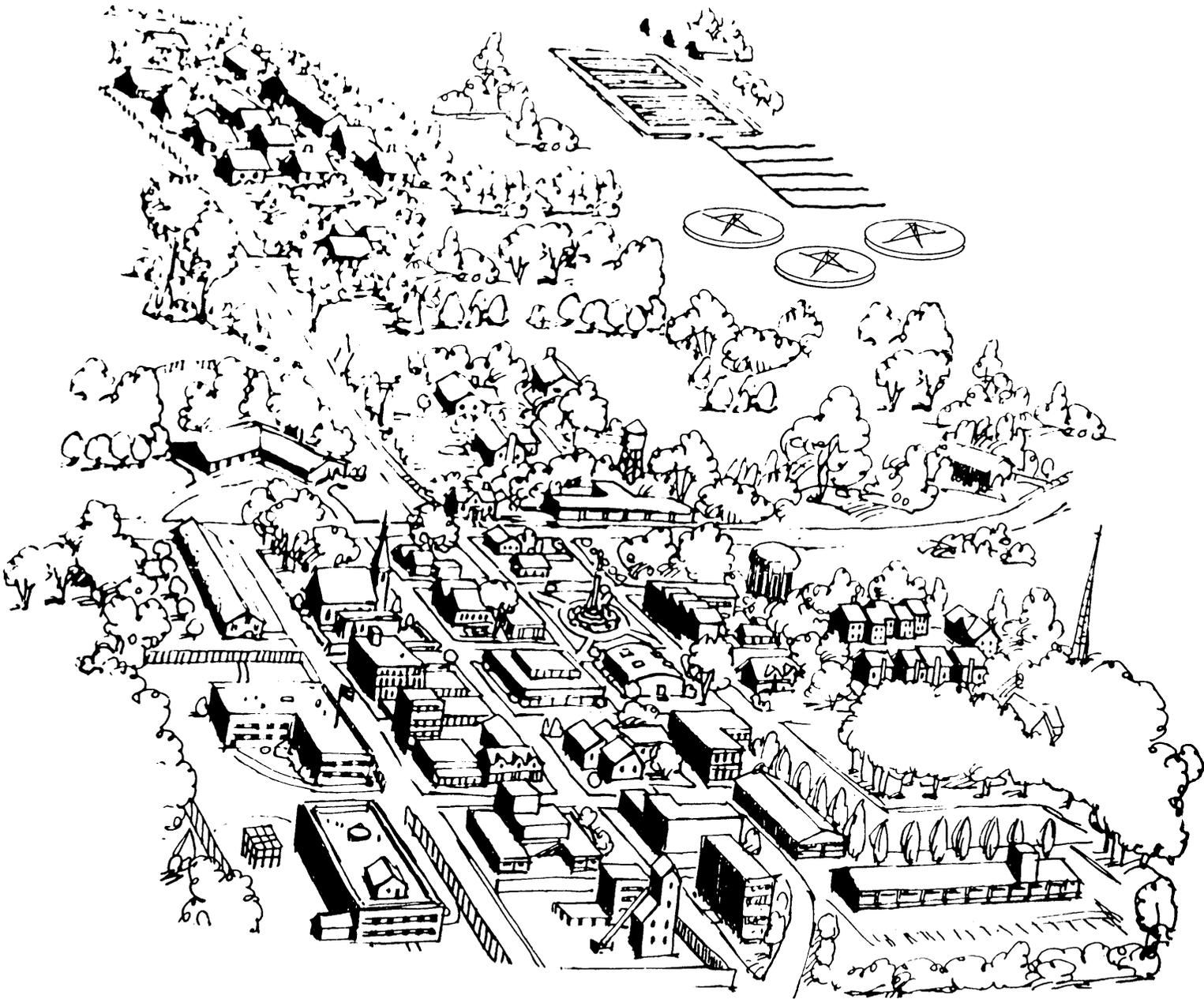




# The Municipal Sector Study

## Impacts of Environmental Regulations on Municipalities



# **MUNICIPAL SECTOR STUDY**

## **IMPACTS OF ENVIRONMENTAL REGULATIONS ON MUNICIPALITIES**

Prepared for

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## EXECUTIVE SUMMARY

### A. IMPACTS

Today, Federal and state agencies charged with establishing new standards of safety, health and environmental protection are redefining what constitutes adequate qualities of community services. New environmental regulations will require that stricter standards be met by suppliers of drinking water, sewage treatment, and other environmental services. Most environmental services are now operated and managed by local government authorities (e.g., cities, towns, counties). As a result, local governments will be responsible for meeting the stricter standards. The magnitude and timing of the additional investments in environmental protection have raised questions about the ability of municipalities to achieve these new levels of performance.

This study examined the impacts of 22 environmental regulations that municipalities will have to comply with in the near future. The study calculated the increases in user charges per household, and the ability of municipalities to raise needed capital by issuing revenue and general obligation bonds -- the two principal means of obtaining capital. The evaluation of the results must take into account two qualifications. First, some of the cost information is preliminary, because many regulations are under development. The regulatory options and the ways to alleviate the impacts of the regulations are under discussion within EPA. The discussions could lead to results different from those found in this study. Second, some of the regulations will go into effect in four or five years and the municipalities appear to have sufficient lead time to adjust their financial conditions and plan future debt issues. The severity of impact will depend on their willingness, foresight, and ability to make needed adjustments.

The results of the analysis, based on an examination of the financial conditions of 270 municipalities, suggest the following:

**1. USER CHARGE IMPACTS**

Small communities with populations of fewer than 2,500 will experience the largest user charge increases. About 20% of these communities will experience cost increases of more than 100% (Table 1). The user charges of 35% of the cities in this category will increase by 50 to 100 percent. Of the cities in the other four categories no city will experience rate increases of more than 100%, and up to 20% of the cities will experience user charge increases of between 50 and 100%. Thus, the small communities will experience the largest rate shock resulting from the regulations.

The environmental expenditures of small communities will increase from about 1.3% to more than 2.0% of the average gross household income (Figure 1). This translates into increased outlays of \$170 per household per year for communities with populations of fewer than 2,500 (Table 2). Residents in the largest city size category will have to increase their outlays by a little less than 0.5% of the household income, but the dollar increase will be about the same (\$160). The corresponding increases for other city size categories are much less - between \$70 and \$90.

Depending on the city size category, drinking water and wastewater regulations could contribute significantly to the cumulative household burden. Water and wastewater user charges in communities with populations of fewer than 2,500 will increase by about \$40 - \$45 respectively, or, in other words, these two groups of regulations will contribute about 50% of the increase in user charges for the smallest communities. Drinking water regulations will increase user

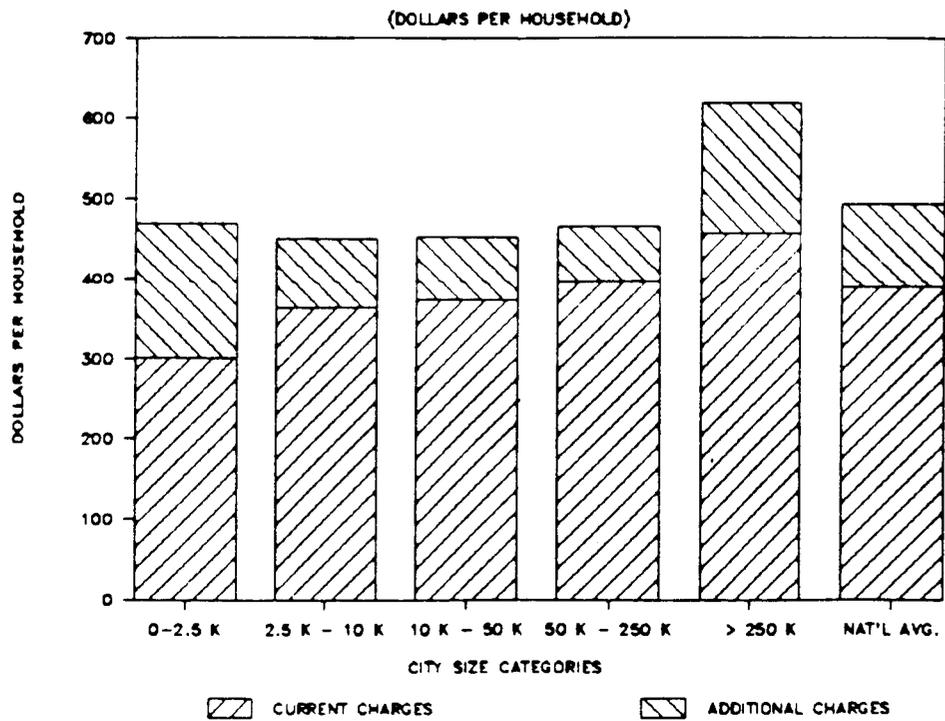
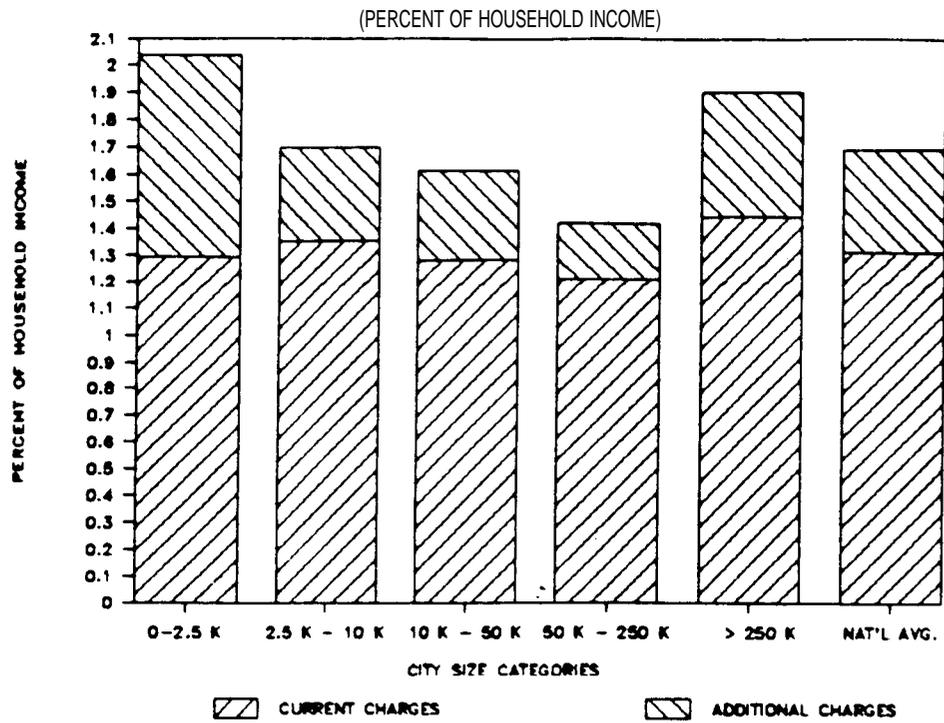
**TABLE 1**

**POTENTIAL CUMULATIVE IMPACT OF ENVIRONMENTAL REGULATIONS -**  
**PERCENT INCREASE IN HOUSEHOLD USER CHARGES**

Municipality Size Category	Number of Municipalities	Percent of Municipalities in the Category		
		Increase as percent of current charges		
		0 - 50%	50 - 100%	> 100%
0 - 2,500	26,315	45%*	35%	20%
2,500 - 10,000	6,279	90	10	0
10,000 - 50,000	2,694	80	20	0
50,000 - 250,000	463	100	0	0
Over 250,000	59	80	20	0
Percent of Municipalities		56	29	15
Percent of Population		83	15	2

\* This means that 45% of the municipalities in the 0 - 2,500 category will experience an increase in user charges in the range of 0 - 50% above the current charges.

FIGURE 1. CURRENT AND POTENTIAL ADDITIONAL AVERAGE ANNUAL HOUSEHOLD COSTS FOR ENVIRONMENTAL SERVICES



Source : PP&E's Municipal Database

TABLE 2

POTENTIAL INCREASE IN ANNUAL USER CHARGE DUE TO ENVIRONMENTAL REGULATIONS  
(Dollars Per Household)

Municipality Size Category	Number of Municipalities	Types of Regulations				
		Wastewater	Drinking Water	Solid Waste	Miscellaneous	Cumulative
0 - 2,500	26,315	\$ 45*	\$ 40	\$ 26	\$ 59	\$ 170
2,500 - 10,000	6,279	20	15	23	32	90
10,000 - 50,000	2,694	20	5	32	23	80
50,000 - 250,000	463	20	10	28	12	70
Over 250,000	59	60	15	51	34	160

\* User charge increases have been calculated using weighted average costs of new regulations.  
The costs that a municipality may incur will depend on the regulations it has to comply with.

charges of other communities by only \$5 to \$15 per household. The wastewater regulations, on the other hand, will increase the user charges by about \$60 in cities with populations larger than 250,000 and by about \$20 in cities in the 2,500 to 250,000-population categories.

## **2. ABILITY OF WATER AND SEWER SYSTEMS TO ISSUE REVENUE BONDS**

Water and sewer systems raise the capital needed to comply with environmental regulations by pledging future revenues as security for the loans. Some of the water and sewer systems may not be able to issue revenue bonds or obtain bank loans because the post-regulatory user charges will be very high when compared to the income of their customers. Three thresholds -- 1.0%, 1.25% and 2.0% -- of the gross household income have been used as criteria for determining the ability of each utility system to issue revenue bonds in the long run. Because households in approximately 95% of municipalities pay less than 1.25% of the gross household income, the impacts are discussed using the lower two thresholds.

On a nation-wide basis between 9% and 21% of the systems may find it difficult to issue revenue bonds in the long run. About 26% of the water and sewer systems in the fewer-than-2,500-person category, and between 4% and 11% of the systems in the other four categories may have difficulty issuing revenue bonds in the long term, if the threshold of 1.0% is used as the evaluation criterion (Table 3). On the other hand, if a threshold of 1.25% is used as the criterion, approximately 12% of the systems in the fewer-than-2,500-person category and up to 3% in the other categories may not be able to issue revenue bonds in the long run. Hence, water and sewage systems in communities with populations of fewer

**TABLE 3**

**POTENTIAL IMPACT OF EPA REGULATIONS ON THE ABILITY OF WATER AND SEWER SYSTEMS TO ISSUE REVENUE BONDS/ OBTAIN BANK LOANS IN THE LONG TERM\***

Municipality Size Category		Number of Municipalities	Percent of Systems Which May Fail to Issue Revenue Bonds In the Long Term *		
			User Charge >1.0%	Household Income >1.25%	>2.0%
0 - 2,500	26,315	26% (5 ***)	12% (2)	2% (0)	
2,500 - 10,000	6,279	8 (2)	2 (1)	0 (0)	
10,000 - 50,000	2,694	7 (3)	2 (1)	0 (0)	
50,000 - 250,000	463	4 (4)	0 (0)	0 (0)	
Over 250,000	59	11 (4)	3 (0)	0 (0)	
Percent of Systems			21 (4)	9 (2)	1 (0)
Percent of Population			9 (4)	3 (1)	1 (0)

\* A water system or a sewer system fails to issue revenue bonds in the long term when each individual system fails the user charge threshold of 1.0%, 1.25% or 2.0%.

\*\* Small communities generally do not issue revenue bonds; instead, they get bank loans that are backed by user charges. The criteria used in the above tests are applicable to small communities.

\*\*\* Percent of systems exceeding thresholds prior to complying with new regulations (Numbers within parentheses are baseline failures).

than 2,500 and greater than 250,000 will be most affected by the new regulations. Those systems that cannot issue revenue bonds may have to ask communities supporting them to raise capital by means of general obligation bonds.

### 3. ABILITY OF CITIES TO ISSUE GENERAL OBLIGATION BONDS

Cities also obtain long-term capital by pledging their full faith and taxing powers. The ability of a city to issue general obligation bonds (or obtain bank loans that have the backing of the taxing powers) is evaluated in this study by examining the ratios of debt service (after regulations take effect) to municipal revenues, and debt service to market value of taxable property. If both ratios exceed their respective thresholds, the city is considered unable to issue general obligation bonds.

Cities with populations of more than 50,000 do not fail the test (Table 4). This means that large cities will have no economic difficulty in issuing general obligation debt. Even if their water and sewer systems are unable to issue revenue bonds, these cities have sufficient income and a tax base that will enable them to obtain the required capital. The picture is less favorable for small cities. Between 20 and 30 percent of cities with populations under 2,500 fail this test and therefore may not be able to obtain money from the capital markets. The inability of water or sewer systems to issue revenue bonds in the long term does not affect the capacity of supporting communities to issue general obligation bonds or to obtain bank loans by pledging their full faith and credit. Difficulties arise mainly because of the inability of financially weak municipalities to finance the requirements of the solid waste and miscellaneous regulations.

**TABLE 4**

**POTENTIAL IMPACT OF EPA REGULATIONS ON THE ABILITY OF MUNICIPALITIES  
TO ISSUE GENERAL OBLIGATION BONDS/OBTAIN BANK LOANS\***

Municipality Size Category	Number of Municipalities	Percent Of Municipalities Which May Fail To Issue G.O. Bonds/Obtain Bank Loans In Each Category **	
		Test I ***	Test II
0 - 2,500	26,315	21% (8 ****)	30% (12)
2,500 - 10,000	6,279	4 (3)	9 (9)
10,000 - 50,000	2,694	2 (0)	6 (6)
50,000 - 250,000	463	0 (0)	0 (0)
Over 250,000	59	0 (0)	0 (0)
Percent of Municipalities		16 (7)	24 (11)
Percent of Population		3 (2)	6 (5)

\* Small communities generally do not issue general obligation bonds; instead they get bank loans that are backed by the full faith and taxing powers of the municipalities. The criteria used to determine G.O. bond failure are applicable to small and large communities.

\*\* A user charge/income threshold of 1.0% and results of the long term revenue bond test were used to conduct this analysis. Results obtained with 1.25% and 2.0% thresholds were virtually identical to those shown here.

\*\*\* Test I: (a)  $\frac{\text{Annual Debt Service}}{\text{Municipal Revenues}} \geq 0.2$  and (b)  $\frac{\text{Annual Debt Service}}{\text{Market Value of Taxable Property}} \geq 0.008$

Test II: (a)  $\frac{\text{Annual Debt Service}}{\text{Municipal Revenues}} \geq 0.15$  and (b)  $\frac{\text{Annual Debt Service}}{\text{Market Value of Taxable Property}} \geq 0.006$

\*\*\*\* Numbers within parentheses are baseline failures.

## **B. POLICY CONSIDERATIONS**

The EPA could undertake the following actions to support communities' efforts to comply with environmental regulations:

- Public education programs may be expanded to make people aware of the benefits of investing in environmental protection, and to increase their willingness to pay for the higher quality of environmental services.
- Community outreach programs could be expanded to help small cities understand the requirements of numerous new laws, and help develop plans for obtaining needed capital in order to reduce financial impacts.
- Technical assistance programs could be provided either in the form of guidance -- such as sharing scientific, technical, or management information -- or technical services -- such as supplying laboratory or engineering services.
- Direct financial assistance in the form of either grants or loans for communities that cannot afford the services in the long run may be provided by state governments.
- Additional research should be conducted to identify the characteristics of small communities that have difficulty in financing and affording new environmental controls.

- If certain environmental regulations do not seem reasonable from cost or environmental risk points-of-view, exemptions from strict compliance deadlines and technical requirements may be given, to the extent permitted by law.

## 1. INTRODUCTION

### A. PURPOSE OF THE STUDY

Today, Federal and state agencies charged with establishing new standards of safety, health, and environmental protection are redefining what constitutes adequate qualities of community services. New environmental regulations will require that additional measures to protect public health and the environment be taken by suppliers of drinking water, sewage treatment, and other environmental services. Most environmental services are now operated and managed by local government authorities (e. g., cities, towns, counties). As a result, local governments will be responsible for meeting the stricter standards. The magnitude and timing of the additional environmental investments have raised questions about the ability of municipalities to achieve these new levels of performance.

This Municipal Sector Study report has been prepared in response to the EPA Administrator's request for an assessment of the combined impacts of recent and forthcoming environmental regulations on municipalities. The Administrator's request arose from the concern that the EPA's regulatory review process focuses on only one regulation at a time. When examined individually, the impact of each individual regulation may be negligible, but the cumulative impact of multiple regulations may impose an excessive financial burden on municipalities. Indeed, during the last few years the number of environmental regulations that apply to municipalities has increased rapidly.

This study reviewed 39 major regulations that municipalities may have to comply with in the near future (Figure I-1). Estimates of capital, operating and administrative costs were available for only 22 of these regulations. The cost information for the remaining 16 regulations was not available either because it is too early to decide

FIGURE I-1. LIST OF REGULATIONS CONSIDERED IN THE MUNICIPAL SECTOR STUDY

<u>REGULATIONS WITH COST DATA</u>	<u>REGULATION STATUS</u>
<b>A. Drinking Water</b>	
1. Inorganic Compounds (IOCs)	In Development
2. Synthetic Organic Compounds (SOCs)	In Development
3. Volatile Organic Compounds (VOCS)	Promulgated
4. Fluorides	Promulgated
5. Lead and Copper Corrosion Control	Proposed
6. Lead and Copper MCL	Proposed
7. Coliform Monitoring	Proposed
8. Surface Water Treatment Rule: Filtered	Proposed
9. Surface Water Treatment Rule: Unfiltered	Proposed
10. Radionuclides	In Development
11. Disinfection	In Development
<b>B. Wastewater Treatment</b>	
1. Secondary Treatment of Municipal Wastewater	Promulgated
2. Pretreatment Requirements	Promulgated
3. Sewage Sludge Disposal -- Technical Regulations for Use and Disposal	In Development
<b>C. Solid Waste Disposal</b>	
1. Municipal Landfill Subtitle D Criteria	Proposed
2. Municipal Waste Combusters-Air Standards	In Development
3. Municipal Waste Combusters-Ash Standards	In Development
<b>D. Miscellaneous Regulations</b>	
1. Underground Storage Tanks - Technical Standards	In Development
2. Underground Storage Tanks - Financial Standards	Promulgated
3. Stormwater Management	In Development
4. Asbestos in Schools Rule	Promulgated
5. SARA Title III Requirements	Promulgated

FIGURE I-1. LIST OF REGULATIONS CONSIDERED IN THE MUNICIPAL SECTOR STUDY  
 (contd.)

REGULATIONS NOT INCLUDED IN THE COST ANALYSIS

**A. Drinking Water**

- |                              |                |
|------------------------------|----------------|
| 1. Well-head Protection Plan | In Development |
| 2. Pesticides in Groundwater | In Development |
| 3. Disinfection By-products  | In Development |

**B. Wastewater Treatment**

- |  |                |
|--|----------------|
| 1. National Estuary Program                        | In Development |
| 2. Wetlands Protection Program - 404(c) permits    | Promulgated    |
| 3. Nonpoint Source Regulations Guidance/Mgmt Plans | In Development |
| 4. Section 304(1) - Toxics in Water Bodies         | In Development |

**C. Solid Waste Disposal**

- |  |                |
|--|----------------|
| 1. National Contingency Plan - Superfund Program             | In Development |
| 2. Low-level Radiation Waste Standards                       | In Development |
| 3. Toxicity Characteristics of Solid and<br>Hazardous Wastes | In Development |

**D. Miscellaneous Regulations**

- |  |                 |
|--|-----------------|
| 1. Heavy Duty Diesel Vehicles  | Promulgated     |
| 2. Gasoline Marketing  | In Development  |
| 3. Diesel Fuel Standards   | In Development  |
| 4. Revisions to National Ambient Air Quality<br>Standards (Ozone, Carbon Monoxide,<br>Particulate Matter, Nitrogen Oxides,<br>Sulfur Oxides) | In Development  |
| 5. Asbestos in Public Buildings  | May be Required |

which regulatory options will be selected, or because the regulations affect municipalities indirectly and the extent of the impact is too uncertain to be included in the analysis at this time.

#### **B. LOCAL GOVERNMENT EXPENDITURES AND COSTS TO HOUSEHOLDS**

Local governments\* currently allocate a sizeable portion of their budgets to environmental services. As shown in Figure I-2, smaller cities tend to direct a greater portion of their budgets to environmental services than do larger cities. These services, for the purpose of this figure, include drinking water, wastewater treatment, and solid waste disposal. The costs of meeting some of the other environmental requirements may fall under transportation, education, fire protection, and administration. The proportions given in the figure may therefore be underestimated.

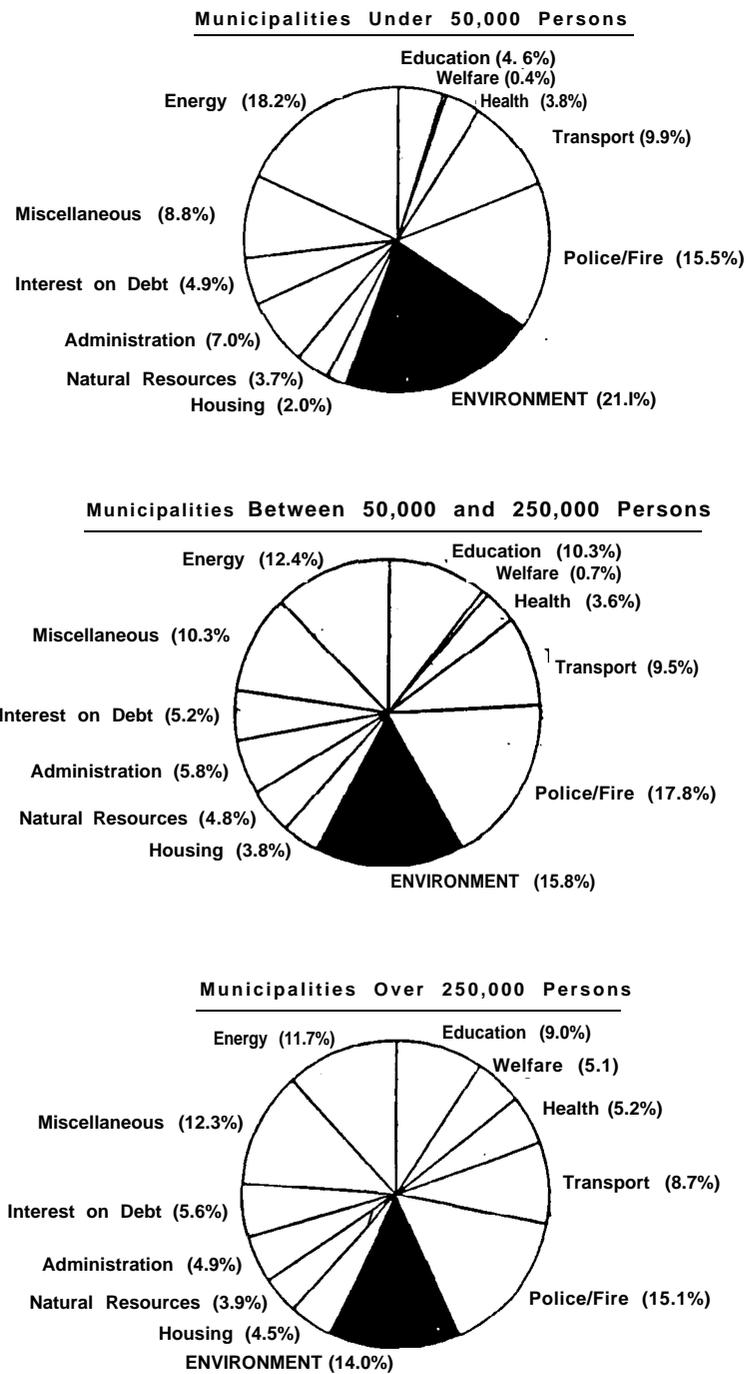
Consumers in the smallest and largest communities tend to pay higher costs for environmental services than do consumers in mid-sized cities. Figure I-3 shows how the average cost per household and the percentage of gross household income spent on environmental services varies across a sample of municipalities. Drinking water and wastewater treatment costs, measured as a percentage of household income, tend to be higher in small communities. Even though residents of small communities tend to pay lower actual costs, their relatively low incomes require that they allocate a larger portion of their income to environmental expenditures than do residents of larger communities. The solid waste costs tend to be lower for smaller communities, probably because of the reduced level of service needed in these communities.

The average expenditures fail to reveal the variability of the costs on a per-household basis. Figure I-4 shows how costs for drinking water services vary for sampled municipalities. While 40% of the communities under 2,500 persons currently pay between 0.25% and 0.50% of their gross

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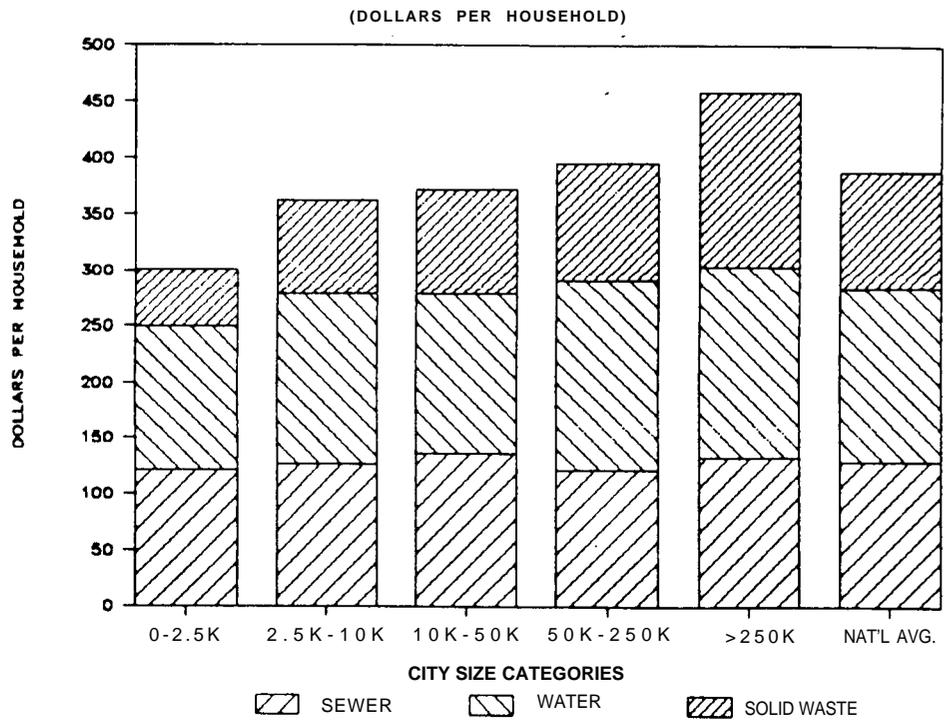
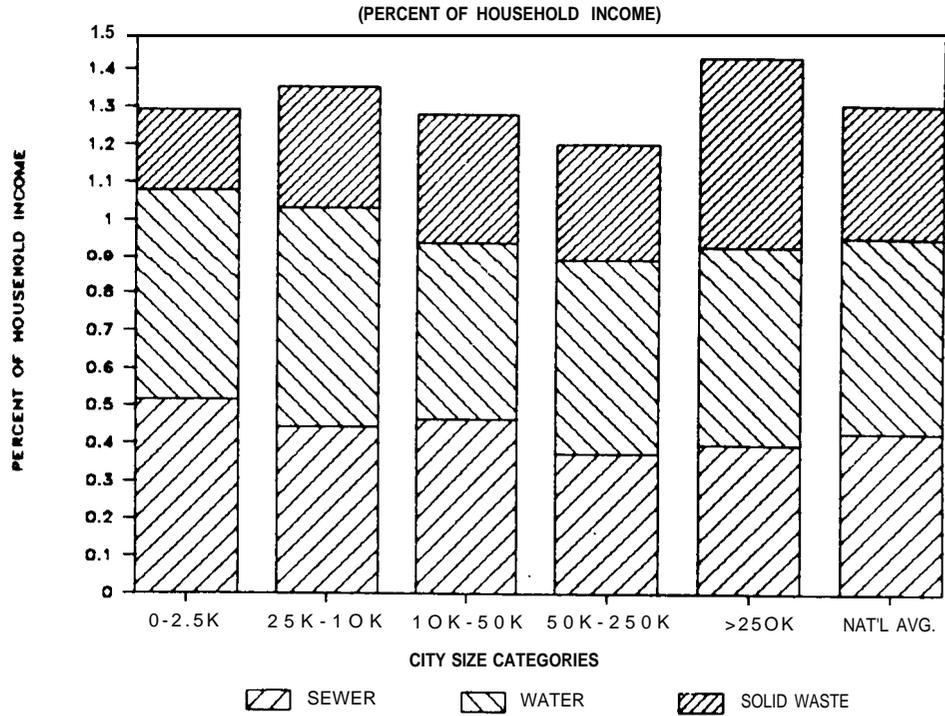
\*For the purposes of this report municipalities mean cities, towns, townships, counties and other forms of local government units.

