DCCUMENT RESUME

06509 - [B1946972]

The Environmental Protection Agency's Water Pollution Control Construction Grants Program. July 11, 1978. 16 pp. + 9 enclosures (35 pp.).

Testimony before the House Committee on Public Works and Transportation: Investigations and Review Subcommittee; by Elmer B. Staats, Comptroller General.

Contact: Office of the Comptroller General.
Organization Concerned: Environmental Protection Agency.
Congressional Relevance: House Committee on Public Works and Transportation: Investigations and Review Subcommittee.
Authority: Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Water Pollution Control Act Amendment of 1956. Clean Water Act of 1977.

Since it was initiated in 1956, the Environmental Protection Agency's water pollution control construction grants program has been expanded by removing the dollar ceiling and increasing the Federal share of project costs. The Congress appropriated almost $25 billion between 1970 and 1978 and authorized another $20 billion through 1982 for the program. Advanced waste treatment facilities frequently are not well justified and may not substantially improve water quality. In spite of this, EPA's 1977 data showed that 565 advanced waste treatment projects were under construction at a cost of $2.7 billion. The following problem areas require attention: projects are being constructed with little or no on-site inspections; comprehensive planning has not been accomplished; nonpoint sources of pollution, such as runoff from agricultural and forest lands, are now more of a problem than industrial and municipal point sources; little is known about the extent of toxic chemical spills and discharges; treatment plants are being constructed where they are not needed; low-income families are finding it difficult to pay user charges and other fees; administrative and financial controls over construction grant funds need strengthening; and operation and maintenance problems have decreased the effectiveness of complete plants. (Author/HTW)

6972

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

FOR RELEASE ON DELIVERY
EXPECTED AT 10 A.M. EDT
TUESDAY, JULY 11, 1978

STATEMENT OF
ELMER B. STAATS
COMPTROLLER GENERAL OF THE UNITED STATES

BEFORE THE
SUBCOMMITTEE ON INVESTIGATIONS AND REVIEW
HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

ON

THE ENVIRONMENTAL PROTECTION AGENCY'S
WATER POLLUTION CONTROL CONSTRUCTION GRANTS PROGRAM

Mr. Chairman and Members of the Subcommittee:

We are here at your invitation to present our observations and concerns regarding the multi-billion dollar construction grants program that is now growing larger and more costly each year. Our comments will be based on issues presented in a number of our recently issued reports (Attachment 1) which address a wide range of activities directly related to the construction grants program and contain many recommendations aimed at improving program implementation. We have also provided as attachments detailed data and examples to amplify some of the areas I will discuss.

We believe these hearings are most timely because of the growing concern in the country and the Congress over inflation. Of special interest is the extent to which Federal programs and activities, particularly regulatory activities such as those associated with the

costly water pollution control program, may contribute to inflation. Also, as evidenced by the Congress' current interest in Sunset legislation, periodically there is a need to critically evaluate where a Federal program has been, consider where it is headed, assess its accomplishments and shortcomings, and determine whether its direction should be changed or its growth altered.

Any program with the magnitude, scope, and complexity of the construction grants program, the Nation's largest public works program, is bound to experience problems. What concerns us is that many of the problem areas have persisted and their long-term resolution is in doubt. Advanced waste treatment facilities—the most expensive type of pollution control—frequently are not well justified and may not substantially improve water quality. Accordingly, the benefits derived from the funds invested in such facilities are often subject to serious question. Projects are being constructed with little or no on-site inspections. Comprehensive planning has not been accomplished. Nonpoint sources of pollution, such as runoff from agriculture and forest lands, are now more of a problem than industrial or municipal point sources. Very little is known about the extent of toxic chemical spills and discharges into the Nation's waters. Treatment plants are being constructed where they are not needed. Low-income families in small communities are finding it very difficult to pay user charges and hookup and connection fees brought about by expensive treatment plants. Administrative and financial controls over construction

grant funds need strengthening. Continuing operation and maintenance (O&M) problems have significantly decreased the effectiveness of completed plants. Each of these areas needs the close attention of EPA.

We have worked closely with this subcommittee in the past and will continue to provide assistance as needed as part of our overall responsibilities to the Congress.

Water pollution construction is extremely costly

The program began under the Water Pollution Control Act Amendment of 1956. At first, only small communities participated because grants under this Act were limited to the lesser of 30 percent of the project cost or $250,000. The 1966 water pollution amendments opened the program to cities of all sizes by removing the dollar ceiling, and increasing the Federal share of project costs under some circumstances to 40 or 50 percent and later to 55 percent. The most extensive and far-reaching program legislation was Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972, which increased the Federal share to 75 percent of project costs. Most of the projects currently funded receive 75 percent Federal money.

The Clean Water Act of 1977 opens the possibility of a still higher Federal share. A project using innovative and alternative technology can receive up to 85 percent Federal money. If such a project fails, 100 percent grants are available to fund modification or replacement costs.

Congress appropriated almost $25 billion between 1970 and 1978 (see Attachment II) and authorized another $20 billion through 1982. Beyond 1982, EPA's 1976 needs survey shows that $150 billion in Federal funds will be needed through 1990. The National Commission on Water Quality estimated that both public and private costs for water pollution was between $160 and $670 billion expressed in 1975 dollars. The range of these costs results from the uncertainty over the cost to control storm-water runoff which could total $427 billion.

Keep in mind that EPA's estimates are for controlling point sources of pollution only and do not address pollution from nonpoint sources. We see nonpoint pollution as a multibillion dollar problem now coming onto the horizon. Also, pollution costs will go even higher when industries add pretreatment components to meet toxic chemical standards scheduled to be developed by December 1979.

Not only are the capital costs for building the waste treatment plants high but O&M costs paid by the users are staggering as well. EPA estimated annual O&M costs at $1.1 billion for the 21,100 plants operating in 1977, and $1.7 billion for the 24,700 plants to be operated in 1981.

Up to now many projects have been located in the larger metropolitan areas where the local share costs can be spread over a substantial number of users. But many smaller and less affluent communities are constructing sewage facilities, and the user charges and the hookup and connection fees are causing, and will continue to cause, financial hardships to most families in economically depressed communities. We believe this situation

will become more widespread in the future as more of these communities become involved in the program. While the Federal Government contributes 75 percent to certain capital costs, the users--homeowners and industrial and commercial firms-pay all the O&M costs.

Advanced waste treatment facilities--
are they worth the cost?

We are particularly concerned with a trend towards constructing very expensive advanced waste treatment facilities. Many communities are being required to provide such treatment without reasonable assurances that the treatment will significantly improve water quality. We question whether advanced waste treatment facilities which provide only marginal water quality improvement should continue to be funded.

Secondary treatment plants are generally designed to remove 85 percent of the pollutants. Removal of the last 15 percent through advanced waste treatment could cost at least 5 times as much as the first 85 percent. For example, the cost of expanding existing capacity and adding advanced treatment capabilities at the Blue Plains, Alexandria and Arlington facilities is estimated to increase from $160 to $650 million, of which the Federal share is $459 million (Attachment III). O&M costs are expected to increase from $15.6 to $90.4 million annually. (Attachment IV.)

We reported in December 1976 that EPA was financing some advanced waste treatment facilities without sufficient water quality data and planning. We concluded that EPA and the States need to obtain better water quality information and consider all water pollution control alternatives so that treatment methods selected would improve water quality and result in more efficient use of Federal funds.

A July 1977 report prepared by an EPA contractor confirmed that more scientific knowledge is needed to specifically identify the effects of advanced waste treatment on improving water quality. The contractor's review of EPA's six "best" examples of advanced treatment facilities concluded that the treatment requirements have proven to be largely unnecessary or ineffective in solving the problems they were designed to address. (Attachment V contains the report's conclusions and an example.)

In spite of this, EPA seems to be going full speed ahead with advanced waste treatment facilities nationwide. Its December 1977 data shows that 565 advanced waste treatment projects were under construction with a $2.7 billion price tag. EPA's latest needs survey shows that $21.3 billion is required for advanced treatment facilities. EPA also estimates that by 1990, one-half of the population will have advanced waste treatment.

