

# **OPERATIONS AND MAINTENANCE MANUAL**

## **KENNEDY TOWNSHIP SANITARY SEWER SYSTEM**

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## **I. GENERAL INFORMATION - SYSTEM DESCRIPTION**

### **A. Purpose**

This Operation and Maintenance plan (O & M) is to be used as a guide for the Kennedy Township's sanitary sewer system. The purpose of the manual is to instruct the operating and maintenance personnel in the proper understanding, techniques, references, and necessary procedures for operating and maintaining the Kennedy Township Pump Stations and sewage collection system.

By following the guidelines recommended in this manual, Kennedy Township will be assured an efficient, effective, continuous operation in accordance with the rules and regulations of ALCOSAN, the Allegheny County Health Department, the Commonwealth of Pennsylvania Department of Environmental Protection, and United States Environmental Protection Agency.

The ultimate goal of this wastewater system is to efficiently convey the incoming waste in the most efficient manner possible. This manual will outline the recommendations and methods permissible by the sewage system; to enable the pump station operating and maintenance personnel to evaluate the quantity of incoming waste and convey waste at a maximum efficiency in an attempt to achieve this goal.

### **B. Manual User Guide**

This operation manual has been prepared to facilitate easy and quick reference. Pump station operators should study the manual's Table of Contents to become familiar with the information presented in it. The chapters are arranged in a logical order beginning with a general introduction, collection systems management, collection systems operations, maintenance and equipment, collection system capacity assurance program and appendices.

It is recommended that all operating personnel read the entire manual so that they become familiar of the details contained in each chapter.

### **C. Operation and Managerial Responsibility**

The general public is well aware of the effects of water quality and the costs associated with it. The Kennedy Township Board of Commissioners requires high level of performance from its operations and maintenance staff.

#### **1. Operator Responsibility**

The person in charge who is responsible for the operations and maintenance of the sewerage system is the Sewer Foreman. They have the most difficult and demanding position in the employer's organizational chart.

The sewer foreman has to have an operator's license to run the pump stations as well as an intricate knowledge of the sanitary sewer system. Maintenance personnel are expected to have similar knowledge and licenses for operation and maintenance of the pump stations and sewerage system.

**a. General**

**Operational Procedures**

The operator in charge should be thoroughly familiar with his own sanitary sewer system. He should know the function of each unit in the system; how each unit accomplishes its function; how to evaluate the operation of each pump station in the system; how to evaluate each station, and how each unit fits into the overall sanitary sewer system. The sewer foreman should also be thoroughly familiar with the theory and practice of operations of his own facilities and those of other types of systems.

**Accurate Records**

The sewer foreman and maintenance staff shall keep complete and accurate records of all phases of pump station operations and maintenance.

**Managing Operating Funds**

The Township will prepare an annual operating budget and a five (5) year capital projects budget. The following items are to be included in the budget:

1) Separation of Maintenance Costs

This portion of the operation and maintenance manual is provided to guide pump station personnel in the keeping of adequate records to enable costs of maintenance to be extracted and maintenance budgets to be compiled. Pump station information on maintenance costs are very important for their incorporation and maintenance budget. It is important to divide the maintenance operations into service categories and keep costs separate for each category. The service categories recommended are:

Preventive maintenance  
Corrective maintenance  
Major repairs or alterations

It is recommended that the facility's personnel work in conjunction with the municipal bookkeeping department to maintain the information on cost and man-hours.

### Preventive Maintenance

Most of the cost attributable to preventive maintenance will be in man-hours since a major part of this maintenance is performed with a minimum of consumed parts and materials. Costs should be further divided into the following:

- Site Work
- Building housekeeping
- Equipment and tank cleaning
- Painting
- Lubrication
- Administration
- Miscellaneous

### Corrective Maintenance

The costs falling into this category will include labor and materials for replacing parts in machinery and making repairs to leaking pipes, fittings, valves, etc. Corrective maintenance costs shall be made up of labor and materials. In this category the difference between labor costs and material costs shall not be as great as in the preventive cost category. Costs should be further divided into the following:

- Machinery repairs
- Piping repairs
- Site work repairs
- Tank repairs
- Building repairs
- Electrical repairs
- Small equipment replacement

### Major Repairs or Alterations

Major repairs or alteration costs do not occur frequently or on a regular routine basis. Whenever these type costs are incurred they should be kept separate and tallied as such:

- Construction additions
- Contract maintenance items
- Major equipment replacement
- Process modification

## 2) Cost Accounting System

The pump station operator is to set up a cost accounting filing system to retain information on costs of preventive maintenance, corrective maintenance and major repairs or alterations. The acquired information shall be kept in file folders along with purchase orders, receipts, man-hour reports and other important papers. Man-hours for each employee are to be broken down into the half hour of the work shift with charge numbers established to separate operations and maintenance work. Individual charge numbers are to be assigned to each category or maintenance work; e.g., preventive, corrective and major repairs or alterations. Since the cost accounting system is to be incorporated into the municipalities bookkeeping system, charge numbers should be acquired from this agency and maintained throughout the pump stations filing network. The cost accounting files prove an invaluable asset to local and public officials and to those involved in financing the operation and maintenance of the sewage system.

### **Keeping the Township Commissioners Informed**

The sewer foreman shall continue to provide a monthly report to the Commissioner in charge of sanitary sewers in relation to design standards, physical condition, and the costs of operations and repairs.

The Township Board of Commissioners shall be provided with the monthly report as well so they may be aware of any potential repairs or necessary expansion of facilities.

### **Keeping Informed of Current O&M Practices**

The sewer foreman or operator in charge should be familiar with and continuously informed of the best maintenance procedures. Proper maintenance leads to an efficient system.

#### **b. Courses and Operator Schools Available**

The sewer foreman and operators should participate in continuing educational classes as well as attend seminars related to the proper operations and maintenance of the sanitary sewer system.

#### **c. Professional Journals and Periodicals Related to Wastewater Systems**

The sewer foreman and operators should subscribe to magazines, journals and periodicals related to wastewater systems.

## **2. System Management and Responsibility**

In Kennedy Township the sewer foreman is the person in charge of the wastewater system. He is a licensed operator and is considered as the manager of the system. His responsibilities include, but are not limited to the following:

- a. The maintenance of efficient system operation and maintenance
- b. Maintaining sewerage system operational and management records
- c. Develop a listing of staff requirements, develop job descriptions, develop an organizational chart and assign personnel.
- d. Provide adequate working conditions, safety equipment, and provide proper tools for operations personnel
- e. Establish and implement an operator training program
- f. Provide salaries commensurate with the skill level, experience and responsibilities of a sewer foreman and operators/laborers
- g. Providing operations personnel with sufficient funds to properly operate and maintain the Township's wastewater system
- h. Project the need for increased future expenditures. The sewer foreman should advise the Township Treasurer of the expected future needs to permit early budgeting if possible.
- i. Being thoroughly familiar with the system, the sewer foreman should know the function of each unit in the system; how each unit accomplishes its function; how to evaluate the operation of each unit; and how each unit fits into the overall system and collection process. The sewer foreman should be thoroughly familiar with the theory and practice of the operations of his own system and to some extent those of other types of systems.

The Sewer Foreman is assisted by the public works staff. The responsibilities of the staff include but are not limited to the following:

### **3) Maintenance Staff**

A system as small as this one operates with a limited number of personnel and therefore is expected to be short of qualified individuals needed to perform many of the technical maintenance services required. Only properly trained personnel can be expected to perform satisfactory inspections, repairs and corrective and preventive maintenance tasks. The maintenance staff for this system generally consists of the operator, assistant operator and maintenance personnel. The operator and assistant operator are expected to assist in performing preventive

maintenance items as well as corrective maintenance and supervising contract maintenance work.

#### 4) Maintenance Staff Capabilities and Limitations

Properly trained personnel must possess a through knowledge of the functions and operation of the equipment and the procedures for servicing. Pump station operations and maintenance personnel are generally limited in their knowledge of equipment specifics which places many maintenance tasks under contract maintenance work.

Pump station personnel at these facilities must be familiar enough with the equipment to perform routine maintenance tasks such as monitoring for unusual noises, smells and visual defects, lubricating, cleansing, etc. Whenever contract maintenance or maintenance beyond the capabilities of the full time and/or part time staff is performed, the plant workmen should observe the work and ask as many questions as possible to acquire additional knowledge of the maintenance. Any information gained in this manner can be put to good use later in cutting maintenance costs and reducing equipment down time.

Another area of information for pump station personnel is the manufacturer's service manuals. These manuals must be thoroughly reviewed before maintenance is performed unless the workmen are familiar with the maintenance requirements. Generally work on pump equipment requires knowledge of mechanical equipment and some mechanical aptitude. Electrical maintenance, other than changing light bulbs and fuses, requires detailed electrical abilities and should be done by a certified electrician; therefore, most electrical maintenance shall be contract maintenance.

### **D. Description of Pumping Stations and Pipeline Type**

There are ten (10) sanitary sewage pumping stations.

Each pump station has a force main. All force mains are ductile iron pipe and fabricated iron pipe for casing for all road borings.

## **II. COLLECTION SYSTEM MANAGEMENT**

The Sewer Foreman shall routinely consult with the Township Engineer to review the overall status of the Township sewerage system. Upcoming sewer maintenance repair and televising shall be determined and planned as necessary. Mapping updates shall be completed on an as needed basis.

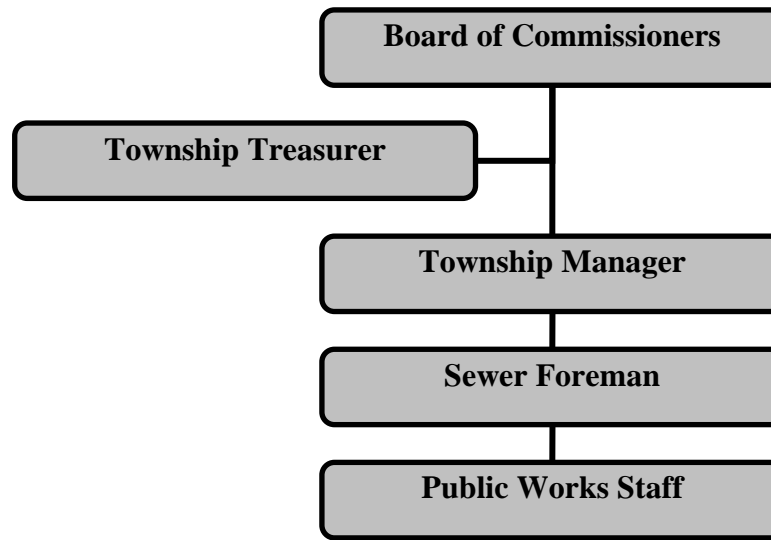
Future budgeting for upcoming sewer projects shall be reviewed with the Township Treasurer and Manager.



The Township shall routinely review the public works department workload to determine what level of staffing is necessary to ensure routine maintenance and upcoming projects remain on schedule.

## **A. Organizational Structure**

Kennedy Township's organizational chains of command for implementing the measures in its O&M Plan are as follows:



### **1. Administrative and Maintenance**

#### Board of Commissioners

The governing body of the Township is responsible for the overall implementation of the O&M plan.

#### Kennedy Township Manager

Kennedy Township has a manager. He is the chief administrator. The Kennedy Township Manager is responsible for overseeing the Township public works department. He answers to the Board of Commissioners.

#### Sewer Foreman

The sewer foreman is responsible for the overall operations and maintenance of the Township's sanitary sewer system. This includes all pump stations, forcemains and gravity sewers. He is a licensed professional for operations of the pump stations. His primary duties include the daily inspections of the pump stations, making any necessary repairs to the pump stations, sanitary sewer lines, reporting any violations,

implementing the SSO Response Plan and making sure spare parts are available for pump stations.

### Laborers

The laborers report to the sewer foreman. Their primary responsibility is to assist the sewer foreman in maintaining and operating Kennedy Township's sanitary sewer system.

## **2. Reporting of SSO's**

The chain of communication for reporting SSO's can be found in Appendix A the SSO Response Plan.

## **B. Budgeting**

Appropriating adequate operational funds to facilitate proper levels of operation and maintenance is prerequisite to implementation of a successful preventive maintenance program. Lack of funding is a primary cause of neglect and resultant deterioration.

Annual line item budget development by the Administrative Staff, Engineer and Operations Superintendent is recommended. A key element of the operation budget program is the tracking of costs in order to have accurate records each time the annual operating budget is developed. The Township can utilize available modules in the software database to develop the budget by tracking maintenance and capital costs.

Having an annual baseline provides documentation for future budget considerations and provides justification for future rate increases and other sources of funding.

## **C. Training**

Comprehensive Operator Training and Certification (aka Sacramento Training) is available through distance education through the California State University, Sacramento CA. Two certificate courses are offered:

- Operation & Maintenance of Wastewater Collection Systems Vol. I
- Operation & Maintenance of Wastewater Collection Systems Vol. II

PaDEP web site link and course information is as follows:

[http://www.dep.state.pa.us/waterops\\_apps/etpmain/ApprTraining/Public/CourseDetail.asp?CourseIDNum=87](http://www.dep.state.pa.us/waterops_apps/etpmain/ApprTraining/Public/CourseDetail.asp?CourseIDNum=87)

Course ID: 86

Title: Operation & Maintenance of Wastewater Collection Systems Vol. I and Volume II

Industry: Wastewater  
Contact Hours: 90

Background: Volume I provides operators with the information needed to operate and maintain collection systems efficiently and effectively. Certification boards throughout the United States and Canada recognize this course as a means of preparing and qualifying to be a successful collection system operator.

Content:

- \* The wastewater collection system operator
- \* Why collection system operation and maintenance
- \* Wastewater collection systems
- \* Safe procedures
- \* Inspection and testing collection systems
- \* Pipeline cleaning and maintenance methods
- \* Underground repair

Audience: The target audience for this course is the person interested in working in the wastewater collection field and wishing to prepare for certification license exams, to learn how to do the job safely and effectively, and/or to meet educational needs for promotion.

Course Format: Distance Education

Training Provider ID:20

Name: California State University, Sacramento

Address: Office of Water Programs, 6000 J St, Sacramento, CA - 958196025

Contact Person: Ramzi J Mahmood

Telephone: 916-278-6142

Fax: 916-278-5959

E-Mail: [wateroffice@csus.edu](mailto:wateroffice@csus.edu)

Web site: <http://www.owp.csus.edu>

Additional training is available at:

[http://www.wef.org/ConferencesTraining/Conferences/SpecialtyConference/Collection\\_Systems06.htm](http://www.wef.org/ConferencesTraining/Conferences/SpecialtyConference/Collection_Systems06.htm)

## **D. Compliance**

Kennedy Township shall insure that all sewer maintenance and construction is in compliance with the local, state, and federal requirements and permits. This includes, but is not limited to the Township Consent Order, the Act 537 Plan, PA DEP permits, Allegheny County Health Department and ALCOSAN standards and requirements.

## **E. Communication and Customer Service**

Communication and customer service are key components to the O&M Plan. Customers with concerns about the collection system can call the Township offices with their issues. The calls shall be channeled to the Township Manager and he/she can then direct the appropriate personnel to investigate the caller's issue. Emergency calls after normal Township business hours can be placed to the police department.

## **F. SSO Notification Program**

The plan should contain a mechanism to keep the customers notified of impacts to them, such as outages (including projected lengths of time), road closings, etc. A representative from management should be given the role of dealing with the media to address public concerns. All other employees should refer inquiries to this designated spokesperson.

## **G. Record Keeping**

Records shall be kept of repairs to the collection system. They will be in a separate file. These records include televising, repairs, preventive and routine maintenance. The files will be maintained by the Sewer Foreman and retained at the Township offices. Records will be kept in both a paper and when possible a digital format.

## **H. Legal Authority**

1. Kennedy Township does not permit connections of surface stormwater to the sanitary sewer system as per Paragraph 7 of the ACO. Dye testing is done whenever a building is sold to assure compliance with this requirement.
2. Kennedy Township requires that sewers and connections be properly designed and constructed as per the Township's Subdivision and Land Development Ordinance, as summarized below:

### Introduction

These specifications, which cover requirements for construction of all the Township's standard sewer line facilities, are intended for, and apply to all such projects, whether directly contracted with a Contractor(s) by the Township, or contracted directly through the auspices of a land developer (which, in turn, employs a construction contractor(s)).

### Inspection of Construction Work

All work performed in connection with the extension, modification or improvement of public wastewater facilities within the Township shall be required to conform to all rules and regulations and shall be inspected during construction by an authorized representative of the Township. All completed

work shall be required to meet the approval of the Township's Engineer and shall be changed, modified, replaced, removed or otherwise corrected by the Contractor to such extent as directed by the Township's Engineer.

The work will be periodically or continuously inspected during its progress and when substantially completed, shall be inspected jointly, by the Township's Engineer and the Contractor, when the punch-list of uncompleted or corrective work will be prepared. After all punch-list items have been taken care of to the satisfaction of the Township's Engineer, the work will be declared complete and the 18-month maintenance bond period shall simultaneously commence. During the term of the maintenance bond, the Contractor shall return when and as required to reconcile any problems resulting from construction, such as mechanical malfunctions, trench settlement, pavement failure, surface restorations, drainage, etc. In addition, a maintenance bond inspection shall be made by the Township's Engineer at a date between six and twelve months following the date of declaration of completion of construction. The Contractor will be notified in advance of that inspection date and map participate therein.

#### Construction Record Drawings

The Contractor shall retain one reasonably clean set of drawings of the proposed improvements at the job, on which he shall note changes in pipeline alignments and elevations and any other changes from the preconstruction approved plans. He shall also reference the locations of the ends of sewer service laterals so that the same may be uncovered and connected at future times. The set of prints on which such field information is recorded shall be turned over to the Developer's Engineer for transposing that information onto the original drawings. When completed, Engineer/Developer must submit three (3) sets of the Construction Record Drawings to Kennedy Township before any Building Permits can be issued.

3. Kennedy Township or its Engineer inspects and test all new or rehabilitated sanitary sewers. Testing may be in the form of smoke and dye tests, mandrel and televising.
4. Currently there are no formal agreements or memorandums of understanding with any of the neighboring communities of Kennedy Township. The two municipalities that receive flows from the Township are Stowe Township and McKees Rocks Borough. Any proposed sewer lines that might affect the flows in these lines will be constructed to the standards previously noted and will be updated in the GIS system.
5. All existing and future industrial users of the sanitary sewer system within the Township are required to comply with ALCOSAN's pretreatment program as outlined in 40 CFR 403.5.

### **III. Collection System Operations, Maintenance and Equipment**

The Township keeps the basic equipment necessary to maintain the sewage system in house. Any special equipment may be rented on an as needed basis. The Township will maintain a budget for maintenance equipment and rental equipment.

#### **A. Safety**

Safety shall be a factor of the collection system's operation, maintenance and equipment. Proper safety gear shall be worn at all times by the personnel working on sewer projects. Items such as trench shoring will be required for any excavation of sewers. A written safety policy should be created. Also, a safety committee should be formed. It should assure regular safety meetings are held with employees and safety training programs are attended by personnel.

#### **B. Odors**

Odors shall be responded to as soon as they are called into the Township. The Township will take the name of the caller, location of reported odor and dispatch the appropriate personnel to the area as soon as it is reported.

#### **C. Planned Maintenance and Scheduling**

Regularly planned and scheduled maintenance of the sanitary sewer will be part of this plan. Televising, manhole inspection and routine maintenance such as CCTV, root cutting, grouting will be part of the program. Work will be performed by the Township and outside contractors if necessary.

#### **D. Internal Inspection Program (Televising)**

Collection system televising will be conducted in accordance with the Township Administrative Consent Order (ACO) and utilizes the NASSCO Structural Defect Rating System.

The NASSCO ratings shown on the televising logs should be reviewed and Engineering judgment applied to the ratings before proceeding to further televising, cleaning or making repairs.

NASSCO Level 5 structural defects will be scheduled for repair when they are discovered and as such will not impact the on-going schedule for cleaning and televising of sewer lines. The municipality/authority should consider televising as a part of the inspection requirements at the time of construction. New construction is considered to be Level 1/Grade 1. NASSCO recognizes that the mechanism and rate of pipeline deterioration are highly dependent on local conditions. However, NASSCO provides general guidelines on the estimated time for progression of a structural defect to the point where it is likely to cause sewer line failure. The NASSCO predictive estimates are:

- Level 5 – Pipe has failed or will fail within 5 years
- Level 4 – Pipe will probably fail in 5 to 10 years
- Level 3 – Pipe may fail in 10 to 20 years
- Level 2 – Pipe is unlikely to fail for at least 20 years
- Level 1 Failure is unlikely in the foreseeable future

These NASSCO predictive estimates are used in the determination of these guidelines for sewer line cleaning and televising.

It is acknowledged that NASSCO also has a grading system for O&M conditions. The initial round of televising-based O&M grading is to be used, along with the structural grading, to establish the baseline for identifying segments that require immediate and potentially on-going attention relative to routing re-current cleaning.

### ***PRIORITY SEWER LINES***

The system's priority sewer lines should be determined by the Engineer and staff based on their knowledge of the system, recent televising, Engineering judgment, and identification of those areas that are prone to chronic problems or deterioration. Priority sewer lines for cleaning and priority sewer lines for televising should be listed in a comprehensive maintenance schedule and/or shown on a map and included as an attachment to this document or in an appendix to the system O&M Plan.

The maintenance schedule/map of priority sewers should be reviewed on an annual basis and lines added or deleted as appropriate, including:

- Lines are to be added to the list if: current televising results indicate major sediment accumulation, capacity issues are present, or other maintenance issues are determined at the discretion of the Engineer.
- Lines are to be removed from the list based upon results of televising inspection indicating minimal sediment deposition, excellent pipe condition or if rehabilitation/replacement mitigates the reasons for the line to be on the priority sewer list

### ***TELEVISIONING***

**Priority sewer lines** are to be televised on an as-needed basis but at least every three (3) years. Priority lines include but are not limited to:

- Major Trunk Sewers and Interceptor Sewers with known problems. It is noted that these sewers are sometimes located in remote areas and should be walked for visual inspection on a regular basis.
- Siphons, regardless of size
- Sewers with limited available capacity (subject to backups)

**Non-priority sewer lines** are to be televised based on the most recent NASSCO rating of the sewer line.

- Segments with Level 4 structural defects should be televised at least every 5 to 10 years
- Segments with Level 3 structural defects should be televised at least every 10 to 20 years
- Segments with Level 1 or 2 structural defects should be televised only as-needed based on inspections and complaint reports.

## **E. Sewer Cleaning**

**Priority sewer lines** are to be cleaned on an as-needed basis but at least every one to two years. Priority lines include, but are not limited to:

- Siphons, regardless of size
- Lines prone to sediment accumulation due to bellying or low slope values
- Lines prone to either root intrusion or grease accumulation
- Chronic problem areas are identified as those that require annual or more frequent attention and result in surcharge and backup conditions, basement flooding, and/or property damage. Special emphasis should be placed on identification of an remediation of the problem(s)

**Non-priority sewer lines** are to be cleaned only as-needed based on inspections and complaint reports

## **F. Chemical Cleaning and Root Removal**

The Township should implement an annual cleaning and root removal program. Initial cleaning/root removal and re-televising efforts should focus on those portions of the system (i.e. manhole to manhole segments) that exhibit NASSCO Level 4 and 5 O&M defects. Each manhole to manhole segment should be rated based on average defect Grade value (i.e. Total Grade value of defects divided by total defects observed). These sites should be revisited at least annually until the defects are stabilized, eliminated or reduced to a Level 3 or less. The footages presented are based on the recent system wide CCTV findings. The Minimum Recommended Frequency guideline should be applied to all line segments exhibiting chronic, or persistent, maintenance problems such as basement flooding. Annual Total Footage is based on the average Recommended Frequency

## **G. Maintenance of Right-of-way**

The alignment and location of the proposed pipelines and appurtenances is shown on the plans on which street, highway and/or other acquired rights-of-way limits have also been superimposed. No pipeline shall be relocated outside of the street or other right-of-way within which it is shown without obtaining the formal written approval for such change from the Township. Where a special pipeline rights-of-way is obtained through private property, the minimum permanent width for operation and maintenance purposes shall be



20 feet; the width of the temporary right-of-way obtained through such private properties for initial pipeline installation and construction purposes shall be 40 feet; 10 feet of which shall be located adjacent to and on the outside of both limits of the permanent right-of-way. The minimum distance between the center of any longitudinal pipeline and the right-of-way limit line shall be 5 feet. All construction activities shall be confined within the 40 feet wide construction right-of-way.

The pipeline construction Contractor shall, however, make his own arrangements for office space, materials storage yards, change trailers, sanitary facilities, utility services, debris disposal sites, and for ingress and egress to any location along the pipeline project for which the Contractor desires or requires use and for which the Township has obtained no such right-of-way.

Proposed pipelines and appurtenances may also encroach upon right-of-way occupied by pipelines or other facilities owned, operated and/or maintained by other utility companies. It shall be the responsibility of the Contractor to notify the appropriate representatives of those agencies in advance of performing any work therein and to conduct all construction activities in accordance with the respective regulations appertaining thereto.

The juxtaposition of water and sewer lines proposed to be constructed in connection with land development projects shall be such that regardless of the sequencing of various utility line construction (gas, power, telephone, water, storm sewer, sanitary sewers, etc.) no pipeline shall be aligned longitudinally, along either the water or sanitary sewer lines, any closer than three feet. It is imperative that such minimum distance be obtained along all sanitary sewer and water lines to provide space required for future maintenance and/or repairs.

In accordance with the regulations of the Pennsylvania Department of Environmental Protection, the separation between water and sewer pipelines shall be as shown in SD-2 of the Township subdivision and land development ordinance.

Street right-of-way must be maintained and resorted anytime the collection system is affected by a sanitary sewer project. This includes construction of sewers, rehabilitation of existing sewers, and tying in structures to the collection system.

The alignment and location of the proposed pipelines and appurtenances is shown on the plans on which street, highway and/or other acquired rights-of-way limits have also been superimposed. No pipeline shall be relocated outside of the street or other right-of-way within which it is shown without obtaining the formal written approval for such change from the Township. Where a special pipeline right-of-way is obtained through private property, the minimum permanent width for operation and maintenance purposes shall be 20 feet; the width of the temporary right-of-way obtained through such private properties for initial pipeline installation and construction purposes shall be 40 feet; 10 feet of which shall be located adjacent to and on the outside of both limits of the permanent right-of-way. The minimum distance between the center of any longitudinal pipeline and the

right-of-way limit line shall be 5 feet. All construction activities shall be confined within the 40 feet wide construction right-of-way.

## **H. Emergency Response**

The sewer foreman is on call twenty-four (24) hours a day seven (7) days a week to address such emergencies. The procedure outlined in the SSO Response Plan should be followed including proper Township, PA DEP, ACHD and resident notifications.

## **I. Equipment and Tools Management**

The Township shall keep the necessary equipment and tools on-hand to operate its collection system efficiently. This excludes heavy equipment such as a Vactor truck. Use of Vactor trucks will or other specialized pieces of equipment may be rented on an as needed basis.

## **J. Pump Station Operation**

Every wastewater pumping station must be recognized as a highly specialized and complex facility. It is the pump station management's responsibility to pump sewage at the lowest unit cost with the highest efficiency. A key to fulfilling this responsibility is a sound maintenance management program.

### **1. Scope**

#### **a. General**

All moving parts of any type of machinery must be kept clean, well lubricated and properly adjusted. If equipment is not maintained properly, wear will increase, efficiency will decrease and eventually the equipment will fail. A well planned and implemented preventive maintenance program will be effective in assuring maximum efficiency and long life for each item of equipment installed in the pumping stations.

The equipment selected for use in these pumping stations was considered on the basis on the basis of initial cost and for its ability to provide long life and service under the working conditions to which it would be subjected. Most equipment is of heavy duty type and with proper care should provide many years of service without requiring any corrective maintenance.

The life care of any piece of equipment is dependent upon the care the machine receives. Properly maintained, the major equipment items of this wastewater pumping facility should provide approximately twenty (20) years of service.

#### **b. Preventive Maintenance**

As previously mentioned, the preventive maintenance, program is perhaps the most important of all maintenance procedures. Manufacturer's catalogues and literature furnished with the equipment generally furnish the preventive maintenance requirements of the equipment. This type of maintenance generally consists of lubrication, cleaning, adjusting, replacing worn parts, winterizing, housekeeping and work directed by this manual, equipment service requirements, and sensual (including visual, audio, feel and smell) observations which can be accomplished with the tools provided at the pump stations and by workmen having an average understanding of the workings of the machinery and total pumping station operation.

Preventive maintenance will not require skilled or factory trained workmen nor sophisticated tools and machinery. Each workman responsible for this type maintenance will be required to become familiar with the purpose, scope, advantages, safety precautions, economics, and necessity of the performance of the work.

c. Corrective Maintenance

Some items of equipment located in the pump stations may have corrective maintenance performed by the operator or unskilled workmen at the pump station site. Some items of equipment may require corrective maintenance performed by a highly skilled or factory trained personnel at the pump stations. Additionally there are some items which cannot be repaired at the stations and will require corrective maintenance performed at the manufacturing plant or a plant required for this type of repair work..

Whenever an item of equipment requires repair the operator should, except for minor items, always acquire additional assistance from persons such as:

- 1) Laborers
- 2) Engineer
- 3) Manufacturer
- 4) Skilled repairman

This assistant is to determine the cause and result of the failure or malfunction. The operator then must evaluate the knowledge of his workmen, the instruction provided with the equipment, the tools at hand, and the availability of repair in order to ascertain whether the corrective maintenance should be undertaken by the employees of the pump station's owner or whether the repair should be made by contract maintenance.

d. Contract Maintenance

Contract maintenance is that portion of corrective maintenance which cannot be done by municipal employees (regular, part time or temporary). This type of

maintenance is that which is conducted in its entirety by hiring of workmen skilled and regularly engaged in the type of work involved whether it is a factory which builds equipment, a service agency of the factory, or whether it be a privately owned independent firm skilled in the nature of the work required.

## 2. List of basic features

The following is a list of basic features of the maintenance management system recommended for adoption and use at these pump stations.

- e. Equipment record system
- f. Planning and scheduling
- g. Storeroom and inventory system
- h. Maintenance and personnel
- i. Cost and budgets for maintenance operations

### **K. Pump Station Operation: Inspection**

Each pump station is to be inspected daily. The sewer foreman or his assigned laborer will be responsible for checking each station, taking readings, monitoring pump cycles, and the general maintenance of each pump station.

### **L. Pump Station Operation: Emergencies**

Each pump station is equipped with a call-out system in case of emergencies such as high water alarms, power failures, etc. The sewer foreman is on call twenty-four (24) hours a day seven (7) days a week to address such emergencies.

### **M. Pump Station Operation: Monitoring**

The sewer foreman or his assigned laborer will be responsible for checking each station, taking readings, monitoring pump cycles, and the general maintenance of each pump station.

#### 1. Maintenance Guidelines (preventative and corrective)

The pump stations and facilities do not observe holidays, vacations or weekend shutdowns. The pump stations do experience variations in flows and maintenance work loads. Under these conditions, it is imperative that maintenance is planned and scheduled so that there is no idle time or peak work load period. Preventative maintenance must be performed on a periodic basis. For pump station equipment, the manufacturer's maintenance manuals must be consulted and a schedule of maintenance required listed. For pump station facilities other than equipment, inspections of items and/or pump station history will provide information for putting together a schedule.

Corrective maintenance must be scheduled immediately upon occurrence. A history of corrective maintenance problems will greatly contribute to scheduling future work of a similar nature. Indoor and outdoor maintenance should be scheduled to take advantage of good or inclement weather.

All maintenance work should be scheduled just as the operating routine has to be scheduled. Preventative maintenance should not be a haphazard procedure to be done if time permits.

Some types of maintenance must be scheduled on a yearly basis. There are seasonal items to be scheduled such as;

- a. Lawn and landscaping work
- b. Snow removal
- c. Exterior painting

There are items which may occur annually or others with as much as four or five year intervals. These items include:

- a. Painting
- b. Roofing
- c. Paving and road repairs
- d. Fencing
- e. Insulating
- f. Electrical system upgrading
- g. Plumbing revisions

The manufacturer's maintenance manual is generally the best guide for preventive maintenance instructions for any item of equipment. Most equipment is mass produced on a competitive basis and the cost of its maintenance should be consistent with its value, life expectancy and replacement costs. Equipment should be rated as to its critical position in the sewage system and its maintenance priority. Unnecessary or too frequent preventive maintenance can be as wasteful as improper maintenance procedures.

## 2. Schedule Chart

A schedule chart with priorities of subjects, personnel and time is a convenient aid to reduce impulse searches for work, for idle personnel. The schedule chart may be divided into daily, weekly, monthly, quarterly, semi-annually, and yearly sections so that the entire range of maintenance functions can be observed. Color tabs and labels can be coded to account for all personnel and their duties at a specific point in time. The removal of the tag from the schedule chart indicates the work is underway or has been completed. The chart provides a graphic indication of tasks that are running behind. Charts are available from most office supply companies. The size, method of use, and detail of the schedule chart depends upon facility management.

### 3. Work Order System

A work order system should be established to initiate all corrective maintenance tasks. The work order will aid in identifying work to be accomplished, procedure priority, and information on any special aspects of the job. A log of the work orders will provide a record of when the work order was initiated and completed. The work order forms should be numbered to provide a means of maintaining accountability.

#### a. Work Order Form

A sample work order form is included in Appendix B. The operator is requested to complete a work order format which is convenient, explicit and cost effective.

#### b. Work Order Log

Each form is to be numbered consecutively and dated at the time the work order is initiated. A brief description of the work to be performed must also be tallied. Whenever the work is done a listing of personnel, title and hours are to be recorded. The date the work is done should be noted. The person making out the work order form should sign whenever the form is initiated. The date of completion is to be entered and any unusual or exceptional conditions noted under comments.

### 4. Contract Maintenance Work

The plant owner should make arrangements with contractors and repair services to aid the pump station maintenance personnel in performing various maintenance tasks and emergency repairs. These tasks may include structural, electrical and mechanical problems or malfunctions in the sewers themselves. Other general maintenance tasks such as snow removal, ground work, painting, or other minor functions can be contracted out.

## **N. Pump Station Operation: Record Keeping**

Proper record keeping will be essential to the successful implementation of this O & M Manual. Records for flows, call-outs, routine and preventive maintenance and major capital improvements will be kept by the Township. The following items should be included in the pump station record keeping:

#### 1. Preventive Maintenance Items

A list of preventive maintenance items to be performed is to be recorded. These are acquired from the manufacturer's maintenance catalog or made up by persons familiar with the equipment operation and operating conditions. Adjacent to the maintenance item is to be noted the frequency of the maintenance. Space must be

provided to note when the maintenance was performed, by whom and comments as to any irregular observations detected. Specific data on the number of man-hours, cost and material or supplies consumed should be noted whenever any unusual preventive maintenance is performed. Routine maintenance may be documented simply by date and initial of the person doing the work.

## 2. Corrective Maintenance

All the information mentioned under the paragraph above must be kept for preventive maintenance items. This information may be kept on the record or an additional file may be made and stapled or attached to the preventive maintenance record when documenting the corrective maintenance should be recorded with a contrasting color or underlined in another color so that this information clearly stands out and is easily distinguished from the preventive maintenance items. Unusual preventive maintenance should also be logged with a contrasting color.

## 3. Budget Development System

All information relative to costs of maintenance (e.g., man-hours, wages, cost of spare parts, contract costs, etc.) are also to be noted and filed chronologically for each fiscal year. The work done, the date and all costs relating to the particular work accomplished should be noted. This information will be used annually in compiling a budget for the following year.

## 4. Equipment Record Keeping

An equipment record system is recommended for pump stations. This data should be filed on a weekly basis. The following information shall be recorded:

- a. Name and number given to the item
- b. Name of manufacturer or supplier
- c. Name of telephone number of representative
- d. Cost and installation date
- e. Model number, serial number, size, type, etc.
- f. Equipment data
- g. Maintenance item on hand
- h. Spare parts on hand

## 5. Purchase Orders

In order to effectively implement a procedure for the acquisition of supplies and inventory items a purchase order system should be established and followed, if one does not exist. The system will provide a record of the date an item was ordered and when received, quantity, unit cost, total cost, supplier and item destination (stock, preventive maintenance, corrective maintenance, service). Standing purchase orders can be used effectively for spreading out delivery of large quantities of supplies.

Each purchase order must be assigned a number and an understood designation to keep from coming in conflict with other purchase orders made out by the owner of the sewage system. Filing must be done in numerical order. Once an order is filled, the file copy is to be transferred from “Purchase Orders Outstanding” file to “Purchase Orders Filled” file. A sample purchase order form is provided in the Appendix B of this manual.

#### **O. Pump Station Operation: Force Mains and Air Vacuum Valves**

Force Mains and air vacuum valves are regularly maintained by the Sewer Foreman. They are monitored and replaced when necessary.

#### **P. Pump Station Operation: Parts Inventory**

An equipment record system must be kept for all the pumps stations. The system recommended will prove to be simple, effective, and adequate for this facility. The system will contain a file on each item of equipment with enough information to provide a record and history of the equipment to sufficiently maintain a complete record. Additional file data are required for special information regarding other factors of concern at the pump stations and these items are discussed in other chapters of this O&M Manual.

##### **1. Equipment Numbering System**

Each item of equipment in each pump station requiring maintenance should be assigned a number for easy identification and to insure that all equipment receives proper attention. The pump stations have been divided for equipment numbering with a range of numbers allotted for each one. Each piece of equipment in each pump station will be prefixed by the number range designated for that station. The following specific areas and block number assignments are suggested:

b. Porters Hollow Pump Station	100 to 199
c. Herbst Hollow Pump Station`	200 to 299
d. Elwood Court Pump Station	300 to 399
e. Diebold Road Pump Station	400 to 499
f. Forest Grove Pump Station	500 to 599
g. Richard Street Pump Station	600 to 699
h. Ewing Road Pump Station	700 to 799
i. Vinge Road Pump Station	800 to 899
j. Clever Road Pump Station	900 to 999
k. Oak Point Pump Station	1000 to 1099

Not all number in the range or block of numbers will be utilized. Major equipment items would be assigned numbers of the ten denominations and accessory equipment would be assigned units of the numbers denominations. In this manner additional



numbers are available for expansion either when additional equipment is added to the pump station or when additional files are required for accessory items.

## 2. Equipment catalog

An equipment catalog is to be prepared by the operation which lists alphabetically each item of equipment which has been assigned a number. A second listing should be included in the equipment catalog itemizing all equipment numerically with its assigned number. This will become a cross reference listing in case an exact equipment name may not be remembered.

The catalog will provide a convenient reference for locating equipment and identifying equipment numbers. Both digital and hard copies of the equipment catalog should be readily available at all times.

The person compiling the equipment catalog should keep in mind that the catalog will be used by other persons; therefore, the entries must be legible and clear enough to adequately convey to the user the information desired.

## 3. Information and Data requirements

The following is a description of the type of information and equipment data which would be maintained for each item of equipment listed in the in the equipment catalog:

### Equipment Name

Each item of equipment must be given a name or title. This name generally is associated with the function provided by the equipment. A name should be assigned that is understandable by any person familiar with pump stations. Where a common term or name is already in practice or use this name shall be used. This name or title will also occur in the equipment catalog.

### Equipment Number

Each item of equipment should be given a number. The assigned number of the equipment shall be given which will pinpoint and locate the item. In case there is confusion as to terminology or names, the numbering system would be a second method of determining exactly the item of concern.

### Purchase Data

The name and address of the manufacturer of the equipment must be placed in the equipment catalog. In case the equipment was furnished through a local representative, the name and address of the vendor should be noted. A telephone number and perhaps name of individual is helpful in establishing a relationship with

the supplier. The date the item was purchased and the name of the purchaser is important to the vendor in determining exact parameters of the equipment. The cost of the equipment should be noted as well.

#### Manufacturer's Data

Whenever nomenclature regarding the size, model, type and serial numbers are available these items should be recorded in the equipment catalog since many times this valuable information becomes obliterated from the equipment due to rust, paint, wear, etc. over a period of time. Many times the manufacturers of equipment require this date for replacement items.

#### Electrical and/or Mechanical Data

Pertinent electrical or mechanical data, usually obtained from plates fastened to the equipment or from the person who designed the original installation, must be recorded. Due to various options available on most equipment, it is important, when replacing or repairing, to have readily available sufficient data to properly order from the manufacturer. The nameplate may become mutilated over time; therefore, this source of information should not be relied upon. The design individual probably will not have available the exact information desired after a few years, since most design firms periodically retire their file. As much as possible of the electrical and mechanical information should be recorded information even though it may be determined that some of this data is of lesser importance.

