NRRI 88-8

SURFACE WATER TREATMENT RULES AND AFFORDABILITY: AN ANALYSIS OF SELECTED ISSUES IN IMPLEMENTATION OF THE 1986 AMENDMENTS TO THE SAFE DRINKING WATER ACT

Vivian Witkind Davis
Senior Research Associate

Ann P. Laubach
Graduate Research Associate

THE NATIONAL REGULATORY RESEARCH INSTITUTE
1080 Carmack Road
Columbus, Ohio 43210

July 1988

This report was prepared by The National Regulatory Research Institute (NRRI) with funding provided by participating member commissions of the National Association of Regulatory Utility Commissioners (NARUC). The views and opinions of the authors do not necessarily state or reflect the views, opinions, or policies of the NRRI, the NARUC, or NARUC member commissions.

EXECUTIVE SUMMARY

Amendments in 1986 to the Safe Drinking Water Act require the U.S. Environmental Protection Agency (EPA) to specify criteria under which filtration must be used as a treatment technique for public water systems supplied by surface water. Under the Amendments the EPA must also publish maximum allowable levels for turbidity.

Concerned that the proposed criteria on surface water treatment could prove costly to water utilities under the jurisdiction of the state regulatory commissions, the NARUC Water Committee asked The National Regulatory Research Institute (NRRI) to investigate the impact of the proposed regulations. The NRRI was also to solicit opinions on EPA informal proposals on standards of "affordability" of expenditures to meet SDWA requirements. Criteria on affordability would be used as an aid to judging when a treatment technique would be too expensive for smaller systems across the country and to help decide whether particular water systems can be exempt from meeting an EPA standard on the basis of economic hardship. Such criteria would not be limited to surface water systems but would apply to all water systems and contaminants regulated under the Amendments.

Proposed Rules on Surface Water Treatment

The EPA Nov. 3, 1987, published proposed rules on filtration, turbidity, and disinfection of all public water systems using surface water. Suggested revisions to the proposed rules were published May 6, 1988. If, as expected, the rules are finalized by December 1988, systems required to install filtration will have to do so by December 1992.

The EPA predicts that all of the 2,882 public water systems nationally that use surface water and that do not currently have filtration will incur some additional costs under the surface water treatment rule. The capital costs for these systems are estimated at $1.6 billion. Of an additional 6,919 systems that already filter, EPA estimates that 5,128 will have to upgrade their systems to meet the new standards. Capital costs for the upgrading are estimated by EPA at $333 million.

Driving the proposed surface water treatment rules is evidence that disease outbreaks caused by impure surface water are on the increase and could be sharply reduced by improved water treatment. EPA reports that from 1971 through 1985 over 100 reported outbreaks of waterborne disease affecting over 34,000 people could be attributed to deficiencies in treatment by water systems using surface water. Application of the new surface water treatment rules is expected by EPA to result in elimination of most such outbreaks.

Results of NRRI Survey on Surface Water Treatment Rules

Through a survey of the state regulatory commissions conducted in the fall of 1987, the NRRI found that few jurisdictional water utilities are likely to have to bear the costs of installing filtration. Only 121 commission-regulated systems, 51 of them in Pennsylvania, are not currently

filtering their drinking water. Some of these will be able to avoid filtration by switching to ground water sources or gaining exceptions to the filtration criteria.

There were 12 unfiltered, commission-regulated water utilities serving 25 to 100 people identified in the survey. Taking this smallest size category and using it as an example, according to EPA estimates of the annual costs of new filtration systems these utilities would incur an estimated additional cost of $10,000 annually, or as much as $400 a year per person. Even if such a utility was granted an exception to the rules the costs of maintaining the exception are predicted to amount to $3,500 a year, or $140 annually per person. There are substantial economies of scale to the provision of filtered water, so that per person costs for the largest systems will be only a few dollars annually. But EPA cost estimates are likely to be low, as was borne out in NRRI case studies of the cost of filtration.

For systems using surface water and already filtering, the new rules would require that filtered water turbidity be less than or equal to .5 NTU in 95 percent of the measurements taken each month. In some cases a turbidity standard of 1 NTU 95 percent of the time may be sufficient. Of the 316 water systems for which commission staff reported data on turbidity standards currently being met, only six were out of compliance with the existing standard and 70 were already meeting the .5 NTU standard. But staff at only 14 commissions were able to report such data.

The NRRI survey requested information on water use and water bills and concluded that both are subject to much more variation than taken into account in EPA assumptions that are being used to judge the impact of the new regulations. Annual water use ranges from 40,000 to 240,000 gallons a year, according to commission staff estimates for their states, where EPA suggests assuming 146,000 gallons a year. Similarly, EPA estimates current water bills for small utilities at $100 to $150 a year. Yet the ranges in annual residential water bills reported by commission staff were much greater than $50. The average low end of the ranges was $111 and the average high end, $406.

Survey Results on Affordability

Commission staff members participating in the NRRI survey disagreed with the dollar amount of water bills deemed affordable by the EPA under an informal proposal current at the time of the survey. They also disagreed with the criteria on which the possible affordability standard was based and with the logic offered by EPA in justifying the standard. EPA's proposal would have allowed water bills up to $550 on average nationally. Commission staff, on average, would support total bills that are about half that amount.

Many of the staff respondents would not support increases above what is already being paid by residential water users in their states, suggesting that commissions are likely to scrutinize the costs of SDWA improvements critically. Many commission staff members participating in the survey predicted severe consequences for ratepayers, regulated companies, and the

commissions if increases as high as the EPA was suggesting occurred. They warned of rate shock and of economic hardship for low-income ratepayers.

While EPA was suggesting that median income might be an equitable measure of the affordability of new treatment under the SDWA, commission staff overwhelmingly would tie any increases and ultimate water bills to existing local bills. The effect on local bills has since been added to the EPA guidance on affordability as a criterion to be taken into consideration along with community income.

The commission staff suggested a variety of ways of deviating from existing bills. Percentage increases from current average bills or current maximums were suggested most often. The importance of public acceptability of increased rates was emphasized. Survey respondents suggested that customers are often willing to pay substantially more for their water if they believe they are getting value for their money.

Other factors mentioned by commission staff to be considered in assessing affordability were: (1) the proportion of households on fixed incomes or with low incomes, (2) whether or not existing utility service was adequate, and (3) the local price of drilling an individual well.

Other Considerations on Affordability

The concept of "affordability" has to do both with people's willingness to pay for a good or service, or their purchasing preferences, and their ability to pay for it, or the budget available to them. Willingness to pay may be most closely measured by deviation from existing water bills. Commissions tend to be concerned that utility customers will be unwilling to pay more for water. But the case of capital improvements to meet drinking water standards may be perceived somewhat differently by customers than earlier severe increases in energy prices, where they were called on to pay much more for exactly the same product. And over time utility customers can adjust to higher water rates, as they have to higher energy rates. Ability to pay may be best measured by community income adjusted for the proportion of low income residents and the costs of alternative sources of drinking water. Any standard of affordability developed by EPA must take into account both willingness to pay and ability to pay.

Welfare economics and common sense suggest that spending for a social program should proceed only to the point where benefits equal costs. Under the SDWA there is a presumption that benefits of meeting standards will equal or exceed costs. But decisions on exemptions from meeting the standards under Section 1416 of the SDWA Amendments clearly call for at least a qualitative assessment of costs versus benefits. It is interesting to note that the EPA's own assessment of costs and benefits concluded that surface water treatment is not cost effective for the three smallest categories of water utilities or for the city of Reno, the largest commission-regulated water utility affected by the rules.

One issue not taken into account by the EPA thus far in considering affordability is the distinction between ability to pay for the customers of water systems and the ability to pay for the water systems themselves. The state regulatory commissions regulate many small, private water companies

that are not providing adequate water service now and are unlikely to be able to raise the capital to meet new SDWA requirements. Compliance with the SDWA for such companies would call for new funding mechanisms and possibly new regulatory approaches.

Commission Action

Perhaps the most important conclusion of this report relates to the process of reviewing requests for exemptions. Primacy agencies (the environmental or health agencies responsible for implementation of the SDWA at the state level) are not required to consult with state regulatory commissions on affordability. A water utility can receive approval from the primacy agency for capital improvements to meet SDWA standards and only later go to the commission to ask for a rate increase. The commission must then fulfill its own statutory obligations, deciding such questions as whether the plant additions are used and useful, whether investment decisions were prudent, and what rates are just and reasonable. Cooperation between a primacy agency and a commission will be a key component of the process of reaching a feasible decision on affordability that assures safe drinking water. To the extent that commissions and primacy agencies are able to institute cooperative review of exemptions for utilities that they mutually regulate, the reasonableness and public acceptability of such decisions are likely to be enhanced.