FIGURE I-2. DISTRIBUTION OF MUNICIPAL EXPENDITURES FOR SERVICES IN 1985-86



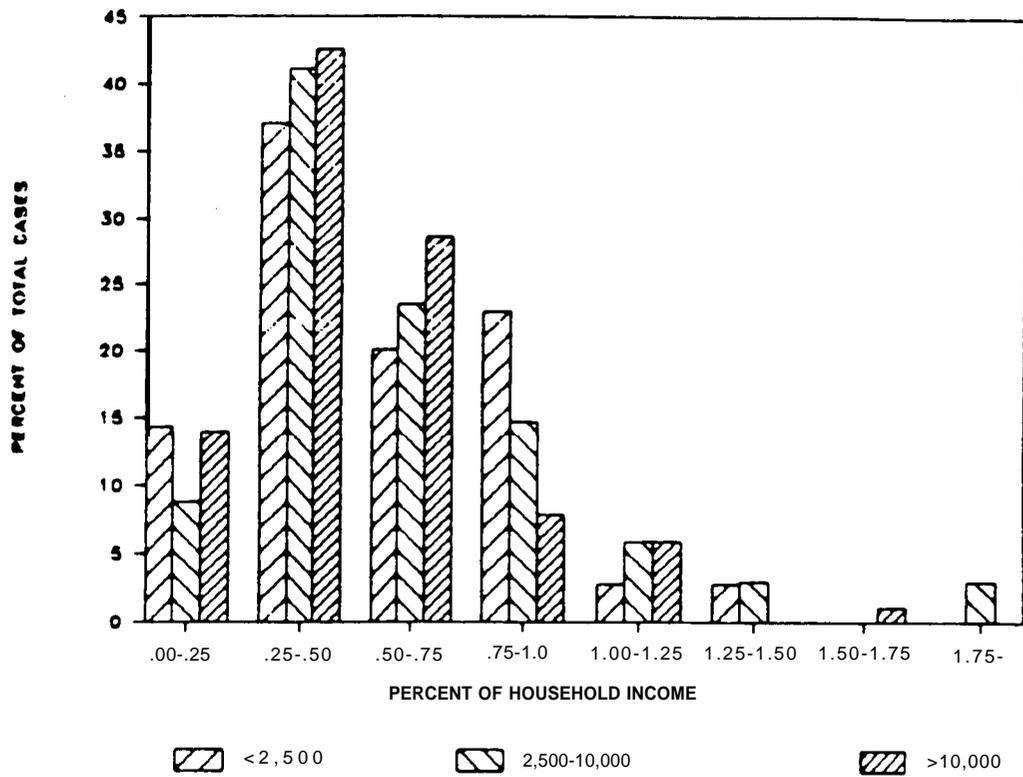
Source 1984 - 1985 Census of Governments - City Finances

FIGURE I-3. CURRENT AVERAGE ANNUAL HOUSEHOLD COSTS FOR ENVIRONMENTAL SERVICES



Source : PP&E's Municipal Database

FIGURE I-4. VARIATION IN THE COST OF DRINKING WATER SERVICES  
 (percent of household income)



Source : PP&E's Municipal Database

household income for drinking water, about 10% of them pay more than 1.0%. Geographic, demographic, and political factors contribute to the variation in the costs of the services. For example, in some areas in the country, inorganic chemicals naturally occur in the ground water. If the ground water in these areas is the primary source of drinking water, the communities will have to shoulder the cost of removing the inorganic contaminants. Communities in other parts of the country may not have to remove the same inorganic chemicals, hence they may provide drinking water to their customers at lower rates.

Information on current fees are used to establish a baseline series of user charges for drinking water, wastewater, and solid waste services. The costs of the additional regulations and the subsequent changes in user fees are used to address the impacts on households and characterize the potential severity of these impacts on households and municipal finances.

### **C. UNDERSTANDING FINANCING MECHANISMS**

While some of the environmental regulations will impose only administrative costs upon local governments, other regulations will require that municipalities install capital equipment and notify operating practices at existing facilities. This capital equipment must be financed by some means. Some traditional forms of financing the equipment include pay-as-you-go financing, special assessment bonds, Federal grants, revenue bonds, and general obligation bonds. The salient features of these mechanisms are discussed below.

Pay-as-you-go financing involves dedicating a portion of revenues to a capital reserve account. The revenues may come from taxes or user fees. In practice, most cities have been unable to reserve adequate funds for replacement of their deteriorating capital equipment. In addition, this pay-as-you-go method is normally not feasible for financing large expenditures.

Special assessment bonds are means of issuing long-term debt with repayment insured through compulsory charges or taxes levied on specific properties that benefit from capital investment. Special assessments are sometimes used to fund wastewater and drinking water treatment extensions or improvements. Special assessment bonds usually have maturities of five to ten years.

Federal grants to support public works were once a major source of capital financing. EPA grants, for example, have contributed a substantial proportion of the capital investment in wastewater treatment made during the past 15 years. Funding for many programs has been reduced and recast as Federal and state government loan programs. Federal budget constraints will dictate the availability of federal funds; however, the focus of municipal financing programs is expected to shift to loan mechanisms administered by state personnel.

Revenue bonds are a primary means of obtaining capital for environmental projects that are run as independent units of local governments. They are backed by user charges paid by customers, and are usually issued by authorities managing the system. The authorities have the power and responsibility to recover expenses through an adequate system of fees and user charges. Local governments have adopted this mechanism to fund water supply, wastewater treatment, and, more recently, solid waste disposal facilities.

General obligation (G. O.) bonds are used by local governments to finance construction of major general purpose facilities, including public schools, municipal parking garages, highways, police stations, and other public buildings. The bonds are backed by the full faith and credit of local governments, and are repaid with revenues raised from property, income, and other taxes. The proportion of G. O. bonds issued has declined recently because of voter approval requirements, the complexity of the issuance process (especially where multiple governments are involved), and a movement toward 'user-pay' principles

of capital financing. Often double-barrel bonds, which are revenue bonds with a backup G.O. pledge, are also used to raise capital.

A focal point of the study is to examine the ability of the municipalities and their independent units to issue revenue and general obligation bonds. These two mechanisms will be the primary means of raising capital for cities subjected to the regulations. It is unlikely that the other three mechanisms will be used to finance major capital expenditures.

#### **D. ORGANIZATION OF THE REPORT**

The remainder of the report contains four chapters. The second chapter describes, in more detail, the overall methodology used in the study to measure economic impacts on households and city finances. The third chapter discusses the anticipated regulatory impacts. The fourth chapter describes the limitations of the study. The fifth chapter contains recommendations based on results from the analysis. In addition, several appendices are attached to provide the necessary background information about the data and the model used in the analysis.

## **II. METHODOLOGY OF THE STUDY**

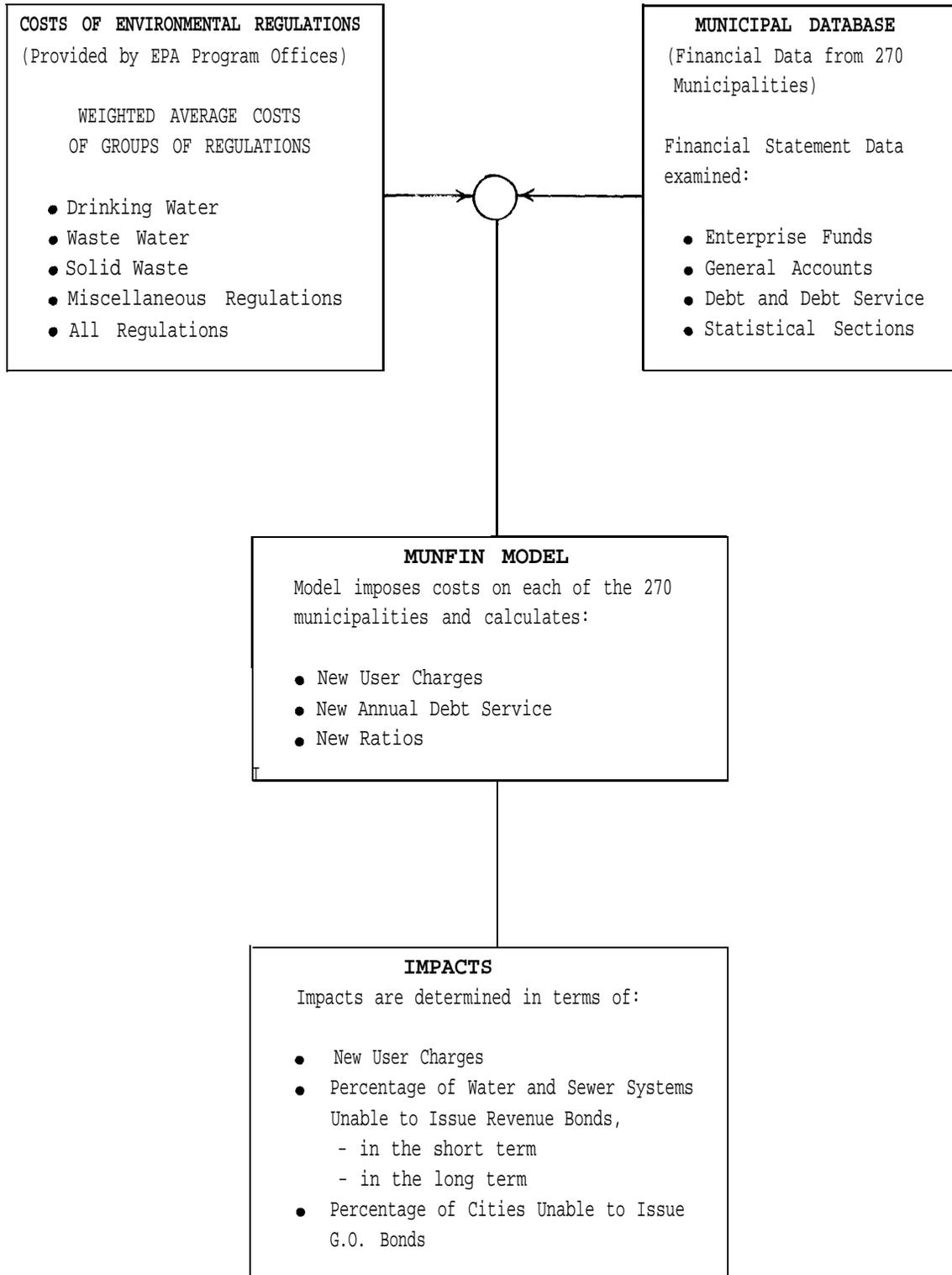
This study uses financial data from the 1986 financial statements of 270 randomly sampled municipalities. These data form the baseline upon which the costs of the regulations were imposed. Because there was particular interest in describing the impacts of regulations on communities of different sizes, the communities in the sample were divided into five size categories. The study calculated impacts on user charges and financial conditions of communities in each category. The sample results were then extrapolated to the total population of cities. If a certain percentage of cities in the sample failed a criterion, it was assumed that an equal percentage of cities in the total population would also fail that criterion. The criteria used to determine the impacts are discussed in detail in the next chapter. The study consisted of the following five steps.

### **A. GENERAL METHODOLOGY**

#### **1. DEVELOPMENT OF FINANCIAL DATABASE**

The overall methodology employed in the study is shown in Figure II-1. As a first step in the study, two major databases were set up. The first database, henceforth referred to as the municipal database, contained fiscal year 1986 financial information on the operations of 270 randomly selected municipalities and their sewer, water, and solid waste systems. To develop the database, various financial documents, including municipal financial statements, sewer system annual statements, and municipal bond statements, were obtained. In addition, the municipal finance departments were contacted to obtain data on the residential share of water and sewer system revenues and the market value of property. These latter pieces of data were necessary for calculating the impacts, but were often unavailable in the above documents. The information contained in the database constitutes the baseline expenditures and the financial conditions of municipalities.

FIGURE II-1. GENERAL METHODOLOGY FOR CALCULATING IMPACTS OF REGULATIONS



It was used for calculating the impacts of the regulations. The details of the sample, the procedures for extracting relevant information from financial documents, the data elements for which data were gathered, and the quality and validity of the data are discussed in Appendix A.

## 2. DEVELOPMENT OF COST DATABASE

The second database, henceforth referred to as the cost database, contained information on the capital, operating, and administrative costs associated with each of the 22 environmental regulations shown earlier in Figure I-1. The cost information was prepared by EPA program offices as part of the regulatory process. The data are summarized in appropriate tables and are presented in Appendix B. In order to determine differential impacts on small and large municipalities, the cost data were analyzed for municipalities in eight population categories. To determine impacts, these eight categories were aggregated into five categories for two reasons: The sample sizes in two smallest and the two largest size categories were relatively small and the aggregation helped obtain samples of sufficient sizes, and it did not alter the conclusion of the study. The impacts of the regulations were calculated for the five categories shown below:

Population Size Categories		Number of
Cost Data	Impact Analysis	Municipalities
0 - 500		
500 - 2,500	0 - 2,500	26,315
2,500 - 10,000	2,500 - 10,000	6,279
10,000 - 50,000	10,000 - 50,000	2,694
50,000 - 100,000		
100,000 - 250,000	50,000 - 250,000	463
250,000 - 500,000	Over 250,000	59
Over 500,000		

Source: 1984-1985 Census of Governments.

Some of the cost information is preliminary, because many regulations are under development. The regulatory options and the ways to alleviate the impacts of the regulations are under discussion within EPA. The discussions could lead to results different from those found in this study.

### **3. DETERMINATION OF WEIGHTED AVERAGE COSTS**

The primary purpose of this study is to determine the combined impact of all the regulations on municipalities. The critical information needed to achieve this objective is the number and type of regulations that will affect a city. A city may be subject to only one regulation, or it may face numerous regulations. Hence, the costs it faces and its ability to meet those costs will depend upon the number of regulations affecting it. Information on the number of regulations that affect each of the 270 cities in our sample was not available. However, the information on the percentage of cities affected (or the probability of a city being affected) by each regulation for each of the size categories was available. This information was used to determine weighted average costs of five groups of regulations: Drinking water, wastewater, solid waste, all other (miscellaneous), and all regulations. The methodology to determine the costs for each is given in Appendix C.

### **4. DEVELOPMENT OF THE MUNFIN MODEL**

The MUNFIN model, a variation of the MABEL model, was used to conduct this study. In its original form, the MABEL model evaluates a municipality's ability to pay enforcement-related capital expenditures and penalties. MABEL was designed to evaluate the ability of a single city to comply with a single regulation. MABEL was modified for this study so that it could process costs of the five groups of regulations and determine the financial impacts on hundreds of communities simultaneously. In addition, the output was modified to suit the purposes of this study.

The MUNFIN simulates the decision-making process of the financial community when it considers lending money for long-term purposes. For example, the model determines whether the loans will be supported by user charges imposed on the customers of the water and sewer systems, or by the full faith and credit of the governments. If the loans will be supported by user charges, the model then examines the uncertainty of future revenues from the systems. The focus of the analysis is on variables that determine the long-term financial health of a municipality. These variables include household income, debt service, and the market value of property. Financial ratios that are often used to examine the short-term financial health of a community are not explicitly included in the model. A detailed description of the MUNFIN model is given in Appendix D.

## **5. DETERMINATION OF IMPACTS OF REGULATIONS**

After obtaining the costs of the regulations, the MUNFIN model was used to determine the impacts of the regulations. The regulations were divided into two groups: (1) water and sewer regulations affecting the respective enterprise systems, and (2) all other regulations affecting the general fund. The study first determined if water and sewer systems could raise the needed capital by issuing revenue bonds, that is, by pledging future revenues from the respective systems as collateral for the bonds. If a water or sewer system could not issue revenue bonds, then the municipalities supporting it were assumed to be responsible for raising the needed money. Therefore, if neither system could issue revenue bonds, a city was assumed to bear the costs associated with meeting drinking water and/or wastewater regulations, as well as the cost of solid waste and miscellaneous regulations.

### **B. CRITERIA FOR DETERMINING IMPACTS**

The ability to obtain the capital for required environmental improvements is only one factor that affects compliance with the regulations. An equally important concern is the consumers' willingness to pay the increased costs. If consumers perceive that costs are

excessive, the mandates of the regulations will be difficult to meet. Therefore, the study examines the expected increases in user charges well as the expected impacts of the regulations on the municipalities' ability to raise capital.

To analyze the impacts, the study divides a city's management of environmental services into two categories:

- the enterprise systems, and
- the non-enterprise systems.

In general, sewer and water systems are run as enterprise systems. Some solid waste systems using energy and resource recovery technologies also fall into this category. The enterprise systems are designed to operate as independent business units. They have the authority to impose user charges and raise money in the financial markets by issuing revenue bonds. Only when they are unable to issue revenue bonds, will the cities owning them step in and raise the needed capital by issuing general obligation bonds. The study assumes that the provision of drinking water and wastewater systems are run as enterprise units, and the drinking water and wastewater treatment regulations shown in Figure I-1 affect them.

The non-enterprise systems typically are not supported by user fees. These services are funded using tax revenues (typically property taxes), and the associated expenses are listed in the General Fund accounts of the financial statements of cities. Capital needed for these activities is usually raised by issuing general obligation bonds, which are serviced by tax revenues. Environmental regulations raise the costs of these activities, and will result in tax increases over the long-term. Financing the capital investments called for by these regulations will also increase the total debt of affected cities. The solid waste and miscellaneous regulations listed in Figure I-1 are assumed to affect the non-enterprise parts of local governments.

The criteria for determining the user charge and financial impacts are discussed below.

### **1. User Charge Impacts**

Households will incur two types of costs: (1) increases in user charges to cover the costs of regulations imposed on water and sewer systems, and, (2) increases in taxes to cover the costs of solid waste and miscellaneous regulations affecting the General Fund. In this study, both types of costs are combined and represented as an annual user charge per household. The impact on user charges is calculated separately for the following groups:

- drinking water regulations
- sewer system regulations, and
- all regulations.

The impacts on user charges were analyzed in three ways: (1) the percent increase in user charges over existing charges, (2) the post-regulatory user charges calculated as a percent of gross household income, and (3) the increase in user charges expressed in dollars. To calculate the percent increase in water and sewer rates, the current user charges were used as the baseline. To calculate the percent increase in user charges due to all regulations, the sum of drinking water, sewer, and solid waste user charges is used as the baseline cost. The cumulative baseline figures should include costs of miscellaneous regulations, but they were excluded from the calculations because the relevant data were not available from the financial reports of municipalities. Their exclusion should not present a problem because the current costs of miscellaneous regulations are extremely small, as few, if any, are in effect.

### **2. Ability to Raise Capital**

A water or sewer system has two preferred options to raise needed capital. It will first attempt to raise money by issuing revenue

bonds. If it cannot, then it will ask the municipalities supporting it to issue general obligation bonds. However, the municipality may already need to obtain additional capital to comply with solid waste and other environmental regulations. Therefore, a municipality may have to issue general obligation bonds to comply with not only the solid waste and miscellaneous regulations, but also with drinking water and wastewater regulations. The issues pertaining to the ability to issue revenue and general obligation bonds in the long and short term are discussed below.

**a. Ability to Issue Revenue Bonds in the Long Term**

The ability of a sewer or water system to obtain money from the capital markets depends on the income of its customers, that is, the residents of the community. For example, if the income of a community is higher than another community's, it can obtain more money under the same financial conditions. In the case of water and sewer systems, the average gross household income was compared to the user charges that households will be expected to pay for existing and new requirements to determine the ability of the system to issue revenue bonds. The percentage of gross household income that is devoted to sewer and water services was separately calculated as follows:

$$\frac{\text{System's User Charge Revenue} \times 100}{\text{Gross Household Income} \times \text{No. of Households}}$$

Then, this ratio is compared to three different threshold limits: 1.0%, 1.25% and 2.0% of the household income. If this ratio exceeds a threshold, that is, if user charges are more than the specified percentage of gross household income, the systems are assumed to be unable to issue revenue bonds. The 1.0% and 1.25% thresholds are approximately equal to the mean plus two standard deviations of the values of the user charge to income ratio for the 270 communities sampled; hence, user charges of about 95% of the communities are less than these thresholds. The 2% threshold, sometimes used to indicate financial hardship, is not exceeded by any of the 270 communities in the

sample. When the ratio exceeded a threshold, it was assumed that lending institutions would consider the income to be too low to afford the high charges and may not lend the money; thus, the community may not be able to raise the needed capital. All those concerned with the regulations -- consumers, bankers, and governments -- will gradually accept the regulations and new user charge thresholds will eventually be defined. Therefore, the thresholds should be used as relative measures of the ability to raise money, or, of the willingness of investors to lend money.

**b. Ability to Issue Revenue Bonds In the Short Term**

Some of the systems that can raise money in the long term may find it difficult to raise money in the short term. Water and sewer systems encounter this difficulty when they do not recover their expenses through adequate user charges, that is, when their expenses exceed their revenues. The deficits occur under many circumstances including high unemployment, voter rejection of rate increases, and bad management of utility operations. Investors look upon deficits with great alarm, and consider them as indicators of uncertainty of future revenues from the systems, or an inability of the community to make hard choices. When the deficits occur, investors will usually not lend the needed capital immediately; instead, they will ask the community to demonstrate that it can raise the charges to adequate levels. Depending upon the size of the deficit, communities may take anywhere from two to four years to balance their water and sewer budgets.

**C. Ability to Issue General Obligation Bonds**

This test was used in those cases where regulations affect non-enterprise units of the local government. Under the general framework established in this study, this occurs when:

- a municipality is subject to solid waste and miscellaneous regulations, and

- water and sewer systems cannot issue revenue bonds in the long term, so the supporting municipalities have to obtain needed capital.

The capital needed for compliance with the regulations will usually be obtained by issuing general obligation (G. O.) bonds.

A financial test that takes into account municipal revenues, debt service, and property value was used to evaluate financial capability. If a city fails this test it was assumed that it would be precluded from issuing G.O. bonds; that is, it would be unable to pledge its full faith and credit to get additional capital.

The threshold values for the two ratios used in the general obligation test were derived from an examination of the financial conditions of about 30 cities with Baa bond ratings. Even though the cities exceeding the two thresholds would generally not be able to issue general obligation bonds, the thresholds derived from the data (called primary thresholds for the purposes of this presentation) cannot be treated as absolute; therefore, sensitivity analysis was performed by using the following thresholds;

R A T I O	PRIMARY THRESHOLDS	ALTERNATIVE THRESHOLDS
<u>Debt Service</u> municipal revenues	0.2	0.15
<u>Debt Service</u> Property Value	0.008	0.006

Note that only when both ratios exceed their respective thresholds, is the city presumed to be unable to raise the needed money by issuing general obligation bonds.

## C. DESCRIPTION OF REGULATIONS

To focus the analysis on cumulative impacts, the regulations have been aggregated into four groups: drinking water; sewer (wastewater) ; solid waste; and the miscellaneous (all remaining) regulations. Salient features of these groups are described below.

### 1. Drinking Water Regulations

Eleven regulations will affect drinking water systems in the near future. These are:

- Inorganic Compounds (IOCs)
- Synthetic Organic Compounds (SOCs)
- Volatile Organic Compounds (VOCS)
- Fluorides
- Lead and Copper Corrosion Control
- Lead and Copper MCLs
- Coliform Monitoring
- Surface Water Treatment Rule (Filtered systems)
- Surface Water Treatment Rule (Unfiltered system)
- Radionuclides
- Disinfection

These regulations are in various stages of development. They should all be promulgated within the next few years. Because they will go into effect within a short time of each other, the affected cities can comply with them in a comprehensive, rather than, piecemeal fashion. For purposes of this analysis, the impacts have been analyzed assuming that all communities would install the necessary equipment to comply with all regulations at the same time. However, it is expected that the smaller municipalities -- those under 10,000 persons -- would make their treatment decisions in 1992, and would implement the regulatory requirements by 1996. Communities greater than 10,000 would make their treatment decisions around 1989. Twenty-five percent of these cities would start complying in 1990, another twenty-five would begin

implementing requirements by 1992, and the rest would comply by 1996. These long lead times should help communities plan to comply with the regulations and reduce the severity of impacts to some extent.

## **2. Sewer System Regulations**

Several major regulations and program changes either will or are already affecting sewer systems. These include the establishment of state revolving loan fund programs, strategies to clean water quality limited waters, and the marine and estuarine protection program. The costs of implementing the latter two programs were not available and therefore were not included in the analysis. The costs associated with the Secondary Treatment Requirements, Pretreatment Program and Sewage Sludge Disposal were included in the analysis.

All major and minor sewage treatment facilities are required to comply with the secondary treatment requirements, and most of them have taken the necessary steps to do so. The cost data for this program was derived by using the Needs Survey information on unmet capital requirements for major and minor facilities. The costs include the total current construction needs of these facilities, including needs for secondary and advanced treatment, infiltration/inflow correction, sewer replacement/rehabilitation, new collector sewers, new interceptor sewers, and correction of combined sewer overflows. In addition, costs for all nondischarging minor facilities in need of further capital investment are included in the data. The cost data does not include unpermitted facilities that need to meet water quality goals, or compliant facilities that have additional needs to maintain compliance. Because these costs are expected to be significant, this analysis may underestimate the impacts.

The costs may not reflect the actual costs to achieve compliance. Systems may be able to modify current operating practices to reduce the amount of additional capital needed. Because the Needs Survey is organized by facility, the costs and population data do not equate directly to municipality size. That is, costs of smaller systems

were matched with smaller cities, and larger systems were matched with larger cities. In reality, some smaller cities are tied into regional systems, so their costs may be lower than that of cities operating their own facilities. Despite these limitations, the cost data provide a reasonable portrayal of how costs are likely to vary across different community sizes. The number of communities affected is expected to be larger than the number of communities identified as requiring additional expenditures to achieve compliance.

Because most cities have already instituted pretreatment programs, the associated costs used in this study were based on current pretreatment costs incurred by a sample of cities. This regulation imposes only administrative costs, primarily for larger cities (over 10,000 persons).

Of the fifteen thousand municipal wastewater treatment plants about 3,000 are covered by the proposed rule. Of the 3,000, more than 85% use land application as a means of disposing of sludge. Other means of disposal include incineration, ocean disposal, landfilling, and distribution and marketing. The average costs used in the analysis are based on cost information on all forms of sewage disposal.

### 3. Solid Waste Regulations

The regulations affecting municipal solid waste disposal facilities examined in this study are the Subtitle 'D' criteria regulation and the regulations affecting municipal waste combustors, (air and ash disposal). The Subtitle 'D' Criteria establishes, among other things, design, performance and ground water monitoring requirements for municipal landfills.

Depending on the size of a municipality, the solid waste disposal operations may be managed differently. In small cities, solid waste collection and disposal is paid from the General Fund accounts, that is, the general tax revenues; hence, it is treated as a non-enterprise system. On the other hand, the solid waste disposal units are operated

as enterprise systems in many large cities. This means that they are established to recover their expenses through some system of user charges, even though their expenses may initially be paid out of the general revenues of the cities that own and operate them. With increasing importance of the solid waste disposal problems, municipalities are paying more attention to the cost of disposal and are planning to institute user charge systems. In addition, solid waste services are privatized to some extent in most areas (especially the suburbs). In large cities, the cost of the new regulations will be passed to the users through higher fees. Because the preliminary analysis indicated that the impacts on small communities would be of concern to EPA, this study treats solid waste facilities as non-enterprise units.

Air and ash regulations for municipal combustors affect one-third of the cities in the 100,000-250,000 category and most cities over 250,000 people. The costs include more expensive disposal of ash residuals and installation of technologies to reduce gas emissions from combustion units.

#### **4. Miscellaneous Regulations**

Five regulations other than water, sewer, and solid waste regulations have been included in this separate category. In general, they will affect non-enterprise units of a municipality; therefore, their costs will be paid from tax revenues. Four of the five regulations, namely, Asbestos in Schools Rule, SARA Title III Requirements, and Underground Storage Tanks (technical and financial standards) are assumed to affect all municipalities in the country. Stormwater requirements under consideration at this time will initially affect only cities with populations greater than 100,000.

### III. IMPACTS OF THE ENVIRONMENTAL REGULATIONS

This chapter consists of two major sections. The first section discusses the probability of cities being subject to one or more regulations and presents the weighted average costs of the regulations. The second section discusses the impacts of the regulations on households and municipal government finances.

