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10/11/77

CONTINUING NEED FOR IMPROVED
OPERATION AND MAINTENANCE OF
MUNICIPAL WASTE TREATMENT PLANTS/
ENVIRONMENTAL PROTECTION AGENCY

CED-77-46
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To assist States and municipalities in meeting water pollution abatement requirements, the Federal Water Pollution Control Act authorizes grants for constructing publicly owned waste treatment facilities to prevent the discharge of untreated or inadequately treated sewage or other waste into waterways. The act's 1972 amendments established a national permit program for controlling the discharge of pollutants into navigable waters and required that each discharger of pollutants obtain a permit from EPA or a State with an EPA-approved permit program.

We reported that:

- Operation and maintenance problems at municipal waste treatment plants constructed with Federal grant assistance have been widespread for many years and have led to inefficient plant operations and the discharging of unnecessarily high pollution loads into the Nation's waterways.
- Until EPA, States, and local communities place a higher priority on operation and maintenance, the problems noted in the report will continue to adversely affect plant performance, pollution abatement, and the high capital investment in waste treatment.

We recommended that the Administrator, Environmental Protection Agency:

- Develop and publish guidance for the regional offices which specifies the operation and maintenance considerations which should be discussed with municipalities during preapplication conferences.
- Instruct the regional offices and the States that, whenever discharge permits are to be issued or revised for waste treatment plants with major operation and maintenance problems, such permits should be appropriately tailored on the basis of actual operating data obtained from sources such as inspection and discharge monitoring reports to help correct the problems.

--Require the States to conduct regularly scheduled operation and maintenance inspections at municipal waste treatment plants in accordance with EPA guidelines and to document the results of these inspections on the standard EPA form.

--Require all regions and encourage the States to maintain an adequate technical assistance capability.

EPA agreed with our findings but took exception to two of the four recommendations. It disagreed that specific operation and maintenance requirements should be included in municipal permits. We believe that incorporating specific operation and maintenance requirements in the permits of waste treatment plants experiencing major operation and maintenance problems which are contributing to current poor performance, or are likely to lead to poor performance and violations of water quality requirements, would enable EPA and the States to require that such problems be corrected before the occurrence of equipment and process failures and major effluent violations.

Regarding the maintenance of an adequate technical assistance capability, EPA stated that it and the States lack the resources to address all technical assistance problems, and that it must stimulate the private sector to meet this demand. Because of the overriding need to protect the Federal investment in municipal waste treatment plants and to meet water quality goals, we believe that (1) technical assistance should be available to a municipality when it seeks help in solving complex operation problems at a waste treatment plant and (2) until the private sector develops sufficient capability to provide effective technical assistance, EPA and the States should provide these services.

EPA believes that stringent EPA and State enforcement of national water pollution control permit requirements, plus an increased emphasis nationally on municipal treatment plant operation and maintenance considerations, will be required to achieve performance and reliability objectives of municipal waste treatment plants.

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ENVIRONMENTAL PROGRAMS

Water:

Continuing problems in operating and maintaining
municipal waste treatment plants.

Actions for preventing and correcting operation
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REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL
OF THE UNITED STATES



Continuing Need For Improved Operation And Maintenance Of Municipal Waste Treatment Plants

Environmental Protection Agency

For many years operation and maintenance problems at municipal waste treatment plants constructed with Federal grant assistance have caused inefficient plant operations and discharging of unnecessarily high pollution loads into the Nation's waterways.

GAO recommends the Agency strengthen its regional office and State efforts to improve plant operation and maintenance.

Until the Agency, States, and local communities place a higher priority on operation and maintenance, the problems noted in this report will continue to adversely affect plant performance, pollution abatement, and the high capital investment in waste treatment.

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-166506

To the President of the Senate and the
Speaker of the House of Representatives

This report discusses the continuing need for improved operation and maintenance of municipal waste treatment plants constructed under grants awarded by the Environmental Protection Agency.

We issued a report on September 1, 1970 (B-166506), which noted that operation and maintenance problems at municipal waste treatment plants had been widespread for many years and had resulted in inefficient plant operations. Our current review was made to determine whether these problems are still widespread and to evaluate the effectiveness of actions taken since 1970 by the Agency, the States, and municipalities to improve operation and maintenance at municipal waste treatment plants.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53) and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget; the Chairman of the Council on Environmental Quality; and the Administrator, Environmental Protection Agency.

R. G. K. 11u
ACTING Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

CONTINUING NEED FOR IMPROVED
OPERATION AND MAINTENANCE OF
MUNICIPAL WASTE TREATMENT PLANTS
Environmental Protection Agency

D I G E S T

Operation and maintenance problems at municipal waste treatment plants constructed with Federal grant assistance have been widespread for many years and have led to inefficient plant operations.

GAO visited 28 plants in 6 States and noted (1) insufficient qualified plant-operating personnel, (2) inadequate budgets, (3) inadequate controls over industrial waste, (4) inadequate laboratory controls, (5) inadequate plant design and equipment, and (6) infiltration/inflow problems.

The Environmental Protection Agency is aware of the operation and maintenance problems and has identified actions necessary to correct some of them; however, its regional offices and the States have been slow to effectively implement these actions.

Until such time as the Agency, the States, and the local communities place a higher priority on operation and maintenance, in terms of both manpower and resources, the problems noted in the report will continue to adversely affect the high capital investment that has been made and is continuing to be made in waste treatment facilities. In addition, unless the facilities are properly operated and maintained, it is unlikely that water quality goals can be achieved.

GAO recommends that the Administrator, Environmental Protection Agency:

- Develop and publish guidance for the regional offices which specifies the operation and maintenance considerations which should be discussed with municipalities during preapplication conferences. (See p. 24.)

--Instruct the regional offices and the States that, whenever discharge permits are to be issued or revised for waste treatment plants with major operation and maintenance problems, such permits should be appropriately tailored on the basis of actual operating data obtained from sources such as inspection and discharge monitoring reports to help correct the problems. (See p. 33.)

--Require the States to conduct regularly scheduled operation and maintenance inspections at municipal waste treatment plants in accordance with Agency guidelines and to document the results of these inspections on the standard Agency form. (See p. 43.)

--Require all regions and encourage the States to maintain an adequate technical assistance capability. (See p. 46.)

The Agency stated that the report correctly emphasizes the observed lack of improvement nationally in municipal waste treatment plant performance. The Agency agreed that much of the continuing problem is due to the low priority assigned to operation- and maintenance-related activities by all levels of government, as well as the private sector.

The Agency took exception, however, to two of the four recommendations. It disagreed that specific operation and maintenance requirements should be included in municipal permits. GAO believes that incorporating specific operation and maintenance requirements in the permits of waste treatment plants experiencing major operation and maintenance problems which are contributing to current poor performance, or are likely to lead to poor performance and violations of water quality requirements, would enable the Agency and the States to require that such problems be corrected before the occurrence of equipment and process failures and major effluent violations.

Regarding the maintenance of an adequate technical assistance capability, the Agency stated that it and the States lack the resources to address all technical assistance problems,

and that it must stimulate the private sector to meet this demand. Because of the overriding need to protect the Federal investment in municipal waste treatment plants and to meet water quality goals, GAO believes that (1) technical assistance should be available to a municipality when it seeks help in solving complex operation problems at a waste treatment plant and (2) until the private sector develops sufficient capability to provide effective technical assistance, the Agency and the States should provide these services.

The Agency believes that stringent Agency and State enforcement of national water pollution control permit requirements, plus an increased emphasis nationally on municipal treatment plant operation and maintenance considerations, will be required to achieve performance and reliability objectives of municipal waste treatment plants. (See app. I.)

Federal grants of about \$18.9 billion had been awarded from fiscal year 1957 to December 31, 1976, to help State and local governments and interstate commissions construct wastewater treatment projects. Local governments are responsible for operating and maintaining the facilities.

The Environmental Protection Agency estimated that the cost of operating and maintaining 21,059 waste treatment plants would total \$1.1 billion in fiscal year 1977. Although Federal grants are not authorized for the operation and maintenance of these plants, the Agency has a continuing interest in effective waste treatment and in safeguarding the investment of Federal funds.

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ABBREVIATIONS

BOD	biochemical oxygen demand
EPA	Environmental Protection Agency
GAO	General Accounting Office
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance

CHAPTER 1

INTRODUCTION

The objective of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) (33 U.S.C. 1251) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The act established two goals: (1) eliminate the discharge of pollutants into navigable waters of the United States by 1985 and (2) attain water quality sufficient for the protection and propagation of fish, shellfish, and wildlife and for recreation by July 1, 1983.

The 1972 amendments require that, as a minimum level, secondary treatment is to be used by publicly owned waste treatment plants by July 1, 1977, and that by July 1, 1983, publicly owned waste treatment works are to use best practicable waste treatment technology. Higher levels of treatment may be required if needed to meet water quality standards. The States have the primary responsibility for abating and eliminating water pollution.

CONSTRUCTION GRANT PROGRAM

The Federal Water Pollution Control Act Amendments of 1956 (Public Law 84-660) created the waste treatment construction grant program. The act authorized grants for constructing waste treatment facilities to prevent untreated or inadequately treated sewage or other waste discharges into waterways. The grant recipient (State, municipality, intermunicipality or interstate agency) received Federal funds for 30 percent of the project costs. Subsequent amendments to the act increased the Federal share of project costs up to a maximum of 55 percent.

Under the 1972 amendments, the Environmental Protection Agency (EPA) has authority to make grants to municipalities for 75 percent of the costs to construct publicly owned waste treatment plants. The act does not authorize grants for the operation and maintenance (O&M) costs of municipal waste treatment plants.

To assist States and municipalities in meeting the requirements of the 1972 amendments, the Congress authorized the allocation of \$18 billion for fiscal years 1973-75 for constructing waste treatment facilities. As of December 31, 1976, about \$6.1 billion was still available for obligation.

An additional \$480 million was provided by Public Law 94-447 October 1, 1976, for the construction grant program. In December 1976 EPA proposed to the Office of Management and Budget that the Congress authorize additional program funding of \$4.5 billion annually for the 10-year period from fiscal year 1977 to fiscal year 1986.

From fiscal year 1957 to December 31, 1976, Federal funds totaling about \$18.9 billion had been obligated under the waste treatment construction grant program. Facilities authorized for construction under the program included treatment plants, interceptor and outfall sewers, and pumping, power, and other equipment. The 1972 amendments made collector systems, combined storm and sanitary sewers, and recycled water supply facilities eligible for Federal assistance.

A picture of a typical municipal secondary waste treatment facility is shown on the following page.

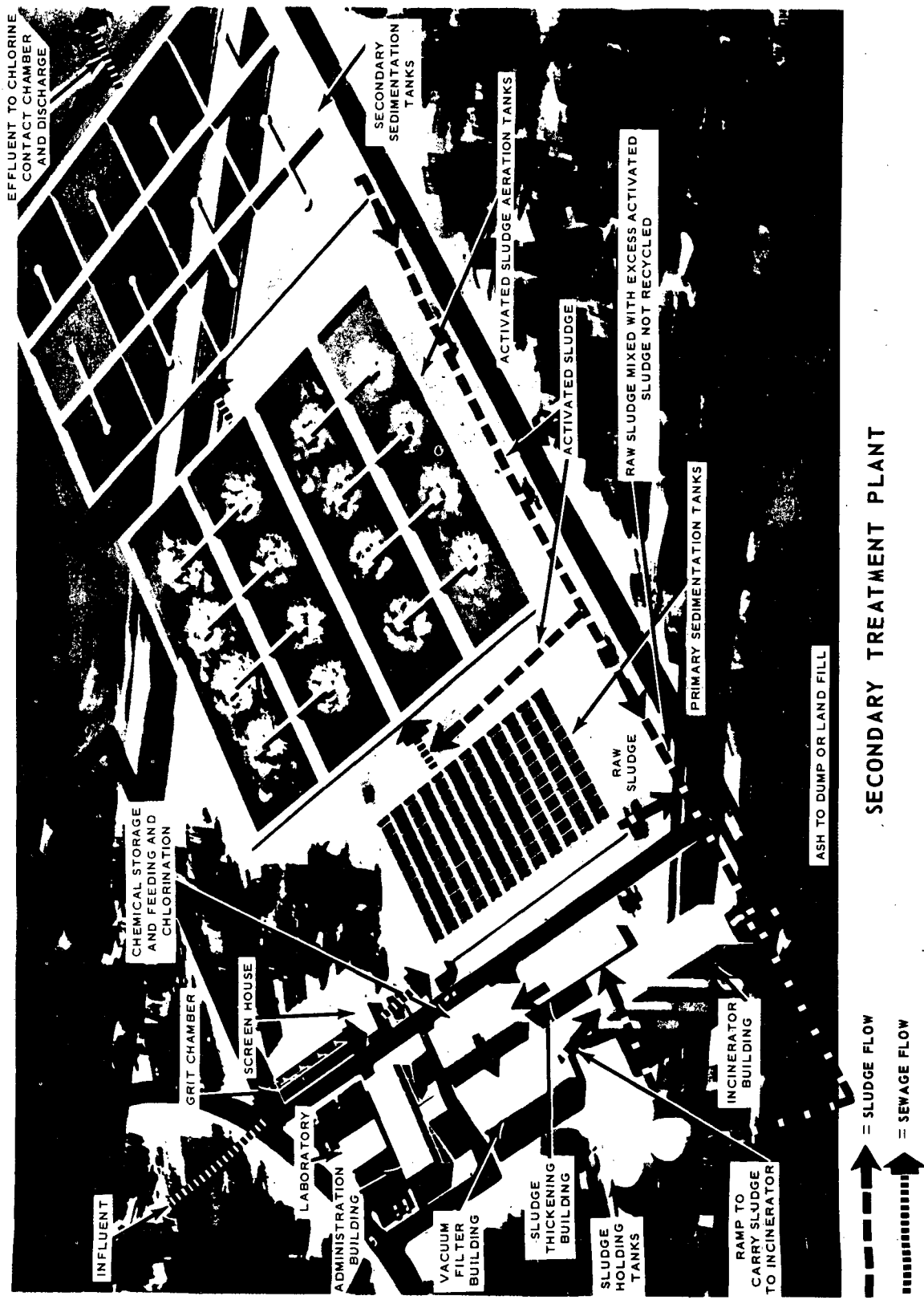
PERMIT PROGRAM

The 1972 amendments also established the National Pollutant Discharge Elimination System (NPDES), a national permit program for controlling the discharge of pollutants. The act makes it illegal for dischargers, including waste treatment plants, to discharge pollutants into the Nation's navigable waters without an NPDES permit.

The permit specifies (1) effluent limitations, (2) schedules, as appropriate, setting forth the type of actions required and time frames for complying with the effluent limitations, (3) self-monitoring of wastewater flows and of specified pollutants in the influent and effluent, and (4) periodic reporting of plant performance. Permit conditions can be enforced by EPA and/or States with EPA-approved permit programs by issuing administrative orders or court actions. EPA policy has called for using the permit program for helping to improve the operational efficiency of municipal waste treatment plants.

RESPONSIBILITY FOR PLANT OPERATION AND MAINTENANCE

The 1972 amendments require that before EPA approves a grant for the construction of a waste treatment facility, the grantee shall make adequate provisions for proper and efficient operation and maintenance of the facility in accordance with a plan of operation approved by the State or interstate water pollution control agency.



SECONDARY TREATMENT PLANT

EPA's implementing regulations specify that the plan of operation shall include, as a minimum, provision for:

"(1) An operation and maintenance manual for each facility, (2) an emergency operating and response program, (3) properly trained management, operation and maintenance personnel, (4) adequate budget for operation and maintenance, (5) operational reports, and (6) provisions for laboratory testing adequate to determine influent and effluent characteristics and removal efficiencies."

EPA regulations also require that the State have an effective operation and maintenance monitoring program to assure that waste treatment facilities assisted with Federal funds comply with applicable grant and permit conditions.