In recent hearings before the House Appropriations Subcommittee, EPA officials agreed with the conclusions expressed in our advanced waste treatment report. One official said that EPA and the States had given insufficient attention to planning, and that EPA was committed to a more rigorous analysis at the planning stage, to the cost effectiveness of particular projects, to the consideration of the alternatives, and to the importance of projected O&M costs. He also said EPA was shifting more resources to the planning stage.

We believe, Mr. Chairman, that the attention that your Subcommittee has focused on this subject is useful and needed.

Construction inspections

To insure fiscal integrity and quality control over EPA's multibillion dollar construction grants program, an effective construction inspection program is essential. Without such inspections, EPA has little assurance that the projects are being properly managed, are meeting environmental objectives, are on schedule, and are being constructed in accordance with approved plans, specifications, and change orders. Although EPA personnel have performed many of the inspections, State inspectors, or inspectors under interagency agreements with the General Services Administration and Corps of Engineers, also perform on-site construction inspections.

Our September 1977 report noted that EPA made infrequent interim construction project inspections which were usually announced in advance and were primarily concerned with administrative requirements, construction progress, and obvious deficiencies. In addition, the degree of monitoring of projects by the eight States included in our review was inconsistent. Monitoring was absent in five States and generally limited to one interim visit in another State. The two other States, however, inspected each project at least monthly.

EPA's Office of Audit recently completed a four-region study of inspections and found major problems as to scope, frequency, timeliness, and follow-up of previously reported deficiencies.

Comprehensive planning is not being done

Although areawide planning should provide a sound basis for determining the type of facilities and the degree of treatment needed to solve water pollution problems, the planning program has not been of much value. As of May 31, 1978, none of the 224 areawide water quality plans required by the law have been completed and approved by EPA; few, if any, will be completed by the November 1978 deadline. (Attachment VI.) Despite the lack of planning, billions are spent each year for waste treatment facilities that may not be the most effective alternative for achieving water quality goals. (Attachment VII shows an example of the benefits of planning.)

As early as 1969, we reported to the Congress on the need for comprehensive planning and recommended that systematic planning be developed to relate facility construction to water quality improvement. EPA and the States gave a low priority to the areawide planning program in the early years of Public Law 92-500. Our current review has identified major problems with the program. The technical capability to identify the cause and effect relationship among nonpoint pollution sources and the expected water quality impacts of various control techniques does not now exist; planning agencies will not continue areawide planning without Federal funds; areawide plans if developed may not be implemented because of institutional problems; and the general public has participated little in the planning process.

Nonpoint pollution is a major problem

Nonpoint pollution, runoffs from agriculture and forest lands, mining and construction sites, and urban area storms, are because of their nature, difficult to measure, control and eliminate. We do know, however, that nonpoint pollution is a major problem, accounting for more than half the pollutants entering national waters. This percentage will increase as progress is made in abating point sources of pollution. Federal and State officials agree that in many areas the 1983 water quality goals cannot be attained because of nonpoint pollution. EPA's May 1976 report to the Congress on an inventory of the Nation's water quality indicated that 37 States reported that some portion of their waters will not meet the 1983 goals because of nonpoint pollution.

Very little is known about the cause/effect relationship of nonpoint pollution to water quality, the exact magnitude of nonpoint problems, and the costs which will be incurred to correct the problems. What is disturbing to us is that the funds now being spent to build facilities to control point sources of pollution may not have as much impact on improving water quality as originally believed because nonpoint pollution may be negating or at least lessening the impact.

Toxic chemical discharges and spills

About 40,000 industrial plants across the country discharge toxic chemicals into municipal sewer systems. Such chemicals can cause a number of potentially serious health and environmental

problems. Some can disrupt the operation of treatment plants by killing the biological matter in the treatment process. Other chemicals can pass through a municipal plant without receiving adequate treatment. Once in the waterways, many pollutants are long-lasting, toxic to aquatic life, and can concentrate in the food chain. Also, many are known or suspected cancer-causing agents.

Until very recently, EPA had no effective strategy to deal with toxic water pollutants. By December 1979, it plans to set pretreatment standards for 21 industrial categories. EPA will initially concentrate on setting standards for 65 toxic pollutants. Compliance will be required within three years after the standards are issued.

We are currently undertaking a broad survey of this area.

Secondary treatment is not always needed

The law requires municipal wastewater treatment facilities to provide at least secondary treatment to any discharges made to fresh water regardless of the effect such treatment will have on water quality. There are some locations, however, where secondary treatment may not be needed because the treatment will only marginally improve the quality of the receiving water. If some rivers have the capacity to absorb wastewater discharges from a lower level of treatment, greater flexibility should be permitted to consider alternatives and the characteristics and uses of the receiving waterways.

We recently reviewed two municipal waste treatment facilities in the St. Louis, Missouri area that are to be upgraded from primary to secondary treatment facilities at an expected Federal cost of $163 million. We found that such treatment will have little effect on improving the water quality and, especially, the uses of the receiving water—the Mississippi River. Two primary purposes of secondary treatment are to enhance oxygen levels of receiving waters and reduce suspended solids. In this case, there was no oxygen problem and secondary treatment would have no significant impact on suspended solid concentrations.

The need for secondary treatment facilities is now coming under increasing criticism. The State of Kansas, for example, has reported to the Congress that pollution control costs to meet the goals of Public Law 92-500 is $6.2 billion, or a statewide average cost of $600,000 per mile of stream. For this expenditure, the State does not anticipate any major increases in beneficial water use.

Also, the Congress has not required secondary treatment where deep ocean outfalls can be used, thus significantly reducing treatment costs. We have indications, however, that deep ocean outfalls may not be effectively used because EPA's regulations may overly restrict their use.

We are very concerned that cost/benefit analysis is almost nonexistant when determining the degree of water cleanup needed for municipalities. This suggests that the law must be more flexible

so that each secondary treatment facility can be evaluated on its own merits since the cost-benefit ratio varies greatly depending on each facility's circumstances. Our May 1978 report recommends that the Congress amend the law to eliminate the mandatory requirement for secondary treatment of discharges to fresh water and to permit the EPA Administrator to grant waivers, deferrals, or modifications on a case-by-case basis when dischargers can demonstrate that the enviromental impact of secondary treatment will be minimal or insignificant.

Administrative and financial controls need strengthening

Administrative and financial controls over grants given to communities under the construction grants program need strengthening. There is no assurance that waste treatment facilities have been designed and constructed in the most cost-effective manner.

Grantees generally accept--without negotiations--fees proposed by engineers for design services. This occurs with small grantees because their staff members do not have adequate qualifications or the expertise to effectively negotiate contracts with consulting engineers for design of treatment facilities. Larger grantees usually have engineering staff with the capability to negotiate but are not doing so in most cases.

Construction costs could be lowered if grantees would solicit both separate and combined bidding for various project segments. This would give the grantee an opportunity to compare the costs

of project construction on the basis of several alternatives and choose the combination of bids that would provide the lowest construction cost.

Treatment plant costs are sometimes unreasonably high because of elaborate, costly aesthetic features. Our 1977 report contained several examples of such costly features. We believe there is a need for EPA to establish criteria restricting Federal grant participation in the cost of unnecessary ornamental or aesthetic features.

Many grantees--large and small--were not maintaining the required accounting records and, in many cases, requested and obtained erroneous reimbursements from EPA. Inadequate recordkeeping by grantees has resulted in undue reliance on consulting engineers to maintain accounting records and prepare progress payment requests. Because EPA reviews of such payment requests are inadequate and inconsistent, many erroneous claims have been made and paid by EPA.

In May 1975 we reported on the potential of value analysis. Value analysis is designed to reduce waste treatment plant costs by eliminating gold plating and unnecessary features, substituting new materials or methods, and considering less costly alternatives. By using trained, interdisciplinary teams of architects and engineers, high-cost areas can be identified, modified or eliminated if they do not contribute to the system's basic functions.