#### A. COSTS OF REGULATIONS

The capital and operating costs that a city must bear depend on the number and type of regulations with which a city must comply. Because several of the regulations affect only a small fraction of the cities, it is unlikely that many cities will be affected by more than five or six regulations (Appendix B). This conclusion can be illustrated by examining the data on the number of the municipally owned drinking water systems. As shown in Table III-1, nine of the eleven regulations -- IOCs and Fluorides, VOCs, SWTR (Unfiltered), Colifom (Monitoring), Disinfection, Lead and Copper MCLs, and Radionuclides -- will affect either none or only a handful of cities with populations greater than 50,000.

Individual regulations often affect only a small percentage of the total number of systems in the smaller size categories. For example, the SOCs regulation will affect about 1,200 systems in the less than 500 persons category, about 9% of all systems in this category. IOCs and Fluorides will affect less than 0.5% of the systems with populations of less than 50,000. The small probability of occurrence of certain contaminants means that a randomly selected city would be affected by only a few regulations. The expected cost a city has to bear will be much smaller than the cumulative cost of all regulations. To determine the impacts of the regulations, weighted average costs for the five groups of regulations were calculated. These are presented in Table III-2.

TABLE III-1

NUMBER OF MUNICIPALITIES POTENTIALLY AFFECTED BY DRINKING WATER REGULATIONS\*

Regulations	Municipality Size Category							
	0 to 500	500 to 2,500	2,500 to 10,000	10,000 to 50,000	50,000 to 100,000	100,000 to 250,000	250,000 to 500,000	Over 500,000
Fluorides	66	33	8	2	0	0	0	0
Disinfection	4,724	2,361	439	169	3	0	0	0
Lead Control	5,554	5,028	1,684	1,044	185	52	55	23
VOCs	231	212	84	57	7	3	2	1
IOCs	151	59	20	13	0	0	0	0
SOCs	1,186	413	116	56	8	3	2	1
Radionuclides (500)	5,652	3,891	881	451	30	8	8	1
Coliform Monitoring	10,199	10,150	567	169	35	0	0	0
SWTR (Unfiltered)	172	310	130	79	20	4	4	3
SWTR (Filtered)	273	957	811	704	209	70	69	32
Lead & Copper (MCL)	125	107	33	19	3	1	1	0

**Total Number of Communities:** 35,810

\* All municipalities are subject to drinking water regulations. These are the estimated number of municipalities that will need to invest in additional treatment technologies to comply with the regulations. The number of municipalities affected by other regulations are shown in Appendix B.

Source : Office of Drinking Water, EPA

Table III-2

**POTENTIAL WEIGHTED AVERAGE CAPITAL AND O&M COSTS FOR  
ADDITIONAL EPA REGULATIONS**

(Thousands of 1966 dollars)

Municipality Size Category	Type of Cost									
	Drinking Water		Wastewater		Solid Waste		Miscellaneous**		Cumulative	
	Total Capital Cost	Annual O&M Cost	Total Capital Cost	Annual O&M Coat	Total Capital Cost	Annual O&M Cost	Total Capital Cost	Annual O&M Cost	Total Capital Cost	Annual O&M Cost
0 - 500	40	4	23	2	2	2	37	5	102	13
500 - 2,500	46	7	115	5	10	10	43	6	212	28
2,500 - 10,000	105	14	264	11	37	37	114	11	519	73
10,000 - 50,000	274	39	1,058	44	172	171	390	35	1,894	289
50,000 - 100,000	1,132	110	3,285	132	591	435	770	72	5,778	750
100,000 - 250,000	1,869	203	9,510	365	2,350	968	1,889	233	15,618	1,769
250,000 - 500,000	6,421	661	30,354	1,291	11,875	2,699	3,999	612	52,649	5,264
Over 500,000	10,010	1,457	102,742	4,041	26,597	6,835	9,632	1,066	148,980	13,399

\* Many of the cost estimates are based on existing regulatory development documents and are subject to change. For more information see Appendix B.

\*\* Miscellaneous category includes underground storage tank controls, asbestos in schools, SARA Title III, and stormwater requirements.

Source: EPA Cost Estimates

As shown in Table III-2, cities of different sizes will be affected most by different groups of regulations. Table III-2 shows that:

- For cities with populations greater than 250,000, wastewater capital costs on average will account for more than 50% of the costs of all regulations. Drinking water and solid waste regulations will account for about 7% and 15% of the costs, respectively.
- In comparison, the miscellaneous and drinking water regulations will account for about 60% and 25%, respectively, of the capital costs for cities with populations under 500.
- Although wastewater capital costs dominate in the 10,000 to 250,000 categories, drinking water and miscellaneous costs constitute a significant portion of the cumulative costs of the regulations.

The costs given in Table III-2 were used as inputs to the MUNFIN model in order to calculate the economic impacts to households and the financial capabilities of cities.

#### **B. IMPACTS OF THE REGULATIONS**

This section is divided into two parts. The first part describes the cumulative impacts of all regulations and the impacts of drinking water and wastewater regulations on user charges. The second part discusses the short and long-term ability of water and sewer systems and municipalities to raise the capital needed to comply with the regulations.

## 1. Impacts on User Charges

The regulations will affect households in two ways. First, water and sewer system revenue bonds will have to be supported by systems' revenues, and therefore, the customers (households) will have to pay higher user charges. Second, general obligation bonds, issued to comply with solid waste and miscellaneous regulations and, when necessary, drinking water and sewer regulations, will have to be supported by the taxing powers of the governments. In the long run, local taxes will have to increase to cover the cost increases. Hence, the net cost to households will be the sum of user charges imposed directly by the water and sewer systems, and a tax increase imposed by their governments. In this study, the net cost was not separated into the two components. Instead, it was calculated as a combined number that amounts to the total burden on households. The household impacts were calculated as follows:

- Increase in user charges in dollars and as a percent of household income;
- Percent increase in user charges (over existing charges);
- Post-regulatory charges as percent of household income.

These impacts are given for weighted average costs of all regulations combined. (Post-regulatory user charges for drinking water and wastewater services are discussed in the section dealing with the ability of the systems to issue revenue bonds in the long-term.) The user charges are presented in two ways. First, the increases or the new household charges are divided into several ranges. For example, the percent increase in user charges is given in three ranges: 0-50%, 50-100%, and greater than 100%. The distribution of impacts is determined by calculating the number of cities in the sample within each range. Second, the user charge increases are given in terms of dollars required of an average household in each of the city size categories. These data are discussed below.

Table III-3 shows the percent increase in user charges due to all regulations. To calculate this increase, the sum of current drinking water, sewer, and solid waste charges were used as the baseline of current household expense. Thus, the increase measured was the percent increase over the current costs of drinking water, wastewater and solid waste services.

The analysis shows that small communities with populations of less than 2,500 will experience the largest user charge increases. About 20 percent of these communities will experience cost increases of more than 100%. The user charges of 35% of the cities in this category will increase by 50 to 100%. Only 45% of them will experience rate increases of less than 50%. In comparison, none of the cities in the other four size categories will experience cost increases of more than 100%, and between 80% and 100% of the cities will experience rate increases of less than 25%. Thus, the small communities will experience the largest rate shock resulting from the regulations.

The rate increases will force the households in small communities to pay a larger portion of income for environmental services than households in large communities in the post-regulatory period. Table III-4 shows the post-regulatory cost of all environmental regulations (that is, after the new regulations have taken effect). A larger portion of the communities in the two smallest categories will pay more than 2.5% of gross household income for environmental services than communities in the other categories. About a quarter of the communities in the less than 2,500 person category and 15 percent in the 2,500-10,000 person category will pay more than 2.5% of their household income for the environmental services. In comparison, about 10 percent of the cities in the over 10,000 category will pay more than 2.5% of the household income for the environmental services. Furthermore, while 50 to 70 percent of the communities in the 2,500 to 250,000 person sizes will spend less than 1.5% of their income on environmental services, only 40 percent of the communities in the less than 2,500 category and 30 percent in the greater than 250,000 category will do so as a result

TABLE III-3

POTENTIAL CUMULATIVE IMPACT OF ENVIRONMENTAL REGULATIONS -  
PERCENT INCREASE IN HOUSEHOLD USER CHARGES

Municipality Size Category	Number of Municipalities	Percent of Municipalities in the Category		
		Increase as percent of current charges *		
		0 - 50%	50 - 100%	> 100%
0 - 2,500	26,315	45%	35%	20%
2,500 - 10,000	6,279	90	10	0
10,000 - 50,000	2,694	80	20	0
50,000 - 250,000	463	100	0	0
Over 250,000	59	80	20	0
Percent of Municipalities		56	29	15
Percent of Population		83	15	2

\* Percent increase in user charge is calculated as follows:

$$\frac{\text{Additional (Drinking Water+Wastewater+Solid Waste+Miscellaneous) Costs} \times 100}{\text{Current (Drinking Water+Wastewater+Solid Waste) Costs}}$$

TABLE III-4

POTENTIAL CUMULATIVE IMPACT OF ENVIRONMENTAL REGULATIONS --  
POST-REGULATORY USER CHARGES AS PERCENT OF HOUSEHOLD INCOME

Municipality Size Category	Number of Municipalities	Percent of Municipalities in the Category		
		User Charges as Percent of Household Income		
		0 - 1.5%	1.5 - 2.5%	>2.5%
0 - 2,500	26,315	40% *	35%	25%
2,500 - 10,000	6,279	55	30	15
10,000 - 50,000	2,694	50	40	10
50,000 - 250,000	463	70	25	5
Over 250,000	59	30	60	10
Percent of Municipalities		44	34	22
Percent of Population		50	37	12

\* This means that 40% of the municipalities in the 0 - 2,500 category will experience an increase in user charges in the range of 0 - 1.5% of the gross average household income.

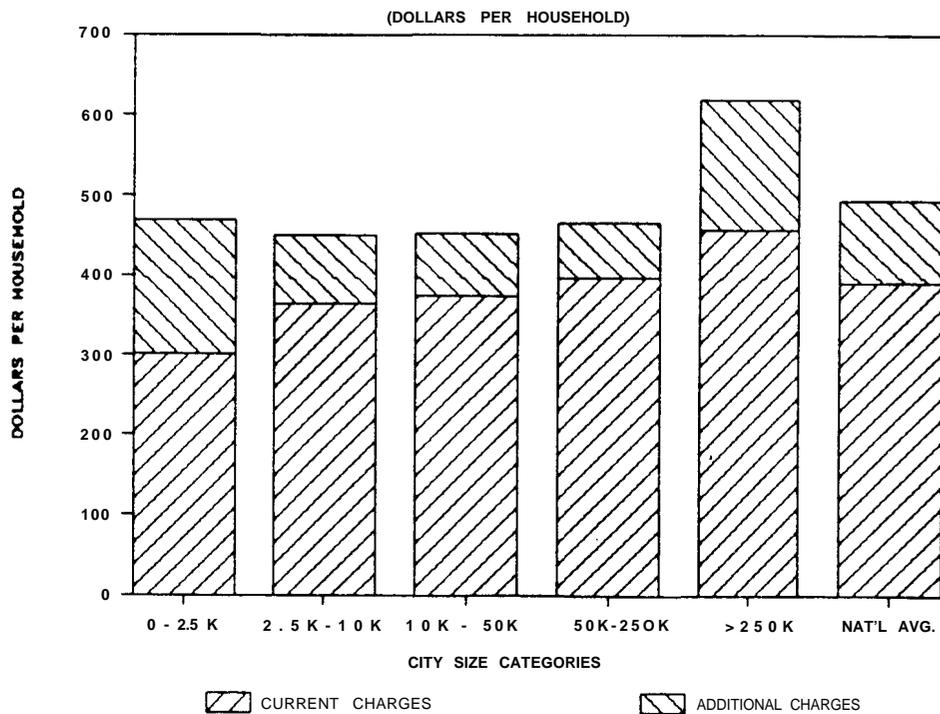
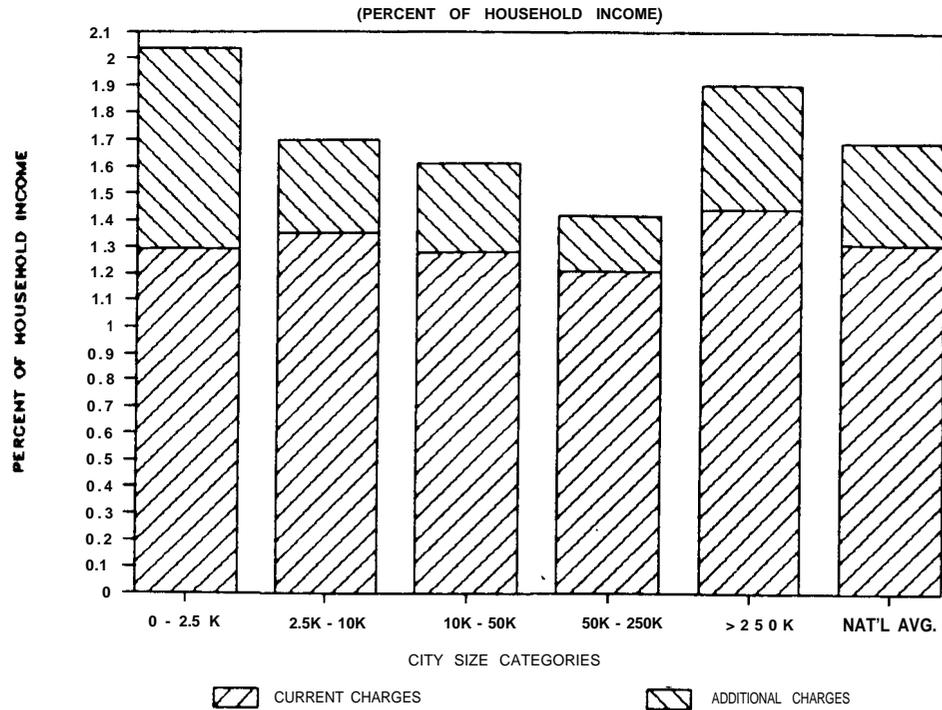
of the regulations. Almost 60 percent of the cities in the greater than 250,000 category will spend between 1.5% and 2.5% of the household income on environmental expenditures.

The environmental expenditures of small communities will increase from about 1.3% of the household income to more than 2.0% (Figure III-1). This translates into increased outlays of \$170 per household per year for communities with populations less than 2,500 (Table III-5). Residents in the largest cities will have to increase their outlays by less than 0.5% of the household income, but the dollar increase will be about the same (\$160). The corresponding increases for other city size categories are much less -- between \$70 and \$90.

These results suggest that the greatest additional outlays for environmental services will occur in small and large municipalities. The relatively greater wealth of average households in larger cities will diminish the impacts; however, almost every large city contains pockets of low income residents who will bear a much greater burden than higher income groups. Small municipalities will experience large increases in rates. Households in these communities will have to dedicate a greater portion of their income for these services than will households in larger communities.

Water and wastewater user charges in the less than 2,500 category communities will increase by about \$40 and \$45 respectively, or, in other words, these two groups of regulations will contribute about 50% of the increase in user charges for the smallest communities. Drinking water regulations will increase user charges of other communities by only \$5 to \$15 per household. The wastewater regulations, on the other hand, will increase the user charges by about \$60 in cities with populations larger than 250,000 and by about \$20 in communities in the 2,500 to 250,000 population categories.

FIGURE III-1. CURRENT AND POTENTIAL ADDITIONAL AVERAGE ANNUAL HOUSEHOLD COSTS FOR ENVIRONMENTAL SERVICES



Source : PP&E's Municipal Database

TABLE III-5

POTENTIAL INCREASE IN ANNUAL USER CHARGE DUE TO ENVIRONMENTAL REGULATIONS

(Dollars Per Household)

Municipality Size Category	Number of Municipalities	Types of Regulations				
		Wastewater	Drinking Water	Solid Waste	Miscellaneous	Cumulative
0 - 2,500	26,315	\$ 45*	\$ 40	\$ 26	\$59	\$ 170
2,500 - 10,000	6,279	20	15	23	32	90
10,000 - 50,000	2,694	20	5	32	23	80
50,000 - 250,000	463	20	10	28	12	70
Over 250,000	59	60	15	51	34	160

\* User charge increases have been calculated using weighted average costs of new regulation.  
The costs that a municipality may incur will depend on the regulations it has to comply with.

## 2. Impacts of Costs on Financial Health of Cities

As discussed in Section C of this Chapter, water and sewer systems have two options for raising the capital needed to build treatment facilities:

- Issue Revenue Bonds\*, and
  
- Request Municipalities Supporting Them to Issue General Obligation Bonds

Because municipal water or sewer systems are typically run as enterprise units, systems will prefer to issue a revenue bond and pledge future revenues toward payment of the debt service. In those cases where there exists a high degree of uncertainty in attaining the needed level of future revenues, the cities will not be able to issue revenue bonds. The uncertainty may arise when: (1) the system is not already recovering its current expenditures through adequate user charges, (perhaps, reflecting an unwillingness on the part of customers to bear the cost of clean water); (2) income of the residents is too low; (3) future revenues are based on highly uncertain growth of the service population, and; (4) the national economy is expected to be in recession in the immediate future. This study examines only two of these four factors - whether the income is too low and whether the systems are recovering their current expenditures. The inclusion of the other two factors is beyond the scope of this study.

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\*Although small communities do not issue revenue bonds, financial institutions will use criteria similar to those used by investment bankers in cases involving large cities. To qualify small systems for long-term loans, they will evaluate the performance history of the system, the user charges to income ratio, and use revenues from the system as collateral for the loan. Just as in cases where large cities are denied access to revenue bonds, banks will refuse to approve loans to small cities where their systems do not pass the criteria described in this report. Similarly, small cities generally do not issue general obligation bonds, but are evaluated in much the same manner as large cities before being given long-term loans for capital purchases.

Inadequate income is a long-term problem. When the income is insufficient, that is, when the user charges are high with respect to income, the customers may not be able to afford the charges. In addition, investors may not be willing to lend money because they will be uncertain about the customers' willingness and ability to pay charges that are much greater than the rates charged elsewhere in the country. In the absence of lenders' willingness to advance the capital, the city will not be able to obtain the necessary financing. This will result in long-term constraints on the availability of revenue bond financing for water and sewer projects.

Inability to recover current expenditures through adequate user charges is considered a short-term problem, provided the customers have sufficient income. When water and sewer systems of a community are not recovering their costs, investors usually refuse to lend money to them. However, if the community demonstrates its willingness to raise rates (by legally raising the rates and collecting sufficient revenues for a period of one or two years), investors are likely to change their minds and agree to provide the capital. Depending on the size of the deficit, a community may take anywhere from one to four years to balance its books and demonstrate that it has an adequate performance history.

When water and sewer systems cannot issue revenue bonds, they can ask the municipalities supporting them to issue general obligation bonds. However, other financial obligations or poor financial conditions may dictate that a city is unable to issue general obligation bonds. When cities are unable to use either mechanism, the water and sewer systems will not be able to raise the needed capital. \*

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\*Municipalities may be able to increase their ability to issue general obligation bonds over time by reducing the level of debt service. But it usually is much harder to do this than it is to adjust user charges for environmental services. The ability of the municipality to adjust its financial conditions by taking advantage of alternative financial mechanisms, though possible, is not addressed in this report. It should be noted that small communities generally have fewer options to make adjustments than large cities.

**a. Ability to Issue Revenue Bonds in the Long Term**

Post-regulatory user charges affect the ability of the water and sewer systems to issue revenue bonds. According to the criteria established for this study, if the new charges for these services for each utility exceed 1.0%, 1.25% or 2.0% of the gross household income, then the systems will not be able to issue the revenue bonds in the long term. Note that the lower two thresholds are approximately equal to the mean plus two standard deviations of the values of the ratios for 270 municipalities surveyed in the study. Therefore, user charges, for water and sewer services separately, in approximately 95% of the municipalities are less than the two thresholds. The user charges may have to double or quadruple before they exceed the 2% threshold.

Table III-6 provides the post-regulatory user charges for drinking water services as a percentage of average household income. Depending on the size of the city, user charges of between 68 and 96 percent of the systems will be less than 1.0 percent of household income (one of the two thresholds for determining if costs of drinking water services are excessive). This suggests that a large portion of systems in all city size categories will not have trouble raising money in the capital markets in the long term. Similarly, as shown in Table III-7, the customers of the vast majority of sewer systems will have to pay less than 1.0% of their gross household income -- one of the thresholds above which the charges are considered excessive -- for sewer services.

The data also show that a significant portion of the water and sewer systems will exceed the lower two thresholds, and therefore, may have trouble raising the needed capital in the long term. Table III-8 shows that about a quarter of the water and sewer systems in the less-than-2,500- persons category and between 4% and 11% of the systems in the other four categories, may have difficulty issuing revenue bonds in the long term, if the threshold of 1.0% is used as the evaluation criterion. On a nation-wide basis, 21% of the water and sewer systems will exceed this threshold. Comparatively, if the threshold of 1.25% is used as the criterion for evaluation, about 12% of the systems in the

TABLE III-6

POTENTIAL IMPACT OF DRINKING WATER REGULATIONS-  
POST-REGULATORY USER CHARGES AS PERCENT OF HOUSEHOLD INCOME

Municipality Size Category	Number of Municipalities	Percent of Municipalities in the Category				
		User Charges as Percent of Household Income				
		0-0.5%	0.5-1.0%	1.0-1.5%	1.5-2.0%	> 2.0%
0 - 2,500	26,315	36%*	32%	28%	2%	2%
2,500 - 10,000	6,279	44	44	6	6	0
10,000 - 50,000	2,694	61	35	2	2	0
50,000 - 250,000	463	52	36	12	0	0
Over 250,000	59	50	33	17	0	0
Percent of Municipalities		39	35	23	2	1
Percent of Population		51	36	4	2	1

\* This means that for 36% of the municipalities in the 0 - 2,500 category the new user charges will be 0 - 0.5% of the gross average household income.

TABLE III-7

POTENTIAL IMPACT OF WASTEWATER REGULATIONS-  
POST-REGULATORY USER CHARGES AS PERCENT OF HOUSEHOLD INCOME

Municipality Size Category	Number of Municipalities	Percent of Municipalities in the Category				
		User Charges as Percent of Household Income				
		0-0.5%	0.5-1.0%	1.0-1.5%	1.5-2.0%	> 2.0%
0 - 2,500	26,315	35%*	40%	17%	8%	0%
2,500 - 10,000	6,279	59	35	6	0	0
10,000 - 50,000	2,694	58	34	8	0	0
50,000 - 250,000	463	71	29	0	0	0
Over 250,000	59	44	50	0	0	0
Percent of Municipalities		41	39	14	6	0
Percent of Population		56	37	6	1	0

\* This means that for 35% of the municipalities in the 0 - 2,500 category the new user charges will be 0 - 0.5% of the gross household income.

TABLE III-8

POTENTIAL IMPACT OF EPA REGULATIONS ON THE ABILITY OF WATER AND SEWER SYSTEMS TO ISSUE REVENUE BONDS/ OBTAIN BANK LOANS IN THE LONG TERM\*

Municipality Size Category		Number of Municipalities	Percent of Systems Which May Fail To Issue Revenue Bonds in the Long Term*		
			User Charge >1.0%	Household Income >1.25%	Income >2.0%
0 - 2,500	26,315	26% (5 ***)	12% (2)	2% (0)	
2,500 - 10,000	6,279	8 (2)	2 (1)	0 (0)	
10,000 - 50,000	2,694	7 (3)	2 (1)	0 (0)	
50,000 - 250,000	463	4 (4)	0 (0)	0 (0)	
Over 250,000	59	11 (4)	3 (0)	0 (0)	
Percent of Systems			21 (4)	9 (2)	1 (0)
Percent of Population			9 (4)	3 (1)	1 (0)

\* A water system or a sewer system fails to issue revenue bonds in the long term when each individual system fails the user charge threshold of 1.0%, 1.25% or 2.0%.

\*\* Small communities generally do not issue revenue bonds; instead, they get bank loans that are backed by user charges. The criteria used in the above tests are applicable to small communities.

\*\*\* Percent of systems exceeding thresholds prior to complying with new regulations (Numbers within parentheses are baseline failures).

smallest--under 2,500 persons -- category, and up to 3% of the systems in the other categories, will have difficulty in issuing revenue bonds in the long term. Nationally, about 9% of the systems exceed this second threshold. Thus, regardless of the two thresholds chosen, systems in the smallest and largest category will be most affected by the regulations and many may not be able to pledge future user charge revenues as security for their bank loans. These systems will likely have to ask communities supporting them to raise money by means of general obligation bonds. Note that the new environmental regulations are not totally responsible for the long-term difficulty in issuing revenue bonds. As shown in table III-8, the user charge to income ratios of between two and five percent of the systems are more than the 1.0% threshold. This means that these systems will have difficulty in issuing revenue bonds even in the absence of new regulations.

**b. Ability to Issue Revenue Bonds in the Short-Term**

Some of the systems that can issue revenue bonds in the long term may not be able to issue them in the short-term because of their history of obtaining adequate revenues to cover the costs of services. Table III-9 shows the systems that will fail to issue revenue bonds in the short term, but will be able to issue them in the long term. These systems do not recover their expenses through sufficient user charges, but their customers have adequate incomes to permit them to raise the rates and balance expenditures and revenues. The short-term inability to issue revenue bonds means that the regulations will require these communities to discontinue practices that pay the deficits through subsidies or tax revenues. To comply with the new regulations and issue revenue bonds, communities will have to raise the rates. Because tax and rate increases are politically unpopular, a political problem may arise before the economic one. The communities are expected to be able to raise their rates because their income is adequate, that is, the new user charges are less than either 1.0% or 1.25% of the annual household income -- the two scenarios considered in this analysis. The 2.0% threshold is not used in this part of the study because the user charges of none of the systems exceed it.

As shown in Table III-9, 16% of the water and sewer systems will find it difficult to issue revenue bonds in the short-term if the threshold of 1.0% (ratio of user charges to household income) is taken as the evaluation criteria. On the other hand, if the threshold of 1.25% of the household income is taken as the evaluation criteria, 18% of the water and sewer systems may experience difficulty issuing revenue bonds in the short-term. The data in the table do not show any consistent pattern of difficulty among large and small cities. The absence of a pattern is not surprising, however. The budget deficits occur for two main reasons: inability of a system to increase rates during bad economic times and poor management.

The hard economic conditions occur in different parts of the country at different times and affect communities of all sizes. For example, the drop in oil prices has adversely affected the oil states during the last two years, but the drought is affecting the agricultural states this year. Communities that were in relatively weak financial condition before the adverse economic conditions are probably in much poorer shape. They have probably cut budgets, reduced services, and delayed tax or rate increases. If the water and sewer systems in these hard hit communities have had to comply with new environmental requirements, they may be experiencing budgetary deficits and covering them by using revenues from the general treasury or short-term loans.

The budget deficits may also result from periodic water shortages during which water supplies usually decrease. Costs of obtaining or treating water rise, but the water and sewer rates remain stable. The resulting shortfall is covered by short-term loans, capital reserves, or revenues from other sources. Finally, the deficits may occur due to inadequate management practices, which make it difficult to track and control expenditures.

The financial conditions of water and sewer systems may change over time. A water system may gradually raise costs to its customers in order to recover the cost of supplying water. Usually, it is possible

TABLE III-9

POTENTIAL IMPACT OF EPA REGULATIONS ON THE ABILITY OF SEWER AND WATER SYSTEMS  
TO ISSUE REVENUE BONDS/OBTAIN BANK LOANS IN THE SHORT TERM\*

Municipality Size Category	Number of Municipalities	Percent of Systems Which May Fail to Issue Revenue Bonds/Obtain Bank Loans In Each Category	
		User Charge / Household Income <1.0%	< 1.25%
0 - 2,500	26,315	17%	18%
2,500 - 10,000	6,279	17	21
10,000 - 50,000	2,694	10	12
50,000 - 250,000	463	13	13
Over 250,000	59	7	10
Percent of Municipalities		16	18
Percent of Population		13	15

\* A system falls to issue revenue bonds in the short term, when it passes the user charge threshold (i.e. when user charge/household income ratio is less than 1.0% or 1.25%) and fails the performance history test.

\*\* Small communities generally do not issue revenue bonds; instead, they get bank loans that are backed by user charges. The criteria used in the above tests are applicable to small communities.

to adjust the rates by small amounts each year. Depending on the level of the annual deficit (difference between expenditures and revenues) some water systems may take four to five years to raise their rates to adequate levels. This study did not examine the ability of the systems to make needed adjustments. The results presented below simply indicate if the systems had large deficits in 1986. If they had large deficits, it was assumed that they may not be able to raise the needed capital if subject to the regulations in the short-term.

### **c. Failure of Municipalities to Issue General Obligation Bonds**

When either water or sewer systems cannot raise capital by issuing revenue bonds, they will ask the municipalities to assist them by issuing general obligation (G. O. ) bonds. Because a city bears the costs of the solid waste and miscellaneous regulations, a city may find itself responsible for the following kinds of costs.

- Costs of Sewer, Drinking Water, Solid Waste and Miscellaneous regulations
- Costs of either Water or Sewer, Solid Waste and Miscellaneous regulations
- Costs of only Solid Waste and Miscellaneous regulations

The capital cost component of the above costs will have to be raised by issuing G.O. bonds. Depending on the ability of the sewer and water systems to issue revenue bonds, some of the cities may have to raise greater amounts of money via G.O. bonds. The financial health of some cities may be affected to a greater extent by the same environmental regulations than other cities.

Table III-10 shows the cumulative affect of the regulations on the ability of cities to issue G.O. bonds. The results are given for two scenarios. The first scenario pertains to the user charge threshold of

TABLE III-10

POTENTIAL IMPACT OF EPA REGULATIONS ON THE ABILITY OF MUNICIPALITIES  
TO ISSUE GENERAL OBLIGATION BONDS/OBTAIN BANK LOANS\*

Municipality Size Category	Number of Municipalities	Percent of Municipalities Which May Fail To Issue G.O. Bonds/Obtain Bank Loans In Each Category*	
		Test I ***	Test II
0 - 2,500	26,315	21% (8 ****)	30% (12)
2,500 - 10,000	6,279	4 (3)	9 (9)
10,000 - 50,000	2,694	2 (0)	6 (6)
50,000 - 250,000	463	0 (0)	0 (0)
Over 250,000	59	0 (0)	0 (0)
Percent of Municipalities		16 (7)	24 (11)
Percent of Population		3 (2)	6 (5)

\* Small communities generally do not issue general obligation bonds; instead they get bank loans that are backed by the full faith and taxing powers of the municipalities. The criteria used to determine G.O. bond failure are applicable to small and large communities.

