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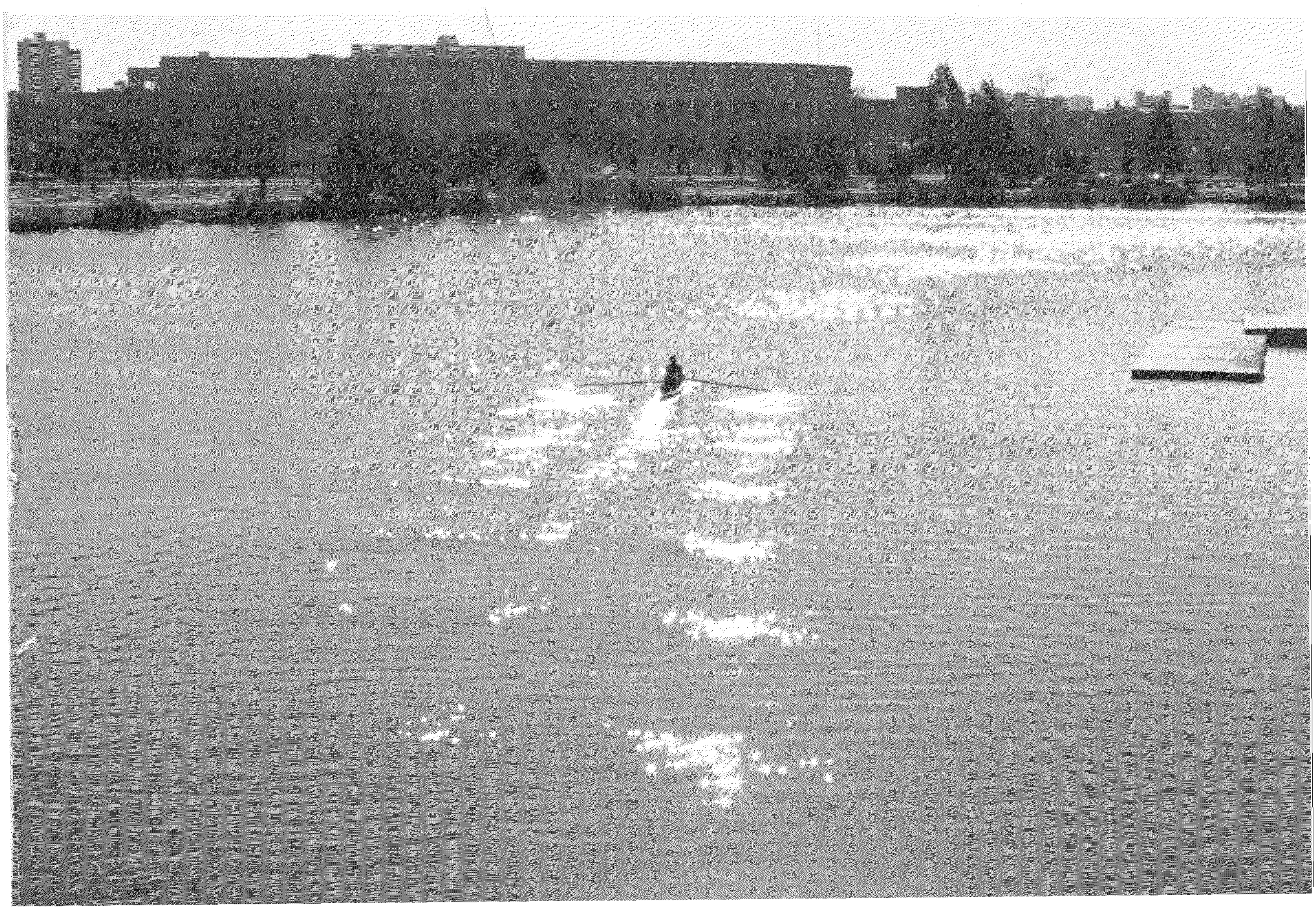
Environmental Regulations and Technology

The National Pretreatment Program



EPA/625/10-86/005

Environmental Regulations and Technology

The National Pretreatment Program

July 1986

Office of Water Enforcement and Permits
Office of Water
U.S. Environmental Protection Agency
Washington, DC 20460

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This guidance was published by
U.S. Environmental Protection Agency
Center for Environmental Research Information
Office of Research Program Management
Office of Research and Development
Cincinnati OH 45268

Contents

1. Introduction: What Is Pretreatment?

Beneath the streets of every city and many smaller communities. a system of sewers and pumps conveys wastewater away from homes, factories, offices, and stores. This disposed water, which may contain a variety of domestic, commercial, and industrial wastes, flows through the sewers to a wastewater treatment plant. There, pollutants are removed and the cleansed water is discharged into an adjacent water body, such as a river, bay. lake, or ocean. The residues of the treatment process (sludges) are either used productively as a soil conditioner or disposed of as a solid waste.

Industrlal plants are only one of many sources of wastewater discharged into municipal sewers. But the wastewater discharged by industry is often contaminated by a variety of toxic or otherwise harmful substances not common to other sources- the by-products of industrial processes such as cyanide from electroplating shops and lead from the manufacture of batteries. These wastes can pose serious hazards. Because sewage collection and treatment systems have not been designed to treat them, industrial wastes can damage the sewers and interfere with the operation of treatment plants;

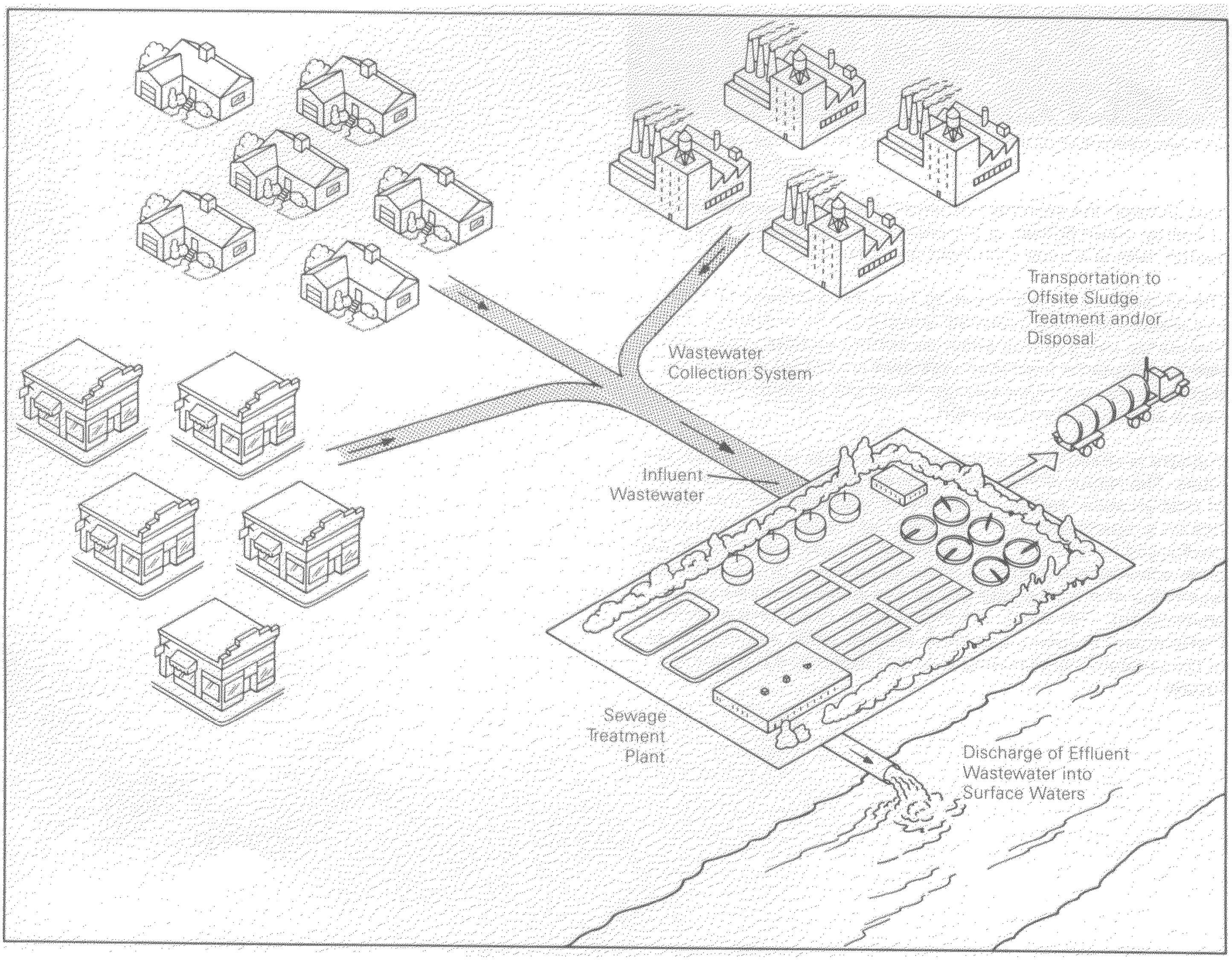
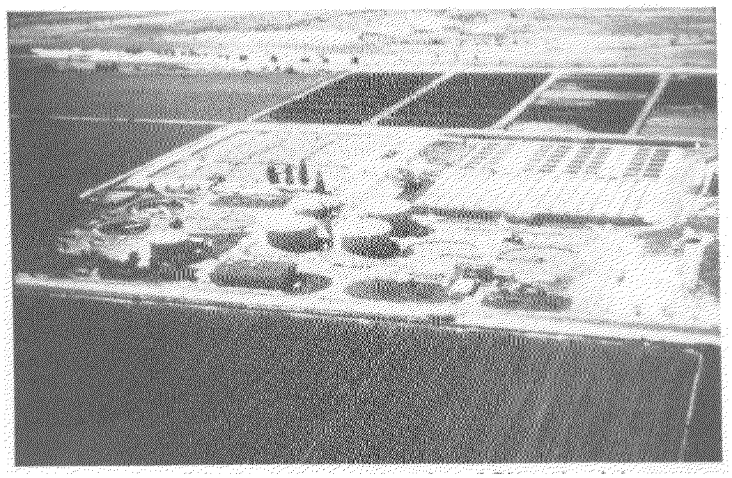


Figure 1. Wastewater Collection and Treatment. Industry, households and commercial establishments discharge wastewater into a system of drains, pipes, and pumping stations (a sewage collection system) that channel the flow to the sewage treatment plant. At the plant, the wastewaters are treated and discharged into surface waters. Solids removed from the wastewater during treatment are either disposed of or used productively.



Sewage Treatment plant serving the city of Phoenix, Arizona.

pass through the systems untreated. resulting in contamination of nearby water bodies and Increase the cost and environmental risks of sludge treatment and disposal.

The undesirable effects resulting from the discharge of industrial wastewater into municipal sewers can be prevented. Industrial plants using proven pollution control technologies, can remove pollutants from their wastewaters ***before*** discharging them Into the municipal sewage treatment system. This practice IS known as "pretreatment."

Industry IS already pretreating its wastewater in many communities. The National Pretreatment Program, a cooperative effort of federal, state, and local officials, is implementing this practice on a nationwide basis. By reducing the level of pollutants discharged by Industry into municipal sewage systems, the pro gram ensures that industrial development vital to the economic well being of a community will be compatible with a healthy environment. This document explains the need for the National Pretreatment Program; describes federal, state, and local roles in the program's implementation; and explores the program's future.

2. The Need for Pretreatment

Problems of Industrial Discharges into Sewage Systems

Pretreatment programs are implemented by the municipal authorities operating the sewage collection systems and sewage treatment plants, commonly referred to as publicly-owned treatment works or POTWs. These programs are needed to eliminate several serious problems that can occur when industrial wastewaters are discharged into sewage systems (Figure 2):

- Toxic industrial pollutants may pass through the treatment plant, polluting a receiving water body and posing a threat to aquatic life, and, through the food chain, to human health.
- Toxic industrial wastes may interfere with the operation of the treatment plant, rendering treatment of other wastes less effective.
- Industrial wastes containing high levels of toxic metal or organic compounds can contaminate sludge, making disposal options more expensive and more limited.
- Industrial wastewater can corrode the pipes and equipment in the sewage collection system and the treatment plant.
- Highly volatile wastes can explode, causing considerable damage.
- Some wastes may interact to produce toxic gases which pose health hazards to workers in the sewers and the treatment plant.

Figure 2. Problems that May Occur When Industrial Wastewaters are Discharged into Sewage Treatment Systems. All these problems can be controlled through pretreatment.

As the following discussions illustrate. a number of communities have already experienced dramatic improvements in environmental quality by aggressively implementing pretreatment programs.

"Pass-Through" of Toxic Pollutants

Sewage treatment facilities generally are not designed to remove toxic industrial pollutants (Figure 3) and these contaminants may therefore pass partially treated into the receiving waters. This phenomenon, commonly referred to as "pass through," is a major source of pollution and a national environmental problem. Toxic industrial compounds can cause fish kills, increase the risk of cancer in humans, and bring about a variety of other health and environmental effects. In addition, they may render receiving waters unsuitable for recreation and for use as water supplies.