To reduce rate shock from paying for SDWA improvements, commissions will want to consider methods that have been used in other utility areas, such as phase-in plans, construction work in progress, and variations in amortization and depreciation rates. In assessing local costs for adding or upgrading filtration, commissions can take limited stock in published EPA estimates, even when they are adjusted for inflation. EPA cost estimates do not take into account real estate costs, which are highly site specific. They do not consider taxes, which are important for costs to a private water company but of course not relevant to a municipal one. And they assume a risk-free borrowing power based on the public sector rather than the interest rates available to private water companies. An evaluation of proposed costs of new treatment for a regulated company might begin with EPA estimates of costs for that size utility and the proposed treatment but will likely depend on the company's particular situation.

Although most of the local impact of the SDWA Amendments is several years away, it is not too early for the commissions to prepare to meet these challenges. It is hoped that the extensive information provided in this report will help commissions to fashion a proactive stance in meeting their responsibilities for SDWA implementation.

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FOREWORD

The Safe Drinking Water Act Amendments of 1986 will call for major improvements in water treatment for many commission-regulated water utilities. Recently proposed rules on surface water treatment are one aspect of implementation of the Amendments that will have an impact on jurisdictional utilities. Possible criteria for judging the "affordability" of meeting the Amendments' requirements for surface and ground water utilities are another. This report is intended to provide commissioners and commission staff with empirical information and policy analysis that will aid in developing commission approaches to the new surface water treatment requirements and decisions on affordability.

Douglas N. Jones
Director
July 5, 1988

ACKNOWLEDGEMENTS

The authors wish to express their sincere thanks to the staff of the public service commissions who responded to the survey conducted for this report and follow-up telephone calls for additional information.

We are particularly grateful for the time given to us by several persons who reviewed and made very constructive comments on a draft of this report. Commissioner Thomas Stephens of Nevada gave considerable time to a careful review of the draft. Chairman of the NARUC Water Committee, Delaware Commissioner Nancy M. Norling provided crucial and incisive comments as did Commissioner Paul Foran of Illinois. Staff members Peter Kosak of Connecticut, Robert Mulligan from New York, and Bill Sankpill of Missouri, Chairman of the Staff Subcommittee on Water, also were generous in giving their time to review the draft. A.W. Marks of the EPA Office of Drinking Water and National Association of Water Companies Executive Director James Groff provided commentary from the federal and industry perspectives. We appreciate their advice.

We wish to thank NRRI Associate Director Raymond W. Lawton (who reviewed more than one draft of the report) for his direction and support. The typing expertise of Carole Prutsman and Evelyn Shacklett (who suffered many drafts) is also very much appreciated. The final contents of this report are, of course, the full responsibility of the authors.

CHAPTER 1
INTRODUCTION

Under the 1986 Amendments to the Safe Drinking Water Act (SDWA) the U.S. Environmental Protection Agency (EPA) is setting criteria for determining where mandatory filtration of surface water supplies may be required. The NARUC Water Committee was concerned that the proposed criteria on surface water treatment could prove costly to water utilities under the jurisdiction of the state regulatory commissions. The Water Committee asked The National Regulatory Research Institute (NRRI) to survey the commissions to aid in identifying the impact of the new regulations. At the same time the NRRI was to solicit observations on the "affordability" of new treatment technologies. The EPA has proposed setting criteria on affordability as an aid to judging when a treatment technique will be too expensive for smaller systems across the country and to help decide whether particular water systems can be exempt from meeting an EPA standard on the basis of economic hardship. The affordability criteria would apply to ground water systems as well as surface water systems.

The EPA is predicting that all of the 2,882 public water systems nationally that use surface water and that do not currently have filtration will incur some costs under the surface water treatment rule.[1] The capital costs for these systems are estimated at $1.6 billion, of which 42 percent is attributable to New York City and 14 other large cities. Installing filtration in the Reno-Sparks plant in Nevada, the only one of the fifteen large utilities that is regulated by a state utility commission, has been estimated by EPA to cost $4.15 million annually (see table 2-4). Of an

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[1] Environmental Protection Agency, "National Primary Drinking Water Regulations; Filtration and Disinfection; Turbidity, Giardia Lamblia, Viruses, Legionella, and Heterotrophic Bacteria; Proposed Rule," Federal Register, Vol. 52, No. 212, Nov. 3, 1987, 42202-003; referred to herein as "proposed rule."

additional 6,919 systems that already filter, EPA estimates that 5,128 will have to upgrade their systems to comply with the new rules. Capital costs for this upgrading are estimated at $333 million.[2]

The NRRI survey of the commissions conducted in the fall of 1987 found that few commission-regulated water utilities are likely to have to install new filtration plants, but that those that do are likely to incur costs higher than projected by EPA. Only 449 regulated water utilities were reported to use surface water by the 39 commissions participating in the survey.[3] Of those, 121 do not currently filter their water. Because many surface water systems are expected to be able to meet criteria for an exception to the filtration requirements, or may choose to begin using an alternate source, it is not clear how many of the 121 systems might actually have to install filtration. However, it is important to note that water utilities using surface water are among the largest ones regulated by the commissions. Where a jurisdictional water utility does have to install treatment, the costs may be significant. Furthermore, the cost of acquiring and keeping an exception to filtration criteria can itself be substantial. And the requirements for watershed control in order to gain an exception may be too difficult for many utilities to meet.

It is thought that more commission-regulated utilities will be affected by the new turbidity requirements. Commission staff surveyed are not certain of the impact of moving from a currently required 1.0 NTU standard for turbidity to a .5 NTU standard, as proposed by EPA. Although there are a number of commission-regulated surface water utilities that are currently meeting the new standard, there may be substantial costs to meeting the stricter standard for those that are not and are required to do so. The survey did not request information on the impact of required changes in

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[2] Ibid., 42205-06.

[3] Florida did not participate in the survey, but a Florida staff member did tell the NRRI that there are no regulated surface water utilities in that state. This brings to 40 the number of states on which the NRRI has this information, out of 45 states where water utilities are regulated by public service commissions. Water utilities are not regulated by the commissions in Georgia, Minnesota, Nebraska, North and South Dakota, and the District of Columbia.

disinfection practices, but for some water utilities regulated by the commissions, this could also have a significant impact.

Although the proposed rules on surface water treatment may not have a substantial effect on many commissions, the EPA approach to affordability will affect commission regulation of water utilities faced with making capital improvements to meet other SDWA requirements. EPA documents on surface water treatment discuss approaches to affordability, but this is an issue that will come up in application of standards on ground water as well. Under the SDWA, a regulated water system may apply for an exemption to the state primacy agency (the state health or environmental agency delegated the responsibility for SDWA enforcement by EPA), and it is the primacy agency that makes the determination as to whether an exemption may be granted. Economic hardship is a criterion for approving an exemption.

In deciding whether economic hardship exists for commission-regulated water utilities, the primacy agencies are under no obligation to look to the commissions for how much of a rate increase consumers can afford. It is possible that a water utility can receive approval from a primacy agency to install expensive new water treatment without the primacy agency ever consulting the state regulatory commission. Even if the primacy agency asked, the commission might not be able indicate in advance its rate treatment for estimated SDWA compliance costs. And whether or not there is early cooperation with the primacy agency, commissions may find themselves in a dilemma as they weigh the cost of utility SDWA compliance against statutory requirements that govern commission regulation, such as the obligation to approve only prudently incurred costs, the requirement that plant be used and useful, and the requirement that rates be just and reasonable.

Using a preliminary EPA proposal on affordability and the commission staff's reaction to it as a starting point, this report explores in chapter 7 some of the dimensions of the concept of affordability and suggests some approaches. These are not meant as prescriptions to the commissions, but as starting points for discussion. In general, it is proposed that, while there must be equitable, uniformly applied, substantive requirements for granting exemptions under the SDWA, much will depend on the regulatory process at the state and local level in specific cases.

In discussing "affordability," many commission staff respondents called for relating any increases in water bills to existing bills, rather than to an alternative measure of affordability. They would by and large sharply restrict such increases. These survey results suggest that EPA and state commissions judge affordability by different criteria and that this difference may cause problems. Cooperation between a primacy agency and the commission will be a key component of the process of reaching a feasible decision that assures high quality drinking water. Such a process will educate the public, the commission, and other parties on the costs, the benefits and the alternatives involved, potentially enhancing the reasonableness and the public acceptability of the ultimate decision.

While the main thrust of the NRRI survey of the commissions was on surface water treatment and affordability, the survey also explored two related issues, water bills and water consumption, to compare them to EPA estimates of these factors. EPA estimates an average annual residential water bill for homes served by small water systems in the United States at $100-$150 and has used this figure to compute affordable increases in annual water rates.[4] The ranges in annual bills reported by respondents to the NRRI survey were much greater than $50, suggesting much more variability in impact of higher water rates than implied by the EPA average. Similarly, in examining the costs of compliance with the filtration and disinfection requirements, EPA has used a ballpark figure of 146,000 gallons a year for national residential consumption of water.[5] Annual residential water use reported by the commissions, by comparison, ranged from 40,000 gallons in an eastern state to 240,000 gallons in a western one, a variation that should be taken into account in judging the impact of proposed new SDWA rules.

Chapter 2 of the report reviews EPA's proposed rules and background information on surface water treatment. Chapter 3 discusses the general

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[4] "National Primary Drinking Water Regulations; Synthetic Organic Chemicals; Monitoring for Unregulated Contaminants; Final Rule," Federal Register, Vol. 52, No. 130, July 8, 1987, 25707.

