Handbook on Wastewater Management for Local Representatives

Developed by the New York State Department of Environmental Conservation, the US EPA Region 2, Environmental Finance Center at Syracuse University, and the New York Water Environment Association

February 2007

Handbook on Wastewater Management for Local Representatives

Produced under a cooperative agreement between –

NYWEA

NYS DEC

Environmental Finance Center
Syracuse University

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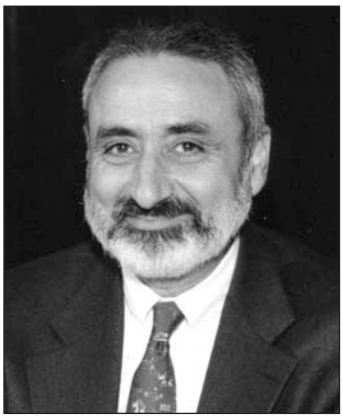
Introduction

Local officials play an integral part in the administration of wastewater treatment plants within their communities. Wastewater treatment plants are a critical capital asset and as a local official it is your responsibility to understand the operations and management procedures associated with it. As public managers, local officials need the skills and tools to address problems that may arise at their community's plants. Because wastewater may impede public health or the environment within a community, it is important that elected officials familiarize themselves with basic terminology and responsibilities relating to wastewater treatment plants.

This handbook is designed to be a reference tool for local officials, public administrators, and managers. In addition to the basic treatment operations, this handbook will discuss the strategies to ensure compliance, funding, adequate training, and public education. This reference will also help public officials familiarize themselves with financial management tools, loan and grant assistance, as well as learn about capital improvement planning to enhance long term economic viability.

The handbook is broken into different sections. Each section discusses important topics and subject matters that will provide public officials with the basic information needed to understand how wastewater treatment plants operate. There are additional resources located at the end of each chapter for those who would like to learn more. In the appendices, topics such Advanced Evaluation Techniques, including the time value of money, are discussed in more detail, as well as sample forms for reporting and gathering information to properly manage their wastewater systems. In addition, this handbook has a comprehensive glossary of terms and glossary of financial terms.



Dedication

We dedicate this handbook to N.G. Kaul who passed away on February 25, 2004. He had 27 years of service with the NYSDEC and retired as the former Director of the Division of Water. Well known for his management and engineering skills, he is most fondly remembered for his people skills. He was a strong leader for environmental protection and the mission of protecting public health. Recognizing the critical role that wastewater treatment plays, N.G. was an avid supporter of operators and the need for ongoing training. He worked to assure that funding and support were available to maintain high standards in the wastewater profession.

Acknowledgements

The Handbook on Wastewater Management for Local Representatives was produced under a cooperative agreement between the EPA Region 2 Environmental Finance Center (EFC) at the Maxwell School of Syracuse University, the New York State Department of Environmental Conservation (NYSDEC), and the New York Water Environment Association (NYWEA).

The sections in each chapter were drafted by a number of authors from various public, private and non-profit agencies, and many chapters were adapted from the Maryland Center for Environmental Training publication, *Drinking Water and Wastewater Handbook for Local Officials.* We would like to extend our gratitude to the Maryland Center for Environmental Training (MCET) of the College of Southern Maryland as their manual was a major resource for the material produced in this handbook and we would like to recognize their commitment to environmental stewardship.

The EFC would like to thank Phil Smith from the NYSDEC and Patricia Cerro-Reehil from NYWEA for their contributions to this project and unwavering dedication to achieve success. Additionally, we would like to thank Keneck Skibinski, NYWEA Past President and Chief Operator for the Herkimer County Sewer District, for his major contributions to the technical and administrative sections of this handbook.

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We would also like to thank Doug Zamelis from the law offices of Green & Seifter, PLLC for his contribution to the legal and regulatory overview section. We would like to thank Lori Burkhammer from the Water Environment Federation for her contribution to the public relations chapter. We would also like to thank Philip Tiewater from GHG, LLC for his contribution on capital improvement planning.

We would also like to thank the EPA Environmental Financial Advisory Board and the Environmental Finance Center Network as referenced in the Glossary of Financial Terms from the *Guidebook of Financial Tools: Paying for Sustainable Environmental Systems* (April 1999 revision).

The chapters were compiled by the staff from the Environmental Finance Center at the Maxwell School under the direction of Amy Santos and with the assistance of Jessica Kemler. Overall, Amy did an excellent job with the development of the handbook. Thanks also to Anne Sabach, Sabach Design, for the photo and graphics work.

To obtain copies of the handbook, contact the:

NYSDEC
Facility Operations Assistance Section
625 Broadway
Albany, NY 12233-3506
Phone: 518-402-8089
Fax: 518-402-8082

Table of Contents

Ten Steps to Protect and Maintain Your Wastewater Utility

1 **Compliance, compliance, compliance!**

Make sure you are in compliance with the State Pollution Discharge Elimination System (SPDES) Permit requirements. Get a copy of 6 NYCRR Part 750 to the Sewer Board Chair and Chief Operator!

See Chapter 4 for more information on regulatory compliance issues.

2 **Re-visit your sewer rates.**

On a regular basis, at least annually, review your usage fees and determine if you are implementing full cost pricing. Forecast realistic operational and maintenance expenses and include funds for a sewer department capital reserve and debt service. Financial sustainability is the key!

See Chapter 2 for more information about Sustainable Financing.

3 **Build a strong case for rate increases!**

Do your homework and communicate with your operator to determine necessary wastewater infrastructure improvements. Educate the public about the critical service a wastewater treatment plant provides by protecting public health and preserving the environment for future generations.

See Chapter 5 for more information about Public Relations.

4 **Establish an equipment replacement schedule.**

Clearly identify what equipment will need to be replaced and when, and be sure to include major repairs and improvements – like a new roof!

See Chapter 1 for more information about maintenance and Chapter 2 for more information about Capital Improvement Planning.

5 **Establish a reserve fund – and don't rob the cookie jar!**

Federal funding is shrinking, undercapitalization is a reality, and yet, many wastewater treatment systems and equipment are beyond their useful lives. You can adopt an "ostrich mentality" or be a visionary and avoid the pitfall of satisfying short-term priorities by dipping into the reserve fund to cover routine operational expenses.

See Chapter 2 for more information about Sustainable Financing and Chapter 3 for more information about state and federal funding options.

6 **Address maintenance backlogs.**

Find out if your plant is suffering from a maintenance backlog and work with your operator to determine a course of corrective action. What will it take to get to the point we can start thinking "preventive"?

See Chapter 1 for more information on operations and maintenance.

7 **Operators need ongoing training.**

Don't "nickel and dime" the staff that are your frontline defenders of public health and protectors of a huge capital investment. NYSDEC regulations mandate continuous training.

See Chapter 1 for more information on personnel management and training needs.

8 **Stop robbing Peter to pay Paul!**

Is a politically correct sewer budget and stagnant rates causing you to subsidize the plant from the General Fund?

See Chapter 2 for more information about Sustainable Financing.

9 **Avoid the NIMT (Not In My Term) syndrome or mentality.**

Your constituents are looking to you to make things happen, demonstrate leadership, and get results. Public health and environmental quality are important issues to everybody! A well operated, properly maintained and fiscally sound wastewater system provides the foundation for sustainable development and community growth.

See Chapter 5 for more information about Public Relations.

10 **Visit the wastewater plant!**

Know your operators, and familiarize yourself with the basic operations of the plant.

See Chapter 1 for more information about plant operations.

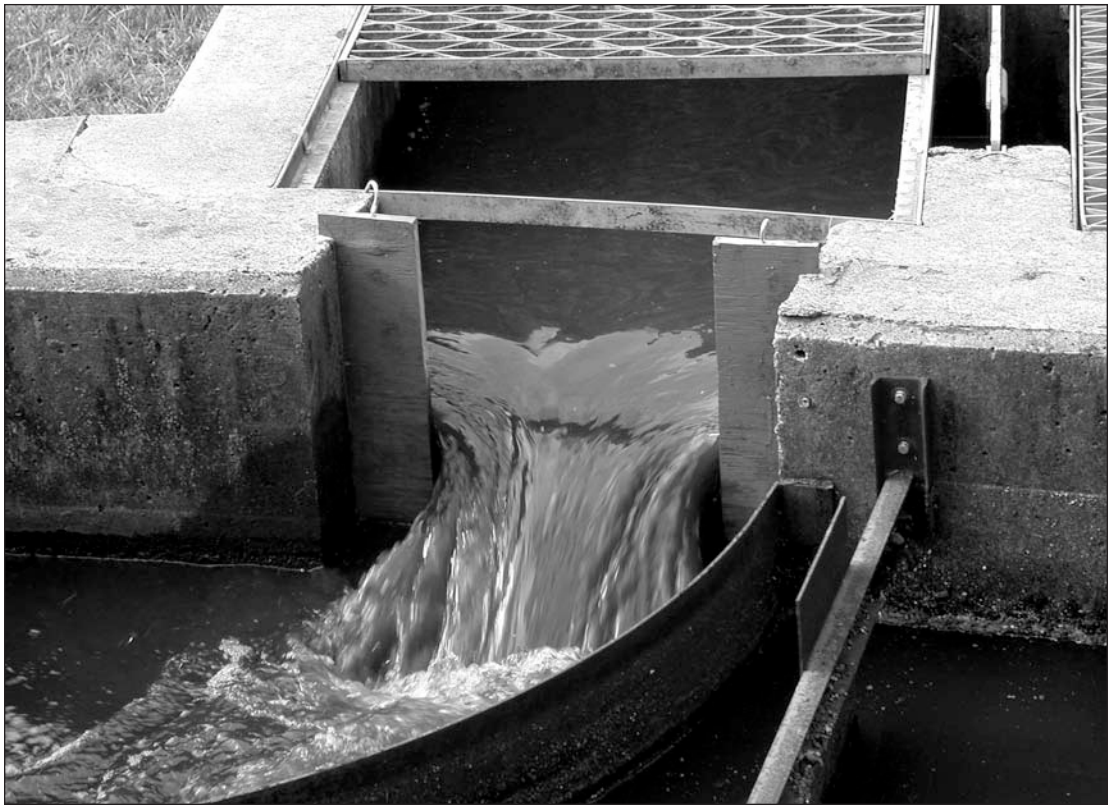
Communication, commitment, involvement and support are the key factors to successful wastewater management. Get started today!

Learn more about the "Ten Steps" at the next Panel on Wastewater for Local Representatives.

Contact the NYWEA at 315-422-7811.

Chapter 1 Contents:
Introduction to Wastewater Management

Wastewater plants protect public health and protect the environment.



Chapter 1 Introduction to Wastewater Management

Wastewater 101

Overview

The section provides an overview of wastewater treatment and is intended to provide a brief description of what processes may be at your wastewater plant. Although each plant is designed for particular conditions, there are many similarities in how different processes operate. There may be differences between your plant and a neighboring plant in terms of size, ground area, shape of tanks (circular or rectangular), or the types of treatment processes they use.

What is wastewater?

Wastewater or sewage is the byproduct of many uses of water. There are the household uses such as showering, dishwashing, laundry and, of course, flushing the toilet. Additionally, companies use water for many purposes including processes, products, and cleaning or rinsing of parts. After the water has been used, it enters the wastewater stream, and it flows to the wastewater treatment plant. When people visit a treatment plant for the first time, often it is not what they perceived it would be. These wastewater plants are complex facilities and provide a high quality product.

Why treat wastewater?

We need to remove the wastewater pollutants to protect the environment and protect public health. When water is used by our society, the water becomes contaminated with pollutants. If left untreated, these pollutants would negatively affect our water environment. For example, organic matter can cause oxygen depletion in lakes, rivers, and streams. This biological decomposition of organics could result in fish kills and/or foul odors. Waterborne diseases are also eliminated through proper wastewater treatment. Additionally, there are many pollutants that could exhibit toxic effects on aquatic life and the public.

How do we collect the wastewater?

The sewer or collection system is designed so that it flows to a centralized treatment location. The collection system is comprised of smaller sewers with a diameter of about four inches. As more homes and companies are connected along the system, the pipes become larger in diameter. Where gravity systems are not practical, pumping stations are often included to lift the wastewater.

In New York State and in many other states, there are some very old collection systems. Some sewer piping was actually installed in the late 1800's! Materials of construction and methods of construction have changed significantly over the years. Many systems experience problems during wet weather periods with inflow and infiltration. This is commonly referred to as "I&I." Wet weather operating periods typically occur when the snow melts in the spring and/or during heavy rainstorms. Water resulting from snowmelt or storms should flow into a storm water system and not into the sanitary sewer system. Unfortunately, this isn't always the case.

Groundwater infiltration makes efficient treatment difficult.

What is Inflow & Infiltration (I&I)?

Inflow is water from a sump pump or a roof leader. This is relatively clean water that should be discharged to a storm water system. In some cases, homeowners in low lying areas connect sump pumps (illegally) to the sewer because it is relatively easy and inexpensive. In many communities, there are "combined sewers" that carry street runoff, as well as wastewater.

Infiltration is water from high groundwater levels. Older sewer pipes may have leaking joints or cracks that allows the water to enter the system. Infiltration usually occurs in the spring when melting snow and rain saturate the ground.

Excessive I&I can lead to Combined Sewer Overflow (CSO) and Sanitary Sewer Overflow (SSO) points in a collection system. If you have CSOs or SSOs, the NYSDEC is probably talking to you about it!

What happens after collection of the wastewater?

The wastewater continues to flow through the collection system and eventually reaches the wastewater treatment plant. Upon reaching the plant, the flow first encounters preliminary treatment. Preliminary treatment is followed by primary treatment, then secondary treatment, and perhaps advanced or tertiary treatment. The solids or "sludge" removed from the wastewater stream also needs to be treated.

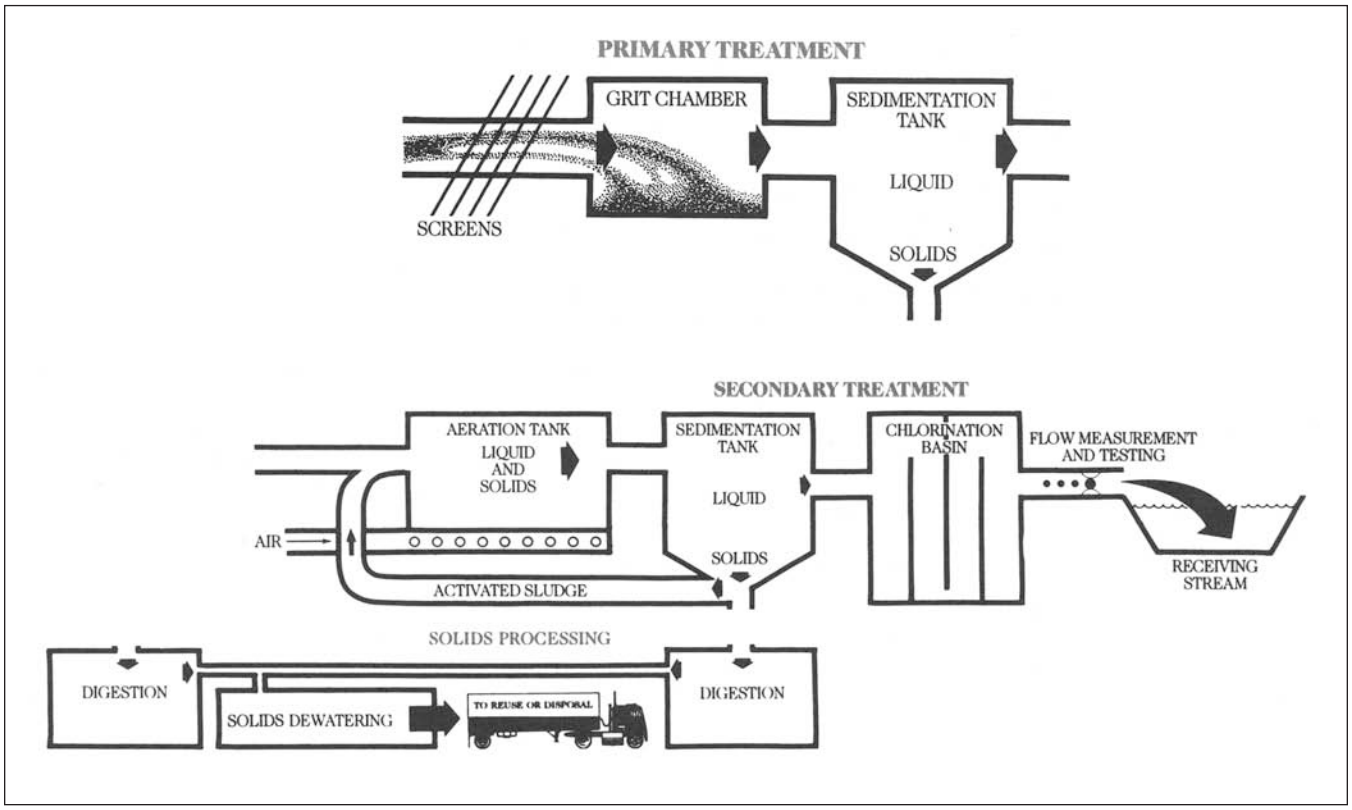


Diagram of Wastewater Treatment Processes
From *Clean Water For Today: What is Wastewater Treatment?* Water Environment Federation

What is Preliminary Treatment?

Preliminary treatment processes are the first processes that the wastewater encounters. This typically involves flow measurement so that the operator can quantify how much wastewater is being treated. Flow monitoring is commonly followed by screenings removal. Screenings are string like materials and large foreign objects like sticks or perhaps an errant golf ball. These materials need to be removed because they can damage machinery or clog processes. Screenings can be removed using bar screens and other devices designed for this purpose.

The next process in preliminary treatment is grit removal. Grit is comprised of inorganic material such as sand, gravel, eggshells, etc. It is desirable to remove grit to prevent wear and abrasion on pumps and other mechanical equipment. Grit can also plug lines and pipes. In this influent area, sampling equipment is often used to collect small portions of the wastewater for analysis. Sampling enables the operator to determine the pollutant loadings entering the plant (influent).

Preliminary treatment commonly includes raw sewage pumps. Screening and grit removal are important to the proper operation of the raw sewage pumps. These materials will cause clogging and cause wear on the internal parts. These raw sewage pumps deliver the flow to the next phase of treatment: Primary Treatment.

What is Primary Treatment?

Primary treatment is a physical settling process that removes solids. Wastewater that enters the primary settling tank (or clarifier) is slowed down to enable the heavier solids to settle to the bottom. Lighter materials, such as grease, will float to the top of the tank. Settling tanks are designed with mechanisms to remove both the settled solids, as well as the floating solids. Primary clarifiers are either circular or rectangular. Both types work equally well when properly designed and maintained. Not all plants have primary treatment.

Primary treatment generates primary sludge. The sludge is removed and pumped to the solids treatment process for ultimate removal.

What's left after we remove the pollutants that settle and float? The wastewater still has solids remaining after primary treatment. These solids are either dissolved or suspended. Dissolved solids are very small solids (e.g., dissolving sugar in water). You cannot see the solids but they are there. Suspended solids can be likened to the same ends of a magnet. The solids repel each other. These solids are small, but are visible to the human eye. We remove these dissolved and suspended solids through the next phase of treatment: Secondary Treatment.

Above and at right: Rotating biological contactors (Secondary Treatment)

Intermittent sand filter (Secondary Treatment)

What is Secondary Treatment?

Secondary treatment is a biological treatment process used to stabilize the dissolved solids. Microorganisms (e.g., bacteria) feed on the organic solids (food) in the wastewater and convert the organics into a cellular or biological mass that can later be removed. These biological processes are aerobic processes. Oxygen must be provided for these aerobic organisms to work properly and efficiently.

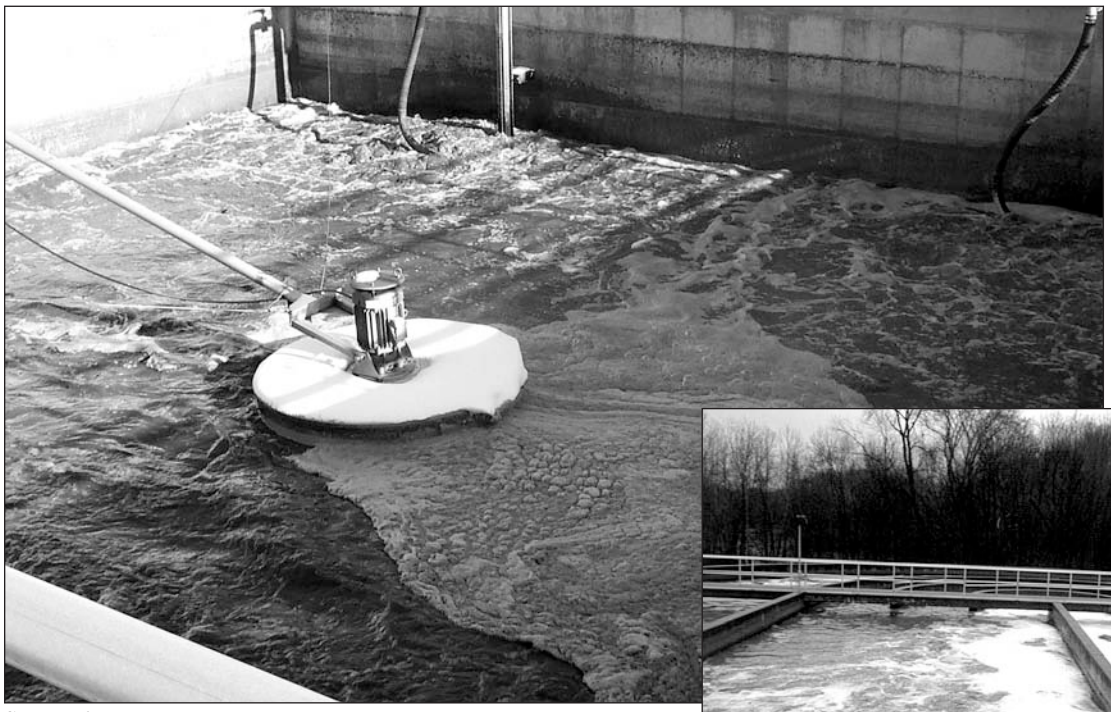
An integral part of secondary treatment processes is another set of settling tanks or clarifiers. These secondary clarifiers (final clarifiers) remove the biological mass that has grown during biological treatment.

There are many different kinds of secondary processes that can be employed. A very common secondary process is known as activated sludge. In activated sludge treatment, the wastewater is mixed with organisms that are returned from the secondary clarifiers. There is a continuous return of organisms from the secondary clarifiers. This is called return sludge or return activated sludge. Oxygen is provided in the aeration tank either by blowers and diffusers or by a mechanical mixing process.

A variation of the activated sludge process that is becoming more popular is known as Sequential Batch Reactors (SBR's). This process differs from the more conventional activated sludge systems in that it also uses the aeration tank as a settling tank. This is accomplished by turning off the air to the diffusers or the mixers and allowing the solids to separate from the wastewater. During this settling period, the flow is diverted into a second SBR tank for continuous treatment. Advantages of this SBR process include a relatively small footprint and the capability of removing nutrients (both nitrogen and phosphorus).

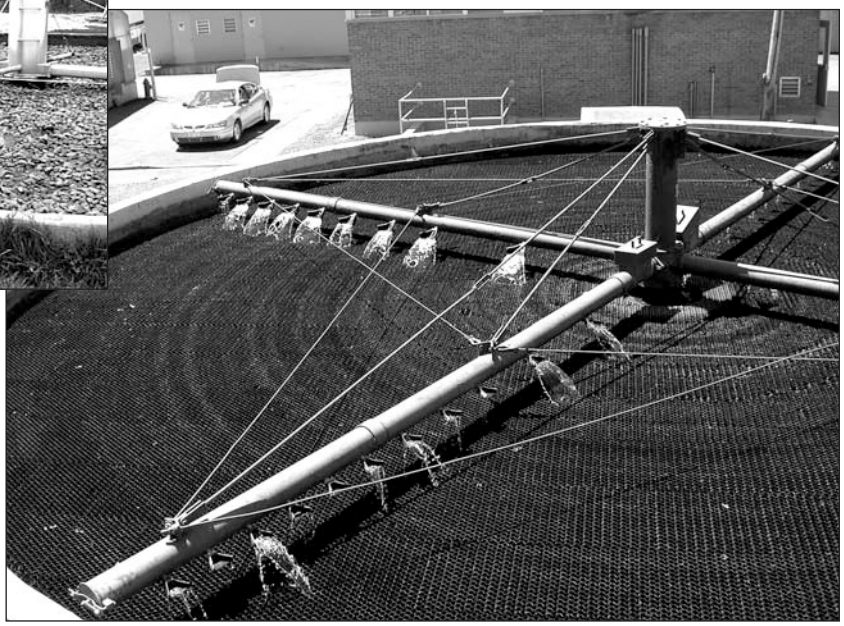
Lagoon systems are also a form of biological or secondary treatment. These lagoons systems are used where there is a lot of land available and/or the wastewater flows (quantities) are low. Lagoons are constructed with lined earthen bottoms and are less expensive to construct than are activated sludge processes that use concrete tanks. Limitations of lagoons may include excessive algae growth (solids violations) and poor performance in the winter.

Common Secondary Treatment Processes



Sequential batch reactor

Activated sludge



Fixed film and old trickling filter stone, above, are sometimes replaced with more efficient plastic media, right.

Aerated lagoons are secondary treatment processes.

Another type of secondary treatment is known as fixed film processes. Fixed film processes consist of two types: Trickling Filters or Rotating Biological Contactors (RBC's). Trickling filters are sometimes called Bio Towers. Trickling filters are beds with a synthetic material (media). An under-drain system and a rotary distribution system apply the wastewater to the media. The microorganisms grow attached to the rocks or synthetic media as opposed to liquid suspension in the activated sludge. A circular rotary distributor moves over the media bed and the wastewater is trickled onto the media. As the wastewater flows over the media, it comes into contact with the microorganisms and picks up oxygen. When the biological growth becomes too thick, it falls off the media and flows with the wastewater to a secondary settling tank for removal. Many trickling filter plants that originally were designed with rock media have changed to the more efficient plastic media.

The RBC is similar to the trickling filter in that it uses an attached biological growth. An RBC has panels that are circular and mounted to a shaft. The wastewater flows into a basin beneath the media and the media rotates with the shaft. The microorganisms are contacted with the wastewater. Since the RBC's expose the media to the air, oxygen is picked up and transferred into the growth. RBCs have low energy requirements. These systems need to be protected from cold weather by a building.

Intermittent sand filters are employed in some smaller applications. As wastewater passes through the filter bed, solids are removed. Microorganisms grow in the removed solids layer and provide biological treatment of the wastewater as it flows through the sand bed. The sand will need to be replaced at some point in time. Additionally, these sand filter systems generally perform poorly in the winter.

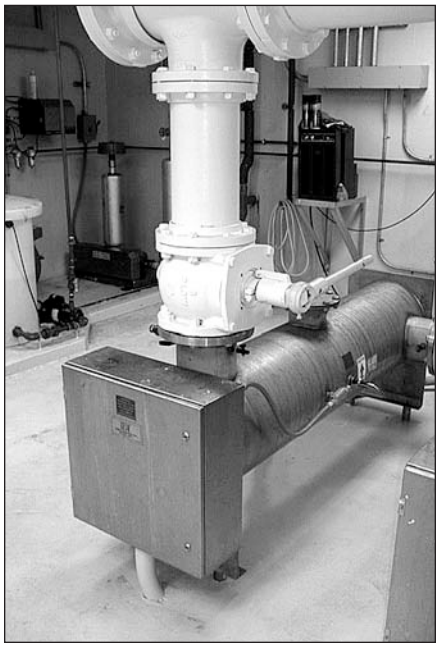
All of the secondary treatment processes produce biosolids. These biosolids are pumped to the solids treatment system for further processing.

What comes after Secondary Treatment?

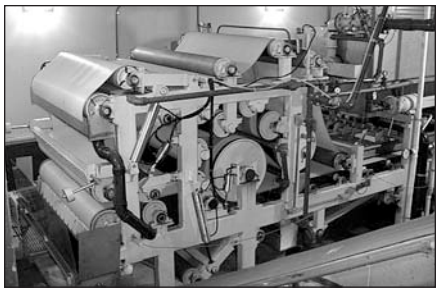
In many plants, the next process is called disinfection. Disinfection means the inactivation of disease-causing organisms. It is sometimes confused with sterilization which means the killing of all organisms. In disinfection, the wastewater following secondary treatment is usually treated in one of two ways: (1) chlorination or (2) ultra-violet radiation.

Chlorination involves the use of chlorine, either in the form of a gas (less common today), or as a liquid (sodium hypochlorite). The chlorine oxidizes the microorganisms. The effectiveness of this process is monitored by testing the fecal coliform group. This indicator group of microorganisms are easy to grow in a laboratory and are tougher to kill than pathogens. Some chlorination systems also have dechlorination systems to remove any residual chlorine.

Ultraviolet (UV) disinfection systems contact the treated secondary wastewater with UV light bulbs that are encased in clear housings. The UV light kills pathogenic organisms by using a germicidal photochemical wavelength. Unlike chlorination, UV leaves no residual in the wastewater with which to be concerned. Plants that use UV must either have dual UV systems or have chlorination as a backup. Additionally, these UV systems are energy consumptive.



Many plants are switching from chlorination to UV disinfection.



A belt press is often used to dewater sludge.

What is Advanced Treatment?

Some treatment plants may be required to remove nutrients (nitrogen and phosphorus) due to the possible negative impacts on the receiving stream (e.g., ammonia toxicity to fish). Advanced treatment processes are used to remove nutrients, additional solids, and/or biochemical oxygen demand. Advance treatment provides a very high level of treatment that goes beyond secondary treatment. In the case of nitrogen removal, the processes are biological. For phosphorus removal, chemical additives are normally required.

Where do all the solids go?

Solids that settle out in the primary and secondary clarifiers are referred to as sludge. Sludge from biological treatment processes (e.g., activated sludge) are referred to as biosolids. Sludge is the byproduct of treating the liquid wastewater. Proper solids handling is of paramount importance. If sludge is not removed, problems will occur in other areas of the plant. Excess solids can also lead to SPDES Permit violations and odor problems. There are many different options available for solids handling. Local conditions usually dictate which option is best for your particular facility. General categories of sludge handling include digestion processes, hauling of liquid sludge to a larger treatment plant, thickening, dewatering by mechanical means (belt filter presses, centrifuges), incineration, land filling, and land application.

The Herkimer County Wastewater Plant is designed for 6.1 million gallons per day (mgd). Sludge is pumped to a gravity thickener, treated to reduce odors, and dewatered using a belt filter press. The dewatered solids are treated using dry lime for stabilization and loaded into a roll off container. A contractor takes the container and stores the solids. The sludge is later land applied on crop fields.

Sludge or 'biosolids' are the byproduct of wastewater treatment.

The City of Little Falls Wastewater Plant is a 5.0 mgd design and pumps the sludge to a gravity thickener. Solids are dewatered using a belt filter press and then incinerated. The remaining ash is landfilled.

The Village of Clinton Wastewater Plant is a 2.5 mgd design that gravity thickens the sludge before pumping into an anaerobic digester. In the past, solids removed from the digester were pumped to a drying bed and landfilled. The drying beds were troublesome due to weather dependency e.g. rain and winter. Solids from the anaerobic digesters now go to a belt filter press, and then to a landfill.

The Old Forge Wastewater Plant (0.45 mgd) pumps the sludge to an aerobic digester. When the digester approaches capacity, the solids are then treated with polymer and processed through a thickening device. The solids are stored in another aerated tank until it is time to call for a tank truck. A contractor hauls 6,000 gallons to the Watertown Wastewater Plant for further treatment and disposal.

In summary, there are many options available for sludge treatment and handling.

Where does the water go after treatment?

The treated wastewater is referred to as effluent. The effluent is discharged to a water body such as a lake, river, stream, or groundwater. Conditions contained in the State Pollutant Discharge Elimination System (SPDES) Permit are designed to minimize the impact that the effluent may have on the receiving stream. Small streams that have a classification of trout spawning or that are used downstream for drinking purposes have more stringent (tighter) permit limits than streams that discharge into a water body with a higher flow and/or sizeable tributaries.

Sand drying beds can be problematic, particularly with rainy conditions.

What are common wastewater terms?

In wastewater vernacular, there are acronyms for many processes. Some of the most common terms are listed below with a brief description. A more comprehensive glossary of wastewater terms begins on page 110.

Aerobic: A process that requires dissolved oxygen to operate properly. The microorganisms need the oxygen to "eat" the food properly.

Anaerobic: A process that can operate or needs to operate without oxygen being present. A good example is an anaerobic digester used for solids handling.

Biochemical Oxygen Demand (BOD_5): A test that measures the organic strength of a sample of wastewater. It provides information on the organic load or how much "food" there will be for organisms. The load can be either to a treatment plant unit or to a receiving water body.

Clarifier or settling tank: Tanks designed for the physical separation of wastewater floatable solids and settleable solids. These two terms are widely used interchangeably.

Disinfection: Killing disease-causing organisms, differing from sterilization, which kills all organisms.

Dissolved Oxygen (DO): A test usually performed by an electronic meter that measures the dissolved oxygen of a sample or process unit. It is important because many of the treatment processes require oxygen (aerobic) to operate properly. Too much oxygen can mean that money is wasted through excess energy consumption to provide the oxygen, which is relatively insoluble in water.

Effluent: Wastewater or other liquid, partially or completely treated, flowing from a reservoir, basin, treatment process, or treatment plant.

Influent: Wastewater or other liquid flowing into a reservoir, basin, or treatment plant.

Parts per million (ppm) or milligrams per liter (mg/L): These terms refer to the results of analyses such as TSS or BOD_5. These terms are used interchangeably and mean exactly the same thing.

Total Suspended Solids (TSS): Data from a test that measures by weight how much particulate material is contained in wastewater samples by filtering the sample through a special fiberglass filter. For example, TSS measures the solids that can be seen in a beaker.

Additional Resources

Biosolids Recycling: An Environmentally Sound Way to Put a Valuable Resource to Work for All of Us
Nature's Way: How Wastewater Treatment Works For You
Clean Water for Today: What is Wastewater Treatment?
Be in the Know, Go with the Flow!
All available from:

Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994
Phone: 703-684-2452
Fax: 703-684-2492
www.wef.org

Personnel Management

As stamped on the manhole cover above, communication is at the heart of good management.

Communities should consider personnel management as important as funding for equipment repair and replacement. Local officials must realize that an adequate, well-trained staff is necessary both to provide cost-effective Operations and Maintenance (O&M) of their facilities and to ensure compliance with all regulatory requirements.

This section will provide some guidelines to help local officials determine the necessary steps to develop the best possible staff.

Developing an Adequate Staffing Plan

Generally, staffing is the largest component of an O&M budget for a wastewater facility. For small communities, these costs comprise the main budget component. Local officials should not try to reduce O&M direct labor costs as a way of cutting budgets. For example, it may be that large amounts of overtime pay are being spent on existing staff. Hiring additional personnel may be a more cost-effective approach to spending personnel dollars. Another factor involved in determining staffing cost effectiveness is the use of outside contractors to perform certain O&M functions. A community might consider using contractors for functions such as major maintenance or overhaul.

Development of a staffing plan will not only ensure cost effectiveness, but will also help local officials meet their responsibility to ensure that wastewater facilities comply with state and federal regulations. Inadequate or poorly trained staff inevitably leads to non-compliance problems and potential fines. In addition to complying with appropriate regulations, local officials also have a responsibility to the citizens of their communities to provide uninterrupted utility service. Protection of the environment is the key consideration in the management of a utility system. An adequate staffing plan is essential to achieving that goal. Here are the steps for preparing a staffing plan:

1. Develop an organizational chart. It is important to have a clear organizational chart to determine how utilities need to be managed. The current trend is to separate water and wastewater utilities from other public works to improve performance, and to enable technical personnel to develop comprehensive expertise in their areas of responsibility. To effectively implement this organizational approach, local officials need adequate information about specific job responsibilities to then determine the number and type of personnel required.

   The product of this first step in developing a staffing plan is an organizational chart showing all lines of supervision and authority, all filled and unfilled positions, and an approximation of all needed, but as yet unauthorized positions.

2. Conduct a task analysis. A detailed task analysis will help determine how many workers are needed and the level of experience and expertise necessary for each wastewater facility job. Begin by identifying all O&M tasks that must be accomplished to ensure adequate performance by the facility. Include tasks that are currently being accomplished, as well as those that should be done but might not be due to lack of time, talent, or other resources. The task list should reflect all routine O&M tasks required for the entire year. Some tasks may be daily, while others might be performed weekly, monthly, or even yearly. To develop a comprehensive task list that truly reflects the needs of the facility, an experienced supervisor familiar with the facility should be involved at all stages of the task analysis.

   The product of this second step in developing a staffing plan is a comprehensive task list, organized by unit processes.

3. Determine staffing requirements. The next step is to review the task list and estimate the time each task normally requires. It is necessary to compute the total number of person-hours per task, per technical skill, per year required to provide adequate O&M of the facility. Once that number is determined, it may be divided by the total number of hours that each worker is available per year, taking into account vacations, holidays, etc. In this way it will be possible to derive a number that approximates the personnel hours needed to provide adequate O&M for the facilities in question.

   The product of this third step in developing a staffing plan is a break out of required staffing hours, by skill and by task.
4. Create job descriptions. Once the estimated number of staff hours is determined, the organizational chart should be appropriately modified and each staff member's responsibilities redefined. Detailed job descriptions for each position identified on the chart should be prepared or old job descriptions should be modified and updated. Remember to get input from the people actually doing the job. Job descriptions should include areas of responsibility, summaries of required tasks, subordinates supervised, and supervisors to whom reports are made.