As authorized by section 106 of the act, EPA makes grants to States and interstate agencies to assist them in administering programs for the prevention, reduction, and elimination of pollution. The State or interstate agency submits an annual program, which identifies expected accomplishments during the year, to the EPA Regional Administrator for review and approval.

To help insure adequate funding of the operation and maintenance of waste treatment facilities, the 1972 amendments require that:

"* * *the Administrator [of EPA] shall not approve any grant for any treatment works * * * after March 1, 1973, unless he shall first have determined that the applicant (A) has adopted or will adopt a system of charges to assure that each recipient of waste treatment services within the applicant's jurisdiction * * * will pay its proportionate share of the costs of operation and maintenance (including replacement) of any waste treatment services provided by the applicant; * * * and (C) has legal, institutional, managerial, and financial capability to insure adequate construction, operation, and maintenance of treatment works throughout the applicant's jurisdiction, as determined by the Administrator."

EPA staff has estimated that the cost of operating and maintaining municipal waste treatment plants would total about \$1.1 billion for 21,059 plants in fiscal year 1977 and \$1.71 billion for 24,694 plants in fiscal year 1981.

SCOPE OF REVIEW

On September 1, 1970, we issued a report to the Congress entitled "Need for Improved Operation and Maintenance of Municipal Waste Treatment Plants" (B-166506). Our current report presents the results of a followup review to ascertain whether O&M problems are still widespread and to evaluate the effectiveness of actions taken since 1970 by EPA and the States and municipalities to improve O&M at municipal waste treatment plants.

We conducted our review at EPA headquarters in Washington, D.C.; EPA regional offices in Dallas, Texas; Philadelphia, Pennsylvania; and Seattle, Washington; and at State water pollution control agencies in Louisiana, Pennsylvania, and Washington. We reviewed the operation and maintenance of 17 municipal waste treatment plants in these 3 States. We also made followup reviews of the operation and maintenance of 11 plants which were included in our September 1, 1970, report. These plants are located in Georgia, Indiana, Kentucky, Montana, Oregon, and Tennessee. We also analyzed 100 State and EPA reports on O&M, inspections made during 1975 in Idaho, Louisiana, Oregon, Pennsylvania, and Washington.

We examined pertinent legislation, regulations, instructions, reports, records, and other documents, and interviewed officials knowledgeable in the field of water pollution control, including EPA headquarters and regional officials, State and municipal officials, plant operators, consulting engineers, and members of professional organizations.

CHAPTER 2

CONTINUING PROBLEMS IN OPERATING AND MAINTAINING MUNICIPAL WASTE TREATMENT PLANTS

In our September 1, 1970, report to the Congress we noted that operation and maintenance problems had been widespread for many years and had led to inefficient plant operations. Our followup review showed that operation and maintenance problems are still widespread. Many plants are not meeting their design criteria and therefore are contributing unnecessarily high pollution loads to the receiving waterways.

Satisfactory O&M is critical to a plant's overall performance. Proper O&M practices are essential for the achievement of the efficient operation of waste treatment plants and can reduce future construction and replacement costs by prolonging the life of plant equipment. EPA has recognized the importance of improved O&M by requiring facilities planning initiated after April 30, 1974, to include an evaluation of improved effluent quality attainable by upgrading O&M of existing facilities as an alternative or supplement to constructing new facilities. Waste treatment facilities must be properly maintained in order to protect the huge investment of Federal, State, and local construction funds.

In our 1970 report we noted that 11 of the 12 municipal waste treatment plants we visited in 1969 had experienced or were experiencing O&M problems. In 1975 we found that O&M had significantly improved at only 3 of the 11 plants that were still operating. In order to determine the magnitude of the problem and obtain a wider geographic distribution of municipal waste treatment plants that appeared to have serious O&M problems, we visited 17 additional plants in Louisiana, Pennsylvania, and Washington. Major O&M problems noted at the 28 plants we reviewed in 1975 included (1) insufficient qualified plant-operating personnel, (2) inadequate budgets for O&M, (3) inadequate controls over industrial wastes, (4) inadequate laboratory controls, (5) inadequate plant design and equipment, and (6) infiltration/inflow problems.

EPA STUDIES SHOW THAT OPERATION AND MAINTENANCE PROBLEMS ARE WIDESPREAD

Section 210 of the Federal Water Pollution Control Act, as amended, requires EPA to make an annual survey to determine the efficiency of the operation and maintenance of

treatment works constructed with Federal grants made under the act. EPA's 1975 survey covered an analysis of 954 plant inspections made during 1973 and 1974. Only 386 of the 954 plants had enough design and operational performance data to determine whether the plant was meeting design criteria for biochemical oxygen demand (BOD) removal. Of the remaining plants, 484 did not have sufficient operational performance data to compare with design data, and 84 plants lacked adequate records of design data.

The EPA survey showed that 40 percent of the 386 plants were operating below their design criteria for BOD removal and 49 percent of 305 plants were operating below their design criteria for suspended solids removal. Data on suspended solids removal was not available for 81 plants. EPA observed that many of the unsatisfactory plants could be brought to acceptable levels of performance by increased attention to O&M activities.

The EPA survey also showed that a large percentage of the plants had O&M problems and deficiencies. Major problems included inadequate laboratory testing, and deficient O&M management practices, such as inadequate replacement, inadequate spare parts inventories, inadequate records of maintenance repairs and replacement, inadequate routine maintenance schedules, and the incidence of operational, mechanical, or manpower deficiencies requiring followup. The O&M problems and deficiencies shown by the survey are summarized in the following table.

<u>Problems and deficiencies</u>	Percent of 392 plants with sufficient design and operational data (note a)	Percent of 484 plants with insufficient operational data	Percent of 876 plants included in survey (note a)
Need followup action to correct operational, mechanical, or manpower deficiencies	36	83	62
Inadequate laboratory facilities and/or inadequate laboratory testing programs	21	b/69	47
Inadequate spare parts inventories	23	26	25
Inadequate records of maintenance, repairs, and replacements	14	33	25
Inadequate routine maintenance schedules	12	18	15
No O&M manuals designed specifically for plant	44	48	46
Operations and other plant personnel do not routinely attend short courses, school, or other training	15	35	26
Infiltration/inflow	75	55	64
Hydraulically overloaded	21	c/18	d/19

a/Six plants included in this analysis were later eliminated by EPA for other purposes of the survey because of plants' unusual design features.

b/Most of these facilities are primary treatment plants and lagoons, smaller than 1 million gallons per day.

c/Based on 301 plants having both design and average daily flow rates.

d/Based on 693 plants having both design and average daily flow rates.

In an October 1975 paper presented at an annual conference of the Water Pollution Control Federation 1/, an EPA official pointed out that more than half of the secondary treatment facilities were not meeting the removal requirements specified in the current secondary treatment definition. He said that the experience of EPA regional office personnel who improved plant operation through technical assistance showed that many unsatisfactory and poorly performing plants could perform more efficiently by adopting better O&M practices. He estimated that as many as 1,700 secondary treatment facilities nationwide which did not meet the secondary treatment requirements may have the potential to do so through improved O&M procedures and/or relatively minor plant modification.

The EPA official also pointed out that the significance of adequate laboratory facilities was highlighted in EPA's 1975 survey of plant operation and maintenance, which noted that, with adequately equipped laboratories, plant performance in one State could have been improved by about 20 percent. The EPA official concluded that resolution of the O&M problems was essential to achieve efficient and reliable plant operations.

An April 1976 EPA staff report 2/ on EPA and State programs relating to the operation and maintenance of municipal waste treatment facilities and general compliance with issued permits stated that:

"The study substantiated the fact that existing facilities are not being operated or maintained properly. It further showed that inadequate laboratory capabilities and practices, non-existent or inadequate O&M manuals, lack of training and poor routine maintenance programs are significant problems that must be remedied."

GAO REVIEW OF OPERATION AND MAINTENANCE PROBLEMS

We analyzed 100 State and EPA reports on O&M inspections made during 1975 in Louisiana, Pennsylvania, Idaho,

1/A nonprofit technical membership organization whose stated objective is to advance the fundamental and practical knowledge of all aspects of water pollution control.

2/Prepared by Offices of Water Enforcement and Water Program Operations.

Oregon, and Washington. Our analysis showed the existence of the following problems and deficiencies.

	<u>Frequency</u>
Industrial waste problems	16
Inadequate laboratory controls	53
Infiltration/inflow problems	70
Staffing deficiencies	26
Training deficiencies	41
Budget deficiencies	27

To test the results of EPA and State O&M inspections we analyzed the operations of 28 municipal waste treatment facilities. The following table shows the number and percent of the 28 plants which we noted with O&M problems.

	<u>Number of plants</u>	<u>Percent of plants</u>
Inadequate controls over industrial wastes	13	a/46
Inadequate laboratory controls	11	39
Inadequate plant design and proper equipment	15	54
Infiltration/inflow problems	15	54
Insufficient number of qualified plant-operating personnel	13	46
Inadequate budget for operation and maintenance	5	18

a/The extent and type of industrial wastes and related treatment problems may vary among areas serviced by treatment plants.

The following sections discuss our observations concerning the existence of these O&M problems.

Inadequate controls over industrial wastes

Industrial wastes were causing operating problems at 13 of the 28 treatment plants we reviewed, including 5 of the 6 plants at which we had noted industrial waste problems during our 1969 review.

Industrial wastes entering a municipal waste treatment plant may upset and overload the plant's treatment processes and cause inadequately treated effluent to be discharged into the receiving waters. Our current review showed that some of the plants were receiving industrial pollutants such as oil, grease, blood from slaughterhouses, acids, dyes, and formaldehyde.

Oil and grease cause sludges and floating scums that do not settle, drain, or dry properly during the treatment process. The biological and bacterial action of the treatment plant processes may be retarded or stopped entirely by the presence of certain toxic materials such as formaldehyde, cyanides, and other chemicals.

Also, many industrial wastes carry a higher BOD load than domestic sewage and, unless pretreated before entering the municipal waste treatment plant, may overload the plant equipment.

For example, at one plant we visited wastes containing a high BOD load, formaldehyde, and acid from a yeast-producing company caused a significant BOD loading and appeared to be causing a sludge settling problem. The plant was designed to handle about 3,260 pounds of BOD per day, of which 530 pounds were expected to be contributed by the yeast company. In August 1973 the yeast company was connected to the city's sewer system and by December 1973 the company's discharge was contributing an average of about 1,435 pounds of BOD per day to the treatment plant's influent. The city engineer estimated that the expected life of the plant would be reduced by 10 years if the yeast company continued to discharge BOD at this level.

The amount of BOD discharged by the yeast company varied widely on a day-to-day basis. This variation had great impact on the quality of the municipal plant's treatment. Because the micro-organisms which consume the wastes need time to grow, they cannot absorb a sudden change in BOD load. During the first week of December 1974, the treatment plant's influent experienced BOD load increase from 929 pounds on December 2 to 5,645 pounds on December 3. During November 1974, before the sudden December increase, the treatment plant averaged 92-percent BOD removal, but by December 4 the removal rate was down to 67 percent.

The municipal treatment plant was also experiencing a sludge settling problem which the city engineer and plant operators attributed to wastes from the yeast company. They said that the treatment plant did not have this problem before the yeast company was connected to the city's sewer

system or when the yeast company was not operating during vacation periods. An EPA official believed that acidity from the yeast plant, as well as the formaldehyde, might adversely affect the growth of waste-removing organisms during the treatment process.

An EPA official stated that EPA planned to fund a detailed analysis of the treatment plant's influent to determine the specific cause of the sludge settling problem. He said that the solution might be for the yeast company to pretreat wastes before they are discharged to the municipal treatment plant.

Our review showed that although some municipalities had ordinances for controlling industrial wastes, they appeared to be ineffective or were not being enforced. During our visit at one municipal treatment plant with industrial waste problems, municipal officials said they were reluctant to enforce ordinances because jobs would be lost if the industry closed down.

The 1972 amendments require EPA to publish pretreatment standards for the introduction of pollutants into publicly owned treatment works for those pollutants which are determined not to be susceptible to treatment or which would interfere with the operation of the treatment works. The act allows industry up to 3 years from the time pretreatment standards are promulgated to achieve compliance.

In addition, EPA's regulations on the National Pollutant Discharge Elimination System specify that a municipal permittee shall require any industrial user of the treatment works to comply with the pretreatment requirements. As of April 30, 1976, however, EPA had not issued all of the pretreatment standards. An EPA official said that a time frame for completing the standards had not been established, and attributed the slow development of the standards to limited staff resources and limited technical data on certain industries.

In the April 1976 EPA staff report relating to municipal waste treatment facilities, the National Enforcement Investigations Center Staff, on the basis of inspections of 22 waste treatment facilities in 4 regions, recommended that:

- Municipalities should be encouraged to complete and maintain inventories of industrial users of the municipal sewer system.
- Industrial waste ordinances should be instituted and enforced.

--Municipalities should become aware of the industrial components of their influent sewage and what effects these materials have on treatment plant operations.

Inadequate laboratory controls

Adequate laboratory controls and testing procedures are essential for determining the operational efficiency of a treatment plant and whether adjustments to the treatment processes are needed. EPA noted in its 1975 survey of plant operation and maintenance that inadequate laboratory testing presented a major difficulty in assessing the operational efficiency of treatment plants.

Our analysis of the 100 inspection reports showed that 53 of the plants had inadequate laboratory controls. Laboratory controls and/or testing procedures were also inadequate at 11 of the 28 plants which we reviewed in detail. In some cases the plants we visited lacked adequate equipment needed for laboratory testing. At one plant which had the necessary laboratory equipment, the operator informed us he did not know how to perform all the required tests.

In the past EPA had not required many small treatment plants to report laboratory test results. However, the 1972 amendments to the act made it illegal to discharge pollutants into the Nation's navigable waters without a permit. The permits specify effluent limitations and require that self-monitoring data be summarized on a monthly basis and reported periodically to EPA and/or the State. Dischargers failing to adhere to permit requirements may be subject to civil or criminal penalties.

Therefore, laboratory testing, maintenance of operating records, and reporting is now a legal requirement for all treatment plants which discharge their effluents into navigable waters. Such testing and recordkeeping are also needed to facilitate Federal, State, and local supervision; guide plant personnel in locating and solving operational problems; provide proof of performance; and justify decisions, expenditures and recommendations concerning plant operations.

Inadequate plant design and proper equipment

Our 1970 report indicated a need for improved design and proper equipment at 7 of the 12 plants visited. Our 1975 review of the 28 treatment plants showed that design problems and equipment difficulties were being experienced at 15 plants.

Design and equipment deficiencies can make efficient operation of a treatment plant very difficult and can cause serious operation and maintenance problems. The lack of needed equipment or equipment failures can cause periods of inadequate treatment of wastes or complete bypassing of municipal treatment facilities.

A 10-million-gallon a day plant which began operating in January 1973 was shut down and completely bypassed for about 5 months from November 5, 1974, through March 31, 1975, because an oversized bearing installed by the manufacturer in the arm of the trickling filter caused the arm to become inoperable. The city had to manufacture the bearing in its own machine shop because the manufacturer was not able to promptly supply the necessary replacement part.

According to a city official, various modifications had to be made to the plant to get it to operate properly. For example, only a small portion of the grit in the grit hopper was being removed. The size of the hopper had to be reduced and the suction pipe was extended to obtain the proper suction velocity needed to keep the hopper clean.

At another municipal treatment plant we visited--a 7-million-gallon a day facility which began operating in June 1972--the plant superintendent pointed out design problems that hindered proper operation and maintenance of the plant, including:

--Heavy flows from the city's combined sewer system periodically upset the treatment process because the plant was unable to divert part of the flow. A diversion chamber was constructed in 1974 to correct the problem but no equipment was provided to measure or chlorinate the diverted flow.