An estimated 37 percent of the toxic industrial compounds entering the surface waters of the United States do so by passing through sewage treatment facilities unaltered (Figure 4). These compounds may contain either heavy metals or toxic organic substances. The U.S. Environmental Protection Agency (EPA) estimates that 56 million pounds (25 million kg) of toxic metal compounds are discharged annually by industry into municipal sewage systems, and an estimated 22 million pounds (10 million kg) of these metal compounds pass through unaffected by treatment. When toxic organic compounds are included. the total amount of toxic industrial compounds passing through sewage treatment systems unaffected approaches 100 million pounds 145 million kg) per year (1).

Pretreatment programs will dramatically reduce the quantity of toxic pollutants reaching surface waters. A recent EPA study estimated that full enforcement of the standards contained in the National Pretreatment Program would cut industrial dis-

Figure 3. Conventional and Toxic Pollutants

Conventional pollutants and *toxic pollutants* describe two broad categories of contaminants in wastewaters. Conventional pollutants are contained in the sanitary wastes of households, commercial establishments, and industry, and include sand, leaves, bits of trash, ground up food from sink disposals, laundry and bath waters, and human wastes. If these pollutants were discharged directly to surface waters, the waters would rapidly become open odiferous cesspools, spreading disease and destroying aquatic life. Most POTWs have, therefore, been designed to remove conventional pollutants. The Clean Water Act defines five broad categories of conventional pollutants:

1. *Biochemical Oxygen Demand (BOD)* - This pollutant category measures the tendency of wastewaters to use oxygen in the receiving waters (i.e., the surface water bodies into which the wastewaters are discharged). Oxygen is consumed when organisms in the receiving waters metabolize the organic material in the wastewater. If loo much oxygen is consumed, fish or other aquatic life in the receiving waters might be endangered. Thus, POTW treatment systems are designed to reduce the BOD of the wastewater.
2. *Suspended Solids*- This parameter is a measure of the concentration of solid particles that are suspended in the wastewater.
3. *Fecal Coliform* - Fecal coliform bacteria are found in the digestive tract of humans and animals. Their presence in water indicates the potential presence of harmful organisms that can thrive in the human digestive system, such as dysentery protozoa, typhus bacteria, and other pathogenic (i.e., disease-causing) microorganisms. Fecal coliform bacteria are used as a measure of health risk since they are more easily detected than the pathogens.
4. pH - pH is a measure of the acidicity or alkalinity of wastewater. pH is measured on a scale of 1 to 14, 1 being extremely acidic, 7 neutral, and 14 extremely alkaline. Most healthy surface waters have a nearly neutral pH; i.e., they are neither strongly acidic nor alkaline. Many aquatic species will not thrive or may die if the pH of their habitat changes even slightly. Thus it iS important to neutralize wastewater prior to discharge.
5. *Oil and Grease* - These pollutants interfere with POTW treatment processes, impair the use of sludge as a soil conditioner, and degrade receiving water quality when present in excessive amounts.

Toxic pollutants are those pollutants that are harmful to one or more forms of animal or plant life. They are primarily grouped into organics and metals.

1. *Organic Pollutants* - These pollutants include pesticides, solvents, PCBs, and dloxins. Some of these compounds are lethal to animal life in the range of 1 part contaminant to 1 million parts water.
2. *Metals* - The metals of concern are known as the "heavy" metals and include lead, silver, mercury, copper, chromium, zinc, and cadmium. Most heavy metals are not immediately lethal; however, they can accumulate in vital organs of animals, including humans, causing health problems. Asbestos and cyanide are two other non-organic toxic pollutants frequently found in industrial wastewater.

Removal of toxic pollutants by industrial pretreatment is critical, since most POTW treatment processes were not designed to control these pollutants, and since toxic pollutants may destroy the bacteria that are necessary for wastewater treatment.

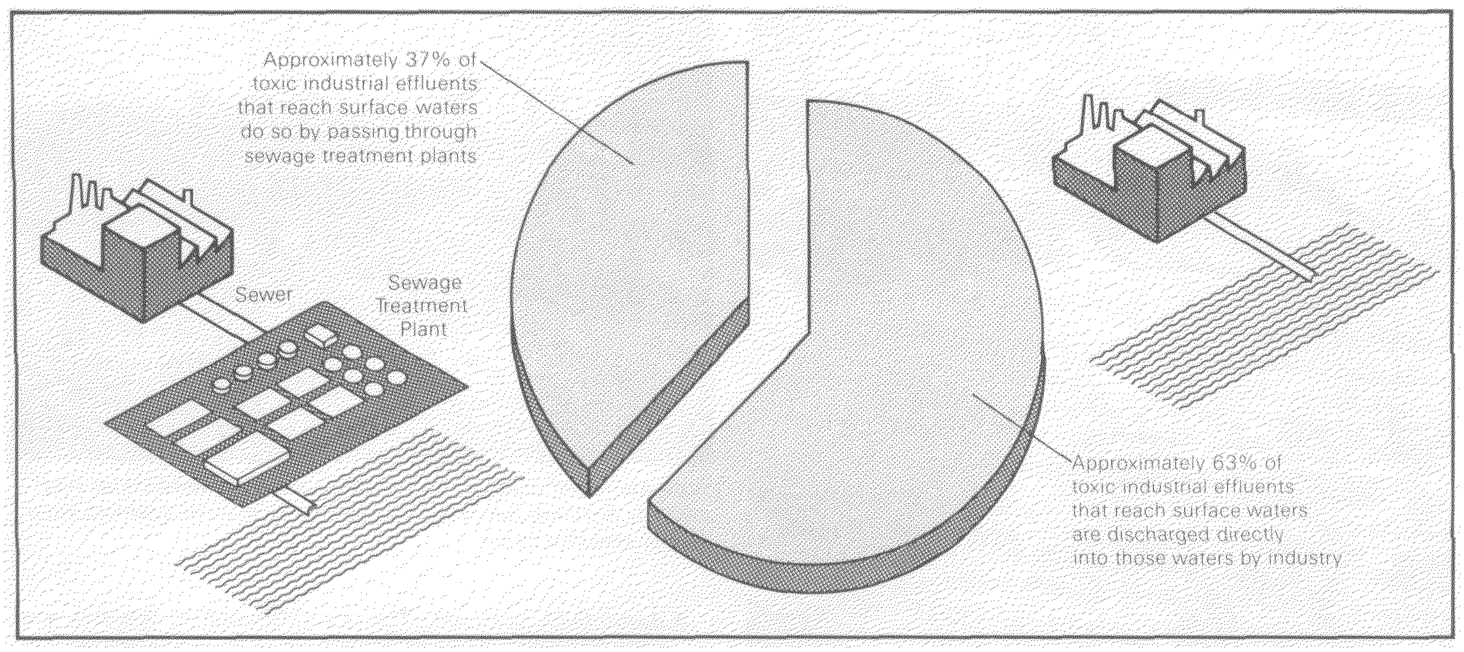


Figure 4. How Toxic Industrial Effluents Reach Surface Waters.

charges of toxic metal compounds into sewage systems by 84 percent from 56 million to 9 million pounds (4 million kilo grams) per year (2). This would reduce the annual quantity of metals passing through the nation's sewage treatment plants from 22 million to 4 million pounds (10 to 2 million kilograms) a year.

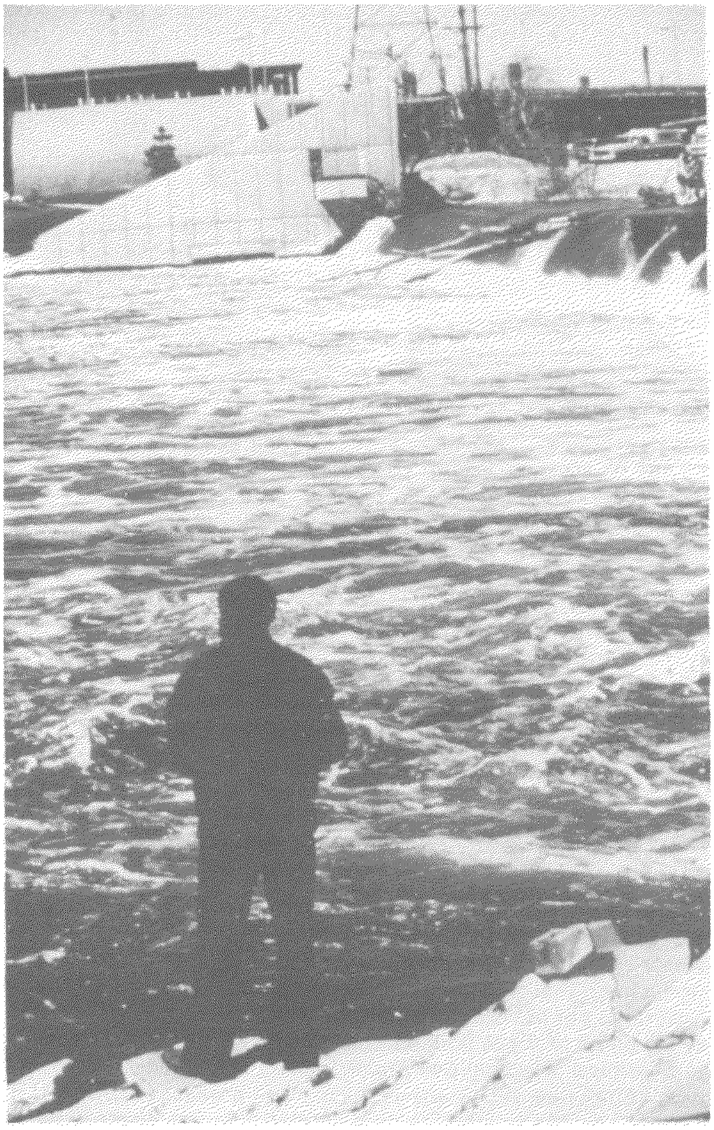
Pretreatment has already produced significant improvements in environmental quality in a number of communities.

- *Grand Rapids, Michigan* The Grand Rapids POTW discharges treated wastewater into the Grand River. The area had experienced fish kills due to cyanide and heavy metals in the wastewater in the early 1960s. Controls on industrial discharges of cyanide and metals into the municipal sewer system were instituted in 1969, and ten years later concentrations of heavy metals had dropped approximately 87 percent in both incoming and treated wastewater. Trout and salmon had returned to the Grand River by 1974 (3).
- *Rockford, Illinois* In 1974, Rockford instituted a pretreatment program limiting the discharge of cyanide and metals into its sewer system. In 1976, the city also implemented a program limiting discharges of other pollutants into the sewer system and instituted a system of water usage fees designed to encourage industrial water conservation. It also imposed further pretreatment requirements in 1982 in conjunction with its implementation of the National Pretreatment Program. As a result of these programs, cadmium, chromium, and zinc levels in treated wastewater from the POTW decreased by more than 85 percent from 1973 to 1983. Toxic metal concentrations in the nearby Rock River declined by almost 50 percent (4).

Interference with POTW Operations

A second problem is that toxic industrial compounds can interfere with POTW operations. Municipal wastewater treatment systems (Figure 5) are designed to treat typical household wastes and biodegradable commercial and industrial wastes. Some industrial discharges, however, contain a variety of toxic pollutants not envisioned when the system was designed. While some of these pollutants pass through the treatment system without affecting operations, others may directly interfere with POTW operations, particularly those processes that employ bacteria to stabilize organic matter in the wastewater.

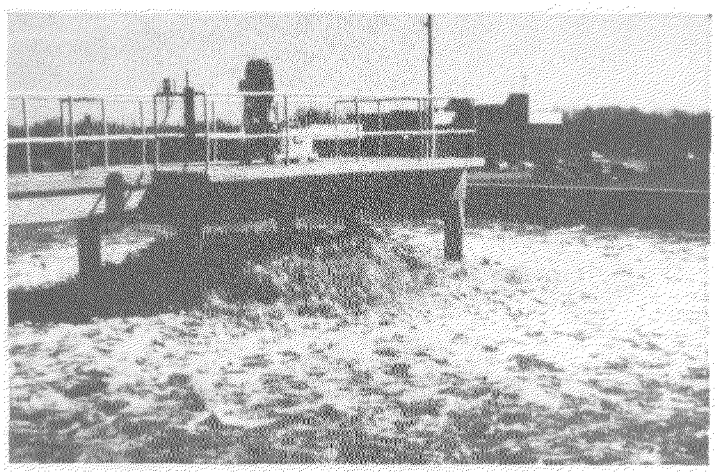
The toxic effects of metals on bacteria can interfere with both primary and secondary treatment systems. In *primary treatment* of wastewater, solids usually are removed by sedimentation. These solids are referred to as primary sludge. Primary sludge is often treated in digesters that utilize bacteria under anaerobic conditions to render the sludge acceptable for disposal. Toxic metal compounds, particularly those containing chromium, can destroy these bacteria or inhibit their reproduction, thereby disrupting the sludge treatment process and producing sludges that cannot be disposed of without special treatment.



A fish ladder on the Grand River in Michigan. Fish returned to this river following implementation of an effective pretreatment program.

