REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Improvements Needed In Operating And Maintaining Waste Water Treatment Plants

Department of Defense

In reacting to GAO's findings at 20 military bases, Defense promised to correct plant, equipment, staffing, training, and testing problems at its waste water treatment plants to comply with compulsory effluent limitations and water quality standards. Some planned projects, however, cannot possibly meet the July 1, 1977, deadline. The Congress should amend the Federal Water Pollution Control Act to allow for extending the deadline, where necessary, for Federal agency treatment plants.

LCD-76-312

JUNE 18, 1976

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 is our report on the Department of Defense's efforts to operate its waste water treatment plants in compliance with the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251). That act established the goal of eliminating the discharge of pollutants into navigable waters by 1985. Publicly owned treatment works (including Federal facilities) must achieve secondary treatment by July 1, 1977.

We issued reports on December 20, 1974 (B-166506), and February 9, 1976 (B-166506), which indicated that municipalities and industrial dischargers were encountering difficulties in complying with the act. This report, showing that the Department of Defense is encountering similar problems, recommends that the Congress amend the act to allow the Environmental Protection Agency to grant Federal agencies extensions, where necessary, and recommends ways for the Department of Defense to improve plant operations.

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 Secretary of Defense; and the Administrator, Environmental Protection Agency.

Comptroller General
of the United States

Contents

ABBREVIATIONS

BOD	biochemical oxygen demand
DOD	Department of Defense
EPA	Environmental Protection Agency
GAO	General Accounting Office
OMB	Office of Management and Budget

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

IMPROVEMENTS NEEDED IN OPERATING AND MAINTAINING WASTE WATER TREATMENT PLANTS
Department of Defense

D I G E S T

Executive Order 11752 requires each Federal agency head to insure that facilities under his jurisdiction are designed, constructed, operated, and maintained to comply with Federal and State water quality standards.

The Federal Water Pollution Control Act, as amended, requires that these standards be met by July 1, 1977. Many Defense facilities do not meet these water quality standards and Defense has not taken measures to insure compliance by July 1, 1977. (See pp. 2 and 17.)

In view of the improvements needed and time required to accomplish them, GAO recommends that the Congress amend the Federal Water Pollution Control Act to provide that the Environmental Protection Agency may grant Federal agencies extensions to achieve water quality requirements beyond July 1, 1977, where necessary. (See p. 22.)

Because effectiveness of the Defense waste water treatment program is seriously impaired by problems of design, operation, and maintenance of facilities, GAO recommends that the Secretary of Defense direct the Secretaries of the Army, Navy, and Air Force to establish the necessary controls for insuring that waste treatment facilities comply with effluent limitations and water quality standards. Defense should have the military services:

--Determine the capabilities of all treatment plants and the improvements in plant and operations needed to meet effluent limitations and water quality standards.

--Price out, budget for, and program improvements in plant, laboratory equipment, staff,

and training that would bring plants into compliance with applicable water quality standards.

--Monitor the progress of improvements by using internal operating reports and evaluations made by the Environmental Protection Agency and environmental groups within Defense. (See p. 17.)

Defense generally agreed with GAO's recommendations and said it would emphasize the requirements of the executive order and the actions needed to conform with the applicable effluent limitations and water quality standards.

The Environmental Protection Agency concurred with GAO's recommendations to the Secretary of Defense and said that proper staffing and staff training, preventive maintenance programs, replacement of obsolete equipment, and implementation of adequate laboratory testing programs should be emphasized. (See p. 18.)

GAO rated the condition of 20 waste water treatment plants by using Environmental Protection Agency criteria. Of these 20 plants, 1 was found satisfactory, 1 was conditionally satisfactory, and 18 were unsatisfactory. Some improvements were needed at all 20 plants. The problems identified involved (1) plant design, (2) inoperable equipment, (3) lack of testing equipment and procedures, and (4) shortages of qualified plant-operating personnel. (See ch. 2.)

GAO also reviewed about 380 evaluations of Defense treatment plants made by the Environmental Protection Agency, environmental groups within Defense, consulting engineers, and State agencies and noted that the evaluations had identified similar problems at many other Defense treatment plants. (See ch. 3.)

Officials at many locations said that the lack of operation and maintenance funds kept them from obtaining equipment and filling authorized positions. Some plants had not requested funds for needed test equipment. Several officials said

that denial of authorization for additional staff hindered their hiring operators and that trained operators were hard to find. According to a 1975 Environmental Protection Agency survey, the services had failed to identify those in need of training. As a result, the services were required to operate the plants as best they could with untrained or inadequately trained operators. (See pp. 9, 10, and 11.)

All three services cited improvements that they made or are making at many of the plants that GAO visited. The Army and Navy said that plans were underway to implement the recommendations. The Air Force said that it would make a comprehensive survey of all plants and would develop a monitoring system to insure that water quality standards are met. (See pp. 20 and 21.)

Some of the plants GAO examined are over 30 years old and are outmoded. Although problems of outmoded plants, difficulty in hiring trained operators, and shortages of funds contributed to the existing conditions, Defense is not relieved of its responsibility to comply with the water quality standards established by law. GAO believes that, to overcome these problems, all administrative levels need to emphasize waste water treatment processes. (See p. 3.)

CHAPTER 1

INTRODUCTION

Federal waste water treatment plants are subject to the same Federal, State, interstate, and local water quality standards and effluent limitations as non-Federal waste water treatment plants.

The Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251) stress eliminating the discharge of pollutants into the navigable waters by 1985 as a national goal. Publicly owned treatment works (including Federal facilities) must achieve secondary treatment by July 1, 1977, or any more stringent limitations, including those necessary to meet water quality standards established pursuant to State or Federal laws or regulations unless specifically exempted. A Federal plant may only be exempted if the President requests funds for a specific project and the Congress fails to appropriate the requested funds. The Environmental Protection Agency (EPA) establishes minimum levels of effluent quality required for secondary treatment. Some States have established more stringent standards than those of EPA.

The act also created the National Pollutant Discharge Elimination System. Under the system all Federal agencies must obtain a permit from EPA to discharge any pollutant into navigable waters. Permits are issued on the condition that the discharge will meet all applicable requirements of EPA regulations relating to effluent limitations, water quality standards, new source performance standards, toxic effluent standards, inspections, and monitoring and entry provisions.

At the time of our fieldwork, EPA was (1) taking an inventory of Federal facilities requiring discharge permits, (2) inspecting them, and (3) depending on the classification of the receiving waters, setting discharge limitations and issuing permits. Before EPA issues permits to Federal installations, the permit application is sent to the respective State for approval to insure that the State's water quality standards are met.

For those Federal facilities that cannot meet applicable discharge standards, EPA may issue interim effluent limitations based on the capability of the existing plant, with final limitations that will meet the latest standards established for the receiving waters. July 1, 1977, is the latest date by which final effluent limitations must be achieved.

Executive Order 11752 dated December 17, 1973, states the Federal Government shall provide leadership in the nationwide effort to protect and enhance the quality of our air, water, and land resources through compliance with applicable standards for the prevention, control, and abatement of environmental pollution in full cooperation with State and local governments. It requires the head of each Federal agency

--to insure that facilities under his jurisdiction are designed, constructed, operated, and maintained to comply with Federal and State water quality standards and

--to present a plan each year to the Director of the Office of Management and Budget (OMB) for improvements necessary to meet Federal, State, interstate, and local water quality standards and effluent limitations.

The Department of Defense (DOD) has about 560 major Army, Navy, and Air Force installations in the United States. Of these, about 200 connect or plan to connect to public sewage systems and about 280 had their own treatment plants in operation at the time of our fieldwork. Most of the other bases were either inactive or excess.

Project proposals for capital improvements to waste treatment facilities originate at the base level and are reviewed at various levels, including the environmental, engineering, and budgeting offices in each service. The services assign priorities to each project, and those with the highest priorities are then included in each service's military construction program which is limited by budget guidelines set by the President. DOD, EPA, and OMB review the service's program requests and a DOD military construction program is prepared for submittal to the Congress.

During the 9 fiscal years 1968 through 1976, the Congress appropriated about $263 million to DOD for improvements to waste water treatment plants and connections to public sewage systems. Budget estimates for construction in fiscal year 1977 to improve existing plants or construct new pollution abatement facilities are currently $56 million. The estimated budget for 1978 is $79 million.