#### Spare Parts

There should be spare parts for each pump station at a central location or on site. Records of spare parts should be kept. Each time the spare part is taken out of the inventory it should be accounted and replaced. When spare parts are added the inventory should reflect that addition.

#### Storeroom and Inventory System

A central storeroom for spare parts, equipment, and supplies should be maintained. This storeroom should be kept neat and orderly at all times to facilitate finding inventory items.

- a. Spare Parts/Components Inventory: It is recommended that adequate quantities of spare parts and equipment components be kept on hand to permit maintenance schedules to be met.
- b. Storeroom Inventory Procedures: This portion of the manual is intended to give guidance to the operator of a functional system to use in keeping account of the storeroom items.

- c. Numbering system: Spare parts and components should be listed in a central catalog and assigned a number. The numbering system should be compatible with, but not in conflict with, the equipment numbering system listed earlier in this chapter of the Operation and Maintenance Manual. For example, all inventory items used for the Porters Hollow Pump Station should be listed above number 100 series to further identify several items for a single piece of equipment letters should suffix the equipment number.
- d. Withdrawal Slip: On larger systems a withdrawal slip should be used whenever any item is taken out of inventory. This slip will be a record showing when the item was used and for what purpose. This information can be transferred to the central catalog card for the item to aid in determining when reorder is required. For this system a withdrawal slip program is not required and probably will not contribute significantly to the inventory record keeping system.
- e. Inventory Quantities: The township maintains a full set of tools required for the maintenance and repair of mechanical equipment and one pressure grease gun for each type of grease required for the equipment. The Township will also keep on supply one extra set of ball bearings, two sets of packing and one extra shaft sleeve (where applicable) for each size pump used on the project. Items not specifically used for sewage pumping have been purposely omitted from the list. Some of these items include: paper, pencils, file folders, forms, oils, greases, fuses, light bulbs, cleansers, etc.
- f. Record System: A record system to facilitate storeroom inventory items is recommended for use in the pump stations. The record system must not be complex; yet, it must be inclusive sufficiently to enable personnel to readily determine the storeroom stock with a minimum of paperwork and time. This may be done in a digital format. A separate file folder must be maintained by the pump station operator entitled "Inventory Items." The first item in the file will be the master inventory card. This card will identify each item used in the inventory associated number. A sample master inventory card is shown in Appendix B of this manual. Each item of inventory shall be assigned a number and a description of the item which shall be placed on a card entitled "Inventory Item." The cards shall be placed in the file folder in chronological order numerically with a subsequent placing alphabetically according to description of the item.

#### **IV. Collection System Capacity Assurance Program**

A Sewer Capacity Assurance Program shall be developed to monitor the flows throughout the Township sewer system. The program shall include flow monitoring of dry and wet weather flows in accordance with the CMOM program developed by the EPA (see Appendix C). Reporting from this program shall be used to located sources of infiltration/inflow to the sewer system.

## **A. Modeling**

The Township Engineer shall develop or utilize models to monitor flow conditions throughout the Township's sewer system. The model shall incorporate flow monitoring data for wet and dry weather flows, along with local rainfall data. Modeling shall produce flow levels, velocities, and average flow volumes.

## **B. Engineering: Design**

The Township Engineer shall utilize the data obtained from the flow monitoring and modeling to develop a report of the sewer system capacities. The report shall ultimately be used to determine what sewers have insufficient capacity or are receiving significant I/I. Recommendations should be made to the township regarding upsizing sewers with insufficient capacity or removing I/I sources.

## **C. Engineering: Capacity**

Before any permits are issued a sewer capacity letter must be Issued from the Township Engineer. It shall be prepared in accordance with all applicable regulations.

## **D. Engineering: System Mapping, As-built plans, and Updating**

The Township will keep an up-to-date map of the sanitary sewers and manhole locations. It will require from developers as-built plans for all site plans and subdivisions as part of its continued mapping update program.

## **E. Engineering: Construction**

All new sanitary sewers will be designed by a licensed Engineer. This includes both preliminary drawings and as-built drawings. All sewer rehabilitation and construction will be reviewed by a licensed Engineer. Construction of new sewers will be monitored by a construction observer from the Township Engineer as well as the Township sewer foreman.

## **F. Sewer System Capacity Evaluation**

### **1. Evaluation: Engineering Assessment**

The Township Engineer shall assess the capacity of the sanitary sewer system before any additional flows are generated into it. This includes any new developments that would affect the system.

### **2. Evaluation: Flow Monitoring**

The sanitary sewer system will be monitored for flow. Portable flow monitors will be used to determine if capacity is decreasing in pipes and manholes. Flow monitoring

should be done on a regularly scheduled basis and at strategic locations within the system.

### 3. Evaluation: Smoke and Dye Testing

#### Illegal Storm Drain Connections: Smoke Testing and Post Real Estate Transfer Dye Testing and Inspection

The removal of illegal connections is an important step in reducing the amount of direct inflow into the sewer system. Direct inflow from roof leaders, driveway drains, and other connections increases the amount of flow to the sewer system. This additional flow increases the cost of treatment and reduces the capacity of the sewer system during wet weather events.

To assist in the permanent removal of these connections, the Township has adopted an ordinance requiring all real estate title transfers be contingent upon dye test and defect inspection results. One purpose of the ordinance is to insure that these disconnections are permanent. This program also assists in the identification of any connections that have not previously been identified.

Failure of the dye test or inspection during a real estate transfer should prevent the purchaser from completing the transaction until the illegal connection is removed and or defects repaired. The Township should inspect the property after the dye testing results are submitted to insure that the purchaser has permanently removed the connection or repaired the defect. The Township should also inspect and confirm the accessibility of any manhole located on the property. After compliance with the removal of the connection, the Township should release the title to the purchaser.

In addition to the follow up dye testing it is recommended that the Township initiate an annual smoke testing program. Twenty five percent (25%) of the system should be smoke tested each year.

### 4. Evaluation: Manhole Inspection

#### a. Manhole Accessibility Field Review Schedule

Accessibility to the sewer system is required in order to evaluate and maintain the system. A primary initial objective of the O&M program will be to evaluate the accessibility of each manhole in the system. Follow up accessibility reviews are suggested as part of annual road paving programs and review/issuance of grading and building permits as these activities are significant contributors to inaccessibility problems. The township should visit each of the manhole structures located in the system to verify the following:

- The manholes are accessible
- The tops of the manholes are not buried or paved over

- The manhole lids have not been displaced, removed or damaged

Each visitation to a manhole should be recorded on the “Accessibility Field Review Form” (see Appendix B) and filed. Any change in status of the manhole accessibility should be noted and a photograph of the manhole location should be taken. If corrective action is required, the Public Works foreman should schedule the field maintenance personnel to correct the issue.

#### b. Manhole Physical Survey Schedule

The Township should internally inspect each manhole in the system every two years. A physical inspection of each manhole will assist in proactively identifying defects in the system before they deteriorate to the point of failure. It is recommended that at least 10% of manholes be inspected each year. The goals of the physical survey are to:

- Prevent the premature failure of the structures
- Identify collection system maintenance needs
- Identify any system surcharging/bypassing
- Maintain each manhole structure in a proactive manner

Personnel working on the survey program should be properly trained regarding confined space entry. Each manhole inspection should be recorded on the

Manhole Physical Survey form (see Appendix B): This form should be filled out by the personnel completing the inspection and submitted to the Public Works foreman for cataloging when the survey is complete. The inspector should take photographs of any areas that require repair. All deficiencies should be noted and ranked for repair scheduling.

Each survey form should be considered as the initiation of a work order. The form should describe in some level of detail the nature of the repairs required. If the repairs are within the capabilities of the Public Works department the form should include as an attachment a listing of materials needed to complete the repair. If the repairs are beyond the capabilities of the crew and require outside contract the form should include a brief scope description. Site access or traffic concerns that may be present should be identified.

The Township should initiate repairs using the Project Tracking form in Appendix B.

The sewer foreman should complete the basic information prior to assigning the work to a crew. The crew or sewer foreman should complete this document after the repair work is complete. This document should also be used during routine maintenance repairs. The Township should catalog these forms for future reference in their maintenance database.

## **G. Manholes and Mainline Sewers**

### **1. Manholes**

Manhole overflows must be properly reported and filed as mentioned in this manual. The cause of the overflow shall be analyzed by the township Engineer and any downstream capacity issues will be rectified to prevent further overflows.

### **2. Mainline Sewers**

Overflows occurring at manholes, as mentioned above, indicate there may be a capacity issue in the downstream mainline sewers. The pipes should be analyzed for blockage or inadequate capacity and the cause of the overflow should be immediately corrected.

All new sewers will be evaluated by the township engineer to verify that adequate pipe capacity is available for current and future conditions.

## **H. Inflow and Infiltration: Continuing Sewer Assessment**

The Township shall follow sewer televising, repair, and I&I testing programs as outlined in this manual. I&I flow reductions shall be performed as outlined in the Township Consent Order.

## **I. Program Plan Audits**

The Township will complete a system wide Sanitary Sewer audit and will prepare a summarized report and submit it to the Allegheny County Health Department at least once every five (5) years. This audit report will identify: the number of overflows recorded (if applicable) within the Township, the deficiencies and causes for the overflows, and the procedure that was followed to respond and correct the deficiencies.

**APPENDIX A:**

**SANITARY SEWER OVERFLOW (SSO)  
RESPONSE PLAN**





**Sanitary Sewer Overflow Response Plan Working Committee**  
**SANITARY SEWER OVERFLOW RESPONSE PLAN**

**I. PURPOSE**

**The Township of Kennedy has structured this Sanitary Sewer Overflow Response Plan to satisfy requirements for such plan, as laid forth within the Administrative Consent Order by and between the Allegheny County Health Department.**

**II. GENERAL**

The Sanitary Sewer Overflow Response Plan (SSORP) is designed to define appropriate actions by Kennedy Township upon notification of a possible sanitary sewage overflow caused by problems within the municipally owned sewer system. Kennedy Township (Township) shall dispatch the appropriate crews to investigate the possible overflow, identify the responsible party(ies), and provide appropriate customer service to minimize the effects of the overflow on public health and quality of surface waters. The SSORP further includes provisions to ensure safety pursuant to the directions provided by the Allegheny County Health Department (ACHD), Pennsylvania Department of Environmental Protection (DEP) and that notification and reporting is made to the appropriate local and state agencies. For purposes of this SSORP, "confirmed sewage spill" is also sometimes referred to as "sewer overflow", "overflow", or "SO". The effective date of this plan will be May 31, 2005.

**A. Objectives**

The primary objectives of the SSORP are to:

- Protect public health and the environment, and
- Satisfy the requirements of regulatory agencies and waste discharge permits which address procedures for managing sanitary sewer overflows.

Additional objectives of the SSORP are to:

- Provide appropriate customer service, protect the wastewater treatment plants and collection
- Provide appropriate customer service, protect the wastewater treatment plants and collection system including all related appurtenances and personnel, and
- Protect property from overflows resulting from problems within a publicly owned sanitary sewage system.

**B. Organization of Plan**

The key elements of the SSORP are addressed individually as follows:

Section I	Key Purpose
Section II	General
Section II	Overflow Response Procedure
Section IV	Regulatory Agency Notification Procedure
Section V	Distribution and Maintenance of SSORP

### **III. OVERFLOW RESPONSE PROCEDURE**

The Sanitary Sewer Overflow Response Procedure presents a strategy for the Township of Kennedy to mobilize labor, materials, tools, and equipment to correct or repair any condition which may cause or contribute to an un-permitted discharge from a publicly owned sanitary system. A wide range of potential system failures is considered by the plan. Being prepared to respond to system failures could lessen the effect of overflows to surface waters, land, or buildings.

#### **A. Receipt of Information Regarding an SSO**

System employees or the public may detect an overflow. The Township of Kennedy is primarily responsible for receiving phone calls from the public notifying the Township of possible overflows from the wastewater conveyance and system. The Township is then responsible for forwarding the possible overflow information to the appropriate party within the Township.

The emergency response shall be available 24 hours per day, 365 days of the year.

1. The person at the Township receiving the call from the public will obtain all relevant information available regarding the possible overflow including:
  - a. Time and date call was received;
  - b. Specific location and/or address of possible overflow;
  - c. Description of problem; and
  - d. Caller's name and call back phone number.
2. Pump station failures are monitored by the Township. The operator on duty shall convey all information regarding alarms to the Township to initiate the investigation.
3. Sanitary sewer overflows detected by any personnel in the course of their normal duties shall be reported to the Township. Dispatched personnel should record all relevant overflow information and report back information to the Township. The Township shall dispatch additional response crews, equipment, or contracted services as necessary.
4. It is the responsibility of the appropriate Township personnel or the response crew to gather all spill response data and communicate this data back to the Township as soon as possible. Until verified, the report of a possible spill will be referred to as a "sewer inspection" (SI), not a "sanitary sewer overflow" (SSO).
5. A sewer inspection or sewer overflow report should be completed by the maintenance division of the Township within 24 hours of the responding crews confirmation of an overflow. The Township is responsible for reviewing, updating, signing, and submitting the final sewer inspection or overflow report form to the proper agency including, but not limited to, the ACHD (and/or DEP).

## **B. Dispatch of Appropriate Crews to Site of Sewer**

Failure of any element within the Township owned and operated wastewater conveyance system that threatens to cause or causes a sanitary sewage overflow will trigger a response to isolate and correct the problem. Crews and equipment shall be available to respond to any SI/SO locations. Crews will be dispatched to any site of a reported SO as soon as possible.

### **Dispatching Crews**

- Upon receipt of a report of a sewage overflow, all response crew members shall proceed to the Township maintenance facility where they will gather all necessary equipment and resources before proceeding to the site of the SI/SO. Delays or conflicts in assignments and issues regarding equipment and resources should be reported to the Township supervisor for resolution.
- The response crew leader should report his/her findings, including possible damage to public system and if assessable to a private party, to the Township supervisor. If the Township has not received findings from the response crew leader within an appropriate time frame, then they should contact the response crew leader to determine the status of the investigation.

### **Additional Resources**

- Requests for additional personnel, material, supplies, and equipment from response crews shall be received by the response crew leader and conveyed to the Township.

### **Preliminary Assessment of Damage to Private and Public Property**

- The response crews should use discretion in assisting property owners/occupants who are affected by a SSO. Be aware that the Township could face increased liability for any further damages inflicted to private property during such assistance. Appropriate photographs and video footage, if possible, should be taken of the area of the SO and impacted area, allowing for thorough documentation of the nature and extent of the impact. Photographs of videotape are to be forwarded to the Township for filing with the inspection/overflow report.

### **Coordination with Hazardous Material Response**

- Upon arrival at the scene of a SSO, should a suspicious substance (e.g., oil sheen, foamy residue) be found on the ground surface, or should a suspicious odor (e.g. gasoline) not common to the sewer system be detected, response crew leader should contact the Township for guidance before taking further action.
- The Township will alert the local fire department if necessary. The response crew leader shall await the arrival of the local fire department.

- After arrival of the local fire department, response crew members will take direction from the commanding officer of the local fire department. Only when the commanding officer determines it is safe and appropriate for the response crew members to proceed, can containment, clean-up, and corrective activities be performed in accordance with the SSORP.
- Remember that vehicle engines, portable pumps, or open flames (e.g., cigarette lighters) can provide the ignition for an explosion or fire should flammable vapors or fluids be present at the site. Maintain a safe distance and observe caution until and after assistance arrives.

#### Post-Cleanup Activities

- The appropriate Township should conduct a follow up visit to the site of the overflow, if possible, to ensure the provisions of the SSORP and other directives were properly followed.
- The response crew leader is responsible for confirming that the SI/SO Report was provided to the Township.

### C. **Overflow Correction, Containment, and Clean-Up**

Blocked sewers, pipe failures, or mechanical malfunctions can cause sanitary sewage overflows. Other natural and man-made disturbances are also possible causes of sanitary sewer overflows.

This section describes specific actions to be performed by response crews during an SSO. The objectives of these actions are to:

- Determine the apparent cause of the overflow, for example whether the cause lies in the publicly owned sewer or a private lateral;
- Protect public health, the environment, and property by minimizing SSO impacts as soon as possible;
- Establish parameters with appropriate barricades and control zones with vehicles or natural topography (e.g., hills, berms);
- Communicate preliminary overflow information and potential impacts as soon as practical to the regulatory agency, and
- Contain the SSO to the maximum extent possible including preventing the discharge of sanitary sewage into surface waters.

Circumstances may arise when the Township could benefit from support of private-sector construction assistance.

#### 1. **Responsibilities of Response Crew Upon Arrival**

It is the responsibility of the first personnel who arrive at the site of a sanitary sewer overflow to protect the health and safety of the public by mitigating the impact of the overflow to the extent possible. Should the overflow not be the responsibility of the Township, but there is imminent danger to public health, public or private property or to the waters of the U.S., then prudent action should be taken until the responsible party assumes control and provides remedial actions.

Upon arrival at a SSO the response crew should do the following:

- Determine the cause of the sanitary sewer overflow;
- If necessary, identify and request additional resources to correct the overflow or to determine its cause;
- Determine if private property is impacted. If it is, the Township should inform the ACHD (or DEP if appropriate) by faxing the standardized report form, which is provided as Appendix "B" to the ACHD Administrative Consent Order, to:

***Allegheny County Health Department  
Chief of Public Drinking Water & Waste Management***

Phone: 412.578.8040

Fax: 412.578.8053

24-hour phone number: 412.687.2243

***Pennsylvania Department of Environmental Protection***

24-hour phone number: 412.442.4000

Fax: 412.442.4194 or 412.442.4303

- Appropriate personnel, materials, supplies, and/or equipment which can be dispatched to minimize the impact of the overflow.

2. Initial Measures of Containment

Initiate measures to contain the SSO, thereby minimizing impact to public health or the environment.

3. Additional Measures Under Potentially Prolonged Overflow Conditions

In the event of a prolonged sewer line blockage or a sewer line collapse, a determination should be made to set up a portable bypass pumping operation around the obstruction.

- Appropriate measures shall be taken to effectively handle the sewage flow.
- Continuous or periodic monitoring shall be implemented as required.

- Regulatory agency issues shall be addressed in conjunction with emergency repairs.

#### 4. Cleanup

Sewer overflow sites are to be promptly cleaned to the highest degree possible after an overflow. No readily identifiable residue is to remain in the area of the SSO.

- The SSO site is to be secured to prevent access to the site by the public until the site has been thoroughly cleaned.
- Where practical, the area is to be thoroughly flushed and cleaned of any sewage or wash-down water. Solids and debris are to be transported for proper disposal.
- Where appropriate, the overflow site is to be disinfected and ponds formed by the SSO will be pumped dry and the residue will be disposed of properly.

#### **D. Overflow Report**

An overflow report shall be completed by the response personnel, who shall promptly notify the "title of appropriate person" within the Township when the overflow is eliminated.

To properly complete an overflow report:

- Determine if the SSO may have impacted the surface waters.
- Characterize the SSO by evaluating the following:
  - a. Sewage overflows to stormwater system,
  - b. Preplanned or emergency maintenance jobs involving bypass pumping,
  - c. Overflows where observation or on-site evidence clearly indicates all sanitary sewage was retained on land and did not reach surface water and where cleanup occurs, and
  - d. Any other pertinent information relating to each individual SSO.
- Use one of the following criteria to estimate the start date/time of the SSO:
  - a. Information reported to Township and later substantiated by a sewer investigator or response crew, or
  - b. Visual observation.
- Use one of the following criteria to estimate the end date/time of the SSO:

- a. When the blockage is cleared or flow is controlled or contained; or (When the flow of the sanitary sewer is controlled or contained by removing the blockage???)
- b. The arrival time of the sewer investigator or response crew, if the overflow stopped between the time it was reported and the time of arrival.
- Estimate the flow rate of the SSO in gallons per minute (GPM) by:
  - a. Direct observations of the overflow or;
  - b. Estimated measurement of actual overflow.
- Estimate the volume of the sanitary sewer overflow when rate of overflow is known by:
  - a. Multiplying the duration of the overflow by the overflow rate.
- Photograph of the event.
- Describe any damage to the exterior areas of public/private property.

#### **IV. REGULATORY AGENCY NOTIFICATION PLAN**

The Regulatory Agency Notification Plan establishes procedures that the Township shall follow to provide formal notice to the ACHD as necessary in the event of the SSOs. The following reporting criteria explain to whom various forms of notification should be sent to, and lists agencies/individuals to be contacted.

##### **Notification Procedure:**

The Township should notify the county regulatory agency representatives as soon as possible and keep them abreast of response actions and final corrective actions.

Notification will be by telephone or by fax no later than twenty-four (24) hours or the next working day after an overflow is confirmed. The initial and overflow report should be faxed on the standardized reporting form (Appendix "A") to:

***Allegheny County Health Department  
Chief of Public Drinking Water & Waste Management***

Phone: 412.578.8040

Fax: 412.578.8053

24-hour phone number: 412.687.2243

***Pennsylvania Department of Environmental Protection***

24-hour phone number: 412.442.4000

Fax: 412.442.4194 or 412.442.4303

## **V. DISTRIBUTION AND MAINTENANCE OF SSORP**

Annual updates to the SSORP should be made to reflect all changes in policies and procedures as may be required to achieve its objectives.

### **A. Submittal and Availability of SSORP**

Copies of the SSORP and any amendments should be distributed to the following departments and functional positions:

Executive Office Complex – One copy.

Maintenance Division – One copy per operations management personnel.

Plants – One copy per location.

All other personnel who may become incidentally involved in responding to overflows should be familiar with the SSORP. Appended to the SSORP should be a sign off sheet that states that they have read and completely understand the SSORP.

### **B. Review and Update of SSORP**

The SSORP should be reviewed and amended as appropriate. The Township should:

- Update the SSORP with the issuance of a revised or new NPDES permit or state waste discharge permit.
- Review and update as needed the various contact person lists included in the SSORP.



## SANITARY SEWER OVERFLOW (SSO) INSPECTION QUESTIONNAIRE

Name of Facility/Utility/Municipality: \_\_\_\_\_

*Note: The inspector should review the NPDES permit prior to the on-site visit (obtain from Water Division) in order to familiarize him/her of its requirements relative to SSO's. Which of the following does the facility's permit contain (indicate by a checkmark)?*

- (1) *A prohibition on unauthorized discharges from the collection system to waters of the U.S.?*
- (2) *A requirement to report all SSO's to the permitting authority?*
- (3) *A provision of proper operation and maintenance of the SSS?*
- (4) *A duty to mitigate discharges?*
- (5) *A requirement for public notification of SSO's?*
- (6) *Any other requirements (if yes, describe)*

1. What is the approximate age range of the sanitary sewer system (SSS)?
2. What is the approximate size of the SSS's service area? Identify all jurisdictions, which contribute flow to the collection system. Is there a map of the system (obtain a copy if possible)?
3. What is the approximate population served by the SSS?
4. What percentage of the collection system is separate and what percentage is combined?
5. What percentage of the system is gravity fed and what percentage is pumped, i.e. force main.
6. How many pump stations are there within the SSS and what is their pumping capacity?
7. What are the following flows (for entire SSS service are):

Average Daily-  
Peak Dry Weather-  
Peak Wet Weather-

8. Describe the flow monitoring program implemented for peak flow or sewer line capacity evaluations and provide documentation of the monitoring conducted in the past three (3) years. Were flows determined by actual metering or by calculation using pump run times, etc?
9. Describe any sewer construction/expansion/replacement/rehabilitation projects conducted in the past three (3) years.
10. Who owns and operates the SSS? Do they have inter-jurisdictional agreements with other municipalities that contribute flow to the POTW?
11. What POTW receives the flow from this SSS?
12. Who owns and operates the POTW?
13. What is the facility's annual budget for the operation and maintenance of its collection system? Provide documentation of the budget for the past three (3) years. (Note: It May be difficult to isolate the collection system budget separately.)

14. Describe the facility's spare parts inventory.
15. How much staff is dedicated for O&M functions?
16. What type of training has this staff received? How often is it given?
17. Describe the operation and maintenance program for the SSS (include TV/smoke/dye testing, cleaning of sewers, repair and replacement of sewers, cleaning and sealing of manholes, preventive/predictive maintenance of pump stations, etc.)

18. Describe how the effectiveness of the I/I reduction programs is evaluated (obtain any available reports)?
19. Describe the SSS inspection program (items inspected, frequency, manpower, equipment, etc.). Obtain copies of the inspection SOP if one exists and the inspection log that is used to document results. Describe procedure for correcting problems found during inspections.
20. List chronic problems that have occurred or are occurring within the SSS and have resulted in a SSO (i.e., corrosion, grease, roots, other blockages, I/I, inadequate pumping capacity, pump failures, construction related, hydraulic overloads, power failures, industrial connections, illegal connections, vandalism, etc.).

21. In the past five (5) years how many known SSO's occurred (included overflows to streams, to streets, to streets or basement backups)?
22. How are SSO's identified? How are they recorded? (obtain copies of SSO event documentation)
23. Describe below for each individual overflow: where it occurred, whether it entered a receiving stream, cause (indicate whether dry or wet weather occurrence) and remedial actions that were taken?
24. Describe any water quality monitoring that is conducted to identify impacts of SSO's.

25. Are any particularly sensitive areas (i.e., drinking water sources, public beaches, fish advisories, shellfish beds, endangered species, etc.) located downstream from SSO points? If yes, describe.
26. Have all SSO's been reported to the permitting authority?
27. How is the public notified of SSO's
28. Does the facility have an Overflow Emergency Response/Notification Plan? If so, obtain a copy.
29. Describe any complaints concerning SSO's that were received from the public and activities performed to investigate and address problems.
30. Describe any short or long term investigations and/or remediation plans that have been developed by the facility (obtain copies) and provide status of implementation. This should include ones that have been developed voluntarily, as well as ones required by state corrective action plans or planning requirements.

31. Describe what measures the facility has taken to comply with its permit's SSO requirements (i.e., the prohibition of discharges and the reporting of any events that occur). Indicate all actions which were successful in reducing or eliminating subsequent SSOs.

Other Comments

Some Causes of SSO's (and possible corrective actions)

Inadequate pumping capacity – install larger pumps/more redundancy or additional pump stations; reduce peak flows

Inadequate WWTP capacity – expand WWTP; reduce peak flows

Undersized sewer lines creating bottlenecks – replace undersize sewers with larger pipes; reduce peak flows

Improper operation of lift stations or pumps – devise better operating system

Pump failure – perform better preventative/predictive maintenance programs for pumps

Broken, blocked or otherwise poorly maintained manholes – perform better maintenance program for sewer system including more regular cleaning and inspections/rehabs/replacements/slip lining, etc.

Blocked, broken, cracked, or collapsed sewer lines – perform better maintenance program for sewer system including more regular cleaning and inspections; replace sewer lines

Pretreatment related problems – adopt pretreatment program or improve existing program

Illegal connections (i.e. sump pumps and roof drains) – prohibit such connections through sewer ordinance and enforce

I/I resulting from heavy rainfall – inspect/test sewer system and correct faulty joints or other problems

Power failure (no emergency power) – provide emergency power

Industrial or commercial connections overloading line capacity or causing blockages (i.e. grease) – adopt and enforce a sewer moratorium; implement more frequent targeted cleaning/preventative maintenance

Vandalism

Severe acts of nature (i.e., floods, etc.)



**APPENDIX B:**  
**SAMPLE FORMS**

Kennedy Township  
Administrative Consent Order  
Appendix B



**Allegheny County Health Department**  
Public Drinking Water & Waste Management  
3901 Penn Avenue, Building #5  
Pittsburgh, PA 15224-1318  
Phone: 412-578-8040 FAX: 412-578-8053

**SANITARY SEWER OVERFLOW FASCIMILE REPORTING FORM**

<b>MUNICIPALITY/AUTHORITY REPORTING INCIDENT</b>			
<b>DATE OF OCCURRENCE</b>		<b>TIME OF OCCURRENCE</b>	
<b>BEGIN</b>	<b>END</b>	<b>BEGIN</b>	<b>END</b>
<b>LOCATION OF OVERFLOW</b> (street address, diversion structure ID, outfall ID)			
<b>ANY PREVIOUS OVERFLOWS AT THIS LOCATION?</b> (Yes / No)	<b>ESTIMATED DURATION OF OVERFLOW</b>	<b>ESTIMATED TOTAL VOLUME RELEASED</b>	
	<b>HOURS</b>	<b>GALLONS</b>	
<b>DESTINATION OF OVERFLOW</b> (building or basement, ground, storm sewer to stream, directly to stream)			
<b>SPECIFIC RECEIVING WATERS</b>			
<b>SEWER SYSTEM COMPONENT FROM WHICH OVERFLOW OCCURRED</b> (M = manhole; P = pipe; C = constructed overflow; PS = pump station; O = other)		<b>WET OR DRY CONDITIONS</b>	
<b>CAUSE OF OVERFLOW</b> (W = extreme weather; G = grease problem; R = roots; S = sediment; B = other blockages; D = deterioration of line due to aging system or lack of repair; F = equipment failure, structural failure or power failure; 3 = 3 <sup>rd</sup> party action including vandalism; O = other, please describe)	<b>SPECIFIC DESCRIPTION OF CAUSE</b>		
<b>STEPS/ACTION TAKEN TO MINIMIZE/ELIMINATE OVERFLOW</b> (where appropriate)			
<b>STEPS/ACTION TAKEN FOR CLEAN-UP</b> (where appropriate)			
<b>REPORT MADE TO DEP</b> (check permit for reporting requirements)			
<b>DATE</b>		<b>TIME</b>	
<b>PERSON COMPLETING FORM</b>			
<b>NAME</b>		<b>TITLE</b>	
<b>CONTACT PERSON</b>			
<b>NAME</b>		<b>PHONE NUMBER</b>	

## Accessibility Field Review Form Township of Kennedy

Inspector Name:				Date of Field Review:	
	Manhole Structure Number	Manhole Status		Photograph Taken	Description of Accessibility Problem
		No Action Required	Corrective Action Required		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

## Manhole Physical Survey Form Township of Kennedy

Inspector Name:		Date of Physical Survey:	
Manhole Number:		Location Description:	
Weather Conditions:			
<b>Casting/Lid:</b>			
Type:	<input type="checkbox"/> Vented	<input type="checkbox"/> Solid	Buried: <input type="checkbox"/> Yes <input type="checkbox"/> No
		How Deep?	FT
<b>Ladder Bars:</b>			
Type:	<input type="checkbox"/> Steel	<input type="checkbox"/> PVC	<input type="checkbox"/> Cast Iron
Condition:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair (some repair required)	<input type="checkbox"/> Poor (extensive repair required)
		Replace	
Description of Repair Work			
<b>Barrel:</b>			
Construction	<input type="checkbox"/> Brick	<input type="checkbox"/> Precast:	<input type="checkbox"/> Other:
Condition:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair (some repair required)	<input type="checkbox"/> Poor (extensive repair required)
		Replace	
Description of Repair Work			
<b>Bottom:</b>			
Construction	<input type="checkbox"/> Brick	<input type="checkbox"/> Precast:	<input type="checkbox"/> Cast-in-place
Condition:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair (some repair required)	<input type="checkbox"/> Poor (extensive repair required)
		Replace	
Description of Repair Work			
Debris:			
Additional Observations: (include a description of materials needed for repair, access, traffic, and other issues that the repair crew will need to know prior to arriving at the site.)			

## SAMPLE CONFINED SPACE ENTRY PERMIT FORM

### CONFINED SPACE ENTRY PERMIT

DATE: \_\_\_\_\_

Area of Equipment to be entered: \_\_\_\_\_

Location: \_\_\_\_\_

Purpose of entry: \_\_\_\_\_

Testing instrument(s) used: \_\_\_\_\_

Ventilation equipment used: \_\_\_\_\_

Safety and Rescue equipment provided: \_\_\_\_\_

Periodic Checks	Time	Oxygen Per Cent	% Reading	Tested By	Comment
Prior to Entry:  1. 2. 3. 4. 5. 6. 7. 8.					

This confined space has been inspected and found safe for entry for the period covered.

Signed: \_\_\_\_\_  
(Person in Charge)                      (Date)                      (Time)

## SAMPLE CORRECTIVE MAINTENANCE RECORD

NAME OF EQUIPMENT ITEM: \_\_\_\_\_ INVENTORY NUMBER: \_\_\_\_\_

[illegible]

## SAMPLE EMERGENCY INVENTORY SHEET

[illegible]

## SAMPLE EQUIPMENT DATA CARD

Card No. 1

Side No. 1

NAME OF EQUIPMENT ITEM:\_\_\_\_\_INVENTORY NUMBER\_\_\_\_\_

MODEL NUMBER: \_\_\_\_\_ SERIAL NUMBER: \_\_\_\_\_ SIZE: \_\_\_\_\_

MANUFACTURERS NAME AND ADDRESS:\_\_\_\_\_

PURCHASER'S NAME, ADDRESS AND TELEPHONE: \_\_\_\_\_

DATE PURCHASED: \_\_\_\_\_ PURCHASE PRICE: \_\_\_\_\_

EQUIPMENT DATA:

---

---

---

## MAINTENANCE ITEMS ON HAND

## SPARE PARTS ON HAND

[illegible]



## SAMPLE INVENTORY CARD

INVENTORY ITEM	
_____	_____
Item Description	Item Number
Quality in Inventory _____	Date _____
Last Purchase Date _____	Purchase Cost per Item _____
Vendor's Name & Address _____	
Delivery Waiting Period _____	Telephone _____

## SAMPLE MASTER INVENTORY CARD

## MASTER INVENTORY

Description

Inventory Card Number

## SAMPLE PREVENTATIVE MAINTENANCE RECORD

NAME OF EQUIPMENT ITEM: \_\_\_\_\_ INVENTORY NUMBER: \_\_\_\_\_

[illegible]

# SAMPLE PURCHASE ORDER

NO. MRSTP \_\_\_\_\_  
 THIS ORDER NUMBER MUST APPEAR ON  
 ALL PACKAGES, INVOICES, AND SHIPPING  
 PAPERS

VENDOR

PURCHASE ORDER  
 Kennedy Township  
 340 Pine Hollow Road  
 Coraopolis, PA 15108  
 S  
 H  
 I  
 P  
 T  
 O

DATE:	DATE REQ:	TERMS:	F.O.B.	SHIP VIA:	ITEM DESTINATION:	DATE REC'D
QUANTITY	DESCRIPTION	UNIT COST	TOTAL COST			

## SAMPLE VULNERABILITY ANALYSIS WORKSHEET

TREATMENT SYSTEM: \_\_\_\_\_

ASSUMED EMERGENCY: \_\_\_\_\_

DESCRIPTION OF EMERGENCY: \_\_\_\_\_

SYSTEM COMPONENT	EFFECTS OF EMERGENCY	PREVENTION RECOMMENDATIONS
	TYPE AND EXTENT	
<u>COLLECTION SYSTEM</u>		
<u>PRETREATMENT</u>		
<u>SEWAGE PUMPING</u>		
<u>SECONDARY TREATMENT</u>		
<u>DISINFECTION</u>		
<u>DISINFECTION</u>		
<u>COMMUNICATIONS</u>		

DATE: \_\_\_\_\_

ANALYST: \_\_\_\_\_

**WASTEWATER TREATMENT SYSTEM  
EMERGENCY INVENTORY**

SYSTEM: \_\_\_\_\_

PREPARED BY: \_\_\_\_\_

(SIGNATURE)

**DUPLICATE EQUIPMENT IN STOCK**

DESCRIPTION	MAKE	SIZE	TYPE	VOLTAGE	HP	CAPACITY	NO.

**PARTS AND COMPONENTS IN STOCK**

DESCRIPTION	SIZE	NO.	APPLICATION IN SYSTEM

**EMERGENCY EQUIPMENT AND REPAIR TOOLS**

DESCRIPTION	NO.	APPLICATION IN SYSTEM

PIPE	SIZE					
	TYPE					
	LENGTH					

AVERAGE CHEMICAL STOCK	TYPE					
	FORM					
	QUANTITY					

**COMMUNICATIONS EQUIPMENT**

DESCRIPTION	LOCATION

**MAPS AND FACILITY LAYOUT DETAILS**


\_\_\_\_\_  
OFFICIAL AUTHORIZING INVENTORY

## Project Tracking Form Township of Kennedy

<b>Project Tracking Form Township of Kennedy</b>										
Project Number:										
Date of Complaint (if any) or Work Order:					Name of complainant (if any):					
Address:										
Location Description:										
Complaint Tracking Number (if any):										
Description of reported condition or Maintenance Request:										
Manhole from:					Manhole to:					
Charge to:					Project Classification:					
Contractor:										
Project Engineer:										
Project Inspector:										
Crew Foreman:					<b>Work Type</b>					
<b>Project Summary Information:</b>					<input type="checkbox"/>	Main Line New Installation				
					<input type="checkbox"/>	Main Line Replacement				
					<input type="checkbox"/>	Main Line Repair				
					<input type="checkbox"/>	Main Line Bulk Head				
					<input type="checkbox"/>	Main Line Fill, Seal Abandon				
Start Date:										
Completion Date:										
Estimated Days to completion:										
Cut Size (feet):		Length		Width		<input type="checkbox"/>	Manhole New Installation			
						<input type="checkbox"/>	Manhole Replacement			
		Average Depth				<input type="checkbox"/>	Manhole Repair			
Permit Number:					<input type="checkbox"/> Manhole Rehabilitation					
Utilities Phone Numbers		Gas				<input type="checkbox"/>	Manhole Raise			
		Electric								
		Phone				<input type="checkbox"/>	Encasement Installation			
		Cable				Encasement Report				
		Water								
Project Notes (include description of equipment used, number of personnel required and any difficulties encountered):					<input type="checkbox"/>	Force Main Replacement				
					<input type="checkbox"/>	Force Main Repair				
					<input type="checkbox"/>	Force Main Valve Replacement				
					<input type="checkbox"/>	Force Main Valve Repair				
					<b>One Call Serial Numbers and Dates:</b>					<input type="checkbox"/>
<input type="checkbox"/>	Low Pressure Force Main Replacement									
<input type="checkbox"/>	Low Pressure Force Main Repair									
<input type="checkbox"/>	Low Pressure Force Main Valve Replacement									
<input type="checkbox"/>	Low Pressure Force Main Valve Repair									
<input type="checkbox"/>										
<input type="checkbox"/>										
<input type="checkbox"/>	Building Lateral New Installation									
<input type="checkbox"/>	Building Lateral Replacement									
<input type="checkbox"/>	Building Lateral Repair									
Project Difficulty Rating:					<input type="checkbox"/>	Building Lateral Relocate				
					<input type="checkbox"/>	Other (describe):				
(Easy, Moderate, Difficult)										

TOWNSHIP OF KENNEDY  
WORK ORDER

WORK ORDER NO. \_\_\_\_\_ DATE:\_\_\_\_\_

WORK TO BE PERFORMED:

MATERIALS TO BE PURCHASED:

WORK PERFORMED BY:

- |    |       |             |
|----|-------|-------------|
| 1. | _____ | _____ HOURS |
| 2. | _____ | _____ HOURS |
| 3. | _____ | _____ HOURS |
| 4. | _____ | _____ HOURS |

WORK COMPLETED:

SIGNED:\_\_\_\_\_

DATE:\_\_\_\_\_

COMMENTS:



**APPENDIX C:**

**CAPACITY, MANAGEMENT, OPERATIONS, AND  
MAINTENANCE (CMOM) GUIDELINES**



WEF Collection Systems Committee  
CMOM Project / O & M

# The O & M in CMOM: “Operation & Maintenance”

## A Reference Guide for Utility Operators

# **The O & M in CMOM: Operation & Maintenance**

## **A Reference Guide for Utility Operators**

- This draft is a compilation of documentation intended to act as reference and guidance for utilities as they create a CMOM plan either through their voluntary efforts, or as required by Federal or State compliance, audit invitation, or violation response.
- The EPA SSO proposal includes standard permit conditions addressing capacity, management, operation and maintenance (CMOM) requirements; a prohibition on discharges (with a framework for a defense for unavoidable discharges); and requirements for reporting, public notification, and recordkeeping for municipal sanitary sewer collection systems and SSO's. Within the EPA's draft is proposal of a regulatory framework for applying NPDES permit conditions, including applicable standard permit conditions, to municipal satellite collection systems. Municipal satellite collection systems are sanitary sewers owned or operated by a municipality that convey sewage or industrial wastewater to a publicly owned treatment works (POTW) that has a treatment plant owned or operated by a different municipality. Implementation of this proposal will improve the capacity, management, operation and maintenance of municipal sanitary sewer collection systems and improve public notice for SSO events

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# CMOM Policy and Regulations

## What Is CMOM?

[www.epa.gov/npdes/pubs/cmomselfreview.pdf](http://www.epa.gov/npdes/pubs/cmomselfreview.pdf)

CMOM stands for “Capacity, Management, Operations, and Maintenance”. It is a flexible, dynamic framework for municipalities to identify and incorporate widely accepted wastewater industry practices to:

- Better manage, operate, and maintain collection systems
- Investigate capacity constrained areas of the collection system
- Respond to sanitary sewer overflow (SSO) events

In CMOM planning, the utility selects performance goal targets, and designs CMOM activities to meet the goals. Information collection and management practices are used to track how well each CMOM activity is meeting the performance goals, and whether overall system efficiency is improving.

