REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Better Data Collection And Planning Is Needed To Justify Advanced Waste Treatment Construction

Environmental Protection Agency

Costs for advanced waste treatment are higher than costs for secondary treatment. The Environmental Protection Agency is financing some advanced waste treatment facilities without sufficient water quality data and planning.

In many instances, these facilities may not be the most effective or efficient means for achieving water quality goals. The Agency and the States need to obtain better water quality information and consider all water pollution control alternatives so that treatment methods selected will improve water quality and will result in more effective and efficient use of Federal funds.

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

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

This report discusses the need for the Environmental Protection Agency to require better water quality data collection and planning to justify the construction of advanced waste treatment facilities funded under the Federal Water Pollution Control Act Amendments of 1972.

Because large amounts of Federal funds are needed to construct advanced waste treatment facilities, a review was made to determine whether such facilities are the most effective or efficient means for improving water quality. We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

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

Comptroller General
of the United States

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ABBREVIATIONS

AWT	advanced waste treatment
BOD	biochemical oxygen demand
CBOD	carbonaceous BOD
EPA	Environmental Protection Agency
GAO	General Accounting Office
mgd	million gallons per day
NBOD	nitrogenous BOD
USGS	United States Geological Survey

Glossary

Advanced waste treatment (AWT)	Processes which remove additional pollutants from wastewater beyond those eliminated by primary and secondary treatment. The most common AWT processes include (1) nitrification (removal of nitrogenous biochemical oxygen demand (NBOD)), (2) denitrification (removal of nitrogen), and (3) phosphorus removal.
Algal blooms	Prolific growths of algae which can be caused by an abundance of phosphorus and nitrogen in water. When decaying, algae can cause severe decreases in the oxygen of the water; certain species cause taste and odor problems. The AWT processes of denitrification and phosphorus removal are designed to prevent algal blooms in waste-receiving waters.
Biochemical oxygen demand (BOD)	A measure of the oxygen consumed in the biological processes that break down organic matter in water and wastewater. Carbonaceous BOD (CBOD) is the readily oxidizable organic matter which is primarily removed by secondary treatment, and nitrogenous BOD (an organic matter difficult to oxidize) is removed by the AWT process of nitrification.
Cause and effect data	Cause data describes how pollution is occurring and by whom as well as the amount of pollution from each source. Effect data describes to what degree water quality would be improved after one or more of the causes of pollution were eliminated.
Dissolved oxygen	The oxygen dissolved in water. Dissolved oxygen is necessary for the life of fish and other aquatic organisms and

	for the prevention of offensive odors. Dissolved oxygen is consumed by CBOD and NBOD. Secondary treatment and the AWT process of nitrification are designed to protect dissolved oxygen in waste-receiving waters.
Effluent	The wastewater discharged by an industry or municipality.
Effluent limitations	Restrictions established by a State or EPA on quantities, rates, and concentrations of chemical, physical, biological, and other constituents discharged from point sources.
Effluent-limited segment	A segment of a river whose water quality criteria can be met through secondary treatment of waste discharges.
Nonpoint sources	Sources of pollution that are difficult to pinpoint and measure. Common examples include runoff from agriculture and forest lands, runoff from mining and construction, and storm runoff from urban areas.
Nutrients	Elements or compounds essential as raw materials for organism growth and development. In this report, nutrients usually imply nitrogen and phosphorus.
Point sources	Specific sources of pollution that can be readily identified, such as factories and sewage treatment plants.
Primary waste treatment	Treatment usually involving screening and sedimentation for the removal of the larger solids in wastewater. The CBOD removal from domestic sewage by this process is about 30 percent.
Secondary waste treatment	Treatment using biological processes to accelerate the decomposition of sewage and thereby reduce CBOD by 80 to 90 percent.

Sludge	The solid matter removed from wastewater through treatment. Sludge handling involves the processes that remove solids and make them ready for disposal. Disposal may involve incineration, dumping in oceans, or land application.
Water quality criteria	Specific concentrations of water pollutants which, if not exceeded, are expected to allow a body of water to be suitable for its designated use.
Water-quality-limited segment	A segment of a river whose water quality criteria can not be met through secondary treatment and can only be met through advanced treatment of waste discharges.
Water quality standard	Water quality standards contain four elements: the designated use (such as recreation, drinking water, and fish and wildlife propagation) to be made for a body of water, criteria to protect those uses, implementation plans (for needed water quality improvement programs), and an enforcement plan.

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

BETTER DATA COLLECTION AND PLANNING IS NEEDED TO JUSTIFY ADVANCED WASTE TREATMENT CONSTRUCTION
Environmental Protection Agency

D I G E S T

The 1972 amendments to the Federal Water Pollution Control Act authorized $18 billion for the construction of publicly owned waste treatment facilities. As of March 31, 1976, about $8.9 billion had been obligated for constructing publicly owned waste treatment facilities.

To this end, the Environmental Protection Agency and the States have placed a high priority on constructing such facilities and on issuing discharge permits. In many cases, these facilities will provide advanced waste treatment that is expensive as compared to facilities providing secondary treatment.

Because the 1972 amendments require municipalities to provide secondary treatment by July 1, 1977, extensive planning and data gathering was not of major importance in deciding to build secondary treatment facilities, since the minimum treatment levels were stipulated by law.

As a result, low priority was placed on gathering data on types, extent, and sources of pollution and on preparing comprehensive pollution abatement plans for river basins and local areas. Without reliable data and sound plans, however, the multimillion dollar advanced waste treatment facilities being constructed may not be the most effective and efficient means for achieving water quality goals.

GAO recommends that the Environmental Protection Agency:

--Publish final regulations on data collection which indicate specifically how States are to obtain information on adequate water quality.

CED-77-12

--Reassess its existing priorities to determine whether comprehensive water quality planning and data collection programs should be given additional emphasis.

--Determine whether existing resources at the State level are adequate to implement effective comprehensive water quality planning and data collection programs, and if not, request additional resources from the Congress.

--Before approving grants for the construction of expensive advanced waste treatment facilities, make sure that all water pollution control alternatives have been considered and that adequate information has been obtained on expected water quality improvements, high initial capital costs and annual operation and maintenance expense, sludge disposal problems that may result, and the existence of trained personnel to properly operate and maintain the facility.

If the Congress wishes to maintain closer scrutiny over the Agency's funding of advanced treatment facilities, the Congress may want to consider having the Administrator, Environmental Protection Agency, report to the Congress annually on the (1) costs and potential water quality improvements of new advanced treatment facilities and (2) problems and accomplishments of completed advanced treatment facilities in meeting their water quality objectives.

NEED TO IMPROVE WATER QUALITY PLANNING AND DATA COLLECTION

Comprehensive information on water quality conditions and trends is essential in planning abatement actions needed to improve water quality. The Congress recognized the need for this when it enacted the Federal Water Pollution Control Act Amendments of 1972. These amendments require that comprehensive areawide and basin plans be prepared for determining the best course of action to follow for improving water quality.

Water quality data needed to support river basin and areawide planning are generally inadequate, and it is unlikely that adequate water quality data for determining the best course of action at the least cost to solve water pollution problems will be included in the plans once they are completed. One reason planning by the States is not comprehensive enough to identify the specific causes of water quality problems is that the Agency did not provide the States with detailed regulations for developing data collection programs which would produce the water quality information necessary to support the planning function. (See pp. 13 to 17.)

GAO believes there will be no improvement to the continuing problem of a lack of comprehensive plans until adequate data on the causes and effects of water pollution is obtained. It is only on the basis of such data that rational decisions can be made on treatment and other pollution abatement measures.

CONSTRUCTING MUNICIPAL ADVANCED WASTE TREATMENT FACILITIES NOT ADEQUATELY JUSTIFIED

Many expensive municipal advanced waste treatment facilities are being constructed even though they may not be the most effective or efficient means for achieving water quality goals.

In the States GAO visited, municipalities are constructing or planning to construct 26 expensive advanced waste treatment facilities, involving about $882 million in Federal funds, to remove higher percentages of pollutants and nutrients. However, adequate water quality information on the major causes of pollution was not available.

Without more information on the sources of pollution and their effects on water quality, a thorough analysis of all alternative means of reaching water quality goals, and additional experimentation with advanced processes, the justification for several of these

advanced waste treatment facilities is questionable. Possible alternatives to advanced waste treatment include low flow augmentation, control of nonpoint sources of pollution, and a variety of other pollution abatement actions.

Justifications for advanced waste treatment facilities should consider the high initial capital costs and annual operation and maintenance expenses of the proposed facilities as well as the resulting sludge disposal problems and the need for trained personnel to operate and maintain the facilities properly. (See pp. 22 to 35.)

In the Washington, D.C., area, the Blue Plains, Alexandria, and Arlington advanced treatment facilities are being built at an estimated Federal cost of $459 million. There is considerable uncertainty as to the expected improvements these facilities will have on the water quality of the Potomac River. Operation and maintenance costs for these plants will total about $90 million a year. (See pp. 28 to 34.)

In Maryland, advanced waste treatment facilities, costing an estimated $69 million in Federal funds, were planned for the Patuxent River Basin. These facilities were to remove nitrogen. GAO's review of the information used to justify constructing these facilities indicated that a less expensive program--such as phosphorus removal--might also be as feasible in improving water quality in the Patuxent.

As a result of GAO's questions, Maryland reevaluated the need for removing nitrogen at four facilities and decided to defer constructing the nitrogen removal process, thereby saving $13.5 million in Federal funds. Maryland officials believe that greater benefits can be achieved by using the funds for other purposes, such as upgrading primary treatment facilities to secondary treatment. (See pp. 23 to 25.)

An example of the benefits of using good water quality data in planning is the U.S. Geological Survey study of the Willamette

River in Oregon. The U.S. Geological Survey thorough study of the waste receiving waters and careful analysis of alternative pollution control measures appear to have successfully identified more effective and efficient methods of achieving Oregon's water quality standards than originally planned. The study and analysis may save several million dollars in Federal and State construction funding.

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 require considerable time and money, but the Willamette example shows the great potential benefits that can result if this additional time and money is spent. (See ch. 4.)

In commenting on this report, the Agency agreed with its main theme that costly treatment facilities providing treatment levels beyond the secondary level generally should not be approved until intensive water quality studies have been completed. The Agency agreed also with the recommendations made. However, both the Agency and the States commenting on the report questioned some of the issues raised. (See app. II through VI.)

Chapter 5 is an evaluation of agency and State comments.

CHAPTER 1

INTRODUCTION

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

To reach these goals, the amendments require that by July 1, 1977, as a minimum, secondary treatment is to be used by publicly owned waste treatment facilities and that by July 1, 1983, publicly owned waste treatment facilities are to use a level of treatment which the Environmental Protection Agency (EPA) determines will achieve the goals of the amendments. If the minimum required levels do not enable the waters to meet water quality standards established by the States, the States can require higher levels of treatment so that the water quality standards can be met.

The States have the primary responsibility for abating and eliminating water pollution. Under the amendments, the States and interstate agencies receive grants for carrying out programs for preventing, reducing, and eliminating pollution. The Federal allotment of funds to the States or interstate agencies is based on the extent of the pollution problems in each of the States. These funds are to help the States and interstate agencies fund their programs in such areas as planning, monitoring, and various other water pollution abatement activities.

The Federal role is one of supporting research and providing technical and financial assistance to States, interstate agencies, and municipalities. Where States do not accept or fulfill their responsibilities, EPA has the authority to carry out abatement activities.

Under the 1972 amendments, EPA's Administrator has authority to make grants to municipalities for 75 percent of the eligible costs to construct publicly owned waste treatment facilities. The 1972 amendments authorized EPA to allocate $18 billion to the States--$5 billion, $6 billion, and $7 billion for fiscal years 1973, 1974, and 1975, respectively. The waste treatment construction grant program has become the Nation's largest single public works

program. As of March 31, 1976, EPA had obligated about $8.9 billion for construction of publicly owned waste treatment facilities. The remaining $9.1 billion must be obligated by September 30, 1977, or be reallocated to those States which have used their full allocation.

PLANNING FOR WATER POLLUTION ABATEMENT

Sections 208 and 303(e) of the 1972 amendments require two major levels of water quality management planning: (1) areawide waste treatment management plans to be developed by either local agencies in specifically designated local areas or States in all areas not covered by a local areawide planning agency and (2) river basin[1/] water quality management plans to be developed by the States.

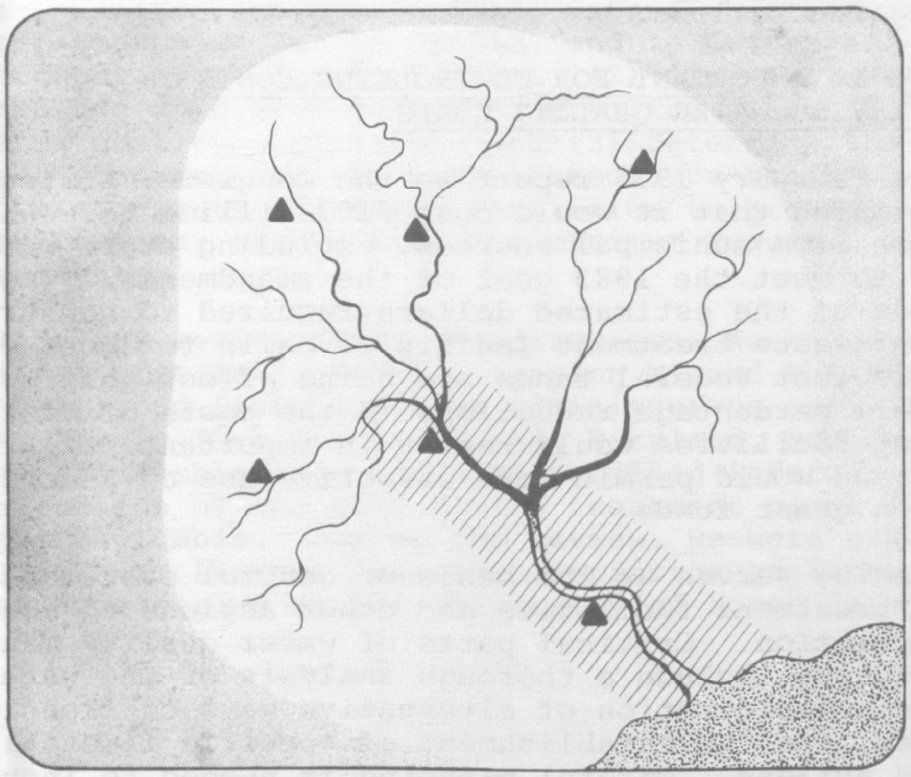
Areawide (section 208) plans are to address difficult urban-industrial and nonpoint source water quality problems. River basin (section 303(e)) plans are to identify water quality problems and set forth effective remedial programs so that river basin water quality can be improved. Areawide and basin plans are to be used in decisionmaking and, therefore, must have sufficient detail to facilitate the necessary analysis for decisions.