Most DOD waste water treatment plants are designed to provide secondary treatment. Appendix III describes primary and secondary treatment and contains a flow diagram for a typical trickling filter secondary treatment plant.

CHAPTER 2

PROBLEMS IN OPERATING WASTE WATER TREATMENT PLANTS

We visited 20 plants designed to provide secondary treatment. The effluent from only two plants met the Environmental Protection Agency's applicable final permit limitations. The other plants require upgrading to meet established standards.

We recognize that some plants are 30 or more years old and were not built to meet current water quality standards. Operators at many of the plants are doing a commendable job in achieving the present degree of treatment, considering the handicap under which they work. Although problems of outmoded plants, difficulty in hiring trained operators, and shortages of funds contribute to the existing conditions, DOD is not relieved of its responsibility to comply with established water quality standards. We believe that, to overcome these problems, more emphasis at all administrative levels needs to be placed on waste water treatment processes.

The table on page 4 summarizes the problems identified at each plant.

PLANT DESIGN PROBLEMS

Design problems at 19 plants involved such matters as plant overloading and inability to maintain continuous operations and to achieve the required treatment level.

Plant overloading

Overloading at 17 plants caused sewage effluent to be discharged to receiving waters without adequate treatment. Contrary to EPA standards 11 of these plants had to bypass sewage without any primary treatment or chlorination during high flow periods.

Overloading was caused by infiltration, combined storm and sanitary sewers, and insufficient plant capacity. Infiltration, occurring at 16 plants, is the intrusion of ground or surface water into a sanitary sewer system due to a break in the watertight integrity of the system.

Summary of Findings at Plants Evaluated

Location	Improvements needed in: Plant	Equipment	Staffing and/or training	Testing equipment or procedures	Does effluent meet EPA final permit requirements?	Rating of plant (note a)	Are plant improvements needed?	Has plant complied with recommendations of prior evaluations?
U.S. Army:								
Fort Bragg, N.C.	X	X		X	No	U	Yes	No
Fort Campbell, Ky.	X	X	X	X	No	U	Yes	Partially
Fort Carson, Colo.	X	X	X	X	No	U	Yes	Partially
Fort Dix, N.J.	X	X	X	X	No	U	Yes	Partially
Fort Knox, Ky.	X	X		X	No	U	Yes	Partially
Military Ocean Terminal-Bayonne, N.J.	X	X	X	X	Yes	b/ U	Yes	Yes
Fort Ord, Calif.	X	X	X	X	No	U	Yes	No
Fort Polk, La.	X	X	X	X	No	U	Yes	Partially
Fort Rucker, Ala.	X	X	X	X	No	U	Yes	Partially
Schofield Barracks, Hawaii	X	X	X	X	No	CA	Yes	Partially
U.S. Navy:								
Cecil Field NAS, Fla.	X	X		X	No	U	Yes	No
Jacksonville NAS, Fla.	X	X		X	No	U	Yes	No
Key West NAS, Fla.	X	X	X	X	No	U	Yes	Partially
Pearl Harbor NS, Hawaii	X				Yes	A	Yes	No prior evaluation
U.S. Air Force:								
Lockport AFS, N.Y.		X	X	X	No	U	Yes	Partially
Malmstrom AFB, Mont.	X	X		X	No	U	Yes	Partially
McGuire AFB, N.J.	X	X	X	X	No	U	Yes	No
Myrtle Beach AFB, S.C.	X	X		X	No	U	Yes	Partially
Pease AFB, N.H.	X	X		X	No	U	Yes	No
Roanoke Rapids AFS, N.C.	X	X	X	X	No	U	Yes	Partially

a/U--unacceptable
A--acceptable
CA--conditionally acceptable

b/According to EPA standards a plant can be rated "unacceptable" even though the effluent meets EPA permit requirements. This plant did not keep operational data, and the sampling and testing procedures were unacceptable.

The following examples illustrate the extent to which plant capacity was exceeded during rainy periods.

Plant	Cause	Design flow	Peak flow
		(millions of gallons per day)	
Fort Bragg	Infiltration	6.8	16.3
Fort Campbell	Infiltration	3.5	11.4
Fort Carson	Infiltration	3.6	6.3
Fort Dix	Infiltration	3.5	8.0
Fort Knox	Infiltration	6.0	17.0
Jacksonville Naval Air Station	Combined storm and sanitary sewers	2.2	7.5
Pease Air Force Base	Insufficient capacity and infiltration	.6	2.9

EPA requires that sources of severe infiltration be identified and sealed off to prevent plant overloading. We believe that operators of plants with infiltration problems should identify the sources and seal them off.

Standby power and alarm systems

Federal guidelines recommend standby power to operate the plant or the capability to retain inadequately treated wastes during power failures. EPA also recommends an alarm system to warn operators when the power fails so that emergency procedures can be implemented to insure that minimum required treatment is achieved. Seventeen plants did not have recommended standby power, and 13 did not have alarm systems. At 12 treatment plants, we were told that, because standby power was not available, the plants had bypassed sewage (9 without disinfection) to the receiving waters during power outages.

Inadequate chlorination facilities

National standards adopted by EPA require that effluent discharges be chlorinated. EPA guidelines state that chlorine contact chambers should be constructed to provide a detention period of 30 minutes during average flows (15 minutes during peak flows) to allow sufficient mixing of the chlorine to achieve disinfection. The chlorination facilities at 12 of the plants were inadequate. The deficiencies included a lack of (3 plants) or inadequately designed (9 plants) chlorine contact chambers and no provision to chlorinate partially treated sewage in case of power outages or during bypass conditions.

Other design problems

Other design problems are:

--Lack of suitable influent flow meters. Flow data is needed to assist in controlling plant operations.

--Inflexible design arrangements in the sludge lines that do not allow pumping sludge from one clarifier at a time.

--Omission of, or inadequate, oil and grease traps to collect oils and greases before they enter the sewage treatment plant.

--Lack of flow meters on pumps that recirculate sewage back to trickling filters or aeration tanks. Determination of flow is needed to control the operation.

--Inadequate sludge pumps.

--Failure to provide means to remove floating sludge from clarifiers.

--Use of mercury seals in comminutors and trickling filters. Mercury is considered a highly toxic substance, and EPA banned mercury seals in 1970 because of the possibility of leakage and contamination of the receiving waters.

--Placement of drains from sludge beds that route the drained liquid to receiving waters (without disinfection) instead of back to the headworks of the plant.

--Insufficient protection to prevent sewage from backflowing into and contaminating potable water supplies.

Financing capital improvements

For the 18 plants needing capital improvements, only 3 had construction projects that could correct deficiencies by July 1, 1977, because of the time required to contract for and complete construction. Eleven have received or requested $62.3 million in the following fiscal years appropriations:

	1975	1976	1977	1978
		(000 omitted)		
Fort Bragg	$ -	$ -	$ -	$13,155
Fort Campbell	1,948	-	154	-
Fort Carson	360	-	5,133	-
Fort Knox	-	10,291	-	2,600
Fort Ord	-	-	6,933	-
Fort Polk	1,544	286	4,020	9,000
Fort Rucker	-	-	594	-
Cecil Field Naval Air Station	894	-	-	-
Malmstrom Air Force Base	-	-	1,739	-
McGuire Air Force Base	-	-	-	3,001
Pease Air Force Base	639	-	-	-
	$5,385	$10,577	$18,573	$27,755

PROBLEMS RELATED TO EQUIPMENT AND OPERATIONS

Nineteen of the plants we visited needed improvements in operation and maintenance.

Equipment and maintenance

To function effectively, treatment plants need (1) sufficient funds to replace worn out equipment, (2) an inventory of spare parts, and (3) a preventive maintenance program to keep equipment functioning properly and to use it most productively.

Most plants did not keep a sufficient spare parts inventory, and when breakdowns occurred, lengthy periods with inoperable equipment were experienced. Only three had a spare parts inventory that would keep most equipment working if parts wore out. Equipment necessary for effective operation at 14 plants was not functioning at the time of our visits.

Eight of the plants had no regularly scheduled preventive maintenance program or no records of maintenance. Maintenance was done primarily on an as-needed basis to try to keep the plant operating. In addition, seven plants did not have an operation and maintenance manual for the plant which described the functions, piping, valves, electrical schematics, operation procedures, and emergency procedures.