## The CMOM Program and what it entails

[http://www.neiwpcc.org/PDF\\_Docs/WEBOM&R.CH2.pdf](http://www.neiwpcc.org/PDF_Docs/WEBOM&R.CH2.pdf)

The proposed CMOM approach outlines a dynamic system management framework that encourages evaluating and prioritizing efforts to identify and correct performance-limiting situations in the collection system. Industry technical guidance supports the need for dynamic approaches that use information about system performance, changing conditions, and operation and maintenance practices to guide and modify responses, routine activities, procedures, and capital investments.

The CMOM program was developed in an attempt to establish a process and framework that would allow collection system owners and operators to:

1. Understand the components that make up the collection system and how the collection system performs.
2. Identify goals and objectives for managing a specific collection system.
3. Provide the necessary program structure to allow goals to be met; including ensuring appropriate program components are in place, organization of administrative and maintenance functions, legal authorities, measures and activities, and design and performance standards.
4. Strive for adjustment of implementation activities to reflect changing conditions; including monitoring and measuring program implementation and making appropriate modifications, conducting necessary system evaluations, implementing a capacity assurance program, and conducting periodic program audits to evaluate implementation and to identify deficiencies and steps to respond to them.
5. Prepare for and respond to emergency events.
6. Communicate with interested parties on the implementation and performance of the CMOM program.

### General Performance Standards

As first conceptualized in the 2001 draft proposal, EPA’s CMOM standard permit condition for municipal sanitary sewer collection systems would contain five general performance standards.

The permittee would need to:

1. Properly manage, operate and maintain, at all times, the parts of the collection system that the permittee owns or over which it has operational control.
2. Provide adequate capacity to convey base flows and peak flows.

3. Take all feasible steps to stop, and mitigate the impact of, sanitary sewer overflows.
4. Provide notification to parties with a reasonable potential for exposure to pollutants associated with the overflow event.
5. Develop a written summary of their CMOM program and make it, and required program audits, available to the public upon request.

### **CMOM Program Components**

EPA's proposed CMOM program identifies six components EPA believes are generally necessary to meet the five performance standards in the proposed standard condition. The CMOM program would need to:

1. Identify program goals consistent with the general standards.
2. Identify administrative and maintenance functions responsible for implementing the CMOM program and chain of communication for complying with reporting requirements for SSOs.
3. Include legal authorities necessary for implementing the CMOM program.
4. Address appropriate measures and activities necessary to meet the performance standards.
5. Provide design and performance provisions.
6. Monitor program implementation and measure its effectiveness.

## **MOM (CMOM) Programs Are Utility-Specific.**

[www.epa.region4/water/wpeb/pdfs/self-audit\\_review2-3.pdf](http://www.epa.region4/water/wpeb/pdfs/self-audit_review2-3.pdf)

Utilities may have different titles for the various MOM programs and may have them organized differently. Individual utilities may choose to consolidate some of the closely related MOM programs or individual utilities may not need all of the program because of utility specific circumstances. Finally, individual utilities may have additional MOM programs that are not contained in this {document}. Having programs that are specific to the individual Utility means that the programs should be tailored to match the Utility's geographic, physical, and climatic conditions, the system's level of complexity, the configuration of the system's infrastructure, and the system's level of sophistication. Utilities may have a number of the needed MOM programs implemented through contract rather than by their own trained personnel.

The concept behind the CMOM project is that the self-audit report is not to be written for the EPA. Rather, it is to be prepared for the utility management and utility policy makers and then submitted to the EPA as evidence of program status.

The seven elements that should comprise every proper MOM program are as follows:

- ♦ Must be utility specific. (common thread for each of the remaining six elements)
- ♦ Must have a purpose
- ♦ Must have a defined goal
- ♦ Must be in writing
- ♦ Must be implemented by trained personnel
- ♦ Must have performance measures
- ♦ Must be subject to periodic evaluation (including or beginning with this audit)

## **SUMMARY COMMENTS on CMOM**

### **From July 29, 1999, SSO Federal Advisory Committee Meeting**

<http://www.epa.gov/npdes/pubs/cmomfac.htm>

The C-MOM program is derived from a need for improved sewer system operation and maintenance. The first C-MOM components ensuring proper installation and testing of new and rehabilitated lines; inter-jurisdictional agreements for wastewater services; and requirements for the implementation of an information management system. One of the basic information systems that a municipality should have an accurate map of the sewer system. C-MOM programs will eliminate one of the greatest utility deficiencies: management of information. C-MOM would also look at municipal satellite collection systems, and require that the relationship between systems be defined in the C-MOM plan. To date, inter-jurisdictional agreements have most often been related to billing, rather than operations and maintenance.

The next tenets of C-MOM are capacity assurance in the collection system and at the treatment plant. Done correctly, capacity assurance would move maintenance from reactive to proactive and preventative.

C-MOM would also require communities to develop overflow response and emergency operations plans. EPA expects that the utility would have a contingency plan covering how information would be received and dispatched, mobilization, notification of health officials and NPDES authorities, and training on how the plan would be implemented.

A complete C-MOM program would also include assessing a system's current physical conditions and determining which components of the system need to be repaired.

The C-MOM also highlights new connections and flows from service laterals, since 80% of all backups are the fault of homeowners not maintaining private laterals. The idea under the new connections subsection is to ensure that private lateral connections are good and that there is adequate capacity.

The C-MOM requirement to optimize treatment facility operation during peak flows is designed to protect the treatment plant and its biota. It is expected that a good utility will have a peak flow management plan for the treatment plant.

C-MOM would also require training. There is nothing in the CWA about training, but a poorly trained O&M staff would be ineffective. Training should cover not only equipment, but also how the collection system works.

The final area of C-MOM is a summary of the management program, which describes what the program requires, including goals and performance measures. Municipalities would also be required to conduct periodic audits, as part of C-MOM, to determine the effectiveness of their programs. Since in most current cases there is too little MOM, the plan would help identify the right amount to get the job done. This could be accomplished through the use of performance measures.

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## **Why CMOM?**

[http://www.ceriworld.org/PDFs/EMS\\_SSO.pdf](http://www.ceriworld.org/PDFs/EMS_SSO.pdf)

## **Proposed EPA Regulations for SSO's (May, 2000)**

Following President Clinton's Executive Order in May of 1999, the US EPA was developing formal regulatory language for public comment and adoption. The SSO Federal Advisory Committee met on July 28-29, 1999 and again on October 18-19, 1999 and unanimously supported documents addressing CMOM, Prohibition on SSO's, Recording Keeping, Reporting and Public Notification, and Satellite Systems. The following documents represent the current language being reviewed by the Office of Management and Budget (OMB) to control SSO's. The pending rules were sent to OMB at the end of March 2000. As of December 2000, OMB still had not released their review.

NPDES Requirements Overview for Municipal Sanitary Sewer Collection Systems Rule - Published on the WWW, May 13, 2000:

- Establishes NPDES standard permit conditions for recordkeeping, reporting, public notification, capacity assurance, management, operation and maintenance, emergency response, and audit requirements for municipal sanitary sewer collection systems.
- Establishes a standard permit condition that prohibits sanitary sewer overflows (SSO's) and recognizes that under very limited circumstances, some SSO's may be unavoidable.
- Requires that municipal satellite collection systems must obtain permit conditions.

Draft documents relating to NPDES permit requirements for sanitary sewer collection systems and SSO's are provided below:

[Recording Keeping, Reporting and Public Notification § 122.41: \(4 pages\)](#)

[Capacity, Management, Operation and Maintenance \(CMOM\) § 122.42\(f\): \(4 pages\)](#)

[Prohibition §122.42\(g\): \(2 pages\)](#)

[Satellite Collection Systems §122.38: \(2 pages\)](#)

[Peak Excess Flow Treatment Facilities for Sanitary Sewer Collection Systems \(PEFTFs\): \(2 pages\)](#)

[Watershed Management for SSO's: A Discussion Paper: \(6 pages\)](#)

[Chapter X of the Enforcement Management System \(EMS\): Setting Priorities for Addressing Discharges From Separate Sanitary Sewers. \(12 pages\)](#)

This last document outlines the conditions that sewer system operators must meet to achieve success in warding off enforcement action from the EPA for SSO's.

---

## EPA CMOM Program Outline

<b><u>Operation and Maintenance Audit Outline</u></b>	<b><u>Administration Audit</u></b>
Maintenance Scheduling	Financial <ul style="list-style-type: none"> <li>• User rate/User Charge</li> <li>• Public Education/Outreach</li> </ul>
Sewer Cleaning	Personnel <ul style="list-style-type: none"> <li>• Organization</li> <li>• Job Descriptions</li> <li>• Operator Safety</li> </ul>
Hydrogen Sulfide (Odor) Monitoring and Control	Equipment and Tools
Lift Stations <ul style="list-style-type: none"> <li>• Operation</li> <li>• Emergency Response Plan</li> <li>• Alarms &amp; Monitoring</li> <li>• Inspection</li> <li>• Preventive &amp; Routine Maintenance</li> <li>• Force Mains and Air/Vacuum Valves</li> </ul>	Legal - Sewer Ordinance
Sewer System Evaluation <ul style="list-style-type: none"> <li>• Flow Monitoring</li> <li>• Manhole Inspection</li> <li>• Sewer Cleaning Related to I/I Reduction</li> <li>• Internal T.V. Inspection</li> <li>• Smoke Testing and Dyed Water Flooding</li> </ul>	Engineering <ul style="list-style-type: none"> <li>• System Mapping</li> <li>• Design</li> <li>• Construction</li> <li>• Sewer Evaluation/Rehabilitation</li> <li>• Water Quality Monitoring</li> </ul>
Rehabilitation <ul style="list-style-type: none"> <li>• Mainline Repairs</li> <li>• Manhole Repairs</li> </ul>	Management Information Systems
	Complaints
	Public Relations
	Emergency Maintenance and Contingency Plans

## CMOM Documentation Requirements

- Written Summary of CMOM Program
  - Available to NPDES authority and public
- Overflow Emergency Response Plan
  - Planned response, remediation and notification
- Program Audit Report
- System Evaluation Capacity Assurance Plan

## From EPA Region 4: Utility Self-Audit Review

[http://www.epa.gov/Region4/water/wpeb/pdfs/self-audit\\_review2-3.pdf](http://www.epa.gov/Region4/water/wpeb/pdfs/self-audit_review2-3.pdf)

## Combined Sewer Overflows CSO Control Policy

[http://cfpub.epa.gov/npdes/cso/cpolicy.cfm?program\\_id=5](http://cfpub.epa.gov/npdes/cso/cpolicy.cfm?program_id=5)

EPA's [Combined Sewer Overflow Control Policy](#) [PDF Format] is a national framework for control of CSOs through the National Pollutant Discharge Elimination System (NPDES) permitting program. The Policy resulted from negotiations among municipal organizations, environmental groups, and State agencies. It provides guidance to municipalities and State and Federal permitting authorities on how to meet the Clean Water Act's pollution control goals as flexibly and cost-effectively as possible. The CSO Policy was published April 19, 1994, at 59 Fed. Reg. 18688.

The Policy contains four fundamental principles to ensure that CSO controls are cost-effective and meet local environmental objectives:

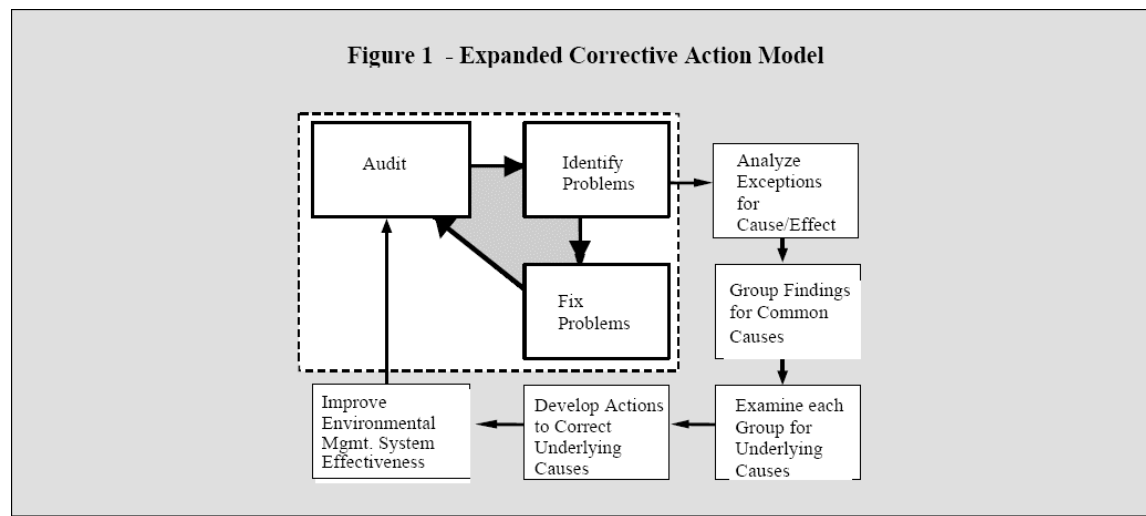
- Clear levels of control to meet health and environmental objectives
- Flexibility to consider the site-specific nature of CSOs and find the most cost-effective way to control them
- Phased implementation of CSO controls to accommodate a community's financial capability
- Review and revision of water quality standards during the development of CSO control plans to reflect the site-specific wet weather impacts of CSOs

EPA continues to develop guidance and information to foster implementation of the CSO Policy. State and EPA NPDES permitting authorities are working with permittees to incorporate CSO conditions into NPDES permits and other enforceable mechanisms, such as administrative or judicial orders. The first milestone under the CSO Policy was the January 1, 1997, deadline for implementing minimum technology-based controls (the "[nine minimum controls](#).") The nine minimum controls are measures that can reduce the prevalence and impacts of CSOs and that are not expected to require significant engineering studies or major construction.

# Protocol for Conducting Environmental Compliance Audits for Municipal Facilities

<http://www.epa.gov/Compliance/resources/policies/incentives/auditing/mww1122final.pdf>

Protocol for Conducting Environmental Compliance Audits for Municipal Facilities under U.S. EPA's Wastewater Regulations



## Sanitary Sewer Overflows Federal Advisory Subcommittee

[http://cfpub.epa.gov/npdes/ssso/advisorsub.cfm?program\\_id=4](http://cfpub.epa.gov/npdes/ssso/advisorsub.cfm?program_id=4)

EPA has found that SSO's caused by poor sewer collection system management pose a substantial health and environmental challenge. The response to this challenge varies considerably from state to state. Many municipalities have asked for national consistency in the way permits are considered for wastewater discharges, including SSO's, and in enforcement of the law prohibiting unpermitted discharges.

In response, EPA has convened representatives of states, municipalities, health agencies, and environmental advocacy groups to advise EPA on how to best meet this challenge. This SSO Federal Advisory Subcommittee examines the need for national consistency in permitting and enforcement, effective sewer operation and maintenance principles, public notification for SSO's with potential health or environmental dangers, and other public policy issues. EPA carefully considers the Subcommittee's recommendations for regulatory and nonregulatory actions to reduce SSO's nationally.

## Key Issues Identified by the SSO Subcommittee

[http://cfpub.epa.gov/npdes/ssso/keyissues.cfm?program\\_id=4](http://cfpub.epa.gov/npdes/ssso/keyissues.cfm?program_id=4)

Stakeholder interviews identified the following key issues for consideration by the SSO Subcommittee:

- Need for better information on the extent and causes of SSO's;
- Difficulties faced by operators in proactively identifying and correcting sanitary sewer line problems which may lead to SSO's;
- Technical feasibility of achieving zero wet weather related SSO's;

- Need for guidance on how to consider the impacts of SSO's in the larger context of achieving clean water goals (watershed approach);
- Cost of compliance;
- Minimum SSO volume to trigger reporting requirements;

Use of the [CSO \(combined sewer overflow\) Control Policy](#) as a basis for any SSO Rule;

- Use of a national performance standard versus a design standard;
  - Timing of issuance of an SSO policy;
  - Need for consistency in enforcement actions initiated by State and Federal regulatory authorities.
- 

## Combined Sewer Overflows - CSO Control Policy

<http://cfpub.epa.gov/npdes/cso/cpolicy.cfm>

EPA continues to develop guidance and information to foster implementation of the CSO Policy. State and EPA NPDES permitting authorities are working with permittees to incorporate CSO conditions into NPDES permits and other enforceable mechanisms, such as administrative or judicial orders. The first milestone under the CSO Policy was the January 1, 1997, deadline for implementing minimum technology-based controls (the "[nine minimum controls](#)." ) The nine minimum controls are measures that can reduce the prevalence and impacts of CSOs and that are not expected to require significant engineering studies or major construction. Communities with combined sewer systems are also expected to develop [long-term CSO control plans](#) that will ultimately provide for full compliance with the Clean Water Act, including attainment of water quality standards.

## Sanitary Sewer Overflows Archived Publications

[http://cfpub.epa.gov/npdes/docs.cfm?program\\_id=4&view=archivedprog&sort=name](http://cfpub.epa.gov/npdes/docs.cfm?program_id=4&view=archivedprog&sort=name)

These discussions are the derivatives of the CMOM approach to mitigating SSO's.

## U.S. EPA SSO Federal Advisory Committee Meeting

<http://www.epa.gov/npdes/pubs/2exsumm1.pdf>

Discussion Topics include an overview of the discussion on the following topics:

- Capacity, Management, Operations & Maintenance (CMOM)
- Prohibition on Municipal Sanitary Sewer System Discharges
- Wet Weather Treatment/Peak Excess Flow Treatment Facilities (PEFTF)
- Reporting and Public Notification
- Satellite Collection Systems
- Watershed Approach
- Implementation



# Sanitary Sewer Overflows Current Regulatory Framework and Proposed Rule

[http://cfpub.epa.gov/npdes/home.cfm?program\\_id=4](http://cfpub.epa.gov/npdes/home.cfm?program_id=4)

EPA is proposing NPDES permit regulations to improve the capacity, management, operation, and maintenance of municipal sanitary sewer collection systems and to improve public notification of SSO events. The proposed rule would reduce health and environmental risks caused by exposure to raw sewage, improve the performance of treatment facilities, and protect the nation's collection system infrastructure by enhancing and maintaining system capacity, reducing equipment and operational failures, and extending the life of sewage treatment equipment.

A [draft notice of proposed rulemaking](#) was signed by EPA Administrator Browner on January 4, 2001. In accordance with the January 20, 2001, memorandum from the Assistant to the President and Chief of Staff, entitled "Regulatory Review Plan," published in the [Federal Register](#) on January 24, 2001, 66 FR 7701, EPA withdrew this document from the Office of Federal Register to give the incoming Administration the opportunity to review it.

## Proposed Rule To Protect Communities From Overflowing Sewers

<http://www.epa.gov/npdes/regulations/facsheet.pdf>

*The Environmental Protection Agency (EPA) is proposing to clarify and expand permit requirements under the Clean Water Act for 19,000 municipal sanitary sewer collection systems in order to reduce sanitary sewer overflows. The proposed requirements will help communities improve some of our Nation's most valuable infrastructure—our wastewater collection systems—by requiring facilities to develop and implement new capacity, management, operation, and maintenance programs and public notification programs. The 19,000 systems covered by this rule include 4,800 municipal satellite collection systems which will be directly regulated under the Clean Water Act for the first time.*

### Background

A combination of factors has resulted in releases of untreated sewage from some parts of the collection systems before it reaches treatment facilities, known as sanitary sewer overflows. EPA estimates that there are at least 40,000 overflows of sanitary sewers each year. Sanitary sewer overflows that discharge to surface waters are prohibited under the Clean Water Act since 1972. Municipal wastewater treatment plants that discharge are currently required to comply with National Pollutant Discharge Elimination System (NPDES) permits, which require record-keeping and reporting of overflows and maintenance of their collection system. Most satellite sewage collection systems do not currently have NPDES permits.

### Proposed Rule to Reduce Sewer Overflows

EPA is proposing revisions to the NPDES permit regulations to improve the operation of municipal sanitary sewer collection systems, reduce the frequency and occurrence of sewer overflows, and provide more effective public notification when overflows do occur. This rule primarily addresses sanitary sewer overflows, not combined sewer overflows, in these categories:

- Capacity Assurance, Management, Operation, and Maintenance Programs.
- Notifying the Public and Health Authorities
- Prohibition of Overflows..
- Expanding Permit Coverage to Satellite Systems



## Utility Self-Audit Review Guidance & Information

[http://www.epa.gov/Region4/water/wpeb/pdfs/self-audit\\_review2-3.pdf](http://www.epa.gov/Region4/water/wpeb/pdfs/self-audit_review2-3.pdf)

MOM programs are utility specific. Utilities may have different titles for the various MOM programs and may have them organized differently than we do in the Region 4 guidance. Most, if not all, of the programs used in the development of this check sheet will be part of sewerage utilities actual programs. However, individual utilities may not need to have all of the listed programs. Individual utilities may choose to consolidate some of the closely related MOM programs or individual utilities may not need all of the program because of utility specific circumstances. Finally, individual utilities may have additional MOM programs that are not contained in this check sheet. **The concept behind the Project is that the self-audit report is not to be written for {the regulating entity}. Rather, it is to be prepared for the utility management and utility policy makers and then submitted to {the regulating entity} as evidence of program status .**

Seven elements that should comprise every proper MOM program are emphasized. These are as follows:

- *Must be POTW specific* (common thread for each of the remaining six elements)
- Must have a purpose (take from written program documentation)
- Must have a defined goal (take from written program documentation)
- Must be in writing (incorporate by reference)
- Must be implemented by trained personnel (or contracted personnel)
- Must have performance measures (to determine program effectiveness )
- Must be subject to periodic evaluation (including, or beginning with, this audit)

Having programs that are specific to the individual POTW means that the programs should be tailored to match the POTW's geographic, physical and climatic conditions, the system's level of complexity, the configuration of the system's infrastructure and the system's level of sophistication. Utilities may have a number of the needed MOM programs implemented through contract rather than by their own trained personnel.

## Violations must be submitted for Self-Audit/Self Disclosure Policy Coverage

[http://www.epa.gov/Region4/water/wpeb/pdfs/self-audit\\_review2-3.pdf](http://www.epa.gov/Region4/water/wpeb/pdfs/self-audit_review2-3.pdf)

In order for the utility to obtain the benefits offered by EPA's Self-Audit/Self-Disclosure Policy, all Clean Water Act and, if the utility has an NPDES permit, all permit violations that have occurred during the *past five (5) years* must be submitted with the self-audit/self-disclosure report. Un-permitted Discharges Applicable Clean Water Act violations will typically fall into the category of un-permitted discharges to the Waters of the United States. Under most relevant circumstances these occur when a sanitary sewer overflow reaches the waters directly or by way of storm drainage infrastructure. In order to assure that the violations are addressed adequately under the policy, the following information, if existing, should be submitted for each un-permitted discharge:

- Location
- Name of Receiving Water
- Estimate of Overflow Volume
- Description of System Component

- Date/Time Started/Stopped
- Root Cause or Suspected Root Cause
- Steps Taken to Reduce, Eliminate

## Sanitary Sewer Overflow Reporting - CA State Regional Board 8

<http://www.swrcb.ca.gov/rwqcb8/pdf/02-14.pdf>

This Monitoring and Reporting Program (MRP) establishes monitoring, record keeping, reporting and public notification requirements for Order No. R8-2002-0014, "General Waste Discharge Requirements for Sewage Collection Agencies in Orange County within the Santa Ana Region."

### Definitions

1. **Sanitary Sewer Overflow** - A sanitary sewer overflow (SSO) is any overflow, spill, release, discharge or diversion of wastewater from a sanitary sewer system. SSO's include:
  - (i) overflows or releases of wastewater that reach waters of the United States;
  - (ii) overflows or releases of wastewater that do not reach waters of the United States; and
  - (iii) wastewater backups into buildings and on private property that are caused by blockages or flow conditions in a sanitary sewer, other than a building lateral. Wastewater backups into buildings caused by a blockage or other malfunction of a building lateral that is privately owned is a SSO when sewage is discharged off of private property into streets, stormdrains, or waters of the State.
2. **Sanitary Sewer System** – Any system of pipes, pump stations, sewer lines, etc., used to collect and convey sewage to a treatment plant. Temporary storage and conveyance facilities (such as vaults, temporary piping, construction trenches, wet wells, impoundments, tanks, highlines, etc.) are considered to be part of the sanitary sewer system, and discharges of sewage to these facilities are not sanitary sewer overflows,

### Reporting requirements

1. If samples are collected, monitoring results must be reported on discharge monitoring report forms approved by the Executive Officer.
2. Records shall be maintained by the discharger for a minimum of five years from the date of the sample, measurement, report or application. This period may be extended during the course of any unresolved litigation regarding a discharge or when requested by the Regional Board Executive Officer.
3. All records shall be made available for review upon request.
4. All monitoring instruments and devices that are used by the discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy;
5. The discharger shall retain records of all SSO's, including, but not limited to:
  - a. All original strip chart recordings for continuous monitoring instrumentation;
  - b. Service call records and complaint logs of calls received by the discharger;
  - c. Spill calls;
  - d. Spill records;
  - e. Copies of all reports required by this Order;
  - f. The location of the overflow and the receiving water if any (street address or GPS coordinates);
  - g. An estimate of the volume of the overflow;

- h. A description of the sewer system component from which the release occurred (e.g., manhole, constructed overflow pipe, crack in pipe);
  - i. The estimated date and time when the overflow began and when it stopped;
  - j. The cause or suspected cause of the overflow;
  - k. Steps that have been and will be taken to prevent the overflow from recurring and a schedule to implement those steps.
  - l. Work orders from the previous 3 years which are associated with responses and investigations of system problems related to sanitary sewer overflows;
  - m. A list and description of complaints from customers or others from the previous 3 years; and
  - n. Documentation of performance and implementation measures for the previous 3 years.
6. If monitoring is conducted of any SSO, records of monitoring information shall include:
- a. The date, exact place, and time of sampling or measurements;
  - b. The individual(s) who performed the sampling or measurements;
  - c. The date(s) analyses performed;
  - d. The individual(s) who performed the analyses;
  - e. The analytical technique or method used; and,
  - f. The results of such analysis.
- 

## Tracking SSO's

- How many SSO events have been reported in the past 5 years?
  - What percent of the SSO's were less than 1,000 gallons in the past 5 years?
  - Does the utility document and report all SSO's regardless of size?
  - Does the utility document basement backups?
  - Are there areas that experience frequent basement or street flooding?
  - Approximately what percent of SSO's discharges were from each of the following in the last 5 years?
    - Pump stations
    - Manholes
    - Lateral and branch sewers
    - Main and trunk sewers
    - Structural bypasses
  - Approximately what percent of SSO's discharges were caused by the following in the last 5 years?
    - Debris Buildup
    - Root intrusion
    - Excessive infiltration and inflow
    - Collapsed pipe
    - Capacity limitations
    - Fats, oil, and grease
    - Vandalism
  - Water percentage of SSO's were released to:
    - Soil
    - Basements
    - Paved area
    - Surface water (rivers, lakes/streams)
    - Coastal, ocean beaches
  - For surface water releases, what percent are to areas that could affect:
    - Contact recreation (beaches, swimming areas)
    - Drinking water sources
    - Shellfish growing areas
  - How many chronic SSO locations are there in the system
  - Are pipes with chronic SSO's being monitored for sufficient capacity and/or structural condition?
  - Prior to collapse, are structurally deteriorating pipelines being monitored
-

# CMOM Program Checklist

<http://www.epa.gov/npdes/pubs/cmomselfreview.pdf>

The CMOM Program Checklist is designed to help utilities perform an initial evaluation of CMOM activities. It is not intended to serve as an absolute indicator of a successful CMOM program, nor will all of the questions apply to every utility.

## What is CMOM?

CMOM stands for "capacity, management, operations, and maintenance." It is a flexible, dynamic framework for municipalities to identify and incorporate widely-accepted wastewater industry practices to:

- Better manage, operate, and maintain collection systems
- Investigate capacity constrained areas of the collection system
- Respond to sanitary sewer overflow (SSO) events

## What is the purpose of the CMOM program checklist?

The checklist is a screening-level tool that can help utilities evaluate CMOM programs and identify general areas of strength and weakness. Completing this CMOM assessment will allow the utility to flag CMOM program areas that need improvement and establish priorities for additional, more detailed assessments.

A portion of the information contained in the checklist is listed below:

## Utility Contact Information

### Permitted Treatment & Collection Facilities

- WWTP Effluent
- Collection System
- Wet-Weather Facility

### Collection System Description

Treatment Facilities

Access & Maintenance

Conveyance & Pumping

Service Area Characteristics

- Number of Service Connections
- Collection system service lateral responsibility
- Combined Sewer Systems
- Gravity Sewers/Force Mains
  - Pipe Diameter
  - Pipe Materials
- Satellite Communities and Sewer Use Ordinance (SUO)
- Equipment and Collection System Maintenance (ESM)

Operations Characteristics

- Maintenance Record for Equipment
- Equipment Parts Inventory
- Internal TV Inspection
- Sewer Cleaning
- Manhole Inspection and Assessment
- Pump Stations
- Capacity Assessment
- SSO Tracking
- Smoke and Dye Testing

- Hydrogen Sulfide Monitoring & Control

## Sewer Use Ordinance Example:

<http://www.owasa.org/pages/seweruseord/suosection3.asp>

## EPA Regional CMOM Activity



## **Region 1: Maine (MA); New Hampshire (NH); Vermont (VT); Massachusetts (MA); Rhode Island (RI); Connecticut (CT)**

<http://www.epa.gov/region1/eco/cso/index.html>

The CSO problem is especially acute in New England, where more than 100 communities are burdened with CSO pipes that discharge hundreds of millions of gallons of untreated sewage and stormwater into waterways after heavy rains. EPA realizes that fixing CSOs is an expensive proposition and is committed to finding innovative abatement strategies that meet environmental standards while ensuring that the projects are affordable to local communities. EPA has adopted a CSO Control Policy that is aimed at minimizing CSO pollution impacts to water bodies while requiring case-by-case community approaches that give state and local flexibility in development of the solutions. EPA New England has combined enforcement and assistance efforts to show flexibility in crafting projects and implementation schedules. Communities are given flexibility through lengthy schedules to do the work and encouragement to use technologies that maximize environmental benefits. EPA New England is the first to use a watershed-based approach to prioritize CSO controls along with other critical environmental needs so that taxpayer dollars are spent to maximize environmental returns—more environmental benefit at the least cost.

### **Environmental Management Systems (EMS)**

<http://www.epa.gov/region1/assistance/ems/resources.html>

An EMS is a set of management processes and procedures that allows an organization to analyze, control and reduce the environmental impact of its activities, products and services and operate with greater efficiency and control. Benefits expected include improved overall environmental performance (including areas not currently regulated), expanded pollution prevention opportunities, improved compliance, and enhanced operational control and efficiency.

There is increasing recognition of the potential for EMSs to help organizations maintain compliance and achieve better overall environmental performance. EPA has long supported the use of systematic management approaches for maintaining compliance at regulated facilities. While several EMS standards are in use worldwide, a voluntary international EMS standard, ISO 14001, has been adopted by the U.S. and many other countries. While ISO 14001 has no official regulatory standing at this time, EPA and states are exploring the potential use of ISO 14001 in a public policy context through various pilot projects and initiatives.

### **National Environmental Performance Track Program**

<http://www.epa.gov/region1/assistance/ems/performtrack.html>

To encourage continuous environmental improvement, EPA offers incentives to Performance Track members. For example, EPA promotes the program and its members through national press releases and an annual national meeting during which the accomplishments of Performance Track members are recognized by the EPA Administrator and other top EPA officials. EPA New England also issues press releases and holds semi-annual meetings with the New England members. These meetings provide opportunities for members to network and share information. Members discuss issues and provide feedback to senior regional EPA officials.

An additional incentive to Performance Track facilities is their designation as a low priority for routine EPA inspections. As a low inspection priority, member facilities can save the resources and time regularly spent preparing for and responding to inspections.

Your facility could be eligible for Performance Track if you:

- have an established environmental management system (EMS)
- have a good compliance record
- are committed to continuous improvement in environmental performance
- are committed to public outreach and reporting

EPA New England coordinates with the six New England states in implementing the Performance Track program.

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## **Optimizing Operation, Maintenance and Rehabilitation of Sanitary Sewer Collection Systems**

(New England Interstate Water Pollution Control Commission)

<http://www.neiwpcc.org/Index.htm?omrmanual.htm~mainFrame>

NEIWPCC recently developed and released a comprehensive manual titled *Optimizing Operation, Maintenance, and Rehabilitation of Sanitary Sewer Collection Systems*. This manual helps collection system owners and operators optimize system performance, enhance effectiveness of maintenance programs, and reduce the long-term costs of operation. The manual was made possible by a grant from the U.S. Environmental Protection Agency. It was compiled and written under the direction of an advisory committee consisting of representatives of NEIWPCC member state environmental agencies, EPA, and wastewater consultants.

### **Current Regulations for Collection System Operation and Maintenance**

It is worth noting that Federal requirements for operation and maintenance of collection systems are not new and presently exist within NPDES regulations. Under existing federal regulations at 40 CFR 122.41, all NPDES permits must contain two standard conditions addressing operation and maintenance.

**A. Proper Operation and Maintenance Requirements at 40 CFR 122.41(e)** requires proper operation and maintenance of permitted wastewater systems and related facilities to achieve compliance with permit conditions.

**B. Duty to Mitigate at 40 CFR 122.41(d)** requires the permittee to take all reasonable steps to minimize or prevent any discharge in violation of the permit that has a reasonable likelihood of adversely affecting human health or the environment.

Inadequate collection system operation and maintenance practices, particularly those that lead to SSO's, would violate these permit conditions. In addition, the Clean Water Act Construction Grants Program established provisions requiring grantees that received EPA funding to assure proper and efficient operation and maintenance of treatment works and their associated collection systems. These provisions require the development of operation and maintenance manuals, emergency operating programs, personnel training, adequate budget, and operational reports.

### **Maintenance Activities**

The purpose of operation and maintenance (O&M) programs is to maintain design functionality (capacity and integrity) and/or to restore the system components to the original condition and thus functionality. The ability to effectively operate and maintain a wastewater collection system so it performs as intended depends greatly on site conditions, proper design (including selection of appropriate materials and



equipment), construction and inspection, testing and acceptance, and system start-up. This is true for both the collection system and the system laterals and service connections. O&M staff should be involved at the beginning of each project, including planning, design, construction, acceptance and start-up. When a collection system is designed with future O&M considerations in mind, the result is a more effective program in terms of O&M cost and performance.

Wastewater system maintenance can be either a proactive or reactive activity. Effective O&M programs are based on knowing what components make up the system, where they are located, and the condition of the components. With that information, proactive maintenance can be planned and scheduled, rehabilitation needs identified, and long-term Capital Improvement Programs (CIPs) planned and budgeted.

### **Corrective Maintenance**

Maintenance classified as corrective, including emergency maintenance, is reactive. Only when the equipment or system fails is maintenance performed. Reliance on reactive maintenance will always result in poor system performance, especially as the system ages. A corrective maintenance approach is characterized by:

- The inability to plan and schedule work.
- The inability to budget adequately.
- Poor use of resources.
- A high incidence of equipment and system failures.

Emergency maintenance involves two types of emergencies: normal emergencies and extraordinary situations. Normal emergencies can happen on a daily basis whether it is a pipe break or a blockage in a sewer. An effective maintenance program can reduce normal emergencies. Extraordinary emergencies, such as high-intensity rainstorms, hurricanes, floods, and earthquakes, will always be unpredictable occurrences. However, the effects of extraordinary emergencies on the system's performance can be minimized by implementation of a planned maintenance program and development of a comprehensive emergency response plan.

### **Preventive Maintenance**

Maintenance classified as preventive is proactive and is defined by a programmed, systematic approach to maintenance activities. This type of maintenance will always result in improved system performance except in the case where major chronic problems are the result of design and/or construction flaws that cannot be completely corrected by O&M activities. Proactive maintenance is performed on a periodic (preventive) basis or an as needed (predictive) basis. Preventive maintenance can be scheduled on the basis of specific criteria such as known problem areas (for example—a siphon that often gets clogged, a low point that is often first to overflow in a storm event, or even an area prone to blockages), equipment operating time since the last maintenance was performed, or passage of a certain amount of time (calendar period).

### **Predictive Maintenance**

The third type of maintenance is predictive. Predictive maintenance, which is also proactive, is a method of establishing baseline performance data, monitoring performance criteria over a period of time, and observing changes in performance so that failure can be predicted and maintenance can be performed on a planned, scheduled basis. System performance is frequently a reliable indicator of how the system is operated and maintained. Agencies that historically relied primarily on corrective maintenance as their method of operating and maintaining the system are never able to focus on preventive and predictive maintenance since most of their resources are directed at corrective maintenance activities and it is difficult to free up these resources to begin developing preventive maintenance programs.

## **Region 2: New York State (NY); New Jersey (NJ); Puerto Rico (PR); Virgin Islands (VI)**

<http://www.epa.gov/Region2/plan/r2plan9.pdf>



### **Combined Sewer/Sanitary Sewer Overflows**

CSOs and SSO's result in releases of raw sewage. The health and environmental risks attributed to CSOs and SSO's depend on a number of factors including location, season (varying potential for public exposure and habitat impact), frequency, volume, the amount and type of pollutants present in the discharge, and the uses, conditions, and characteristics of the receiving waters. The most immediate health risks associated with CSOs and SSO's to our waters are bacteria, viruses, and other pathogens.

In addition to pathogens, raw sewage may contain metals, synthetic chemicals (including endocrine system disruptors and pesticides), nutrients, and oils which can be detrimental to the health of humans and wildlife. Water quality impacts from CSOs and SSO's may also include changes to the physical characteristics and viability of aquatic habitats causing oxygen depletion and fish kills. These impacts, in turn, can cause adverse economic impacts such as beach and shellfish harvesting closures, increased risks and demands on drinking water sources, and impairment of people's ability to use waters for recreational purposes.

The Region will continue to oversee New York and New Jersey's implementation of their CSO strategies. In Puerto Rico, we do not have clear documentation of the existence of combined sewer systems in the San Juan area. The Region will work with Commonwealth agencies to make this determination and address any problems identified.

The Region has developed CSO Enforcement Strategies with the States to ensure compliance with both short and long term CSO Policy and NPDES permit requirements. Currently, we address unpermitted SSO's in NY and NJ as they are identified. Certain SSO points are permitted in the state of NY. We have requested that both states, as part of the State-specific SSO Enforcement Strategies under development, complete an inventory of known SSO points and identify actions necessary to eliminate and reduce unpermitted SSO's. EPA is also currently developing a National SSO Policy which will include permit language and guidance regarding the elimination of SSO's. The states will be requested to develop their own SSO strategy based on the National SSO Policy. In Puerto Rico and U.S. Virgin Islands, Region 2 will implement the National SSO Policy once it is finalized and, in PR, will continue to enforce against SSO's as we become aware of them.

### **Clean Water Act (CWA) 301(h) Variance Decisions/PR/EPA MOA Implementation**

Decisions on pending variance applications for 6 Puerto Rico POTWs must be made following completion of application requirements by PRASA. The proposed decisions will be in the form of draft NPDES permits for the six PR plants and related decision documents including associated Environmental Justice analyses. Hearings will be held to ensure public participation prior to final decisions. Due to its poor compliance with the minimum primary floor and 301(h) requirements, Region 2 has proposed denials of the waiver applications for the St. Thomas and St. Croix facilities. Region 2 will make final determinations after full consideration of the public comment that is received.

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## **Region 3: Pennsylvania (PA); Maryland (MD); Delaware (DE); District of Columbia (DC)**

<http://www.epa.gov/reg3wapd/cso/EnforcementComplianceAssistance.htm>

### **Enforcement, Compliance, and Assistance**

The national frame work for addressing the CSO problem is established through [CSO Control Policy](#), published April 19, 1994. The Policy provides guidance on how communities with combined sewer systems can meet Clean Water Act goals in as flexible and cost-effective a manner as possible. The Policy also provides guidance to permitting and enforcement agencies on how the CSO problem is to be addressed.

