CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

CAPITAL INVESTMENT FOR WATER POLLUTION CONTROL AT THE STATE AND LOCAL LEVEL

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by

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This report has been reviewed by the Office of Planning and Evaluation, Environmental Protection Agency, and approved for publication. Approval does not necessarily reflect the views and policies of the U.S. Environmental Protection Agency.

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I. SUMMARY

This study of the investment program in municipal sewage waste handling facilities is aimed at providing a better understanding of the priorities, problems and approaches to water pollution control at the state level. It also suggests the need for certain legislative and administrative refinements in the federal grant program.

The study is based on a survey of nine sample state government programs conducted by personal visits to the state water pollution control offices. The interviews were conducted primarily with the engineer in charge of the construction grants program. The nine state governments in the judgmentally selected sample are Massachusetts, New York, Ohio, Maryland, Alabama, Texas, New Mexico, California and Washington; they represent various degrees of population size, urbanization, industrialization and hydrological conditions, and account for approximately two-fifths of the national population and municipal sewage treatment investment needs.

Major Findings

Municipal governments have a considerable role in this program. They develop the plans for treatment projects for state and federal funding support, provide the basic technical and economic information used to evaluate the proposed projects, themselves depend largely on consulting engineering firms for developing planning

alternatives and the information base, and attempt to persuade their own voters to approve the sale of bonds to finance the municipal share of the project.

The primary role for the state government is to encourage, pressure, and if necessary propose legislation and initiate litigation to compel municipalities to actively deal with the water pollution problem in accordance with state and federal standards. There is the basic need to insure that communities are taking adequate and speedy measures to attain designated water quality standards. In addition, strong traditions of local home rule and autonomy pose serious problems for developing cooperative type treatment systems serving two or more communities. Among the sample state governments, there is a relatively wide variation in the response to the local home rule institution.

The policy emphasis in the survey states is placed on the need for adequate treatment of municipal wastes in the shortest possible time; it is implemented by programs to initiate the maximum number of new treatment projects each year. This approach sometimes conflicts with attempts to develop optimum type systems regarding treatment technology and regionalization. New studies of alternative systems that have been required to qualify municipal projects for federal aid have led to delays of six months to several years in developing new plans and obtaining local, state and federal approval to proceed with the projects on the revised basis.

The annually updated five year estimates of investment needs for municipal waste handling facilities at the state level are developed on a project by project basis; they are based on preliminary studies prepared by municipal governments, and on rule of thumb estimates by the state government for potential projects not covered in the locally prepared projections. The sum of the estimated dollar expenditures for these individual projects to a statewide total is considered by the sample states as a very broad order of magnitude of investment needs. The five year projection of investment needs developed from this project by project approach is not related to a statewide statistical depiction of the population and industries that would be served by these treatment systems.

There are no alternative cost estimates of five year needs prepared by the sample states using an overall statistical approach based on detailed state needs of existing and projected household and industrial sources of pollution. The only statewide estimates of this type have been developed by EPA from aggregate rather than from detailed state data; these have varied significantly from the state prepared project by project estimates. Thus, on a national basis, projections of investment requirements for the 1972-76 period in 1971 prices amount to $14 billion based on the EPA statistical model, as compared with $18 billion for the project by project estimates. The relative differences between these two estimates are still greater at the state level.

Conclusions

National policy for guiding and administering the water pollution control program is faced with a diversity of problems and remedies at the state and local level. Aspects of the national program that need refinement and apply generally to the sample states are as follows.

1. Development of general cost-benefit guidelines that can be applied expeditiously in the review of prospective municipal projects submitted for federal support. The sample states tend to view the present procedures in applying for federal grants as delaying and increasing the costs of the program, rather than as making a substantive contribution in combating pollution. The restudying of prospective municipal projects for possible alternative treatment systems sometimes causes delays of several years in their implementation. The guidelines would be aimed at reducing the number of these multiple studies by indicating the type of information that should accompany the initial grant request. The guidelines should clarify the concept of regionalization and include criteria for incorporating municipal projects in regional systems.

2. Development of specific measures in the grant legislation and administration to deal with the local autonomy problem. The difficulty of obtaining local participation in regional type systems significantly delays and shapes the pollution control program. Suggested means for dealing with the institution of local

home rule branch into the fields of political science and public administration, and probably would require additional studies in those areas. The techniques applied in some of the sample states should be considered in any such recommendations. These include programs for educating the public, enforcement, and for providing technical and financial assistance to municipalities.

3. Provision of adequate grant funds to the state governments for planning studies. These include regionalization and cost-benefit analyses for municipal projects; development of the relationship between the currently prepared five year investment projections, derived by summing the estimated project by project costs to a statewide total, to the anticipated statewide effects that the municipal projects would have on handling domestic and industrial sewage wastes; and for the preparation of overall statewide statistical projections of five year investment needs for municipal treatment works similar to the EPA model using detailed state data. These planning aspects typically are nonexistent or need considerable strengthening, and the surveyed states indicate that such preconstruction planning is relatively underfinanced as compared with direct outlays for capital structures and equipment.

II. OVERALL THRUST OF THE STUDY

Each year in its Annual Report on Clean Water to Congress, EPA presents updated projections for approximately five years into the future on a state-by-state basis of capital expenditures for municipal sewage treatment plants and sewering lines required for the achievement of state and federal water quality standards. These estimates of investment needs for public waste handling facilities to combat water pollution are used as a basis for budgeting economic resources to the program on a national basis, and for guiding the distribution of water pollution control federal grant funds to the separate states.

The most recent municipal investment needs projections as published in the 1972 EPA Annual Report covering the five year fiscal 1972-76 period amounted in 1971 prices to a national total of $18 billion. Under this program level, the current matching formula of 50 percent implies federal outlays of $9 billion; if the matching proportion is increased to levels that currently are included in the separate bills which have passed in both houses of Congress, the federal payment would come to approximately $12 billion.

What basic factors are shaping this program? How are the estimates of need developed? This study of the water pollution

control program in nine states is intended to provide EPA with a better understanding of state perception and implementation of the goals and priorities of the program, the information base that is used in developing the capital expenditure needs estimates, planning considerations given to providing for reserve capacity, institutional problems in attaining area wide and regional cooperation among municipalities, and constraints resulting from construction related bottlenecks. The nine sample states are Massachusetts, New York, Ohio, Maryland, Alabama, Texas, New Mexico, California and Washington.

In using the estimates of need as a basic framework, the study covers a broad spectrum of factors affecting the state capital investment programs. The purpose is to present the general direction and impetus of the state programs, and to characterize the state-by-state variations of problems and approaches in the control of water pollution. It is neither an analysis of the operational details nor an evaluation of the performance and achievements at the state level. Similarly, references to the views of the states with regard to EPA programs are included as one of the factors affecting state perceptions and actions; they are not an evaluation of the EPA program.

Research Procedures

The nine states in the sample were selected judgmentally by EPA as being representative of regional and geographic variations with regard to population size, urbanization, industrialization, political institutions, and hydrology. The sample states also account for a significant share of the national population and investment needs for municipal sewage waste facilities. Their combined population in 1970 of 78 million was 38 percent of the national total, and their aggregated estimates of need for waste handling facilities during the 1972-76 period in 1971 prices of $7 billion accounts for 39 percent of national needs.

The contractor conducted the survey by personal visits to the water pollution control offices in each of the sample states. A formal questionnaire (Appendix) was used in conducting the in-depth interviews; a letter of introduction from EPA to the state offices (Appendix) facilitated the arrangements for these visits. The visits typically took one full day. Background written information on the state programs based on guidelines, reports, speeches, legislation, public information material, etc., also was provided to the contractor. During the writing of this report, follow-up telephone calls to all of the sample states were made to clarify certain points. The survey visits and follow-up telephone calls were conducted from February to May of 1972.

The state government personnel had a copy of the questionnaire during the interviews. The primary person in these interviews was the staff engineer who directs the state capital facilities grant program for sewage waste facilities to the municipalities. In several states, certain parts of the survey were conducted along with other personnel who have a detailed knowledge in particular parts of the program; some report to the engineer in charge of the grants program and others were in different departments of the water pollution control agency.

Additional technical considerations on the survey methodology are discussed in Section IV.

III. DETAILED FINDINGS

This section presents the state responses to the survey on a question-by-question basis; the question numbers are cited in the side headings. Due to the close relationship of certain questions, selected ones are treated under the same topic. The statements throughout this section reflect the views as expressed by the states.

1. & 2. Priorities for the Municipal Water Pollution Control Program

The topic of priorities is aimed at characterizing the emphasis that the states give to various aspects of the water pollution control program. Question 1 is concerned with the ranking of priorities and Question 2 with the reasons for the ranking; they are combined in this discussion.

This topic is basically qualitative. Although the results are presented quantitatively in classified tables, they are based on judgments of persons with experience in carrying out broad policy directives. Lack of a common quantitative measure such as dollars precludes a strict interpretation of the interstate comparisons of the numerical ratings; therefore, the program priorities are discussed state by state.

The priorities reflect how the state policies have evolved in their practical implementation; how key personnel perceive the

problems; and the direction that the program has taken in dealing with the problems. The list of priorities is not typically spelled out in state legislation or administrative procedures.

Table 1 summarizes the state rankings of each of the major priorities. In order to simplify the presentation, it lists but does not rank the detailed components within each of the major categories. The detailed components are then shown in Table 2. The state-by-state narrative of the priorities follows the presentation of these tables.