Early construction projects were not subjected to this cost saving technique. However, EPA now requires that value analysis be applied

to all projects with a total estimated cost of $10 million or more. Value analysis has been used on 28 projects and resulted in an estimated net savings of $73.6 million including capital and O&M costs. These savings represent 5.2 percent of the total construction costs estimated at $1.4 billion for the 28 projects. For example, $574,000 was saved on one project when a value analysis team recommended a less expensive construction material. It is clear that value analysis can play a very significant role in keeping construction costs to a minimum and should be applied on larger construction projects below $10 million. (Attachment VIII shows additional examples of administrative and financial problems.)

Serious operation and maintenance problems persist

Finally, my last point relates to a most important area. After an expensive wastewater treatment plant is built, it must be properly operated and maintained or else its effectiveness is diminished. Studies have consistently detailed major and widespread O&M problems which, over the years, have led to inefficient plant operations and have caused unnecessarily high pollution loads in the Nation's waterways. It is unlikely that water quality goals can be achieved if O&M problems are not resolved.

Local governments are responsible for operating and maintaining treatment plants. Although Federal grants are not authorized for O&M at these plants, EPA has a continuing responsibility to ensure

effective waste treatment and to safeguard the federally-funded capital investment.

Our September 1970 report noted O&M problems at 11 of 12 plants. Our follow-up report in April 1977 showed that only 3 of the 11 original plants had significantly improved the effectiveness of their O&M activities. We added 17 more plants in 3 States to our review making a total of 28 plants reviewed. We identified the following causes of common O&M problems: at 13 plants, controls over industrial wastes were inadequate; at 11 plants, laboratory controls and testing procedures needed strengthening; at 15 plants, plant design and equipment was not adequate; at 15 plants, there were infiltration/inflow problems; at 13 plants, qualified personnel was minimal; and at 5 plants, budgets were not well established. (Attachment IX contains other examples of O&M problems.)

A 1975 EPA survey showed that 34 percent of 803 plants were operating below their design criteria for biochemical oxygen demand removal, and 41 percent were operating below their design criteria for suspended solids removal. EPA observed that many unsatisfactory plants could be brought to acceptable levels of performance by increased attention to O&M activities.

In the National Commission on Water Quality Report to the Congress dated March 18, 1976, the Commission's Chairman expressed similar concern on the need for better O&M. He stated that there was already considerable evidence indicating that some of the most

modern existing facilities were not operating efficiently or were being inadequately maintained. He foresaw situations in which, even after billions of dollars are spent upgrading treatment, the Nation would not have much cleaner water because of ineffective O&M practices.

EPA, the States, and the local communities must place a higher priority on O&M. We believe that EPA could do a great deal to assist the States and local communities with O&M problems through its technical assistance and education and training problems and by assuring good plant design. Unless this happens, the problems noted will continue to adversely affect the high capital investment that has been made and is continuing to be made in treatment facilities. This area of the program must be better managed.

— — — — —

This completes my prepared statement. We will now be glad to respond to any questions you might have.

ATTACHMENT I

LIST OF GAO's REPORTS ON THE CONSTRUCTION GRANTS PROGRAM

"Examination into the Effectiveness of the Construction Grant Program for Abating, Controlling, and Preventing Water Pollution", B-166506, November 3, 1969

"Need for Improved Operation and Maintenance of Municipal Waste Treatment Plants", B-166506, September 1, 1970

"Alternatives to Secondary Sewage Treatment Offer Greater Improvements in Missouri River Water Quality", B-125042, January 6, 1972

"Potential of Value Analysis for Reducing Waste Treatment Plant Costs", RED-75-367, May 8, 1975

"Delays in Constructing Waste Treatment Facilities After Award of Construction Grants--Improvements Made", CED-77-1, November 10, 1976

"Better Data Collection and Planning is Needed to Justify Advanced Waste Treatment Construction", CED-77-12, December 21, 1976

"Continuing Need for Improved Operation and Maintenance of Municipal Waste Treatment Plants", CED-77-46, April 11, 1977

"Multibillion Dollar Construction Grant Program: Are Controls Over Federal Funds Adequate?", CED-77-113, September 12, 1977

"National Water Quality Goals Cannot Be Attained Without More Attention to Pollution from Diffused or "Nonpoint" Sources", CED-78-6, December 20, 1977

"Environmental Protection Agency's Construction Grant Program--Stronger Financial Controls Needed", CED-78-24, April 3, 1978

"Secondary Treatment of Municipal Wastewater in the St. Louis Area --Minimal Impact Expected", CED-78-76, May 12, 1978

"Questions Continue as to Prices in Contracting for Architectural - Engineering Services Under the Environmental Protection Agency Construction Grants Program", CED-78-94, June 6, 1978

ATTACHMENT II

ENVIRONMENTAL PROTECTION AGENCY
CONSTRUCTION GRANTS FOR WASTEWATER TREATMENT WORKS
(In thousands of dollars)

Fiscal year	Authorized	Appropriated	Obligations
1970	$ 1,000,000	$ 800,000	$ 424,999
1971	1,250,000	1,000,000	1,228,364
1972	2,000,000	2,000,000	787,635
1973	7,750,000 1/	1,900,000 2/	2,926,271
1974	6,500,000 3/	600,000 5/	2,790,681
1975	7,000,000 4/	1,400,000 5/	4,226,936
1976	----	800,000 5/	4,329,228
Transition Qt.	----	800,000 5/	687,634
1977	1,700,000	3,800,000 5/	----
		1,980,000 6/	7,501,146
1978	4,500,000	4,500,000	4,000,000 (Est.)
		5,000,000 5/	
	$31,800,000	$24,580,000	$28,902,894

1/ Contract authority in P.L. 92-500, $5 billion; reimbursement to States, $2,750 million.

2/ Appropriated for reimbursement to States.

3/ Contract authority, $6 billion; reimbursement to States, $600 million.

4/ Contract authority - total $18 billion.

5/ Appropriated for payments against contract authority obligations.

6/ $1 billion of $4.5 billion supplemental request; $480 million, Public Works Appropriation Act, P.L. 94-447, $300 million reimbursement to States, Economic Stimulus Appropriations Act, P.L. 95-29; $200 million reimbursement to States, HUD-Independent Agencies Appropriation Act, P.L. 94-378.

ATTACHMENT III

COST DATA FOR THREE AWT PLANTS IN THE WASHINGTON, D.C. AREA

The construction costs for existing primary and secondary facilities and for increased capacity including proposed advance treatment facilities for the three plants, as of March 1975, are shown below.

	Average capacity of proposed facilities (mgd)	Cost of existing facilities	Cost of proposed facilities (note a)	
			Nutrient removal	Increased capacity and advanced treatment including nutrient removal
		($ in millions)		
Blue Plains	309	$150	b/$335	b/$482
Alexandria	54	4	70	104
Arlington	30	6	36	64
		$160	$441	$650

a/ Does not include cost of existing facilities.
b/ $100 million of this amount has been deferred until a final decision has been made about the need for removing nitrogen.

As shown by the above table, the cost for advanced treatment facilities in the Metropolitan Washington, D.C., area is enormous. Of the $650 million total cost for expansion and advanced treatment at the three facilities, the estimated Federal share is about $459 million. For the Blue Plains plant, nutrient removal is estimated to cost more than two times the combined cost for existing primary and secondary treatment.

The existing and projected O&M costs for AWT facilities in the Washington, D.C., area are expected to increase from $15.6 to $90.4 million annually after expansion and installation of AWT. (See attachment IV.)

ATTACHMENT IV
Page 1

OPERATION AND MAINTENANCE COSTS OF THREE AWT FACILITIES FOR WASHINGTON, D.C. AREA

The following chart shows a comparison of the current and projected O&M costs for the three advanced treatment facilities in the Metropolitan Washington, D.C. area as of March 1975.

	Current annual operation and maintenance costs for secondary treatment	Projected annual costs after expansion and advanced treatment is installed
	(millions)	
Blue Plains	$13.0	$76.0
Alexandria	1.2	10.0
Arlington	1.4	4.4
TOTAL	$15.6	$90.4

Although the design capacity of the Blue Plains facility was being increased by 29 percent because of expansion and the modifications which would add AWT, the projected operating costs were to rise from about $13 to $76 million (a sixfold increase) due principally to the modifications adding AWT. With a 25-percent increase in size, Arlington's O&M costs were estimated to rise from $1.4 to $4.4 million (a threefold increase). Some of the increased O&M costs can be attributed to the expanded capacity of the facility but a large part of the costs are directly attributable to the advanced treatment facilities.

