UnLitter Us Campaign**

The City has long realized that litter-free neighborhood streets are very much a function of attitude and behavior. In an attempt to rid the City of litter, the Philadelphia Streets Department has implemented a public service campaign called "UnLitter Us". This campaign uses social media services like Facebook, Twitter, YouTube, and the radio to invigorate and educate Philadelphia residents on the importance of not littering in order to keep the City clean. The slogan "You. Your Block. Your City." reinforces that one person can make all the difference in ensuring the cleanliness of their block and spreading the word about this campaign. This program informs interested persons by providing educational material and holding events to promote the environmental movement. Members of UnLitter Us have been asked to pledge "I love where I live and I know litter has no place here. I pledge to learn more about what litter is, to help do away with it, and to ask my friends and family to join the movement for a litter free Philly." The campaign has also utilized the creativity of some of the City's most gifted poets to express their outrage over litter and their dream of seeing it stopped. YouTube videos of their messages can be found on the campaign's Facebook and Twitter pages, as well as the Philadelphia Streets Department website.

### **Keep Philadelphia Beautiful Campaign**

The Keep Philadelphia Beautiful Campaign assists communities in the improvement of neighborhood environments through litter prevention, beautification projects, and waste reduction. It's core element, the "Litter Free School Zone" program, educates Philadelphia's youth on the benefits of waste management and the reduce-reuse-recycle philosophy. The campaign partners with other anti-litter initiatives to inform youth and adults on how to maintain a clean city, reduce waste, and how their actions affect the way their school, block, and City look.

## 7.2.1.2 Maintenance-Related Litter Control Initiatives

### Weekly Curbside Pickup

Residential trash and recycling is collected curbside weekly but can also be dropped off at the City's three Sanitation Convenience Centers. Residential waste is separated into three categories: collectible trash, yard waste, and oversized items. Yard waste can be placed into trash receptacles and plastic bags and collected with residential trash, except during leaf season when it must be bagged separately in special biodegradable bags. Oversized items, such as refrigerators, washers, and dryers, must be taken to a Sanitation Convenience Center. However, two items of furniture per week can be collected curbside. Recyclables are also collected curbside, and the City has various recycling programs in place to encourage residents to recycle everything they can. These programs are discussed further this section.

### Philly Bagged Leaf Drive

During November and early December, the Philadelphia Streets Department hosts a Bagged Leaf Drive where, in addition to the regular weekly curbside pickup, curbside collection of bagged leaves is conducted throughout the entire City. Bagged leaves can also be dropped off at any of the three Sanitation Convenience Centers during this time. The leaves must be collected in biodegradable paper bag which can be purchased at nearby grocery stores and major home improvement retailers. The leaves and bags will be recycled and used for composting purposes like fertilizing gardens and nourishing trees. The use of the biodegradable paper bags reduces contamination in the recycling process, and allows crews to easily identify bags of leaves. Leaves set out in other bags or containers may be collected as rubbish. The collection and recycling of leaves helps reduce the amount of debris on streets and sidewalks, and conserves landfill space.

### Christmas Tree Recycling

Every January the Philadelphia Streets Department holds a two week event where bare, undecorated Christmas trees are collected during weekly curbside trash & recycling pickup. The trees collected curbside are composted or turned into mulch. Trees can also be dropped off at any of the City's three Sanitation Convenience Centers. In addition to the official services provided by the Philadelphia Streets Department, other community organizations across the City offer tree-cycling services. The tree collections reduce waste following the holiday season, and allow Christmas trees to be re-purposed instead of taking up space in landfills.

### Philly Spring Cleanup

Since 2007, the City of Philadelphia has implemented a city-wide volunteer campaign every spring to spruce up streets and parks. Dubbed "Philly Spring Cleanup", the campaign distributes supplies (trash bags, rakes, paint, gloves, brooms, and recycle bins) and enlists volunteers to assist with beautification projects and litter reduction. The Cleanup program also provides additional support to projects by assisting with planning, directing volunteers to organized sites, and collecting trash and recyclables at the conclusion of projects.

### **Circular Free Program**

Philadelphia residents or businesses that do not wish to receive hand delivered advertising circulars or handbills at their property can fill out a form for a “Circular Non-Delivery” decal to notify advertisement distributors to refrain from delivering advertisements to their property. Per Chapter 10-700 of the Philadelphia Code, the Department of Licenses and Inspections maintains a commercial handbill “Non-Delivery” list identifying all properties whose owners request non-delivery. If the property continues to receive circulars or advertisements from businesses, they can contact Department of Licenses and Inspections to fine violators. This helps prevent litter across the City by limiting the number of unwanted circulars from ending up in the street.

### **7.2.2 Recycling Programs**

Without city-wide recycling programs, plastic bottles and aluminum cans are tossed into regular trash receptacles or on the ground, eventually ending up in catch basins. To combat this, the City of Philadelphia has implemented a single stream curbside recycling program as outlined in Title 25 of the Pennsylvania Code, subchapter E regarding the requirements of municipal recycling programs. The program accepts glass, metal, most household plastic containers (including tops and lids of cans and bottles), cardboard, mixed paper, newspapers, cartons, and more. In addition, many other forms of recyclable materials not eligible to be collected curbside are collected at the City’s three Sanitation Convenience Centers, a large network of commercial recycling centers, and community recycling centers. The full list of acceptable recyclables can be found at: <http://www.philadelphiastreet.com/recycling-full-how-to.aspx>.

### **Recycling Rewards Program**

The City of Philadelphia partnered with Recyclebank to educate residents about more sustainable practices and provide incentives for recycling. Residents who enroll in the program can earn points that can be redeemed for discounts on groceries, entertainment, and gift cards. In order to participate, City residents must sign up for an account through Recyclebank’s website. They then receive a sticker for their recycling bin that has a unique barcode that is scanned each time their curbside recycling is collected and points are deposited into the resident’s account. The amount of points earned through recycling varies on the amount of recyclables the entire neighborhood produces such that there is an incentive to encourage other neighbors to recycle. Points can also be earned through educational activities available on Recyclebank’s website. The program is offered to over 540,000 City residents and recently received the Outstanding Award in Public/Private Partnerships from the United States Conference of Mayors.

### **“Styrofoam” Foam Pilot Program**

In November of 2011, the City of Philadelphia and the Philadelphia Streets Department launched a polystyrene foam (#6) recycling pilot program. The free program allows residents and businesses to recycle clean foam #6 cups and many other commonly used #6 foam consumer materials at the City’s Northeast Sanitation Convenience Center. Commonly referred

to as “Styrofoam”, a registered trademark of the Dow Chemical Company, foam #6 is a recyclable product that is used in a wide range of consumer products, such as cups, foodservice containers, plates, egg cartons and large molded blocks used to package electronics.

### **7.2.3 Hazardous Wastes/ Bulk & Oversized Disposal / Illegal Dumping**

Hazardous materials and wastes, when not properly disposed, can infiltrate the City’s sewer system and affect the cleanliness of waterways. Similarly, illegal dumping of any material is extremely harmful to the environment. The City of Philadelphia has developed methods for the proper disposal of unsafe and unwanted materials that significantly reduce or eliminate environmental damage.