The NPDES Permitting program establishes enforceable obligations in CSO community discharge permits that reflect the requirements of the CSO Policy. It is the responsibility of the compliance assurance and enforcement program to ensure that these requirements are met. The EPA Office of Enforcement and Compliance Assurance has identified CSO discharges as a national compliance priority. It has directed that compliance assistance, compliance monitoring and enforcement of CSO requirements be prioritized by looking at regulated facilities contributing to the impairment of watersheds, beaches and shellfish beds, source water protection areas, environmental justice areas, and other sensitive areas.

Region III considers discharges from combined sewers as a significant environmental threat warranting State and federal attention. In response to the problem, the Region and States have implemented a compliance and enforcement strategy to educate the regulated community, identify non-compliance, and take necessary action to address facilities in violation of their NPDES requirements.

In assessing the compliance status of each combined sewer system, Regional enforcement personnel worked in coordination with the Regional permitting and water quality programs to obtain information about the CSOs in each state. The results of this survey can be found in the [Your Community](#) portion of our website.

### **Targeting of Compliance Assurance Efforts**

Our priority is to investigate CSO noncompliance in communities where CSOs are known to be a problem either due to citizen complaints and inquiries or from the analysis of water quality data. In prioritizing the remaining CSO communities, the Region and delegated States consider site-specific environmental and public health impacts from CSOs. Enforcement efforts are prioritized according to the number of CSO outfalls in each community, treatment plant flow, stream impairment data from 305(b) lists, STORET data for pathogens, and known impacts/degradation by urban environments. Additionally, EPA and the delegated States conduct a select number of random inspections in order to determine, in a statistically valid manner, the compliance rate through the [Statistically Valid Non-Compliance Rate Study](#). This information is then used to identify particular compliance problems and to develop tools and strategies to address them.

### **Enforcement Response**

To identify and correct non-compliance, EPA will work with the delegated States using its authorities directly or by supporting the States to address non-compliance. Region III will use the following enforcement tools to accomplish this task: Section 308 Information Request Letters, Administrative Orders, Section 309(g) Administrative Penalty Orders, Section 309(b) civil judicial actions and Section 504 Emergency Powers, as appropriate. For most permit violations, the federal enforcement response will be, at a minimum, an Administrative Order (AO) seeking necessary relief to ensure compliance; the Region will consider the issuance of an Administrative Penalty Order on a case-by-case basis taking into account the statutory factors and available resources. If a permittee is in violation of an Administrative Order, a judicial action will be considered. However, issuance of an AO will not be required prior to initiating a judicial action. Judicial action will be considered in cases where extensive injunctive relief is necessary and/or penalty liability exceeds \$137,500. To view recent EPA and state enforcement activity please see the [example case narratives page](#).

### **CSO Compliance Assistance**

Compliance assistance and education is a critical component in ensuring that the goals of the CSO Policy are met. EPA has conducted and has participated in numerous trainings and seminars on the requirements of the CSO Policy and how municipalities might better operate and manage their systems. In addition to this hands on training, there exists a number of sources of information on the internet that provides useful advice to the regulated community. Please see the links at the bottom of this page for technical compliance and assistance information.

## **Region 4: North Carolina (NC); South Carolina (SC); Georgia (GA); Florida (FL); Alabama (AL); Mississippi (MS); Tennessee (TN); Kentucky (KY)**

<http://www.epa.gov/compliance/resources/policies/civil/cwa/mom-pilot-reg4.pdf>



The Region 4 MOM Program invites municipalities to complete a detailed self-assessment and check list of key aspects of their municipal wastewater facilities and collection systems, and establish MOM programs and/or develop remedial measures that will work to eliminate sanitary sewer overflows (SSO's) through proper management, operation, and maintenance of their sewer infrastructure. The Region's MOM Program looks at all aspects of a wastewater system's management and performance, from system inventory and mapping to flow monitoring and corrosion detection<sup>1</sup>.

The Region 4 MOM program consists of three phases as described below:

### **Phase 1 [Initial Assessment]**

The initial phase of the MOM Program invites municipalities to complete the previously described detailed self-assessment and checklist of key aspects of their municipal wastewater facilities and collection systems. The assessment looks at all aspects of a wastewater system's management and performance to determine whether basic MOM programs are missing which could be contributing to SSO's. If a municipality declines the invitation to participate in the program and complete the self assessment or if fails to timely and adequately complete the assessment, the Region will pursue a traditional enforcement track to identify and address potential violations.

### **Phase 2 [Administrative Order, Consent/Diagnostic Assessment]**

The Region will review the self-assessment done by each participating municipality and determine whether there are aspects of the MOM program that need to be established or improved by the municipality. If such aspects need to be established or improved, the Region will invite the municipality to enter into and administrative order on consent (AOC) to implement the missing or inadequate programs. Because these are essentially management programs rather than infrastructure upgrades, the AOC will be of short duration, generally one to two years, and no longer than three years<sup>2</sup>.

If, in addition to MOM Program elements that need to be adopted, short term remedial (infrastructure) measures are identified at that time, and those measure can be fully implemented in less than three (3) years, then these remedial measure may also be included in an AOC at this stage. If the self-assessment and checklist indicate that the municipality must undertake significant infrastructure improvements that cannot be fully implemented within three (3) years, the Region will generally proceed directly to a Phase 3 or judicial enforcement action to address the compliance problems.

### **Phase 3 [Long Term Remedial Action]**

After Phase 2 is fully implemented, the Region will assess whether long term remedial action is required. If required, the Region will proceed and enter into negotiation for long term remedial measures. If these measure will require five (5) years or longer to implement, the remedial measures will be incorporated into a consent decree; schedules under five (5) years may be addressed in an AOC or judicial consent decree as appropriate<sup>3</sup>.

<sup>1</sup>More specifically, the MOM Program look at peak flow analysis, overflow documentation and reporting, emergency flow control, grease control, pretreatment analysis, manhole inspection, defect analysis, smoke testing, service lateral investigations, hydraulic

cleaning, pump station performance and adequacy, system rehabilitation, capacity assurance, equipment and tools management, spare parts inventory, and management, customer complaint management, water quality monitoring, and public notification.

<sup>2</sup>After the implementation period, the AOC may also require an additional two (2) years of periodic reporting on the progress and effectiveness of the implementation of the AOC's requirements followed by a final report summarizing the actions taken and accomplishments achieved pursuant to the AOC.

In order to receive consideration under this Agency's self-audit policy, each invitee must:

- Conduct an initial system-wide (by sewershed) assessment using existing data;
- Conduct an audit of its facility;
- Identify strengths/deficiencies;
- Prepare an audit report;
- Develop an improvement plan; and,
- Certify its findings and plan for improvement to Region 4.

This MOM pilot program has only been approved in Region 4. However, municipalities in the other Regions who wish to voluntarily conduct a self-assessment to assist them in evaluating their systems may obtain a copy of the detailed assessment on EPA's website at:

<http://www.epa.gov/region4/water/wpeb/momproject/index.html>

Additional information:

[http://www.epa.gov/Region4/ead/attachments/1999\\_accomplishments\\_report.pdf](http://www.epa.gov/Region4/ead/attachments/1999_accomplishments_report.pdf)

[http://www.epa.gov/Region4/water/wpeb/pdfs/self-audit\\_review2-3.pdf](http://www.epa.gov/Region4/water/wpeb/pdfs/self-audit_review2-3.pdf)

## **Region 5: Minnesota (MN); Wisconsin (WI); Michigan (MI); Illinois (IL); Indiana IN); Ohio (OH)**

<http://www.epa.gov/region5/>

<http://dnr.wi.gov/org/caer/cfa/EL/Guide/opmancwf.htm>

If a municipality is receiving a loan from the [Clean Water Fund Program](#) (CWFP), they must submit for review an Operation and Maintenance (O&M) Manual for its wastewater treatment facility and/or collection system. If the municipality already has an approved O&M Manual, they can meet this requirement by submitting to DNR an addendum to the original Manual.

OPERATION AND MAINTENANCE (Not required for draft acceptance)

<http://dnr.wi.gov/org/caer/cfa/EL/forms/3400143.pdf>

The following topics must be addressed in the O&M Manual:

- general information;
- staffing;
- records and recordkeeping;
- laboratory;
- safety;
- utility systems;
- a description of the process, operations, and controls;
- maintenance



A. Sewers and Manholes

1. Functional description of system (may refer to maps and general description)
2. Normal operation, alternative operation and emergency operation
3. Inspections
4. Maintenance tasks, schedules and procedures
5. Emergency repair procedures and procedures for obtaining outside help
6. Trouble shooting guide (table format)
7. Safety associated with tasks

B. Lift Stations

1. Function, location and description of lift stations
2. Schematic drawing
3. Normal operation, startup, alternate operation and emergency operation
4. Maintenance tasks, schedules and procedures
5. Emergency repair procedures and procedures for obtaining outside help
6. Trouble shooting guide (table format)
7. Safety associated with tasks

C. Sewer Cleaning Equipment

1. Function, location of sewer rodders, balls, kites, buckets and/or flushing equipment (each unit)
2. Emergency repair procedures and procedures for obtaining outside help
3. Trouble shooting guide (table format)
4. Safety associated with tasks

D. Safety Equipment

1. Tasks and procedures
2. Personnel assigned to each task
3. Schedules by which tasks are done
4. Trouble shooting guide (table format)

E. Emergency Generators and Pumps

1. Functional description, location and procedures
2. Startup and normal operation
3. Emergency repair procedures and procedures for obtaining outside help
4. Trouble shooting guide (table format)
5. Safety associated with tasks

F. Appurtenances (inverted siphons, chlorinators, air relief valves, telemetering equipment, etc.

1. Functional description, schematics and location
2. Normal operation, alternate operation and emergency operation
3. Mechanical and/or electrical components
4. Trouble shooting guide (table format)
5. Safety associated with tasks

## **Region 6: New Mexico (NM); Texas (TX); Oklahoma (OK); Louisiana (LA); Arkansas (AR)**

<http://www.epa.gov/earth1r6/6en/w/sso/sso.htm>



## Sanitary Sewer Overflows

What are SSO's and how can we reduce them: [EPA 832-K-96-001 - Summer 1996](#)

EPA's Office of Enforcement and Compliance Assurance - [Compliance and Enforcement Strategy Addressing Combined Sewer Overflows and Sanitary Sewer Overflows](#) (pdf).

EPA's Office of Water's [SSO Web page](#).

Region 6 Draft Strategy for Wet Weather Sanitary Sewer Overflows:

[ASCII Text format \(can view with Netscape\)](#)

[Adobe Acrobat format \(retains original formatting\)](#)



**I. INTRODUCTION.** Many municipalities are not aware of their obligations regarding sanitary sewer overflows (SSO's), especially during wet weather conditions. SSO's of untreated or partially treated wastewater from collection systems which may reach waters of the U.S. are violations of Section 301 of the Clean Water Act (CWA) and the provisions of NPDES permits, and therefore subject to enforcement actions. In addition, federal regulations [40 CFR Part 122.41(1)(6)] require that all such discharges which may endanger health or the environment must be reported to EPA. The Region's approach to addressing SSO's is to require permittees to develop and implement an SSO corrective action program which will result in locating and eliminating overflows in the shortest possible time period. Each permittee is responsible for aggressively pursuing solutions for both the technical and fiscal problems which may arise during the implementation of a corrective action program, and EPA expects permittees to utilize state-of-the-art methods and expertise in evaluating their system.

**II. PURPOSE OF STRATEGY.** The intent of this Region 6 strategy/guidance is to inform and provide direction. Agency decisions in any particular case will be made by applying the law and regulations on the basis of specific facts. The purpose of the strategy is also to establish a standard for both the regulated communities, EPA Region 6 and State regulatory agencies in addressing wet weather SSO's. This strategy recognizes the site specific nature of SSO's and provides flexibility for local situations and consistency for enforcing the existing requirements of the law.

**III. SUMMARY OF STRATEGY.** The majority of overflows that occur in the collection systems are due primarily to wet weather inflow/infiltration combined with hydraulic restrictions such as insufficient line capacity and line blockages due to poor maintenance. Those permittees experiencing only dry weather overflows must develop and implement a preventivemaintenance program which prevents dry weather overflows. However, permittees with wet weather overflows problems within the collection system shall develop and implement a program which includes either the "presumption" approach or the "demonstration" approach to address all existing and potential sources of overflows. Under the demonstration approach, a permittee may demonstrate that a selected control program is adequate to locate and eliminate SSO's and achieve compliance with its NPDES permit and the CWA. The presumption approach affords permittees the option to show, through a system-wide evaluation, that rehabilitation of the collection system alone will not achieve compliance with the CWA and the NPDES permit. The Region may then allow the use of wet weather alternatives in addition to the rehabilitation program. These approaches incorporate the options and principles contained in the Agency's Combined Sewer Overflow (CSO) Control Policy (40 CFR 122), which are applicable to SSO's. If wet weather discharges are allowed, then the permittee must consider environmental justice and water quality impacts in the location of such discharges. Any SSO control program must provide long term adherence to technology based and water quality based requirements of the Clean Water Act.

**LEGAL ISSUES:** In the absence of specific permission for an SSO discharge, an SSO discharge is an unpermitted discharge. However, SSO discharges may result from other permit violations, such as general provisions requiring permittees to maintain the sewer system properly and to operate the system to minimize inflow and infiltration and maximize the amount of pollutants reaching the headworks for treatment. Thus, a POTW with SSO's would be in violation of its permit as well as the CWA 301(a) prohibition against unpermitted discharges. SSO discharges are also subject to reporting under the permit provisions requiring reporting of noncompliance with permit provisions. For example, reporting is required if the SSO discharge results from the permittee's failure to meet obligations under the permit to properly maintain and operate the sewer system. An SSO discharge could also be specifically identified as subject to monitoring and reporting requirements in the permit. In addition, there has been question of whether an SSO discharge needs to reach the waters of the U.S. in order to be subject to CWA requirements. For determining whether the SSO discharge constitutes an unpermitted discharge in violation of Section 301 of the CWA, a discharge must reach waters of the U.S. However, for purposes of determining whether the SSO discharge results from permit violations, no such findings need be made. To be an unpermitted discharge in violation of the CWA, the SSO discharge must reach surface waters, either directly or indirectly through groundwater hydrologically connected to surface waters. If, however, the SSO discharge results from permit violations, e.g., a permit provision requiring proper operation and maintenance of the sewer system, then there is no need to establish a connection between the discharge and waters of the U.S. Some have questioned whether a SSO is an illegal bypass. In the 1989 National Combined Sewer Overflow Control Policy, EPA interprets the bypass provisions under 40 CFR 122.41 to apply only to those flows which reach the headworks of the treatment facility, but do not receive full treatment. Flows which discharge prior to reaching the headworks are not bypasses and cannot be authorized under the bypass provisions in EPA's regulations. Rather, such discharges must be authorized separately by an NPDES permit. Because SSO's, like CSOs, never reach the headworks, the analysis would be the same for SSO's. In addition, SSO's, unlike CSOs, may be unintentional. Diversions must be intentional, however, to meet the definition of bypass in the regulations to see 40 CFR 122.41(m)].

## **Region 7: Nebraska (NE); Iowa (IO); Kansas (KS); Missouri (MO)**

<http://www.epa.gov/region7/>

"This program is a great example of the Agency's commitment to working with the regulated community. It provides an incentive for entities to police themselves before the regulators step in."

## **Region 8: Montana (MT); North Dakota (ND); South Dakota (SD); Wyoming (WY); Utah (UT); Colorado (CO)**

<http://www.epa.gov/region8/>

## **Region 9: California (CA); Nevada (NV); Arizona (AZ); Hawaii (HI); Guam; American Samoa; Trust Territories; Northern Mariana Islands Commonwealth**

<http://www.epa.gov/Region9/annualreport/03/pdf/fullreport.pdf>

### **EPA, Regional Boards Take Action to Prevent Sewage Spills**

Some beach closures are caused by spills or overflows from sewage collection systems. To reduce these spills, EPA surveyed every coastal sewage system in southern California and found many to be experiencing such spills. Some systems had few sewage spills, while others had hundreds. Only a small number of these were directly responsible for beach closures, but it only takes one to close a beach for several days. The others – usually on streets and sidewalks, ultimately emptying into storm drains, channels, and creeks – are also a hazard to public health. In 2001, EPA and the **Los Angeles Regional Water Quality Control Board** (one of nine state-appointed regional boards in California that enforce state and federal clean water laws) jointly sued Los Angeles to ensure that the city takes additional measures to stop sewage spills. In 2002, EPA also issued compliance orders to the cities of San Diego, Laguna Beach (Orange County) and Carpinteria Sanitary District in Santa Barbara County, requiring them to take similar actions to reduce sewage spills. The orders require specific measures aimed at reducing the number and volume of spills over a sustained period. The orders are expected to help achieve measurable reductions in sewage spills, to protect the Southern California Coast and beaches.

The **San Diego Regional Water Quality Control Board** had similar problems with sewage spills in the 48 cities and special districts that collect and treat sewage in its region. In 1996, the San Diego Regional Board issued a permit that requires cities and districts to:

- Control, terminate, and recover spilled sewage and monitor impacts
- Correct problems that caused the spills
- Maintain spill prevention and response plans
- Maintain records of spills and responses
- Open their operations to Regional Board inspectors

The Regional Board enforced the requirements of this permit, in some cases imposing substantial penalties. Over the past seven years, the number of significant sewer spills and overflows has dropped by 57%. Mindful of this success, the Santa Ana and Central Coast Regional Boards have taken similar actions.

EPA's compliance orders complement the regional boards' actions by focusing on long term infrastructure upgrades.

### **Sanitary Sewer Overflows**

[www.epa.gov/reg9/](http://www.epa.gov/reg9/)

EPA's Pacific Southwest Region (Region 9) includes the States of Arizona, California, Hawaii and Nevada; Guam; American Samoa; the Northern Mariana Islands; and the Trust Territories. Each of the States in Region 9 has been delegated authority to implement the Clean Water Act NPDES program. EPA Region 9 staff work together with the States to regulate sanitary sewer overflows (SSO's). Efforts are underway to collect data on SSO's and provide compliance assistance through conferences and workshops. Region 9 States have issued NPDES permits to wastewater collection systems. EPA and the States have conducted inspections of collection systems and taken enforcement actions for sewage spills.

### **EPA Region 9 SSO Priorities**

EPA Region 9 places a priority on what the agency calls "wet weather discharges" including storm water, concentrated animal feeding operations (CAFOs) and sanitary sewer overflows. With only two combined sewer systems in Region 9 (San Francisco and Sacramento), most of the Region's attention is directed at the separate sanitary sewage collection systems. Most sewage spills in Region 9 are caused by blockages (including grease and roots) and broken sewer pipes. Some systems, particularly in Northern California and Hawaii, experience significant wet weather overflows resulting from infiltration and inflow. Aging and deteriorated sewer pipes contribute to many of the blockage and wet weather related spills.

Region 9 compliance and enforcement efforts are targeted at:



- large volume SSO's with significant environmental impacts;
- systems with frequent spills indicative of CMOM deficiencies;
- systems with known CMOM deficiencies;
- systems serving large population centers;
- systems located in watersheds with known impacts from SSO's including closures of recreational beaches;
- and systems with SSO's posing risks to public health including spills in public areas and Abasement backups.

In keeping with these priorities, EPA Region 9 has evaluated dozens of collection systems in coastal Southern California, Hawaii and Guam and taken several administrative and civil judicial enforcement actions against systems with frequent spills.

### **SSO Data Collection**

SSO reporting requirements as established in NPDES permits or state regulations vary across the Region 9 States. Arizona, California and Hawaii maintain SSO databases. California is working to develop a uniform and comprehensive statewide SSO database that will rely on direct electronic reporting by the collection systems. EPA Region 9 uses the Clean Water Act section 308 information gathering authority to collect data on SSO's.

### **CMOM Type Permits**

State of California Regional Water Quality Control Boards for the San Diego, Santa Ana and Central Coast Regions have issued general Waste Discharge Requirements (permits) for sewage collection systems. These permits prohibit sewage spills, require reporting of sewage spills and mandate development of collection system management plans similar to the CMOM plans contemplated in EPA=s draft SSO regulation. Other California Regional Boards have issued waste discharge requirements to individual collection systems. The California State Water Resources Control Board recently convened a workgroup to examine options for a consistent statewide approach to regulating sewage collection systems. EPA Region 9 supports State efforts to establish permits for collection systems.

### **Outreach and Compliance Assistance**

EPA Region 9 actively participates in collection system conferences and workshops including those sponsored by the Water Environment Federation and affiliated State associations. At these conferences and workshops Region 9 staff promote the need for and benefits of CMOM programs, grease (FOG) source control programs and asset management.

## **Region 10: Washington (WA); Oregon (OR); Idaho (ID); Alaska (AK)**

<http://www.epa.gov/Region10/offices/woo/wappa02.pdf>

### **National wet weather priorities**

Reason for priority: Runoff from wet weather events (e.g., overflows from combined sewers, sanitary sewers, stormwater runoff) remain a leading cause of water quality impairment as documented in CWA Section 305(b) reports. Control of runoff from wet weather events directly supports the Clean Water Action Plan and the Pacific Northwest salmon recovery efforts.

**a. CSOs**

Ecology will include requirements to implement Ecology's CSO rule in all NPDES permits to combined sewer overflow (CSO) facilities. Ecology's rule is equivalent to the nine minimum controls, as outlined in EPA's 1997 CSO Control Policy. The NPDES permit for each CSO facility shall also require compliance with an approved CSO reduction plan that includes public notification requirements and post construction compliance monitoring.

**b. SSO's**

Ecology shall assure that all new NPDES permits written after July 2001 include language prohibiting sanitary sewer overflows (SSO's) and requiring reporting if such SSO's occur. Ecology will develop a report listing facilities with SSO problems and provide EPA with such report by October 2002.

## **Consent Decrees From All Regions, Including CMOM Language:**

<http://www.epa.gov/compliance/resources/decrees/civil/cwa/baltimore-cd.pdf>

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<http://www.mawss.com/consentdecreedocs.htm>

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<http://www.epa.gov/compliance/resources/decrees/civil/cwa/dcwasac-d.pdf>

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<http://www.epa.gov/compliance/resources/decrees/civil/cwa/hamilton-cd.pdf>

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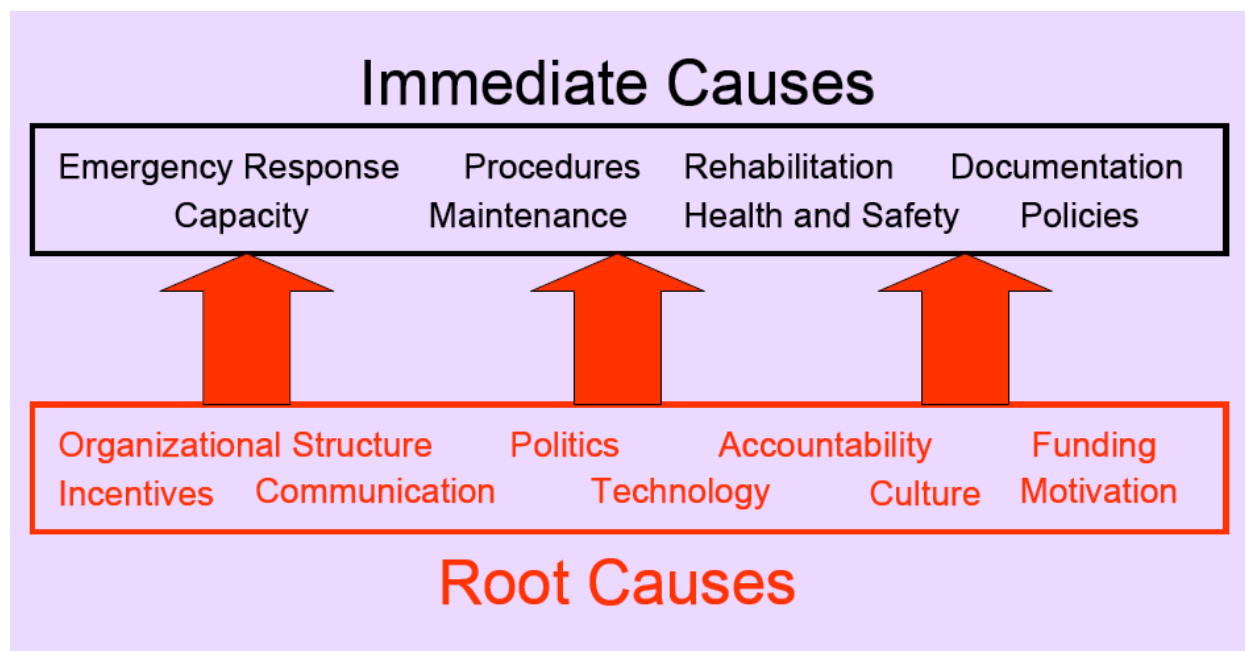
<http://www.epa.gov/compliance/resources/decrees/civil/cwa/toledo-cd.pdf>

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<http://www.epa.gov/compliance/resources/decrees/civil/cwa/batonrouge-cd.pdf>

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## Potential Root Causes of Non-Compliance – a diagram



**Sustainable CMOM compliance needs to address root causes.**

(From "cMOM as a Catalyst for Business Improvement", WEF/CWEA Collection Systems 2002 Conference, Authors: Guillermo J. Garcia, Malcolm Pirnie, Inc.; John Gonzales, City of Sparks, Nevada)

## Case Studies, Fact Sheets, and Other Information

[http://cfpub.epa.gov/npdes/sso/featuredinfo.cfm?program\\_id=4](http://cfpub.epa.gov/npdes/sso/featuredinfo.cfm?program_id=4)

### City of Mobile, Alabama, Sewer Overflows Settlement

<http://www.epa.gov/compliance/resources/cases/civil/cwa/mobile.html>

<http://www.epa.gov/compliance/resources/decrees/civil/cwa/mobile-cd.pdf>

The Justice Department, the Environmental Protection Agency and the State of Alabama announced on January 24, 2002 a major Clean Water Act settlement involving the Water and Sewer Board of the **City of Mobile, AL**, for violations of the National Pollutant Discharge Elimination System (NPDES) permit program. Mobile Bay Watch, Inc., a local citizens' group, is also a party in the settlement. Since 1993, the Board has experienced numerous unpermitted discharges from its transmission and collection systems, and also sporadic violations of the effluent limitations of its NPDES permits. The Board owns and operates three publicly-owned treatment works (POTWs), which discharge treated wastewater into Mobile Bay and its tributary, as well as the transmission and collection systems that carry wastewater to the POTWs for treatment. From 1995-1999, unpermitted discharge volumes of sanitary sewer overflows reaching waters of the U.S. ranged from 2.116 million gallons per year to 4.199 million gallons per year. This is the first EPA case to resolve claims against a participant in the Agency's Region 4 Maintenance, Operation and Management Compliance (MOM) Program. The program is intended to bring all

southeastern region POTWs into compliance with the "proper operation and maintenance" provision of their NPDES permits by 2011.

### **Clearwater, FL Abates Sanitary Sewer Overflows**

(Using the EPA Region 4 Management, Operations and Maintenance Approach)

<http://www.epa.gov/npdes/pubs/clearwater.pdf>

Public sewer utilities in EPA Region 4 have been asked to implement management, operation and maintenance (MOM) programs. Participating municipalities complete self-assessments of their utilities and submit recommendations for improvements to the Region, along with prioritized implementation schedules. MOM project successes in Region 4 have contributed to national development of the capacity, management, operations, and maintenance (CMOM) approach. The City of Clearwater joined the program in 1998 and submitted its MOM Plan in 1999. An early benefit of the self-assessment was identification of needed maintenance program improvements that were phased in starting before the Mom Plan was complete, moving the City from a reactive to a proactive maintenance approach. As a result, the number of sanitary sewer overflows began to decrease substantially within the first year.

### **Greenwood Metropolitan Authority, Greenwood County, South Carolina**

CMOM Program Sets Foundation For SSO Control, Regional Growth

<http://www.epa.gov/npdes/sso/greenwood/index.htm>

For **Greenwood Metropolitan District (Metro)**, a good Comprehensive Management, Operations, and Maintenance Plan was more than a way to abate sanitary sewer overflows (SSO's): it was also a way to bring community leaders to consensus on difficult, expensive infrastructure problems. The CMOM solution is expected to yield SSO reductions within four years and pave the way for growth in the region. While developing its CMOM proposal, Metro found that many of its existing best management practices covered these recommended elements. But the CMOM approach was useful in translating all the activities into a written plan that helped clarify for local civic leaders why it was necessary to provide Metro the legal authority and operational control over the entire system. According to Metro, one of the best things they did when implementing the CMOM program was to seek the support of SCDHEC. They see the State agency as a partner in this effort. Metro also emphasizes that open communication with SCDHEC as well as individuals in WEF, AMSA, within Metro itself and the community have provided an invaluable source of insight and support. Constant communication and education are essential for a program of this magnitude to be successful.

### **Fairfax County Wastewater Collection Division, Burke, Virginia**

IMPLEMENTING INTEGRATED CMOM

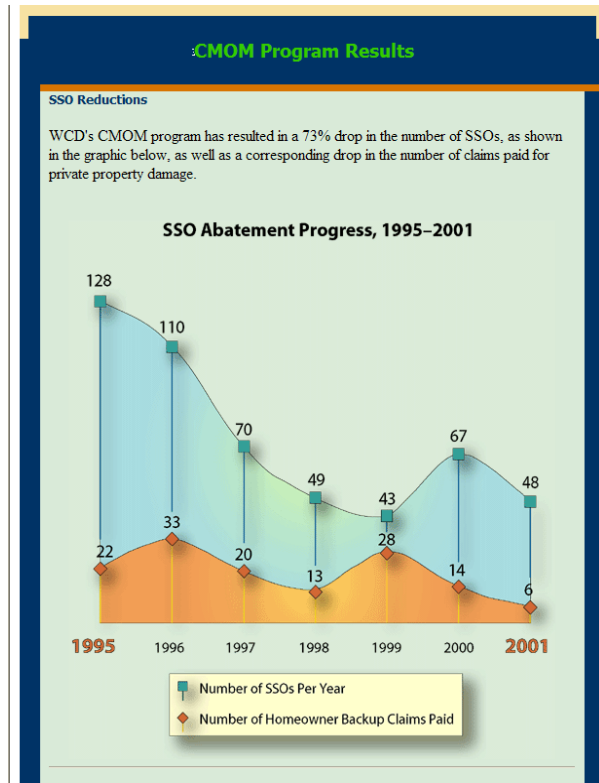
<http://www.epa.gov/npdes/sso/virginia/>

Fairfax County Wastewater Collection Division (WCD) is using a capacity, management, operation and maintenance (CMOM) approach based on the EPA-recommended model to abate sanitary sewer overflows (SSOs), extend the life of its sewer system assets, and improve customer satisfaction. Since its inception in 1995, WCD's CMOM program has cut

### **FAIRFAX CNTYS CMOM PROGRAM RESULTS**

<http://www.epa.gov/npdes/sso/virginia/results.htm>

SSOs by 67%, reduced operations and maintenance (O&M) and capital improvement costs, and led to a major restructuring of WCD's personnel organization. Over time, WCD believes CMOM will help optimize the service life of sewer system assets and ensure that adequate sewer capacity remains available to the growing county. WCD believes the success of its CMOM program hinges on three important factors: Every element of CMOM must be addressed, Personnel at all levels in the organization must be involved in the planning and implementation of activities, and Planning must be rooted in CMOM goals yet flexible enough to respond to changing conditions



### City of Youngstown, Ohio, Sewer Overflows Settlement

<http://www.epa.gov/compliance/resources/cases/civil/cwa/youngstown.html>

<http://www.epa.gov/compliance/resources/decrees/civil/cwa/youngstown-cd.pdf>

The Justice Department, the U.S. Environmental Protection Agency, and the State of Ohio announced a settlement with the **City of Youngstown** on Tuesday, March 5, 2002, that will reduce and perhaps eliminate long-standing and significant raw sewage discharges from its combined sewer system. Under the settlement, the City estimates that it will spend \$12 million in short-term improvements over the next six years and \$100 million over the next two decades to develop and implement a long-term sewage discharge control plan. This settlement is expected to eliminate 800 million gallons of illegal sewage discharges annually. The settlement puts Youngstown on an enforceable schedule to eliminate direct discharges of raw sewage, eliminate a sewer overflow at Orchard Meadow near Mill Creek Park's Lily Pond, replace two pump stations and make significant improvements to operation and maintenance of the sewer system.

### Orange County Within The Santa Ana, California Region

General Waste Discharge Requirements For Sewage Collection Agencies

<http://www.swrcb.ca.gov/rwqcb8/pdf/02-14.pdf>

SSO's are a frequent occurrence in the portions of **Orange County** within the Santa Ana Region. The chief causes of sanitary sewer overflows include grease blockages, root blockages, sewer line flood damage, manhole structure failures, vandalism, pump station mechanical failures, power outages, storm or ground water inflow/infiltration, debris blockages, collection system age and construction material failures, lack of proper operation and maintenance, lack of capacity and contractor caused damages. Most of these SSO's

are preventable with adequate and appropriate source control measures and operation and maintenance of the sewage collection system. In Orange County, from January 1, 2000 through August 30, 2001, there were approximately 250 SSO's. SSO's from publicly owned sewage collection systems accounted for almost 75% of these sewage spills, with the remainder occurring on private property.

### **Cincinnati MSD Consent Decree on Sanitary Sewer Overflows**

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[http://www.msdcg.org/downloads/consent\\_decree/](http://www.msdcg.org/downloads/consent_decree/)  
[http://www.msdcg.org/downloads/consent\\_decree/final\\_cd.pdf](http://www.msdcg.org/downloads/consent_decree/final_cd.pdf)

On February 15, 2002, the U.S. Department of Justice, on behalf of the U.S. EPA and Ohio EPA, and with the approval of the Hamilton County Board of Commissioners and the **City of Cincinnati**, lodged an Interim Partial Consent Decree on Sanitary Sewer Overflows with the United States District Court for the Southern District of Ohio, Western Division. The consent decree documents can be downloaded or read online. There are also 10 exhibit attachments to the consent decree. These exhibits describe various MSD divisions' operating plans, consent decree action plans, as well as some definitions in the decree.

[Main Consent Decree document](#) (132 KB file)

[Exhibit 1, Non-MSD Sewers](#) (233 KB file)

[Exhibit 2, Other Permitted Treatment Facilities](#) (42 KB file)

[Exhibit 3, Projects/Schedules](#) (265 KB file)

[Exhibit 4, Model and Data Collection Work Plan](#) (5.7 MB file)

[Exhibit 5, SSO Monitoring and Reporting Plan](#) (1.3 MB file)

[Exhibit 6, Sewer Overflow Response Plan](#) (871 KB file)

[Exhibit 7, Operation and Maintenance Program](#) (1.1 MB file)

[Exhibit 8, Industrial Waste SSO/CSO Management and Minimization Plan](#) (21.7 MB file)

[Exhibit 9, Pump/Lift Station Operation and Maintenance Plan](#) (1.2 MB file)

[Exhibit 10, Short Term Capacity Plan](#) (3.5 MB file)

### **Miami-Dade County Water And Sewer Department's CMOM Program:**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

**Miami Dade Water and Sewer Department** MDWASD is the sixth largest public utility in the United States, providing direct service to over 365,000 retail customers. Wholesale water service is provided to fourteen (14) municipalities and wholesale sewer service is provided to twelve (12) of the county's twenty-nine (29) municipalities. The County's current population of two (2) million is expected to reach three (3) million by 2015. Brown and Caldwell is assembling Miami-Dade County Water and Sewer Department's (WASD) existing capacity, management, operation and maintenance (CMOM) programs into a comprehensive summary document that meets the EPA's proposed program, while at the same time supports WASD's Peak Flow Management Strategy. WASD has been operating under two federal consent decrees since 1994.

During that time, WASD has developed and implemented numerous management, operation and maintenance programs that have resulted in an increased rate of compliance, a substantial reduction in the number of sanitary sewer overflows; and, an increased utility efficiency. MDWASD wants to continue to improve its operational capabilities and stay ahead of the regulatory process. The purpose of this project is to bring all of the WASD's management, operation and maintenance programs, together with the supporting standard procedures, into a summary document. This document will assist the department in identifying what areas the department is lacking and where they have done a good job. This paper will present the results of the CMOM activity and where MDWASD will focus its efforts for improvements. It will also explain how its efforts related to CMOM compare with the draft EPA's proposed National Pollutant Discharge System Regulation, 40 CFR 122.42(e) requirements.

### **San Diego Collection System Assessment Program: Lessons Learned**

<https://www.wef.org/applications/periodicals> (KEY WORDS: CMOM, collection system, audits, SSO's)

The **City of San Diego** has embarked on a ten-year program to reduce sanitary sewer overflows (SSO's) in its 2,900-mile collection system by replacing, rehabilitating and repairing sewer pipes that are susceptible to overflows. An important component of this program is a plan for inspection and condition assessment of the City's sewer assets. The City has scheduled closed-circuit television (CCTV) inspection for approximately 1,200 miles of pipe, as well as detailed inspections for approximately 26,000 manholes. At approximately the midpoint of the inspection program, the City is able to report on the successes and the challenges of its inspection program.

### **PROACTIVE PROGRAMS AND PARTNERING WITH EPA IMPACTS ENFORCEMENT ACTION OUTCOME**

<https://www.wef.org/applications/periodicals> (KEY WORDS: CMOM, collection system, audits, SSO's)

In April 2002, the United States Environmental Protection Agency delivered Administrative Order CWA-309-9-02-17 to the **City of San Diego** requiring the development of 13 wastewater collection system plans. The order sets forth a comprehensive set of requirements that address all of the major components of controlling sanitary sewer overflows, from operations and maintenance requirements to rehabilitation and replacement of sewer pipes. This paper describes the advantages of the proactive planning, analysis, and implementation activities that the City performed prior to issuance of the Administrative Order and how these activities, along with open dialogue and partnering with the EPA, resulted in the development of Administrative Order requirements that are aligned with City goals and strategies.

### **Springfield, Missouri Developing CMOM Program**

**Springfield, Missouri** is under no mandatory requirement to develop a CMOM program; however the utility understands the benefits of a structured comprehensive program for their wastewater utility. They enlisted the assistance of a consulting firm to lead key employees through a CMOM Assessment. The assessment was a self-evaluation of their current work practices and documentation as defined in EPA documents. The assessment revealed that Springfield is doing many activities very well and in accordance with the intent of CMOM. Those excellent programs include an extensive sewer main and manhole rehabilitation program that has been underway for ten years. It has resulted in significant reductions in infiltration and inflow. The utility has an excellent mapping system, excellent sewer design and construction standards, and a sanitary sewer evaluation survey program that includes manhole inspections, smoke testing and temporary flow monitoring.

The utility wants to build on these excellent CMOM programs by focusing on important areas that need additional attention. The CMOM Assessment process identified those areas and a phased plan was created



to develop and implement those additional improvements. These include developing a documented CMOM Program that is aligned with the EPA CMOM audit procedures, a sewer laterals program, grease control, contingency plans, and data integration among utility work groups. The utility will develop these programs using small teams of employees with guidance from the consultant. Springfield has retained the expertise of the former Collection System Supervisor to head up the CMOM Program effort.

Contact: Mr. Wayne Latimer, 417-874-1213, [wlatimer@ci.springfield.mo.us](mailto:wlatimer@ci.springfield.mo.us)

### **Luquillo, Puerto Rico: A Methodology For Evaluation And Design Improvements In Wet Weather Sanitary Sewer Systems** A Pilot Case Study

<http://www.wef.org/applications/periodicals> (KEY WORDS: FLOW METER)

This paper describes the methodology that has been used to evaluate wet weather flows within the sanitary sewer system in the municipality of **Luquillo, Puerto Rico**. The methodology is based on a unit hydrograph model that predicts rainfall dependent infiltration and inflow (RDI/I) for a given unit of rainfall (volume or intensity). The RDI/I model has been calibrated by comparing predicted wet weather flows to those observed in the five flowmeter locations for which rainfall and flow rate data has been collected. Once the RDI/I is calibrated to the data collected from these five locations, then the methodology may be used to extrapolate to other areas which exhibit similar RDI/I characteristics in terms of rainfall and sanitary sewer system infrastructure. An extensive flow monitoring program has been undertaken to quantify existing wet weather sanitary sewer system flow characteristics in the Luquillo study area. Five flow monitoring locations have been deployed in areas that were determined to provide appropriate coverage of geographical as well as water/land use conditions. Flow data, consisting of flow rate, velocity, depth and rainfall intensity, was collected over a period of 45 days in order to capture rainfall events which produced significant RDI/I response. This is the set of data which has been used as input to the hydrograph decomposition methodology presented here. Section 1 describes the basic sanitary sewer system flow components that are considered in this analysis, and the methodology used to decompose flow monitoring data into these components. Section 2 presents the specifics of the hydrograph decomposition methodology for data analysis which is used to predict RDI/I flows for a given rainfall event. Section 3 presents the results obtained from the data analysis. Finally, Section 4 discusses some preliminary guidelines to be used in planning and design of improvements to the Luquillo sewer system.