Statistically in Table 1, there is a possible total of 45 rankings (9 states and 5 categories). There is an actual total of 40 rankings because 5 states did not indicate an "other write-in" category. Also, five states classified two or more categories as their first priority: Washington (4); California (3); Maryland, Alabama and New Mexico (2 each). Due to these factors, and to the absence of more than one category ranked as the second and lower priorities, there are less than nine entries ranked in each of the third, fourth and fifth priorities (column totals).

Primary emphasis is given to the first three categories of achieving water pollution standards, maximizing treatment, and encouraging institutional efficiency. Improving sewering coverage

is given a generally lower rating. The "other write-in" category when it is used is rated relatively high.

The selection of more than one category for first priority ranking by several states is justified variously as reflecting federal program requirements and the policy of giving attention to the special aspects of each project. In the latter case, one project might focus on achieving water pollution standards, another on maximizing treatment, and a third on institutional efficiency (cooperative treatment systems).

The joint selection of achieving water pollution standards and maximizing treatment appears to be indicative of the view that these categories are the basic input-output aspects of the program. In this context, achieving pollution standards represents the outputs or results and maximizing treatment refers to the inputs or effort of the program.

The general engineering rule for designing adequate capacity in treatment systems to accommodate future growth in sewage loads is 20 years for treatment plants, and 50 years (or the ultimate population density of the area based on land use and zoning regulations) for interceptor sewers. Treatment levels for new projects in the sample states are reported as a minimum secondary level of 85 percent BOD removal, with the exception of primary waivers for ocean disposals. Higher tertiary

treatment levels are required selectively depending on the toxicity of the pollutants, and the assimilative capacity and uses of the receiving stream.

A characteristic view of cooperative regional systems is that the initial investment costs are higher than the smaller decentralized systems because of the additional interceptor sewers required in the former; and that the economic analysis of these alternatives should include the total investment and operating costs over the lifetime of the project. Economies of scale both in the construction and operation of regional plants are typically contrasted with the increased sewering requirements. In detailed analyses of investment costs, this tends to revolve on the distance between communities in a proposed regional system and the associated sewering costs; thus, depending on the terrain and other geographical factors, the direct relationship between distance and sewering costs varies by project.

Additional sections on institutional efficiency include a discussion of the relationship between local autonomy and regionalization, and state notions of the effect that proposed increases in industry cost recovery payments would have on the development of joint municipal-industrial treatment.

Table 1. SUMMARY OF PRIORITY RANKINGS

	1st	2nd	3rd	4th	5th	Total
Achieve Water Pollution Standards	5	2	1	1	0	9
Abate existing pollution Avert future pollution	Ohio N. Y. Ala. Cal. Wash.	Mass. Md.	N. Mex.	Tex.		
Maximize Treatment	5	1	3	0	0	9
Highest possible treatment Some treatment of all municipal wastes Some treatment of all industrial wastes	Mass. Ala. Cal. Wash. N. Mex.	Ohio	N. Y. Tex. Md.			
Encourage Institutional Efficiency	4	2	2	1	0	9
Joint treatment of municipal & industrial wastes Unified sanitary districts Regional & river basin systems	Cal. Wash. N. Mex. Md.	N. Y. Tex.	Mass. Ala.	Ohio		
Improve Sewering Coverage	1	3	1	3	1	9
Install sanitary sewers Separate storm & sanitary sewers	Wash.	Ala. Cal. N. Mex.	Ohio	Mass. N. Y. Md.	Tex.	
Other (write-in) a/	2	1	1	0	0	4
	Tex. Md.	Wash.	Cal.			
TOTAL	17	9	8	5	1	40

Note: The detailed components under each major category in this table are shown only to describe the major category. The detailed components are tabulated in Table 2.

a/ Tex. - Educate public to pass bond issues and regionalize; Md. - Eliminate health hazards; Wash. - Shoreline management for aesthetics; Cal. - Increase interceptor sewer capacity.

Table 2 summarizes the reasons given for the selection of the broad priority categories. It shows which of the detailed components in Table 1 was the dominant factor in each of the major categories; the number appearing next to each state is the ranking of the major category given in Table 1.

The tabulations suggest a concentration of dominant components within each category, although all components received at least one priority rating. There are no apparent patterns of relationship among the sample states for (a) the priority given to the major category and the primary component within that category and (b) the primary component within each major category with those in other major categories. These might be deduced from a statistical analysis, but they probably would be highly tentative because of the smallness of the sample and the qualitative nature of the responses.

Table 2. DOMINANT COMPONENT OF BROAD PRIORITIES

Achieve Water Pollution Standards - - -	Abate Existing Pollution	Avert Future Pollution
	7	2
	Mass. - 2 N. Y. - 1 Ohio - 1 Md.- 2 Ala.- 1 Cal.- 1 Wash.- 1	Tex. - 4 N. Mex. - 3

Maximize Treatment - - -	Highest Possible Treatment	Some Treatment of all Municipal and Industrial Wastes	Operate to Highest Capability a/	Reuse for Irrigation a/
	4	3	1	1
	Ala.- 1 Tex.- 3 N. Mex.- 1 Wash. - 1	Mass.- 1 N. Y. - 3 Md.- 3	Ohio - 2	Cal.- 1

Encourage Institutional Efficiency - - -	Joint Treatment of Municipal & Industrial Wastes	Unified Sanitary Districts	Regional & River Basin Systems	All three Equally	Joint Mun. -Ind. & Unified Sanitary Equally
	1	1	5	1	1
	Ohio - 4	Mass.- 3	N. Y. - 2 Md.- 1 Tex.- 2 Cal.- 1 Wash.- 1	N. Mex.- 1	Ala. - 3

Improve Sewering Coverage - - -	Install Sanitary Sewers	Separate Storm and Sanitary Sewers	Install & Separate Equally	Neither Install nor Separate
	5	2	1	1
	Md.- 4 Ala.- 2 Tex.- 5 N. Mex.- 2 Cal.- 2	Mass.- 4 Ohio - 3	Wash.- 1	N. Y. - 4

NOTE: Number next to each state indicates the ranking of the major category given in Table 1.

a/ Written-in by states.

State-by-State Portrait of Priorities

The narrative covers the sample states in the general regional sequence as follows: Massachusetts, New York, Ohio, Maryland, Alabama, Texas, New Mexico, California and Washington.

Massachusetts - Due to a backlog of sewered but untreated waste, Massachusetts views the treatment of raw waste as a primary function, and the upgrading of existing treatment as next in importance. It does not promote sewering of the unsewered population because of the treatment needs of the existing sewered population, except in rapidly growing areas where the continued installation of septic tanks might have harmful effects on groundwaters; in the latter case, the state is working with engineering consultants who are studying the problem.

There is considered to be an adequate supply of relatively good quality water in the state as witnessed by the many inland waters that are used for recreation and to a lesser extent for drinking, as well as the coastline which is used for swimming and fishing. It has been a long standing state policy to use the upland watershed for water supply, and the downland shed for waste disposal.

Because of this view of no water supply problem, the state

considers that the federal thrust for making every stream usable for recreation and fishing as unrealistic from a cost-benefit point of view; this is based on the notion that the costs would not justify the benefits, although no such studies have been made.

Approximately two-thirds of the state population is served by sewage abatement districts that handle waste on a metropolitan area basis. This type of regional system has a long tradition in the state.

The remaining one-third of the state that is not covered by the abatement districts is in less densely populated areas. The question of regionalizing these areas is indicated as involving problems of higher capital costs and the strong local home rule tradition. There is a general feeling that as part of the process of obtaining federal grants, too many planning studies are being required for possible regional systems, when the additional costs to regionalize would not be worth the incremental improvement in water quality. This is aggravated by the tendency of many of these communities to want to remain independent, including some that are not on a friendly basis. The regionalization studies sometimes result in delays of the treatment project for several years, thus allowing the water quality to further deteriorate and raising

construction costs because of inflation. Cited examples of these delays include the Williamstown-North Adams and Hatsfield-Northhampton projects.

New York - The dominant priority is the achievement of water pollution standards. Emphasis is placed on abating existing pollution resulting from backlog needs, although the state maintains a long-term list of municipal projects with tentative annual starting dates to 1990.

The second priority of institutional efficiency focuses on extending the current area wide planning into a regional framework. Under the Comprehensive Sewerage Study Program, the state has financed since 1966 the development of county level master plans for sewerage systems; they include several proposed alternative approaches and one recommended system. The plans are prepared by consulting engineering firms under contract with the state; the program is funded and administered by the state, although the planning report is also reviewed and accepted at the local level. They are now scheduled to be updated at least once every five years.

The plans are the core of the area planning in the state. The interim regional plan is an amalgamation of the county plans; the final regional plan will be developed from more complete and

detailed information.

The third priority of maximizing treatment concentrates on providing secondary treatment for sewered waste which currently is receiving primary or no treatment. The state views the changing definitions of treatment as required for federal grants as a bottleneck in starting construction on these projects. The concern is that plans developed under standards existing at the time of their preparation are reviewed in the light of subsequently adopted higher standards, resulting in delays for plan revisions of six months to several years depending on the size of the project.

Examples of rising standards that have resulted in delays on specific projects are cited as occurring in the definition of secondary treatment from the previously used 75 percent BOD removal to 80-85 percent BOD removal in a Hudson River Enforcement Conference, and in the federal adoption in 1971 of a minimum requirement of 85 percent BOD removal; delays are also cited by new requirements for phosphorous removals on the Great Lakes.