   The product of this fourth step in developing a staffing plan is an updated set of written job descriptions.
5. Implement staffing changes. After approving the staffing changes recommended by steps 3 and 4, the O&M budget must be modified appropriately. In addition to follow-up budget monitoring relating to these staff changes, management should periodically assess them in terms of improved efficiency and performance of the utility's O&M.

   The product of this final step in developing a staffing plan is a new written staffing plan and corresponding budget.

Plant Coverage

Plant coverage guidelines call for enough time for the operators to collect, analyze, and record required samples. The plant should be manned by the Chief Operator or Assistant/Shift Operator a minimum of two (2) hours every day. Additionally, the Chief Operator should be on-site not less than 30 days per calendar quarter. Note that these are the minimum levels of coverage and NYSDEC's Regional Water Engineer may require more coverage depending upon plant size, the receiving water, permit limits, etc.

Certification and Training

The "Grades" of certification are divided into the following levels: 1, 2, 3, and 4. Grade 1 is the lowest level of certification and applies primarily to the smallest plants. Activated sludge plants have an "A" designation. A "Scoring System" is used to determine the required Grade of Chief and Assistant/Shift Operators.

Education requirements vary depending upon Grade. The minimum education required is High School Diploma or High School Equivalency. Classroom training also varies as a function of Grade. For a Grade 2A applicant, the following training is required:

Basic Operations Course (10 days)

Activated Sludge Course (5 days)

Laboratory Proficiency (5 days)

Grade 3/3A operators would also need the Supervision and Technical Operations Course (5 days). Grade 4/4A operators would go on to take the Management Course (4 days).

All applicants must have hands-on operating experience and must have his/her actual operating experience verified. Applications with the necessary documentation are filed with the NYSDEC Regional Offices or County Health Department where appropriate.

Ongoing training is required for certification renewal.

All certified wastewater operators are required to renew their certificates every five (5) years. Treatment technologies are changing and operators need to keep abreast with the latest operational approaches. Operators are required to attend seminars and obtain between 20 and 80 training contact hours. Failure to renew means that the certificate has expired and that the operator is not certified. If the Chief Operator's certificate has expired, he/she is not certified and the plant may not be under responsible supervision. In a well-run facility, good training will result in a substantial payback. Local officials need to vigorously support continuing education to comply with the regulations. Certified operators generally do a better job. Annual budgets should include line items for certification training (when appropriate) and for renewal training. Work plans and schedules should allow for time to attend training.

Regulations provide for the suspension and/or revocation of operator certificates if the operator was negligent, or practiced fraud or deceit in the performance of his/her duties. The operators are expected to keep up on maintenance and routine sludge removal. Local officials have to financially support these activities. Falsification of data and discharge monitoring reports is very serious and criminal.

All the certification requirements are described in 6NYCRR Part 650 – *Qualifications of Operators of Wastewater Treatment Plants* and in the *Wastewater Treatment Plant Operator (WWTPO) Manual*. For electronic copies of Part 650 and the WWTPO Manual, visit the following website:

http://www.dec.state.ny.us/website/dow/bwcp/opcert.html

For paper copies, contact NYSDEC's Facility Operations Assistance Section, 625 Broadway, Albany, NY 12233-3506 or call 518-402-8089.

Additional Training Needs

In addition to ensuring compliance with certification regulations, a comprehensive training program for wastewater operators will provide other significant benefits for a local government. A well-trained staff is essential for efficient utility O&M. Good training will result in a substantial payback over the years in terms of well-run facilities. Far-sighted local officials will make sure that O&M budgets provide adequate funds for staff to go to the best training available. This may mean sending staff to off-site training events, paying the cost of course registration as well as travel expenses, or having staff attend training programs during working hours and directing other personnel to fill in during that time.

Another training option is to contract on-site training customized to the individual wastewater facility. Not all training needed is technical in nature. Training programs relating to management, supervision, and other important skills, such as effective report writing and use of the computer, are also important in developing a more efficient and productive staff.

If the staff size is sufficiently large, it may be a good idea to designate a training coordinator. This individual can determine staff training needs and watch for appropriate training opportunities or courses. The training coordinator can schedule employees for off-site training, set up on-site training classes, and monitor the training budget. The coordinator should also evaluate the training programs and determine which ones are most effective in improving staff performance. The individual coordinating training should have some technical experience in water or wastewater treatment.

Training Sources

Many sources of training are available for operators of wastewater treatment facilities. Training will be available through the following organizations:

- State environmental training centers
- State regulatory agencies
- Operator associations
- Professional organizations such as the Water Environmental Federation, the American Water Works Association, and the Rural Water Association

In addition, a local government may contract training, including on-site programs, using operations and maintenance consultants, consulting engineers, or manufacturer's representatives.

Quality training opportunities are important for staff development. The best training is not necessarily the cheapest. It is up to local officials to work with their staff to ensure that training being considered develops a staff that can provide effective O&M of the water and wastewater facilities.

Additional Resources

Utility Management and Manage for Success – Effective Utility Leadership Practices
Office of Water Programs
California State University, Sacramento
6000 J Street
Sacramento, CA 95819
Phone: 916-278-6142
Fax: 916-278-5959
www.owp.csus.edu

Benchmarking Wastewater Operations, Collection, Treatment, and Biosolids Management – Final Report
Plant Manager's Handbook – MOP SM-4
The Popular Plant Manager – MOP SM-6
Utility Management Digest
All available from:
Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994
Phone: 703-684-1452
Fax: 703-684-2492
www.wef.org

A Supervisory Management Correspondence Course for the Water/Wastewater Field: Internet Version
Office of Executive Development Programs
Michigan State University
3535 Forest Road
Lansing, MI 48910
Phone: 800-356-5705
Fax: 517-353-0796

Training Sources

NY Water Environment Association
525 Plum Street, Suite 102
Syracuse, NY 13204
Phone: 315-422-7811
Fax: 315-422-3851
www.nywea.org

NY Rural Water Association
PO Box 487
Claverack, NY 12513
Phone: 518-828-3155
Fax: 518-828-0582
www.nyruralwater.org

New England Interstate Water Pollution Control Commission
116 John Street
Lowell, MA 01852-1124
Phone: 978-323-7929 or 978-323-7930
Fax: 978-323-7919
www.neiwpcc.org

New York State Department of Environmental Conservation (NYSDEC)
Facility Operations Assistance Section
625 Broadway,
Albany, NY 12233-3506
Phone: 518-402-8089
Fax: 518-402-8082
www.dec.state.ny.us/website/dow/bwcp/foas_main.html

Adirondack Community College
640 Bay Road
Queensbury, NY 12804
Phone: 518-743-2403
Fax: 518-745-1433
Contact: Lou Buck
buckl@sunyacc.edu
www.sunyacc.edu

Corning Community College
1 Academic Drive
Corning, NY 14830
Phone: 607-962-9457
www.corning-cc.edu
Contact: Sheryl Rosenbloom
rosenbloom@corning-cc.edu

Environmental Finance Center
The Maxwell School at Syracuse University
Executive Education Department
219 Maxwell Hall
Syracuse, NY 13244
Phone: 315-443-9994
Fax: 315-443-5330
http://www.maxwell.syr.edu/efc

Great Lakes Center
1300 Elmwood Avenue
SUNY College at Buffalo
Buffalo, NY 14222
Phone: 716-878-5422
Fax: 716-878-6644
www.buffalostate.edu
Contact: Dr. Harish Sikka
sikkahc@buffalostate.edu

Hudson Valley Community College
80 Vandenburg Avenue
Troy, NY 12180
Phone: 518-629-4830
Fax: 518-629-4870
www.hvcc.edu

SUNY at Delhi
2 Main Street
Delhi, NY 13753
Phone: 607-746-4548
www.delhi.edu
Contact: Loraine Horner
hornerlv@delhi.edu

SUNY at Morrisville
PO Box 901
Morrisville, NY 13408
Phone: 315-684-6670
Fax: 315-684-6609
www.morrisville.edu
Contact: Kathleen White
whitekl@morrisville.edu

Ulster Community College
Cottekill Road
Stone Ridge, NY 12484
Phone: 845-687-5173
Fax: 845-687-5083
www.sunyulster.edu
Contact: Ted Skaar
skaart@sunyulster.edu

NYSDOL, Public Employee Safety and Health
State Office Campus, Building 12
Albany, NY 12240
Phone: 518-457-5508
Fax: 518-485-1150
www.labor.state.ny.us./workerprotection/safety-health/DOSH_DIRECTORY.shtm

US DOL, Occupational Safety and Health Administration
201 Varick Street, Room 670
New York, NY 10014
Phone: 212-337-2378
Fax: 212-337-2371
www.osha.gov/oshdir/r02.html

Collection System and Plant Maintenance

Overview

Maintenance is essential to the sustainability of every wastewater system. A preventive maintenance program combined with good operational practices will reduce the need for much of the corrective or emergency maintenance. A good preventive maintenance program will service not only mechanical and electrical equipment, but also the distribution and collection systems, grounds and buildings.

Maintenance includes all functions required to keep a facility operating in accordance with its original design capacities and performance. This includes repairs to broken, damaged, or worn-out equipment (emergency maintenance), and the periodic replacement of equipment and facilities that have reached the end of their design life (corrective or replacement maintenance).

Maintenance Program Elements

A comprehensive preventive maintenance program will have the following components:

- Equipment and component inventory
- Manufacturer's literature
- Preventive maintenance task list
- Records of maintenance performed
- Technical resources
- Tools and equipment
- Spare parts inventory
- Personnel training
- Budgeting
- Scheduling and monitoring
- Recordkeeping

Proper maintenance of the collection system is critical for optimum system performance. (Town of Tonawanda)

Equipment and Component Inventory

The backbone of any preventive maintenance program is a comprehensive listing or inventory of all system components and equipment. This listing should include a name and code number to every part of the system.

Manufacturer's Literature

For each piece of equipment or component identified in the inventory, the manufacturer's literature should be obtained and compiled. For a new or upgraded facility, it is often the contractor's responsibility to provide manufacturer's information for all installed equipment.

Preventive Maintenance Task List

Once all of the equipment and components have been itemized and the manufacturer's literature has been collected, it is time to develop the comprehensive list of preventive maintenance tasks and to schedule them. Working systematically through each component of the facility, and remembering to address additional areas such as building and grounds maintenance, all preventive maintenance tasks must be identified and a frequency for scheduling should be assigned.

Records of Maintenance Performed

Records must be kept indicating which maintenance tasks have been performed and when. This is helpful for two reasons. First, it is imperative to verify the completion of each maintenance task. Second, to schedule future maintenance activities or to verify the condition of certain equipment, it is always helpful to be able to refer back to the record of past maintenance performed.

All tanks should be inspected once per year.

Technical Resources

Manufacturer's maintenance specifications do not always provide complete information on all maintenance tasks. Certain general maintenance tasks are not covered in detail in manufacturer's maintenance manuals, and many general maintenance tasks are not addressed in manufacturer's information at all.

Tools and Equipment

Every wastewater system must have suitable tools and the required specialized equipment available to perform maintenance. These tools and equipment should be of good quality, because they are likely to be used for many years.

Spare Parts Inventory

It is important to maintain an inventory of spare parts required for preventive maintenance, as well as for corrective and emergency maintenance. The initial inventory must be developed based on the requirements of each preventive maintenance task. Procedures also should be implemented to make sure that parts are replaced in the inventory as they are used. Database management of spare parts inventories is usually necessary in larger utilities.

Personnel Training

Even a well-developed maintenance program with a full staff for implementation will not be able to complete the required work unless the staff are trained in both how to carry out the maintenance program and in the precise skills required to perform specific maintenance tasks. If the maintenance program has not

been developed internally, the consultant or entity that developed it should be required to provide training in its implementation.

Budgeting for Maintenance

Budgeting for maintenance will require that sufficient funding is available for the following:

- *Preventive Maintenance — Operating budget*
  - Labor (staff time, person hours)
  - Parts and supplies
  - Equipment
- *Emergency Maintenance — Operations reserve account*
  - Labor (overtime)
  - Materials, parts, supplies
  - Replacement equipment
  - Contractors
- *Equipment Replacement — Capital reserve account*
  - Evaluation and design
  - Labor
  - Equipment cost
  - Contractors

Replacement valve with preassembly awaiting installation

Estimating Staff Hours for Various Maintenance Functions (Task Analysis)

Sufficient labor must be available and funded for preventive maintenance functions. A good preventive maintenance program will document the schedule and work plan for each maintenance function. This schedule serves as the basis for estimating the labor requirements for preventive maintenance.

To determine trade and person-hour requirements for each preventive maintenance function, the function should be broken down into tasks. The tasks can then be analyzed further to determine person-hours required for the specific maintenance function and the specific trades needed.

Setting Up a Reserve Account for Emergency Maintenance

Development of an annual budget for maintenance is relatively easy and straightforward, if emergency maintenance is sufficiently funded as annual reserve account contributions.

Emergency maintenance is perhaps the most difficult function to address when trying to anticipate the funding requirements for an emergency repair reserve account. A good preventive maintenance program will cut down on emergency maintenance requirements. Unforeseen conditions, defective equipment and materials, and acts of nature make it certain that some emergency maintenance will always be a fact of life.

Failure of sludge handling equipment may result in liquid hauling.

Devising Management Systems to Ensure Timely and Cost-Effective Maintenance

Basic preventive maintenance and record keeping systems are typically card systems that can be adapted to the complexity of the facility being served. Simple single card systems use one card for each piece of equipment, with the front detailing the equipment and its maintenance requirements and the back recording maintenance performed (see the Sample Equipment Maintenance Card). Multiple card systems are similar, but use separate cards for equipment information, maintenance requirements, and records of maintenance performed.

Sample Equipment Maintenance Card

Front

Equipment Inventory #: _____

Description: _____

Manufacturer: _____ Serial #: _____

Supplier: _____

Address: _____

_____

Phone: _____

Maintenance To Be Performed *Frequency*

_____

_____

_____

_____

Back

Maintenance Performed *Date* *Initials*

_____

_____

_____

_____

Many utilities are moving away from card systems and using one of the many software programs developed specifically for scheduling and tracking preventive maintenance. When used as part of an asset management strategy, these software programs can be very useful for the wastewater facilities.

A very important part of the preventive maintenance program development and improvement is appropriate scheduling of maintenance activities. Preventive maintenance schedules must consider variations in plant and equipment utilization. For example, in wastewater systems, this may involve scheduling to accommodate seasonal wet weather flows or intermittent industrial discharges.

Scheduling should consider weather and its effect on maintenance activities and personnel. Whenever possible, outdoor maintenance activities should be scheduled when favorable seasonal weather conditions can be expected.

Maintenance Reporting and Record Keeping

Once maintenance is performed, it must be properly recorded in a timely fashion, usually on the same day as performed. Preventive maintenance tasks are not complete until their accompanying paperwork is done.

Additional Resources

Plant Maintenance Program – MOP OM 3

Water Environment Federation

601 Wythe Street

Alexandria, VA 22314-1994

Phone: 703-684: 2452

Fax: 703-684-2492

Website: www.wef.org

Protecting and Maintaining Wastewater Infrastructure

This section is a compilation of material provided by J. Kirk Rowland, a NYWEA Past President and Division Head – Water & Sewer Maintenance for the Town of Tonawanda; Richard J. Lyons, NYWEA State Board Representative for the Capital Chapter and Executive Director for the Albany County Sewer District; and Keneck Skibinski, a NYWEA Past President and Chief Operator for the Herkimer County Sewer District.

Mission: cleaner water for future generations

Overview

Wastewater infrastructure is a huge capital investment which must be protected and maintained. It is the responsibility of the elected officials and board members to effectively carry out the associated financial and administrative responsibilities for positive, long term stewardship of this capital asset.

Wastewater infrastructure systems are comprised of many components including the collection system pumping stations, treatment plant and personnel. As was emphasized in "Wastewater 101," problems with any one component can have an adverse impact on the rest of the system, often with costly consequences. In many municipalities, wastewater infrastructure is the most significant budget expense next to highway projects.

In addition to the costs incurred to design and build infrastructure systems, both capital and operations expenses are affected by current events. Remember the rise in fuel costs during 2005 that was stimulated by Hurricanes Rita and Katrina? Many communities have also been impacted by changing regulations on Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs). Increasingly stringent regulations and rising fuel and materials costs are significantly impacting your wastewater system's bottom line. To ensure proper long term stewardship, local officials and board members should be familiar with the bottom line.

Budgeting Basics for Wastewater Utilities

In a general sense, the budget can be divided into two basic categories: Operation & Maintenance (O&M) and Capital Expenditures.

The O&M budget provides for the support of routine maintenance, daily operations, and scheduled repairs. Every piece of equipment has a life cycle and will eventually deteriorate to the point of replacement. Without a long term Capital Improvement Plan (CIP) and a funded reserve account to support the CIP, your municipality could find itself without the funds to support needed replacements.

User fees, typically based on metered water consumption, are collected to fund the O&M component. A proper budget ensures that staff, chemicals, and parts are available to keep the system properly operating. A proper budget also helps the municipality to meet their SPDES Permit, which is a legal obligation.

Municipal debt obligations are paid by funds that are typically raised by a tax levy based upon assessed valuation. These funds pay for the debt service on the original bond issued to construct the plant and any other projects that have been undertaken and financed by bonds or bond anticipation notes.

Case Studies

The following two case studies are intended to illustrate the critical importance of budgeting and project planning to help in maintaining a healthy bottom line. Both facilities have won awards for their fine operations and management. An in-depth discussion of financial planning and capital improvement processes follows in Chapter 2.

The **Herkimer County Sewer District Wastewater Treatment Plant (WWTP)** is located in Mohawk and is a medium sized facility. This is an example of a realistic operations and management budget that adjusts for increases in the costs. It also looks at:

- Identifying and correcting collection systems deficiencies (e.g., I&I)
- Planning and financing for capital replacement and improvement projects (e.g., new bar screen)
- Reducing energy costs (e.g., variable frequency drives)

Many communities will have to deal with old sewer systems.

The plant is designed for a flow of 6.1 million gallons per day (mgd). It has an annual average flow of 4.3 mgd (weather dependent). There are six staff at the plant. The District is comprised of the following five municipal entities: the Villages of Mohawk, Ilion, Frankfort, and portions of the Townships of German Flatts and Frankfort. Presently (2006), the District has a reserve account (fund balance) of $700,000.

The District's O&M budget for 2006 is $1.03 million. Since 1984, the District has accepted hauled liquid wastes such as septage, landfill leachate, municipal sludge, and non-hazardous commercial waste. The District averages $210,000 annually in revenue from these hauled wastes.

The sludge from the plant is high lime stabilized and is then land applied by a contractor. The contractor also hauls sludge to a storage site during the off months. Annually, about 3,000 wet tons are generated and land applied. When compared to the landfill approach, the land application program saved the District over $100,000 a year. The land application and hauling rate is $45 per ton. In comparison, the landfill fees are $79 per ton plus the costs of transporting the sludge with District personnel and vehicles. Land application is a permitted beneficial reuse of the sludge. This approach returns nutrients (nitrogen and phosphorus) and alkalinity to the soil.

The table below summarizes the percentages of the major expenses for the WWTP in the 2006 O&M Budget. Note that 'Personnel' is often one of the major budget line items.

Personnel	22%
Fringe Benefits	15%
Electrical	15%
Chemicals	10%
Solids Handling	16%
Contractual	22%

Three primary treatment facilities were replaced by the secondary treatment plant in 1981. The Villages and Towns continue to own most of the collection system. Some of these sewers are very old vitrified clay pipes that were installed in the late 1800's! These sewers are in need of replacement.

The WWTP experiences SPDES flow violations due to spring thaw and rainfall every two to three years. In the first instance, the NYSDEC required that the District notify each of the five contributing municipal entities that the violations were occurring due to faulty sewers that allowed inflow and infiltration (I&I). The District asked the municipalities to inform the District of any work that had either been completed or was planned. The Village of Mohawk had completed an 800-foot sewer upgrade on two streets to alleviate cellar flooding during

Operators are our frontline defenders against water pollution.

Pumps and motors don't last forever.

periods of high water on Fulmer Creek which flows through the heart of the Village. The work had alleviated the flooding problems in the sewer, but brought no change to the magnitude of flows at the District's WWTP.

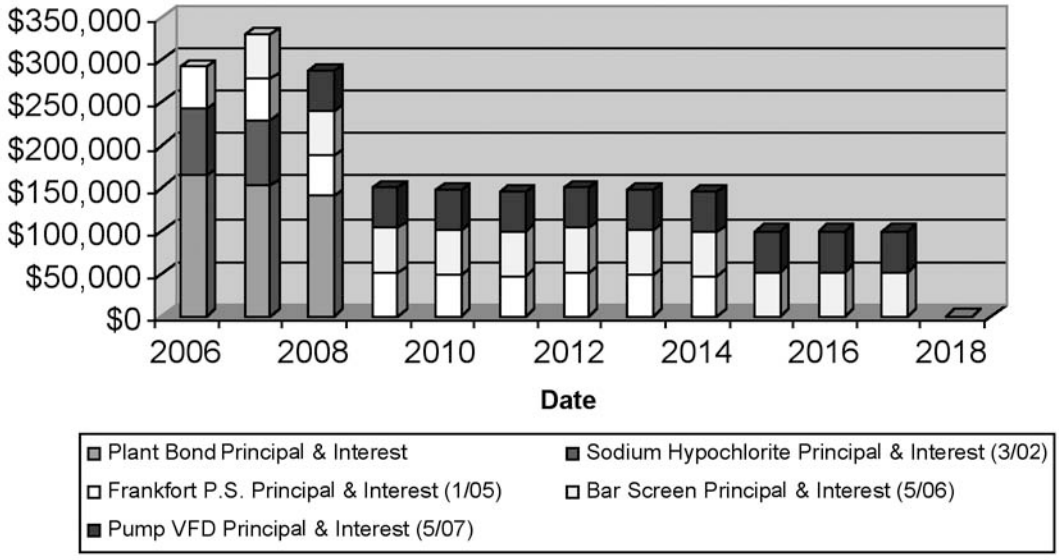
The next violation resulted in a requirement for the District to survey its system to verify that the manhole covers in remote areas were secure and that watertight covers had gaskets in place. This work is presently (2006) ongoing, but it is not expected to have an effect on peak flows. The problem areas lie within the Villages and Towns where an acute lack of funds prevents any real progress.

Since the District does not own the leaking sewers, the District has to work collaboratively with each contributing municipality to address the root causes of the SPDES violations. To compound the issue, there is no recent information available on the condition of these sewers. The last I&I study was completed in 1974. It is unlikely that the problem areas have improved.

It is anticipated that a new I&I study would be the first step in correcting the problems. The District would then develop a corrective action plan. Informal discussions have revealed the Village's and Town's frustrations. The Village and Town can only charge for repairs on properties with tax levies. However, the District could charge the tax exempt properties to lessen the burden.

The table on the next page shows the District's Capital Budget for 2006. This money is collected from tax levies as a breakout on the Herkimer County taxes. The Plant Bond (25 year obligation) will be fully repaid in 2008. The Sodium Hypochlorite Project that resulted in a change from compressed ton cylinders to liquid chlorine will be fully repaid in 2007 and has a 5-year Bond Anticipation Note (BAN). The Frankfort Pump Station Project (10-year Bond) will be fully repaid in 2015. The Bar Screen Project is planned for construction in 2006 and repayment of either the BAN or Bond is anticipated to begin in 2007. Depending upon the completion of the Bar Screen Project, a Variable Frequency Drive (VFD) Unit Project on the main raw sewage pumps is planned for 2007.

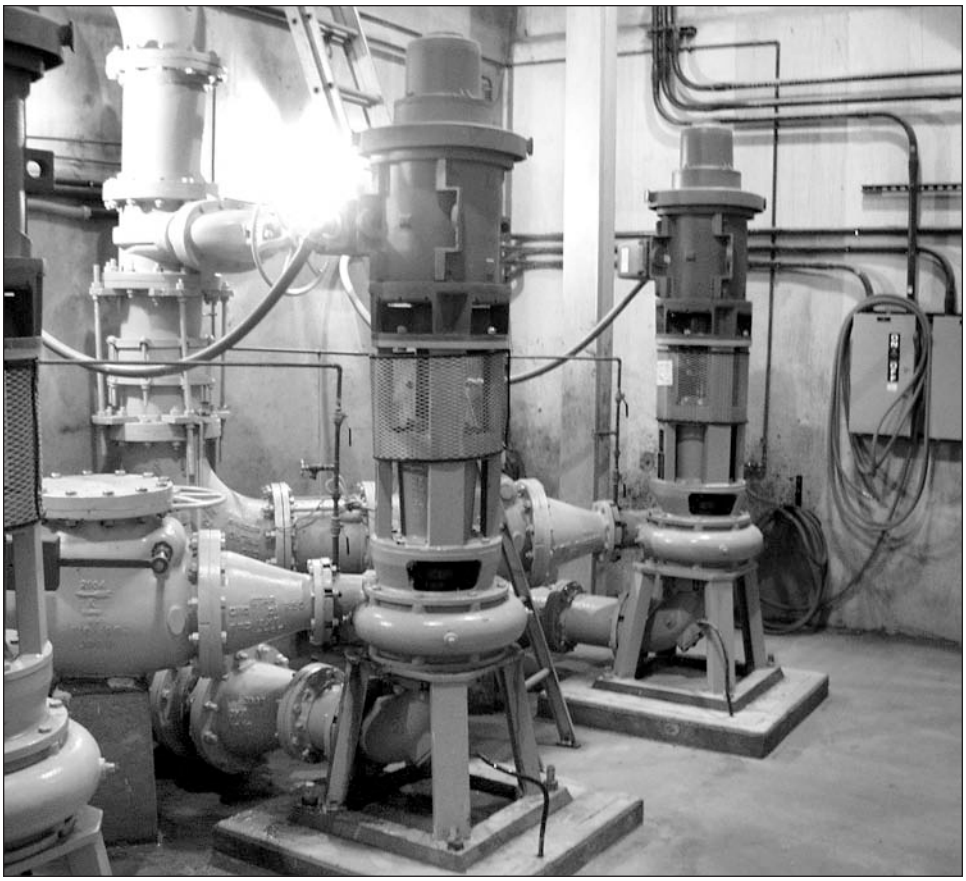
Various capital charges projected through 2018.



Herkimer County Sewer District Capital Payments 2006
Bond and Bond Anticipation Notes

	PLANT	SODIUM HYPO	FRANKFORT PS	BAR SCREEN	PUMP VFD	TOTAL
	Start $3,100,000	Start $359,247	Start $386,000	Est. $500,000	Est. $450,000	CAPITAL CHARGES
	25 Year Bond	3/1/2002	1/15/2005	5/1/2006	5/1/2007	COLLECTED
2006	$164,025	$78,366	$49,669			$292,060
2007	$152,415	$77,000	$48,269	$52,000		$329,684
2008	$140,805	$0	$46,869	$52,000	$47,000	$286,674
2009	$0	$0	$50,469	$52,000	$47,000	$149,469
2010	$0	$0	$48,869	$52,000	$47,000	$147,869
2011	$0	$0	$47,219	$52,000	$47,000	$146,219
2012	$0	$0	$50,569	$52,000	$47,000	$149,569
2013	$0	$0	$48,713	$52,000	$47,000	$147,713
2014	$0	$0	$46,856	$52,000	$47,000	$145,856
2015	$0	$0	$0	$52,000	$47,000	$99,000
2016	$0	$0	$0	$52,000	$47,000	$99,000
2017	$0	$0	$0	$0	$47,000	$47,000
2018					$0	

* All payments include principal and interest.



New and more efficient pumping (Herkimer County Sewer District)

The District has already accomplished many repairs, replacements, and enhancements including the following projects:

- Belt Press Upgrade Project (1990) that replaced two plate and frame pressure filters with a two-meter BDP, Inc. belt filter press. The replacement added approximately 40% more capacity than existed with both plate and frame presses combined. Cost: $200,000
- Grit Bucket Elevator Project (2000) that replaced a 20-year-old carbon steel unit that was very badly corroded with a stainless steel unit. Cost: $300,000
- Roofing Replacement Project (2001) that replaced a 21-year-old built up asphalt roof and insulation with new insulation and a rubber roofing membrane. Roofs were replaced on the two main buildings of the WWTP, the Raw Sewage Pump Station, and the Operations Building. Cost: $74,000
- Sodium Hypochlorite Project (2002) replaced the gaseous chlorine system using one-ton cylinders, which posed a significant community threat, with a liquid sodium hypochlorite system. The hypochlorite system does not pose a significant threat to the local community. Note that the planning for this project was well underway prior to September 11, 2001. Cost: $320,000
- Frankfort Pump Station Project (2005) replaced all three raw sewage pumps with slightly larger pumps and VFDs with a new control panel and flow metering. Cost: $389,000

Other projects that are to be phased in to mitigate the financial burden on affected taxpayers are as follows:

- New Bar Screen (2006)
- Dump Pad Extension (2006)
- Raw Sewage Pumps VFDs (2007)
- Upgrade HVAC in Operations Building (2007)

The Bar Screen and Dump Pad projects have been combined to achieve overall cost savings due to their physical proximity and the use of a single bidding process and contractor mobilization. This combined project is also addressing issues with three corroded doors, replacing four hand-operated sluice gates, and a hydraulic sluice gate and piping.

Plans are being formulated for installing VFDs on the three main raw sewage pumps and changing the check valves on the pumps in 2007. However, this will depend upon the final financed cost of the Bar Screen and Dump Pad Projects. A preliminary study has been performed regarding a project to upgrade the electrical heating system in the Operations Building. This will also be sequenced in as the capital budget allows.

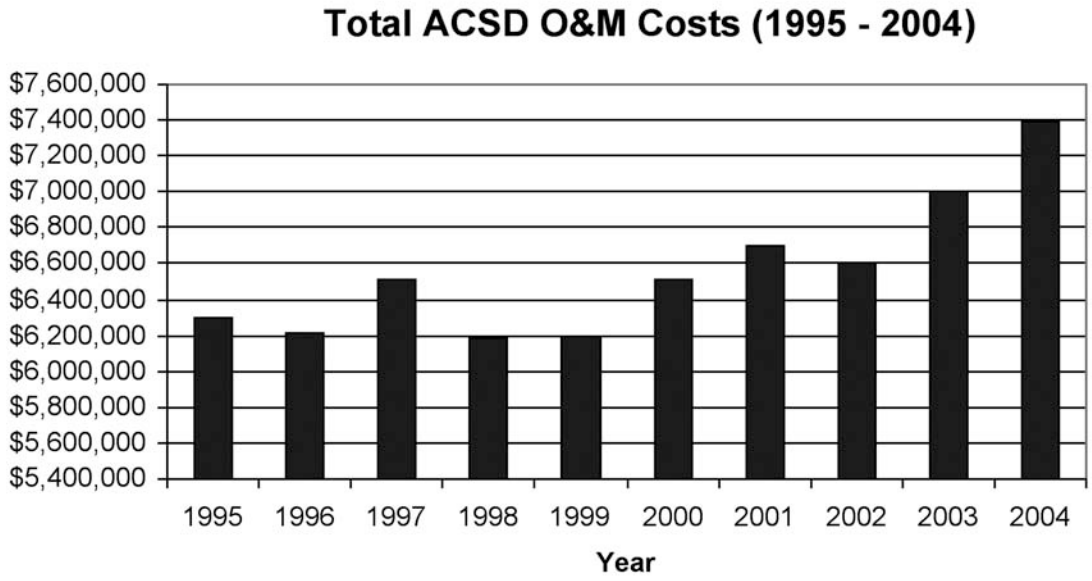
A potential future project that could enhance process control would involve changing the mechanical aerators to a fine bubble diffuser system. This would allow for an anoxic selector to be constructed for filamentous organism control. The lack of failures with the existing equipment and the relatively inexpensive power compared to commercially provided power have held this project back.

Albany County Sewer District (ACSD) is the second case study and is comprised of two large plants. This is an example pertaining to the following issues:

- Budgeting to meet rising operations and management costs
- Establishing and implementing a Five-Year Capital Plan
- Utilizing a combination of funding sources (e.g., NYSERDA and NYSEFC)
- Savings through enhanced energy efficiencies

The North Plant is located in Menands and is designed for 35 mgd. The South Plant is located in Albany and is designed for 25 mgd. The plants have a total of 30 metering pits and regulating chambers. ACSD serves the following eight (8) communities: City of Albany, City of Cohoes, City of Watervliet, Village of Menands, Village of Green Island, and parts of the Village of Colonie, Town of Colonie, and Town of Guilderland. The collection system serves twelve (12) significant industrial users.

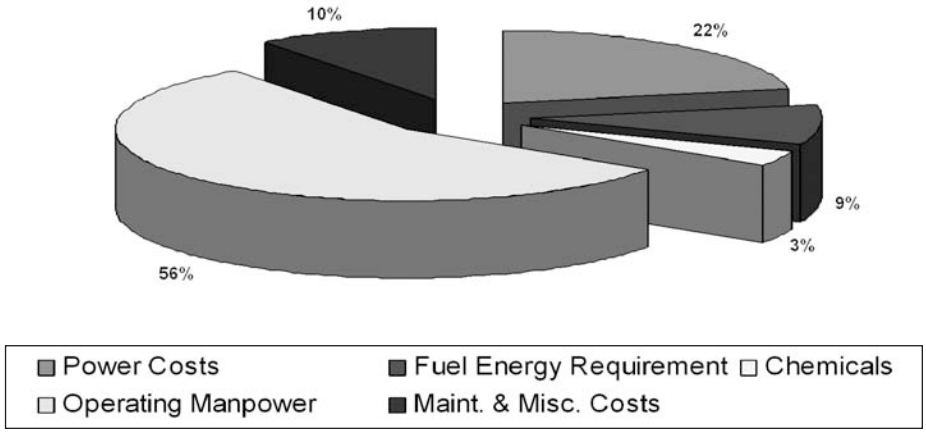
The following chart shows the combined budget for the entire ACSD. Note that the revenue from septage and other hauled waste activity is not included in this chart. The hauled waste revenue has increased 100% in the past three (3) years with about $1,000,000 being raised annually to help offset the rising operating costs.



The chart below shows the various O&M costs for 2004. The breakdown was as follows:

- Power $1.62 million
- Manpower (including fringe benefits) $4.3 million
- Fuel $0.69 million
- Chemicals $0.22 million
- Maintenance & miscellaneous $0.74 million

Total Plant O&M Costs $7,376,778 (2004)



ACSD maintains a Five-Year Capital Plan (Plan) that is updated annually as new improvement projects are necessary. The requirement for the Plan was enacted in 1993 and is required by Resolution 370 of the Albany County Legislature. It defines a Capital Plan Project as any project with a cost greater than $250,000. The Plan must be approved by the District Board of Commissioners, the County Legislature, and the County Executive. The current Plan includes the following projects:

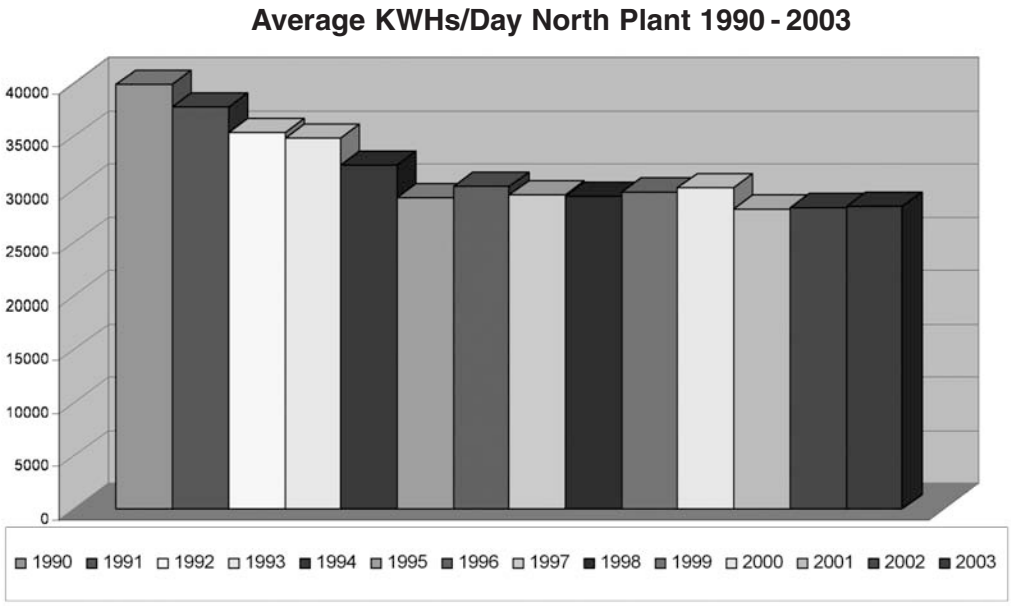
- 2006–Effluent Disinfection . . . . . $9.4 million
- 2007–Phase 2 Roof Replacement . . . . . $0.87 million
- 2007–Belt Filter Press . . . . . $0.36 million
- 2008–Final Clarifier . . . . . $2.1 million

Most projects are financed by NYS Environmental Facilities Corporation (NYSEFC) using the State Revolving Loan Fund (SRF). The ACSD has also received more than $2.2 million in grants since 1994. The NYS Energy Research Development Agency (NYSERDA) programs and Niagara Mohawk Energy Reduction for Non-Profits provided over $1 million for the aeration upgrades and all of the associated engineering costs. The 1996 Clean Water/Clean Air Act provided the grant funding for the Influent Pump Project. ACSD has found good use of regionalization and NYSERDA grants that are not available to smaller communities. The largest member community has lost 27% of its population and 42% of the household incomes are less than $25,000 per year. The ACSD currently maintains a reserve fund of $1.2 million.