Bacteria are also used in *secondary treatment* of wastewater to remove non toxic organic wastes. If toxic pollutants adversely affect the bacteria at this stage, the secondary treatment system will not remove pathogenic organisms or much of the *remaining organic material*. Failure of the secondary treatment system can result in the discharge of partially treated wastewater into surface waters, resulting in sludge deposits and a reduced oxygen level in these water bodies.

Pretreatment programs have helped a number of communities increase the effectiveness of their sewage treatment systems.



Toxic industrial discharges can interfere with wastewater treatment by harming bacteria in biological treatment systems such as this aeration basin.

- *Broomfield, Colorado.* The city of Broomfield operates one sewage treatment plant serving 25,000 people. Before 1982, when the city instituted a pretreatment program, toxic metal compounds from industries in the area had interfered with the city's treatment system on many occasions, causing as many as ten violations of the city's water quality permit in a single year. Since implementing its pretreatment program, Broomfield has had only one violation each year. City officials attribute this dramatic improvement to the reduction in the quantity of toxic metal compounds in the wastewater discharged by local industries (5).

Sludge Contamination

While some toxic materials pass through the treatment plant unaffected, others are removed and remain in the municipal wastewater sludge. The contamination of sludge by high levels of toxic metal compounds or toxic organic compounds from industrial users may preclude some use or disposal methods. If the sludge is destined for a landfill, these pollutants may leach out and contaminate adjacent surface and ground waters. When incineration is used, toxic pollutants may be released to the atmosphere. Uncontaminated sludges or products derived from them (such as compost) may be applied to agricultural land as a fertilizer or a soil conditioner. Such beneficial use eliminates the need for disposal of the sludge as a "waste." However, contaminated sludges are generally not suitable for such beneficial use, as the crops or pasture grasses produced may not be safe for human or animal consumption. Through pretreatment many of these problems can be avoided.

- *Milwaukee, Wisconsin.* The Milwaukee Metropolitan Sewerage District (MMSD) sells its sludge as a product called Milorganite, which is used as a soil conditioner and fertilizer. In 1979, MMSD noted an excessive level of cad

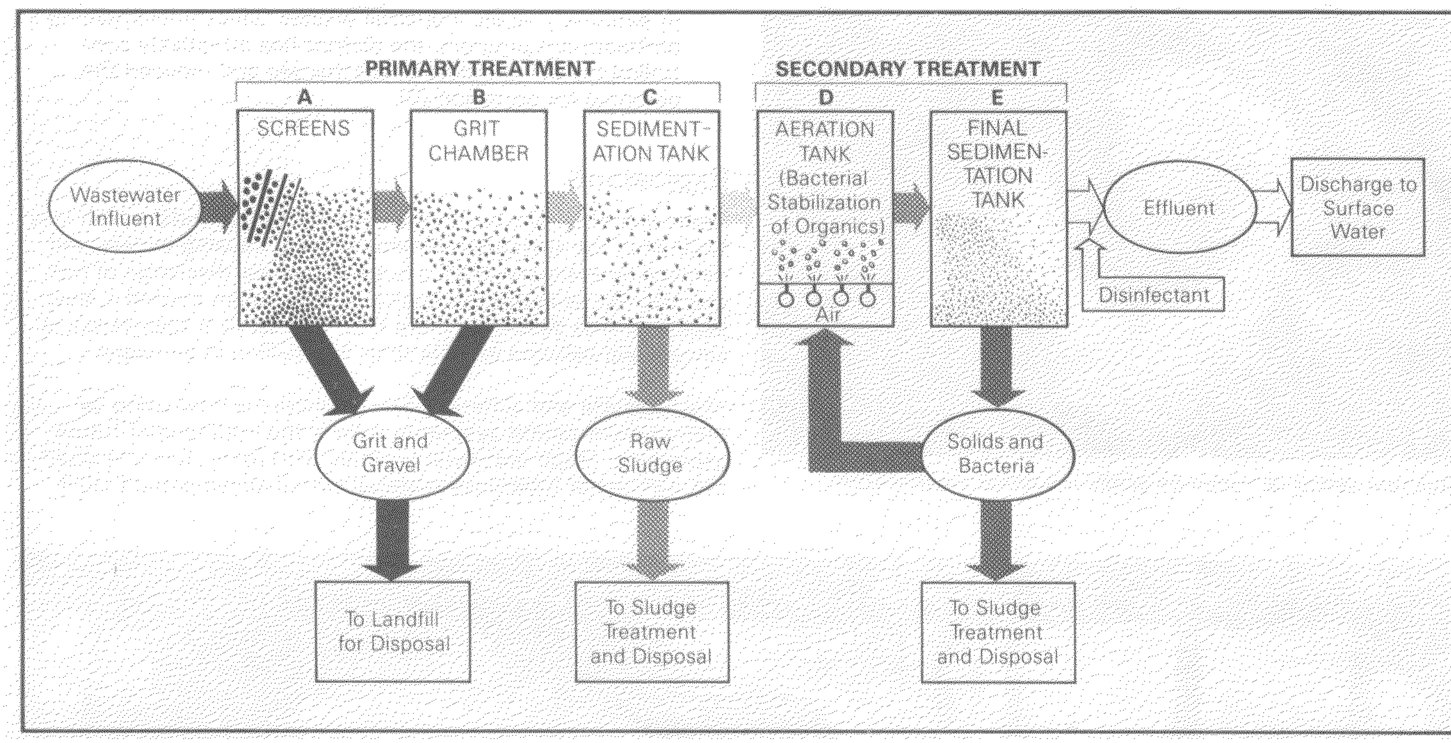


Figure 5. The Wastewater Treatment System at a POTW. On entering the sewage treatment plant, the wastewater is first passed through a series of coarse screens (A) to remove leaves, rocks, sticks, and other large pieces of trash. The sewage then flows into a grit chamber (B) and a sedimentation tank (C) where sand and suspended particles settle out. The remaining wastewater still contains a high percentage of organic material, most of which is in soluble form. To remove this material, the wastewater is treated in a large tank into which air is continually added and mixed (D). Here, aerobic bacteria remove much of the remaining organic matter in the wastewater. After sedimentation (E), the wastewater is disinfected to destroy any remaining pathogenic bacteria, and then discharged to surface waters.

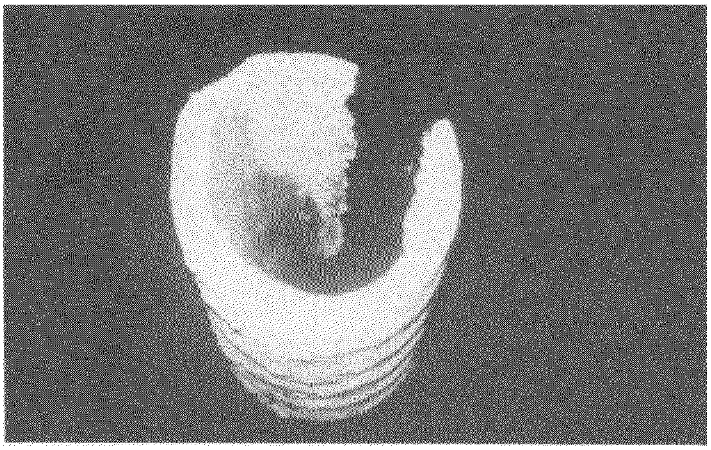
mium in its sludge, which threatened the continued marketing and use of Milorganite. The district adopted an ordinance for the control of cadmium in 1980. From 1980 to 1984, cadmium levels in incoming wastewater declined by 69 percent. The MMSD has recently instituted additional controls on other toxic metal compounds. All these measures will ensure the continued marketing and use of Milorganite (6).

- *Hampton Roads Sanitation District, Virginia* In the early 1970s, sewage sludge from the Hampton Roads Sanitation District showed a high level of certain metals as a result of industrial discharges. The district began its pretreatment program in 1972. By 1985, sludge quality from eight of nine treatment plants had improved sufficiently to allow land application (7).

Corrosion

Highly acidic industrial wastes can corrode piping and equipment in both the sewage collection system and the sewage treatment plant, causing disruptions in service and leakage of raw sewage, and the necessity for replacing sewer lines and pumping stations in the system. Municipal pretreatment programs place restrictions on the pH of industrial discharges, greatly reducing the potential for corrosion.

- *Washington Suburban Sanitary Commission (WSSC)* The WSSC, which has six treatment plants serving Prince Georges and Montgomery Counties, Maryland, has experienced numerous corrosion problems due to highly acidic industrial discharges. Several thousand feet of sewer line have had to be replaced or repaired. The WSSC developed extensive pretreatment requirements in 1972 and received federal approval of its program in 1983. The pretreatment program has enabled the WSSC to identify and control the sources of its corrosion problems (8).
- *Melbourne, Florida* The Municipal Sewer District of the city of Melbourne, Florida, operates three sewage treatment plants that process a total of approximately 6 million gallons (23 million liters) of wastewater per day. The city has experienced corrosion problems in its sewers. At one location a pumping station was destroyed by the discharge



Concrete sewer corroded by acidic industrial wastewaters.

of extremely acidic industrial wastes. Since implementing a pretreatment program, the district has effectively controlled the pH of industrial discharges and reduced the potential for corrosion (9).

Explosions

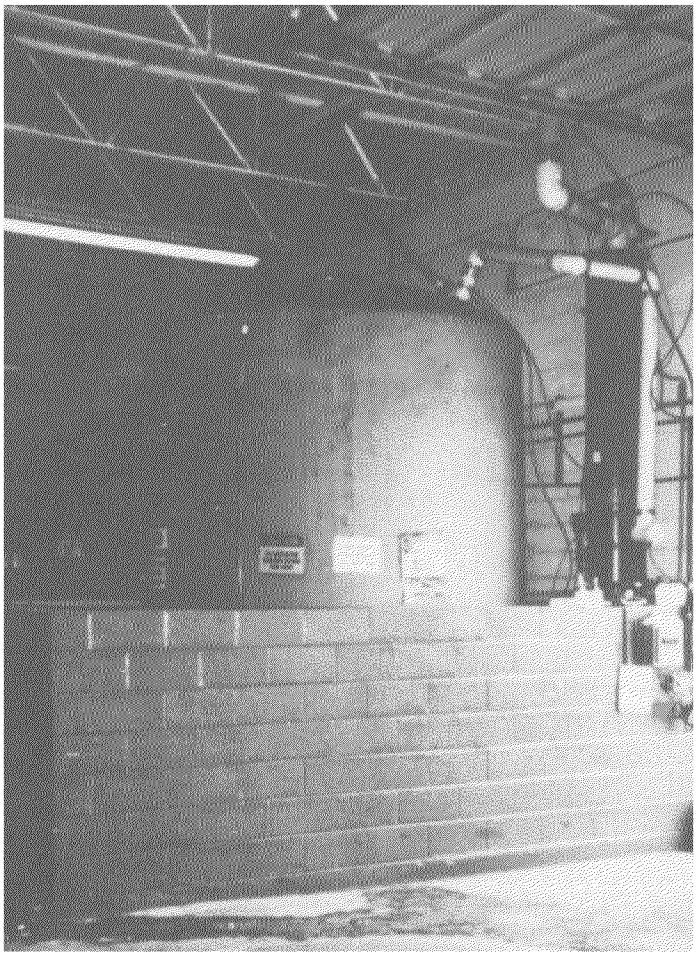
Some industrial wastes contain volatile compounds, which may explode in the sewage treatment system, causing widespread damage. In February 1981, a large accidental discharge of hexane into the Louisville, Kentucky, sewer system caused a major explosion that destroyed more than 3 miles (4.8 kilometers) of sewers and resulted in more than $20 million in damages.

The Louisville and Jefferson Sewer District is now using its pretreatment permit system to reduce the likelihood of future explosions. Major industrial facilities with more than one drum (55 gallons) of hazardous material stored above ground must

An explosion in the Louisville sewers resulted in over $20 million in damages.

develop a plan to deal with accidental spills as a condition of sewer use. The plan must include security procedures, training of employees, a contingency plan for emergencies, administrative procedures, and a spill history for the facility. Of the 130 major industrial facilities that use the system, 100 have been required to submit spill plans. All plans must be approved by a professional engineer.

As a further precaution, the sewer district has expanded its sampling and monitoring procedures. Each day 30 locations throughout the collection system are monitored for explosive hazards and pH. Sewage samples are also collected regularly.



A wall around an industrial storage container provides an effective control measure that prevents any accidentally spilled materials from entering the sewer.

Worker Hazards

The discharge of industrial wastes into sewers can also result in the release of poisonous gases. This typically occurs when highly acidic wastes combine with other wastes in the collection system. For example, wastes from electroplating often contain traces of cyanide. If the sewage is acidic, a reaction resulting in the formation of highly toxic hydrogen cyanide gas may occur. Similarly, sulfides from leather tanning, in combination with acidic sewage, can generate poisonous hydrogen sulfide gas.

Poisonous gas in the sewers is a serious health and safety hazard, particularly for municipal workers. By controlling both the pH of industrial discharges and the discharge of toxic substances such as cyanide, pretreatment programs greatly reduce such hazards.