The state view is that due to the long lead time involved in planning, municipal votes on bond issues, federal approval of grant funds, and starting construction, it is more important to get the projects underway than to go through the entire process again to obtain the incremental improvements. Thus, it would

prefer a grandfather clause for federal grants which would maintain the standards existing at the time the project plans were developed. The state also indicated that additional federal funds should be supplied to conduct studies that are required under the new standards, which is not the case at present.

The fourth item of improving sewering coverage is not given particular attention under the NEEDS program because it is not eligible for EPA grants. However, encouragement is given to communities that currently are not violating water quality standards, but which voluntarily want to replace septic tanks with sewers to accommodate future growth and/or because of concern with poor soil absorption and groundwater pollution.

In this connection, the purpose of the above-noted county master plans for sewage handling is to provide guidance to the counties for sewage development. The backbone of the sewering focus in these plans is the state law which requires sewering for developments of five or more houses, unless conditions are found suitable for subsurface disposal. The determination of this suitability is based on tests conducted by consulting engineers, Department of Agriculture Soil Conservation Service, and local knowledge of septic tank failures as indicated in the files of the county engineer. This is indicated as being a judgment of the

nature of the soil and the availability of nearby treatment facilities.

The plans assume given land use and zoning preferences, but recommendations are made for no further growth in areas with poor soil conditions until sewering is installed. In cases such as Long Island, this would be done because of the dependence on groundwaters for the water supply. It would also be done in areas with a high clay content in the soil and consequent inability to absorb septic tank seepage, in contrast to soils in other areas that have a high sand and gravel content.

In significant financial developments, a state environmental bond issue will be submitted for voter approval in November 1972. The bond total of $1. 2 billion is planned to deal with state needs for the coming five years; it is divided into $650 million for water pollution, $150 million for air pollution, and $400 million for preserving forest, recreational and other land resources. A state transportation bond issue was voted down in November 1971, but the hope is that the environmental issue will not be faced with the same controversy. One problem might be that the promotion of the 1965 water pollution bond issue for $1. 2 billion possibly oversold the prospective achievements of the program; that issue is all committed except for a small reserve for anticipated higher project costs. The state also is

attempting to receive $1.3 billion in federal reimbursable funds which it asserts represents the prefinancing by state and local governments of the federal share of treatment projects.

Ohio - The first priority is the achievement of water pollution standards for abating existing pollution. The state emphasizes correction of obvious violations of standards -- including special attention to their effect on health -- that people can see, taste or smell; these obvious violations are estimated to account for roughly 90 percent of all water pollution problems. Considerations of health are viewed as directly protecting persons from disease, in contrast to ecological concerns of protecting aquatic life, which are not necessarily related to health.

A new program for anticipating future sources of pollution in municipal treatment plants is just getting under way. It is based on using data processing records to get an indication of when these plants should be upgraded or expanded.

The second priority of maximizing treatment focuses on obtaining secondary treatment levels of 85 percent BOD removal everywhere, and tertiary levels where necessary. A major treatment problem is that existing plants are not operating to their highest capability. This is viewed to be largely due to a manpower

shortage of competent plant operators and salary levels that are too low to attract persons into the field.

The third priority of improving sewering coverage focuses on the problem of combined sanitary and storm sewers. The emphasis here is in dealing with storm overflows, such as by storage systems, rather than by the separation of the two types of sewers. The installation of sanitary sewers is considered as a voluntary local activity, and thus is relatively unimportant in the state program. Trunk sewering needs are recognized to exist for small communities with disposal problems that cannot afford a large system, but the installation of trunk sewers in these cases requires an expansion of projects eligible for EPA grants.

The fourth priority of institutional efficiency focuses primarily on the encouragement to joint municipal and industrial treatment, and secondarily on unified sanitary districts. There currently is no state law to establish regions, and this type of planning is not emphasized; the conservatory district for the Miami River planning region is an exception to this pattern.

The state views the home rule tradition as a major impediment to cooperative treatment. For example, counties as individual entities voluntarily establish sewer districts, and unincorporated communities do not have to join the district; certain of these

unincorporated districts have formed sewer districts of their own. It is this voluntary aspect of cooperative systems that is the major problem.

There is a possible mechanism in recent state legislation on the Ohio Water Development Authority that would permit the state to mandatorily establish sewage districts, but the power to do so is vague; consequently, specific legislation is required to strengthen the development of cooperative systems. Currently, Cincinnati has an effective metropolitan area treatment system, and Cleveland is expected to have one as a result of court directives.

The lack of authority carries over into the several metropolitan area plans that deal with water pollution control as developed under various federal programs (e.g., those by Housing and Urban Development, Corps Engineers, and EPA); thus, these programs are in state planning agencies that do not have implementation authority. The multiplicity of these plans also tends to fragment the planning process; HUD is attempting to correct this by designating which plan is the major one.

Cost-benefit studies are viewed as being necessary for implementation of regional treatment systems. The problem reflects the longer time frame and resultant excess capacity associated

with the larger-scale projects, as compared with smaller decentralized interim plants which would be built to accommodate treatment needs for ten years into the future. The focus in this thinking is that regionalization should be accomplished in steps rather than at one time.

Maryland - The first priority is given to two categories, elimination of health hazards (other write-in) and institutional efficiency. The emphasis on health reflects a concentration on the prevention of diseases to persons by avoiding any existing possibility of personal contact with sewage. This takes precedence over the improvement of the downstream quality of the receiving stream with regard to aquatic life, recreational and other uses. Examples cited as being indicative of the health orientation is the proposed project for a relief sewer at Cabin John to bypass currently overloaded treatment facilities, and the use of safety valves if pumping stations are not working properly to insure that the waste goes into the streams instead of backing up into homes and streets.

The high priority assigned to institutional efficiency emphasizes the regional planning effort. Cooperative planning presently is done at the county level. The submission of county sewage plans required by state legislation was first due in January 1970; they are reviewed annually, and if changes are proposed, the state is notified and a hearing procedure is set up. The sewer and water plans are based on assumed land use and zoning patterns as designated by the

localities; they do not recommend land uses. The state indicated that there was some local resistance to the plans because of the assumption that the state was dictating land uses, but in fact that there was no such state involvement.

Plans in those counties with unincorporated municipalities are viewed as having a stronger regionalization framework than those for incorporated communities because of the greater local autonomy in the incorporated areas. The development of river basin plans is taking the county plans as its starting point.

The second priority of achieving water pollution standards concentrates on the abatement of existing pollution. The less important programs for the prevention of future pollution are reflected in the provision of interceptor sewers for partially developed areas and planned subdivision development.

The third priority of maximizing treatment focuses on providing a minimum level of secondary treatment. Within this framework, preference is given to eliminating all discharges of untreated wastes, in contrast to the achievement of tertiary treatment in certain places. This reflects the above emphasis on abating existing pollution.

The fourth priority of improving sewering coverage is primarily a policy for the installation of sanitary sewers. The county plans noted above encourage building in areas that require sewering; the plans are supposed to show which areas

can be served by septic tanks on interim and permanent bases; the permanent service is typically in rural areas. Generally, the view is that many areas have had severe problems with septic tanks and the accompanying possibility of polluting underground aquifers. The separation of combined sanitary and storm sewers is encouraged, but little is done because of the lack of state and federal money.

The view was also expressed that federal grants should be made available for repairs to existing treatment systems. Thus, under the current program, some problems that could be handled by less costly repairs might be being dealt with by more expensive new plants because of the availability of federal money for these projects and not for repairs. This reflects the tendency for municipalities to rely on grants for their treatment facilities.

Alabama - Achievement of water pollution standards and treatment maximization are both considered as first priority items. The emphasis on achieving pollution standards is primarily on abating existing pollution. In addition, although a community may not be violating pollution standards, remedial treatment can be required if the existing disposal is ruled to be a health hazard.

The treatment goal is to upgrade primary treatment facilities to secondary levels if they violate standards or when additions are contemplated to expand capacity. All new plants, including those for handling currently untreated sewered wastes, are designed for a minimum of secondary treatment.

The second priority of improving sewering coverage is solely concerned with replacing septic tanks with sanitary sewers. There are no combined sanitary and storm sewers in the state; this probably reflects the later development in Alabama of treatment systems than in some other states, and the recognition by that time that combined sewers could cause a problem.

The third priority of institutional efficiency focuses equally on joint municipal-industrial treatment and unified sanitary districts. There are general land use plans for planning districts representing combinations of counties; and municipal applications for sewage treatment grants must be in conformance with these plans. However, due to the home rule tradition, it is viewed as almost impossible to get communities to cooperate except with very strong state pressure and enforcement. This type of effort does not appear to be emphasized in the state program.

Regional systems are viewed as being even more difficult to develop in light of the home rule tradition; additional enforcement legislation is considered as a possible requirement for these systems. Regional systems also are considered to require more money because of higher investment costs for the larger systems. In addition, the state indicated that federal funds should be provided for the development of basin plans.

The general difficulty of obtaining area cooperation for sewage districts as compared with that for water districts is

attributed to the greater willingness on the part of the population to pay for water usage. This negative attitude toward paying for sewage handling is viewed as a major bottleneck in attaining cooperative treatment systems.

Financially, Alabama does not have a state grant program for sewage treatment works. It provides instead state loans, which the municipality must repay. The reason given for the absence of a state grant program is the shortage of state revenues.