### **City of Sandy Hook, Kentucky: A Small City Addresses Collection System Capacity, Maintenance And Operations Management**

<http://www.wef.org/applications/periodicals> (KEY WORDS: FLOW METER)

Constructed in the early to mid 70s, the collection system for the **City of Sandy Hook, Kentucky** was victimized by changing political agendas, limited operating budgets, non-existent capital budgets, limited and changing staff and the vagaries of time. Existing maps of the collection system identified approximately 30,000 lineal feet of pipe, 220 manholes and seven pump stations. Each of the pump stations contained an overflow.

In 2000, the State of Kentucky decided to build a penitentiary near the **City of Sandy Hook** with the prison's wastewater discharging to the City's treatment plant. This decision would require substantial changes to the treatment plant and resulted in a desire to analyze and upgrade the collection system at the same time. The analysis and upgrade of the collection system study had to be designed to fulfill a number of requirements because the opportunity presented to the City was quite possibly a one-time event. With multiple conditions driving the project, financial assistance was obtained and the program to upgrade the City facilities began in early 2001.



A multiphase data collection and analysis program was used that included: inspection of the plant headworks, system metering, and pump stations; collection system flow metering with rainfall recording; groundwater level identification; structure inspections; flow isolations; and smoke test and CCTV inspections. The use of state-of-the-art electronic equipment and digital aerial maps allowed for actual locating of structures and inspection findings with all their attributes at an exact location in the field. This type of data collection also enabled accurate maps to be constructed in a very short time. As each phase was performed, different layers of the system map were created identifying such components as map corrections, flow characteristics, infiltration related problems, inflow related problems, maintenance problems and hydraulic problems. The accurate and timely development of these maps and their databases allowed for quick assessment of data as it was collected.

### **City Of Baltimore, Maryland: Identification And Assessment Of Critical Wastewater Facilities**

<https://www.wef.org/applications/periodicals> (KEY WORDS: CMOM, collection system, audits, SSO's)

The **City of Baltimore, Maryland** is addressing the challenges posed by an aging infrastructure placed under increasing service demands. Concerned that problems with critical components of the wastewater collection and conveyance system could result in unintended sanitary sewer overflows (SSO's) to the Chesapeake Bay, the City proactively prepared a comprehensive Emergency Response Plan. This Plan was prepared in accordance with the previously circulated U.S. EPA guidelines for development of a Capacity Assurance, Management, Operations and Maintenance (CMOM) program. The planning project initiated by Baltimore City is similar to future efforts that may well be required of most major municipalities. This presentation focuses on the initial phase of the project, wherein critical facilities were identified and inspected. Critical facilities were identified through a series of workshops with City O&M staff, and through research and analysis of record documents. The list included pumping stations, significant pipelines and valves, and system components deemed to be at a high risk of failure. These facilities were ranked in terms of risk and potential impacts to ongoing service, public health or the environment, and inspections were conducted to identify factors which might contribute to failure or inhibit the City's ability to respond in a timely, effective manner. The critical facilities lists and inspection findings were fundamental to the development of the Emergency Response Plan. This Plan, along with implementation of the recommended mitigation measures, will significantly reduce the incidence and severity of unintentional sewage discharges and contribute greatly to Baltimore's overall SSO compliance.

### **City Of Atlanta: Long-Term Watershed Monitoring Approach**

<https://www.wef.org/applications/periodicals> (KEY WORDS: CMOM, collection system, audits, SSO's)

The **City of Atlanta** (COA) has initiated a Long-term Watershed Monitoring (LTWM) Program for all major watersheds within the City limits. The purpose of this program is to collect data needed to assess stream improvements and identify any pollution reduction that can be attributed to the Clean Water Atlanta (CWA) program implementation, which was implemented after two Consent Decrees were imposed from a 1995 lawsuit. Although there are no direct Consent Decree requirements or penalties associated with the LTWM Program, it is intended to replace the current Sanitary Sewer Overflow (SSO) Consent Decree event driven sampling and consolidate other sampling required under the National Pollutant Discharge Elimination System (NPDES) program. The LTWM Program includes the following major tasks: • Station Selection, Set-up, and Installation • Water Quality Monitoring, Maintenance, and Data Retrieval • Biological Monitoring • Data Management and Reporting • Public Involvement • Watershed Management Plan Twenty stations were selected to monitor stream flow, water quality, and biotic integrity within each of the major watersheds within the city limits. Installation of the situ water quality and flow monitoring equipment is expected to be completed in May of 2003. The overall water quality monitoring program is scheduled to begin in May of 2003; however, a high flow synoptic event was captured in two river basins in March 2003. Initial data results are expected back during May. Biological monitoring was initiated at all 20 station locations in December of 2001 and the

results are presented herein. The watershed data management system is currently in the development phase and should be completed by summer 2003.

#### Developing A Strategy For Implementing Mandated "Mom" Plans: A City Of Atlanta Perspective

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

In late 1999, the United States EPA (EPA) and the Georgia Environmental Protection Division (EPD) completed settlement negotiations with the **City of Atlanta** requiring, in part, the implementation of a management, operations and maintenance ("MOM") program for the City's wastewater collection and transmission systems in order to help control sanitary sewer overflows (SSO's). With one exception, all other MOM program component plans of which there are a total of ten, are under implementation including the Grease Management Program and the Collection & Transmission Systems Contingency and Emergency Response Plan. The Long-Term Operation Plan will be prepared only after the construction of capital improvements to remediate SSO's are completed over the next 10 years. Several of the program components including the aforementioned have been under implementation since mid-1999 so the City is particularly experienced in the MOM "business". Each MOM plan was prepared as a stand-alone document that helps demonstrate irrefutable compliance with each provision of the consent decree addressing the MOM program. While collectively these plans should comprise the City's comprehensive operations and maintenance management plan, something was decisively missing. Specifically, a strategic "how to" approach was needed to guide implementation of the MOM program as an integrated management system with established goals, objectives and schedules for the entire sanitary sewer utility, and reflective of the reality of available resources and resolution of any conflicting priorities.

#### Austin, Texas Clean Water Program

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The **City of Austin**, the capital of the State of Texas and home to the University of Texas, is a community of nearly three quarters of a million people. The City owns and operates the water and wastewater systems providing service connections to about 182,977 customers in the City limits and outlying areas. The City's wastewater system consists of 2,300 miles of pipelines, 109 wastewater lift stations, three major wastewater treatment plants, and one central biosolids processing plant. The City has experienced rapid growth over the last twenty years because of its unique blend of high tech industry and governmental affairs. The City of Austin is consistently rated as having one of the highest quality of life in the country. This explosive growth has led to problems with the wastewater collection system leading to increasing numbers of sanitary sewer overflows (SSO's).

#### Eliminating Overflows In Austin Texas

<http://www.trenchlessonline.com/coverstory.php?Show=april2004>

The **City of Austin**, like countless municipalities across the United States, had been addressing sanitary sewer overflows (SSO's) on an individual basis for years. The Environmental Protection Agency (EPA) soon stepped in, issuing an administrative order on April 28, 1999 that called for the elimination of all sewer overflows by the end of 2007. Now two years into the massive undertaking, dubbed Austin's "Clean Water Program," the City has approximately 45 months to complete the \$200 million endeavor -- or face the consequences. EPA has instituted a series of 14 deadlines, each carrying stiff penalties of \$27,500 per day, per violation. To meet those deadlines, the City has meticulously planned every stage of the program, instituting several innovative procedures to delegate responsibility, deal with EPA, gain community support and get the job done.

## City Of Los Angeles CMOM Program

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The **City of Los Angeles Bureau of Sanitation Wastewater Engineering Services Division** led a Citywide effort to prepare documentation of the City's Capacity, Management, Operations, and Maintenance (CMOM) Program in response to the U.S. Environmental Protection Agency's proposed rules. The proposed rules will require an integrated collection system plan encompassing all aspects of wastewater collection system in order to minimize or eliminate Sanitary Sewer Overflows (SSO's). The proposed rules, dated March 24, 2000, clarify the National Pollutant Discharge Elimination System (NPDES) permit requirements for operation and maintenance of wastewater collection systems and the permittees' duty to diminish and mitigate for SSO's. The City's CMOM program is developed to meet the requirements of the proposed EPA regulations. It includes a collection system planning business plan that integrates various elements of the collection system into a unified whole. A Fats, Oils, and Grease (FOG) control program, a roots control program, and a wet-weather overflow reduction program are also major components of the City's CMOM program.

## East Providence, Rhode Island: Combining Pilot I/I Remediation With System Modeling To Guide SSO Reduction Decision Making

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The **East Providence, Rhode Island** sewer system is subject to infiltration and inflow (I/I) and is particularly influenced by wet weather, resulting periodically in sanitary sewer overflows (SSO's). During periods of sustained intense rainfall concurrent with high groundwater levels, portions of the sewer system overflow, especially at the Watchemoket Cove Wastewater Pumping Station. As a result of a lawsuit initiated by Save the Bay, a Rhode Island based environmental action/protection organization, the City of East Providence and the Rhode Island Department of Environmental Management (RIDEM) entered into a consent agreement in 1999. The consent order stipulates that the City perform sewer system studies to identify measures to eliminate SSO's at the City's wastewater pumping stations, and includes other CMOM (Capacity, Management, Operations, and Maintenance) related requirements (Syde and Beardsley, 2001). CDM developed a unique approach to SSO analysis by creating a computer model of the East Providence sewer system to aid in evaluating alternatives for improving the system's operation with the goal of reducing the volume and frequency of overflow events. The model was used to quantify overflows in the existing system, and predicted overflow frequency and estimated system improvement costs were used to establish a long-term plan for reducing SSO's. This paper outlines the remediation process followed by the City and shows how, through I/I investigations, pilot I/I remediation, sanitary sewer system modeling, and implementation of CMOM initiatives, the City has improved the capacity of their sewer system and guided their long-term planning objectives for the reduction of SSO's.

## Village of Beverly Hills, Michigan: A Pilot Program For Removal Of I/I From Private Sources

<https://www.wef.org/applications/periodicals> (KEY WORDS: FLOW METER, INFILTRATION, INFLOW, PRIVATE SOURCES, SUMP PUMP DISCONNECTION)

The **Village of Beverly Hills**, located in Oakland County, Michigan, is a part of the **Evergreen-Farmington Sewage Disposal System (EFSDS)**. Wastewater from the EFSDS is transported through Oakland County interceptors to the City of Detroit where it receives treatment at the Detroit Wastewater Treatment Plant. Infiltration and inflow (I/I) into the sanitary system from public and private I/I sources overloads the sewer system and causes basement flooding and sanitary sewer overflows (SSOs) to local surface waters during large rain events. Current practices to reduce such occurrences involve the construction of relief sewers or sanitary retention tanks. Decreasing clear water inflow to the sanitary sewer system has been a major goal of Beverly Hills through the 1990's. Sump pumps from residences are connected to the sanitary sewer system in

many areas of the Village and the EFSDS. Beverly Hills partnered with the Oakland County Drain Commission (OCDC) to investigate the effectiveness of removing sump pump connections to the sanitary sewer system in an effort to correct this I/I source. A pilot sump pump disconnection program was undertaken in Beverly Hills in 1993 to reduce I/I. The contribution of sump pumps was evaluated through a long-term metering program conducted by OCDC. A 74.5-acre residential area was selected to serve as the study area for a sump pump removal program. Sanitary flow and precipitation for the study area were measured from 1992 to 1998. A comparison of dry weather flow and wet weather flow before and after sump pump removal was conducted to estimate the amount of inflow attributable to the sump pumps. To account for the unique and somewhat delayed characteristics of sump pump inflow from a rainfall event, several factors of inflow were examined: volume of inflow, peak inflow, and time for the wet weather hydrograph to recede. All factors suggested a quantifiable decrease in inflow after the sump pump removal. The percent capture of the sanitary sewer system, a function of wet weather inflow volume, was also examined. The percent capture was found to decrease from 1.8% to 0.5%. The decrease in percent capture after sump pump removal was used to estimate sanitary inflow of 6,400 gallons per sump pump per year for the study area. This figure was used to provide quantitative predictions for larger areas. The evaluation of flow meter and precipitation data demonstrated that the sump pump disconnection did decrease the wet weather inflow into the sanitary sewer system. It also provided quantitative means to predict the wet weather effect of sump pumps in other regions of the EFSDS.

### **City Of Gastonia, NC: Conducting A MOM Self-Audit**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The U.S. Environmental Protection Agency (EPA) considers sanitary sewer overflows (SSO's) to be a violation of the Clean Water Act. The EPA further considers SSO's to be an indication of improper management, operations and maintenance by the utility. To address these issues, EPA Region 4 implemented a Management, Operations and Maintenance (MOM) audit program. During the last three years, EPA Region 4 has invited several utilities in each of Region 4 states, including the **City of Gastonia in North Carolina**, to participate in the program. This paper will discuss the City's initial reaction to this perceived "unfunded mandate" as well as the City's modified opinion following the conclusion of the self-audit. Some examples from the Gastonia Self-Audit will be provided to help the audience conduct a better self-audit should you be "invited to join the party." Some of those lessons learned during the Gastonia Self-Audit process include:

- Present your performance measures in "benchmark measure" terms.
- Don't be shy about reporting your successes.
- Take the opportunity to take a fresh look at your procedures.
- Document, document, document.
- Track your results and make improvements as necessary.

Subsequent to the Region 4 initiative, EPA has, on a national level, developed CMOM regulations adding the "C" for Capacity assurance. CMOM regulations were issued by the Clinton Administration in January 2001, but put on hold by the Bush Administration. It is not currently known when the CMOM regulations might be re-activated.

### **Allen County, Ohio (Lima, Ohio): Cost-Effective GIS Solution For Buried Infrastructure Meets Regulatory Requirements**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The **Allen County** Sanitary Engineering Department was required to develop an Inflow/Infiltration (I/I) identification and reduction program in an effort to prevent Sanitary Sewer Overflows (SSO). Management of the data and coordination of the inspections was crucial for this project to be a success. With no existing digital information, the County decided to take a two front approach: 1) develop a Geographic Information System (GIS) of their sewer network and 2) perform a detailed condition assessment. The GIS would become

the means by which the condition assessment process and its resulting data would be organized. Once completed the County would be armed with the information needed to efficiently and effectively correct their SSO problems. This paper reviews the process that Allen County and its consultants went through to achieve their goals.

### **Sacramento CSD-1's Experience: Developing A CMOM Program**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

**Sacramento County Sanitation District 1 (CSD-1)** is currently performing one of the first comprehensive CMOM projects in the United States. The CMOM project has completed an extensive audit of CSD-1 and identified necessary improvements. The audit process evaluated information from performance data, documents, and interviews of a cross section of staff. While many individual areas for improvement were found during the audit, most were minor and not directly related to sanitary sewer overflows (SSO's). Short-term and long-term improvements were identified in three key areas: 1. Reduce SSO's and stoppages 2. Implement asset management 3. Improve information management Overall, the success of the project was based on a good understanding of CSD-1's performance measures and active support and participation from all levels of staff and management.

### **Grease Impact Assessment Rehabilitation Pilot Project**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The **County Sanitation District No. 1 (CSD-1) of Sacramento County, California** is completing a two-year project on the impact of grease accumulation in selected areas of their collection system. Current grease handling policies of CSD-1 and local food producing facility wastewater flows result in heavy localized grease accumulation in the collection system that account for approximately seven percent of the annual grease related sewage overflows, and 36 percent of the flooded structure mitigation costs related to the overflows. This project is being completed to meet two critical objectives for CSD-1: 1) The cost to clean grease related sewage overflows in businesses and residences are increasing and CSD-1 is looking to optimize maintenance practices within available operating budgets. 2) CSD-1 is taking a proactive stance to be able to meet the new regulatory requirements related to the US EPA Sanitary Sewer Overflow (SSO) policy with the accompanying Capacity Management Operation and Maintenance (CMOM) guidelines. Meeting these objectives required establishing six goals that allowed the project team to define the field investigations, comparable industry practices, and the analysis and recommendations for the project. The goals of the project are to develop alternatives that mitigate grease impact, reduce operating costs, reduce blockages and overflows in the collection system, improve customer service, and work within the framework of the SSO and CMOM requirements. This paper presents a summary of the key findings and recommendations that resulted from the project along with the recommendations to implement an active grease source control program. The project consists of collecting information on four existing isolated areas of the CSD-1 collection system that are chronic maintenance problems due to grease build-up. A survey of 21 agencies nationwide with grease handling programs was conducted, to establish a range of options for CSD-1 to consider for dealing with grease within their collection system. The results of the survey were used in conjunction with the findings from the TV inspection to develop alternatives for grease control within the CSD-1 collection system.

### **Houston's Business Plan For Continual Improvement**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The **City of Houston** has a reputation for Texas-style delivery of its public services – big, efficient and friendly. To help maintain this reputation, the city's Public Utilities Division decided to develop a formalized plan to "institutionalize" the Division's general philosophy of continuous improvement. The resulting



Continuous Improvement for Collection Systems (CICS pronounced “Sis”) plan serves as a baseline inventory for existing conditions related to the wastewater infrastructure and to the city’s organizational structure for managing those facilities. Based on this system overview and evaluation process, initial opportunities for continuous improvement were identified. A CICS Steering Committee formed to begin the team building process improvement implementation. The continuous improvement goals are to: • Improve customer service. • Optimize system performance and asset management. • Strengthen regulatory compliance. Accomplishing of these goals is expected to result in improved operations and a reduction in the number of sanitary sewer overflows (SSO’s).

### **City Of Charleton: Launching CMOM Using An EMS**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO’s)

Environmental performance ... environmental compliance ... sewer system overflows ... capacity assurance – all very hot topics in today’s times. And with these issues, enforcement is poised to strike a hard blow to the wastewater collection operations throughout the U.S. in the form of the Environmental Protection Agency’s proposed Capacity, Management, Operation & Maintenance (CMOM) regulations (See draft Management, Operation and Maintenance Comprehensive, List of Programs for Sewer and Treatment Systems, Environmental Protection Agency – Region 4). These regulations and the proposed CMOM program are complex on many levels. To assist utilities with this effort, it is important to know what tools are available. It is **Charleston CPW’s** experience that an Environmental Management System (EMS) could provide a solid foundation for launching a CMOM program.

### **Protecting Paradise: CMOM Comes To Yosemite National Park**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO’s)

Nearly 4 million visitors enjoy the splendor of **Yosemite National Park** each year, with over 22,000 visitors on an average day during the peak season. Unseen by these visitors is the infrastructure necessary to support a small city. U.S. National Park Service (Park Service) staff are responsible for the operation and maintenance of approximately 34 miles of wastewater collection system, 3 major sewage lift stations, 4 major grease interceptors, and a 1 million gallon-per-day tertiary wastewater treatment plant serving Yosemite Valley, as well as numerous smaller developed areas outside of the Valley. Park engineering and utilities staff face unique challenges in operating and maintaining this infrastructure. Increased visitation and changing use patterns require Park staff to continually adjust and adapt. Much of the park’s sewer infrastructure dates from the 1930’s, and funding for large capital projects requires Congressional approval and an extraordinary level of public review. Maintenance and repair schedules are hampered by access during the peak tourist season and by weather during much of the remainder of the year. Many of the park concessionaire employees are seasonal, and require re-education on proper system use (i.e grease management) each year. Visitors often misuse park restrooms for garbage disposal. Over-riding all of these engineering, administrative, and operational concerns are the consequences of a significant sanitary sewer overflow (SSO) discharging to the Merced River – a designated National Wild and Scenic River. A catastrophic flood in January 1997 highlighted the vulnerabilities of the sewer infrastructure. Several critical elements of the collection system and interceptor from **Yosemite Valley** to the **El Portal Wastewater Treatment Facility** were destroyed. Park Service staff responded with a fast-track designbuild project that replaced the damaged pipelines, and began a concerted effort to upgrade the entire collection system. Concurrently, the Park Service has adopted the Merced Wild and Scenic River Plan and the Yosemite Valley Plan to guide future land use decisions in the Valley.

In the past year, the Park Service has launched a comprehensive and systematic program to mitigate factors that might result in a sewage discharge to the Merced River. The program addresses capacity, management, operations and maintenance of the Yosemite Valley and El Portal wastewater collection systems. This aggressive program encompasses four main elements: condition and capacity assessments; spill prevention

and response planning; pre-treatment, including grease and garbage management; and public education. A review of specific program elements and lessons learned in addressing the unique challenges of the national park environment provides a strong foundation for compliance with pending federal and state SSO regulations.

### **Richmond, Va Strengthens Its Collection System and GASB 34 Position**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

Introduction **Richmond, Virginia** is embarked on a systematic rehabilitation of its 1500 mile sanitary sewer collection system, parts of which date back to the mid-1800s. Aging infrastructure, regulatory requirements for overflow mitigation and new accounting requirements (under GASB 34) are all drivers for this rehabilitation program. The roadmap for this rehabilitation program is a Collection System Master Plan. This paper describes how the Richmond Collection System Master Plan addresses the drivers listed above and shows the benefits that Richmond derives. The approaches presented in this paper are fully transferable to other municipal collection systems.

### **Tennessee Cities: Sewer Flow Monitoring Crucial To EPA's CMOM Compliance**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

Flow monitors have been used extensively for conducting inflow and infiltration (I/I) studies in sewage collection systems over the past 28 years. These studies are part of the United States Environmental Protection Agency's (EPA) requirements for properly sizing new facilities, and identifying excessive I/I in pipes that may require rehabilitation. However, properly planned networks of flow meters are capable of providing much more information about sewer system operation than estimates of I/I and input parameters for sewer simulation models. In particular, the advent of instruments designed for gravity sewers that calculate flow using the continuity equation from depth and velocity data, allow analysts to evaluate operating conditions and to diagnose some capacity problems, unrelated to I/I. These additional capabilities have assumed greater significance in light of EPA's pending sanitary sewer overflow (SSO) regulations which give emphasis to proper system operations and maintenance (O&M). Presently, promulgation of the proposed regulations has been delayed due to the change of political administration. However, sewer system operators should still recognize that the practices outlined in the proposed regulations primarily represent good operating procedures, and only have a secondary regulatory function. This paper discusses experiences in three cities with the application of flow monitoring networks that follow the strategy intended by the CMOM program. The **City of Chattanooga** installed a permanent network of flow monitors for revenue billing applied to its regional customers. In addition to improving the accuracy of bill calculation, the city also discovered capacity problems at several locations. The **City of Nashville** has maintained a long-term network of 70 flow monitors in its trunk sewer system and 19 meters in chronic, wet-weather overflow locations. Analysis of major trunks using multiple meters revealed previously unsuspected problems with potential I/I in the upstream sewer tributaries. Data from both permanent meters and over a thousand temporary meters installed before and after sewer rehabilitation have allowed system managers to document over 10 million m<sup>3</sup> (2.7 billion gallons) of I/I removal annually. Additionally, Nashville has documented a reduction of 64% of annual duration of SSO's using a combination of 23 long-term and 53 short-term meters. Finally, **Jackson, TN** saved significant costs and avoided urban disruption when data from a flow monitoring network revealed that a major sewer trunk line with overflows was actually not overloaded. Lining rehabilitation was sufficient to recover capacity and eliminate back-ups and overflows.

### **Central Contra Costa Sanitary District in Martinez, California: Small Diameter Clay Sewer Pipe**

#### **An O&M Strategy: Replace It Now Or Run It To Failure**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

Clay sewer pipe installed prior to 1955 used oakum and cement mortar, tar, or hot sulfur to seal the joints. These materials have not performed well over time. Maintenance data from the **Central Contra Costa Sanitary District in Martinez, California**, was analyzed to determine the relationship between cleaning frequency and age for small diameter clay pipe. The clay pipe performed reasonably well for the approximately 35 years. After 35 years in service, the required cleaning frequency increased as the joint materials failed. In addition, root intrusion accelerated the failure of the pipe. It appears that the joints had fully failed at 50 years. This finding is supported by evidence from observations made during routine repairs. This finding contradicts the literature values of 90 to 120 years for the life expectancy of clay pipe. Industry standards, regulatory requirements (and penalties), escalating property damage claims, and public concerns about exposure to sewage-borne pathogens are causing the costs of operating and maintaining aging sewers to increase. Prior published life cycle cost estimates have only considered the cost of periodic cleaning which appears to be less than 30% of the actual cost of O&M. This paper presents an overview of clay pipe service issues, the results of the maintenance data analysis, and a cost model, based on actual maintenance data, for use in evaluating the real cost of continuing to maintain a pipe segment compared to the cost of replacement. The decision to replace now (or soon) will be discussed in light of current and future costs and SSO standards.

### **Orange County Sanitation District (OCSD), California: Starting A Collection System Outreach Program**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The **Orange County Sanitation District (OCSD)** owns and operates regional wastewater collection and treatment facilities under an NPDES Permit. We collect, transport and treat about 240 MGD of flow from 25 autonomous satellite cities and sewer agencies in a 470 square mile metropolitan service area. Population served is about 2.3 million. We are also developing the architecture for a GIS. In response to sanitary sewer overflows (SSO's) the Federal Advisory Committee was formed by the EPA in 1994 to help draft the proposed SSO Rules also known as CMOM, the acronym for: Capacity, Management, Operations and Maintenance. The Collection Facilities O&M management team identified a need to begin working closer with all satellites due to potential permitting and responsibility issues that proposed CMOM may bring. The outcome was a strategy to develop and implement our OCSD City and Agency Collection Facilities O&M Survey, also known as our Outreach Program. This program completed it's fourth year in June 2001 and has proven successful in improving communications, sharing information, improved collaboration on daily O&M issues, I/I reduction, spill response planning & reporting, and other topics. The overall goals for the Outreach Program are to become more knowledgeable of the assets managed by our satellite agencies, to leverage expertise in the region, and promote improved networking among cities and collection system owners, operators and managers. As it is well received by our 25 member Board of Directors and our Executive Management Team it is now one of OCSD's annual Critical Goals. The information compiled is shared with our satellite partners, local and regional regulators, the media, and others. There has been increased emphasis by our California Water Quality Control Board-Santa Ana (Region 8) on reducing beach closures due to sanitary sewer overflows. In late April of 2002, the Regional Board is scheduled to adopt Waste Discharge Requirements for sanitary sewers and a general permitting program. The structure of the WDRs are very similar to EPA's proposed CMOM. The Outreach Program has proven beneficial in developing teamwork and cooperation. The presentation and paper will provide adequate information for the reader and attendee to develop a plan for initiating their own Outreach Program in their region or watershed. The attribute information collected during the Outreach Program is very valuable in defining and supporting the needs for a Geographic Information System (GIS).

### **City Of Thousand Oaks, California Wastewater System Master Plan: Preparing For CMOM**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

The **City of Thousand Oaks in Ventura County, California** provides wastewater collection and treatment services to approximately 120,000 residents. In mid-2000, the City's Public Works Department began an



update to its Wastewater System Master Plan. Although an updated capital improvement program was the main objective of the Master Plan, the City also wanted to assess its operation and maintenance (O&M) program in comparison to other agencies, and to identify possible areas for improvement. Anticipating the future Sanitary Sewer Overflow (SSO) Rule and the Capacity, Management, Operations, and Maintenance (CMOM) program requirements, the City decided to accomplish its O&M assessment goal by including in the Master Plan a task to perform a preliminary CMOM program assessment. Integrating the CMOM assessment into the Master Plan provided a convenient mechanism for the City to tap into the knowledge and expertise of the engineering consultants on board for the Master Plan, resulted in synergies between the two efforts, and facilitated immediate implementation of selected recommendations that came out of the preliminary CMOM assessment. Self-audit and performance benchmarking methods were found to be useful tools for conducting the CMOM program assessment. This paper describes these tools and how they were applied within the context of a Wastewater System Master Plan. The paper also presents examples of the findings and conclusions in the case of the City of Thousand Oaks.

### **City of Coral Springs, Florida: THE PRE-CMOM STUDY**

<https://www.wef.org/applications/periodicals> (KEY WORDS CMOM, collection system, audits, SSO's)

Launching a CMOM Study appears to be an overwhelming, expensive, and somewhat mysterious undertaking. CMOM is a new requirement, so many utility managers are understandably apprehensive of authorizing the study and unsure of properly budgeting for it. This paper will present the methodology to conduct a preliminary study, not to begin the full CMOM study, but to assess the current status of compliance. The comparison of the results of the Pre-CMOM Study to the CMOM requirements will become the scope of work of the full CMOM Study. This paper addresses the methodology as employed for the **City of Coral Springs, Florida**. Coral Springs is located in South Florida, approximately equidistant from Fort Lauderdale and West Palm Beach. Coral Springs has a population of 112,000 (2002) plus an extensive business community.

### **Vallejo, California: WebGIS Tools Move Toward CMOM Compliance**

<https://www.wef.org/applications/periodicals> (KEY WORDS: CMOM, collection system, audits, SSO's)

A custom Web-based Geographic Information System (WebGIS) allows for the integration of the maintenance management system (MMS), engineering drawings and geographical information system (GIS) at the **Vallejo Sanitation and Flood Control District**. WebGIS allows all staff (including O&M, engineering, and management) to access District databases and maps of its sanitary sewer system using a web browser (Figure 1). Ultimately, the WebGIS may be available to the general public via the Internet and through a kiosk located at the District's headquarters. In addition, the architecture of the WebGIS has the flexibility to integrate with other databases and maps layers used by the District and the City such as billing databases and potable water and storm drain system maps. WebGIS developers collaborated with the District to understand business processes before development started (Figure 2). By integrating existing processes, the custom WebGIS compliment business practices without creating new work. The MMS is still run by the O&M staff, and the engineering department maintains records of improvements to the system. Now, however, the O&M and engineering staffs are working from a shared source of information that allows each of them to perform their functions more efficiently. WebGIS integration positions the District well for early compliance with portions of the proposed Capacity Management, Operations and Maintenance (CMOM) regulations. The system provides maps and asset/condition assessment data required by CMOM. GIS maps and databases might also be integrated with hydraulic model of the District's system. Engineering staff can visually identify areas subject to Sanitary Sewer Overflows (SSO's), frequent corrective maintenance, and odor complaints. Capital planning can then be targeted to maximize results.

### **A Watershed Approach To SSO Management**

<https://www.wef.org/applications/periodicals> (KEY WORDS: Sanitary Sewer Overflows, SSO, Watershed, SWMM, Stormwater, Water Quality)

A watershed approach to Sanitary Sewer Overflow (SSO) management was applied as part of an SSO elimination program for the Vallejo Sanitation and Flood Control District in Northern California. This approach was applied to estimate the total pollutant loads from SSO's, urban stormwater, and flows from the Napa River watershed. Flows generated from this approach were coupled with water quality data from a sampling program to project concentrations and loads for the three wet weather components (SSO, stormwater and upstream watershed discharges). This study is currently being used to set permit limits for a design wet weather event. The watershed approach used a combination of monitoring and modeling techniques to estimate the improvements to water quality for a variety of SSO elimination programs. Monitoring data included the use of radar and ground-level rain gages, flow monitoring data, and water quality samples. Modeling consisted of a detailed sanitary sewer collection model, an urban stormwater model, and a watershed model. These models were calibrated using available monitoring data to project flows for a variety of design events (i.e. 1-year, 5-year, and 20-year). This paper outlines the process used to project flows and water quality impacts for assessment of SSO's within a watershed. The modeling included 51 years of continuous flow simulation. A modified version of EPA SWMM coupled with the MOUSE model (Danish Hydraulic Institute) was applied as the collection system model. This method can be used to accurately predict wet weather flows within +/- 5 percent of measured flows. By applying a holistic approach to SSO management programs can be developed that provide cost-effective solutions for protecting water quality and public health. While wet weather SSO's can only be managed up to a given design event (i.e. 5-year event), they can not usually be eliminated for every wet weather event. However, by taking a watershed approach to SSO management, the impacts to both the public and the receiving waters can be minimized to a cost-effective level. This technique can be applied to any collection system (and upstream watershed) to help set pollutant discharge limits that comply with local permitting regulations. By providing the "whole picture" to a municipal district and a regulatory agency, permits can be set for specific facilities and can be used in the future to potentially allow pollutant trading between pollutant sources.

#### **Plainfield (New Jersey) Area Regional Sewerage Authority: Manhole Inserts to Reduce Inflow in the Borough of Fanwood**

The Plainfield Area Regional Sewerage Authority (PARSA) operates a regional interceptor system in central New Jersey. PARSA was created in 1996 as part of the settlement agreement ending an 8-year lawsuit against the former public operating agency. Sanitary sewer overflows, plagued the new agency, as decades of maintenance neglect took its toll. In phase 2 of the I/I reduction program, PARSA began focusing its attention on the local collection systems of its 8 member communities. Initially, the PARSA staff identified problem towns based on the billing meters. The staff initially looked at the comparison between dry weather and wet weather hydrographs. To determine where the extraneous flow was coming from, portable flow meters were installed in the three major flow basins. The Stewart Place flow basin was an area identified by the town as one that experienced basement backups during heavy rain events. The staff realized that all the manholes contained large pick holes that could be the source of inflow. These pick holes are the size of silver dollars and when under standing water can take in a tremendous amount of inflow. Based on the flow monitoring data, and the manhole covers, the PARSA staff decided to try a manhole inserts to reduce the inflow in the Stewart Place flow basin. The project consisted of installing inserts in all of the 350 +/- manholes in the flow basin.

#### **Orange County, Florida's CMOM Program**

Orange County Utilities (OCU) is responsible for the operation and maintenance of approximately 590 miles of gravity sewer, 440 miles of force main and 600 pumping stations. OCU decided to proactively initiate a CMOM (Capacity, Management, Operation and Maintenance) program without a regulatory mandate. In the Fall of 2002, the County hired a consulting team to guide and assist in the development of a program to meet expected CMOM requirements. Included in the team are engineers, information technology experts, and best work practices consultants; a diverse group that represents the many elements of a comprehensive CMOM program. Upon reviewing the proposed SSO (Sanitary Sewer Overflow) Rule that was published by EPA on the web in January 2001, Orange County staff realized that the basic principles of the rule were founded in the best work practices of successful utilities. Many of the programs were either already in place, under development or planned for future implementation at the utility. OCU wanted to plan these activities under a "CMOM umbrella".

Following a CMOM Assessment that was conducted in early 2003, OCU initiated a CMOM Audit and Plan as well as a Pilot SSES (Sanitary Sewer Evaluation Survey) project. The CMOM Audit and Plan were a detailed review of current practices and programs and a plan for future endeavors within the wastewater system. The SSES pilot was initiated to develop and test specific protocols that will be used in the future throughout the wastewater utility. The consultants developed a CMOM Audit template that simulates an EPA CMOM Audit. It includes the definitions of each CMOM element as described in Region 4's MOM Program. It also includes the check-sheet that EPA would use if they were performing the audit or reviewing a utility's self-audit. The goal of the audit was to simulate an EPA audit as closely as possible. In performing the audit the consultants found that Orange County was doing an excellent job in many areas of CMOM. The desire of the utility is to build on those strengths by addressing areas of concern. Using the CMOM Audit as the starting point, a CMOM Plan was developed. It takes into account current concerns of the utility such as force main failures, grease blockages, the need for reports and visuals from the work management system and GIS, and emergency response plans. Priority was given those CMOM elements that provide the greatest benefit in resolving these concerns. The plan will be used to develop and budget needed program enhancements to improve the overall wastewater utility and minimize SSO's. The SSES Pilot project was established within the CMOM plan as a means of developing protocols and providing guidance for initial and subsequent SSES and sewer rehabilitation work.

OCU has seen early benefits of the CMOM development project even though it is in its initial stages. The CMOM Assessment and subsequent CMOM Audit provided a forum for staff to discuss needs of the system in both large groups representing all segments of the utility to smaller groups focused on particular utility sections. They have been able to hear and appreciate the needs of other sections and therefore understand CMOM Plan priorities. Having a thorough review of the entire system at one point in time has helped OCU staff and management establish priorities for system-wide improvements.

### **Norfolk, Virginia - Conducting A Major Sanitary Evaluation Survey (SSES) Consistent With EPA's Proposed SSO Rule**

The City of Norfolk Virginia, a satellite system to Hampton Roads Sanitation District, received a special order from DEQ that included terms for *"...a long term strategy to address sanitary sewer system overflow events..."*. The City recognized the importance of maintaining open communications with DEQ and HRSD so workshops were held

Special Order Addressed the SSES Purpose: *"The purpose of the SSES is to document the existing system layout and load capacities, identify areas requiring rehabilitation, improvements, and/or maintenance, and propose recommendations for rehabilitation and infiltration and inflow reduction."*

The SSES approach agenda included the following:

- Field investigations
- Engineering evaluations
  - Base Parameters
  - Hydraulic model
  - SSO Causes
  - Conditions assessment
- Long term control plan
  - SSO Control Projects
  - Schedule
  - Cost
- Management, Operation & Maintenance (MOM)

The City conducted an initial system characterization, giving them pertinent information regarding predominant sewer pipe age. They then went forward with flow and rainfall monitoring to determine the effects of wet weather contributing to SSO's. They additionally learned the distribution of mainline sewers below average groundwater level that may impact the watershed. Smoke testing and manhole inspections were conducted, leading the team to Engineering Evaluations that would take them to the next step . . . the Technical Approach.

This assisted the City in configuring the base parameters of their Average Daily Flow (ADF):

- October & November 2001 were the Driest Months During the Flow-Monitoring Period (Total Monthly Rainfall of 0.8 & 0.15 Inches Respectively)
- This Period Was Used for Estimating:
- Dry Weather ADF
- Dry Weather Infiltration
- Return Wastewater Flow (RWF)

The City has implemented a Capital Program including:

■ SSO Control Projects. These capital SSO Control Projects will provide remediation of the various conditions that have been identified as causing SSOs within the System.

■ System Assets Upkeep Projects. These are capital projects associated with the normal long-term upkeep of the System assets and reliability of service. These projects are not related remediation of conditions for the control of SSOs. Instead, they are required to maintain the value and service requirements of the continuously aging assets of the System. They additionally implemented their MOM (Management, Operation, Maintenance) Practices:

- MOM Practices Will Extend the Expected Service Life of System Assets
- Information Management System (IMS) Used for Record Keeping & Reporting

Specific Examples of Recent & Ongoing MOM Improvements

- Designation of Two “Overflow Coordinators”
- Creation of an “Overflow Review Committee” that Provides Routine Review of Cause & Effects of SSOs &
- Recommends Enhancements to O&M Practices to Address & Control SSOs
- Continued Participation with Regional Hampton Roads SSO Reporting Efforts
- Refinement of Routine PM Schedules & Training of Staff on the Routine Practices for Each Pumping Station
- Norfolk’s Award Winning “Fight The Fat” Outreach Program
- Additional cleaning occurs, in anticipation of wet weather, at locations that are more vulnerable to grease & root intrusion stoppages

### **Gladstone, Missouri: Collection System I/I Analysis, Prioritization, And Rehabilitation**

<http://www.wef.org/applications/periodicals> (KEY WORDS: SSO)

Collection Systems are being required to meet new regulatory codes and requirements. Cities and Municipalities are taking proactive approaches to reduce Inflow and Infiltration (I/I) into their collection systems in order to meet regulatory and future Capacity Assurance, Management, Operations and Maintenance (CMOM) requirements. Public Sector Sources of I/I include deteriorating and aging manholes and pipelines. The focus of this paper is a collection system study for the City of Gladstone, Missouri (Gladstone). The purpose of this study was to identify and quantify I/I entering the collection system, and to create a rehabilitation plan which effectively prioritizes pipes and manholes to reduce I/I. Field work including flow monitoring, manhole inspections, visual pipe inspections, smoke testing, dye testing, building inspections, closed circuit television inspections (CCTV), and surveying were used to locate I/I. The paper will also discuss the key role that Black & Veatch’s Sanitary Sewer Management System (SSMS) software played in defining the manhole and pipeline projects and the implementation of a Geographic Information System (GIS) to create an inventory of the collection system and provide easy access to data for this study and for future use by the City.