- *Chicago, Illinois.* In the early 1970s, highly acidic wastes in the Chicago sewer system combined with sulfides discharged by leather tanneries to form hydrogen sulfide gas. The gas caused nausea and dizziness among POTW workers and there was a risk of fatal exposures. The Metropolitan Sanitary District of Greater Chicago implemented both sulfide and pH controls to stop the formation of hydrogen sulfide and other poisonous gases (10).
- *New York, New York.* The New York City Department of Environmental Protection operates 12 treatment plants serving all the boroughs of New York City. At one plant a worker was overcome by fumes emanating from solvents discharged by a nearby industrial laundry. City officials determined that these hazardous pollutants came from rags saturated with industrial solvents. The officials prohibited the facility from laundering rags contaminated by solvents, and thereby eliminated the hazard (11).

3. Overview of the National Treatment Program

Restrictions on the pollutant content of wastewaters discharged by industry into municipal sewage systems have existed in some localities for many years. The Milwaukee Metropolitan Sewerage District, for example. has regulated pH, oil and grease, and temperature levels in industrial wastewaters since the 1920s (Figure 6). Such regulations are the predecessors of modern pretreatment programs, which include both national standards and local programs to control industrial pollutants.

National Standards

The federal government's role in pretreatment began with the passage of the Clean Water Act in 1972. The Act called for the EPA to develop national pretreatment standards to control industrial discharges into sewage systems. The standards are uniform national requirements which restrict the level of certain pollutants in the sewage from industries. All POTWs must enforce the federal standards, The standards in effect today consist of two sets of rules: "categorical pretreatment standards" and "prohibited discharge standards."

Categorical pretreatment standards are organized by type of industry, and different requirements are mandated for each specific industry. For example, there is a categorical standard for the iron and steel industry which limits the concentration of ammonia, cyanide, and other specific toxic pollutants that may be present in the wastewater discharged into sewage systems by any firm in that industry.

Prohibited discharge standards prohibit any discharge to sewer systems of certain types of wastes from all sources. For example, the release of any wastewaters with a pH lower than 5.0 is forbidden, since such wastes may corrode the sewer system. chapter 4 of this document describes the prohibited discharge standards and the categorical pretreatment standards in detail.

Local Programs

The overall framework for the National Pretreatment Program is contained in the General Pretreatment Regulations that EPA published in 1978 and modified in 1981 (Figure 7). These regulations require all large POTWs - those designed to accommodate flows of more than 5 million gallons (19 million liters) per day - and smaller POTWs with significant industrial discharges to establish local pretreatment programs. Approximately 1,500 POTWs are participating in the National Pretreatment Program by developing local programs. The local programs, which are described in detail in Chapter 5, must enforce all national pretreatment standards. The local POTWs also may enforce more stringent discharge requirements (i.e., local limits) to prevent disruption of the sewage treatment system, adverse environmental impacts, or disruption of sludge use or disposal. Thus, the National Pretreatment Program consists of approximately 1,500 local programs designed to meet federal requirements and to accommodate unique local concerns.

RULES AND REGULATIONS

Applicable to the

MILWAUKEE METROPOLITAN SEWERAGE DISTRICT

ADOPTED NOVEMBER 30, 1923

REVISED and AMENDED JULY 11, 1935

ADOPTED BY THE

SEWERAGE COMMISSION

OF THE

CITY OF MILWAUKEE

ON JULY 11, 1935

and the

METROPOLITAN SEWERAGE COMMISSION

OF THE

COUNTY OF MILWAUKEE

ON JULY 18, 1935

EFFECTIVE AUGUST 1, 1935

MILWAUKEE, WISCONSIN

Figure 6. Early Milwaukee Pretreatment Regulations.

Delegation to Local Level

The decision to delegate enforcement authority for the pretreatment program to the local level was based on several factors. First, POTW officials are familiar with their industrial users. They usually know the location, wastewater flow, and pollutant loadings of the industries they serve. They may already have mechanisms to regulate their industrial clients, such as permits or contracts, These documents may contain agreements concerning both the nature and volume of industrial discharges and fees for the service. Thus, POTWs already have administrative mechanisms and client relationships in place on which to base enforcement of the pretreatment program.

Figure 7. The General Pretreatment Regulations

The General Pretreatment Regulations define the National Pretreatment Program. These regulations are published in Volume 40, Part 403 of the *Code of Federal Regulations* (40 CFR 403). This document is available in many libraries and government offices. The General Pretreatment Regulations contained in 40 CFR 403 are divided into 16 subparts 403.1 through 403.16.

403.1 *Purpose and Applicability*
403.2 *Objectives of General Pretreatment Regulations*
403.3 *Definitions*
403.4 *State or Local Law*
403.5 *National Pretreatment Standards: Prohibited Discharge*
403.6 *National Pretreatment Standards: Categorical Standards*
403.7 *Revision of Categorical Pretreatment Standards to Reflect POTW Removal of Pollutants*
403.8 *POTW Pretreatment Programs Development by POTW*
403.9 *POTW Pretreatment Programs and/or Authorization to Revise Pretreatrnent Standards: Submission for Approval*
403.10 *Development and Submission of NPDES State Pretreatment Programs*
403.11 *Approval Procedures for POTW Pretreatment Programs and POTW Revision of Categorical Pretreatment Standards*
403.12 *Reporting Requirements for POTWs and Industrial Users*
403.13 *Variances from Categorical Pretreatment Standards for Fundamentally Different Factors*
403.14 *Confidentiality*
403.15 *Net/Gross Calculation*
403.16 *Upset Provision*

As of July 1986, the EPA was in the process of revising certain definitions and other technical components of the regulations.

A second reason for delegating pretreatment authority to the local level is that the POTWs are in the best position to understand and to correct problems within their own treatment systems. Therefore, they can tailor discharge requirements in pretreatment permits to preclude inference with their particular treatment system. The POTW is also in the best position to understand other problems that must be considered in formulating pretreatment permits, such as the hazard of explosions or corrosion in the sewage system and the treatment plant.

Finally, the POTW is the logical level of government to respond to emergencies in the treatment system. The unexpected discharge of pollutants by an industrial user could result in the discharge of untreated wastes by the POTW itself, violating federal standards and presenting an environmental hazard. In many cases, the POTW can quickly pinpoint the cause of the problem and take corrective action.

Although a strong case can be made for POTW control of pretreatment programs, the states of Vermont, Connecticut, and Mississippi have elected to direct the program at the state level. Several other states, such as Nebraska and New Jersey, delegate authority to some POTWs but retain authority in other sewer districts. The reasons for this approach include the lack of funding, technical resources, or administrative structure at the POTW level or the preference by some states for centralized control of environmental programs. In most states, however, approved pretreatment programs are or will soon be implemented by POTWs.

Approval of Pretreatment Programs

Federal, state, and local government agencies are all involved in establishing pretreatment programs. In general, the federal government requires that states develop pretreatment programs; the states, in turn, review, approve, and oversee the programs of local POTWs. The specifics of pretreatment program development and approval, however, vary from state to state, depending on the status of the state's program to control direct discharges - the National Pollutant Discharge Elimination System (NPDES).

NPDES Programs

The National Pollutant Discharge Elimination System (NPDES) regulates the direct discharge of wastewaters to surface waters (Figure 8). Under this program, industrial facilities and POTWs must receive an NPDES permit before discharging wastewater directly to surface waters. The permits require compliance with all federal standards and may also require additional controls based on local conditions.

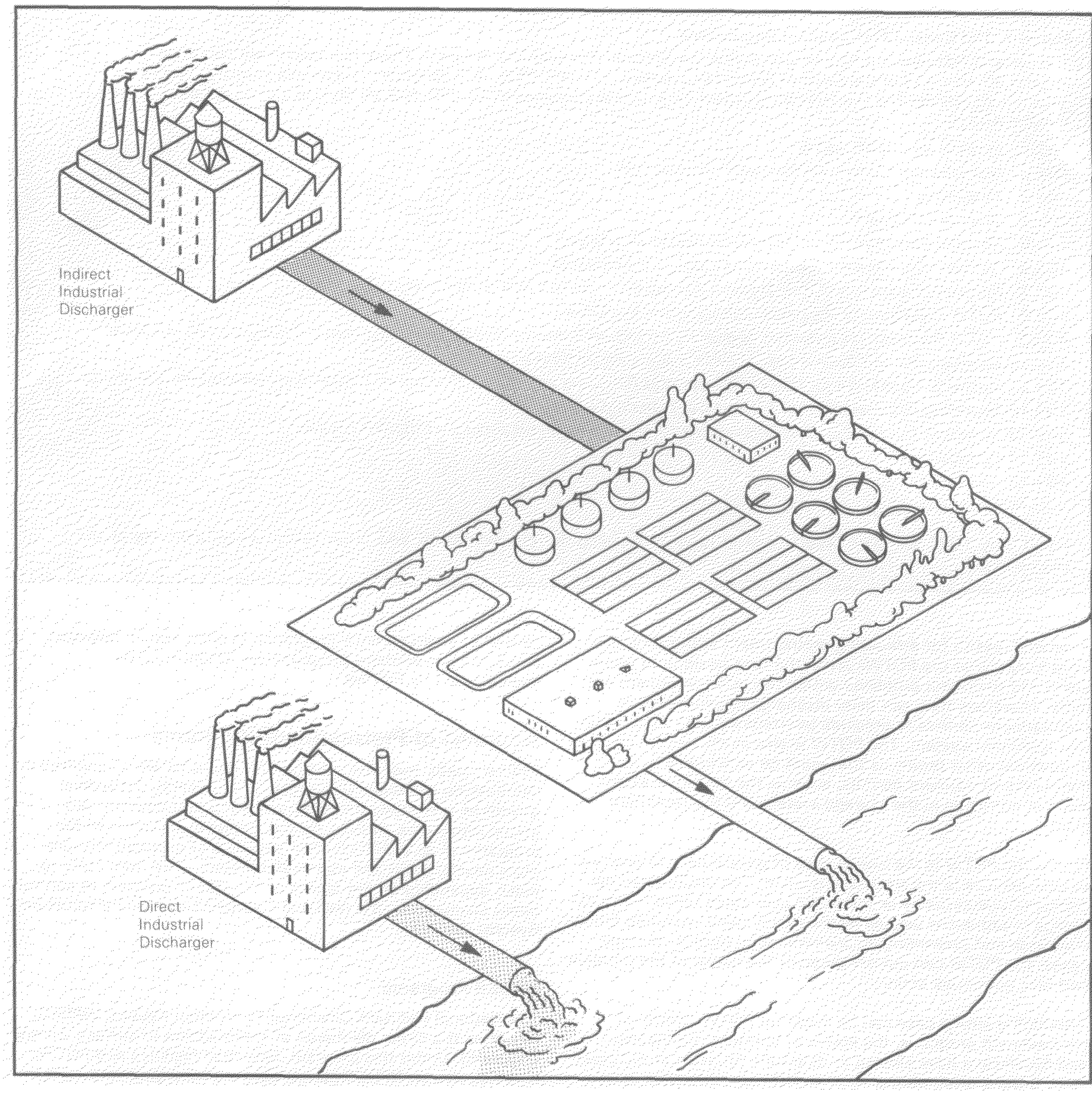


Figure 8. Direct and Indirect Industrial Dischargers. Industrial or municipal sewage treatment facilities that discharge their wastewaters directly into rivers, streams, lakes, bays, estuaries, and oceans are referred to as direct dischargers. Industrial facilities that discharge their wastewaters into a municipal sewer system are referred to as indirect dischargers; it is these indirect dischargers that the National Pretreatment Program aims to regulate.