Recent state legislation authorized the state to sell bonds for the loan assistance program. The purpose of this legislation is to qualify municipal sewage projects for the maximum 55 percent share of federal grant funds by insuring that project funds would be available for construction; otherwise, the federal grant covers 30 percent of the project cost. This financial mechanism is indicated as being similar to that used in other selected states, such as Mississippi, Louisiana, Tennessee and Florida; among the sample states, it is also used in Texas.

Texas - The first priority is assigned to educating the public in the "other write-in" category. This focuses on developing a positive local attitude for passing bond issues and participating in regional systems. The educational program is comprised of extensive traveling by state personnel, provision of speakers and

visual aids, news releases to the press, preparation of written materials, and appearances at public hearings. It is aimed at school children as well as adults.

The second priority of encouraging institutional efficiency concentrates on developing regional and river basin systems. The general emphasis is on persuading the local communities that regional systems over their lifetime are less costly than decentralized treatment works; that is, that the higher initial investment costs are more than offset by lower operating costs.

The location of regional and subregional treatment plants is sometimes included in the general land use plans developed under HUD programs. When the plans are vague on these facilities, the state specifies their location; public hearings are held if communities object to these designations, but the state makes the final decision.

The third priority of maximizing treatment is concerned with obtaining the highest possible treatment. In the case of municipalities, this is defined as a minimum of 90 percent BOD removal. Industrial treatment requirements are just getting under way in the state; the program provides for a stepwise schedule to permit industry to achieve the treatment standards over a period of time.

The fourth priority of achieving water pollution standards gives somewhat greater emphasis to averting future pollution than to abating existing pollution. This reflects the long standing state policy for several decades of installing secondary treatment facilities, thus permitting greater concentration now on anticipating future pollution problems by achieving still higher levels of treatment.

The fifth priority of improving sewering coverage focuses on the installation of sanitary sewers. There are very few combined sanitary and storm sewers in the state because of its relatively late development on the frontier and the resultant advantage that was taken of advanced engineering techniques, and because of drier areas which do not require considerable storm sewer capacities.

Texas does not have a state grant program for municipal sewage treatment works. It provides instead loans to municipalities by the state Water Quality Enhancement Board; the Board was established in 1971, and uses municipal bonds as collateral for the loans. The purpose of the loan mechanism is to satisfy federal requirements for state financial participation in order to receive the maximum federal grant of 55 percent. This method of compensating for a shortage of state revenues is similar to that noted above for Alabama.

New Mexico - The first priority rating is given equally to maximizing treatment and encouraging institutional efficiency. The

emphasis in maximizing treatment is on achieving minimum tertiary treatment well above 90 percent BOD removal for municipal plants, and minimum secondary treatment or control for industry wastes. All municipal plants currently have secondary treatment. These treatment standards reflect the extreme dryness of the state (e. g. the average annual rainfall in Albuquerque is 8 inches as compared with 43 inches in Boston), and the resultant high premium that is placed on all available water. Much of the treated water is indicated as being reused for irrigation; also, regulations are being written to restrict the location of septic tanks within minimum distances from trout streams and groundwaters.

The attention to institutional efficiency gives equal importance to joint municipal-industrial treatment, unified sanitary districts, and regional systems; the particular emphasis is stated to depend on the needs of each project. The major pollution problem is considered to be in Albuquerque (300,000 population) and its surrounding areas (500,000 population), which combined account for roughly 80 percent of the state population. The Albuquerque metropolitan area encompassing Bernalillo County is indicated as currently being planned for cooperative sewage treatment at the county level. In the surrounding areas, the focus is on replacing septic tanks with cooperative treatment systems.

The probability of treatment of industrial waste by municipal plants is stated as depending on the distance of the industry from the

municipal facility. The emphasis appears to be on joint treatment when the industry is located in the municipality, as contrasted with more private treatment for plants located beyond the municipal facility limits; this reflects the additional costs for sewering as the distance increases from the municipality. Planning wise, the sewer and water elements in the HUD financed land use plans are considered to be very poor.

The second priority of improving sewering coverage focuses on the installation of sanitary sewers. Because of the dependence on groundwaters for drinking in this dry state and the view that septic tanks are harmful to groundwaters, sewering is favored over septic tanks in existing and new developments. Sewering is also viewed as a leverage to attain high treatment levels and cooperative treatment systems.

The third priority of achieving water pollution standards concentrates on averting future pollution. This reflects the view that current standards are relatively close to achievement, but that a high level effort is required to insure that potable water continues to be available in this arid state.

California - First priority ranking is given to the three categories of achieving water pollution standards, maximizing treatment, and encouraging institutional efficiency. The emphasis in achieving water pollution standards is on abating existing pollution. State funding of projects is limited to anticipated capacity needs for 20 years into the future for both treatment plants and sewering;

this is consistent with the typical engineering rule for treatment plants; but it is less than the engineering convention of building sewer lines to accommodate future growth for 50 years or the ultimate population of the area based on land use and zoning codes. The reason cited for the 20 year limitation is the lack of state funds; if the project is slated for say, 50 years, the state calculates the 20 year capacity and funds only that amount.

The state will accommodate communities that wish to pursue a no growth policy if the community agrees to no further connections to the sewering system once the treatment plant is operating at 90 percent of capacity; no contracts have yet been signed on this basis, but some are anticipated. It is considered that developers may test this policy in court.

Treatment maximization generally focuses on encouraging the highest practicable technology. Within this context, construction funds are indicated as being available to build in options for using alternative technologies, including the consideration of possible future regulatory decisions. Considerable attention is also given to the possible reuse of sewage wastewaters for crop irrigation and recharging groundwater aquifers. In this connection, projects would be supported to the best available

technology if a viable reuse is demonstrated. These projects are indicated as being available for support even if rough estimates indicate a benefit-cost ratio of no greater than one-to-one in order to get future experience in water reuse treatment.

The institutional efficiency priority is dominated by regionalization systems. In applying for grant funds, it is stated that communities must consider the costs and benefits of joining in cooperative systems with other communities. These include waste management programs, which may involve removing solids from relatively clean water at one end of the line and then reusing that water for irrigation and groundwater aquifers, with the remaining sludge going further down the line for ultimate treatment; the technical term for this management technique is scalping. The state indicated that if the municipal plans do not address the possibility of regionalization, they are sent back for such study. In addition, if the only bottleneck to regionalization is the institutional one of local autonomy, the communities must proceed with the regional scheme if they want state aid; otherwise, they would have to finance the project with nonstate funds. So far, no community is reported to have been turned down on this basis.

The second priority of improving sewering coverage

concentrates on the installation of sanitary sewers. It is considered that the relatively few communities that should replace septic tanks with sewering are in a poor financial condition to do so.

The third priority in the "other write-in" category is for interceptors that only increase capacity, but which are not directly tied to new or additional treatment plant capacity. This is in contrast to interceptors that are part of a new or expanded treatment system; in that case, the interceptors are ranked as a first priority under maximizing treatment.

Washington - All four specified categories covering water pollution standards, treatment, institutional efficiency and sewering coverage are ranked as first priority items. The reason cited for this equal rating is that they are all consistent with EPA policy.

In achieving water pollution standards, the greatest weight is given to abating existing pollution. All treatment projects are designed to achieve and maintain the designated standards. The prevention of future pollution in part is shaped by the extent that local authorities install utilities in relatively undeveloped areas, thus encouraging future population growth away from areas that currently have heavy pollution problems.

The concentration in treatment maximization is on attaining the highest possible treatment. This is defined as the minimum requirement of secondary treatment, and higher levels where

needed. The selection of treatment levels above the minimum requirement generally reflects a combination of the highest known available technology tempered by its relative costs. The state considers that the primary waiver provision on ocean discharges is a useful technique for establishing priorities, as in the Puget Sound case. Its preference is for using available monies for interceptor sewers and maintaining fresh water quality rather than for developing secondary treatment for ocean discharges.

The main focus of institutional efficiency is on the development of regional systems. Regional plans were developed by the state in 1971, and new municipal treatment projects are required to be in conformance with them. Regionalization of treatment projects is required if one of the following conditions is significant: (a) economies of scale (b) improvement in the downstream water quality (c) multiplicity of discharges in overlapping jurisdictions into two or more streams (d) diversion of the discharge downstream if the upstream does not have adequate assimilative capacity.

The requirement of examining alternative regionalization possibilities in extensive studies of several communities in various combinations for projects that are submitted for federal grants is indicated as causing unnecessary work, delays of at least one year, and ultimately higher construction costs due to the ensuing inflation. The Alderwood-Lynwood-Olympus project is cited as an example of where, with minimum information, the potential for regionalization could have

been determined to be useful in 15 years in the future rather than now, but multiple studies still were required.

The state also indicated that hundreds of small and medium sized business firms have been forced to join municipal treatment systems in order to reduce the multiplicity of discharges, insure that the waste program gets full-time attention, and to have more control over the quality of downstream waters and those that are transferred to other basins. The view concerning companies that have closed down or are threatening to do so because of pollution abatement requirements is that many were using outmoded equipment that was installed several years ago, and that they had become inefficient and marginal operations before the more recent pollution control requirements. If the time schedule assigned to industries to upgrade their treatment program is shown to be unreasonable, the state will liberalize the schedule.

The improvement of sewering coverage currently focuses on the installation of sanitary sewers, and plans are being developed for a new capital program to separate combined sanitary-storm sewers. Orders are issued to install sewering in communities that are considered to have significant septic tank problems; these typically occur in areas that have population concentrations and in which septic tanks have adverse effects on groundwaters.