--The volume of grit removed was too large to be hauled manually out of the grit chamber. A conveyor belt was being installed to help remove the grit.

--Large pieces of debris accumulated in the comminutor area and had to be manually removed daily. The area around the comminutor was not easily accessible and made the operation difficult and dangerous for employees. The installation of a mechanical bar screen before the comminutor would have helped to eliminate this problem.

--The aeration tank could not be completely drained because the drain pipe was positioned about one foot

from the bottom of the tank. The tank was too deep to use a portable pump.

--The foam retardation sprays for the aeration tank used water from the aeration tank. This caused the spray nozzles to frequently clog with scum.

Many of the treatment plants that we reviewed lack spare parts inventories, standby power sources, and alarm systems for equipment failures, which can cause periods of inadequate treatment or complete bypassing of the plant. Some plants were designed without the needed accessibility to treatment components for sampling or maintenance while others were not provided with the necessary equipment that would give flexibility in operational control. For example, many plants do not have sufficient measurement devices between the different unit processes to allow the operator to determine the adjustments needed for the most efficient operation.

EPA regional officials acknowledged that the design of waste treatment plants often makes proper operation and maintenance difficult. Region VI (Dallas) estimated that at least one-half of the smaller treatment plants lacked automatic automatic flow measuring devices.

EPA's predecessor agency prepared a manual of treatment works design guidelines and maintained a technical bulletin service to advise the regions, States, and design engineers on new policy and technology as it affected sewage interceptors and wastewater treatment facilities. The guidelines were intended to fill the void in existing technical manuals and to provide information about newer technological advances. However, the design portion of these guidelines has not been updated since 1971.

EPA also began issuing technical bulletins in 1971 which were intended to (1) amplify specific areas contained in the original guidelines, (2) define and analyze certain deficiencies in design, and (3) evaluate new advances in technology and provide guidance for incorporating them into new facilities.

In addition, EPA has developed a technology transfer program which prepares and disseminates publications and audio-visual material and conducts seminars for transferring the latest technologies to potential users.

Infiltration/inflow problems

EPA's 1975 survey of the operation and maintenance of treatment works indicated that about 64 percent of the

plants had infiltration/inflow problems. Fifteen of the 28 plants we visited were experiencing such problems.

Severe infiltration/inflow problems in a municipal sewage system can cause hydraulic overloading of a plant, thereby impairing the efficiency of the treatment processes and, in some cases, requiring that raw sewage bypass the treatment plant and be discharged into the receiving waters.

Infiltration occurs when ground water enters a sewer system through means such as defective pipes, pipe joints, connections, or manhole walls. Inflow is caused by water discharged into a sewer system from sources such as roof leaders; cellar, yard, and foundation drains; manhole covers; cross connections from storm sewers and combined sewers; catch basins; storm waters; surface runoff; or street wash waters.

At several of the treatment plants we visited, municipal officials considered infiltration to be one of their principal operating problems:

--In one city with separate storm water sewers, a 1975 EPA inspection report noted that infiltration was one of the factors contributing to hydraulic overloading of the treatment plant, and recommended that plans be made for studying the infiltration/inflow problem. The city manager confirmed that infiltration was a problem because the sewer lines were deteriorating from long service.

--At a second plant, where an EPA inspector attributed hydraulic overloading of the plant to infiltration, a city official told us that the city had been surveying its sewer lines and had been installing new lines where needed. He said that an ordinance had also been enacted prohibiting hookups which had resulted in inflow into the system.

--At a third plant infiltration/inflow problems were being experienced partly because rainwater spouts and catch basins were connected to the sewer system.

EPA officials agreed that infiltration/inflow problems were particularly acute in older municipalities with combined sewer systems or cracked sewer joints. EPA region VI considered infiltration/inflow to be the major factor in operation and maintenance problems--a large number of plants in the region must either bypass raw sewage during rainy periods or risk upsetting the biological treatment process.

The 1972 amendments require that after July 1, 1973, EPA not make any grant for construction of a treatment works unless the applicant shows that each sewer collection system discharging into the treatment works is not subject to excess infiltration/inflow. Compliance with these provisions should help minimize the adverse effect of such problems on the operational efficiency of waste treatment plants.

In a report to the Congress dated February 10, 1975, EPA said that the States had estimated costs of \$5.3 billion for correction of sewer infiltration/inflow and \$7.3 billion for replacement and/or major rehabilitation of existing sewage collection systems where such extensive corrective actions were necessary for the total integrity of the system.

Insufficient number of qualified plant-operating personnel

Operation and maintenance problems at waste treatment facilities are frequently caused by a lack of qualified personnel to operate the plant. Waste treatment plants must be staffed with an adequate number of qualified personnel to achieve the designed level of treatment and to protect the Federal, State, and local investments in the physical plant. Deficiencies in either the quantity or qualifications of the operating staff can adversely affect a plant's operation.

Our 1970 report noted that 7 of the 12 plants we visited were understaffed and/or the plant personnel needed training. Our followup review of the 28 waste treatment plants in 1975 showed that 13 plants had similar problems. The 100 inspection reports we analyzed indicated that 26 of the plants had staffing deficiencies and 41 had training deficiencies.

At a 9.75-million-gallon a day facility which we visited in 1975, EPA had concluded that nine additional plant personnel were needed. The plant had no preventative maintenance system--only emergency situations were attended to--and the plant superintendent performed laboratory testing because of the lack of laboratory personnel. EPA noted that the superintendent had not been able to perform the necessary tests in accordance with approved testing procedures because of time constraints. Also, the city would not provide funds for operator training. City officials informed us that the director of public works resigned in September 1975 because the city did not provide funds for hiring additional plant-operating staff.

At a second plant--a one-half-million-gallon a day facility--the operator said he was unable to perform 6 of the 12 laboratory tests required by the NPDES permit although

he had attended 2 basic wastewater treatment courses. We noted that the operator did not perform and record all laboratory tests on certain days. He explained that he also worked about 2 hours a day for the city park department and was also responsible for inspecting the sewage collection system.

At a third plant--a 1.7-million-gallon a day facility--the operator, who was hired in 1972, had no previous plant-operating experience or training and was not certified by the State. In prior years the plant had two operators. The current operator had received some on-the-job training from the previous operator and had attended a State training session in 1974, but did not believe he was adequately prepared to take the State's operator certification test.

The EPA inspector who accompanied us on a visit to this plant noted that debris removed from the grit chamber was lying on the ground instead of being disposed of properly. In addition, he observed that the digester was not producing methane gas, which indicated that sludge was not being digested properly. The inspector recommended that the temperature of the digester be increased to improve digestion. We noted also that the laboratory controls and records were not adequate. Our review of State inspection reports from January 1969 to August 1974 showed that improper grit disposal and inadequate laboratory controls had been noted previously.

Laboratory tests at this plant were being performed by a municipal official--the former plant operator--sporadically and were being taught to the current plant operator. However, no formal records were being maintained on any of the tests performed. According to municipal officials, tests would be conducted regularly and records would be maintained once the operator became familiar with the testing methodology. Because of the problems noted, the EPA inspector gave the plant an unacceptable rating and recommended hiring an additional operator.

EPA regional officials told us that treatment plant operators who can be hired at present salary levels are not motivated to upgrade their skills. There is a feeling among some operators that the small increase in pay resulting from upgrading skills does not justify the effort. On the other hand, the highly motivated person usually advances into a supervisory position and is then no longer a plant operator.

An August 1974 EPA report on manpower training needs and resources stated that approximately 85,000 persons were needed for optimal operation and maintenance of then-existing

waste treatment facilities. This estimate was 27 percent more than the approximately 67,000 full- and part-time workers engaged in operation and maintenance activities for municipal plants. EPA expected that this shortage of plant-operating personnel would continue because projected employment figures for July 1977 would still be 5,000 fewer than needed for optimum operation of existing plants. EPA estimated that for the period from January 1974 to July 1977, the maintenance and development of the municipal waste treatment plant work force would require recruiting and training 10,000 new hires each year as well as upgrading and updating an average of over 38,000 workers annually. EPA concluded that the consequence of inadequate staff resources could be that the Nation would not be able to fully utilize its multibillion dollar investment in physical facilities to attain water quality objectives by 1977.

Inadequate budget for operation and maintenance

Many O&M problems at waste treatment facilities are caused by a community's limited funding capability. An adequate operating budget for a treatment plant is an essential factor for insuring the continued operation of the plant at designed efficiency. An inadequate budget can, among other things, impede the (1) recruitment and retention of a sufficient number of qualified plant-operating personnel, (2) periodic attendance of plant personnel at training courses, (3) establishment of an effective preventative maintenance system, and (4) maintenance of an adequate spare parts inventory and the acquisition of needed replacement equipment.

Our analysis of the 100 inspection reports showed that 27 of the plants had inadequate budgets for O&M. In addition, 5 of 28 plants we visited during our review had inadequate budgets.

For example, we visited a .35-million-gallon a day plant which was in a general state of disrepair. At this plant we noted that (1) many items of equipment were broken down and inoperative, (2) the operator spent only about 2 hours a day at the plant, (3) preventative maintenance was not performed regularly, and (4) laboratory testing was incomplete because of lack of equipment. A State official told us that because of an inadequate O&M budget, the plant could not afford to purchase the equipment needed for performing the necessary laboratory tests or to have the tests performed by a contractor. He said that available funds were limited because the town was losing population and, consequently, potential revenue.

The EPA inspector who accompanied us on the visit to this plant found the inadequate operating budget to be a major problem. He recommended that the city make funds available to operate the plant effectively, provide at least one full-time plant operator, and have plant personnel attend State training courses.

EPA's regional administrator for Region VI said he believed that--next to infiltration/inflow--inadequate budgets and unqualified operators were the most important causes of O&M problems in small municipalities. He pointed out that when the operating budget is inadequate in a small municipality the operator will generally be unqualified because the town cannot pay a large enough salary to obtain a qualified operator.

A July 1974 research report prepared by a contractor for EPA concluded that the lack of adequate compensation was one of the principal factors hindering the recruitment and retention of workers for treatment facilities. Of 136 non-supervisory personnel interviewed in 10 cities, 111, or 82 percent, said their salaries were not adequate for the duties they performed. Supervisory personnel indicated that the excessive turnover would be greatly reduced if the workers were better paid.

The Administrator, EPA, testified on March 9, 1976, before a Subcommittee of the House Committee on Appropriations that local governments, which have received Federal grant assistance for constructing waste treatment plants but are required to bear the cost of plant operation and maintenance, tend to underfinance the operation and maintenance activities because of their own budgetary constraints. The Deputy Administrator, EPA, testified that:

"* * *Typically in the past the people who operate sewage treatment plants suffer from an exceedingly low-pay schedule within municipal government, and are not trained to high levels of excellence and high standards of performance.

"As secondary treatment plants are built replacing the primary treatment plants, there is a definite jump upward in the quality of operation called for which is not matched by efforts at the municipal level to meet that."

The 1972 amendments require that EPA shall not approve a construction grant after March 1, 1973, unless the applicant has adopted or will adopt a system of user charges to assure that each recipient of waste treatment services will pay his

proportionate share of the costs of operation and maintenance (including replacement) of any waste treatment services provided by the applicant. Compliance with these provisions should help provide needed funds for proper operation and maintenance of new waste treatment facilities. However, local communities may have continuing problems funding proper O&M of older wastewater treatment facilities because of inadequate revenues and budgetary constraints.

CONCLUSIONS

Until such time as the Agency, the States, and the local communities place a higher priority on O&M, in terms of both staffing and resources, the problems noted in the report will continue to detrimentally affect the high capital investment that has been made and is continuing to be made in waste treatment facilities. In addition, unless the facilities are properly operated and maintained, it is unlikely that water quality goals can be achieved.

AGENCY COMMENTS

In commenting on our preliminary report by letter dated January 12, 1977, EPA agreed that much of the continuing problem in municipal waste treatment plant performance is due to the low priority assigned to O&M-related activities by all levels of government and the private sector. EPA believes that more stringent enforcement by the Agency and States plus an increased emphasis nationally on municipal treatment plant O&M considerations will be required to achieve performance and reliability objectives of municipal waste treatment plants. (See app. I. Other comments in EPA's letter are recognized in appropriate sections of this report.)

Appropriate sections of our preliminary report were also provided to States and municipalities for comment. Comments received from these parties were considered and incorporated in this report.

CHAPTER 3

ACTIONS TAKEN BY EPA AND THE STATES TO PREVENT AND CORRECT OPERATION AND MAINTENANCE PROBLEMS

EPA policy and program guidance have called for the EPA regions and States to institute certain procedures and controls, which if effectively implemented should help to prevent or to identify and correct operation and maintenance problems at municipal waste treatment plants. However, the EPA regions and States have not consistently implemented these proposed corrective actions. We identified certain other actions EPA could take to strengthen its O&M program. Actions can be taken for preventing O&M problems at new plants and for identifying and correcting O&M problems at existing plants. The following sections discuss our observations concerning these potential corrective actions.

ACTIONS FOR PREVENTING OPERATION AND MAINTENANCE PROBLEMS AT NEW PLANTS

Appropriate actions systematically applied before and during construction of a waste treatment plant can avoid potential O&M problems before the plant begins operating. These actions include effective preapplication conferences, adequate review of construction plans and specifications, periodic inspections of construction projects, and the preparation of adequate O&M manuals.

Preapplication conferences

EPA policy calls for the regional offices to conduct preapplication conferences for municipalities with projects on a State's construction grant priority list. An EPA memorandum, transmitted to the regional offices on April 2, 1974, pointed out that early attention to O&M will assure that planning takes place for proper operation of the facilities when constructed and that O&M requirements are considered during the design of the facilities.

Our review showed that the frequency of preapplication conferences held by EPA varied among regional offices, and that O&M considerations were not always emphasized during these conferences. Of the three regions included in our review, only officials from region VI said that preapplication conferences were held for every project on a State's priority list. However, the only O&M consideration mentioned was an explanation of the requirements of the EPA O&M inspection report.

Region III (Philadelphia) held preapplication conferences infrequently and only at the request of the grantee. A region X (Seattle) official stated that, although the project engineers were encouraged to hold preapplication conferences for all projects, this was not being done and many of the meetings were held only at the grantee's request.

State officials told us that during the predesign stage EPA should emphasize more the importance and benefits of municipalities properly operating and maintaining sewage treatment plants.

A November 1974 report prepared by an EPA construction grants review group stated that the preapplication conference should give a comprehensive overview of the program, including the importance of providing proper project O&M. The report noted, however, that in most regions few preapplication conferences had been held because of manpower constraints and that such conferences, when held, were usually limited to answering general procedural questions, rather than considering specific project-related requirements.

In a May 1975 report the EPA Administrator's special construction grants task force concluded that the application development stage is the most important phase of the construction grant process. The report recommended that (1) preapplication conferences should be expanded to permit a thorough coverage of program requirements, (2) EPA participate actively in all preapplication conferences, and (3) a greater effort be made to present clear and understandable program requirements to the grantee and consultant.

In a February 18, 1976, memorandum to EPA regional administrators, the EPA Deputy Administrator stated that to help assure sound construction grant program management, State and regional offices should devote maximum effort to preapplication conferences and project assistance following approval of State priority lists.

In addition to emphasizing the importance of preapplication conferences in regional operating guidance, we believe that EPA should also provide guidance to the regions which specifies the O&M considerations which should be discussed with municipalities during preapplication conferences. Such O&M considerations might include emphasizing the need for (1) flexibility in process control, (2) facility reliability, (3) adequate budgeting, staffing, and training, (4) adequate laboratory controls and testing, and (5) a proper preventative and remedial maintenance system.

RECOMMENDATION

We recommend that the Administrator of EPA develop and publish guidance for the regional offices which specifies the O&M considerations which should be discussed with municipalities during preapplication conferences.