EPA regulations require that basin planning include a monitoring program to (1) collect the data needed to determine the relationships between water quality and individual polluters, (2) identify nonpoint sources of pollution, and (3) gather data necessary to set and review water quality standards and determine total allowable maximum daily amounts of pollution.

Whereas the river basin plan is concerned with evaluating the extent to which each river basin is polluted, the areawide plan is concerned, in most cases, with only a particular part of a river basin identified as having substantial water quality control problems as a result of urban-industrial concentrations. (See diagram on p. 3.) Areawide planning, as EPA initially implemented it under section 208 of the 1972 amendments, was performed exclusively by local agencies in specifically designated local areas. As the result of a June 1975 court decision, however, EPA has recently implemented section 208(a)(6) of the 1972 amendments which requires each State to act as the planning agency for all areas not covered by a local areawide planning agency. EPA will require such planning only where a need exists, such as river basin planning.

1/The area drained by a river and its tributaries.

RELATIONSHIP BETWEEN
AREAWIDE AND RIVER BASIN PLANNING
AS DISCUSSED IN THIS REPORT



Areawide waste treatment management plan (section 208)

River basin plan (section 303e)

Sewage treatment plant

As a result of the June 1975 court decision, EPA revised its water quality planning requirements and promulgated final regulations on November 28, 1975. In February 1976 EPA issued "Draft Guidelines for State and Areawide Water Quality Management Program Development." The initial basin plans developed by the States and areawide plans developed by the local agencies will be incorporated into the statewide water quality management plans along with any additional State areawide planning deemed necessary. This report refers primarily to EPA's areawide and basin planning before the promulgation of the November 28, 1975, planning regulations.

PLANNING IS IMPORTANT FOR CONTROLLING COSTS AND ACHIEVING WATER QUALITY GOALS

In a February 1975 report to the Congress, States and EPA estimated that it would cost $107 billion to control pollution from municipal sources, excluding storm water runoff, to meet the 1983 goal of the amendments. The magnitude of the estimated dollars required to construct municipal waste treatment facilities calls for cost controls to insure that Federal funds are being effectively used. Even small percentage reductions in the costs of waste treatment facilities would result in important dollar savings and would permit more effective use of Federal construction grant funds.

Planning serves as the basis of control over construction of treatment facilities and other actions to abate water pollution. Critical parts of water quality management planning include a thorough analysis of the water, a careful consideration of alternative ways of cleaning up the water, and the establishment of specific timetables for required actions. Careful planning is needed to insure that construction grant funds are used most effectively to improve and protect the quality of the Nation's waters.

The 1972 amendments state that treatment facility construction must be in conformity with any applicable basin plan and included in any applicable areawide plan. Developing adequate water quality management plans, especially where advanced waste treatment is needed but also for effluent-limited segments where only secondary treatment is needed, requires (1) collecting water quality data to define the causes of pollution, (2) knowing the effects on water quality if various pollutants are eliminated, (3) identifying all viable management alternatives, and (4) deciding which alternative would be the best to use.

A 1974 evaluation of State water quality standards by an EPA contractor stated that, without knowing the full

extent of water quality problems and their causes, a fortune may be spent on a cleanup program only to find that the the water is still far below standard.

SCOPE OF REVIEW

Because of the magnitude of Federal funds being spent for constructing waste treatment facilities, we made a review to (1) ascertain whether the States had adequate data to develop water quality management plans, particularly for water-quality-limited receiving waters where advanced wastewater treatment may be needed, and to determine alternative methods of pollution control, (2) find out whether the States had completed basin and areawide plans to direct their water quality activities, and (3) determine the effect of present planning, or the lack thereof, on decisions to build advanced waste treatment facilities to provide a level of treatment higher than the minimum required by the 1972 amendments.

We made our review at EPA headquarters, Washington, D.C.; EPA regional offices in Seattle (region X) and Philadelphia (region III); and State agencies administering activities under the act in five States--Idaho, Maryland, Oregon, Virginia, and Washington. We also obtained information on the construction of the Blue Plains treatment plant in the District of Columbia. During the review, we were assisted by Dr. Donald T. Lauria, Associate Professor of Water Resources Engineering at the University of North Carolina.

CHAPTER 2

NEED TO IMPROVE WATER QUALITY PLANNING AND DATA COLLECTION

Comprehensive information about water quality conditions and trends is essential in planning abatement actions needed to improve water quality. The Congress recognized the need for collecting coordinated and comprehensive water quality data and for effective water quality planning when it enacted the Federal Water Pollution Control Act Amendments of 1972. These amendments require that comprehensive areawide (section 208) and basin (section 303(e)) plans be prepared for determining the best course of action to follow for improving water quality. While such planning is important for all waste-receiving waters, it is particularly so for water-quality-limited segments where advanced wastewater treatment may be needed.

However, comprehensive areawide and basin plans will not be completed in a timely manner because the Environmental Protection Agency and the States have not given the planning process a high priority. Funding and manpower for planning has been assigned a lower priority compared to other pollution control activities, such as awarding waste treatment facility construction grants and issuing industrial and municipal discharge permits. In addition, EPA did not promptly issue planning regulations for use by State agencies nor did it approve most of the funding for areawide planning agencies until June 1975, the deadline for 100 percent funding of these agencies under the 1972 amendments.

Comprehensive planning has also been delayed because of problems encountered by local planning agencies. Basin plans will be delayed because of the time-consuming process of dealing with the comments and opposing views of public interest groups. The areawide planning process may not be entirely successful because of the short time frame (2 years) mandated for completing plans and the uncertainty of continued funding of areawide planning agencies.

Further, water quality data needed to support river basin and areawide planning is generally inadequate, and it is unlikely that such plans when completed will be adequate for determining the best course of action at the least cost to solve water pollution problems. This is especially critical for constructing municipal advanced waste treatment facilities as discussed in chapter 3.

The U.S. Geological Survey was successful in gathering adequate water quality data on the Willamette River in

Oregon and, as a result, was able to identify more effective and efficient methods for achieving Oregon's water quality standards than through treatment, as originally planned. The potential benefits which may be realized from gathering good water quality data may result in savings of several millions of dollars in Federal, State, and local construction funds. This study, which is discussed in chapter 4, is an excellent example of the work and benefits associated with sound water quality planning.

LACK OF COMPREHENSIVE PLANNING CONTINUES TO BE A PROBLEM

The lack of comprehensive water quality management plans to direct waste treatment facilities' construction has been a problem for many years. Our review of the development of basin and areawide plans by the 5 States we visited showed that, as of July 1, 1976, only 23 basin plans of an expected 76 had been completed and approved and that no areawide plans had been completed. Not all the initial basin water quality plans and the areawide plans will be completed until the end of 1976 and mid-1977, respectively.

Consequently, it will be some time before comprehensive water quality plans will have an impact on waste treatment facilities' construction. Large amounts of Federal funds, however, have already been obligated to States for treatment facilities' construction. As of March 31, 1976, a total of about $8.9 billion had been obligated by EPA nationwide under the 1972 act, and $927 million had been obligated in the five states and the District of Columbia that we visited.

As early as 1967, the Commissioner of the Federal Water Pollution Control Administration, the predecessor to EPA, stated that decisions to construct treatment facilities were not based on comprehensive plans. These plans were first required by the Federal Water Pollution Control Act of 1956, which was enacted 16 years before passage of the 1972 amendments.

In our November 3, 1969, report to the Congress entitled "Examination Into the Effectiveness of the Construction Grant Program For Abating, Controlling, and Preventing Water Pollution" (B-166506), we pointed out the need for comprehensive water quality planning. We noted that before 1968 Federal comprehensive planning for construction grant decisions was inadequate, and we recommended that systematic planning relate the construction of waste treatment facilities to improvements in water quality.

Regulations issued in 1970 by the Federal Water Quality Administration (successor to the Federal Water Pollution Control Administration) emphasized the need for planning by requiring that construction grants be approved only for projects included in current comprehensive plans for pollution abatement. EPA and State officials said that few of these plans were completed upon passage of the 1972 amendments which required States and local agencies to prepare basin and areawide plans for use as a basis for EPA funding waste treatment facilities' construction.

LOW PRIORITY PLACED ON PLANNING

EPA issues annually a Water Quality Strategy Paper to provide guidance to States and EPA regional offices on priority program areas and resource allocations for the coming year. The first strategy paper was issued for fiscal year 1974. EPA's strategy papers for fiscal years 1974 and 1975 gave higher priority to awarding waste treatment construction grants and issuing discharge permits.

In the five States we visited, the lower priority placed by EPA on planning was reflected in the States' own water pollution control planning. EPA and State officials informed us that funding and manpower at the State level were channeled into the construction grant and permit programs during fiscal year 1975 rather than into planning. EPA and State officials said that, during this period, several States reassigned planners to the permit program to try to meet the statutory deadline for issuing discharge permits.

The lower emphasis on planning is evident in that EPA did not promptly issue basin and areawide regulations, and approval of grant funding for areawide agencies was largely delayed until June 1975, the deadline for 100 percent funding of these agencies under the 1972 amendments. Of the 17 areawide agencies in the States we visited, 13 received funding in June 1975.

EPA regulations originally required that the States submit basin plans by July 1, 1975. In some instances, however, EPA regional administrators extended this date. EPA issued interim basin planning regulations in March 1973. Final EPA regulations on basin plans were published on June 3, 1974, almost 2 years after enactment of the 1972 amendments.

PROBLEMS ENCOUNTERED IN DEVELOPING AREAWIDE PLANS

The areawide plan is designed for areas with substantial water quality control problems due to urban-industrial concentrations or other factors and is supposed to bring about improved environmental quality on the Nation's waterways by 1983. The plan is to tie together the various Federal water pollution abatement requirements, including municipal, industrial, residual waste, runoff, and groundwater pollution abatement. Regional and local agencies are responsible for planning and implementing these provisions. Areawide agencies have 2 years from receipt of a planning grant to complete their areawide plan and obtain approval from the State and EPA.

The 1972 amendments provide a timetable for local agencies to develop areawide plans. According to this original timetable, such areawide plans would be certified by the Governor and submitted to EPA no later than mid-1976. EPA did not promulgate regulations for designating areawide agencies--which were required by the 1972 amendments to be issued by January 16, 1973--until September 14, 1973. Also interim regulations detailing the roles and responsibilities of designated areawide agencies were published in May 1974 and were not finalized until November 28, 1975.

According to the 1972 amendments, areawide grants to designated agencies should have been awarded within 1 year after the area and the planning agency had been designated. In the States we visited, 9 of the 17 areawide agencies received funding after this 1-year period.

Nationally, as of June 30, 1975, a total of 149 local planning agencies had been designated as areawide agencies and had been awarded grants for areawide planning. As of July 1, 1976, there were no completed and approved areawide plans. Although areawide planning is to bring about environmental quality improvement on the Nation's waterways by 1983, a number of problems might preclude the areawide planning process from achieving this goal.

A July 1975 report by an EPA contractor entitled "National Profile of Section 208 Areawide Management Planning Agencies" made the following observations after a review of the areawide planning process.

--The 2 years required by law to accomplish all the analysis, planning, evaluation, and approval required for the areawide plan is too short a time frame. Requirements for public participation, local review,

and approval are very time consuming and cut significantly into the planning period.

--Most areawide agencies have serious doubts about their ability to finance the planning process on their own after the 2-year period expires. Local governments do not consider themselves bound to pay for areawide planning after the termination of the grant and are not showing financial commitment to the continuing planning process.

--It is unclear what the areawide planning management system will look like, how it will be created, and what powers it should exercise. The general insistence on "local autonomy" by jurisdictions within the areas will be a serious constraint on innovative regional management alternatives.

--Areawide planning budgets are generally inconsistent in format or incomplete due to a lack of staff and expertise in price and cost analysis. Because the makeup of the budgeted items varies among areawide agencies, it will be very difficult to either analyze the direction or evaluate the progress of the areawide planning process on a national basis.

--There is a serious need for EPA to provide more technical guidance to local areawide planning agencies. The greatest demand was for guidance on nonpoint source analysis, point and nonpoint sources of pollution monitoring, and urban storm water and combined sewer analysis.

An EPA study team report dated February 19, 1976, concerning EPA management of the areawide planning program stated that agency policy and guidance for the program has been inadequate, EPA's administration of the program has been weak, and most currently funded planning agencies will be unable to complete all the complex tasks within the time frame mandated by the 1972 amendments. To improve the management of the program, the report suggested that EPA:

--Provide more adequate and timely guidance to areawide planning agencies on such matters as (1) defining more explicitly State responsibilities in the program and (2) clarifying and defining the relationship between areawide planning and other EPA pollution control programs.