#### **Hazardous Waste**

Handling and disposing of hazardous waste materials requires a special set of regulations due to the potential damage they can cause to people, pets, and the environment. Pennsylvania residents must follow the requirements for household hazardous waste disposal outlined in Title 25 of the Pennsylvania Code, subchapter F. In Philadelphia, if hazardous waste is present in the sewer system it is generally the result of illegal dumping of household and industrial waste or improper disposal of hazardous waste by flushing waste down a drain. In order to prevent illegal and improper disposal, Philadelphia has a program that collects hazardous waste at specified sites on advertised days. Household hazardous waste drop-off events are held seven times a year at selected locations throughout the City. The events have been very successful at collecting hazardous materials that may have otherwise been incorrectly disposed of. Since fiscal year 2004, over 2,223,637 lbs of household hazardous waste that since fiscal year 2004 over 1,675,387 lbs of televisions and computer equipment have been collected from 33,605 Philadelphians. More information regarding household hazardous waste disposal can be accessed at: <http://www.philadelphiastreet.com/hazardous-waste.aspx>

#### **Bulk and Oversized Disposal**

Inappropriate disposal of bulk or oversized items can also be a source of pollutants within the City. In order to prevent illegal disposal of these items, Philadelphia residents can set out compactable furniture, such as sofas, mattresses, box springs etc., for collection at curbside, up to two items per week. Residents may bring all other bulk or oversized items, such as metal oversized items, appliances, and tires, (limit of two oversized items and four tires) to one of the City’s three Sanitation Convenience Centers.

#### **Illegal Dumping**

Illegal dumping is a serious offense in Philadelphia. The City has strict illegal dumping regulations that prohibit the disposal of items at any location except by approved methods. Illegal dumping policies are regularly enforced by several City agencies, including the Philadelphia Streets, Police, Parks, Health, and Fire Departments. Penalties can be very severe, with fines of up to \$10,000, possible vehicle confiscation, and imprisonment of up to five years being potential consequences. If illegal dumping occurs, a City-wide Cleaning Unit uses a short dump crew to clean affected public areas. Residents can find information on how to report

illegal dumping at: <http://www.philadelphiastreet.com/san-residential-oversized-items-and-dumping.aspx>

### 7.2.4 Street Cleaning

Street cleaning prevents litter, debris, and sand deposited on city streets from entering catch basins and the combined sewer system.

#### Street Sweeping and Cleaning

The City's street cleaning program consists of routine cleaning of major commercial corridors. In addition, street and sidewalk cleaning is supplemented in higher trafficked areas by special service districts such as Center City District and University City District. Often these special service districts employ maintenance teams to operate street sweepers, manually sweep sidewalks, remove graffiti, and clear excessive weeds from sidewalks and tree wells.

Weekend residential clean-ups are scheduled regularly through community organizations and block captains. Brooms, shovels, and bags are distributed to assist residents in cleaning their sidewalks and streets. Special truck pickups from the Philadelphia Streets Department can be scheduled for these weekends.

#### SWEEP

SWEEP (Streets & Walkways Education and Enforcement Program) is a City program created to educate Philadelphia citizens about their responsibilities under the Sanitation Code. SWEEP enforces the law through intensified street patrols by uniformed litter enforcement officers, computerized tracking of code violation notices, and speedy adjudication of violations. Through education and enforcement, SWEEP supports and enhances individual and community efforts to maintain a clean City. Since keeping litter off the streets is less expensive than cleaning it up, this compliance program is also cost effective.

#### Philadelphia More Beautiful Committee

The Philadelphia More Beautiful Committee, part of the Philadelphia Streets Department's Sanitation Division, began in 1965 as part of the "Clean-Up, Paint-Up, Fix-Up" initiative. Over the years, the initiative has evolved into an urban environmental partnership between City government and approximately 6,500 Block Captains and their respective blocks. The Philadelphia More Beautiful Committee is an effective approach to combating neighborhood grime with organized block cleanings and has grown to be one of the largest volunteer organizations of its kind in the country.

Starting with a few hundred cleanups in the early years, cleaning and beautification activities have increased to over 9,000 each year. Over 90,000 volunteers, including Block Captains and their neighbors, community groups and their units, fill approximately 110,000 bags during their cleaning activities each year. The Philadelphia More Beautiful Committee Clean Block events occur on Saturdays multiple times per year. A full schedule of Clean Block events can be found at: <http://www.philadelphiastreet.com/pmbc-cleanup-schedule.aspx>

### **7.2.5 Inlet Cleaning**

As discussed in Section 6, the City of Philadelphia has a system of trapped storm sewer inlets or Catch basins. Trapped stormwater inlets, caused by pollution, must be maintained in order to prevent flooding. The Philadelphia Water Department (Water Department) also maintains all City-owned storm sewer inlets as part of its inlet cleaning program, removing pollution from the streets. Please refer to SECTION 6.1.1 *Inlet Cleaning* for more information on this topic.

### **7.2.6 Waterways Restoration Team Cleanups**

The Water Department's Waterways Restoration Team is a multi-crew force dedicated to removing large trash from the 100 miles of stream systems that define the City's neighborhoods. The Waterways Restoration Team performs regular cleanups of the City's streams to help improve water quality and reduce water pollution. The removal of debris from the streams limits the amount of pollution entering the major waterways that provide drinking water for the City of Philadelphia. For more information on the Waterways Restoration Team, please refer to SECTION 6.1.3 Waterways Restoration Team.

## **7.3 Existing Public Information and Education Programs**

Educating the public about CSOs and their harmful impact on receiving waters can significantly reduce the amount of pollutants and floatables able to enter waterways. When people are informed about the issues pollutants and floatables can cause, they are empowered to make small behavior changes to assist in prevention efforts. Public education programs can reduce the amount of litter and contaminants on the streets, and thereby reducing the amount of floatables and pollutants in the receiving waters. The Water Department has developed a proactive approach to employing public information and education programs as a method of reducing potential sources of runoff contaminants.

### **7.3.1 Public Outreach Program**

While developing the CSO Long Term Control Plan Update (LTCPU), the Water Department implemented an extensive CSO LTCPU Public Participation Program consisting of educational materials and public outreach events focused on the LTCPU. This program has evolved into the Green Stormwater Infrastructure Public Outreach and Participation Program. The goals of this program are to raise awareness of stormwater management and to increase public support for green stormwater infrastructure in impacted communities to help facilitate the successful implementation and maintenance of green stormwater infrastructure.

### CSO LTCPU Backgrounders

A series of three - eight page backgrounders were designed for a general audience and provided an introduction to the CSO LTCPU, along with the history, background, and approach taken by the Water Department to address CSOs. The backgrounders were distributed to partners, the CSO LTCPU advisory committee, and to the public at public meetings, public events, and through the Phillywatersheds.org website.