[5] Malcolm Pirnie, Inc., and CWC-HDR, Inc., Guidance Manual for Compliance With the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources, prepared for the U.S. EPA Office of Drinking Water, draft, Oct. 8, 1987, 9-2.

results of the NRRI survey of the commissions and chapter 4 some case studies of the cost of treating surface water that were revealed through the survey. Chapter 5 discusses survey results on water consumption and the range of annual water bills for commission-regulated water utilities. Chapter 6 looks at results of the NRRI survey on affordability, and chapter 7 offers thoughts on the meaning of affordability and some possible approaches. Chapter 8 summarizes and comments on the findings of the report.

This report is the third in a series being prepared by the NRRI to aid public utility commissions in playing a proactive role in implementation of the SDWA in the context of their statutory responsibilities. Briefing Paper on the Economic Impact of the Safe Drinking Water Act Amendments of 1986 (July 1987) gave a general overview of the SDWA and reviewed the existing literature on costs of SDWA improvements. A Preliminary Review of Certain Costs of the Safe Drinking Water Act Amendments of 1986 for Commission-Regulated Ground Water Utilities (September 1987) used existing EPA estimates of probable costs for various sizes of water systems to estimate hypothetical costs for a group of commission-regulated water companies. Future NRRI work on the SDWA Amendments is expected to focus on actual costs of field-tested technologies and commission options for phasing in increased treatment costs.

CHAPTER 2

THE EPA APPROACH TO SURFACE WATER TREATMENT

The SDWA Amendments of 1986 require EPA to specify criteria under which filtration must be used as a treatment technique for public water systems supplied by surface water. The Amendments also required that EPA publish maximum allowable levels of turbidity. The EPA Nov. 3, 1987, published proposed rules on (1) filtration, turbidity, and disinfection for all public water systems using surface water, and (2) maximum contaminant levels (MCLs) for five microbiological contaminants.[1] The criteria for deciding when filtration is required, as mandated by the SDWA, include consideration of source water quality, watershed management, and existing treatment techniques. In its proposed rules, the EPA called for requiring public water systems to meet turbidity levels tailored to specific treatment techniques. The EPA proposed numerous revisions to these rules on May 6, 1988. These revisions would ease the burden of compliance to some degree by making certain technical requirements less difficult to fulfill.[2]

This chapter of the NRRI report reviews the proposed rules on surface water treatment and accompanying documents. Provisions for exemptions are briefly reviewed as they relate to surface water treatment, with the bulk of this discussion reserved for later chapters on affordability. Some technical background information on treatment techniques and requirements of the proposed rule is presented in this chapter for the interested reader. Other readers may wish to turn directly to the sections of the chapter devoted to costs or to the chapter's summary.

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[1] Proposed rule.

[2] Environmental Protection Agency, "National Primary Drinking Water Regulations, Filtration and Disinfection; Turbidity, Giardia Lamblia, Viruses, Legionella, and Heterotropic Bacteria; Total Coliforms; Notice of Availability; Close of Public Comment Period; Proposed Rule," Federal Register, Vol. 53, No. 88, May 6, 1988, 16348-16358.

Driving the proposed surface water treatment rules is evidence that outbreaks of diseases caused by impure surface water are on the increase and could be sharply reduced by improved water treatment. In many parts of the country filtration is a normal part of water treatment. Where it is not, primarily in the northeast and far west, it is for the most part because historically the source water has been very clean. Population growth and development of previously untouched watershed land is changing that.

Waterborne Disease

Application of the new surface water treatment rules is expected by EPA to result in elimination of most incidences of waterborne disease from microbiological contamination of surface water. EPA reports that from 1971 through 1985 over 100 reported outbreaks of waterborne disease affecting over 34,000 people could be attributed to deficiencies in treatment by water systems using surface water. Many more outbreaks, possibly even a majority, are not reported, states EPA, because they are not recognized or traced back to the water source.[3]

The number of reported outbreaks of waterborne disease has, moreover, risen in recent years, most significantly in the late 1970s, as shown in figure 2-1. This increase has been attributed to a number of factors, including inadequate operation and maintenance practices at water treatment facilities; improved reporting practices in recent years; growth in population causing an increase in the sources of contamination; the appearance of new strains of diseases, such as those associated with Giardia, Legionella, and Crypto sporidium;[4] and the use of indicator organisms such as total coliform that are not 100 percent accurate.[5] The EPA contends that U.S. citizens have a "false sense of security" with regard

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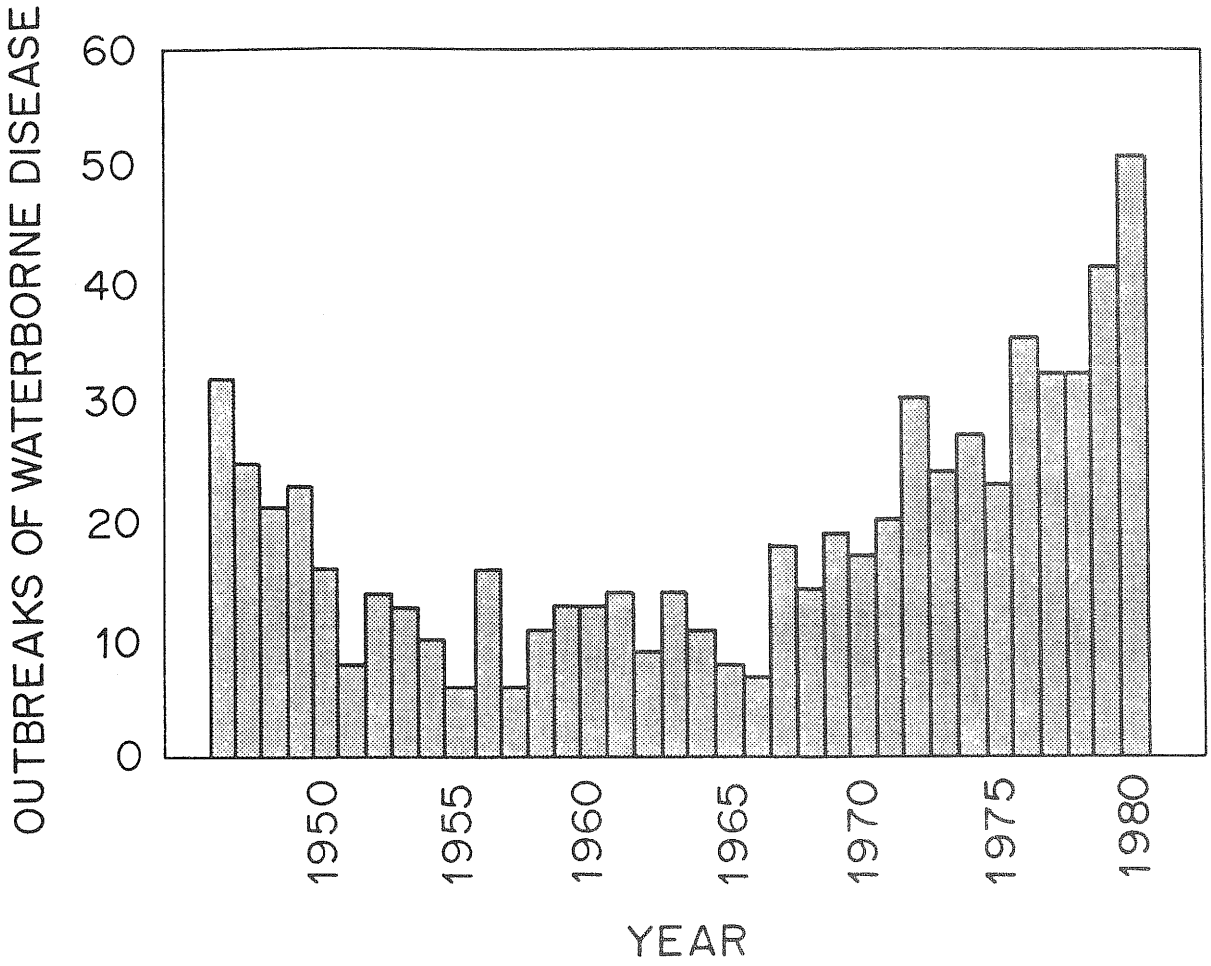
[3] Ibid., 42182-3.

[4] Crypto sporidium is a recently discovered waterborne pathogen. It is similar to Giardia but highly resistant to chlorination, making the case for filtration even stronger.

[5] Wade Miller Associates, Inc., Regulatory Impact Analysis: Benefits and Costs of Proposed Surface Water Treatment Rule and Total Coliform Rule, prepared for EPA Office of Drinking Water, Contract Order 68-01-7034, Task Order No. C-1, 1987, 2-4 to 2-8.



Source: EPA Office of Drinking Water, Technologies and Costs for the Treatment of Microbial Contaminants in Potable Water Supplies, Revised Draft Final, April 1987, 3.