Funding for a program to separate combined sanitary-storm sewers is expected from a state bond issue which will be voted on in November 1972 and from new federal programs. The state does not have an existing capital program for this purpose, but it has ordered communities to develop plans for the separation of combined sewers in anticipation of this new funding.

The second priority in the "other write-in" category is concerned with shoreline aesthetics. Any private or public development within 200 feet from a waterway must have a public hearing. In the case of treatment systems which are considered to be unaesthetic, the state requires sunken development and landscaping. Public hearings take into consideration the possible detrimental effect of the proposed treatment systems with regard to silt from construction, fish, game, or any other interest.

Local Home Rule: Municipal Action and Regionalization

Each of the nine states characterized itself as having strong local home rule. In terms of the water pollution control program, this means that sewage treatment is basically a local government function. And a considerable amount of prodding, persuasion and enforcement is required by the state in getting many municipalities to deal with the pollution problem. Moreover, local bond issues

have to be sold to finance construction of the treatment works, and these issues typically are voted on by referendum of the local population.

The home rule tradition also tends to foster in sewage treatment the attitude of autonomy rather than cooperation among municipalities and sewage districts. The tendency is for each jurisdiction to want to limit its responsibility for water pollution problems to its geographic boundaries, and in the process to have complete control of the program.

There is a large voluntary aspect at the local level regarding the degree of area and regional cooperation. This is tempered somewhat to the extent that the state makes this a condition of receiving state aid; hypothetically, at least, if a municipality is violating water pollution standards, and it does not conform to state requirements for aid, it could be enjoined to finance the project entirely with its own funds. However, the state recognizes that this could result in considerable delays because of stalling tactics and court battles, and ultimately, a plea of financial inability on the part of the municipality.

In the case of cooperative areawide and regional systems, which in this study is referred to as institutional efficiency,

differences are apparent among the sample states in encouraging cooperation. States which seem to have the weightiest push for cooperation are California, Texas, New York, Maryland, Washington and New Mexico. There are, however, varying approaches among these states in fostering cooperation, as described above in the state-by-state portraits. To briefly recapitulate, California, which appears to have the strongest regionalization policy of the sample states, puts the burden of proof on the municipality; Texas utilizes Council of Government plans, designates regional and sub-regional plants, and has a highly developed educational program; New York and Maryland have county level sewage plans, and state organizations which provide investment, technical and operational services to cooperating municipalities (these state organizations are discussed in #4 below under incentives); Washington requires that municipal projects are in conformance with regional plans; and New Mexico links the replacement of septic tanks with sewering as increasing its leverage for encouraging cooperative treatment.

Massachusetts, Ohio and Alabama appear to have a lesser emphasis on cooperation, although in the case of Massachusetts, this is primarily in the nonmetropolitan less sparsely populated sections of the state. These latter states seem to have a stronger home rule tradition than the others in the sample, although the

respondents in all nine states referred to the prominence of this institution in their own states.

The states which give more emphasis to cooperative treatment systems seem to take a longer view of controlling the downstream quality of the water and in developing efficiencies in the operation of the water pollution control program. However, all of the sample states stress that the merits of regionalization should be considered on a case-by-case basis. Thus, higher initial investment costs appear to be associated with the larger scale regional projects than those for the smaller decentralized plants primarily because of the additional interceptor sewer requirements; there are also time delays of sometimes several years in the implementation of regional systems. The consensus is that the incremental improvements in water quality that would be obtained from these systems should be considered in light of their additional investment costs and time lags.

This problem is discussed further in #3 below on the allocation of state funds to municipalities.

Cost Recovery and Municipal Treatment of Industrial Wastes

The use by industry of municipal treatment systems is a type of institutional efficiency that bridges the private and public sectors. In some cases industry pretreats the waste so as not to overload the

municipal system, while pollutants in other industrial wastes do not require pretreatment. In general, the benefits of joint municipal-industry treatment systems are viewed as providing greater control over the downstream quality of the water by consolidating treatment operations and monitoring in fewer installations, and in affording opportunities for economies of scale.

Proposed federal legislation on the share that industry would pay to use municipal treatment plants includes an assessment for the amount of the use that is attributable to federal funds; this cost provision is not in the existing grant program.

The effect that this increased cost would have on the industry incentive to join a municipal system appears to be negative to those survey respondents who ventured any notions. But there is considerable uncertainty because of the lack of information on how industry would view its alternatives. The few states that gave any hunches based them on comments that they hear from industry.

The industry alternatives include such considerations as tax write-offs for pollution abatement equipment, long-run plans to remain in the particular location and long-run commitments to pay for the treatment facility required by the municipality, willingness to devote company time and resources to pollution abatement, proximity to a stream, and concern

for the firm's public image. Of those who ventured opinions, the tendency is to consider that large firms have more alternatives available to them than medium and smaller sized firms; and consequently that the larger firms would be more uncertain to join a municipal treatment system because of the proposed increase in the industry payment.

3. Allocation of State Aid to Municipalities

This topic concentrates on the factors that are considered in deciding whether to provide state funds for specific municipal projects. The emphasis in the exploration of state and allocations is on how the long-run policy goals in the previous questions on priorities are implemented in short-run spending decisions. It may be recalled that all states in the sample survey provide grants to municipalities with the exception of Alabama and Texas; the latter provide initial state assistance funds which the municipalities must pay back in the entirety.

Table 3 presents the ranking of the considerations involved in providing state aid. Most states checked from one to three factors as being significant in these decisions. Consequently, there are 28 out of a possible total of 45 rankings (9 states and 5 categories).

The first two categories of ready to proceed on actual projects

and need to upgrade and expand existing plants account for 16 of the 28 entries; these factors also dominate the first and second rankings. The remaining 12 responses are distributed roughly equally among the other three categories; in order of importance with regard to both number of responses and ranking, they are "other write-in", encourage sewering and some treatment of all wastes, and build now to minimize rising construction costs.

Table 3. ALLOCATION FACTORS FOR STATE AID TO MUNICIPAL PROJECTS

	1st	2nd	3rd	4th	5th	Total
Municipalities are Ready to Proceed on Actual Projects	5	0	3	1	0	9
	Mass. N. Y. Ohio Cal. N. Mex.		Md. Ala. Wash.	Tex.		
Need to Upgrade Treatment and/or Increase Capacity in Existing Plants	3	4	0	0	0	7
	Ala. Tex. Wash.	Ohio Cal. N. Mex. Md.				
Encourage Sewering & Some Treatment of All Wastes	0	1	1	2	0	4
		Tex.	N. Mex.	Cal. Md.		
Build Now to Minimize Rising Construction Costs	1	0	0	1	1	3
	Tex. b/			N. Mex.	Md.	
Other (write-in) a/	1	2	2	0	0	5
	Md.	Ala. Wash.	Tex. Cal.			
TOTAL	10	7	6	4	1	28

a/ Md. - Eliminate health hazards; Ala. - Per capita costs; Wash. - Financial Capability of municipalities; Tex. - Combat health and nuisance problems; Cal. - Encourage regional systems and water reuse projects.

b/ Ranked as a qualified first only if the project is urgently needed.

The basis for these yardsticks stems largely from the application of general criteria devised by the EPA predecessor agency in the Department of the Interior. Federal guidelines, including such factors as ready to proceed, pollution abatement need, and financial capability of the municipality in several of the states are assigned varying weights in formulas by the states. With the passage of time, these criterion and formulas have been modified in content and application. Thus, some states rely only on ready to proceed, while others revise factors in the formula and weighting schemes. For example, New York and Maryland have not used the formula approach in the past, but currently are developing numerical weights for future use.

The implementation of the criterion and formulas in allocating funds reflects to a considerable extent the following characteristics of state programs:

a. A major state program objective is to get the maximum number of municipal treatment projects underway around the state.

b. In the annual federal grant cycle, only projects that are fairly well advanced in the planning process realistically can be considered for funding in the coming year.

c. In considering individual projects for financial aid, objective numerical rules can be established for ready to go (e. g. first come, first serve) and financial need criteria (e. g. local per capita income), but technical considerations regarding the general category of pollution abatement needs are subject to more qualitative engineering judgments.

d. The state review policy of municipal applications for grants is not to reject projects as such for state aid. Rather, it is to require plan revisions and further study, if necessary, in order to qualify for state aid.

Due to the overlapping of this topic with the formula type approach, the above general patterns are considered to more closely depict the state allocation procedures than the specific responses to Table 3. Thus, the state variations in Table 3 appear more as refinements of these patterns as evidenced by the application of quantitative and qualitative aspects of the formulas, rather than as fundamental differences in the attributes of the

allocation process.

For example, Massachusetts, New York and Ohio indicate ready to proceed as the first and only criterion affecting their allocations; and Texas classifies only ready to proceed projects in an active list, but does not include this factor in its formula. By contrast, the Maryland, Alabama and Washington responses tended to deemphasize the ready to proceed factor. However, the 9 sample states uniformly concentrate in the short run on the program objective of having the maximum number of municipalities initiate and upgrade their sewage treatment.

The essential finding of this analysis is that in the short run, all states emphasize the objective of initiating the maximum number of municipal treatment projects that are consistent with the state perception of its longer run goals as expressed in the first section on priorities. The focus in one way or another on ready to proceed reflects the underlying drive to pursue the treatment program with minimum delays. This is in contrast to a program that would aim at the optimally efficient treatment system, but which would result in further delays in the direct alleviation of pollution by withholding funds from projects which are not in conformance with an optimal system.