Additionally, ACSD has completed many capital improvement projects, including the following:

- 1994 – Aeration System (fine bubble diffuser system): $2.8 million
- 1999 – Influent Pumps (VFD's on raw sewage pumps): $1.6 million
- 2000 – Emergency Generator: $0.5 million
- 2002 – Mechanical Fine Screens: $1.5 million
- 2004 – Roof Replacement (rubber membrane roofing): $0.5 million
- 2005/2006 – Incinerator Improvements: $4.5 million
- 2005 – SCADA: $0.5 million
- 2005/2006 – Concrete Rehabilitation of Sludge Storage Tanks: $0.55 million

Over the years, ACSD has found significant errors in the electrical charges. It is important to closely review electrical bills. ACSD has undertaken many projects that have resulted in increased energy efficiency and thus lowering energy costs. The Aeration Project (1994) and the Influent Pumps Project (1999) have helped lower energy consumption from 38,000 KWH per day in 1990 to 27,500 KWH per day in 2003. The drop in energy consumption from 1990 to 1993 was facilitated by a focus on process control, as well as heating, ventilating, air conditioning (HVAC), and other changes. The chart below shows energy usage at the North Plant from 1990 through 2003. Note that fluctuations are due to wet weather years and associated pumping costs that are beyond plant personnel control.



Capital Projects that Focus on Energy Efficiency

ACSD's collections system has issues with Combined Sewer Overflows (CSOs). Similar to the Herkimer County Sewer District, the member communities own, operate, and maintain their own collection systems. Four (4) of the systems that contribute to ACSD have CSOs. The CSOs are permitted to the member communities, but are maintained by the ACSD. ACSD also has adopted a regional approach to controlling the CSOs, using an "east side – west side of the river" approach.

NYSDEC regulations require the development of a Long Term Control Plan (LTCP) for the CSOs. ACSD began this effort in the fall of 2005. The cost of the LTCP is $4 million, with a $2 million grant received from the State Environmental Protection Fund (EPF). The cost of the implementation and control devices is estimated to be approximately $300 million. There is no information available on the impact to the wastewater treatment plants.

The ACSD has been successful in defraying costs to residents through enhanced energy efficiency leading to cost savings. Additionally, excess plant capacity is used to generate approximately $1 million per year in revenue through the acceptance of hauled liquid wastes, including septage. Additionally, the South Plant effluent has been contracted for reuse as cooling water at a power plant. The disposal of ash from the incinerators was negotiated in a cooperative service agreement for the acceptance of the landfill's leachate. All of the above have helped to control the escalation of O&M costs and the debt load with a decreasing population base.

How long does a roof last? (ACSD's new roof)

Summary

Local officials should visit the treatment plant and become more familiar with its operations, equipment, and staff to ensure that the O&M budget is adequately funded. Revisit user fees regularly. Review the sewer rates on an annual basis. Make smaller, more frequent rate adjustments to meet the needs of future repairs and replacement costs. Remember: if you fail to plan, then you plan to fail! Providing the operators with the tools they need will help move the facility toward long-term sustainability.

Additional Resources

From the New England Interstate Water Pollution Control Commission – *Special Report: Keeping the Plants in Good Hands*

NEIWPCC
116 John Street
Lowell, MA 01852-1124
Phone: 978-323-7929
Fax: 978-323-7919
www.neiwpcc.org

Investing in wastewater infrastructure protects the number one customer – the receiving stream.

Chapter 2 Contents:
Sustainable Financing

Planning for capital improvements helps ensure sustainability. (Village of Croghan)

Chapter 2 Sustainable Financing

Financial Management and Business Planning

Overview

The most difficult challenges facing local wastewater utilities are financing new equipment and capital facilities, as well as implementing appropriate rate structures. Financing can be a balancing act. Impending construction and additional equipment must comply with user needs and uphold environmental provisions pertaining to a utility system. Financial planning must effectively balance the customers' service cost against the benefits that they receive from the utility.

Wastewater pricing, typically called "rates" or "user charges," is the principal mechanism by which customers evaluate their utility systems. One of the major objectives of a utility is to provide service at the lowest possible price while still maintaining quality and ensuring it into the future. Given the recent national need for water conservation, utility pricing structures that include conservation considerations have become more widespread.

Wastewater capital facilities represent a major investment. Utilities must develop and implement a comprehensive capital and financial planning process to ensure present and future self-sufficiency. Such a process generally consists of the following five steps:

1. Evaluating the local socioeconomic factors affecting capital and financial planning, and development of a Comprehensive Twenty-Year Facility Master Plan
2. Identifying and scheduling capital improvements and review of best and alternative financing methods for each capital project
3. Determining annual operating and maintenance budgets
4. Calculating fees and charges
5. Monitoring the utility's performance and evaluating its economic impact on customers

Capital and Financial Planning

Business Plans

The dual responsibility of financial and service excellence are becoming profoundly difficult challenges in regards to wastewater treatment facilities. For this reason, some states have developed policies that insist upon system financial viability. The various parts of a comprehensive business plan, such as a Facility's Plan, a Management and Administration Plan, Operations and Maintenance Plan, and a Financial Plan are outlined in this chapter.

Five- and Twenty-Year Capital Improvement Plans

Developing effective long-range capital and financing plans is a major challenge to most communities. Local governments (or special districts) need to identify the types of facilities needed over a long period (usually 20 years) for maintaining or upgrading water and wastewater treatment quality, replacing aging infrastructure, expanding service, and providing for smaller capital replacement needs. While developing its list of capital needs, the community must identify the financial resources for those improvements and balance costs against economic impacts on customers.

The first step in the planning process is to identify the different types of long-term assets that the utility may need to procure. These may include the following items:

- Major Facilities: Wastewater facilities include the treatment plant, interceptors, outfall lines, major pumping stations, and sludge disposal facilities.
- Water and Wastewater Extensions: Collection sewers and water distribution mains (i.e., lines that extend from the trunk system to a specific part of the service area), lift stations, pressure boosting systems, etc.

- Water and Wastewater Service Installations: laterals connecting from the water distribution or sewer collection mains to the customer's property line.
- Capital Equipment and Minor Capital Items: equipment components (e.g., pumps, motors, instrumentation) of major capital facilities.
- Capitalized Services: costs of engineering design, construction management, economic and environmental studies, debt issuance costs, etc.

Planning Process

Local officials need to follow a comprehensive planning process that ensures that all relevant factors are considered and that the capital plan is consistent with both the utility's long-term objectives and the community's local comprehensive plan. It is important to first evaluate the demographic and economic factors that will affect the utility over time. These factors include the following items:

- Customer demand and usage (historic, current, and projected)
- Water conservation objectives
- Economic projections for the service area
- Infrastructure condition
- Current and expected environmental regulations
- Customer expectations (service improvements, etc.)
- Levels of available federal and state assistance
- Utility and community philosophical and legal restrictions

Once these issues are considered, a Master Facilities Plan can be developed. A Master Facilities Plan identifies the capital facilities required for expansion, upgrade, and rehabilitation of the water and wastewater systems. Typically, these plans cover a 20- to 30-year period and are developed by a team of engineering, environmental, and financial experts. These experts jointly evaluate the system's condition and the technological alternatives for solving identified problems. The Master Facilities Plan provides general descriptions of needed facilities, including expected dates of construction and cost estimates. The plan should be reviewed annually, and typically the first five years of the plan are developed in greater detail and becomes the utility's Five-Year Capital Improvement Program. The first year of the plan is generally adopted as the utility's capital budget.

The Five-Year Capital Improvement Plan (CIP) is a planning tool to assist local officials in identifying, ranking, and scheduling various water and wastewater system upgrade or repair projects. The CIP is a statement of prioritized needs. While officials are encouraged to be realistic in developing and updating a CIP, needed projects should not be withheld from the list due to an apparent lack of funds. Funds may become available from unexpected outside sources or from the citizens' willingness to pay for the projects through increased rates.

The 5-year CIP should include the replacement of major equipment.

Financing Capital Costs

After the utility has developed its Master Facilities Plan and capital improvements budget, the next step is to identify alternative financing sources. Depending on the utility's financial situation, numerous financing tools, or combinations of different resources can be used. For example, a utility could tap any one, or several, of the following sources for financing capital improvements:

- Bonds or equivalent long-term debt
- State revolving loan funds
- State bond banks
- Federal and state grants
- Short-term loans and Bond Anticipation Notes (BANS)
- Capital recovery charges also referred to as System Development Charges (SDCs), impact fees, capacity charges, etc.
- Other user charges, or special assessments
- Lease or purchase agreements
- Operating revenues
- Investment income

Most utilities are forced to use a combination of short- and long-term financing for large capital improvements. Developer contributions are used when the developer benefits directly from a capital expansion of service. In most utility financing plans, user charges or assessments are the primary source for recovering or reserving capital costs. Impact fees are also commonly used to finance capital expansions. Since customer affordability is a major concern for all utilities, federal and state grants are also a valuable (but declining) source of financing for utilities.

Long-Term Debt or Loans

Local governments typically incur long-term debt to spread the repayment cost of large and infrequent major capital projects over a number of years, typically 20 to 30 years. This approach keeps annual debt service costs low and ensures that future users of the system will help pay for the project. However, utilities must not jeopardize their financial integrity by incurring excessive debt. Minor replacements should always be financed from operating reserves. An optimum mix of revenue and debt financing of capital improvements is necessary if current and future users are to share equitably in repaying the capital costs of water or wastewater systems.

The amount of debt a utility carries is extremely important. Generally, debt service (principal and interest payments) should not exceed 30 percent of a total annual budget. In other words, in an annual budget of $1 million, no more than $300,000 should be dedicated to principal and interest payments on debt. Total debt exceeding this percentage places an excessive burden on customers for past capital costs and will seriously impair a utility's ability both to operate and maintain its system, as well as to engage in further borrowing.

With good maintenance, a typical water or wastewater treatment plant may last about 35 to 40 years. If the term of current debt exceeds this time, the local utility should consider refinancing its debt to shorten the term, especially if by doing so it can also lower the interest rate on the outstanding debt.

Special Assessments and Impact Fees

Impact fees and special assessments can also be used to finance water and wastewater capital projects. Ideally, both methods equitably recover the costs of capital improvements from those present and future customers who directly benefit from the improvements.

A special assessment is a charge imposed against certain properties to pay part or all of the cost of a specific improvement or service that principally benefits those properties. Revenue received from special assessments is intended to pay the debt service on the bonds issued to finance a capital project. Two of the most common techniques used to calculate the charge are front footage and area, such as footage along a street or acreage. Assessments may also be levied on an *ad valorem* (in proportion to the value) basis. Special assessments can be charged on a monthly or annual basis or as a one-time charge.

Some local governments establish special assessment districts for capital projects. These districts may be inside or outside the local government's boundaries and are formed before any construction begins. Most towns, counties, and utility districts are legally empowered to levy special assessments. However, state law almost always determines the uses which may be made of special assessment districts, and it is these laws that authorize their organization and define their character.

Impact fees are sometimes called system development charges, system capacity charges, system buy-in charges, connection fees, or facilities charges.

These fees are typically a one-time charge to new customers when they are connected to the water and/or wastewater system. System development charges are "capital recovery fees that are generally established as one time charges assessed against developers or new water or wastewater customers as a way to recover a part or all of the costs of additional system capacity constructed for their use" (see "Source" on page 48 – Raftelis, p.73). Impact fees are most often used in high growth areas where sentiment exists to force growth to pay its own way. The amount of an impact fee typically ranges from several hundred to several thousand dollars for residential connections.

Like special assessments, impact fees are designed to recover costs associated with constructing or upgrading the major capital components of a water or wastewater system. Expenditures for new local service lines, water and sewer taps, and other assets benefiting a specific customer or residential development are normally recovered though special assessments, tap fees, and developer contributions.

Funds from impact fees may be used to finance the new capital facilities required by growth and expansion, but never for routine system operation and maintenance. In fact, some states have statutes that limit

the use of impact fees. Therefore, local officials need to make sure that the calculation, assessment, and implementation of any system of impact fees comply with all local and state requirements. The amount of the impact fee may not exceed the cost of providing capacity and must take into account the capital payments already being made as part of user rates.

When considering impact fees or special assessments, it is important to take into account the following items:

- Equity
- Revenue potential
- Legality
- Implementation
- Simplicity
- Impact on development

The method of calculating a system development charge depends on the purpose of the front-end charge. While it may seem simple to implement the fee charged by other systems, the amount of each system's fees must be based on the actual cost of capacity. If the fee is not directly related to the cost of providing expanded service, the likely result will be litigation.

Annual Operating Budgets and Revenue Requirements

Once the capital and operating budgets are developed, the plan's annual revenue requirements must be calculated. Usually revenue is needed for the following elements:

- Operating and maintenance costs for existing facilities
- Existing and new debt service
- Reserves for capital replacement and expansion

Accounting for Operations and Maintenance

Unlike capital costs, which are incurred only when a utility is expanding or replacing facilities, operating and maintenance (O&M) costs are ongoing and recurring. Salaries and wages, electricity, materials and supplies, chemicals, and equipment rental are all examples of O&M costs. To properly account for O&M costs, a utility must appropriately classify and track the costs as they are incurred. The costs are first classified and tracked through a chart of line item accounts and then grouped into functional categories. This allows a more efficient allocation of the actual costs of service to the various classes of customers (residential, industrial, institutional, etc). Often local governments account for costs by tracking specific object codes. Such object categories include labor, contractual services, commodities, administration, and miscellaneous costs (e.g., training).

Reserve Accounts

A well-managed utility always funds reserve accounts. Most of the problems experienced by utilities that use an "as the need arises" approach to operating crises are caused by this lack of financial planning for capital improvements needed to replace deteriorating infrastructure. Instead of managing the problem through financial foresight, the utility becomes the victim of its own shortsightedness. Many utilities establish capital replacement reserves for items that have high costs, typically with service lives from three to 10 years.

In addition, some especially large utilities fund reserves for the future replacement of major capital items, such as distribution lines and water storage facilities. A few utilities have also chosen to establish reserves for capital expansion, in a conscious effort to promote growth. Typically, such reserves are supported through customer rates and system development charges.

The following types of reserve funds are essential to well-managed utilities. A utility may employ all or a combination of these reserves.

Replacement and Repair Reserve

Most of the major equipment items should be paid for with funds from a replacement and repair reserve account. Other costs for which the utility should also reserve funds include the rehabilitation of storage tanks, replacing and repairing distribution lines, and making other infrequent or unforeseen repairs to the facility. A typical replacement and repair reserve should be capitalized and kept at about five percent of the total system replacement cost.

Debt Service Reserve

Some bond ordinances require that communities set up debt service reserves that can be drawn upon if a utility cannot meet its debt obligations through current revenues. Depending on the precise wording of lending covenants, some of the other reserves discussed in this section may be used to satisfy debt service reserve requirements.

Expansion Reserve

Some communities that wish to promote growth set up an expansion reserve to extend sewer lines or to increase plant capacity. This reserve should not be financed with user fees or rates, but from capital recovery charges (impact fees) and contributions.

Contingency Operating Reserve

A contingency reserve provides for unforeseen expenditures or price increases that result in higher than expected O&M costs. This reserve is set as a percentage of O&M costs and should be reviewed regularly and adjusted to reflect the cash flow needs of the utility. A rule of thumb for calculating the needs of a contingency reserve is 45 days of working capital, or about 12 percent of the O&M budget.

Binghamton-Johnson City Joint Sewage Treatment Plant (Summer 2006)

Rate Stabilization Reserve

Since water usage and wastewater treatment needs can vary from year to year, this reserve is used by local utilities to stabilize rates and minimize the need for drastic rate hikes. This reserve is intended to defray costs during periods when rates do not generate enough revenue to cover system costs.

Rates

Establishing and maintaining reasonable and fair rates is a key element in the successful operation, maintenance, and future viability of any wastewater system. Preserving a system's financial integrity with rates fair to both customer and utility has always been a challenge, especially for the small system.

Utilities must strive to fairly assign the costs of supplying water and treating wastewater to various classes of users and then to recover those costs through fair rates that will sustain the system. Rates must be based on actual costs for providing service. Goals for any rate structure should include financial adequacy, equity, legality, impact on customers, simplicity and ease of implementation, competitiveness with surrounding communities, and water conservation.

Another goal of sound rate setting is stability because it is critical to avoid frequent, unexpected, or drastic rate increases. Sudden large increases always upset consumers and, in some cases, create a financial burden, especially for those people on fixed incomes. At times, elected officials can be reluctant to increase rates. They wait until a drastic increase is totally unavoidable. When this occurs, the rate hike cannot be phased in, because the immediate need for funds is too urgent. Thus, rates should be reviewed annually as part of the budget process and increased by the necessary small increments on a regular basis.

Loan and Grant Programs

Agencies offer loans and grants, either directly or through state and local governments, for wastewater projects. Many state governments also offer low interest loans through bond pools, or use their bonding authority to provide low interest loans to smaller local governments.

Please refer to Chapter 3 for additional information about state and federal funding sources.

For additional information on financial terms, please refer to the Financial Glossary which begins on page 100.

Source

Comprehensive Guide to Water and Wastewater Financing and Pricing, Second Edition, by George A. Raftelis, 1993.

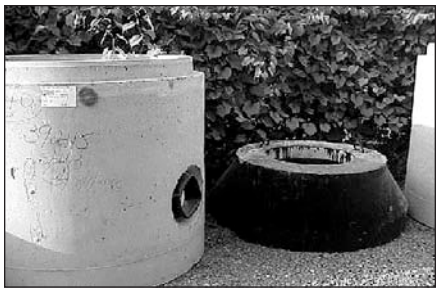
Additional Resources

Financial Management and Business Planning 1–5, Ben Lin and Richard Pieser, Urban Land Institute, 1992.

Meeting Water Utility Revenue Requirements: Financing and Rate Making Alternatives, National Regulatory Research Institute, November 1993.

Special Districts: A Useful Technique for Financing Infrastructure by Douglas R. Porter.

Capital Improvement Planning



Capital improvement projects need to be well planned.

Overview

Capital Improvement Planning (CIP) is an important function of any infrastructure intensive industry. Wastewater utilities are no different. Unfortunately, many organizations treat CIP as a separate function from other decision processes such as operation and maintenance decisions. There is no such distinction. All of the decisions regarding an asset are on a continuum, a decision-making continuum that starts with the *planning* decisions before an asset is *designed, built, constructed,* then *operated and maintained (O&M),* then *replaced or rehabilitated* to *retirement or decommissioning.* The decisions at any stage have an impact upon later decisions. For example, a poor design decision for a new pump station can lead to more maintenance or more operations expenses throughout the pump station's life. Eventually, a poorly designed pump station will be replaced early because the O&M expenses are too high. Replacement is typically more expensive than rehabilitation.

Another example of this continuum is poor O&M. Poor O&M leads to early capital investment because the equipment did not last as long as predicted or designed. Looking at the continuum of decision-making is the best illustration of the need for good decisions, and the connection between all of the decisions in an assets life cycle.

Besides decisions making, a CIP includes scheduling or timing of projects or initiatives. Timing is very important.

Decision Making

Every day decisions are made.

- Where to send a crew?
- Which pipe to replace?
- Which project to fund?
- Which employee to promote?

Each of these decisions is a risk management decision.

- Where should this crew be so that I minimize my risk for a breakdown?
- Which pipe is most likely to collapse?
- Which project will provide me with the most protection from liability?
- Which person will provide the best protection from mistakes and organizational problems?

Risk management is a daily activity. Risk management implies the risks cannot be eliminated but it can be managed. Risk can be managed with good decisions. Good decisions are a result of good processes and good data.

There are many processes to consider. The key is to break each process down into steps and then examine each step for improvement. Some processes or procedures to consider are as follows:

- Procurement processes (services and materials)
- Design processes
- Maintenance procedures
- Operations procedures
- Human relations processes
- Budget processes
- Demand analysis

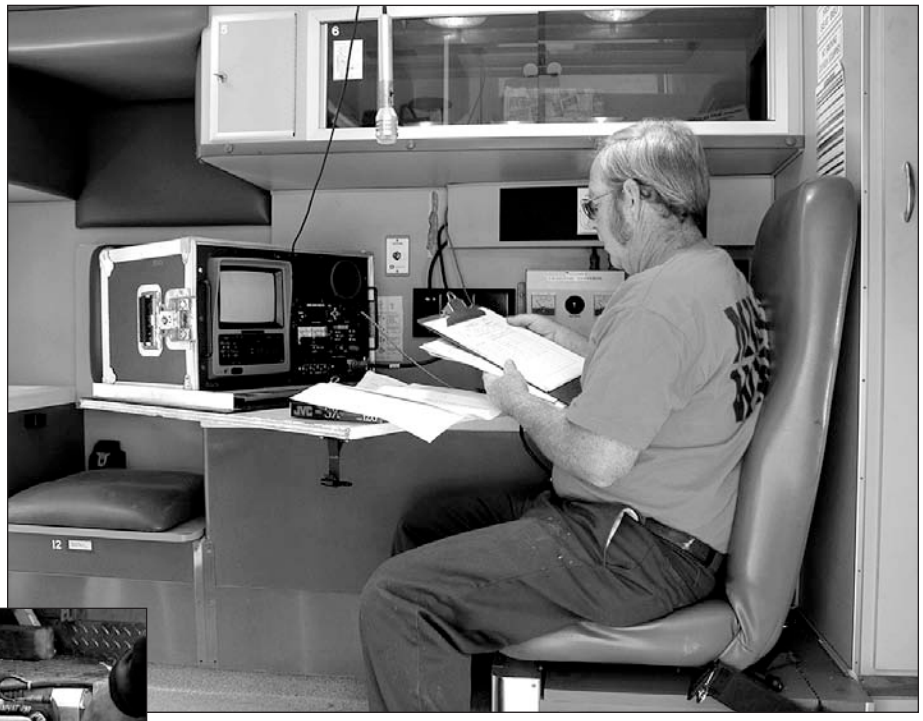
Data is the second requirement for good decisions. Depending upon the level of sophistication of the process or the organization, the data requirements change. Some examples of data include the following items:

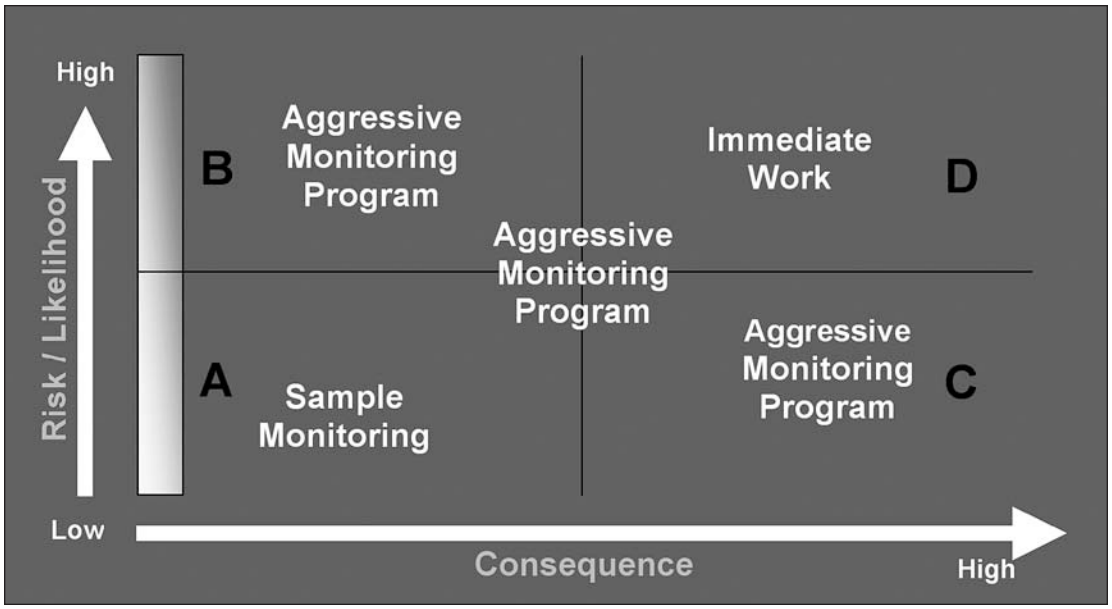
- Inventory
- Condition
- Maintenance history
- Performance history
- Cost history

The combination of good processes and good data brings high *confidence* decisions. High confidence decisions are the key to risk management, or managing risk. When choosing among competing interests, choose based upon the highest confidence.

One of these processes is *business risk.* How an organization assigns business risk is important. Reducing the business risk exposure is important for managing risk. There are two elements to reducing business risk– understanding the *probability* an asset or process will fail, and understanding the *consequences* of that failure.

Minoa's sewer camera work helps the Village set priorities.





This 2x2 matrix (see above) is a simple example using probability of failure and consequence to make decisions. After ranking probability of failure as high or low, then ranking consequence as high or low, there is a logical breakdown of where to focus resources.

- Project A can wait
- Project B and C need resources to study
- Project D needs to be done

This structure is necessary to choose among competing interests and dissimilar projects, like comparing apples and oranges.

Life Cycle Cost Analysis (LCCA)

There are a variety of decisions to make in the life of an asset. The best tool for these decisions is Life Cycle Cost Analysis. LCCA can be used to choose among alternative technologies, alternative manufacturers, or alternative strategies. The key inputs are costs and timeframe. This is a great *process* but to achieve high confidence good data is needed. Good costs data, whether historical or other source, is needed.

Estimating Life Cycle Costs

The Life Cycle Cost of an asset can be expressed by the following simple formula:

LCC = capital cost + life-time operating costs + life-time maintenance costs + disposal cost: residual value.

However, ascertaining a measure of each variable in the formula can be difficult. Future costs are usually subject to a level of uncertainty that arises from a variety of factors, including:

- The prediction of the pattern of use of the asset over time
- The nature and scale of operating costs
- The need for, and cost of, maintenance activities
- The impact of inflation and the opportunity cost on individual and aggregate costs
- The prediction of the length of the asset's useful life
- The significance of future expenditure compared with present day expenditure

Discounting Future Costs

When an organization has a choice of incurring a cost now or in the future, it generally considers the benefits of alternative uses for the available funds and the cost of raising the necessary funds. Future costs are regarded as less significant because the costs have the potential to be funded by effective use of existing funds over the intervening period.

For example, if a $100 purchase is to be made today, it is necessary to have $100 available now. However, if the purchase can occur in three years' time for $100, it would be possible to generate the required $100 by investing $75.10 at an interest rate of 10% for the three years. If the funds can be used in some other way by the organization, it may be able to generate more than 10% per year, which would make the future cost even more attractive.

In a similar way, the value of a payment to be received at a future time is regarded as less than the value of receiving it now.

In order to quantify the time impact on future receipts and costs, these cash flows are converted to an equivalent ***Present Value (Cost)***. This conversion is based on an estimated discount rate (r) and uses the following formula:

Present Value (Cost) = $FV/(1+r)^n$

Where:

FV = the amount to be spent or received at a point in the future
n = the number of intervals between the present and the future transaction (e.g., years)
r = the discount rate applicable to the chosen intervals; and

For example, an expense of $100 in three years' time with a discount rate of 10% would have a present value (PV) of:

$$PV = -100/(1+0.1)^3$$
$$= -100/1.331$$
$$= -\$75.10 \text{ (negative for a cost)}$$

The ***Net Present Value (NPV)*** is the difference between the present value of future revenue and the present value of future costs for an activity over a given period.

Advanced Economic Evaluation Techniques

While the basic NPV calculation is simple, it doesn't suit comparisons of projects or options where there is a difference in two core areas:

- The cost (or size) of the investment, and
- The life (or time frame) of the expenditure.

Because investments will often have different combinations of cost and life, the appropriate measure should be used to ensure an accurate and true comparative evaluation.

There are four key measures that should be considered when undertaking the performance of a potential investment, each of which is specifically aligned to negate the inaccuracies resulting from differing cost and life combinations. These measures are summarized in the following table:

Measure Selection Table

Investment Costs (Size)	*Investment Lives (Time)*	*Appropriate Measure to Use*
Same	Same	Net Present Value (NPV)
Different	Same	Present Value Index (PVI)
Same	Different	Annuity of NPV
Different	Different	Annuity of PVI

It is important that the correct measure is used to suit the appropriate circumstances, as a misleading result can be obtained. Examples of each of these measures are reviewed in Appendix A.

In general, these measures have the following advantages and disadvantages:

Advantages

- They consider the time value of money
- Measures use standard accounting and economic techniques
- No ambiguities/anomalies in options comparison (as long as correct measure is used)

Disadvantages

- Tedious calculation unless computer modeled
- Need to know organization's opportunity cost of capital
- There is subjectivity in determining expected annual cash inflows and expected period of benefit

Sensitivity Analyses

Sensitivity analysis can be utilized to explore the relative effects of changes in items that contribute to cash flow on the economic viability of the project as a whole. It pinpoints areas, which are most critical in terms of uncertainty or risk, and indicates where confidence in estimates is most vital. Sensitivity analysis is used to explore the effects on a project of uncertainty in different areas, but does not attempt to quantify the relative uncertainty in different areas. This is still left to subjective assessment. A sensitivity analysis should be performed after completing the initial economic evaluation and after ranking of options.

Typical sensitivity tests that could be applied are:

- Cost estimates (+/– 10%)
- Benefit estimates (+/– 10%)
- Variations in opportunity cost of capital
- Changes in CIP (if nominal values are adopted)
- Labor costs (+/– 15%)
- Changes in timing of implementation

Any large-scale study should be set up keeping in mind the desirability of sensitivity analyses. Computerization lends itself to this concept, with the facility for repetitive runs varying one parameter at a time.

Final Comparison of Alternative Projects

It is important to remember that the total present value amount or Annualized PVI calculated in project evaluation is a comparative value. This means that alternative investments can be compared using this calculated amount, but it does not necessarily tell us anything about the absolute cost of a project, such as the expected risk cost, etc. Hence, the use of this calculated amount for any other purpose would need to be logically reasoned and justified.

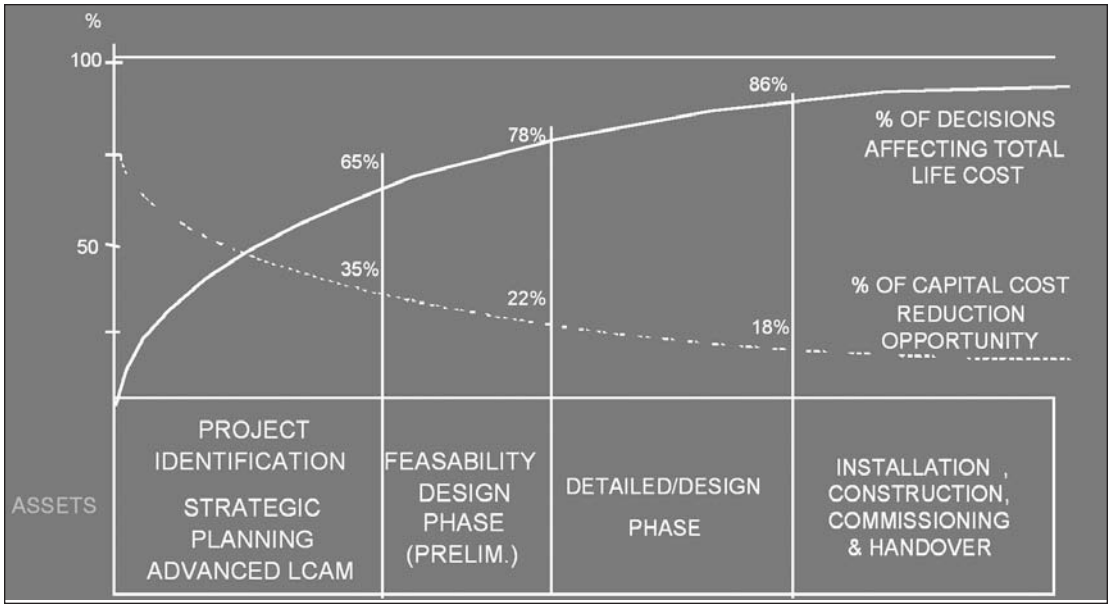
In the comparison of alternative projects, the Present Value amounts calculated must be significantly different for a final decision to be made on economic grounds only. All aspects, including technical, economic, social and environmental factors, need to be considered as part of the project evaluation process before a decision can be made for implementation.

Decisions and Their Effects on LCC

A major portion of projected Life Cycle Cost stems from the consequences of decisions made during the early phases of program planning and conceptual design.

It is the early decisions of defining product need, operating requirements and the support concept that commits a large percentage of the support resources expended during the product's operation phase.

Decision makers need to be aware of the LCC implications of decisions taken early in a product life cycle. Product-related decision support processes should rely on thorough and relevant analytical activities.



Times of Opportunity for Cost Reduction

The best opportunities to achieve significant cost benefits occur during the early concept development and design phase of any project. At this time, significant changes can be made for the least cost. At later stages of the project many costs have become *"locked in."* To achieve the maximum benefit available during this stage of the project, it is important to explore the following:

- A range of alternative solutions
- The cost drivers for each alternative
- The time period for which the asset will be required
- The level and frequency of usage
- The maintenance and/or operating arrangements and costs
- Quantification of future cash flows
- Quantification of risk

The concept of the Life Cycle of an asset provides a framework to document and compare alternatives.

Selecting Potential Options for Comparison

The intervention (or treatment) options available include the following:

- Maintain Status Quo
- Do-nothing/Run to Fail
- Rehabilitate
- Replace
- Non Asset solutions
- Dispose

The Status Quo option is defined as maintaining the current operations and maintenance behavior. It is the base case against which other options are compared. In the situation where a new asset is being built, only the options are compared.

The Do-Nothing/Run to Fail option is literally not spending any money on planned maintenance or refurbishments unless required to maintain a minimum level of service to the customer. The Do-Nothing/Run To Fail option will have the benefits of nil planned maintenance cost but at the expense of increased risk exposure, increased repairs (unplanned maintenance) and premature replacement of the asset (reduced effective life).

Assessment of different rehabilitation or replacement strategies requires an understanding of the costs and longevity of different asset types and interventions.

The main benefits to be derived from appropriate intervention options are identified as follows:

- Savings in maintenance and operations
- Avoidance of expected risk cost
- Savings in interest due to deferred replacement (because of life extension)

There may be other benefits such as:

- Improved production
- Improved level of service

Base Data required for such analysis includes:

- Operating cost per annum
- Maintenance cost per annum
- Consequential cost of failure (ancillary costs)
- Replacement cost of asset (as new)
- Intervention cost (zero for Do-Nothing) and timing
- Theoretical life of asset
- Current age of asset
- Increase in maintenance cost, % per annum (under the maintaining status quo situation)
- Number of failures expected (for multiple failure assets)

Effect of Intervention

- Life extension of assets, years
- % (per annum) reduction in maintenance
- % reduction in risk cost.

The % reduction in maintenance cost and risk cost are assumed to be constant, although one can argue that the effectiveness of the treatment will dissipate over the years.

Selection of Preferred Option

When a life cycle cost analysis has been prepared for each option under consideration, it is possible to:

- Calculate the annualized PVI of each option
- Consider projected cash flows in the context of the funding available
- Identify issues related to the ultimate disposal of the asset

Decision-makers can use this information as part of the selection process in conjunction with other operational or policy constraints.

Business Drivers

Agencies are constantly working to be sure they are doing the *right project,* at the *right time,* for the *right costs* and for the *right reason.* The previous sections on Good Decision Making and Lifecycle Costs Analysis address the first three of the *rights.* The *right reason* for a project is an important element. No matter how well a project is designed and constructed, it cannot overcome a poor original reason. There are many empty shopping malls built in the wrong place for the wrong reason. There are many pump stations in the middle of a cornfield awaiting that subdivision that never arrived. Sometimes the wrong reason made a project happen too soon, or too late. Not a bad decision but it could be better. In today's environment of constrained resources, no agency can afford to misuse resources. CIP should answer the question: Is this where our precious resources should be spent? How can we be sure?

An organization, especially a public agency, should have a clear idea of their mission. That mission should be apparent in every aspect of the organization. Using such a mission as a guide, an organization should have a set of business principles that drive the decision making process.

Typically, a wastewater agency will include in its mission a statement about protecting the environment. How is that to be accomplished? How does that mission balance with other missions such as fiscal responsibility. Which is more important? When an organization has a clear mission and has the discipline to stay the course, the CIP will reflect that mission through the use of business drivers in the decision making process. This alignment of the business processes with the mission of the organization helps to insure the *right* project is resourced.

Chapter 3 Contents:
State and Federal Funding Options

Photo courtesy of NYSEFC

New York State Water and Sewer Co-funding Initiative

Overview

The provision of adequate water and wastewater infrastructure is critical for public health, environmental protection and for economically viable communities. Implementing a new system or modifying existing facilities is a huge undertaking for local government that will involve a significant financial investment. Under the direction of Governor George Pataki, and in response to the recommendations of the Lt. Governor's Quality Communities Interagency Task Force Report, the NYS Water and Sewer Infrastructure Co-Funding Initiative was created.

This initiative is designed to provide assistance to communities in the development of a funding package that will permit the infrastructure project to move forward toward implementation. Specifically, the Co-funding Initiative works to improve the efficiency of the infrastructure funding process by providing a single point of contact for information. In addition, the Initiative is providing for coordinated multi-agency consideration of the financing needs of municipal infrastructure projects. All of these efforts are aimed at increasing the level of service to communities and optimizing the use of state and federal financial resources.

The Co-funding Initiative was introduced in the spring of 2002, and a Memorandum of Understanding (MOU) that formalizes this multi-agency initiative was signed in 2003. Those signing the MOU are: the Environmental Facilities Corporation, the Department of Environmental Conservation, the Department of Health; USDA Rural Development, the Governor's Office for Small Cities, and the Department of State.