Figure 2-1. Number of reported outbreaks of waterborne disease in the United States, 1946-1980

to water quality[6] and that new threats to water systems will make even systems that are not currently experiencing water quality problems vulnerable in the near future. For example, protecting watersheds by controlling human intrusion was long thought to be a reliable means of assuring high quality water. Giardia cysts, however, are carried by wildlife and can be transmitted to humans via water from such protected watersheds.

The American Water Works Association (AWWA), in comments submitted to the EPA on Dec. 29, 1987, criticized the portion of the EPA's proposed regulation addressing public health. The AWWA's criticism was based not on any doubt that the number of water quality problems may be rising but on what the AWWA believes is an inappropriate approach to responding to this problem. According to the AWWA, if the EPA believes that the increase in outbreaks is due in part to improperly operated water treatment systems and that some of these outbreaks are not being identified or reported, then the EPA should define what an improperly operated treatment system is and implement a way these treatment systems can be identified and improved. The AWWA suggests the creation of mandatory state-wide certification programs for all personnel responsible for operating treatment plants as well as requiring all state health departments to conduct standardized epidemiological studies after every suspected waterborne disease outbreak to verify whether or not a water system was the cause.[7]

Levels of Treatment

In looking at levels of treatment, EPA notes that the data indicate that systems using both filtration and disinfection are significantly more effective in preventing waterborne disease than systems that use only disinfection. The AWWA considers filtration of waters that are contaminated

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[6] EPA Office of Drinking Water, Technologies and Costs for the Treatment of Microbial Contaminants in Potable Water Supplies, Revised Draft Final, April, 1987, II-12.

[7] American Water Works Association, "Conceptual Comments on the EPA Proposed Rules for Surface Water Treatment and Total Coliforms Including the Accompanying Guidance Document," Dec. 29, 1987, 1-2.

or vulnerable to contamination "the preferred treatment method of microbiological contaminant removal."[8] The AWWA notes that filtration has been in use for nearly 100 years and that even without disinfection, filtration has been known to vastly improve the potability of drinking water. Today, says the AWWA, good watershed management and the protection of surface water from microbial contamination may not by themselves be sufficient to protect the public health under all contingencies where surface water is the source. Simple disinfection as the only treatment for surface water sources is ineffective in preventing waterborne transmission of Giardia, they say. All surface water should receive pretreatment and filtration in addition to disinfection.[9]

Under the proposed rule, all public water systems using any surface water source would have to treat their surface water to achieve at least 99.9 percent removal and/or inactivation of Giardia cysts, and at least 99.99 percent removal and/or inactivation of enteric viruses. Every water system would have to disinfect. Unless a system could also meet criteria for an exception to the rules, it would also have to filter.

The effectiveness of filtration is currently measured by turbidity, which is the light scatter or absorption caused by suspended or colloidal matter in the water. Although the existence of suspended particles in water does not in itself constitute a health concern, high turbidity levels may interfere with other parts of the water treatment process by reducing the effectiveness of disinfection and distorting total coliform analyses. In addition, low turbidity often indicates that pathogens such as Giardia cysts have been removed.[10] The standard of measurement for turbidity is nephelometric turbidity units (NTU).

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[8] American Water Works Association, "Comments of the American Water Works Association on the Aug. 6, 1986, Draft Criteria for Filtration Rule," 1.
[9] AWWA Committee on the Status of Waterborne Diseases in the United States and Canada in 1984, in EPA Office of Drinking Water, Technologies and Costs, op. cit., II-24 and II-25.
[10] Proposed rule, 42180.

Once a system meets the criteria for filtration, the requirements for inactivation of Giardia and enteric viruses would be assumed to be met without monitoring if a system were meeting "CT" values appropriate to the pH and temperature of the treated water. CT values are obtained by multiplying disinfectant residual concentration ("C") by disinfectant contact time ("T" in minutes).

Types of Filtration[11]

The EPA's proposed rules allow a variety of treatment technologies to meet the performance levels for inactivating Giardia and enteric viruses. Conventional treatment would be considered the best technology for most source waters. Direct filtration would be allowed under certain source water quality conditions determined by the state to meet the performance levels. Other technologies could be used to meet the performance standards if they could be proven effective enough.

Conventional treatment is the most frequently used type of filtration. It includes chemical addition, rapid mixing, coagulation, flocculation, sedimentation, and then filtration and disinfection. In order to remove suspended particles from the raw water, a coagulant such as aluminum sulfate is added to the water and is dispersed throughout the water by means of rapid mixing. The water then flows into a flocculation basin where the coagulation process continues at a controlled rate to produce floc. The water then enters a sedimentation basin where, under a detention time of one to four hours, the floc will settle out. It is in the sedimentation basin that most turbidity is normally removed. The water is next treated by rapid-sand filters and/or dual-media or multia-media filters to remove remaining particles and further reduce turbidity. Rapid-sand filtration refers to the speed with which the water passes through the filters, which necessitates the use of chemical coagulation to assure the removal of particles. In dual-media and multi-media filtration, layers of sand and

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[11] The explanation of different filtration techniques presented here is derived from EPA Office of Drinking Water, Technologies and Costs, op. cit., III-1 to III-40.

other media such as anthracite coal are used in combination. Disinfection is the final step of this treatment method.

Three other kinds of filtration--direct, diatomaceous earth, and slow-sand--can be installed and operated at generally lower cost than conventional filtration, but usually require relatively high quality water in order to work effectively. Direct filtration can mean one of a variety of treatment methods. Direct filtration usually does not include sedimentation basins in the process, but instead only chemical coagulation and mixing followed by dual-media or mixed-media filtration and disinfection. Sometimes, however, direct filtration includes flocculation prior to filtration or the use of a contact basin to improve the mixing of the coagulant, trap silt and sand, and allow for prechlorination. Simple direct filtration is an effective treatment method if the raw water has low turbidity levels in all seasons. Additional steps in the direct filtration process can help to make treatment more reliable if raw water quality is variable.

Diatomaceous earth filtration is also useful for raw water that has low turbidity levels. In its most basic form, this kind of filtration is accomplished simply by passing raw water through a diatomite filter, which is a filter derived from diatom, a class of algae with silicified skeletons. During the filtration process, the permeability of the filter is maintained by the addition of more diatomite, known as body feed. In order for diatomaceous earth filtration to be used widely for water quality treatment, various forms of pretreatment such as coagulation and settling will probably be required.

Slow-sand filtration uses biological and physical mechanisms, rather than chemical ones, to remove suspended particles from water. The pores between the sand particles are much smaller than for rapid-sand filtration, and the water passes through the filter at a much slower rate; the water is then disinfected prior to delivery to customers. Slow-sand filtration has been successful in water systems that have consistently low turbidity levels, although when this method is combined with chemical pretreatment it becomes useful over a much greater range of turbidity levels.

Package filtration plants normally use the same treatment methods as conventional filtration. They are factory-assembled, mobile units that are often used in remote areas such as parks that do not have access to a public

water supply, but also serve some community water systems. They are a low-cost option to a conventional filtration system and usually do not require a full-time operator.

Criteria for Requiring Filtration for Systems Not Currently Filtering

EPA's criteria for determining whether filtration is required are based on the quality of the source water and several other tests. Figure 2-2 shows the process by which decisions will be made on which systems should install new filtration or modify existing filtration. According to this decision tree, if the surface water system does not currently filter the water, it may still comply with the rule if it meets the required water quality and site-specific conditions established by the EPA and is thereby qualified for an exception to the rule. If a non-filtering water system fails to meet the EPA's water quality and site-specific conditions, however, it must either qualify for a temporary exemption from the rules (and must eventually install filtration), or it will be in violation and must immediately install filtration.

For surface water systems that already filter the water, a system will be in compliance with the rule if it satisfies the EPA's design operation performance criteria. A system that fails to meet this criteria will either have to qualify for a temporary exemption from the rule, as noted above, or will be in violation and will have to immediately modify its treatment method to bring its filtration into compliance with the rule.

To be granted an exception, a water system must meet the following criteria:[12]

1. Coliform limits: The fecal coliform concentration in water prior to disinfection must be less than 20/100 ml. in 90 percent of the samples, or the total coliform concentration in water prior to disinfection must be less than 100/100 ml. in 90 percent of the samples.

2. Turbidity limits: A system must demonstrate on an ongoing basis that the turbidity of the water prior to disinfection does not exceed 5 NTU.