Review of construction plans and specifications

EPA regional offices approve plans and specifications for construction of waste treatment plants before construction grants are awarded to municipalities. Each of the three States included in our review also approved the plans and specifications before they were submitted to EPA. Reviews of plans and specifications provide opportunities to identify potential design deficiencies that could cause O&M problems.

Technical reviews of plans and specifications are made by EPA and States to insure that the treatment plant will achieve required effluent limitations and that sound engineering design principles are employed. According to EPA, the review should include an examination of O&M features, such as the adequacy of pumps, controls, measuring devices, laboratory facilities, and safety features.

In the November 1974 report, the EPA construction grants review group stated that 7 of the 10 regional offices were not effectively integrating O&M activities into the construction review process and recommended, among other things, that the regions review plans and specifications from an O&M perspective.

A 1975 report on EPA's construction grant program--prepared for the National Commission on Water Quality--noted the lack of emphasis on O&M considerations during the review of plans and specifications. The report stated that:

"Review procedures***fail to emphasize the importance of O&M. In 7 of 8 regions for example, plans and specifications are not reviewed from the standpoint of operability. Region VI cited one instance of a newly constructed plant being totally inoperable;***. O&M is generally not considered until Step 3 [construction of a facility] in the construction grants process. "

We found major differences in the scope of reviews of plans and specifications among EPA regions, within a region, and within a State.

In Region X, we interviewed four EPA engineers who were responsible for reviewing plans and specifications submitted by the State of Washington. We noted that:

- Two engineers did not conduct detailed reviews of plans and specifications and relied primarily on the reviews made by State personnel. One of these engineers reviewed O&M features only if the State review found something unusual.
- One engineer made detailed reviews of plans and specifications which included certain O&M aspects such as the adequacy of laboratory supplies, equipment, and space.
- One engineer reviewed plans and specifications but because he had held his position for only a short time, had only made detailed reviews of projects for the adequacy of interceptors.

The regional office had a checklist for engineers reviewing plans and specifications, but it did not specifically address O&M matters and was not used by all engineers.

We discussed the review of plans and specifications with responsible State engineers in three of four State of Washington regions. Concerning the review of plans and specifications for O&M considerations, we noted that:

- One engineer relied on the consulting engineers employed by the municipalities to have adequately considered O&M in the design of treatment facilities. He did not complete a checklist when reviewing construction plans.
- One engineer reviewed specific features of the facility design for potential impact on O&M. His review included a consideration of instrumentation, laboratory provisions, and other equipment needed to evaluate how the plant would operate. He said that he had developed a comprehensive checklist for reviewing all plant design criteria.
- One engineer relied on certain published standards in reviewing plans and specifications but did not use a formal checklist. Although he looked at certain O&M features, he made no concerted effort to review the plans and specifications from an O&M perspective. He also indicated that he did not always have enough time to make an adequate review.

Region III officials stated that they reviewed the plans and specifications submitted by Pennsylvania and completed an O&M checklist during their review. The officials told us that the adequacy of the State's reviews varied. Engineers in some Pennsylvania State regional offices reviewed plans and specifications in great detail while engineers in other State regional offices made more general reviews and required closer scrutiny by EPA personnel.

Region VI officials told us that they were reviewing all plans and specifications from Louisiana. They said that although a checklist had not been developed for reviewing plant designs for O&M considerations, State engineers were required to complete an O&M evaluation on each plant--in most cases the EPA O&M inspection report form was used--to show that all features having potential impact on O&M had been properly reviewed.

In order that reviews of plans and specifications include adequate consideration of O&M features, we believe that EPA regions and/or States should be required to complete a checklist which incorporates all major O&M considerations. Such a checklist would enable Federal and State reviewers to make a more uniform, thorough review and could be used to identify potential problems in facility design that may affect O&M. For example, the checklist could provide for the consideration of adequate measuring devices for maintaining overall processing control, sufficient access for equipment maintenance, and backup equipment at critical processing points.

In February 1976 EPA published a handbook of procedures for the construction grant program. The handbook contains a program checklist--to review engineering drawings, specifications, and engineering reports--which incorporates certain O&M considerations. The handbook recommends, but does not require, the use of the checklist during the review of plans and specifications. We believe that use of this checklist by EPA and the States would help provide a more adequate, uniform examination of O&M factors during reviews of plans and specifications.

Inspections of construction projects

Onsite inspections of new municipal waste treatment projects are made to insure that the project construction is being managed properly, is on schedule, and is being constructed in accordance with approved plans, specifications, and change orders. Project inspections are made during construction and when it is completed. Inspections during construction may be by the State or EPA. EPA has the

responsibility under Federal regulations for conducting final inspections.

Interim inspections

The EPA construction grants review group reported in November 1974 that the frequency of interim inspections varied widely among the regions, primarily because of different program priorities and staff constraints. According to the report one region conducted at least two inspections per project annually, four regions conducted them less frequently, and five regions made no inspections. Interim inspections generally averaged 1 staff-day and covered to the extent possible the (1) percent of work completed, (2) general quality of construction, (3) current and potential problems, and (4) general compliance with grant conditions.

The review group believed that interim inspections could play an important role in insuring cost-effective facilities and in deterring and detecting irregularities. The review group stated that in addition to the four areas covered currently, an expanded or redirected interim inspection could appropriately address the following areas:

- The quality of project management or supervision by the grantee of his architect/engineer consultant.
- Unsafe construction practices, such as inadequate shoring of ditches or traffic warning.
- Construction deficiencies, such as improper joining of pipe.
- The activities performed and documentation maintained by the resident inspector.

At the time of our review, only region X of the three EPA regions included in our review performed interim inspections on a regularly scheduled basis during construction of treatment facilities. A region X official informed us that the States are invited to make joint inspections with EPA but do not always do so. He said that region X had made 37 of about 60 scheduled interim construction inspections during fiscal year 1976.

Failure to conduct interim inspections in regions III and VI stemmed from personnel shortages, according to EPA officials.

In EPA's fiscal year 1977 regional operating guidance, dated February 18, 1976, the EPA Deputy Administrator stated that the regional offices should move toward increased interim construction inspections and audits. On March 18, 1976, EPA announced that it had signed interagency agreements with the Corps of Engineers and the General Services Administration that will utilize their inspection services to assist in EPA's expansion of interim construction inspections.

Final inspections

As a condition for approving final payment of Federal funds to the grantee, EPA has responsibility for inspecting each construction project within 60 days after being notified that construction is complete.

Our review indicated that generally the three regions we visited were conducting final inspections in a satisfactory manner. For example, in making final inspections of treatment plants, EPA region III inspectors determined--on the basis of what they saw--whether a plant was constructed in accordance with approved plans and specifications and whether any structural, mechanical, hydraulic, or biological problems were apparent. The inspectors also obtained information on plant staffing and qualifications of plant operators. In addition, observations were made on the adequacy of laboratory testing equipment, maintenance, and safety features.

EPA's February 1976 handbook of procedures for municipal waste treatment construction grant program provides that final inspections should determine, among other things, that (1) the facilities are complete, operating, and will meet the effluent limitations required by the NPDES permit, (2) all equipment is operational and performing satisfactorily, (3) appropriate operation and maintenance staff has been hired for the facility and instructed in startup and operational procedures, (4) laboratory facilities are complete and sufficient to conduct appropriate tests, and (5) the operation and maintenance manual, with a schedule for routine maintenance and testing, is readily available and procedures are being carried out in accordance with the manual.

Following these procedures during final inspections of waste treatment construction projects would help detect potential O&M problems before the plant began operating.

Preparation and use of operation and maintenance manuals

An O&M manual is intended to pull together all information an operator needs to efficiently and effectively

operate a waste treatment plant. The primary purpose of an O&M manual is to help insure that the performance record of a treatment system remains high.

EPA regional offices, or States to which EPA has delegated the authority, must review O&M manuals for all new EPA-assisted projects for treatment plants. No more than 90 percent of the grant amount may be paid to a municipality until EPA has approved a satisfactory O&M manual. As of September 30, 1976, EPA had delegated the authority to review O&M manuals to 37 States.

Although the requirement that an O&M manual be prepared for each treatment plant has existed since 1969, EPA's 1975 survey of the efficiency of municipal wastewater treatment works indicated that about 46 percent of all plants surveyed did not have O&M manuals. A majority of the 28 plants covered by our review did not have O&M manuals.

Opinions of State and local officials differed as to the usefulness of O&M manuals. The operator of one plant said he found the O&M manual helpful in day-to-day operations. The operator of another plant said that, while he found the O&M manual useful in making laboratory tests, he usually did not consult it for plant maintenance but instead relied on his own mechanical ability and knowledge of the plant. The operator of a third plant was unaware that the facility had an O&M manual.

In our discussions with State of Pennsylvania regional officials, some said that the O&M manuals provided the plant operators with needed information on properly operating and maintaining the treatment plants. Another official in the State said that O&M manuals would be helpful primarily to a new plant operator if there was no one available to help during the transition period. Still other officials stated that O&M manuals were not useful to plant operators and that the time required to review the manuals could be better spent in making inspections of waste treatment plants under construction.

In a 1973 EPA publication on considerations to be given for preparation of O&M manuals, it was recognized that many manuals were inadequate and that:

"A problem area common to most existing O&M Manuals is the language style in which they are written. Generally these manuals are written by engineers, critiqued by engineers and approved by engineers. If these manuals are to benefit treatment system operation, they must be aimed at those individuals operating the facilities and not design engineers."

EPA's Office of Audit also has identified instances where O&M manuals were inadequate. For example, a March 1975 audit report on a review of EPA region I (Boston) administration of the water pollution control program, EPA's auditors stated that O&M manuals were frequently too detailed and costly and were usually too complex to guide the plant operators.

The audit report also stated that the manuals were seldom used by waste treatment plant personnel. EPA regional officials told the EPA auditors that (1) operators of the larger, highly complex treatment plants relied primarily on their own knowledge and skill rather than on the O&M manual to provide proper plant operation and maintenance and (2) the unskilled operators common to the small treatment plants usually found the O&M manual to be of little value because it was frequently too technical.

To improve O&M manuals EPA headquarters conducted a training course in each EPA region by July 1975 for the purpose of informing consulting engineers and EPA and State personnel on the type of information that should be included in an O&M manual. The need to write the manual so that it could be understood by treatment plant personnel was emphasized.

ACTIONS FOR IDENTIFYING AND CORRECTING OPERATION AND MAINTENANCE PROBLEMS AT EXISTING PLANTS

EPA and the States can help to identify and correct problems at existing waste treatment facilities that are being neither efficiently operated nor adequately maintained by implementing certain controls and procedures. These actions include (1) using the water pollution control permit program to require optimum facility operation, (2) designing a quality assurance program for waste treatment laboratories, (3) making periodic O&M inspections at waste treatment facilities, (4) providing technical assistance in correcting major O&M problems, (5) providing adequate opportunities for upgrading the skills of waste treatment facility personnel and helping to insure that new hires are adequately qualified, and (6) requiring that waste treatment operators be certified so that they meet certain minimum skills.

Use of water pollution control permit program to improve operation and maintenance

EPA policy has called for (1) closely linking municipal permits issued under the National Pollutant Discharge

Elimination System with efforts to improve the operational efficiency of municipal waste treatment facilities, (2) establishing performance requirements in the permit that can be used to achieve improved operation of those facilities, and (3) insuring that O&M considerations are adequately integrated into municipal permits.

We believe that if this policy is implemented and if EPA and the States implement appropriate monitoring and enforcement actions, the permit program could be an effective tool for helping municipal waste treatment plants to achieve optimum operation and maintenance levels. During our review, however, we noted certain problem areas concerning permit self-monitoring requirements and the incorporation of O&M considerations into permit conditions which may hinder the effective utilization of the permit program for improving the operational efficiency of treatment plants.

Self-monitoring

Periodic self-monitoring by municipalities provides basic data on a waste treatment plant's operational efficiency and compliance with effluent requirements. EPA regulations require that except for minor discharges of less than 50,000 gallons a day, all dischargers which have been issued NPDES permits shall monitor their flow rates and pollutants as specified in their permits. Permittees are also required to record the monitoring results and to report them periodically to EPA and/or the States. These discharge monitoring reports enable EPA or the States to monitor a plant's compliance with the effluent limitations in the permit.

During our review we noted that noncompliance with self-monitoring reporting requirements and permit effluent limitations may be widespread. For example, our review of 28 municipal permits issued in the State of Washington which required discharge monitoring reports showed that 6 permittees had failed to submit monitoring reports, 9 had submitted incomplete monitoring reports, 3 had exceeded their effluent limitations, and 10 were in compliance with the reporting requirements and effluent limitations.

We also discussed this matter in our report to the Subcommittee on Investigations and Review, House Committee on Public Works and Transportation, titled "Implementing the National Water Pollution Control Permit Program: Progress and Problems" (RED-76-60, February 9, 1976). We reported that:

"For the 60 municipal permits we reviewed [in Regions III and V], 52 required submitting

discharge monitoring reports during our review. We found that 16 had exceeded their interim or final effluent limitations, 7 had submitted incomplete monitoring reports, and 20 had failed to submit monitoring reports. EPA or the States followed up in 11 cases and either contacted the permittee or determined no further action was necessary. The other 32 apparently were not contacted."

We also stated that region III had placed low priority on monitoring and enforcing effluent limitations, and for the most part took no action to follow up on the noncompliance.

The April 1976 EPA staff report on EPA and State programs relating to municipal waste treatment facilities also noted that "* * * violations of interim and statutory effluent limits are receiving limited enforcement response."

Integration of operation and maintenance considerations into permits

Because NPDES permits establish conditions which a municipality is required to comply with, the integration of O&M considerations into permits can be a major factor for inducing municipalities to achieve effective and efficient O&M of their waste treatment plants.

To obtain the maximum potential benefits of integrating O&M considerations into permits, we believe that such permit conditions should be tailored, to the extent practicable, to require correction of specific problems at the individual treatment plants. Problems could be determined on the basis of recent EPA and/or State inspections and other O&M data provided by municipalities.

EPA informed us that the 1972 amendments to the act and agency regulations provide authority to include in permits conditions necessary to assure compliance by the permittee with effluent limitations and other water quality standards. Such conditions may include reasonable staffing requirements which may specify the number of operators to be employed, their general qualifications, and their levels of training.

EPA has encouraged the States and EPA regional offices to include special O&M conditions in NPDES permits under certain circumstances. For example, an EPA program guidance memorandum dated May 7, 1974, suggested that certain treatment plants could attain optimum performance by being required to make minor plant modifications. Examples of such modifications included the replacement of existing

equipment with new equipment when it would improve operation, and modifications to the treatment process, such as provision for disinfection or the application of chemical coagulants and conditioners, to reduce pollutant discharges.

We examined permits for 15 of the waste treatment plants included in our review. Eight of the permits contained special conditions which addressed specific O&M problems. However, seven permits contained standardized permit conditions which were not tailored to a plant's problems. For example, EPA inspection reports indicated that a major municipal treatment plant in Pennsylvania had serious O&M problems including (1) understaffing, (2) lack of operator training, (3) no preventative maintenance program, and (4) inadequate laboratory testing. The permit for the plant contained only standardized conditions which were used in several other region III permits. An EPA region III official told us that permits issued in that region were not tailored to specific O&M problems but usually consisted only of standardized clauses.

An EPA report on a review of the quality of municipal permits as of June 1974 noted that in some regions certain O&M considerations recommended by EPA headquarters had not been incorporated into permits. A region VI official told us that the region's emphasis was on issuing all discharge permits before December 31, 1974, with the intent of going back later and revising them as needed. He stated that the region had neither the time nor the staff to inspect each plant to determine its specific requirements at the time the permits were issued.