As applicable situations arise, other financial assistance programs are brought into the project discussions as part of the co-funding process. The NYS Energy Research and Development Authority (NYSERDA) can provide grant funding for energy related research, and also provides rebates on certain energy saving equipment and systems that are part of the project. The Oil Spill Fund, administered by the Office of the State Comptroller, can provide grant funds in situations where environmental damage associated with an oil spill results in additional project cost to the municipality. Where projects are primarily associated with economic development, the Co-funding Initiative can facilitate discussions with Empire State Development and the US Department of Commerce Economic Development Administration.

A principal goal of the Co-funding Initiative is to offer a single point of contact for communities to learn more about applicable state and federal funding programs that may provide needed financial assistance. This single contact is the Co-funding Coordinator, who can be reached by email at coordinator@nycofunding.org or by calling 1-800-882-9721. Additional information is also available on the internet at www.nycofunding.org .

Although the Co-funding Initiative provides a means to increase the cooperation and communication among the various agencies, each program retains its individual eligibility criteria and program goals. Each of the programs currently involved in the New York State Co-funding Initiative are discussed in greater detail in subsequent sections of this handbook.

New York State Environmental Facilities Corporation (NYSEFC)

Overview

The New York State Environmental Facilities Corporation (NYSEFC) is a public benefit corporation created by the New York State Legislature in 1970. The NYSEFC administers a number of federal and state funded programs aimed primarily at maintaining and improving water quality and protecting public health within New York State. The two largest programs that NYSEFC co-administers are the Clean Water and Drinking Water State Revolving Loan Funds (CWSRF and DWSRF).

The CWSRF was created in July 1989 and the first CWSRF bonds were sold by NYSEFC in May 1990. Federal legislation established the DWSRF in August 1996. Since creation of these two SRF programs, the NYSEFC has issued approximately $10 billion in SRF bonds to provide proceeds to New York State municipal entities for water and sewer infrastructure.

In 1993, the first CWSRF loans were closed with communities using multiple funding sources and the use of co-funding has continued to increase since that time. The NYSEFC serves as the focal point of the Co-funding Initiative and houses the Co-funding Coordinator for the Initiative.

In addition to administering loan and grant funds through the CWSRF and DWSRF and providing for the coordination of the Co-funding Initiative, the NYSEFC, through its Community Assistance Program, provides direct technical assistance and project development services to municipalities. These assistance services are configured to provide guidance to small, rural municipalities as they proceed through project planning, scheduling and the application processes of various applicable funding programs.

Clean Water State Revolving Fund (CWSRF) and the Community Assistance Program

Types of Assistance

The CWSRF provides low cost, subsidized interest rate long-term financing for the planning, design and construction of facilities that protect, maintain or improve the quality of New York State waters. Interest-free short term loans can be made available to assist in financing design and construction until such time as the project's long-term costs are clearly identified and long-term financing can be closed. In certain instances, where the proposed project will result in an extreme financial burden on the users of the facilities, the program can provide interest-free long-term loans (referred to as hardship loans).

To assist small, rural communities navigate the intricacies of the CWSRF loan program; the Environmental Facilities Corporation (EFC) offers the services of a group of highly experienced staff members. These individuals, members of the Community Assistance Program, are available to work closely with elected officials and interested members of the public to help identify, organize and schedule appropriate tasks needed to pull the project together and apply for project funding.

Eligibility

Loan recipients, except for financing being sought for land acquisition, must be municipal. Land acquisition financing may be by municipalities or by not-for-profit organizations. Specific portions of projects may not be eligible for SRF financing. This determination can only be made following a detailed review of the project's engineering report and/or design documents.

Eligibility for a hardship loan is determined through a separate application process. Specific information on the project and service area of the project is requested by EFC for this application and analysis.

Eligibility for financing with the CWSRF is dependent on the numerical score the project receives in accordance with the water quality based scoring system contained in the NYSDEC program regulations (6 NYCRR Part 649). A project must receive a score high enough to place it above any funding line established in the current Intended Use Plan (IUP). More information related to program eligibility is available by contacting the Environmental Finance Center (EFC).

Program Use

Loan proceeds may be used to pay for any eligible expenses associated with the following types of projects:

1. Treatment works projects (referred to as Section 212 projects). This category includes projects such as sewers, treatment facilities, combined sewer overflow (CSO) abatement, sludge treatment facilities and sewer rehabilitation.
2. Non-point source pollution control projects (referred to as Section 319 projects), such as capping and closing of municipal landfills, remediation of contamination from leaking storage tanks, highway de-icing materials storage, stream bank stabilization, land acquisition or conservation easements for water quality protection and decentralized wastewater systems.
3. Estuary Conservation and Management Plans and Projects (referred to as Section 320 projects) that implement specific US EPA-approved plans.

Short-term loans are interest-free and are closed for an amount equal to approximately one-half of the eligible project costs. Normal long-term loans are closed for an interest rate equal to one-half of the interest rate of the most recent EFC bond sale. Long-term hardship loans can be made at an interest rate as low as zero per cent. Short term loans are for a maximum term of three years. Long-term loans are made for a 20-year term but could have a term of up to a maximum of 30 years.

The services of the Community Assistance Program are available to any municipality that is pursuing a project eligible for CWSRF financing. The level to which the Community Assistance staff members become involved is entirely dependent on the desire of the community and the status of the project development related to funding agency requirements.

Application Procedure

Application procedures and materials are available from EFC by using the contact information provided below. As stated previously, the availability of financing is dependent on the numerical score the project receives and where that score places the project in relation to any funding line. The scoring process begins with the submission of a project listing form. This is a short form that provides basic information related to the project purpose, estimated cost and estimated implementation schedule. The listing form can also be obtained using the contact information provided.

There is no application procedure associated with obtaining help from the Community Assistance Program for your project. Simply contact the Community Assistance Program using the contact information listed below.

Where to Apply

NYS Environmental Facilities Corporation
625 Broadway
Albany, NY
12207-2997
Phone: 1-800-882-9721 or 518-402-7438
Fax: 518-402-7456
Website: www.nysefc.org

United States Department of Agriculture (USDA)

Overview

The mission of USDA Rural Development is to deliver programs in a way that will support increasing economic opportunity and improve the quality of life of rural residents. As a venture of capital entity, Rural Development provides equity and technical assistance to finance and foster growth in home ownership, business development, and critical community and technology infrastructure.

Water and Wastewater Disposal Loan and Grant Program

Water and waste disposal services have been taken for granted in American cities since at least the 1920's. But if you lived in a rural area only 60 years ago, chances are you went without these necessities of modern life and the high standard of living they make possible.

Modern utilities came to rural America through some of the most successful government initiatives in American history, carried out through the United States Department of Agriculture (USDA) working with rural cooperatives, nonprofit associations, public bodies, and for-profit utilities. Today, USDA Rural Development Utilities Programs carries on this tradition helping rural utilities to expand and to keep their technology up to date, and helping to establish new and vital services such as distance learning and telemedicine.

The public-private partnership which is forged between Rural Development Utilities Programs and these industries results in billions of dollars in rural infrastructure development and creates thousands of jobs for the American economy.

Please visit the national website at http://www.usda.gov/rus/ for information concerning all of our programs.

Program Description

The program provides loans and grants to water and wastewater facilities, and services to low-income rural communities whose residents face significant health risks with service area populations up to 10,000.

Funding Type

The program provides loan terms up to 40 years. The interest rate is indexed to the Median Household Income of the service area. Minimum "Poverty Rate" is 4.5 percent. The "Market and Intermediate" rates vary as per the Federal Financing Bank Rate every three months.

Eligibility

Provide loan and grant funds to water and wastewater projects serving the most financially needy communities. Financial assistance should result in reasonable user costs for rural residents.

Eligibility Assessment

Competition is intense. Applications far exceed available funds.

Community Facilities Program

Program Description

Community facilities, such as public safety buildings, schools, libraries, museums, day care centers, health care clinics, and fire and rescue support services, are all essential to the quality of life in rural America. USDA Rural Development's Community Facilities Program offers financial assistance to help communities provide vital services and amenities for their residents and visitors.

Funding Usage

Funding is used to construct, enlarge, or renovate facilities for health care, public safety, and public services. It is also used to acquire land needed for a facility, pay necessary professional fees, and purchase equipment required for a facility's operation.

Eligibility

Grants, loans, and loan guarantees are available to public bodies, such as municipalities, counties, special purpose districts, non-profit corporations and tribal governments. Applicants must be in rural areas and towns of up to 20,000 in population.

Terms

The maximum term for all loans is 40 years. However, the repayment period is limited to the useful life of the facility or any statutory limitation on the applicant's borrowing authority. Interest rates for direct loans vary depending upon the median household income of the community.

Eligibility

Grants are authorized on a graduated scale. Priority is given to applicants located in less populated rural communities with low median household incomes. The MHI is either below the poverty line or below 90% of the State metropolitan MHI (whichever is higher). A grant may be used in combination with other financial assistance, such as a direct or guaranteed loan, applicant contribution, or loans and grants from other sources. Typical grant size is $25,000.

Security Required

Bonds, Notes, Mortgages

Application Procedure

Pre-determination/applications are accepted throughout the fiscal year. Contact Rural Development local offices (see following list) for your pre-eligibility/pre-determination packet.

Scott Collins, Acting State Director
The Galleries of Syracuse
441 S. Salina St., Suite 357
Syracuse, New York 13202

Syracuse Staff
David A. Miller, PE, Community Programs Director
Environmental Coordinator
Phone: 315-477-6427
Fax: 315-477-6448

Gail Giannotta, CF Specialist – 315-477-6429
Dolores Weichert, CP Technician – 315-477-6434
Michael Bosak, State Architect – 315-477-6421
Madeline Crowe, Environmental Protection Specialist – 315-477-6432
Marcy Newman, State Engineer – 315-782-7289, ext. 117

Rural Development Local Servicing Offices
Eastern Region:
Ronda Falkena, Area Director – 845-987-8111
Orange, Bronx, Putnam, Sullivan, Dutchess, Queens, Ulster, Kings, Richmond, Westchester, Nassau, Rockland, New York, Suffolk Counties:
George Popp, RD Manager
Suite 104, 1st Floor
225 Dolson Avenue
Middletown, NY 10940-6569
Phone: 845-343-1872, ext. 4

Clinton, Essex, Franklin Counties:
Rob Ivy, RD Manager
6064 Route 22, Suite 3
Plattsburgh, NY 12901-9601
Phone: 518-561-4616, ext. 4

Washington, Saratoga, Columbia, Hamilton, Rensselaer, Warren Counties:
Gretchen Pinkel, RD Manager
2530 State Route 40
Greenwich, NY 12834-9627
Phone: 518-692-9940, ext. 4

Fulton, Albany, Greene, Montgomery, Otsego, Schenectady, Schoharie Counties:
Patricia Snover, RD Manager
113 Hales Mills Road
Johnstown, NY 12095-3741
Phone: 518-762-0077, ext. 4

Oneida, Herkimer, Madison Counties:
Kathleen Goodman, RD Manager
9025 River Road
Marcy, NY 13403-2301
Phone: 315-736-3316, ext. 4

Broome, Chenango, Cortland, Delaware, Tioga Counties:
Barbara Thompson, RD Manager,
1163 Upper Front Street
Binghamton, NY 13905-1117
Phone: 607-723-1384, ext. 5

Western Region:
Katherine McCoy, Area Director – 607-835-6580

Genesee, Monroe, Niagara, Orleans, Wyoming Counties:
James Walfrand, RD Manager
29 Liberty Street, Suite 2
Batavia, NY 14020-3294
Phone: 585-343-9167, ext. 2200

Steuben, Allegany, Livingston Counties:
Margaret Evanek, RD Manager
415 W. Morris Street
Bath, NY 14810-1038
Phone: 607-776-7398, ext. 4

Ontario, Wayne, Yates Counties:
Michaela Sergent, RD Manager
3037 County Road 10
Canandaigua, NY 14424-8007
Phone: 585-394-0525, ext. 4

Tompkins, Chemung, Schuyler, Seneca Counties:
Margaret West, RD Manager
903 Hanshaw Road, Suite 2
Ithaca, NY 14850-1530
Phone: 607-257-2737, ext. 4

Onondaga, Cayuga, Oswego Counties:
Brenda Smith, RD Manager
2571 US Route 11, Suite 4
Lafayette, NY 13084-9641
Phone: 315-677-3552, ext. 4

St. Lawrence County:
Brian Murray, RD Manager
1942 Old Dekalb Road
Canton, NY 13617
Phone: 315-386-2401, ext. 4

Cattaraugus, Chautauqua, Erie Counties:
Darla Granger, RD Manager
8 Martha Street
PO Box 776
Ellicottville, NY14731-0776
Phone: 716-699-2375, ext. 4

Jefferson and Lewis Counties:
Carol McDonald, RD Manager
21168 NYS Route 232
PO Box 838
Watertown, NY 13601-0838
Phone: 315-782-7289, ext. 4

Appalachian Regional Commission

Overview

The Appalachian Regional Commission (ARC) was established by the Federal Appalachian Regional Development Act of 1965 to improve the economy and quality of life in the 13-state Appalachian region. ARC provides financial and technical assistance to the region in meeting its special problems, to promote its economic development, and to establish a framework for joint federal-state-local efforts toward providing the basic facilities essential to its growth, attacking its common problems and meeting its common needs on a coordinated and concerted regional basis.

New York State is one of the 13 states in the federally-defined Appalachian region that includes all of West Virginia, and parts of Pennsylvania, Ohio, Maryland, Virginia, Kentucky, North Carolina, South Carolina, Tennessee, Georgia, Alabama and Mississippi. The governors of the 13 Appalachian states and the federal co-chairman appointed by the US President comprise the Commission. A state co-chairman, elected from among the governors, is rotated among the states, and an executive director heads the Commission's staff.

The Governor of New York State is a member of the Commission with the Secretary of State serving as his Alternate. The Department of State (DOS) is the official agent of the State of New York responsible for administering the Appalachian Program in New York State. As the official representative of New York, DOS cooperates with the federal government and other Appalachian states in administering the provisions of the Appalachian Regional Development Act. DOS sets funding priorities and prepares an Appalachian Development Plan for the State.

ARC is a unique partnership of federal, state and local governments. To assist local planning and to ensure that ARC funds are used to serve communities, the Commission's member-states work with area-wide planning and development agencies called Local Development Districts (LDD's). Each LDD has a professional staff and a board consisting of elected officials and public representatives of several counties. Both work with citizens to assess local needs and prepare local development plans based on those needs.

Area Development Program

Under the Area Development Program, the Appalachian states are responsible for recommending local and state projects within their borders that will receive assistance. Each federal fiscal year New York State submits an annual Investment Package to ARC, including projects that are proposed for funding with Area Development resources that year.

ARC's Strategic Plan 2005-2010 guides investment of Area Development Program funds. This plan details four general goals, the last (Goal 4) being the "Building of the Appalachian Development Highway System to Reduce Appalachia's Isolation." While New York State recognizes this as a crucial goal, projects involving actual highway construction are funded and administered by other federal and state agencies. Therefore, all projects must implement one of the first three ARC General Goals identified below.

- Goal 1: Increase job opportunities and per capita income in Appalachia to reach parity with the nation.
- Goal 2: Strengthen the capacity of the people of Appalachia to compete in the global economy.
- Goal 3: Develop and improve Appalachia's infrastructure to make the region economically competitive.

Types of Assistance

In New York State, there is a cap on ARC grant assistance of $150,000, which cannot exceed 50% of the total project cost.

Eligibility

The federally defined Appalachian portion of New York State ("Appalachian New York") contains the following fourteen counties: Chautauqua, Cattaraugus, Allegany, Steuben, Schuyler, Chemung, Tompkins, Tioga, Cortland, Broome, Chenango, Otsego, Delaware, and Schoharie. Any municipality, governmental entity or non-profit entity that is public or private that serves the Appalachian New York area is eligible for Area Development Program funds.

Program Use

New York State has established objectives and strategies for use of Commission funds under each of the three general goals. These strategies provide the key state policy framework for investment of ARC resources in Appalachian New York. All project proposals must implement one of the State strategies developed for Area Development resources. The following are the project activities that are eligible for ARC funding:

Goal 1

- Technical assistance promoting leadership development
- Training that strengthens the skills of local government officials and/or civic leaders
- Local government assistance demonstrations
- Business development and assistance
- Entrepreneurial and managerial skills training
- Education and training developed to stimulate entrepreneurship
- Development of formal and informal networks of professional and trade service providers
- Identification of initial debt and equity capital for new businesses
- Business development
- Asset-based that integrate conservation and economic development
- Promotion of increased international business activity that embraces both new domestic and global opportunities
- Information technology

Goal 2

- Promotion of leadership development, civic involvement and community improvement
- Workforce training
- Child care programs
- Basic skills for adults
- College preparation
- Educational excellence
- Rural health developing or expanding licensed primary health care (including dental)
- Rural health promoting rural health professional recruitment and retention
- Health and wellness

Goal 3

- Infrastructure related strategic development and technical assistance
- Development and improvement of water and wastewater systems supporting job creation or retention
- Development and improvement of water and wastewater systems addressing fully documented critical health/safety needs in distressed areas "pockets of poverty" (as defined by ARC)
- Telecommunications including telemedicine and telehealth
- Infrastructure promoting the responsible stewardship and use of natural assets and the development of environmentally sensitive industries
- Infrastructure assisting the development and rehabilitation of industrial/business sites and business incubators encouraging the creation of new enterprises and the expansion of existing businesses
- Intermodal transportation strategies

Application Procedure

Applications are solicited on an annual basis, generally in June, and must be received by the appropriate LDD. The LDDs assist DOS, work with project applicants, and prepare a recommended annual priority list of projects for consideration by the State, generally at the end of August. DOS will recommend an official New York State Appalachian Regional Investment Package for each fiscal year to the Governor for his transmission to the Appalachian Regional Commission, generally in December. Project sponsors can anticipate ARC project approvals after April of the following year. A project cannot begin nor can budget items in the ARC budget be expended prior to ARC approval.

Where to Apply

The first point of contact for potential project sponsors and the agency to which applications are submitted is the Local Development District that serves the project's proposed service area. The LDDs and the respective counties they serve are as follows:

Allegany, Cattaraugus, and Chautauqua Counties:

Southern Tier West Regional Planning and Development Board
4039 Route 219, Suite 200
Salamanca, New York 14779
Phone: 716-945-5301
Fax: 716-945-5550
www.southerntierwest.org
Executive Director – Donald R. Rychnowski
Program Contact – Ginger G. Malak
Email: gmalak@southerntierwest.org

Chemung, Schuyler, and Steuben Counties:

Southern Tier Central Regional Planning and Development Board
145 Village Square
Painted Post, New York 14870
Phone: 607-962-5092
Fax: 607-962-3400
www.stcrpdb.dst.ny.us
Executive Director – Marcia D. Weber
Program Contact – Thomas McGarry
Email: tmcgarry@stny.rr.com

Broome, Chenango, Cortland, Delaware, Otsego, Schoharie, Tioga, and Tompkins Counties
Southern Tier East Regional Planning Development Board
375 State Street
Binghamton, New York 13901
Phone: 607-724-1327
Fax: 607-724-1194
www.steny.org
Director – Robert A. Augenstern
Program Contact – Lynn Cebula
Email: lcebula@steny.org

ARC General Information, contact:
Kyle Wilber, ARC Program Director
New York State Department of State
Division of Local Government
41 State Street
Albany, New York 12231
Phone: 518-473-3694
Fax: 518-474-6572

Other Assistance

ARC requires a state or federal agency to serve as the "Basic Agency" to administer ARC funds for all construction projects. To keep costs down for the administration of ARC funds, ARC has agreements with other federal and state agencies for ARC fund administration. There are no additional administration requirements, only that of the Basic Agency. Only those agencies designated by ARC may serve as basic agencies. These agencies also provide technical assistance and project monitoring to DOS, ARC, and the LDDs. In New York State, the following agencies assist DOS:

- The Governor's Office for Small Cities
- US Department of Agriculture, Rural Development
- US Department of Commerce, Economic Development Administration
- US Department of Housing and Urban Development
- US Department of Education

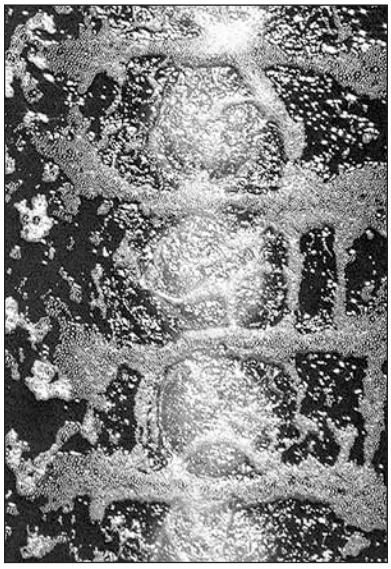
Other state agencies also provide assistance to DOS. The Department of Transportation is responsible for administering the Appalachian Highway Program in New York State, as well as advising on access road funding and other transportation projects. The Department of Health, Department of Economic Development, Environmental Facilities Corporation, State Education Department, and other state agencies also provide technical assistance as needed.

New York State Energy Research Development Authority (NYSERDA)

Overview

The New York State Energy Research and Development Authority (NYSERDA) is a public benefit corporation created in 1975 by the New York State Legislature.

NYSERDA administers the **New York Energy $mart**[SM] program, designed to support certain public benefit programs during the transition to a more competitive electricity market. Some 40 programs are funded by a charge on the electricity transmitted and distributed by the State's investor-owned utilities. **The New York Energy $mart**[SM] program provides energy efficiency services across New York State's residential and business sectors. NYSERDA also promotes research and development, and environmental protection activities.



Fine bubble systems are very energy efficient.

Basic research revenues are derived from an assessment on the intrastate sales of New York State's investor-owned electric and gas utilities, and voluntary annual contributions by the New York Power Authority and the Long Island Power Authority. Additional research dollars come from limited corporate funds.

With rising infrastructure demands and decreasing resources, municipalities are continuously looking for cost-saving measures, particularly with respect to operating costs. Many of the water and wastewater treatment plants in New York State are experiencing unnecessarily high operating costs due to overloading, failing equipment, lack of process-control instrumentation, and operating problems. These conditions often result in excessive energy use.

To help solve these problems, NYSERDA offers municipalities cost-sharing opportunities for energy studies, capital incentives for the installation of energy-efficient equipment and processes, and research and demonstration programs for innovative technologies. These opportunities are designed to assist the municipality in making sound energy decisions about their processes and equipment, thereby reducing their utility bills.

Technical Assistance Programs

FlexTech Services

This program allows facilities to use one of NYSERDA's 36 pre-selected engineering firms (FlexTech Contractors) to provide customized technical assistance. Projects are cost-shared by NYSERDA on a 50:50 basis. A municipality and NYSERDA each pay the FlexTech contractor 50% of the study cost, and NYSERDA can provide up to $50,000 per project.

Technical Assistance Program

This program allows a facility manager to choose its own third party engineering firm for the purpose of developing and delivering customized technical assistance. Selected projects are cost shared by NYSERDA on a 50:50 basis. A municipality is reimbursed by NYSERDA 50% of the study costs, up to $50,000 upon approval of the final report.

Implementation Examples

Examples of projects for both programs include, but are not limited to, the following:

- **Energy Feasibility Studies** identify energy-efficient capital improvements include, but are not limited to, motor replacement and sizing, use of variable speed drives, pump station upgrades, lighting, and HVAC upgrades, etc.
- **Process Efficiency Studies** are designed to help a facility meet changing effluent quality requirements, eliminate capacity constraints, or just improve overall energy efficiency. These studies tend to focus on energy efficiency rather than conservation. Recommended changes may include equipment upgrades or operational changes.
- **Long-Term Energy Management** studies review the condition of the existing equipment and facilities, and identify ways to make them more efficient. Efficiency measures are generally prioritized based on expected life of the existing equipment and the savings associated with the change. These studies are useful for long-term planning.
- **Combined Heat and Power and Renewable Generation** studies determine the site-specific technical and economic feasibility of installing combined heat and power or electricity generation capacity. These systems can be fueled by renewable resources such as biogas from digesters at wastewater treatment plants. Studies determine site-load match, sizing, standby costs, interconnect requirements, maintenance requirements and costs, simple payback, etc.

Eligibility

All New York State municipal water and wastewater facilities are eligible with the exception of those who receive electrical energy from the New York Power Authority (NYPA) or the Long Island Power Authority (LIPA).

How to Apply

Municipalities interested in FlexTech Services should contact NYSERDA. Staff is available to evaluate potential projects, assist with consultant selection, arrange for site visits, and coordinate project scopes of work. Referral forms are available at www.nyserda.org/programs/Technical_Assistance/FlexTech.asp

Technical Assistance

Copies of the program and applications can be downloaded from NYSERDA's website at www.nyserda.org. Copies are also available by calling 1-866-NYSERDA, by faxing NYSERDA at fax (518) 862-1091 or e-mail: info@nyserda.org.

Contact
NYSERDA
17 Columbia Circle
Albany, NY 12203-6399
Phone: 1-866-NYSERDA
Local Phone: 518-862-1090
Fax: 518-862-1091
www.nyserda.org

Smart Equipment Choices Program

Types of Assistance

This program is designed for simple equipment upgrades. Larger or more complex projects should investigate the Commercial Industrial Program. The Smart Equipment Choices Program offers cash back incentives for the installation of qualified premium efficiency electrical equipment including, but not limited to, motors, variable speed drives, lighting and controls, and HVAC equipment. Facilities may receive up to $10,000 in incentives through this program per program year.

Eligibility

To be eligible, a municipality must be an electrical distribution customer served by one of the following electric utility companies and pay into the System Benefits Charge (SBC) program: Central Hudson, Con Edison, NYSEG, National Grid, Orange and Rockland, and Rochester Gas and Electric.

Implementation Examples

Motors are major energy users. A motor running at a typical water and wastewater treatment plant for 4,000 hours a year has an annual electricity cost of about 10 times its capital cost.

Motors consume a large amount of energy, so even modest efficiency gains can deliver substantial savings. A typical 100 HP motor at full load with continuous operation 24 hours a day seven days a week, costs $70,000 per year to operate. For a nominal incremental cost, using a NEMA™ Premium Efficiency motor will save the municipality approximately $1,400 per year at an electric rate of $0.10 per kWh.

Qualified 100 HP motors are eligible for an incentive of over $300. A variable speed drive (VSD) on the same motor would be eligible for an incentive of $1,500.

How to Apply

The program provides a complete list of eligible equipment and the incentives available. Information about the program and application copies can be downloaded from NYSERDA's website at www.nyserda.org. Copies are also available by calling 1-866-NYSERDA, by faxing NYSERDA at fax (518) 862-1091 or e-mail: info@nyserda.org.

Contact
NYSERDA
17 Columbia Circle
Albany, NY 12203-6399
Phone: 1-866-NYSERDA
Local Phone: 518-862-1090
Fax: 518-862-1091
www.nyserda.org

Commercial and Industrial Performance Program

Types of Assistance

This program is designed for larger projects than would be appropriate for Smart Equipment Choices. Financial incentives are paid on a performance basis to contractors implementing cost-effective electrical efficiency improvements. For most projects, the NYSERDA incentives are equal to one year of annual energy cost savings and average approximately 20% of project cost.

Incentives are calculated based on the difference between the existing and the upgraded electrical energy use. Annual electrical energy savings (kWh) is multiplied by the NYSERDA incentive. For most measures, an incentive of $0.10/kWh is used. The maximum NYSERDA incentive is $400,000. The agreement is between NYSERDA and a third party, typically an Energy Services Company or the design engineering firm. The contract between the municipality and the third party can be performance based or a traditional fee-for-service contract. NYSERDA incentive payments are made to the third party. The amount of incentive passed through to the municipality is negotiable between the third party and the municipality.

Eligibility

To be eligible, the municipality must be electrical distribution customers served by one of the following electric utility companies and pay into the System Benefits Charge (SBC) program: Central Hudson, Con Edison, NYSEG, National Grid, Orange and Rockland, and Rochester Gas and Electric.

Assistance Examples

Typical projects include, but are not limited to upgrades to pumping systems, the addition of variable speed drives, use of premium efficiency motors, or changes in treatment process such as upgrading from mechanical mixers to fine bubble aeration. The incentives are based on kWh savings, but projects which improve overall water quality per unit energy may also be eligible.

How to Apply

Copies of the program and applications can be downloaded from NYSERDA's website at www.nyserda.org. Copies are also available by calling 1-866-NYSERDA, by faxing NYSERDA at fax (518) 862-1091 or e-mail: info@nyserda.org.

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Municipal Water and Wastewater Treatment Plant Program Assistance

Types of Assistance

The Municipal Water and Wastewater Technologies is a competitive program. Proposals are developed and submitted for review by municipalities or their Contractors. Projects must develop, demonstrate, or increase the use of innovative or underutilized energy-efficient water and wastewater technologies in New York State. Selected projects must show quantifiable energy, environmental, and/or economic benefits for a New York State municipal wastewater treatment plant (WWTP) or water treatment plant (WTP), and show opportunities for replication at other New York State municipal treatment plants. For product development projects, the proposal must also emphasize near-term application of the technology and/or show economic benefits to New York State in the form of creation or retention of jobs in New York State.

All proposals must be cost shared. A minimum of 50 percent cost-sharing is required for proposals requesting NYSERDA investment in product development. A minimum of 25 percent cost-sharing is required for all other projects. NYSERDA typically makes multiple awards up to $250,000 per project.

Eligibility

All New York State municipal water and wastewater treatment plants are eligible.

Implementation Examples

Successful proposals have included demonstration and pilot projects evaluating the effectiveness of course mono-media filtration, demonstration of UV disinfection at a secondary wastewater treatment plant, partnering to support development of UV disinfection reactor validation center, pilot testing of innovative biological nutrient removal processes, demonstration of software to control system pumping, piloting of innovative membrane bioreactor process, and others.

How to Apply

This program has been released annually. When soliciting proposals, the program is posted on NYSERDA's website at www.nyserda.org. To receive a Program Announcement by mail, e-mail: info@nyserda.org or call 1-866-NYSERDA.

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Chapter 4 Contents:
Regulatory Overview and Legal Responsibilities

Every operator has a bad day.

Chapter 4 Regulatory Overview and Legal Responsibilities

Addressing Regulations and Legal Considerations

Overview

Governmental efforts to regulate pollution of the waters of the United States date back as far as the Rivers and Harbors Act of 1899. However, the effects of the industrial revolution and rapid population growth on the nation's waterways signaled that more was required to maintain healthy and pure waters, and to restore those that had become impaired.

Today, discharges to the waters of the United States are highly regulated by, among other laws, the Federal Water Pollution Control Act (FWPCA), commonly known as the Clean Water Act. Originally enacted in 1970, FWPCA's intent was to eventually eliminate discharges of pollutants and that all waterways in the United States be fishable and available to swim in by 1985. FWPCA, like many comprehensive environmental laws, contains provisions related to research, grants for construction of treatment works and state water pollution control revolving funds, as well as provisions requiring the establishment of water quality standards and a system to permit the discharge of pollutants to the waters of the United States. That system, the National Pollutant Discharge Elimination System (NPDES), provides the framework within which discharges from municipal, industrial, and other facilities are regulated. Discharges which are not authorized by or are not in compliance with a permit are illegal and subject the owner and operator to possible enforcement and legal liability.

In enacting FWPCA, Congress authorized the United States Environmental Protection Agency (US EPA) to issue detailed regulations to carry out the requirements of the law. Those details are set forth in the Code of Federal Regulations. US EPA implements the NPDES in states and territories where authority has not been delegated to a state or territory.

New York, which has been delegated such authority by the federal government, has demonstrated a long-standing and vigorous commitment to protection of its waters dating back to 1953 and the Department of Health's Pure Waters Program. In 1972, the New York legislature enacted the modern version of the state's Water Pollution Control Act, which is codified in the New York Environmental Conservation Law (ECL). Article 17 of the ECL authorizes the New York State Department of Environmental Conservation (NYSDEC) to implement New York's State Pollutant Discharge Elimination System (SPDES) permitting program. NYSDEC has promulgated detailed regulations which are set forth in Title 6 of the Official Compilation of New York Codes, Rules and Regulations (NYCRR), and has issued written guidance documents known as the Technical & Operational Guidance Series (TOGS).

Virtually all aspects of wastewater treatment in New York are specifically regulated. The initial design and construction of a wastewater treatment plant must be reviewed and approved by NYSDEC before a permit can be issued. The operators of municipal wastewater treatment plants must be certified, and the effectiveness of treatment must be continually monitored and performance results regularly self-reported to NYSDEC. With all federal and state laws, regulations, and guidance documents available online, owners and operators of wastewater treatment plants have instant access to the authorities under which they operate. After more than 35 years of administering the Clean Water Act, federal and state environmental enforcement authorities have no sympathy for public or private owners or operators who feign ignorance of applicable and relevant legal requirements or fail to comply therewith.

Legal Responsibilities

Owners and operators of wastewater treatment plants face many challenges in complying with the applicable laws and regulations. NYSDEC and other agencies will often work cooperatively with owners and operators of wastewater treatment plants to write appropriate SPDES permits and to achieve compliance with the permits. A plant owner or operator who does not communicate regularly and establish a rapport

with the agency that issues and administers its discharge permit is much more likely to be out of compliance than one who does.

In New York, owners and operators who regularly violate applicable water pollution control laws, regulations, or permits and fail to take appropriate measures to abate such violations will attract the enforcement attention of NYSDEC and the relationship with the agency can rapidly change from cooperative to adversarial. That attention, and the legal proceedings which often follow, can result in civil or criminal prosecution and liability for owners and operators. Municipal bodies which own wastewater treatment plants are not immune from enforcement.

The self-monitoring and reporting conditions of SPDES permits present obvious opportunities and incentives for owners and operators to effect less than full compliance, so a substantial amount of governmental enforcement efforts are focused on improper monitoring and reporting. Through such efforts, enforcement authorities seek to directly punish owners and operators for violations, and deter others from engaging in the same or similar illegal conduct.

Enforcement

Governmental enforcement of water pollution control laws in New York is almost exclusively by NYSDEC, though US EPA has reserved in its delegation of authority to New York and other states the ability to step in and "overfile," (i.e., commence a federal enforcement action if US EPA determines that state enforcement is inadequate or insufficient).

Governmental enforcement actions against owners and operators can be initiated in several ways. NYSDEC Division of Water staff identify the majority of violations of water pollution control laws, regulations, and permits. NYSDEC's Division of Law Enforcement and Bureau of Environmental Conservation Investigations, staffed by fully authorized investigators and law enforcement officers with specialized environmental training, also identify many violations. These uniformed and plain-clothed enforcement officers follow up on referrals from NYSDEC staff and tips from the public, and they have authority to issue Environmental Compliance Appearance Tickets or Consent Orders to violators.

Violations and Penalties

Depending on several factors, including the mental state of the violator and seriousness of a violation, enforcement can be in the form of criminal, civil, and/or administrative prosecution.

When an owner or operator commits a knowing and willful violation of a water pollution control law, regulation, or permit, or commits an act or omission so negligent or extreme, he exposes himself to criminal prosecution and liability. According to NYSDEC, the most common criminal violation committed by owners and operators of wastewater treatment plants is the submission of monthly discharge monitoring reports containing false information concerning the levels of pollutants discharged, the level of treatment achieved, or the operation of the facility.

Lack of preventive maintenance may cause violations.

If NYSDEC determines that criminal prosecution of an owner or operator is warranted and appropriate, it can refer the matter to a United States Attorney to commence legal proceedings in Federal District Court, or to the New York Attorney General or District Attorney for prosecution in New York State Courts.

As in all criminal proceedings, where the loss of one's personal liberty may be at stake, the prosecution bears a high burden and must prove beyond a reasonable doubt that the owner or operator committed the alleged violations. An owner or operator convicted of a criminal violation could face prison, in addition to monetary and other criminal penalties.

If NYSDEC determines that in committing a violation an owner or operator lacked the required knowing and willful mental state, the Department can still initiate civil enforcement proceedings. Civil enforcement can seek correction or abatement of violations, remediation or restoration of environmental damage, as well as monetary penalties. Article 71 of the ECL provides for civil penalties for most violations of water pollution control laws, regulations, and permits of up to $37,500.00 per day of violation. Civil enforcement also serves to punish violators and deter others from engaging in the same or similar conduct.

NYSDEC often resolves civil enforcement proceedings through Consent Orders. A Consent Order is a legally binding contract between the violator, known as a Respondent, and NYSDEC. In entering into a Consent Order, the Respondent waives his right to the hearing which he is entitled to by law, and agrees to do certain things, typically including the payment of a penalty and the taking of appropriate remedial measures to correct the violation. Violation of the terms of a Consent Order can result in penalties of up to $37,500.00 per day of violation, and renewed prosecution of the original violations.

Administrative Proceedings

If a violation cannot be resolved in a Consent Order, NYSDEC can initiate an administrative proceeding before an Administrative Law Judge (ALJ) where NYSDEC can seek an order to require compliance, as well as civil penalties. Such an administrative proceeding is commenced by the filing and service of a Notice of Hearing and Administrative Complaint, or a Notice of Motion for an Order Without Hearing. The ALJ, an employee of NYSDEC, conducts a hearing, hears the testimony of witnesses, reviews evidence put forward by NYSDEC staff and the Respondent, and makes a recommendation to the NYSDEC Commissioner.

The Commissioner can adopt the ALJ's report and recommendation, or make his or her own determination. NYSDEC's burden of proof in an administrative hearing is low, and the decisions of the ALJ and Commissioner will be upheld as long as such decisions are not arbitrary or capricious. Penalties imposed after an administrative hearing will often be greater than the original amount sought by NYSDEC in a Consent Order. The penalty normally has a "Payable Amount," and the Consent Order may contain "Stipulated Penalties" for violations of its terms.