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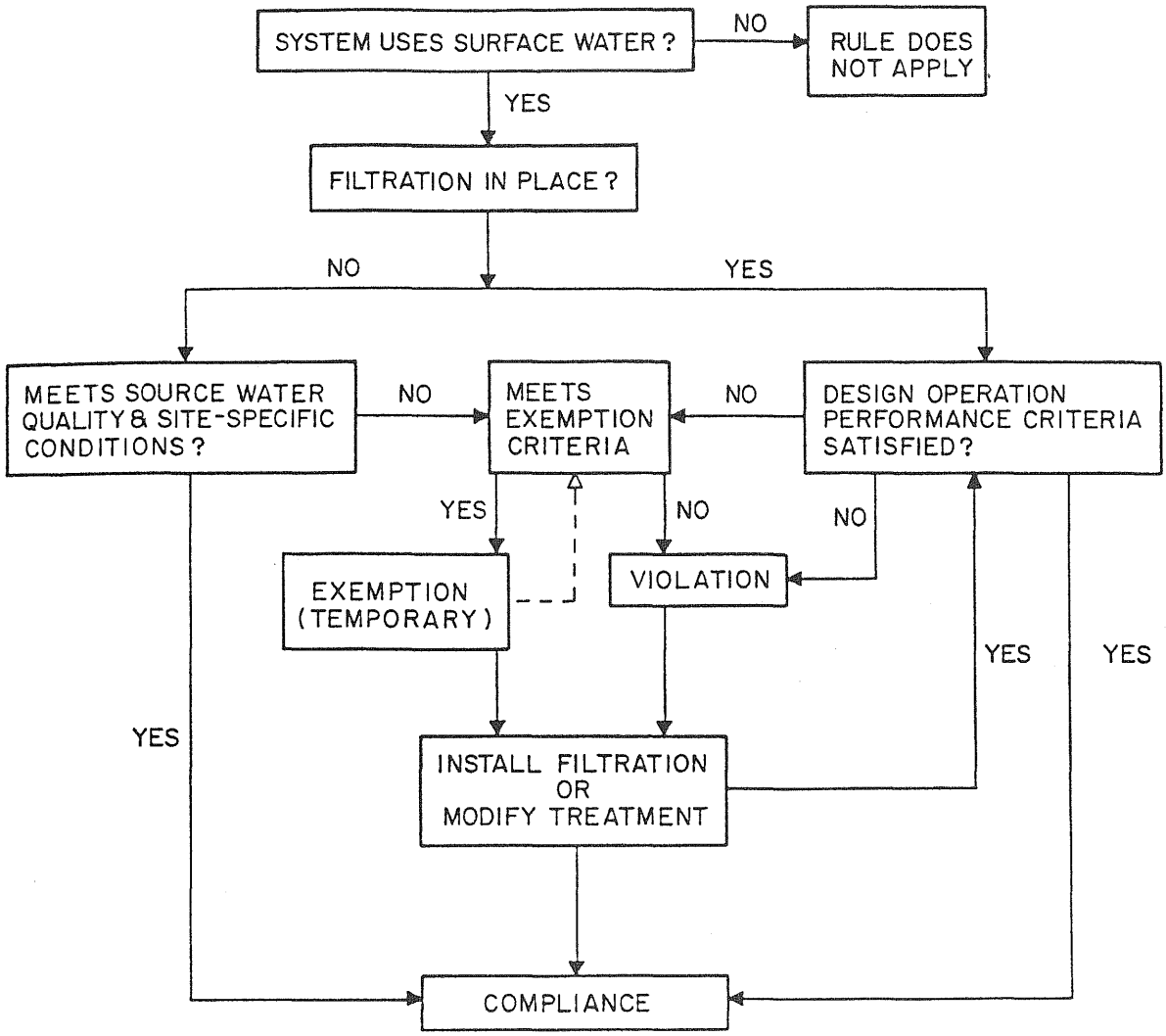
[12] Proposed rule, 42185-42188.



Source: Modified from EPA, Proposed rule, 42191

Fig. 2-2. EPA process for deciding when surface water treatment improvements are required

3. Disinfection: A system must practice disinfection and have redundant disinfection capability. The system must demonstrate on an ongoing basis that the disinfectant residual of at least 0.2 mg/l is maintained in the water entering the distribution system. The system must meet CT values.

4. Watershed control: A system must maintain an effective watershed control program. This includes characterization of the watershed hydrology and land ownership, identification of watershed characteristics and activities which may have an adverse impact on water quality, and programs to monitor and control the occurrence of activities which may be detrimental to water quality. The water system must demonstrate through ownership or written agreements with landowners in the watershed, or both, that it is able to control all human activities which may have an adverse impact on water quality.

5. Sanitary survey: The system must have an on-site sanitary survey each year. The survey results must indicate to the state's satisfaction that the water being supplied is safe.

6. Disease outbreaks: A system in its current configuration must not have had an identified waterborne disease outbreak.

7. Long-term total coliform level: The system must comply with the long-term MCL for total coliforms. No more than five percent of the coliform measurements in the distribution system can be positive for any 12 previous months or 20 previous samples.

8. Trihalomethanes: A system must demonstrate that it is in compliance with the total trihalomethane regulation. This now only applies to systems serving over 10,000 people. But when new regulations for disinfection by-products are promulgated, these limits will also be imposed on smaller systems.

Criteria for Systems Already Filtering

The EPA rule also proposed criteria for determining whether treatment is adequate for systems which are already filtering. These include design and operating conditions, disinfection requirements, turbidity monitoring

requirements, and turbidity performance criteria. The performance criteria for turbidity differ depending on the type of filtration system:[13]

1. For systems using conventional treatment or direct filtration, the proposed rule requires that filtered water turbidity be less than or equal to .5 NTU in 95 percent of the measurements taken every month. If, however, a state determines that with conventional or direct filtration, Giardia lamblia cysts are being effectively removed or inactivated or Giardia lamblia cyst-sized particles are being removed from the water at higher turbidity levels, the state can allow a turbidity performance standard of up to 1 NTU in 95 percent of the monthly samples. Under the Nov. 3, 1987, version of the proposed rule, a state would have been allowed to make such a determination only after a water system had made an appropriate showing, such as the results of pilot plant studies. Under the May 6, 1988, version, such a showing by the water system would not be required.

2. For systems using slow sand filtration, the proposed rule would require that the filtered water turbidity be less than or equal to 1 NTU in 95 percent of the measurements taken each month and at no time exceed 5 NTU.

3. For systems using diatomaceous earth filtration, the filtered water turbidity must be less than or equal to 1 NTU in 95 percent of the measurements taken each month and at no time exceed 5 NTU.

4. For other filtration technologies, the state may allow a turbidity level of up to 1 NTU in 95 percent of the monthly samples, provided the technology achieves 99.9 percent removal and/or inactivation of Giardia lamblia cysts and enteric viruses.

Timetable for Implementation of Surface Water Treatment Rule

The proposed rule is to be implemented within four years whether or not states follow through with their part of the implementation. Within 18 months of promulgation, states must promulgate their own criteria for determining which systems must filter. These must be at least as stringent as those required by EPA. Within 12 months of promulgation of state

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[13] Proposed rule, 42214.

criteria, each state must determine which systems will be required to filter. Within another 18 months, systems that the state has determined must filter, must install filtration. Subjective criteria, such as those applying to watershed control, would go into effect when established by the state. But for systems in states that do not promulgate their own criteria, systems not meeting the objective criteria for avoiding filtration 30 months after promulgation of the proposed rule would be required both to (1) install filtration and (2) meet the objective performance criteria for the filtration technology they choose within 48 months of promulgation. Thus, under this scenario, the state would lose any ability to refine the rules.

Rules on surface water treatment were to have been made final by Dec. 19, 1987, according to the statute. This deadline was not met. If the EPA were to promulgate its final filtration regulation by December 1988 the following implementation timetables would apply:

Timetable for states that promulgate their own criteria:

December 1988: EPA promulgates rule.

June 1990: States promulgate filtration criteria.

June 1991: States determine which systems much filter.

December 1992: Systems required to filter must install filtration.

Timetable for states that do not promulgate their own criteria:

December 1988: EPA promulgates rule.

June 1991: Systems must comply with objective criteria for avoiding filtration.

December 1992: Systems failing to comply with objective criteria for avoiding filtration by June 1991 must install filtration and meet objective performance criteria.

Exemptions

A system that could not obtain an exception to the filtration criteria might be able to obtain an exemption for up to one year due to other circumstances. Under the proposed rule no exemptions are to be allowed from the requirement of providing disinfection for surface water systems, but exemptions would be allowed for the degree of disinfection required and for

meeting the filtration requirements. For larger systems, an initial one-year exemption can be extended for up to three additional years if certain requirements are met, while for systems with 500 or fewer service connections, additional two-year exemptions can be granted if certain requirements are met.[14]

Besides meeting an "affordability" criterion, discussed in detail in chapters 6 and 7 of this report, the system attempting to gain an exemption from surface water treatment requirements must also show that it cannot use an alternate source and that the public health will be protected. Alternatives include the use of ground water, connection to a nearby water purveyor, and use of an alternate surface water supply. Protection of public health would usually require interim response measures during the exemption period. These measures include some or all of the following: (1) use of higher disinfectant dosages without exceeding the MCL for trihalomethanes; (2) installation of a replacement or additional disinfection system, (3) increased monitoring and reporting, (4) increased watershed protection, (5) increased frequency of sanitary surveys, (6) temporarily purchasing water from a nearby water system, (7) for small systems, temporary installation of package treatment plant, and (8) increasing contact time by re-routing water through reservoirs.[15]

EPA Estimate of Cost of Proposed Surface Water Treatment Rules

The EPA estimates that the capital cost for filtration for unfiltered systems is $1,613 million, annualized at $216 million per year over 20 years. For currently filtered systems the estimated total national costs are $333 million in capital costs, or $95 million annualized over 20 years.[16] Additional monitoring requirements for filtered systems might add as much as $16 million, depending on the extent of existing monitoring.