Operational problems included plugged spray nozzles on trickling filter arms, septic conditions of clarifiers caused by improper sludge pumping and cleaning or poorly adjusted scrapers, overchlorination of the effluent in an attempt to reduce biochemical oxygen demand (BOD) and suspended solids in the effluent (too much chlorination can be toxic to fish and other aquatic life), and poor maintenance of oil and grease traps to remove oil and grease before it entered the treatment plant.

Deficiencies in laboratory equipment and procedures

To determine the effectiveness of sewage treatment plant operations and whether the pollutants in the effluent are within limits established for the receiving water, EPA permits require tests for BOD, suspended solids, acidity and alkalinity, and fecal coliform. BOD and suspended solids tests are required on both the influent to the plant and the effluent from the plant to determine the rate of removal. Some plants are also required to make additional tests for dissolved oxygen, nitrogen, ammonia, phosphorus, chlorine residual, and oils and greases because of the characteristics of the waste water, type of operation, or particularly stringent requirements of the receiving body of water. Other tests are usually considered necessary for plant operation. Such tests could include measuring dissolved oxygen levels at various places in the process (particularly in activated sludge tanks), total solids, volatile solids, and volatile acids.

At three plants tests were not made because of a lack of equipment or because an inexperienced operator did not know how to make the tests. At these plants we could not determine whether pollution limitations for parameters, such as BOD and suspended solids, were being met. At a fourth plant independent State tests indicated that BOD and suspended solids limitations were being met. Tests were made at the plant, but the results were not recorded. Without such information, EPA considers that the plants are not in compliance with the permit. At the other 16 plants, tests were made and results recorded, but we found problems at most plants that indicated the test results were questionable.

Laboratory equipment

At 11 plants essential items of laboratory equipment needed to make the tests required by the EPA permits were either obsolete or defective. These included an inaccurate

analytical balance, inadequate temperature control on a muffle furnace, an obsolete testing procedures manual, and an inoperative water distillation unit. Of the 11 plants, 6 had recognized the need for equipment and had requested funding. The staff at some plants said they did not realize they needed the test equipment.

Laboratory procedures

Procedures for sampling and testing were not acceptable at 10 plants. EPA permits require that analytical and sampling methods conform to the latest edition of "Standard Methods for the Examination of Water and Wastewater" or such other equivalent methods which EPA approves.

Failure to follow acceptable analytical and sampling procedures can result in unreliable test data. For example, at two plants we visited, the operators' test results indicated 100 percent removal of BOD on many tests. These were at trickling filter treatment plants that had equipment, design, or operational problems. Apparently, neither the operators nor higher level management questioned the test results even though trickling filter plants are not capable of achieving 100 percent BOD removal. Comparing such test results with independent test results showed that the plants were not achieving such a high degree of BOD removal. Since the independent test results were also available to the operators and management, we believe the test results should have served as a signal that each plant's testing procedures were questionable.

Generally we believe that, although not applicable to all plants, testing procedures could be improved by proper sampling methods, better quality control during testing, and adhering to procedures set forth in standard methods.

Need for additional operators and training

A plant cannot provide the degree of treatment intended by its design nor can the investment in its physical facilities be protected unless it is adequately staffed. The staff must be qualified not only to operate the plant but also to make the laboratory tests essential for measuring results.

Using EPA staffing guidelines and EPA assistance, we estimated the staffing needs and compared the estimates with existing staff. The estimates covered such factors as the type of treatment, age of the plant, climate, hours the

plant should be staffed, laboratory time, and training needs. We found that 10 plants were understaffed (6 by 3 or more operators), 9 plants were overstaffed, and 1 was staffed with the number of operators recommended.

We observed that, as a result of understaffing, plants were manned fewer hours than EPA considered essential. For example, one plant was manned by one operator, 8 hours a day, 5 days a week. An EPA engineer said the plant should be manned 24 hours a day, 7 days a week. EPA staffing criteria indicated that the plant should have had four operators. During 1974 the plant had operational problems. Also, many required laboratory tests were not made, and when they were, the results were unreliable. In addition, the operating logs and required records were incomplete.

Understaffing can have other detrimental results. There may not be enough operators to do required maintenance and repairs, and if the shortage is severe enough, the staff may not be able to do such required operational duties as pumping sludge from clarifiers and changing valves controlling recirculation rates of the flow through the plant.

Equally or possibly more important than the number of operators are the experience and qualifications of the operators. We found that plants had trouble hiring qualified operators and needed programs to train operators. Several plants were operated by staff with no training in sewage treatment plant operations, and other plants had staff with varying degrees of training and experience up to the point where operator qualifications would be considered suitable.

A February 1975 EPA survey at Department of Defense and other Federal facilities indicated that most Federal agency headquarters did not have information as to the number of operators employed, whether operators were suitably trained, and whether training was needed and being provided. The survey concluded that the need for training was much greater than the actual training being given and that major problems were lack of funds for training and failure to identify those in need of training. The reports from DOD bases showed a need to increase the work force at treatment plants by 397 positions, or 23 percent, and to provide training for 1,352 operators by July 1, 1977.

Also, for most of the plants we visited, the States had a mandatory certification program for operators of similar municipal plants. DOD installations are not required to comply with these programs, but those we visited generally attempted to hire certified operators and encouraged

noncertified operators to pass the required test. Operators were encouraged to continue training to improve their qualifications. Although 58 of the 145 operators in the plants we visited were certified, 28, or nearly half, were at 4 plants.

Base officials said that (1) lack of funds kept them from filling authorized positions, (2) in other cases, denial of authorization for additional staff hindered their hiring operators, and (3) trained operators were hard to find.

We believe that the shortage of qualified operators impairs the plants' capability to maintain designed efficiency and to remain in compliance with permit conditions.

Financing operation and maintenance improvements

Headquarters environmental offices and intermediate commands have delegated to base commanders the responsibility for operating and maintaining existing facilities or initiating action to improve existing facilities. Intermediate commands and headquarters environmental offices had not made a concerted effort to insure that base commanders were taking the necessary actions to correct the problems relating to equipment, maintenance, operation, testing, and staffing.

Replacement or repair of equipment, cost of operators, and other operation and maintenance costs are funded by operations and maintenance appropriations. The military services said that fiscal year 1975 operation and maintenance costs for waste water treatment plants were $44 million. Requests for operation and maintenance funds associated with pollution control originate at the base level. These requests are combined with funding requests for other installation operation and maintenance needs, such as utilities and road and building repair and maintenance. The request submitted by the base to the military service headquarters is for one line item--base operation and maintenance. Each item making up the base request loses its identity in the budget request as it is processed.

During the budget process, any reductions in budget requests, appropriations less than requests, and allocations of funds within the department do not specify which operations and maintenance items reductions should be applied to. Funds actually received by the base commanders are therefore general funds and can be used for any purpose associated with operation and maintenance of base facilities.

DOD officials said that operation and maintenance funds have been very limited in recent years and base commanders have been forced to use them only for the highest priority

items--such as costs associated with the mission of the base. As a result, there are not enough operation and maintenance funds available to finance needed improvements for waste treatment facilities.

We believe that, because Federal treatment plants must meet secondary treatment standards or applicable water quality standards by July 1, 1977, more emphasis needs to be placed on accomplishing the necessary improvements and, until operation of the plants is considered acceptable, each of the departments should obtain an accurate assessment of improvements needed and their estimated costs. Further, progress at the base level should be monitored to insure that timely corrective action is taken.

CHAPTER 3

NEED FOR MORE RESPONSIVE ACTION ON RECOMMENDATIONS OF ENVIRONMENTAL TEAMS

The waste treatment plants at most Department of Defense installations have been included in detailed environmental health evaluations made by environmental engineering teams of the three services. The Environmental Protection Agency, State agencies, and consulting engineers have also evaluated performance of many waste treatment plants.

We reviewed 380 evaluations made between 1969 and July 1974 at 325 DOD installations. Most of the evaluations were extensive and identified many problems similar to those we found. We believe that if the plants had acted on the recommendations made, the efficiency of the plants would have increased. Plants at 19 installations we reviewed had been evaluated, but only limited action had been taken on the problems identified by the environmental teams and their recommendations for improvements. The schedule on pages 14 and 15 lists these evaluations and the number of problems noted and corrected up to the time of our visit.