NYSDEC has issued qualifications for operators of wastewater treatment plants which are set forth at 6 NYCRR Part 650. Pursuant to this regulation, NYSDEC is authorized to issue a certification to an operator who satisfies those qualifications. If NYSDEC determines that an operator certification was issued by mistake or as a result of fraud, or if NYSDEC determines that an operator was negligent, or practiced fraud or deceit in the performance of his or her duties, NYSDEC can commence an administrative proceeding before an ALJ to revoke the operator's certification.

Owners and operators should understand that criminal prosecution of violations of water pollution control laws, regulations, and permits does not preclude simultaneous or subsequent civil and administrative enforcement, and vice versa. As such, a single violation of a water pollution control law, regulation, or permit could result in a scenario where an operator faces criminal prosecution by a United States Attorney and is subject to an administrative proceeding concerning the revocation of his or her certification, while the owner of the facility, which could be a municipal body, faces a civil enforcement action which could result in civil penalties and expensive corrective action.

If a violation is particularly egregious and the Commissioner of NYSDEC determines that a condition or activity presents an imminent danger to the health or welfare of the people of the state or is likely to result in irreparable damage to natural resources, the Commissioner can issue a Summary Abatement Order requiring the immediate cessation of such condition or activity. Because this remedy is considered drastic, an administrative hearing must be provided within 15 days of the issuance of the Commissioner's Summary Abatement Order.

Because Congress recognized that the federal and state governments could not effectively monitor compliance of all discharges and enforce all violations, it included in FWPCA a "Citizen Suit" provision which

allows any citizen to act as a "private attorney general" to commence civil enforcement proceedings in Federal District Court to enforce compliance with FWPCA and violations of NPDES and SPDES permits. Since citizen suits may not be maintained for wholly past violations or where the federal or state government is diligently prosecuting such violations, it is in owners' and operators' best interest to immediately abate the violation if possible, and it may be advisable to seek the initiation of government enforcement activities so as to preempt a citizen suit.

Conclusion

Wastewater treatment is highly regulated at the federal, state, and sometimes even the regional and local level. Given that criminal violations of water pollution control laws, regulations, and permits can result in incarceration and civil penalties as high as $37,500.00 per day, and given that an operator's certification and source of livelihood can be revoked for cause, there is simply no substitute for compliance. Compliance requires proper planning by the owner, proper monitoring and maintenance by the operator, and cooperation and assistance by the relevant regulatory authority. Though non-compliance may appear in certain instances to provide some illusory short-term savings, compliance is, over the long term, a much more cost effective strategy.

Useful Resources

From the Local Government Environmental Assistance Network entitled: *The Primer for Local Governments on Environmental Liability,* www.legean.org/documents/primer.pdf.

State Pollutant Discharge Elimination System and Discharge Report Monitoring

NYSDEC has a program that has been approved by the US Environmental Protection Agency (US EPA) for the control of wastewater and storm water discharges. Under New York State law, the program is called the State Pollutant Discharge Elimination System and is commonly referred to as SPDES. The program controls point source discharges to ground waters and surface waters (see glossary for definitions if necessary).

Special Conditions of Permits

For your assistance, a sample SPDES Permit is included in Appendix B.

The Special Conditions (Part 1) of the Permit includes some basic information on the wastewater facility, such as the permittee, facility name, mailing address, and location. It also includes information on the drainage basin, receiving water, and SPDES Number and expiration date. Located on page 1 of the permit is the Discharge Monitoring Report (DMR) mailing address. Page 2 of the permit includes the "Effluent Limitations and Monitoring Requirements." Effluent limitations are the maximum allowable concentrations or ranges for various physical, chemical, and/or biological parameters. Limitations are also specified for flow (million gallons per day) and mass loadings (pounds per day). Monitoring requirements are noted in terms of frequency of collection, sample type (composite vs. grab), and sample location (influent or effluent). Recording, reporting and additional monitoring requirements are shown on Page 4 of Part 1.

Sometimes a plant upgrade is needed to maintain SPDES compliance. (Lake Placid)

Part 750 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (NYCRR) provides the statutory authority for requiring a SPDES Permit and operating in accordance with a SPDES Permit.

The complete regulation can be found at the following website:
www.dec.state.ny.us/website/dow/part750.pdf

Some important sections of Part 750 include:

- Public Notification of Discharges (750-1.12) requires that a sign be erected or posted where wastewaters are discharged to surface waters.
- Modification of SPDES Permits (750-1.18) provides the grounds for Permit changes.
- General Provisions of a SPDES Permit (750-2.1) indicates that any Permit noncompliance constitutes a violation of the Environmental Conservation Law (ECL) and the Clean Water Act.
- Inspection and Entry (750-2.3) allows for the NYSDEC to enter onsite, inspect, sample, request various records, etc.
- Operator and Permittee Liability (750-2.4) clearly outlines the possible criminal and administrative liabilities to the operator and/or the owner.
- Routine Monitoring, Recording, and Reporting (750-2.5) discusses the kinds of records that must be maintained, the testing and analytical procedures required, and the need to submit Discharge Monitoring Reports (DMRs).
- Incident Reporting (750-2.7) outlines the procedures for reporting of a bypass, upset, or other incident.
- Disposal System Operation and Quality Control (750-2.8) requires that the plant have preventive and corrective maintenance programs and must also have written procedures for O&M, training new operators, and laboratory QA/QC. The system shall not receive wastes beyond design capacity. The plant will have sufficient staff to satisfactorily operate and maintain the treatment works.
- National Pretreatment Standards (750-2.9) requires the plant to develop a pretreatment program to monitor and control industrial users. This section also requires that excessive infiltration and inflow be identified and removed.

For questions and clarification of these regulations, contact the Regional Water Engineer in your area or visit the website listed above.

Discharge Report Monitoring

SPDES requires that wastewater facilities complete and submit Discharge Monitoring Reports (DMRs). DMRs are a legal document and any falsification of data can result in legal implications. Failure to submit the DMR is a violation of the SPDES Permit, Article 17 of the NYS Environmental Conservation Law, and the Federal Clean Water Act. Records must be kept for five (5) years.

For your assistance, a sample DMR is shown in Appendix C.

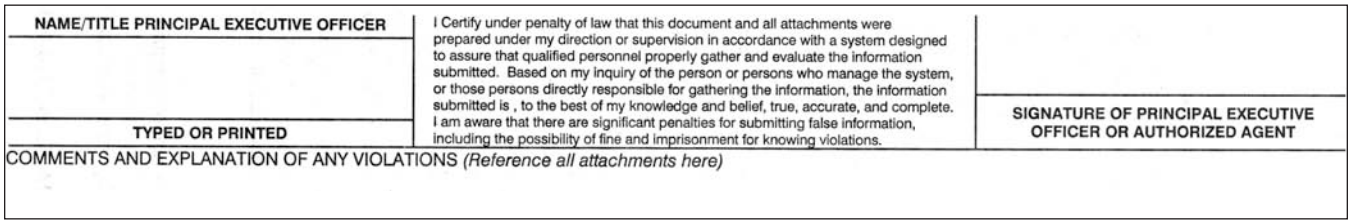
Across the top of the DMR is the mailing information about the facility, the SPDES permit number, and the monitoring period. Monitoring can take place monthly, quarterly, semi-annually or annually. The parameters and the monitoring locations are listed down the left side of the DMR and may require several pages. These parameters and monitoring locations correspond with the SPDES permit limits. Data is entered in the open "Sample Measurement" boxes. On the righthand side of the DMR, there is a column *"No. Ex."* This is a summary of the Number of Excursions (violations) and is tracked by the Compliance Coordinator.

Across the bottom of the DMR is the signature information. The name/Principal Executive Officer (PEO) is the person who must authorize. By signing the DMR, the PEO concedes that the data on the DMR is true, accurate, and complete to the best of his or her knowledge. Importantly, changes in the authorized signer must be made in writing to the NYSDEC.

Appendix C also has the *Discharge Monitoring Report Signature Authorization Form* that must be submitted to the NYSDEC.

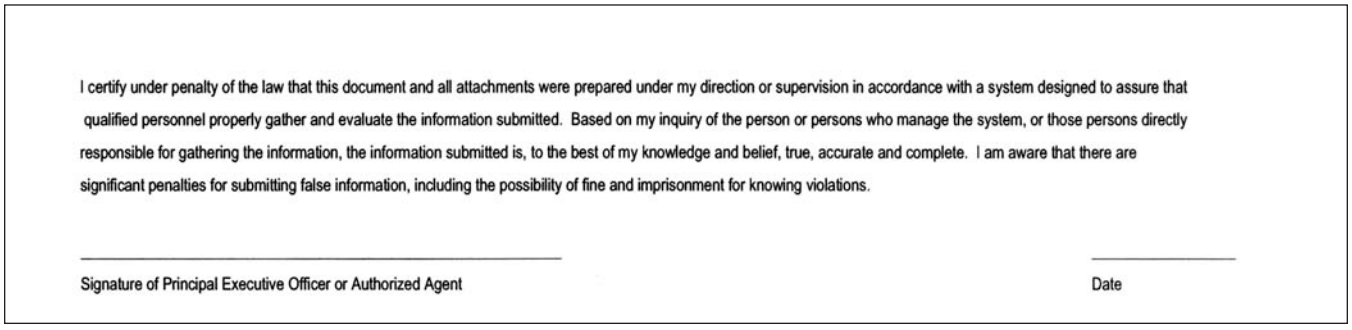
Visit the following website for the *DMR Manual* that explains how to complete the DMR, for Frequently Asked Questions, and for various forms that may not be available in this manual:

www.dec.state.ny.us/website/dow/bwcp/dmrmanual.html



NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT
COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*		

Certification on the Discharge Monitoring Report



I certify under penalty of the law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of Principal Executive Officer or Authorized Agent

Date

The Monthly Operating Report is also a very legal document.

Questions regarding DMRs should be directed to:
SPDES Compliance Information System
NYSDEC
625 Broadway
Albany, NY 1233-3506
Phone: 518-402-8154

NYSDEC's SPDES Compliance System and You

Wastewater treatment facilities are monitored by NYSDEC to verify compliance with the SPDES Permit using a combination of approaches including Discharge Monitoring Reports (DMRs), onsite inspections and reconnaissance, and effluent sampling/analyses. NYSDEC responses to violations of the SPDES Permit may include:

- Phone Call from the Regional Inspector
- Onsite Inspection
- Technical Assistance
- Warning Letter from the Regional Inspector
- Compliance Conference
- Notice of Violation (NOV)
- Sewer Moratorium
- Penalties
- Order on Consent
- Notice of Hearing and Complaint (NOHC)
- State or Federal Prosecution
- SPDES Permit Modification


Technical assistance is one of several compliance tools.

The level of NYSDEC response is a function of several factors including the number, severity, duration of violations, and the extent of cooperation by the community. Noncompliant wastewater facilities are tracked by a US EPA system called the Significant Noncompliance Action Program (SNAP). Facilities are included in the SNAP indices as a result of effluent violations, which can include missing deadlines for construction upgrades or non-filing of the DMR. The US EPA and NYSDEC meet quarterly to discuss appropriate compliance strategies to achieve SPDES Permit limits. If violations continue, the US EPA requires that NYSDEC use their enforce mechanisms, or else the US EPA will execute an enforcement action of their own, called an "Overfile."

As an operator and local official, it is important to note that like most agency information, the public has access to the US EPA compliance database, under the "Enforcement and Compliance History Online (ECHO) provision." Anyone can have access to up to 800,000 facilities nationwide and can review up to two (2) years of data for a center. You can visit the following website to check if your community's wastewater treatment facility is compliant: www.epa.gov/echo/index.html.

"Envirofacts Data Warehouse" is another US EPA database that can be searched to check for violations and compliance records specific to treatment plants. The "Water Discharge Permits Query Form" allows for the retrieval of selected data from the Permit Compliance System (PCS) that includes the National Pollutant Discharge Elimination System (NPDES). You can access this information on the following website: www.epa.gov/enviro.

Compliance, staying off SNAP, and avoiding possible legalities brought by public interest groups involves good management and operation procedures. The following list is just a few suggestions in order to maintain compliance:

- Meet SPDES Permit Limits
- Comply with Part 750
- Meet Deadlines in Orders and Permits
- Work with your NYSDEC Inspector
- Report Sampling and Monitoring Results Honestly
- Renew Operator Certifications On Time
- Establish an Adequate O&M Budget
- Revisit Sewer Rates
- Capital Improvement Plan and Reserve
- Preventive Maintenance and Process Control Systems
- Attend Ongoing Operator Training
- Train and Retain Good Staff

Ongoing training of operators is good business.

Additional Resources

SPDES Permit Regulations – 6 NYCRR PART 750

NYSDEC

Bureau of Water Permits

625 Broadway

Albany, NY 12233-3505

Phone: 518-402-8111

Manual for Completing the Discharge Monitoring Report for the State Pollutant Discharge Elimination System

NYSDEC

Bureau of Water Compliance Programs

625 Broadway

Albany, NY 12233-3506

Phone: 518-402-8154

Chapter 5 Contents:
Public Relations

Chapter 5 Public Relations

Responding to Consumer and Operator Demands

Overview

The development of a positive relationship between local officials and the public relating to wastewater utility service is critically important. The public has given local authorities the responsibility for providing proper wastewater treatment and disposal. The public expects protection of the environment and public health, as well as, quality service for a fair price.

The intricacies of wastewater systems operation and maintenance are foreign to the vast majority of the public. Citizens do want to make meaningful input to local government on the public impact and costs of these facilities. For this public input process to have useful substance, there should be both public education and an established process by which the public may participate.

Managing and Updating an Enlightened Rate System

Customers will be most aware of the impact of wastewater service each time they receive their utility bill. Wastewater service costs represent a financial impact for many users, and public officials need to ensure that the rates charged for water and wastewater service are fair and correct. Responsible financial management is of the utmost importance. This includes proper budgeting and planning for operations and future equipment replacement, as well as other improvements that may influence the rate structure for your system.

The rates charged for wastewater service will have a significant impact on a community's potential for growth and viability. Utility management must look for the most cost-efficient ways to provide top quality service and must devise user rates that are fair to the customers, but give due consideration to the long-term integrity of the utility.

Methods for Avoiding "Shock" Rate Increases

Proper annual budgeting and planning for future needs allow officials to prepare for the financial obligations for wastewater management. Based on the financial data, utility rates can be managed to avoid excessive "shock" rate increases.

Annual budgets will, of course, increase incrementally with time. This is due to inflationary increases in most typical components of the budgets, including energy, labor, chemicals, and supplies. Sharp increases in annual budgets should be avoided. Unless past financial management has been lax, or preventive maintenance consistently deferred, there should be no necessity for drastic budget increases. There should be no serious unforeseen financial emergencies. Rates and connection fees should be allowed to float gently upward to accommodate inflation and to provide funds for the orderly, planned replacement of capital equipment as ends of life cycles are reached.

Example of Rate Inflation

If inflation rates average three percent per year, the cost of replacing a $10,000 main booster pump will increase about $0.82 cents every day that it is in service. This suggests that if the pump were to give 15 years of service, its predicted replacement cost would be about $14,789. This amount must be collected from customers as service that is rendered and be placed in capital equipment reserves to be available when needed. Several approaches have been used successfully in local communities for both capturing the reserves needed and meeting the financial requirements of ongoing O&M.

Adapting Rates

The first approach is to adapt rates to long-term financial trends. Increases in charges result from an annual average prime rate that is established for the preceding calendar year. Some utilities use other indices, such as the annual inflation rate or increases in energy costs. This approach is usually codified into local ordinance, effectively limiting acrimonious debate.

Another approach is to establish multi-year rate structures in which one rate is charged over three, five, or seven year periods. This rate is carefully calculated to accommodate expected growth, inflation, and equipment replacement and must be based on careful and informed planning. Early years of the multi-year rate structure will yield more revenue than needed (late years less). Obviously, surpluses from the early years must be placed in reserves to cover later shortfalls.

Planning is required in any water or wastewater system for day-to-day operation and maintenance, equipment replacement, and service upgrades. Planning must also include the potential for emergency situations. Proper planning combined with good financial management calls for funds for these activities to be set aside early and well managed in budgets and reserve accounts.

Major improvements to wastewater facilities may require additional sources of revenue such as grants and loans. Choosing the best available sources of funding can have a significant impact on ultimate user cost, and therefore local officials should thoroughly evaluate all funding options. Good public relations demands that local officials work effectively on behalf of the utility users to secure the lowest cost financing available.

Note that additional information relating to user rates can be found in Chapter 2, in the section entitled "Financial Management and Business Planning."

Educating Consumers and Promoting Best Practices and Consumer Responsibility

Because local government acts as the primary provider for wastewater treatment to its citizens, government also becomes their link to understanding the proper use of those services. Utilities have the opportunity (and the duty) to educate their customers regarding the services, citizen responsibilities, and the worthy environmental protection goals which those utilities support.

Plant tours can be very educational and enlightening to the public.

Health and Safety

Another public relations responsibility is to educate consumers about how their actions can protect the environment, their own health and safety, and that of the community.

Water and Energy Conservation

Water conservation is an important issue on two levels. First, as consumers conserve water, they conserve the capacity of the facilities that carry out treatment. Excessive water use wastes the capacity of the systems producing the water and treating the resulting wastewater. Second, with increasing regularity, public demand for water exceeds locally-available supplies. Water conservation efforts are the best tool for stretching those supplies as far as possible to serve the present and future needs of communities.

Experience and public opinion surveys indicate that most customers are interested in conserving water. However, they may not know how, despite the fact that water conservation techniques are convenient and easy to implement. Customers appreciate cost savings from reduced usage, as well as interest by their water company in helping them protect the environment and public health. Effective public education campaigns can substantially improve water conservation, contribute to system capacity, and build appreciation for the important work of treatment plant staff and local officials.

Topics related to water conservation include the following:

- Leak Protection – How much water does a leak waste?
- Lawn and Garden – How much water is used for landscaping? What type of landscaping uses less water?
- Car Washing – What can be done to reduce water use with driveway car washing? How much water can be saved by commercial car washing?
- Household Use – How can changes in household water use habits save on water usage?
- Industrial and Commercial – How can pollution prevention concepts be used to reduce water usage and wastewater generation?
- Water Metering – How is water usage affected by billing based on usage vs. flat rates with no restrictions on usage?

Another good public relations tool is to implement and then publicize an in-plant energy conservation program. Energy conservation is significant because of the heavy impact of energy costs on a typical facility's operating budget. Energy conservation can be a positive tool for saving costs without reducing operating effectiveness. Energy conservation programs generally require identifying the locations with high energy use, identifying possible savings, establishing new operating practices to save energy, and making cost-effective capital investments in energy saving equipment.

Source Water Protection

The actions of irresponsible individual consumers can have disastrous effects on groundwater and surface water supplies. These impacts on water supplies can also prevent their use for recreation and as natural habitats. Customers must be informed about how their actions, such as the use and disposal of chemicals, fertilizers, and household products can affect water supplies.

To protect water supplies from contamination, communities need watershed management plans (surface water supplies) and wellhead protection programs (groundwater supplies).

Storm Sewers

While the operation of storm sewers may not be governed by the sewer authority, storm sewers are an important and often misunderstood part of a community's infrastructure. Misuse of storm sewers can lead to significant water pollution.

Many people do not know that sanitary sewers flow to treatment plants which provide significant treatment to remove pollutants before discharge. Most storm sewers flow directly to natural waters, with little or no treatment. Often these natural waters are community raw water supplies.

Chemicals that are discharged into storm sewers, or that run off into the storm sewers from lawns or driveways, are not removed before they reach those natural waters. Many communities have started educational programs to help the public understand the importance of limiting polluting discharges into storm sewers. These programs have often included painting messages next to storm water inlets (street drains) to indicate that only rainwater should be discharged.

Proper Disposal of Hazardous Waste

Improper disposal of hazardous waste can cause contamination of surface water supplies, groundwater, and soil. Hazardous waste can also adversely affect the biological treatment processes at wastewater plants and can contaminate landfills that were not designed to receive these materials. Many communities have started household hazardous waste programs to inform the public of the proper disposal procedures for various waste products.

Often the first step in a household hazardous waste program is to educate the public about the types of common materials that are hazardous. Many products used daily are considered hazardous when they become waste. For example, the used or leftover contents of household products such as paints, cleaners, stains and varnishes, car batteries, motor oil, and pesticides are all household hazardous wastes.

Brochures and bill stuffers can be used to address the issues relating to proper hazardous waste disposal. In addition, most state environmental protection agencies offer hazardous waste disposal programs that can help communities address this issue.

Communicating and Managing the Public Image of the Facility

It is essential for the public to know that the community's facilities are well managed. Because the public is so quick to realize when there are problems with their local facilities, assumptions could be associated with poor management. Consequently, it is important that all aspects of wastewater service, including management, provide the highest quality service and render a professional impression that begins with reliable service.

Public Meetings

As a public body, a community's utility commission will have regular public meetings. These meetings must be orderly, well managed, and productive. Technical presentations at these meetings should be well prepared and should be both technically complete and, especially if requiring budgetary appropriations, easily understood by the lay public. Business at public meetings should be completed in a professional manner, and unnecessary or repetitive discussion should be minimized.

While public participation is to be encouraged at such meetings, it too should be conducted and managed in a professional manner. Members of the public must be required to keep their presentations brief and to the point. At times, it may be necessary to place a time limit on public comments to allow sufficient time for all public input. It is important to manage the presentation of public comment so that it is relevant to the discussion and not repetitive. Leaders should be ready to refocus the discussions if individuals provide irrelevant testimony or repeat the comments previously presented.

Managing the Media

Absent of an effort to bring the good work of community utility systems to the media's attention, the media will not be seen until there is a problem. Even if the utility receives media coverage for the positive aspects of its operations, there is always potential to receive negative media attention. To make a good impression, leaders should be as open and honest as possible, being sure of their facts and providing fact sheets or summaries to avoid any misstatements about negative events or accidents.

Many publications and training courses are available to help staff deal with the media. It may be best to delegate responsibility for media contact to a single individual with good communication skills and to assure that they are trained in the specifics of media interaction. This individual can then coordinate media contacts with technical staff relating to specific issues.

Public Service Announcements

Public service announcements are a good way to promote environmental and safety messages to the public on behalf of utility operations. Local media outlets can provide more information on the specific requirements for placing a public service announcement.

Open Houses

An open house, tour, or other special event is an excellent way to get the public and perhaps the media to see what goes on in water or wastewater systems. It can also be an event in which employees and public officials may involve their families in their work.

The event should be well organized, with a specific schedule of events. Tours should be in small groups along a safe (and, if possible, odor-free) route. If necessary, safety equipment such as hard hats and hearing protection should be provided. Speakers should be well prepared and ready to answer questions from their audience. Often a panel of individuals may be the best approach to answering the wide range of questions that can come from the public.

Open house at Cooperstown celebrating their new UV system.

Bill Stuffer Announcements

The bill stuffer has long been a favorite tool of the water and wastewater utility manager. Bill stuffer informational packets are also available from a number of commercial suppliers. These are professionally prepared documents that cover a wide range of public education topics of interest to water and wastewater customers.

Some bill stuffers are specific to topics that may be of growing importance to the community, such as source water protection, biosolids (sludge) management, or wastewater recycling. Bill stuffers provide an opportunity to begin the educational process for the consumer and community. Most bill stuffers can be customized to include specific information about the utility.

Customer Surveys

Often a utility loses contact with its users. This may be the result of not listening, or listening to only a select vocal few. To obtain a representative set of consumer opinions, it can be helpful to conduct a customer survey. It may also be used to gauge the level of customer satisfaction and to direct efforts for service improvements. A survey development, marketing, or public relations professional should be consulted for assistance in conducting a customer survey. These professionals are familiar with the procedures for proper survey preparation, distribution, validation, and interpretation.

Newsletters

An annual, biannual, or quarterly newsletter is an excellent way to communicate to customers the plans and accomplishments of a water or wastewater utility. Newsletters should be brief and to the point. An important consideration in deciding to publish a newsletter is consistency. Once a utility decides it is going to publish a newsletter, it must maintain that commitment. Failure to follow through will reflect poorly on the professionalism of the operation.

Responding to Correspondence

It is important that the utility respond promptly to all correspondence from its customers. If an issue is likely to take some time to address, a reply should nevertheless be sent immediately, indicating when the customer may expect a specific response. The response should be thorough and attempt to fully address the issues raised in the original correspondence. Replies to correspondence may require a meeting to discuss more difficult issues, and a summary of the results of that subsequent meeting should be sent to the correspondent.

All correspondence should be professionally prepared. It should be signed by an authority representing the organization. A file of all incoming correspondence and replies should be maintained for future reference.

Tools for Public Education

Overview

Many organizations are available to assist communities with outreach and communication programs. These programs assure the public that their water quality and wastewater facilities are operating efficiently. Educational programs refrain from using technical jargon and communicate in layman terms in order to effectively reach their audiences. To ensure that the community understands the value of their municipality's utility center, educational programs should be made available.

Water Environment Federation (WEF) Public Education Program

As a leading source of water quality information, the Water Environment Federation (WEF) develops programs and materials to help its members communicate with their target audiences about key water quality issues. As a not-for-profit technical and education organization for water quality professionals, its goal is to increase an understanding of the direct role water and wastewater services have in the protection of public health, the economy, and the environment.

Since 1928, WEF has worked to provide its members, public officials, and the general public with the necessary tools to engage in or learn ways to improve quality of life through water resources management, water protection, and water and wastewater treatment.

For the general public, WEF offers a full brochure series, videos, posters, and CD-ROMs on a wide range of water quality topics including wastewater treatment processes, careers, point and non-point source pollution, watershed management, water and wastewater infrastructure, fats, oils and greases, and water and biosolids recycling. Developed by water quality professionals, the materials can be used as informational mailers, bill inserts, and handouts for community meetings, exhibits, plant tours, and school programs.

For educators, WEF offers "The Water Sourcebook," a supplemental K-12 school curriculum on water quality. The popular hands-on series is designed to be an easy way for teachers, non-formal educators, and water quality professionals to teach elementary and secondary grades about today's most important water quality issues including wastewater and drinking water treatment, ground and surface water, and wetlands.

Recognition of an excellent operation in Old Forge. From left to right: Gregg Gendron, NYSDEC; Robert Moore, Town Supervisor; Ted Riehle, Chief Operator; Sandra LeBarron, NYSDEC; John De Voldre, Operator; Ken Skibinski, NYWEA.

To supplement this effort, WEF also offers a full-day, hands-on training workshop for high school science teachers at WEFTEC®, the Federation's annual technical exhibition and conference. Featuring Sewer Science, a mobile wastewater treatment plant equipped with specially designed tanks, real-life laboratory analytical equipment and workbook, the award-winning WEF, guides teachers through a simulation of the wastewater treatment process. The miniature laboratory and supplemental materials through a unique partnership of corporations, municipalities, consultants, community organizations, and area high schools are then provided exclusively to high schools in the conference host city for a full academic year.

For students, WEF organizes the Stockholm Junior Water Prize (SJWP), the most prestigious international youth award for a high school water science research project. Organized in the United States by WEF and its member associations, with support from ITT Industries and the Coca-Cola Company, its purpose is to increase students' interest in water-related issues and research, and to sensitize them, as future leaders, to global water challenges.

Winners from St. Johnsville. From left to right: Mark Trombetta, Operator; Fred Campione, Operator; Gene Colorito, Plant Supervisor; N.G. Kaul, DOW NYSDEC; Mayor Wilfred Y. Kraft.

Four levels of competition culminate with a US national winner joining representatives from 30 countries at the international competition in Sweden. Held in conjunction with World Water Week, national winners participate in a seven-day educational and cultural exchange program including exhibition and presentation of their projects. The international winner receives $5,000 (USD) and a blue crystal sculpture in the shape of a water droplet presented by HRH Crown Princess Victoria of Sweden, Patron of the Prize.

Understanding the influential role of the general public, public officials, and the media in the formation of public opinion and policy, WEF also works to inform those audiences about water quality through educational tours, congressional testimony, newsletters, news releases, press events, formal comments on regulatory and legislative matters, and grassroots public education programs.

Currently, WEF is in the process of developing *Water is Life, and Infrastructure Makes it Happen*™, a grassroots program designed to educate the general public, local leaders, and media about the value of water and wastewater infrastructure and the importance of investing in its long-term stability.

Centered on the issue of crumbling or overburdened US water and wastewater systems, the program highlights the need for user rate increases due to declining federal and state funding for water-related projects. Developed by WEF, in alliance with several national partners, the program will use drinking water and wastewater utilities to distribute materials and create activities both locally and statewide. With a goal of full implementation by WEFTEC® 2006 in Dallas, Texas, WEF is actively working with several key partners to refine and finalize the multi-faceted program.

A description of WEF awards, as well as other organizations that honor and recognize achievements in water and environmental stewardship and professionalism, are described on the next page.

Awards for Excellence

Water Environment Federation (WEF)

The Water Environment Federation (WEF) also presents a variety of awards that recognize achievements in the water environment profession. Some of the categories include the following:

- Outstanding Personal Service
- Excellence in Water Quality Achievement
- Service in Public Education
- Published Papers
- Project and Professional Excellence
- Service in the Operations Field

For further information, contact:

WEF
601 Wythe Street
Alexandria, VA 22314-1994
Phone: 703-684-2400
Fax: 703-684-2492
www.wef.org

Andrew M. Weist Operations and Maintenance Awards Program

NYSDEC has the *Andrew M. Weist Operations and Maintenance Awards Program* that recognizes wastewater treatment facilities for their quality operations and an exemplary record of compliance. This award acknowledges the efforts of staff and municipal leaders for their dedication and professionalism. This award was founded in 1996. This award was renamed in 1999 in memory of Andrew M. Weist. Andy was with the NYSDEC for over 32 years and was the Section Chief of the Facility Operations Assistance Section. Applications are due by March 21 of each year.

For an application package, contact:

Gregg Gendron
NYSDEC
Phone: 518-402- 8096
Fax: 518-402-8082
Email: gwgendro@gw.dec.state.ny.us
www.dec.state.ny.us/website/dow/bwcp/w_awards.html

New York Water Environment Association

The New York Water Environment Association (NYWEA) has several awards for wastewater treatment plants and operators. NYWEA members are eligible to receive special recognition for professional achievements in the field of water quality and for individual service to the Association. Awards are presented at the annual meeting each year.

For further information, contact:

NYWEA
525 Plum Street, Suite 102
Syracuse, NY 13204
Phone: 315-422-7811
Fax: 315-422-3851
www.nywea.org.

NYRWA Wastewater Operator of the Year

The New York Rural Water Association (NYRWA) has awards for the Wastewater Operator of the Year in recognition of their commitment to protecting the environment and also the Wastewater System of the Year for continued excellence in treatment operations and progressive management practices. Awards are presented at the annual conference in May of each year. NYRWA also recognizes a Water Operator and System of the Year, a Friend of Rural Water, and an Associate Member of the Year.

For further information, contact:

NYRWA
P.O. Box 487
Claverack, NY 12513
Phone: 518-828-3155
Fax: 518-828-0582
www.nyrwawater.org

Useful Contacts and Additional Resources

In addition to the resources at the end of each chapter, the following contacts and resources are available for your convenience:

EPA Headquarters
Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20004
Main Number: 202-272-0167

EPA Region 2 Offices and Facilities
Main Regional Office
290 Broadway
New York, NY 10007-1866
Phone: 212-637-3000

Hudson River Field Office
421 Lower Main Street
Hudson Falls, NY 12839
Phone: 518-747-4389
Toll Free: 866-615-6490
Fax: 518-747-8149

Western New York Public Information Office
186 Exchange Street
Buffalo, New York 14204
Phone: 716-551-4410
Fax: 716-551-4417

Long Island Sound Office
888 Washington Boulevard
Stamford, CT 06904-2152
Phone: 203-977-1541
Fax: 203-977-1546

Headquarters Information Resource Center
Phone: 202-566-0556
Fax: 202-566-0562
Email: library-hq@epamail.epa.gov

Public Outreach

Specific questions or needs may be directed to:
Media Relations:
Phone: 212-637-3675
Fax: 212-637-4445

Environmental Education:
Phone: 212-637-3671
Fax: 212-637-4445

Inter-Governmental Relations & Community Involvement:
Phone: 212-637-3650
Fax: 212-637-3657

EPA Regional Library
Voice: 212-637-3185
Fax: 212-637-3086
Email: Library.Region2@epa.gov

Important Regional Offices

New York City Department of Environmental Protection
Commissioner Emily Lloyd
59-17 Junction Boulevard
Flushing, NY 11373
Phone: 212-NEW YORK (212-639-9675)
Fax: 718-595-3525

New York State Department of Environmental Conservation
Commissioner Denise M. Sheehan
625 Broadway
Albany, NY 12233-1011
Phone: 518-402-8540
Fax: 518-402-9016

Interstate Environmental Commission (IEC)
Howard Golub, Executive Director and Chief Engineer
Judith L. Baron, Chairperson
311 West 43rd Street – Suite 201
New York, NY 10036
Phone: 212-582-0380
Fax: 212-581-5719

Important Numbers

AIR RISC Hotline 919-541-0888

Antimicrobial Hotline 703-308-0127

Asbestos and Small Business Ombudsman 800-368-5888

Center for Publications & Information 800-490-9198

Clean Air Technology Center 919-541-0800

Environmental Justice Hotline 800-962-6215

Energy Star Hotline 888-STAR-YES (888-782-7937)

Indoor Air Quality 800-438-4318

Inspector General 202-566-2476

Lead Info. Center 800-LEAD-FYI (800-532-3394)

National Pesticide Information Center 800-858-7378

Pay-As-You-Throw Helpline 888-372-7298

Radon Information Hotline 800-767-7236

Radon "Fix-it" Hotline 800-644-6999

Pollution Prevention Clearinghouse 202-566-0799

RCRA/Superfund/UST/EPCRA 800-424-9346

Safe Drinking Water Hotline 800-426-4791

Small Business (and Asbestos) Ombudsman 800-368-5888

STORET Hotline (surface water quality database information) 800-424-9067

Stratospheric Ozone 800-296-1996

Toxic Release Inventory 800-535-0202

Toxic Substances Control Act (TSCA) 202-554-1404

Wastewater/Small Flows 800-624-8301

WASTEWI$E Help line 800-EPA-WISE (800-372-9473)

Wetlands Protection 800-832-7828

DEC Contact Information for Wastewater Treatment Facility Assistance

Main Offices
Facility Operations Assistance Section
625 Broadway
Albany, NY 12233-3506
Phone: 518-402-8177)
Fax: 518-402-9029

Phil Smith, P.E.
Section Chief
518-402-8092

Alan Cherubin
Environmental Program Specialist 1
Regions 4 & 6 Certification
518-402-8155

G. Michael Coley, P.E.
Environmental Engineer 2
Region 3 Certification
518-402-8086

Gregg Gendron
Environmental Program Specialist 2
Regions 5 & 8 Certification
518-402-8096

Rich Malaczynski, P.E.
Environmental Engineer 2
Regions 1 & 7 Certification
518-402-8087

Tim Miller
Environmental Program Specialist 2
Region 2 Certification
518-402-8106

Bob Wither, P.E.
Environmental Engineer 2
Region 9 Certification
518-402-8097

Robin Yasinsac
Administrative and *Operator Facts*
518-402-8089

DEC Regional Offices

Region 1 Suffolk and Nassau Counties 631-444-0204

Region 2 Manhattan, Bronx, Queens, Brooklyn, and Staten Island 718-482-4900

Region 3 Sullivan, Ulster, Orange, Dutchess, Putnam, Rockland, and Westchester Counties 845-256-3000

Region 4 Montgomery, Otsego, Delaware, Schoharie, Schenectady, Albany, Greene, Rensselaer, and Columbia Counties 518-357-2234

Region 5 Franklin, Clinton, Essex, Hamilton, Warren, Fulton, Saratoga, and Washington Counties 518-897-1200

Region 6 Jefferson, St. Lawrence, Lewis, Oneida, and Herkimer Counties 315-785-2239

Region 7 Oswego, Cayuga, Onondaga, Madison, Tompkins, Cortland, Chenango, Tioga, and Broome Counties 315-426-7400

Region 8 Orleans, Monroe, Wayne, Genesee, Livingston, Ontario, Yates, Seneca, Steuben, Schuyler, and Chemung Counties 585-226-2466

Region 9 Niagara, Erie, Wyoming, Chautauqua, Cattaraugus, and Allegany Counties 716-851-7000

Additional Resources for Environmental Information

Air and Waste Management Association
420 Fort Duquesne Blvd.
Pittsburgh, PA 15222-1435
Phone: 412-232-3444
Fax: 412-232-3450
www.awma.org

American Water Works Association (AWWA)
6666 West Quincy Avenue
Denver, CO 80235
Phone: 303-794-7711
Fax: 303-347-0804
www.awwa.org

Center for Environmental Research Information (CERI)
P.O. Box 42419
Cincinnati, OH 45242-0419
Phone: 513-569-7562
Fax: 513-489-8695
www.epa.gov/ttbnrmrl

Emergency Planning and Community Right-to-Know Information Hotline (EPCRA)
Arlington, VA
Toll Free: 800-535-0202
Phone: 703-412-9877

Environmental Council of States
444 North Capitol Street
Suite 305
Washington, DC 20001
Phone: 202-624-3660
Fax: 202-624-3666
www.sso.org/ecos

Foundation for Cross-Connection Control and Hydraulic Research
University of Southern California
AHF 232
Los Angeles, CA 90089-0371
Phone: 213-740-6780

The Groundwater Foundation
P.O. Box 22558
Lincoln, NE 68502-0558
Phone: 402-434-2740
Fax: 402-434-2742
www.groundwater.org

Local Government Environmental Network (LGEAN)
Phone: 877-865-4326
www. LGEAN.org

National Association of Counties
440 First Street, NW
Washington, DC 20001
Phone: 202-393-6226
www.naco.org

National Drinking Water Clearinghouse
West Virginia University, P.O. Box 6064
Morgantown, WV 26506-6064
Toll Free: 800-624-8301
Fax: 304-293-3161
www. ndwc.wvu.edu

National Environmental Training Association (NETA)
3020 E. Camelback
Suite 399
Phoenix, AZ 85016-4421
Phone: 602-956-6099
Fax: 602-956-6399
www.ehs-training.org

National Response Center
c/o U.S. Coast Guard
2100 2nd Street, SW
Washington, DC 20593-0001
Toll Free: 800-424-8802 or
Phone: 202-267-2675
Fax: 202-267-1322
www.nrc.uscg.mil/nrchp.html

National Rural Water Association (NRWA)
2915 S. 13th Street
Duncan, OK 73533
Phone: 580-252-0629
Fax: 580-255-4476
www.nrwa.org

Safe Drinking Water Hotline
US EPA Office of Groundwater and
Drinking Water (4601)
1200 Pennsylvania Avenue, NW
Washington, DC 20460-0003
Toll Free: 800-426-4791
Fax: 202-564-3753
www.epa.gov/safewater/hotline/index.html

Solid Waste Association of North America (SWANA)
P.O. Box 7219
Silver Spring, MD 20907-7219
Toll Free: 800-467-9262
Fax: 301-589-7068
www.swana.org

Toxic Substances Control Act (TSCA) Assistance Information Service
Washington, DC
Phone: 202-554-1404

US EPA Pollution Prevention Information Clearinghouse (PPIC)
1200 Pennsylvania Avenue, NW (7409M)
Washington, DC 20460
Phone: 202-566-0799
Fax: 202-564-8899
www.epa.gov/oppt/ppic/index.htm

U.S. Geological Survey
Branch of Distributions
Water Information Clearinghouse
P.O. Box 25286
Denver, CO 80225
Toll Free: 800-426-9000
www.usgs.gov/

Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994
Phone: 703-684-2492
Fax: 703-684-2492
www.wef.org

Waste Reduction Resource Center
1639 Mail Service Center
Raleigh, NC 27699-1639
Toll Free: 800-476-8686
Fax: 919-715-1612
http://wrrc.p2pays.org

Financial Glossary

The following "Glossary of Financial Terms" was excerpted from:

A Guidebook of Financial Tools: Paying for Sustainable Environmental Systems (April 1999 revision). Timothy McProuty, US EPA/OCFO/OETI, Environmental Finance Team. Available online: http://www.epa.gov/efinpage/guidebook/guidebooktp.htm

The tools described in this Guidebook do not necessarily represent the views or policies of the Environmental Protection Agency or any other agencies in the Federal Government.