# Collection System Operations

## Protocols for Identifying Sanitary Sewer Overflows

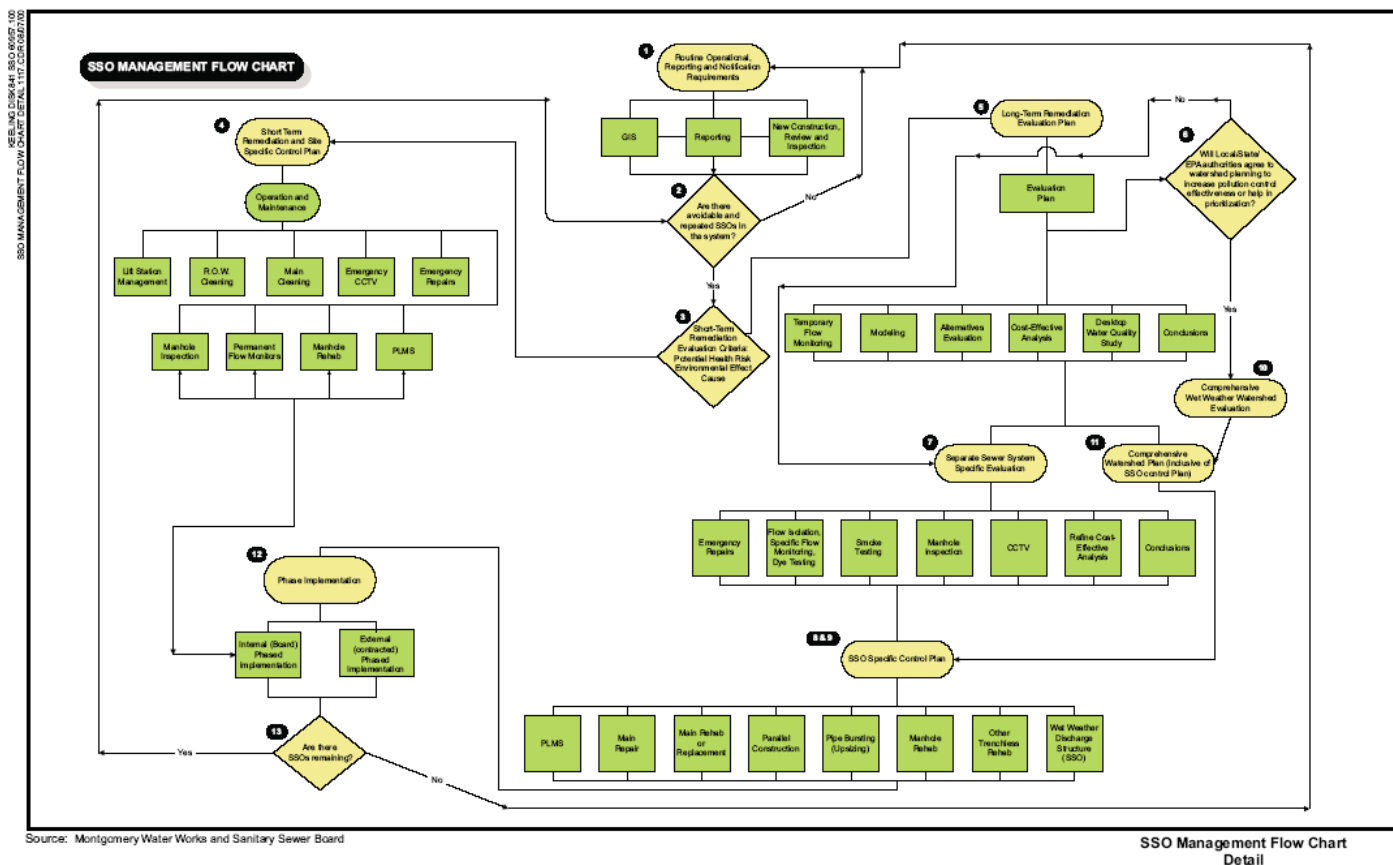
<http://www.epa.gov/npdes/pubs/ascessofinal.pdf>

The objective of this project was to develop a guidance manual to identify and evaluate existing protocols for identifying Sanitary Sewer Overflows (SSO's), to develop a comprehensive set of protocols for identifying the locations of SSO's, and to disseminate the project findings. Identification of likely locations of SSO's and evaluation of the causes of SSO's should be a part of a comprehensive preventive maintenance program and a capital expenditures plan. Cities and agencies need established and proven guidance on identifying and evaluating the causes of SSO's. Such guidance should cover both wet weather and dry weather SSO's.

A data collection survey was conducted, not intended to obtain responses from a representative sample of agencies, but to collect data from agencies known to be leaders and innovators in terms of SSO identification and control.

<b>Table 1</b> <b>SSO Management Activities as Reported by Surveyed Agencies</b>	
Category	Activity
Reactive SSO Response	Dispatch Crews
	Clean Area
	Investigate Cause
	Report
	Prepare Work Order
	Stabilize Streambank
	Perform Repair
	Store Flow if Possible
	CCTV
Proactive SSO Measures	Develop Wet Weather Operational Plan
	Upgrade Pumping Stations
	Provide Relief/Equalization
	Reduce I/I
	Conduct Hydraulic Review
	Change System Configuration
	Correct Manhole Channel Geometry
	Conduct Ongoing SSES
	Establish Cleaning and Root Removal Program
	Train Personnel
	Increase Resources
	Improve Record Keeping
	Conduct Hydraulic Modeling
	Inspect Creek Crossings
	Improve Maps
	Conduct Observations During Rainfall
	Track and Investigate SSOs
	Develop Inspection Procedures
	Conduct Survey/Walking/Helicopter Inspection Program
	Create Flood Response Team (Floodbusters)
	Implement GIS/SCADA
	Modify Design Standards
	Implement Oil and Grease Control Program
	Conduct Life-Cycle Costing During Design
	Implement Computerized Maintenance
	Identify Flat Sewers and Problem Configurations

<b>Table 2</b> <b>Protocols for Identifying SSOs</b>	
<b>Protocol</b>	<b>Element</b>
Hydraulic Capacity	Hydraulic Modeling
	Scattergraphs
	Inventory
	Wastewater Flows
	Rainfall
Maintenance and Inspection	Notification by Customer and/or General Public
	Visual Inspections
	Scheduled Maintenance
	Remote Sensing
	GIS Implementation
	Sanitary Sewer Management Systems
	Flow Monitoring
	Rainfall Monitoring
	Stream Gauging
	Trend Analysis
	Receiving Water Monitoring
	SSES Activities
	New Inspection Technologies
Structural Protocol	Rating Systems
	Inspection Techniques
	Corrosion Monitoring
	Pipe Testing
	Loading Analysis
	Finite Element Stress Analysis



### 1. What is your normal response to the SSO events listed?

- Dispatch crew
- Report to regulatory agency
- Clean and disinfect
- Conduct line blockage analysis
- Conduct a surcharge review for wet weather SSO's
- Correct manhole geometry

### 2. What are your most significant maintenance problems?

- Roots
- Grease
- Deterioration of older sewers
- Lack of long-term maintenance program
- Matching the appropriate cleaning tools and equipment with appropriate cleaning frequency

### 3. What maintenance activities do you think are beneficial to preventing dry weather and wet weather SSO's?

- SSES Studies
- Remote alarm testing
- Effective preventive maintenance program
- Effective rehabilitation program
- Exercising lift station equipment

### 4. What are the limitations for the various methods for finding SSO's?

- Ability to control private sector sources
- Difficulty in identifying appropriate manholes for installing flow meters.
- Manhole inspections are limited by buried manholes that take time to locate
- Out of date maps
- Relying on public for notification of SSO's
- Accuracy of flow monitoring equipment



- Lack of experienced maintenance staff
- 5. What inspection methods do you think are effective in identifying potential SSO locations?**
- CCTV
  - Smoke testing
  - Flow monitoring
  - Dye testing
  - Visual observation
  - SCADA system connected to a computer model
  - Flood response team
- 6. Do you utilize any written protocols or procedures for identifying or investigating SSO's or potential locations of SSO's?**
- SSO mapping
  - Wet weather response procedure
  - Inspection of high probability SSO lines
  - Helicopter over-flights of selected areas
- 7. Do you have any plans for developing protocols for identifying or investigating SSO's? Do you have any ideas for an effective protocol?**
- Implement work order system
  - Implement GIS and SCADA
  - Develop PM plan and develop contracts for expediting repairs
- 8. Have you identified any recurring design deficiencies that may be causing SSO's (e.g., flat sewer slopes)?**
- Overloaded sewer lines
  - Flat line slopes
  - Series of 90 degree bends
  - Hydraulic restrictions at manholes
- 9. Have you made any design changes to correct the above problems?**
- Working with the engineers in public works that approve private developments
  - Constructing relief sewers designed to correct the existing overloaded sewers.
  - Revising design standards specify minimum 2 ft./sec. design flow characteristics.
- 10. What are the most common SSO defects fixed?**
- Pipe problems
  - Manhole deficiencies
  - Remove sewer blockages
  - Hydraulic blockages
  - Cleaning of grease stoppages
  - Root clearing and replacement of broken pipes
  - Manholes rehabilitation
- 11. Do you expect SSO requirements to be added in the future?**
- Increase in SSO requirements
  - Permitting of collection system
  - Reporting of SSO incidents
- 12. Do you have an I/I management program?**
- I/I Program
  - Dedicated CIP for collection system improvements
- 13. Do you have a corrosion control program?**
- Relining of pipes and manholes
  - Industrial sources control
  - Addition of sodium hypochlorite to reduce hydrogen sulfide

## Typical Sanitary Sewer Problems

<http://www.cabmphandbooks.com/Documents/Municipal/SC-76.pdf>

- Old and deteriorated main and lateral pipes - Sewers range in age from 30 to 100 years with an average age of 50 years.
- Cracked sewer pipes - Existing sewers are mostly clay pipes which can crack as they deteriorate with age and also by earth movement.
- Misaligned and open pipe joints - Most of the mortar used to seal the joints between sections of clay pipe has deteriorated.
- Undersized sewer pipe - The existing sewer system is overloaded due to new sewer hookups, underground water infiltration, and illegal roof and/or yard drain connections.
- Defective manholes - Old manholes are made of bricks. Typical problems associated with brick manholes are loose bricks, missing bricks, and misaligned manholes.
- Missing and/or unrecorded sewer pipes and manholes - This problem is typical in the easement or backline sewer. Sewer pipe locations shown on the sewer record map are different from the actual sewer location.
- Sewer main under houses and other improvements - Complaints of sewer main alignment crossing the house and other improvements. A solution to this problem requires an agreement with the property owner for a new sewer easement at a relocated line.

#### **Causes of Sanitary Sewer Backups**

- Root infiltration - Tree roots are a major cause of backups.
- Water inflow/infiltration - Rain water entering the sewer pipe causes overflows.
- Solids - Typical solids that buildup in the pipe and cause backups are grease, dirt, bones, tampons, paper towels, diapers, broken dishware, garbage, concrete, and debris.
- Structural defects in pipes and manholes - Sags in the line, cracks, holes, protruding laterals, misaligned pipe, offset joints are all possible causes of backups.

#### **Design Considerations**

Sanitary sewer overflows can often be reduced or eliminated by a number of practices, in addition to sewer system cleaning and maintenance, including the following:

- Reducing infiltration and inflow through rehabilitation and repair of broken or leaking sewer lines.
- Enlarging or upgrading the capacity of sewer lines, pump stations, or sewage treatment plants.
- Constructing wet weather storage and treatment facilities to treat excess flows.
- Addressing SSO's during sewer system master planning and facilities planning.

## **MOM Programs Performance Summary**

[http://www.epa.gov/region4/water/wpeb/pdfs/self-audit\\_review2-3.pdf](http://www.epa.gov/region4/water/wpeb/pdfs/self-audit_review2-3.pdf)

- A. Customer Complaints
- B. NPDES Permit Violations
- C. Number of Capacity Related Overflows
- D. Number of Maintenance Related Overflows
- E. Number of Operations Related Overflows
- F. Number of Blockages
- G. Number of Cave-ins
- H. Number of Pump Station Failures
- I. Peak Flow Factors at Treatment Plant (1 hour high/dry month avg.)
- J. Monthly Average Treatment Plant Flow Rate
- K. Monthly High One Day Treatment Flow Rate
- L. Number of By-Passes at Treatment Plant
- M. Volume of Treatment Plant By-Passes
- N. WWTP Weekly Average Influent BOD Concentration

# Sanitary Sewer Overflow Toolbox

<http://cfpub.epa.gov/npdes/ssso/toolbox.cfm>

EPA is working with states, local governments, technical trade associations, the Small Government Outreach Group, and others to develop a range of "tools" for use in implementing the proposed SSO Rule. This toolbox will help municipalities and states to implement requirements in an effective and cost-efficient manner.

**CMOM Can Help Municipalities Now:** EPA has developed a comprehensive management framework called Capacity, Management, Operations, and Maintenance (CMOM) to assist municipalities in developing more comprehensive sanitary sewer system management programs.

## Operation & Maintenance Programs

[www.epa.gov/region4/water/wpeb/pdfs/self-audit\\_review2-3.pdf](http://www.epa.gov/region4/water/wpeb/pdfs/self-audit_review2-3.pdf)

### Operation Programs

- A. Pump Station Operation Programs
  - 1. Routine Operating Programs
  - 2. Emergency Operating Programs
- B. Pretreatment Programs
  - 1. Industrial User Permitting Program
  - 2. Inspection and Sampling Program
  - 3. Enforcement Program
- C. Corrosion Control Programs
  - 1. Inspection Program
  - 2. Control Measures Program
  - 3. Monitoring Program
  - 4. Performance Measures
- D. Grease Trap Inspection and Enforcement Programs.
  - 1. Permitting Program
  - 2. Inspection Program
  - 3. Enforcement Program
  - 4. Performance Measures
- E. New Connection Tap-In Program
  - 1. Installation of New Service Taps
  - 2. Inspection Program
  - 3. Enforcement Program
  - 4. Performance Measures

- F. Flow Monitoring Field Operation Programs
  - 1. Permanent Stations
  - 2. Temporary Stations
- G. Septic Tank Haulers Program
  - 1. Permitting Program
  - 2. Inspection Program
  - 3. Enforcement Program
  - 4. Performance Measures
- H. "Call Before You Dig" Program
  - 1. Permitting Program
  - 2. Inspection Program
  - 3. Enforcement Program
  - 4. Performance Measures



## Maintenance Programs

- A. Pump Station Preventive Maintenance
  - 1. Electrical Maintenance
  - 2. Mechanical Maintenance.
  - 3. Physical Maintenance
- B. Force Main Preventive Maintenance
  - 1. Air Release Valves
  - 2. Valve Exercise Program
- C. Gravity Line Preventive Maintenance
  - 1. Routine Hydraulic Cleaning
  - 2. Routine Mechanical Cleaning
  - 3. Root Control Program
  - 4. Manhole Preventive Maintenance
- D. Maintenance of Way
  - 1. Maintenance of Rights-of-Way and Easements
  - 2. Monitoring of Street Paving
  - 3. Line Location for Third Parties
- E. Un-Scheduled Maintenance
  - 1. Response to Complaints

## Collection System Operation

<http://www.ssr-inc.com/cmombook.asp>

VI. Operation Programs			
	A. Pump Station Operation Programs		
		1. Routine Operating Programs	
		a.	Manned Pump Stations - SOPs
		b.	Un-Manned Pump Stations - SOPs
		c.	Number of Crews/Personnel
		d.	Elapsed Time Meters - Record Times
		e.	System Pressure - Record Pressures
		f.	Wet Well Set Points
		g.	Check Alarms
		h.	Check Stand-By Power

			i. Standard Forms
			j. Established Pump Station Checking Program
			k. Performance Measures
		2.	Emergency Operating Programs (31)
			a. Manned Pump Stations - Emergency SOPs
			b. Un-Manned Pump Stations - Emergency SOPs
			c. Stand-By Power
			d. Portable Power
			e. Portable Pumping
			f. Standard Forms
			g. Performance Measures
			h. Emergency By-Pass
		B.	Pretreatment Programs (Sewer and Plant Protection - Not an Evaluation of the Pretreatment Program) (29)
		1.	Industrial User Permitting Program
		2.	Inspection and Sampling Program
		3.	Enforcement Program
		C.	Corrosion Control Programs (16)
		1.	Inspection Program
		2.	Control Measures Program
		3.	Monitoring Program
		4.	Performance Measures
		D.	Grease Trap Inspection and Enforcement Programs
		1.	Permitting Program
		2.	Inspection Program
		3.	Enforcement Program
		4.	Performance Measures
		E.	New Connection Tap-In Program
		1.	Installation of New Service Taps
		2.	Inspection Program
		3.	Enforcement Program
		4.	Performance Measures
		F.	Flow Monitoring Field Operation Programs (17)
		1.	Permanent Stations
			a. Routine Servicing
			b. Contract
			c. Crew Size and Equipment
		2.	Temporary Stations
			a. Routine Servicing
			b. Contract
			c. Crew Size and Equipment
		G.	Septic Tank Haulers Program
		1.	Permitting Program
		2.	Inspection Program
		3.	Enforcement Program



		4. Performance Measures
	H.	"Call Before You Dig" Program
		1. Permitting Program
		2. Inspection Program
		3. Enforcement Program
		4. Performance Measures

## Collection System Maintenance

<http://www.ssr-inc.com/cmombook.asp>

VII. Maintenance Programs		
	A.	Pump Station Preventive Maintenance
		1. Electrical Maintenance
		a. Manned Stations - SMPs
		b. Un-Manned Stations - SMPs
		c. Number of Crews/Personnel
		d. Scheduling
		e. Standard Forms
		f. Records
		g. Performance Measures
		2. Mechanical Maintenance
		a. Manned Stations - SMPs
		b. Un-Manned Stations - SMPs
		c. Number of Crews/Personnel
		d. Scheduling
		e. Standard Forms
		f. Records
		g. Performance Measures
		3. Physical Maintenance
		a. Manned Stations - SMPs
		b. Un-Manned Stations - SMPs
		c. Number of Crews/Personnel
		d. Scheduling
		e. Standard Forms
		f. Records
		g. Performance Measures

		B. Force Main Preventive Maintenance
		1. Air Release Valves
		a. Number of Crews/Personnel
		b. Scheduling
		c. Standard Forms
		d. Records
		e. Performance Measures
		2. Valve Exercise Program
		a. Number of Crews/Personnel
		b. Scheduling
		c. Standard Forms
		d. Records
		e. Performance Measures
		C. Gravity Line Preventive Maintenance
		1. Routine Hydraulic Cleaning
		a. Need Determination/Scheduling
		b. Number of Crews/Personnel
		c. Equipment (Jetter, Combination Unit)
		d. Scheduling
		e. Standard Forms
		f. Records
		g. Performance Measures
		2. Routine Mechanical Cleaning
		a. Need Determination/Scheduling
		b. Number of Crews/Personnel
		c. Equipment (Rodder, Bucket Machine)
		d. Scheduling
		e. Standard Forms
		f. Records
		g. Performance Measures
		3. Root Control Program
		a. Need Determination/Scheduling
		b. Number of Crews/Personnel
		c. Scheduling
		d. Hydraulic Root Removal
		e. Mechanical Root Removal
		f. Chemical Control

			g. Standard Forms
			h. Records
			i. Performance Measures
		4.	Manhole Preventive Maintenance
			a. Need Determination/Scheduling
			b. Number of Crews/Personnel
			c. Scheduling
			d. Rings and Lids
			e. Structural Repair
			f. Standard Forms
			g. Records
			h. Performance Measures

## Capacity Assessment

<http://www.epa.gov/npdes/pubs/cmomselfreview.pdf>

- Does the utility have a flow monitoring program?
- Does the utility have a comprehensive capacity assessment and planning program?
- Are flows measured prior to allowing new connections?
- Do you have a tool (hydraulic model, spreadsheet, etc.) for assessing whether adequate capacity exists in the sewer system?
- Does your capacity assessment tool produce results consistent with conditions observed in the system?
- What is the ratio of peak wet weather flow to average dry weather flow at the wastewater treatment plant?
- How many permanent flow meters are currently in the system? *(Include meters at pump stations and wastewater treatment plants .*
- How frequently are the flow meters checked? *(e.g. Daily, Weekly, Monthly, etc.)*
- Do the flow meter checks include the following? *(Check all that apply)*
  - Velocity reading
  - Independent water level
  - Downloading data
  - Cleaning away debris
  - Checking the desiccant
  - Battery condition
- Are records maintained for each inspection?
- Do the flow monitoring records include the following? *(Check all that apply)*
  - Descriptive location of flow meter
  - Frequency of flow meter inspection
  - Type of flow meter
  - Frequency of flow meter calibration
- Does the utility maintain any rain gauges or have access to local rainfall data?
- Does the utility have any wet weather capacity problems?
- Are low points or flood-plain areas monitored during rain events?
- Does the utility have any dry weather capacity problems?
- Is flow monitoring used for billing purposes, capacity analysis, and/or inflow and infiltration investigations?



# Flow Monitoring

<http://www.sc-ec.org/PDFs/2004SCEC/23-3%20Flow%20Monitoring.pdf>

## Why Flow Monitor for Sanitary Sewer Assessment?

The objective of the sanitary sewer is to convey only the sanitary flow into treatment plants. Unintended infiltration and direct inflow (I/I) of storm water are extraneous flows and should be minimized as they reduce the available capacity to transport wastewater. The System Evaluation and Capacity Assurance Plan, of which flow monitoring is the primary step, is needed to identify, characterize and address hydraulic deficiencies in the collection system. Generally the plan should address:

Flow monitoring is a cost-effective method for maximizing the use of existing sewer infrastructure. Flow monitoring provides valuable information about the actual flows conveyed. Owners can be made aware of the variables in sewer flows due to unknown and improper connections, the conditions of joints, cracks, and the susceptibility to allow ground and surface infiltration and inflow.

- Collection and analysis of appropriate information on the management and performance of your collection system
- Development of management and performance objectives and goals of your collection system
- Clarification of management and performance objectives
- Selection and implementation measures
- Development and evaluation of alternatives
- Continued monitoring, assessment, and adjustment of implemented measures

Sources of flow in the sanitary sewer include 'domestic' dry-weather flow and other extraneous (unintended) inflows. Identifying the sources of extraneous flows into the sanitary sewer is an important step. The hydrograph of sanitary sewers is made up with the following components:

### Baseflow Source

The waste flow generated from 'normal' residential, commercial and industrial operations, known as dry-weather flow.

### Infiltration Source

Originates in part from groundwater leakage into the sewers and from rainfall-induced surface seepage through the soil cover.

### Inflow Source

The direct contribution of storm water through openings in manhole covers, directly-connected roof drains, sump-pumps or other storm-related elements such as catch-basins or drain-pipes.

## The How-To's of Flow Metering for CMOM Compliance

<http://www.sc-ec.org/PDFs/2004SCEC/23-3%20Flow%20Monitoring.pdf>

A typical temporary monitoring period varies from a minimum of three months, to a maximum of six months. In most instances, it is critical that both the spring melt and a range of summer storm events are captured in the monitoring programs. In order to perform a detailed analysis of infiltration/inflow and pipe capacity, it is

necessary to obtain flow-monitoring information during both dry and wet weather. Under ideal conditions, multiple rain events of varying intensities are monitored in order to accurately assess the inflow response for each event. Information obtained during the monitoring period can be used to determine the following:

1. Average daily flow - dry weather
2. Peak flow - dry weather
3. Average daily flow - wet weather
4. Peak flow - wet weather
5. Peak inflow rates
6. Total I/I volume

Meter site selection can be accomplished after reviewing the collection system maps and preliminary field inspection of any sanitary sewer overflow (SSO) locations. Each monitoring site should be selected so that the footage of the collection system upstream of the meter can be isolated for the purposes of determining extraneous infiltration/inflow. Installation of rainfall meters across the study area to measure rainfall intensity and duration throughout the monitoring period can assist in establishing wet weather capacity for SSO analysis. Two basic sewer channel flow meter technologies are available: (1) "Wetted sensors", or submersible sensors, where the level/velocity sensor is mounted in the flow stream and the sensor is secured to a mounting band that fits snugly in the pipeline and (2) "Non-contact" radar sensors, where the sensor is mounted in a level position above the flow stream ensuring that the radar signal is aimed at the flow and does not hit invert walls. A data logger is installed at the top of the manhole. For the most accurate data, flow direction should not change abruptly going through the manhole. The manhole should not have debris, brick or any other objects that might disrupt the flow.

#### **Reporting:**

After the primary discharge locations have been established, it is important that a flow balance calculation is completed to identify system problems and quantify flow volumes and contribution percentages. Flow balance calculations will indicate system constraints and problems at a glance. Tabular reports allow the system to be assessed using volumetric techniques, allowing for complete site-by-site quantification. Scatter plot analysis determines if capacity issues are due to upstream backwater conditions or downstream system hydraulics. Scatter plot shapes clearly indicate if base flows are present and how much. Scatter plots also indicate if the system is conforming to conventional gravity flow conditions or to a combination of open channel and closed pipe flow hydraulics. Flow Monitoring Program Reports should include site reports for each station, a summary of data collected at each monitoring station and discussions of the following:

- Dry weather analysis (including calculated base flows and diurnal patterns)
- Wet weather analysis (including locations impacted by I/I and to what degree)
- Tables and figures necessary to explain the results and findings
- Conclusions & recommendations
- Hydrographs and tabular data for each station for the monitoring period

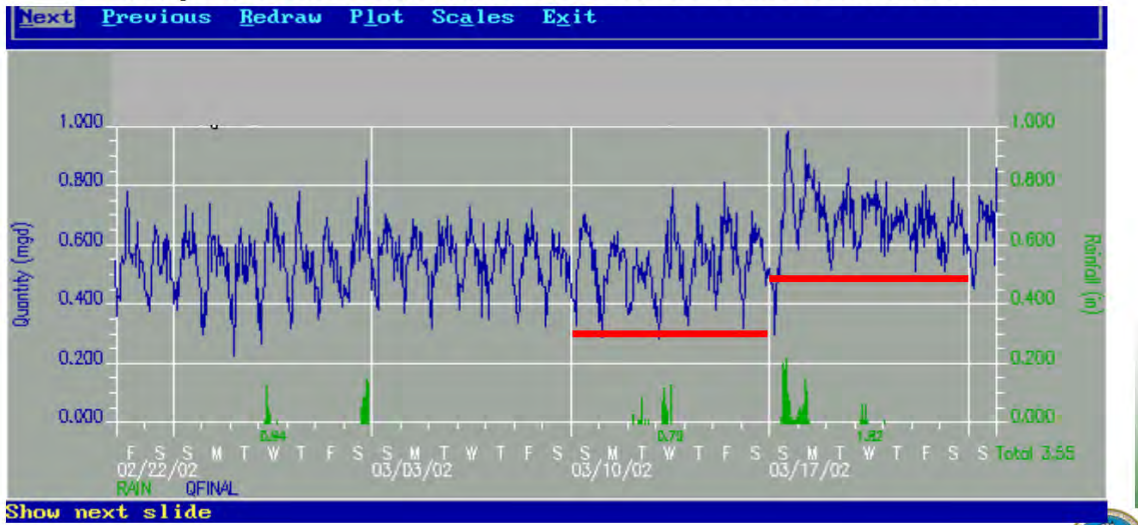
#### **Develop Flow Monitoring and CMOM Programs**

Formal development of a CMOM program is critical for all communities that experience any SSO's no matter how rare. The EPA has set a standard of care that must be implemented. Any overflows that are associated with events that should not have occurred with proper O&M practice will now be considered a violation that is subject to monetary and legal fines.

With the proposed modifications to USEPA regulations establishing NPDES requirements to develop and implement CMOM programs for POTW's and satellite collection systems, you ask how to comply with regulations and remain efficient. The answer: A Flow Monitoring Program will ensure accurate measurement of local hydraulics, base flows and capacity. Planning and establishing a Flow Monitoring Program in conjunction with an ongoing CMOM program will bring your wastewater collection system into compliance with USEPA regulations and NPDES requirements. Remember, the CMOM program will act as the primary mechanism for potentially offsetting an enforcement action. As an added benefit, your CMOM program will result in a more efficient, better run collection system. Flow metering as a component of CMOM and ongoing sewer system investigations will assist municipalities in optimizing all aspects of the system's hydraulic performance.

# Flow Monitoring

## Response to the wet weather – INFILTRATION Condition

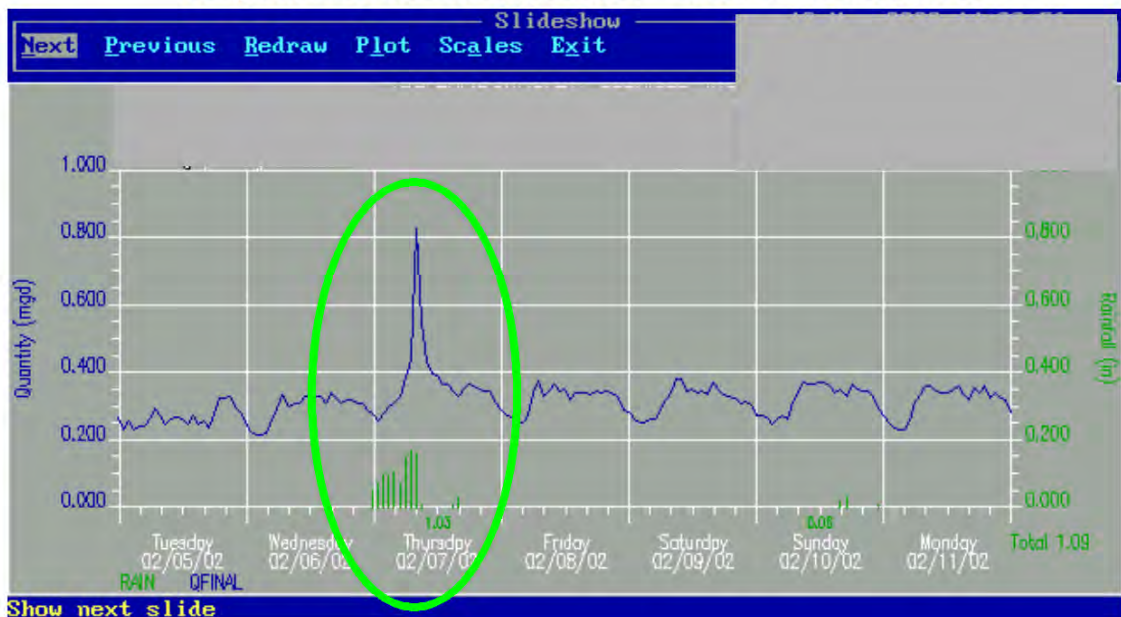


GREELEY AND HANSEN LLC

City of Norfolk, Virginia

# Flow Monitoring

## Response to the wet weather – INFLOW Condition



GREELEY AND HANSEN LLC

City of Norfolk, Virginia

## Capacity Monitoring (Wet Weather Assessments)

<http://www.epa.gov/npdes/pubs/cmomselfreview.pdf>

- Does the utility have a flow monitoring program?
- Are flows measured prior to allowing new connections?
- Do you have a tool (hydraulic model, spreadsheet, etc.) for assessing whether adequate capacity exists in the sewer system?
- Does your capacity assessment tool produce results consistent with conditions observed in the system?
- Does the utility have a comprehensive capacity assessment and planning program?
- What is the ratio of peak wet weather flow to average dry weather flow at the wastewater treatment plant?
- How many permanent flow meters are currently in the system? (*Include meters at pump stations and wastewater treatment plants*)
- How frequently are the flow meters checked? (*e.g. Daily, Weekly, Monthly, etc.*)
- Do the flow meter checks include the following?
  - Velocity reading
  - Independent water level
  - Downloading data
  - Cleaning away debris
  - Checking the desiccant
  - Battery condition
- Are records maintained for each inspection?
- Do the flow monitoring records include the following?
  - Descriptive location of flow meter
  - Frequency of flow meter inspection
  - Type of flow meter
  - Frequency of flow meter calibration
- Does the utility have any dry weather capacity problems?
- Does the utility have any wet weather capacity problems?
- Does the utility maintain any rain gauges or have access to local rainfall data?
- Is flow monitoring used for billing purposes, capacity analysis, and/or inflow and infiltration investigations?
- Are low points or flood-plain areas monitored during rain events?

## Smoke and Dye Testing

<http://www.epa.gov/npdes/pubs/cmomselfreview.pdf>

- Does the utility have a smoke testing program to identify sources of inflow and infiltration?
- Does the utility have a smoke testing program to identify sources of inflow and infiltration in illegal connectors?
- Are there written procedures for the frequency and schedule of smoke testing?
- Is there a documented procedure for notifying local residents that smoke testing will be conducted in their area?
- Is there a documented procedure for isolating line segments?
- Does the utility have a smoke testing program to identify sources of inflow and infiltration in house laterals (private service laterals)?
- What is the guideline for the maximum amount of the line to be tested at one time? (*Feet or Miles*)
- Are there guidelines for the weather conditions under which smoke testing should be conducted?
- Does the utility have a goal for the percent of the system smoke tested each year?

- What percent of the system has been smoke tested over the past year?
- Do the written records contain location, address, and description of the smoking element that produced a positive result?
- Does the utility have a dye testing program?
- Are there written procedures for dye testing?
- Does the utility have a goal for the percent of the system dye tested each year?
- What percent of the main collection system has been dye tested over the past year?
- Does the utility share smoke and dye testing equipment with another utility?

## Hydrogen Sulfide Monitoring and Control

- How would you rate the systems vulnerability for hydrogen sulfide corrosion?
- Does the utility take hydrogen sulfide corrosion into consideration when designing new or replacement sewers?
- Does the utility have a corrosion control program?
- Does the utility have written procedures for the application of chemical dosages?
- Are the chemical dosages, dates, and locations documented?
- Does the utility document where odor is a continual problem in the system?
- Does the utility have a program in place for renewing or replacing severely corroded sewer lines to prevent collapse?
- Are the following methods used for hydrogen sulfide control?
  - Biofiltration
  - Potassium permanganate
  - Enzymes
  - Aeration
  - Iron salts
  - Activated char coal canisters
  - Hydrogen peroxide
  - Chlorine
  - Sodium hydroxide
  - other
- How often are the valves maintained and inspected? (*Weekly, Monthly, etc.*)
- Does the system contain air relief valves at the high points of the force main system?

## Routine Preventive Operation and Maintenance Activities

[http://www.neiwpcc.org/PDF\\_Docs/WEBOM&R.CH2.pdf](http://www.neiwpcc.org/PDF_Docs/WEBOM&R.CH2.pdf)

A good preventive maintenance program is one of the best ways to keep a system in good working order and prevent service interruptions and system failures which can result in overflows and/or backups. In addition to preventing service interruptions and system failures, a preventive maintenance program can protect the capital investment in the collection system.

Preventive maintenance activities should ensure that the permittee:

- Routinely inspects the collection system, including pump stations, and addresses defects or other problems.
- Investigates complaints and promptly corrects faulty conditions.
- Provides maintenance records, an adequate workforce and appropriate equipment in working order.
- Maintains and updates a schedule of planned activities.

Preventive maintenance activities typically address:



- Planned, systematic, and scheduled inspections to determine current conditions and plan for maintenance and repairs.
- Planned, systematic, and scheduled cleaning and repairs of the system based on past history.
- Proper sealing and/or maintenance of manholes.
- Regular repair of deteriorating sewer lines.
- Remediation of poor construction.
- Inspection and maintenance of pump stations and other appurtenances.
- A program to ensure that new sewers and connections are properly designed, inspected and constructed and new connections of inflow sources are prohibited.
- A program to oversee lateral and private collection system installations that tie in to public wastewater collection systems.
- A program to eliminate existing illegal inflow sources and a strategy for informing and educating the public about such sources.

## Optimization of Collection System Maintenance Frequencies and System Performance

<http://www.asce.org/pdf/finalreport.pdf>

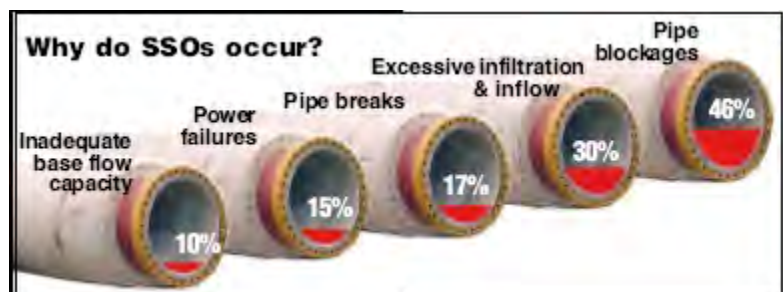
Cleaning, root removal, and pump station service are the most important routine maintenance activities; although a total of 12 key maintenance activities are still necessary for a balanced routine maintenance program. The relationship of maintenance and performance was explored and it was found that a strong relationship exists between the maintenance frequency and system historical performance. Independent variables related to maintenance frequency include customer complaints, manhole overflows, pipe failures, system sizes, number of pump stations, regional location, and pump station failures. Pipe failures, SSO's, and customer complaints are the most important performance measures.

Collection system maintenance can be optimized by creating a better balance of maintenance activities, increasing or decreasing budgets as appropriate, and evaluating performance of the system against the maintenance frequency being implemented. In time, by monitoring both maintenance and performance, agencies will be able to strike the right balance for their system and maintain acceptable performance and the least reinvestment cost.

### Routine Maintenance Activities

#### Regulator/Tide Gate Maintenance

#### Pump Station Maintenance



If conditions upstream of the pump station (such as development) increase the flow above the design values, steps should be taken to upgrade the station to meet the increased flow rate. Pump station upgrading may include such items as:

- Installing new pumps and motors.
- Changing out impellers.
- Upgrading/changing pump controls to maximize use of all pumps during wet weather.
- Modifying system piping to improve the system head curve.
- Installing additional force main piping for wet weather pumping.

**Sewer Line Maintenance**

Sewer line maintenance can be broken down into two main components, which include the use of diagnostic methods to identify potential trouble spots in the line; and actual physical inspections of the lines for cracks, breaks, or blockages.

**Diagnostic Methods**

The use of diagnostic methods allows system operators to predict where problems may occur in the lines, thus allowing a more efficient use of O&M resources. Proper maintenance of a sewer system requires a knowledge of the system, including information about the age of the system, the drainage areas served, the elevations of the drainage structures, and slopes of the sewer lines. Adequate knowledge of the age of the sewer system is crucial because many older systems are constructed of weaker materials (such as clay pipe) that are prone to cracking and collapsing. Cracked and collapsed sewers can pose significant problems, such as infiltration of the sewer flow

into the groundwater and the introduction of sediment into the system. This may lead to hydraulic restrictions. Knowing which sections of the sewer system are the oldest or identifying sections that are made of less sturdy materials will allow the system operators to track the most likely trouble spots in the system.

### **Physical Inspections**

Sewer lines should be inspected regularly to ensure peak performance. Sewers are commonly inspected by television cameras, but if the sewers are large enough and flow conditions are low enough, manual inspection may be possible. Inspections should be used to identify blockages, cracks, or other problems in the lines. Blockages are typically the result of sediment and grit accumulating in the sewer system, although dislodged vegetation and debris restrict flow as well. Another common cause of sewer blockages is tree roots, which can grow through cracked sewers. System blockages in sewer systems can decrease both the hydraulic capacity of the sewer and its effective storage capacity. This can cause flow to back up and overflow the sewer system. Crews should ensure that all lines are cleared of all lodged debris. They should check and empty any in-line grit chambers or flushing stations where sediment routinely causes blockages in the system. Cracked sewers should be repaired and collapsed sewers should be replaced to restore the system capacity and prevent infiltration.

### **Catch Basin and Grit Chamber Maintenance**

Catch basins and grit chambers are inlet chambers that provide sumps for the retention of sediment, grit, and debris. These basins should be cleaned on a routine basis to prevent grit and sediment from filling the structure and passing untreated flow. Cleaning methods include utilizing vacuum trucks, jet sprays, submersible pumps that can handle grit and slurry mixtures, and clamshell buckets.

### **Sediment Control**

As sediment is a significant source of the problems in combined sewer systems, control of sediment from the source can prove beneficial. An example of source control includes implementing and maintaining effective erosion control practices for construction in the drainage area. These practices will prevent sediment from being transported to the sewer inlet during a rainfall event.

### **Infiltration & Inflow**

Sewer system evaluation studies (SSES), such as smoke testing and television inspection, are effective methods of determining infiltration and inflow of groundwater into the sewer system. This is the result of structural failure of the piping system that allows groundwater into the piping system and is a common problem in older sewer systems. Often, tree roots will grow into the broken piping system, causing more blockage problems in the sewer. This problem is a serious one not only because it introduces additional flow into the sewer system which can lead to surcharges and overflows, but also because it can introduce sediment into the system, which can cause the problems outlined above.

### **Sewer System Evaluation**

Many of the techniques in use for SSES work should be a part of a utility's operation and maintenance program.

### **Flow Monitoring**

Flow monitoring data collection and evaluation should be an important part of a good O&M program. A well-designed flow monitoring program will give a snapshot of the current condition of the system. By isolating the portions of the system that are making the greatest contribution to the problem, resources can be directed where they will be of greatest benefit.