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[14] Proposed rule, 42193.
[15] Malcolm Pirnie, Inc., and CWC-HDR, Inc., Guidance Manual for Compliance With the Filtration and Disinfection Requirements For Public Water Systems Using Surface Water Sources, op. cit., 9-6 - 9-7.
[16] Proposed rule, 42202-03.

Figure 2-3 shows the EPA's estimates of costs of installing filtration for systems serving less than 100,000 people, or 2,867 of the affected systems. Of the 15 systems with populations greater than 100,000, only Reno-Sparks, Nevada, is regulated by the state public service commission. The 15 large systems that are presently unfiltered account for 42 percent of the projected total costs in the worst case scenario projected by EPA. They also account for approximately 16 million of the estimated 21.4 million people exposed to unfiltered surface water.[17] Over 90 percent of the currently unfiltered water systems serve fewer than 10,000 people.[18] Table 2-1 shows EPA estimates of treatment costs for various types of filtration. Almost half (47 percent) of the 2,867 water systems that are not currently filtering (a figure that does not include the 15 largest systems) are expected to come into compliance without installing expensive new filtration systems, according to EPA predictions.[19] Sixteen percent will meet the exemption requirements (457 systems) while 31 percent will switch to an alternate water source, either ground or purchased (899 systems). A total of 1,511 of the unfiltered systems, or 53 percent, are expected by EPA to install filtration. The EPA projects that slow sand filtration will be chosen by the majority of the systems (990 systems) that do end up having to install filtration, and another 221 will install package treatment plants. The remainder are expected to install conventional treatment, direct filtration, diatomaceous earth filtration, and ultrafiltration.[20] The estimated compliance choices were generated by EPA by consulting with experts in the water supply field. The experts met as a group and came to consensus opinions on compliance choices for various sizes of water utilities, based on cost and other factors. Real estate costs were not included in estimating the costs of installing filtration. EPA did not include real estate costs because they are very site-specific, although of course they could in many cases be substantial.

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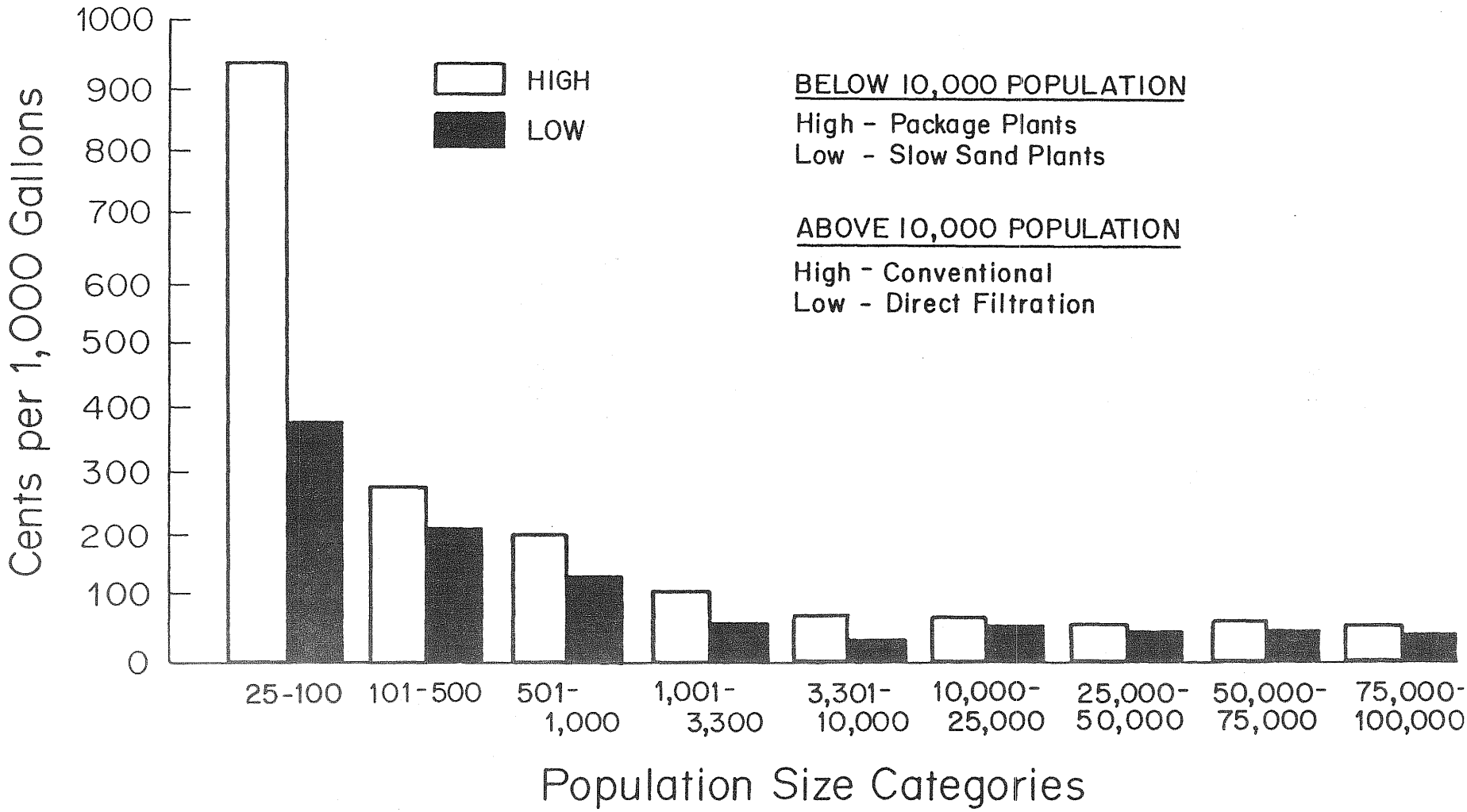
[17] Proposed rule, 42205-06.
[18] Ibid.
[19] Ibid.
[20] Ibid.



Source: EPA, Proposed rule, 42204

Fig. 2-3. Cost of installing filtration in systems serving less than 100,000 people

TABLE 2-1

EPA SUMMARY OF TOTAL COSTS FOR INSTALLING FILTRATION

	Size Category[1]											
	1	2	3	4	5	6	7	8	9	10	11	12
Design Flow (mgd)	0.026	0.068	0.166	0.50	2.50	5.85	11.59	22.86	39.68	109.9	404	1,275
Average Flow (mgd)	0.013	0.045	0.133	0.40	1.30	3.25	6.75	11.50	20.00	55.5	205	650
	Total Cost of Treatment (cents/1,000 gallons)											
Filtration Processes[2]												
Complete treatment package plants	944.5	277.4	195.1	113.6	72.8	52.4						
Conventional complete treatment					104.1	70.3	58.6	61.9	53.8	39.3	32.0	31.0
Conventional treatment with automatic backwashing filters					87.9	58.3	50.8	57.6	49.4	41.5		
Direct filtration using pressure filters			322.7	137.2	79.1	48.8	39.2	45.8	36.9	28.2		
Direct filtration using gravity filters preceded by flocculation				150.2	90.5	58.4	46.8	50.5	39.8	28.6	23.6	21.3
Direct filtration using gravity filters and contact basins				131.2	80.9	54.7	44.2	48.0	37.5	26.3	21.4	19.1
Direct filtration using diatomaceous earth	672.9	227.2	134.7	66.6	43.1	43.1	36.1	48.1	41.7	35.4		
Slow-sand filtration	377.8	205.1	133.4	54.7	34.3	28.7	25.3					
Package ultrafiltration plants	455.6	226.8	179.2	138.4								

[1] Population ranges for each category are:

1. 25-100
2. 101-500
3. 501-1,000
4. 1,001-3,300
5. 3,301-10,000
6. 10,001-25,000
7. 25,001-50,000
8. 50,001-75,000
9. 75,001-100,000
10. 100,001-500,000
11. 500,001-1,000,000
12. >1,000,000

[2] Each process group includes chemical addition and individual liquid and solids handling processes required for operation; excluded are raw water pumping, finished water pumping, and disinfection.

Source: EPA Office of Drinking Water, Technologies and Costs for the Treatment of Microbial Contaminants in Potable Water Supplies, Revised Draft Final, April, 1987, 20.