The responses to this survey suggest that the two approaches

of immediacy and optimality characterize in a broad sense a major difference between the state (immediacy) and EPA (optimality) in the process of obtaining approval for federal aid for municipal projects. Thus, there appear to be differences of opinion regarding the incremental benefits that are derived from more optimal systems with regard to regionalization and treatment standards as compared with the accompanying delays and higher costs. This type of difference also appears in state-municipal relations, in this case with the state pressing for the more optimal approach.

There probably will always be significant economic, technological and intergovernmental judgments involved in dealing with the allocation of state aid. On the one hand, the state pushes the municipalities to undertake specific projects that are necessary to protect the quality of the water streams, and where feasible, to apply treatment standards above the minimum requirements and incorporate single projects with larger scale cooperative treatment systems. On the other hand, there is also the concern with making certain that the water does get treated, and given the institutional bottlenecks, to consider the alternatives of further delays associated with additional studies of possible combinations of more efficient treatment systems.

The survey responses in this area suggested the need for general guidelines from EPA that would permit more judgments

to be made of these considerations without the delays involved in restudying possible treatment schemes. These guidelines would also incorporate a consideration of the costs and benefits involved in the development of projects with higher treatment levels and larger scale regional systems, although it is recognized that the definition and measurement of benefits in particular raise difficult problems.

4. Incentives and Penalties to Foster Municipal Action

Incentives - The general incentive throughout the sample states is the federal-state grant program; as noted earlier, Alabama and Texas provide state loans rather than grants. In order to qualify for this assistance, municipal projects must conform to certain treatment standards, local financing provisions, regional planning considerations, etc. These requirements are approved by the state water pollution agency and the regional EPA offices.

New York, Ohio and Maryland have special state agencies that assist municipalities with technical services and financing problems. The New York Environmental Facilities Corporation and the Maryland Environmental Service provide under contract to municipalities technical services for planning, building, operating and maintaining treatment facilities that generally are not within municipal capabilities; lower interest rates also are

obtainable for these locally owned projects that are built and/or operated under state auspices. Perhaps the most significant aspect of these agencies is their potential for helping to overcome voluntarily the local autonomy home rule problem by suggesting (as a third party) the development of larger scale projects that would accommodate two or more communities.

The Ohio Water Development Authority provides initial loan funds to municipalities for the entire cost of the treatment project. This is comprised of a 30 percent state grant and a 70 percent state loan, part of which is paid back to the state by the federal grant. The major purpose is to avoid delays in the start of construction because of a hiatus in federal legislation and appropriations; the result is to insure that no project is held up because of this problem, and that all municipalities participate equally in federal funds that ultimately are made available.

The OWDA also has legal advantages in that its financing is not shown as part of the municipal debt, and consequently these projects are not subject to statutory local debt limits. Similarly, since the state financing is done with revenue rather than general obligation bonds, it is outside the state debt limits. Municipalities also benefit from lower interest rates than they would ordinarily obtain under their own auspices.

Penalties - The general pattern for state enforcement of municipal action on pollution projects includes the gamut of persuasion and appearances at local hearings, compliance orders, fines, court actions, and bans on new sewering connections. The states typically use court actions only as a last resort because of the time delays involved in litigation; in addition, there is uncertainty regarding the outcome of court cases. In the absence of state legislation, however, favorable court decisions to the state are also viewed as filling a gap and as setting a precedent for future projects. New York and Texas indicate that many cases are actually settled out of court due to the pressure of legal action on the community; Massachusetts, Ohio and New Mexico, on the other hand, report lengthier and less successful court actions.

Bans on new sewering connections to an overloaded treatment system in practice result in a halt to new building; this is particularly effective in communities that are anxious for future growth. They generally appear to cover federally insured and conventionally financed housing, but connection bans in Alabama and Texas are confined to FHA and VA housing.

Among the more unique enforcement programs, California stated that its enforcement actions can take place at a very early stage, citing threatened or potential pollution as the basis for fines,

cease and desist orders, and connection bans. California also pointed to the difficulty arising when desired state standards are higher than federal enforcement; thus, the state is attempting to initiate a policy of some type of secondary treatment (physical-chemical or biological-chemical in the 65-85 percent BOD removal range) for ocean discharges, but recent federal waivers allowing primary treatment for ocean disposals in the New York Bight and Puget Sound reduce support for such a policy. (Subsequent to the survey, California adopted the higher standards - The New York Times, July 10, 1972, p. 27.).

In the field of industry enforcement, Washington stated that it has required hundreds of small and medium sized business firms to join municipal treatment systems; this was discussed earlier in the section dealing with the state-by-state portrait of priorities. New York indicated that federal enforcement of immediate treatment requirements for industry lessens the possibility that the industry will join a municipal system, and pointed to the need for more coordination of federal and state enforcement actions.

5 and 7. Five-Year Projections of Investment Needs for Municipal Sewage Treatment Systems

The five-year state projections of investment needs for municipal treatment systems in the sample states are developed on a project by project basis. They are intended to cover only those projects which are eligible for EPA grants (e. g. treatment plants, pumping stations, interceptor and outfall sewers). Construction on the projects is assumed to start but not necessarily be completed during the five-year period. The cost estimates represent the total expenditures necessary to complete the projects.

Table 4 summarizes the source of the five-year estimates in the sample states. Estimates for five states are derived in part from the municipality, and in part reflect dollar totals prepared by the state. Those originating from the municipality appear to be based on some type of preliminary engineering study; they are supplemented selectively with state prepared rule of thumb estimates for projects that the state believes are necessary but which have not been designated by the municipality. California includes only those projects that have been developed at the municipal level. The New York and the bulk of the Maryland estimates are based on the county plans, and the Texas estimates are from the Council of Government plans noted earlier in the state portraits of priorities; Maryland indicated that more than 90 percent of the estimates result from the county plans supplemented by direct contacts with municipalities, and that the remainder

represent state prepared estimates. Maryland and Texas noted that noneligible EPA grant projects are sometimes in their estimates.

The expenditure estimates on the five year project lists for the sample states are not added up to statewide totals, except for New York and California; these summations presumably are done by the EPA regional offices. The states generally consider that the direct survey of the municipalities by EPA is useful for updating the project lists, although New York and Alabama suggested that some of the municipal responses are ballpark estimates.

Table 4. SOURCE OF FIVE YEAR PROJECTIONS OF INVESTMENT NEEDS

Combination of Municipality and State	Municipality	County And Regional Plans
Massachusetts	California	New York
Ohio		Maryland a/
Alabama		Texas
New Mexico		
Washington		
TOTAL 5	1	3

a/ County plans and direct municipal contacts over 90%; state estimates less than 10%.

The price levels of the investment needs estimates vary among the sample states. Generally, those for Massachusetts, Alabama and California are indicated as being in current prices representing the assumed years of construction, and those in the other six states are in constant prices representing various base years. The base years in the constant price estimates range from mixtures of the years in which the various project plans were developed, to a partial

updating to the most recent year for some of the projects, to a complete updating to the most recent year for all of the projects. Techniques also vary for projecting future price levels and for updating the base year constant prices to the most recent year. Table 5 summarizes the price aspects of the five year investment needs projections as indicated by the sample states.

Table 5. PRICE LEVELS OF THE FIVE YEAR 1972-76 INVESTMENT NEEDS PROJECTIONS

	Current Prices	Constant Prices			Estimating Techniques
		Mixture of base years representing the years project plans were developed	Update some projects from base year to recent year	Update all projects from base year to recent year	
	Massachusetts	--	--	--	Not certain
	Alabama	--	--	--	Annual inflation of 5%
	California	--	--	--	Extrapolate ENR index a/
	--	Ohio	--	--	Not applicable
	--	Maryland	--	--	"
	--	Texas	--	--	"
	--	--	New Mexico	--	Annual inflation of 12%
	--	--	--	New York	Extrapolate ENR index a/
	--	--	--	Washington	Annual inflation of 5.5%
TOTAL	3	3	1	2	

a/ ENR - Engineering News Record

The level of treatment for all projects in the 1972-76 investment needs projections in the sample states generally provides for a minimum requirement of 85 percent BOD removal, except for ocean disposals which are permitted primary treatment waivers. The minimum treatment levels for inland water disposals are raised selectively to 90 percent BOD removal and higher depending on the uses and assimilative capacity of the receiving stream. Texas and New Mexico have minimum requirements in excess of 90 percent BOD removal.

Minimum chlorine residuals of one part per million are required by the sample states. Washington requires bacteria standards for those plants without chlorine facilities; Washington also has a maximum residual after dilution of 0.2 per million to protect salmon and trout. Ohio uses a maximum guideline of 0.5 per million after 20 minutes of detention time, and is raising questions regarding the possible detrimental effects of chlorine compounds. California requires dechlorinating facilities selectively depending on the characteristics of the receiving stream; it indicated that a fish kill occurred in Sacramento because of overchlorination, and that chlorine limitations will have to be established. Maryland currently is examining the potential harmful effects of chlorine residuals on aquatic life and the accompanying need for dechlorinating facilities. The

other sample states do not view chlorine residuals as a possible problem; they generally consider that the receiving streams can accommodate the chlorine dosages, and that municipalities will not overchlorinate because of the expense of the chlorinating process.

Nutrient removal capabilities in the sample states are required selectively based on the characteristics of each project and its receiving stream. The states indicated that nutrient removal facilities require minimal capital investment costs, with the large expense being in their operation.