Accelerated Depreciation: Any depreciation method that allows for greater deductions or charges in the earlier years of an assets depreciable life, with charges becoming progressively smaller in each successive period. Examples would include the double declining balance and sum-of-the-years digits methods.

Accrual Accounting Method: A form of reporting profits or losses based on: the consummation of a transaction being accepted by form of contract or invoice without the realization of cash or an expense that has been incurred but has not yet been disbursed.

Accrual Basis: The practice of record keeping by which income is recorded when earned and expenses are recorded when incurred, even though the cash may be received or paid out later.

Ad Valorem Tax: A tax based on the assessed value of property. Counties, school districts, and municipalities usually are authorized to levy *ad valorem* taxes. Special districts can also be authorized to levy *ad valorem* taxes.

Amortization: A breakdown of periodic loan payments into two components: a principal portion and an interest portion. The gradual reduction of a debt by means of equal periodic payments sufficient to meet current interest and liquidate the debt at maturity. When the debt involves real property, often the periodic payments include a sum sufficient to pay taxes and hazard insurance.

Annualization: The process of adjusting a utility company's annual historical information to reflect a full 12-month period for known changes reasonably expected to continue into the future. Annualization adjustments are routinely made in developing a utility company's total cost of service.

Appreciation: The increase in the value of an asset in excess of its depreciable cost which is due to economic and other conditions, as distinguished from increases in value due to improvements or additions made to it.

Asset: Anything owned by an individual or a business, which has commercial or exchange value. Assets may consist of specific property or claims against others, in contrast to obligations due others. (See also Liabilities).

Asset Based Lending: A loan to an individual or company collateralized by a specific asset or group of assets. Typically asset based loans do not require real property as collateral.

Asset Sale: An asset sale is the transfer of ownership of government assets, commercial-type enterprises, or functions to the private sector. In general, the government has no role in the financial support, management, or oversight of a sold asset. However, if the asset is sold to a company in an industry with monopolistic characteristics, the government may regulate certain aspects of the business, such as utility rates.

Assurance/Performance Bonding: Performance or assurance bonding is a requirement that users of environmental resources place in an escrow account a sum of money adequate to cover potential future environmental damages.

Authority (Lease Revenue): A bond secured by the lease between the authority and another agency. The lease payments from the "city" to the agency are equal to the debt service.

Bond: An interest-bearing certificate issued by governments and corporations when they borrow money. The issuer agrees to pay a fixed principal sum on a specified date (the maturity date) and at a specified rate of interest. In measuring municipal bond volume, a bond is a security maturing more than one year from issuance; shorter-term obligations are usually termed notes or commercial paper.

Bond Anticipation Note (BAN): A note issued by public agencies to secure temporary (often partial) financing for a project that will eventually be fully financed (and the BAN repaid) through the sale of bonds.

Bond Bank: A state-chartered organization that purchases the bonds of local governments and secures its own debt with the pool of local bonds. This arrangement cuts borrowing costs for the local issuers because the bond bank's debt usually carries higher ratings than that of the municipalities, whose issues are usually too small to be rated anyway. Credit enhancements, such as bond insurance, are also cheaper when purchased for larger issues. Localities' use of the bond bank is voluntary.

Bond Counsel: A lawyer who reviews the legal documents and writes an opinion on the security, tax-exempt status and issuance authority of a bond or note.

Bond Discount: The excess of the face value of a bond over the price for which it is acquired or sold. The price does not include accrued interest at the date of acquisition or sale.

Bond Election: The process by which voters approve or reject bond issues.

Bond-Equivalent Yield: The annualized yield to maturity computed by doubling the semiannual yield.

Bond Fund: A fund formerly used to account for the proceeds of general-obligation bond issues. Such proceeds are not accounted for in a capital-projects fund.

Bond Indenture: The contract that sets forth the promises of a corporate bond issuer and the rights of investors.

Bond Insurance: Insurance that can be purchased by an issuer for either an entire issue or specific maturities, which guarantees the payment of principal and/or interest. This security usually provides a higher credit rating and thus a lower borrowing cost for an issuer.

Bond Issued: Bond sold.

Bond Premium: The excess of the price at which a bond is acquired or sold over its face value. The price does not include accrued interest at the date of acquisition or sale.

Bond Proceeds: The money the issuer receives from its bond sale.

Bonded Debt: That portion of indebtedness represented by outstanding bonds.

Bonds Authorized and Un-issued: Bonds that have been legally authorized but not issued and which can be issued and sold without further authorization. This term must not be confused with the terms "margin of borrowing power" or "legal debt margin," either one of which represents the difference between the legal debt limit of a government and the debt outstanding against it.

Bonds, Debenture: A form of long-term loan included in debt capital, which is secured by the general credit worthiness of the utility.

Bonds, Mortgage: A form of long-term loan, included in debt capital, which is secured by the utility's property.

Budget: A budget is an itemized listing of the amount of all estimated revenue which a given business anticipates receiving, along with a listing of the amount of all estimated costs and expenses that will be incurred in obtaining the above mentioned income during a given period of time. A budget is typically for one business cycle, such as a year, or for several cycles (such as a five year capital budget).

Callable Bond: A bond that can be redeemed by the issuer prior to its maturity. Usually a premium is paid to the bond owner when the bond is called.

Capital: Funds necessary to establish or operate a business.

Capitalization: Also called financial leverage ratios, ratios that compare debt to total capitalization and thus reflect the extent to which a corporation is trading on its equity. These ratios can be interpreted only in the context of the stability of industry and company earnings and cash flow.

Capital Budget: This is the estimated amount planned to be expended for capital items in a given fiscal period. Capital items are fixed assets such as facilities and equipment, the cost of which is normally written off over a number of fiscal periods. The capital budget, however, is limited to the expenditures which will be made within the fiscal year comparable to the related operating budgets.

Capital Costs: Expenditures that typically result in the acquisition or addition to fixed assets that have a useful life of over one year and a cost greater than a threshold value established by the owner. Capital costs include expenditures for replacements and major additions, but not for repairs.

Capital Lease: A lease that meets at least one of the following criteria, and therefore must be treated essentially as a loan for book accounting purposes: title passes automatically by the end of the lease term; lease contains a bargain purchase option; lease term is greater that 75% of estimated economic life of the equipment; present value of lease payments is greater than 90% of the equipment's fair market value.

Capital Outlay: Expenditures that result in the acquisition of or addition to fixed assets.

Capital-Projects Fund: A fund created to account for financial resources to be used for the acquisition or construction of major capital facilities (other than those financed by proprietary funds, special funds, and trust funds).

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act.

Collateral: Assets pledged as security against a loan in case of default. The intangible or tangible property given as security to the lender by the account credit for any obligations and indebtedness of account creditor.

Commercial Loan: A loan from a privately-owned bank at market rates.

Community Water System: A water system which supplies drinking water to 25 or more of the same people year-round in their residences.

Connection Fee: A charge assessed to new users of a utility system to cover the costs of constructing capacity for their use.

Contracting Out: Contracting out is the hiring of private-sector firms or non-profit organizations to provide goods or service for the government. Under this approach, the government remains the financier and has management and policy control over the type and quality of goods or services to be provided. Thus, the government can replace contractors that do not perform well.

Cost of Capital: The weighted-average cost of funds that a firm secures from both debt and equity sources in order to fund its assets. The use of a firm's cost of capital is essential in making accurate capital budgeting and project investment decisions.

Coupon Rate: The interest rate specified on interest coupons attached to a bond. The term is synonymous with nominal interest rate.

Coverage: The ratio of revenue available for debt service to the average annual debt service requirements of an issue of revenue bonds.

Current Assets: Current assets are those assets of a company which are reasonable expected to be realized in cash or sold, or consumed during the normal operating cycle of the business (usually one year). Such assets include cash, accounts receivable and money due usually within one year, short-term investments, US government bonds, inventories, and prepaid expenses.

Current Liabilities: Liabilities to be paid within one year of the balance sheet date.

Debenture Bonds: *See Bonds, Debenture.*

Debt: An obligation resulting from the borrowing of money or from the purchase of goods and services. Debts of governments include bonds, time warrants, and floating debt.

Debt to Equity Ratio: A return on investment; an investment created by a form of debt, i.e., bank loan, investor funds, etc. of which is converted to profit then retained in earnings which is referred to as "owner" or "stockholder" equity.

Debt Financing: Raising funds for a business by borrowing, often in the form of bank loans.

Debt Limit (Ceiling): The legal maximum debt-incurring power of a State or locality. Debt limits are often imposed by constitutional, statutory, or local charter provisions.

Debt, Long-term: Debt that is payable more than one year from the date it was incurred.

Debt Per Capita: Bonds divided by population. When compared with other jurisdictions, this statistic serves as an indicator of the use of public debt capacity in the area in question.

Debt Ratio: The ratio of an issuer's debt outstanding to a measure of property value.

Debt Service: The amount of money necessary to pay interest and principal charges on an outstanding debt.

Debt Service Fund: A fund created by a bond indenture and held by the trustee, usually amounting to principal and interest payment for one year, and used only if normal revenues are not sufficient to pay debt service.

Debt Service Fund Requirements: The amount of revenue that must be provided for a debt service fund so that all principal and interest payments can be made in full on schedule.

Debt Service Requirements: The amount of money required to pay interest on outstanding debt, serial maturities of principal for serial bonds, and required contributions to accumulate monies for future retirement of term bonds.

Debt Service Reserve Fund: A fund created by a bond indenture and held by the trustee, usually amounting to principal and interest payment for one year, and used only if normal revenues are not sufficient to pay debt service.

Debt, Short-term: Debt that falls due in a period of under a year.

Default: The failure to make timely payment of interest or principal on a debt instrument; or the occurrence of an event as stipulated in the indenture of trust resulting in an abrogation of that agreement. An issuer does not default until it fails to make a payment.

Depreciation: The amount of expense charged against earnings by a company to write off the cost of a plant or machine over its useful life, giving consideration to wear and tear, obsolescence, and salvage value. If the expense is assumed to be incurred in equal amounts in each business period over the life of the asset, the depreciation method used is straight line (SL). If the expense is assumed to be incurred in decreasing amounts in each business period over the life of the asset, the method used is said to be accelerated. Two commonly used variations of the accelerated method of depreciating an asset are the sum-of-years digits (SYD) and the double-declining balance (DDB) methods. Frequently, accelerated depreciation is chosen for a businesses' tax expense but straight line is chosen for its financial reporting purposes.

Direct Cost: A cost that can be economically traced to a single cost object.

Discount Rate: The time value of money or the rate of interest a company wants to earn on its investments.

Easement: In most states, an easement is a legal restriction contained within a deed that prohibits certain land uses in perpetuity. For example, an easement might prohibit development of more than one house on 20 acres of oceanfront property. Private landowners who place easements on their property for natural resources protection can take a tax write-off representing the value lost on the property due to the deed restrictions.

Earmarking: Statutory or constitutional dedication of revenues to specific government projects or programs.

Economic Life of Leased Property: The estimated period during which the property is expected to be economically usable by one or more users, with normal repairs and maintenance for the purpose for which it was intended at the inception of the lease.

Environmental Cost Accounting: The addition of environmental cost information into existing cost accounting procedures and/or recognizing embedded environmental costs and allocating them to appropriate products and processes.

Estimated Useful Life: The period in which an asset is expected to be useful in trade or business.

Equity: Equity reflects the fairness of the distribution of the funding burden for an AFM among individuals. Equity can be approached from two directions: those who create or contribute to environmental problems should bear the funding burden (the "polluter" pays), or those who benefit from program activities should bear the funding burden (the "beneficiary" pays.)

Equipment Leasing: Contracting to pay monthly fees to use equipment, instead of buying it.

Fee: A fee is generally a charge for services rendered. Although laws vary widely, many states require that fees be set at rates that will cover only the costs of the services provided.

Finance Lease: A lease used to finance the purchase of equipment; not a true lease. Finance leases are generally considered to be capital leases from an accounting perspective and non-tax leases from a tax perspective.

Fines and Penalties: Fines and penalties require offenders to pay monetary damages for violating government laws or regulations.

Fixed Assets: Those assets of a permanent nature required for the normal conduct of a business, and which will not normally be converted into cash during the ensuring fiscal period. For example, furniture, fixtures, land, and buildings are all fixed assets. However, accounts receivable and inventory are not.

Fixed Cost: Fixed costs are operating expenses that are incurred by facilities and organizations which are kept in readiness to do business without regard to actual volumes of production and sales. Fixed costs remain relatively constant until changed by managerial decision. Within general limits they do not vary with business volume. Examples of fixed costs consist of rent, property taxes, and interest expense.

Full Cost Accounting: A method of financial and management accounting that allocates all direct and indirect historical costs to a product or process.

Full Cost Recovery: Full cost recovery means charging fees to completely cover costs incurred by a particular activity or service. Some state and local governments, as well as local utilities, are beginning to practice full cost recovery by legislatively requiring that fees be set to cover the complete cost of services rendered.

Full Faith and Credit: The pledge of the general taxing power of a government to pay its debt obligations.

Full Payout Lease: A lease in which the total of the lease payments pay back to the leaser the entire cost of the equipment including financing, overhead, and a reasonable rate of return, with little or no dependence on a residual value.

Fund: A fiscal and accounting entity with a self-balancing set of accounts recording cash and other financial resources, together with all related liabilities and residual equities or balances, and changes therein, which are segregated for the purpose of carrying on specific activities or attaining certain objectives in accordance with special regulations, restrictions, or limitations.

General Obligation Bond: A security backed by the full faith and credit of a state or locality. In the event of default, the holders of general obligation bonds have the right to compel a tax levy or legislative appropriation in order to satisfy the debt obligation.

Grant: A monetary sum awarded to a State or local government or non-profit organization that does not need to be repaid. Typically, grants are awarded by the federal government to State or local governments or by States to local governments, to finance a particular activity or facility.

Grant Anticipation Notes (GAN): Notes issued by public agencies to secure temporary financing for projects awaiting the receipt of permanent funding through governmental grants. The GAN is repaid from grant proceeds.

Gross Direct Debt: The total amount of bonded debt of a government (general obligation bonds plus revenue bonds).

Guarantee, loan: Promise to take responsibility for payment of part or all of a debt if the person borrowing the money fails to pay off the loan.

Guaranty or Guaranty Agreement: The agreement of a third party to pay debt service on a debt in the event of default by the issuer.

Impact Fee: A fee assessed against private developers in compensation for the new capacity requirements their projects impose upon public facilities.

Industrial-Revenue Bonds: Bonds issued by governments, the proceeds of which are used to construct facilities for a private business enterprise. Lease payments made by the business enterprise to the government are used to service the bonds. Such bonds may be in the form of general-obligation bonds, combination bonds, or revenue bonds.

Insured Bond: A municipal bond backed both by the credit of the municipal issuer and by commercial insurance policies.

Interest: The charge or cost of borrowing money, measured in terms of a percentage per annum of the principal amount.

Internal Rate of Return: A return on an investment greater than the amount described in a contract or any other investment instrument. The internal rate-of-return is measured by the ability of the investor to reduce internal expenses during the course of managing the investment; which means the investor actually makes more than what is outlined in the contract or other investment instrument.

Lease: A contract through which an owner of equipment (the leaser) conveys the right to use its equipment to another party (the lessee) for a specified period of time (the lease term) for specified periodic payments.

Lease Purchase: Full payout, net leases structured with a term equal to the equipment's estimated useful life. Because many Lease Purchases include a bargain purchase option for the lessee to purchase the equipment for one dollar at the expiration of the lease, these leases are often referred to as dollar buyout or buck-out-leases. Lease purchases are generally considered to be Capital Leases from an accounting perspective and non-tax leases from a tax perspective due to their bargain purchase option and length of lease term.

Lease Rental Bonds: Bonds for which the principal and interest are payable exclusively from rental payments from a lessee. Rental payments are often derived from earnings of an enterprise that may be run by the lessee or the leaser. Rental payments may also come from taxes levied by the lessee.

Lease Schedule: A schedule to a Master Lease agreement describing the leased equipment, rentals and other terms applicable to the equipment.

Lessee: The party to a lease agreement who is obligated to pay the rentals to the leaser and is entitled to use and possess the leased equipment during the lease term.

Leaser: The party to a lease agreement who has legal or tax title to the equipment (in the case of a true tax lease), grants the lessee the right to use the equipment for the lease term and is entitled to receive the rental payments.

Leverage: Debt in relation to equity.

Leveraging: The use of grant or loan funds as reserve funds for the issuance of debt. Leveraging is used by several states participating in the Water Pollution Control State Revolving Fund program to increase the amount of funds available for loans.

Liability: Claim on the assets of a company.

Liability Assignment: Liability assigned through common law or statute, whereby individuals or companies may be held financially responsible for environmental damage resulting from their activities.

Lien: An attachment, voluntary or involuntary. A lender will apply a lien to encumber real or personal property. The lien can be granted by an abstract judgment rendered by a court of law.

Life Cycle Costing (LCC): A systematic process of evaluating the life-cycle costs of a product, product line, process, system, or facility by identifying life-cycle consequences and assigning monetary values to those consequences. Also called Life Cycle Cost Assessment (LCCA).

Life-Cycle Assessment/Analysis (LCA): A holistic approach to identifying the environmental consequences of a product, process, or activity through its entire life cycle and to identifying opportunities for achieving environmental improvements. EPA specifies four major stages in a life-cycle of a product, process, or activity: raw materials acquisition, manufacturing, consumer use/reuse maintenance, and recycle/waste management. LCA focuses on environmental impacts not costs.

Limited-Tax General Obligation Bond: A general obligation bond that is limited as to revenue sources.

Long-Term Debt: Debt that is payable more than one year from the date it was incurred.

Moral Obligation Bond: A state or municipal bond that is not backed by the full faith and credit of the issuer. The issuer of a moral obligation bond asserts the intent of the legislative body to make appropriations sufficient to cure any deficiency in monies required to meet debt service, but the issuer has no legally enforceable obligation to do so.

Municipal Bond: A debt obligation issued by a state, state agency or authority, or a political subdivision, such as county, city, town or village. They may be issued for general governmental needs or special projects. Issuance must be approved by referendum or by an electoral body.

Municipal Bond Insurance: Insurance policies that protect investors if a municipal bond should default–the bonds will be purchased from investors at par. The insurance may either be purchased by the issuer or the investor. Two major insurers of municipal bonds are the Ambac Indemnity Corporation and the Municipal Bond Insurance Association (MBIA). Insured municipal bonds usually have the highest ratings. Subsequently, the bond's marketability increases, which lowers the costs to their issuers. However, the yield on an insured bond is usually lower than similarly rated uninsured bonds–the cost of the insurance is passed on to the investor. To obtain the extra degree of safety, many investors do not care if the yields are slightly lower.

Municipal Improvement Certificates: Certificates issued in lieu of bonds for the financing of special improvements. As a result, these certificates are placed in the contractor's hands for collection from the special assessment payers.

Municipal Lease: A lease designed to meet the special needs of state and local governments. The lease contains a non-appropriation clause which states that the only condition under which the entity may be released from its payment obligations is when the legislature or funding authority fails to appropriate funds. Since the lessee is a municipality or an organization supporting the government, it is exempt from paying federal income taxes. For this reason, the IRS does not charge the leaser income taxes on leases to these customers.

Non-Transient, Non-Community Water System: A water system which supplies water to 25 or more of the same people at least six months per year in places other than their residences. Some examples are schools, factories, office buildings, and hospitals which have their own water systems.

Operating Costs: Costs that are directly related to rendering of services, sale of merchandise, production and disposition of commodities, collection of revenues, and other ongoing activities.

Operating Lease: A lease which is treated as a true lease (as opposed to a loan) for book accounting purposes. As defined in FASB 13, an operating lease must have all of the following characteristics.

- lease term is less than 75% of estimated economic life of the equipment
- present value of lease payment is less than 90% of the equipment's fair market value
- lease cannot contain a bargain purchase option (i.e., less than the fair market value)
- ownership is retained by the leaser during and after the lease term.

An operating lease is accounted for by the lessee without showing an asset (for the equipment) or a liability (for the lease payment obligations) on his balance sheet. Periodic payments are accounted for by the lessee as operating expenses of the period.

Original Issue Discount (OID): When a long-term debt instrument is issued at a price that is lower than its stated redemption value, the difference is called Original Issue Discount (OID).

Payment-in-Kind (PIK) Bond: A bond that gives the issuer an option (during an initial period) either to make coupon payments in cash or to give the bondholder a similar bond.

Prime Rate: The interest rate banks charge their best customers.

Privatization (Public-Private Partnership): Under a public-private partnership, sometimes referred to as a joint venture, a contractual arrangement is firmed between public and private-sector partners that can include a variety of activities that involve the private sector in the development, financing, ownership, and operation of a public facility or service. It typically includes infrastructure projects and/or facilities. In such a partnership, public and private resources are pooled and responsibilities divided so that the partners' efforts complement one another. Typically, each partner shares in income resulting from the partnership in direct proportion to the contracting in that the private-sector partner usually makes a substantial cash, at-risk, equity investment in the project, and the public sector gains access to new revenue or service delivery capacity without having to pay the private-sector partner. Leasing arrangements can be used to facilitate public-private partnerships.

Private Placement: The sale of stock in a company directly to a pre-selected buyer, often an institutional investor.

Public-Private Partnership: These partnerships involve a variety of techniques and activities to promote more sector involvement in providing traditional government services. They can include involving a private partner in construction, financing, operation, and/or ownership of a facility.

Public Water System (PWS): Any water system which provides water to at least 25 people for at least 60 days annually. There is more than 170,000 PWSs providing water from wells, rivers and other sources to about 250 million Americans. The others drink water from private wells. There are differing standards for PWSs of different sizes and types.

Ratings: Credit quality evaluation of bonds and notes made by independent rating services and brokerage firm analysts. Generally, a higher bond rating lowers the interest rate expected by debtors for repayment, and therefore overall capital costs. State and local governments can improve their bond ratings by using credit enhancement mechanisms.

Recourse: A type of borrowing in which the borrower (as a leaser funding a lease) is fully at risk to the lender for repayment of the obligation. The recourse borrower (leaser) is required to make payments to the lender whether or not the lessee fulfills its obligation under the lease agreement.

Refunded Bonds: Also called a pre-refunded bond, one that originally may have been issued as a general obligation or revenue bond but that is now secured by an "escrow fund" consisting entirely of direct US Government obligations that are sufficient for paying the bondholders.

Return On Assets (ROA): A common measure of profitability based upon the amount of assets invested; ROA is equal to the ratio of either 1) net income to total assets or 2) net income available to common stockholders to total assets.

Return On Equity (ROE): A measure of profitability related to the amount of invested equity; ROE is equal to the ratio of either 1) net income to owner's equity or 2) net income available to common stockholders to common equity.

Revenue Anticipation Notes (RANs): Notes issued in anticipation of non-tax revenues, generally from other governmental entities (i.e., state aid to a school district).

Revenue Base: The revenue base is the value of the product, income, property, or the number of population against which a fee or tax is charged. For example, the revenue base for a state tax per ton of fertilizer sold would be the tons of fertilizer sold in the state, while the revenue base for a motor vehicle license fee would be the number of vehicles licensed in the state. The size and characteristics of the revenue base, along with the rate of the fee or tax, determine the revenue potential of fee and tax programs.

Revenue Bonds: Bonds whose principal and interest are payable exclusively from earnings of a public enterprise.

Revenue Potential: A measure of the amount of money that can be raised by a particular financing mechanism. For fee and tax programs, revenue potential is a function of the rate of the fee or tax and the size of the revenue base. State and local governments need to consider the revenue potential of an AFM in their jurisdiction in order to determine if it meets their financing needs.

Revenue Stability: Revenue stability refers to the pattern of revenues from a particular revenue source. Some sources provide revenues in stable amounts annually. Other revenue sources are unstable, providing only one-time or erratic revenues from year to year. State and local governments should match ongoing program costs to stable revenue sources, while non-recurring costs can be matched to less stable revenue sources.

Revolving Fund: A revolving loan fund program may consist of several accounts or revolving funds that make loans or other types of assistance available for various projects. Typically, the fund is initially capitalized by appropriations, grants, or other monies. After the initial loans are made, future loans are supported by repayments, making the fund "revolving."

Serial Bonds: Bonds whose principal is repaid in periodic installments over the life of the issue. Corporate bonds arranged so that specified principal amounts become due on specified dates. Related: Term Bonds.

Sole Proprietorship: A sole proprietorship is a form of business organization. The distinguishing characteristics of this form are only one owner for the business and the business is unincorporated.

Special Annuity Bonds: Serial bonds in which annual installments of bond principal are arranged so that the combined payments for principal and interest are approximately the same each year.

Special Assessment: A charge imposed against certain properties to defray part or all of the cost of a specific improvement or service deemed to primarily benefit those properties.

Special Assessment Bonds: Bonds payable from the proceeds of assessments imposed against properties which have been specially benefited by the construction of public improvements.

Special Assessment Fund: A fund used to account for the financing of public improvements or services deemed to benefit primarily the properties against which special assessments are levied.

Special Districts: An independent unit of local government organized to perform a single governmental function or a limited number of related functions. A single purpose or local taxing district can be organized for a special purpose such as a road, sewer, irrigation or fire district. Special districts usually have the power to incur debt and levy taxes.

Special District Bonds: Bonds issued by a special district.

Special Tax Bond: A bond that is secured by a special tax, such as a liquor tax.

Straight Line Method: A way to figure depreciation for property that ratably deducts the same amount for each year in the recovery period. The rate (in percentage terms) is determined by dividing 1 by the number of years in the recovery period.

Subordinated Debenture Bond: An unsecured bond that ranks after secured debt, after debenture bonds, and often after some general creditors in it claim on assets and earnings. Related: Debenture Bond, Mortgage Bond, Collateral Trust Bonds.

Sustainable Development: The concept of using resources in an ecologically sound manner so that they will be sustainable over the long term. Put another way by the Executive Secretary of the UN Economic and Social Commission for Asia and the Pacific, it is "an approach to progress that meets the needs of the present without compromising the ability of future generations to meet their needs."

Tax: A tax is generally a charge against sales, income or property. Unlike fees, most jurisdictions do not require that there be a direct relationship between a tax and the use of funds.

Tax Anticipation Notes (TANs): Short-term debt that will be retired with taxes to be collected at a later date.

Tax Base: *See revenue base.*

Tax Increment Financing: The dedication of incremental increases in real estate taxes to repay an original investment in improved public facilities that created increased real estate values.

Term Bonds: Often referred to as bullet-maturity bonds or simply bullet bonds, bonds whose principal is payable at maturity. *Related: Serial Bonds.*

Term Interest: A life interest in property, an interest in property for a term of years, or an income interest in a trust. It generally refers to a present or future interest in income from property or the right to use property which terminates or fails upon the lapse of time, the occurrence of an event or the failure of an event to occur.

Transient, Non-Community Water System: A system which provides water in a place such as a gas station or campground where people do not remain for long time periods. These systems do not have to test or treat their water for contaminants which pose long-term health risks because fewer than 25 people drink the water over a long period. They still must test for microbes and several chemicals.

Trust Fund: Funds created by State and local governments to receive revenues generated by a tax or other mechanism, and disburse funds for the purposes for which the revenues are collected.

Unadjusted Depreciable Basis: The basis of an item of property for purposes of figuring gain on a sale without taking into account any depreciation taken in earlier years but with adjustments for amortization, the section 179 deduction, any deduction claimed for clean-fuel vehicles or clean-fuel vehicle refueling property, and any electric vehicle credit.

Useful Life: An estimate of how long an item of property can be expected to be usable in trade or business or to produce income. Under MACRS, you recover the cost of property over a set period. The recovery period is based on your property's property class. Your property's class is usually determined by its class life. The class life for most property is set and listed in IRS Appendix B.

User Fees: User fees require those who use a government service to pay some or all of the cost of the service, rather than having the government pay for it through revenues generated by taxes. The fees charged for entry into public parks are an example of a user fee.

Value: A term which defines the worth of an object or item. Value is usually preceded by a word(s), such as Fair or Fair Market, and defined in the document where found. Not all value for an item is the same.

Working Capital: The cash available to a company for the ongoing operations of the business.

Zero-Coupon Bonds: Zero-coupon bonds are bonds priced at a large discount from face value. The bonds mature at full face value so the difference between the original issue price and the face value represents interest income. The issuer of the zero coupon bond saves on cash flow since the interest isn't paid out until the end of the bond holding period.

Glossary of Terms

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For copies of the operator training manuals on the safe operation and maintenance of water and wastewater facilities that are the original source of these definitions, contact the Office of Water Programs, 916-278-6142 or by e-mail at wateroffice@csus.edu.

Abatement: Putting an end to an undesirable or unlawful condition affecting the wastewater collection system. A property owner found to have inflow sources connected to the collection system may be issued a "Notice of Abatement." Such notices will usually describe the violation, suggest corrective measures, and grant a period of time for compliance.

Absorption: The taking in or soaking up of one substance into the body of another by molecular or chemical action (as tree roots absorb dissolved nutrients in the soil).

Acid: A substance that tends to lose a proton, dissolves in water with the formation of hydrogen ions, contains hydrogen which may be replaced by metals to form salts, and is corrosive.

Activated Carbon: Adsorptive particles or granules of carbon usually obtained by heating carbon (such as wood). These particles or granules have a high capacity to selectively remove certain trace and soluble materials from water.

Activated Sludge: Sludge particles produced in raw or settled wastewater (primary effluent) by the growth of organisms (including zoogleal bacteria) in aeration tanks in the presence of dissolved oxygen. The term "activated" comes from the fact that the particles are teeming with bacteria, fungi, and protozoa. Activated sludge is different from primary sludge in that the sludge particles contain many living organisms that can feed on the incoming wastewater.

Activated Sludge Process: A biological wastewater treatment process that speeds up the decomposition of wastes in the wastewater being treated. Activated sludge is added to wastewater and the mixture (mixed liquid) is aerated and agitated. After some time in the aeration tank, the activated sludge is allowed to settle out by sedimentation and is disposed of (wasted) or reused (returned to the aeration tank) as needed. The remaining wastewater then undergoes more treatment.

Advanced Waste Treatment: Any process of water renovation that upgrades treated wastewater to meet specific reuse requirements. May include general cleanup of water or removal of specific parts of wastes insufficiently removed by conventional treatment processes. Typical processes include chemical treatment and pressure filtration. Also called "tertiary treatment."

Aeration: The process of adding air to water. Air can be added to water by either passing air through water or passing water through air. In wastewater treatment, air is added to freshen wastewater and to keep solids in suspension. With mixtures of wastewater and activated sludge, adding air provides mixing and oxygen for the microorganisms treating the wastewater.

Aeration Tank: The tank where raw or settled wastewater is mixed with return sludge and aerated. The same as "aeration bay," "aerator," or "reactor."

Aerobic Bacteria: Bacteria which will live and reproduce only in an environment containing oxygen which is available for their respiration (breathing), namely atmospheric oxygen or oxygen dissolved in water. Oxygen combined chemically, such as in water molecules (H_2O), cannot be used for respiration by aerobic bacteria.

Aerobic Digestion: The breakdown of wastes by microorganisms in the presence of dissolved oxygen. This digestion process may be used to treat only waste activated sludge, or trickling filter sludge and primary (raw) sludge, or waste sludge from activated sludge treatment plants designed without primary settling. The sludge to be treated is placed in a large aerated tank where aerobic microorganisms decompose the organic matter in the sludge. This is an extension of the activated sludge process.

Aerobic Process: A waste treatment process conducted under aerobic (in the presence of "free" or dissolved oxygen) conditions.

Air Blower: A device used to ventilate manholes and lift stations.

Algal Bloom: Sudden, massive growths of microscopic and macroscopic plant life, such as green or blue-green algae, which develop in lakes and reservoirs.

Alkaline: The condition of water or soil that contains a sufficient amount of alkali substances to raise the pH above 7.0.

Alkalinity: The capacity of water or wastewater to neutralize acids. This capacity is caused by the water's content of carbonate, bicarbonate, hydroxide, and occasionally borate, silicate, and phosphate. Alkalinity is expressed in milligrams per liter of equivalent calcium carbonate. Alkalinity is not the same as pH because water does not have to be strongly basic (high pH) to have a high alkalinity. Alkalinity is a measure of how much acid must be added to a liquid to lower the pH to 4.5.

Anaerobic: A condition in which atmospheric or dissolved molecular oxygen is not present in the aquatic (water) environment.

Anaerobic Bacteria: Bacteria that live and reproduce in an environment containing no "free" or dissolved oxygen. Anaerobic bacteria obtain their oxygen supply by breaking down chemical compounds which contain oxygen, such as sulfate.

Anaerobic Digester: A wastewater solids treatment device in which the solids and water (about 5 percent solids, 95 percent water) are placed in a large tank where bacteria decompose the solids in the absence of dissolved oxygen.

Anoxic: A condition in which the aquatic (water) environment does not contain enough dissolved molecular oxygen, which is called an oxygen deficient condition. Generally refers to an environment in which chemically bound oxygen, such as in nitrate, is present.

BOD_5: Refers to the five-day biochemical oxygen demand. The total amount of oxygen used by microorganisms decomposing organic matter increases each day until the ultimate BOD is reached, usually in 50 to 70 days. BOD usually refers to the five-day BOD or BOD_5.

Backwashing: The process of reversing the flow of water back through the filter media to remove the entrapped solids.

Bacteria: Living organisms, microscopic in size, which usually consist of a single cell. Most bacteria use organic matter for their food and produce waste products as a result of their life processes.

Bar Rack: A screen composed of parallel bars, either vertical or inclined, placed in a sewer or other waterway to catch debris. The screenings may be raked from it.

Biochemical Oxygen Demand (BOD): The rate at which organisms use the oxygen in water or wastewater while stabilizing decomposable organic matter under aerobic conditions. In decomposition, organic matter serves as food for the bacteria and energy results from its oxidation. BOD measurements are used as a measure of the organic strength of wastes in water.

Biological Process: A waste treatment process by which bacteria and other microorganisms break down complex organic materials into simple, nontoxic, more stable substances.

Biomass: A mass or clump of organic material consisting of living organisms feeding on the wastes in wastewater, dead organisms, and other debris.

Biosolids: A primarily organic solid product produced by wastewater treatment processes that can be beneficially recycled. The word "biosolids" is replacing the word "sludge."

Blower: A device used to ventilate manholes and lift stations.

Branch Sewer: A sewer that receives wastewater from a relatively small area and discharges into a main sewer serving more than one branch sewer area.

Break: A fracture or opening in a pipe, manhole or other structure due to structural failure and/or structural defect.

Building Sewer: A gravity-flow pipeline connecting a building wastewater collection system to a lateral or branch sewer. The building sewer may begin at the outside of the building's foundation wall or some distance (such as 2 to 10 feet) from the wall, depending on local sewer ordinances. Also called a "house connection" or a "service connection."

Building Wastewater Collection System: All of the wastewater drains pipes and their hardware that connect plumbing fixtures inside or adjacent to a building to the building sewers. This includes traps, vents, and cleanouts.

Bypass: A pipe, valve, gate, weir, trench or other device designed to permit all or part of a wastewater flow to be diverted from usual channels or flow. Sometimes refers to a special line which carries the flow around a facility or device that needs maintenance or repair. In a wastewater treatment plant, overload flows should be bypassed into a holding pond for future treatment.