Techniques used to monitor flow include continuous metering, nighttime field measurements, quantification of pump run-times, and flow measurements taken at the treatment plant. Continuous flow measurement at key locations throughout the collection system will give the most accurate indication of system integrity. The other techniques have been used to some advantage with smaller systems.

Use of meters which measure depth of flow and velocity will allow accurate results, even under surcharged conditions. Meters are available which allow continuous data recording which can either be downloaded locally or transmitted to a remote location. Coupled with appropriate software, this is a powerful tool for sewer system evaluation.



## Manhole Inspection

Inspecting manholes is an important part of any maintenance program. Often utilities are unaware of the location of many of their manholes. This is unfortunate since manholes are an important source of I/I and are good indicators of problems in the system. Missing manhole lids and offset manhole cones are often the result of sewer overflows. Debris on manhole steps or high waterlines indicate the presence of surcharged conditions. Some utilities use manhole inserts to reduce inflow to the system. A manhole insert is a small, tub-shaped plastic device installed at the top of the manhole and held in position by the manhole lid. Its purpose is to catch water that enters the manhole via holes in the lid or via the access pick holes.

- Does the utility have a routine manhole inspection program?
- Is there a data management system for documenting and tracking manhole inspection activities?
- What triggers whether a manhole needs rehabilitation?

## Sewer Cleaning Methods Related to I/I Reduction

### MECHANICAL

#### Rodding

- Uses an engine and a drive unit with continuous rods or sectional rods.
- As blades rotate they break up grease deposits, cut roots, and loosen debris.
- Rodders also help thread the cables used for TV inspections and bucket machines.
- Most effective in lines up to 300 mm (12 inches) in diameter.

#### Bucket Machine

- Cylindrical device, closed on one end with 2 opposing hinged jaws at the other.
- Jaws open and scrape off the material and deposit it in the bucket.
- Partially removes large deposits of silt, sand, gravel, and some types of solid waste.

### HYDRAULIC

#### Balling

- A threaded rubber cleaning ball that spins and scrubs the pipe interior as flow increases in the sewer line.
- Removes deposits of settled inorganic material and grease build-up.
- Most effective in sewers ranging in size from 13-60 cm (5-24 inches).

#### Flushing

- Introduces a heavy flow of water into the line at a manhole.
- Removes floatables and some sand and grit.
- Most effective when used in combination with other mechanical operations, such as rodding or bucket machine cleaning.

#### Jetting

- Directs high velocities of water against pipe walls.
- Removes debris and grease build-up, clears blockages, and cuts roots within small diameter pipes.
- Efficient for routine cleaning of small diameter, low flow sewers.

#### Scooter

- Round, rubber-rimmed, hinged metal shield that is mounted on a steel framework on small wheels. The shield works as a plug to build a head of water.
- Scours the inner walls of the pipe lines.
- Effective in removing heavy debris and cleaning grease from line.

#### Kites, Bags, and Poly Pigs

- Similar in function to the ball.
- Rigid rims on bag and kite induce a scouring action.
- Effective in moving accumulations of decayed debris and grease downstream.

#### Silt Traps

- Collect sediments at convenient locations.
- Must be emptied on a regular basis as part of the maintenance program.

#### Grease Traps and

- The ultimate solution to grease build-up is to trap and remove it.

- Sand/Oil Interceptors**
- These devices are required by some uniform building codes and/or sewer-use ordinances. Typically sand/oil interceptors are required for automotive business discharge.
  - Need to be thoroughly cleaned to function properly.
  - Cleaning frequency varies from twice a month to once every 6 months, depending on the amount of grease in the discharge.
  - Need to educate restaurant and automobile businesses about the need to maintain these traps.

## CHEMICALS

*Before using these chemicals review the Material Safety Data Sheets (MSDS) and consult the local authorities on the proper use of chemicals as per local ordinance and the proper disposal of the chemicals used in the operation. If assistance or guidance is needed regarding the application of certain chemicals, contact the U.S. EPA or state water pollution control agency.*

- Used to control roots, grease, odors (H<sub>2</sub>S gas), concrete corrosion, rodents and insects.
- *Root Control* - longer lasting effects than power rodder (approximately 2-5 years).
- *H<sub>2</sub>S gas* - some common chemicals used are chlorine (Cl<sub>2</sub>), hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), pure oxygen (O<sub>2</sub>), air, lime (Ca(OH)<sub>2</sub>), sodium hydroxide (NaOH), and iron salts.
- *Grease and soap problems* - some common chemicals used are bioacids, digester, enzymes, bacteria cultures, catalysts, caustics, hydroxides, and neutralizers.

- Are sewers cleaned prior to flow monitoring?
- Are sewers cleaned prior to televised inspection?

### • Televised Inspection

Inspecting sewers using closed-circuit television (CCTV) cameras is a powerful tool for I/I reduction. Leaking joints or punctures can be easily detected and often repaired at the time of inspection. CCTV is also a good method to inspect the integrity of new construction before the warranty expires.

- Does the utility use televised inspection? If so, in what context?

### • Smoke Testing and Dyed Water Flooding

These techniques are useful to locate defects in the system and illegal connections.

- Does the utility use smoke testing to identify sources of inflow into the system?
- Does the utility use dyed water flooding to identify suspected sources (indirect connections) of inflow into the system when smoke testing yields inconclusive results?
- Is there a data management system for tracking these activities?
- Is there a document that describes the procedures that the utility follows? Are there any standard forms?

## Rehabilitation

Several techniques are available for sewer rehabilitation. A determination of the best techniques to apply to a particular situation should be made following the SSES and an economic analysis comparing the different options.

## Main Line Repairs

### Point and Replacement Repairs

- Point repairs consist of repairing cracked, corroded, or broken gravity sewers and force mains. This work typically includes excavation to the location of the break, removal of the broken pipe section(s) and replacement with new pipe.

### Joint Testing and Grouting

- Joint testing and grouting are done on sewer line sections with leaking joints but no structural defects. This work can be done in conjunction with the routine televising of lines. Grouting has a limited life and must be repeated every 5-10 years.

### Sewer Lining

- Sewer lining is a technique which returns pipe to new condition. Many of the current systems can be used where pipe is structurally deficient. Due to the limited excavation required for these techniques, they are good choices where surface construction would cause much disruption.
- What type of main line repairs has the utility used in the past?
- Does the utility currently use any of above techniques for main line repairs?

## Maintenance

<http://www.cityofdavenportiowa.com/publicworks/sewer/duties.htm>

### Sewer Maintenance - Duties

1. Cleaning all City Sanitary & Storm Sewers.
2. Cleaning of all City Storm Catch Basins.
3. Televising of all New & Existing Storm & Sanitary Sewer Lines.
4. Repair of all City Storm & Sanitary Sewer Lines (Cave-Ins).
5. Repair and or Replacement of all Storm & Sanitary Manholes.
6. Responsible for Maintenance & Operation of Pump Stations & Flood Gates.
7. 24 Hour a day on call service for Storm & Sanitary Sewer Back- ups.
8. Responsible for River & Creek Floods (Sandbags, Gate Closings, & Dikes).
9. Repair and or Replacement of Storm Sewer Catch Basins.
10. Locate & Mark City Main-Line Sewers for Utilities & contractors.
11. Set-up & Maintain Barricades for Sewer Division Excavations.
12. Cut & Remove roots from Sanitary & Storm Lines in problem areas.
13. Install new Sanitary & Storm Lines at the direction of City Engineering Division.
14. Answer all Citizen complaints regarding Sewer Malfunctions.
15. Assist Street Division in Snow Removal & Storm Clean-up.

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## Combined Sewer Overflow O&M Fact Sheet: Proper Operation and Maintenance

<http://www.epa.gov/owm/mtb/o&m.pdf>

Proper O&M of combined sanitary sewers and overflows is not significantly different from that of sanitary sewer systems, with the objective being to maintain maximum flow to the wastewater treatment plant and to maximize either in-line storage capacity or detention upstream of the system inlets. There are several key components of an O&M program that a municipality/authority must provide to ensure proper O&M and to meet the minimum control requirement. These program components include:

- Scheduling routine inspections, maintenance and cleaning of the CSS, regulators and outfalls.
- Developing O&M reporting and record keeping systems with maintenance procedures and inspection reports.
- Providing training for O&M personnel.
- Reviewing the O&M program periodically to up-date and revise procedures as necessary.

### Operational Review

Prior to developing an O&M program, the municipality should undertake an operational review of its system to inventory and assess existing facilities, operating conditions and maintenance practices. The municipality should have a complete plan of the collection system, showing all sewers and points where any CSOs and outfalls are located. This plan should reference streets and other utilities to enable the maintenance crews to

locate structures quickly. This plan may also aid in scheduling and planning the inspection and maintenance of the CSS system and overflows; for example, the regions or areas that are prone to flooding or premature overflows should be inspected first after a major storm.

### **Record Keeping System**

The O&M program should include a record keeping component. The record keeping system should document maintenance procedures through inspection reports. These reports should include information about when the system was inspected, and, if applicable, what maintenance action was taken, including the equipment used and the personnel involved. Geographical information systems (GIS) and desktop mapping may be useful in storing O&M data on the CSO system, as well as in developing a database of problem areas.

### **System Operating Procedures**

Each municipality should have written policies, procedures, or protocols for training O&M personnel and should conduct periodic reviews and revisions of the O&M program. Some municipalities have reported that alternating crews between O&M and other functions has proven beneficial because it reduces the tedium of the work by making it less routine, and it promotes the cross training of employees. Other municipalities prefer devoting personnel strictly to O&M because it keeps the work assignments simple.

### **Training**

The O&M Program should have established training goals, procedures, and schedules. Training should provide the maintenance personnel with an understanding of the operations and system characteristics. Hands-on training illustrates the specific O&M procedure to those directly responsible for performing these activities. In addition, the nature of the O&M work may require employees to work in confined spaces or to be exposed to dangerous gases. Providing proper safety training, in accordance with Occupational Safety and Health Administration (OSHA) standards, is imperative. Safety programs should be reviewed, and, if necessary, updated periodically. Tide gates that require underwater inspection should only be inspected by a certified diver.

## **Manhole Inspection and Assessment**

<http://www.epa.gov/npdes/pubs/cmomselfreview.pdf>

- Does the utility have a routine manhole inspection and assessment program?
- Are the results and observations from the routine manhole inspections recorded?
- Does the utility have a goal for the number of manholes inspected annually?
- How many manholes were inspected during the past year?
- Do the records for manhole/pipe inspection include the following?
  - Inflow from manhole covers
  - Conditions of the frame and cover
  - Evidence of surcharge
  - Offsets or misalignments
  - Atmospheric hazards measurements (especially hydrogen sulfide)
  - Recording conditions of (corbel, walls, bench, trough, and pipe seals)
  - Details on the root cause of cracks or breaks in the manhole or pipe including blockages
  - Accumulations of grease, debris, or grit
  - Presence of corrosion
  - If repair is necessary
  - Manhole identifying number/location
  - Wastewater flow characteristics (flowing freely or backed up)
  - Presence of infiltration, location, and estimated quantity
- Does the utility have a grouting program?

## Internal TV Inspection

<http://www.epa.gov/npdes/pubs/cmomselfreview.pdf>

- Does the utility have a standardized pipeline condition assessment program?
- Are main line and lateral repairs checked by internal TV inspection after the repair(s) have been made?
- Is internal TV inspection used to perform condition assessment?
- Are there written operation procedures and guidelines for the internal TV inspection program?
- Is a rating system used to determine the severity of the defects found during the inspection process?
- Approximately what percent of the total defects determined by TV inspection during the past 5 years were the following:

▪ Failed coatings or linings	▪ Fats, oil, and grease	▪ Joint separation	▪ Root intrusions
▪ House connection leaks	▪ Broken pipes	▪ Crushed pipes	▪ Minor cracks
▪ Illegal connections	▪ Debris	▪ Collapsed pipes	▪ Other
▪ Pipe corrosion (H <sub>2</sub> S)	▪ Line deflection	▪ Offset joints	

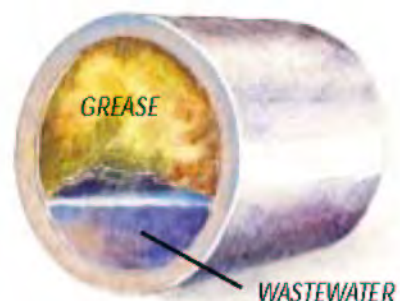
- Do the internal TV record logs include the following?

▪ Results of the internal TV inspection (including a structural rating)	▪ Distance recorded by internal TV	▪ Cleanliness of the line
▪ Pipe size, type, length, and joint spacing	Location and identification of line being televised by manholes	▪ Internal TV operator name

## Fats, Oils, and Grease Control Program

(Derived from <http://www.swrcb.ca.gov/rwqcb8/pdf/02-14.pdf> , CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SANTA ANA REGION, ORDER NO. R8-2002-0014, GENERAL WASTE DISCHARGE REQUIREMENTS FOR SEWAGE COLLECTION AGENCIES IN ORANGE COUNTY WITHIN THE SANTA ANA REGION)

Prepare and implement a grease, fat, and oil source control program to reduce the amount of these substances discharged to the sewer collection system. This plan should include the legal authority to prohibit discharges to the system and identify measures to prevent SSO's caused by fats, oils, and grease blockages of sewers. The elements of an effective grease control program may include requirements to install grease removal devices (such as traps or, preferably, interceptors), design standards for the removal devices, maintenance requirements, BMP requirements, record keeping and reporting requirements. An effective grease control program must also include authority to inspect grease producing facilities, enforcement authorities, and sufficient staff to inspect and enforce the grease ordinance.



- (A) The grease control program shall identify sections of the sewer system subject to grease blockages and establish a cleaning maintenance schedule for each section; and
  - (B) The program shall develop and implement source control measures, for all sources of grease and fats discharged to the sewer system, for each section identified.
- 

## Grease Trap and Interceptor Maintenance

<http://www.oracwa.org/Pages/maintenance.htm>

The required maintenance frequency for grease interceptors and traps depends greatly on the amount of FOG a facility generates as well as any best management practices (BMPs) that the establishment implements to reduce the FOG discharged into its sanitary sewer system. In many cases, an establishment that implements BMPs will realize financial benefit through a reduction in their required grease interceptor and trap maintenance frequency. Refer to [Best Management Practices](#) for examples of BMPs that FOG generating establishments should implement.

<http://www.oracwa.org/Pages/bmp.htm>

Prevent Blockages in the Sanitary Sewer System:  
See Tables outlining BMP's for an FOG (Fats, Oils, Grease) Program.

<http://www.oracwa.org/Pages/checklist.htm>

Compliance Checklist for FOG  
Installation Checklist for grease traps and grease interceptors

# Root Control

Best Practices for Sanitary Sewer Root Control - Best Management Practices  
Developed by the California WEA Collection System Collaborative Benchmarking Group

(This document is available in its entirety through the CWEA at [www.cwea.org](http://www.cwea.org))

## Goals

- Eliminate the recurrence of preventable and chronic SSO's caused by root intrusion
- Protect public health and safety
- Reduce adverse impacts to the environment, waterways of the state, and their beneficial uses
- Understand the benefits and components of an Integrated Root Control Program.
- Reduce root-caused maintenance activities and associated costs
- Improve maintenance efficiency

## Objectives

- Eliminate preventable root caused SSO's
- Reduce deterioration of the Collection System, caused by Root Intrusion.
- Ensure corrective action is taken in a timely manner
- Identify and implement measures to control root intrusion
- Ensure compliance with current regulatory requirements



## Components of Integrated Root Control Programs

### Prevention of Root Intrusion:

- Evaluation of System Condition
- Historical Records
- Public Outreach can be useful in educating property owners on tree and shrub selection and placement.
- Evaluation of Options to Control Roots:
  - Monitor
  - Corrective Measures
  - Mechanical Removal
  - Chemical Control

## Cleaning the Collection System

[http://www.neiwpcc.org/PDF\\_Docs/WEBOM&R.CH7.pdf](http://www.neiwpcc.org/PDF_Docs/WEBOM&R.CH7.pdf)

Stoppages in gravity sewers usually are caused either by structural defects or by an accumulation of material in the pipe. Accumulated material can include fats, oil, grease, sediment, or other materials. Certain structural defects, such as protruding taps, may catch debris, which then causes a further buildup of solids that will eventually block the sewer. Root intrusion through structural defects is a major contributor to blockages.

Repair or elimination of any defects that contribute to a buildup of material in the pipe should be evaluated as part of a rehabilitation program since the defects will always be a maintenance problem.

Mechanical and hydraulic cleaning of sewers is a cost-effective method of removing material that interferes with the proper operation of the sewer. The objective is to remove all material clinging to the interior surface of the pipe so that the sewer pipe can carry full pipe flow without any restrictions that might result in blockages due to reduced pipe capacity.

Sewer cleaning should be scheduled on a regular cycle: for example, 100 percent of the pipes are cleaned every 1, 3, or 5 years. However, unless the cleaning schedule is adjusted to take into account the actual conditions in various parts of the collection system pipelines, routine cleaning can result in over-maintenance of the system. In most collection systems, some sections do not require frequent cleaning while other sections may require cleaning on a more frequent basis, such as monthly, if they are susceptible to blockages. Information from the inspection program should be used to help identify chronic problem areas in the gravity sewer system and related structures in the wastewater collection system, quantify defects and problem areas, and develop a preventive maintenance sewer cleaning program based on actual conditions in a particular wastewater collection system.

Cleaning is either scheduled or unscheduled. Scheduled cleaning is proactive in that cleaning is done on a preventive basis to remove material prior to a stoppage occurring. Preventive cleaning activities can be supplemented by additional cleaning on an as-needed basis in cases where predictive information such as previous history, inspection data, pipe age and material, slope, or other information indicates a need for more frequent cleaning.

## Sewer Cleaning

<http://www.epa.gov/npdes/pubs/cmomselfreview.pdf>

- What is the system cleaning frequency? (The entire system is cleaned every "X" years)
- What is the utility's plan for system cleaning (% or frequency in years)?
- What percent of the sewer lines are cleaned, even high/repeat cleaning trouble spots, during the past year?
- Is there a program to identify sewer line segments, with chronic problems, that should be cleaned on a more frequent schedule?
- Does the utility have a root control program?
- Does the utility have a fats, oils, and grease (FOG) program?
- What is the average number of stoppages experienced per mile of sewer pipe per year?
- Has the number of stoppages increased, decreased, or stayed the same over the past 5 years?
- Are stoppages plotted on maps and correlated with other data such as pipe size and material or location?
- Do the sewer cleaning records include the following information?
  - Cause of stoppage
  - Further actions necessary/initiated
  - Location of stoppage or routine cleaning activity
  - Date and time
  - Identity of cleaning crew
  - Method of cleaning
- If sewer cleaning is done by a contractor are videos taken of before and after cleaning?



## Average Weight of Root Control as Maintenance Activity

<http://www.asce.org/pdf/finalreport.pdf>

Average Weight of Maintenance Activity		
Activity	Relative Importance (Weight)	Number of Responses
1. Cleaning	17.7%	36
2. Root removal	8.4%	36
3. Pump station service	14.1%	36
4. Flow monitoring	7.0%	33
5. Manhole inspection	6.4%	35
6. Smoke testing	3.3%	31
7. CCTV	10.5%	34
8. Private sector inspections	2.0%	32
9. Manhole rehabilitation	5.6%	37
10. Main line rehabilitation	12.6%	36
11. Relief construction	6.3%	35
12. Private sector I/I removal	6.1%	34
Total	100%	

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## Sewer Line Treatment for Roots

<http://eppserver.ag.utk.edu/pat/PATinfo/C16/C16index.htm>

Sewer line root control is a matter of using the right technologies. To be successful, the technology must be effective and must not adversely effect people or the environment.

Metam-sodium for sewer root control was classified for restricted use in 1996. The U.S. Environmental Protection Agency (EPA), which is responsible for registration of pesticide products, made this decision because of concerns that metam-sodium products used for sewer root control could adversely affect the health of humans, domestic animals and the environment. This action means that metam-sodium root control products may only be purchased by certified pesticide applicators. People desiring certification status must apply to their state's pesticide lead agency. This lead agency will also provide information about the state's pesticide law and specific requirements for certification.

This manual is a valuable source of information for people preparing for certification. Each chapter of this manual covers material considered essential to the proper understanding and implementation of root control involving metam-sodium. Also included are basic information and guidelines to assist the applicator in solving practical problems involving root control with metam-sodium.

The intrusion of roots is probably the most destructive problem encountered in a wastewater collection system. Root related problems include:

- Sewer stoppages and overflows
  - Structural damage caused by growing roots
  - 
  - 
  - Formation of septic pools behind root masses, which generate hydrogen sulfide, gases and other odors
  - Reduction in hydraulic capacity, and loss of self-scouring velocities
  - Infiltration where the pipe is seasonally under the water table
-

# Non-Chemical Methods of Root Control

## Cultural Control

Cultural control must be implemented before roots have a chance to become a problem. Two major cultural methods are:

- 1) Careful installation and inspection of sewer lines during construction
  - 2) Control of the selection of tree species and planting sites
- 

## Physical Control

Physical control of sewer line roots involves isolating the environment of the sewer pipe from the roots around or near the sewer pipe. Three examples of physical control are:

- 1) Tree removal
  - 2) Pipeline replacement
  - 3) Pipe lining
- 

## Mechanical Control

The main advantage of mechanical control is that it is the only method of relieving a root blockage. Chemicals are ineffective and dangerous when used in plugged or surcharging sewers. Sewer stoppage is an emergency situation and the municipality should have some type of mechanical device control for correcting such problems.

The main disadvantage of mechanical control is that it provides no residual control or long term effectiveness. Root masses grow back heavier each time they are cut. Mechanical control is often used in conjunction with chemical control, for example, to prepare sewer lines for rehabilitation with pipe-lining and grouting.

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## Chemical Root Control

Chemicals can kill roots for a distance beyond the point of contact, providing control of root growths outside the sewer pipe. Many chemicals have been tried for root control. Note: not all products may be registered in all states, or there may be special handling requirements not specified on the label. Applicators should check with local authorities before using pesticides.

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# Sewer Utility Maintenance

<http://www.cabmphandbooks.com/Documents/Municipal/SC-76.pdf>

## Sanitary Sewer Maintenance

Applicable to municipalities who own and operated a sewage collection system. Facilities that are covered under this program include sanitary sewer pipes and pump stations owned and operated by a municipality. The owner of the sanitary sewer facilities is the entity responsible for carrying out this prevention and response program.

- Clean sewer lines on a regular basis to remove grease, grit, and other debris that may lead to sewer backups.
  - Establish routine maintenance program. Cleaning should be conducted at an established minimum frequency and more frequently for problem areas such as restaurants that are identified
  - Cleaning activities may require removal of tree roots and other identified obstructions.
  - During routine maintenance and inspection note the condition of sanitary sewer structures and identify areas that need repair or maintenance. Items to note may include the following:
    - Cracked/deteriorating pipes
    - Leaking joints/seals at manhole
    - Frequent line plugs
    - Line generally flows at or near capacity
    - Suspected infiltration or exfiltration.
-

- Prioritize repairs based on the nature and severity of the problem. Immediate clearing of blockage or repair is required where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, sewer line blockages). These repairs may be temporary until scheduled or capital improvements can be completed.
- Review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure.

### **Spills and Overflows**

- Identify and track sanitary sewer discharges. Identify dry weather infiltration and inflow first. Wet weather overflow connections are very difficult to locate.
- Locate wet weather overflows and leaking sanitary sewers using conventional source identification techniques such as monitoring and field screening. Techniques used to identify other illicit connection sources can also be used for sewer system evaluation surveys
- Implement community awareness programs for monitoring sanitary sewer wet weather overflows. A citizen’s hotline for reporting observed overflow conditions should be established to supplement field screening efforts.
- Establish lead department/agency responsible for spill response and containment. Provide coordination within departments.
- When a spill, leak, and/or overflow occurs and when disinfecting a sewage contaminated area, take every effort to ensure that the sewage, disinfectant and/or sewage treated with the disinfectant is not discharged to the storm drain system or receiving waters. Methods may include:
  - Blocking storm drain inlets and catch basins
  - Containing and diverting sewage and disinfectant away from open channels and other storm drain fixtures (using sandbags, inflatable dams, etc.)
  - Removing the material with vacuum equipment
- Record required information at the spill site.
- Perform field tests as necessary to determine the source of the spill.
- Develop notification procedures regarding spill reporting.

### **Septic Systems**

- Ensure that homeowners, installers, and inspectors are educated in proper maintenance of septic systems. This may require coordination with staff from other departments. Outreach to homeowners should include inspection reminders informing them that inspection and perhaps maintenance is due for their systems. Recommend that the system be inspected annually and pumped-out regularly.
- Programs which seek to address failing septic systems should consider using field screening to pinpoint areas where more detailed onsite inspection surveys are warranted.

### **Training**

- Conduct annual training of water utility personnel and service contractors. (field screening, sampling, smoke/dye testing, TV inspection).
- OSHA-required Health and Safety Training 29 CFR 1910.120 plus annual Refresher Training (as needed).
- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and federal OSHA 29 CFR 1910.146).

### **Spill Response and Prevention**

- See previous section regarding spills and overflows cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

### **Other Considerations**

- Enact ordinance granting “right-of-entry” to locate potentially responsible parties for sewer overflows.
- Reliance on individual onsite inspection to detect failed septic systems can be a major limitation. The individual onsite inspection is very labor-intensive and requires access to private property to pinpoint the exact location of the failing system.

- A significant limitation to correcting failing septic systems is the lack of techniques available for detecting individual failed septic systems.

### **Costs**

- Departmental cooperation recommended for sharing or borrowing staff resources and equipment from municipal wastewater department.
- Infiltration, inflow, and wet weather overflows from sanitary sewers are very labor and equipment intensive to locate.
- The costs associated with detecting and correcting septic system failures are subject to a number of factors, including availability of trained personnel, cost of materials, and the level of follow-up required to fix the system problems.

### **Maintenance**

- Minimum 2-person teams to perform field screening and associated sampling.
- Larger teams required for implementing other techniques (i.e. zinc chloride smoke testing, fluorometric dye testing, television camera inspection and physical inspection with confined space entry) to identify sewer system leaks.
- Program coordination required for handling emergencies, record keeping, etc.
- Many of the problems associated with improper use of septic systems may be attributed to lack of user knowledge on operation and maintenance. Educational materials for homeowners and training courses for installers and inspectors can reduce the incidence of pollution from these widespread and commonly used pollution control devices.
- 

## **Collection System Operation and Maintenance**

A maintenance program for the collection system, including its gravity sewer lines, force mains, pumping stations and other appurtenances (e.g., manholes, pressure sewers, inverted siphons, meter vaults), to provide for the proper operation and maintenance of equipment while minimizing failures, malfunctions, and line blockages due to the lack of adequate preventive care, shall include:

### **Inspection of the Collection System:**

- a. All gravity lines having a diameter of eight inches or greater using closed circuit television;
- b. all force mains; and
- c. all appurtenances – i.e., manholes, junction chambers, siphons.

### **Force Mains**

- Inspection of force mains will be carried out utilizing one or more methodologies appropriate to the specific characteristics of each force main; these methodologies may include, but are not limited to, visual/CCTV, radiography, ultrasonic/sonar and coupon sampling.
- Force main inspections shall be carried out in such a manner as to allow adequate assessment of the condition of all parts of each force main.
- Use all appropriate means to identify sources of I/I, including smoke and/or dye testing. Use smoke and/or dye testing in accordance with the standard protocols and procedures.

### **Cross-connections:**

- Identify all physical connections between the Collection System and stormwater collection system.
- Propose in a Sewershed Study and Plan for each sewershed an expeditious schedule for the elimination of each such connections.
- Record and prioritize rehabilitation and other corrective action for all defects identified through the inspections.
- Routine preventive maintenance of pumping stations;
- Sealing (where appropriate), and maintenance, of manholes;
- Identification and remediation of poor construction;
- Procedures for ensuring that new sewers and connections are properly designed and constructed (including testing of new sewer installations) to prevent overflows and to ensure that new connections of inflow sources are prohibited;

- Procedures for ensuring that rehabilitation projects are properly designed and constructed (including testing of rehabilitation installations) to prevent overflows;
- A grease control program that, at a minimum, maps identified grease blockages, notifies pretreatment staff of recurring grease blockages, requires the installation of grease traps and/or the implementation of a trap cleaning and inspection program, and a proposal that includes scheduled inspection of known problem areas;
- A root control program that addresses, at minimum, scheduling and performing corrective measures including both short-term mitigation of root intrusion (*i.e.*, routine maintenance) and rehabilitation of the areas in which root intrusion has caused recurring blockages (*i.e.*, sewer replacement or relining), and a proposal that includes scheduled inspection of known problem areas;
- Procedures for identification of all known locations where Baltimore does not have ready physical and legal access to the Collection System, the causes for lack of access, and its strategy for obtaining and maintaining access to such location;
- Description of method for documenting complaints, work orders, updates to equipment inventory, and changes to Collection System components, as well as entry of such data into databases comprising the information management system
- Corrective maintenance response and reporting procedures.
- Perform the inspections of the Collection System in accordance with the SSES Handbook, "Specification Guidelines; Wastewater Collection Systems Maintenance and Rehabilitation" by the National Association of Sewer Service Companies ("NASSCO") specifications and standards (hereinafter "NASSCO Guidelines"), and sound engineering practice.

## Pump/Lift Station Operation & Maintenance Procedures

### Pump Station Maintenance

<http://www.epa.gov/owm/mtb/o&m.pdf>

Pump stations should be maintained to operate at the design conditions. Wet wells should be routinely cleaned because grit and solids deposition in the wet well can damage or restrict the flow of wastewater into the pump. Inadequate or improper pump station operation can lead to reduced storage and hydraulic capacity during wet weather, and, if the pumping capacity is severely restricted, dry weather overflows can result. In general, inadequate pumping capacity is caused by:

- Mechanical, electrical, or instrumentation problems.
- Changes in the upstream drainage area that cause storm runoff to exceed the original design basis.
- Changes in the discharge piping (e.g., tying-in or manifolding with another pressure system) that creates more head loss in the discharge system.

If conditions upstream of the pump station (such as development) increase the flow above the design values, steps should be taken to upgrade the station to meet the increased flow rate. Pump station upgrading may include such items as:

- Installing new pumps and motors.
- Changing out impellers.
- Upgrading/changing pump controls to maximize use of all pumps during wet weather.
- Modifying system piping to improve the system head curve.
- Installing additional force main piping for wet weather pumping.

Depending on the complexity of the system, changes to the downstream discharge conditions that may affect the system head curve may require extensive study and should be evaluated on a case-by-case basis.

### Pump/Lift Station Operation & Maintenance Procedures

[http://www.msdcg.org/downloads/consent\\_decree/cd\\_exhibit\\_09\\_PLSOMP.pdf](http://www.msdcg.org/downloads/consent_decree/cd_exhibit_09_PLSOMP.pdf)

### **Example from Cincinnati MSD:**

#### **Responsibility:**

Maintain all pump stations in a reliable and ready condition.

Respond and make repairs quickly to prevent or minimize any negative environmental impact, if a problem does occur.

Take quick decisive action to (1) stop the incident and (2) to protect the public from potential health risks in the event of an overflow.

#### **Continuous Monitoring of Pump Stations (Telemetry)**

Each station is continuously monitored through the MSD radio telemetry system. Monitoring parameters include, but are not limited to:

Power status (power failure)

Wet well status (high well)

Dry well status (where applicable)

Generator status

Entry alarm (on the Remote Terminal Unit)

The telemetry system is maintained in proper working order by MSD maintenance staff.

Additionally the aid of the electrical engineering staff is available to assist in maintaining the radio telemetry system.

#### **Pump Station Inspection**

In addition to the continuous monitoring, each station is inspected on a regular schedule. The frequency of these inspections is determined on a station-by-station basis, and is based on factors such as age, operating history, size and potential for negative environmental impact.

#### **Pump Station Maintenance Preventive Maintenance:**

A schedule listing the PM and inspection frequency is maintained for each station. PM activities typically include, but are not limited to the following:

- Periodic service and calibration of all instrumentation, such as flow meters, level sensors, alarms, elapsed time meters and telemetry equipment.
- Routine inspection and service for all station equipment including:
  - Engines and generators
  - Motors
  - Pumps
  - Wet wells
  - Impellers
  - Seals
  - Bearings
  - Wear clearances
  - Couplings
  - Drives
  - Air release valves
  - Related equipment

Records of all PM activities are kept on file. Where available, these records are kept in a computerized maintenance management system (CMMS).

#### **Corrective Maintenance:**

A procedure for performing corrective maintenance is maintained in each operating section. This procedure includes, but is not limited to:

- Work order writing procedures
- Operator inspection procedures
- Emergency response procedures
- Call in procedures
- Notification procedures if an environmental incident is involved

## **Unplanned Events:**

### **Response Procedures**

Each operating section has a procedure that includes the proper response for various alarm conditions from the pump stations. Alarm response is determined by personnel availability in the operating section, weather conditions and the characteristics of the station involved. When called for, maintenance personnel are dispatched to the station to evaluate and correct the condition. If the operating section cannot make this response, personnel from another section or from the Central Services section are called in. For any incident that involves an overflow, an Environmental Event Report is filled out. A sample is collected and sent to the laboratory along with an Overflow Monitoring form. The incident is also reported in accordance with the Reporting Procedures listed below.

### **Reporting and Notification Procedures**

All non-permitted overflows are reported to the EPA's 24 hour emergency response number and are followed up with a detailed letter, in accordance with the guidelines established by that agency, including, when appropriate, whether failure to comply with the Pump Station Operation and Maintenance procedure caused or contributed to an SSO. The EPA emergency response phone number is posted at each of the treatment facilities. In addition, for any overflow that may affect public health or safety, the health department with local jurisdiction is notified.

In the event of a fish or wildlife kill attributed to the overflow, the Department of Natural Resources is notified. EPA emergency response, Health Department, and Department of Natural Resources numbers are made available.

### **Unplanned Event Mitigation**

Any area impacted by an overflow is flushed or cleaned as needed to remove debris, prevent odors and preserve the environment.

### **Personnel Training:**

Require that all employees receive OSHA required training that is related to their job. In the case of pump and lift station maintenance, this training includes confined space entry, CPR, first aid and emergency response. In addition, employees are encouraged to attend skills training which is pertinent to their job duties.

### **Record keeping:**

Each operating section keeps records of operation and maintenance performance indicators such as:

- Equipment run hours
- Reliability history
- Maintenance and calibration history

### **Submersible Pump Preventive Maintenance – Weekly Before Beginning Station Route**

- At a telemetry computer check the status of each station on the route for alarms and any operating problems.

### **At Each Station:**

#### **Check Telemetry**

- Check and release intrusion alarm switch.
- If there is a fault in the telemetry panel, reset the telemetry panel.

#### **Check Control Cabinet**

- Test any "push to test" lights.
- Check seal failure light
- Ensure all breakers are on.
- *If a breaker is not on, investigate panel to try to determine why the breaker tripped. If there is no obvious reason to explain why the breaker tripped, reset the breaker. If the reset breaker trips again, contact the crew leader or SOM. If there is an obvious reason to explain why the breaker tripped, contact an electrician. If repairs cannot be made, contact the crew leader or SOM.*

- Visually inspect control panel wiring for obvious signs of electrical problems, such as, burned wiring, wire off terminal, and burn spots on cabinet. *If this is observed, investigate reason. Call an electrician, if necessary.*
- Operate pump in manual mode.
- Check wet well for turbulence, unusual noise and inspect the check valve to see if it has moved.
- After the pump has been tested, turn off pump and place back in AUTO mode.
- Check Wet Well
- Check wet well for grease and debris.
- Tilt and hold the high level float upside down for 30 seconds. Then lower the float to normal position.
- Close the wet well cover.

#### Check Generator

- Open generator covers.
- Check oil level.
- Check water level, if a level gauge is installed.
- Check fuel level.
- Inspect hoses and belts
- Check piping for leaks
- Check battery condition
- Check charging system
- Check that the generator is warm.
- Check the generator control panel for generator fault lights.
- Replace generator covers.
- If you have any generator problems, contact the generator repair person.

#### Housekeeping

- Clean up any spills found at the site.
- Wipe down station as needed.
- Pick up any litter found at the site
- Leaving pump station
- Ensure that all switches, controls and valves are in the correct position.
- Ensure the pumps are in AUTO mode.
- Record results of inspection in the logbook. *Note any problems found. If no problems were found, note that no problems were found.*
- Record run times in the logbook.
- Record run times on the work order.
- Ensure all cabinets and pits are closed.
- Ensure all locks are in place.
- Ensure the gate is locked.
- Call Station 10 and verify that they received a high wet well and an intrusion alarm.
- Have alarms cleared
- Continue to next station or assignment.

## Force Main Operation & Maintenance

[www.epa.gov/owm/mtb/force\\_main\\_sewers.pdf](http://www.epa.gov/owm/mtb/force_main_sewers.pdf)

### Description

Force mains are pipelines that convey wastewater under pressure from the discharge side of a pump or pneumatic ejector to a discharge point. Pumps or compressors located in a lift station provide the energy for wastewater conveyance in force mains.

The key elements of force mains are:

1. Pipe.
2. Valves.
3. Pressure surge control devices.



#### 4. Force main cleaning system.

##### **Common Modifications**

Force mains may be aerated or the wastewater chlorinated at the pump station to prevent odors and excessive corrosion. Pressure surge control devices are installed to reduce pipeline pressure below a safe operating pressure during lift station start-up and shut-off. Typically, automatically operated valves (cone or ball type) control pressure surges at the pump discharge or pressure surge tanks. Normally, force main cleaning includes running a manufactured “pigging” device through the line and long force mains are typically equipped with “pig” insertion and retrieval stations. In most cases, insertion facilities are located within the lift station and the pig removal station is at the discharge point of the force main. Several launching and retrieval stations are usually provided in long force mains to facilitate cleaning of the pipeline.

##### **Force Main Operation & Maintenance**

[http://www.neiwpcc.org/PDF\\_Docs/WEBOM&R.CH7.pdf](http://www.neiwpcc.org/PDF_Docs/WEBOM&R.CH7.pdf)

Pressure surges are abrupt increases in operating pressure in force mains, which typically occur during pump start-up and shut-off. Pressure surges may have negative effects on force main integrity but can be reduced by proper pump station and pipeline design. Pressure surge control devices can be installed to reduce pipeline pressure below a safe operating pressure during lift station start-up and shut-off.

The operation of force main-lift station systems is usually automated and does not require continuous on-site operator presence. However, annual force main route inspections are recommended to ensure normal functioning and to identify potential problems. Special attention should be given to the integrity of the force main surface and pipeline connections, unusual noise, vibration, pipe and pipe joint leakage and displacement, valve arrangement and leakage, lift station operation and performance, discharge pump rates and pump speed, and pump suction and discharge pressures. One common method of determining the condition of the force main is by routine pump station calibration. If this is done on an annual basis, any changes in capacity and discharge head in the pump station can be identified. Because these changes could also be attributed to pump wear, it is essential to verify that the pumps are in good working order before determining that the force main needs cleaning. The most common method of cleaning force mains is by use of polyurethane swabs, which are better known as “poly pigs.” Poly pigs are available in various densities and surface coatings. To use this method, poly pigs are inserted into the pipeline, which is then pressurized behind the pig. As the device travels through the force main it scours the inside of the pipe. Normally, the use of poly pigs requires that the pump station be temporarily shut down. Provisions must be made for handling incoming wastewater, either through bypass pumping or by providing adequate short-term storage. A launching point must be available for insertion of the pig and access at the discharge end of the force main must be available for removing the pig. Insertion facilities can be located within the pump station. Several launching and retrieval stations are usually provided in long force mains to facilitate cleaning the pipeline.

The following factors should be considered when using poly pigs to clean force mains:

- Provisions must be made for bypassing the pump station or providing alternative wastewater storage while the force main is being cleaned.
- A launching station must be provided, either in the pump station or at the beginning of the force main.
- External pumps and a water supply are needed to propel the pig through the force main.
- The force main must be drained any time it is worked on.
- Provisions must be made to track the pig through the force main in case it gets hung up and can not be removed except by digging up the pipeline.
- The debris removed by the cleaning operation must be collected and taken to an appropriate disposal site.

The dissolved oxygen content of the wastewater is often depleted in the wetwell of the lift station, and its subsequent passage through the force main results in the discharge of septic wastewater, which not only lacks oxygen but often contains sulfides. Frequent cleaning and maintenance of force mains is required to remove solids and grease buildup and minimize corrosion due to the high concentration of sulfides.