In compiling the cost data in tables 2-1 and 2-3, the EPA used the Construction Cost Index (CCI) contained in Engineering News Record magazine. The EPA assumed that the CCI in late 1986 was 405 and suggested that the following formula be used when updating these costs:

$$\text{Updated Cost} = \text{Construction Cost} \frac{(\text{Current CCI})}{405}$$ [21]

In computing national costs of $333 million for turbidity control, EPA estimated that the current average monthly turbidity being achieved in the water industry is .7 NTU. The EPA believes the proposed standard is equivalent to a monthly average of about .3 NTU. From survey data through the Association of State Drinking Water Administrators, EPA estimated that about 5,128 systems are achieving monthly averages above .3 NTU. These noncomplying systems were categorized by size and type of filtration currently in place. Various compliance choices were evaluated. They included combinations of (1) hiring a consulting engineer to do diagnostic analysis, (2) improving operation and maintenance practices, (3) adding rapid mix, (4) adding pH adjustment capability, (5) replacing filter media, (6) adding polymer, (7) adding alum or $FeCl_3$, and (8) adding flocculation or contact chambers.[22] Table 2-2 shows average system-level costs, which include combinations of these options.

The EPA has also estimated the costs associated with obtaining an exception from the requirement to filter according to the criteria listed above. To fulfill the exception criteria, a water system will normally have to implement a much more detailed monitoring program than it had previously, including:

- Annual watershed surveys and a watershed monitoring program
- Sampling and analysis for fecal coliforms
- Continuous turbidity monitoring

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[21] EPA Office of Drinking Water, Technologies and Costs, op. cit., VI-4.
[22] Proposed rule, 42205-06.

TABLE 2-2

EPA ESTIMATES OF COSTS OF UPGRADING
TO MEET TURBIDITY PERFORMANCE REQUIREMENTS

System size (by population served)	Costs (cents/1,000 gallons)
25-100	78
101-500	32
501-1,000	27
1,001-3,300	15
3,301-10,000	7
10,001-25,000	3
25,001-50,000	2
50,000	<2

Source: EPA, Proposed rule, 42206

- Monitoring for pH, temperature, and chlorine residual after disinfection, and
- Analysis for coliforms by standard plate count, injured coliforms and high-volume coliform testing, to demonstrate that turbidity is not interfering with the effectiveness of disinfection.[23]

Using the estimated cost tables prepared by the EPA, the cost of gaining an exception for a small water system can be calculated at between $.87 per thousand gallons of water or $3,500 annually (for systems serving 25-100 people), and $.09 per thousand gallons or $12,700 annually (for systems serving 1,001-3,300 people). (See table 2-3.) For the largest systems these costs can be as high as $647,000 a year. The cost of gaining an exception to the filtration requirement, while considerable, is ordinarily much less than the cost of installing and operating filtration devices. A comparison of table 2-1 and table 2-3 shows that for the smallest size systems, the cost of an exception is about one-fifth the cost of filtration,

[23] EPA Office of Drinking Water, Technologies and Costs, op. cit., C-1 to C-2.

TABLE 2-3

EPA ESTIMATE OF A UTILITY'S COST OF OBTAINING AN EXCEPTION

Treatment Method	Annual Cost	Population Served 25-100	101-500	500-1,000	1,001-3,300	3,301-10,000	10,000+
Sanitary survey and watershed management program	cents/1000gal.	21.1	14.6	9.5	6.0	3.6	2.5 to 0.3
	$1000/year	1.0	2.4	4.6	8.7	17.2	29.4 to 644
Raw water fecal coliform monitoring	cents/1000gal.	31.6	9.1	6.2	2.1	1.0	0.5 to 0.0
	$1000/year	1.5	1.5	3.0	3.0	4.5	6.0 to 3.1
Turbidity monitoring	cents/1000gal.	5.0	1.4	0.5	0.2	0.0	0.0
	$1000/year	.24	.24	.24	.24	0.24	0.24 to 0.0
pH, temperature, and chlorine residual monitoring equipment	cents/1000gal.	13.6	3.9	1.3	0.4	0.1	0.1 to 0.0
	$1000/year	.65	.65	.65	.65	0.65	0.65 to 0.0
Additional finished water monitoring to demonstrate noninterference of turbidity with disinfection	cents/1000gal.	15.3	4.4	1.5	0.5	0.3	0.1 to 0.0
	$1000/year	.07	.07	.07	.07	0.15	0.15 to 0.11
Total	cents/1,000 gallons	86.6	33.4	19.0	9.2	5.0	3.2 to 0.3
	$1,000/year	3.5	4.9	8.6	12.7	22.7	36.4 to 647.2

Source: EPA, Office of Drinking Water, Technologies and Costs for the Treatment of Microbial Contaminants in Potable Water Supplies, Revised Draft Final, April, 1987, C-1 to C-17

and for the largest of the small systems (those serving 1,001 to 3,300 people), the cost of an exception is only one-sixth the cost of filtration.

The EPA has not made an estimate of the cost of obtaining an exemption from the filtration requirements of the EPA's proposed rule, although water systems will certainly incur some costs in securing an exemption. The interim response measures described in the section above called "Criteria for Requiring Filtration" may involve taking monitoring and/or treatment measures similar to those required for exceptions. Additionally, there will be some costs associated with showing that no alternative water source is available. It is important to note, moreover, that a water system that is taking these extra steps in an effort to obtain an exception or an exemption

will not necessarily succeed in its endeavor. The system may be incurring costs that will not ultimately pay off. This is especially true for water systems that obtain exemptions which only postpone filtration temporarily.

Cost-Benefit Analysis of the Surface Water Treatment Rules

Under the SDWA, decisions to meet treatment requirements are not made on the basis of cost-benefit calculations. But the EPA is required under Executive Order 12291 to conduct a regulatory impact analysis of major regulations. The EPA does consider the regulatory impact analysis to be one source of information that can aid its decision-making. Through the regulatory impact analysis of surface water treatment regulations, EPA found that nationally between 212,000 and 470,000 cases per year of disease from contaminated water could be avoided directly through the improved treatment mandated by the rule. There would also be indirect benefits of removal of some contaminants beyond the scope of the rule because of the reduced turbidity.[24]

The AWWA has also recognized the benefits that can accrue from low turbidity. The organization has stated that not only are low turbidity levels achievable by all water systems, the American public expects and demands high quality drinking water:

> Today's consumer expects a sparkling, clear water. The goal of less than 0.1 NTU insures satisfaction in this respect. There is evidence that freedom from disease organisms is associated with freedom from turbidity and that complete freedom from taste and odor requires no less than such clarity. Improved technology in the modern treatment processes make this a completely practical goal.[25]

EPA's estimates of costs and benefits from surface water treatment are based on the results of a single case study. Four major categories of costs

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[24] Proposed rule, 42206.
[25] Statement of policy by the AWWA regarding "Quality Goals for Potable Water," from the American Water Works Association Journal, December 1968, quoted in EPA, Office of Drinking Water, Technologies and Costs, II-26.

were estimated for an outbreak of giardiasis in Luzerne County, Pennsylvania, in 1983 and 1984. Costs to individuals, businesses, agencies, and water utilities totaled between $23.3 million and $55.5 million. The losses to individuals included in the analysis were direct medical costs, costs associated with lost work time and productivity, lost leisure time, and the costs of avoidance of additional infection and disease by purchasing bottled water or boiling tap water.[26]

From this one case, EPA attempted to extrapolate costs to the entire country. A breakeven analysis was conducted based on varying assumptions of the endemic rate of illness, the probability of an outbreak, the severity of an outbreak, and the timing and nature of steps taken by potentially exposed persons to avert illness. Table 2-4 shows the estimated net benefits of installing filtration assuming an outbreak of disease once in 50 years as it resulted from the analysis. Where a low damage estimate and high treatment cost is assumed, net benefits are negative for every size of water utility. The highest net benefits are achieved for the average of the 15 large systems currently not filtering their water. For Reno-Sparks, however, the regulatory impact analysis reports a net economic loss even if the high damage estimate and low treatment cost is used. The high estimate for Reno is a net loss of $700,000 an year and the low estimate, a net loss of $2.08 million a year. In the three smallest size categories, negative net benefits are projected in both the high and low estimates.

Summary

Waterborne disease affecting some 34,000 Americans from 1971 through 1985 is attributed by the EPA to deficient surface water treatment. Most such disease could be wiped out by improvements in treatment, according to the EPA. About 10,000 public water systems use surface water. Of the 7,000 systems that already filter, about 5,000 would have to upgrade their filtration systems under the proposed rules. The 3,000 systems that do not

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[26] Proposed rule, 42207.