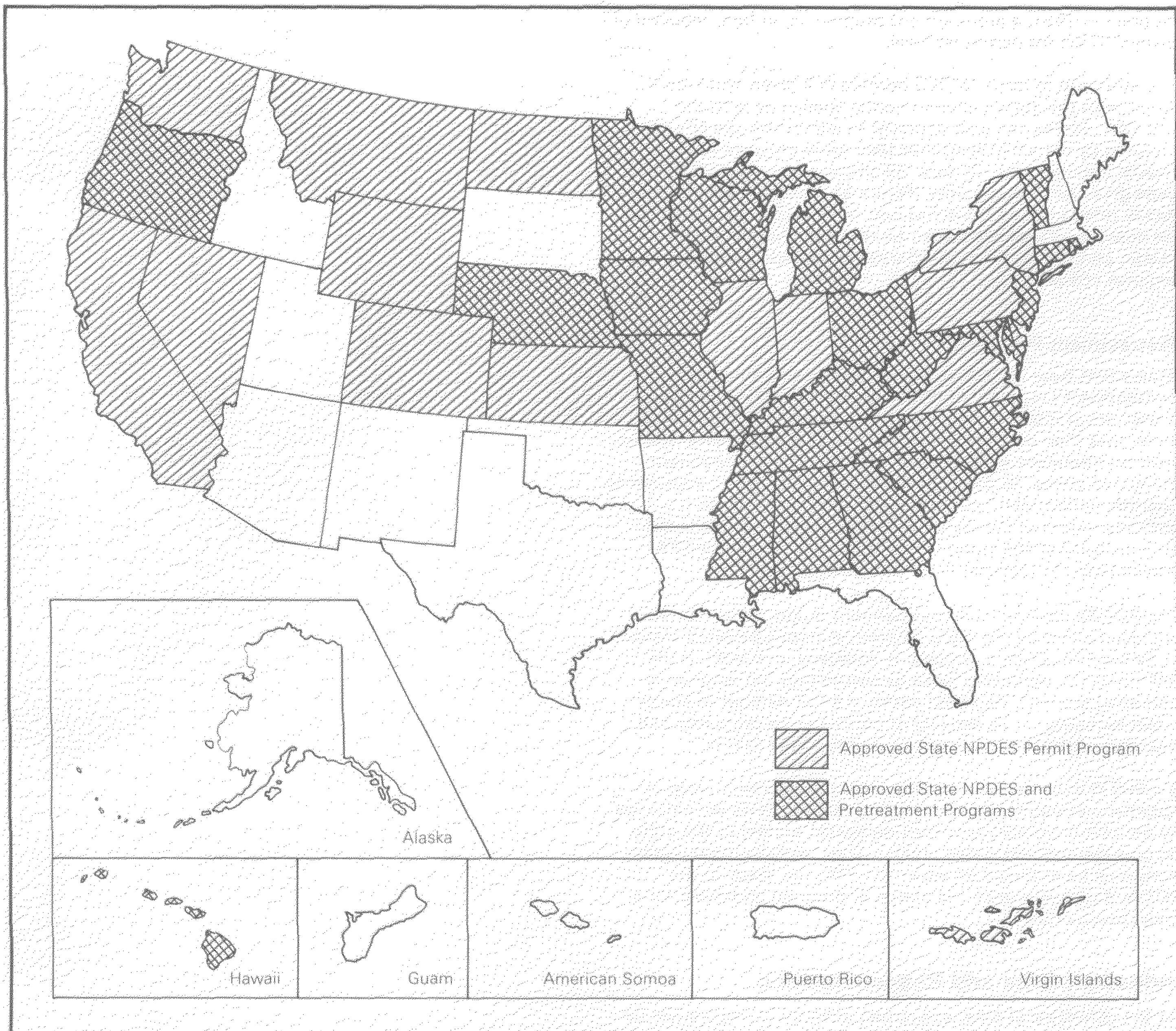


Figure 9. Status of State NPDES and Pretreatment Program Delegation (July 1986). Thirty-six states and one territory have approved NPDES programs. Twenty-two states have approved pretreatment programs.

Because POTWs are direct dischargers, they must obtain and comply with an NPDES permit. This permit limits the amount of pollutants the sewage treatment plant may discharge. If the concentration of pollutants is too high, or if its discharges endanger public health or the environment, it violates its permit and can be fined and/or forced to upgrade its operation.

A POTW may have trouble meeting its NPDES permit conditions if the concentration of toxics in the wastewater flowing into the treatment plant (the influent wastewater) is too high. One way to control the concentration of toxics in the influent wastewater is to require pretreatment. Thus, the conditions of a POTW's discharge permit might dictate the need for pretreatment. Since the implementation of the National Pretreatment

Program in 1981, a pretreatment program is, in fact, *required* of many POTWs for permit renewal.

The authority to issue NPDES permits in a given state rests either with the state's environmental agency or with the U.S. EPA. States can gain approval to administer the NPDES program by demonstrating that their state program meets all federal requirements. To date, 36 states and 1 territory have been given NPDES authority (Figure 9). These states are commonly referred to as NPDES states. In NPDES states, permits for direct discharge are issued by the state; in non-NPDES states, permits for direct discharge are issued by the EPA regional office.

Pretreatment Programs

States that have NPDES authority are required to develop pretreatment programs for EPA approval (40 CFR 403.10). States are granted pretreatment authority by the EPA if they show that their program meets all federal requirements. States with pretreatment authority are referred to as pretreatment-delegated states. To date, 22 states have been given approval to operate pretreatment programs (Figure 9). In these states, implementation of the National Pretreatment Program is the responsibility of the state; in the remaining states, the EPA implements the National Pretreatment Program.

The POTWs develop local pretreatment programs which are approved either by the state (in pretreatment-delegated states) or by the EPA. Once a program is approved, the state or the EPA conducts periodic checks to ensure that the program is operating properly. As noted above, a small number of states retain authority for all aspects of pretreatment programs and, therefore, do not delegate any authority to the POTW.

If a POTW does not have an approved pretreatment program, national pretreatment standards and requirements are enforced by the EPA (in nonpretreatment-delegated states) or the state (in pretreatment-delegated states). Thus, pretreatment regulations may be enforced by either the EPA, the state, or the POTW, depending upon the status of program approvals for a given community.

Industry's Role and Responsibilities

As the generator of toxic pollutants, industry is responsible for the removal of contaminants present in quantities that might cause problems in the collection system, the treatment plant, or the outside environment. Industry must finance, construct, and operate any pollution control equipment or facilities necessary to comply with pollutant discharge limits required under federal pretreatment regulations or local pollution control rules. Compliance by industry ensures that industrial toxic pollutants will not damage human health or the environment.

4. National Pretreatment Standards

The federal government has developed national regulations or "standards" that restrict the quantity of toxic Industrial pollutants discharged into sewage systems. Individual POTWs can impose limitations stricter than the national standards, but cannot allow less stringent levels of control except under certain special circumstances.

Rationale for National Standards

Although POTWs have the legal authority to develop discharge limitations for their industrial users, there are several reasons for having national standards. First, there are many long-term health and environmental impacts of industrial pollutants that are not Immediately apparent to local communities. Because of these potential long term Impacts, Congress required in the Clean Water Act that national effluent standards for Industrial facilities be established based on the best pollution control technology that can be economically achieved. It IS logical that the federal government (EPA) develops these technology based standards since it has access to the technical resources needed to assess the Industrial processes utilized by each Industry and to identify the best economically achievable pollution control technology.

A second reason for federal standards IS to ensure that all sewage districts control the toxic discharges of Industrial facilities to certain minimum levels. Without these standards, some POTWs would not Implement a pretreatment program which effectively controls toxic pollutants. In some communities, for example, there IS political pressure to relax pollution control requirements for facilities that provide a large number of local lobs. Federal standards ensure that all POTWs will provide a minimum level of control, thus making a contribution to the goal of reducing toxic pollution of the nation's waters.

Finally, national pretreatment standards assure a degree of equity within each Industry regarding expenses for pollution control. If pollution control requirements were established solely by POTWs. then two firms producing the same product in different sewage districts might be subject to widely different pollution limitations and costs. This could lead to an unfair competitive advantage for one of the firms. The national standards ensure that firms in the same Industry are subject to the same minimum requirements throughout the country.

The national pretreatment standards consist of two sets of rules, *prohibited discharge standards* and *categorical pretreat ment standards.*

Prohibited Discharge Standards

The national prohibited discharge standards forbid certain types of discharges by any sewage system user (40 CFR 403.5). The prohibited discharge standards apply to all sewage system users, regardless of whether or not they are covered by categorical pretreatment standards.

These standards have both general and specific prohibitions. The general prohibitions forbid pollutants to be discharged into the sewage system if they pass through the POTW untreated or if they interfere with POTW operations. The specific prohibitions outlaw the discharge of five categories of pollutants:

- Pollutants that create a fire hazard or explosion hazard in the collection system or treatment plant.
- Pollutants that are corrosive, including any discharge with a pH lower than 5.0, unless the POTW is specifically designed to handle such discharges.
- Solid or viscous pollutants in amounts that will obstruct the flow in the collection system and treatment plant, resulting in Interference with operations.
- Any pollutant discharged in quantities sufficient to Interfere with POTW operations.
- Discharges with temperatures above 104°F (40°C) when they reach the treatment plant, or hot enough to Interfere with biological treatment processes at the sewage treatment plant.

The POTWs must enforce these general and specific prohibitions as a condition for approval of their pretreatment programs. POTWs must establish limits on specific pollutants from certain facilities to ensure that the prohibited discharge standards are not violated. For example, if an industrial plant discharges a pollutant that could cause interference, the POTW would have to set limits on that pollutant in the plant's pretreatment permit.

Categorical Pretreatment Standards

Categorical pretreatment standards are pollution control regulations for specific Industries. The standards regulate the level of pollutants in the wastes discharged into the sewage system from an Industrial process (Figure 10). Each categorical standard covers one Industrial category. Within the Industrial category, separate pollution control requirements might be established for distinct Industrial processes or "subcategories" (Figure 11).

Categorical standards place restrictions on 126 toxic pollutants identified by EPA as having the greatest potential to harm human health or the environment (Table 1). The categorical standards may require that industrial facilities reduce their discharges of these toxic substances by 80 percent or more. Some of the categorical standards also regulate industrial discharges of certain *non-conventional* pollutants which are not included in the list of 126 toxic pollutants but which nevertheless present a threat to the aquatic environment or to human health. Categorical standards have been or are being developed for industrial categories that generate the bulk of toxic Industrial pollutants (Table 2).

Development of Categorical Standards

The Industrial Technology Division within the EPA Office of Water Regulations and Standards develops the federal categorical pretreatment standards. This is done in conjunction with the development of pollution control regulations for *direct dischargers.* The process begins with the collection of a

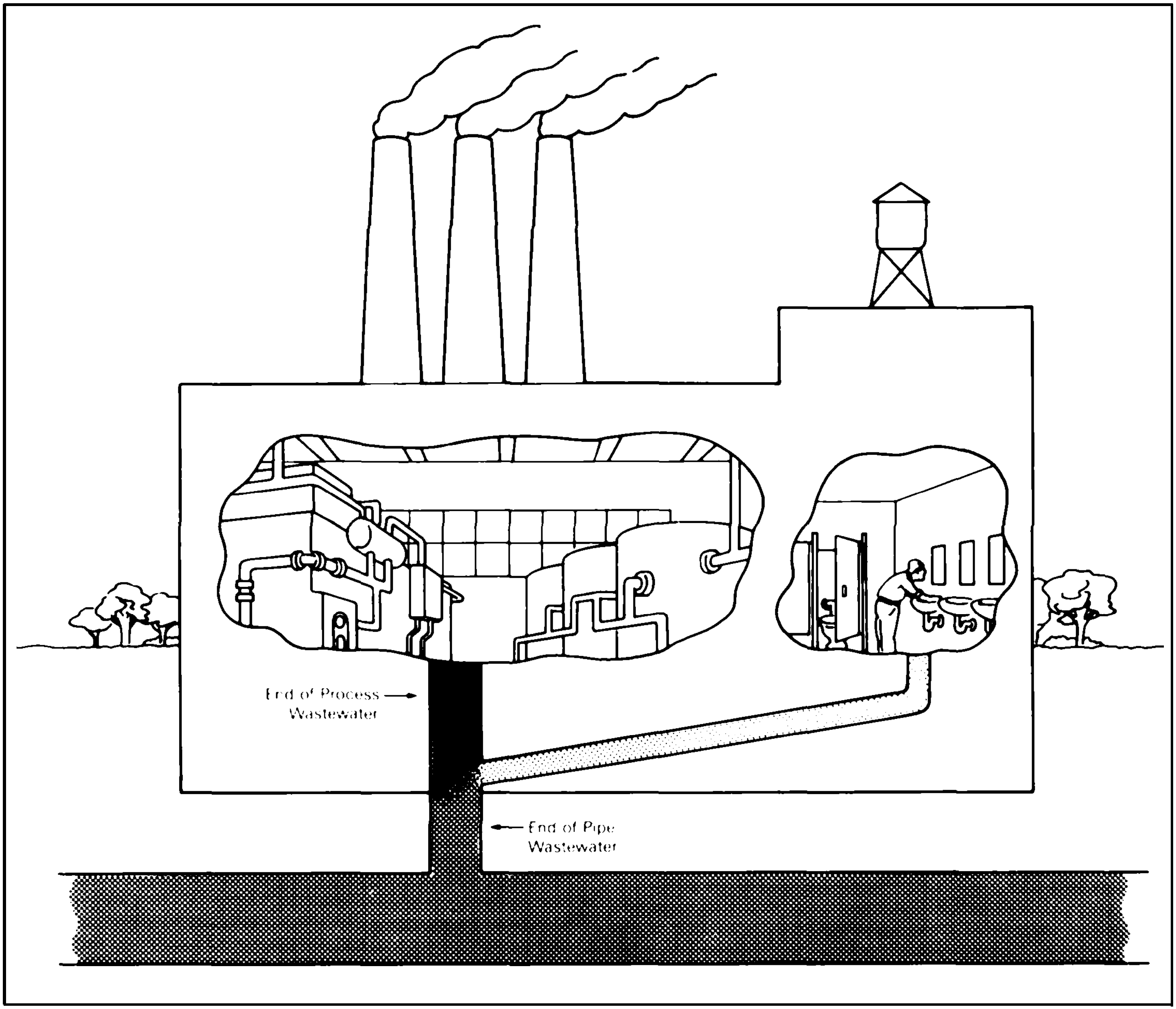


Figure 10. End-of-Process Versus End-of-Pipe Wastewaters. **A manufacturing facility covered by a categorical standard generates wastewater within the Industrial process, and may also generate other wastewaters (e.g., sanitary wastes from bathrooms and shower facilities). The categorical standard regulates the wastewater coming out of the industrial process (i.e., the *end-of-process* wastewater). In some cases, end-of-process wastewater combines with other wastewaters kg., sanitary wastes) prior to discharge into the sewer. Wastewater discharged into the sewer, which may consist of several types of wastewater from within the manufacturing facility, is referred to as *end-of-pipe* wastewater. Individual POTWs may monitor the wastewater at an end-of-process or an end-of-pipe location. If the POTW monitors at an end-of-pipe location, it must perform certain calculations to translate the end-of-process pollutant limitations in the standard into end-of-pipe requirements for the entire facility. A mathematical formula, termed the *combined* waste *stream formula,* has been developed for this purpose (40 CFR 403.6[e]).**

variety of process engineering and environmental data concerning the regulated industry. EPA reviews these data to determine the types and quantities of effluents generated by the industry.