A base that took considerable corrective action on an evaluation report was the Army's Military Ocean Terminal in Bayonne, New Jersey. In April 1973 an engineer from EPA's New York region found a number of serious problems at this site. During our evaluation of this plant in July 1974, we found that some problems existed, but considerable corrective action had been taken on previous recommendations. For example, a defective pump and valve in the return sludge line were fixed, and a qualified treatment plant operator had been hired.

Summary of previous evaluations and corrective action taken

Site	Evaluated by	Date	Sewage treatment plant problems noted	Corrected before GAO visit
Fort Bragg	EPA	4-72	3	0
	Army Medical Laboratory	5-72	3	0
	do.	3-74	3	0
Fort Campbell	do.	7-73	9	3
	do.	6-71	8	4
Fort Carson	do.	7-73	33	1
Fort Dix	do.	5-72	5	1
	Air Force Environmental Health Laboratory	7-73	3	0
	Consulting engineer	1-71	8	0
Fort Knox	Army Medical Laboratory	3-74	12	3
	EPA	10-71	20	10
	Consulting engineer	5-73	8	0
Military Ocean Terminal, Bayonne	EPA	4-73	6	4
Fort Ord	Army Medical Laboratory	9-73	8	0
Fort Polk	Water Pollution Control Administration	10-69	2	0
	Army Medical Laboratory	7-74	12	4
Fort Rucker	do.	7-73	21	4
Schofield Bks.	do.	4-74	29	11

Site	Evaluated by	Date	Sewage treatment plant problems noted	Corrected before GAO visit
Cecil Field NAS	a/NAVFAC	5-73	8	0
Jacksonville NAS	EPA	7-72	5	0
Key West NAS	EPA	4-73	3	0
	EPA	9-71	6	1
	NAVFAC	1-73	9	1
Pearl Harbor Navy Base	No prior evaluation			
Lockport AFS	EPA	4-73	4	1
Malmstrom AFB	Air Force Environmental Health Laboratory	9-73	31	6
McGuire AFB	do.	7-73	5	0
Myrtle Beach AFB	do.	11-71	7	2
	EPA	4-72	7	2
	Air Force bioenvironmental engineer	11-72	2	2
Pease AFB	New Hampshire	3-73	5	0
Roanoke Rapids AFS	EPA	7-72	6	1
	Air Force environmentalists	5-73	4	2
	do.	5-74	8	1
Total			303	64

a/NAVFAC--Naval Facilities Engineering Command.

Corrective action, such as that taken at Bayonne, was the exception rather than the rule. At the other extreme was the situation at Fort Carson, Colorado. In July 1973 environmental engineers from an Army Medical Laboratory noted 33 problems which reduced the plant's efficiency. We found that only 1 of the 33 problems had been corrected at the time of our August 1974 visit.

Regulations within each service state the responsibilities of each environmental engineering team. Some teams make evaluations when requested to do so by the base while other groups make evaluations according to a schedule. Environmentalists from the three services said that directives within each service did not require the base to reply to their recommendations and there was no procedure which would insure that the bases took any followup action.

Sewage treatment plant operators and base officials responsible for operating treatment plants have not been responsive to the recommendations made during evaluations of the waste treatment plants. They said that lack of funds accounted for some of the failure to make the necessary corrections. We observed that some recommendations dealt with operational changes that did not require funds for implementation but even these recommendations were not always implemented. We believe that greater emphasis needs to be placed on the importance of waste treatment, especially at the installation level, and base commanders should be required to respond to the findings and recommendations of evaluating groups. We also believe that monitoring and followup procedures are needed to insure that timely action is taken to correct the deficiencies.

CHAPTER 4

CONCLUSIONS, RECOMMENDATIONS, AGENCY COMMENTS, AND OUR EVALUATION

The effectiveness of Department of Defense waste water treatment facilities is seriously impaired by the design and operation and maintenance problems that exist at many plants. Furthermore, DOD does not have sufficient management procedures to identify existing problems and to insure that action will be taken to correct the problems. As a result, many facilities do not conform to Federal and State water quality standards and there is no assurance they will be able to by July 1, 1977, as required by the Federal Water Pollution Control Act, as amended.

Our visits to treatment plants and review of evaluations made by the Environmental Protection Agency and environmental groups within DOD showed that design and operation and maintenance problems were widespread. Only two plants were meeting the Federal and State water quality standards applicable to the plant. Using EPA criteria for rating plants, we rated 18 unsatisfactory, 1 conditionally satisfactory, and 1 satisfactory. Improvements to increase the effectiveness of the waste water treatment were needed at all 20 plants. The problems we identified involved (1) plant design, (2) inoperable equipment, (3) shortages of qualified plant-operating personnel, and (4) lack of testing equipment and procedures.

A common reason given by base officials for shortcomings in treatment plant design, equipment, and operating staff is shortage of money. Although we recognize that this explanation may have validity in particular cases, such as escalating costs of new construction, we question its general applicability, particularly in regard to operation and maintenance funds. A part of these funds was justified and requested for improvements to meet water quality standards established by law. We believe that DOD's present system for making improvements does not sufficiently emphasize pollution problems to achieve the results needed.

RECOMMENDATIONS TO THE SECRETARY OF DEFENSE

We recommend that the Secretary of Defense, in accordance with Executive Order 11752 requirements (see p. 2), have the Secretaries of the Army, Navy, and Air Force establish controls to insure that waste water treatment facilities are designed, constructed, operated, and maintained so that treated waste waters will conform with compulsory effluent limitations and water quality standards. The Department should have the military services:

--Determine the capabilities of all treatment plants and the improvements in plant and operations needed to meet effluent limitations and water quality standards.

--Price out, budget for, and program the improvements in plant, laboratory equipment, staff, and training that would bring plants into compliance with applicable water quality standards.

--Monitor and follow up on operations and the progress of the improvements through use of internal operating reports and evaluations made by EPA and environmental groups within DOD.

AGENCY COMMENTS AND OUR EVALUATION

Environmental Protection Agency

EPA concurred with our recommendations to the Secretary of Defense. EPA stated that particular emphasis should be placed on proper staffing and staff training, preventive maintenance programs and replacement of obsolete equipment, and implementation of adequate laboratory testing programs. EPA further stated that such actions can result in greatly increased treatment facility performance efficiency and reliability, even in those cases where new plant construction is needed for ultimate compliance with permit requirements. (See app. I.)

Department of Defense

The Department of Defense generally agreed with our conclusions and recommendations and its reply to our proposed report stated that the Office of the Secretary of Defense would take steps to emphasize the requirements of Executive Order 11752 and necessary actions to conform with the applicable effluent limitations and water quality standards. (See app. II.)

DOD specifically agreed that

--sources of infiltration should be identified and sealed off or otherwise corrected to prevent overloading of the plants;

--standby power to operate the plant or capability to retain inadequately treated water during power failures should be provided as well as appropriate alarm signals;

--adequate chlorination, provision of necessary spare parts and laboratory equipment, and testing as prescribed should be accomplished; and

--appropriate remedial actions toward correcting outstanding deficiencies to comply with water quality standards should receive priority attention.

DOD commented that some operational and maintenance services are often provided by craftsmen of separate shops on a DOD installation, which decreases the required on-site staffing at the plant. In our evaluation of plant staffing (p. 9), we took into account those craftsmen that spent only part of their time working at the plants. In addition, we noted instances of overstaffing as well as understaffing. While personnel ceilings and funding constraints as noted by DOD may be problems hampering staffing of some plants, these would seem to be controllable by DOD. We believe that staffing should be adequate to properly maintain the treatment plants and at the same time operate them effectively to meet water quality standards. We believe that, to achieve this objective, DOD should consider revising personnel ceilings and allocating money to provide sufficient personnel.

With regard to training of operators, DOD stated that training programs have been used in the past; however, with the emphasis on waste water facility operation and maintenance, an updated and more comprehensive effort is required and steps are being taken to provide the necessary training for operators. With respect to operator qualifications, DOD stated its program policy for environmental protection requires that operators meet proficiency levels consistent with the operator certification requirements of the State in which the facility is located.