A major reason for the expected increase in O&M costs of AWT for these facilities is the vast amounts of chemicals and energy which are required. For example, if the proposed Blue Plains plant were completed as originally planned, the daily quantities and projected costs of chemicals expected to be used for the AWT processes would be

Treatment	Chemical needed	Quantity	Cost
Phosphorus removal	alum	114 tons	$11,600
Nitrogen removal	methanol	19,600 gallons	12,700
	lime	65 tons	3,300
	alum	85 tons	8,600
	polymer	195 pounds	450

ATTACHMENT IV
Page 2

Also, sludge incineration, if used, would require 45,000 gallons of fuel oil a day at a cost of $19,800.

Because of population increases and improved sewage treatment processes, the volume of sludge generated by treatment facilities is expected to increase significantly. Nationwide, about 4 million tons of sludge are generated annually. EPA estimates that the total volume of sludge produced will reach 10 million tons by 1985. For the Blue Plains plant, the proposed expansion and nutrient removal facilities are expected to increase the amount of sludge produced from about 400 to 2,000 tons a day, a 500-percent increase.

ATTACHMENT V
Page 1

VERTEX REPORT: MAJOR CONCLUSIONS AND THE SAN JOSE/SANTA CLARA AWT PROJECT

The major conclusions in the Vertex report a/ are

—AWT planning is filled with assumptions, guesswork, and oversimplifications because planners don't know nearly enough about water and the way it responds to wasteloads,

—compliance with water quality standards has not been ensured by AWT,

—if total maximum daily loads had to be adjusted downwards to compensate for "any lack of knowledge" the "margin of safety", discharges would have to be [illegible] forbidden in vast areas of the country, and

—although we may never know enough to specify the precise relationship between wasteloads and water quality, we can certainly do a lot better than we're doing now.

SAN JOSE/SANTA CLARA AWT PROJECT

Since the early 1950's, California has required more and more pollution control and in 1951, the State required that dissolved oxygen in the San Jose/Santa Clara waters never fall below 2.0 mg/l (milligrams per liter). At the present time, the secondary treatment plant for this area is being upgraded to AWT, new facilities for sludge handling are being designed, and the State has ordered San Jose/Santa Clara to move its outfalls from the tidal tibutaries to the deep bay. According to the mathematical modelors, this new round of construction, like its predecessor, is foredoomed to failure. The modelers now believe that non-point sources cause most of the problem. If San Jose/Santa Clara does move its discharge from the tidal tributaries to the deep bay, they believe that the pollution problems will be worse.

a/ An Analysis of Planning for Advanced Wastewater Treatment (AWT) by Jerome Horowitz and Larry Hazel, Prepared for EPA under EPA contract 68-01-4338, July 1977, The Vertex Corporation, McLean, VA.

ATTACHMENT V
Page 2

The Vertex report is very critical of the need to construct AWT facilities because, even after the facilities are constructed, the pollution problems will remain. According to the report,

> "The most recent mathematical model (which is an improvement on many of the earlier versions—versions that led to the requirement for AWT and for a new outfall deep in bay) has shown that all earlier plans were fundamentally wrong. The modelers now contend that AWT and a new outfall in deep water will not bring the waters around San Jose into compliance with WQS [water quality standards]. The DO [dissolved oxygen] standard, in particular, will be violated no matter what San Jose/Santa Clara may do about pollution control."

ATTACHMENT VI

RESPONSE OF THE 16 AREAWIDE PLANNING AGENCIES TO THE STATUTORY REQUIREMENTS

	Number of agency responses					
	1/	2/	3/	4/	5/	6/
1. The identification of municipal and industrial treatment works needed over a 20-year period and how to finance construction;	4	5	7			
2. The establishment of construction priorities and time schedules for treatment works;	7	6	3			
3. The establishment of a regulatory program to oversee the requirements of section 201 of the act;	7	4	5			
4. The identification of agencies necessary to construct, operate, and maintain all required facilities and otherwise carry out the plan;	8	5	3			
5. The identification of financing, costs, and time necessary to carry out the plan;	3	2	11			
6. A process to identify, if appropriate, agriculture and silviculture related nonpoint sources of pollution and control measures;	3		13			
7. A process to identify, if appropriate mine related sources of pollution and control measures;			10	6		
8. A process to identify construction activity related sources of pollution and control measures;	2		11		3	
9. A process to identify, if appropriate, salt water intrusion from reductions of fresh water and control measures	2	2	12			
10. A process to control the disposition of all residual waste which could affect water quality; and	4	2	9	1		
11. A process to control the disposal of pollutants on land or in subsurface excavations to protect water quality.	4	2	8	1	1	

1/ Will be completely and adequately addressed during areawide planning

2/ This requirement was not addressed under the areawide planning effort, but has been adequately addressed as part of the facilities planning (or some other planning) effort.

3/ Although considered during areawide planning, we were informed that a lack of time, data, or funds prohibited completion of work in this area. As a result, this area will probably receive "conditional" approval and work will have to be completed during a continued planning phase to obtain unconditional EPA approval.

4/ Officials indicated that this requirement was not a problem and therefore not addressed during areawide planning.

5/ Not addressed at all.

6/ This requirement considered to be a State responsibility and the local areawide planning agencies did not address.

ATTACHMENT VII
Page 1

THE WILLAMETTE STUDY--AN EXAMPLE OF THE BENEFITS OF USING GOOD DATA FOR PLANNING

Several experts we contacted in the field of water quality analysis stated that much of the national effort to attain desirable water quality is based on inadequate data. Methods of obtaining the needed water quality information are available and are starting to be implemented by some of the States. At the same time, however, even these methods are being continuously improved. In addition to EPA obtaining water quality information, other Federal agencies are assisting in developing methods for obtaining and interpreting water quality data.

After collecting cause and effect data based on a pilot study of the Willamette River in Oregon, a U.S. Geological Survey (USGS) team identified alternatives for achieving water quality standards. These alternatives may save several million dollars in Federal and State construction funds. Several members of the Department of the Interior's Advisory Committee on Water Data for Public Use--which includes national authorities on pollution control--said that the Willamette study was excellent and should be used as an example of how water quality studies should be done. Oregon Department of Environmental Quality officials also stated that the USGS study was well done and that the State is using the results of the study to clean up its water.

CLEANING UP THE WILLAMETTE RIVER

The Willamette River Basin is located in northwestern Oregon. Within the basin are three of the State's largest cities, Portland, Salem, and Eugene and about 70 percent of the State's population. The basin supports an important timber, agricultural, industrial, and recreational economy and also extensive fish and wildlife areas.

The Willamette River has been carefully studied in the past and, on the basis of this information, extensive cleanup has been made in Oregon by various industries, the State, and the Federal Government. The goal of this cleanup was to provide a water quality that satisfied the recreational and aesthetic requirements of people and an adequate environment for fish. One of the most important measures of water quality is dissolved oxygen. The State has set requirements for minimum levels of dissolved oxygen necessary for fish and other aquatic organisms and for the prevention of offensive odors.

ATTACHMENT VII
Page 2

Through several years of extensive cleanup, all the industrial and municipal dischargers on the river finally achieved secondary treatment of their wastes in 1972. The Willamette River is now the largest river in the United States on which all known point sources of wastewaters receive secondary treatment. As a result, the water quality of the river has markedly improved, reaching the State standards for dissolved oxygen in all but extremely low-flow years.

Because of strong State interest in environmental matters, the State Department of Environmental Quality planned to take additional actions to make sure that the Willamette water quality met or exceeded State standards at all times. The State planned to require advanced wastewater treatment for all municipal and industrial polluters to remove additional amounts of BOD and suspended solids. This advanced treatment requirement would have affected a large number of municipal polluters and could have cost tens of millions of Federal and State dollars.