\*\* A user charge/income threshold of 1.0% and results of the long term revenue bond test were used to conduct this analysis. Results obtained with 1.25% and 2.0% thresholds were virtually identical to those shown here.

\*\*\* Test I: (a)  $\frac{\text{Annual Debt Service}}{\text{Municipal Revenues}} \geq 0.2$  and (b)  $\frac{\text{Annual Debt Service}}{\text{Market Value of Taxable Property}} \geq 0.008$

Test II: (a)  $\frac{\text{Annual Debt Service}}{\text{Municipal Revenues}} \geq 0.15$  and (b)  $\frac{\text{Annual Debt Service}}{\text{Market Value of Taxable Property}} \geq 0.006$

\*\*\*\* Numbers within parentheses are baseline failures.

1.0% and a G.O. bond test with threshold values for annual debt service to municipal revenues, the debt service to market value of taxable property of 0.2 and 0.008 respectively. The second scenario uses the same user charge threshold, but decreases the two debt service thresholds to 0.15 and 0.006 respectively. A larger number of cities should fail the smaller threshold values of the bond test. Thus the two scenarios provide a range of the percent of cities that may fail to raise capital by pledging their full faith and credit. \*

Table III-10 shows that cities with populations of larger than 50,000 people are not expected to fail the test under either scenario. This implies that large cities are not likely to have difficulty in issuing general obligation debt to finance additional environmental requirements. Even if their water and sewer systems are unable to issue revenue bonds, the city governments have sufficient revenues and tax bases to come to their rescue and obtain the required capital. The picture is less favorable for small cities. Between 21% and 30% of cities with populations under 2,500 fail this test. Therefore, about a quarter of cities in this category may not be able to obtain money from the capital markets. The current weak financial conditions of small communities are responsible for some of the difficulty. Table III-10 shows that 8.0% and 12.0% of the communities in the less than 2,500 person category are in poor financial health if tests I and II respectively are used as the criteria for evaluation. These communities are expected to find it difficult to issue general obligation bonds even in the absence of regulations.

The combined costs of solid waste and other miscellaneous regulations also contribute to the difficulty cities may have obtaining the funding. Of those communities whose water or sewer systems fail to issue revenue bonds, most are able to issue general obligation bonds or otherwise get bank loans by pledging their full faith and credit. Table III-11 shows the cumulative effect of solid waste and miscellaneous

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\* This study examined the G.O. bond failure rate at the 1.25% and 2.0% thresholds for user charge. The results were found to be virtually identical to those given in Table III-10.

TABLE III-11

POTENTIAL IMPACT OF MISCELLANEOUS AND SOLID WASTE REGULATIONS ON THE ABILITY OF CITIES TO ISSUE GENERAL OBLIGATION BONDS/OBTAIN BANK LOANS\*

Municipality Size Category	Number of Municipalities	Percent of Municipalities Which May Fail To Issue G. O. Bonds	
		All Regulations	Miscellaneous + Solid Waste
0 - 2,500	26,315	21% **	18%
2,500 - 10,000	6,279	4	3
10,000 - 50,000	2,694	2	1
50,000 - 250,000	463	0	0
Over 250,000	59	0	0
Percent of Municipalities		16	14
Percent of Population		4	3

\* Small communities generally do not issue G.O. bonds; instead, they get bank loans that are backed by the full faith and credit of the municipalities. The criteria used to determine G.O. bond failure are applicable to small and large communities.

\*\* Analysis is based on the following thresholds:

(a) User Charge Threshold = 1.0%

(b)  $\frac{\text{Annual Debt Service}}{\text{Municipal Revenues}}$  = 0.2

(c)  $\frac{\text{Annual Debt Service}}{\text{Market Value of Taxable Property}}$  = 0.008

regulations. About 18% of the cities in the less-than-2,500-person category have difficulty financing the solid waste and miscellaneous regulations. Therefore, in those cases where cities need to cover the additional costs of financing water and sewer regulations, an additional 3% of the cities in this size category may face financial constraints.

In summary, the regulations are likely to affect municipalities in the following ways:

- Small communities with populations of fewer than 2,500 are likely to experience the largest user charge increases; as a result, households in these communities are likely to pay a larger portion of their income for environmental services than households in large communities in the post-regulatory period. The largest impacts, in terms of dollars, should be felt by the smallest (fewer than 2,500) and the largest (greater than 250,000) size categories.
- The majority of water and sewer systems, in all city size categories, should not have trouble raising money by means of revenue bonds in the capital markets in the long term. However, it is likely that between 12 and 26 percent of the systems in communities with populations less than 2,500 will not be able to raise money in the long term due to inadequate income. In addition, between 16 and 18 percent of the water and sewer systems will find it difficult to issue revenue bonds in the short term due to budgetary deficits. These systems will have to adjust their budgets and/or rates to obtain adequate revenues.
- Communities with populations over 50,000 should be able to issue general obligation bonds. But some of the smaller communities are likely to have difficulty issuing G.O. bonds. In other words, these communities should experience greater difficulty in obtaining long-term financing for environmental compliance. This impact would be felt the hardest in the smallest size category with populations of less than 2,500 where between 21 and 30 percent would be unable to issue G.O. bonds.

#### **IV. LIMITATIONS OF THE STUDY**

This study, by necessity, undertook several simplifying procedures and made many assumptions. These are discussed below.

##### **A. VALIDITY OF THE SAMPLE OF CITIES**

Considerable care was taken to obtain a statistically valid sample of cities. The cities from different size categories were selected using random selection techniques. The validity of the sample is indicated by many results of the baseline analysis that are consistent with other EPA databases on costs and user charges for services. Furthermore, the results were found to be internally consistent. For example, the means and variances of user charges of the eight municipal size categories had similar statistical characteristics. None of the means was so different from others as to indicate unreasonable results. This internal consistency indicates that the results of this study are reflective of the total population of the cities in the country. Still, one should keep in mind that the municipal database is a relatively small sample of communities, and there is an element of uncertainty about the inferences made from the sample to the entire population. To reduce this uncertainty, EPA has collected data for 50 to 100 randomly selected additional small cities. Preliminary results indicate that the means and variance of the new sample are virtually similar to those of the earlier sample.

##### **B. ADJUSTMENTS IN FINANCIAL CONDITIONS**

The financial database was prepared using records from 1986 financial statements. The fiscal conditions of communities are contingent upon many factors in the economy (e.g. inflation, unemployment, international trade). Depending on the influence of the economy, the financial conditions of municipalities may become better or they may become worse than they were in 1986. Note that we are not discussing financial conditions of specific municipalities in our sample. This study does not attempt to address the future changes in

financial conditions of cities.

Another adjustment can be predicted with greater certainty. Some of the regulations will go into effect in four or five years. Therefore, the municipalities have sufficient lead time to make adjustments to their financial conditions and to plan future debt issues. Whether or not they have the willingness, foresight, and ability to make needed adjustments is open to question.

In interpreting these results, one should take into account the ability of municipalities to make fiscal adjustments, and the resulting new standards of affordability. For example, practically all systems subject to the regulations will eventually raise their user charges. This means that the average user charges will increase to new levels. The needed adjustments usually take several years, and they occur only after all concerned parties (bankers, consumers, and the governments) accept the environmental requirements and the associated increases.

The systems in strong financial condition, that is, whose post-regulatory rates are expected to be below the thresholds will lead the way. They should be able to get the needed capital, but it may take them many years to raise the rates by the desired amounts. Some of these strong communities may not be able to issue revenue bonds immediately because of large rate increases. They may have to issue either double barrel bonds that are supported by both system revenues and the full faith and credit of the municipalities, or short-term notes. Thus, the adjustment may take a long time. Some of the systems whose post-regulatory rates are expected to exceed the thresholds may be able to issue revenue bonds, but only after the systems with strong financial health have demonstrated that they can successfully raise the rate to cover the cost of new regulations.

**C. CONSUMER WILLINGNESS AND FINANCIAL ABILITY**

The financial willingness and ability criteria are heavily based upon current household user fees and debt serviced by the

municipality. These criteria are limited in their ability to accurately forecast the consumer's willingness to pay for environmental services. The criteria serve as useful indicators, but only when local governments make arrangements to raise fees or initiate a bond referendum to finance new construction will the preferences be known. Indeed, EPA expects that consumers, bankers, and governments eventually will accept the new requirements and will be willing to pay much higher charges for improved environmental services.

Many of these environmental services are goods for which consumers can make some adjustments in their consumption patterns, so as prices rise, their demand for the services may change. The study also fails to allow for major changes in the production of environmental services, some of which may decrease the eventual cost of meeting the regulations. Municipalities may choose to enter into regional services in order to take advantage of scale economies. They may choose to privatize services, which could free them from the responsibility of raising funds to finance the construction of facilities. They may also purchase services from adjacent municipalities or special districts. These actions may relieve the smaller communities of raising capital.

The impact evaluation criteria show if a municipality will have difficulties when faced with the new requirements, in the absence of other capital needs. Some municipalities may not have to reach the thresholds used in the study before they find themselves constrained, particularly in light of the large number of additional public works demands being made of local governments. The criteria may, therefore, be construed as being too conservative. The thresholds have been developed using empirical data; hence, they cannot be treated as absolutes. The variables themselves are used by the financial community for assessing financial conditions. PP&E Inc. conducted a review of the variables and their thresholds by testing them on financial conditions of selected cities and confirmed their suitability for this study. The results of the review will be made available in the near future.

**D. LIMITED AVAILABILITY OF COST INFORMATION**

Information on both the baseline costs as well as costs of new regulations was limited. The cost of all environmental services is not available from the financial reports of municipalities. For example, the cost of complying with the asbestos regulations is not given in any particular line item. In this study, the baseline environmental costs were assumed to be the sum of drinking water, wastewater and solid waste water services. These costs constitute between 80% and 90% of the total costs. Therefore, the actual increase in user charges as a percent of existing environmental costs will be a little lower than those given in the report.

Another consideration in interpreting the results of the study is the limited set of EPA regulations that were included in the cost analysis. Although more than 40 actions in the list of 85 considered in the study were identified as having some implications for local government, only 23 regulations were at that stage of development where cost data were available. Several of the omitted requirements may require significant investments in local government resources (e.g., asbestos in public buildings), or may lead to major changes in current land use patterns (e. g., groundwater protection, nonpoint source guidelines). The results of this study therefore provide a somewhat limited picture of the environmental needs of local governments. This study captures only a portion of the total picture.

**E. ENVIRONMENTAL SERVICES PROVIDED BY PRIVATE ORGANIZATIONS**

The supply of environmental services to households is currently undertaken by governmental units and private companies. The pattern of supply varies for several reasons, including geographic, political, economic, and historic or institutional considerations. In many parts of the country private companies own and operate drinking water and waste disposal operations. Wastewater treatment plants are, however, predominantly owned and operated by governments. A small proportion --1 to 2 percent-- of the sewer systems are operated under service

contracts whereby the firm provides services for a fee. Over 50 percent of community water systems are owned and operated by private investors, associations, and institutions other than local governments. The majority of these private operations are small systems serving fewer than 1000 persons. Approximately 20 percent of municipal landfills are owned and operated by private firms, and a large proportion of governments owning landfills contract for collection services.

The issue of ownership is an important aspect to consider when addressing the financial implications of an expanding environmental program. Most private firms can directly bill consumers, when required, to expand their operations without having to meet the financial and legislative procedural requirements made of governments. Private firms, unless regulated as a public utility, will not have to meet the voter's approval on raising rates or incurring additional debt to fund capital improvements. But they may be constrained in raising user fees, should they wish to retain customers, when substitute services are available. There are other issues surrounding aspects of public versus private provision of environmental services, but these issues are beyond the scope of this report.

**F. CONSTRAINTS ON LOCAL GOVERNMENT DEBT FINANCING**

The ability to issue new bonds or use other types of financing may be constrained by many state and Federal statutes, and by the need to improve all public infrastructures, including highways and rapid transit systems. The analysis does not take into account the following constraints that municipalities may face in issuing debt.

**1. Tax and Expenditure Restrictions**

Many state governments have legislated tax and expenditure restrictions for local governments. These restrictions prevent local governments from exceeding either the established tax rate or levies (revenues) for a given fiscal year. Other limits are set on assessment increases resulting from appreciating property values. Limits may be

placed on total debt incurred by a local government, expressed as a percentage of taxable or assessed property values. Voter approval may be required for a bond referendum, and the criteria for approval can be strict (e. g., two-thirds majority vote, 80% approval of local council members). There are many exceptions to the statutory limitations, and few local governments have reached the limits set by state governments. Nevertheless, with rapidly expanding environmental and other public infrastructure needs, there may be instances where these limits will be binding, particularly when large commitments fall upon smaller governments.

## **2. The 1986 Tax Reform Act**

An important action affecting capital financing by local governments was the 1986 Tax Reform Act. Changes in the tax codes have implications for financing mechanisms that enjoyed tax-exempt status under earlier rules. Revenue and G.O. bonds or "governmental purpose" bonds will maintain their tax-exempt status, provided that private involvement represents less than 10 percent of the uses of the proceeds. When and if tax-exempt status cannot be obtained, the investors will expect higher interest rates and customers will have to pay higher user charge rates to cover the higher cost of debt.

The new tax codes also have implications for private operation and ownership of public facilities. Many of the tax advantages enjoyed by private firms and local governments through public-private financing have been eliminated. Limitations on tax-exempt status for private-activity bonds do not void the option for private operation of public facilities. Maintaining tax-exempt status for capital financing, however, will require governments to retain ownership of, and obligations for supplying, the environmental service. This will not lead to noticeable differences in current practices, but it may affect future capital financial decisions.

### 3. Infrastructure Outlays

Infrastructure constructed made during the 1950s to the 1970s are reaching the end of their useful lives and are in need of rehabilitation and replacement. New requirements have placed greater demands on existing services, and reduced federal grant funding of programs is placing greater responsibility for financing public works on local governments. Government spending for public works has increased in real terms from \$60 billion in 1960 to \$105 billion in 1985. However, public works expenditures as a percentage of national economic indicators, such as Gross National Product, have steadily declined from 3.5 percent to 2.5 percent over this same period. The proportionate rate of decline in capital outlays has been more precipitous, falling from 2.3 percent to 1.1 percent.

Estimates of future public infrastructure needs have been prepared by several private and governmental institutions (Table IV-1). They suggest that there are large current capital needs in all areas of public infrastructure that will extend into the next century. These projections do not include many of the costs that will be incurred when meeting the additional EPA regulations examined in this study. The reports on capital needs project major shortfalls in funding (Table IV-2). New environmental requirements will increase the size of these shortfalls. It should be noted that analyses by the Office of Management and Budget have suggested methods of better defining needs by taking into account the consumers' willingness to pay for these services. These methods may lower the overall level of estimated capital needs and may show no shortfall at all. In any case, the consumers are expected to continue to pay for all infrastructure needs for the foreseeable future. The analysis in this report examines the ability of communities to incur environmental expenditures only. Costs of other infrastructure needs may make it difficult for some communities to raise needed capital even for environmental projects.

TABLE IV-1

THREE NATIONAL NEEDS STUDIES:  
COMPARISON OF ANNUAL CAPITAL INVESTMENT REQUIREMENTS  
(In billions of 1982 dollars)

<u>Infrastructure Category</u>	<u>ACG Study</u> (19 yr. ave.) <sup>a</sup>	<u>CBO Study</u> (1983-90)	<u>JEC Study</u> (1983-2000)
Highways and Bridges	\$ 62.8 <sup>b</sup>	\$ 27.2	\$ 40.0
Other transportation (mass transit, railroads, airports, ports, locks, waterways) <sup>c</sup>	17.5	11.1	9.9
Drinking water	6.9	7.7	5.3
Wastewater treatment	25.4	6.6	9.1
Drainage	5.6	NA	— <sup>d</sup>
Total	\$ 118.2	\$ 52.6	\$ 64.3

<sup>a</sup>The time frame for addressing needs varied by specific infrastructure category from 5 to 25 years and averaged 19 years.  
<sup>b</sup>Highways only. Bridges were estimated separately at an additional, one-time repair cost of \$51.7 billion.  
<sup>c</sup>Needs for locks and waterways were not available from the JEC study; and needs for railroads were not available from the CBO study.  
<sup>d</sup>Included under wastewater treatment.

Source: *Peterson, et. al., Infrastructure Needs Studies: A Critique*, a paper prepared for the National Council on Public Works Improvement by The Urban Institute, July 1, 1986.

AGC : Associated General Contractors of America  
CBO : Congressional Budget Office  
JEC : Joint Economic Committee

TABLE IV-2

THREE NATIONAL NEEDS STUDIES:  
COMPARISON OF ANNUAL CAPITAL INVESTMENT SHORTFALLS  
(in billions of 1982 dollars)

<u>Infrastructure Category</u>	<u>ACG Study</u> (19 yr. ave.) <sup>a</sup>	<u>CBO Study</u> (1983-90)	<u>JEC Study</u> (1983-2000)
Highways and bridges	\$ 44.8	b	\$ 14.7
Other transportation <sup>c</sup>	4.8	b	4.9
Drinking water	4.5	b	2.3
Wastewater treatment	18.4	b	2.7
Drainage	NA	NA	— <sup>d</sup>
Total Shortfall	\$ 71.7	\$ 17.4	\$ 24.6
Total Shortfalls as a percentage of total needs	60.7%	33.170	38.3%

<sup>a</sup>The time frame for addressing needs varied by specific infrastructure category from 5 to 25 years and averaged 19 years.  
<sup>b</sup>Shortfall figures for individual infrastructure categories were not specified, but are included in the total.  
<sup>c</sup>Other transportation includes mass transit, railroads, airports, ports, locks, and waterways. Shortfall estimates for railroads were not available for the CBO study, and shortfalls for mass transit, airports and ports were not available for the AGC study. Neither the AGC nor the JEC study estimated the shortfall for locks, waterways, dams, or the air traffic control system. These however, are maintained in CBO's estimate of total annual shortfall.  
<sup>d</sup>Included under wastewater treatment.

Source: *Peterson, et. al., Infrastructure Needs Studies: A Critique*, a paper prepared for the National Council on Public Works Improvement by the Urban Institute, July 1, 1986

AGC : Associated General Contractors of America  
CBO : Congressional Budget Office  
JEC : Joint Economic Committee

#### **G. BOND ISSUING PROCESS**

This study made two simplifying assumptions regarding the bond issuing process. First, the study assumed that water and sewer systems issue revenue bonds. In practice, however, it is the supporting cities that conduct the required administrative tasks and issue bonds on behalf of the systems. Second, the study assumed that cities prefer to issue revenue bonds, but often it is cheaper to issue G.O. bonds. Therefore, a city may choose G.O. bonds over revenue bonds, especially if the city is in good financial condition.

For the above reasons, care should be taken in interpreting the results of the study. One of the primary goals of this undertaking is to better understand the difficulty of considering the ramifications of proposed EPA actions on local governments. Whether or not the results of this study can be used to accurately predict the number of municipalities that will have difficulties in meeting these new regulations is uncertain. The fact that EPA acknowledges the importance of this information and has made an effort to tackle this issue, in and of itself, is a positive step toward developing a better regulatory process.

## V. POLICY CONSIDERATIONS

The primary finding of the municipal sector study is that many small and some large communities will face serious difficulty in raising the capital needed to improve environmental services. The problem is partly due to the timing of the needs -- a large new set of requirements to be met in a fairly short time period -- partly due to weak financial conditions of water and sewer systems and municipalities.

A number of activities have been suggested to support the efforts of all communities to comply with environmental regulations.

### A. PUBLIC EDUCATION INITIATIVES

Public education has two purposes. First, making the people aware of the potential net benefits to be gained by investing in environmental protection should increase their stated willingness to pay for the project or service. Second, where the environmental benefits are diffuse and it is difficult to assign benefits to specific groups of payers (e. g., long-distance air pollution), moral suasion may improve compliance as people become aware of the larger cooperative undertaking that is being proposed. Public notification requirements, and efforts to better communicate information on pollution risks, are but a few of the methods at the disposal of federal, state and local governments for including the public in establishing environmental programs and setting priorities.

### B. TECHNICAL ASSISTANCE INITIATIVES

#### 1. Technical Assistance

In many cases, small communities do not need full-time personnel in all specialties or service areas. Provision (for a fee) of such services by a central authority, either the federal government or state

governments could allow small communities to gain from economies of scale and scope.

Such technical assistance programs could take the form of either guidance -- such as sharing scientific, technical, or management information -- or such technical services as supplying laboratory or engineering services. In addition, educational institutions (technical and academic) can continue to play an important role in working with local communities in need of their particular levels of expertise.

## **2. Public Partnerships**

Partnerships provide an informal mechanism for communities to share expertise, to purchase services and goods in larger volumes for discounts, and, more formally, to raise capital in larger, more cost-effective blocks. Partnerships between unequal entities could be encouraged by providing incentives to the larger (wealthier) partner. Potential partners include large cities and small cities, well-to-do cities and poor cities, and urban cities and rural cities.

## **3. Regionalization**

Regionalization is a more structured form of partnership, in which two or more communities create a joint venture for a particular purpose, such as construction of a water supply system. This action allows a variety of efficiency gains, including economies of scale and scope, and large-volume purchase discounts. The use of regionalized services may be more suitable for some environmental services, but not necessarily for all services. For example, in those instances where regionalization may lead to a central waste collection and disposal service and to concentration of pollution risks, the centralization of treatment and disposal operations must be examined.

## C. FINANCIAL INITIATIVES

### 1. Reform of Existing Rate Structure

In cases where the basic management structure is in place, rate reform may still be needed. Rate reform may include raising the level of rates (increasing revenue) or changing the rate structure (e.g., instituting marginal cost pricing, including peak load pricing when appropriate). Communities can examine current rate structures to insure that rates are generating revenues equal to the full cost of services. Current provisions for obtaining federal grants include this element, and efforts are underway to evaluate whether communities have been establishing suitable rate structures.

### 2. Development Taxes

Special taxes may be levied in areas undergoing rapid growth and development. These assessments could be earmarked for the improvement of environmental services and could be levied on developers directly or on property owners who expect to profit from development. As environmental improvements often affect property values, a similar approach might be used even in relatively low-growth areas. Many specific versions of development taxes have been devised. A few of the more common are:

- ad valorem on property;
- exactions from developers (in kind or cash); and
- tax incremental financing (tax rates are not changed, but as property values rise, property tax revenues above a baseline are devoted to special uses, such as sewage system construction or road building).

### **3. Special Revenue Districts**

Certain geographic areas, within one political jurisdiction or several jurisdictions, are created for the purpose of raising revenue from residents in the area to be used for specified purposes. Examples include road districts, sewer and water districts, or other types of local service districts.

### **4. Enterprise Fund Management**

Utilities or enterprise fund management systems are used to ensure that revenues raised from certain groups of payers are used for the intended purpose and are managed according to sound financial principles. Organizations of these types can help to balance costs and revenues by improving financial management and, therefore, can improve access to capital markets.

### **5. Direct Financial Assistance**

Direct financial assistance may be appropriate for low-income communities where it is agreed that the environmental protection services should be made available to all citizens, regardless of ability to pay. It may be appropriate to provide assistance only to those communities that fail an "income" or other "means" test. Such assistance could be from state governments, which would need to consider adopting appropriate tests for directing financial assistance, and utilizing them in a consistent manner across their states. Direct financial assistance could be in the form of either grants or loans for communities that cannot afford the services in the long run or loans for communities that are experiencing short-term cash-flow problems.

## **D. OTHER ACTIONS**

### **1. Extended Compliance Schedules**

If certain environmental regulations do not seem reasonable for a specific group of people, or if the timing of the compliance schedule is not reasonable, then a delay of the regulation or a permanent exemption may be appropriate. Such actions should only be allowed subject to certain constraints, such as that no "unreasonable risk to health" would be created. In all instances, the ability to grant exemptions is dictated by existing legislation. Several existing laws allow for exemptions, but the rules are not consistent, and do not dictate what measures should be considered when allowing for an exemption. The EPA does not have an internally consistent method for determining when the costs of a requirement are unaffordable, either to the household, or for purposes of evaluating the cumulative economic impacts of its programs. Efforts are underway within EPA to resolve existing inconsistencies, and establish a protocol for granting exemptions where allowed for by law.

### **2. Privatization**

Communities can explore methods of working with private companies to assist in the provision of environmental services. Several aspects of privatization include:

- Private sector ownership, construction and/or operation facilities (reduce cost of services by taking advantage of economic and/or administrative efficiencies)
- Private financing of new capital formation, or refinancing existing financial obligations (reduce financial obligations of community).

Private companies have been involved in the provision of several environmental activities, particularly solid waste and drinking water services, and a growing number of companies are expressing interest in providing wastewater treatment services.

Despite the potential advantages of public/private partnerships, the current supply of private firms is relatively small. Private involvement in many environmental services can be affected by federal and state tax requirements, several of which have undergone significant revisions in recent years. Some of the revisions have reduced the tax advantages of public/private ownership. In addition, decisions to use private companies require considerable effort in establishing contractual arrangements and liability responsibilities in cases of damages or permit violations. EPA is currently investigating this issue in greater depth, and plans to hold several conferences with experts in the field and interested parties in the coming months.

**E. ADDITIONAL RESEARCH**

An important finding of the municipal sector study is that not all small communities are expected to face financial difficulties. This fact suggests that further analysis should be conducted to identify the characteristics of small communities that make them more likely to experience difficulty in financing and affording new environmental protection. For example, does a problem typically arise in small communities that are:

- very small or sparsely populated (lack economies of scale and scope),
- poorly managed (have poor access to financial markets),
- low income (are unable to afford environmental protection),
- rural (have poor access to technical services),
- uninformed (lack understanding of the importance of environmental protection),
- facing significant environmental burdens (are currently investing an above average amount of resources to combat existing pollution problems), or
- located in a particular state (are some states more aggressive in assisting their financially constrained communities)?

If EPA could identify those characteristics of small communities that

inhibit compliance with environmental regulations, then it could design an assistance strategy that is targeted to the sources of the problem.

APPENDIX A

BASELINE DATA

**APPENDIX A - BASELINE DATA**

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## **I. GENERAL DESCRIPTION OF THE DATA**

### **A. THE SAMPLE**

The sample was taken from a population of approximately 12,000 Publicly Owned Treatment Works. Sample cases were selected by means of a stratified random sample for five different flow ranges (Table A-1). Of the 700 local governments in the sample 285 responded by sending various financial documents. The final database for the Municipal Sector consists of 270 cases (Tables A-2, A-3).

The local governments in the sample were contacted several times. First, all 700 communities were reached by telephone in order to explain what was needed and to find out to whom the request should be sent. Then letters were mailed to all the communities. A few weeks after the first round of letters had been sent, follow up letters were sent to everyone who had yet to respond. After this stage, hundreds of calls were made to obtain information from those who failed to respond and to get additional specific data for the purpose of completing the study. The result of this effort was a relatively high response rate.

### **B. DATA EXTRACTION**

Various types of documents were received by local governments and authorities including:

- Comprehensive Annual Financial Reports.
- Official General Obligation and Revenue Bond Statements.
- Water and Sewer system annual and financial reports.
- Ordinances and service rate schedules.
- Various types of planning reports.