DOD also stated that in one service's recent review of Discharge Monitoring Reports covering 3 months and involving 204 National Pollution Discharge Elimination System permits, 95 percent of the 28,000 discharge parameters were in compliance with permit limitations. In addition, biochemical oxygen demand and suspended solids removal requirements were completely satisfied in 65 percent of the permits. DOD felt these statistics were more representative of actual waste water treatment plant performance than indicated by our report.

Our review was directed toward determining whether improvements were needed to enable the plants to comply with

final permit requirements. Our sample was not intended to be a scientific sample. Our intent was to include treatment plants of each service and of different sizes, types of treatment, and location and only plants designed to provide secondary treatment.

To arrive at a conclusion as to whether the results of the DOD review of compliance with requirements of 204 permits are representative of actual performance of DOD plants, we believe that additional information is needed. The following matters have a direct bearing on whether the results cited were representative.

--We were told that the 204 permits were all for Navy plants, thus performance of Army and Air Force plants was not included.

--We were told that actual performance was compared with interim permit requirements. These are less stringent than final requirements effective July 1, 1977.

--As disclosed by our review, testing equipment and procedures at many plants were not in accordance with accepted laboratory methods; accordingly, the accuracy of reported plant operational data was questionable.

For these reasons, we doubt that the level of performance indicated by the DOD review accurately reflects a representative picture of DOD plants' capability to meet permit requirements. DOD expects to improve the monitoring and followup procedures on plant operations and progress of improvements as a result of assignment of responsibility to the Navy for a new Tri-Service Manual. The manual will cover the operation and maintenance of domestic and industrial waste water systems and will provide updated criteria for uniform coverage in this area. The manual is proposed for DOD-wide use and is scheduled for completion by the end of 1977.

DOD also provided summary comments of the Army, Navy, and Air Force and their specific comments on individual plants. All three services cited improvements that they made or are making at many of the plants since completion of our fieldwork. The services took issue with some of the various problems we detailed at the individual plants, but the overall comments of each service signified agreement with our conclusions and recommendations.

The Army said that sincere efforts have been and are being made to comply with the permits. They estimated that

one-time construction costs for fiscal years 1976, 1977, and 1978 would be about $200 million. The Army also estimated that operating costs would increase by about $3 million a year for additional staff. The additional staff is needed not only for sewage treatment plants but also for industrial waste treatment and potable water treatment plants. They said that because of the construction time required, the construction projects involved cannot possibly meet the July 1, 1977, requirements. They also believed that, as more EPA permits are received and requirements become more stringent, additional costs would accrue but the total cost requirements were indeterminate at this time.

The Navy stated that, of the approximately 38 deficiencies noted at the 4 Navy treatment plants, 35 have either been corrected, are in the process of final design and construction, or are in military construction projects for which funds are available. Projects were being developed to correct the remaining three deficiencies. They explained that for some projects it was prudent to defer some maintenance items and correct the deficiencies during major construction.

The Navy agreed that better management controls were needed over work controlled by local base commanders and stated that a system would be initiated wherein unsatisfied minor deficiencies and instances of noncompliance with permit requirements would be brought to the attention of higher command levels.

We believe that the Air Force was especially responsive to our overall recommendations. The Air Force stated that a survey of all Air Force waste water treatment plants had been initiated to determine a full and comprehensive status of their treatment capabilities and efficiencies and to determine improvements required to upgrade plants and systems to meet July 1, 1977, requirements. With this inventory of facilities, the remaining requirements for compliance will be determined and corrective action will be initiated. The Air Force will also review its manning requirements and will resolve any differences with standards established by EPA. In addition, in the area of monitoring, the Air Force will establish a monitoring system to provide the necessary control to insure compliance with effluent and water quality standards.

We were informed that as a result of our review, the Air Force planned to use surveys, such as those performed by the base bioenvironmental engineer, Environmental Health Laboratories, and EPA and State agencies, as part of their control and monitoring system.

While comments from the Army and Navy indicated agreement with our conclusions and recommendations and that plans were underway to implement our recommendations, they did not indicate that such plans provided for a comprehensive survey of all plants and a monitoring system as recommended by us and initiated and planned by the Air Force. We believe that the Army and Navy should include a comprehensive survey in their planning to insure that present capabilities and needed improvements are determined for all waste water treatment plants and establish appropriate controls to insure that water quality standards are met on a continuing basis.

RECOMMENDATION TO THE CONGRESS

Congress should amend the Federal Water Pollution Control Act to provide that the Environmental Protection Agency may grant Federal agencies extensions beyond July 1, 1977, where necessary, to achieve water quality requirements, since currently planned projects for bringing some plants into compliance with compulsory effluent limitations cannot possibly be completed before the present deadline.

In a recent report (RED-76-60 dated February 9, 1976) to the Subcommittee on Investigations and Review, House Committee on Public Works and Transportation, we proposed that the Subcommittee consider amending the act to allow the Environmental Protection Agency to grant extensions on a case-by-case basis to

--industrial dischargers that cannot meet the July 1, 1977, deadline because of litigation and

--municipal dischargers that cannot meet the July 1, 1977, deadline because of insufficient time and Federal funds.

We believe that section 13 concerning time requirements in H.R. 9560 partly reflects our position. That section provides, in part, that section 301 of the Federal Water Pollution Control Act (33 U.S.C. 1311) be amended by adding at the end thereof the following new subsection:

"(g) (1) The Administrator may modify the time for achieving the requirements of subsections (b) (1) (B) and (C) of this section for any publicly owned treatment works to extend such time beyond the dates specified in such paragraphs, if the Administrator determines that the construction of such treatment works necessary for the achievement of

such requirements cannot be completed by the dates specified in such paragraphs.

"(2) No time modification granted by the Administrator under this subsection shall extend beyond July 1, 1982, except in the case of treatment works which the Administrator determines are based on innovative technology relating to the abatement and control of water pollution in which case time modifications may extend up to, but not beyond July 1, 1983."

CHAPTER 5

SCOPE OF REVIEW

In addition to the installations listed on page 4, we made our review at the following locations:

Army:

- Environmental Office, Deputy Chief of Staff for Logistics, U.S. Army Headquarters.
- Environmental Hygiene Agency, Aberdeen Proving Ground, Maryland.
- Health Services Command, Fort Sam Houston, Texas.

Navy:

- Naval Environmental Protection Support Service and Naval Facilities Engineering Command, Office of Chief of Naval Operations, U.S. Navy Headquarters.

Air Force:

- Directorate of Civil Engineering, Office of Deputy Chief of Staff for Services, Programs and Resources, U.S. Air Force Headquarters.
- Air Force Environmental Health Laboratory, Kelly Air Force Base, Texas.

We visited or contacted all 10 Environmental Protection Agency regional offices, 5 Army Medical Laboratories, 6 Naval Facilities Engineering Command Division Offices, and 1 Air Force Environmental Health Laboratory to obtain and review evaluations they had made of sewage treatment facilities.

CRITERIA USED FOR EVALUATING PLANTS

In evaluating the plants selected for review, we used the same criteria EPA inspectors used in their evaluations and ratings of operation and maintenance of waste water treatment plants. For a plant to be rated acceptable, EPA requires that:

1. The plant produce an effluent that meets an assigned effluent standard, permit requirement, or regulation; plant efficiency is consistently equal to or better than design efficiency; and disinfection, when required, is consistently adequate.

2. Adequate sampling and testing procedures are followed.

3. Raw or partially treated wastes are not bypassed more than is absolutely necessary. When bypasses must be

made, at least the equivalent of primary treatment and disinfection is provided.

4. Management, supervisory, and key operational positions are assigned to personnel qualified to insure continuity of effective operations.

5. Staff size is adequate to continue operating the plant efficiently and to do all required preventive and emergency maintenance.

6. Training for new entry personnel and for upgrading or updating present staff is available and accessible to employees.

EPA rates plants as conditional if the following exist but could be remedied with minor corrective action.

1. The plant produces an effluent that is below but consistently close to the assigned effluent standard, permit requirement, or regulation, and the plant is not under orders to upgrade treatment.

2. Plant staffing, maintenance, or laboratory sampling and procedures are substandard, and a trend indicates that even though effluent standards are being met at present they will, in all probability, fall below an acceptable standard in the near future.