CSO-Combined Sewer Overflow: Wastewater that flows out of a sewer (or lift station) as a result of flows exceeding the hydraulic capacity of the sewer. CSOs usually occur during periods of heavy precipitation or high levels of runoff from snow melt or other runoff sources.

Catch Basin: A chamber or well used with storm or combined sewers as a means of removing grit, which might otherwise enter and be deposited in sewers.

Categorical Limits: Industrial wastewater discharge pollutant effluent limits developed by EPA that are applied to the effluent from any industry in any category anywhere in the United States that discharges to a POTW. These are pollutant effluent limits based on the technology available to treat the waste streams from the processes of the specific industrial category and normally are measured at the point of discharge from the regulated process. The pollutant effluent limits are listed in the Code of Federal Regulations.

Cathodic Protection: An electrical system for prevention of rust, corrosion, and pitting of metal surfaces which are in contact with water or soil. A low-voltage current is made to flow through a liquid (water) or a soil in contact with the metal in such a manner that the external electromotive force renders the metal structure cathodic. This concentrates corrosion on auxiliary anodic parts which are deliberately allowed to corrode instead of letting the structure corrode.

Certification Examination: An examination administered by a state or professional association that operators take to indicate a level of professional competence.

Chain of Custody: A record of each person involved in the handling and possession of a sample from the person who collected the sample to the person who analyzed the sample in the laboratory and to the person who witnessed disposal of the sample.

Chlorination: The application of chlorine to water or wastewater, generally for the purpose of disinfection, but frequently for accomplishing other biological or chemical results (aiding coagulation and controlling tastes and odors).

Chlorinator: A metering device which is used to add chlorine to water.

Chlorine Contact Unit: A baffled basin that provides sufficient detention time for disinfection to occur.

Clarification: Any process or combination of processes the main purpose of which is to reduce the concentration of suspended matter in a liquid.

Clarifier: A large circular or rectangular tank or basin in which water is held for a period of time during which the heavier suspended solids settle to the bottom. Clarifiers are also called settling basins and sedimentation basins. May also be a tank or basin in which wastewater is held for a period of time during which the heavier solids settle to the bottom and the lighter materials float to the water surface.

Clean Water Act: An act passed by the US Congress to control water pollution. The Federal Water Pollution Control Act passed in 1972 (Public Law [PL] 92-500). It was amended in 1977 (the Clean Water Act, PL 95-217) and again in 1987 (the Water Quality Act, PL 100-4).

Coagulant: A chemical that causes very fine particles to clump (floc) together into larger particles. This makes it easier to separate the solids from the liquids by settling, skimming, draining or filtering.

Coagulation: The clumping together of very fine particles into larger particles (floc) caused by the use of chemicals (coagulants). The chemicals neutralize the electrical charges of the fine particles, allowing them to come closer and form larger clumps. This clumping together makes it easier to separate the solids from the water by settling, skimming, draining or filtering.

Code of Federal Regulations (CFR): A publication of the United States Government which contains all of the proposed and finalized federal regulations, including environmental regulations.

Coliform: A group of bacteria found in the intestines of warm-blooded animals (including humans) and also in plants, soil, air and water. Fecal coliforms are a specific class of bacteria which only inhabit the intestines of warm-blooded animals. The presence of coliform bacteria is an indication that the water is polluted and may contain pathogenic (disease-causing) organisms.

Collection System: A network of pipes, manholes, cleanouts, traps, siphons, lift stations and other structures used to collect all wastewater and wastewater-carried wastes of an area and transport them to a treatment plant or disposal system. The collection system includes land, wastewater lines and appurtenances, pumping stations and general property.

Combined Sewer: A sewer designed to carry both sanitary wastewaters and storm or surface water runoff.

Combined Wastewater: A mixture of storm or surface runoff and other wastewater such as domestic or industrial wastewater.

Comminutor: A device used to reduce the size of the solid chunks in wastewater by shredding (comminuting). The shredding action is like many scissors cutting or chopping to shreds all the large solids material in the wastewater.

Compliance: The act of meeting specified conditions or requirements.

Composite (Proportional) Sample: A composite sample is a collection of individual samples obtained at regular intervals, usually every one or two hours during a 24-hour time span. Each individual sample is combined with the others in proportion to the rate of flow when the sample was collected. The resulting mixture (composite sample) forms a representative sample and is analyzed to determine the average conditions during the sampling period.

Confined Space: Confined space means a space is threefold, it is large enough and so configured that an employee can bodily enter and perform assigned work; it has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and it is not designed for continuous employee occupancy.

Contamination: The introduction into water of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the water unfit for its next intended use.

Conventional Treatment: The common treatment processes such as preliminary treatment, sedimentation, flotation, trickling filter, rotating biological contactor, activated sludge and chlorination wastewater treatment processes used by POTWs.

Corrosion: The gradual decomposition or destruction of a material by chemical action, often due to an electrochemical reaction. Corrosion may be caused by (1) stray current electrolysis, (2) galvanic corrosion caused by dissimilar metals, or (3) differential-concentration cells. Corrosion starts at the surface of a material and moves inward.

Corrosion Inhibitors: Substances that slow the rate of corrosion.

Corrosive Gases: In water, dissolved oxygen reacts readily with metals at the anode of a corrosion cell, accelerating the rate of corrosion until a film of oxidation products such as rust forms. At the cathode where hydrogen gas may form a coating on the cathode and slow the corrosion rate, oxygen reacts rapidly with hydrogen gas forming water, and again increases the rate of corrosion.

Cross Connection: 1. A connection between a storm drain system and a sanitary collection system. 2. Less frequently used to mean a connection between two sections of a collection system to handle anticipated overloads of one system. 3. A connection between drinking (potable) water and an unapproved water supply.

Cryptosporidium: A waterborne intestinal parasite that causes a disease called cryptosporidiosis in infected humans. Symptoms of the disease include diarrhea, cramps, and weight loss. *Cryptosporidium* contamination is found in most surface waters and some groundwater. Commonly referred to as "crypto."

Dissolved Oxygen (DO): DO is the molecular (atmospheric) oxygen dissolved in water or wastewater.

Dechlorination: The deliberate removal of chlorine from water. The partial or complete reduction of residual chlorine by any chemical or physical process.

Degradation: The conversion or breakdown of a substance to simpler compounds. For example, the degradation of organic matter to carbon dioxide and water.

Denitrification: An anoxic process that occurs when nitrite or nitrate ions are reduced to nitrogen gas and nitrogen bubbles are formed as a result of this process. The bubbles attach to the biological floc in the activated sludge process and float the floc to the surface of the secondary clarifiers. This condition is often the cause of rising sludge observed in secondary clarifiers or gravity thickeners. *Also see "nitrification."*

Detention Time: 1. The theoretical (calculated) time required for a small amount of water to pass through a tank at a given rate of flow. 2. The actual time in hours, minutes or seconds that a small amount of water is in a settling basin, flocculating basin or rapid-mix chamber. In storage reservoirs, detention time is the length of time entering water will be held before being drafted for use (several weeks to years, several months being typical).

Dewater: To drain or remove water from an enclosure. A structure may be dewatered so that it can be inspected or repaired. Dewater also means draining or removing water from sludge to increase the solids concentration.

Diffused-Air Aeration: A diffused air activated sludge plant takes air, compresses it, and then discharges the air below the water surface of the aerator through some type of air diffusion device.

Digester: A tank in which sludge is placed to allow decomposition by microorganisms. Digestion may occur under anaerobic (more common) or aerobic conditions.

Direct Discharger: A point source that discharges a pollutant(s) to waters of the United States, such as streams, lakes or oceans. These sources are subject to the National Pollutant Discharge Elimination System (NPDES) program regulations.

Direct Filtration: A method of treating water which consists of the addition of coagulant chemicals, flash mixing, coagulation, minimal flocculation, and filtration. The flocculation facilities may be omitted, but the physical-chemical reactions will occur to some extent. The sedimentation process is omitted. *Also see "conventional filtration" and "in-line filtration."*

Direct Runoff: Water that flows over the ground surface or through the ground directly into streams, rivers, or lakes.

Disinfection: The process designed to kill or inactivate most microorganisms in wastewater, including essentially all pathogenic (disease-causing) bacteria. There are several ways to disinfect, with chlorination being the most frequently used in water and wastewater treatment plants.

Disinfection By-Product (DBP): A contaminant formed by the reaction of disinfection chemicals (such as chlorine) with other substances in the water being disinfected.

Dissolved Oxygen Molecular (atmospheric): Oxygen dissolved in water or wastewater, usually abbreviated DO.

Distributor: The rotating mechanism that distributes the wastewater evenly over the surface of a trickling filter or other process unit.

Domestic: Residential living facilities. A domestic area will be predominantly residential in occupancy and is sometimes referred to as a "bedroom area" or "bedroom community."

Downstream: The direction of the flow of water. In the lower part of a sewer or collection system or in that direction.

EPA or United States Environmental Protection Agency: A regulatory agency established by the US Congress to administer the nation's environmental laws. Also called the US EPA.

Easement: Legal right to use the property of others for a specific purpose. For example, a utility company may have a five-foot easement along the property line of a home. This gives the utility the legal right to install and maintain a sewer line within the easement.

Effluent: Water or other liquid—raw (untreated), partially or completely treated—flowing from a reservoir, basin, treatment process, or treatment plant.

Effluent Limits: Pollutant limitations developed by a POTW for industrial plants discharging to the POTW system. At a minimum, all industrial facilities are required to comply with federal prohibited discharge standards. The industries covered by federal categorical standards must also comply with the appropriate discharge limitations. The POTW may also establish local limits more stringent than or in addition to the federal standards for some or all of its industrial users.

Equalizing Basin: A holding basin in which variations in flow and composition of a liquid are averaged. Such basins are used to provide a flow of reasonably uniform volume and composition to a treatment unit. Also called a balancing reservoir.

Eutrophication: The increase in the nutrient levels of a lake or other body of water; this usually causes an increase in the growth of aquatic animal and plant life.

Explosimeter: An instrument used to detect explosive atmospheres. When the Lower Explosive Limit (LEL) of an atmosphere is exceeded, an alarm signal on the instrument is activated. Also called a combustible gas detector.

Fixed Film Process: Biological process where the microbes are attached to medium such as rock or plastic.

Float (Control): A device used to measure the elevation of the surface of water. The float rests on the surface of the water and rises or falls with it. The elevation of the water surface is measured by a rod, chain, rope, or tape attached to the float.

Flow Recording: A record of a flow measurement past any selected point. Usually consists of time, velocity and amount (in gallons) with maximum and minimum rates as well as the total amount over a given time period.

Force Main: A pipe that carries wastewater under pressure from the discharge side of a pump to a point of gravity flow downstream.

Geographic Information System (GIS): A computer program that combines mapping with detailed information about the physical locations of structures such as pipes, valves, and manholes within geographic areas. The system is used to help operators and maintenance personnel locate utility system features or structures and to assist with the scheduling and performance of maintenance activities.

GPD: Initials standing for "Gallons Per Day."

GPM: Initials standing for "Gallons Per Minute."

Giardia: A waterborne intestinal parasite that causes a disease called *giardias* is in infected humans. Symptoms of the disease include diarrhea, cramps, and weight loss. *Giardia* contamination is found in most surface waters and some groundwater.

Grab Sample: A single sample of water collected at a particular time and place which represents the composition of the water only at that time and place.

Gravity Flow: Water or wastewater flowing from a higher elevation to a lower elevation due to the force of gravity. The water does not flow due to energy provided by a pump. Wherever possible, wastewater collection systems are designed to use the force of gravity to convey waste liquids and solids.

Grease: In a collection system, grease is considered to be the residues of fats, detergents, waxes, free fatty acids, calcium and magnesium soaps, mineral oils, and certain other nonfatty materials which tend to separate from water and coagulate as floatables or scums.

Grease Trap: A receptacle designed to collect and retain grease and fatty substances usually found in kitchens or from similar wastes. It is installed in the drainage system between the kitchen or other point of production of the waste and the building wastewater collection line. Commonly used to control grease from restaurants.

Grit: The heavy material present in wastewater, such as sand, coffee grounds, eggshells, gravel and cinders. Grit tends to settle out at flow velocities below 2 ft/sec and accumulate in the invert or bottoms of the pipelines. Also called "detritus."

Grit Removal: Grit removal is accomplished by providing an enlarged channel or chamber which causes the flow velocity to be reduced and allows the heavier grit to settle to the bottom of the channel where it can be removed.

Groundwater: Sub surface water in the saturation zone from which wells and springs are fed. In a strict sense the term applies only to water below the water table. Also called "phreatic water" and "plerotic water."

Hazard Communication: Employee "Right-to-Know" legislation requires employers to inform employees (pretreatment inspectors) of the possible health effects resulting from contact with hazardous substances. At locations where this legislation is in force, employers must provide employees with information regarding any hazardous substances which they might be exposed to under normal work conditions or reasonably foreseeable emergency conditions resulting from workplace conditions. OSHA's Hazard Communication Standard (HCS) (Title 29 CFR Part 1910.1200) is the federal regulation and state statutes are called Worker Right-to-Know Laws. *Also see "Community Right-to-Know" and "SARA."*

Headworks: The facilities where wastewater enters a wastewater treatment plant. The headworks may consist of bar screens, comminutors, and a wet well and pumps.

High-Velocity Cleaner: A machine designed to remove grease and debris from the smaller diameter sewer pipes with high-velocity jets of water. Also called a "jet cleaner," "jet rodder," "hydraulic cleaner," "high-pressure cleaner," or "hydro jet."

Hydraulic Cleaning: Cleaning pipe with water under enough pressure to produce high water velocities.
- Using a ball, kite, or similar sewer cleaning device
- Using a scooter
- Flushing

Hydraulic Loading: Hydraulic loading refers to the flows (MGD or cu m/day) to a treatment plant or treatment process. Detention times, surface loadings and weir overflow rates are directly influenced by flows.

Hydrogen Ion Concentration [H+]: The weight of hydrogen ion in moles per liter of solution. Commonly expressed as the pH value, which is the logarithm of the reciprocal of the hydrogen ion concentration.

Hydrogen Sulfide Gas (H_2S): Hydrogen sulfide is a gas with a rotten egg odor. This gas is produced under anaerobic conditions. Hydrogen sulfide gas is particularly dangerous because it dulls the sense of smell so that you don't notice it after you have been around it for a while. In high concentrations, hydrogen sulfide gas is only noticeable for a very short time before it dulls the sense of smell. The gas is very poisonous to the respiratory system, explosive, flammable, colorless, and heavier than air.

Hypochlorination: The application of hypochlorite compounds to water or wastewater for the purpose of disinfection.

Hypochlorinators: Chlorine pumps, chemical feed pumps or devices used to dispense chlorine solutions made from hypochlorites such as bleach (sodium hypochlorite) or calcium hypochlorite into the water being treated.

Hypochlorite: Chemical compounds containing available chlorine; used for disinfection. They are available as liquids (bleach) or solids (powder, granules, and pellets) in barrels, drums, and cans. Salts of hypochlorous acid.

Indirect Discharger: A non-domestic discharger introducing pollutants to a POTW. These facilities are subject to the EPA pretreatment regulations.

Industrial Pretreatment (Waste) Inspector: A person who conducts inspections of industrial pretreatment facilities to ensure protection of the environment and compliance with general and categorical pretreatment regulations. Also called an inspector and a pretreatment inspector.

Industrial Waste Survey: A survey of all companies that discharge to a POTW. The survey identifies the magnitude of the wastewater flows and pollutants in the discharge.

Industrial Wastewater: Liquid wastes originating from industrial processing. Because industries have peculiar liquid waste characteristics requiring special consideration, these sources are usually handled and treated separately before being discharged to a wastewater collection system.

Infiltration: The seepage of groundwater into a sewer system, including service connections. Seepage frequently occurs through defective or cracked pipes, pipe joints and connections, interceptor access risers and covers, or manhole walls.

Infiltration/Inflow: The total quantity of water from both infiltration and inflow without distinguishing the source. Abbreviated I & I or I/I.

Inflow: Water discharged into a sewer system and service connections from such sources as, but not limited to, roof leaders, cellars, yard and area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, around manhole covers or through holes in the covers, cross connections from storm and combined sewer systems, catch basins, storm waters, surface runoff, street wash waters or drainage. Inflow differs from infiltration in that it is a direct discharge into the sewer rather than a leak in the sewer itself. *See "internal inflow."*

Influent: Water, wastewater, or other liquid—raw (untreated) or partially treated—flowing into an interceptor, reservoir, basin, treatment process, or treatment plant.

Inlet: 1. A surface connection to a drain pipe. 2. A chamber for collecting storm water with no well below the outlet pipe for collecting grit. Often connected to a catch basin or a "basin manhole" ("cleanout manhole") with a grit chamber.

Inorganic: Material such as sand, salt, iron, calcium salts and other mineral materials. Inorganic substances are of mineral origin, whereas organic substances are usually of animal or plant origin. *Also see "organic."*

Inorganic Waste: Waste material such as sand, salt, iron, calcium, and other mineral materials which are only slightly affected by the action of organisms. Inorganic wastes are chemical substances of mineral origin; whereas organic wastes are chemical substances of an animal or plant origin.

Interceptor Sewer: A large sewer that receives flow from a number of sewers and conducts the wastewater to a treatment plant. Often called an interceptor. The term interceptor is sometimes used in small communities to describe a septic tank or other holding tank which serves as a temporary wastewater storage reservoir for a Septic Tank Effluent Pump (STEP) system.

Lateral Sewer: A sewer that discharges into a branch or other sewer and has no other common sewer tributary to it. Sometimes called a "street sewer" because it collects wastewater from individual homes.

Lift Station: A wastewater pumping station that lifts the wastewater to a higher elevation when continuing the sewer at reasonable slopes would involve excessive depths of trench. Also, an installation of pumps that raise wastewater from areas too low to drain into available sewers. These stations may be equipped with air-operated ejectors or centrifugal pumps. Sometimes called a "pump station," but this term is usually reserved for a similar type of facility that is discharging into a long force main, while a lift station has a discharge line or force main only up to the downstream gravity sewer. Throughout this manual when we refer to lift stations, we intend to include pump stations.

Loading: Quantity of material applied to a device at one time.

Lower Explosive Limit (LEL): The lowest concentration of gas or vapor (percent by volume in air) that explodes if an ignition source is present at ambient temperature. At temperatures above 250°F the LEL decreases because explosibility increases with higher temperature.

Lower Flammable Limit (LFL): The lowest concentration of a gas or vapor (percent by volume in air) that burns if an ignition source is present.

MG: Initials for "Million Gallons."

MGD: Initials for "Million Gallons Per Day."

mg/L: *See "milligrams per liter," mg/L.*

MPN: MPN is the Most Probable Number of coliform-group organisms per unit volume of sample water. Expressed as a density or population of organisms per 100 mL of sample water.

Main Line: Branch or lateral sewers that collect wastewater from building sewers and service lines.

Main Sewer: A sewer line that receives wastewater from many tributary branches and sewer lines and serves as an outlet for a large territory or is used to feed an intercepting sewer.

Manhole: An opening in a sewer provided for the purpose of permitting operators or equipment to enter or leave a sewer. Sometimes called an "access hole" or a "maintenance hole."

Masking Agents: Substances used to cover up or disguise unpleasant odors. Liquid masking agents are dripped into the wastewater, sprayed into the air, or evaporated (using heat) with the unpleasant fumes or odors and then discharged into the air by blowers to make an undesirable odor less noticeable.

Material Safety Data Sheet (MSDS): A document which provides pertinent information and a profile of a particular hazardous substance or mixture. An MSDS is normally developed by the manufacturer or formulator of the hazardous substance or mixture. The MSDS is required to be made available to employees and operators whenever there is the likelihood of the hazardous substance or mixture being introduced into the workplace. Some manufacturers are preparing MSDSs for products that are not considered to be hazardous to show that the product or substance is not hazardous.

Measured Flow: A flow which has been physically measured.

Media: The material in a trickling filter on which slime accumulates and organisms grow. As settled wastewater trickles over the media, organisms in the slime remove certain types of wastes thereby partially treating the wastewater. Also the material in a rotating biological contactor or in a gravity or pressure filter.

Microorganisms: Very small organisms that can be seen only through a microscope. Some microorganisms use the wastes in wastewater for food and thus remove or alter much of the undesirable matter.

Milligrams Per Liter, mg/L: A measure of the concentration by weight of a substance per unit volume in water or wastewater. In reporting the results of water and wastewater analysis, mg/L is preferred to the unit parts per million (ppm), to which it is approximately equivalent.

Million Gallons: A unit of measurement used in wastewater treatment plant design and collection system capacities or performances.

Motor Efficiency: The ratio of energy delivered by a motor to the energy supplied to it during a fixed period or cycle. Motor efficiency ratings will vary depending upon motor manufacturer and usually will be near 90.0 percent.

NIOSH: The National Institute of Occupational Safety and Health is an organization that tests and approves safety equipment for particular applications. NIOSH is the primary federal agency engaged in research in the national effort to eliminate on-the-job hazards to the health and safety of working people. The NIOSH Publications Catalog contains a listing of NIOSH publications concerning industrial hygiene and occupational health. To obtain a copy of the catalog, write to National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161. NTIS Stock No. PB-86-116-787.

NPDES Permit: National Pollutant Discharge Elimination System permit is the regulatory agency document issued by either a federal or state agency which is designed to control all discharges of pollutants from point sources and storm water runoff into US waterways. NPDES permits regulate discharges into navigable waters from all point sources of pollution, including industries, municipal wastewater treatment plants, sanitary landfills, large agricultural feedlots, and return irrigation flows.

Neutralization: Addition of an acid or alkali (base) to a liquid to cause the pH of the liquid to move toward a neutral pH of 7.0.

Nitrification Stage: A stage of decomposition that occurs in biological treatment processes when aerobic bacteria, using dissolved oxygen, change nitrogen compounds (ammonia and organic nitrogen) into oxidized nitrogen (usually nitrate). The second-stage BOD is sometimes referred to as the "nitrification stage" (first-stage BOD is called the "carbonaceous stage").

Nitrifying Bacteria: Bacteria that change the ammonia and organic nitrogen in wastewater into oxidized nitrogen (usually nitrate).

Nitrogenous: A term used to describe chemical compounds (usually organic) containing nitrogen in combined forms. Proteins and nitrate are nitrogenous compounds.

Noncompatible Pollutants: Those pollutants which are normally not removed by the POTW treatment system. These pollutants may be a toxic waste and may pass through the POTW untreated or interfere with the treatment system. Examples of noncompatible pollutants include heavy metals such as copper, nickel, lead, and zinc; organics such as methylene chloride, 1,1,1-trichloroethylene, methyl ethyl ketone, acetone, and gasoline; or sludges containing toxic organics or metals.

Nonpotable: Water that may contain objectionable pollution, contamination, minerals, or infective agents and is considered unsafe and/or unpalatable for drinking.

Nutrient: Any substance that is assimilated (taken in) by organisms and promotes growth. Nitrogen and phosphorus are nutrients which promote the growth of algae. There are other essential and trace elements which are also considered nutrients.

O&M Manual: Operation and Maintenance Manual. A manual that describes detailed procedures for operators to follow to operate and maintain specific water or wastewater treatment or pretreatment plants and the equipment of the plants.

OSHA: The Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA) is a federal law designed to protect the health and safety of industrial workers, including the operators of water supply and treatment systems and wastewater treatment plants. The Act regulates the design, construction, operation, and maintenance of water supply systems, water treatment plants, wastewater collection systems, and wastewater treatment plants. OSHA also refers to the federal and state agencies which administer the OSHA regulations.

Organic: Substances that come from animal or plant sources. Organic substances always contain carbon. (Inorganic materials are chemical substances of mineral origin.) *Also see "inorganic."*

Organics: 1. A term used to refer to chemical compounds made from carbon molecules. These compounds may be natural materials (such as animal or plant sources) or manmade materials (such as synthetic organics). *Also see "organic."* 2. Any form of animal or plant life. *Also see "bacteria."*

Organism: Any form of animal or plant life. *Also see "bacteria."*

Outfall: 1. The point, location or structure where wastewater or drainage discharges from a sewer, drain, or other conduit. 2. The conduit leading to the final disposal point or area.

Outfall Sewer: A sewer that receives wastewater from a collection system or from a wastewater treatment plant and carries it to a point of ultimate or final discharge in the environment. *See "outfall."*

Outlet: Downstream opening or discharge end of a pipe, culvert, or canal.

Oxidation: Oxidation is the addition of oxygen, removal of hydrogen, or the removal of electrons from an element or compound. In the environment, organic matter is oxidized to more stable substances. The opposite of reduction.

Oxidation Ditch: The oxidation ditch is a modified form of the activated sludge process. The ditch consists of two channels placed side by side and connected at the ends to produce one continuous loop of wastewater flow and a brush rotator assembly placed across the channel to provide aeration and circulation.

Oxidizing Agent: Any substance, such as oxygen (O_2) or chlorine (Cl_2), that will readily add (take on) electrons. The opposite is a reducing agent.

POTW–Publicly Owned Treatment Works: A treatment works which is owned by a state, municipality, city, town, special sewer district or other publicly owned and financed entity as opposed to a privately (industrial) owned treatment facility. This definition includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage (wastewater) or industrial wastes of a liquid nature. It also includes sewers, pipes and other conveyances only if they carry wastewater to a POTW treatment plant. The term also means the municipality (public entity) which has jurisdiction over the indirect discharges to and the discharges from such a treatment works.

P**ounds per Square Inch Gage pressure (PSIG):** The pressure within a closed container or pipe measured with a gage in pounds per square inch.

Package Treatment Plant: A small wastewater treatment plant often fabricated at the manufacturer's factory, hauled to the site, and installed as one facility. The package may be either a small primary or a secondary wastewater treatment plant.

Parts Per Million (PPM): A measurement of concentration on a weight or volume basis. This term is equivalent to milligrams per liter (mg/L) which is the preferred term.

Pass-Through: The passage of untreated pollutants through a publicly owned treatment works (POTW) which could violate applicable water quality standards or National Pollutant Discharge Elimination System (NPDES) effluent limitations.

Pathogenic Organisms: Organisms, including bacteria, viruses or cysts, capable of causing diseases *(giardiasis, cryptosporidiosis,* typhoid, cholera, dysentery) in a host (such as a person). There are many types of organisms which do not cause disease. These organisms are called non-pathogenic.

Peak Demand: The maximum momentary load placed on a water treatment plant, pumping station or distribution system. This demand is usually the maximum average load in one hour or less, but may be specified as the instantaneous load or the load during some other short time period.

Peaking Factor: Ratio of a maximum flow to the average flow, such as maximum hourly flow or maximum daily flow to the average daily flow.

Permissible Exposure Limit (PEL): The maximum 8-hour time weighted average of any airborne contaminant (such as dust, mist, vapor, gas, noise) to which an operator may be exposed. At no time may the exposure level exceed the ceiling concentration for that contaminant. Ceiling levels of regulated contaminants are listed in the Code of Federal Regulations (CFR) Title 29 Part 1910, Subparts G and Z. *Also see "Time Weighted Average (TWA)."*

pH: pH is an expression of the intensity of the basic or acidic condition of a liquid. The pH may range from 0 to 14, where 0 is most acidic, 14 most basic, and 7 neutral. Natural waters usually have a pH between 6.5 and 8.5.

Physical Waste Treatment Process: Physical waste treatment processes include use of racks, screens, comminutors, clarifiers (sedimentation and flotation) and filtration. Chemical or biological reactions are important treatment processes, but not part of a physical treatment process.

Pig: Refers to a poly pig which is a bullet-shaped device made of hard rubber or similar material. This device is used to clean pipes. It is inserted in one end of a pipe, moves through the pipe under pressure, and is removed from the other end of the pipe.

Pilot Scale Study: A method of studying different ways of treating wastewater and solids or to obtain design criteria on a small scale in the field.

Pipe Capacity: In a gravity-flow sewer system, pipe capacity is the total amount in gallons a pipe is able to pass in a specific time period.

Pipe Cleaning: Removing grease, grit, roots and other debris from a pipe run by means of one of the hydraulic cleaning methods. *See "balling," "hydraulic cleaning," and "kite."*

Pipe Diameter: The nominal or commercially designated inside diameter of a pipe, unless otherwise stated.

Pipe Joint: A place where two sections of pipe are coupled or joined together.

Pipe Section: A single length of pipe between two joints or couplers.

Plan View: A diagram or photo showing a facility as it would appear when looking down on top of it.

Plant Hydraulic Capacity: The flow or load, in millions of gallons per day (or portion thereof), that a treatment plant is designed to handle.

Pollutant: Any substance which causes impairment (reduction) of water quality to a degree that has an adverse effect on any beneficial use of the water.

Pollution: The impairment (reduction) of water quality by agricultural, domestic or industrial wastes (including thermal and radioactive wastes) to a degree that the natural water quality is changed to hinder any beneficial use of the water or render it offensive to the senses of sight, taste, or smell or when sufficient amounts of wastes create or pose a potential threat to human health or the environment.

Polyelectrolyte: A high-molecular-weight (relatively heavy) substance having points of positive or negative electrical charges that is formed by either natural or manmade processes. Natural polyelectrolytes may be of biological origin or derived from starch products and cellulose derivatives. Manmade polyelectrolytes consist of simple substances that have been made into complex, high-molecular-weight substances. Used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water. Often called a "polymer."

Polymer: A long chain molecule formed by the union of many monomers (molecules of lower molecular weight). Polymers are used with other chemical coagulants to aid in binding small suspended particles to larger chemical flocs for their removal from water.

Ponding: A condition occurring on trickling filters when the hollow spaces (voids) become plugged to the extent that water passage through the filter is inadequate. Ponding may be the result of excessive slime growths, trash, or media breakdown.

Postchlorination: The addition of chlorine to the plant effluent, following plant treatment, for disinfection purposes.

Potable Water: Water that does not contain objectionable pollution, contamination, minerals, or infective agents and is considered satisfactory for drinking.

Pre-Aeration: The addition of air at the initial stages of treatment to freshen the wastewater, removes gases, add oxygen, and promote flotation of grease, and aid coagulation.

Prechlorination (wastewater): The addition of chlorine in the collection system serving the plant or at the headworks of the plant prior to other treatment processes mainly for odor and corrosion control. Also applied to aid disinfection, to reduce plant BOD load, to aid in settling, to control foaming in Imhoff units and to help remove oil.

Precursor, THM: Natural organic compounds found in all surface and groundwater. These compounds may react with halogens (such as chlorine) to form trihalomethanes (THMs); they must be present in order for THMs to form.

Preliminary Treatment: The removal of metal, rocks, rags, sand, eggshells, and similar materials which may hinder the operation of a wastewater treatment plant. Preliminary treatment is accomplished by using equipment such as racks, bar screens, comminutors, and grit removal systems.

Pretreatment Facility: Industrial wastewater treatment plant consisting of one or more treatment devices designed to remove sufficient pollutants from wastewaters to allow an industry to comply with effluent limits established by the US EPA General and Categorical Pretreatment Regulations or locally derived prohibited discharge requirements and local effluent limits. Compliance with effluent limits allows for a legal discharge to a POTW.

Pretreatment Inspector: A person who conducts inspections of industrial pretreatment facilities to ensure protection of the environment and compliance with general and categorical pretreatment regulations. Also called an "industrial pretreatment (waste) inspector" and an "inspector."

Preventive Maintenance: Regularly scheduled servicing of machinery or other equipment using appropriate tools, tests and lubricants. This type of maintenance can prolong the useful life of equipment and machinery and increase its efficiency by detecting and correcting problems before they cause a breakdown of the equipment.

Primary Clarifier: A wastewater treatment device which consists of a rectangular or circular tank that allows those substances in wastewater that readily settle or float to be separated from the wastewater being treated.

Primary Treatment: A wastewater treatment process that takes place in a rectangular or circular tank and allows those substances in wastewater that readily settle or float to be separated from the water being treated.

Priority Pollutants: The EPA has proposed a list of 126 priority toxic pollutants. These substances are an environmental hazard and may be present in water. Because of the known or suspected hazards of these pollutants, industrial users of the substances are subject to regulation. The toxicity to humans may be substantiated by human epidemiological studies or based on effects on laboratory animals related to carcinogenicity, mutagenicity, teratogenicity, or reproduction. Toxicity to fish and wildlife may be related to either acute or chronic effects on the organisms themselves or to humans by bioaccumulation in food fish. Persistence (including mobility and degradability) and treatability are also important factors.

Pump: A mechanical device for causing flow, for raising or lifting water or other fluid, or for applying pressure to fluids.

Pump Station: Installation of pumps to lift wastewater to a higher elevation in places where flat land would require excessively deep sewer trenches. Also used to raise wastewater from areas too low to drain into available collection lines. These stations may be equipped with air-operated ejectors or centrifugal pumps. *See "lift station."*

Rack: Evenly spaced parallel metal bars or rods located in the influent channel to remove rags, rocks, and cans from wastewater.

Raw Wastewater: Plant influent or wastewater before any treatment.

Receiving Water: A stream, river, lake, ocean, or other surface or groundwater into which treated or untreated wastewater is discharged.

Regulator: A device used in combined sewers to control or regulate the diversion of flow.

Representative Sample: A sample portion of material, water, or waste stream that is as nearly identical in content and consistency as possible to that in the larger body of material or water being sampled.

Residual Chlorine: The amount of free and/or available chlorine remaining after a given contact time under specified conditions.

Respiration: The process in which an organism uses oxygen for its life processes and gives off carbon dioxide.

Retention Time: The time water, sludge or solids are retained or held in a clarifier or sedimentation tank. *See "detention time."*

Return Sludge: The recycled sludge in a POTW that is pumped from a secondary clarifier sludge hopper to the aeration tank.

Reuse: The use of water or wastewater after it has been discharged and then withdrawn by another user. *Also see "recycle."*

Right-to-Know Laws: Employee "Right-to-Know" legislation requires employers to inform employees (operators) of the possible health effects resulting from contact with hazardous substances. At locations where this legislation is in force, employers must provide employees with information regarding any hazardous substances which they might be exposed to under normal work conditions or reasonably foreseeable emergency conditions resulting from workplace conditions. OSHA's Hazard Communication Standard (HCS) (Title 29 CFR Part 1910.1200) is the federal regulation and state statutes are called Worker Right-to-Know Laws.

Rising Sludge: Rising sludge occurs in the secondary clarifiers of activated sludge plants when the sludge settles to the bottom of the clarifier, is compacted, and then starts to rise to the surface, usually as a result of denitrification.

Rotary Pump: A type of displacement pump consisting essentially of elements rotating in a pump case which they closely fit. The rotation of these elements alternately draws in and discharges the water being pumped. Such pumps act with neither suction nor discharge valves, operate at almost any speed, and do not depend on centrifugal forces to lift the water.

Runoff: That part of rain or other precipitation that runs off the surface of a drainage area and does not enter the soil or the sewer system as inflow.

SARA: Superfund Amendments and Reauthorization Act of 1986. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, has enacted in 1980. The Superfund Amendments increase Superfund revenues to $8.5 billion and strengthen the EPA's authority to conduct short-term (removal), long-term (remedial) and enforcement actions. The Amendments also strengthen state involvements in the cleanup process and the Agency's commitments to research and development, training, health assessments, and public participation. A number of new statutory authorities, such as Community Right-to-Know, are also established.

SCADA System: Supervisory Control and Data Acquisition System. Computer-monitored alarms, response, control and data acquisition systems used by operators to monitor and adjust their treatment processes and monitor their operations.

SIC Code: Standard Industrial Classification Code. A code number system used to identify various types of industries. In 1997, the United States and Canada replaced the SIC code system with the North American Industry Classification System (NAICS); Mexico adopted the NAICS in 1998.

Sanitary Collection System: The pipe system for collecting and carrying liquid and liquid-carried wastes from domestic sources to a wastewater treatment plant. *Also see "wastewater collection system."*

Sanitary Sewer: A pipe or conduit (sewer) intended to carry wastewater or waterborne wastes from homes, businesses, and industries to the POTW (Publicly Owned Treatment Works). Storm water runoff or unpolluted water should be collected and transported in a separate system of pipes or conduits (storm sewers) to natural watercourses.

Scale: A combination of mineral salts and bacterial accumulation that sticks to the inside of a collection pipe under certain conditions. Scale, in extreme growth circumstances, creates additional friction loss to the flow of water. Scale may also accumulate on surfaces other than pipes.

Schedule, (pipe): A sizing system of numbers that specifies the ID (inside diameter) and OD (outside diameter) for each diameter pipe. The schedule number is the ratio of internal pressure in psi divided by the allowable fiber stress multiplied by 1,000. Typical schedules of iron and steel pipe are schedules 40, 80, and 160. Other forms of piping are divided into various classes with their own schedule schemes.

Schmutzdecke: A layer of trapped matter at the surface of a slow sand filter in which a dense population of microorganisms develops. These microorganisms within the film or mat feed on and break down incoming organic material trapped in the mat. In doing so the microorganisms both remove organic matter and add mass to the mat, further developing the mat and increasing the physical straining action of the mat.

Scooter: A sewer cleaning tool whose cleansing action depends on the development of high water velocity around the outside edge of a circular shield. The metal shield is rimmed with a rubber coating and is attached to a framework on wheels (like a child's scooter). The angle of the shield is controlled by a chain-spring system which regulates the head of water behind the scooter and thus the cleansing velocity of the water flowing around the shield.

Screen: A device used to retain or remove suspended or floating objects in wastewater. The screen has openings that are generally uniform in size. It retains or removes objects larger than the openings. A screen may consist of bars, rods, wires, gratings, wire mesh, or perforated plates.

Scum: A layer or film of foreign matter (such as grease, oil) that has risen to the surface of water or wastewater; a residue deposited on the ledge of a sewer, channel, or wet well at the water surface; a mass of solid matter that floats on the surface.