Specific financial and debt information was extracted from the documents. The data includes: environmental expenses and revenues

TABLE A-1

NUMBER OF SELECTED POTWs

BY FLOW CATEGORY

(Providing Secondary or Greater Treatment)

Flow Ranges (mgd)	Number of Plants	Number Selected for Sample
less than 0.01	445	-0-
0.01 - 0.10	2,759	144
0.11 - 1.0	5,381	149
1.01 - 2.0	1,031	132
2.01 - 10.0	1,450	140
10.01 and up	<u>494</u>	<u>132</u>
	11,560	697

Source: 1986 Needs Survey Database and PP&E analysis

TABLE A-2

Distribution of Municipal Database Sample  
by Municipality Size Categories

Municipality Size Categories	Number in Sample	Average Household Income
0 - 2,500	59	\$ 24,505
2,500 - 10,000	55	\$ 29,336
10,000 - 50,000	83	\$ 30,438
50,000 - 250,000	54	\$ 33,343
> 250,000	19	\$ 32,238
TOTAL	270	

TABLE A-3

CITIES RESPONDING TO PP&E'SUSER CHARGE SURVEY

CITY	ST	CITY	ST	CITY	ST	CITY	ST	CITY	ST	CITY	ST
TRUSSVILLE	AL	HARLAN	IA	FITCHBURG	MA	JACKSON	Ms	ORRVILLE	OH	KNOX CITY	TX
OXFORD	AL	FAIRFAX	IA	MILFORD	MA	CORINTH	Ms	MAUHEE	OH	FREEPORT	TX
SPRINGVILLE	AL	CARROLL	IA	LOWELL	MA	ROANOKE RAPIDS	NC	STEUBENVILLE	OH	WEBSTER	TX
ULM	AR	BEACON	IA	MONTAGUE	MA	DURHAM	NC	TROY	OH	PALESTINE	TX
SILOAM SPRINGS	AR	ORANGE CITY	IA	LAWRENCE	MA	BOILING SPRS	NC	RAVENNA	OH	CALDWELL	TX
JUDSONIA	AR	BOXHOLM	IA	GAITHERSBURG	MD	Greensboro	NC	GREENVILLE	OH	BRENNHAM	TX
SULPHUR SPRINGS	AR	WEISER	ID	Rockville	MD	WINSTON-SALEM	NC	VANDALIAI	OH	RICHARDSON	TX
SCOTTSDALE	AZ	SANDPOINT	ID	Upper Marlboro	MD	BUNN	NC	BATAVIA	OH	HOUSTON	TX
TUCSON	AZ	SYCAMORE	IL	CHURCHTON	MD	MONROE	NC	ANDOVER	OH	WICHITA FALLS	TX
PALO ALTO	CA	OTTAWA	IL	WATERVILLE	ME	WILLIAMSTON	NC	MCALESTER	OK	ROBERT LEE	TX
SEASIDE	CA	URBANA	IL	PORTLAND	ME	CHARLOTTE	NC	ARDMORE	OK	DALLAS	TX
STOCKTON	CA	SPRING VALLEY	IL	OLD ORCHARD BEA	ME	GASTONIA	NC	WOODWARD	OK	EL PASO	TX
NOVATO	CA	WAUKEGAN	IL	PITTSFIELD	ME	ALBEMARLE	NC	CHOCTAW	OK	TYLER	TX
LOMPOC	CA	ROCK FALLS	IL	THREE RIVERS	MI	THOMASVILLE	NC	LINCOLN CITY	OR	CORPUS CHRISTI	TX
RIVERSIDE	CA	CRYSTAL LAKE	IL	GRAND RAPIDS	MI	CANDO	ND	DALLAS	OR	LOGAN	UT
PETALUMA	CA	ELGIN	IL	FLINT	MI	RUGBY	ND	REEDSPORT	OR	SALT LAKE CITY	UT
IRVINE	CA	DURAND	IL	NILES	MI	YORK	NE	HERMISTON	OR	LURAY, TOWN OF	VA
SO SAN FRANCISCO	CA	BOLINGBROOK	IL	BAY CITY	MI	SIDNEY	NE	CANBY	OR	CHRISTIANSBURG	VA
REDDING	CA	MAHOMET	IL	CADILLAC	MI	GRAND ISLAND	NE	LANCASTER	PA	ROANOKE	VA
SANTA BARBARA	CA	AURORA	IL	ADRIAN	MI	FRIEND	NE	CHAMBERSBURG	PA	NEWPORT NEWS	VA
HAYWARD	CA	CARTERVILLE	IL	SCOTVILLE	MI	SCOTTSBLUFF	NE	TOPTON	PA	EVERETT	WA
ESTES PARK	CO	QUINCY	IL	DETROIT	MI	BROWNVILLE	NE	SAEGERTONN	PA	WENATCHEE	WA
GLENWOOD SPRS	CO	HEYWORTH	IL	MILFORD	MI	TECUMSEH	NE	PITTSBURGH	PA	OAK HARBOR	WA
HOTCHKISS	CO	DONGOLA	IL	SHAKOPEE	MN	CONCORD	NH	INDIANA	PA	VANCOUVER	WA
MILLIKEN	CO	CORDOVA	IL	GRAND RAPIDS	MN	LAMBERTVILLE	NJ	PALMYRA	PA	TACONA	WA
Northglenn	CO	SPRINGFIELD	IL	GLYNDON	MN	CHERRY HILL	NJ	MYERSTOUN	PA	WINLOCK	WA
FORT COLLINS	CO	COLUMBUS	IN	STARBUCK	MN	BRIDGETON	NJ	SLATINGTON	PA	SILVER LAKE	WI
ECKLEY	CO	RUSHVILLE	IN	RICHMOND	MN	RARITAN TWP	NJ	CHARLEROI	PA	GREEN BAY	WI
LONGMONT	CO	EVANSVILLE	IN	WINONA	MN	MOUNT LAUREL TW	NJ	CLAIRTON	PA	BEAR CREEK	WI
NEW LONDON	CT	ELWOOD	IN	RENVILLE	MN	HADDONFIELD	NJ	YORK	PA	DE PERE	WI
NORWALK	CT	MORGANTOWN	IN	MOTLEY	MN	ROSWELL	NM	LEWISBURG	PA	ELEVA	WI
HARTFORD	CT	ABILENE	KS	STEPHEN	MN	JEMEZ SPRINGS	NM	IRWIN	PA	ETTRICK	WI
BRIDGEPORT	CT	WELLINGTON	KS	ALDEN	MN	ARTESIA	NM	NEW BRIGHTON	Pa	WATERTOUN	WI
Dover	DE	Kansas City	KS	FORESTON	MN	LAS VEGAS	NV	UNION	SC	WILTON	WI
BRADENTON	FL	Shawnee	KS	FRANKFORD	MO	GREENE	NY	GREENVILLE	SC	KENOSHA	WI
WNTER HAVEN	FL	EDGERTOWN	KS	ST. JAMES	MO	SUFFERN	NY	MYRTLE BEACH	SC	HUDSON	WI
PORT ST JOE	FL	KENSINGTON	KS	HERMITAGE	MO	LONG BEACH	NY	GAFFNEY	SC	BELOIT	WI
PENSACOLA	FL	TOPEKA	KS	Hillsboro	MO	ROCHESTER	NY	GAFFNEY	SC	CASHTON	WI
PLANTATION	FL	HUTCHINSON	KS	URBANA	MO	MAYBROOK	NY	AIKEN	SC	Parkersburg	WV
Atlanta	GA	HERINGTON	KS	CALHOUN	MO	HORNELL	NY	SPRINGFIELD	SD	BLUEFIELD	WV
DALTON	GA	CONCORDIA	KS	WARRENSBURG	MO	ARCADE	NY	SHELBYVILLE	TN	CHARLESTON	WV
AUGUSTA	GA	OVERLAND PARK	KS	KANSAS CITY	MO	NORTH TONAWANDA	NY	MEMPHIS	TN	LA BARGE	WY
MACON	GA	MIDDLESBORO	KY	INDEPENDENCE	MO	WALLKILL	NY	OAK RIDGE	TN	KEMMERER	WY
GRIFFIN	GA	MONROE	LA	ASHLAND	MS	OBERLIN	OH	Nashville	TM		
ANAMOSIA	IA	SAREPTA	LA	GREENVILLE	MS	Cleveland City	OH	SPRINGFIELD	TN		
UNDERWOOD	IA	OAK GROVE	LA	OCEAN SPRINGS	MS	DAYTON	OH	CLEVELAND	TN		
DUBUQUE	IA	HOUMA	LA	ARTESIA	MS	LOGAN	OH	GALVESTON	TX		
MERRILL	IA	THIBODAU	LA	MOSS POINT	MS	LIMA	OH	FARMERSVILLE	TX		

information regarding residential use; numerous items concerning debt and debt service; general government revenues; and, market value of taxable property (Exhibit A-1).

**C. THE QUALITY OF THE DATA**

The financial data was gathered from over 1,000 documents and over 500 telephone calls for additional specific information. The financial documents were thoroughly examined. Approximately one half of a man-year was spent analyzing, assimilating and compiling the data.

As a result of this massive effort, many costs were accurately identified. For example, the percentage of total revenues from residential users was ascertained as well as the number of households using a particular system or service. Another example was the discovery of what households were actually paying for their water and sewer services. Specifically, it was determined whether general obligation debt (for water and/or sewer) was serviced by general funds (i.e. property taxes) or enterprise funds (i.e. user fees).

**D. THE VALIDITY OF THE DATA**

The baseline data was compared, to the extent possible, with census results. These comparisons, which allowed for inflation and other factors, revealed only small (e.g. 5 percent) discrepancies in the baseline data.

Furthermore, 95% confidence intervals were calculated for sewer, water, and solid waste means, with excellent results. The mean of annual household income for sewer was 0.44 % with a confidence interval of plus or minus 0.03 %; for water the mean was 0.53% with a confidence interval of plus or minus 0.04 %; and for solid waste the mean was 0.32 % with a confidence interval of plus or minus 0.04 %.

EXHIBIT A-1

DATA BEING EXTRACTED FROM  
FINANCIAL REPORTS OF CITIES IN THE STUDY

CITY:

DATE :

SEWER REV. RATING: /  
G.O. BOND RATING: /  
Moody's/S&P

**1. ENVIRONMENTAL EXPENSES**

(Source: Enterprise Fund/General Fund)

	<u>SEWER</u>	<u>WATER</u>	<u>SOLID WASTE</u>
PAGE #, DOCUMENT:	_____	_____	_____
O&M:	_____	_____	_____
DEPRECIATION	_____	_____	_____
Less Depreciation on contributed assets	_____	_____	_____
INTEREST EXPENSE	_____	_____	_____
Less INTEREST REVENUE	_____	_____	_____
Other Non-Operating Expenses less Revenue	_____	_____	_____
G.O. BOND                      Int. (Source: Debt Service Fund)                      Princ.	_____	_____	_____
Other (e.g. Extraordinary loss/gain on refunding:	_____	_____	_____
<b>TOTAL</b>	_____	_____	_____
<b>REVENUES</b>	_____	_____	_____
Net Transfers out	_____	_____	_____
Increase in Retained Earnings	_____	_____	_____

**II. HOUSEHOLDS**

# of Households:	_____	Pg/Doc. _____
# of Service Conn.	_____	_____
Population	_____	Pg/Doc. _____
Monthly Charge: (9,000 gal/mo.)	_____	_____ Pg/Doc. _____

**III. SEWER/WATER USERS**

	NUMBER	FLOW	REVENUES	Pg/Doc.
Residential:	_____	_____	_____	_____
Commercial:	_____	_____	_____	_____
Industrial:	_____	_____	_____	_____

**IV. DEBT**

Annual debt service (prin. & int.)  
(Source: Governmental fund types)  
(Debt Service, General Fund &  
Special Revenue):

	_____	_____
General Obligation Debt:	_____	_____
Enterprise G.O. Debt:	_____	_____
Revenue Debt:	_____	_____
Other:	_____	_____
Other:	_____	_____
Other:	_____	_____
Total Direct Long-term Debt:	_____	_____
Overlapping Debt:	_____	_____
Total Direct and Overlapping Debt:	_____	_____
Legal Debt Limit:	_____	* _____ = _____
Legal Debt Margin:		_____
Voting		_____
Nonvoting:		_____

Revenue Debt Margin:	_____	_____
Voting:	_____	_____
Nonvoting:	_____	_____

**V. LOCAL GOVERNMENT REVENUES**

General Fund:	_____	_____
Special Revenue:	_____	_____
Debt Service:	_____	_____
Capital Projects:	_____	_____
Special Assessment:	_____	_____
Expendable Trust:	_____	_____
<b>TOTAL</b>	_____	_____

**VI. TAXABLE PROPERTY**

Market Value of Property:	_____	_____
OR Calculate Market Value		
Assessed Value:	_____	_____
Assessment Rate:	_____	_____
OR Calculate Assessment Value		
Property Tax Rate:	_____	_____
Property Taxes Collected:	_____	_____

## **II. WATER BASELINE DESCRIPTION**

The average household pays approximately one half of one percent (0.532%) of its gross income on water (Figure A-1). The average for households in municipalities with populations of less than 2,500 is higher (0.562%) (Figure A-2). The percent of gross household income devoted to water services is also higher for municipalities with populations between 2,500 and 10,000 than it is for the overall average (Figure A-3). The average for large municipalities with populations over 10,000 is smaller (0.501%) than the national average (Figure A-4). Residents of smaller municipalities typically pay a higher percent of their gross income on water services than do residents of larger municipalities.

The national mean and standard deviation were calculated to be 0.53% and 0.29%, respectively. For the purposes of this study, we developed three thresholds, 1.0 %, 1.25 % and 2.0 %, that represent varying degrees of excessive user charges (Table A-4).

The average annual household expenditure for water services is \$149 for the nation (Figure A-5).

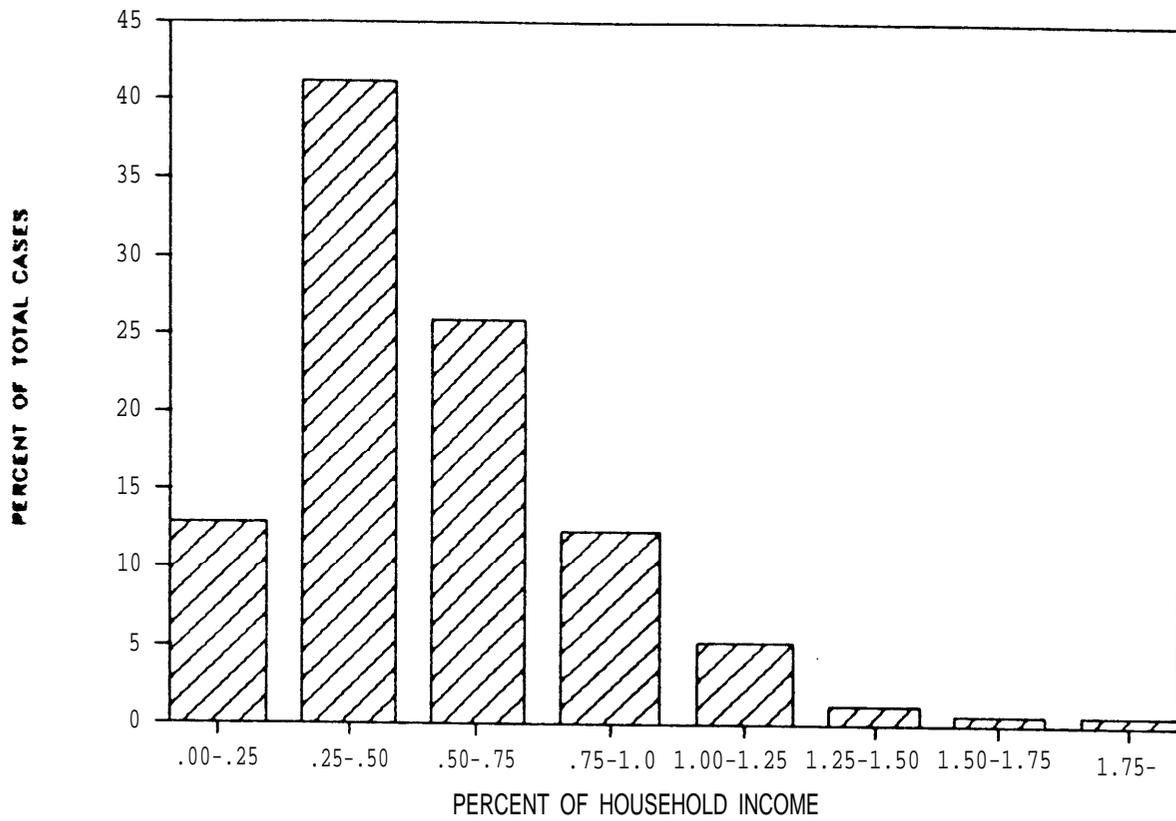
TABLE A-4

WATER CHARGES AS A PERCENT OF HOUSEHOLD INCOME

Size Category	Number of Cases	Mean	Standard Deviation
Less than 2,500	35	.562	.303
2,500 - 10,000	34	.59	.351
Greater than 10,000	101	.501	.262
<b>All Cases</b>	<b>170</b>	<b>.532</b>	<b>.293</b>

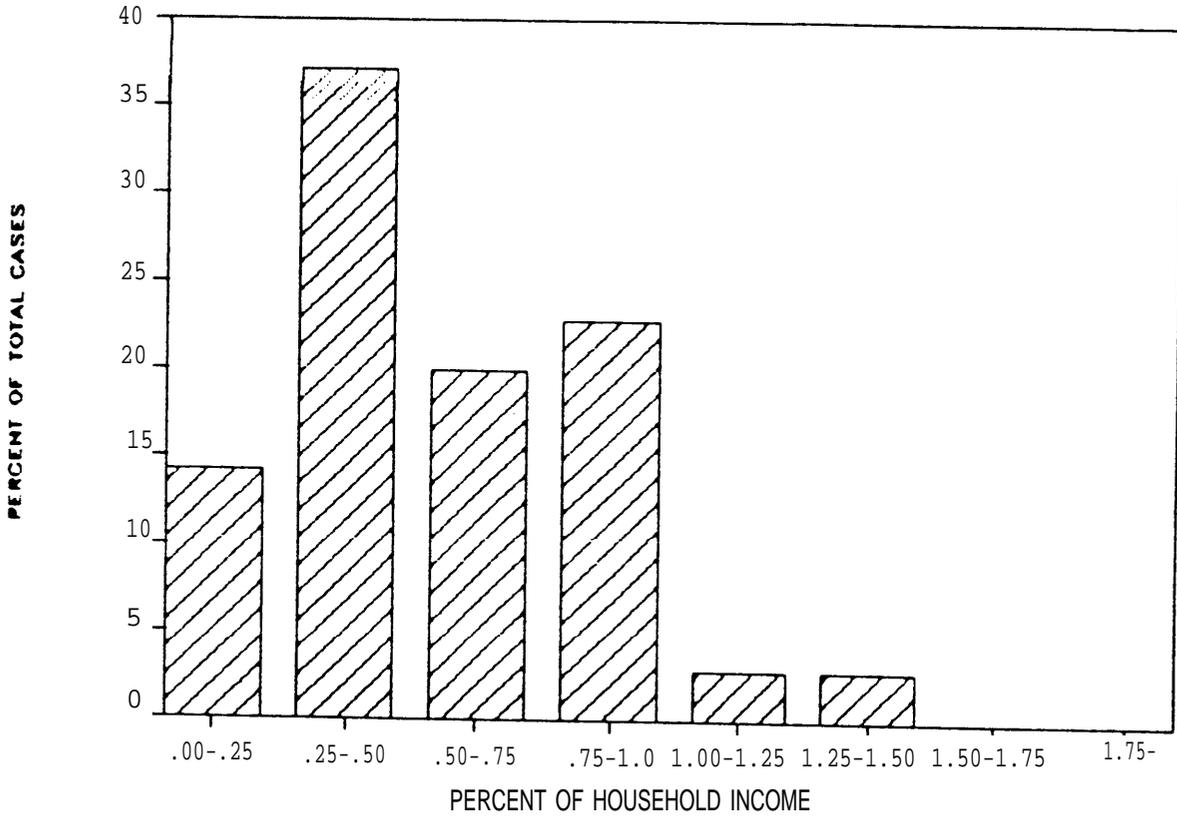
WATER USER CHARGES AS PERCENT  
OF GROSS HOUSEHOLD INCOME  
(All Communities)

FIGURE A-1



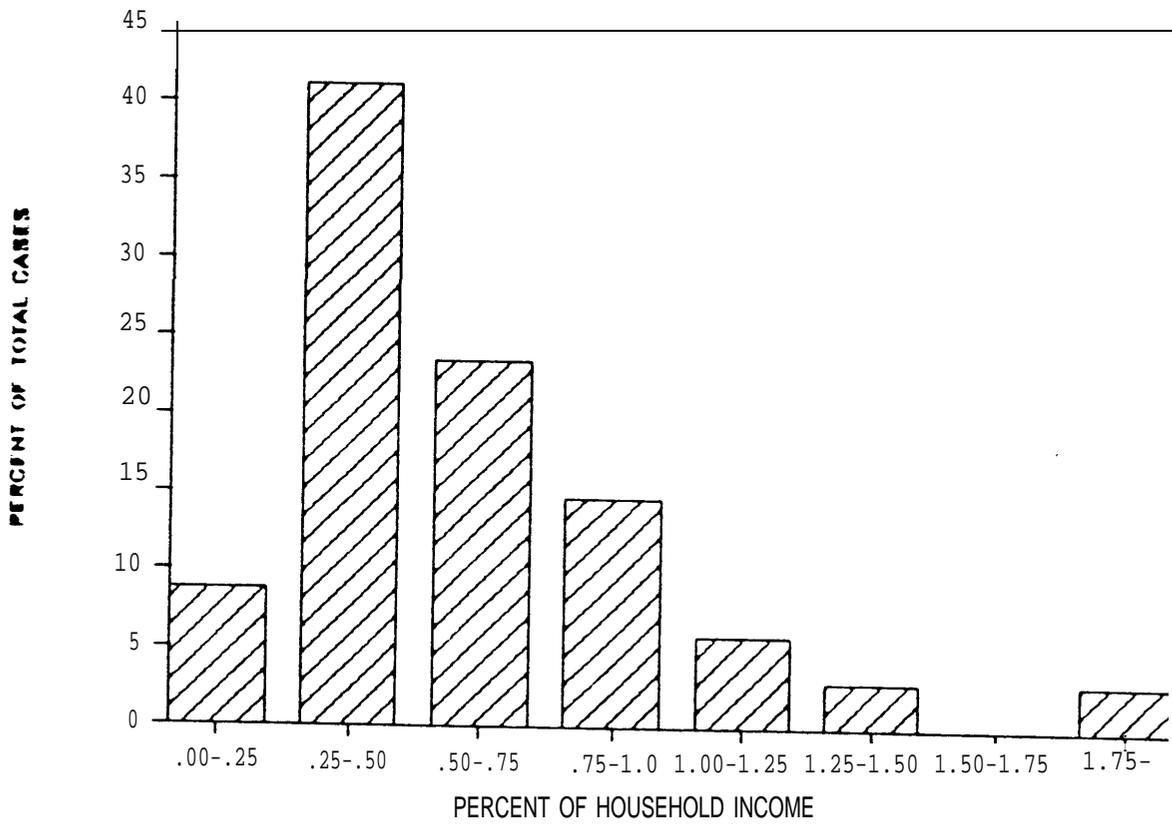
WATER USER CHARGES AS PERCENT  
OF GROSS HOUSEHOLD INCOME  
(Communities with Population  
Less Than 2,500)

**FIGURE A-2**



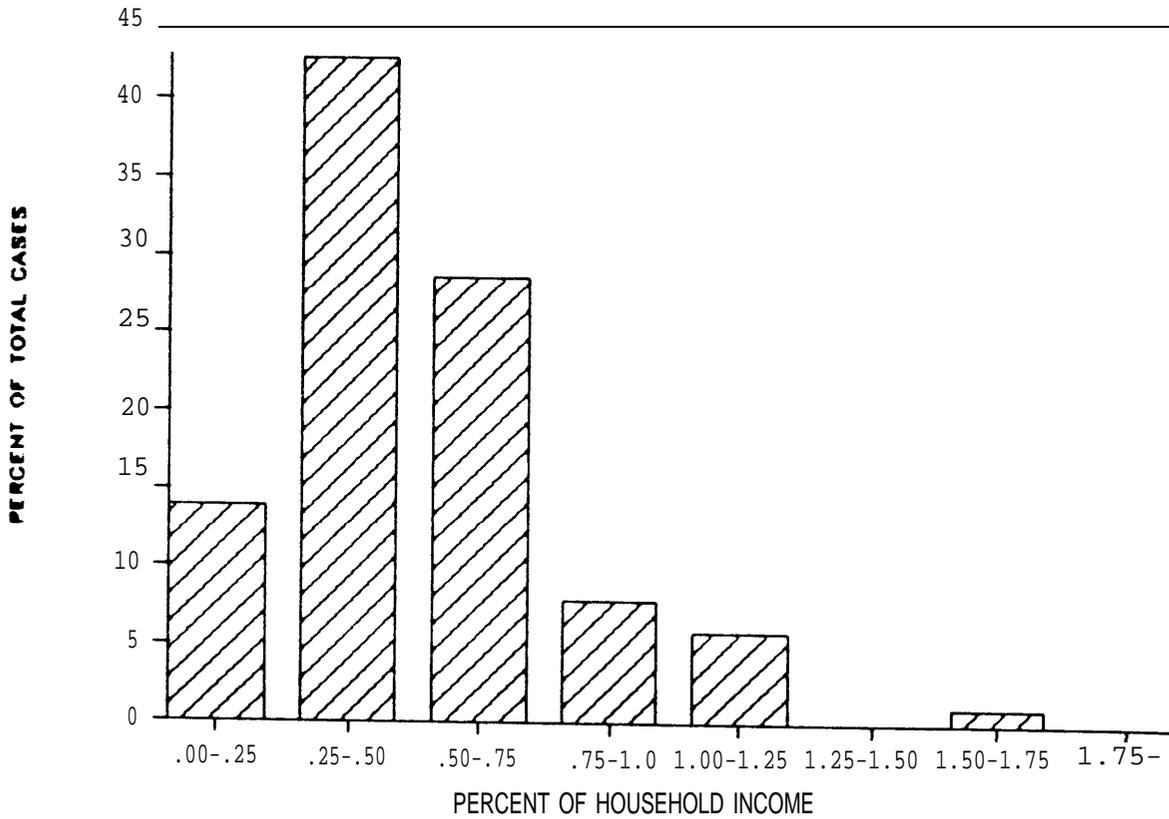
WATER USER CHARGES AS PERCENT  
OF GROSS HOUSEHOLD INCOME  
(Communities with Population  
Between 2,500 and 10,000)

FIGURE A-3



WATER USER CHARGES AS PERCENT  
OF GROSS HOUSEHOLD INCOME  
(Communities with Population  
Greater Than 10,000)

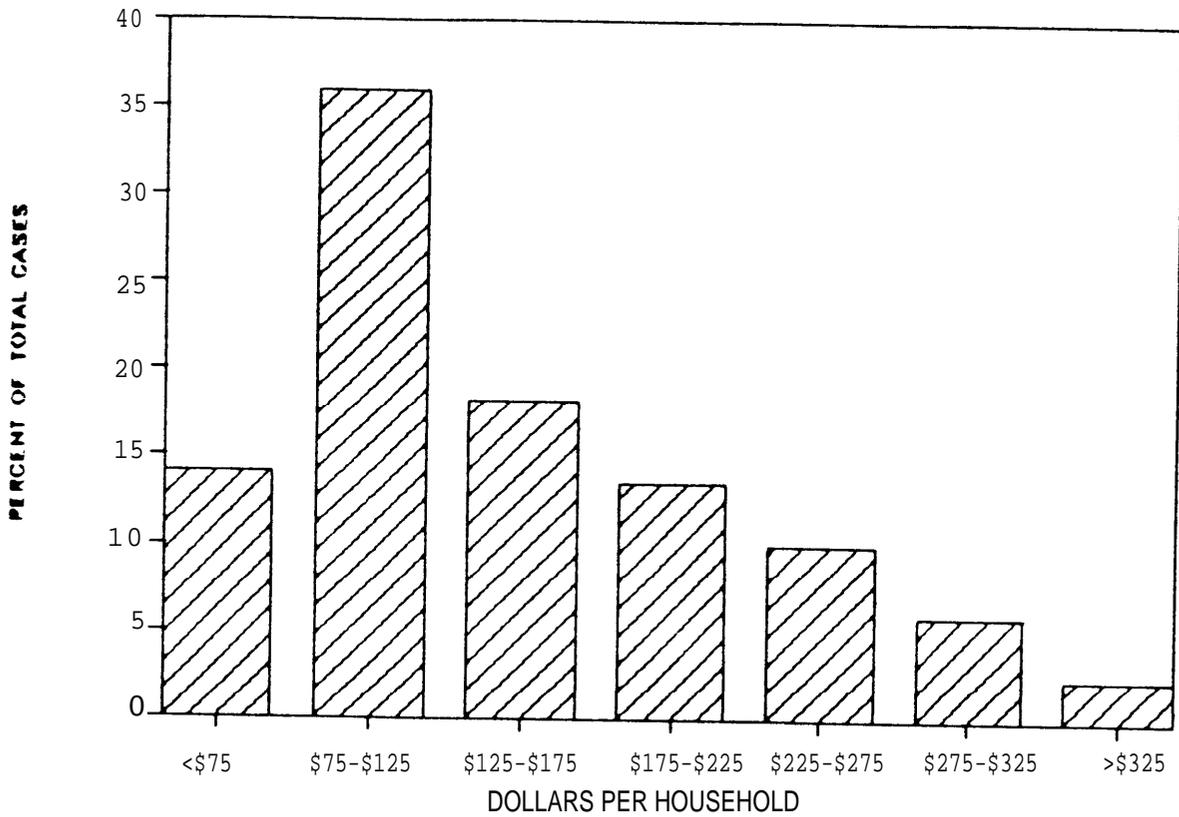
**FIGURE A-4**



ANNUAL HOUSEHOLD EXPENDITURES FOR WATER

(In Dollars)

FIGURE A-5



### III. SEWER BASELINE DESCRIPTION

The average annual household expenditure for sewer is 0.44 percent of gross household income (Table A-5 and Figure A-6). This average was also determined for three population categories: communities under 2,500 (0.511%); communities between 2,500 and 10,000 (0.442%) and; communities over 10,000 (0.426%). (See Figures A-7, A-8, and A-9). Smaller communities (less than 2,500), on the average pay significantly more per household for wastewater services (19.8%) than larger communities (over 10,000). This is a relatively greater difference than that found in drinking water user fees compared with water costs. Wastewater facilities are more capital intensive. Some of the difference between the two is attributable to economies of scale in the production of wastewater treatment. There may also be a reluctance on the part of smaller communities to recover the final costs of water treatment through user fees, and rely instead on partial recovery through general revenues (e.g., property taxes).

The national mean and standard deviation were calculated to be 0.44% and 0.25%, respectively. For the purposes of this study, we developed three thresholds, 1.0 %, 1.25 % and 2.0 %, that represent varying degrees of excessive user charges.

The average annual household expenditure for sewer services is \$127 (Figure A-10).