EPA rates plants as unacceptable if one or more of the following apply:

1. Operational performance is substantially below required levels.

2. Plant bypasses more frequently than is necessary or fails to provide the equivalent of primary treatment and disinfection of bypasses.

3. No operational data is maintained.

4. The quality of sampling and testing procedures is unacceptable.

At all but two of the plants we visited, an EPA engineer accompanied us to assist in the evaluation and help resolve technical questions that arose. At the two other plants, we were given technical assistance by DOD environmental engineers. Generally, the EPA or other engineers who accompanied us agreed with our findings and observations.

APPENDIX I

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

JAN 15 1976

OFFICE OF
PLANNING AND MANAGEMENT

Mr. Henry Eschwege
Director, Resources and Economic
Development Division
U. S. General Accounting Office
Washington, DC 20548

Dear Mr. Eschwege:

We have received your proposed report to Congress entitled "Need for Improvements in the Operation and Maintenance of DoD Waste Water Treatment Plants."

The report provides a comprehensive analysis of operational problems at selected DoD facilities which are similar to those we have found for municipal treatment facilities in our Performance Efficiency Survey as directed by Section 210 of PL 92-500.

GAO recognizes the need for greater attention to improved operation and maintenance at all surveyed facilities in order to increase treatment efficiencies. We feel that particular emphasis should be placed on proper staffing and staff training, preventive maintenance programs and replacement of obsolete equipment, and implementation of adequate laboratory testing programs. Such actions can result in greatly increased treatment facility performance efficiency and reliability, even in those cases where new plant construction is needed for ultimate compliance with permit requirements.

We concur with GAO's recommendations to the Secretary of Defense. It is particularly important that DoD comply with the intent of Executive Order 11752 in taking the administrative actions needed to correct the treatment facility operational deficiencies noted. Strong leadership by the Federal government in the area of plant operations and maintenance can be of great assistance to our program efforts nationwide.

APPENDIX I

I appreciate the opportunity you have given EPA to review and comment on this report prior to its submission to Congress.

Sincerely yours,

Alvin L. Alm
Assistant Administrator
for Planning and Management

APPENDIX II

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

IN
INSTALLATIONS AND LOGISTICS

27 JAN 1976

Mr. F. J. Shafer
Director, Logistics and
Communications Division
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Shafer:

This is in response to your letter of November 17, 1975 to the Secretary of Defense which forwarded copies of your draft report entitled "Need for Improvements in the Operation and Maintenance of DoD Waste Water Treatment Plants," Code 945239 (OSD Case #4224).

The draft report has been reviewed by this office and the Military Departments. Comments resulting from these reviews are attached.

We appreciate the opportunity to review and comment on this report. The findings and recommendations contained therein will be helpful in our continuing efforts DoD-wide to ensure compliance with the applicable federal and state water quality standards.

Sincerely,

JOHN J. BENNETT
Acting Assistant Secretary of Defense
(Installations and Logistics)

Enclosure

APPENDIX II

Department of Defense Position
On
GAO Draft Report, Dated November 17, 1975
(Code 945239 - OSD Case #4224)

"Need for Improvements in the Operation and Maintenance of DoD Waste Water Treatment Plants"

I. GAO Draft Report Summary

Executive Order 11752 requires the head of each federal agency to assure that facilities under his jurisdiction are designed, constructed, operated and maintained to comply with federal and state water quality standards. The Federal Water Pollution Control Act, as amended, requires that these standards be met by July 1, 1977. Using EPA criteria for rating plants, the GAO reviewed 20 DoD plants that were designed to provide secondary-type waste water treatment and found that improvements to increase the effectiveness of the waste water treatment were needed at all 20 plants. GAO rated 18 plants unsatisfactory, one conditionally unsatisfactory, and one satisfactory. The problems identified were attributable to (1) plant deficiencies, (2) inoperable or obsolete equipment, (3) lack of testing equipment and procedures, and (4) shortages of qualified plant operating personnel. The GAO also reviewed 380 evaluations of DoD plants conducted by EPA and various other groups and concluded that similar problems existed at many other plants. Some of the plants reviewed by GAO had corrected problems noted in these evaluations. It was recommended that the Secretary of Defense have the Army, Navy and Air Force establish controls to assure that waste treatment facilities are designed, constructed, operated and maintained so that treated waste waters will conform with applicable effluent limitations and water quality standards.

II. Defense Position Summary

The Department of Defense generally agrees with the basic conclusions and recommendation of the draft report. It is fully intended that DoD facilities meet the requirements imposed by the NPDES permit system and operated to obtain maximum performance. DoD Directive 4165.2 outlines broad objectives for the DoD Real Property Maintenance Activities (RPMA) Program, one of which is "To furnish utilities services in the most cost effective manner, taking into consideration the priorities of mission assigned to the installations and facilities served and total life cycle costs." Program policies included therein for environmental protection in the RPMA area require that operators of pollution control

facilities meet proficiency levels consistent with the operator certification requirements of the state in which the facility is located. The Military Services initiated development of pertinent certification programs shortly after the start of Fiscal Year 1974. Operating personnel for water and waste water facilities are encouraged to enroll in short courses and to obtain operators licenses under certification programs administered by state and regional authorities. Certification for plant operators is voluntary at this time as Civil Service regulations prohibit mandatory state certification as an employment prerequisite.

The Military Services have programs underway for all their plants to solve deficiencies such as outlined in the report. In its review, the GAO recognizes the problems of outmoded plants, difficulty in recruitment of trained operators, and budgetary constraints. The draft report has been helpful by pointing out specific deficiencies and areas for corrective actions. Important influencing factors which act to delay program efforts or implementation of previous recommendations must also be considered; i.e., time consuming negotiations with proposed regional or area wide systems, requirement by Section 807 of P.L. 93-408 for construction of DoD waste water facilities to be limited to those that are in timing with local and state water pollution abatement programs, inflationary trends which cause timing delays of proposed award actions, corrections of deficiencies via entirely new construction and/or repair projects in various stages and design, time required to program or secure funding for such projects, advisable management decisions to defer maintenance on selected items to keep the major process equipment on line or allow their correction as a part of major projects.

Many of the major plant deficiencies will necessarily require emphasis, time, follow-up and, in some instances, programming actions for full compliance. Depending on the type of improvement project required, it is programmed and budgeted for in either the Military Construction Program or the Operation and Maintenance budget. Pertinent data from additional surveys performed by environmental representatives, as well as EPA and state agency offices, are incorporated into the applicable program. The Office, Secretary of Defense will take steps to emphasize the requirements of the Executive Order 11752 and necessary actions to conform with the applicable effluent limitations and water quality standards.

III. Defense Comments

A. General

Monitoring and follow-up procedures on plant operations and

APPENDIX II

progress of improvements are an integral part of the normal command chain of the Services. Internal operating reports as a result of routine evaluations and on-site visits/surveys by Service personnel as well as audit reviews are utilized. The National Pollutant Discharge Elimination System (NPDES) permit system which prescribes water quality standards which must be met, schedules for compliance, and necessary reporting to monitor compliance in this area will also be used as a control device. A recent review by one Service of 204 NPDES permits involving waste water monitoring requirements reflected that for the last quarter of the Discharge Monitoring Reports of 28,000 discharge parameter analyses made, 95% (over 26,000) were in compliance with NPDES limitations. Additionally, parameters involving consideration of Biochemical Oxygen Demand (BOD) and suspended solids removal were found to be completely satisfied in 65% of the permits. These data are felt to be more representative of the actual waste water treatment plant performance than indicated by the draft report sampling. It should be noted in this connection that the survey was conducted using the EPA checklist covering a number of items related to the treatment plants and if any one checked item was judged unsatisfactory, then the plant could be rated unsatisfactory even though effluent requirements may have been met. Earlier this year, the Navy was assigned the Lead Service assignment for a new Tri-Service Manual covering the Operation and Maintenance of Domestic and Industrial Waste Water Systems, being proposed for DoD-wide use and scheduled to be completed by the end of next year, which will provide updated criteria for uniform coverage in this area. This basic standard manual should materially improve performance of this function.