**Table 7-1: CSO LTCPU Backgrounders**

Backgrounder I	The CSO Long Term Control Plan – History & Background
Backgrounder II	The CSO Long Term Control Plan Update – Clean Water Benefits & The Balanced Approach
Backgrounder III	Current Status of Our Waterways

### CSO-related Bill Stuffers, Waterwheels and Other Publications

The Water Department has generated numerous publications including bill stuffers, newsletters, brochures, and other reports and documents regarding billing and environmental issues for many years. The bill stuffers and WaterWheel newsletters are mailed out with the water bill to the estimated half million Water Department customers. Several documents developed under the CSO LTCPU Public Participation Program were additionally distributed throughout the City with customer billing.

### Green City, Clean Waters Ambassadors

In the spring of 2012, the Water Department developed an educational training pilot program with its contractor, the Pennsylvania Environmental Council, designed to educate community leaders and others interested in greening their neighborhoods, arming them with the best resources and latest information to help strengthen connections between communities and the Water Department. The Water Department aims to merge and evolve the Adoption program into the Ambassadors program in the coming years.

### Green Stormwater Infrastructure Notification & Outreach Process for Green Programs

Public outreach that helps increase public acceptance and buy in of green stormwater infrastructure projects should occur at every phase, from site identification to design and from construction to post – construction. The Water Department's notification process involves multiple layers and will evolve as its green programs grow. Tasks vary per green program, but they may include outreach to property owners and site users; meetings with partners and presentations at community meetings and events; solicitation of design feedback (at times); coordination of public education and resources (i.e., environmental education curriculum in classroom or during after care at recreation center); event planning for ribbon-cuttings (for select sites); partnership development with users of the site, civics and other partners; coordination for adoption opportunities and more.

These initiatives specifically support the following Water Department programs and projects:

- Green Streets
- Green Parks and Vacant Lands
- Green Parking
- Green Schools
- Green Campus
- Green Public Facilities
- Green Industry, Business, Commerce and Institutions
- Stormwater Management Enhancement Districts/Signature Projects
- *Community Input Form*
- 21st Century Pennsylvania Horticultural Society contract
- Green 2015

### **Stormwater Art**

The Water Department works with local artists on various artistic mediums that can help interpret *Green City, Clean Waters* through art in an effort to raise awareness about green stormwater infrastructure. Example projects include yarn bombing (temporary knitted yarn art) of stormwater tree trenches; rain barrel wrap designs created by local students; Soak It Up design workshops with artist, Stacy Levy; signature art projects at gateways and/or model sites; inlet art; calendar art contests, etc.

Furthermore, the Water Department is interested in branding green stormwater infrastructure or nearby sites (such as street furniture) with a symbol that is an identifiable feature to unify and distinguish all green stormwater infrastructure projects throughout the City. Through branding the public may better recognize the Water Department's green investments.

### **Green City, Clean Waters Signage**

The Water Department is currently developing interpretive signage and plans to install the signage at select green stormwater infrastructure locations. A variety of sign types have been fabricated. Currently, public feedback is being collected on the test signage as the feedback will inform the final design.

### **Green Stormwater Infrastructure Partnerships & Advisory Committees**

The Water Department has a variety of existing partners and strives to create new partnerships to ensure coordination, to keep partners up to date and to obtain feedback from stakeholders to inform the development of future public participation programs. Partners range from inter-agency representatives and environmental advocates to civic representatives and non-profit leaders. Meetings tend to be held on an as needed basis. Sample partnerships and advisory committees include: *Green City, Clean Waters Advisory Committee*; *Green City, Clean Waters EPA Education & Outreach Working Group*; and the *Green Homes Advisory Committee*, among others.

### 7.3.2 Websites

#### **Phillywatersheds.org**

Phillywatersheds.org is an important Water Department website, which acts as a hub for all of the Water Department-related watershed-based programs and partnership information. The website describes what the Water Department is doing for the watersheds of Philadelphia including information on CSOs. It offers educational tools, public meeting materials, maps, and copies of the reports generated by the Water Department or its partners. The website provides information to public on what issues are currently problematic for the City's watersheds, how these issues are being addressed, and what citizens of Philadelphia can do to help improve watershed health.

One of the most exciting features of the website is interactive mapping, which allows the viewer to learn about what's going on in their own watershed. Maps are available for green stormwater infrastructure projects, traditional infrastructure projects, waterways restoration projects, community partnership projects and for each of the seven major watersheds within Philadelphia. The website also has a section for the community to get involved and benefit from what the City is doing, including tips on how to manage stormwater, information on public events, and an input form to submit project ideas. In May of 2011, a blog was added to the site to increase public awareness of the City's projects, events and announcements. Updated regularly, the blog (<http://www.phillywatersheds.org/blog>) also covers watershed-wide news and issues, ranging from educational topics to partner events.

Additionally, the website houses the CSO Public Notification System, known as CSOcast, which is discussed in further detail in Section 8.

#### **RiverCast-[www.phillyrivercast.org](http://www.phillyrivercast.org)**

RiverCast is the first operable web-based recreational warning system in the United States. Using real-time flow, precipitation, and turbidity data, RiverCast predicts bacteria levels within a section of the Schuylkill River heavily used by the public for swimming, rowing, and boating. RiverCast translates the predicted bacteria levels into one of three ratings, each of which corresponds to suggested guidelines for recreation. High bacteria levels, for example, translate to a "red" rating, in which RiverCast advises that the water quality may not be suitable for any contact with the river. RiverCast guidelines offer tools for the public to make informed decisions about recreation, and thus help protect the public against water-borne illnesses. RiverCast ensures continued safe recreational use of the Schuylkill River, while promoting public awareness of water quality concerns and indirectly engaging support for source water protection measures. Over 475,000 users have visited RiverCast since it was first released in June 2005.

#### **Schuylkill Action Network - [www.schuylkillwaters.org](http://www.schuylkillwaters.org)**

Philadelphia is the farthest downstream city along the Schuylkill River, a source of drinking water for Philadelphia residents. The Schuylkill Action Network website supports the Schuylkill Action Network's Stormwater Workgroup including providing information about projects, events, and publications and a public component that conveys the Schuylkill Action Network's

message about protecting and improving the Schuylkill River to outside audiences. The Schuylkill Action Network Stormwater Workgroup is a network of members who strive to identify cost-effective approaches to stormwater management through project prioritization and planning. The workgroup has implemented best stormwater management practices at many priority lands while raising several hundred thousand dollars of additional funds for continued action on priority lands. One of the key tasks of the Schuylkill Action Network Stormwater Workgroup has been to collaboratively address stormwater issues by targeting municipalities located in Berks, Montgomery and Chester counties – areas with significantly impaired streams due to stormwater. The workgroup assisted these municipalities in adopting consistent stormwater ordinances, developing Environmental Advisory Committees and conducting other activities beyond what is required under current regulations.