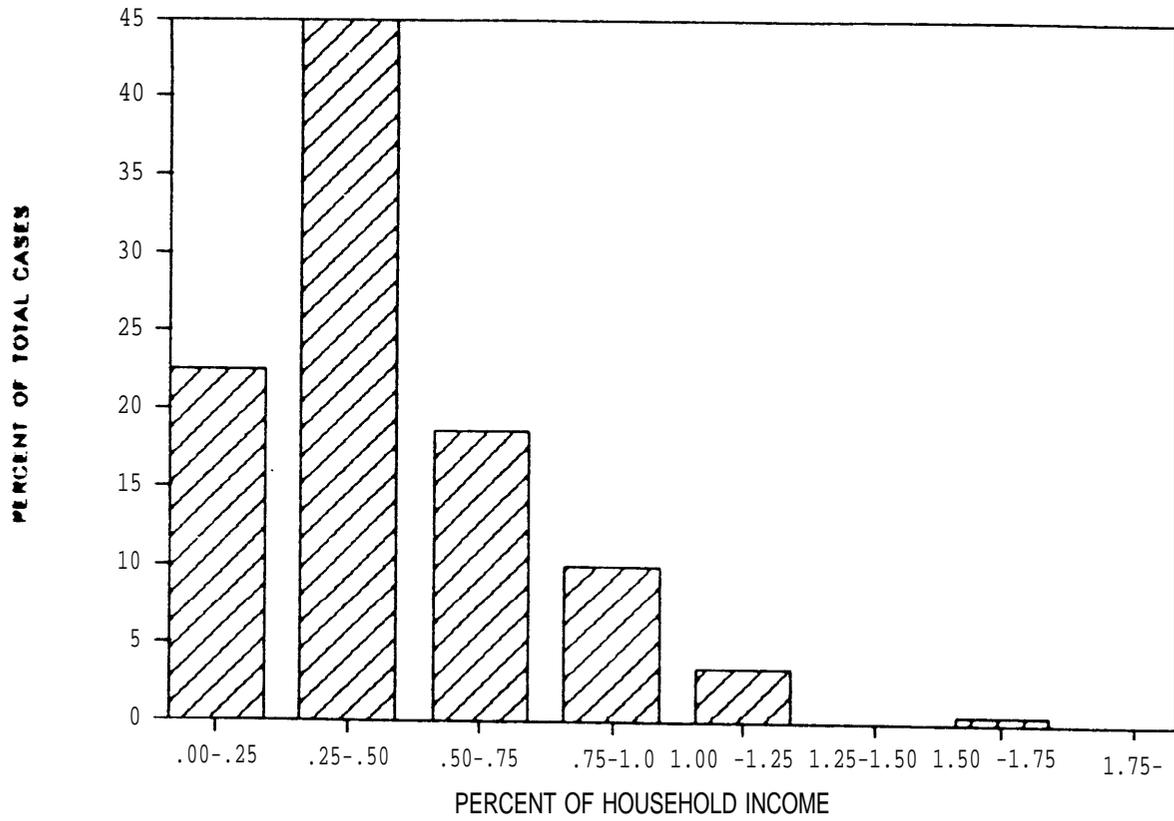
TABLE A-5

SEWER CHARGES AS A PERCENT OF HOUSEHOLD INCOME

Size Category	Number of Cases	Mean	Standard Deviation
Less than 2,500	48	.511	.337
2,500 - 10,000	51	.442	.203
Greater than 10,000	132	.426	.226
<b>All Cases</b>	<b>231</b>	<b>.447</b>	<b>.251</b>

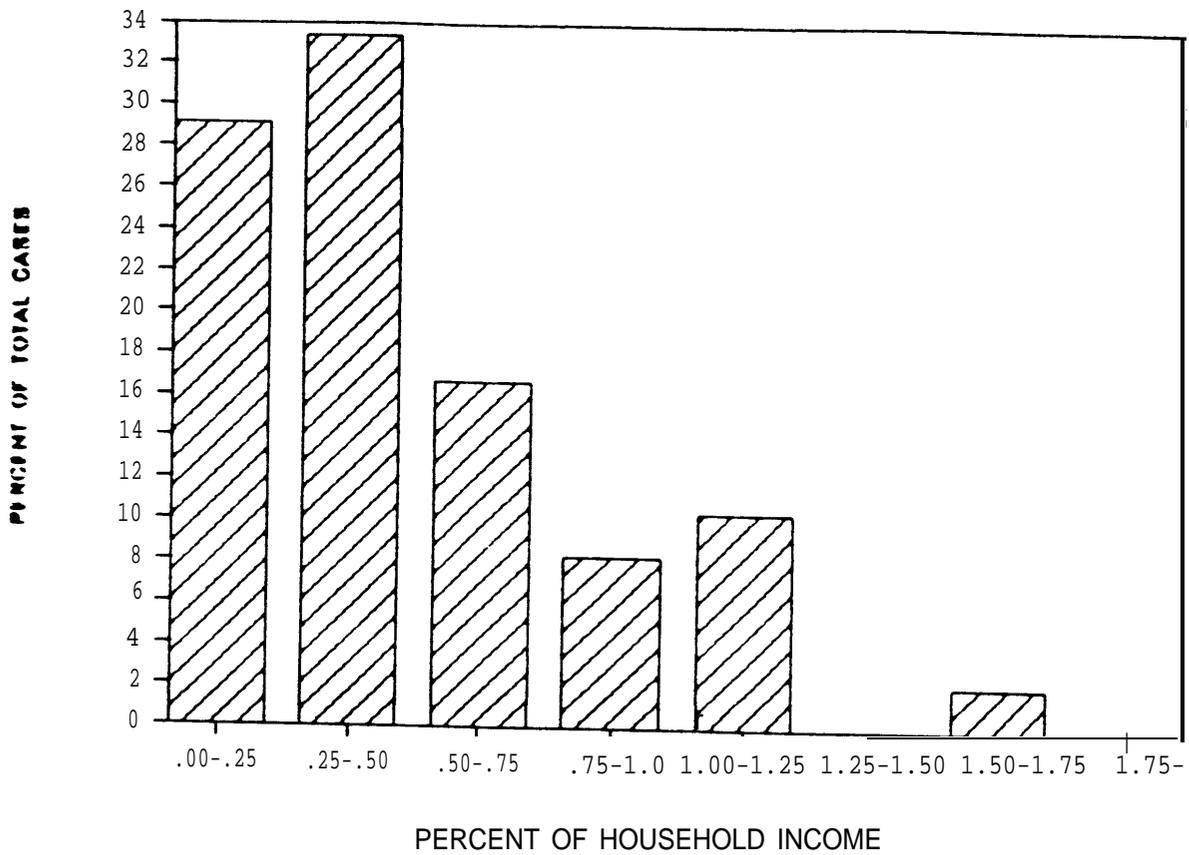
SEWER USER CHARGES AS PERCENT  
OF GROSS HOUSEHOLD INCOME  
(All Communities)

FIGURE A-6



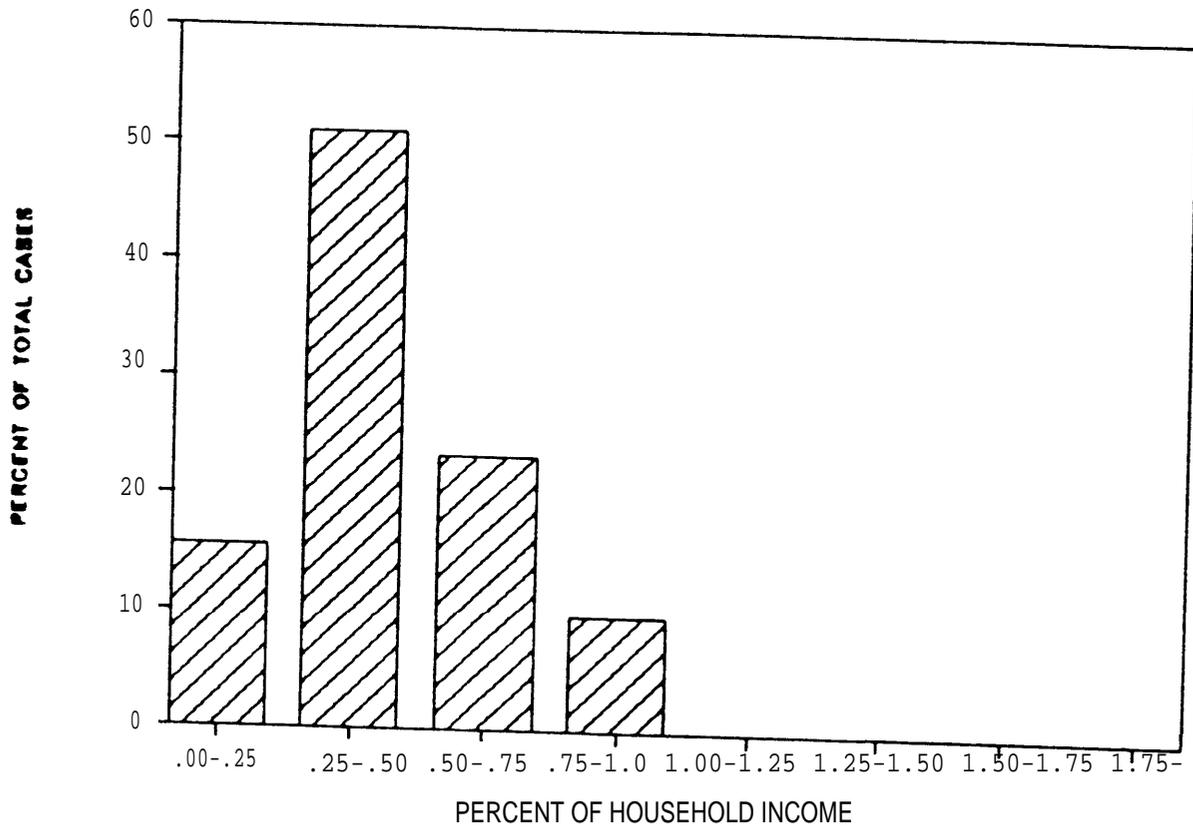
SEWER USER CHARGES AS PERCENT  
OF GROSS HOUSEHOLD INCOME  
(Communities with Population  
Less Than 2,500)

FIGURE A-7



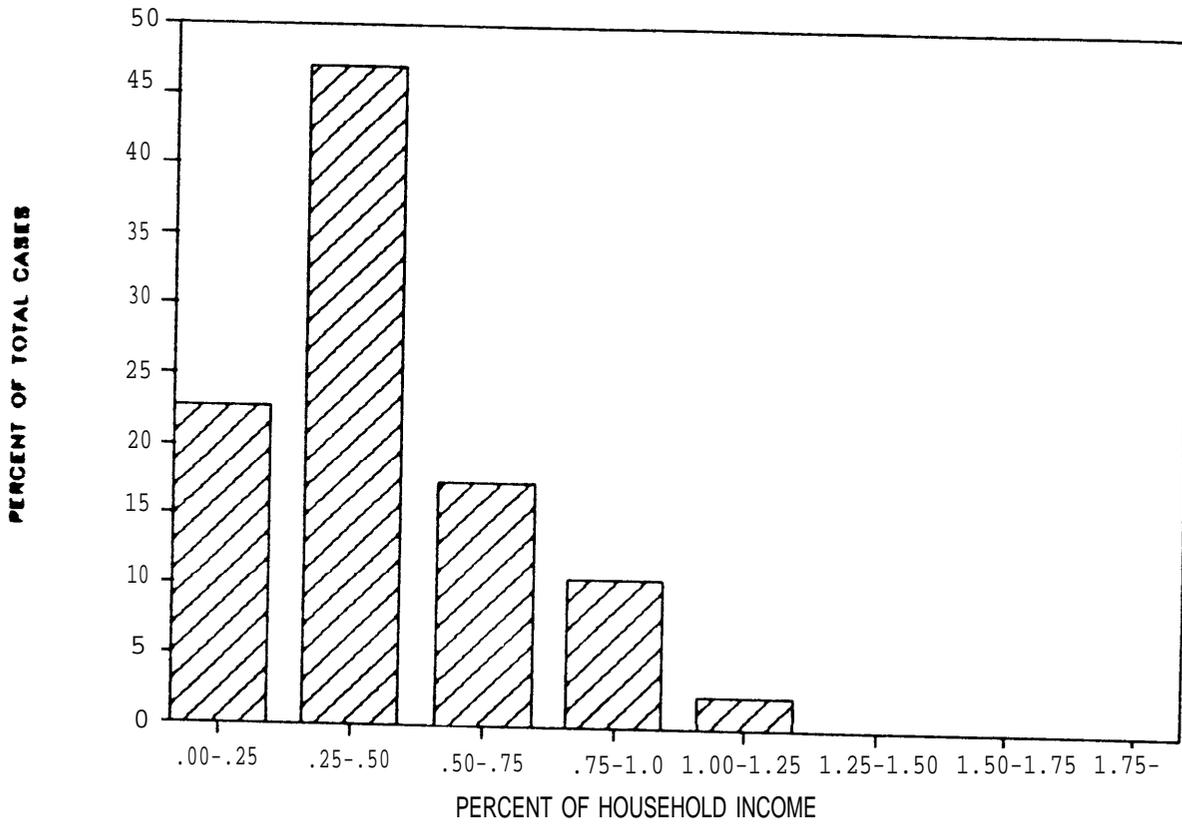
SEWER USER CHARGES AS PERCENT  
OF GROSS HOUSEHOLD INCOME  
(Communities with Population  
Between 2,500 and 10,000)

FIGURE A-8



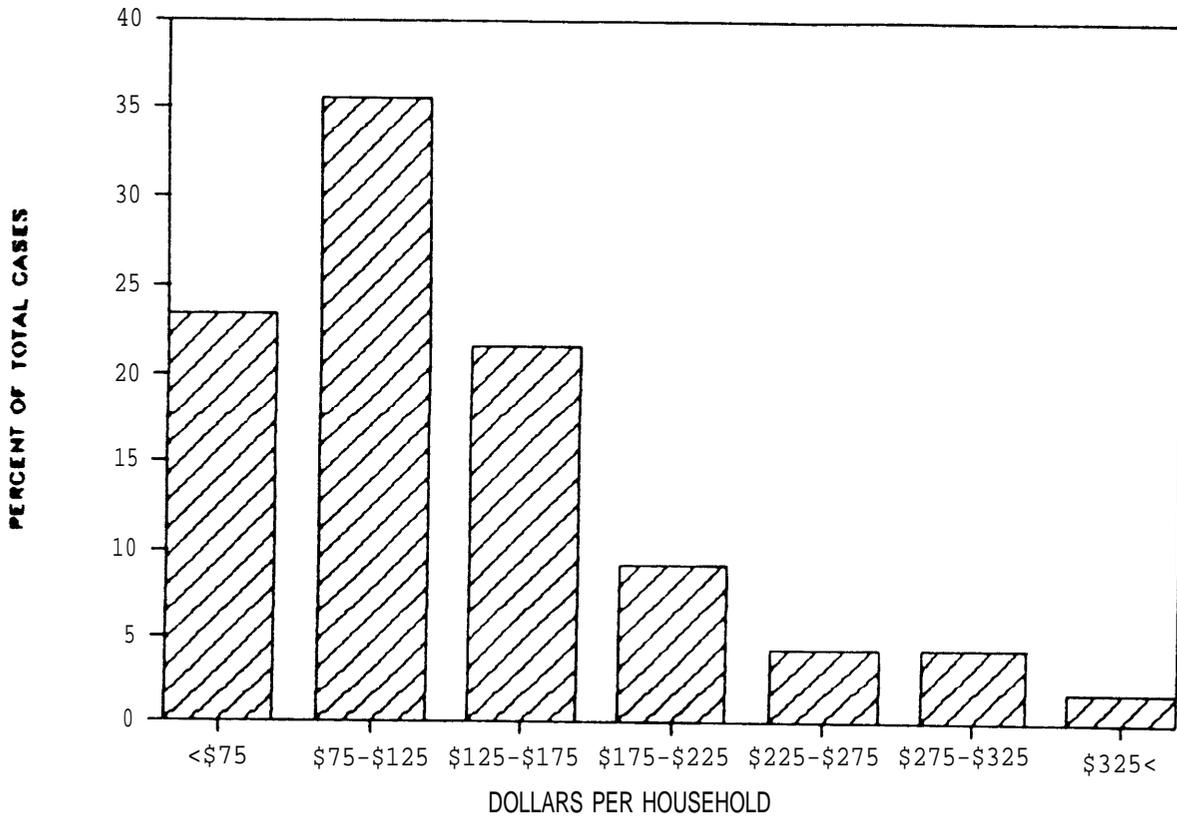
SEWER USER CHARGES AS PERCENT  
OF GROSS HOUSEHOLD INCOME  
(Communities with Population  
Greater Than 10,000)

FIGURE A-9



ANNUAL HOUSEHOLD EXPENDITURES FOR SEWER  
(In Dollars)

FIGURE A-10



#### **IV. SOLID WASTE BASELINE DESCRIPTION**

In many communities, residents pay for private solid waste disposal services; hence the data obtained in financial requests represents only the costs of solid waste disposal when the service is provided by the municipality. Based on the data available from the financial reports of these cities, the average annual household expenditure for solid waste services (collection and landfill) is 0.32 percent of gross household income (Table A-6 and Figure A-11). This percentage varies significantly depending on the size of the population: communities with populations less than 2,500 (0.213%); communities with populations between 2,500 and 10,000 (0.321 %); and communities with populations greater than 10,000 (0.351 %). (Figures A-12, A-13 and A-14).

The average annual household expense for solid waste is \$ 92 (Figure A-15).

TABLE A-6

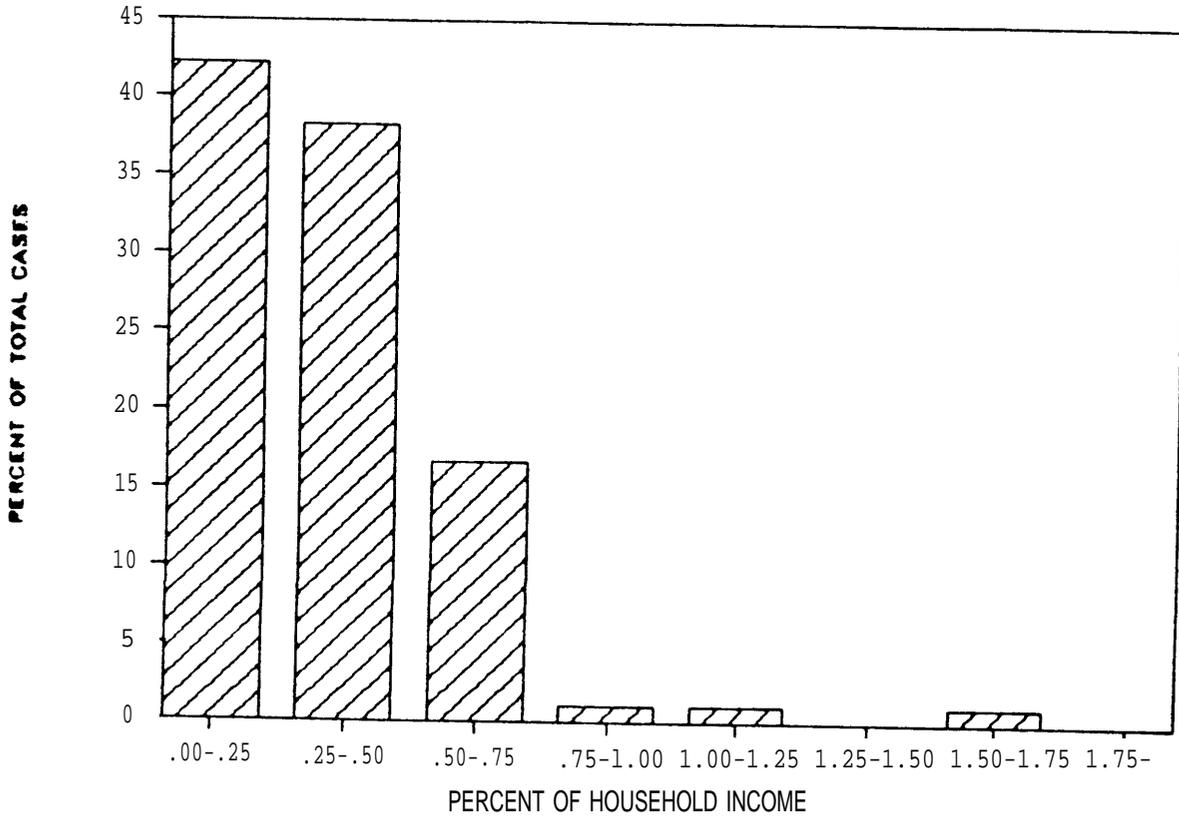
SOLID WASTE CHARGES AS A PERCENT OF HOUSEHOLD INCOME\*

Size Category	Number of Cases	Mean	Standard Deviation
Less than 2,500	16	.213	.093
2,500 - 10,000	19	.321	.239
Greater than 10,000	67	.351	.228
All Cases	102	.32	.22

\*These costs represent costs paid by the city and exclude costs paid by consumers directly to disposal service companies.

\*COST OF SOLID WASTE SERVICES AS  
PERCENT OF GROSS HOUSEHOLD INCOME  
(All Cities)

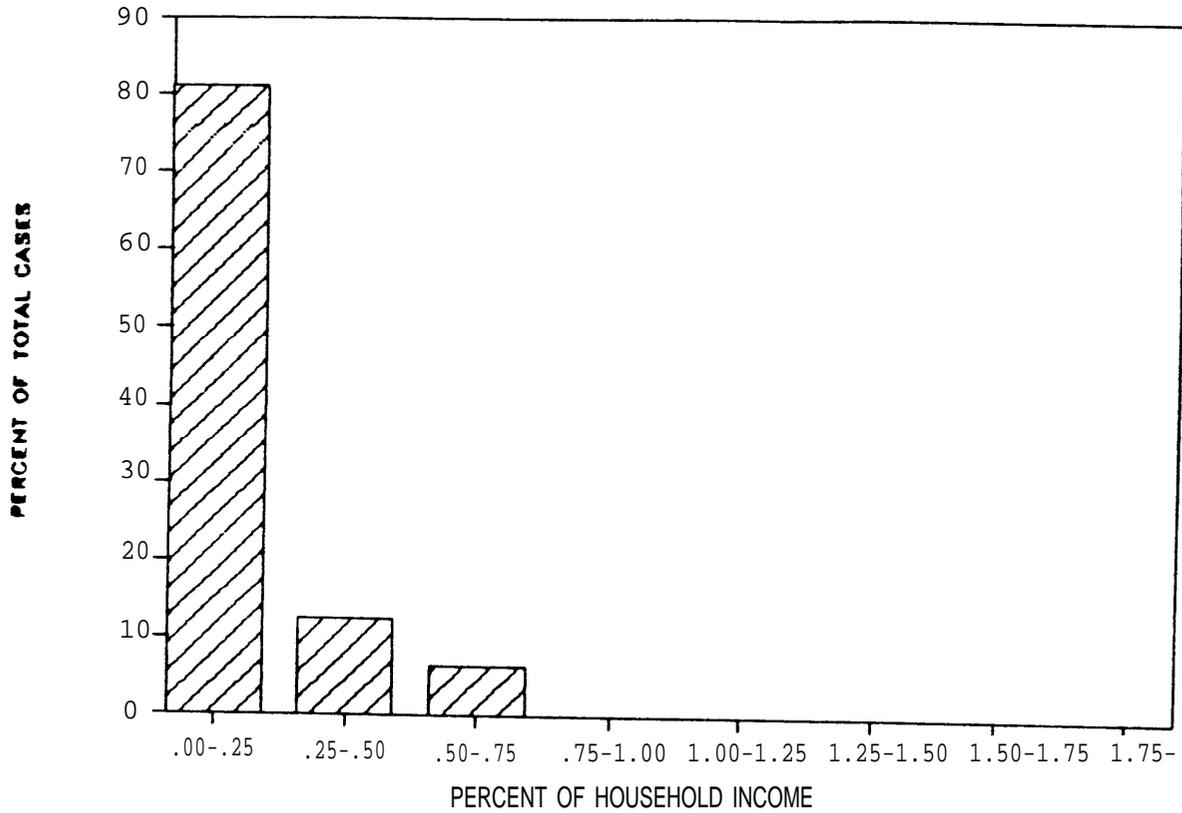
FIGURE A-11



\*These costs represent costs paid by the city and exclude costs paid by consumers directly to disposal service companies.

\*COST OF SOLID WASTE SERVICES AS  
PERCENT OF GROSS HOUSEHOLD INCOME  
(Communities with Population  
Less Than 2,500)

FIGURE A-12

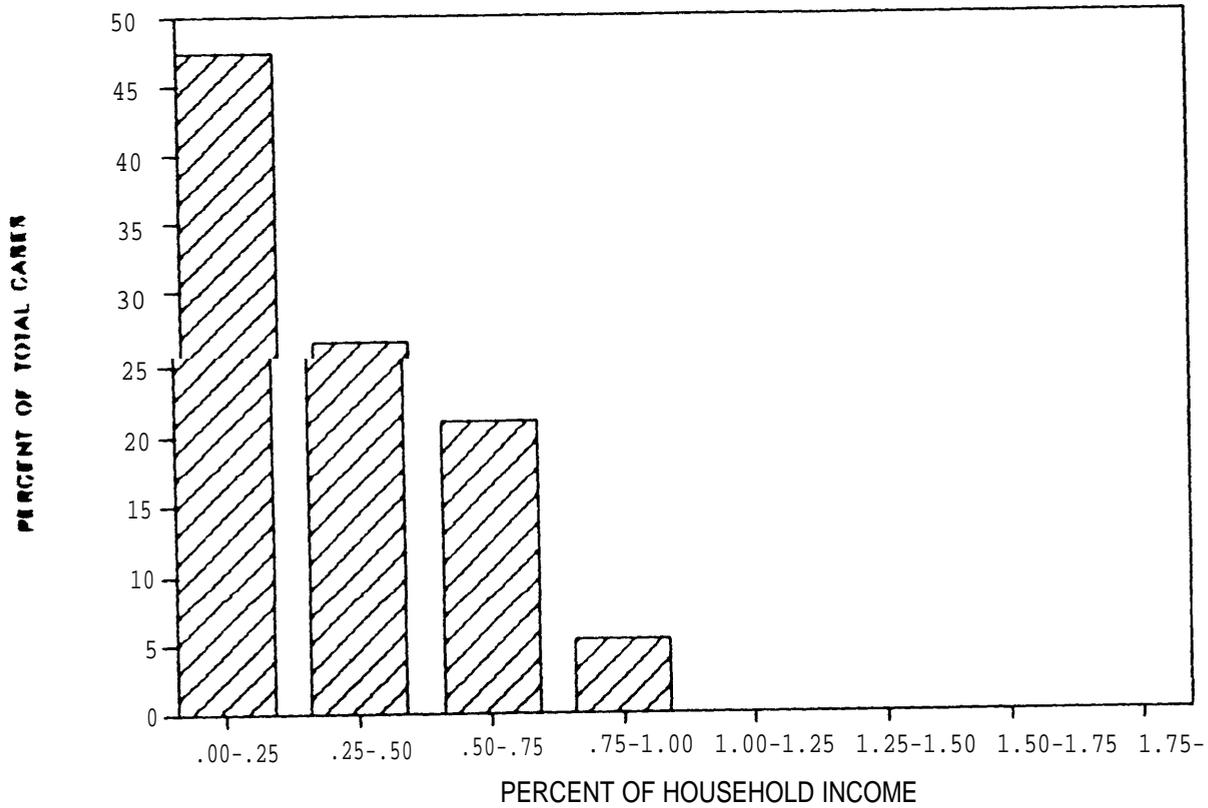


\*These costs represent costs paid by the city and exclude costs paid by consumers directly to disposal service companies.

\*COST OF SOLID WASTE SERVICES AS  
PERCENT OF GROSS HOUSEHOLD INCOME

(Communities with Population  
Between 2,500 and 10,000)

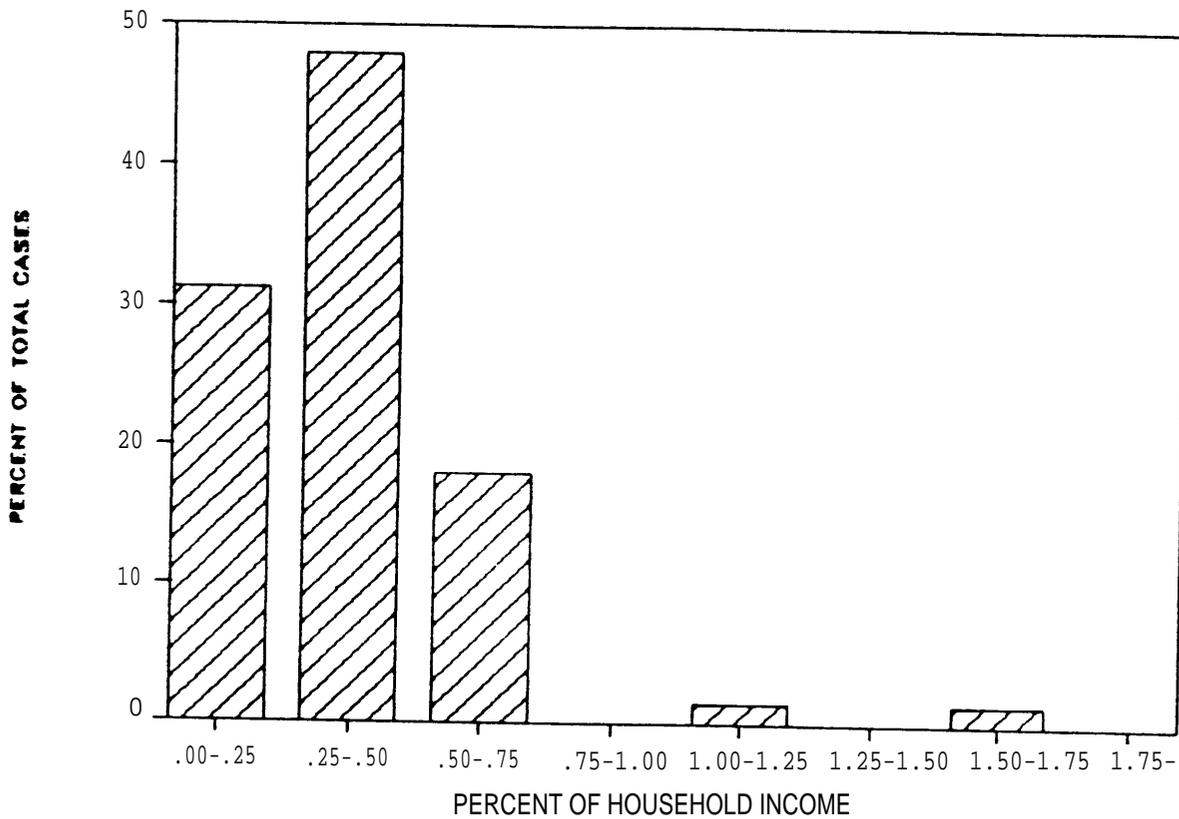
FIGURE A-13



\*These costs represent costs paid by the city and exclude costs paid by consumers directly to disposal service companies.

\*COST OF SOLID WASTE SERVICES AS  
PERCENT OF GROSS HOUSEHOLD INCOME  
(Communities with Population  
Greater Than 10,000)

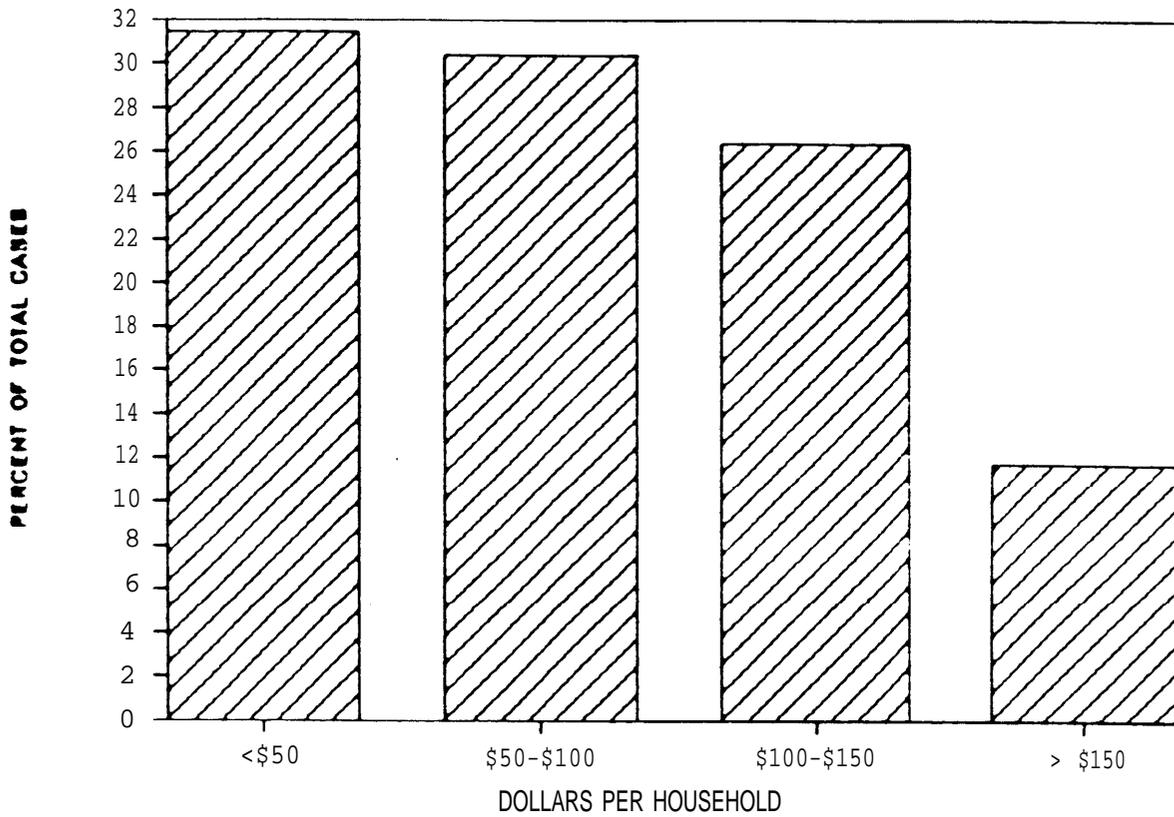
FIGURE A-14



\*These costs represent costs paid by the city and exclude costs paid by consumers directly to disposal service companies.