The results of the U.S. Geological Survey study of the Willamette, begun in January 1973 and done in cooperation with the Oregon Department of Environmental Quality, indicated that effective and efficient management alternatives were available which could achieve the desired water quality standard, yet save millions of dollars.

A DESCRIPTION OF THE WILLAMETTE STUDY

The purpose of the Willamette River pilot study was to (1) develop and test new methods for river quality analysis and (2) use the information obtained to determine the impact of various alternatives on water quality. As noted by the study team:

> "Achievement of desirable river quality at acceptable cost requires that management decisions be based on sound impact assessments, not on arbitrary assumptions. Thus, the vital link between resource-development plans and management decisions is scientific assessment to predict the probable impacts of each planning alternative."

To understand the cause and effect water quality relationships in the Willamette Basin, the study team looked at the basin's hydrology, chemistry, and biology. The team stated that river basin studies have to be developed on a case-by-case basis because each basin has different characteristics that need to be considered.

ATTACHMENT VII
Page 3

A large amount of river quality data had been collected in previous studies, and much of this data was useful for background purposes of the USGS study. Information on pollutant loadings, flow, and water quality had not been collected at the same time. Consequently, cause and effect relationships could not be determined. Additionally, in order for monitoring and surveying information to be useful, the sampling has to be aimed at the specific needs of the program managers. Water quality experts cannot simply collect general data and try to use it later for a variety of specific purposes.

The study team prepared a mathematical model of dissolved oxygen to test alternatives concerned with variable water flow and pollutant loadings. The study team defined specific data needs and modified certain standard tests to meet the changing conditions of the wat r. For instance, most of the BOD tests in previous river quality studies were given a 5-day analysis which is a standard test. However, the basinwide implementation of secondary treatment had removed a substantial percentage of the rapidly decaying wastes from the water. The remaining wastes in the river tended to degrade much more slowly. The study team thus used a 20-day test of BOD which was more meaningful.

Because river quality planning and management decisions in the Willamette Basin have been dictated primarily by poor water quality conditions that occur during the summer when low flows and high temperatures exist, the study team aimed the tests and modeling at this critical period. The study team believed that collecting extensive dissolved oxygen data during the remainder of the year for assessing management alternatives would waste both time and money. Because only a short period of the year needed to be studied, fieldwork could be very intensive to provide a high degree of data reliability.

The study emphasized the importance of timeliness in gathering information for water quality planning and management needs. Even with this emphasis, however, the study took 2-1/2 years to complete. In commenting on the extended time frame, the study team stated that few, if any, rivers have existing data that is valid and adequate enough to permit sound river quality planning. Therefore, for complex river systems, 2 to 3 years of intensive data collection, verification, and analysis during critical periods is generally needed. The data can be collected during a short, low-flow period during the summer, but it takes 2 or more years to analyze and verify the conclusions developed from the data.

ATTACHMENT VII
Page 4

The study cost an estimated $500,000 to complete. A large part of the money, however, was used to experiment with new approaches, testing techniques, and methods of analysis. The director of the study team estimated that a similar study, using the newly developed approaches and methods, would cost about $150,000 to $200,000 and would require 2 years to complete.

The study did require a great deal of money, but it is only a fraction of the tens of millions of dollars it would have cost to install advanced waste treatment facilities to remove more BOD and suspended solids basinwide.

RESULTS OF THE WILLAMETTE STUDY

The study team found that the generally high quality of the Willamette River during most of the year was the result of two factors--basinwide implementation of secondary treatment and low-flow augmentation. The naturally occurring low summer flows have been augmented by a number of Corps of Engineers reservoirs which were built for irrigation and navigation and not for water quality enhancement. The Corps maintains a minimum flow of 6,000 cubic feet per second during the critical summer months. In comparison, the naturally occurring low flow for the unusually dry summer of 1973 would have been 3,260 cubic feet per second.

The study team stated that, without flow augmentation, State dissolved oxygen standards would have been violated for a large segment of the river during the 1973 natural flow. They also found that, even though secondary treatment had a profound effect on the river, increasing BOD and suspended solids removal by implementing advanced waste treatment would not have appreciably increased the dissolved oxygen levels further. One reason for this is because, of the total remaining BOD in the river, almost one-half represents natural sources of pollution. Thus only one-half of the BOD is potentially amenable to removal by higher levels of treatment at point sources.

According to the study team, the major factor affecting dissolved oxygen levels in the only segment of the river that did not meet State standards in the summer of 1973 was the discharge of ammonia by industrial dischargers. About 68 percent of the ammonia came from one industrial discharger. When this ammonia is discharged to the Willamette, it reacts with bacteria in the river to change its chemical form. This reaction consumes dissolved oxygen.

The study results indicated that advanced waste treatment construction for all municipal and industrial dischargers

ATTACHMENT VII
Page 5

to remove additional amounts of BOD and suspended solids over secondary treatment levels would not appreciably increase the dissolved oxygen levels in the river. Instead, the study results showed that the continued augmenting of the flow of the river from reservoirs and controlling just the one industrial firm's large ammonia discharge would greatly reduce the impact of nitrogen and achieve desirable dissolved oxygen levels throughout the Willamette River.

The effect of the dissolved oxygen level of the various alternatives examined by the study team is shown on page 42. The dotted line represents the State standards for dissolved oxygen levels in the Willamette. Line B shows the actual dissolved oxygen levels in the Willamette during the summer of 1973, when the flow was augmented to 6,000 cubic feet per second. Line C shows what the dissolved oxygen levels would have been in the summer of 1973 if the Willamette's flow had not been augmented. As can be readily seen, if the flow had not been augmented, the dissolved oxygen levels would have violated the State standards for a large segment of the river.

Line A represents the dissolved oxygen levels attainable through the continued use of low-flow augmentation and the reduction of ammonia from present dischargers. Under this alternative, the State standards would be exceeded at all times.

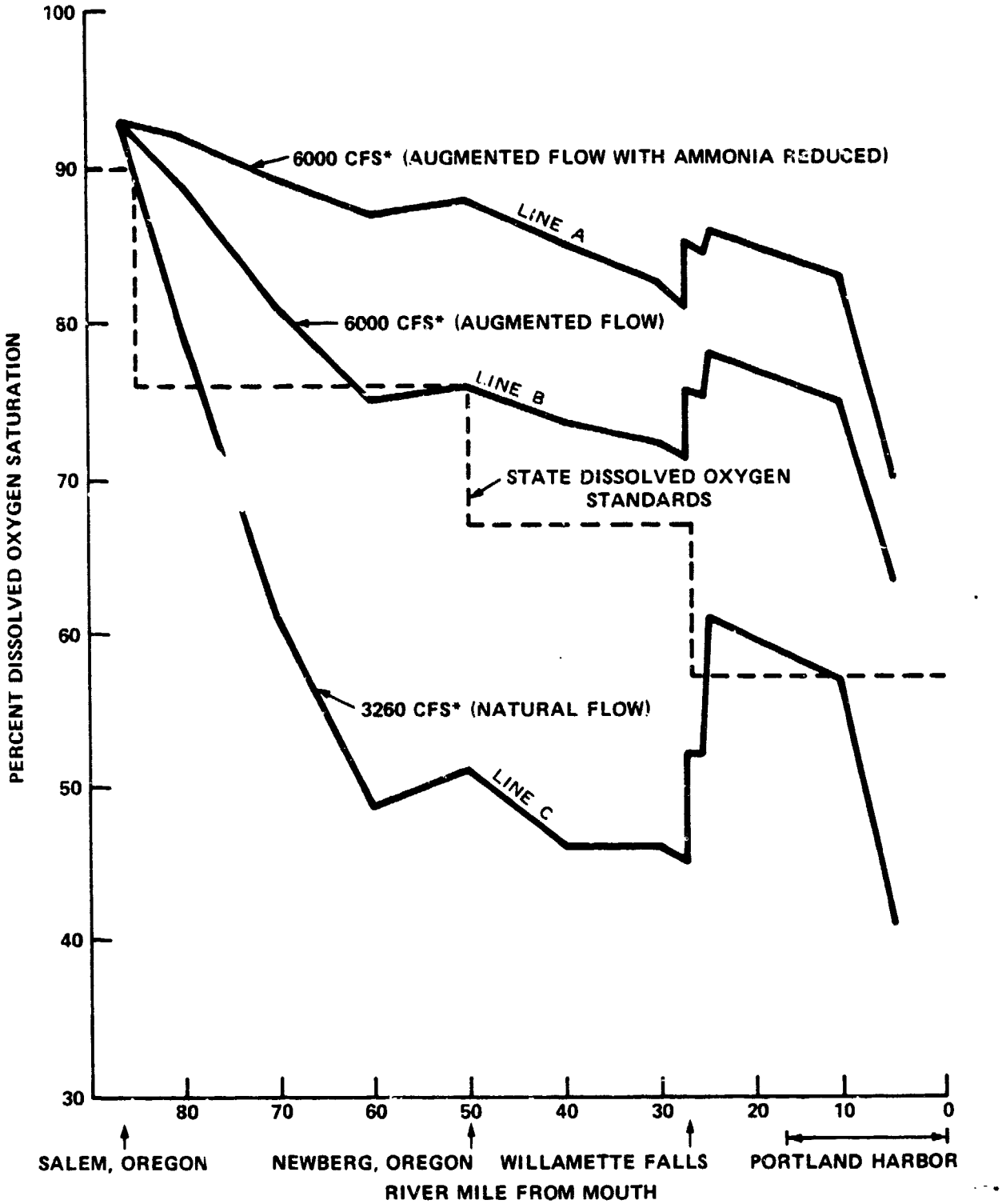
If all municipal and industrial dischargers were required to go to advanced waste treatment to remove additional amounts of BOD and suspended solids as originally planned by the State, the study showed that the existing dissolved oxygen levels, as shown by line B, would not change substantially.