--Improve the formal planning and reporting system to permit continuous monitoring of program performance.

--Give greater attention to the review and analysis of subcontracts entered into by areawide agencies.

An EPA Planning Division official acknowledged that there are problems associated with areawide planning. To help rectify the problems set forth in the "National Profile of Section 208 Areawide Management Planning Agencies" and the EPA study team's report, EPA issued a "Strategy for the Water Quality Management Process" in January 1976.

The strategy instructs areawide planning agencies to rank the planning issues that they must address and consider first the most important issues so that they will have something worthwhile to show for their efforts after 2 years. The strategy also instructs the areawide planning agencies to direct their efforts towards solving pollution problems not being addressed by other ongoing planning. The purpose of this is to avoid duplicating effort. In addition, EPA, in conjunction with the States, has developed a program to monitor and evaluate the progress of areawide planning to insure that the areawide planning agencies are provided with the assistance they need and that they will achieve program goals.

DELAYS IN DEVELOPING RIVER BASIN PLANS

The river basin plan is designed to coordinate and direct water quality management for a river basin by:

--Identifying problems: determining existing water quality, applicable water quality standards, and point and nonpoint sources of pollution.

--Determining priorities: assessing water quality and abatement needs to establish priorities for awarding construction grants, processing permits, and taking other needed steps to achieve water quality goals.

--Scheduling actions: setting forth compliance schedules or target abatement dates and indicating necessary State and local activities.

--Coordinating planning: identifying needs and priorities for treatment facility plans and areawide plans within the basin.

Although EPA has made studies to evaluate the areawide planning process, it has not made studies of basin planning. During our review, however, we did note instances where some States were hindered by several factors during the basin plans' development. Idaho, for instance, had expected

to submit its six basin plans to EPA by December 1975. State officials informed us that their basin planning was delayed significantly because of active opposition by agricultural interest groups to an initial draft of a basin plan which was the subject of a public meeting held in November 1973. An EPA official stated that initial opposition from these interest groups centered on a potential threat to water-drawing rights. Later, opposition to the plan's proposed requirements for changes in agricultural practices became the primary problem delaying the basin plans' development in Idaho. The EPA officials stated that the planning process will take more time to insure that agricultural problems like these have been fully considered.

To speed up completion of the basin plans, all six plans were consolidated into one plan. On July 23, 1976, EPA approved the consolidated plan.

Although Oregon's basin plans have been drafted since mid-1974, only one draft plan has been submitted to EPA for its approval. An EPA official said that a major reason that completion of the basin plans had been delayed was because the draft basin plans had yet to be reconciled with land use plans.

As of May 1975, Maryland had the only basin plan completed and approved in the five States we visited. Maryland's remaining 17 basin plans are scheduled to be submitted by October 1976 for EPA's approval. Maryland officials stated that--by July 1975--public advisory groups had become active in the development of all 18 river basin planning areas. The State officials informed us that one factor delaying the completion of the plans was the additional time required by the public advisory groups to review and comment on the plans submitted to them by the State.

We also looked at whether States were calculating total maximum daily loads and waste load allocations for river segments. EPA regulations require that basin plans include, for water-quality-limited segments, a determination of the maximum daily discharge limit for each specific pollutant. This is to be done by first calculating from mathematical models the total maximum allowable daily waste loads which can be safely discharged to river segments without violating water quality standards and then allocating these allowable loads among polluters discharging into receiving waters.

In the States we visited, it was noted that few of the initial basin plans were to contain total allowable maximum

daily loads or waste load allocations. Waste load allocations in the river basin plans are either incomplete or inadequate because they are based on insufficient data. In Maryland, for example, 24 of the State's 206 river segments are considered high-priority, water-quality-limited segments for which waste load allocations are required. A Maryland official said that, as of May 21, 1975, the State had waste load allocations for only 8 of the 24 river segments. The State official said that sufficient data was not available to make the waste load allocations for the remaining 16 segments.

In Washington about 60 percent of the stream segments are classified as water quality limited. A State official informed us, however, that none of the initial basin plans will include total allowable maximum daily loads or any waste load allocations since the parameter in question is generally bacteria or the waste is from a nonpoint source. More research is needed before maximum daily loads and waste load allocations can be determined on these types of wastes.

In three of the five States visited, 69 percent of the stream segments were classified as not capable of meeting water quality standards primarily because of nonpoint sources of water pollution. State and EPA officials affirmed the lack of available data on nonpoint source discharges and possible pollution control alternatives.

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It will probably be a number of years before the basin and areawide planning process will have an impact on determining the best approach to solving water quality problems. The usefulness of the plans will depend primarily on the planning agencies' ability to obtain meaningful data on all the factors affecting water pollution control problems.

NEED TO IMPROVE WATER QUALITY DATA COLLECTION PROGRAMS

The data collection programs of the five States we visited were generally inadequate for identifying specific causes of water quality problems. Although the 1972 amendments became effective in October 1972, EPA still has not issued final regulations detailing specific information on how or when to collect water quality data. Further, EPA and the States have placed a low priority on data collection.

Without such information, it is unlikely that the areawide and basin plans will be adequate for determining the best course of action to take for constructing advanced waste treatment facilities.

Unless EPA increases emphasis on collecting needed water quality data in its national strategy paper, strengthens its data collection regulations, and improves its review of State data collection programs to insure that reliable data is obtained, areawide and river basin plans the States submit will continue to lack adequate data necessary to solve water pollution problems.

In commenting on the impact of the Federal water pollution control effort, the National Commission on Water Quality--in its March 18, 1976, report--stated that:

> "We also find that there is still a major lack of adequate information. We simply do not know enough. There are not sufficient data to tell us exactly how bad the water was, or how much better it is getting. The measuring and analytical techniques and predictive methodologies are not good enough in many instances to tell us the scope and value of incremental water quality improvements. If billions of dollars are to be invested wisely, we must have more and better data collected over an adequate term of years."

EPA's Water Quality Strategy Paper for fiscal years 1974 and 1975 emphasized issuing discharge permits and awarding waste treatment construction grants because EPA believed this would result in the most immediate improvements in water quality. EPA's fiscal year 1976 national strategy paper still gives highest priority to issuing construction grants but shifts the emphasis from permit issuing to permit enforcing. State officials told us that insufficient State resources--both manpower and funding--have been allocated to data collection and analysis because both the 1972 amendments and EPA guidance heavily emphasized controlling point sources of pollution by issuing permits and awarding construction grants.

State officials informed us that the lack of detailed monitoring regulations from EPA has also contributed to the States' inability to develop adequate data collection and analysis programs. The 1972 amendments require that--to be eligible for a pollution control program grant--the States must have a water quality monitoring program. In June 1973 EPA issued interim monitoring regulations to implement this requirement, but the regulations were very general and did not contain specific information on how or when to collect water quality data.

In August 1974, about 2 years after the 1972 amendments were passed, EPA issued proposed regulations to clarify data collection required by States. According to EPA officials,

the proposed regulations were based on a model data collection program. An EPA official said that State officials complained that they could not comply with the program in the proposed regulations because they lacked funding and qualified manpower. The EPA official stated that, as a result of the State comments, the regulations were going to be revised to a "bare bones program" so that State programs would be in compliance.

On April 27, 1976, EPA issued general regulations on the components of State water quality monitoring programs. Rather than publishing the technical details of monitoring programs as regulations, the EPA Administrator stated that EPA will issue guidance documents in the future which will detail recommended monitoring practices.

We believe that, without specific regulations on the need for adequate data collection programs, States will continue their current efforts with little emphasis on the use of intensive surveys to obtain necessary water quality data. An EPA region X official stated that without more detailed data collection regulations, EPA lacked the clout needed to force improvements in State data collection and analysis programs.

STATES' WATER QUALITY DATA COLLECTION PROGRAMS

The States we visited were mainly oriented to fixed-station network monitoring. 1/ This monitoring is a baseline for determining existing water quality conditions and in particular for identifying the existence of water quality problems. It is not particularly concerned, however, with determining the specific causes of water quality problems, and it is the identification of such causes that is the starting point for developing comprehensive water quality plans with viable solutions.

Once a potential water quality problem is identified, an intensive surveying program 2/ is needed to quantify the

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1/ Fixed-station network monitoring is the repeated sampling and measurement of water quality conditions at fixed points.

2/ An intensive survey concentrates on collecting the data needed to understand the cause and effect relationship between sources of pollution and instream water quality. Information on pollution sources, streamflow, and instream water quality should be obtained at the same time.

problem, identify the causes, examine the alternatives, and decide on a course of action for achieving water quality standards. Data from a fixed-station network is normally inadequate for serving these functions, in part because it does not enable development of the relationship between water quality and pollutional loads. Intensive surveys produce data suitable for determining the amount of pollutants to be removed and other actions needed to achieve water quality standards.

The five States we visited had performed intensive surveys on only a few river segments. Washington had not made intensive surveys even though 96--or about 60 percent--of the river segments were classified as water quality limited. State officials told us that, because the 1972 amendments placed a heavy workload on the States, they needed additional time to reorganize their traditional monitoring to provide the information required.

Oregon made few intensive surveys. Although all river segments in the State were classified as water quality limited, intensive surveys, according to an Oregon State official, were not generally made because of inadequate resources to collect all the data required by EPA.

In Idaho 16--or about 17 percent--of the water-quality-limited segments were intensively surveyed, some of which were done in cooperation with Federal agencies. State officials recognized that an improved State monitoring program was needed, but they were reluctant to make major changes until EPA published more detailed monitoring regulations.

EPA region X officials are developing a data collection program for use in their region which emphasizes the cause and effect relationship between sources of pollution and instream water quality. The central theme of this program is on defining cause and effect relationships as a basis for problem solving. Data obtained from limited fixed-station monitoring at key locations identifies problems. Intensive surveys are then made only where major water quality problems are noted.

In Maryland 9--or about 4 percent--of the 206 segments were intensively surveyed. These intensive surveys were made to help predict the effect water pollution control actions would have on water quality. Intensive surveys and modeling were underway for 35 more segments. As of May 1975, Maryland was still in the process of determining how many of its 206 river segments should be classified as water quality limited.

Virginia officials informed us that stream surveys were initiated in 20 of 75 water-quality-limited segments; however, not all of the 20 surveys were intensive. Some of the surveys were not sufficiently intensive to obtain necessary water quality data on the causes and effects of pollutants. State officials indicated that the data collection program was not adequately funded or staffed to obtain the needed data on all pollution sources.

CONCLUSION

Comprehensive planning is a key element in State water pollution control programs and should have a major impact on decisions to build expensive advanced waste treatment facilities. In the States we visited, the initial basin and areawide plans will be delayed primarily because EPA and the States have not given planning a high priority. As a result, these plans will not have a major impact on current decisions to construct advanced waste treatment facilities. Meanwhile, millions of dollars in Federal funds are being spent in these States to build such facilities.

It appears that because of limited funding and manpower at the State level as well as the lack of detailed data collection regulations, the initial basin plans, when completed, generally will be based on inadequate data, will not include a determination of allowable maximum daily loads, and will contain little consideration of nonpoint sources of pollution. Without such information, it is questionable as to how effective the plans will be towards improving water quality where advanced waste treatment facilities are to be constructed.

Water quality information States use for planning purposes generally is based on fixed-station network monitoring and is not comprehensive enough to identify the specific causes of water quality problems although such information is critical in developing adequate plans. Accordingly, we believe that there will be no improvement to the continuing problem of a lack of comprehensive plans until adequate data on the causes and effects of water pollution is obtained.

Although areawide (section 208) and river basin (section 303(e)) planning and data collection are not especially critical in cases where secondary treatment plants are required on effluent-limited segments, such planning becomes extremely important to reasonably predict cause and effect relationships for improving water quality where advanced waste treatment facility contruction is being considered.

The National Commission on Water Quality in its March 18, 1976, report recommended to the Congress that an ongoing national assessment of the quality of the Nation's waters be undertaken to determine progress toward water quality goals and objectives and that the progress be periodically reported to the Congress. The Commission also said that there must be renewed commitment to a data collection and analysis program encompassing an adequate range of parameters, a network of collection points providing satisfactory national geographic coverage, and a timespan during which changes in water quality and biological response are likely to be reflected.

We concur in the Commission's concern over the need for better water quality data collection.

RECOMMENDATIONS

We recommend that the Administrator, EPA:

--Publish final data collection regulations which will specifically state how the States are to obtain adequate water quality information through the use of intensive surveys and require that such surveys be made in those instances when the expenditure of large amounts of funds are contemplated.

--Reassess existing priorities within EPA to determine whether comprehensive water quality planning and data collection programs should be given additional emphasis.

--Determine whether existing resources at the State level are adequate to implement effective comprehensive water quality planning and data collection programs. If existing resources are inadequate, additional resources should be requested from the Congress.

CHAPTER 3

CONSTRUCTION OF MUNICIPAL ADVANCED WASTE TREATMENT FACILITIES NOT ADEQUATELY JUSTIFIED

Many expensive municipal advanced waste treatment facilities are being constructed even though they may not be the most effective or efficient means for achieving water quality goals. In the States we visited, municipalities are constructing or planning to construct 26 expensive advanced waste treatment facilities, involving about $882 million in Federal funds, to remove higher percentages of pollutants and nutrients. However, adequate information for planning these facilities was not available. Without such information, decisions to build advanced waste treatment facilities were being made without carefully considering whether other less costly methods were available to control water pollution. Possible alternatives to advanced waste treatment facilities include low-flow augmentation, instream aeration, control of nonpoint sources of pollution, and a variety of other pollution abatement actions.

The most common advanced waste treatment processes being planned or constructed in the States we visited included nitrogen and phosphorus removal. By removing these nutrients, the States hope to control the algal growth thereby improving water quality. Exact scientific knowledge is usually lacking, however, on the amount of each nutrient to be removed and the effect of such removal on the growth of algae in waste-receiving waters.