Secondary Clarifier: A wastewater treatment device which consists of a rectangular or circular tank that allows those substances not removed by previous treatment processes that settle or float to be separated from the wastewater being treated.

Secondary Element: The secondary measuring device or flow meter used with a primary measuring device (element) to measure the rate of liquid flow. In open channels bubblers and floats are secondary elements. Differential pressure measuring devices are the secondary elements in pipes or pressure conduits. The purpose of the secondary measuring device is to (1) measure the liquid level in open channels or the differential pressure in pipes, and (2) convert this measurement into an appropriate flow rate according to the known liquid level or differential pressure and flow rate relationship of the primary measuring device. This flow rate may be integrated (added up) to obtain a totalized volume, transmitted to a recording device, and/or used to pace an automatic sampler.

Secondary Treatment: A wastewater treatment process used to convert dissolved or suspended materials into a form more readily separated from the water being treated. Usually the process follows primary treatment by sedimentation. The process commonly is a type of biological treatment process followed by secondary clarifiers that allow the solids to settle out from the water being treated.

Sedimentation (wastewater): The process of settling and depositing of suspended matter carried by wastewater. Sedimentation usually occurs by gravity when the velocity of the wastewater is reduced below the point at which it can transport the suspended material.

Sedimentation Basin: Clarifier, Settling Tank. A tank or basin in which wastewater is held for a period of time during which the heavier solids settle to the bottom and the lighter materials float to the water surface.

Seed Sludge: In wastewater treatment, seed, seed culture or seed sludge refers to a mass of sludge which contains populations of microorganisms. When a seed sludge is mixed with wastewater or sludge being treated, the process of biological decomposition takes place more rapidly.

Septage: The sludge produced in septic tanks.

Septic (wastewater): A condition produced by anaerobic bacteria. If severe, the wastewater produces hydrogen sulfide, turns black, gives off foul odors, contains little or no dissolved oxygen, and the wastewater has a high oxygen demand.

Septic Tank: A system sometimes used where wastewater collection systems and treatment plants are not available. The system is a settling tank in which settled sludge and floatable scum are in intimate contact with the wastewater flowing through the tank and the organic solids are decomposed by anaerobic bacterial action. Used to treat wastewater and produce an effluent that flows into a subsurface leaching (filtering and disposal) system where additional treatment takes place. Also referred to as an "interceptor;" however, the preferred term is "septic tank."

Septic Tank Effluent Pump (STEP) System: A facility where effluent is pumped from a septic tank into a pressurized collection system which may flow into a gravity sewer, treatment plant, or subsurface leaching system.

Septicity: The condition in which organic matter decomposes to form foul-smelling products associated with the absence of free oxygen. If severe, the wastewater produces hydrogen sulfide, turns black, gives off foul odors, contains little or no dissolved oxygen, and the wastewater has a high oxygen demand.

Series Operation: Wastewater being treated flows through one treatment unit and then flows through another similar treatment unit.

Service: Any individual person, group of persons, thing, or groups of things served with water through a single pipe, gate, valve, or similar means of transfer from a main distribution system.

Service Pipe: The pipeline extending from the water main to the building served or to the consumer's system.

Sewage: The used household water and water-carried solids that flow in sewers to a wastewater treatment plant. The preferred term is "wastewater."

Sewer: A pipe or conduit that carries wastewater or drainage water. The term "collection line" is often used also.

Sewer Gas: Gas in collection lines (sewers) that result from the decomposition of organic matter in the wastewater. When testing for gases found in sewers, test for lack of oxygen and also for explosive and toxic gases. Any gas present in the wastewater collection system, even though it is from such sources as gas mains, gasoline, and cleaning fluid.

Sewer Main: A sewer pipe to which building laterals are connected. Also called a "collection main."

Sewerage: System of piping with appurtenances for collecting, moving and treating wastewater from source to discharge.

Shock Load (wastewater): The arrival at a plant of a waste which is toxic to organisms in sufficient quantity or strength to cause operating problems. Possible problems include odors and sloughing off of the growth or slime on the trickling filters media. Organic or hydraulic overloads also can cause a shock load.

Short-Circuiting: A condition that occurs in tanks or basins when some of the water travels faster than the rest of the flowing water. This is usually undesirable since it may result in shorter contact, reaction, or settling times in comparison with the theoretical (calculated) or presumed detention times.

Side Stream: Wastewater flows that develop from other storage or treatment facilities. This wastewater may or may not need additional treatment.

Significant Industrial User (SIU): A Significant Industrial User (SIU) includes: all categorical industrial users, and any non categorical industrial user that discharges 25,000 gallons per day or more of process wastewater ("process wastewater" excludes sanitary, noncontact cooling and boiler blow down wastewaters), or contributes a process waste stream which makes up five percent or more of the average dry weather hydraulic or organic (BOD, TSS) capacity of a treatment plant, or has a reasonable potential, in the opinion of the Control or Approval Authority, to adversely affect the POTW treatment plant (inhibition, pass-through of pollutants, sludge contamination, or endangerment of POTW workers).

Significant Noncompliance: An industrial user is in significant noncompliance if its violation meets one or more of the following criteria:

- Chronic violation of wastewater discharge limits, defined here as those in which 66 percent or more of all of the measurements taken during a six-month period exceed (by any magnitude) the daily maximum limit or the average limit for the same pollutant parameter
- Technical Review Criteria (TRC) violations, defined here as those in which 33 percent or more of all of the measurements for each pollutant parameter taken during a six-month period equal or exceed the product of the daily maximum limit or the average limit multiplied by the applicable TRC (TRC = 1.4 for BOD, TSS, fats, oil and grease, and 1.2 for all other pollutants except pH)
- Any other violation of a pretreatment effluent limit (daily maximum or longer-term average) that the Control Authority determines has caused, alone or in combination with other discharges, interference or pass through (including endangering the health of POTW personnel or the general public)
- Any discharge of a pollutant that has caused imminent endangerment to human health, welfare or to the environment or has resulted in the POTW's exercise of its emergency authority to halt or prevent such a discharge
- Failure to meet, within 90 days after the schedule date, a compliance schedule milestone contained in a local control mechanism or enforcement order for starting construction, completing construction, or attaining final compliance
- Failure to provide, within 30 days after the due date, required reports such as baseline monitoring reports, 90-day compliance reports, periodic self-monitoring reports, and reports on compliance with compliance schedules
- Failure to accurately report noncompliance
- Any other violation which the Control Authority determines will adversely affect the operation or implementation of the local pretreatment program

Sludge: The settleable solids separated from liquids during processing or the deposits of foreign materials on the bottoms of streams or other bodies of water.

Sludge Digestion: The process of changing organic matter in sludge into a gas or a liquid or a more stable solid form. These changes take place as microorganisms feed on sludge in anaerobic (more common) or aerobic digesters.

Slugs: Intermittent releases or discharges of wastewater.

Smoke Test: A method of blowing smoke into a closed-off section of a sewer system to locate sources of surface inflow.

Software Programs: Computer programs; the list of instructions that tell a computer how to perform a given task or tasks. Some software programs are designed and written to monitor and control municipal water and wastewater treatment processes.

Solids Concentration: The solids in the aeration tank which carry microorganisms that feed on wastewater.

Soluble BOD: Soluble BOD is the BOD of water that has been filtered in the standard suspended solids test.

Stabilization: Processes that convert organic materials to a form that resists change. Organic material is stabilized by bacteria which convert the material to gases and other relatively inert substances. Stabilized organic material generally will not give off obnoxious odors.

Stabilized Waste: A waste that has been treated or decomposed to the extent that, if discharged or released, its rate and state of decomposition would be such that the waste would not cause a nuisance or odors.

Sterilization: The removal or destruction of all microorganisms, including pathogenic and other bacteria, vegetative forms and spores. Compare with "disinfection."

Storm Collection System: A system of gutters, catch basins, yard drains, culverts and pipes for the purpose of conducting storm waters from an area, but intended to exclude domestic and industrial wastes.

Storm Runoff: The amount of runoff that reaches the point of measurement within a relatively short period of time after the occurrence of a storm or other form of precipitation. Also called "direct runoff."

Storm Sewer: A separate pipe, conduit or open channel (sewer) that carries runoff from storms, surface drainage, and street wash, but does not include domestic and industrial wastes. Storm sewers are often the recipients of hazardous or toxic substances due to the illegal dumping of hazardous wastes or spills created by accidents involving vehicles and trains transporting these substances. *Also see "sanitary sewer."*

Sump: The term "sump" refers to a structure which connects an industrial discharger to a public sewer. The structure (sump) could be a sample box, a clarifier or an intercepting sewer.

Supernatant (wastewater): Liquid removed from settled sludge. Supernatant commonly refers to the liquid between the sludge on the bottom and the scum on the surface of an anaerobic digester. This liquid is usually returned to the influent wet well or to the primary clarifier.

Surcharge: Sewers are surcharged when the supply of water to be carried is greater than the capacity of the pipes to carry the flow. The surface of the wastewater in manholes rises above the top of the sewer pipe, and the sewer is under pressure or a head, rather than at atmospheric pressure.

Surface Runoff: The precipitation that cannot be absorbed by the soil and flows across the surface by gravity. The water that reaches a stream by traveling over the soil surface or falls directly into the stream channels, including not only the large permanent streams but also the tiny rills and rivulets. Water that remains after infiltration, interception, and surface storage has been deducted from total precipitation.

Surfactant: Abbreviation for surface-active agent. The active agent in detergents that possesses a high cleaning ability.

Suspended Growth Processes: Wastewater treatment processes in which the microorganisms and bacteria treating the wastes are suspended in the wastewater being treated. The wastes flow around and through the suspended growths. The various modes of the activated sludge process make use of suspended growth reactors. These reactors can be used for BOD removal, nitrification and denitrification.

Suspended Solids: 1. Solids that either float on the surface or are suspended in water, wastewater, or other liquids, and which are largely removable by laboratory filtering. 2. The quantity of material removed from water in a laboratory test, as prescribed in Standard Methods for the Examination of Water and Wastewater, and referred to as Total Suspended Solids Dried at 103° to 105°C.

Temperature Sensor: A device that opens and closes a switch in response to changes in the temperature. This device might be a metal contact, or a thermocouple that generates minute electric current proportional to the difference in heat, or a variable resistor whose value changes in response to changes in temperature. Also called a "heat sensor."

Tertiary Treatment: Any process of water renovation that upgrades treated wastewater to meet specific reuse requirements. May include general cleanup of water or removal of specific parts of wastes insufficiently removed by conventional treatment processes. Typical processes include chemical treatment and pressure filtration. Also called "advanced waste treatment."

Thickening: Treatment to remove water from the sludge mass to reduce the volume that must be handled.

Total Flow: The total flow passing a selected point of measurement in the collection system during a specified period of time.

Total Residual Chlorine: The amount of available chlorine remaining after a given contact time. The sum of the combined available residual chlorine and the free available residual chlorine. *Also see "residual chlorine."*

Toxic: A substance which is poisonous to a living organism.

Trap: 1. In the wastewater collection system of a building, plumbing codes require every drain connection from an appliance or fixture to have a trap. The trap in this case is a gooseneck that holds water to prevent vapors or gases in a collection system from entering the building. 2. Various other types of special traps are used in collection systems such as a grit trap or sand trap.

Trickling Filter: A treatment process in which the wastewater trickles over media that provide the opportunity for the formation of slimes or biomass which contain organisms that feed upon and remove wastes from the water being treated.

Trickling Filter Media: Rocks or other durable materials that make up the body of the filter. Synthetic (manufactured) media have been used successfully.

Trihalomethanes (THMs): Derivatives of methane, CH_4, in which three halogen atoms (chlorine or bromine) are substituted for three of the hydrogen atoms. Often formed during chlorination by reactions with natural organic materials in the water. The resulting compounds (THMs) are suspected of causing cancer.

Turbidity: The cloudy appearance of water caused by the presence of suspended and colloidal matter. In the waterworks field, a turbidity measurement is used to indicate the clarity of water. Technically, turbidity is an optical property of the water based on the amount of light reflected by suspended particles. Turbidity cannot be directly equated to suspended solids because white particles reflect more light than dark-colored particles and many small particles will reflect more light than an equivalent large particle.

Turbidity Meter: An instrument for measuring and comparing the turbidity of liquids by passing light through them and determining how much light is reflected by the particles in the liquid. The normal measuring range is 0 to 100 and is expressed as Nephelometric Turbidity Units (NTUs).

Turbidity Units (TU): Turbidity units are a measure of the cloudiness of water. If measured by a nephelometric (deflected light) instrumental procedure, turbidity units are expressed in nephelometric turbidity units (NTU) or simply TU. Those turbidity units obtained by visual methods are expressed in Jackson Turbidity Units (JTU) which is a measure of the cloudiness of water; they are used to indicate the clarity of water. There is no real connection between NTUs and JTUs. The Jackson turbidimeter is a visual method and the nephelometer is an instrumental method based on deflected light.

Turbulent Mixers: Devices that mix air bubbles and water and cause turbulence to dissolve oxygen in the water.

US EPA: United States Environmental Protection Agency.

Ultra filtration: A membrane filters process used for the removal of some organic compounds in an aqueous (watery) solution.

Upstream: The direction against the flow of water; or, toward or in the higher part of a sewer or collection system.

Variable Costs (wastewater): Costs that a utility must cover or pay that are associated with the actual collection, treatment, and disposal of wastewater. The costs vary or fluctuate. *Also see "fixed costs."*

Vulnerability Assessment (water): An evaluation of drinking water source quality and its vulnerability to contamination by pathogens and toxic chemicals.

Waste Activated Sludge (WAS), mg/L: The excess growth of microorganisms which must be removed from the process to keep the biological system in balance.

Wastewater: A community's used water and water-carried solids (including used water from industrial processes) that flow to a treatment plant. Storm water, surface water, and groundwater infiltration also may be included in the wastewater that enters a wastewater treatment plant. The term "sewage" usually refers to household wastes, but this word is being replaced by the term "wastewater."

Wastewater Collection System: The pipe system for collecting and carrying water and water-carried wastes from domestic and industrial sources to a wastewater treatment plant.

Wastewater Facilities: The pipes, conduits, structures, equipment, and processes required to collect, convey, and treat domestic and industrial wastes, and dispose of the effluent and sludge.

Wastewater Ordinance: The basic document granting authority to administer a pretreatment inspection program. This ordinance must contain certain basic elements to provide a legal framework for effective enforcement.

Wastewater Treatment Plant: An arrangement of pipes, equipment, devices, tanks and structures for treating wastewater and industrial wastes. A water pollution control plant.

Water Cycle: The process of evaporation of water into the air and its return to earth by precipitation (rain or snow). This process also includes transpiration from plants, groundwater movement, and runoff into rivers, streams and the ocean. Also called the "hydrologic cycle."

Watershed: The region or land area that contributes to the drainage or catchments area above a specific point on a stream or river.

Weir: A wall or plate placed in an open channel and used to measure the flow of water. The depth of the flow over the weir can be used to calculate the flow rate, or a chart or conversion table may be used to convert depth to flow. A wall or obstruction used to control flow (from settling tanks and clarifiers) to ensure a uniform flow rate and avoid short-circuiting.

A number of terms were taken from the US EPA Office of Water, Office of Groundwater and Drinking Water, Drinking Water Glossary.

Appendix A

Advanced Evaluation Techniques

Description and Demonstration Advanced Evaluation Techniques

There are four key measures that should be considered when undertaking the performance of a potential investment, each of which is specifically aligned to negate the inaccuracies resulting from differing cost and life combinations. These measures are summarized in the following table:

Measure Selection Table

Investment Costs (Size)	Investment Lives (Time)	Appropriate Measure to Use
Same	Same	Net Present Value (NPV)
Different	Same	Present Value Index (PVI)
Same	Different	Annuity of NPV
Different	Different	Annuity of PVI

It is important that the correct measure is used to suit the appropriate circumstances, as a misleading result can be obtained. Each of these measures are reviewed in the following sections.

In general, these measures have the following advantages and disadvantages:

Advantages

- They consider the time value of money
- Measures use standard accounting and economic techniques
- No ambiguities/anomalies in options comparison (as long as correct measure is used)

Disadvantages

- Tedious calculation unless computer modeled
- Need to know organization's opportunity cost of capital
- There is subjectivity in determining expected annual cash inflows and expected period of benefit

Net Present Value (NPV)

NPV evaluations should not be used for a comparison when options with different investment sizes are being compared. The present value method compares the present value of future cash flows expected from an investment project to the initial cash outlay for that investment. Net cash flows are the difference between forecasted cash inflow received because of the investment with the expected cash outflow of the investment. *If the NPV is negative, then the project is rejected.*

Advantages and Disadvantages

- Measures actual worth using standard of profitability
- Is only appropriate when the projects evaluated have a similar expected life and costs

Present Value Index (PVI)

The Present Value Index is essentially a ratio of the present value of net inflows to the present value of the original investment. *If this ratio is less than one, then that option should be rejected.*

Advantages and Disadvantages

- Negates the impact of different capital investments in options being compared
- Only a suitable comparator when the same investment life exists for both investments

Annuity of NPV (Net Present Value)

This method is suitable for use when investment sizes are the same, but the lives are unequal. It is found by dividing the NPV by the PV of annuity. The output of this evaluation method displays an annual benefit (or loss) expected from the investment. *The option with a higher annuity of NPV is preferred. An option with a negative annuity of NPV should be rejected.*

Advantages and Disadvantages

- Negates the impact of differing investment lives
- Options being compared must have the same investment costs to deliver reasonable results

Annuity of PVI (Present Value Index)

The Annuity of PVI should be utilized when the investment sizes are different, and unequal investment lives are present. The annuity of PVI is calculated through two calculations, the output of which is a rate of return. This rate of return should exceed the organization's internal hurdle rate with the option having the highest rate of return being preferable.

Advantages and Disadvantages

- Allows for both different investment costs and sizes
- Is more complex to evaluate

Calculation Example

Take the case of a potential investment. There are two identified options – Machine C or Machine D. Both of these machines can do the task required of them, but they have different investment costs and lives. The minimum required rate of return is 12%.

Example option details table

	Machine C	**Machine D**
Cost (assumed as today's value, thus not discounted)	$20,000	$65,000
Salvage value	$0	$5000
Estimated life	5 years	12 years
Added revenue per year	$16,000	$22,000
Added out of pocket costs per year	($10,200)	($10,000)
Net cash inflows	$5,800	$12,000

For this particular example, both the costs and the lives are different, as such an Annuity of PVI would ideally be utilized as per the PVI Calculation Table. However, to show how the different calculations are undertaken, and the different answers that can be obtained if the incorrect method is used, each method of evaluation will be undertaken.

NPV Calculation Table

	Machine C	**Machine D**
PV of inflows (= Revenue x PV of an annuity of $1)	5,800 x 3.6048 = 20,909	12,000 x 6.1944 = 74,328
Plus PV of salvage (= Salvage value x PV of $1 at time of salvage)	0 x 0.5674 = 0	5,000 x 0.2567 = 1,284
Equals **PV Total of inflows**	**20,909**	**75,612**
Less PV of original investment	(20,000)	(65,000)
Equals **Net Present Value**	**$909**	**$10,612**

Evaluation Rules:

1. If NPV is negative, then reject
2. The option with the higher NPV is preferred

Based on these rules, Machine D would be the preferred option under NPV analysis.

PVI Calculation Table

	Machine C	Machine D
PV of total inflows	20,909	75,612
PV of original investment	20,000	65,000
PVI = PV of total inflows/PV of original investment	20,909/20,000 = 1.045	75,612/65,000 = 1.163

Evaluation Rules:

3. If PVI is less than 1, then reject
4. The option with the greater PVI is preferred

Based on these rules, Machine D would be the preferred option under PVI analysis.

Annuity of NPV Calculation Table

	Machine C	Machine D
NPV	909	10,612
PV of Annuity	3.6048	6.1944
Annuity of NPV (= NPV/PV of Annuity)	**909/3.6048 = $252**	**10,612/6.1944 = $1,713**

Evaluation Rules:

5. If Annuity of NPV is negative, then reject
6. The option with the greater Annuity of NPV is preferred

Based on these rules, Machine D would be the preferred option under Annuity of NPV analysis.

Annuity of PVI Calculation Table

	Machine C	Machine D
PV Annuity (= PV of total inflows/PV of annuity of $1 at end of life)	20,909/3.6048 = 5,800	75,612/6.1944 = 12,207
PV of original investment	20,000	65,000
Annuity of PVI (= PV Annuity/PV of original investment)	**5,800/20,000 = 0.29**	**12,207/65,000 = 0.19**

Evaluation Rules:

7. The rate of return found should equal or exceed the internal hurdle rate for the organization, otherwise reject the option.
8. The option with the higher rate of return is preferred

Based on these rules, Machine C with an annual 29% return would be the preferred option under Annuity of PVI analysis.

Appendix B

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

Industrial Code:	**4952**	SPDES Number:	**NY- 003 1208**
Discharge Class (CL):	**05**	DEC Number:	**3-5148-00042-00003**
Toxic Class (TX):	**N**	Effective Date (EDP):	**09/01/2004**
Major Drainage Basin:	**13**	Expiration Date (ExDP):	**08/31/2009**
Sub Drainage Basin:	**07**	Modification Dates: (EDPM)	**TBD**
Water Index Number:	**H-171**		
Compact Area:			

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name: **Village of Saugerties** Attention: **Mayor**
Street: **43 Partition street**
City: **Saugerties** State: **NY** Zip Code: **12477**
is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: **V/O Saugerties Dock Street Sewage Treatment Plant**
Location (C,T,V): **Saugerties (V)** County: **Ulster**
Facility Address: **111 Dock Street**
City: **Saugerties** State: **NY** Zip Code: **12477**
NYTM -E: 587.3 NYTM - N: 658.2
From Outfall No.: **001** at Latitude: **42 ° 04 ′ 28 ″** & Longitude: **73 ° 56 ′ 42 ″**
into receiving waters known as: **Esopus Creek** Class: **C**
and; (list other Outfalls, Receiving Waters & Water Classifications)

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1.2(a) and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: **Village of Saugerties STP**
Street: **43 Partition Street**
City: **Saugerties** State: **NY** Zip Code: **12477**
Responsible Official or Agent: **Alphonse Marino** Phone: **(845) 246-2331**

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:
CO BWP - Permit Coordinator
RWE
RPA
EPA Region II - Jeffrey Gratz
EFC
Ulster Co. Health Dept

Permit Administrator: Margaret Duke
Address: 21 South Putt Corners Road
New Paltz, NY 12561-1696
Signature: Date: / /

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.		

PARA-METER	EFFLUENT LIMIT	PRACTICAL QUANTITATION LIMIT (PQL)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based limits, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the analytical method specified in the permit shall be used to monitor the amount of the pollutant in the outfall to this level, provided that the laboratory analyst has complied with the specified quality assurance/quality control procedures in the relevant method. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This PQL can be neither lowered nor raised without a modification of this permit.	Type I or Type II Action Levels are monitoring requirements, as defined below in Note 2, that trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, Temperature, concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Note 1: DAILY DISCHARGE.: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day.

DAILY MAX.: The highest allowable daily discharge. DAILY MIN.: The lowest allowable daily discharge.

MONTHLY AVG: The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week.

30 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of : the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

7 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar week.

RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown.

Note 2: ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards. TYPE I : The additional monitoring requirement is triggered upon receipt by the permittee of any monitoring results in excess of the stated Action Level. TYPE II: The additional monitoring requirement is triggered upon receipt by the permittee of any monitoring results that show the stated action level exceeded for four of six consecutive samples, or for two of six consecutive samples by 20 % or more, or for any one sample

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL No.	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	[X] All Year [ ] Seasonal from _____ to _____	Esopus Creek	09/01/2004	08/31/2009

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly average	1.36	MGD			Continuous	Recorder	X		
BOD_5	Monthly average	30	mg/l	340	lbs/d	1/week	24 hr. Comp	X	X	(1)
BOD_5	7 day average	45	mg/l	510	lbs/d	1/week	24 hr. Comp		X	
Solids, Suspended	Monthly average	30	mg/l	340	lbs/d	1/week	24 hr. Comp	X	X	(1)
Solids, Suspended	7 day average	45	mg/l	510	lbs/d	1/week	24 hr. Comp		X	
Solids, Settleable	Daily Max.	0.3	ml/l			2/day	Grab		X	
pH	Range	6.0 - 8.5	SU			2/day	Grab		X	
Temperature	Daily Maximum	Monitor	Deg. F			2/day	Grab		X	
Nitrogen, Ammonia (as NH_3)	Daily Max.	Monitor	mg/l						X	
Nitrogen, TKN (as N)	Daily Max.	Monitor	mg/l						X	
Effluent Disinfection required: [X] All Year [ ] Seasonal from _____ to _____										
Coliform, Fecal	30 day geometric mean	200	No./ 100 ml			1/week	Grab		X	
Coliform, Fecal	7 day geometric mean	400	No./ 100 ml			1/week	Grab		X	
Chlorine, Total Residual	Daily Max.	2.0	mg/l			2/day	Grab		X	

FOOTNOTES: (1) and effluent shall not exceed 15 % and 15 % of influent concentration values for BOD_5 & TSS respectively.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL No.	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
001	Effluent	Esopus Creek	09/01/2004	08/31/2009

PARAMETER	MONITORING ACTION LEVEL		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	TYPE I	TYPE II				
Copper, Total	0.45		Lbs/day	1/Quarter	24 hr. Composite	
Lead, Total	0.30		Lbs/day	1/Quarter	24 hr. Composite	
Zinc, Total	0.60		Lbs/day	1/Quarter	24 hr. Composite	

COMPLIANCE SCHEDULE

a) The permittee shall comply with the following schedule.

Action Code	Outfall Number(s)	Compliance Action	Due Date
	001	The permittee shall conduct sampling for the following parameters detected in the WWTP effluent and listed in the permit application. Sampling shall be once per week for a period of 3 months. Parameter / Method / Detection Level Required, ug/l / Sample Type Available Cyanide / EPA, OIA-1677 / 2.0 / 24 hr.Comp. Sampling and analysis results, along with the average flow for each sampling day, shall be submitted to Al Fuchs, Chief, Wastewater Permits - South Section, 625 Broadway, Albany, NY, 12233-3505, as well as to the Regional Water Engineer. After review of the results, the Department may reopen the permit to add additional limits or action levels for these parameters.	EDPM + 5 months

The above compliance actions are one time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT", the permittee is not required to repeat the submission. The above due dates are independent from the effective date of the permit stated in the letter of "SPDES NOTICE/RENEWAL APPLICATION/PERMIT."

b) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice under terms of the General Conditions (Part ll), Section 5. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:

1. A short description of the non-compliance;
2. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
3. A description or any factors which tend to explain or mitigate the non-compliance; and
4. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

c) The permittee shall submit copies of any document required by the above schedule of compliance to NYSDEC Regional Water Engineer at the location listed under the section of this permit entitled RECORDING, REPORTING AND

DISCHARGE NOTIFICATION REQUIREMENTS

a) The permittee shall maintain the existing identification signs at all outfalls to surface waters, which have not been waived by the Department in accordance with 17-0815-a. The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address :

NYSDEC Division of Water Regional Phone: ( ) - ### -####

b) For each discharge required to have a sign in accordance with a), the permittee shall provide for public review at a repository accessible to the public, copies of the Discharge Monitoring Reports (DMRs) as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years.

c) The permittee shall periodically inspect the outfall identification signs in order to ensure that they are maintained, are still visible and contain information that is current and factually correct.

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

a) The permittee shall also refer to 6 NYCRR Part 750-1.2(a) and 750-2 for additional information concerning monitoring and reporting requirements and conditions.

b) The monitoring information required by this permit shall be summarized, signed and retained for a period of at least five years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each __3__ month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 and must summarize information for January to December of the previous year in a format acceptable to the Department.

[X] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:
[X] Regional Water Engineer and/or [X] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:

Department of Environmental Conservation
Division of Water
Bureau of Water Compliance Programs
625 Broadway
Albany, New York 12233-3506

Phone: (518) 402-8177

Send the **first copy** (second sheet) of each DMR page to:

Department of Environmental Conservation
Regional Water Engineer
100 Hillside Avenue, Suite 1W
White Plains, NY 10603-2860

Phone: 914-428-2505

c) Noncompliance with the provisions of this permit shall be reported to the Department as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2.

d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

e) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculations and recording of the data on the Discharge Monitoring Reports.

f) Calculation for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

g) Unless otherwise specified, all information recorded on the Discharge Monitoring Report shall be based upon measurements and sampling carried out during the most recently completed reporting period.

h) Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section five hundred two of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be sent to the Environmental Laboratory Accreditation Program, New York State Health Department Center for Laboratories and Research, Division of Environmental Sciences , The Nelson A. Rockefeller Empire State Plaza, Albany, New York 12201.

Appendix C

NYSDEC SUPPLEMENTAL INSTRUCTIONS - ATTACHMENT
Discharge Monitoring Report (DMR) Authorization

Your SPDES permit, when issued, may require you to periodically submit a Discharge Monitoring Report (DMR). The reports must be signed as follows:

1. for a corporation: by a responsible corporate officer. For the purposes of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or a vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making function for the corporation, or

(ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures, or

2. for a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

3. for a municipality, state, federal, or other public agency: by either a principal or executive officer or ranking elected official. A principal executive officer of a federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency; or

4. a duly authorized representative of the person described in items (1), (2) or (3). A person is a duly authorized representative only if:

(i) the authorization is made in writing by a person described in paragraph (1), (2) or (3);

(ii) the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position);

(iii) the written authorization is submitted to the Department.

Changes to authorization: If an authorization under paragraph (4) is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph (4) must be submitted to the Department prior to or together with any reports to be signed by an authorized representative.

THE TABLE BELOW MUST BE COMPLETED AND FILED WITH YOUR APPLICATION. The person identified on the first line will be listed in Part I of the issued permit under the DMR MAILING ADDRESS section and must be a person described in paragraph (1), (2), (3) or (4). The table may be used to designate an authorized representative as described in paragraph (4).

THE APPLICANT MUST NOTIFY THE DEPARTMENT OF ANY CHANGE IN THIS INFORMATION DURING THE LIFE OF THE PERMIT

Name and/or Title of person responsible for signing and submitting DMR's:			Phone: ( )
Mailing Name:			
Mailing Address:	City:	State:	Zip Code:
Name of person described in paragraph (1), (2) or (3):	Title:		
Signature of person described in paragraph (1), (2), or (3):			Date:

Failure to submit this completed page with your application will result in your application being declared incomplete. This will delay issuance of your permit and authorization to discharge.
(Rev. 5/00)

PERMITTEE NAME/ADDRESS (Include Facility Name/Location (If Different))
NAME CLD FORGE SEWER DISTRICT
ADDRESS CLD FORGE SD WWTP
PULLMAN AVENUE
CLD FORGE NY 13420
FACILITY CLD FORGE SD WWTP
LOCATION CLD FORGE NY 13420
ATTN: ROBERT A MOORE, SUPERVISOR

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

NY0021351 — PERMIT NUMBER
001 A — DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	05	02	01	TO	05	02	28

Received NYSDEC BWCP
MAR 18 2005

MINOR
(SUBR 06)
F - FINAL
WWTP OUTFALL

*** NO DISCHARGE [__] ***
NOTE: Read instructions before completing this form.

Form Approved.
OMB No. 2040-0004

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE, WATER DEG. FAHRENHEIT	SAMPLE MEASUREMENT	******	******		******	46	******	(15)	0	01/01	GR
00011 G 0 0 RAW SEW/INFLUENT	PERMIT REQUIREMENT	******	****** **** ****		******	REPORT DAILY AV	******	DEG.F		DAILY	GRAB
TEMPERATURE, WATER DEG. FAHRENHEIT	SAMPLE MEASUREMENT	******	******		******	49	******	(15)	0	01/01	GR
00011 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	****** **** ****		******	REPORT DAILY AV	******	DEG.F		DAILY	GRAB
BOD, 5-DAY (20 DEG. C)	SAMPLE MEASUREMENT	******	******		******	303	330	(19)	0	02/30	24
00310 G 0 0 RAW SEW/INFLUENT	PERMIT REQUIREMENT	******	****** **** ****		******	REPORT 30DA AVG	REPORT 7 DA AVG	MG/L		TWICE/MONTH	COMP-6
BOD, 5-DAY (20 DEG. C)	SAMPLE MEASUREMENT	7.0	9.8	(26)	******	9.3	12.0	(19)	0	02/30	24
00310 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	112 30DA AVG	169 7 DA AVG	LBS/DY	******	30 30DA AVG	45 7 DA AVG	MG/L		TWICE/MONTH	COMP-6
PH	SAMPLE MEASUREMENT	******	******		6.70	******	7.42	(12)	0	01/01	GR
00400 G 0 0 RAW SEW/INFLUENT	PERMIT REQUIREMENT	******	****** **** ****		REPORT MINIMUM	******	REPORT MAXIMUM	SU		DAILY	GRAB
PH	SAMPLE MEASUREMENT	******	******		6.13	******	6.73	(12)	0	01/01	GR
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	****** **** ****		6.0 MINIMUM	******	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	******	******		******	186	******	(19)	0	02/30	24
00530 G 0 0 RAW SEW/INFLUENT	PERMIT REQUIREMENT	******	****** **** ****		******	REPORT 30DA AVG	******	MG/L		TWICE/MONTH	COMP-6

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE		
ROBERT A MOORE TOWN SUPERVISOR	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	R O A Moore	315 369-3121	05	3	16
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE / NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

This is a 4 part form — PAGE — OF

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)
NAME OLD FORGE SEWER DISTRICT
ADDRESS OLD FORGE SD WWTP
PULLMAN AVENUE
OLD FORGE NY 13420
FACILITY OLD FORGE SD WWTP
LOCATION OLD FORGE NY 13420
ATTN: ROBERT A MOORE, SUPERVISOR

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

NY0021351 PERMIT NUMBER
001 A DISCHARGE NUMBER

MONITORING PERIOD
FROM YEAR 05 MO 02 DAY 01 TO YEAR 05 MO 02 DAY 28

OMB No. 2040-0004

Combined Sewer Overflow

MAR 18 2005

MINOR
(SUBR 06)
F - FINAL
WWTP OUTFALL

*** NO DISCHARGE [ ] ***
NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	<3	<4	(26)	******	<4	<4	(19)	0	02/30	24
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	112 30DA AVG	169 7 DA AVG	LBS/DY	******	30 30DA AVG	45 7 DA AVG	MG/L		TWICE/MONTH	COMP-6
SOLIDS, SETTLEABLE	SAMPLE MEASUREMENT	******	******		******	******	28	(25)	0	01/01	GR
00545 G 0 0 RAW SEW/INFLUENT	PERMIT REQUIREMENT	******	****** **** ****		******	******	REPORT DAILY MX	ML/L		DAILY	GRAB
SOLIDS, SETTLEABLE	SAMPLE MEASUREMENT	******	******		******	******	<0.1	(25)	0	01/01	GR
00545 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	****** **** ****		******	******	0.3 DAILY MX	ML/L		DAILY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	0.095	******	(03)	******	******	******		0	99/99	RC
50050 G 0 0 RAW SEW/INFLUENT	PERMIT REQUIREMENT	0.45 30DA ARI	******	MGD	******	******	******	**** ****		CONTINUOUS	RECORDR
BOD, 5-DAY PERCENT REMOVAL	SAMPLE MEASUREMENT	******	******		97	******	******	(23)	0	02/30	CA
81010 K 0 0 PERCENT REMOVAL	PERMIT REQUIREMENT	******	****** **** ****		85 MO AVG	******	******	PER-CENT		TWICE/MONTH	CALCTD
SOLIDS, SUSPENDED PERCENT REMOVAL	SAMPLE MEASUREMENT	******	******		98	******	******	(23)	0	02/30	CA
81011 K 0 0 PERCENT REMOVAL	PERMIT REQUIREMENT	******	****** **** ****		85 MO AVG	******	******	PER-CENT		TWICE/MONTH	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE		
ROBERT A MOORE TOWN SUPERVISOR TYPED OR PRINTED	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE 315 NUMBER 369-3121	YEAR 05	MO 3	DAY 16

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

EPA Form 3320-1 (Rev. 3/99) Previous editions may be used.

01705/050218-1995 This is a 1-part form.

PAGE 2 OF 2

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
NAME CLD FORGE SEWER DISTRICT
ADDRESS CLD FORGE SD WWTP
PULLMAN AVENUE
CLD FORGE NY 13420
FACILITY CLD FORGE SD WWTP
LOCATION CLD FORGE NY 13420
ATTN: ROBERT A MOORE, SUPERVISOR

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

NY0021351 — PERMIT NUMBER
002 A — DISCHARGE NUMBER

MONITORING PERIOD
FROM YEAR 05 MO 02 DAY 01 TO YEAR 05 MO 02 DAY 28

MINOR
(SUBR 06)
F - FINAL
CONTROLLED DIVERSION STRUCTURE

*** NO DISCHARGE |X| ***
NOTE: Read instructions before completing this form.

OMB No. 2040-0004

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
FLOW RATE	SAMPLE MEASUREMENT	******	NODI 9	(07)	******	******	******		0	99/99	RC
00056 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	******	REPORT DAILY MX	GPD	******	******	******	**** ****		CONTINUOUS	CONTIN
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
ROBERT A MOORE
TOWN SUPERVISOR
TYPED OR PRINTED

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

R A Moore
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 315 NUMBER 369-3121
DATE: YEAR 05 MO 3 DAY 16

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

EPA Form 3320-1 (Rev. 3/99) Previous editions may be used.

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This handbook is designed to be a reference tool for local officials, public administrators and managers. In addition to the basic treatment operations, this handbook will discuss the strategies to ensure compliance, funding, adequate training, and public education. This reference will also help public officials familiarize themselves with financial management tools, loan and grant assistance, as well as learn about capital improvement planning to enhance long-term economic viability.