#### **Delaware Valley Early Warning System - [www.DelawareValleyEWS.org](http://www.DelawareValleyEWS.org)**

The Delaware Valley Early Warning System is an integrated monitoring, notification, and communication system designed to provide advanced warning of surface water contamination events in the Schuylkill and Lower Delaware River Watersheds. The notification system is a powerful tool that allows a person to initiate emergency notifications to multiple recipients through a single call or through the Early Warning System website. It is a communication and notification system that emergency response personnel and water suppliers can use to share information about source water contamination events. It also provides access to water quality data throughout the watershed, thus alerting water suppliers to a change in water quality long before it reaches their intake. The Early Warning System water quality monitoring network collects continuous water quality data from select drinking water intakes along the main stem Delaware River and transmits that information to the Early Warning System server, thus making it available to the Early Warning System participants via the website. Dischargers are encouraged (preferably required) to use the Early Warning System to make downstream notifications of overflows, spills and accidental discharges. The Delaware Valley Early Warning System has reduced the time in which water suppliers become aware of and react to water quality events of all kinds.

#### **Stormwater Billing - [http://www.phila.gov/water/stormwater\\_billing.html](http://www.phila.gov/water/stormwater_billing.html)**

The Water Department has a stormwater billing website to help non-residential properties determine the cost of their bill based on the new stormwater billing charges, which is determined by the amount of impervious surface on a property. This information can help property owners reduce the amount storm water entering the sewer system, thereby reducing the possible occurrence of CSOs.

### **Philadelphia Water Department Plan Review Website -**

<http://www.pwdplanreview.org>

The Water Department's Plan Review Group has a website for guidance in the Philadelphia Stormwater Management regulations, understand the review process and submit stormwater management plan applications for review. The information conducted by this Group greatly affects how stormwater gets managed on non-residential properties in the City, which can affect the capacity of our sewer systems thereby indirectly affecting occurrences of CSOs and preventing pollution that may be contained within the stormwater.

### **Phila.gov/Water**

The main website for the Water Department can be accessed at <http://www.phila.gov/water>. Many aspects of the Water Department can be accessed through this website, including the Water Department's mission, regulations, water quality reports, stormwater information, important news, and much more. The information provided on this website can help educate users about what the Water Department is doing to improve water quality and distribution, and provide useful contact information to report water-related emergencies. Within the subsections of this website, information conducted by the Water Department's Industrial Waste Unit on efforts on pretreatment program is provided.

### **Philadelphia Water Department on Social Media**

Social Media has become a very useful tool to pollution prevention, helping to spread information about the Water Department programs that are improving the City. The Water Department maintains two Facebook pages to keep residents informed on any news and events at or hosted by the department. These pages can be accessed at:

<http://www.facebook.com/PhillyH2O> and <http://www.facebook.com/phillywatershed>

The Water Department also has a Twitter account, providing helpful hints, resolving customer complaints and providing news concerning the department and water in general. The page can be found at: <https://twitter.com/PhillyH2O>, and one can follow the account at @PhillyH2O.

### **Philadelphia Water Department Videos**

The Water Department hosts videos on Vimeo and YouTube which provide information and news on its programs and vision for Philadelphia. The videos can be access at the following link:

- <http://www.vimeo.com/phillywatersheds>
- <http://www.youtube.com/pwdepartment>

## **7.3.3 Public Outreach and Participation Programs**

Public outreach and public participation programs provide the public with stormwater education, notification of projects and opportunities to experience green stormwater infrastructure so that the public can use that knowledge to help implement stormwater management on their properties and in their communities.

### **Fairmount Water Works Interpretive Center**

The Fairmount Water Works Interpretive Center is the Water Department's renowned environmental education center located on the banks of the Schuylkill River in Philadelphia. The Center tells the story of the Schuylkill River and its human connections throughout history. Interactive exhibits and innovative educational programs meld history, technology, and science to explain the many issues facing the region's urban watersheds. Since opening its doors in October of 2003, the Fairmount Water Works Interpretive Center has had over 280,000 visitors tour the center, participate in its programs, and sign up for educational events and online updates. The Fairmount Water Works Interpretive Center provides visitors with the opportunity to learn how their actions can have an effect on the waterways, and encourages pollution prevention. More information on the Center can be found at:

<http://www.fairmountwaterworks.org>

### **Rain Check Pilot Program**

Rain Check is a pilot program, started by the Water Department, to assist local residents install landscape improvements that manage stormwater runoff. Through this program, the Water Department offers free stormwater property assessments and shares in the cost of the implementation of one of five stormwater management practices on a participants' property. The five green tools include downspout planters, rain gardens, pavement removal, porous paving and yard trees. This program is an opportunity for residents to participate in greening the City and to install landscape improvements at a fraction of typical costs. By managing stormwater runoff at home with the Green Tools offered through Rain Check, (including rain gardens, downspout planters, de-paving, porous pavers and yard trees) every resident can make a difference in helping to protect the health of our waterways. During the current pilot phase, about 250 participants from 11 different neighborhoods across the City are participating. More information on the program can be found at the following site:

[http://www.phillywatersheds.org/whats\\_in\\_it\\_for\\_you/residents/raincheck](http://www.phillywatersheds.org/whats_in_it_for_you/residents/raincheck).

### **Green Homes Technical Evaluation and Improvement**

The Water Department is piloting, monitoring and evaluating residential green tools and tracking technology improvements for these tools.

#### **Downspout Planter Technology Improvements**

The Water Department works with Shift Design on fabricating a stormwater downspout planter starter kit, stormwater downspout planter that could be prefabricated and modular, that maximizes the stormwater storage capacity and controls the drain down. The goal was to create a downspout planter that is aesthetically appealing to homeowners and has a "do-it-yourself" assembly style. A prototype has been designed and is being piloted through the Rain Check program.

#### **Philadelphia Water Department Facility Residential Pilot Projects**

Installation, inspection, maintenance, and evaluation of downspout planters and other pilot residential tools are conducted at Water Department facilities. This project also

provides an opportunity to strengthen communication between Water Department employees at the facilities and the Center City staff.

### **Rain Barrel Program**

The Water Department implemented a Rain Barrel program to educate the public about stormwater and how it takes up capacity in the sewer system which contributes to the occurrences of CSOs. Rain barrels create de-centralized storage which helps create more capacity in the sewer system and also gives the property owner access to this water for their own use such as plant watering and car washing. Since the start of this program, 2,766 rain barrels have been distributed and installed throughout Philadelphia by the Water Department or the program partner, the Energy Coordinating Agency. Rain barrels are offered free of charge to residents who participate in Water Department-sponsored rain barrel workshops, where they have the opportunity to learn about the benefits of managing stormwater runoff and techniques for rain barrel usage. To ensure proper installation, the rain barrels are installed by the Energy Coordinating Agency or their partners. Information on the Water Department's Rain Barrel program and upcoming workshops can be found at the following website:

[http://www.phillywatersheds.org/whats\\_in\\_it\\_for\\_you/residents/rainbarrel](http://www.phillywatersheds.org/whats_in_it_for_you/residents/rainbarrel)

### **Rebuilding Together Philadelphia**

The Water Department first worked with Rebuilding Together Philadelphia in October 2010 when over 100 volunteers spent a Saturday building and installing 20 downspout planters, 15 rain barrels and one rain garden in the Cobbs Creek neighborhood. Building off of this previous success, in 2012 new Rebuilding Together Philadelphia volunteers built and installed a total of 34 downspout planters in economically disadvantaged sections of West Oak Lane, Mantua, Germantown, Overbrook and Nicetown to encourage residents to “soak it up” in their Block Builds. These events include completing critical home repairs, adding energy efficient upgrades, and home modifications for multiple homeowners at a time. Exterior work, such as tree planting, sidewalk remediation and block cleanups, is also completed throughout the participating blocks to tie the residential projects together and to further galvanize the community to continue improvements.