With few exceptions, constructing advanced waste treatment facilities is extremely expensive. The capital cost of waste treatment facilities increases dramatically with levels of treatment beyond secondary. In 1972 data from EPA indicated that it would cost at least five times as much to remove the last 15 percent of the pollutants as to remove the first 85 percent.

Not only are initial capital costs of advanced treatment facilities enormous, but also annual operation and maintenance costs are high. For example, after expanding the capacity of the Blue Plains plant that serves most of the Washington D.C., area by 29 percent and adding advanced waste treatment, the annual operating costs are expected to rise from $13 million to $76 million--a sixfold increase--due primarily to the addition of advanced waste treatment.

Other problems associated with advanced waste treatment include the disposal of large amounts of sludge which result

from higher degrees of treatment and development of a sufficient number of adequately trained personnel to properly operate and maintain such facilities.

As a result of questions raised during our review, Maryland reevaluated the need for removing nitrogen at four advanced waste treatment facilities it is planning to construct. State officials decided to defer construction of the nitrogen removal processes, thereby saving $13.5 million in Federal construction grant funds, because they felt greater benefits could be obtained by using the funds for other purposes, such as upgrading primary treatment facilities to secondary treatment. In addition, the State is continuing to review the adequacy of the justifications for nutrient (phosphorus and/or nitrogen) removal planned for 17 or 18 other proposed advanced waste treatment facilities.

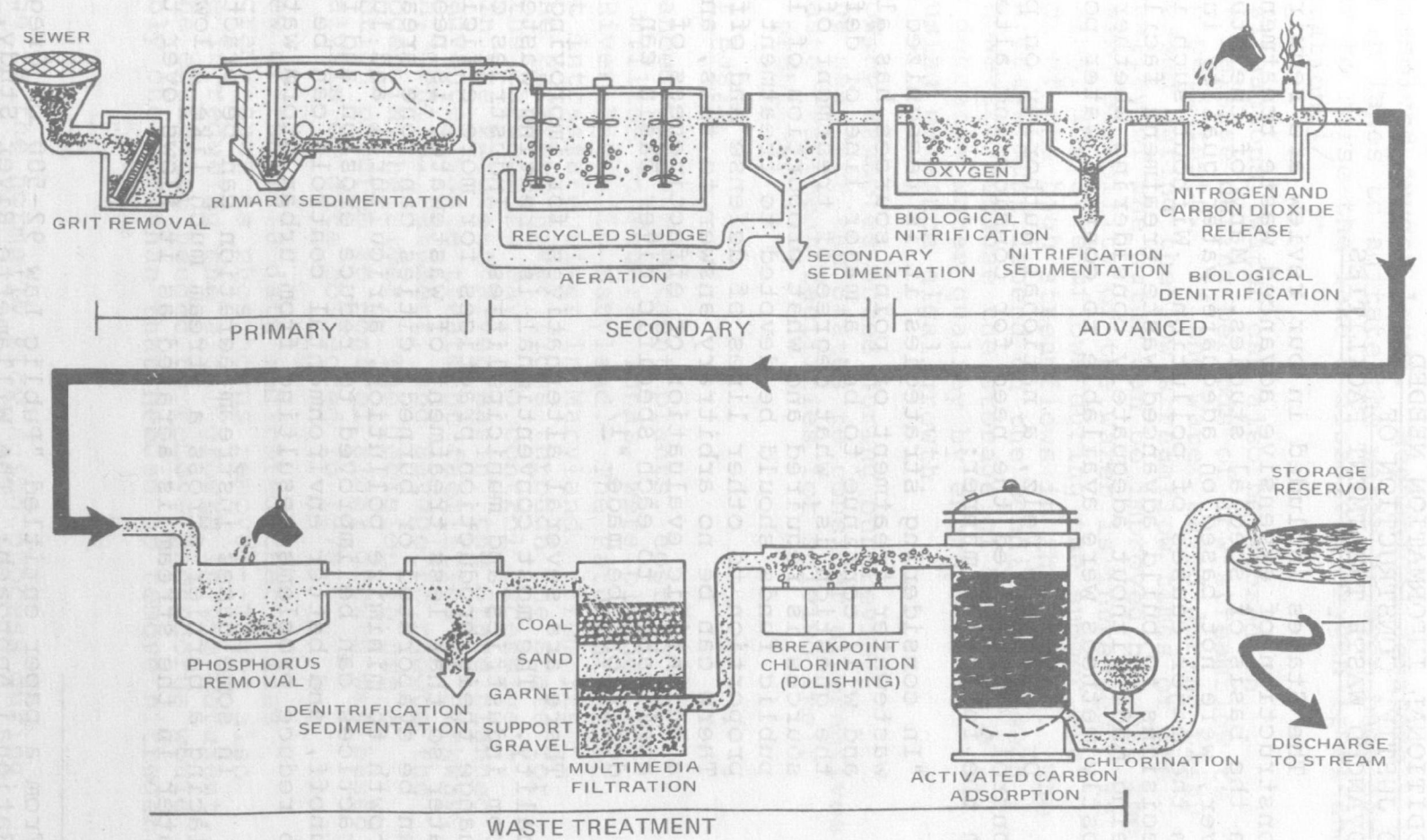
PRIMARY, SECONDARY, AND ADVANCED WASTE TREATMENT

Conventional waste treatment generally includes two processes--primary and secondary treatment. In primary treatment, essentially all settleable solids are removed by plain sedimentation. In secondary treatment, biological processes are used to accelerate the decomposition of sewage and thereby reduce the oxygen demand of the waste. Secondary treatment, in coordination with primary treatment, increases biochemical oxygen demand (BOD) removal from 30 to about 80 or 90 percent.

Advanced waste treatment involves processes which are for removals beyond secondary treatment. Nitrification satisfies the oxygen demand of nitrogenous compounds and thereby reduces the BOD of wastes. Like secondary treatment, it is designed to protect the oxygen resources of waste-receiving waters. Denitrification and phosphorus removal are processes for eliminating nutrients to prevent the production of algal blooms in receiving waters. Denitrification is a biological process with high costs and operating expenses and careful operation by well-trained personnel is required. Phosphorus removal has a lower capital cost but has higher operating costs. This process can be easily started and stopped but results, however, in large quantities of sludge. Other advanced waste treatment processes are intended to remove minute concentrations of pollutants to obtain effluents of extremely high quality.

A diagram of a primary, secondary, and advanced waste treatment process is shown on page 21.

DIAGRAM OF A SEWAGE TREATMENT PLANT INCLUDING ADVANCED WASTE TREATMENT



ADDITIONAL INFORMATION NEEDED TO JUSTIFY CONSTRUCTION OF ADVANCED WASTE TREATMENT FACILITIES

The States included in our review are requiring the construction of expensive advanced waste treatment facilities on the basis of special studies. Many of the studies, however, were not based on adequate water quality information on the major causes of pollution. Without such information, decisions to build advanced waste treatment facilities were being made without adequately considering whether other less costly methods were available to control water pollution.

Dr. Clarence Velz, a national authority on pollution control, emphasized the need for considering alternatives in the following manner:

> "In considering strategies it is recognized that wastewater treatment of point sources has always been, and will continue to be, a major line of defense. But the question is, what degree of treatment of point sources is required and what proportion of limited public funds should be devoted to treatment and what proportion to other lines of defense and offense? There can be no arbitrary answer to this, and only by a scientific evaluation of effectiveness of alternatives applicable to each specific river basin can rational decisions be made."1/

There are several alternatives for improving water quality. The most conventional is treating wastewaters from industries and municipalities. Industries can also change their production practices for more efficient use of water so that less treatment of wastewater is needed, wastes can be evaporated or burned, cities can zone areas of planned growth to minimize pollution, agricultural and lumber practices can be improved to reduce erosion and fertilizer runoff, and better environmental controls can be implemented to reduce problems resulting from urban storm water runoff.

In some cases instream aeration can be practiced by placing a barrier across a stream much like a low dam. Water in the stream is aerated as it flows over the barrier,

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1/From a paper entitled "Public Law 92-500 or Oregon's Rational Approach: The Willamette River Study," prepared for presentation at the June 30-July 2, 1975, meeting of the American Water Resources Association.

raising its dissolved oxygen level. Mechanical aerators can be placed in lakes to agitate the water or even pump air into the water to raise the lake's dissolved oxygen level and slow eutrophication.1/

In many situations, water can also be stored in reservoirs for release during periods of low streamflow to greatly dilute pollutants. If the water saved during rainy months is released during the low streamflow times of the summer, the quality of the water can be improved because the natural cleansing capability of the water is increased. In some river basins, low streamflows during the summer are only a fraction of the high streamflows in the spring. The use of water storage must depend on the condition in each river basin, however, because the storage of water in a reservoir may decrease water quality by entrapment of nutrients, causing nuisance algal growth.

The following examples noted during our review demonstrate the need for the States to consider alternatives to advanced waste treatment facilities for solving their water quality problems.

Patuxent River Basin

Four advanced waste treatment plants, costing an estimated $69 million in Federal funds, were planned for the Patuxent River Basin in Maryland. The Patuxent River is the largest intrastate river in Maryland. From its headwaters, the Patuxent River flows through the State for 110 miles to the Chesapeake Bay. To control excessive algal growth in the Patuxent River Basin, the State planned to construct advanced waste treatment facilities at Parkway, Western Branch, Central Patuxent, and Savage to reduce the level of nitrogen in the river. The decision to use a nitrogen reduction program to control algal growth was based on a State analysis of data collected in 1970.

Our review of the 1970 data indicated that a less expensive program--such as phosphorus removal--might also be as feasible in reducing the algal growth in the Patuxent. The cost of the equipment needed to remove phosphorus would be considerably cheaper than that needed to remove nitrogen.

1/Eutrophication is the normally slow aging process during which a lake becomes so rich in nutrients, especially nitrogen and phosphorus, that algae and other microscopic plant life become superabundant thereby "choking" the lake and causing it to eventually dry up.

Our consultant also reviewed our analysis of the data Maryland used to justify the nitrogen reduction program and agreed that a phosphorus removal program would probably limit the growth of algae in the Patuxent. He concluded also that the algae problem in the Patuxent River Basin was more complex than shown by the State's information since there does not seem to be any clear evidence that either phosphorus or nitrogen is the cause of algal growth. Our consultant stated that the decision on which nutrient to remove must be evaluated in terms of anticipated costs and benefits. He stated that a phosphorus reduction program could be more readily justified since it is a chemical-physical process that is flexible and can be turned on and off as needed, while the nitrogen reduction program planned for the Patuxent River Basin is a biological process that is not so easily controlled.

Because of the complexity of the algae problem in the Patuxent River Basin, our consultant recommended that, before spending the funds required to build the expensive nitrogen reduction plants, the State should research the extent of the algae problem and alternative solutions to it. In this regard, he recommended that, before deciding on a particular type of treatment, the State should:

--Identify the relationship of the location and magnitude of peak algal growth to streamflow to determine the frequency with which excessive algal growths occur.

--Determine those streamflows which produce the critical nutrient concentration that is necessary to promote noticeable algal growth. This should be done for both existing and assumed future users of the waste treatment system. Such analysis will hopefully indicate whether nutrient removal is needed for all or only part of the year. If the analysis shows that nutrient removal is needed part of the time, then a flexible process should be the preferred treatment.

Our observations on the lack of justification for the construction of nitrogen removal facilities at the treatment plants proposed for the Patuxent River were discussed with Maryland officials during our review. On the basis of our observations, Maryland reevaluated the need for a nitrogen removal program and decided to defer construction of the facilities but design them so that nutrient removal facilities can be added in the future. The nitrogen removal program has been deferred because Maryland officials now believe that greater benefits can be achieved by using the

funds for other purposes, such as upgrading primary treatment facilities to secondary treatment.

At the time of our review, Maryland officials had not developed the total cost savings resulting from deferring nitrogen removal at the four facilities on the Patuxent River. Later, cost figures were developed for the Savage facility that indicate that capital cost savings of $3.6 million would be realized and that total savings over the useful life of the facility would be $16.3 million, including operation and maintenance, interest, and amortization. We estimate that, by using the cost figures developed for the Savage facility and applying them to the other three facilities, Maryland's decision to defer nitrogen removal at all four facilities on the Patuxent River would save $13.5 million in Federal funds and $2.2 million in State funds.

In addition, the State is continuing to review the adequacy of the justifications for nutrient (phosphorus and/or nitrogen) removal at the other 17 or 18 proposed advanced waste treatment facilities.

Tualatin River Basin

An advanced waste treatment facility, providing phosphorus removal and high levels of filtration, is being built in the Tualatin River Basin in Oregon at a total Federal cost of about $19 million. The study justifying this facility's construction stated that water quality standards in this basin could not be attained without river flow augmentation and control of runoff from agricultural lands.

Although Oregon is requiring advanced treatment for all point sources in the Tualatin River Basin, it appears that this action alone will be insufficient because the river's flow and runoff from agricultural lands will not be controlled. In addition, the State has not determined the most effective or efficient actions needed in the river basin to achieve water quality standards.

One consideration in determining which water pollution control alternative to implement is whether the alternative is eligible for Federal funding. For instance, although EPA provides funds for construction of waste treatment facilities, an Oregon Department of Environmental Quality official stated that no EPA funds are available for construction of reservoirs for low-flow augmentation.