ANNUAL HOUSEHOLD EXPENDITURES FOR SOLID WASTE  
(In Dollars)

FIGURE A-15



## V. GENERAL OBLIGATION BASELINE DATA

### A. All Cases

Two tests were devised to predict whether or not a community could issue general obligation debt. The first test is based on the ratio of the community's annual debt service to general government revenues, and the second is based on the ratio of annual debt service to total market value of taxable property (Table A-7). These two ratios are a good reflection of the financial condition of a municipality. Furthermore, there is a high correlation between these ratios and other financial ratios used in municipal credit analysis. These ratios also provide an indication of how much additional debt can be supported by the municipality.

The baseline average for the first ratio, debt service to government revenues, is 8.1 %. In other words, communities devote, on the average, 8 % of their revenues to meet their debt service needs (Figure A-16). This average is higher (10.5 %) for communities with populations less than 2,500. There is also a very high standard deviation for small communities. This is understandable because small communities either have no general obligation debt, or if they do, it constitutes a relatively high percentage of their revenues. Accordingly, there is a bimodal distribution of this ratio for small communities (Figure A-17). The second ratio, debt service to market value of property has a baseline average of 0.22 percent for all communities (Figure A-19).

### B. Baa-rated Cases

The purpose of the general obligation bond test, as with other parts of the MUNFIN model, is to simulate some of the decisions made in the municipal bond market. In this market, the ability of a municipality to issue general obligation bonds at affordable interest rates largely depends on the bond rating. The threshold limits in the model represent points beyond which communities will experience great difficulty in

attempting to issue general obligation debt.

Threshold limits were determined by examining a sample of financially weak communities within the overall municipal database. The selection was based on the community's bond rating. Approximately 30 communities were chosen that have a Baa bond rating, the lowest investment grade bond rating possible. The Baa bond rating indicates that the bonds are neither highly nor poorly secured. Ratings below Baa denote that the bond issue is either speculative or in some form of default.

The calculated means of the debt ratios for the Baa cases are significantly higher than for the municipal database (which includes all the Baa cases and many unrated cases). The means of the ratio of debt service to government revenues are 8 % for the complete database and 12 % for the Baa sample (Tables A-7, A-8). The means of the ratio of debt service to market value of taxable property are 0.005 for the complete database and 0.008 for the Baa sample (Tables A-7, A-8).

The threshold limits for the two ratios were set at the mean plus one standard deviation. The limits are 0.20 and 0.008 for the debt service to government revenues ratio and the debt service to market value of property ratio, respectively (Table A-8). The debt service to government revenues threshold limit of 20 percent is similar to the mean plus one standard deviation of the municipalities with populations less than 2,500. This implies that the smaller municipalities are less able to cope with increased debt service expenses. This has been confirmed by other baseline analyses which show that a higher proportion of the small municipalities exceed the threshold limits than do other municipality size categories. Finally, these threshold limits were tested on some randomly selected municipalities to see what their general financial condition would be if they had to support an additional amount of debt. Our analysis showed that when these municipalities reached the threshold limit they would be unable to assume any more debt.

**TABLE A-7**

**DEBT RATIOS**

Annual Debt Service/Government Revenues

Size Category	Number of Cases	Mean	Standard Deviation
<b>Debt Service/Gov't Revenues</b>			
Less than 2,500	34	.1052	.1123
Greater than 2,500	163	.0769	.0685
All Cases	197	.0818	.0785
<b>Debt Service/Market Value of Taxable Property</b>			
All Cases	197	.002236	.002841

TABLE A-8

DERIVATION OF DEBT RATIO THRESHOLD LIMITS

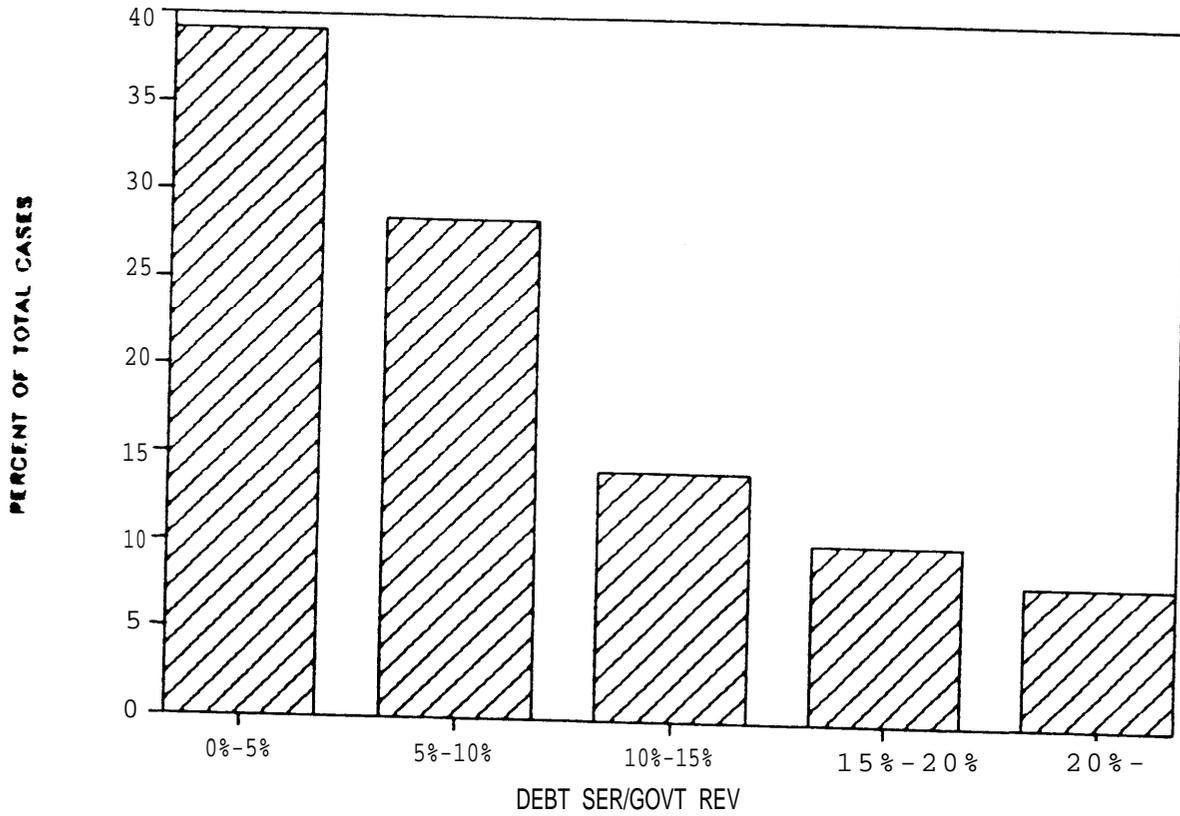
(Based on Baa Cases)

	Debt Service/ Gov't Revenues	Debt Service/ Market Value
Number of Cases	28	26
Mean	.1200	.0038
Standard Deviation	.0835	.0041
Threshold Limits*	.20	.008

\*Threshold limit = Mean + Std. Dev.

DISTRIBUTION OF THE RATIO ANNUAL DEBT  
SERVICE TO GOVERNMENT REVENUES  
(All Sampled Communities)

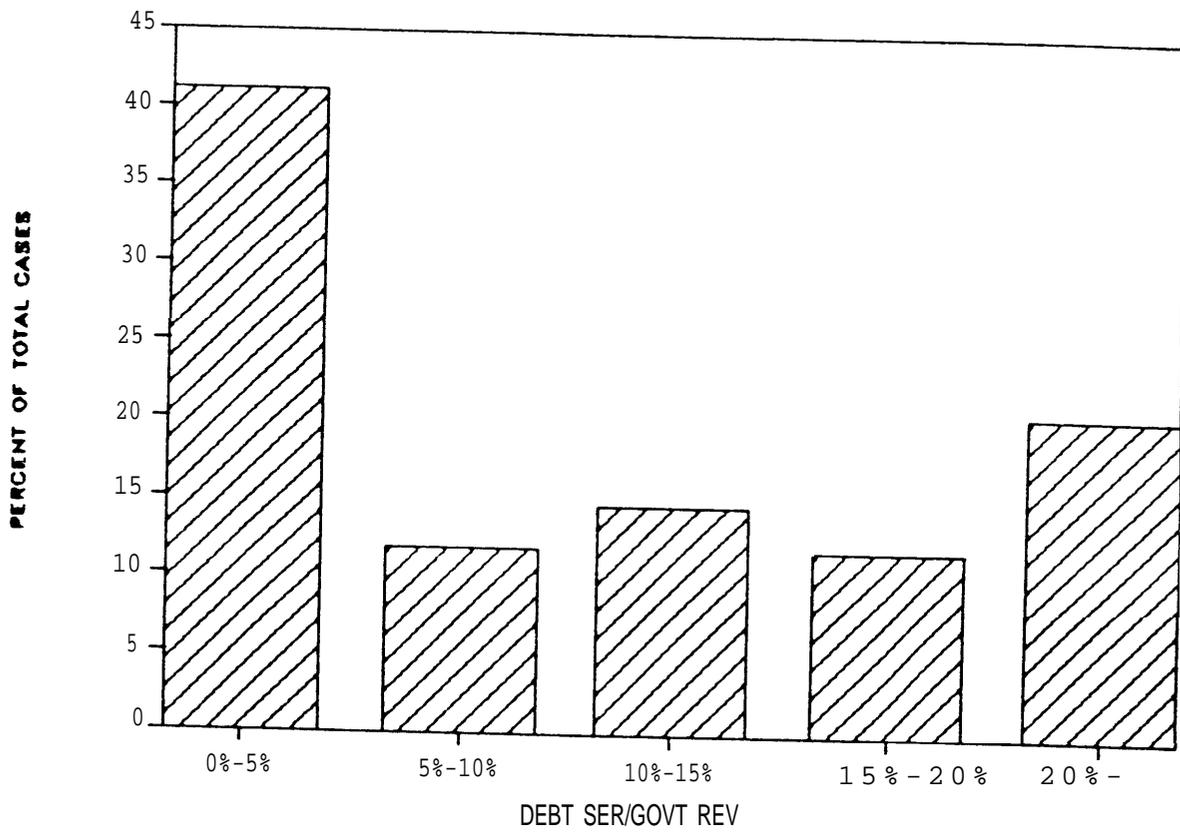
FIGURE A-16



DISTRIBUTION OF THE RATIO ANNUAL DEBT  
SERVICE TO GOVERNMENT REVENUES

(Communities with Population  
Less Than 2,500)

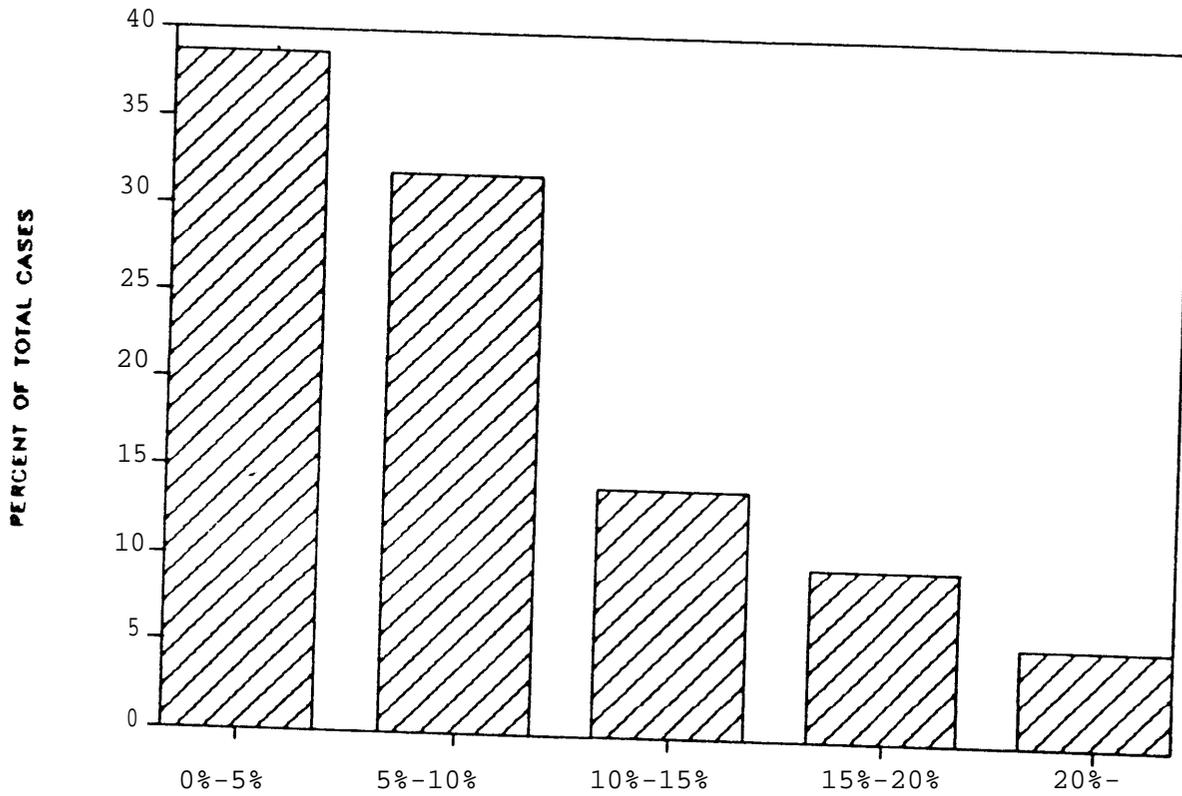
FIGURE A-17



DISTRIBUTION OF THE RATIO ANNUAL DEBT  
SERVICE TO GOVERNMENT REVENUES

(Communities with Population  
Greater Than 2,500)

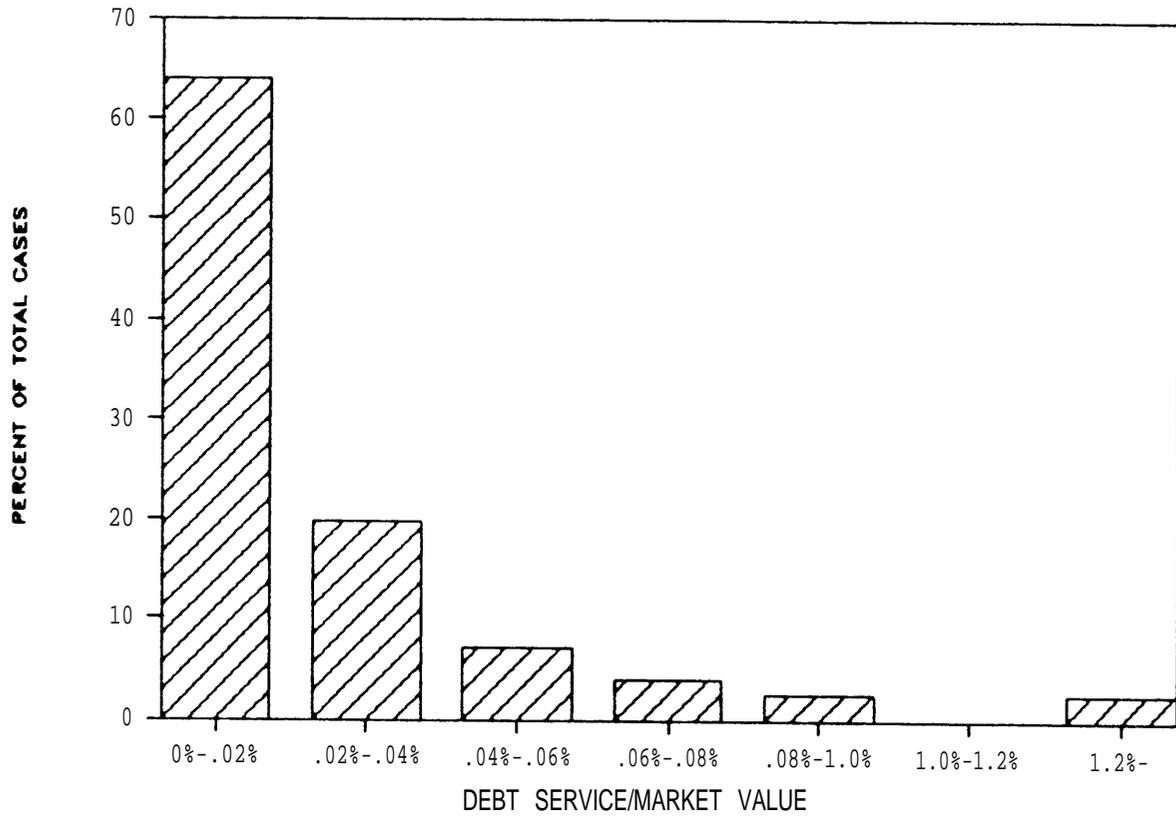
FIGURE A-18



DISTRIBUTION OF THE RATIO ANNUAL DEBT SERVICE  
TO MARKET VALUE OF TAXABLE PROPERTY

(All Communities)

FIGURE A-19



APPENDIX B

COST DATA

**DESCRIPTIONS OF REGULATIONS**

DESCRIPTIONS OF REGULATIONS

**DATA SUMMARY: FLUORIDE IN DRINKING WATER**

**Type of Action**

Final rule (52 FR 11396; April 2, 1986) establishing a maximum contaminant level (MCL) for fluoride in drinking water.

**Regulatory Option Considered**

The rule sets the MCL for Fluoride at 4 mg/l.

**Data Sources Used**

- A. "Economic Assesment of Reducing Fluoride in Drinking Water", Abt Association Inc., November 1985.
  
- B. Cost spreadsheet on public water systems developed for Office of Drinking Water, revised in July, 1988.

**DATA SUMMARY: DISINFECTION**

**Type of Action**

Advance Notice of Proposed Rulemaking (48 FR 455502; October 5, 1983) to establish maximum contaminant levels (MCLs) for disinfection in drinking water.

**Regulatory Option Considered**

Option will establish MCLs, monitoring, and public reporting requirements for disinfection (primarily with chlorine) of drinking water.

**Data Sources Used**

- A. Cost spreadsheet on public water systems developed for ODW, revised in July, 1988.

**DATA SUMMARY: LEAD CORROSION CONTROL**

**Type of Action**

Proposed rule (53 FR 31516; August 18, 1988) drinking water suppliers to install certain corrosion control treatments (including pH adjustment, carbonite, alkalinity adjustment, and corrosion inhibitors). The regulation also will include monitoring and public education requirements depending on water quality characteristics and EPA's judgements regarding the efficacy of treatment techniques.

**Regulatory Options Considered**

The base case option requires drinking water suppliers to install corrosion control treatment in all systems that exceed no-action levels for pH, alkalinity, or average lead content.

**Data Sources Used**

- A. "RIA of Proposed National Primary Drinking Water Regulations for Lead and Copper" (draft), Wade Miller Associates, Inc., June 1, 1988.
  
- B. Cost spreadsheet on public water system developed for ODW, revised in July, 1988.

**DATA SUMMARY: VOLATILE ORGANIC COMPOUNDS IN DRINKING WATER**

**Type of Action**

Final regulation (52 FR 25690; July 8, 1987) establishes maximum contaminant levels (MCLs), monitoring, and public reporting requirements for eight volatile organic compounds (VOCs) in drinking water.

**Regulatory Option Considered**

The MCL established for most of the VOCs is 5 ug/l.

**Data Sources Used**

- A. "Economic Impact Analysis of Proposed Regulations to Control Volatile Synthetic Organic Chemicals (VOCs) in Drinking Water", USEPA/ODW, October, 1985, as amended May 19, 1987.
  
- B. Cost spreadsheet on public water systems developed for ODW, revised in July, 1988.

**DATA SUMMARY: INORGANIC COMPOUNDS IN DRINKING WATER**

**Type of Action**

Proposed rule (50 FR 46902; November 13, 1985) to establish new maximum contaminant levels (MCLs) for eight inorganic chemicals.

**Regulatory Option Considered**

The proposed rule would set levels ranging from a low of 3 ug/l for mercury to a high of 10,000 ug/l for nitrate. Our analysis considers the preferred MCLs (most closely corresponding to MCLGs) for only three chemicals - arsenic, cadmium, and copper -- because these are the only three chemicals where the costs for the preferred MCL are larger than costs of existing regulation.

**Data Sources Used**

- A. "Regulatory Impact Analysis of Proposed Inorganic Chemical Regulations", Wade Miller Associates, Inc. for USEPA, November 1987.
  
- B. Cost spreadsheet on public water systems developed for ODW, revised in July, 1988.

**DATA SUMMARY: SYNTHETIC ORGANIC COMPOUNDS IN DRINKING WATER**

**Type of Action**

Regulation, under development, will establish maximum contaminant

levels (MCLs) and monitoring requirements for certain synthetic organic chemicals (SOCs) in drinking water. The regulation is presently in draft form.

**Regulatory Option Considered**

The draft proposed MCLs vary from a low of 0.0005 ug/l for chlordane, to a high of 2000 ug/l for toluene.

**Data Sources Used**

A. "Draft Regulatory Impact Analysis of Proposed Synthetic Organic Chemicals", USEPA, Office of Drinking Water, August 17, 1987, and revisions of October 13, 1987 to Chapter IV.

B. Cost spreadsheet on public water systems developed for ODW, revised in July, 1988.

**DATA SUMMARY: RADIONUCLIDES**

**Type of Action**

Advance Notice of Proposed Rulemaking (51 FR 34836; September 30, 1986) to establish MCLs and monitoring and public reporting requirements for certain radionuclides.

**Regulatory Option Considered**

EPA is considering alternative MCLs ranging from 1,000 pci/l to 160 pci/l. The analyses used an MCL of 500 pci/l for estimation purposes.

**Data Sources Used**

A. "Preliminary Radon Summary Impacts Table", April 12, 1988, Office of Drinking Water, USEPA.

B. Cost spreadsheet on public water systems developed for ODW, revised in July, 1988.

**DATA SUMMARY: TOTAL COLIFORM RULE**

**Type of Action**

Proposed regulation (52 FR 42224; November 3, 1987) to amend the maximum contaminant levels (MCLs) for total coliform bacteria in all public water systems.

**Regulatory Option Considered**

The option involves the amendment of MCLs for total coliform bacteria. The proposed MCL is determined simply by the presence or absence of coliform bacteria in a percentage of the samples, rather than by the density, by the frequency of sampling. EPA is repropounding the MCLG of zero and a limit for heterotrophic bacteria. The rule also proposes monitoring requirements and analytical methodology.

**Data Sources Used**

- A. "Regulatory Impact Analysis: Benefits and Costs of Proposed Surface Water Treatment Rule and Total Coliform Rule", USEPA/Office of Drinking Water, September 1, 1987.
  
- B. Cost spreadsheet on public water systems developed for ODW, revised in July, 1988.

**DATA SUMMARY: SURFACE WATER TREATMENT RULE**

**Type of Action**

Proposed rule (52 FR 42178; November 3, 1987) setting maximum contaminant level goals (MCLGs) for Giardia Lamblia viruses and Legionella and national primary drinking water regulations for public water systems using surface water sources.

**Regulatory Option Considered**

In addition to setting MCLGs of zero for Giardia Lamblia viruses and

Legionella, the regulation proposes a treatment technique in lieu of an MCL for the contaminants. The option also proposes filtration and disinfection requirements, criteria, and procedures by which the state would determine which systems must comply with the regulation.

**Data Sources Considered**

- A. "Regulatory Impact Analysis: Benefits and Costs of Proposed Surface Water Treatment Rule and Total Coliform Rule", Wade Miller Associates, Inc., September 1, 1987.
- B. Cost spreadsheet on public water systems developed for ODW, revised in July, 1988.

**DATA SUMMARY: LEAD AND COPPER MCL**

**Type of Action**

Proposed rule (53 FR 31516; August 18, 1988) set MCL for lead and copper. Regulations control both occurrence due to source waters and corrosion of lead and plumbing material (see corrosion control rule).

**Regulatory Option Considered**

The MCL options are 5 ug/l for lead and 1300 ug/l for copper entering distribution systems. Technologies for treating lead and copper in source water include coagulation/filtration, ion exchange, lime softening, and reverse osmosis.

**Data Sources Used**

- A. "RIA of Proposed National Primary Drinking Water Regulations for Lead and Copper" (draft), Wade Miller Associates, Inc., June 1, 1988.
- B. Cost spreadsheet on public water systems developed for ODW revised in July, 1988.

**DATA SUMMARY: SECONDARY TREATMENT REQUIREMENTS**

**Type of Action**

Secondary treatment requirements set water quality standards on effluent limitations for municipalities - Sections 301 (b) (1) (B) and (C).

**Regulatory Option Considered**

Municipalities are required to achieve and maintain compliance with their National Pollutant Discharge Elimination System (NPDES) permits in accordance with the requirements of the Clean Water Act (CWA). Permits require municipalities to meet effluent limitations including secondary treatment or more stringent treatment. In order to comply with permits many municipalities require construction of secondary or advanced treatment processes, sewer construction, correction of excessive infiltration/inflow, or correction of combined sewer overflows.

The cost data reflects average capital, O&M and administrative expenditures for systems out of compliance with secondary treatment requirements as of 1986 that would be necessary to bring them into compliance. In addition, capital and O&M costs for improvements to existing or new non-discharging wastewater treatment facilities are included in the analysis.

**Data Sources Used**

- A. "Needs Survey Report to Congress", USEPA, 430/9-87-001, February, 1987.
  
- B. Information from Office of Water concerning methods for deriving O&M and administrative costs from the capital costs data. These are based on data from the sewage sludge rule prepared by Office of Water Regulations and Standards.

**DATA SUMMARY: PRETREATMENT PROGRAM**

**Type of Action**

Final Rule (40 CFR 403) setting requirements for the establishment and administration of the pretreatment program.

**Regulatory Option Considered**

The regulation implements the National Pretreatment Standards for controlling pollutants which interfere with a Publicly Owned Treatment Work's (POTW) treatment processes or pollutants that pass through a treatment plant untreated. Administrative and reporting responsibilities are established for federal, state, and local governments as well as private industry.

**Data Sources Used**

A. Cost worksheets for administrative requirements of municipalities, based upon data derived from the Pretreatment Audit Summary System which contains audit data from local pretreatment programs nationwide and is maintained by EPA's Office of Water Enforcement and Permits.

**DATA SUMMARY: SEWAGE SLUDGE MANAGEMENT**

**Type of Action**

Two regulations are under development: one setting technical standards to establish allowable concentrations of pollutants in sewage sludge for each sludge use and disposal option, and the other setting requirements for approval of state sludge management programs and sludge permitting.

**Regulatory Option Considered**

Option 3 in the Regulatory Impact Analysis on technical standards which would regulate critical sites based on maximum exposed individual risks. The disposal methods affected include land

disposal, monofills, incineration, ocean disposal, and distribution and marketing.

**Data Sources Used**

A. "Draft Regulatory Impact Analysis of the Proposed Regulations for Sewage Sludge Use and Disposal", prepared by Eastern Research Group, Inc. for USEPA, July, 1987.

**DATA SUMMARY: SUBTITLE D CRITERIA**

**Type of Action**

Proposed rule to establish revisions to RCRA Subtitle D criteria for municipal solid waste landfills.

**Regulatory Option Considered**

The proposal establishes general facility standards, groundwater monitoring requirements, post closure standards, and performance and operating requirements. The cost data are associated with federal point-of-compliance (POC) option.

**Data Sources Used**

A. "Draft Regulatory Impact Analysis of Proposed Revisions to Subtitle D Criteria for Municipal Solid Waste Landfills", prepared by Temple, Barker & Sloane, Inc. for the USEPA, December 11, 1987.

**DATA SUMMARY: ASBESTOS IN SCHOOLS**

**Type of Action**

Final Rule (40 CFR Part 763; October 30, 1987) requiring school officials to inspect schools for asbestos-containing materials (ACM) and remove ACM when found. Rule was promulgated under authority of section 203 of Title II of TSCA.

**Regulatory Option Considered**

The rule pertains to all public elementary and secondary schools. Costs were calculated using expected degree of action required (e.g. inspection, maintenance, containment, removal).

**Data Source Used**

A. "Final Schools Rule: Asbestos Hazard Emergency Response Act Regulatory Impact Analysis", Office of Toxic Substances, USEPA, September 1987.

**DATA SUMMARY: TITLE III OF SARA****Type of Action**

Title III requirements are set out in four separate regulations which are in various stages of rulemaking. These include:

- (1) Final rule establishing emergency planning and release notification requirements (52 FR 13378; April 22, 1987);
- (2) Proposed rule setting toxic chemical release reporting requirements (52 FR 21152; June 4, 1987);
- (3) Proposed rule setting trade secret claims for emergency planning and right-to-know information requirements (52 FR 38312; October 15, 1987); and,
- (4) Final rule setting emergency and hazardous chemical inventory forms and community right-to-know reporting requirements (52 FR 38344; October 15, 1987).

**Regulatory Option Considered**

The above final and proposed rules set out various requirements for chemical reporting and emergency planning and release notification.