The EPA next identifies the best available technology economically achieveable (BAT) to control the industry's effluents (Figure 12). BAT technology performance is then analyzed to determine how much of each pollutant the technology can remove from the effluent (the numerical pollution control limits). The EPA standard for direct dischargers is based on these limits. Although industrial discharges must meet EPA numerical pollution control limits, EPA does not require industries to use any specific treatment processes to comply with the standard.

Figure 11. Industrial Categories and Subcategories
An *industrial category*, sometimes referred to as an industry, is a broad classification of establishments involved in an industrial activity. For example, the battery manufacturing industrial category refers to establishments engaged in the manufacture of all types of storage batteries. Within an industrial category, EPA might define a number of *subcategories* to distinguish firms using different processes. In the battery manufacturing industry, for example, EPA has set pollutant discharge limitations for six separate subcategories.

Table 1. Toxic Pollutants Regulated Under Categorical Standards

1. acenaphthene
2. acrolein
3. acrylonitrile
4. benzene
5. benzidine
6. carbon tetrachloride
7. chlorobenzene
8. 1,2,4-trichlorobenzene
9. hexachlorobenzene
10. 1,2-dichloroethane
11. 1,1,1-trichloroethane
12. hexachloroethane
13. 1,1-dichloroethane
14. 1,1,2-trichloroethane
15. 1,1,2,2-tetrachloroethane
16. chloroethane
17. bis(2-chloroethyl) ether
18. 2-chloroethyl vinyl ether (mixed)
19. 2-chloronaphthalene
20. 2,4,6-trichlorophenol
21. parachlorometa cresol
22. chloroform (trichloromethane)
23. 2-chlorophenol
24. 1,2-dichlorobenzene
25. 1,3-dichlorobenzene
26. 1,4-dichlorobenzene
27. 3,3-dichlorobenzidine
28. 1,1-dichloroethylene
29. 1,2-trans-dichloroethylene
30. 2,4-dichlorophenol
31. 1,2-dichloropropane
32. 1,2-dichloropropylene
    (1,3-dichloropropene)
33. 2,4-dimethylphenol
34. 2,4-dinitrotoluene
35. 2,6-dinitrotoluene
36. 1,2-diphenylhydrazine
37. ethylbenzene
38. fluoranthene
39. 4-chlorophenyl phenyl ether
40. 4-bromophenyl phenyl ether
41. bis(2-chloroisopropyl) ether
42. bis(2-chloroethoxy) methane
43. methylene chloride (dichloromethane)
44. methyl chloride (chloromethane)
45. methyl bromide (bromomethane)
46. bromoform (tribromomethane)
47. dichlorobromomethane
48. chlorodibromomethane
49. hexachlorobutadiene
50. hexachlorocyclopentadiene
51. isophorone
52. naphthalene
53. nitrobenzene
54. 2-nitrophenol
55. 4-nitrophenol
56. 2,4-dinitrophenol
57. 4,6-dinitro-o-cresol
58. N-nitrosodimethylamine
59. N-nitrosodiphenylamine
60. N-nitrosodi-n-propylamine
61. pentachlorophenol
62. phenol
63. bis(2-ethylhexyl) phthalate
64. butyl benzyl phthalate
65. di-n-butyl phthalate
66. di-n-octyl phthalate
67. diethyl phthalate
68. dimethyl phthalate
69. benzo(a)anthracene
    (1,2-benzanthracene)
70. benzo(a)pyrene (3,4-benzo-pyrene)
71. 3,4-benzofluoranthene
    (benzo(b)fluoranthene)
72. benzo(k)fluoranthene
    (11,12-benzofluoranthene)
73. chrysene
74. acenaphthylene
75. anthracene
76. benzo(ghi)perylene (1,12-benzoperylene)
77. fluorene
78. phenanthrene
79. dibenzo(ah)anthracene
    (1,2,5,6-dibenzanthracene)
80. indeno (1,2,3-cd)pyrene
    (2,3-o-phenylenepyrene)
81. pyrene
82. tetrachloroethylene
83. toluene
84. trichloroethylene
85. vinyl chloride (chloroethylene)
86. aldrin
87. dieldrin
88. chlordane
    (technical mixture & metabolites)
89. 4,4-DDT
90. 4,4-DDE (p,p-DDX)
91. 4,4-DDD (p,p-TDE)
92. Alpha Endosulfan
93. Beta Endosulfan
94. endosulfan sulfate
95. endrin
96. endrin aldehyde
97. heptachlor
98. heptachlor epoxide
    (BHC-hexachlorocyclohexane)
99. Alpha-BHC
100. Beta-BHC
101. Gamma-BHC (lindane)
102. Delta-BHC
    (PCB-polychlorinated biphenyl)
103. PCB-1242 (Arochlor 1242)
104. PCB-1254 (Arochlor 1254)
105. PCB-1221 (Arochlor 1221)
106. PCB-1232 (Arochlor 1232)
107. PCB-1248 (Arochlor 1248)
108. PCB-1260 (Arochlor 1260)
109. PCB-1016 (Arochlor 1016)
110. toxaphene
111. antimony (total)
112. arsenic (total)
113. asbestos (total)
114. beryllium (total)
115. cadmium (total)
116. chromium (total)
117. copper (total)
118. cyanide (total)
119. lead (total)
120. mercury (total)
121. nickel (total)
122. selenium (total)
123. silver (total)
124. thallium (total)
125. zinc (total)
126. 2,3,7,8-tetrachlorodibenzo-o-dioxin
    (TCDD)

Table 2. Status of Categorical Pretreatment Standards

Industry Category	Date Standard was Issued in *Federal Register*	Effective Date	Compliance Date for Existing Sources[a]
Timber Products	1-26-81	3-30-81	1-26-84
Electroplating	1-28-81	3-30-81	4-27-84 (Non-integrated)[b] 6-30-84 (Integrated)[b]
	7-15-83	8-29-83	7-15-86 (TTO)[b]
Iron and Steel	5-27-82	7-10-82	7-10-85
Inorganic Chemicals I	6-29-82	8-12-82	8-12-85
Textile Mills	9-2-82	10-18-82	—[c]
Petroleum Refining	10-18-82	12-1-82	12-1-85
Pulp, Paper, Paperboard	11-18-82	1-3-83	7-1-84
Steam Electric	11-19-82	1-2-83	7-1-84
Leather Tanning	11-23-82	1-6-83	11-25-85
Porcelain Enameling	11-24-82	1-7-83	11-25-85
Coil Coating I	12-1-82	1-17-83	12-1-85
Electrical and Electronic Components I	4-8-83	5-19-83	7-1-84 (TTO)[d] 11-8-85 (As)[d]
Metal Finishing	7-15-83	8-29-83	6-30-84 (Part 433, TTO)[e] 7-10-85 (Part 420, TTO)[e] 2-15-86 (Final)[e]
Copper Forming	8-15-83	9-26-83	8-15-86
Aluminum Forming	10-24-83	12-7-83	10-24-86
Pharmaceuticals	10-27-83	12-12-83	10-27-86
Coil Coating (Canmaking)	11-17-83	1-2-84	11-17-86
Electrical and Electronic Components II	12-14-83	1-27-84	7-14-86
Non-Ferrous Metals I	3-8-84	4-23-84	3-9-87
Battery Manufacturing	3-9-84	4-23-84	3-9-87
Inorganic Chemicals II	8-22-84	10-5-84	6-29-85 ($CuSO_4$, $NiSO_4$) 8-22-87
Plastics Molding and Forming	12-17-84	1-30-85	[c]
Non-Ferrous Metals Forming	8-23-85	10-7-85	8-23-88
Non-Ferrous Metals II	9-20-85	11-4-85	9-20-88
Pesticides	10-4-85	11-18-85	11-18-88
Metal Molding and Casting (Foundries)	10-30-85	12-13-85	10-31-88
Organic Chemicals and Plastics and Synthetic Fibers	12/86	2/87	2/90

[a] The compliance date for any new source is the same date as the commencement of the discharge.

[b] Integrated electroplators are establishments involved both in electroplating and in other activities that are regulated by other EPA categorical pretreatment standards. Non-integrated electroplators are establishments involved in electroplating only. The compliance date for removal of total toxic organics (TTO) is July 15, 1986.

[c] No numerical pretreatment limits have been established for these industrial categories, and there is no final compliance date for categorical pretreatment standards. Firms in these categories are required to comply only with the General Pretreatment Regulations in 40 CFR 403.

[d] The compliance date for existing Phase I Electrical and Electronic Components manufacturers for TTO is July 1, 1984. The compliance date for arsenic is November 8, 1985.

[e] Existing sources that are subject to the metal finishing standards in 40 CFR Part 433 must comply only with the interim limit for Total Toxic Organics (TTO) by June 30, 1984. Plants also covered by 40 CFR Part 420 must comply with the interim TTO limit by July 10, 1985. The compliance date for metals, cyanide, and final TTO is February 15, 1986, for all sources.

SOURCE U S Environmental Protection Agency, July 1986

The pollution control capabilities of BAT technology are also used to establish pretreatment standards for *indirect dischargers*. Before establishing pretreatment standards based on BAT, however, EPA considers the pollution removal capabilities of sewage treatment plants (Figure 13). If treatment plants using secondary treatment processes typically remove any of an industry's pollutants to the same extent as BAT technology, then pretreatment standards for those pollutants are generally

Figure 12. Categorical Standards Development

In identifying BAT technology for a given industry, EPA considers a number of alternative pollution control systems. Technical and economic analyses are performed to determine whether the systems will work and whether they are economically achievable for the industry. These analyses are described in the *Federal Register* notice of the proposed rule. EPA also publishes a "development document" concerning each industry's pretreatment standard. These documents expand on the discussions in the *Federal Register* and provide more detail concerning the technologies that were considered in establishing BAT. In some cases, EPA also publishes a summary manual concerning an industry's pretreatment standard. To obtain copies of the development documents or summary manuals, contact the U.S. Environmental Protection Agency, Office of Water Regulations and Standards, Industrial Technology Division, Washington, DC.

Figure 13. Removal Capabilities of POTWs

Categorical standards regulate only pollutants that are not controlled by POTW treatment systems. To assess the removal capabilities of POTWs, EPA has developed extensive data on the performance of 50 representative facilities. This data is available in the EPA publication titled *Fate of Priority Pollutants in Publicly Owned Treatment Works.* The information on POTW pollutant removal contained in this document is used to determine whether a given pollutant in an industry must be covered under categorical standards. Copies of the document can be obtained by contacting the U.S. Environmental Protection Agency, Office of Water Regulations and Standards, Industrial Technology Division, Washington, DC.

not promulgated for that industry. If any of an industry's pollutants typically pass through the treatment plant, discharging a higher level of pollutants than would occur if the industry's facilities were direct dischargers using BAT technology, then pretreatment standards equivalent to BAT technology are promulgated for those pollutants for that industry. Thus, pretreatment standards are set using BAT technology as a reference point, with some pollutants excluded based on the performance capabilities of sewage treatment plants.

Implementation of Federal Categorical Standards

Once a categorical standard is promulgated, POTWs or industrial officials might be unsure whether or not a given facility is subject to the new regulation. The POTW or the industrial user can request a ruling by the EPA concerning the industrial category of the facility in question (i.e., a category determination). The Water Division Director in the EPA regional office where the facility is located makes the final decision.

If an industrial facility is subject to a categorical standard, it must submit a report to the POTW documenting the plant operations and discharges. In these reports, referred to as baseline monitoring reports, the industrial facility must also indicate whether applicable pretreatment standards currently are being met. If the standards are not being met, the facility must submit a description of the facilities and operating procedures required for compliance and a schedule showing when these compliance measures will be implemented. If an industrial plant has already submitted the required information as part of its existing pretreatment permit application, it need not resubmit the information in a baseline monitoring report.