Concerning river flow augmentation we noted that, in a 1975 paper prepared for the American Water Resources Association, Dr. Clarence Velz reported:

> "To allow flood waters to escape to the sea and expose men to the risks of severe droughts with dependence upon the least flow is certainly not intelligent nor wise conservation. Many of our water shortages and quality problems are not for lack of water, but stem from our failure to * * * make fuller use of the total annual flow available."
>
> * * * * *
>
> "Surely it becomes questionable to increase expenditures three-to five-fold on elaborate treatment works and do nothing to control the ravages of drought steamflow. If the current 'treatment only' philosophy continues, there is grave danger of spending billions of dollars on what may prove to be regarded as elaborate expensive 'monuments' along the banks of shrunken rivers, rivers which remain inadequate in both quantity and quality for man's needs."

Roanoke River Basin

The Roanoke water pollution control plant is located on the Roanoke River near its confluence with Tinker Creek in Roanoke, Virginia. An estimated $24 million in Federal funds was needed to expand and upgrade the present secondary facility to an advanced waste treatment facility which will remove phosphorus. Construction of the facility was begun in fiscal year 1972 and scheduled for completion in fiscal year 1976. As of July 1976, it was 99 percent complete.

This advanced treatment facility was justified on the basis of a 1970 study which showed that Roanoke River drainage into a lake had a high level of nutrients because of waste loadings in the Roanoke urban area. The study recommended reducing nutrient input to the lowest possible level to limit the growth of nuisance algal blooms in the lake. However, no specific consideration was given to alternative methods of reducing nutrients, and the degree of reduction that should be required for each point and nonpoint source was not specified.

Although advanced waste treatment is being required for the Roanoke facility, a State official thought that the facility would only slow further degredation of the lake rather than improve water quality to any great extent. We believe that before decisions are made to build advanced treatment

facilities, extensive information should be obtained on nonpoint sources of nutrients to determine whether treatment will effect the desired improvement. In addition, alternative abatement measures need to be investigated to determine the most efficient plan for achieving improved levels of water quality.

Designing facilities for future addition of advanced waste treatment processes

While advanced waste treatment facilities are being planned for the Patuxent, Tualatin, and Roanoke River Basins without adequately considering all major factors affecting water quality, Idaho is not going to construct advanced treatment facilities in the Snake River Basin to remove nutrients until it obtains adequate information that clearly justifies constructing such facilities. Without information on the major factors affecting water quality, Idaho is taking a careful approach to constructing expensive treatment facilities.

Idaho is having serious algae problems in reservoirs on the Snake River downstream from Twin Falls. The State is requiring that a new secondary treatment facility at Twin Falls be designed so that phosphorus removal equipment can be added in the future. The additional cost of modifications to provide for the future addition of phosphorus removal equipment is estimated at $2,000, considerably less than 1 percent of the total Federal cost of about $5 million to construct the secondary treatment facility. The Idaho State Grants Coordinator stated that it would be foolish to require advanced waste treatment now because the water quality could not be improved unless the nonpoint source pollution problems are also corrected.

WATER QUALITY BENEFITS OF NUTRIENT REMOVAL FACILITIES ARE UNKNOWN

The principal advanced waste treatment process being planned or constructed in the States we visited was nutrient--nitrogen and phosphorus--removal. By removing these nutrients, the States hope to control the growth of algae thereby improving existing water quality. Exact scientific knowledge is lacking, however, as to the extent algae can be prevented from growing when varying combinations of the nutrients are removed. In addition, it is difficult to predict the effects that light, suspended solids, temperature, and other factors might have on preventing and controlling algal growth. While scientists know that phosphorus, nitrogen, light, temperature, and suspended

solids affect the growth of algae to some degree, they cannot determine with certainty what the effect will be on preventing or reducing algae if one or more of these elements is increased or decreased.

Washington, for example, has approved the construction of an advanced waste treatment facility for phosphorus removal to control an algae problem in the Spokane River. The estimated Federal cost of the facility is about $34 million. Although an EPA study indicated that the river quality may be improved if phosphorus is removed from the facility's effluent, various scientists believe the current state of knowledge of algal growth is such that it is impossible to relate the frequency or severity of algal blooms to specific phosphorus levels in the water.

The EPA region X Chief of the Water Surveillance and Investigation Branch stated that, although EPA lab studies indicated that phosphorus removal would control algal growth in the Spokane River, this concept has never been successfully demonstrated. In addition, no experiments have proved that phosphorus removal will control algal growth in a complex river system.

There is also considerable uncertainty as to the effect nutrient removal will have on preventing algal blooms on the Potomac River in Washington, D.C. Three advanced waste treatment facilities, the Blue Plains plant in Washington, D.C., and the Alexandria and Arlington facilities in Virginia, are planned to provide for nutrient removal on the Potomac River, because the 1969 Potomac Metropolitan Area Enforcement Conference recommended that high levels of phosphorus and nitrogen be removed from the effluent of Washington, D.C., metropolitan area municipal sewage treatment facilities.

A 1969 Federal Water Pollution Control Administration report and various studies since that time have predicted that removal of as much BOD and oxygen-demanding nitrogen as possible will be necessary to achieve the dissolved oxygen standard in the Potomac River Estuary.

Although the costs of constructing these facilities are substantial, we found no evidence to demonstrate what the effect on algae would be if varying amounts of phosphorus and nitrogen were either increased or decreased at these facilities. Much of the information justifying the removal of nutrients at these facilities indicated uncertainty as to whether or not algae could be controlled. In addition, a January 1975 report prepared by the Interstate Commission on the Potomac River Basin and entitled "Non-Point Pollution

in the Potomac River Basin" pointed out that the concentration of nutrients coming downstream in the Potomac River is by itself, great enough to support nuisance levels of algae. Therefore, even if the three facilities removed all nitrogen and phosphorus from their effluent, remaining nutrients could still support nuisance levels of algae.

Because of rising costs and national shortages of energy and other resources, EPA reassessed the water quality management programs in the Washington, D.C., area in 1974. On the basis of this reassessment, EPA decided to defer the removal of nitrogen at the Blue Plains treatment plant for 2 years until the extent of water quality improvement from phosphorus removal can be determined. In explaining the justification for deferring nitrogen removal, EPA indicated the imprecise nature of benefits that are being anticipated from either phosphorus or nitrogen removal:

> "* * *although scientific understanding of algae blooms has greatly improved, the precise benefits to be attained by nitrogen removal remain unclear. Algae nuisances will be reduced somewhat by phosphorus removal, without dentrification--possibly to an acceptable level."

Our consultant stated that the benefits to be derived from constructing advanced waste treatment facilities cannot be accurately estimated until more scientific knowledge has been developed about how this construction will improve water quality. Concerning the building of advanced treatment facilities in the absence of information on expected outcomes, he stated that he

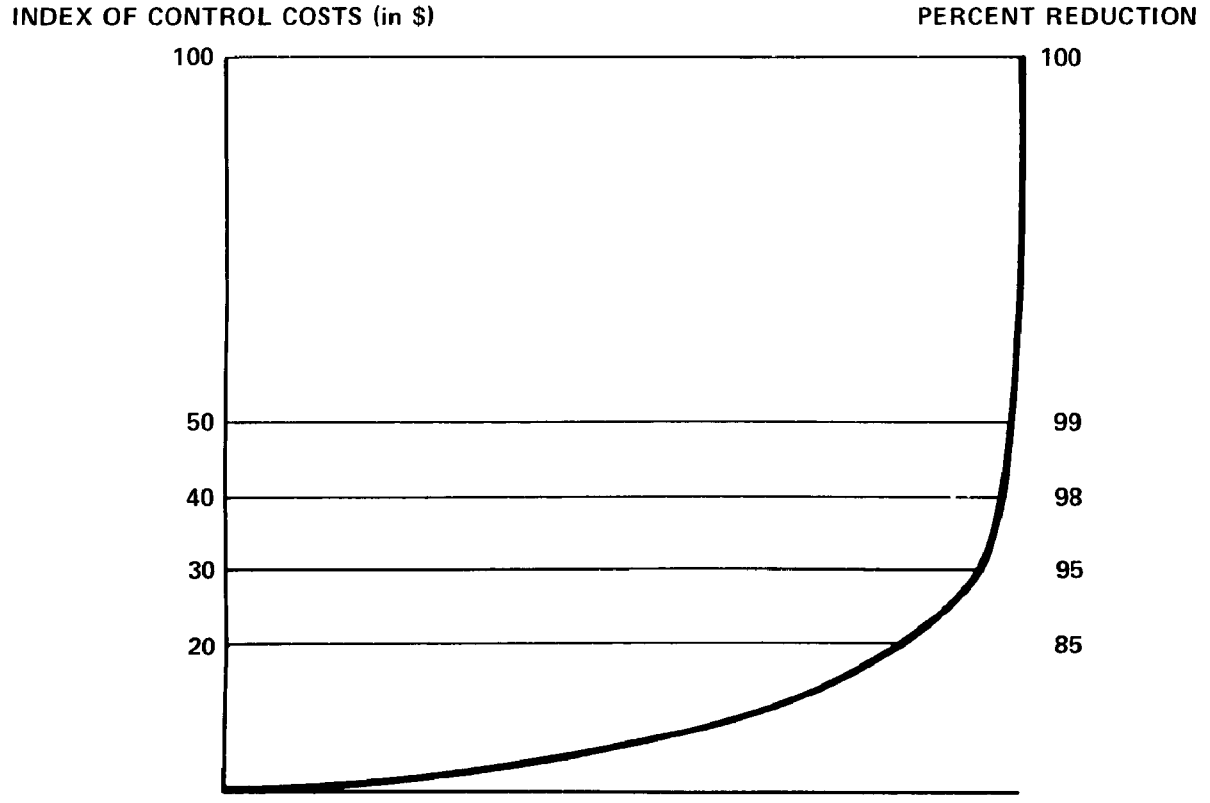
> "* * *would generally be inclined in the absence of knowledge to proceed slowly and cautiously, taking a wait-and-see attitude. Set standards which will not incur costs to society of tens or hundreds of millions of dollars. Set them with advice to the polluter that they may need to be tightened;* * *"

HIGH CAPITAL COST OF ADVANCED WASTE TREATMENT FACILITIES MAY NOT BE JUSTIFIED

With the exception of small, uncomplicated sewage treatment facilities, advanced treatment processes are generally expensive. The cost to remove additional oxygen-consuming materials increases dramatically after the secondary treatment level which removes 80 to 90 percent of the pollutants.

As a result, the incremental water quality improvements due to advanced waste treatment are likely to be modest when compared to the increased costs.

The following chart shows that--with present technology--it would cost at least five times as much to remove the last 15 percent of the pollutants in wastewater as to remove the first 85 percent.



Source: "The Economics of Clean Water," EPA, 1972.

As indicated by the chart, decisions on the level of water quality desired have an enormous impact on the total cost of waste treatment facilities and thus on the demand for Federal funds. For example, the Blue Plains, Alexandria, and Arlington advanced waste treatment facilities planned and under construction for the Metropolitan Washington, D.C., area exemplify the high costs of advanced treatment. All three are located on the Potomac River and are presently secondary treatment facilities that are being upgraded to provide for advanced waste treatment.

The construction costs for existing primary and secondary facilities and for increased capacity including proposed advanced 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
			(000,000 omitted)	
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 of expansion and advanced treatment facilities 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.

In announcing the decision to defer the building of the nitrogen removal process at the Blue Plains plant, the EPA region III Administrator stated that "It is a highly expensive process involving enormous outlays of funds for a relatively small amount of cleanup."

The study justifying the need for nutrient removal facilities at Blue Plains was made in 1969 shortly after the Potomac River had experienced a serious problem with algal growth. There has not been as serious a problem with algal growth since that time, however. Spending large

amounts of Federal funds for nutrient removal facilities to control a water quality problem which has not been demonstrated to be a serious recurring problem does not appear to be justified.

HIGH OPERATION AND MAINTENANCE COSTS OF ADVANCED WASTE TREATMENT FACILITIES

The operation and maintenance costs of advanced waste treatment facilities are also high. The following chart shows a comparison of the current and projected operation and maintenance costs for the three advanced treatment facilities in the Metropolitan Washington, D.C., area.

	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 is being increased by 29 percent because of expansion and the modifications which add advanced waste treatment, the projected operating costs will rise from about $13 million to $76 million (a sixfold increase) due principally to the modifications adding advanced waste treatment. With a 25-percent increase in size, Arlington's operation and maintenance costs will rise from $1.4 to $4.4 million (a threefold increase). Some of the increased operation and maintenance 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 greatly increased operation and maintenance costs of advanced treatment is the vast amounts of chemicals and energy which are required. For example, if the proposed Blue Plains plant were to be completed as originally planned, the daily quantities and projected costs of chemicals expected to be used for the advanced waste treatment processes would be as follows:

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 "	8,600
	polymer	195 pounds	450

Sludge incineration, if used, would require 45,000 gallons of fuel oil a day at a cost of $19,800. The chemical costs for methanol and polymer will not be needed if a final decision is made not to build the nitrogen removal facilities at Blue Plains.

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.

Some cities are experimenting with a variety of sludge disposal methods, ranging from incineration to recycling sludge as fertilizer. Orange County, California, for example, plans to open a pilot plant in 1976 to test a process that reduces sludge to a small residue of carbon ash. Philadelphia, Pennsylvania, is testing the wet oxidation process which involves heating sludge in oxygen and applying sulfuric acid to destroy the organic material. The heating process produces gas and grease containing certain paraffin-type compounds that can be burned as fuel. In addition, a liquid residue contains metals that can be extracted for recycling.

At present, Blue Plains uses land trenching as one of its major means of sludge disposal. However, this requires a large amount of land. The jurisdictions surrounding Blue Plains have had difficulty in obtaining enough land for sludge disposal because land costs are high and many citizens do not like living near sludge disposal sites.