The USGS analysis of the Willamette was completed in August 1975. An official of the Oregon Department of Environmental Quality stated that, because of the new information, the State has revised its water cleanup on the Willamette. Efforts are now being made to reduce the ammonia loadings from both industrial and municipal point sources.

Concerning the need for maintaining adequate flow levels in the river, an official of the Oregon Department of Environmental Quality explained that the State has no control over the water flow levels on the Willamette. Even with the high levels of treatment at the point sources on the Willamette, the present good quality waters would fall below the State standard if the Corps of Engineers decreased the flow levels because of changes in irrigation or navigation.

ATTACHMENT VII
Page 6

IMPACT OF FLOW AND AMMONIA LOADING
ON WILLAMETTE RIVER DISSOLVED OXYGEN LEVELS, JULY–AUGUST 1973



*CUBIC FEET PER SECOND – REPRESENTS THE AVERAGE FLOW AT SALEM, OREGON

ATTACHMENT VII
Page 7

An April 1975 State water quality report noted that, of the various factors affecting water quality, the loss of streamflow would be the most detrimental to water quality. The report emphasized the need for increased attention to streamflow as follows:

> "The value of a flowing stream needs public recognition and support equal to that given to the protection of water quality through the control of waste discharges."

CONCLUSION

Because USGS used better data to develop cause and effect relationships in evaluating the various water pollution control alternatives, more effective, efficient, and economical means of achieving desirable water quality were discovered.

We believe this case study illustrates the potential benefits that can be obtained if additional emphasis is placed on collecting scientifically sound water quality data and using it to carefully analyze management alternatives for water pollution control. In complex river basins, such studies will take a considerable amount of time and money but the Willamette example illustrates the great potential benefits that can result if this additional time and money is spent.

ATTACHMENT VIII
Page 1

EXAMPLES OF ADMINISTRATIVE AND FINANCIAL CONTROL PROBLEMS NOTED IN GAO REPORTS

The following examples are contained in "Environmental Protection Agency's Construction Grant Program--Stronger Financial Controls Needed," dated April 3, 1978 (CED-78-24).

EPA and grantee procurement practices are inadequate

The costs for design and engineering services have been higher than necessary as shown by the following examples.

Middleboro, Massachusetts, accepted in December 1974, without negotiation, a proposed lump sum price of $197,000 for design and construction administration services for expanding and upgrading its treatment facilities. A Middleboro official said the city did not attempt to negotiate the proposed price because it had been doing business with the consulting engineer and believed it could rely on his integrity for reasonableness of the fee.

In Kerman, California, because the grantee lacked expertise to negotiate a consulting engineer contract, a proposed fee of $124,000 for design of its treatment plant was accepted without negotiation. The consulting engineer applied guideline percentages to separate units of construction as follows.

ATTACHMENT VIII
Page 2

	Construction cost	Guideline percentage	Design fee
Treatment plant	$1,369,000	7.3	$ 99,937
Interceptor (note a)	112,962	11.4	12,878
Collector (note a)	100,533	11.6	11,662
TOTAL	$1,582,495		$124,477

a/ Both units are included in one construction contract.

Guideline instructions provide however, that for purposes of computing fees, construction cost is defined as the total cost to the client for execution of work authorized at one time. Had all construction items been combined in arriving at the fee percentage, the total fee would have been reduced about $7,000 because of the declining percentages for larger construction costs. The grantee's unfamiliarity with the guidelines and reliance on the consulting engineer resulted in a higher fee than warranted.

On the other hand, New Hampshire, with many small grantees, recognized its grantees' lack of expertise in negotiating consulting engineer fees. Since April 1970 New Hampshire has been a cosigner to its grantees' consulting engineer contracts and has conducted negotiations involving proposed fees and work scope for over 200 grantees through February 1975. These negotiations reduced proposed fees of $10.3 million by $2.5 million, or about 25 percent. The State took this action because it recognized that

ATTACHMENT VIII
Page 3

consulting engineers were not designing cost-effective facilities and that grantee municipalities were generally not capable of conducting effective negotiations. A State agency official believed that because of the State's system, consulting engineer fees are lower in New Hampshire than in other States.

Construction costs could have been lower if grantee procurement procedures for preparing and processing construction bid packages were changed. Bids for construction services solicited by grantees often (1) limited participation of small construction firms in competing for the work and (2) did not take full advantage of a soliciting method that allows bidding on both individual construction segments as well as total project construction.

Providing for both separate and combined bidding for various project segments affords the grantee the opportunity to compare the costs of the project construction on the basis of several alternatives. In this way, the grantee may choose the combination of bids that provides for the lowest construction cost. With only one type of bidding, the grantee does not know whether a lower price could have been obtained.

Springfield, Massachusetts, for example, divided its $60 million project into eight segments on the basis that

ATTACHMENT VIII
Page 4

better prices would be otained by permitting smaller contractors to compete. The segments were still quite large, however, and were susceptible to further division. For example, when the low bid of $4.8 million for one segment of interceptor sewer was rejected in June 1973 because of questionable contractor experience, the grantee, in order to permit more contractors to compete, split the same segment into two parts and readvertised.

Awards made in January 1974 to the two low bidders totaled about $700,000 less than the original single low bid. By splitting the segment, this grantee was able to accommodate more contractors and reduce construction costs further.

Inadequate financial controls

Salem, New Hampshire, received a $158,000 grant for additions to its treatment facilities in January 1974. The grantee commingled proceeds from all its water and sewer projects in one appropriation account. At year end, the appropriation account was reduced by a single entry for all expenditures from a handwritten worksheet maintained for all projects. Invoices were paid without reference to related agreements and contracts, and grantee officials were not aware of the amounts expended or available for any one project, stating they depended on their engineering firm

ATTACHMENT VIII
Page 5

to keep necessary accounting records. A review of invoices paid by the grantee revealed that a contract ceiling of $8,000 for engineering design had been overpaid by $3,000 during 1974. We also noted that the same official recorded all receipts and disbursements, made deposits and wrote checks, and reconciled the checking account--contrary to good internal control procedures.

Gilbertville, Iowa, received a $262,120 grant to construct waste treatment facilities in April 1974. The grantee did not set up accounting records necessary for proper accountability of project costs. Records were maintained on a cash basis in a receipts and warrants register, and costs were not segregated as to eligiblity or category of expense. In addition, an $82,000 receipt from the Farmers Home Administration was recorded as a receipt from EPA, and two receipts from EPA totaling $98,720 were not recorded. Furthermore, the same person maintained the records, wrote checks, and also deposited receipts--a basic internal control weakness.