The April 1976 EPA staff report on EPA and State programs relating to municipal waste treatment facilities stated that:

"Most permits examined by the study contained some type of O&M provision. Generally, permit requirements dealing with O&M were non-specific and seemed to be providing little impetus for [publicly owned waste treatment facilities] in achieving effluent limitations."

RECOMMENDATION

We recommend that the Administrator, EPA, instruct the regional offices and the States that whenever permits are to be issued or revised for waste treatment plants with major operation and maintenance problems, such permits should be appropriately tailored on the basis of actual operating data obtained from sources such as

inspection and discharge monitoring reports to help correct the problems.

Agency comments and our evaluation

EPA stated that although it recognized the importance of proper operation and maintenance, it did not believe that specific O&M requirements should be included in all municipal permits. EPA also stated that it would be difficult to develop a standard set of O&M practices because of the great variability between waste treatment plants and that even for a particular plant desirable O&M practices may cover a range of practices that vary with conditions rather than one fixed set of practices.

Our recommendation would apply only to waste treatment plants with major O&M problems and calls for tailoring the permits as needed to require correction of such problems. Since the O&M conditions in the permit would address specific problems at a particular plant, the development of a standard set of O&M practices would be unnecessary.

According to EPA, the failure of a waste treatment plant to comply with specific O&M requirements set forth in a permit would not present a compelling reason for enforcement in the absence of a violation of the permit's effluent limitations. However, if a permit's effluent limitations were violated, an enforcement remedy could include the requirement of specific O&M practices even if not required by the permit.

We believe incorporating specific O&M requirements in the permits of waste treatment plants with major O&M problems that are contributing to current poor performance, or are likely to lead to poor performance and violations of water quality requirements, would allow EPA and the States to require that such problems be corrected before equipment and process failures and major effluent violations occurred. Also, such O&M requirements would help protect the huge Government investment in these waste treatment plants.

EPA also commented that although permits presently contain general conditions requiring good overall operation and maintenance, there is some legal question as to the extent to which a permit may require specific management practices as opposed to effluent limitations.

We noted, however, that EPA General Counsel's opinions have held that EPA has the authority to impose appropriate

conditions which are reasonably related to assuring compliance with effluent limitations imposed upon municipal waste treatment plants.

For example, a decision dated June 27, 1975, concerned the authority of the EPA Administrator to impose a specific permit condition which provided that:

"There shall be at all times one qualified operator on the treatment site who is certified by the State of Maryland as a Class A Superintendent."

The EPA General Counsel ruled that the Federal Water Pollution Control Act, as amended, and EPA regulations authorize

"* * *operating conditions, including conditions on treatment plant personnel, which are found to be necessary to assure compliance with the cited conditions."

Another decision, dated January 13, 1977, concerned EPA's authority to require in a permit issued to a municipal waste treatment facility that the owner-operator of the facility promulgate and enforce an ordinance under which industrial users of the facility must pretreat wastes which, although susceptible to treatment at the facility, might not be sufficiently treated by the facility to achieve permit effluent limitations.

In this decision the EPA General Counsel ruled that the precise formulation of the permit condition was not authorized by the act and should be modified to provide the local governmental body the flexibility to seek nonlegislative means to attain effluent limitations through restrictions on users of the facility. He explained, however, that the permit might require that the municipality restrict discharges of pollutants by industrial users to the waste treatment facility, but should not restrict the municipality to carrying out this requirement through laws if alternatives are available.

EPA recommended that permits for treatment plants which have not yet attained the statutory treatment levels contain effluent limitations requiring proper operations and maintenance. EPA noted that in the past its permit program has incorporated such requirements to a limited extent and will do so more broadly in the future.

We agree that permit effluent limitations should be sufficiently stringent to require proper operation and maintenance. However, since such requirements have been

incorporated in permits only to a limited extent, many plants with major O&M problems and inadequate performance will be able to meet their effluent limitations until more stringent permit conditions are imposed. Furthermore, EPA's recommended approach would not require facilities with major O&M problems to take corrective action until their permit effluent limitations are violated.

Quality assurance program for waste treatment laboratories

Because of inadequate laboratory controls and testing, much of the data included in the discharge monitoring reports submitted by municipalities may be of questionable validity. As discussed in chapter 2, laboratory controls and/or testing procedures were inadequate at 11 of the 28 plants we reviewed, and EPA reported in its 1975 survey of plant operation and maintenance that inadequate laboratory testing presented a major difficulty in assessing the operational efficiency of treatment plants. During our review of certain plants in Georgia, a State official told us that less than 50 percent of the data received from municipal waste treatment plants was considered reliable.

EPA officials informed us that while they have no direct authority over waste treatment laboratories, they have tried to improve laboratory data through quality assurance activities. In February 1973 EPA introduced an implementation plan for an Agency-wide quality control program. The goals of the program are to improve and document the accuracy and validity of environmental monitoring measurements so that pollution abatement actions taken can be technically supported. EPA efforts to achieve these goals include encouraging the development of uniform State testing procedures through technical assistance programs; technical visits by regional staff; and issuance of guidance and technical manuals, such as EPA's "Methods Manual" and "Quality Control Manual."

EPA's fiscal year 1977 regional operating guidance recognizes the importance of adequate quality control in collecting environmental and compliance data. The document states that:

"Field and laboratory quality assurance activities are not to be considered as separate, optional, or over target items. Participation in the quality assurance program under Office of Research and Development * * * guidance is mandatory. Every region must have a documented quality assurance program. At the State level,

an approved quality assurance program is considered to be an essential condition for approving of the State water pollution control program grant."

EPA's Deputy Assistant Administrator for Monitoring and Technical Support told us that the quality assurance program is not adequate and has not been able to meet its goals. He said this situation exists because other program areas have traditionally received priority over quality assurance efforts.

An EPA contractor made a study to explore the feasibility of certifying environmental monitoring laboratories, including in-house waste treatment plant laboratories, as a means for assuring that the quality and reliability of data generated by them would meet minimum levels of acceptability. According to the contractor's final report, which was transmitted to EPA in May 1975, a certification program would be very influential in upgrading the quality and reliability of laboratory data. The report stated that an environmental monitoring laboratory certification program would benefit EPA by providing a mechanism that would reject data from laboratories which did not meet capability and performance standards.

According to EPA officials, EPA has not initiated a laboratory certification program because of the lack of legislative authority. They also cited the high costs of operating such a program. EPA officials believe that a voluntary program for certification would be the most positive way of promoting such a program.

Some States have initiated various types of laboratory certification programs. Data furnished to us by EPA officials showed that three States had mandatory certification programs for wastewater laboratories, six States had voluntary programs, eight other States were planning to establish certification programs, and one State had established a task force to study laboratory certification. However, the certification programs vary as to application. For example, of the three mandatory State programs, one applies to both commercial and noncommercial--including municipal treatment plant--wastewater laboratories, the second program applies to both commercial and noncommercial wastewater laboratories but does not include in-house laboratories of municipal waste treatment plants, and the third program applies only to commercial laboratories.

EPA officials believe that a stronger quality assurance program is needed so that laboratory equipment is adequate

and properly calibrated, the laboratory personnel are competent, and the test data is reliable.

Agency comments

In commenting on our preliminary report, EPA confirmed that it has been concerned with the quality of data submitted by NPDES permittees. EPA stated that the certification of permittee laboratories or contract laboratories might help assure data quality. EPA also stated that it could recommend establishing at least a voluntary check sample quality assurance program, which is a less formal option whereby check samples would be submitted to permittees to directly measure their laboratories' ability to determine certain selected parameters.

Operation and maintenance inspections

O&M inspections are performed by States and/or EPA to determine whether waste treatment facilities are operated efficiently and effectively in accordance with plant design and in compliance with permit conditions.

EPA's guidelines on operation and maintenance of waste treatment facilities, dated August 1974, provided that (1) State water pollution control agencies shall conduct thorough inspections, at least annually, of facilities financed under the 1972 amendments, (2) EPA form 7500-5, "Report on Operation and Maintenance of Wastewater Treatment Plant," shall be used for recording the results of the inspections, and (3) copies of the inspection reports shall be furnished to the EPA regional office. The guidelines also specify that States should furnish EPA with copies of reports of other routine O&M inspections.

For projects financed before the 1972 amendments, EPA regulations required State agencies to inspect facilities constructed with Federal funds at least annually for the first 3 years after completion of construction and periodically thereafter.

EPA has required the use of form 7500-5 to report the results of grant compliance inspections by both EPA and State personnel and has urged that it be used whenever possible to report results of any other EPA inspections. Information on plant operations obtained from the form is used for various program support purposes, including the preparation of EPA's annual report to the Congress on efficiency of waste treatment facilities.

One of three States included in our review had not made the number of annual O&M inspections required by EPA and only one State regularly used the EPA form 7500-5 to document the results of O&M inspections. The other two States were using their own forms for recording the results of municipal treatment facility inspections, thereby precluding EPA from obtaining uniform O&M data needed for surveying the efficiency of waste treatment facilities. Also, the EPA regional offices differed in their policies on requiring State O&M inspections.

Our findings at each of the three EPA regions and States we reviewed are summarized in the following sections.

Region III

A region III (Philadelphia) official said all initial O&M inspections in region III were conducted jointly by EPA and State inspectors. Later O&M inspections were made simultaneously with inspections for permit compliance. EPA expected the States to insure the correction of deficiencies identified during O&M inspections. Region III made periodic inquiries to the States on the status of deficiencies, and EPA made followup inspections to insure progress on corrective measures.

Region III's goal was to visit each plant once every 3 years. A regional official informed us that EPA and State personnel jointly inspected about 70 of the approximately 1,340 municipal treatment plants in Pennsylvania during calendar year 1975.

The State of Pennsylvania also conducted periodic inspections of waste treatment plants. A State official informed us that the plants to be inspected were determined by the inspectors and the goal was to visit each plant quarterly; however, this goal had not been achieved. Plants with known problems were inspected more frequently than those without problems. The State's records did not show the actual number of municipal treatment plants inspected, but indicated that during 1974 the State made 3,006 inspections of sewage facilities. As of January 1975 there were 3,236 sewage treatment facilities in Pennsylvania, including 1,342 municipal treatment plants.

State inspections included a review of plant-operating records and an inspection of plant treatment processes. The results of the State inspections were recorded on a one-page State inspection report which was less detailed and did not cover all O&M aspects called for by EPA inspection form 7500-5.

In commenting on a draft of this report, the Director of the State's Bureau of Water Quality Management informed us by letter dated December 1, 1976, that in order to maximize the benefit of each inspection the Bureau was planning to reduce or eliminate inspections of waste treatment plants which had a history of good performance or where violations could only be corrected by additional construction.

A region III official said there was no mandatory O&M reporting requirement for State inspections and the regional office received notification from the States only on major bypasses of the treatment plant by wastewater, oil spills, and fish kill incidents. He said the regional office was working with the States on devising an acceptable inspection report form which EPA and the States could use.

Region VI

The region VI (Dallas) inspection program called for each State to perform annual inspections of all municipal treatment plants in the State. The States were required to prepare an EPA form 7500-5 on the results of each inspection and to furnish copies to EPA.

According to an EPA region VI official, EPA inspectors made 349 O&M inspections during fiscal year 1975. Region VI officials said that all inspection reports (EPA form 7500-5) submitted by State inspectors were reviewed to identify significant problems and the State inspectors were contacted for information if any questions arose.

EPA files contained reports on 75 State inspections of mechanical municipal treatment plants in Louisiana during 1974. A Louisiana official informed us that, as of April 1, 1975, there were 270 mechanical plants in the State. The State official said that all municipal treatment plants would be inspected in 1975 because sanitarians were making the plant inspections with State engineers evaluating the reports. According to an EPA official, O&M inspections were made at almost all municipal waste treatment plants during fiscal year 1975.

Region X

Starting in calendar year 1975, region X (Seattle) required States to make an O&M inspection of a federally funded municipal treatment plan about a year after the plant began operating. A region X official said that the States had the responsibility for establishing their own inspection programs after the first inspection. Before 1975 the States

had been required to make three annual inspections after completing a project.

The region X official informed us that he made some joint inspections with State inspectors whenever he had time available.

Region X requested the State of Washington to perform 45 inspections during calendar year 1974. The State did not provide documentation to EPA showing that any of the requested 45 inspections had been performed. The other 3 States in region X performed annual inspections at 20 of the 73 facilities which the region had requested them to inspect.

Washington State inspection personnel told us they inspected about 70 percent of the treatment plants in 1974 but these inspections were usually documented in only one of the State's four regions. As of December 31, 1975, Washington had identified 297 municipal treatment facilities in the State.

Washington uses EPA form 7500-5 only to document the first operation and maintenance inspection of a newly completed municipal waste treatment facility constructed with Federal funds. A State official informed us that the EPA inspection form was not normally used because it was considered cumbersome.

In December 1974 the State of Washington informed region X that as part of its water quality compliance assurance program, it would make detailed annual onsite inspections of 23 designated municipal dischargers in the State. A "walk-through" inspection would be made of all other municipal dischargers at least once every 2 years. The State was to use its own reporting forms which were to be placed in the State discharger file for access and copying when desired by region X.

In 1975 Washington submitted to region X seven EPA forms 7500-5 on O&M inspections of newly constructed waste treatment facilities. On December 20, 1976, a State official informed us that 32 O&M inspections (using EPA form 7500-5) had been performed in calendar year 1976.

In a February 10, 1976, letter to region X, Washington agreed to perform O&M inspections on newly completed federally funded waste treatment facilities and to use EPA form 7500-5 to record the inspection results. Washington acknowledged that a backlog of inspections had accumulated over the past several years and stated that for facilities

completed during 1976 it would perform the O&M inspection at the same time the EPA regional office performed the final construction inspection of the facility. Washington also stated that by this means, design and construction errors could be found in time to have them corrected before the close of the contract.

Since the EPA regional office requires the States to make only one O&M inspection of a newly constructed waste treatment plant about a year after it is placed in operation, we believe that the purpose of the inspection would be better served if it were made after EPA's final inspection.

EPA expects that in making a final inspection the Federal inspector will be accompanied by an official of the State agency.

If a final inspection is performed in accordance with EPA standards, it should routinely disclose design and construction errors which could result in O&M problems. Therefore, there would be no additional benefit to performing the required State O&M inspection concurrently with the final inspection.

In a letter to us dated December 20, 1976, the head of the State of Washington's Water Quality Management Section stated:

--Few O&M inspections were performed in the State during calendar years 1974 and 1975 because the staff was heavily committed to writing and issuing NPDES permits to the detriment of other programs. The O&M inspections for these years are expected to be completed by June 1977.

--During fiscal year 1976, 339 reconnaissance inspections, which take about one-third to one-half a day, were performed at municipal waste treatment plants in the State; staff of all four regional offices customarily complete a one-page municipal inspection form on the results of each inspection.

--In addition, 36 sampling inspections, which cover all aspects of a permittee's compliance and operation, were completed during fiscal year 1976, including one at each designated major municipal discharger.

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Periodic inspections are essential for identifying operation and maintenance problems. Also, uniform reporting of the inspections' results is needed to provide EPA information on plant operations for program support purposes. We believe there is a need for EPA to emphasize to the regional offices and the States the importance of conducting regularly scheduled O&M inspections at municipal waste treatment facilities, for recording the results of such inspection on EPA form 7500-5, and for furnishing copies of the completed reports to the EPA regions.

RECOMMENDATION

We recommend that the Administrator, EPA, require the States to conduct regularly scheduled operation and maintenance inspections at municipal waste treatment plants in accordance with EPA guidelines, and to document the results of these inspections on the standard EPA form.

Agency comments

In commenting on our draft report, EPA fully agreed with the need for periodic inspection and uniform reporting, and stated that our recommendation was consistent with the Agency's goals and present activities.