6. Stream Standards Pertaining To Drinking, Recreation, Aquatic Life and Other Uses

All of the sample states have adopted water quality standards for stream uses in their states. These standards are a combination of current uses and desired future uses. The inclusion of future uses in the standards typically represents an upgrading of the current stream quality levels. However, Alabama indicated that if the initially designated standards appear in retrospect to be too high, they would be subsequently downgraded; an example of this is in waters that originally were assigned recreational uses because of relatively low population densities, but which subsequently appear to be developing more rapidly than previously projected, and hence would be discharging heavier waste loads than are consistent with

a recreational area.

Historical measures of stream qualities in the sample states typically are not presented to permit a review of quality changes over time. The availability of historical data on water quality also varies among the states. For example, Washington has information dating back to the late 1950's, New York's records are considered to be strong beginning in 1965, and California is currently setting up a data processing system to collect this information. This appears to be an area that with further development could be a useful tool in cost-benefit analyses.

The emphasis among the sample states in achieving and maintaining water quality standards is in the treatment of household and industrial wastes newly entering the receiving stream. Existing programs to clean up the accumulation of past wastes appear to be minimal or nonexistent. However, Washington currently is planning a reclamation program as part of the previously noted bond issue which will be voted on in the latter part of 1972. This would consist of building sewers around lakes to allow the lakes to cleanse themselves by nature; it is considered to be particularly needed to deal with the nutrient problem in densely populated areas.

8. Supply Factors in the Construction Industry

This item deals with constraints in the construction industry that might affect the water pollution control program. The sample

states indicated that they do not give much attention to this aspect of pollution control.

Based on general experience rather than actual tabulations, four states estimate that the construction time for the average project exceeds the planned schedule, three states indicated that the construction time is within the planned period, and two states had no opinion. Massachusetts, Ohio and New Mexico gauge the excess time to average between three to six months, and New York pointed to delays of one year. They are attributed variously to lags in equipment deliveries (e. g. , there were references to longer waits for pumps due to manufacturing production for the Vietnam war), strikes, incompetent contractors, and unanticipated problems with regional systems.

Alabama, Texas and Washington consider that, on the average, the actual construction time meets the planned schedules. This reflects the general pattern of some projects taking one or two months more and others lasting one or two months less than planned. Maryland stated that it would require research into actual records to approximate the time factor; and California indicated that the state grant program was started less than two years ago and consequently there is insufficient experience currently available to estimate construction time comparisons.

The effect on construction time of the transfer of key personnel in the construction industry from job to job is indicated by the sample states as either not known or as not significant.

Information on the number of active construction and design firms is not readily available in the sample states. Some states estimated them while the contractor was in the office, but the information is too sketchy for state comparisons.

The number of construction bids received on municipal treatment systems for several of the sample states appears to range from five to fifteen; Maryland, Texas and New Mexico indicate that they are at the lower end, and Washington does not have an approximation. Generally, the number varies depending on the current amount of heavy construction work available and on the size of the project. For example, when highway construction work is slack, the number of bids for sewage waste facilities tends to be higher and the prices lower than during stronger periods of highway construction activity. Fewer firms also tend to bid on very large projects because of the greater resources required. If bid prices come in much higher than anticipated, some aspects of the project may be scaled down and in other cases new bid offers may be advertised.

9. Future Population Covered by Sewage Waste Systems

The sample states have not developed formal statewide population projections of the number of persons that would be covered separately by treated and untreated sewer systems and septic tanks. Some of the states made very rough ten and fifteen year projections while the contractor was in the office of the distribution of the population with regard to sewage waste handling facilities. These were largely based on assumptions regarding the future treatment systems of urban and rural populations. Projections have not been developed systematically that link the water pollution control program with the anticipated population that would be covered by various forms of waste disposal, as for example, the statewide results of the five year projections of investment needs.

10. & 11. State Review of Municipal Projects Submitted for Grant Assistance

The project plans for municipal sewage treatment systems in the sample states are in large part developed by engineering consulting firms hired by the municipality. The states tend to work closely with the engineering firms in the preparation of the plans.

The state review of the plans concentrates on the technical adequacy of the engineering design. This engineering review is aimed at determining whether the project design is consistent with the project objectives of treatment levels and future capacity. The state looks into the reasonableness of the economic determinants of the project such as the population and industrial development projections, and the need to upgrade and replace existing facilities at the project site. This type of review utilizes information available on statistical trends and any special knowledge of the local area; the latter focuses on judgmental projections of population migration, new industries and industrial plant closings in the local areas served by the proposed project.

However, the state government water pollution control offices have a very strong engineering orientation. The general attitude toward the economic magnitudes used by the consulting firms is to accept them unless they appear to be obviously unrealistic. Thus, the statistical data sources and techniques used by the engineering consulting firms in developing the projections are not a primary concern of the state review.

The financial review of the plans is concerned with the provisions by the municipality for raising sufficient funds to meet the principal and interest payments on its share of the capital investment costs, and to support the current operational and maintenance costs of the facility.

The review process tends to result in project revisions rather than cancellations. This appears to reflect a general policy which has the overall effect of delaying but not rejecting projects. Texas, California and Washington indicate very rough estimates of cancellations ranging from three to five percent of all proposed projects, and the other six sample states report cancellations of zero to one percent.

Some revisions appear on practically all projects. These are in the main carried out directly between the states and the consulting engineers. Six of the sample states indicate that the revisions result in higher expenditures, largely due to an increase in the scope of project; Massachusetts, Ohio and Alabama report that some revisions increase and others reduce the scope of the project, which in the aggregate tend to be offsetting with regard to expenditures.

The major reasons for the revisions are indicated as being an inconsistency of the plans with state water quality standards and priorities. Fewer problems are cited with respect to the population and industrial usage projections.

12. Components of Statewide Investment Projections

Municipal treatment projects typically are constructed for one or more of the following purposes:

a. Upgrade existing facilities-Sometimes linked with replacement

b. Replace existing facilities-Sometimes considered as repairs

c. New facilities for growth of the sewered component of the population

d. New facilities for expanded industrial usage

Engineering plans for plant and equipment in each project are developed in terms of BOD removal and other physical standards. Treatment plants and sewering facilities are designed as a whole for the entire project; there is no distinction of the amount of capacity designed to accommodate upgrading, population growth, etc. (although it is conceivable that such partitioning could be made). The physical plans are then converted to dollar estimates of investment expenditures.

Thus, statewide estimates of a breakdown of the projected five year investment expenditures into the component purposes of the facilities are not prepared by the sample states. However, the states might be able to derive very broad approximations of these items by reviewing the project lists which characterize the nature of each project. This would be most feasible for projects which are undertaken for one overriding purpose.

This type of disaggregation would be useful for a cross-check on an overall statewide basis of the (1) pollution abatement needs

which would be met by the projects included in the five year investment projections with (2) statewide needs as estimated from statistical indicators of capacity and treatment levels of existing plants, and projected growth in the sewered population and industrial users of municipal treatment plants.

The latter type of statewide investment needs projection based on statistical information currently is not developed by the sample states. EPA has prepared statewide projections of this type from relatively aggregate data. As presented in The Economics of Clean Water for 1972 (Vol. I, pp. 118-127, 130-138), the national estimate of needs for 1972-76 in 1971 prices as indicated by the EPA statistical model of state by state needs is approximately $14 billion, as compared with $18 billion based on the survey information of specific projects for municipal sewage treatment systems. The two estimates of needs show still greater variations at the state level. None of the sample states has further developed these statistical estimates by using more refined and detailed information for a more intensive analysis of state investment needs which would reflect substate data, new industrial connections, and upgrading requirements based on actual treatment levels at existing plants.

13. & 14. Capacity Utilization and Reserve Capacity Requirements

The capacity levels that are built into municipal sewage treatment systems in the sample states directly reflect the assumed future time horizon of the projects. As noted earlier, the general

engineering guidelines provide sufficient capacity to accommodate anticipated future growth of 20 years for treatment plants and of 50 years or the potential full population development of the area for sewering.

The time path of assumed rates of growth during intermediate three to five year periods of the long term projections is typically depicted as a relatively straight line which represents fairly uniform growth rates during the intervening periods. Thus, full utilization amounting to 90-95 percent of capacity generally is planned for the latter part of the long term period. The major exception is in areas with an expected long term population outlook characterized by slow growth, stability, or decline; in this case, full utilization is planned much earlier in the long term outlook.

There is a recent tendency among several of the sample states to plan for shorter time horizons for treatment plants as compared with the conventional 20 year engineering guideline. Thus, Texas plans for 5-10 years, Ohio for a minimum of 10 years, Washington and Maryland for 10-15 years, and California for 15 years. Alabama shifted from time period projections to a guideline minimum reserve capacity of 25 percent.

The primary reason given for these deviations from the 20 year standard is the difficulty and uncertainty associated with projections of population migration in local areas. Other considerations include a federal directive cited by Washington to allow for the possibility of converting to regional systems in 10 years rather than to build a decentralized plant with greater capacity that would not be fully utilized for 20

years; and Maryland pointed to the possibility of prospective improvements in treatment technology that would outmode currently built plants in 10-15 years.

IV. ADDITIONAL COMMENTS ON METHODOLOGY

This study is based almost entirely on the response to the questionnaire in personal interviews and follow up telephone calls. The reliability of the information in the report rests on the accuracy of the responses.