The GAO evaluation of waste water treatment plants staffing is reportedly based on EPA staffing criteria intended for municipal sewage plants. It should be noted that some operational and maintenance services performed by municipal plant personnel are often provided by craftsmen of separately established shops on a DoD military installation which decreases the required staffing identifiable on-site at the plant. However, limitations in the form of personnel ceilings in the DoD and funding constraints often preclude the desired coverage by trained operators for standards compliance at the individual facilities.

Training programs in this area have been utilized in one form or another over the years; i.e., correspondence courses, on-the-job-training, formal classroom courses, etc. However, the emphasis on waste water facility operation and maintenance requires an updated and more comprehensive effort. Accordingly, steps are being taken to provide the necessary training. For example, in the Air Force an intensive 12 week schooling is conducted for all basic airmen entering this career field

and it is mandatory for all airmen assigned to waste water treatment plants; an active correspondence course program is available to all plant operators, and engineer-managers are provided a high level one-week seminar through the Institute of Technology. Similarly, in the Navy an expanded training program was inaugurated in 1974 which is presented by the Water and Waste Water Technical School of Neosha, Missouri in the field at Navy and Marine Corps activities. Formal training provided under state and regional certification programs is being utilized by the Army.

It is agreed that sources of inflitration should be identified and sealed off or otherwise corrected to prevent overloading of the plants; that standby power to operate the plant or capability to retain inadequately treated water during power failures should be provided, as well as appropriate alarm signals; that adequate chlorination, provision of necessary spare parts and laboratory equipment, and testing as prescribed should be accomplished; also, that appropriate remedial actions toward correcting outstanding deficiencies to comply with the water quality standards should receive priority attention.

B. Army

1. The Army, concurring in the need for the recommended actions of the draft report, reports that such actions are underway on a continuing basis under the NPDES permit system. Sincere efforts have been made, and are still being made, to comply with the permits; however, some permits have been issued as late as June 1975, a year after the GAO visits which occurred between April and November 1974. The FY 1976 Military Construction Bill appropriated $48.746 million for military construction water pollution control projects and the requests for FY 1977 and 1978 are expected to be around $75 to $80 million each year. The projects involved cannot possibly meet the 1 July 1977 requirements established under PL 92-500 because of the construction time required. It is estimated that one time costs (including FY 1977-78 MCA requests) to comply with current permits will amount to about $200 million with an annual additional requirement of $3.0 million to comply with the GAO recommendations. As more EPA permits are received and requirements become more stringent (in accordance with PL 92-500) additional costs will accrue, but the total cost requirements are indeterminate at this time.

[See GAO note, p. 36.]

C. Navy

1. An overall review of the maintenance deficiencies noted by GAO at the unacceptable Navy plants reveals that of the approximate 38 deficiencies noted, 35 have been either corrected, are in the process of final design or construction, or are in MILCON projects funded by the Congress. Of the remaining three deficiencies, two are for provision of auxiliary power at pump stations and one is for expansion of sludge handling capacity. Projects for these deficiencies are being developed. In considering acceptability of waste water plant operation and maintenance, it must be noted that these plants must produce a consistent product (treated effluent) from a raw material (sewage) which is almost infinitely variable with regard to quantity and quality. The plants include physical, chemical and biological processes involving considerable equipment. As with any industrial process, there is generally some portion of the plant (particularly an old plant) under repair or awaiting repair. Consequently, it is often necessary to defer maintenance on certain items (which may sacrifice a few percentage points of efficiency) to keep the major process equipment in repair. This is particularly true at two of the "unsatisfactory" Navy waste water plants (NAS Cecil Field and NAS Jacksonville) which have funded major MILCON renovation projects under construction or in design. In these situations, it is considered prudent to defer non-essential maintenance items to allow their correction in the major projects.

The report states that accomplishment of needed improvements is left to the discretion of base commanders, and ". . . this system of management is not producing needed results." Actually, this

is only partially correct. Major projects (Military Construction and O&M funded) are identified through detailed environmental surveys made by environmental engineers of the Naval Facilities Engineering Command. These projects are centrally programmed in a phased manner on a nation-wide basis to solve the more serious problems first. Funds thus obtained are "fenced" for the specific purposes intended. It is in the area of minor O&M funded work (i.e., that work within the local base commanders approval authority) that there is little management control beyond the base commander level. The Navy concurs that better management controls over this minor work at waste water treatment plants is required. Accordingly, a system will be initiated wherein unsatisfied minor deficiencies as well as instances of non-compliance with NPDES permit requirements will be brought to the attention of higher command levels.

[See GAO note, p. 36.]

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D. Air Force

1. Air Force installations will be responsible for meeting the requirements and effluent quality standards outlined in the NPDES permits issued by EPA for each point source of discharge. The permits have only been issued during recent months and, consequently, there has been insufficient time for an in-depth review and evaluation. However, positive measures are being taken to insure compliance with the permit requirements. A survey of all Air Force waste water treatment plants has been initiated to determine a full and comprehensive status of their treatment capabilities and efficiencies and to determine improvements required to upgrade plants and systems to meet the July 1, 1977 requirements. This inventory of facilities, which supports the Air Force overall plan for compulsory compliance, will be completed not later than February 15, 1976. A determination will be made then of the remaining requirements for compliance and corrective action will be initiated.

2. The survey covers six Air Force installations and uses criteria based upon the July 1, 1977 EPA Standard. While the report points out deficiencies in operation and maintenance as well as in design, staffing, and training, it does not address some important influencing factors. For example, three of the installations (McGuire AFB, Lockport AFS, and Myrtle Beach AFB) are currently involved in negotiations with proposed regional or area wise systems. Improving these existing on-base systems to meet the 1977 requirements would, in our estimation, result in expenditures inconsistent with good judgment and management. Meanwhile, measures are being taken, at these bases to meet interim standards until a decision can be made whether or not a regional system will be formed. Two other bases surveyed by GAO (Malmstrom and

Peace AFBs) have had major improvements made to their plants in recent years. Because of unanticipated inflation, all projected improvements to correct known and identified deficiencies could not be accomplished in the originally scheduled timeframe. Additional projects have been reprogrammed to correct these deficiencies.

3. Since 1968, there has been an intensive program in the Air Force for plant improvements, including laboratory equipment, to meet progressively more stringent federal and state requirements. Required plant improvements with estimated costs have been made known through the semiannual submittal of the OMB A-106 report. Depending on the type of improvement projects required, these are budgeted for in either the military construction program, the operations and maintenance budget, or the minor construction budget. Progress of achievement for such projects is then tracked through normal budget tracking systems and the A-106 report. In addition to the current outgoing survey, required improvements are usually determined through continuing internal surveys conducted by the Base Civil Engineer and Base Bio-Environmental Engineer, major command technical staff visits, Environmental Health Laboratory studies and/or Environmental Protection Agency or state agency reports.

4. With regards to staffing, the Air Force has established manning requirements and standards for waste water treatment plant operators in its manual AFM 26-3. The Air Force will compare its standards with those requirements set by the Environmental Agency and will attempt to mutually resolve any differences.

5. In the area of monitoring, the Air Force is currently in the final stages of publishing a new regulation which will establish an environmental pollution monitoring system for all its installations. This regulation will provide the necessary control to assure continuing compliance with effluent and water quality standards.