### **Downspout Planter Block Builds**

Rebuilding Together Philadelphia has started a new program called Block Builds, which was created to improve the lives of homeowners in need with energy efficiency upgrades, repair projects, clean-ups, water conservation and other projects that improve the safety, security and value of their homes. Rebuilding Together Philadelphia is offering downspout planters and the installation of the planters free of charge during Block Builds.

### **Educational Green Stormwater Infrastructure Demonstration Projects**

The Water Department will continue to develop educational green stormwater infrastructure demonstration projects in partnership with other agencies and partners to provide high visibility educational experiences that raise awareness about green stormwater infrastructure and inspire residents to implement stormwater management projects on their properties and in their

communities, such as the green roof bus shelter at 15th and Market Street and the living wall that is currently underway at Independence Hall Park at 3rd and Chestnut. The Coastal Nonpoint Pollution program grant that the Water Department has been awarded annually funds the demonstration projects.

### **Infill: Soak It Up**

An 18-month partnership between the Water Department, the Community Design Collaborative and the U.S. Environmental Protection Agency (US EPA) focused on accelerating the adoption, adaptation and implementation of green stormwater management in Philadelphia. The initiative involved a series of design centered programs including exhibitions, workshops, and charrettes. This initiative also culminated in a national green stormwater infrastructure design competition that awarded the three winning teams with cash prizes. The designs responded to typical and complex stormwater management problems in a cost-effective manner.

### **Soak It Up Adoption**

A pilot program designed to support civic organizations interested in helping to monitor and care for Water Department green stormwater infrastructure in their neighborhoods. The program is funded by the Water Department and administered by the Pennsylvania Environmental Council in partnership with the Philadelphia Industrial Development Corporation. Civic associations and other interested non-profit community organizations can apply for small grants to become adoptees. Pilot phase grant recipients will be asked to participate in introductory training, monitor green stormwater infrastructure, collect trash and provide feedback about the site and their experience for one year. The Soak It Up adoption grant pilot program aims to go above and beyond the Water Department's routine maintenance program by engaging civic organizations in helping to ensure that their communities know about and care for green stormwater infrastructure, keeping the sites litter free and attractive.

## **7.3.4 Philadelphia Water Department and Partner Sponsor Events**

### **Philadelphia Watershed and Green Infrastructure Tours**

The Water Department and its partners offer tours several times a year to explore the natural history of a watershed to better understand the buried streams beneath us, or to visit model green stormwater infrastructure projects throughout the City and beyond. By recognizing and showcasing green stormwater infrastructure projects, the Water Department hopes to inspire others to replicate similar stormwater management projects. An on-line green tour alternative is underway. Features, such as podcasts and interactive mapping tools are also being explored for the on-line tour.

### **Philly FUN Fishing Fest**

In celebration of the improving water quality the Water Department and its partners, the Fish and Boat Commission, Philadelphia Parks and Recreation and the Schuylkill River Development Corporation, host the annual Philly FUN Fishing Fest on the banks of the Schuylkill River. The all-ages fishing festival is open to the public, no experience required. Prizes from various local sponsors are provided to the winners of various categories. Fishing instruction is provided by

volunteers, while fishing rods are on loan and bait is donated. The event does not require a fishing license and it is free of charge. The Fishing Fest is an effective means to educate the public on the improving water quality and aquatic resources the City offers.

### **PA Coast Day**

The Water Department, along with the Partnership for the Delaware Estuary and Pennsylvania Department of Environmental Protection Coastal Zone Management Program, sponsors an Annual Pennsylvania Coast Day that usually takes place in September of each year. This event provides the opportunity to increase awareness, educate the public, and promote the public's involvement in coastal issues. The event is designed to target families and youth, and encourages participation in all activities in order for attendees to gain the as much knowledge as possible about how their actions affect the waterways.

The event is advertised to every resident of Philadelphia through a flyer inside the monthly water bill. The flyer is also placed at nearby hotels, museums and various other public places to promote the day. The event is often held at Penn's Landing on the Delaware Riverfront. The event features face painting and crafts for kids, as well as free rides on the Delaware RiverLink Ferry. Furthermore, many attendees also get the chance to tour the Kalmar Nykel and Gazela ships. In addition to all of the activities taking place at Coast Day, many people also visit the neighboring Independence Seaport Museum and have access to a free shuttle to the Fairmount Water Works Interpretive Center.

### **Philadelphia Flower Show – Philadelphia Water Department Exhibit**

Every year, the Water Department has designed an exhibit at the International Philadelphia Flower Show. Though the theme of the flower show changes annually, the Water Department tries to incorporate elements such as green infrastructure techniques, water-saving techniques, and purifying techniques in every exhibit. In recent years, the exhibit includes sustainability practices to demonstrate how green infrastructure can beautify the City while managing stormwater runoff that pollutes our rivers and streams on an international level.

### **Green City, Clean Waters Art Contest**

The Partnership for the Delaware Estuary and the Water Department sponsor an art contest for Philadelphia public, private and home-schooled students, grades K-12, that usually takes place in January of each year. The theme was originally "Protect Philadelphia's Hidden Streams," but was changed to "Green City, Clean Waters." The contest initially was intended to help educate schoolchildren about stormwater runoff pollution, polluting Philadelphia's hidden, underground streams, the Schuylkill and Delaware Rivers, and the Delaware Bay. The contest still strives to educate schoolchildren about stormwater runoff pollution, but also provides City residents with information on how to protect waterways and about the Water Department's new initiatives. Students are asked to create an original piece of artwork that shows how Philadelphians can help prevent stormwater runoff pollution. Alternatively, participants can create an original 30-second video showcasing what pet waste does to our water and how pet owners can help by picking up after their pets. Winning artwork is used to promote pollution prevention messages

on Southeastern Pennsylvania Transportation Authority buses, and in a calendar. Along with the drawings, the calendar contains monthly tips to help prevent water pollution. Winning videos are posted on the Partnership for the Delaware Estuary YouTube channel, and can be accessed at: <http://www.youtube.com/user/DEESTUARY>

### **Delaware Estuary Watershed Workshop for Teachers**

An annual week-long Teacher Workshop is usually held in July of each year in conjunction with the Partnership for the Delaware Estuary, Delaware National Estuarine Research Reserve and the Water Department. Workshop activities typically involve:

- a boat trip along the St. Jones River,
- visiting water quality best management practices,
- performing chemical, physical and biological analysis in fresh and estuarine waters,
- discovering wetlands,
- dissecting oysters,
- learning about local climate change impacts.