To compound the problem, EPA reviews of progress payment requests have not been adequate nor have grantees effectively reviewed consulting engineer and construction contractor billings included in progress payment requests sent to EPA. In processing a Fall River, Massachusetts' grant, the EPA

ATTACHMENT VIII
Page 6

reviewer did not check the cumulative payments of $107,000 against the consulting engineer's contract ceiling of $68,000 for supervision of construction. As a result, EPA erroneously participated in the overpayment of $39,000 to the grantee.

EPA also erroneously participated in $24,800 of engineering costs submitted by Maynard, Massachusetts in a progress payment request because the regional reviewer did not check the engineer's invoices for compliance with contract terms. Without EPA's approval, which is required, the grantee negotiated an amendment to its consulting engineer agreement which increased fee percentages and hourly rates. EPA approved the progress payment and reimbursed the grantee at the increased rates. Had the reviewer checked the rates submitted against the contract rates, the increase would have been identified and questioned. As a result of our bringing this matter to EPA's attention, EPA planned to correct the discrepancy in the final progress payment request.

A closely related problem is that progress payments are made prematurely. EPA regional offices were basing progress payment amounts on the total construction contractor billings to grantees even though grantees were retaining some of the amounts to assure performance by the contractor. Grantees, therefore, held sizable amounts of Federal funds for extended

ATTACHMENT VIII
Page 7

periods. Grantees investing funds in interest-bearing accounts must return all interest income earned to the Federal Government. Grantees, however, were not investing retained funds.

Interest revenue that could be earned if te funds were invested is substantial. We estimated that for calendar year 1975 in EPA's Kansas City region--one of the lowest-funded regions--the potential interest on such premature payments amounted to between $297,000 and $455,000.

- - - - -

The following examples are included in "Multibillion Dollar Construction Grant Program: Are Controls Over Federal Funds Adequate?" dated September 12, 1977 (CED-77-113).

Inadequate Agency control during design phase

EPA's program controls do not assure that project designs are complete and accurate or that plants, when constructed, will provide expected levels of pollution treatment. As a result, waste treatment facilities have been constructed from improper designs. Left uncorrected, they prevent facilities from providing adequate treatment and/or create operation and maintenance problems.

Although the quality of a project design depends primarily on the consulting engineer, until recently EPA

ATTACHMENT VIII
Page 8

provided no guidance on selection but left this decision to grantees. Grantees sometimes selected engineering firms with little regard for their qualifications. In addition, State and EPA design reviews are limited in scope and have not identified numerous design deficiencies.

When design problems are corrected, it is usually done with Federal or local funds rather than at the expense of the party responsible for the deficiency. Although grantees can take legal action based on contractual relationships with their engineers, they seldom do.

One firm, for example, was selected to design major renovations to a treatment plant on the basis of its performance on a recently completed traffic control study. The city official who recommended the firm acknowledged being unaware of its sanitary engineering experience, but felt the quality shown on the traffic control study would extend to the firm's sanitary engineering ability. The project later encountered numerous design-related problems. For example, a room containing equipment flooded whenever the equipment was used because the floor was not sloped and had no drains.

In another case, EPA awarded a $6.5 million grant for upgrading a municipal treatment plant from primary to secondary treatment. Although the upgrading was a large complex project, the municipal officials selected a local

ATTACHMENT VIII
Page 9

firm that specialized in bridge highway design. Since the principals of the firm had never designed a treatment plant, the local firm entered into a joint venture with an out-of-State firm to obtain the necessary sanitary engineering expertise.

The completed project immediately experienced numerous operation and maintenance problems. A principal in the out-of-State firm blamed the municipality and construction contractor for these problems. The municipality engaged an experienced sanitary engineering to study the plant's problems, and several major design deficiencies were found.

For example, the out-of-State firm had specified pumps normally used for clear water as sludge-return pumps, and grit and other solids in the sludge subsequently caused excessive wear on the pump bearings. The pumps ran at a constant speed, making it difficult for the operators to control the amount of sludge returned to the aeration tanks. In addition, controls over the rate at which sewage passed through the various treatment steps were inadequate. This resulted in a varying water level in the primary settling tank, making scum removal ineffective. Within 16 months of initial operation, all four sludge-return pumps had to be removed from service and rebuilt at the municipality's expense.

ATTACHMENT VIII
Page 10

The engineering firm that studied the plant's problems estimated that it would cost $2 to $3 million to correct design deficiencies before the plant could treat waste satisfactorily and operate reliably. Rather than take legal action against the original design engineers, the municipality requested additional EPA funding. EPA awarded a grant increase of $126,566 to the municipality which will partially finance the corrective work and also planned to fund 75 percent of the additional costs necessary to bring the plant into compliance with required treatment levels.

In many situations, grantees have corrected design deficiencies at their own expense. Generally, these deficiencies were relatively minor and did not require any degree of sanitary engineering expertise. For example, sludge in the aerobic digesters at one municipal treatment facility froze during the winter. A municipal official attributed the problem to to inadequate consideration of weather conditions on part of the designer. To correct the situation, the municipality built wood and fiberglass housings over the digesters at a cost of $5,000. The engineer said he did not include digester covers in his design for economic reasons. If the digester covers had been included in the approved plans and specifications, their cost would have been eligible for Federal grant participation and the municipality's share of construction cost would have been reduced.

ATTACHMENT VIII
Page 11

A State engineer told us that municipalities "traditionally" pay for correction of engineers' errors; we found this to be true even when the engineer admits his error. For example, a catwalk at one plant was designed to permit inspection and cleaning of the equipment used to transport sludge. Not only was the catwalk too short, requiring plant personnel to lean out over the end to inspect and clean the equipment, but the inspector had to either crawl over or under a series of pipes that pass directly across the catwalk. The design firm admitted the error, saying it failed to properly coordinate the information on different construction drawings. Nevertheless, the municipality plans to spend $2,000 to partially correct the situation, which it considers a safety hazard.

In other cases, grantees were unable to easily correct design errors or omissions and had to seek technical assistance from independent consulting engineers. For example, a municipality received $4 million from EPA to build a 30 million gallon-per-day primary treatment plant. It was inoperable as designed. The consulting engineer included four grit chambers in the preliminary design, but eliminated them from the final design to reduce costs. This was contrary to applicable engineering standards which require grit chambers to be installed in treatment plants

ATTACHMENT VIII
Page 12

receiving flows from a combined sewer system, as was the case in this instance. Nevertheless, the State and EPA approved the design without grit chambers.

The plant was placed in operation but was soon inoperative because of large quantities of grit flowing into the plant. While some equipment was repaired under warranties, the city paid $22,000 to repair other damaged equipment. For the next 2 years the plant discharged 25 million gallons of raw sewage daily into the adjoining bay. The city had to pay interest charges of $128,000 on borrowed capital needed to reimburse the contractors be ause EPA and the State withheld grant payments pending resolution of the problems. The city also had to pay $325,000 to clean the interceptor line and construct a temporary grit chamber, which completely resolved the grit problem. The city's present consultant estimated that it will cost $820,000 to construct a permanent grit chamber--a cost EPA will not participate in unless the feature is included in a design to upgrade the facility to secondary treatment. The original consultant maintains that the problem was strictly one of operation and maintenance rather than any deficiency in the design.