Technical assistance

Technical assistance that EPA and States provide to municipalities is intended to help municipalities identify and solve operation and maintenance problems which cause inefficient treatment plant performance, and to train State and local personnel in procedures to improve plant performance. The results of technical assistance may lead to EPA and State recommendations for facility modification, replacement of obsolete equipment, and additional laboratory facilities and control tests, operating personnel, and/or operating training.

EPA has encouraged the regional offices to develop the capability to provide indepth, onsite technical assistance to selected facilities. A goal of the technical assistance program is to encourage State agencies and municipalities to develop in-house capabilities or to solicit and use other sources of technical assistance. Technical assistance efforts are to be documented and the improvements achievable through better O&M are to be widely publicized. In its 1975-76 Clean Water Report to the Congress, EPA stated that the technical assistance program was an essential element of the strategy to improve operational efficiency of treatment

plants and was receiving increasing emphasis. EPA also pointed out in the report that it could not provide all necessary technical assistance, and therefore intended to guide and help the States in developing their own programs.

The implementation of the technical assistance program has varied among the EPA regions. The EPA construction grants review group stated in its November 30, 1974, report that 7 of the 10 regional offices had less than effective technical assistance programs. A later EPA program summary report on regional (EPA and States within the regions) activities indicated that technical assistance demonstrations 1/ at major municipal permittees had not been planned by 2 of the 10 regions and had not been conducted in 3 regions as of March 31, 1976.

Data relating to the technical assistance demonstrations conducted in the 3 regions we reviewed and in all 10 regions, as shown in the March 31, 1976, EPA report, are summarized in the following table.

	Region <u>III</u>	Region <u>VI</u>	Region <u>X</u>	Total, all 10 <u>regions</u>
Number of technical assistance demonstrations at major municipal permittees:				
Goal to June 30, 1976	30	109	1	256
Conducted to Mar. 31, 1976	-	46	14	141
Number of major municipal permittees at Mar. 31, 1976	389	364	155	4,423
Percent of technical assistance demonstrations conducted to number of major municipal permittees	-	13	9	3

A region III official informed us that the region lacked the staff needed to provide technical assistance but, from

1/Technical assistance demonstrations include visits of 2 or more days to municipal treatment facilities to demonstrate methods, techniques, and procedures for identifying and correcting deficiencies in plant operation to improve the overall performance and efficiency of the facility.

time to time, the EPA research center in Cincinnati, Ohio, had provided technical assistance to municipal treatment plants with problems. Region VI officials said that the region first developed a technical assistance program in fiscal year 1975, but the region was not adequately staffed to provide all the technical assistance needed to strengthen the O&M program.

In region X, technical assistance was only one of the responsibilities of the one-man O&M staff. He informed us that although the region responded to requests for technical assistance, the availability of the assistance was not being publicized because of the manpower shortage. He estimated that he spent about one-third of a man-year on the technical assistance function but that 2 man-years were needed. He said that he required State personnel to accompany him on technical assistance visits to train them and make them aware of the benefits of technical assistance.

None of the three States we reviewed had a formal technical assistance program. Officials of the three States indicated that inspectors had provided some technical assistance to operators during their routine plant inspections but were not able to provide it on request.

EPA has reported examples of plants which have achieved major improvements in pollution abatement and otherwise improved plant processes as a result of technical assistance. An EPA official stated in October 1975 that:

"The examples [of technical assistance] presented clearly illustrate that actions can be taken at many treatment facilities that will result in significant improvements in operational efficiencies without major investments in capital construction. The operational expertise needed to resolve the problems that exist now and will continue to exist in the future must be developed and made available to the municipalities in an effective manner. Both State agencies and the private sector must assume a more responsible role in satisfying this need."

In the fiscal year 1977 regional operating guidance, dated February 18, 1976, the EPA Deputy Administrator stated

"EPA Regions and States must * * * begin to document and resolve operating problems at existing plants. This can be achieved through a high level of technical assistance and O&M inspection activity in coordination with Regional/State NPDES permit and enforcement strategies."

Conclusion

EPA has demonstrated that the technical assistance program has the potential for helping to identify, evaluate, and solve complex operational problems at municipal treatment plants. In view of the large number of treatment plants which are experiencing O&M problems, the program can be an essential factor in protecting the huge Federal investment in the plants and in helping to achieve the water quality goals of the 1972 amendments.

Agency comments and our evaluation

In commenting on our preliminary report, EPA stated that a study conducted in March 1976 showed that the municipal compliance problem was much greater than originally believed. Consequently, it was decided that EPA and the States lack the resources to address all technical assistance problems. EPA believes that (1) it must stimulate development of the private sector to substantially meet this demand and (2) focusing on aggressive enforcement of municipal permits and insisting that municipalities seek the necessary technical and training assistance should induce the private sector to develop the needed capability. EPA stated also that until the private sector develops this capability, EPA and States should continue to offer some technical assistance.

Because of the overriding need to protect the Federal investment in municipal waste treatment plants and to meet water quality goals, we believe that technical assistance should be available to a municipality when it seeks assistance in solving complex operational problems at a waste treatment plant. Until such time as the private sector develops sufficient capability to provide effective technical assistance, EPA and the States should maintain the capability to provide these services.

RECOMMENDATION

We recommend that the Administrator, EPA, require all regions and encourage the States to maintain an adequate technical assistance capability.

Training of treatment plant operators

An adequate number of properly trained waste treatment plant operators is crucial to achieve efficient operation of municipal treatment facilities and to meet the goals of the 1972 amendments. As noted previously, EPA has estimated that by July 1977 there would be a shortage

of 5,000 municipal treatment plant-operating personnel and a need for the annual recruitment and training of 10,000 new personnel as well as the annual upgrading and updating of about 38,000 workers.

EPA's goal has been to develop the capability at the State and local levels for providing treatment plant operator training.

EPA reported that it awarded \$1.1 million in grants during fiscal year 1975 to States and training institutions to support training of treatment plant operators. EPA also awards grants under the 1972 amendments to State and interstate water pollution control agencies for establishing and maintaining adequate programs for prevention and control of water pollution, including training of public agency personnel.

EPA is also authorized by the 1972 amendments to provide technical training relating to the prevention, reduction, and elimination of water pollution for personnel of public agencies. EPA's National Training Center in Cincinnati, Ohio, has primary responsibility for all EPA direct technical training activities. To help implement EPA's goal of developing individual State self-sufficiency for training treatment plant personnel, the Center produces and distributes instructional materials to State agencies and training institutions and conducts instructor training courses. EPA reported that in 1975, 117 persons from 24 States attended 8 one-week EPA instructor development courses and that about three-fourths of the students were trained in the area of wastewater treatment.

EPA is also authorized by the 1972 amendments to pay 100 percent of the cost, not exceeding \$250,000, for providing a training center at a waste treatment facility in a State to train and upgrade waste treatment works operation and maintenance personnel. As of February 1976, EPA had approved three of eight State applications for the construction of training facilities. Four other States either had constructed or were constructing training facilities with State funds.

Although some training of waste treatment plant operators was being provided in all three States we reviewed, only two of the States had formal training programs. However, the States had experienced problems in delivering training to all operators. Operating personnel in remote areas often were unable to attend courses because of long commuting distances and because some of the smaller communities were unable to pay for training courses or for the travel and lodging expenses involved.

One of three States we reviewed was providing 11-week courses on basic waste treatment plant operations, 2-day courses on basic laboratory testing procedures, and 1-day training on fecal coliform testing. The State also had received a \$20,000 EPA grant to finance on-the-job site treatment plant operator training. Training sessions of 1 or 2 days would be held at about 150 small isolated treatment plants.

Another State was conducting three types of training courses for treatment plant operators. Two courses covered basic subject matter and were intended for operators of smaller plants. The third course included sampling and laboratory procedures and report writing, and was designed for staff functions at larger plants. The courses were offered at 30 sites in the more populous counties. The State tried to establish courses in some of the more remote locations but did not because of low registration and drop-outs stemming from long commuting distances and inclement weather. The State also offered correspondence courses but enrollments were low and the dropout rate was high.

The third State had no formal training program at the time of our review. The State had about \$25,000 in EPA grants earmarked for training activities in fiscal year 1975, and \$12,000 for hiring a training officer. However, as of March 1975 the State had not met any of its training commitments and had not hired a training officer. A State official told us that training courses were offered at five locations in the State to prepare treatment plant operators to take the State certification test.

EPA's 1975 survey indicated that operations and other plant personnel at 26 percent of the surveyed plants did not routinely attend short courses, school, or other training. Our analysis of the inspection reports on 100 waste treatment plants indicated that personnel training deficiencies existed at 41 of the plants.

EPA's 1975-76 Clean Water Report cited the need for improved training as one of the problems meriting special attention. The report stated that

"New and improved training delivery systems must be provided; and State and municipal agencies must be encouraged to ensure that more personnel are given training opportunities."

Operator certification

Certification programs for operators of waste treatment plants have been established by States to help insure the

efficient operation and maintenance of treatment facilities. As of March 1, 1976, 40 States had mandatory operator certification programs and 10 had voluntary programs. However, according to EPA officials, State certification programs have been developed independently of one another and have resulted in diverse classifications of facilities and operator requirements.

EPA officials stated that the Agency has no legal authority to require certification of treatment plant operators. EPA, however, has supported the development of uniform certification programs through the Association of Boards of Certification for Operating Personnel in Water and Wastewater Utilities and by encouraging the establishment of mandatory programs by the States.

In a May 1975 memorandum to regional administrators, the EPA Deputy Assistant Administrator, Office of Water Program Operations, noted that many States were unable or unwilling to revise or enact new legislation to conform to uniform certification guidance and to effectively enforce current certification programs.

The three States covered by our review had mandatory operator certification programs with certification levels related to the size and complexity of the plant. The three States permitted certain operators to become certified under a grandfather clause without an examination. The clause applied to those individuals who had been employed as waste treatment plant operators as of a certain date. Also, two of the three States provided for granting a 2-year temporary certificate to an uncertified operator who was hired by a treatment plant to fill a position requiring a certified operator. The new operator must meet the State's regular certification requirements by the expiration date of the temporary certificate.

The operator certification requirements varied in the three States. Pennsylvania and Washington established minimum experience and/or education requirements, in addition to passing an examination, for each level of operator certification. However, Louisiana had not adopted any education or skill requirements but did require operators to complete a training course before taking the examination for operator certification. A Louisiana State official informed us by letter dated November 17, 1976, that the State had adopted education, experience, and skills requirements for waste treatment works operators on December 20, 1975.

Washington required certification of the person responsible for the operation of a treatment plant as well as each person in charge of a shift, if a plant operated more than one shift. Pennsylvania required each plant to employ one certified operator and to have a standby certified operator available. Louisiana required each treatment plant serving 500 or more persons to have one certified operator. A Pennsylvania official said the State's certification program had the potential for providing the following benefits:

- Assurance of operators' qualifications since a set of standards had to be met.
- Emphasis on quality of performance due to the possibility of revocation or suspension of the certificate.
- Increases in operators' salaries and job security.
- Supplying operators with more leverage and bargaining power for obtaining needed treatment plant funding and equipment.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JAN 12 1977

Mr. Henry Eschwege, Director
Community and Economic Development Division
United States General Accounting Office
Washington, D. C. 20548

OFFICE OF
PLANNING AND MANAGEMENT

Dear Mr. Eschwege:

We have reviewed your draft report on operation and maintenance of municipal waste treatment plants. Our comments are as follows:

National Pollutant Discharge Elimination System (NPDES) Permits

You recommend that operation and maintenance (O&M) performance requirements should be tailored for individual publicly owned treatment works (POTWs) and that these requirements should then be clearly described and incorporated into the NPDES permit.

We recognize the importance of proper operation and maintenance. We do not believe, however, your suggestion that specific operation and maintenance requirements be included in all municipal permits is desirable. The Federal Water Pollution Control Act requires that permits regulate pollution sources through the imposition of effluent limitations. For municipal discharges the Act requires that such effluent limitations reflect secondary treatment or such more stringent requirements as may be necessary to meet water standards. If specific operation and maintenance requirements were set forth in a permit, the failure to comply with those requirements would not present a compelling case for enforcement in the absence of a violation of the permit's effluent limitations. On the other hand, if a permit's effluent limitations are violated, an enforcement remedy can be fashioned to require specific operation and maintenance practices, even in the absence of such practices in the permit. Moreover, the development of a standard set of operation and maintenance practices would be extremely difficult because of the great variability in the types, sizes, and age of municipal treatment plants. Even for a particular treatment plant desirable operation and maintenance practices may cover a range of possible practices that vary with conditions rather than one fixed set of practices. Finally, although permits presently contain general conditions requiring good overall operation and maintenance, there is some legal question on the extent to which a permit may require specific management practices as opposed to effluent limitations. For all these reasons, it does not appear desirable or feasible to impose specific operation and maintenance requirements in permits beyond the general condition now imposed.

We do recommend that NPDES permits to municipal treatment plants which have not yet attained the statutory treatment levels contain effluent limitations requiring proper operation and maintenance. The Permit Program has incorporated such requirements in the past to a limited extent and will do so more broadly in the future. We will also continue rigorous monitoring and enforcement of effluent limitation violations resulting from deficient operation and maintenance.

Quality Assurance Program for Waste Treatment Laboratories

The quality of the data submitted by NPDES permittees in discharge monitoring reports (DMRs) has been a concern to us. Inadequate laboratory quality assurance prevents confident evaluation of DMR data. A quality assurance program for permittees would be separate from the mandatory quality assurance program discussed in the report for each Region, since the only mandatory program currently possible is of an internal EPA program for Regional laboratories.

Certification of permittee laboratories or contract laboratories may be an attractive means for assuring data quality. A less formal option is that of submitting voluntary check samples to permittees in order to directly measure the ability of their laboratories to determine certain selected parameters. This check sample program could be comprehensive or extremely selective depending upon the available resources, but it could be implemented sooner than a certification program. The report issued no recommendations concerning quality assurance, but we could recommend establishing at least a voluntary check sample quality assurance program.

Operation and Maintenance Inspections

We fully agree that periodic inspections are necessary to surface operation and maintenance problems and that uniform reporting of the inspection results will provide essential information on plant operations. It would also increase the information available for the development of permit effluent limitations based on good O&M practices. The Office of Water Enforcement in conjunction with the Office of Water Program Operations has already independently taken steps in the directions recommended by the report. The O&M and nonsampling NPDES compliance inspections have been combined into Compliance Evaluation Inspections to conserve resources and to assure detailed periodic inspections of major municipal facilities. EPA inspection form 7500-5 has been consolidated and revised with the compliance inspection checklists to generate an interim form, T-51, to use on the Compliance Evaluation Inspection. The revised program guidance calls for the completion of all appropriate sections of the form before credit is given to a State or Region for a completed inspection. A permanent form will be developed by a contract initiated in the Office of Water Program Operations.

The Compliance Evaluation Inspection Report fully documents NPDES compliance and O&M results. The GAO report recommends that EPA require the States to regularly inspect the operation and maintenance of municipal waste treatment plants and to document the inspection results on a standard EPA form. This recommendation is consistent with our goals and activities at present.

Training and Technical Assistance

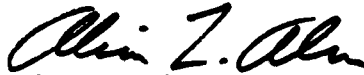
The Municipal Compliance Study of four regions that was conducted in March revealed that the magnitude of the municipal compliance problem was much greater than originally believed. As a result of this study and subsequent national meetings, it was decided that EPA and the States do not have the resources to address all the technical assistance problems. EPA must stimulate development of the private sector to substantially meet this demand. Focusing on aggressive enforcement of municipal permits and insisting that municipalities seek the necessary technical and training assistance should induce the private sector to develop the needed capability. Until the private sector develops, EPA and the States should continue to offer some assistance.

Technical assistance is but one option for achieving permit compliance. Any technical and training assistance provided by EPA should not preclude the use of more demanding regulatory options. To gain the maximum benefit from resources expended, EPA assistance efforts should be directed toward training and away from site-specific technical assistance. These redirected efforts would minimize the possibility of compromising the enforcement position of the Agency.