The Water Department takes the teachers on tours of the Fairmount Water Works Interpretive Center, multiple green stormwater infrastructure locations, and Southeast Water Pollution Control Plant. This segment of the teacher workshop provides the participants with crucial information on non-point source pollution, the local waterways role as a source of their drinking water, and the process undergone to return the water to an acceptable condition. The workshop provides an opportunity for educators to receive free educational and classroom materials to teach students about the importance of watershed maintenance and pollution prevention. For more information on the teachers' workshop visit:

[http://www.delawareestuary.org/acivities\\_teachers\\_watershed\\_workshop.asp](http://www.delawareestuary.org/acivities_teachers_watershed_workshop.asp).

### **Urban Watersheds Revitalization Conference**

Since 2005, the Water Department, along with its partners, has hosted a bi-annual conference titled the Urban Watersheds Revitalization Conference. The event gives the Water Department an opportunity to explore current watershed-related themes that are relevant to the City of Philadelphia and the suburban communities that drain to the City. It also gives a chance for attendees to gain insight into the experiences of Water Department customers as they join the Water Department in "going green," which includes sustainability efforts, pollution prevention, and community cleanups. The conference is held at different locations and it targets the urban and suburban communities in southeastern Pennsylvania. The audience is diverse – comprised of local planners, engineers, municipal representatives, community activists, among others. The event is offered at a nominal fee or free of charge.

### **Community Meetings**

The Water Department participates in community meetings to discuss planned projects with various neighborhoods in the City. These meetings allow the department to gain community input on work the citizens would like to see done. Community meetings also give the Water Department a chance to answer any department related questions and spread information on how the Water Department is addressing issues such as stormwater management, CSOs, and other pollution prevention initiatives.

### **7.3.5 Watershed Partnerships**

The City's initiatives for our watershed partnerships two-fold:

1. To guide and/or provide upstream partners and in-City partners with support that advances the health of Philadelphia's watersheds and
2. To provide outreach support to the Water Department's stream restoration efforts and communities impacted by these efforts to help facilitate the implementation of stream restoration and to establish and reestablish community connections to the creeks and parks in Philadelphia.

The Water Department manages and guides the following watershed partnerships through a contract with Pennsylvania Environmental Council:

- Darby Cobbs
- Delaware Direct
- Schuylkill
- Pennypack
- Poquessing
- Wissahickon

The Water Department provides support to established watershed partnerships either directly (such as in the case of the Tookanky/Tacony-Frankford Creek Watershed) or through the Partnership for Delaware Estuary (the Schuylkill Action Network).

# Section 8

## Minimum Control No. 8

### Public Notification

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#### 8.1 General

Public notification programs are intended to ensure that the public receives adequate information about combined sewer overflows (CSOs), the location of outfalls, the magnitude of the discharges, and the potential impacts on receiving waters. The principal benefit of a notification program is to reduce the potential public health risks in affected areas, and to increase public awareness of CSOs. The methods used are intended to provide reasonable assurance that the affected public will be informed in a timely, cost effective manner. The intent of Minimum Control Measure No. 8 - Public Notification “is to inform the public of the location of CSO outfalls, the actual occurrences of CSOs, the possible health and environmental effects of CSOs, and the recreational or commercial activities (e.g., swimming and shellfish harvesting) curtailed as a result of CSOs”.

#### 8.2 Public Notification Measures

##### 8.2.1 CSOcast

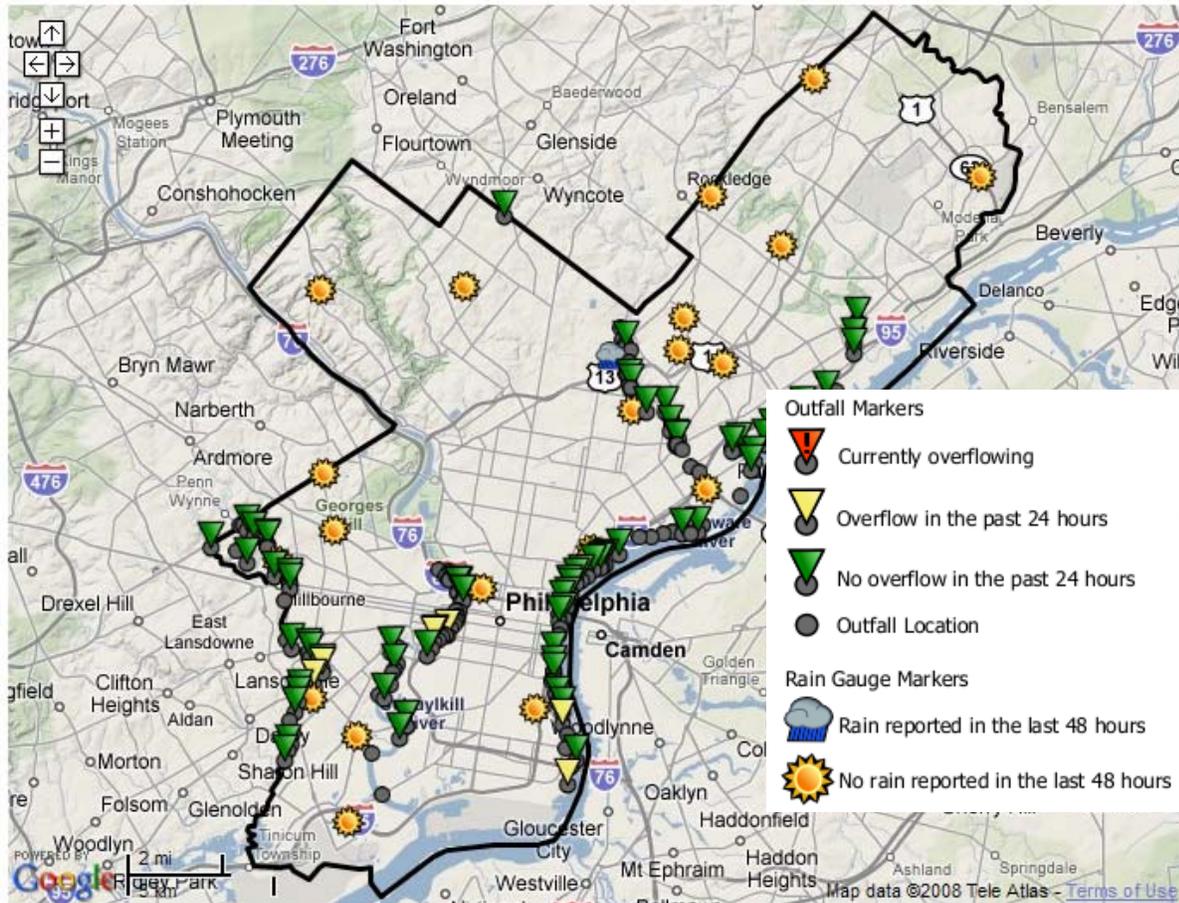
The Water Department has developed an internet-based CSO public notification system called CSOcast, which reports on the predicted overflow status of combined sewer outfalls. The purpose of this notification system is to alert the public to the risk of possible overflows from Philadelphia’s combined sewer system outfalls. Due to possible pollutant contamination, it may be unsafe to come in contact with the water body when a combined sewer outfall is overflowing, as well as for a 24-hour period following a rainfall event.