All industrial facilities included in a category are responsible for installing any pollution control equipment and instituting any operations and maintenance procedures that might be required for compliance with the standard. The effective date of a categorical standard is usually several weeks after the standard is promulgated in the *Federal Register* as a final regulation. In most cases, new facilities must comply with the regulation for any discharges occurring after the effective date of the regulation; existing plants must comply within 3 years of the effective date of the regulation.

Modifications of Categorical Pretreatment Standards

Although categorical standards apply throughout the country, they may be modified in three specific circumstances. If the water coming into a particular industrial facility already contains a pollutant regulated by the categorical standard for that facility, a *net/gross adjustment* may be authorized (40 CFR 403.15). Net/gross adjustments allow the facility to discharge a particular pollutant at a level in excess of the federal standard, but such an adjustment is allowed only to the degree that the pollutant is present in the incoming water.

A second type of adjustment, termed a removal credit, allows a categorical standard to be modified for a particular pollutant at a particular facility if the sewage treatment plant serving the facility removes the pollutant effectively (40 CFR 403.7). If a POTW demonstrates to the EPA Regional Administrator that a pollutant is removed by its sewage treatment process, then the categorical pretreatment standards for that pollutant can be adjusted accordingly for industries served by that POTW.

Categorical standards can also be adjusted if a POTW, an industrial firm, or an interested party can show that a factor or factors exist that were not considered in the development of the standards. For example, a firm or industry might apply for a change in the standard because it is using a process that was *not considered by EPA when the Agency developed the categorical standard.* Such adjustments are termed *fundamentally different factor(s)* variances (40 CFR 403.13).

5. Local Pretreatment Programs

Program Components

The POTWs develop local pretreatment programs which implement federal standards and protect local interests. They prepare detailed pretreatment program documents which are reviewed by the state, in pretreatment-delegated states, or by the EPA. To gain approval, these submissions-must meet the requirements for local pretreatment programs contained in 40 CFR 403 (Figure 14).

Figure 14. EPA Manuals Describing POTW Pretreatment Programs

In addition to obtaining copies of 40 CFR 403, a person interested in understanding the components of local POTW programs should obtain the EPA publication entitled *Guidance Manual for POTW Pretreatment Program Development.* This document explains in lay terms the elements that must be included in a local pretreatment program to gain EPA or state approval. Separate chapters of the document explain the requirements for legal authority, technical information, industrial waste surveys, monitoring, implementation procedures, and program staffing. The document's appendices contain sample forms such as a sample pretreatment permit for an industrial discharger, a checklist for POTW pretreatment program submissions, and a sample compliance schedule.

To be successful, the local pretreatment programs must have the following elements:

- *Building Blocks* - local pretreatment programs require legal authority, a professional staff, funding, and an information base on the industrial dischargers.
- *Effluent Limits-For* industrial users of the sewage system, effluent limitations that enforce federal standards and protect local interests must be established.
- *Implementation* Activities - POTWs must undertake a number of activities to implement their effluent limits including notification, permit administration, inspection, monitoring, and enforcement.
- *Information Handling and Public Access-Pretreatment* programs must include a data management system and must provide mechanisms to allow the public to have access to information about the program and to comment on program elements.

Figure 15 provides an overview of the critical components of a local pretreatment program.

POTW Pretreatment Program Building Blocks

A local pretreatment program must have four major building blocks in order to succeed. First, the POTW must have the legal authority to implement the program. This legal authority usually is based on state law and local ordinances. State law authorizes the municipality to regulate industrial users of municipal sew-

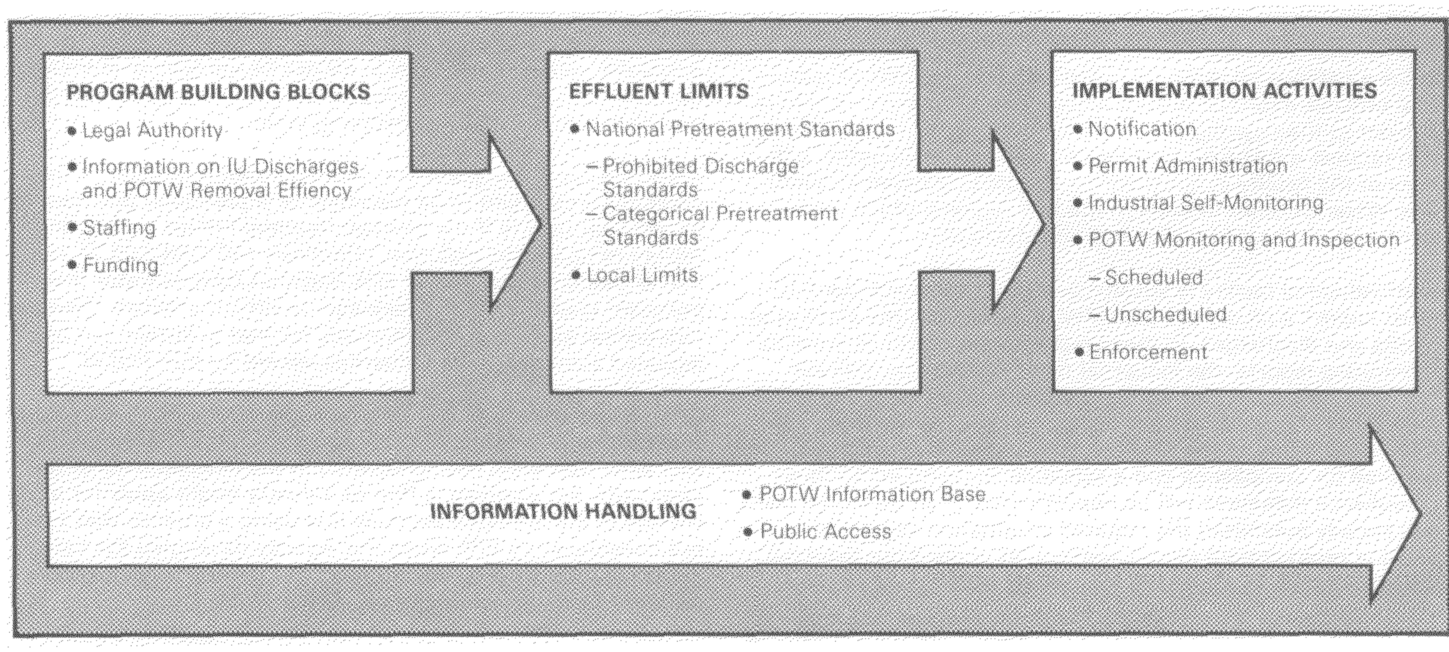


Figure 15. POTW Retreatment Programs.

age systems. The municipality, in turn, establishes a local ordinance that sets forth the components of its pretreatment program and identifies the director of the POTW as the person empowered to implement the program.

The legal authority granted by state and/or local law must authorize the POTW to limit the pollution levels in discharges from industrial users of the sewage system. It must be authorized to enforce national pretreatment standards and to implement local limits in addition to or in excess of the standards. It also must be empowered to issue permits or enter into contracts with industrial users which set forth all applicable pollution control requirements. Finally, the POTW's legal authority also must include the right to inspect and monitor industrial facilities without prior notice, and to take enforcement action against violators.

In addition to obtaining legal authority, the POTW must develop a comprehensive data base describing its industrial dischargers. An industrial waste survey is commonly used to obtain data identifying the volume and pollutant concentration of industrial effluents. This survey provides a data base that allows the POTW to identify the major sources of toxic effluents within the sewage system.

A successful pretreatment program also requires adequate staffing. Personnel are required for sampling and inspection, laboratory analysis, technical assistance, legal assistance, and program administration The resources required for each activity depend upon the size of the sewage district, the number of industrial users, and POTW policies.

The final key building block of a successful pretreatment program is funding. Funding for the program may be included in the municipal budget for the POTW or recovered through charges to the industrial facilities. These charges can be incorporated into a facility's basic fees for sewage services, or levied as a separate pretreatment charge. The size of the charges can be based on the amount of POTW services (e.g.. monitoring) required by a facility, the facility's wastewater flow, or the toxicity of its pollutants.

Effluent Limits

A POTW with adequate legal authority, a sound data base, and adequate staffing and funding can proceed to develop effluent limitations for each industrial plant. At a minimum, all facilities are required to comply with federal prohibited discharge standards. The industries covered by federal categorical standards also must comply with the appropriate discharge limitations.

The POTW may also establish local limits in excess of or in addition to the federal standards for some or all of its industrial users. To identify the need for and the nature of such limits, the POTW determines whether any public health or environmental problems related to POTW operations will exist, even with full enforcement of the federal standards. This assessment addresses the following issues:

- *Interference* - Even with full implementation of federal standards, will the remaining pollutant loadings interfere with the sewage treatment system? To answer this question, the POTW must analyze its treatment system's susceptibility to various problems and its history of breakdowns.
- *Sludge Contamination* - Will any of the pollutants contaminate the municipal sludge? To answer this question, the POTW must determine the concentration of contaminants in its sludge after full enforcement of federal standards and analyze the environmental residuals associated with each possible sludge disposal method.
- *NPDES Permit Violations* -Will the pass-through of any pollutants cause an NPDES permit violation? To answer this question, the POTW must determine whether any of the pollutants that remain in the system after full enforcement of federal standards will pass through the treatment plant in quantities significant enough to cause a permit violation.
- *Surface Water Impacts* - Will any of the pollutants that pass through the treatment plant adversely affect the receiving water body? To answer this question, the POTW must examine the environmental condition of the receiving water body and determine whether the pass-through of any pollutants might have a substantial impact.
- *Worker Safety* - Will any of the pollutants create a safety hazard for municipal employees? To answer this question. the POTW must review the design and operation of its treatment system and the chemical composition of Its pollutant inflow to determine whether any of the pollutants individually, or in combination, will create a worker hazard.

If the answer to any of the above questions is "yes," the POTW will have to establish local limits to be incorporated into the discharge limitations of some or all of the industrial plants that it serves. To determine these limits, the POTW must estimate the maximum concentration of each pollutant in the incoming wastewater that will not cause any of these problems. It can then calculate the maximum pollutant loading of each user that can be allowed without exceeding the maximum concentration of pollutants arriving at the treatment plant. These calculations must consider such factors as the level of pollutants already present in the water supply, the chemical decomposition of pollutants within the sewage system, and the need to accommodate future industrial growth. Based on these calculations, local limits for each pollutant are established for each industrial facility.

Implementation Activities

The POTWs must take a number of steps to implement the effluent limits established in their programs. First, the industrial plants must be notified of the effluent limitations that apply to them. These limitations might be based on categorical pretreatment standards, prohibited discharge standards, or local limits. The effluent limits are then incorporated in a permit. contract, or other agreement between the POTW and the industrial facility.

POTWs must then ensure that the industrial facilities comply with the effluent limits in their pretreatment permits. They require industrial plants to submit self-monitoring reports in which they report the total volume and pollutant concentrations of their wastewater discharges. Federal regulations require that these reports be submitted semi-annually, at a minimum. The industrial facility's pretreatment permit might also require the submittal of additional information such as a description of any accidental discharges into the sewage system.

The POTW cannot rely solely on the information supplied by industry in self-monitoring reports. It must, therefore, conduct its own inspection and monitoring activities. POTWs identify locations within the industrial facility for collecting samples of wastewater for chemical analysis. Sampling locations might be at the end of the industrial process or at the point of connection to the public sewer. The effluent concentrations considered acceptable at each sampling location are based on the facility's pretreatment permit.

POTW personnel monitor an industrial facility.

Municipal personnel periodically visit each industrial site to collect wastewater samples at the designated sampling locations within the facility. Some of these inspections are held on a regularly scheduled basis. There are also unannounced monitoring visits to ensure that the information collected during scheduled visits or submitted in self-monitoring reports truly represents the character of the plant's wastewater discharge. Monitoring also may occur in response to a suspected violation of a pretreatment permit, a public complaint, the suspected presence of explosive or corrosive materials, operating difficulties in the sewage treatment plant, or violation of the POTW's NPDES permit. Monitoring is generally undertaken immediately following the onset of a serious problem.

The frequency and extensiveness of monitoring and inspection by the POTW depends on the facility's potential impact on the sewage system and the environment. In general, major industrial facilities such as those covered by categorical standards are subject to at least one scheduled and one unscheduled monitoring visit per year; more if resources allow. The volume of wastewater discharges, the toxicity of the discharge, or the variability of monitoring results are used by sewer districts to determine the frequency of monitoring visits.

When an industrial plant violates its permit conditions, the POTW takes enforcement action. Before taking this step, however, the POTW verifies the violation. In most cases, verification involves sampling and laboratory analysis of the plant's effluent to confirm that a violation has occurred.

In emergency situations, the sewer district may take immediate action to halt all discharges from a facility that is discharging hazardous pollutants. In less serious cases, however, the POTW will immediately inform the violator verbally of the violation, then later will do so in writing. The facility is required to meet its permit conditions within a specified period of time. Monitoring of the facility's discharges is then instituted to ensure that these compliance deadlines are met.