Overall, we feel that the draft report correctly emphasizes the observed lack of improvement nationally in municipal wastewater treatment plant performance over the past 6 years. The report correctly attributes much of this continuing performance problem to the low priority assigned to O&M related activities by all levels of government and the private sector. We believe that stringent enforcement by the EPA and States of NPDES permit requirements, plus an increased emphasis nationally on municipal treatment plant O&M considerations will be required in order to achieve performance and reliability objectives of municipal wastewater treatment plants.

I understand that detailed EPA comments were discussed with members of your staff on November 24th and many of those comments will be incorporated in your final report.

Sincerely yours,



Alvin L. Alm
Assistant Administrator
for Planning and Management

FOLLOWUP REVIEW OF 11 WASTE TREATMENT PLANTS

During our 1969 review we selected two plants in each of six States which appeared to have serious operation and maintenance problems. We also included 11 of the 12 plants in our 1975 followup review--1 of the 12 plants had since been closed. A discussion follows of our principal findings relating to both our 1969 review and 1975 followup review at each of the 11 plants.

PLANT 1

This 0.6-million-gallons a day facility consists of a primary treatment plant and a 20-acre stabilization pond for secondary treatment. The plant had an average daily flow of about 1 million gallons. We noted the following problems at the plant during our 1969 review:

- Inadequate staffing.
- Operating records not being maintained.
- Laboratory tests not being performed.
- Severe overloading resulting in poor removal of solids.
- Slaughterhouse wastes in the plant's influent.
- Plant flooding problems during periods of heavy rainfall.
- Digester gas burner not working.

During our followup visit to the plant in April 1975, municipal officials told us that:

- The only major change made in the plant since our 1969 visit was the installation of a chlorination unit in 1972.
- The city was contracting for monthly laboratory tests of biochemical oxygen demand, dissolved oxygen, and suspended solids. (However, a State official informed us that the facility's monthly operating reports showed only BOD data which he considered to be unreliable.)
- The plant now had a full-time operator, in addition to a part-time superintendent and laborers on call, as needed, from the city work force.

--Sewer charges had been increased recently and the plant's operating budget was considered adequate for daily operating needs but did not provide for major maintenance items.

--Because of the poor financial condition of the city and many of its residents, it was impracticable to further increase the plant's budget.

The plant superintendent and the operator considered the plant's major operating problem to be infiltration into the sewer lines which were deteriorating because of their long service. The plant operator said that flooding had occurred only once during recent years.

The city had a sewer use ordinance requiring pretreatment of industrial wastes, but it was not enforced. The plant was still receiving slaughterhouse wastes which were impeding its operation.

We also found that (1) the digester gas burner that was inoperable in 1969 was still inoperable, (2) the anaerobic digester did not appear to be functioning, (3) the sludge-drying beds were overgrown with weeds and did not appear to have been used recently, and (4) the effluent flowed out from the stabilization pond at a very high rate because the outfall unit lacked a weir.

The EPA inspector who accompanied us rated the plant "unacceptable" and, on the basis of his O&M inspection report, the State water pollution control agency instructed the municipality to:

--Restore the anaerobic digester and the sludge-drying beds to full operating condition.

--Install a V-notch weir at the effluent structure at the appropriate overflow level.

--Make arrangements for laboratory testing of fecal coliform, suspended solids (influent and effluent) and pH, and for submitting the test results each month to the agency.

--Enforce its sewer use ordinance to insure adequate pretreatment for blood and grease removal from slaughterhouse operations.

- Make plans for (1) upgrading the facility (or constructing a new one), (2) studying infiltration/inflow, and (3) upgrading the operator's training.

The City Manager advised us by letter dated November 17, 1976, that the waste treatment plant had not been upgraded because the municipality was not able to obtain an offer of Federal grant assistance until September 1976. The municipality estimated that, because of the requirements of the construction grants program, the construction or upgrading of the plant would not be completed within the next 3 years.

PLANT 2

This secondary treatment plant had an estimated flow of about 1 million gallons a day in 1969 and 0.6 million gallons a day in 1975.

We noted the following problems during our 1969 review:

- Lack of qualified operators.
- Lack of operating records.
- No laboratory tests being performed.
- No chlorination facilities.
- Sewage bypassing treatment due to an improperly seated gate valve and other operating problems.
- Slaughterhouse wastes entering plant's influent.
- Inadequate operating budget.

Since our visit to this plant in 1969, a new plant has been constructed in another location of the city which has helped to reduce some of the load from the older plant.

A city official told us during our 1975 followup visit that all the operating problems reported in 1969-70 had been corrected and financed from the city's operating budget.

During our 1969 visit the plant had no operator, but the city's superintendent of water and sewage operations said he devoted about 15 hours a week to the plant. According to the superintendent, in April 1975 the sewer system had seven employees, including two certified plant operators, and about 80 hours a week were devoted to the older plant. The operators said that the plant had sufficient staff and that the budget was adequate.

Our 1969 review indicated that one of three primary clarifiers was not functioning properly because an adequate flow was not reaching the third clarifier. During our April 1975 followup visit, the third clarifier was the only one that was operational. The plant superintendent said that the flow distribution problem had been corrected but the other two clarifiers were not working because the reduction gear was out of order. The needed parts were being manufactured because the gear was so old it was no longer available from commercial sources. The two clarifiers had not been operating for about 3 weeks at the time of our visit.

The plant superintendent said that industries no longer discharged into the municipal system; however, our inspection of the headworks (the point at which the influent enters the plant) showed that the influent had a very bright red color. The plant operators were unable to explain the source of the red influent. The EPA inspector who accompanied us believed it was caused by a red textile dye and recommended in his inspection report that the city enforce its city's sewer use ordinance.

The problems of sewage bypassing treatment and ponding of the trickling filter unit, noted during our 1969 review, had been corrected. Also, a chlorination unit had been installed since 1970. However, the ventilating fan in the chlorine room was located near the ceiling. According to the EPA inspector, the fan should be near the floor because chlorine is heavier than air.

The plant had no alternate power source to keep it running if the primary power source failed. Also, it did not have an adequate alarm system for power or equipment failures.

As was the case in 1969, the plant personnel were not maintaining operating records and laboratory testing was not being performed. Consequently, the municipality was unable to comply with the State's requirement for the monthly submission of operating reports.

PLANT 3

This 1.8 million gallons a day secondary treatment plant was placed in operation in September 1966. During our 1969 visit we noted the following operation and maintenance problems:

- Lack of a qualified operator.
- Industrial wastes lessened plant effectiveness.

--Infiltration resulted in hydraulic overloading and sewage bypassing the treatment plant.

--Laboratory tests were not being performed.

Our 1975 followup review showed that the plant continued to have the same industrial waste and infiltration problems it had in 1969. However, an operator had been hired; laboratory testing, except for fecal coliform, was being performed; and operating records were being maintained.

A State inspection report, dated January 25, 1974, noted that (1) because of the hydraulic overloading raw sewage bypassed the plant during daily peak dry weather flows as well as during wet weather, (2) industrial wastes--slaughterhouse wastes, plating acids, and printing ink--were a continuous problem, and (3) the effluent was fairly high in suspended solids.

State and treatment plant officials informed us that the plant had been improved since 1969. These improvements included installation of a new comminutor, flow-watcher, new drags and flights in three primary clarifiers, a new sludge recirculating pump, a gas recirculating system for the digester, and new diffusers and a new blower for the aeration tanks. There had also been some infiltration/inflow work done. As the first step in an infiltration/inflow study, the city identified houses with roof drains tied into the sewer system and required that they be disconnected. The plant was experimenting with the addition of "pickle liquor" (ferric chloride) to the influent to help improve settling of solids. This was also expected to reduce BOD levels.

The city was planning to expand the plant to 3.5-million-gallons a day capacity and add tertiary treatment, pending the award of an EPA construction grant.

The plant operator said that it was very difficult to get many kinds of spare parts. Sometimes there were delays of many months. He also said an additional man was needed because of NPDES requirements, particularly for laboratory work and industrial monitoring, and more training was needed.

The plant operator also told us that some parts of the plant were poorly designed for maintenance. He said it was difficult to get equipment out of the raw sewage pumping wet-well. Also, it was impossible to bypass the primary clarifiers except by bypassing the entire plant. The plant was bypassing about 250,000 gallons a day. Since there was no design method of chlorinating the bypass, the plant operator had positioned a barrel of bleach at a point to drip

into the flow of the bypass line. The operator believed this method provided sufficient chlorination, however, during the winter months it became inoperable due to freezing.

We observed that the bar screen was being bypassed which would probably result in accelerated wear on the comminutor. A number of piping changes had been made at the plant, but the piping was not repainted to meet the State's standardized color coding requirements.

The secondary clarifiers were bulking (solids were coming over the weirs) and there was considerable foam in the final chlorine contact chamber. The chamber was being cleaned only once a year; according to the State's field inspector this should be done every few months. Housekeeping was generally poor. Most of the buildings needed painting.

The treatment plant received an unacceptable rating in a State inspection performed in September 1975. The inspection report noted that major problems were industrial wastes, which continued to upset treatment plant processes, and hydraulic and organic overloading.

The mayor of the municipality advised us by letter dated November 23, 1976, that upsets of treatment plant processes had been substantially reduced since the introduction of industrial surveillance. He stated that performing sufficient monitoring had created budgetary pressures, but new ordinances and rate increases should help implement a waste-policing system.

PLANT 4

This secondary treatment plant with an average daily flow of 18 million gallons was placed in operation in 1967. The plant receives wastewater through a combined sewer system.

We noted the following problems at this plant during our 1969 visit:

- Several required laboratory tests were not being made at recommended frequency.
- Industrial waste entering the plant's influent was causing operating difficulties.

The plant received a Federal grant from 1974 funds for sludge-handling equipment and advanced waste treatment. Construction was started in February 1975.

Plant officials told us during our 1975 followup visit that industrial waste was no longer a problem. However, no industrial waste monitoring was being performed. During our plant inspection we observed various slugs of industrial waste in the plant's influent.

The plant was experiencing severe sludge-handling problems which were causing plant upsets according to the plant superintendent. The State water pollution control agency in a letter to the city on the results of our examination stated that the slugs of industrial waste might be contributing to (1) the shock loading at the plant along with poor sludge digestion and (2) a sludge quality unacceptable for land application.

During wet weather flow the plant bypassed raw sewage to the receiving stream. This was partly unnecessary because the plant operator began bypassing prior to achieving the plant's maximum hydraulic capacity.

The plant was having excessive infiltration/inflow problems partly because downspouts and catch basins were connected to the sewer system. The city was performing a study to determine the extent of the infiltration/inflow within the sewer system.

The State inspector who accompanied us reported also that chlorination was inadequate; overall housekeeping and maintenance was in need of improvement, and laboratory testing had not been meeting requirements under the plant's NPDES permit. He told us that although the plant had a sufficient number of personnel, it needed a qualified maintenance supervisor.

In a March 1976 inspection a State inspector rated the plant as unacceptable and reported major problems stemming from industrial wastes, failure of treatment processes, inadequate equipment maintenance, and periodic hydraulic overloading.

PLANT 5

This secondary treatment plant, constructed in 1939 and expanded with Federal funds in 1965 and 1973, has an average daily flow of about 1.25 million gallons.

During our 1969 visit to this plant we observed that the plant was having major operational difficulties because of industrial wastes, primarily from a tannery. The receiving stream was covered with 4 to 6 inches of foam and the effluent was red in color and changed to black downstream. Also, records of laboratory tests were not maintained.

During our 1975 followup visit we found that the tannery waste problem was still present. Municipal officials said they were reluctant to take enforcement action because of their concern with the further loss in employment if the tannery were to close down--two of the municipality's three major plants had recently discontinued operations.

The municipal officials agreed that the operating budget was inadequate to properly operate and maintain the plant. They said the city council was unwilling to raise the sewer charges, partly because of poor local economic conditions. According to the officials, funds from revenue sharing were used to supplement the sewer charges for financing the plant operation and maintenance.

The municipal officials also told us they had a major infiltration problem which forced the plant to bypass sewage periodically. An August 1974 joint EPA-State inspection report noted that the infiltration occurred during periods of heavy rainfall, bypassing frequency averaged about twice monthly, and the average duration of a bypass was 24 hours.

A number of improvements had been made at the plant since our 1969 visit, but many items of equipment were either out of operation or not functioning properly. For example:

- A primary clarifier weir needed to be leveled.
- The main flow meter was not working so that the exact flow through the plant was not known.
- An aerator pump was not operational.
- The scum removal arm on the primary clarifier needed to be adjusted so that scum would go into the scum box.
- The digester volume gauge needed to be repaired.
- A sludge thickener unit was not operating because a pump was inoperative. Therefore, sludge could not be readily removed from the secondary clarifier and an excessive quantity of suspended solids was entering the final effluent.
- The laboratory incubator which was necessary for BOD testing had been inoperable since about the summer of 1974 but the repair parts still had not been ordered.

We observed that there were no guardrails around the treatment tanks and various pieces of machinery. The plant's consulting engineer acknowledged the lack of protective

railings as an oversight. We also noticed that several pumps located about 40 feet below grade would be difficult if not impossible to remove without disassembling them because of a concrete opening which was undersized for the diameter of the pumps.

The plant was not making all the laboratory tests required by the NPDES permit. The operating records showed that pH and residual chlorine were being recorded daily. However, no data was shown for suspended solids, BOD, or fecal coliform.

In a report on the results of an August 1975 technical assistance study of the waste treatment plant's operation and maintenance problems, the EPA regional office recommended that the tannery be required to cease the discharge of chromium into the plant and that pre-aeration of the tannery waste be provided to satisfy an immediate oxygen demand and prevent septic conditions. EPA commented that until these measures were taken the plant would be unable to function properly regardless of the operation and maintenance efforts expended. The report also recommended correction of the plant's mechanical problems, improvements in laboratory procedures, and maintenance of a spare parts inventory.

In a followup letter to the city dated May 19, 1976, the regional office noted that many of plant's problems had not been corrected. The letter cited the lack of adequate laboratory testing and lack of or inadequate pretreatment of the tannery waste as the most notable outstanding problems.

The city's mayor informed the regional office by letter dated June 14, 1976, that the tannery was developing pretreatment facilities which were expected to be in full operation within 2 years. The mayor stated that the required laboratory tests were being made with the exception of BOD tests and fecal coliform tests for which the plant had no equipment. Repair parts had been obtained and installed in the incubator needed for BOD testing but the incubator still did not work properly and the factory had been unwilling to send a representative to the plant.

The mayor also cited some continuing mechanical problems which he indicated were caused by the unsatisfactory work of the contractor. The mayor said that the city had begun action to have the bonding company complete the work.

In a letter to us dated November 11, 1976, the mayor furnished information which indicated that a contractor had corrected certain mechanical problems. The mayor also stated that the city would shortly increase its sewer rates so that the system would be self-supporting.

PLANT 6

This plant, a 0.35 million gallons a day secondary treatment facility, was completed in 1966.

During 1969 the plant was in poor operating condition and apparently the city was not aware of what would be required to operate and maintain a sewage treatment plant. A State official said the major problem was staffing. No time was spent performing tests or maintaining records.

During our 1975 followup review a State official explained that the plant had two major problems, (1) an infiltration/inflow problem which hydraulically overloaded the plant and required bypassing of sewage during periods of rainfall and (2) because the plant had been badly neglected, many items of equipment were broken down and inoperable.

The State official said that an infiltration/inflow study had to be done; however, it would be at least 3-5 years before any Federal grant funds would be available to enable the city to take corrective action.

A plant operator had been hired about October 1974 to operate both the water supply and wastewater systems. However, because the water supply system had more serious problems than the wastewater system, the plant operator said that he usually spent only about 2 hours a day at the plant. The EPA inspector, who accompanied us, believed a full-time plant operator was needed.