For example, in the spring of 1976, Blue Plains was not operating as efficiently as it could because it did not want to produce more sludge than the available land in the surrounding jurisdictions would be able to handle. In May

1976 EPA cited Blue Plains for violating its permit and stated that "At all times, all facilities shall be operated as efficiently as possible* * *"

EPA later granted Blue Plains a waiver until June 15, 1976, after concluding that Blue Plains had no place to dispose of the sludge. Before the waiver elasped, however, the jurisdictions surrounding Blue Plains were able to obtain sufficient land to allow Blue Plains to resume operating at maximum removal levels by the June 15 deadline.

The District of Columbia is cooperating with Maryland and the U.S. Department of Agriculture to develop a sludge disposal method called composting, which involves a process whereby organic waste is decomposed to produce a humus-like material, which can be used as a soil conditioner. Incineration is proposed as a backup system at Blue Plains.

However, composting, as well as other new sludge disposal methods, is still being developed and its feasibility for widespread use at large sewage treatment facilities--particularly with sludges generated by advanced waste treatment processes which contain large quantities of inorganic chemicals--will have to be determined.

OBTAINING SUFFICIENT NUMBERS OF TRAINED OPERATORS FOR ADVANCED WASTE TREATMENT FACILITIES MAY BE A PROBLEM

A sufficient number of adequately trained personnel to properly operate and maintain advanced waste treatment facilities may not be available once the facilities are constructed. EPA estimates that by 1977 the development of the municipal plant workforce will require recruiting and training an estimated 10,000 additional new treatment plant operators each year in addition to increased training for an estimated 38,000 operators annually. As wastewater treatment facilities become more complex and sophisticated, an even higher level of expertise will be needed to operate them.

The Executive Secretary of the Water Pollution Control Federation said in April 1975, that there is presently a shortage of trained operators to run the planned new facilities. He stated that:

> "If all the required secondary plants were built there would not be enough trained operators to run all the plants. There obviously aren't enough trained operators to run both the needed secondary and advanced wastewater treatment plants."

At the Arlington, Virginia, waste treatment facility, the operating staff is to be increased from its present level of 60 to 95 as a result of expanding the capacity and adding advanced waste treatment. The facility's superintendent stated that he has had difficulty in obtaining qualified operating personnel for the present secondary treatment facility and expected to have continuing difficulty recruiting operators for the advanced treatment facilities.

CONCLUSION

Controlling pollution from municipal sources will be costly--billions of taxpayers' dollars--and the most cost-effective use of Federal funds is essential, especially in view of the Nation's inflation and economic problems.

Advanced waste treatment facilities are being constructed even though some of them may not be the most effective or efficient alternatives for achieving water quality goals. Decisions were made to build some of these expensive treatment facilities, however, even though comprehensive water quality planning had not been done, adequate water quality information on the causes of pollution had not been obtained, and alternatives to advanced waste treatment had not been adequately considered. Possible alternatives to advanced waste treatment plants include low-flow augmentation, control of nonpoint sources of pollution, and a variety of other pollution abatement actions.

Some advanced waste treatment facilities are being constructed without knowing the extent of improvements in water quality, if any, that are to occur once the facilities are constructed. In addition, adequate consideration is not being given to such factors as the high capital costs and annual operation and maintenance expenses of the proposed facilities and the sludge disposal problems which may result because of higher levels of treatment.

RECOMMENDATION

We recommend that, before approving grants for constructing expensive advanced waste treatment facilities, the Administrator of EPA determine that:

--All water pollution control alternatives have been considered.

--Adequate information has been obtained on expected water quality improvements, high initial capital costs and annual operation and maintenance expense, and sludge disposal problems that may result.

MATTER FOR CONSIDERATION BY THE CONGRESS

If the Congress wishes to maintain close scrutiny over EPA's funding of advanced treatment facilities, the Congress may wish to have the Administrator, EPA, annually report to the Congress on the (1) costs and potential water quality improvements of new advanced waste treatment facilities and (2) problems and accomplishments of completed advanced waste treatment facilities in meeting their water quality goals.

CHAPTER 4

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.

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.

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 water. 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.

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

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.

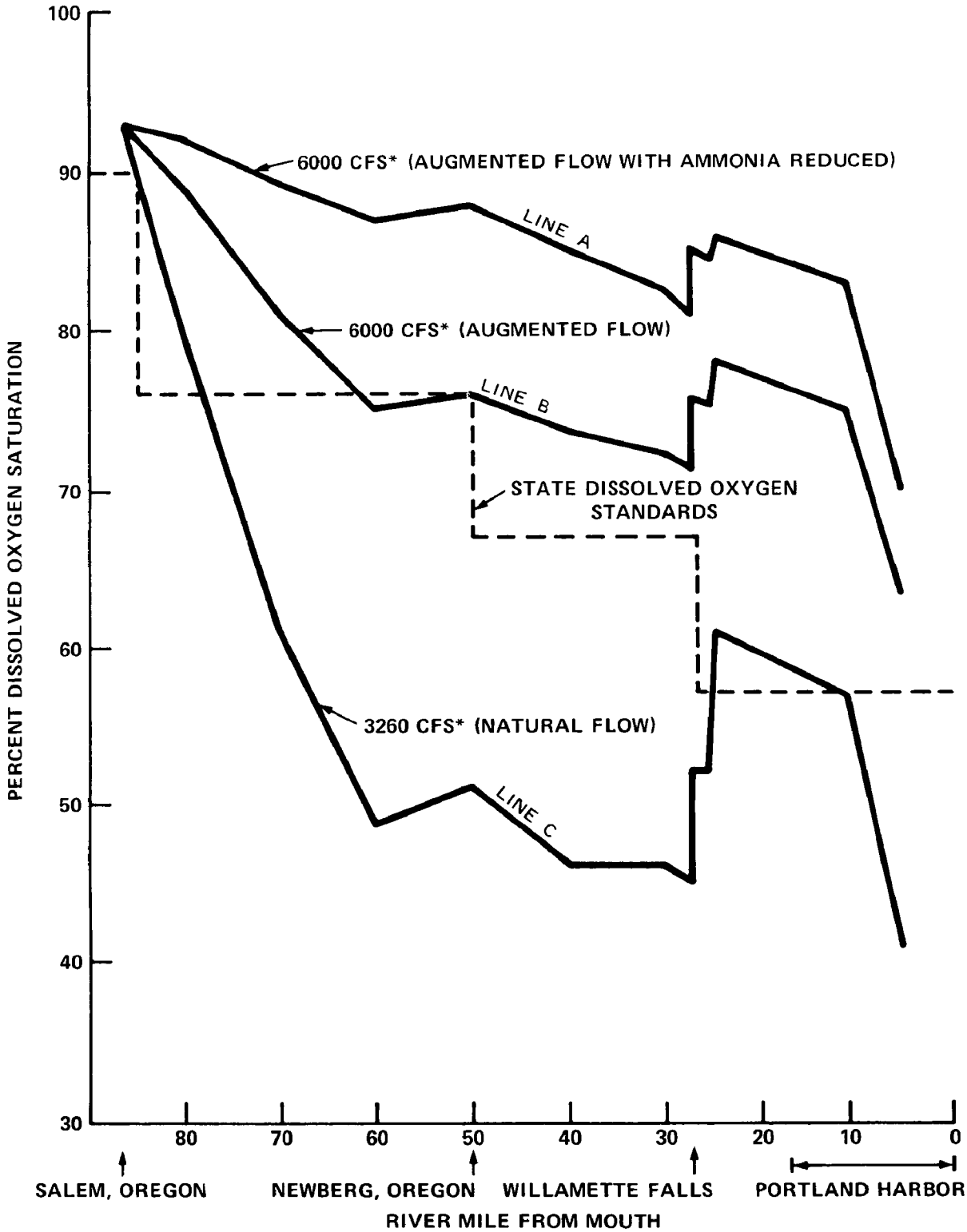
Line A represents the dissolved oxygen levels attainable through the continued use of low-flow augmentation and the reduction of ammonia from present dischargers. Under this alternative, the State standards would be exceeded at all times.

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.

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

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.

CHAPTER 5

AGENCY AND STATE COMMENTS AND OUR EVALUATION

This proposed report was submitted to the Environmental Protection Agency, Idaho, Maryland, Oregon, Virginia, Washington, and the District of Columbia for comments on our review of their activities discussed in the report.

EPA advised us in a September 29, 1976, letter that it agreed with the main thrust of our report that costly treatment facilities providing for treatment levels beyond the secondary level should generally not be approved until intensive water quality cause and effect studies have been completed. (See app. II.) EPA also concurred with our findings that there are instances where adequate monitoring data may not have been collected in the case of some advanced waste treatment projects. EPA's main concern with our proposed report, however, was that most of EPA's construction grant funds are being spent on secondary treatment facilities which are not subject to many of the criticisms raised in the proposed report. According to EPA, significant improvement has been made in planning for secondary treatment facilities.

We agree with EPA that very little water quality planning and data collection are required for construction of secondary treatment facilities. Indeed, a major feature of the 1972 amendments is that secondary treatment is generally required for all municipalities, and because of this, little decisionmaking concerning the need for construction is really needed.

Although less planning and water quality data is generally required for secondary than for advanced waste treatment, we believe it is essential that EPA sufficiently plan and collect cause and effect water quality data before it decides that advanced waste treatment facilities are necessary and that such treatment facilities can achieve water quality goals in an effective and efficient manner.

EPA said that it has problems where some advanced waste treatment facilities are required, particularly in predicting cause and effect relationships. According to EPA, a primary problem in determining cause and effect relationships has been inadequate water quality data.

EPA stated that it has taken steps to evaluate its decisionmaking process for funding advanced waste treatment facilities and recognizes a need for improving water quality data collection. According to EPA, an internal, independent

evaluation group within EPA is currently addressing advanced waste treatment problems through an evaluation of water quality standards, effluent limitations, and other elements of planning that result in advanced waste treatment requirements. In addition, EPA said it formed a working group, which includes State representation, to review monitoring and to develop program and policy revisions. Implementation of the program is expected to substantially strengthen the data base on which advanced waste treatment planning decisions are made.

We concur with EPA's efforts to develop a sound basis on which decisions to build expensive advanced waste treatment facilities can be better justified. In the interim, however, and until the results from EPA evaluations are received, we believe that EPA may wish to consider limiting State construction of expensive advanced waste treatment facilities to a few designated experimental basins.

EPA agreed with our recommendations concerning water quality planning and data collection and suggested two more recommendations for improving the comprehensive planning process.

Technical changes suggested by EPA officials were considered and changes made to the report where appropriate.

Washington felt that the report, in general, raised valid points regarding the problems associated with water pollution abatement planning in the United States. Specifically, the State felt that such problems as the need for more comprehensive data and technical knowledge to determine treatment levels necessary to safeguard or improve water quality and the need for trained operators at existing and newly constructed treatment facilities are well taken and should be resolved for more effective water quality management. However, the State questioned some of the other points we raised. (See app. VI.)

Oregon believed that the general emphasis of the report seemed to be that advanced waste treatment is not necessary to clean up the Nation's waters. (See app. IV.) We believe that the report does not imply that advanced waste treatment is never needed. To the contrary, we believe there can be times when the most effective or efficient means for achieving water quality goals will be for advanced waste treatment facilities to be constructed. We believe, however, that decisions to build advanced waste treatment facilities are justified as long as comprehensive water quality planning has been done, adequate water quality information on the causes of pollution has been obtained, and all water

pollution control alternatives have been considered to insure that advanced treatment processes will improve water quality and will result in the most effective and efficient use of Federal funds.

Virginia stated that, in the past, the States had pressure on them to get the grant funds committed under the philosophy of "use it or lose it." According to Virginia, the States and EPA had insufficient manpower to always assure that the projects funded were fully cost effective. Planning has been behind schedule and out of phase and EPA should not be faulted for putting construction first because it could not do everything at once. Virginia further commented that although current elaborate planning and cost-effectiveness methodologies did not exist in the old days, the then existant planning procedures were applied. (See app. V.)

Maryland did not make any specific comments regarding the general thrust of our report but did comment on a number of specific issues which were pertinent to their own State's activities. (See app. III.)

Various comments made by the States which responded were considered and changes were made to the report where appropriate.

FACT SHEETS FOR THE DISTRICT OF COLUMBIA, IDAHO, MARYLAND, OREGON, VIRGINIA, AND WASHINGTON

DISTRICT OF COLUMBIA FACT SHEET

Funds allocated under Public Law 92-500 for construction:

Fiscal year 1973	$ 14,228,000
Fiscal year 1974	21,342,000
Fiscal year 1975	38,233,800
Fiscal year 1976	72,492,000
Total	$146,295,800

Number of basins and designated areas: Basins: 0 Areas: [a]1

Number of completed and approved plans as of July 1, 1976: Basins: N/A Areawide: 0

Estimated date of completion of basin plans: N/A

Statutory completion date of areawide plan: 1977

Advanced Treatment Facilities Planned or Under Construction as of July 1976

Project	Estimated Federal funding (note b)	Project status
Blue Plains	[c]$328,600,000	[d]58 percent complete

[a]The planning is being done under an areawide agency consisting of Maryland, Virginia, and District of Columbia officials.

[b]Includes costs to upgrade and/or expand the secondary treatment process.

[c]$100,000,000 of this amount has been deferred until a final decision about the need for nitrogen removal is made.

[d]Construction of the denitrification stage of the project has been deferred as noted in footnote c.

IDAHO FACT SHEET

Funds allocated under Public Law 92-500 for construction:

Fiscal year 1973	$ 4,354,000
Fiscal year 1974	6,531,000
Fiscal year 1975	7,898,400
Fiscal year 1976	19,219,100
Total	$38,002,500

Number of basins and designated areas: Basins: [a]6 Areawide: 3

Number of completed and approved plans as of July 1, 1976: Basin: 0 Areawide: 0

Estimated date of completion of basin plans: 1976

Statutory completion date of areawide plans: 1977

Advanced Treatment Facilities Planned or Under Construction as of July 1976

Project (note b)	Estimated Federal funding (note c)	Project status
West Boise	$8,099,000	85 percent complete

[a]In order to speed up their completion, the plans for the six basins were consolidated into one plan.