When compliance deadlines are not met, civil and/or criminal proceedings may be initiated against the violator. In some cases, violations can be handled without litigation. However, when a facility persists in violations that endanger public health and the environment, the POTW may take strong enforcement action. It may levy fines and/or seek injunctions to force the violating facility to come into compliance.

Information Handling and Public Access

POTW pretreatment programs require comprehensive data management systems. Large POTWs that serve many industrial facilities and operate several sewage treatment plants generally will have a computerized data management system. The computer stores records of the pollutant discharges allowed in a facility's permit, and it records the actual pollutant levels detected in wastewater samples. This allows for a rapid comparison of observed and allowed discharges and the automatic detection of violations. The computerized data base can also be used to assist the POTW to determine the source of problems, to calculate local limits, and to plan for system expansion.

In general, information and data that the POTW collects on industrial dischargers is available to the public and to government agencies without restriction. The public owns the POTW and, therefore, has the right to review the information it maintains, including any data showing evidence of detrimental effects on the collection system or the treatment plant. Restrictions are made, however, when the industrial facility is able to demonstrate that the release of such material would divulge information, processes, or methods of production entitled to protection as trade secrets. In these cases, information in a facility's file that might disclose trade secrets or secret processes is not made available for public inspection. However, industrial effluent data always remains available to the public without restriction.

Upon written request to government agencies, non-disclosed portions of a facility's file are made available for uses related to the pretreatment program. For example, a state agency may request confidential information for use in judicial review or enforcement proceedings. The company affected should be notified whenever confidential information is released to a government agency or to the general public.

The pretreatment program is a public service designed to protect the public health and environmental quality of a community. In large part, public support for the program will depend on public participation in the program and public access to the information used in developing and administering the program. The POTW staff is responsible for working with industries and the community to define the objectives and benefits of the pretreatment program. The POTW can hold public meetings during the development of its pretreatment program and during the program's implementation. These meetings open a formal channel for public comment on the program and for dialogue with local industries and environmental groups. When local limits are developed or revised, all interested parties must be notified and invited to comment on these actions.

Public access to non-confidential information regarding the pretreatment program must be maintained at a convenient location. At this place, interested people can read or copy documents, permits, monitoring reports, and records of violations. Local libraries, the city or town hall, and public works offices are usually good locations for public access.

Another aspect of providing information to the public is mandated by federal regulations: the POTW must inform the public whenever a significant violation occurs (40 CFR 403.8 (f)(2)). The POTW is required to publish in the area's largest daily newspaper, on at least an annual basis, the names of industries that have significantly violated pretreatment standards during the previous 12 months.

6. The Future of the Pretreatment Program

The Pretreatment Program Today

The federal, state, and local officials involved in the National Pretreatment Program continually strive to improve its effectiveness. To ensure that the program provides maximum protection to human health and the environment, a number of activities have been undertaken.

The immediate goal of the program is to have all states and POTWs develop pretreatment programs. Significant progress has already been made. Of the 1,468 POTWs now required to develop programs, 1,369 already have approved programs, while another 21 have filed complete submissions that now await government review (Table 3). Most of the remaining sewage authorities have at least started to develop pretreatment programs. The development of state programs also has progressed, with 22 of the 37 NPDES states already having gained EPA approval for their pretreatment programs.

To assist the EPA, state, and POTW personnel in effectively implementing pretreatment programs, the EPA recently convened the Pretreatment Implementation Review Task Force (PIRT). The task force consisted of EPA headquarters personnel, EPA regional personnel, state officials, POTW officials, environmental advocates, and industry representatives. Their report, titled *Pretreatment implementation Review Task Force: Final Report to the Administrator,* was released in January 1985 and is available from the EPA Office of Water Enforcement and Permits, Washington, DC. It recommends improvements in several areas:

- Clarification of the program requirements.
- Improvements in enforcement procedures.
- Allocation of additional resources to the program.
- Better definition of the roles and relationships of program participants.
- Consideration of regulatory changes.

EPA is currently developing guidance documents and policy measures in accordance with these recommendations.

Table 3. Pretreatment Program Approval Status[a]

Region	EPA Required	EPA Approved	Stata Required	state Approved	Total Required	Total Approved
I	68	52	13	11	80	67
II	57	54	24	21	81	76
III	116	90	24	12	139	125
IV	28	23	377	365	417	402
V	99	69	240	204	333	300
VI	123	112		-	123	117
VII	13	13	63	62	76	76
VIII	52	27			53	43
IX	120	120			121	121
X	24	21	21	21	45	42
Totals	700	581	763	697	1468	1369

[a] As of July 1986, approximately 21 complete program submissions were either under or awaiting review, reviewed and found approvable for public notice, or on public notice. Most of the remaining POTWs have submitted one or more portions of their programs for review.

SOURCE U S. EPA. July 1986

Future Issues

Whole-Effluent Toxicity

Several emerging issues provide a new set of challenges to the Pretreatment Program. One issue is the consideration of effluent toxicity in establishing local discharge limitations to be incorporated into pretreatment permits. Currently, pretreatment permits for industrial users of the sewage system restrict the concentration of particular toxic contaminants (e.g., specific toxic metal compounds) rather than the toxicity resulting from the combined effect of all of the pollutants in a facility's wastewater. However, the toxicity of a industrial facility's effluent is not simply the sum of the toxicity of the individual pollutants. Some types of pollutants within a facility's wastewater react with each other to form a more toxic effluent, while some combinations of pollutants neutralize each pollutant's toxicity.

To date, pretreatment permits have not considered the toxicity of the whole effluent. EPA researchers, however, have developed tests to measure whole-effluent toxicity. Regulatory officials are now developing recommended methods for using these toxicity tests to Incorporate whole-effluent toxicity restrictions into industrial pretreatment permits. In other words, future permits will not only limit the discharge of particular toxic substances, but they will also limit the toxicity of the effluent as a whole. This will provide an additional degree of protection to public health and the environment.

Toxics Control Requirements in the Discharge Permits of Sewage Treatment Plants

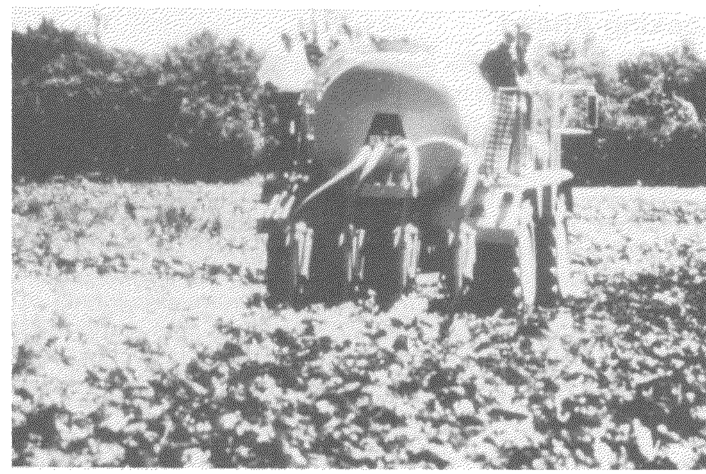
Currently, the discharge permits of municipal sewage treatment plants usually do not contain specific limits for toxic pollutants. The POTWs are restricted by language in their permits prohibiting the discharge of "toxic substances in toxic amounts." Federal and state governments, however, will soon be implementing stricter controls on the ambient concentration of toxic pollutants permitted in surface water bodies (i.e., ambient water quality standards). To comply with these new ambient water quality standards, states and localities may be required to enforce stricter controls on toxic pollutants from all dischargers, including municipal sewage treatment plants.

Because of these changes, it is anticipated that future NPDES permits of sewage treatment plants will include specific limits on toxic pollutants and possible limits on whole-effluent toxicity. These changes will create additional incentives for POTWs to control the toxic discharges of their industrial users so that the level of toxic pollutants in the treatment plant's influent is reduced. Thus, limits on toxic pollutants in future NPDES permits of municipal sewage treatment plants will create the need for more effective pretreatment programs.

Federal Sludge Regulations

A major function of a pretreatment program is to limit the level of toxic contaminants that end up in the sludge of the treatment plant (see Chapter 2). If contaminant levels in sludge are too high, certain disposal methods, such as land application of sludge as a soil conditioner, may become more expensive or be prohibited. Currently, restrictions on sludge disposal are based principally on state regulations.

The EPA is now developing national regulations that will place additional controls on sludge disposal and use. These regulations will cover the major methods of sludge disposal, including landfilling. land application, distribution and marketing, ocean disposal, and incineration. Depending on the exact limitations included in these new rules, POTWs might be required to implement additional pretreatment measures to ensure that their sludges will comply with the new federal regulations.



New federal regulation may place additional restrictions on sludge use and disposal methods, including land application shown here.

Effect of New Hazardous Waste Laws on the Pretreatment Program

Another major challenge to the Pretreatment Program is responding to the effects of the Resource Conservation and Recovery Act (RCRA) amendments, passed by Congress in late 1984. These amendments establish new, more stringent requirements for the treatment, storage, and disposal of hazardous wastes. The concurrent implementation of these amendments and the pretreatment program could result in conflicts. Some industrial establishments might discharge additional quantities of hazardous wastes and toxic pollutants into sewage systems to avoid the costs imposed by more stringent hazardous waste disposal controls. Conversely, the full implementation of pretreatment programs may increase the amount of hazardous wastes (sludges) generated by industrial plants operating pollution control systems to remove toxic pollutants as required under their pretreatment permits.

EPA is currently completing a study to determine whether hazardous discharges to municipal sewage systems will increase as a result of the new RCRA amendments. This subject will also be addressed by the newly formed Clean Water Act/RCRA Task Force. Although the extent of this problem has not yet been quantified, there are several reasons for concern:

- The RCRA program is operated under the assumption that the Pretreatment Program will control hazardous waste discharges to municipal sewage systems. However, the Pretreatment Program principally controls typical industrial wastewater constituents. Hazardous wastes that were not previously associated with industrial wastewater discharges, or pollutant sources outside the purview of the current Clean Water Act classes and categories of industries (see Chapter 4), may receive little regulatory scrutiny under the Pretreatment Program.
- The RCRA Program and the Pretreatment Program use different methods to select materials for regulation. The Pretreatment Program focuses principally on 126 toxic pollutants. RCRA identification of regulated materials is more dynamic. Wastes may be deemed hazardous if they possess certain characteristics or if they have been specifically listed as hazardous by EPA. Listed wastes may encompass substances containing one or more of 375 hazardous constituents.
- The Pretreatment Program is implemented by individual POTWs. These municipal agencies have the authority to expand the list of pollutants covered under their permits to include more than the 126 toxic pollutants. Municipalities must engage in an analytical process to identify pollutants that might interfere with the operation of their POTW or cause environmental problems. To date, however, POTWs have not focused on hazardous constituents.

As a result of all the above factors, industrial establishments generating hazardous wastes may discharge some of these wastes into municipal sewage systems, where they may be unregulated, rather than disposing of them through the regulated RCRA process. Generators of small quantities of hazardous wastes, some of which are now regulated for the first time under the RCRA amendments, might be particularly likely to avoid new disposal costs by discharging hazardous wastes into sewage systems. The increased hazardous discharges into sewage systems could interfere with POTW operation, contaminate POTW sludges, or result in the pass-through of hazardous wastes to receiving waters. Therefore, POTWs will have to broaden the scope of their pretreatment programs to respond to this new source of pollution in the sewage system.

Looking Ahead

In summary, the National Pretreatment Program faces a two-fold challenge. First, it must ensure that all states and affected POTWs complete the job of developing pretreatment programs that enforce all existing federal categorical standards, prohibited discharge standards, and local limits (where necessary). Second, the program must develop new strategies to respond to a number of emerging environment issues such as the potential increase in hazardous waste discharges into the sewage systems. By responding to these challenges, the federal, state, and local officials involved in the National Pretreatment Program will ensure that the benefits of industrial pretreatment, already seen in many areas, will be experienced in hundreds of other communities throughout the country.

7. References

(1) JRB/SAIC, *Assessment of the Impacts of Industrial Discharges on Publicly Owned Treatment Works,* November 1981. SAIC, McLean, Virginia.

(2) Ibid (1).

(3) JRB/SAIC, *Environmental Benefits of Pretreatment.* SAIC, McLean, Virginia.

(4) JRB/SAIC, *Pretreatment Water Quality Improvements.* October 1984, SAIC, McLean, Virginia.

(5) Conversation between Mr. David Meyers of Eastern Research Group, Inc. (ERG) and Mr. Tom Huston of the City of Broomfield, Colorado.

(6) Ibid (4).

(7) Ibid (3).

(8) Conversation between Mr. David Meyers of Eastern Research Group, Inc. and Mr. Michael Armorer of WSSC.

(9) Conversation between Mr. David Meyers of Eastern Research Group, Inc. and Mr. John Roberts of the City of Melbourne, Florida.

(10) Conversation between Mr. David Meyers of Eastern Research Group, Inc. and Mr. Richard Lanyon of the Metropolitan Sanitary District of Greater Chicago.

(11) Conversation between Mr. David Meyers of Eastern Research Group, Inc. and Mr. Thomas Vetter of the New York City Department of Environmental Protection.