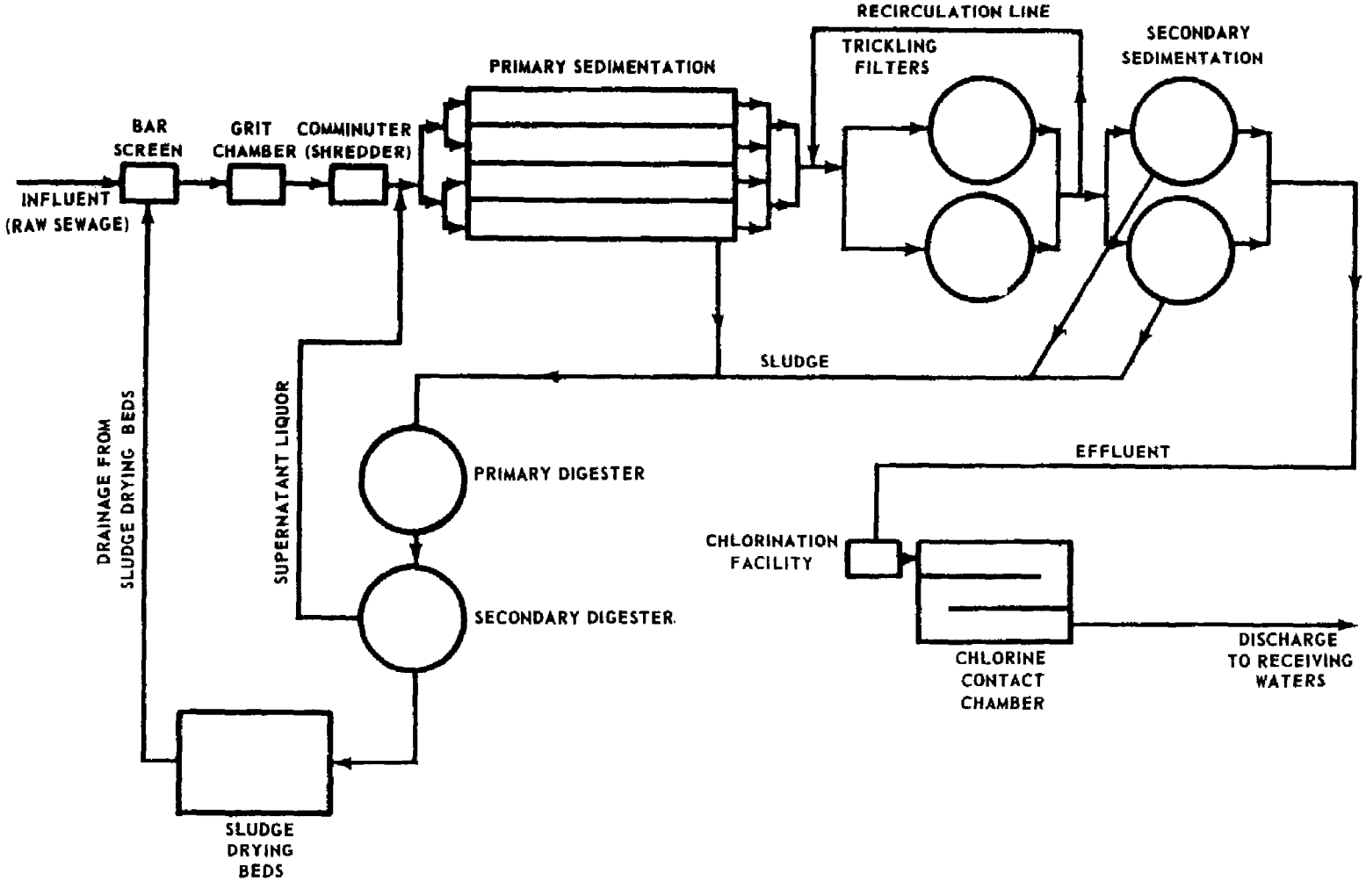
GAO note: Deleted comments refer to individual plant summaries which were included in the draft report and are omitted in the final report.

WASTE TREATMENT PROCESSES

The conventional waste treatment process consists of two steps--primary treatment and secondary treatment. Primary treatment involves (1) the removal of floatable and settleable solids by flotation and sedimentation and (2) chlorination of the effluent. Primary treatment plants normally reduce the biochemical oxygen demand (BOD) by about 35 percent by removing about 50 percent of the suspended solids and about 90 percent of the settleable solids. However, additional treatment is often required, especially when the flow of the receiving stream may be low or when pollution loads are exceptionally high.

Secondary treatment involves the aerobic decomposition of the greater portion of the organic matter left in the effluent after the primary treatment process. (See flow diagram for typical trickling-filter secondary treatment plant, p. 37.) When secondary treatment is required, the main function, generally, is to furnish oxygen to support aerobic decomposition of the organic matter which cannot be removed by sedimentation. EPA permits for secondary treatment plants require 85 percent removal of BOD and suspended solids. If properly operated and maintained, secondary plants without high industrial waste concentrations will normally remove from 85 to 92 percent of the total BOD and approximately 85 percent of the suspended solids. The presence of industrial wastes can generally be expected to reduce these removals if the plant is not properly designed and the treatment process is not carefully controlled. In addition, these removals can be greatly reduced if the plant is not properly operated and maintained.

FLOW DIAGRAM FOR TYPICAL TRICKLING FILTER SECONDARY TREATMENT PLANT



APPENDIX III

APPENDIX IV

GLOSSARY FOR SEWAGE TREATMENT

Activated sludge is a secondary treatment process which removes organic matter from sewage by activating it with air and adding biologically active sludge.

Aeration tank serves as a chamber for injecting air into water.

Aerobic decomposition is the breakdown of organic matter in sewage by bacteria which grow in an aquatic environment containing dissolved oxygen.

Biochemical oxygen demand is the dissolved oxygen required by organisms for the aerobic decomposition of organic matter present in water (in a specific time at a specific temperature). It is used as a measure in determining the strength of sewage and efficiency of a sewage treatment plant.

Chlorinator is a device for adding chlorine gas to sewage to kill infectious bacteria.

Chlorine contact chamber is a detention basin where chlorine is diffused through liquid.

Clarifiers--see sedimentation tanks.

Combined sewer carries both sewage and storm water runoff.

Comminutor is a device for catching and shredding solid matter in the primary stage of waste treatment.

Digestion of sludge takes place in tanks when the materials decompose, resulting in partial gasification, liquefaction, and mineralization of pollutants.

Dissolved oxygen is the oxygen dissolved in sewage water or other liquid expressed in parts per million or percent of saturation.

Effluent is the liquid that comes out of a treatment plant after completion of the treatment process.

Grit chamber is a small detention chamber or an enlargement of a sewer designed to reduce the velocity of flow of the liquid to permit the separation of mineral from organic solids by differential sedimentation.

Industrial waste is the liquid waste from industrial processes as distinct from domestic or sanitary sewage.

Infiltration is the intrusion of ground water into sewer pipes through cracks, joints, or breaks.

Influent is sewage water or other liquids, raw or partially treated, flowing into a treatment plant.

Pollution results when animal, vegetable, mineral, or heat waste or discharges reach water, making it less desirable for domestic, recreation, industry, or wildlife uses.

Receiving waters are rivers, lakes, oceans, or other water courses that receive treated or untreated waste waters.

Sanitary sewers carry waste water from homes, businesses, and industries.

Sedimentation tanks (clarifiers) help remove solids from sewage. The waste water is pumped to the tanks; the solids settle to the bottom or float on top as scum. This scum is skimmed off the top, and the solids in the botton are pumped to incineration, digestion, filtration, or other means of final disposal.

Sewers are a system of pipes that collect and deliver waste water to treatment plants or receiving streams.

Sludge is the solid matter that settles to the bottom, floats, or becomes suspended in the sedimentation tanks.

Sludge drying is the process of removing water from sludge by drainage or evaporation, through exposure to the air, application of heat, or other methods.

Storm sewers are a separate system of pipes that carry surface water runoff.

APPENDIX IV

Supernatant liquor is the liquid in a sludge digestion tank which lies between the sludge at the bottom and the the floating scum at the top.

Suspended solids are the small particles of solid pollutants which are present in sewage and which resist separation from the water by conventional means.

Trickling filters are a support media for bacterial growth, usually a bed of rocks or stones. The sewage is trickled over the bed so the bacteria can break down the organic wastes. The bacteria collects on the stones through repeated use of the filter.

Waste water treatment plant is a series of tanks, screens, filters, and other processes by which pollutants are removed from water.

PRINCIPAL DEPARTMENT OF DEFENSE OFFICIALS RESPONSIBLE FOR ADMINISTERING ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
SECRETARY OF DEFENSE:		
Donald H. Rumsfeld	Nov. 1975	Present
James R. Schlesinger	July 1973	Nov. 1975
SECRETARY OF THE ARMY:		
Martin R. Hoffmann	Aug. 1975	Present
Norman R. Augustine (acting)	July 1975	Aug. 1975
Howard H. Callaway	May 1973	July 1975
SECRETARY OF THE NAVY:		
J. William Middendorf II	Apr. 1974	Present
John W. Warner	May 1972	Apr. 1974
SECRETARY OF THE AIR FORCE:		
Thomas C. Reed	Dec. 1975	Present
John L. McLucas	May 1973	Dec. 1975

UNITED STATES
GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548