In order to forecast overflow conditions at the outfall, CSOcast relies on a network of real-time level sensors at or near the 164 combined sewer outfalls and rain gages located throughout the City. The notification system is based on an analysis of this monitoring data to determine the likelihood of combined sewer overflows. Part of this process involves validating the flow monitoring data with the Water Department's watershed and wastewater conveyance model, which was developed using US EPA’s Storm Water Management Model. The rainfall data is run through the model to estimate where and when overflows are occurring. The model output is then used to validate the monitoring data, ensuring a second level of accuracy. The website was built using the Google Maps Application Programming Interface which allows for the dynamic loading of geographically referenced data that can be viewed with a familiar and user-friendly interface. The map is available 24 hours a day and displays the most up-to-date data available (Figure 8-1). CSOcast has been active since 2008, and the Water Department is constantly

updating and improving the notification system and flow monitoring network in order to deliver the public the best information possible.

The CSOcast notification system can be accessed at:

[http://www.phillywatersheds.org/what\\_were\\_doing/documents\\_and\\_data/live\\_data/csocast](http://www.phillywatersheds.org/what_were_doing/documents_and_data/live_data/csocast)



**Figure 8-1: Sample CSOcast Map**

### 8.2.2 CSO Outfall Identification Signage

The Water Department's first effort at CSO outfall identification signage occurred in 1995. This effort is described in the 1995 document *CSO Documentation: Implementation of Nine Minimum Controls* (Appendix I) and utilized the CSO Outfall numeric identification system detailed in the *System Inventory and Characterization Report* (Philadelphia Water Department, May 1995). Identification numbers were stenciled in visible positions (e.g., along the shoreline) at each of the CSO outfalls in the combined sewer system.

This effort was updated in 2007 with the installation of placards that display the outfall identification number at each of the CSO outfalls. These signs were installed at each of Philadelphia's CSO outfalls, with the exception of 8 difficult to reach sites. These signs are very useful when the public is reporting a problem at an outfall since they are able to accurately

identify its identification number. This helps to alleviate communication problems between the public and Water Department responders.

### 8.2.3 CSO Informational Signage Project

In 2007, the Water Department initiated the CSO Informational Signage Pilot Project to inform the public of the potential hazards of contact with the stream during combined sewer overflow events. Signs were placed at outfalls accessible to the public to let people know that during wet weather it is possible for polluted water to flow from the outfall and contact with the water during such events would be hazardous to their health (Figure 8-2). The signs requested that the Water Department be informed of any overflows during dry weather, and provides an emergency contact number.



**Figure 8-2: Signage from CSO Pilot Signage Project**

This signage project was a pilot project aimed at determining whether outfall signage was a feasible way to accomplish public notification of combined sewer overflows. The Water Department, in conjunction with the Fairmount Park Commission installed 13 signs at CSO outfalls throughout the City. Locations for sign placement were selected based on factors such as high visibility, known recreational areas, and volume of the combined sewer overflow. Installation of the CSO signage was done in summer 2007 and a follow-up survey of the signage sites was completed in October 2007. During this survey, each of the CSO signage sites was visited and photos were taken to confirm the status of the signs that were installed. Survey of the sites determined that several of the signs were removed or vandalized. Of the 13 signs that were installed, 5 were vandalized or removed during the short amount of time between installation and the survey.

Although signage is seen as a simple, low-cost, visual method to raise awareness of combined sewer outfalls, this pilot project highlighted the difficulties in using signage as a public notification system in Philadelphia due to the poor durability of the signs in the field.

### 8.2.4 Phillywatersheds.org

The information available on Phillywatersheds.org is an important method of notifying the public about CSOs. Viewers of the website can find reports on the CSO Control program; projects completed or planned in order to reduce CSOs, and the regulations that stipulate CSO Minimum Control Number 8 – Public Notification

control. This Water Department website also houses the CSOcast notification system mentioned above. Additional information on Phillywatersheds.org is described in further detail in Section 7 – Minimum Control No. 7: Pollution Prevention Program.

### **8.2.5 Other Notification Measures**

The Water Department continues to develop informational materials and maintain websites to educate the public about its CSO discharges and the potential effect on receiving waters. The Water Department has found that one of the best ways for public notification of CSOs is through the traditional public outreach programs described in Section 7 – Minimum Control No. 7: Pollution Prevention Program.

# Section 9

## Minimum Control No. 9

### Monitoring to Characterize CSO Impacts and the Efficacy of CSO Controls

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#### 9.1 Introduction

Monitoring and characterization of combined sewer overflow (CSO) impacts from a combined wastewater collection and treatment system are necessary to document existing conditions and to identify any water quality benefits achievable via CSO mitigation measures. The intent of Minimum Control Measure No. 9 is to characterize the combined sewer system to collect and document information on overflow occurrences and known water quality problems and incidents that reflect use impairments caused by CSOs to provide an indication of the effectiveness of the Nine Minimum Controls.

The City of Philadelphia and the Philadelphia Water Department (Water Department) have implemented many programs, reports, and activities that demonstrate and document the efforts taken to monitor and evaluate CSOs. These initiatives are constantly being updated and evaluated for improvements. This report has supplied many methods for assessing the relative effectiveness of implementing of a number of the Nine Minimum Controls.

- For instance, the City's computerized Operation & Maintenance tracking system described in Section 1 and the sophisticated and expanding flow monitoring systems referenced in Section 5 provide the basis to track, document and quantify the performance of the City's Operation & Maintenance activities (Minimum Control No. 1) as well as compliance with the prohibition of dry weather overflows (Minimum Control No. 5).
- Additionally, the hydraulic and hydrologic models of the City's combined sewer system were used to characterize and quantify the relative effectiveness of implementation of Minimum Control No. 2 and Minimum Control No. 4 in Sections 2 and 4 of this report.
- Analyses performed for, and presented in Section 3 of this report supply a basis for assessing the potential for modifications to the City's pretreatment program to reduce industry-related impacts on CSO discharges.
- Section 6 of this report suggests that a floatables monitoring program continues to be maintained and evaluates solids and floatables control devices used in strategic areas.

The data produced by these analyses and models are incorporated into several different reports used for both internal and external assessment of the Water Department's CSO Control Program. These reports are described in detail below.