[b]Two additional plants are plumbed and one will be plumbed for possible addition of phosphorus removal equipment.

[c]Includes costs to build the secondary treatment process.

MARYLAND FACT SHEET

Funds allocated under Public Law 92-500 for construction:

Fiscal year 1973	$ 85,164,000
Fiscal year 1974	127,746,000
Fiscal year 1975	54,128,100
Fiscal year 1976	297,705,300
Total	$564,743,400

Number of basins and designated areas: Basins: 18 Areas: 1

Number of completed and approved plans as of July 1, 1976: Basin: 1 Areawide: 0

Estimated date of completion of basin plans: 1976

Statutory completion date of areawide plans: 1977

Advanced Treatment Facilities Planned or Under Construction as of July 1976

Project (note a)	Estimated Federal funding (note b)	Project status
Parkway	$ 10,361,000	(c)
Western Branch	35,132,000	(d)
Savage	22,346,000	(e)
Piscataway	43,083,000	(f)
Sod Run	375,000	(g)
Northeast	5,888,000	(g)
Central Patuxent	675,000	(g)
Dickerson	72,000,000	(h)
Total	$189,860,000	

[a]About $83.3 million of Federal funds for Maryland have been included in the total for the Blue Plains Treatment Plant on the District of Columbia fact sheet.

[b]Includes costs to upgrade and/or expand the secondary treatment process.

[c]The expansion of the primary and secondary stages are 99 percent complete. The advanced waste treatment stage is undergoing facilities planning.

[d]The expansion of the primary and secondary stages are 95 percent complete. The advanced waste treatment stage is out for construction bids.

[e]Construction drawings and specifications are complete--construction is being temporarily delayed pending further study on the location of the plant's outfall.

[f]Ten percent complete--construction of the denitrification stage has been deferred until a final decision about the need for nitrogen removal is made.

[g]Facilities planning completed--ready for preparation of construction drawings and specifications.

[h]The construction grant application for this project was returned to the State by EPA for reconsideration of alternatives to the plant.

OREGON FACT SHEET

Funds allocated under Public Law 92-500 for construction:

Fiscal year 1973	$ 16,988,000
Fiscal year 1974	25,432,000
Fiscal year 1975	34,136,700
Fiscal year 1976	77,582,900
Total	$154,139,600

Number of basins and designated areas: Basins: 20 Areas: 4

Number of completed and approved plans as of July 1, 1976: Basin: 0 Areawide: 0

Estimated date of completion of basin plans: 1976

Statutory completion date of areawide plans: 1977

Advanced Treatment Facilities Planned or Under Construction as of July 1976

Project	Estimated Federal funding (note a)	Project status
Arlington	$ 165,000	Completed
Hillsboro	964,000	Completed
North Tillamook Co.	2,226,000	90 percent complete
Rock Creek United Sewage Agency	17,250,000	20 percent complete
Washington Co. Durham	18,525,000	90 percent complete Completed
Total	$39,130,000	

[a]Includes costs to upgrade and/or expand the secondary treatment process.

VIRGINIA FACT SHEET

Funds allocated under Public Law 92-500 for construction:

Fiscal year 1973	$ 58,286,000
Fiscal year 1974	87,429,000
Fiscal year 1975	98,673,400
Fiscal year 1976	251,809,000
Total	$496,197,400

Number of basins and designated areas: Basins: 9 Areas: 5

Number of completed and approved plans as of July 1, 1976: Basin: 0 Areawide: 0

Estimated date of completion of basin plans: 1976

Statutory completion date of areawide plans:
1976 for 3 plans
1977 for 2 plans

Advanced Treatment Facilities Planned or Under Construction as of July 1976

Project (note a)	Estimated Federal funding (note b)	Project status (note c)
Alexandria	$ 73,961,000	(d)
Arlington	46,753,000	85 percent complete
Fairfax (lower Potomac)	47,457,000	70 percent complete
Prince William	23,250,000	(d)
Upper Occoquan	56,471,000	80 percent complete
Aquia	3,592,000	(d)
Roanoke	23,647,000	99 percent complete
Culpeper	5,000,000	(e)
Total	$280,131,000	

[a]An additional $5.3 million in Federal funds for Virginia have been included in the total for the Blue Plains Treatment Plant of the District of Columbia fact sheet.

[b]Includes cost to upgrade and/or expand the secondary treatment process.

[c]The status of the advanced waste treatment part of the plant.

[d]Construction drawings and specifications completed. Ready to begin construction or under construction.

[e]Facilities planning completed. Construction drawings and specifications being prepared.

WASHINGTON FACT SHEET

Funds allocated under Public Law 92-500 for construction:

Fiscal year 1973	$ 17,812,000
Fiscal year 1974	26,718,000
Fiscal year 1975	64,730,500
Fiscal year 1976	103,915,600
Total	$213,176,100

Number of basins and designated areas: Basins: 25 Areas: 3

Number of completed and approved plans as of July 1, 1976: Basin: 22 Areawide: 0

Estimated date of completion of basin plans: 1976

Statutory completion date of areawide plans: 1977

Advanced Treatment Facilities Planned or Under Construction as of July 1976

Project	Estimated Federal funding (note a)	Project status
City of Spokane	$33,530,000	77 percent complete
Stevens Pass S.D.	1,900,000	15 percent complete
Kittitas City S.D. #1	500,000	Planned
Total	$35,930,000	

[a]Includes costs to upgrade and/or expand the secondary treatment process.

APPENDIX II

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

29 SEP 1976

OFFICE OF
PLANNING AND MANAGEMENT

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

Dear Mr. Eschwege:

On July 21, we received copies of G.A.O.'s draft report to Congress entitled "Planning for Water Pollution Abatement: Not Effective in Controlling Costs and Achieving Water Quality Goals," for review and comment.

The main thrust of the text of the report is that costly treatment plants providing for treatment levels beyond the secondary level should generally not be approved until intensive water quality cause and effect studies have been completed. We agree. We also concur that in the case of some advanced wastewater treatment (AWT) projects there are examples where adequate monitoring data may not have been collected. Most construction grant funds, however, are being spent on secondary treatment facilities which are not subject to many of the criticisms raised in the report.

In this regard, EPA has proposed an amendment of P.L. 92-500 to Congress that would limit Federal funding to constructing waste treatment projects necessary to comply with secondary treatment standards unless it can be demonstrated to the Administrator that a higher level of treatment is the most cost-effective means of meeting water quality standards.

Planning for the secondary treatment facilities is covered by Section 201 (Step 1) grants. Within the last two years, significant improvement has been made in such planning, largely as a result of actions taken to

implement recommendations contained in EPA's own evaluation report, "Review of the Municipal Wastewater Treatment Works Program," released in November 1974. The improvements have been effective in both controlling costs and helping to achieve water quality goals.

We recognize that we have problems where some AWT facilities are required, particularly in predicting cause-effect relationships. EPA's internal, independent evaluation group, the Program Evaluation Division (PED), is currently addressing AWT problem areas through an evaluation of water quality standards, effluent limitations and other elements of planning that result in AWT requirements. PED is also evaluating other "front end" elements of the construction grants process, where most of the major decisions affecting the nature and cost of projects are made.

A primary problem in determining cause-effect relationships has been inadequate water quality data. EPA has recognized the problem and last year established the Standing Work Group on Water Monitoring to review monitoring activities and to develop program and policy revisions. The group, which includes state representation, is in the process of developing a basic monitoring program. Implementation of the program is expected to substantially strengthen the data base upon which AWT planning decisions are made.

We agree with the recommendations at the end of Chapter 2 (page 23), but suggest that the following two be added:

-- Enforce and/or expand permit requirements to force municipalities to characterize wet weather discharges.

-- Publish guidelines which would specifically state procedures to be followed in assessing water quality impacts of point and nonpoint sources and in determining levels of control necessary to achieve water quality goals in water quality limited waters.

APPENDIX II

[See GAO note]

A number of proposed technical changes have been submitted informally to your personnel with advance copies of our comments.

We appreciate the opportunity to review and comment on this report prior to its submission to Congess.

Sincerely,

Alvin L. Alm
Assistant Administrator
for Planning and Management

GAO note: Material has been deleted because of changes in final report or because of reference to material not included in our report.

APPENDIX III

OFFICE OF THE SECRETARY
DEPARTMENT OF HEALTH AND MENTAL HYGIENE
201 WEST PRESTON STREET · BALTIMORE, MARYLAND 21201 · Area Code 301 · 383-2740

Neil Solomon, M.D., Ph.D., Secretary

August 26, 1976

Refer to:
EH:SE:WS

Mr. Henry Eschwege
Director
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Eschwege:

The staff of the Environmental Health Administration of our Department has reviewed the Draft Report to Congress for "Planning for Water Pollution Abatement: Not Effective in Controlling Costs and Achieving Water Quality Goals." We would like to comment as follows:

There is a connotation in Chapter 2 indicating a lack of comprehensive planning on behalf of the States studied. We would like to point out that since 1967 the State of Maryland has had an ongoing program of comprehensive water and sewer planning carried out by the counties under the auspicies of this Department, and these plans have formed a major basis for the formulation of area-wide and river basins planning required under subsequent Federal law.

As the State of Maryland has a large shellfish harvesting industry, a great deal of emphasis has been placed by this Department on the assimilation and utilization of bacteriological sampling as a very important facet of water quality control. Towards this end this Department has worked diligently to reduce bacteriological contamination from point sources, with a great degree of success.

In addressing the advanced wastewater treatment requirements, particularly those of nutrient removal, we have, in cooperation with the Water Resources Administration of the Department of Natural Resources, attempted to provide facilities in those areas where their studies indicated need for such facilities. However, as noted in the preamble to the 1977 Grant Priority List, the list is set up to address health and inadequate water problems prior to advanced wastewater treatment for nutrient removal.

APPENDIX III

Finally, Appendix I, Page 3, Maryland State Fact Sheet, under the estimated Federal funding in Column 2, this is subject to change as the Savage Plant has been delayed due to a relocation study for the outfall, the Northeast Plant is undergoing some strong questioning at Environmental Protection Agency at this time, the Central Patuxent Plant has a draft facility plan being prepared and Piscataway and Dickerson Plants have, as has been widely reported, been subjected to considerable change based on some imminent Environmental Protection Agency decisions.

We thank you for the opportunity to comment on this report.

Sincerely yours,

Neil Solomon

Neil Solomon, M.D., Ph.D.
Secretary of Health and
Mental Hygiene

NS:bn

cc: Dr. Benjamin D. White

ROBERT W. STRAUB

Department of Environmental Quality

1234 S.W. MORRISON STREET, PORTLAND, OREGON 97205 Telephone (503) 229- 5324

September 21, 1976

Director, Community &
Economic Development Division
U. S. GENERAL ACCOUNTING OFFICE
Room 6146
441 G Street N. W.
Washington, D. C. 20548

Attention: Mr. Oliver W. Krueger, Assistant Director

Gentlemen:

On September 13, 1976, I finally received the copy of the draft report referred to in your September 3, 1976 letter.

The following comments are offered for your consideration:

1. The USGS Willamette study is mentioned in several places. The USGS study is the best technical study of its type we are aware of anywhere. The study has added new insights into the Department of Environmental Quality's management program by confirming many previous DEQ assumptions (particularly with reference to ammonia load impact). We do not fully agree with USGS management recommendations however. The study did not consider the impact of future population and industrial growth in the basin or the potential for future reduced stream flows as a result of increased consumptive water use for irrigation of food crops.

   The DEQ had projected the need for municipal waste treatment to a 10/10 (mg/l BOD/mg/l suspended solids) level by 1980 in order to accommodate growth without increasing point source waste loads to the river. As a result of the USGS study results, the Department is proposing to delete the 1980 date and instead require upgrading when existing secondary facilities reach capacity and must be upgraded.

   In summary, DEQ has modified the timetable for upgrading Willamette Basin treatment levels as a result of the USGS study -- the ultimate objective has otherwise not been modified however.

U. S. General Accounting Office
Attention: Mr. Oliver W. Krueger
September 21, 1976
Page 2

2. The Tualatin Basin is mentioned on pages 33 and 34. DEQ has consistently supported the need for stream flow augmentation in the Tualatin Basin to meet beneficial uses. With the maximum future flow augmentation realistically practicable, the stream will still not accommodate the secondary treated effluent from a projected 250,000 to 350,000 people. In addition most of the stream flow at the lower end of the basin is legally diverted into Lake Oswego - a recreational lake which has an algae growth problem. The decision to require "advanced waste treatment" in the Tualatin Basin was based on the lack of stream flow, the reality and timing of flow augmentation and the need to reduce phosphorous input to Lake Oswego.

   Also, please note, that DEQ standards in the Tualatin tie treatment levels to stream flow - a dilution ratio standard. Thus the standards allow reduced treatment levels (from advanced to secondary) if dilution water can be provided. So far, it has not been economical for entities to provide significant flow augmentation.

3. Several plants are inaccurately listed as "advanced treatment" in your table on Page 62. Only the Durham and Hillsboro plants have nutrient removal capability and are considered "advanced". Salem is a secondary plant (pure oxygen activated sludge) which treats a large food processing waste load.

   Arlington has a secondary treatment plant with a sand filter for effluent suspended solids removal. (No chemical treatment facilites exist). Discharge is to a boat basin which has restricted mixing.

   North Tillamook County Sanitary Authority is also a secondary treatment plant with a sand filter. Discharge is to an estuary in a shellfish growing area. The filtration is necessary to remove suspended solids from the effluent to achieve adequate disinfection.