The plant operator had begun keeping detailed operating records but they were both inaccurate and incomplete. The records showed plant flow and the results of tests for settleable solids, residual chlorine, dissolved oxygen, and BOD. However, the daily flow was estimated because the flow meter was inoperable as it had been in 1969 and the BOD tests were inaccurate because the incubator had not been operable for at least 2 years. Suspended solids and fecal coliform tests were not being made because of a lack of equipment.

The State officials said that because of an inadequate operating budget, the plant could not afford to either purchase the needed equipment or to have a contractor perform the tests.

We observed that the primary clarifier was flooded because of the high flows and there was no growth on the trickling filter. The trickling filter needed to be painted

and the arms cleaned so that the flow could be distributed evenly over the filter.

The plant operator told us he had no preventive operation and maintenance program because it took all of his time just trying to get the existing equipment back into operation. The plant had no spare parts inventory.

The operator explained that there were several design problems which prevented him from properly operating the plant. One was that the communitor was supposed to be located in a wetwell which was frequently flooded. The communitor had been removed from the wetwell because it had not been operable for a number of years. It had been repaired, but because of the flooding the operator was unable to get down into the wetwell to install it. Another design problem prevented the chlorine contact chamber from being cleaned out because it could not be bypassed.

According to the State official, the city was exploring the possibility of pumping the city's wastewater to another municipality for treatment.

A joint EPA/State inspection in April 1976 showed no improvement in the operation or maintenance of the plant. The inspectors rated the plant as unacceptable and reported major deficiencies or problems in staffing, training, operating budget, laboratory controls, instrumentation, sludge handling and processing, equipment maintenance, and spare parts inventory. They commented in their report that (1) the plant was being improperly operated and maintained because of understaffing and (2) the city should allocate sufficient funds to enable proper plant operation and maintenance.

The mayor of the municipality advised us by letter dated November 29, 1976, that:

- A consulting engineering firm was making an infiltration/inflow study and had completed most of the field work.
- The incubator needed for making BOD tests was now operable.
- The primary clarifier was flooded only during periods of heavy rains.

PLANT 7

This tertiary treatment plant, with an average design flow of 1.5 million gallons a day, was placed in operation in 1967.

During our 1969 visit we noted the following problems:

- Several recommended laboratory tests were not being performed.
- Need for additional staff.
- Infiltration of the combined sewer system was causing an overload problem at the plant, reduced plant efficiency, and necessitated frequent discharging of raw sewage into the receiving stream during winter months.

Infiltration/inflow and hydraulic overloading were still problems in 1975. An engineering firm was conducting an infiltration/inflow study according to the plant superintendent and until the study was completed the cost of correcting the hydraulic overloading problem would not be known.

Staffing had been increased and preventative maintenance was being performed. The plant operator said the budget was adequate for operating the plant but did not make any provisions for major equipment breakdowns.

Laboratory tests were being made as required, except for fecal coliform--the necessary equipment for the fecal coliform tests had been ordered. Daily operating records were being maintained.

The plant operator said the design of the headworks, which put the comminutor before the grit chamber without a bar screen, had required him to perform more maintenance on the comminutors than should be necessary.

The plant had no alternate power supply and no alarm system for power or equipment failures. Also, the plant did not chlorinate sewage bypasses.

PLANT 8

This secondary treatment plant, with an average daily summer flow of about 0.39 million gallons a day, was placed in operation in 1966.

The facility consists of an activated sludge plant followed by a polishing lagoon, with the lagoon effluent being

discharged into a percolation pond. The mechanical plant is not operated during the winter months because of snow and low population. During these months sewage is routed directly to a lagoon. The State has determined, on the basis of the manner of plant effluent discharge, that an NPDES permit is not required.

During 1969, the plant had the following problems:

- Because a comminutor for grinding incoming sewage had not been provided when the plant was built, rags and stringy materials were causing ineffective operation of the sludge pumps. The pumps had to be cleaned several times daily to keep them operating.
- Sewage solids floated on top of the clarifier instead of settling to the bottom.
- Reports on laboratory test results were not prepared.

In May 1975, the plant operator told us that:

- Two comminutors were purchased in 1970 but were not installed until 1974 because of budgetary problems. The comminutors had eliminated the problem of the ineffective operation of the sludge pumps.
- The bulking problem we noted in 1969 had been resolved by the construction of a sludge-mixing device.
- Operating records were being maintained and laboratory tests were being made weekly for BOD and suspended solids during the summer months. Fecal coliform tests were not performed because of lack of equipment.
- He spent about 30 minutes a day at the plant during the winter months and 8-12 hours a day during the summer. Additional help was not needed to operate the plant but backup assistance was available.

In a June 1976 inspection, a State inspector reported that the treatment facilities appeared to be operating satisfactorily and the plant was well maintained.

PLANT 9

This plant, a lagoon, with an average daily flow of .144 million gallons was placed in operation in 1966.

In 1969 the plant operator was not performing laboratory tests, was not maintaining detailed records of operations,

and had not been to a sewage treatment school. Because of the lack of laboratory tests and operating records we were unable to determine whether the plant was operating effectively.

During our 1975 followup review, the city water superintendent said that laboratory tests were still not being made but the city planned to contract for the tests required by the NPDES permit. The only records being kept were of flow and pond depth.

The superintendent said that he inspected the lagoon weekly and, except for occasional cutting and spraying of weeds, no other maintenance was needed.

A State official stated in a letter to us dated April 17, 1975, that the operator had made no attempt to operate the facility to obtain the best results. The official believed that upgrading the facility would be needed--either through improved operation and maintenance practices or through minor construction--to achieve secondary treatment. He believed that greater efficiency could be obtained by a skilled and conscientious operator.

PLANT 10

This plant, a primary treatment facility, which has a design capacity of 3.6 million gallons a day was placed in operation in 1960.

Problems noted in our 1969 review included:

--Inadequate laboratory testing.

--Industrial wastes, primarily chicken feathers from a poultry-processing facility, which interfered with the treatment processes and contaminated the receiving stream.

During our 1975 followup visit, we noted that the plant personnel were making the required laboratory tests, maintained complete operating records, and performed regular preventative maintenance. The plant operator told us that the plant's influent no longer contained chicken feathers--the poultry-processing plant went out of business when the city instituted enforcement action.

The plant had an infiltration/inflow problem and was periodically overloaded, particularly during wet weather. The plant operator said an infiltration/inflow study was being made. He also said that sewage from a highway construction area periodically bypassed the treatment plant

because the excessive flows of mud during heavy rainfalls would clog up the treatment plant's equipment if allowed to enter the plant. He said that such bypassed sewage was being chlorinated.

The plant operator told us he had difficulty obtaining spare parts--no spare parts inventory was kept on hand. Also, the plant had no alternate power supply to keep the plant running in the event of a primary power source failure.

We observed that the chlorine contact chamber was too small for the relatively high loads being treated--the effluent was receiving only 5 to 10 minutes of contact time instead of the 20 to 30 minutes for which the plant was designed.

The treatment plant's NPDES permit called for achieving secondary treatment by June 30, 1977. The plant operator said that planning was underway for a secondary treatment plant.

In a letter dated December 21, 1976, the Acting City Administrator advised us that:

--The poultry-processing plant has resumed operations after installing pretreatment facilities because of the city-instituted enforcement action. The pretreatment prevents the feathers and chicken parts from entering the city sewers. The very high biological content of the poultry plant's waste, however, has doubled the cost of chlorination of the waste treatment plant's effluent.

--The facilities plan for secondary waste treatment was submitted for EPA's review in June 1976 and approval was expected shortly. Therefore, design of the new secondary treatment facility may begin in the near future.

PLANT 11

This secondary treatment plant was constructed in 1965 and expanded in 1972 to its present design capacity of 1.4 million gallons a day.

Our 1969 review showed that the treatment plant had the following problems:

--Incomplete laboratory testing.

--Odor problem.

--Digester not working properly because of a defective recirculating pump. Therefore, no digester tests were performed and no data was available for preparing monthly operating reports.

Our 1975 followup review indicated that the problems noted in 1969 had been corrected. All NPDES permit requirements for laboratory testing, recordkeeping, and effluent limitations were being met. Staffing appeared to be adequate.

The municipality's water and waste superintendent and the plant operator said infiltration was their primary problem.

The plant operator said he had some problem in obtaining spare parts and was starting to build up a spare parts inventory.

The superintendent pointed out the following design deficiencies:

--The point at which grit was removed from the grit chamber was periodically below water. At such times, the operator had to remove the grit from the chamber by hand into a wheelbarrow and then haul it to where it could be placed in a truck.

--The plant could treat wastes effectively up to 1.0 million gallons a day but not up to the 1.4 million gallons a day design capacity.

--The draft tube in the aerobic digester did not extend far enough down into the digester to pick up solids that accumulated at the bottom.

--The plant needed a vacuum filter for helping to dry the sludges during the wet months of the year when drying is not possible outside in the drying beds.

The treatment plant lacked an alternate power source to keep the plant running in the event of a failure of the primary power source. A municipal official told us that the sewage cannot be bypassed into the receiving stream and backs up in the sewer system during power failures.

Also, EPA and State inspectors found that the laboratory space was too small. The State recommended laboratory floor space of at least 200 square feet.

In a letter to us dated November 26, 1976, the mayor of the municipality made the following comments on the infiltration problem at the city's waste treatment plant.

--Infiltration was still a primary problem.

--The city had hired a consultant to make a sewer system evaluation survey.

--Although the study had not yet been completed, the consultant had identified the general problem areas.

--Needed additional survey work should be conducted as soon as possible, but the necessary funds--\$172,000--are not available.

GLOSSARY FOR SEWAGE TREATMENT

Activated Sludge	Sludge that has been aerated and subjected to bacterial action, used to remove organic matter from sewage.
Advanced waste treatment	Wastewater treatment beyond the secondary or biological stage that includes removal of nutrients such as phosphorus and nitrogen and a high percentage of suspended solids. Advanced waste treatment, known as tertiary treatment, is the "polishing stage" of wastewater treatment and produces a high quality effluent.
Aeration	The process of being supplied or impregnated with air. Aeration is used in wastewater treatment to foster biological and chemical purification.
Bar screen	In wastewater treatment, a screen that removes large floating solids.
Biochemical oxygen demand (BOD)	A measure of the oxygen consumed in the biological processes that break down organic matter in water. Large quantities of organic wastes require large amounts of dissolved oxygen. The more oxygen-demanding matter, the greater the pollution.
Chlorinator	A device for adding chlorine gas to sewage to kill infectious bacteria.
Chlorine contact chamber	A detention basin where chlorine is diffused through liquid.
Clarifiers (sedimentation tanks)	Tanks where the solids are allowed to settle or to float as scum. Scum is skimmed off, and settled solids are pumped to incinerators, digesters, filters, or other means of disposal.
Combined sewers	A sewerage system that carries both sanitary sewage and storm water runoff. During dry weather, combined sewers carry all wastewater to the treatment plant. During a storm, only part of the flow is intercepted because of plant overloading; the remainder goes untreated to the receiving stream.

Comminutor	A device that grinds solids to make them easier to treat.
Digester	In a wastewater treatment plant, a closed tank that decreases the volume of solids and stabilizes raw sludge by bacterial action.
Dissolved oxygen	The oxygen dissolved in water. Dissolved oxygen is necessary for the life of fish and other aquatic organisms and for the prevention of offensive odors.
Effluent	The wastewater discharged by an industry or municipality.
Effluent limitations	Restrictions established by a State or EPA on quantities, rates, and concentrations of chemical, physical, biological, and other constituents discharged from point sources.
Fecal coliform bacteria	A group of organisms common to the intestinal tracts of man and of animals. The presence of fecal coliform bacteria in water is an indicator of pollution and of potentially dangerous bacterial contamination.
Grit chamber	A detention chamber or an enlargement of a sewer designed to reduce the velocity of the flow of raw sewage to allow sand, grit, cinders, and small stones to settle to the bottom.
Industrial waste	Liquid waste from industrial processes as distinct from domestic or sanitary sewage.
Influent	Sewage water or other liquids, raw or partially treated, flowing into a treatment plant.
Lagoon	In wastewater treatment, a shallow pond--usually manmade--where sunlight, bacterial action and oxygen interact to restore wastewater to a reasonable state of purity.

Oxidation pond	A manmade lake or pond in which organic wastes are reduced by bacterial action. Often oxygen is bubbled through the pond to speed the process.
Percolation	Downward flow or infiltration of water through the pores or spaces of a rock or soil.
pH	A measure of the acidity or alkalinity of a material, liquid, or solid. pH is represented on a scale of 0 to 14 with 7 representing a neutral state, 0 representing the most acidic, and 14 the most alkaline.
Pretreatment	Any process used to reduce pollution load before the wastewater is introduced into a main sewer system or delivered to a treatment plant
Primary waste treatment	The first stage in wastewater treatment in which substantially all floating or settleable solids are mechanically removed by screening and sedimentation.
Sanitary sewers	Sewers that carry wastewater from homes, businesses, and industry.
Scraper	A device used in the bottom of a sedimentation tank to move settled sludge to a discharge port.
Secondary waste treatment	Wastewater treatment beyond the primary stage, in which biological processes are used to accelerate the decomposition of sewage. The decomposition is accomplished by use of trickling filters or the activated sludge process. As generally defined by EPA, secondary treatment would remove at least 85 percent of both BOD and suspended solids.
Sewers	System of pipes that collect and deliver wastewater to treatment plants or receiving streams.
Skimmer	A mechanical device used to remove floating grease or scum from the surface of wastewater in a tank.

Sludge	The solid matter removed from wastewater through treatment. Sludge handling involves the processes that remove solids and make them ready for disposal. Disposal may involve incineration, dumping in oceans, or land application.
Sludge drying	The process of removing water from sludge by drainage or evaporation, through exposure to the air, application of heat, or other methods.
Storm sewers	A separate system of pipes that carry surface water runoff.
Suspended solids	Small particles of solid pollutants in sewage that contribute to turbidity and that resist separation by conventional means.
Trickling filter	A device for the biological or secondary treatment of wastewater consisting of a bed of rocks or stones that support bacterial growth. Sewage is trickled over the bed enabling the bacteria to break down organic wastes.
Water quality standard	Water quality standards contain four elements: the designated use (such as recreation, drinking water, fish and wildlife propagation) to be made for a body of water, criteria to protect those uses, implementation plans (for needed water quality improvement programs), and a plan of enforcement.

PRINCIPAL ENVIRONMENTAL PROTECTION AGENCY OFFICIALSRESPONSIBLE FOR ACTIVITIES DISCUSSED IN THIS REPORT

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
ADMINISTRATOR:		
Douglas M. Costle	Mar. 1977	Present
John R. Quarles, Jr. (acting)	Jan. 1977	Mar. 1977
Russell E. Train	Sept. 1973	Jan. 1977
John R. Quarles, Jr. (acting)	Aug. 1973	Sept. 1973
Robert W. Fri (acting)	Apr. 1973	Aug. 1973
William D. Ruckelshaus	Dec. 1970	Apr. 1973
ASSISTANT ADMINISTRATOR FOR WATER AND HAZARDOUS MATERIALS:		
Dr. Andrew Breidenback	Sept. 1975	Present
James L. Agee	Apr. 1974	Sept. 1975
Roger Strelow (acting) (note a)	Feb. 1974	Apr. 1974
Robert L. Sansom (note a)	Apr. 1972	Feb. 1974
DEPUTY ASSISTANT ADMINISTRATOR FOR WATER PROGRAM OPERATIONS:		
John R. Rhett	Mar. 1973	Present
Louis De Camp (acting)	Sept. 1972	Mar. 1973
Eugene T. Jensen	June 1971	Sept. 1972

a/Before April 22, 1974, the title of this position was Assistant Administrator for Air and Water Programs.