## Force Main Performance

[www.epa.gov/owm/mtb/force\\_main\\_sewers.pdf](http://www.epa.gov/owm/mtb/force_main_sewers.pdf)

Force main performance is closely tied to the performance of the lift station to which it is connected. Pump-force main performance curves are used to define and compare the operating characteristics of a given pump or set of pumps along with the associated force main. They are also used to identify the best combination of performance characteristics under which the lift station-force main system will operate under typical conditions (flows and pressures). Properly designed pump-force main systems usually allow the lift station pumps to operate at 35 to 55 percent efficiency most of the time. Overall pump efficiency depends on the type of pumps, their control system, and the fluctuation of the influent wastewater flow.

## Force Main Operation And Maintenance

[www.epa.gov/owm/mtb/force\\_main\\_sewers.pdf](http://www.epa.gov/owm/mtb/force_main_sewers.pdf)

The operation of force main-lift station systems is usually automated and does not require continuous on-site operator presence. However, annual force main route inspections are recommended to ensure normal functioning and to identify potential problems. Special attention is given to the integrity of the force main surface and pipeline connections, unusual noise, vibration, pipe and pipe joint leakage and displacement, valving arrangement and leakage, lift station operation and performance, discharge pump rates and pump speed, and pump suction and discharge pressures. Depending on the overall performance of the lift station-force main system, the extent of grease build-up and the need for pipeline pigging are also assessed. If there is an excessive increase in pump head and the headloss increase is caused by grease build-up, the pipeline is pigged. Corrosion is rarely a problem since pipes are primarily constructed of ductile iron or plastic, which are highly resistant to corrosion. Buildup can be removed by pigging the pipeline.

## Equipment Maintenance

From the CMOM Program Self Assessment Checklist

[www.epa.gov/npdes/pubs/cmomselfreview.pdf](http://www.epa.gov/npdes/pubs/cmomselfreview.pdf)

- Is a maintenance card or record kept for each piece of mechanical equipment within the collection system?
- Do collection system personnel coordinate with state, county, and local personnel on repairs, before the street is paved?
- What percent of repair funds are spent on emergency repairs?
  - Maintenance recommendations
  - Instructions on conducting the specific maintenance activity
  - Other observations on the equipment
  - Maintenance schedule
  - A record of maintenance on the equipment to date

## Equipment Parts Inventory

- Are dated tags used to show out-of-service equipment?
- Is there an established system for prioritizing equipment maintenance needs?
- Have critical spare parts been identified?
- Does the utility maintain a stock of spare parts on its maintenance vehicles?

- Does the utility have a system in place to track and maintain an accurate inventory of spare parts?
- Is there a parts standardization policy in place?
- Does the utility have a central location for storing spare parts?
- Are adequate supplies on hand to allow for two point repairs in any part of the system?
- For those parts which are not kept in inventory, does the utility have a readily available source or supplier

## Spare Parts and Equipment

[http://www.neiwpcc.org/PDF\\_Docs/WEBOM&R.CH7.pdf](http://www.neiwpcc.org/PDF_Docs/WEBOM&R.CH7.pdf)

The collection system authority must maintain an adequate inventory of spare parts, equipment, and supplies. Without such an inventory, the collection system may experience long down times or periods of inefficient operation in the event of a breakdown or malfunction. The inventory should contain information from the equipment manufacturer's recommendations, supplemented by historical experience with maintenance and equipment problems.

A review of the equipment and manufacturer's manuals will aid in determining what spare parts should be maintained. The authority should then consider the frequency of usage of the part, how critical the part is, and finally how difficult the part is to obtain when determining how many to have on hand. Spare parts should be kept in a clean, well-protected stock room. The authority should have a procedure for determining which spare parts are critical. *Critical parts* are those that are essential to the operation of the collection system. Like equipment and tools management, a tracking system should be in place, including procedures on logging out materials when maintenance personnel must use them.

# Alternative Sewer Operation & Maintenance

<http://www.septic-info.com/doc/display/16.html>

One of the best features of alternative sewer systems is that they use plastic pipes much smaller in diameter than conventional sewer pipes to collect and transport the wastewater to final treatment. This is possible because the wastewater that goes into alternative sewers always first receives treatment of some kind (in a septic tank or grinder pump, for example) so that any large, solid materials are separated out or ground into smaller pieces. These small-diameter plastic pipes are less expensive and easier to install than conventional sewer pipes, which saves money for both the community and the individual homeowner. This is especially significant considering that collection system construction is often responsible for as much as two-thirds of the total wastewater treatment project costs. Another advantage of alternative sewers is that the construction of the lines and other design factors makes it less likely for wastewater to seep out or for other water to infiltrate the system. Extra water coming through cracked pipes and leaky manhole covers is a common problem with conventional sewers that can be avoided with alternative sewers. However the septic tanks, pump tanks, risers, and other system components must be correctly designed and constructed to be watertight. Extra water adds to the flow received by the treatment facility or other method of final treatment, which can reduce the life of the system and add to the community's costs. In addition, because some alternative sewers don't need to rely on gravity to operate, they also don't have to continuously slope downward like conventional sewers. Instead, they can be buried at very shallow depths, just below the frost line, and can follow the natural contours of the land. This saves money on excavation costs for communities. These features make some alternative sewer designs appropriate for areas with very hilly terrain, extremely flat terrain, shallow bedrock, high water table, or anywhere the costs and environmental impact of excavating for traditional gravity sewers would be prohibitively high. Trenchless installations and other new techniques can further reduce the costs and impact of construction. The plastic pipes also can be routed around ponds, lakes, trees, houses, and other obstacles, which can minimize disruption to the environment and save money for homeowners and communities.

Some alternative sewer system designs allow developers and community planners the advantage of more flexibility, because the most expensive system components for each connection do not need to be purchased or installed until after the individual houses are built. However, this can be viewed as a disadvantage for homeowners because the costs of the onsite components are directly shifted to them. On the other hand, homeowners may pay more in the long run for conventional sewers through higher sewer taxes and fees. The major drawbacks to alternative sewers have to do with operation and maintenance costs and requirements. Alternative sewers have components conventional sewers do not have, such as septic tanks that need to be inspected and pumped and mechanical parts that use electricity. These may cost more to operate and require more frequent and regular maintenance than conventional sewers. Other potential disadvantages with alternative sewers include the possibility of disruption in service due to mechanical breakdowns and power outages. Also, systems may be poorly designed or installed if engineers or contractors have little experience with the technology.

## **STEP (Septic Tank Effluent Pump) Systems**

A STEP system consists of a septic tank to pretreat the wastewater and a submersible, low-horsepower sump pump to push the wastewater through the system. All of the wastewater from each home or business (i.e., the water from sinks, baths, laundry, kitchen, and toilets) enters the septic tank from the conventional gravity sewer leaving the building. No special plumbing is normally required. Once in the septic tank, the wastewater settles into three layers. Greases and floatable materials rise to the top, solid materials settle to the bottom, and partially clarified liquid remains in the middle. The wastewater in the middle layer will eventually be pumped into the pressure sewers. Once this partially treated wastewater leaves the septic tank it is called effluent. Some septic tanks also have filters at the outlet end of the septic tank to further reduce the risk of solids leaving the tank. The effluent pump is located in a pumping chamber either inside the tank or next to the tank. The effluent enters the pumping chamber and triggers a sensor when it rises to a certain level. The effluent is then pumped out for a few minutes until the water level is reduced and a lower level sensor shuts the pump off. There is also a sensor that triggers an alarm if, for some reason, effluent levels get too high in the pumping chamber. All the components of the effluent pump must be resistant to corrosion, since septic tank effluent is particularly corrosive. The PVC

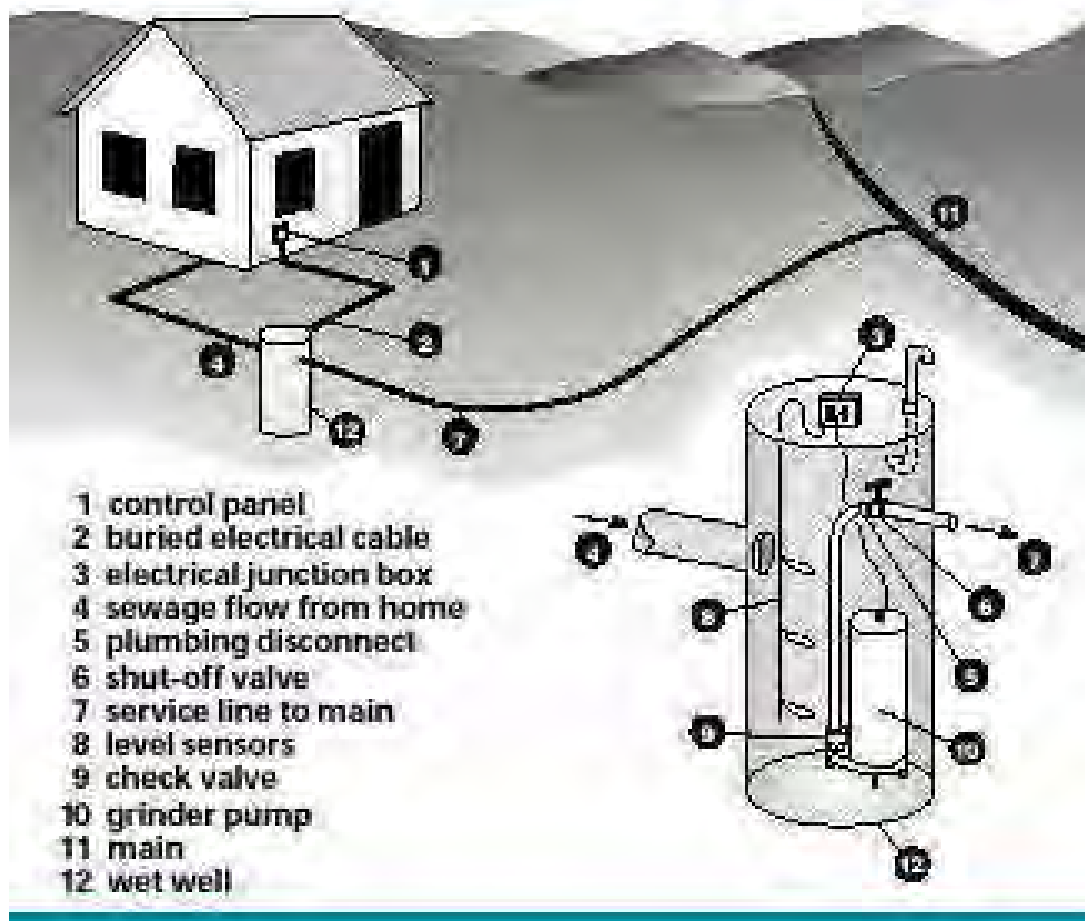
plastic pipes typically used for pressure sewers are very resistant to corrosion. However, the corrosiveness of the effluent can present a problem if the pressure sewer empties into a conventional sewer main made of less resistant material. Because the effluent is relatively free from solids, sewers can be as small as 1.5 inches in diameter for the pipes leading from the service connection, and two or three inches for the mains. This is tiny in comparison to conventional sewers, which are normally required to have a minimum diameter of eight inches.



### Grinder pump systems

Grinder pump pressure sewer systems work somewhat differently than STEP systems. In a grinder pump system, there is no septic tank. Preliminary treatment is performed by the grinder pump itself, which sits in a plastic chamber, called a wet well, that usually has about a 30-gallon capacity. The grinder pump works something like a garbage disposal. Solid materials in the wastewater are cut up and ground into tiny pieces. All of the wastewater is then pumped out into the pressurized line. Grinder pumps are usually one or more horsepower and turn on and off according to the levels in the pumping chamber. They also are usually equipped with one or more alarms. Because the wet well does not provide much room for extra wastewater if the system were to malfunction, and because there is no septic tank, it is very important that same-day emergency service is available for grinder pump connections.

## Grinder Pump System



Pressure sewer systems have different operation and maintenance requirements than conventional sewer systems because they use electricity. However, effluent pumps, which are less than one horse-power, and grinder pumps, which are usually one or two horsepower, usually run for only a few minutes per day, so not much energy is used. Grinder pumps are the more expensive of the two technologies to operate, and power costs for them usually range from \$10 to \$30 per year if the system is watertight and functioning properly. Both effluent pumps and grinder pumps are very reliable. After the first year, when service visits for systems are most frequent, pumps may not require servicing for as long as five to 10 years. Preventive maintenance for pressure sewers includes annual inspections for the pumps, septic tanks, and overall system. Both types of pressure sewer systems use cleanouts instead of manholes as access points for cleaning and monitoring the lines. Cleanouts are smaller, less costly, and, if properly designed and installed, are less likely to leak or require maintenance themselves. Systems need to be designed with cleanouts near any pumps, filters, or other parts that may need maintenance or service. With STEP systems, solids need to be pumped from the septic tank periodically. How often depends on the size of the tank, the number of people in the household, and their particular habits. Most sources suggest once every three to five years as a general guideline for septic tank pumping.

Conserving water, spacing out activities that use a lot of water (like laundry), and being careful about what is flushed into the system can greatly improve the performance of the septic tank and extend the time between pumpings. Pumping frequencies can be more precisely determined based on information obtained at annual system inspections.

Depending on the size of the system, communities often have a maintenance management program or a full-time maintenance employee or staff to ensure that the system is being properly operated and maintained at each connection and to handle emergencies. Preventive maintenance is important with this technology because an overloaded septic tank or broken pump at one connection can potentially affect other parts of the system. Educating homeowners about proper system operation and maintenance is also important.

### **Small-diameter gravity sewer (SDGS) systems**

SDGS systems are also known by a variety of other names, including small-diameter effluent drains, effluent sewers, variable-grade or minimum-grade effluent sewers, small bore sewers, and Australian sewers. Like conventional sewers, SDGS systems use gravity, rather than pumps or pressure, as the main force to collect and transport wastewater to a facility for final treatment or to empty into a conventional sewer main. And like septic tank effluent pump (STEP) pressure sewer systems, SDGS systems use septic tanks to provide primary treatment to the household wastewater and to allow the bulk of the solid materials to settle out. Because the sewers will be collecting and transporting fewer solids, they can be smaller in diameter than conventional sewers. However, the pipes used for SDGS systems need to be somewhat larger (usually a minimum of three to four inches in diameter) than those used for pressure sewers, for example. This is necessary to accommodate any stray solids that may escape in the effluent of a septic tank that is malfunctioning or overloaded—a particular concern with SDGS systems because there are no pumps or pressure in the SDGS lines to further break up or prevent solids from clogging the system.

Because SDGS systems rely on gravity to transport the effluent through the system, the point where the sewer system begins must always be higher than where it ends, and no part of the system can be higher in elevation than the starting point. The sewer is often designed to be laid at variable grades throughout the system. The variable grade of the pipe creates low spots at different points in the system (refer to the figure at left). The effluent backs up at these low points until more and more pressure is created and the effluent is actually propelled over the "hump" in the pipe. This process is called surcharging. Surcharging is an especially helpful process in extremely flat areas where the excavation would need to be particularly deep if the pipe were laid at a continuous downward slope, and there would be no downhill stretches to increase the velocity of the flow. Another option often used with SDGS systems is to have homes that are located at lower elevations than the system use STEP systems to pump effluent up from the home to the SDGS main.

#### **Operation and maintenance**

Because there is a septic tank at each connection, operation and maintenance for SDGS connections is similar to STEP systems and septic systems. Annual inspection of the septic tank is recommended and solids need to be periodically removed from the tank.

The SDGS system laterals (the pipes going to each service connection) can be accessed and cleaned if needed through a series of cleanouts or manholes. Some SDGS systems use pipes at least four inches in diameter so they will accommodate the smallest cleaning tools.

### **Vacuum Sewers**

Vacuum sewers rely on the suction of a vacuum, created by a central pumping station and maintained in the small-diameter mains, to draw and transport wastewater through the system to final treatment. Vacuum sewers, like other alternative sewers, can be designed to suit a variety of site conditions. But because they have limited capabilities for transporting wastewater uphill (usually a maximum of 15 to 20 feet), they are more suited for areas with flat or gently rolling terrain.

The vacuum in the vacuum sewer is drawn by one or more vacuum pumps located in a central pumping station. There are no electrical components at the individual connections to the system. Most of the vacuum system designs used in the U.S. don't require vacuum toilets or any special plumbing inside the house or building. Wastewater flows from the house through the house sewer by gravity to a holding tank. When the wastewater in the holding tank reaches a certain level, usually three to 10 gallons, a sensor prompts a pneumatic valve to open, and the entire plug of wastewater is violently sucked into the lines by the vacuum in the sewer main. The valve stays open a few seconds to also allow some air to be sucked in after the



wastewater. The alternate plugs of wastewater and air from many connections then travel through the mains, drawn by the vacuum to the central pumping station. Along the way, the pipe is designed to follow the contour of the land where the ground slopes naturally, and in other areas is laid at a slight downward grade. Small lifts in the pipe may be used when necessary to keep excavation shallow. At the pumping station, the mains empty into a collection tank. The wastewater is then treated nearby or pumped to another location for treatment. The vacuum pumps are equipped with alarms and an emergency backup generator in case a power outage or other problem develops. Because the initial force of the vacuum taking the wastewater from the valve pit is usually enough to break up any solids in the wastewater, small-diameter plastic pipe can be used for vacuum systems. Usually three- or four-inch diameter pipes from the service connection and four-to 10-inch mains are used for vacuum systems, depending on the flow and design of the system. The vacuum also keeps the lines very clean, so manholes and clean-out points are generally unnecessary.

### Operation and maintenance

Depending on system size, communities using vacuum sewers may employ a full-or part-time operation and maintenance employee or staff. The pumps at the pumping station need to be checked and gauge readings need to be taken daily. Vacuum systems also require a working emergency generator at the pumping station, which also should be checked periodically. Division valves that connect different parts of the sewer lines need to be checked at least twice a year, and the pneumatic vacuum valves at each connection should be checked annually. According to manufacturer recommendations, the vacuum valves and parts of the valve pit may need to be rebuilt or replaced every five to 10 years. Communities interested in installing a vacuum sewer system or investigating vacuum sewers as an option should contact manufacturers regarding the design, costs, installation, and proper system operation and maintenance.

## Small Community Wastewater Collection Systems

<http://www.ext.vt.edu/pubs/waterquality/448-405/448-405.html>

Author: The Water Quality Program Committee, Virginia Tech\*

\*Funding for this project was provided, in part, by Extension Service, USDA, under grant number 91-EWQI-1-9034, "Residential Watershed Management," and by the Virginia Department of Conservation and Recreation, under grant number 94-0612-10, "Residential Water Quality Management."

Publication Number 448-405, July 1996

Conventional sewer systems depend on gravity to deliver the sewage from each property to the treatment plant. Therefore the system's collection pipes must continuously slope downwards. Solids are not separated from the wastewater before it enters the network of collection pipes. To ensure that the pipes do not become clogged with solid material, the downward slope of the pipes must be at a steep gradient that is uniform throughout the system. The pipes must also be laid in straight alignments between manholes to ensure that when a stoppage does occur it can be readily accessed. For conventional sewer systems that serve a large area, there will likely be elevation differences within the network of collection pipes that will require a lift station to transport the sewage to the higher elevation. These requirements can make conventional sewer systems very expensive to install.

### Small Diameter Gravity Sewers

Small diameter gravity sewers use gravity to transport sewage, much like conventional sewers do. However, small diameter gravity sewers are always preceded by a septic tank. The settling that first occurs in the septic tank eliminates much of the solid matter from the wastewater. This enables the collection pipes to have a smaller diameter and a more gradual incline. The pipes used are made of light weight plastic and can be buried at a relatively shallow depth. Manholes are not required for small diameter gravity systems; instead, clean out ports are used to service collector pipes. When it is necessary for the flow to be directed upwards, effluent pumps can be utilized to move the wastewater to higher elevations. High water alarms are normally installed in the septic tanks to alert property owners of any potential problems with their part of the system. Depending on the size of the system, one to two persons can be employed on a part-time basis to handle operation and maintenance, although at least one person should be on call at all times. The only additional maintenance requirement is the periodic pump-out of the septic tanks, which is usually done every three to five years by a contractor hired by the community.



### **Pressure Sewers**

There are two kinds of pressure sewer systems, based upon the type of pump used to provide the pressure. Systems that use a septic tank effluent pump combination are referred to as STEP pressure sewers. Like the small diameter gravity system, STEP pressure sewers utilize septic tanks to settle out the solids; this allows for the use of piping that is extremely narrow in diameter. The effluent pump delivers the wastewater to the sewer pipes and provides the necessary pressure to move it through the system.

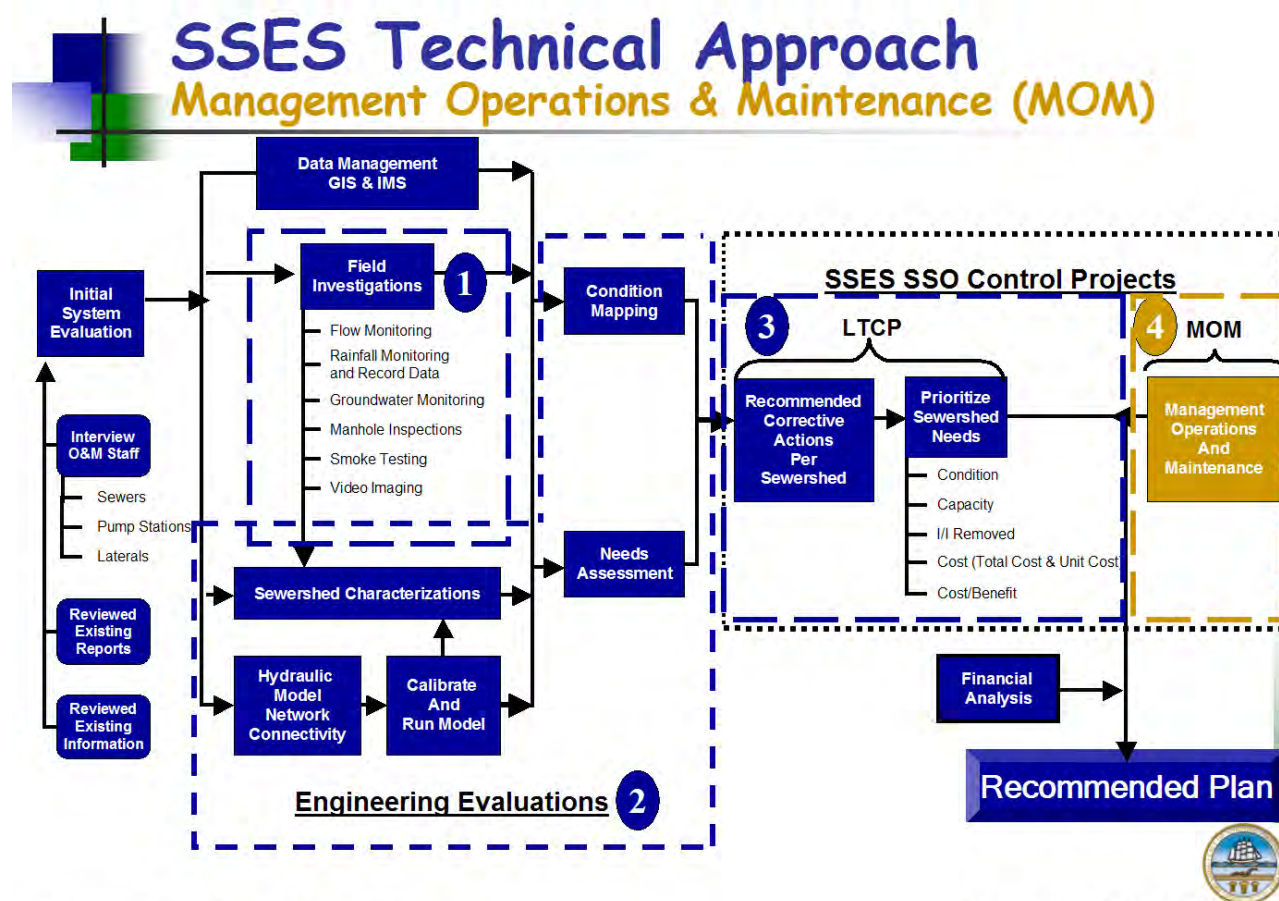
The other type of pressure sewer uses a grinder pump. Wastewater from each property goes to a tank containing a pump with grinder blades that shred the solids into tiny particles. Both solids and liquids are then pumped into the sewer system. Because the effluent contains a mixture of solids as well as liquids, the diameter of the pipes must be slightly larger. However, grinder pumps eliminate the need to periodically pump the septic tanks for all the properties connected to the system. Both the STEP and grinder systems are installed with high water alarms. Because of the addition of the pumps, pressure sewers tend to require more operation and maintenance than small diameter gravity sewers. Operators can usually be hired on a part time basis, as long as someone is on call at all times. Operators will need training on both the plumbing and electrical aspects of the system.

### **Vacuum Sewers**

Wastewater from one or more homes flows by gravity to a holding tank known as the valve pit. When the wastewater level reaches a certain level, sensors within the holding tank open a vacuum valve that allows the contents of the tank to be sucked into the network of collection piping. There are no manholes with a vacuum system; instead, access can be obtained at each valve pit. The vacuum or draw within the system is created at a vacuum station. Vacuum stations are small buildings that house a large storage tank and a system of vacuum pumps.

The maintenance and operation of this system requires a full-time system operator with the necessary training. This can make the operation and maintenance costs of vacuum sewers exceed those of other systems.

# SSES Technical Approach Flow Chart



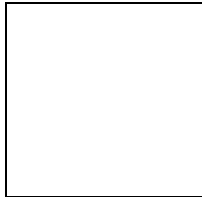
GREELEY AND HANSEN LLC

Says the City of Norfolk, "Our Program Works!"

City of Norfolk, Virginia

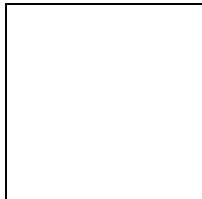
# Rehabilitation Resources

## Nassco Publications



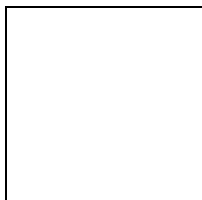
### Manual of Practices

A hands on informative tool full of facts, tables, illustrations, and formulas for CCTV inspection, testing methods, asset management and modeling.



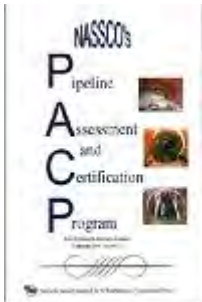
### Inspector's Handbook

Designed to educate and assist inspectors in all phases of sewer rehabilitation.



### Specification Guidelines-11.0.10/03

This CD contains sample specifications and information on pipeline installation and rehabilitation, provided by NASSCO Members.



### PACP Reference Manual

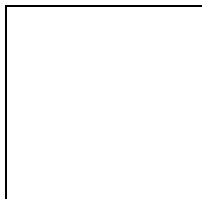
Created to provide standardization and consistency in pipe evaluation, NASSCO's PACP is a comprehensive and reliable reservoir of data to describe the sewer pipe that can be used in prioritization, planning and renovation of wastewater collection systems.

PACP Manual is available in conjunction with a training course.



### RehabZone

A great introduction to rehabilitation.

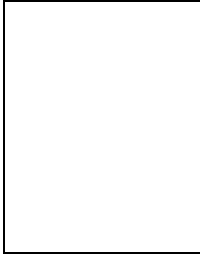


### SRM

Based on Research and Development spanning 20 years.

- Rehab Planning
  - Survey Techniques

- Hydraulic Performance
  - Maintenance Planning
  - Cost Effective Analysis
  - Structural Performance
- Sewer Renovation
  - Structural Design Methods



#### **MSCC**

This document was largely drafted by WRc and it outlined an agreed format and a set of nationally agreed codes covering the internal condition of a sewer.

# Sewer Rehabilitation

[http://www.wef.org/pdffiles/Sewer\\_Rehab\\_Section.pdf](http://www.wef.org/pdffiles/Sewer_Rehab_Section.pdf)

Sewer rehabilitation options have mushroomed over the years. Besides the traditional cut-and-cover pipe replacement, new methods and procedures are put into practice everyday, giving water and wastewater utilities much to consider. Because complete system replacement rarely is financially viable, many communities are taking the rehabilitation path when

## Cut-and-Cover

The traditional sewer replacement method, cut-and-cover involves replacing portions of old pipes with new pipes. It is one of the only ways to correct sags and humps in the pipeline due to differential soil settlement or seismic activity. However, cut-and-cover replacement be very disruptive at the surface because utilities in the vicinity of the lines need to be protected, traffic needs to be controlled around the construction, and costs of cut-and-cover replacement are equal to new sewer construction.

## Pipe Bursting

Trenchless pipe replacement , allowing pipe replacement without having to remove existing pipes, involves inserting a cone-shaped bursting tool into the existing pipe, pulling it through the host pipe using a static pull cable or actuated tool, and breaking the pipe as the tool moves forward. In the static cable version, a pull cable is strung through the pipe and connected at the other end to a winch or backhoe, which pulls the cable (and bursting tool) through the pipe. In the actuated tool version, a pneumatically driven hammer mechanism pounds the tool through the pipe while a cable winch pulls the tool lightly to keep it stable. Afterward a length of replacement pipe is assembled by butt-welds above ground to the appropriate length, attached to the bursting tool, and then pulled into the newly fractured host pipe, thereby replacing it. Laterals are reconnected in a separate operation so the new pipe can “relax,” or contract to a stable length after being stretched. Generally, pipe bursting works best with clay, cast-iron, or un-reinforced concrete sewers and in clay and silt soils.

## Pipe Lining

Pipe lining is another method in which the existing pipe does not have to be removed. This procedure involves inserting a liner into the existing pipe, which renews the interior surface and can increase the structural capacity of the old pipeline. There are three basic types of lining options: thermoplastic (fold-and-form) liners, thermoset (cure-in-place) liners, or slip liners.

- **Thermoplastic (fold-and-form) liners:**

Thermoplastic polyvinyl chloride (PVC) or HDPE liners have been deformed to fit easily within an existing pipe. The liner is heated with hot water or steam to soften it and then is inserted into the sewer through a manhole. Once the liner is in place, heat and pressure are applied to mold the material to the pipe's round shape. Once in place, the liner then is cooled to retain its shape, fitting snugly inside the pipe without adhering to the surface, so they can be replaced easily, if necessary.

- **Thermoset (cure-in-place) liners:**

Thermoset liners are cloth-like fiber shells filled with thermosetting resin, usually a polyester. Liner installation is a three-step process, beginning with “wetting out,” in which resin is applied to the inside of the fiber shell liner tube and forced to go deep within the cloth fibers. Then the liner is placed into the pipe via a manhole (after flow has been bypassed elsewhere). Next, the material is filled with water to invert the tube into the pipeline and curing begins. Curing the pipe involves heating the water used in the second step and circulating it in the pipe for a certain period of time (depending on the size of the repair). When this step is complete, the liner is mechanically bonded to the interior of the existing pipe. The cured liner is very rigid and corrosion-resistant.

- **Slip liners:**

Slip lining involves inserting a new pipe into an old pipe through an insertion pit. This process may or may not require flow bypassing. The process leaves an annular space between the host pipe and liner, which can be sealed at the ends or filled with grout along the length. Slip lining is not as flexible as other pipe lining options and cannot negotiate curves or offsets. However, this lining is a good option for many

replacement problems. Pipe liners can eliminate the need for excavation and as a result, the installation costs can be 50% to 80% of cut-and-cover replacement.

### **Point Repairs**

Often, a sewer problem is limited to one or two areas, so point repairs are more economical than a total pipe replacement. Many point repairs do not require excavation, and the method (cut-and-cover replacement of short segments, internal repair fittings, or chemical grouting) depends on the nature of the defect.

- **Mechanical method:**

This method involves a sheet-metal sleeve that is placed over the repair area and expanded into place. The sleeve has locking tabs to prevent collapse once installed, and the portion of the sleeve in contact with the pipe is often coated with a hydrophilic chemical to seal leaks.

- **Cure-in-place method:**

The cure-in-place method involves an ambient temperature-cured resin, much like the cure-in-place liners. A clamp is placed over the repair and expanded into place with an air-filled bladder, which is left in place for a certain amount of time to allow the resin to cure.

- **Chemical grout**

Chemical Grout is usually made up of hydrophilic polymers that are injected into cracks and leaking joints. Specially designed remote-control devices, called packers, force the grout into the crack or joint.

### **Choosing a Rehab Method**

With so many possible problems in a variety of areas along the sewer line, Gary Beck, P.E., a senior associate and director of the Infrastructure Services Group at George Butler Associates Inc. (Lenexa, Kan.), suggests the following as a guide to choosing the right rehab method.

- **Busy intersection:**

The top choices for problems in this area, Beck said, are cured-in-place piping (CIPP) and lining (trenchless is the first option to reduce surface disruption). CIPP is recommended and will contour to the opening it is inserted into. However, this would not be a viable option if the pipeline is collapsed more than 20% of its length.

- **Disintegrated pipes:**

For disintegrated pipes, pipe bursting is suggested to re-establish the cross-sectional area of the sewer. However, open cut may be necessary if pipe bursting rods can't be used.

- **Small pipes:**

CIPP, fold and form, and pipe busting are the most common solutions because unit costs are reasonable compared to open cut.

- **Large pipes.**

When dealing with large pipes, CIPP, lining, shotcrete, and total replacement are the most common rehab methods. Such pipes typically fail because of corrosion or collapse, which is best dealt with by lining and/or coating with corrosion-resistant materials. Also, by the time a large-diameter sewer needs repair, it often has become undersized for the service area and will need to be replaced with larger pipe.

Sometimes cost-effective rehab solutions are not an option. For example, open cut might be more cost effective for shallow sewers and total replacement is best for pipes with sags and alignment problems. Generally most utilities would rather go trenchless, if possible, to minimize the disruption to customers. When surface conditions make pipe replacement by open excavation expensive, or when the sewer has capacity at its current size, these are ideal applications for sewer rehabilitation. Rehabilitation also is good for sewer lines that still have good oval shapes or good alignment, but need repair because of cracks, breaks, and roots.

## Chart of Additional Compliance Resources

### **Useful Compliance Assistance Resources**

**Office of Enforcement and Compliance Assurance:**  
<http://www.epa.gov/compliance>

**Office of Water:**  
<http://www.epa.gov/npdes/sso>

**Local Government Environmental Assistance Network:**  
<http://www.lgean.org>

**National Small Flows Clearinghouse (aids small communities with wastewater problems):**  
<http://www.nesc.wvu.edu/nsfc>

**Region 4 POTW Management, Operation and Maintenance Program (MOM):**  
<http://www.epa.gov/region04/water/wpeb/momproject/index.html>

**National Compliance Assistance Clearinghouse:**  
<http://www.epa.gov/clearinghouse>

**Compliance Assistance Centers:**  
<http://www.assistancecenters.net>

**Small Business Gateway:**  
<http://www.epa.gov/smallbusiness>

**EPA's Audit Policy:**  
<http://oeaftp.sdc-moses.com/compliance/incentives/auditing/auditpolicy.html>

**APPENDIX D:**  
**FUNDING AND OPERATING BUDGET**



## **Forecast**

The Township will continue to plan to repair and maintain the sanitary sewer system in their yearly budget under the “Pump Station Maintenance / Repair” and the “Sewer Line Maint. & Repairs” line items in the budget. All major construction projects, including those which rehabilitate the pipes noted as a priority from routine televising will continue to be budgeted under the “Capital Improvement” line item. The budget for 2013 currently has \$50,000.00 dedicated to regular maintenance of the 10 pump stations and the sewer lines. Typically, the Township increases the yearly budget approximately 2-5% per year to account for inflation.

## EXPENDITURES and REVENUES

[illegible]

## EXPENDITURES and REVENUES

[illegible]

**2013 KENNEDY TOWNSHIP SEWER FUND  
EXPENDITURES and REVENUES**

<b>KENNEDY TOWNSHIP SEWER FUND</b>				
<b>2013 PROPOSED BUDGET REVENUES</b>				
<b>Estimated Balance as of 12/31/12</b>		<b>\$ 3,175,660.00</b>		
	Sewer Rental Fees	\$ 1,300,000.00		
	Sewer Tap-in Fees	\$ 160,000.00		
	Checks Redeposited	\$ 5,000.00		
	Miscellaneous Refunds	\$ 100,000.00		
	Sewer Liens/Claims	\$ 50,000.00		
	Interest - Money Market Account	\$ 10,000.00		
	Sales & Use Tax Check (RAD) Ref	\$ 100,000.00		
	Stormwater Retention	\$ -		
	<b>Sub-total</b>	<b>\$ 1,725,000.00</b>		
<b>TOTAL PROPOSED CASH BALANCE &amp; RECEIP</b>		<b>\$ 4,900,660.00</b>		

**APPENDIX E:**

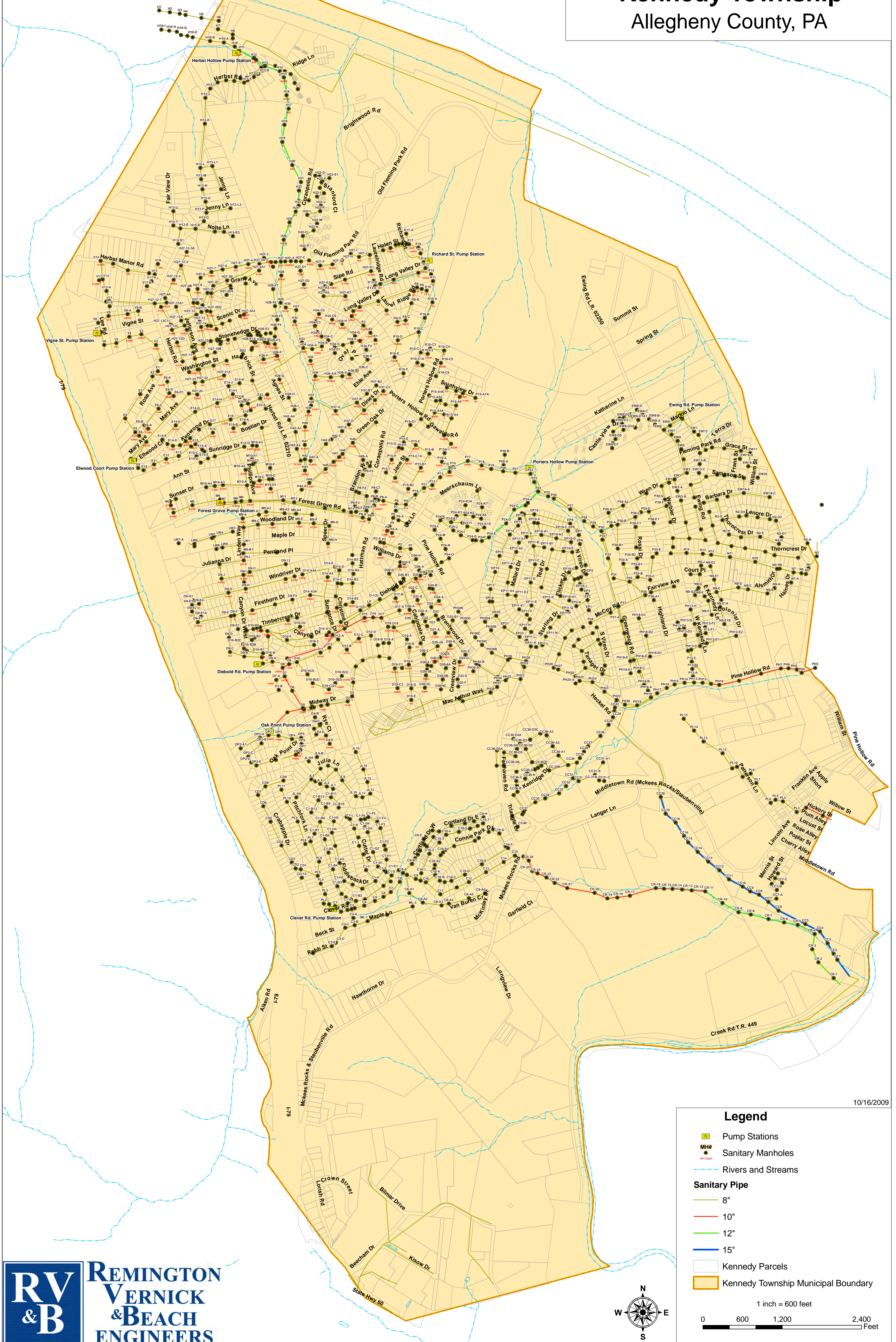
**TOWNSHIP SEWER MAP**



# Sanitary Sewer System




## Kennedy Township

Allegheny County, PA



10/16/2009

### Legend

-  Pump Stations
-  Sanitary Manholes
-  Rivers and Streams

### Sanitary Pipe

- 8"  
10"  
12"

-  Kennedy Parcels
-  Kennedy Township Municipal Boundary

1 inch = 600 feet