   DEQ does not consider secondary plants with sand filters or "effluent polishing ponds" to be "advanced treatment".

4. On Page 16, a statement implies that EPA adoption of monitoring regulations would aid state programs. We find it hard to believe that any state would want more EPA regulations of any kind. In Oregon, EPA regulations and program requirements have distorted our monitoring program to the point where we are unable to apply our limited resources to <u>real</u> data needs.

5. The general emphasis of the report seems to be that advanced waste treatment is not necessary to clean up the nation's waters. The total emphasis is on clean up. It is disturbing that no reference is made to accommodating future growth or preventing pollution. PL 92-500 contains significant requirements regarding anti-degradation. In our view, improved secondary treatment and advanced treatment will be necessary down the road to prevent degradation of water quality as population increases.

We hope these comments are of use to you.

Very truly yours,

LOREN KRAMER
Director

Harold L. Sawyer
Administrator
Water Quality Division

HLS:AK

COMMONWEALTH of VIRGINIA
STATE WATER CONTROL BOARD
2111 Hamilton Street

Eugene T. Jensen
Executive Secretary
Post Office Box 11143
Richmond, Virginia 23230
(804)786-1411

August 30, 1976

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

Dear Mr. Eschwege:

This responds to your July 21 letter concerning General Accounting Office's draft report to Congress entitled "Planning for Water Pollution Abatement: Not Effective in Controlling Costs and Achieving Water Quality Goals."

We have the following comments:

1) The relevant paragraph on page 20 is correct, but we do not believe your conclusions do justice to the need for ongoing fixed-station sampling for long-term trend analysis of water quality, as recommended by USGS in its Circular 719 published in 1975 and as we have practiced for many years. Constant shifting of the stations virtually vitiates the usefulness of the data for this purpose.

2) Pages 34 and 35 (Roanoke River Basin). One of the primary objectives in the Roanoke River below the Roanoke metropolitan area was to reduce biochemical oxygen demand (BOD) sufficiently (i.e., beyond secondary treatment) to maintain dissolved oxygen (DO) standards. Most of the BOD is in the form of carbonaceous organic matter. It is important to point out that, in addition to phosphorous and nitrogen, carbon is also a very necessary nutrient for algae growth. The new Roanoke plant will use a coagulation and filtration process to remove as much as possible of the residual BOD (carbon nutrient) remaining after secondary treatment, but it will concurrently remove respectable amounts of phosphate nutrient. Thus, the AWT process at Roanoke can be amply justified on the basis of maximum BOD removal alone, but the removal of phosphorous can be counted on also to reduce the propensity for algae growth.

It should be noted that the State Water Control Board ordered the Roanoke area communities to apply interim chemical treatment for improving BOD and suspended solids removals at the communities' expense until Federal grant participation programs would enable construction of a permanent treatment facility. The interim measures showed definite improvements in water quality, and long-term permanent construction, based on the interim results, is nearing completion at the Roanoke plant. These new facilities will eliminate all known discharges of raw or improperly-treated sewage in the area, as well as the reduction of nutrients.

We believe that it is apparent that the Roanoke decision was made on the basis of the best planning available prior to 1972. Subsequently, the Board has prepared a metropolitan-regional water quality management plan, which was factored into the planning for the Roanoke plant improvements. While construction of the improvements was proceeding, the Roanoke valley political subdivisions, being appreciative of improvements in the science of determining eutrophication, were one of the first applicants in the nation for an areawide wastewater management study under Section 208 of PL 92-500. This study is also one of the first in the nation to be completed and the findings reflect that point source removal of carbon and phosphorous was the most economical methodology to be incorporated. In conjunction with this study, the State, under Phase II of the 208 program is conducting a special study on Smith Mountain Lake to establish a management tool for future non-point source curtailment on Lake development (located just below the Roanoke metropolitan area).

It will be possible to monitor performance of the Roanoke STP and the quality of the Roanoke River and Smith Mountain Lake to determine if and what further nutrient-removal facilities need to be installed. Therefore, we do not believe that the treatment facilities now installed, or being installed, have been installed blindly. Any facilities now in place, or under construction, will be a usable part of future plant additions if future studies may indicate they are necessary.

3) Pages 36-45 (Washington Metropolitan area). The original BOD and nutrient limitations applicable in the Washington Metropolitan area were imposed by the Potomac Enforcement Conference in 1969, convened under a predecessor act to PL 92-500. As was the case in the Roanoke area, it was generally agreed that, to reduce the total BOD discharge from all point sources in the Washington Metropolitan Area sufficiently to maintain DO standards in the Potomac River, more than secondary treatment would be required. Based on studies made by one of EPA's predecessor agencies, nitrogen and phosphorous nutrient removal objectives were also imposed.

Your consultants' report regarding the Washington Metropolitan Area points out that a definite cause and effect relationship between nutrients and algae growths in the Potomac River has not been shown. It also states that construction of AWT facilities should "proceed slow and cautiously, taking a wait-and-see attitude..." until data show the need for such facilities. As is the case in the Roanoke area, AWT facilities now installed or under construction in the Washington Metropolitan area will reduce carbon (as BOD), which is completely justifiable based on the need for maximum possible BOD removal to improve dissolved oxygen of the Potomac River. Any concurrent phosphorous reduction is a bonus.

Having recognized some of the foregoing shortcomings, and the fact that great amounts of nutrients are contributed to the Potomac estuary from upstream point and non-point sources, coupled with the tremendous cost of installing nitrogen removal facilities, EPA and the owners involved have taken a second look and adopted your consultants' "wait-and-see" attitude with respect to further expenditures for nitrogen removal. While some of the waste treatment construction now underway may not be completely justified from a nitrogen and phosphorous removal standpoint, those portions of the construction aimed at maximum BOD reduction are completely justified.

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4) Page 46, while correct, takes no notice of substantial State/EPA efforts to solve the problem by providing operator training opportunities and, in Virginia, by requiring certification of those operators. Also, we believe that your figure of 154 for the new operating staff at Arlington plant includes maintenance men, painters, electricians, lab technicians, laborers, etc., who may possibly work at other county facilities as well. The incremental need for new operators at Arlington will be about 35, considerably less than implied.

5) Pages 63 and 64 are correct, the latter as of March 1975. In an enclosure we have updated page 64 to reflect July 1976 status, and you may wish to use this enclosure if similar updates are available throughout Appendix I.

The foregoing comments are specific to the Virginia references in your report. We offer also the following very general remarks relative to efficiency and cost effectiveness of the Federal-States water pollution control program.

1. Sanitary engineers have not generally been too innovative.

2. Regulatory agencies, particularly state health departments (who often strongly advise on, even if they do not directly regulate, sewage disposal), tend to be conservative in outlook. This posture is understandable in view of their concern for public health, but it has tended to discourage trial of novel and less-expensive disposal methods.

3. Low-cost alternatives have not been particularly popular and there has been no real incentive to make them so at the technical decision-making level. Consulting engineers' fees are often based on the dollar value of the construction contract or estimate; in practice some of them may do facility planning at or below their cost in hopes of winning the construction supervision contract. This is not to imply conflict-of-interest or bad faith but suggests that the impetus may not exist to encourage minimum-cost solutions. The consultants' local-government clients, especially the smaller ones, often lack engineering expertise to challenge the plans and to seek lower-cost alternatives or indeed to effectively negotiate with the consultants. After all, somebody else is providing 75 percent of the money.

4. There has undoubtedly been pressure on the States, in the past, to get grant funds committed, under the philosophy "use it or lose it." The States, and no doubt EPA as well, had insufficient manpower to always assure that the projects funded were fully cost-effective. We believe that the Congress and the people expected early progress on plant construction after passage of P.L. 92-500. Planning has admittedly been behind schedule and out of phase, but even EPA could not do everything at once, and we cannot fault them for putting construction first. Please realize that, although the current elaborate planning and cost-effectiveness methodologies did not exist in the old days, the then-extant planning procedures were applied. It would probably not have been possible to induce municipalities to spend any extra money in the absence of the arguments developed in the planning phase.

5. P.L. 92-500 does not admit conceptually of any difference in treatment criteria as between major metropolitan areas and small municipalities. The thrust of the NPDES program is to impose minimum effluent standards on all dischargers irrespective of the relative sizes of the discharge and the

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Mr. Henry Eschwege August 30, 1976

receiving stream. I am not arguing for a return to a minimum requirement of primary treatment, but if you wished to minimize treatment facility costs, certainly there are places in the nation where primary treatment plus adequate disinfection would suffice with no measurable impairment of stream quality.

6. P.L. 92-500 does not admit conceptually of natural watercourses being used as conveyors/treaters of wastewater. To use the jargon, wastewater treatment is not an acceptable, designated, or beneficial use of such watercourses. Indeed, the low flow augmentation suggested in your report was roundly condemned by Federal policymakers some years ago, as equivalent to the canard "The solution to pollution is dilution," and the Corps of Engineers, for example, is no longer permitted to factor low flow augmentation for purposes of pollution control into its cost-benefit calculations for proposed projects. If the Federal government now wishes to reverse its position, it is free to do so. In Virginia, we do in fact take credit for low flow augmentation from in-place dams in calculating stream assimilative capacities preparatory to determining maximum permissible discharges for treatment plants, but we do not propose low-flow augmentation projects in order to minimize treatment cost.

We believe that an analysis of the forces at work in the construction grants program, of which the foregoing is a beginning, should be included in your report. We have no magic answers on how to overcome these forces in the interest of optimal usage of the construction funds.

Sincerely yours,

A. H. Paessler
Deputy Executive Secretary

/ap
attachment

Advanced Treatment
Facilities Planned or Under
Construction as of July 1976

Project[1]	Estimated Federal Funding[2]	Project Status[3]
Alexandria	$ 73,961,220	b
Arlington	46,752,700	85 percent complete
Fairfax (lower Potomac)	47,457,000	70 percent complete
Prince William	23,250,000	b
Upper Occoquan	56,470,680	80 percent complete
Aquia	3,592,100	b
Roanoke	23,646,550	99 percent complete
Culpeper	5,000,000	a
Total:	280,130,250	

[1] An additional $5.3 million is Federal funds for Virginia have been included in the total for the Blue Plains Treatment Plant of the District of Columbia fact sheet.

[2] Includes cost to upgrade and/or expand the secondary treatment process.

[3] The status of the advanced waste treatment portion of the plant.

Legend:

a- Facilities planning completed. Construction drawings and specifications being prepared.

b- Construction drawings and specifications completed. Ready to begin construction or under construction.

APPENDIX VI

September 21, 1976

Mr. Henry Eschwege, Director
Community & Economic Development
Division
Room 6146
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Eschwege:

I would like to take this opportunity to thank you for providing the Washington State Department of Ecology the opportunity to review and comment on your draft report titled, "Planning for Water Pollution Abatement: Not Effective in Controlling Costs and Achieving Water Quality Goals". We apologize for the delay in responding and are hopeful that our comments can still be considered as you prepare the final report.

In general, we feel that your report does raise valid points regarding the problems associated with water pollution abatement planning in the United States. Specifically, we feel that such problems as the need for more comprehensive data and technical knowledge to determine treatment levels necessary to safeguard or improve water quality and the need for trained operators at existing and newly constructed treatment facilities are well taken and should be resolved for more effective water quality management. However, at the same time, we do question some of the other points that you raise and some of the conclusions that you have drawn. A brief discussion of these points follows.

We feel it should be mentioned on page 2, paragraph 4, that the initial emphasis in the 303(e) basin plans was on the management of point sources of pollution. This emphasis changed from point sources to nonpoint sources in the 208 areawide program. In addition, the information contained in the last paragraph of page 6 should be brought up to date, viz., that at the present time, all of Washington State's 23 303(e) plans have been submitted to EPA and approved.

We believe you have oversimplified the problem of why basin plans do not contain total maximum daily load and waste load allocation information. It is not merely a lack of data as you state, but more the difficulty of performing the task. If the parameter in question is bacteria or if the waste is from a nonpoint source, it would be difficult if not impossible to perform these calculations. When the "state of the art" advances sufficiently, these determinations will begin showing up more and more in the basin plans.

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We recommend that you discuss in your report the fact that research is needed and a technological transfer required before there will be a widespread use of maximum daily load and waste load allocation analytical methods.

As a minimum, we urge you to revise page 14, paragraph 3. After the first sentence, it should read, "A state official informed us, however, that none of the initial basin plans will include total maximum daily loads or any waste load allocations since the parameter in question is generally bacteria or the waste is from a nonpoint source. More research is needed before maximum daily loads and waste load allocations can be determined on these types of wastes."

A significant point which we believe is misleading is the implication that a monitoring program and water quality data are important prerequisites to construction grant awards. Also, that the state agencies have dropped the ball and now regulations are necessary to force the establishment of adequate monitoring programs. The truth is EPA management has never considered the receiving water quality a major consideration in prioritizing or assigning grants. If they had, the monitoring program would have grown substantially when PL 92-500 was first passed and new construction would have occurred primarily in areas where there was a proven need. As a result, data would now be available showing water quality improvements as a result of new facilities coming on line.

The solution then is not, as the report implies, a big monitoring program, (big does not always mean better) but rather that EPA management recognize that grants should be awarded primarily where water quality data clearly shows a need. The monitoring program will then grow according to need with little prodding through new regulations.

We hope that our brief comments will be helpful to you in your revision process and we are looking forward to hearing from you again. If you have any questions regarding this review letter, please feel free to contact Myron Saikewicz, Department of Ecology, Olympia, Washington 98504, telephone (206) 753-6863.

Sincerely,

Glen H. Fiedler, Supervisor
Water Quality Management Division

GHF:jv

PRINCIPAL ENVIRONMENTAL PROTECTION AGENCY OFFICIALS RESPONSIBLE FOR ACTIVITIES DISCUSSED IN THIS REPORT

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

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