Some design deficiencies are not corrected. Rather than seek correction by the engineer, ask for help from EPA, or pay repair costs themselves, municipalities sometimes decide

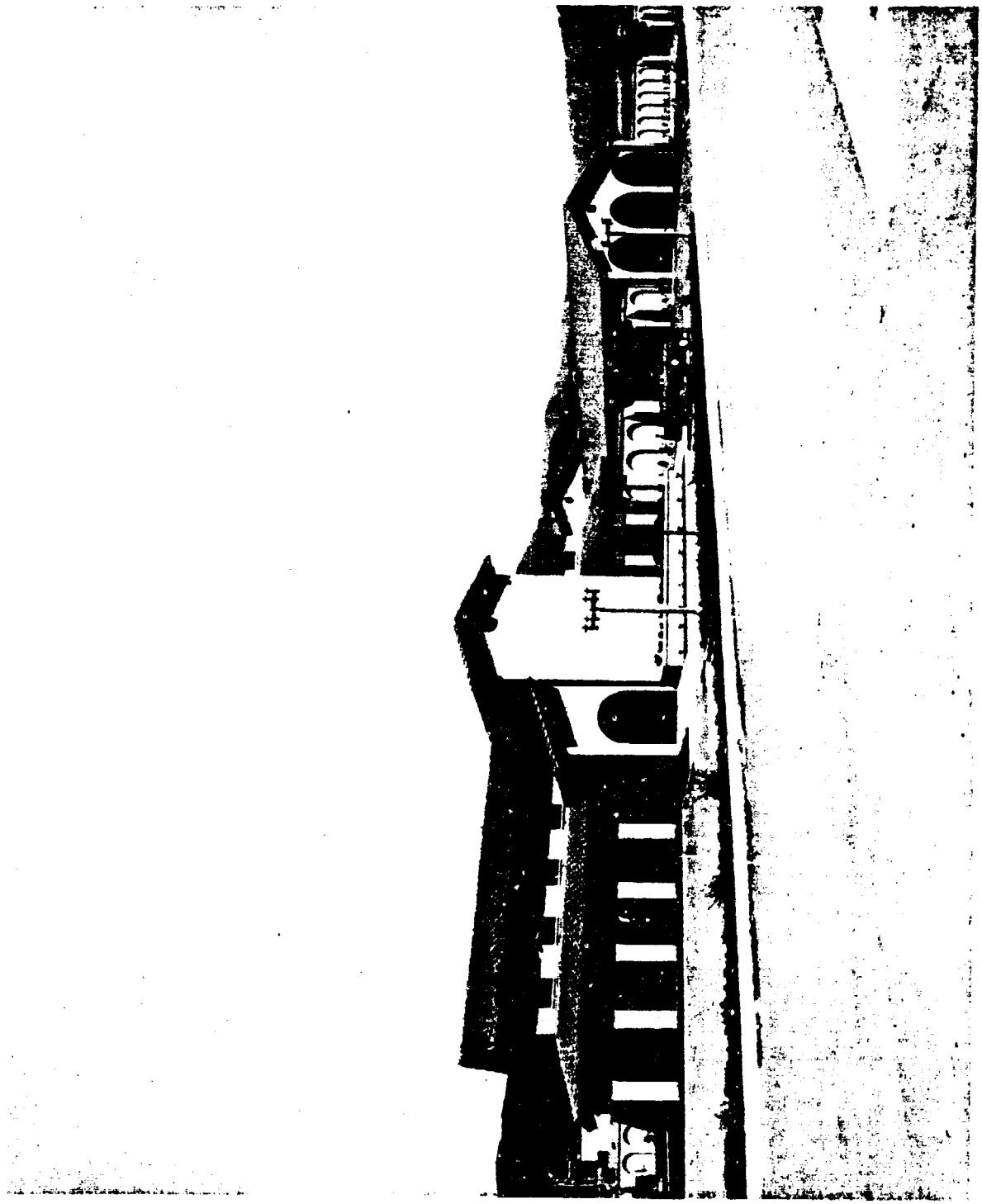
ATTACHMENT VIII
Page 13

to accept the resulting operation and maintenance problems. For example, on one project a grit chamber washdown system used raw sewage. When placed in operation, grease and solids in the sewage clogged the nozzles, trapping the sewage in the pipe. The sewage froze in winter and cracked the pipe's control valves. The design engineer presently responsible for the project stated that the design should have included a strainer to remove solids from the sewage before it was used for washdown. The original design firm has refused to accept responsibility for repairs. Since the washdown system is unuseable, the plant operator uses a high-pressure hose to washdown the tank after each storm.

Other plants have been more costly than necessary because they were designed with elaborate and costly aesthetic features which do not contribute to the functional use of the plant. This practice is occuring because EPA has not established criteria on how Federal grant moneys can be used for ornamental or aesthetic architectural features. As a result, engineers have been relied on to design the most cost-effective facility.

For example, a treatment facility overlooking the Pacific Ocean looks like an old Spanish mission with its stucco exterior, red tile roof, decorative arches, and open wood-beamed ceilings. (See photograph.) The entire facility is surrounded by a 15-foot stucco wall capped with red tile. The wall alone cost $200,000.

ATTACHMENT VIII
Page 14



EPA Region IX-Primary Waste Treatment Facility (6.0 mgd) Designed in the Style of a Spanish Mission.

ATTACHMENT VIII
Page 15

Most of the surrounding structures are small, older houses of no distinctive architecture. The municipality's consulting engineer advised us that the plant was "the best-looking building in town". A city official said that the municipality was relatively poor and was not satisfied with merely constructing a plant whose design was compatible with existing surroundings; it wanted the facility to serve as a catalyst for upgrading the area.

At another treatment plant, a $300,000 mosaic tile fountain was constructed solely to display the quality of the effluent of an advanced waste treatment plant. EPA paid 55 percent of the cost.

One grantee insisted that the design of its treatment plant be compatible with the proposed parkland area on which the plant was constructed. The consulting engineer had to use the architect responsible for the park master plan. He included an $80,000 reflecting pool surrounding the operations building, curved tinted glass windows, and other expensive aesthetic features, for which EPA paid 55 percent of the cost. We questioned whether these features could be justified for Federal grant participation on the basis of compatiblity with the parkland. The treatment plant is not near other buildings in the development and in fact overlooks land which the municipality was using as a refuse disposal area. A grantee official said that someday a golf course may be built on this land.

ATTACHMENT IX
Page 1

EXAMPLES OF OPERATION AND MAINTENANCE PROBLEMS NOTED IN A GAO REPORT

The examples are included in "Continuing Need for Improved Operation and Maintenance of Municipal Waste Treatment Plants," dated April 11, 1977, (CED-77-46).

At one plant, wastes containing a high biochemical oxygen demand (BOD) a/ load, formaldehyde, and acid from a yeast-producing company caused a significant BOD loading and appeared to be causing a sludge settling problem. The yeast company was expected to contribute 530 of the 3,260 pounds of BOD per day which the plant was designed to handle. However, by December 1973--four months after connecting to the city's sewer system--the company's discharge was averaging about 1,435 poundsof BOD daily. The city engineer estimated that the plant's expected life would be shortened by 10 years if the yeast company continued to discharge BOD at this rate.

Also, the amount of BOD discharged by the yeast company varied widely on a day-to-day basis. This variation greatly impacted on the quality of the plant's treatment. Because

---

a/ A measure of the oxygen consumed in the biological processes that break down organic matter in water and wastewater.

ATTACHMENT IX
Page 2

the micro-organisms which consume 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 BOD load increased from 929 pounds on December 2 to 5,645 pounds on December 3. During November 1974, before the sudden December increase, the plant averaged 92 percent BOD removal, but by December 4, the removal rate was down to 67 percent.

The plant was also experiencing a sludge settling problem which the city engineer and plant operators attributed to the yeast company's wastes. 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. EPA was planning to fund a detailed analysis of the plant's influent to determine the specific cause of the sludge settling problem.

At another plant with industrial waste problems, municipal officials said they were reluctant to enforce ordinances for controlling industrial wastes because jobs would be lost if the industry closed down.

At a 7-million-gallon a day facility, which began operating in 1972, design problems that hindered proper O&M of the plant included

ATTACHMENT IX
Page 3

--heavy flows from the city's combined sewer system that 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.

--volumes of grit that were 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 that accumulated in the comminutor area and had to be removed manually each day. 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.

--an aeration tank that 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.

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

ATTACHMENT IX
Page 4

At a 9.75-million-gallon a day facility, EPA has 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 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.

A 350,000-gallon a day plant 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 operation and maintenance budget, the plant could not afford to purchase needed equipment for performing necessary laboratory tests or to have the tests performed by a contractor. He said that available funds were limited

ATTACHMENT IX
Page 5

because the town lost 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.