**Data Sources Used**

- A. "Title III SARA Supplemental Briefing Package: Economic Impacts", December 11, 1987.

**DATA SUMMARY: MUNICIPAL WASTE COMBUSTERS****Type of Action**

Advanced notice of proposed rulemaking (52 FR 25399; July 7, 1987). A preliminary assessment of air emissions from municipal waste combusters was made to determine how much they may contribute to public health risks and the potential costs of controlling these risks. This assessment was made in response to a petition for rulemaking filed by the Natural Resources Defense Council and the states of New York, Connecticut, and Rhode Island. Based on the assessment results, the EPA is examining the regulation of MWC emissions under Sections 111(b) and (d).

**Regulatory Option Considered**

The assessment considers the costs associated with a baseline scenario -- which considers the status quo in add-on control technology for both existing and planned facilities, and associated with a controlled scenario -- which considers uniform application of 0.02 g/dscf outlet loading standard using spray dryer/fabric filter systems and highly efficient ESP systems for existing and planned MWCs.

**Data Source Used**

- A. "Municipal Waste Combustion Study: Report to Congress", OSWER, USEPA, June 1987.
  
- B. Cost worksheets for three types of planned and existing MWC facilities -- RDF, mass burn and modular -- derived from the report to Congress and discussions with OAQPS staff.

**DATA SUMMARY: MUNICIPAL ASH STANDARDS**

**Type of Action**

Regulation under development to establish standards for the handling and disposal of municipal combustion ash.

**Regulation Option Considered**

Information from OSW and OPPE staff using data provided in Subtitle D criteria analysis. Used engineering costs of providing landfills receiving municipal ash with synthetic liner/synthetic cover technology.

**Data Source Used**

A. "Draft Regulatory Impact Analysis of Proposed Revisions to Subtitle D Criteria for Municipal Solid Waste Landfills", prepared by Temple, Barker & Sloane, Inc. for the USEPA. December 11, 1987.

**DATA SUMMARY: STORMWATER REGULATION**

**Type of Action**

Regulation, under development, governing stormwater permit application requirements.

**Regulation Option Considered**

The Water Quality Act requires EPA to promulgate regulations governing stormwater permit applications requirements for stormwater discharges from large municipal systems and medium municipal stormwater systems. Costs are based on projected costs of developing stormwater management plans, and establishing an enforcement program for stormwater systems.

**Data Sources Used**

A. Data from preliminary discussions and analyses performed by the Office of Water Enforcement and Permits.

**DATA SUMMARY: UNDERGROUND STORAGE TANKS - FINANCIAL RESPONSIBILITY**

**Type of Action**

Proposed rule requiring owners and operators of Underground Storage Tanks (UST) to maintain evidence of financial responsibility for taking corrective action and compensating third parties for bodily injury and property damage caused by releases from USTs.

**Regulatory Option Considered**

SARA establishes a minimum amount of financial responsibility at \$ 1 million per occurrence. The cost data reported are for Assumption #1 : all firms that presently do not have insurance and do not qualify for self insurance will be able to obtain insurance. Insurance rates will be \$1,000/year/facility (3 tanks per facility), except for smaller municipal operations (2 or fewer facilities) when costs will be \$2,500/year/facility.

**Data Sources Used**

A. "Regulatory Impact Analysis of Proposed Financial Responsibility Requirements for Underground Storage Tanks Containing Petroleum", prepared by Meridian Research Inc., for USEPA, March 30, 1987.

**DATA SUMMARY: UNDERGROUND STORAGE TANKS - TECHNICAL STANDARDS**

**Type of Action**

Proposed rule (53 FR 37082; September 23, 1988) establishing requirements for leak detection, leak prevention, and corrective action for underground storage tanks.

**Regulatory Option Considered**

The option considered (Option 11) consists of requirements for manual inventory control, monthly leak detection installed within 3 years, corrosion protection for all new tanks, and upgrading to new tank standards within ten years of promulgation.

**Data Sources Used**

A. "Regulatory Impact Analysis for Proposed Technical Standards for Underground Storage Tanks", Sobotka and Company, March 30, 1987.

TABLE B-1

COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY

(affected systems only)\*

**REGULATION: Fluoride in Drinking Water**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	6,589	3,182	66
500 - 2,500	289,040	17,207	33
2,500 - 10,000	1,300,000	120,000	8
10,000 - 50,000	1,800,000	150,000	2
50,000 - 100,000	-0-	-0-	0
100,000 - 250,000	-0-	-0-	0
250,000 - 500,000	-0-	-0-	0
Over 500,000	-0-	-0-	0

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-2**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Disinfection**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	14,479	2,889	4,724
500 - 2,500	33,862	8,877	2,361
2,500 - 10,000	76,067	15,213	439
10,000 - 50,000	147,016	28,432	169
50,000 - 100,000	333,333	-0-	3
100,000 - 250,000	-0-	-0-	0
250,000 - 500,000	-0-	-0-	0
Over 500,000	-0-	-0-	0

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-3**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Lead Corrosion Control**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	3,995	1,584	5,554
500 - 2,500	7,798	4,446	5,028
2,500 - 10,000	54,887	15,026	1,684
10,000 - 50,000	142,726	30,507	1,044
50,000 - 100,000	490,576	37,273	185
100,000 - 250,000	554,382	74,923	52
250,000 - 500,000	554,382	74,923	55
Over 500,000	835,089	358,739	23

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-4**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Volatile Organic Compounds in Drinking Water**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	32,524	2,027	231
500 - 2,500	77,165	7,913	212
2,500 - 10,000	176,699	12,430	84
10,000 - 50,000	463,337	39,105	57
50,000 - 100,000	1,150,488	112,691	7
100,000 - 250,000	3,416,666	333,433	3
250,000 - 500,000	3,416,666	333,433	2
over 500,000	32,926,406	3,791,441	1

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

TABLE B-5

COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY

(affected systems only)\*

**REGULATION: Inorganic Compounds in Drinking Water**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	256,608	14,133	151
500 - 2,500	447,324	70,638	59
2,500 - 10,000	1,050,000	101,011	20
10,000 - 50,000	1,844,245	156,998	13
50,000 - 100,000	-0-	-0-	-0-
100,000 - 250,000	-0-	-0-	-0-
250,000 - 500,000	-0-	-0-	-0-
Over 500,000	-0-	-0-	-0-

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-6**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Synthetic Organic Compounds in Drinking Water**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	63,536	11,053	1,186
500 - 2,500	137,250	25,940	413
2,500 - 10,000	1,018,103	153,163	116
10,000 - 50,000	1,645,057	251,802	56
50,000 - 100,000	4,368,365	613,884	8
100,000 - 250,000	12,400,000	1,740,577	3
250,000 - 500,000	12,400,000	1,740,577	2
Over 500,000	47,528,706	6,837,012	1

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

TABLE B-7

COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY

(affected systems only)\*\*

**REGULATION: Radionuclides (500 MCL)**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	73,069	716	3,019
500 - 2,500	125,984	1,186	1,753
2,500 - 10,000	186,713	12,196	470
10,000 - 50,000	448,311	37,467	240
50,000 - 100,000	1,589,375	155,068	16
100,000 - 250,000	5,048,750	603,818	4
250,000 - 500,000	5,048,750	603,818	4
Over 500,000	19,880,000	2,470,068	1

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-8**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Coliform Monitoring**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	-0-	404	10,199
500 - 2,500	-0-	722	10,150
2,500 - 10,000	-0-	431	567
10,000 - 50,000	-0-	413	169
50,000 - 100,000	-0-	500	35
100,000 - 250,000	-0-	-0-	-0-
250,000 - 500,000	-0-	-0-	-0-
Over 500,000	-0-	-0-	0

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-9**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Surface Water Treatment Rule (Unfiltered)**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	144,344	15,868	172
500 - 2,500	403,456	44,126	310
2,500 - 10,000	1,412,500	52,359	130
10,000 - 50,000	2,653,987	253,635	79
50,000 - 100,000	7,963,061	519,275	20
100,000 - 250,000	34,666,666	2,861,991	4
250,000 - 500,000	34,666,666	2,861,991	4
Over 500,000	34,666,666	2,861,991	3

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

TABLE B-10

COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY

(affected systems only)\*

**REGULATION: Surface Water Treatment Rule (Filtered)**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	13,297	8,935	273
500 - 2,500	21,597	16,588	957
2,500 - 10,000	59,237	19,039	811
10,000 - 50,000	86,555	23,252	704
50,000 - 100,000	182,067	38,985	209
100,000 - 250,000	301,204	48,811	70
250,000 - 500,000	301,204	48,811	69
Over 500,000	794,686	239,801	32

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

TABLE B-

COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY  
(affected systems only)\*

**REGULATION: Lead and Copper (MCL)**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	207,417	15,557	125
500 - 2,500	402,754	39,665	107
2,500 - 10,000	1,575,000	100,000	33
10,000 - 50,000	2,128,709	180,154	19
50,000 - 100,000	2,667,750	667,750	3
100,000 - 250,000	5,500,000	1,000,000	1
250,000 - 500,000	5,500,000	1,000,000	1
Over 500,000	-0-	-0-	-0-

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-11**

**COST OF REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only) \*

**REGULATION: Construction Grants (15% capital grant)**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	42,500	2,300	31
	280,500	14,000	117
	612,000	24,000	118
	1,181,500	48,000	136
500 - 2,500	280,500	14,000	117
	612,000	27,000	510
	1,207,000	50,000	813
	1,972,000	80,000	129
2,500 - 10,000	663,000	27,000	209
	1,547,000	61,000	168
	3,077,000	123,000	303
	5,525,000	222,000	55
10,000 - 50,000	180,200	69,000	36
	3,442,500	133,000	100
	7,293,000	282,000	200
	12,070,000	467,000	85

(Continued)

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-11** (Continued)

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Construction Grants (15% capital grant)**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
50,000 - 100,000	4,250,000	200,000	6
	11,475,000	436,000	26
	24,395,000	927,000	17
	44,115,000	1,676,000	11
100,000 - 250,000	12,750,000	475,000	18
	33,745,000	1,259,000	19
	91,970,000	3,431,000	5
250,000 - 500,000	4,165,000	156,000	4
	54,910,000	2,049,000	19
Over 500,000	57,800,000	2,160,000	3
	327,250,000	12,205,000	7

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-12**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Pretreatment Program**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	-0-	-0-	-0-
500 - 2,500	-0-	-0-	-0-
2,500 - 10,000	-0-	11,250	10
10,000 - 50,000	-0-	14,167	10
50,000 - 100,000	-0-	47,699	10
100,000 - 250,000	-0-	110,149	10
250,000 - 500,000	-0-	380,533	10
Over 500,000	-0-	380,533	10

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-13**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Sewage Sludge Technical Standards**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	285,062	40,199	54
	11,518	20,000	51
	-0-	3,280	931
	-0-	-0-	11,256
500 - 2,500	427,593	60,299	61
	11,518	20,000	58
	-0-	3,280	1,062
	-0-	-0-	12,842
2,500 - 10,000	855,187	120,598	27
	11,518	20,000	26
	-0-	3,280	476
	-0-	-0-	5,750
10,000 - 50,000	1,372,750	400,000	10
	311,857	71,428	6
	-0-	15,228	168
	-0-	-0-	2,510

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

TABLE B-13 (Continued)

COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY

(affected systems only)\*

**REGULATION: Sewage Sludge Technical Standards**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
50,000 - 100,000	1,372,750	400,000	1
	311,857	71,428	1
	-0-	15,228	20
	-0-	-0-	301
100,000 - 250,000	1,372,750	400,000	1
	311,857	71,428	0
	-0-	15,228	9
	-0-	-0-	130
250,000 - 500,000	2,032,500	500,000	1
	-0-	100,000	1
	-0-	35,714	33
	-0-	-0-	0
Over 500,000	2,032,500	500,000	1
	-0-	100,000	0
	-0-	35,714	23
	-0-	-0-	0

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

TABLE B-14

COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY

(affected systems only)\*

REGULATION: Subtitle 'D' Criteria

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	-0-	-0-	0
	6,385	6,750	234
	3,193	3,375	3,097
	1,064	1,125	8,960
500 - 2,500	63,852	67,500	42
	38,311	40,500	428
	19,156	20,250	2,230
	6,385	6,750	11,324
2,500 - 10,000	-0-	-0-	0
	159,629	168,750	107
	79,815	84,375	678
	26,605	28,125	5,494
10,000 - 50,000	-0-	-0-	0
	766,221	810,000	30
	383,110	405,000	268
	127,703	135,000	2,396

(Continued)

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-14** (Continued)

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**  
(affected systems only)\*

**REGULATION: Subtitle 'D' Criteria**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
50,000 - 100,000	-0-	-0-	0
	1,915,552	2,025,000	0
	957,776	1,012,500	37
	319,259	337,500	286
100,000 - 250,000	-0-	-0-	0
	-0-	-0-	0
	2,234,810	2,362,500	3
	774,937	787,500	137
250,000 - 500,000	-0-	-0-	0
	-0-	-0-	0
	4,788,880	5,062,500	1
	1,596,293	1,687,500	34
Over 500,000	-0-	-0-	0
	-0-	-0-	0
	-0-	-0-	0
	4,256,782	4,500,000	24

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-15**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Asbestos in Schools Rule**

Municipality Size	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O&M + Admn. (annual)	
0 - 500	75,918	3,279	3,786
	-0-	402	1,192
	-0-	1,112	5,998
	131,943	487	258
	27,459	1,726	0
	-0-	4,913	1,057
500 - 2,500	91,102	3,935	4,319
	-0-	482	1,360
	-0-	1,334	6,844
	158,332	584	295
	32,591	2,071	0
	-0-	5,895	1,206
2,500 - 10,000	288,488	12,460	1,934
	-0-	1,528	609
	-0-	4,226	3,064
	508,383	1,851	132
	104,344	6,559	0
	-0-	18,670	540

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-15** (Continued)

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Asbestos in Schools Rule**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
10,000 - 50,000	1,047,668	45,250	830
	-0-	5,548	261
	-0-	15,346	1,315
	1,820,813	6,721	57
	378,934	23,819	0
	-0-	67,800	232
50,000 - 100,000	2,019,419	87,222	99
	-0-	10,693	31
	-0-	29,579	158
	3,509,684	12,594	7
	730,409	45,912	0
	-0-	130,686	28
100,000 - 250,000	4,600,631	198,708	43
	-0-	24,361	14
	7,995,746	29,512	3
	1,664,015	104,596	0
	-0-	297,728	12
	-0-	67,387	68

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-15** (continued)

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**  
(affected systems only)\*

**REGULATION: Asbestos in Schools Rule**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
250,000 - 500,000	8,070,083	348,558	11
	-0-	42,733	3
	-0-	118,206	17
	14,025,541	51,768	1
	2,918,892	183,474	0
	-0-	522,252	3
	Over 500,000	23,815,477	1,028,622
	-0-	126,107	2
	-0-	348,834	12
	41,390,519	152,772	1
	8,613,888	541,446	0
	-0-	1,541,208	2

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-16**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Sara Title III Requirements**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	160	26	12,291
500 - 2,500	960	156	14,024
2,500 - 10,000	3,920	637	6,279
10,000 - 50,000	19,200	3,120	2,694
50,000 - 100,000	48,000	7,800	323
100,000 - 250,000	112,000	18,200	140
250,000 - 500,000	208,000	33,800	35
Over 500,000	416,000	67,600	24

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

TABLE B-17

COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY

(affected systems only)\*

**REGULATION: Municipal Inceneration - Air and Ash Disposal**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital. (total)	O & M (annual)	
0 - 500	-0-	-0-	-0-
500 - 2,500	-0-	-0-	-0-
2,500 - 10,000	116,269	51,000	6
10,000 - 50,000	945,381	137,313	33
50,000 - 100,000	2,136,842	218,407	30
100,000 - 250,000	4,692,393	443,765	47
250,000 - 500,000	10,215,215	944,020	66
Over 500,000	22,340,604	2,335,298	24

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-18**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Stormwater**

Municipality Size (population served)**	<u>Types of Costs (1986 dollars)</u>		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	-0-	-0-	-0-
500 - 2,500	-0-	-0-	-0-
2,500 - 10,000	-0-	-0-	-0-
10,000 - 50,000	-0-	-0-	-0-
50,000 - 100,000	-0-	-0-	-0-
100,000 - 250,000	141,026	70,513	140
250,000 - 500,000	614,525	307,263	35
Over 500,000	614,525	307,263	24

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-19**

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**

(affected systems only)\*

**REGULATION: Underground Storage - Financial and Technical Standards)**

Municipality Size (population served)**	Types of Costs (1986 dollars]		No. of Affected Systems
	Capital (total)	O & M (annual)	
0 - 500	11,068	2,700	11,568
	11,068	12,700	708
	11,068	22,700	15
500 - 2,500	11,068	2,700	13,200
	11,068	12,700	808
	11,068	22,700	17
2,500 - 10,000	11,068	2,700	5,910
	11,068	12,700	362
	11,068	22,700	8
10,000 - 50,000	9,365	2,900	2,388
	17,878	12,900	291
	17,878	22,900	15

(Continued)

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

**TABLE B-19** (Continued)

**COST OF THE REGULATION FOR A TYPICAL SYSTEM/CITY**  
(affected systems only)\*

**REGULATION: Underground Storage Tanks - Financial and Technical Standards)**

Municipality Size (population served)**	Types of Costs (1986 dollars)		No. of Affected Systems
	Capital (total)	O & M (annual)	
50,000 - 100,000	23,838	7,200	228
	32,352	17,200	82
	32,352	27,200	13
100,000 - 250,000	47,676	14,400	60
	47,676	24,400	54
	64,703	34,400	26
250,000 - 500,000	378,002	45,600	12
	386,516	55,600	9
	420,570	65,600	14
Over 500,000	378,002	45,600	8
	386,516	55,600	7
	420,570	65,600	9

\*System means school system, water system, sewer system etc.

\*\*Population categories may be combined appropriately if needed.

Source: EPA -- Cost estimates are based on existing regulatory development documents and are subject to change.

APPENDIX C

COSTS METHODOLOGY

METHODOLOGY FOR CALCULATING WEIGHTED AVERAGE COSTS

The weighted average costs for each of the four regulation categories -- drinking water, wastewater, solid waste, and miscellaneous -- were calculated on the basis of the number of municipalities affected by the regulation in each size category. The following example will make the concept clear.

Consider the regulation Fluoride in Drinking Water. Let us assume that to comply with this regulation, each affected municipality in the 0-500 size category requires a total of 'C' dollars. Further assume that out of a total of 'N' municipalities in this population category, 'n' are affected by fluoride in their water systems and need to do something about it. Therefore,

$$\text{Fraction of municipalities affected} = \frac{n}{N}$$

$$\text{Average cost for 0-500 category} = C * \frac{n}{N}$$

To get a weighted average cost for the category of water regulations, one would need to carry out the above computation for each of the water regulations and sum up the results. To illustrate, let us define the following variables for, say, the 0-500 population category:

$C_i$  = Cost per municipality for the  $i^{\text{th}}$  regulation;

$N$  = Total number of municipalities with 0-500 persons; and,

$n_i$  = Number of municipalities affected by the  $i^{\text{th}}$  regulation.

So, if there were 10 drinking water regulations, the variables for the first one would be  $C_1, N$ , and  $n_1$ . The corresponding variables for the second regulation would be  $C_2, N$ , and  $n_2$  and so on. Therefore, the weighted average cost for drinking water regulations for the 0-500 population category would be given by

$$C_{av} = (C_1 * \frac{n_1}{N}) + (C_2 * \frac{n_2}{N}) + \dots + (C_{10} * \frac{n_{10}}{N})$$

Simplifying,

$$C_{av} = \frac{(C_1 * n_1) + (C_2 * n_2) + \dots + (C_{10} * n_{10})}{N}$$

or,

$$C_{av} = \frac{\sum_{i=1}^N (C_i * n_i)}{N}$$

$C_{av}$  would be the weighted average cost that municipalities in the 0-500 category would face to comply with drinking water regulations. To calculate weighted average cost for other size categories, the exercise illustrated above will have to be carried out for each category.

Using this methodology, weighted average costs for other regulation categories -- wastewater, solid waste, and miscellaneous -- can be calculated.

Once costs for each regulation category have been calculated, a cumulative weighted average cost can be obtained by using the following formula:

$$C_{av(\text{cumulative})} = C_{av(\text{water})} + C_{av(\text{wastewater})} \\ + C_{av(\text{solid waste})} + C_{av(\text{miscellaneous})}$$

APPENDIX D

DESCRIPTION OF THE MUNFIN MODEL

## DESCRIPTION OF THE MUNFIN MODEL

MUNFIN is a modified form of MABEL, an earlier computer model, which was designed to evaluate a municipality's ability to pay for enforcement penalties and incur capital and operating costs associated with sewer systems. MUNFIN can be used to solve financial problems faced by sewer, water, solid waste systems and municipalities. It uses the same general logic as MABEL which was developed after reviewing the financial guidebook prepared for the Construction Grants Program, the literature on financial crises experienced by cities in the U.S. during the 1970s, the criteria for issuing municipal bonds, and the tax capacity literature.

The underlying factors in MUNFIN are the wealth and debt of a community. All other variables in the model are related to these two factors. The value of taxable property, the general tax base, household income are all related to the wealth. The debt service is the amount a community is obligated to pay to the bankers periodically. It is considered to be a better measure of the ability to carry additional debt than total debt itself.

The model uses selected ratios pertaining to user charges and municipal debt to evaluate financial capability. It divides the operations of a city into two parts: enterprise units and non-enterprise units. The enterprise units have the authority to recover their expenses by imposing user fees on their customers and their debt is backed by future user charge revenues. In general, water and sewer systems are operated as enterprise units. The non-enterprise units are funded out of the general treasury, that is, their activities are funded by taxes. Their debt is backed by the full faith and credit of the local governments and hence supported by their taxing powers. The model has the ability, therefore, to examine both the enterprise and non-enterprise units of a local government. To a large degree, the model duplicates the decision criteria that bankers use to evaluate the financial condition of a community before giving it a long-term loan.

**A. THE LOGIC OF THE MODEL**

MUNFIN is divided into three parts that correspond to the answers to the following three questions (See Figure 1):

- Can enterprise funds issue revenue bonds in the long term, or, can consumers afford the increased user charges?
- Can enterprise funds raise capital in the short term via revenue bonds?
- Can municipalities raise money via general obligation bonds?

The ability of the water or sewer system to issue revenue bonds in the long term is determined by comparing the ratio of annual user charge per household and household income to threshold values. Two alternative values of 1.25% and 1.0% are used as the thresholds for the purposes of this study. User charges vary across the country for many reasons including the quality of service, demands of the community, fee structure of the enterprise and willingness of consumers to pay higher rates; therefore, it is important to note that the thresholds are not absolute, but relative measures of financial affordability.

If a city exceeds the threshold it is assumed not to be able to issue revenue bonds in the long term. The inability to issue bonds arises not from the willingness of the customers to pay higher user charge rates (although in some communities consumers may protest against rate increases) but from the unwillingness to bankers to accept rates that are much higher than the existing rates of most communities in the country.

The model only examines user charges paid by residential customers and not charges paid by the industrial customers. Hence, the revenues required to cover the increased costs must be appropriated to the different user classes. Nonresidential customers in the U.S. account for a majority of the revenue of the systems. This means that they share a large part of the costs of building, operating and maintaining the systems. Often the institutional customers pay the same sewer rates as the residential customers. The model appropriates the cost of environmental improvements to different types of customers, calculates the user charges per household and determines the ability to issue revenue bonds in the long run.

Not all water and sewer systems that can increase user charges to cover the costs of a regulation can raise the capital in the short term. This problem can be compared to the problem faced by a consumer who can afford the mortgage payments but cannot get a loan from lending institutions because of a poor past performance or current debt obligations. Before lending the money, bankers usually examine the past performance of the system and ask whether the system has recovered its expenses through adequate user charges, and should the user charges be raised to recover additional costs to the system?

The model answers the above question by examining the recent history of the city's revenues and costs. If it determines that the expenditures have exceeded the revenues by a certain amount, it is assumed that the system will have difficulty in issuing revenue bonds in the short term. It will have to raise the user charge rates and show that it can collect sufficient revenues before bankers approve any long-term loan. If it has a sufficient income base, that is, if the user charge to income ratio is below the threshold, a system can raise the user charges. However, it may take more than two years to show that it is politically feasible to raise the user charges and that the rates are adequate. In the meanwhile, the system will have to obtain short-term financing if it wants to construct environmental control facilities.

Inability to raise money by means of revenue bonds does not mean that the system cannot raise money at all. It can issue either double barrel bonds or general obligation bonds. In the case of double barrel bonds, the bonds are backed by the revenues of the system and full faith and credit of the city. In the case of general obligation bonds, the bonds are secured by the full faith and credit (i.e. taxing authority) of the city. In both instances, the financial condition of the city plays an important role. Usually the supporting cities ask bond rating agencies such as Moody's or Standard and Poor's to rate their bonds. Total debt, employment and economic conditions, and accounting and financial management practices are some of the major factors that these firms take into account before negotiating the terms of the bond. MUNFIN evaluates two ratios related to these factors.

1. Debt service of the municipality  
Total revenues of the municipality
  
2. Debt service of the municipality  
Market value of all taxable property

The model calculates new values of these ratios after calculating the debt service resulting from the pollution control general obligation bonds. The new values are then compared with threshold values for the two ratios. Two alternative threshold values for each ratio are used as the criteria. The ratio of debt service and municipal revenues has the primary threshold of 0.20 and an alternative threshold of 0.15. This means that when 20% or 15% of municipal revenues go toward payment of debt service, the municipality is considered to have excessive debt. The ratio of debt service and value of property has the primary threshold of 0.008 and an alternative threshold of 0.006. This means that when debt service amounts to more than about 0.8% or 0.6% of the value of the property, the municipality is considered heavily leveraged. The thresholds for the two ratios were developed by analyzing the data for more than 30 cities that had the lowest grade investment bond rating (Baa). The primary thresholds represent the mean plus two standard deviations of the values of the ratios for the 30

cities in the sample.

The model calculates the values of the ratios in the post compliance period, that is, after a municipality has complied with the laws. If the calculated values exceed the threshold values, the city is assumed to be unable to raise the required money. The values of both ratios must exceed their respective thresholds for a city to fail the G.O. bond test and be unable to issue general obligation bonds.

**B. SELECTED EQUATIONS IN THE MODEL**

Equation A: Determine the annual debt service for the proposed construction costs.

$$S_1 = \frac{R * (1 + R)^T * Y}{(1 + R)^T - 1}$$

$S_1$  = Change in annual debt service due to new debt.

R = Yield for municipal bond or loan.

T = Number of years to maturity for bond or loan.

Y = Capital cost required to comply with regulations.

Equation B: Determine the operating revenue required to pay for the increase in costs using new costs and the information in the 1986 annual report.

$$R_H = X_1 + D + X_2 + 1.25 * (S_1 + S_2) - R_2$$

$R_H$  = Estimated change in operating revenue based on projected costs.

$X_1$  = Estimated change in O&M costs due to pollution control expenditure.

$D$  = Depreciation of the new equipment.

$X_2$  = Existing O&M and replacement costs of the utility.

1.25 = Debt Service Coverage Ratio.

$S_2$  = Existing debt service of the utility.

$R_2$  = Existing operating revenue for the utility.

Equation C: Determine if the new user charges are affordable.

$$\frac{H}{I} \leq L$$

$I$  = Average Household Income.

$L$  = Threshold limit (portion of income that can be spent on current costs plus the costs of the new regulations).

$H$  = New User Charges.

Equation D: Determine the ability of a municipality to issue general obligation bonds.

1. Determine whether the proposed debt service is a reasonable fraction of the total revenue for the municipality.

$$\frac{SO_3 + SO_2}{RO} \leq 0.2 \quad \text{or} \quad .15$$

SO<sub>3</sub> = Change in annual debt service for the municipality due to pollution control debt.

SO<sub>2</sub> = Existing annual debt service for the municipality.

RO = General government revenue for the municipality.

2. Determine whether the proposed debt service is a reasonable fraction of the market value of taxable property.

$$\frac{SO_3 + SO_2}{F} \leq 0.008 \quad \text{or} \quad 0.006$$

F = Market value of taxable property.

### C. SELECTED VARIABLES

The municipal financial data base provides many important variables for the equations used in MUNFIN. This section contains a brief description of some of these variables.

#### 1. Utility Variables

##### (a) Utility Expenses

The utility expenses consist of the operating expenses excluding the interest expense and capital expenditures. Major capital expenditures usually pertain to capital equipment additions or replacements, hence they were not included in the total operating expenses. The interest expense results from the debt carried by the utility. Whether or not a utility carries debt does not directly affect the operations of a utility and therefore, its operating costs. Interest expense was included in the utility's debt service.

(b) Utility Revenues

For the purposes of MUNFIN, the utility's revenues were those revenues that were collected from users of the utility's services and hence, represent what the users pay. Interest revenues were not included in this figure.

(c) Utility's Debt Service

The utility's debt service is the sum of yearly interest and principal payments that the utility must make to meet the terms of the bond (or other debt instrument) that was issued.

(d) Residential Share of the Operating Revenues

A critical variable for the MUNFIN model was the user charges per household. To calculate its value, the share of the revenues that the households paid was needed. This percentage, in most cases, was obtained by examining a utility's annual report or by contacting officials from the utility. In those instances where it was impossible to obtain the percentage, a reliable standard default based on the utility's size and capacity was used.

2. General Government Variables

(a) Annual Municipal Debt Service

The annual municipal debt is the sum of the interest and principal paid by the municipality in a given year to comply with the terms of the G.O. debt. It is an expense for the municipality and must be paid if the city wants to avoid bankruptcy. In the model, the debt service is a major variable and therefore careful attention was paid so that it was calculated accurately. To calculate the municipal debt service, principal and interest payments for General, Special Revenue,

and Debt Service Funds were added.

(b) General Government Revenues

A municipality obtains its revenues from a variety of sources: taxes, grants, bond proceeds, special assessments, pension funds. Some of these were not included in the numbers used in the model. Local government revenues were calculated by adding the revenues from the Governmental Fund Types (i. e., General, Special Revenue, Debt Service, Capital Projects, and Special Assessment) and one Fiduciary Fund Type (i.e. Expendable Trust). Those not included were: Propriety Fund Types (e.g. Enterprise and Internal Service); and, Fiduciary Fund Types (e.g. Pension Trust, Nonexpendable Trust, Agency).