Two principles were followed for obtaining reliable and meaninful answers. First, at the beginning of the interviews, the contractor stated that the study is aimed at assisting EPA in refining the administrative and legislative aspects of the national program by taking into account variations in problems and approaches at the state level. This seemed to reduce the natural defensiveness and the tendency to view the study as an evaluation of the state programs that would be expected on the part of the respondents.

Second, the attempt was made to probe for substantive answers with explanations and examples, rather than to simply record perfunctory type answers. Extensive written notes were taken during the interviews; the report was based almost entirely on these notes, supplemented by the notes taken on the follow up telephone calls and to a lesser extent on the written materials furnished by the states. Thus, the focus was on understanding what was being said and on leaving as little as possible to memory.

The major respondent in each state had the same general responsibility of being the engineer in charge of the construction grant program. This tends to maintain a consistent vantage point for the views expressed.

All of the states were cooperative throughout the study in setting appointments for interviews, patiently answering questions for an average of one full day, calling in other staff members when necessary, providing written materials, and clarifying points on the follow up telephone calls. Also, the EPA letter of introduction provided an expeditious and positive entree to the state offices.

In general, it should be kept in mind that the purpose of the study is to capture the general shape and direction of the sample state programs. A mastery of the operational details of these programs would require far more study.

APPENDIX

EPA Letter of Introduction
Survey Questionnaire

FACSIMILE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Washington, D.C. 20460

March 23, 1972

Mr. Hugh C. Yantis, Jr.
Executive Director
Texas Water Quality Board
1108 Lavaca Street
Austin, Texas 78701

Dear Mr. Yantis:

The Environmental Protection Agency has an ongoing program to improve the effectiveness of the joint federal-state efforts to combat water pollution. One part of this program is the annual assessment of planned construction for municipal waste handling facilities.

As part of this assessment, the Office of Planning and Evaluation has contracted with an economic consultant to conduct a study of selected characteristics of the five-year state water pollution control program.

The consultant, Norman Frumkin located in Washington, D.C., will be calling you by telephone in a few days to arrange an appointment to visit your offices to discuss the plans of local communities in your state to construct waste handling facilities, and how these plans are implemented.

Your assistance to Mr. Frumkin will facilitate the completion of the study.

Thank you for your cooperation.

Sincerely yours,

/s/ Robert L. Sansom

Robert L. Sansom
Deputy Assistant Administrator
for Planning and Evaluation

NORMAN FRUMKIN
1346 CONNECTICUT AVENUE
WASHINGTON, D. C. 20036

SURVEY QUESTIONNAIRE

Five-Year Capital Expenditures for Plant and Equipment Investment in Municipal Sewage Handling Facilities

General Directions

1. Please use as many additional pages as necessary.

2. If there are any questions in completing the form, please call Norman Frumkin person-to-person collect at 202-659-4134.

3. Please return the completed form to:

   Norman Frumkin
   1346 Connecticut Avenue
   Washington, D.C. 20036

4. Your state is identified by number at the top of this page. There is no need to indicate your state elsewhere on this form.

Thank you for your assistance.

This study is being conducted under contract for the U.S. Environmental Protection Agency, Office of Planning and Evaluation.

1. What are the priorities for water pollution control capital construction programs in your state?

	See Note Below*	Check One Rank For Each Lettered Priority Group				
		1st	2nd	3rd	4th	5th
a. Achieve Water Pollution Standards		___	___	___	___	___
1. Abate existing pollution	___					
2. Avert future pollution	___					
b. Maximize Treatment		___	___	___	___	___
1. Highest possible treatment	___					
2. Some treatment of all municipal wastes	___					
3. Some treatment of all industrial wastes	___					
c. Encourage Institutional Efficiency		___	___	___	___	___
1. Joint treatment of municipal and industrial wastes	___					
2. Unified sanitary districts	___					
3. Regional and river basin systems	___					
d. Improve Sewering Coverage		___	___	___	___	___
1. Install sanitary sewers	___					
2. Separate storm and sanitary sewers	___					
e. Other (write in)		___	___	___	___	___

* Check most important numbered items within each lettered group.

2. In general, what are the reasons for the priorities in (1) above?

3. Which factors are emphasized in allocating state funds to municipalities for constructing water pollution control facilities?

	Check One Rank for Each Lettered Item				
	1st	2nd	3rd	4th	5th
a. Municipalities are ready to proceed on actual projects	___	___	___	___	___
b. Need to upgrade treatment and/or increase capacity in existing plants	___	___	___	___	___
c. Encourage sewering and some treatment of all wastes	___	___	___	___	___
d. Build now to minimize rising construction costs	___	___	___	___	___
e. Other (write in)	___	___	___	___	___

Comments:

4. What incentives and penalties does the state use to foster municipal action on water pollution control?

5. Your most recent statewide five-year projection submitted to the U.S. Environmental Protection Agency of capital expenditures for plant and equipment investment in municipal sewage treatment and sewering facilities during the 1972-76 period was $_____ million.

   Were certain operational standards assumed in this projection for controlling the amount of pollutant emissions from treatment plans and sewers into streams of water?

   a. Yes____ No____

   b. If yes, complete the following.

      Percent removal standard of 5-day biochemical oxygen demand:

      ____75% ____80% ____85% ____90% ____% other (write in)

      Other effluent standards (e.g. solids removal, nutrient removal, chlorine residual, stream flows, other):

6. Were stream effect standards measuring the effect that pollution has on the usability of certain bodies of water incorporated in the projection in (5) above?

   a. Yes____ No____

   b. If yes, complete the following.

      1. Stream effect standards pertaining to drinking, swimming, fish and bird life, other characteristics:

      2. Specific bodies of water assigned stream effect standards:

7. What price levels are assumed in the capital expenditure projection in (5) above?

   a. If the projection is based on no change in construction costs over the five-year period (constant prices), check the base year of the price level.

      Base year of price level: ____1970 ____1971 ____1972

   b. If the projection includes an inflation component in construction costs (current rather than constant prices), indicate the assumed annual rate of inflation.

      Annual rate of inflation: _____%

      Comments on factors accounting for the projected inflation, including contribution by prospective wage rate increases in the construction industry:

8. Supply factors in the construction industry engaged in building water pollution control facilities.

   a. From previous construction projects, indicate the average difference between the estimated and actual construction time to completion of the project.

      Actual time more than estimated: _____ months

      Actual time less than estimated: _____ months

      Comments on reasons for these differences:

   b. From previous construction projects, indicate the average time delay caused by the transfer of key personnel in the construction industry from job to job.

      Construction time delay: _____ months

	In-State	Out-of-State
Number of construction firms	_____	_____
Number of design firms	_____	_____

9. Indicate the current and projected proportions of the state population using sewers (treated separate from untreated wastes) as distinguished from septic tanks.

	Percentage of State Population		
	1970	1975	1980
Sewered	____%	____%	____%
Treated wastes	____	____	____
Untreated wastes	____	____	____
Septic tanks	____	____	____
TOTAL	100%	100%	100%

10. In the review by the state government of the five-year projection in (5) above of municipal construction projects prepared at the local level, indicate which of the following items are reviewed.

	Items Reviewed			
	Data Sources		Statistical Procedures	
	Yes	No	Yes	No
Upgrade Existing Facilities				
a. Additions for secondary treatment	____	____	____	____
b. Additions for post-secondary treatment	____	____	____	____
c. Process changes within the same treatment technology*	____	____	____	____
Replace Existing Facilities				
a. Outmoded and inefficient	____	____	____	____
b. Need extensive repairs	____	____	____	____
New Facilities for Domestic Population				
a. Increased sewering of existing population	____	____	____	____
b. Future population growth	____	____	____	____
New Facilities for Industrial Users				
a. Increased usage of firms currently connected to the system	____	____	____	____
b. Growth of new industrial connections	____	____	____	____
Reserve Capacity	____	____	____	____
Other (write in)	____	____	____	____

*These may be capital investments to improve operational efficiency.

11. Indicate the nature of the revisions of the locally prepared municipal projections based on the state review in (10) above.

    a. Percent of total number of projects cancelled: _____%

    b. Percent of total number of projects revised, excluding cancellations: _____%

    c. Change in statewide expenditure total resulting from state review

    Increase in expenditures: _____% Decrease in expenditures: _____%

    d. Causes of the revisions:

	Yes	No
Inconsistency with state priorities in (1) above	____	____
Inconsistency with state allocations in (3) above	____	____
Inconsistency with state standards in (5) and (6) above	____	____
Problems with data sources and procedures in (10) above	____	____
Availability of state funds	____	____

    If yes, fund increase ____, or fund decrease ____

    Comments:

12. Does the state government have statewide estimates of the municipal capital expenditure projection based on the items in (10) above?

    Availability of item estimates: _____None _____Some _____All

    If "Some", indicate which items are available:

13. Indicate the proportion of the treatment plant facilities projected in (5) above which are expected to be utilized in 1975, 1980 and 1985.

    Utilization rate: _____% 1975 _____% 1980 _____% 1985

14. Are there minimum reserve capacity requirements for municipal sewage treatment or collection facilities?

    Yes _____ No _____

    If yes, complete the following.

    a. Characteristics of reserve requirements (specific ratios, general guidelines, other):

    b. Assumptions in setting reserve requirements (margin for peak loads, anticipated growth over given time period, other):

15. General comments regarding problems other than those covered that would help in analysing estimates of need.

    Note: Continue on back of page, if necessary.

16. Please indicate the name, title, agency and telephone of the person to be contacted in the event that additional information may be required.

    Name _____

    Title _____

    Agency _____

    Telephone _____

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