## 9.2 Quarterly CSO Discharge Monitoring Report

Four times a year, following each quarter, the Water Department submits a Quarterly Special Discharge Monitoring Report to the Pennsylvania Department of Environmental Protection documenting the CSO discharges that occurred during the previous quarter. In addition to a list of CSO discharges and their associated outfalls, the report also includes a quarterly record of inspections, discharges, blockages cleared, daily precipitation amounts from rain gages around the City, a map of our wastewater system, and total overflow duration for all 164 CSO point sources in three drainage districts. The report is due 45 days after the end of each quarter. The Water Department provides the report to the Pennsylvania Department of Environmental Protection through an electronic delivery system to expedite the review process.

### 9.2.1 Revised Reporting format

The formatting of the Discharge Monitoring Report was revised in July 2011 to better align with the Water Department's new hydraulic modeling program. The original reporting format was instituted when the Water Department was using a previous hydraulic modeling program called NetSTORM. The NetSTORM modeling program was able to create summary tables for each regulator and required very little data post-processing to achieve the submitted Discharge Monitoring Report format. In 2008, the Water Department's modeling group converted to Storm Water Management Model as its hydraulic modeling program because the program is a more precise tool for predicting overflows. However, the program outputs rawer, less formatted data, meaning Water Department modeling staff dedicate several man-hours post-processing the Storm Water Management Model data for the Discharge Monitoring Report. A more simplistic report format was designed to reduce these man-hours, yet still provide equivalent information to what was previously provided.

## 9.3 CSO Control Program Annual Reports

Every year, the Water Department provides an overview of all the activities and programs pertaining to components of the CSO Control Program in series of different annual reports. These reports include input from Water Department staff and other departments within the City (e.g. Streets Department, Health Department, and the Fairmount Parks Commission).

### 9.3.1 Annual Chapter 94 Municipal Wasteload Management Reports

The Water Department creates an annual report in accordance to PA Code § 94.12, which is intended to provide a review of sewerage facilities for the preceding calendar year to ensure that progress is being made to address existing operational or maintenance problems, or to plan and construct needed additions. The purpose of this regulation is to prevent unpermitted and

insufficiently treated wastewater from entering waters of the Commonwealth by requiring the owners and operators of sewerage facilities to project, plan, and manage future hydraulic, organic and industrial waste loadings to their sewerage facilities. The report includes an overview of activities and programs conducted as stipulated in the City's three National Pollutant Discharge Elimination System (NPDES) Water Pollution Control Plants Permits. This report is due following the end of the calendar year by the 31<sup>st</sup> of March every year.

### 9.3.2 NPDES Permit Annual Report

The Water Department develops an annual report documenting an overview of all its activities and programs pertaining to the CSO portion (Section 28) of the three NPDES Water Pollution Control Plant permits for the previous fiscal year (July 1st through June 30th). This report is conducted in accordance with the City's NPDES permits that are reported to the Pennsylvania Department of Environmental Protection. As of fiscal year 2007, this report began reporting the activities and programs conducted to support the Nine Minimum Controls and the CSO programs, which were previously reported within the Annual Chapter 94 Report mentioned above. This was conducted in order to unify the implementation efforts conducted for both the Municipal Separate Storm Sewer System permit regulations and the Nine Minimum Controls, as well as match up with reporting timeframes into one document. This report is due following the end of every fiscal year by the 30<sup>th</sup> of September.

#### Annual CSO Status Report

A sub-section of the Combined Sewer Management Program Annual Report, the Annual CSO Status Report contains information on rainfall, inspections and maintenance, dry weather discharges, wet weather overflows, and chronic or continuous discharges during the fiscal year. As detailed within the 2007 NPDES permits for the Water Department's three Water Pollution Control Plants, the Annual CSO Status Report includes the following elements:

- Summary of the frequency and volume of CSO discharges during previous fiscal year
- Update of the CSO frequency and volume for a typical hydrologic year
- Summary of the in-stream impacts and effectiveness of CSO controls and restoration projects
- Summary of the information provided in the Quarterly Discharge Monitoring Reports, including:
  - Rainfall data - total inches (to the nearest 0.01-inch) that fell each day and month for the period of the report.
  - The total number of regulator inspections conducted during the period of the report.
  - A list of blockages (if any) corrected or other interceptor maintenance performed, including location, date, and time corrected, and any discharges to the stream observed.
- List of all dry weather overflows, wet weather overflows, chronic or continuous discharges documented during the fiscal year

## 9.4 CSO Long Term Control Plan Update Report

The Water Department completed the Philadelphia CSO Long Term Control Plan Update (LTCPU) in September of 2009. The LTCPU was an update to the Water Department's original CSO Long Term Control Plan (LTCP) commitment adopted in 1997. The LTCPU furthers the City's commitment to watershed-based planning and implementation established by the LTCP. In addition, the LTCPU details the Water Department's plan to increase capture and reduce CSOs through the use of a variety of innovative infrastructure programs that maximize every dollar spent by providing multiple benefits. The plan was amended and adopted in June of 2011 with the signing of a Consent Order and Agreement (COA) between the Water Department and Pennsylvania Department of Environmental Protection, which committed the City of Philadelphia to a 25-program to implement the plan. The LTCPU COA requires the submittal of several deliverables over the course of the program to provide metrics and measure progress. The progress of the LTCPU will be reported annually and evaluated every 5 years to determine if adjustments need to be made to the plan in order to meet the appropriate performance standards. The full Philadelphia CSO LTCPU report and its supplements can be found at the following address: <http://www.phillywatersheds.org/ltcpu>.

## 9.5 Implementation and Adaptive Management Plan

The Implementation and Adaptive Management Plan, developed as one of the deliverables for the LTCPU COA, describes how the *Green City, Clean Waters* program will be implemented by the City during the first five years after approval, and outlines the City's proposal for evaluating progress and making decisions at the five-year marks throughout the 25 year term of the COA. The Implementation and Adaptive Management Plan details the City's plans for tracking, reporting, and assessment of CSO Program activities. In addition, it lays the groundwork for how the City will handle future updates or changes to the program itself. A copy of the Implementation and Adaptive Management Plan is available at the following address: [http://phillywatersheds.org/ltcpu/IAMP\\_body.pdf](http://phillywatersheds.org/ltcpu/IAMP_body.pdf)

## 9.6 Comprehensive Monitoring Plan

The Comprehensive Monitoring Plan, another COA deliverable, describes the City's plans for performing routine monitoring of natural and engineered systems associated with the *Green City, Clean Waters* program. It addresses the monitoring and assessment of surface waters, ground water, rainfall, CSO discharges, sewer flows, and green infrastructure performance. Furthermore, the Comprehensive Monitoring Plan also addresses hydrologic and hydraulic modeling and describes how, with verification from metered data, modeling will be used for performance tracking of the *Green City, Clean Waters* program. A discussion of how the City will adapt its monitoring program if the program is changed or updated is also included. A copy of the Comprehensive Monitoring Plan is available at the following address: <http://phillywatersheds.org/ltcpu/GCCW%20Comprehensive%20Monitoring%20Plan%20Sections%201-10.pdf>