TABLE 2-4

BREAKEVEN ANALYSIS OF INSTALLING FILTRATION
ASSUMING p(OUTBREAK) = 1/50 YEARS

	Outbreak Damages ($ Millions)		Annual Expected Value of Outbreak Damages ($ Millions/yr)		Annual Endemic Damages ($ Millions/yr)		Total Annual Damages ($ Millions/yr)		Annual Cost of Filtration	Net Loss or Gain ($ Millions/yr
Large Water Systems	High	Low	High	Low	High	Low	High	Low	($Mil/yr)	High	Low
Boston, MA	1361.61	558.98	27.23	11.18	18.98	14.06	46.22	25.24	19.63	26.59	5.61
Portland, ME	80.62	32.62	1.61	0.65	1.01	0.76	2.62	1.41	2.17	0.45	-0.76
Newark, NJ	345.86	142.87	6.92	2.86	4.81	3.62	11.73	6.48	3.86	7.87	2.62
New York, NY	4168.48	1658.55	83.37	33.17	52.87	39.56	136.24	72.73	77.07	59.17	-4.34
Syracuse, NY	136.00	55.31	2.72	1.11	1.89	1.38	4.61	2.48	3.64	0.97	-1.16
Utica, NY	67.72	26.37	1.35	0.53	0.86	0.59	2.21	1.12	1.98	0.23	-0.86
Scranton, PA	90.51	38.97	1.81	0.78	1.24	1.02	3.05	1.80	1.11	1.94	0.69
Wilkes-Barre, PA	131.66	56.69	2.63	1.13	1.80	1.49	4.43	2.62	3.02	1.41	-0.40
Bethlehem, PA	60.12	26.46	1.20	0.53	0.91	0.75	2.11	1.28	2.44	-0.33	-1.16
Greenville, SC	306.29	122.98	6.13	2.46	3.56	2.72	9.69	5.18	5.77	3.92	-0.59
San Francisco, CA	1058.50	443.36	21.17	8.87	15.35	11.65	36.52	20.52	12.95	23.57	7.57
Reno-Sparks, NV	100.36	43.76	2.01	0.88	1.44	1.19	3.45	2.07	4.15	-0.70	-2.08
Seattle, WA	659.59	284.50	13.19	5.69	10.64	8.17	23.84	13.86	9.93	13.91	3.93
Tacoma, WA	134.91	53.40	2.70	1.07	2.04	1.36	4.74	2.43	7.05	-2.31	-4.62
Portland, OR	428.20	179.16	8.56	3.58	6.41	2.39	14.97	5.98	11.19	3.78	-5.21
Smaller Population Categories											
75,001-100,000	49.18	19.35	0.98	0.39	1.23	0.91	2.21	1.30	1.85	0.368	-0.55
50,001-75,000	34.71	13.49	0.69	0.27	0.88	0.65	1.57	0.92	1.34	0.237	-0.41
25,001-50,000	21.74	9.80	0.43	0.20	0.52	0.38	0.95	0.58	0.74	0.220	-0.15
10,001-25,000	9.72	4.41	0.19	0.09	0.24	0.18	0.43	0.26	0.25	0.178	0.01
3,301-10,000	3.28	1.49	0.07	0.03	0.08	0.06	0.15	0.09	0.10	0.051	-0.00
1,001-3,300	1.23	0.63	0.02	0.01	0.03	0.02	0.05	0.03	0.05	0.003	-0.01
501-1,000	0.40	0.22	0.01	0.00	0.01	0.01	0.02	0.01	0.04	-0.017	-0.02
101-500	0.14	0.08	0.00	0.00	0.00	0.00	0.01	0.00	0.02	-0.012	-0.01
25-100	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.008	-0.00

Source: Wade Miller Associates, Inc., Regulatory Impact Analysis: Benefits and Costs of Proposed Surface Water Treatment Rule and Total Coliform Rule, prepared for EPA Office of Drinking Water, Contract Order 68-01-7034 Task Order No. C-1, 1987, Exhibit 5-9, 5-31.

have filtration in place will incur costs under the new SDWA requirements, but perhaps only half will have to install new filtration.

The cost-benefit analysis conducted in conjunction with preparation of the proposed surface water treatment rules does not appear to have affected the substance of the rules. Although the methodology of the cost-benefit analysis is subject to some criticism, it is interesting to note that for Reno-Sparks, the largest commission-regulated surface water utility, and for the smallest size categories of surface water utilities, a category of commission concern, the cost-benefit analysis showed net economic losses from installation of surface water treatment.

Exceptions to the surface water treatment rules are allowed, but only under strict conditions and with what could often be a high annual cost. The requirements for an effective watershed control program may be so stringent that many water systems will be unable to meet them and thus unable to gain exceptions. Exemptions, to be discussed in detail later in this report, may be granted by the state primacy agencies under certain conditions, including economic hardship.

CHAPTER 3

GENERAL IMPACT OF SURFACE WATER TREATMENT RULES ON COMMISSION-REGULATED WATER UTILITIES

Concerned about the expected new surface water treatment rules, the NARUC Water Committee in July 1987 asked the NRRI to investigate the potential impact of the rules on commission regulation of water utilities. A survey instrument on surface water treatment and affordability was developed by the NRRI with the help of the NARUC Water Committee and pretested by staff members at four commissions in August of 1987. The final survey was sent in September to staff members at the 45 commissions that regulate water utilities. Thirty-nine commissions (87 percent) responded to the survey.[1] Florida, while not participating in the survey, did report that there are no regulated surface water utilities in that state, bringing to 40 the number of states about which the NRRI has at least some information on commission-regulated surface water utilities and staff opinions on affordability.

This chapter reviews the general results of the survey on surface water treatment. The number of affected systems is discussed, including all regulated surface water systems, systems currently not filtering, and systems that will likely have to improve their control over turbidity. Appendix A is the complete NRRI survey form.

The results of the survey suggest that only a few commissions will be severely affected by the proposed regulations because most commissions do not regulate large numbers of utilities that use surface water, and those that they do regulate are apt to be already filtering. Because the survey focused on limited aspects of the rules, it may be that costs to some larger regulated water utilities that are already filtering are underestimated.

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[1] Commissions that did not participate in the survey were Florida, Hawaii, Maine, Montana, New Jersey, and West Virginia.

Possible costs for one such company are reviewed in chapter 4, along with case studies derived from the survey on filtration and turbidity control.

Number of Regulated Water Utility Systems Using Surface Water

Relatively few of the several thousand water utilities regulated by public utility commissions are using surface water as a source of supply, according to the NRRI survey (table 3-1). The respondents to the NRRI survey reported a total of 449 regulated water utilities using surface water for all or part of their raw water supply. They are concentrated in eight states: California, Connecticut, Indiana, Kentucky, New York, Pennsylvania, Texas, and Wisconsin accounted for 75 percent of regulated utilities using surface water. Pennsylvania regulates the largest number, about 19 percent of the total. Most commissions regulate only a few surface water utilities. Alabama, Arkansas, Florida, Kansas, Michigan, Mississippi, and Washington reported having no jurisdiction over any utilities that use surface water. Nearly half of the commission-regulated utilities (212 utilities) are "small" under the EPA definition. The EPA considers a small water utility to be one that serves 3,300 people or less.

Figure 3-1 shows how few state commissions regulate significant numbers of water utilities with surface water sources. Thirty-three commissions have jurisdiction over fewer than 20 utilities using surface water. The number of regulated surface water utilities is, of course, not a definitive indicator of the extent of the impact of new requirements for treating surface water. Even one or two surface water utilities that have difficulty dealing with EPA requirements could pose substantial problems for regulators aiming to protect ratepayers from rate shock while assuring high quality drinking water. But it does suggest that for most commissions it is likely that few regulated water utilities will be affected by the EPA regulations.

Number of Regulated Water Utility Systems Filtering Surface Water

Only 121 of the regulated surface water utilities are not currently filtering their water, according to the NRRI survey. This represents 27

TABLE 3-1

NUMBER OF COMMISSION-REGULATED WATER UTILITIES THAT USE SURFACE WATER, 1987

	Number of Surface Water Utilities by Number of People Served					
Commission[1]	25-100	101-500	501-3,300	3,301-10,000	10,000+	Total
Alabama	0	0	0	0	0	0
Alaska	0	0	0	3	1	4
Arizona	3	7	2	0	0	12
Arkansas	0	0	0	0	0	0
California	3	10	13	8	29	63
Colorado	2	2	0	0	0	4
Connecticut	0	0	4	4	11	19
Delaware	0	0	0	0	1	1
Florida	0	0	0	0	0	0
Idaho	2	1	0	1	0	4
Illinois	0	0	1	1	4	6
Indiana	1	1	16	10	20	48
Iowa	0	0	0	0	2	2
Kansas	0	0	0	0	0	0
Kentucky	0	0	0	0	0	35[2]
Louisiana	0	1	0	0	0	1
Maryland	0	0	1	1	0	2
Massachusetts	0	3	4	0	5	12
Michigan	0	0	0	0.	0	0
Mississippi	0	0	0	0	0	0
Missouri	0	0	0	1	5	6
Nevada	3	3	5	0	1	12
New Hampshire	1	0	3	0	1	5
New Mexico	1	0	0	0	1	2
New York	1	4	10	2	3	20
North Carolina	0	0	0	0	1	1
Ohio	1	0	1	2	8	12
Oklahoma	6	1	0	0	0	7
Oregon	1	5	1	0	0	7
Pennsylvania	2	6	34	19	26	87[3]
Rhode Island	0	0	0	2	3	5
South Carolina	0	0	0	0	1	1
Tennessee	0	0	0	0	1	1
Texas	0	25	20	2	0	47
Utah	0	1	0	0	0	1
Vermont	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Virginia	0	0	0	0	2	2
Washington	0	0	0	0	0	0
Wisconsin	0	0	0	2	17	19
Wyoming	0	0	0	0	1	1
Total	27	70	115	58	144	449

Source: 1987 NRRI Survey of State Regulatory Commissions

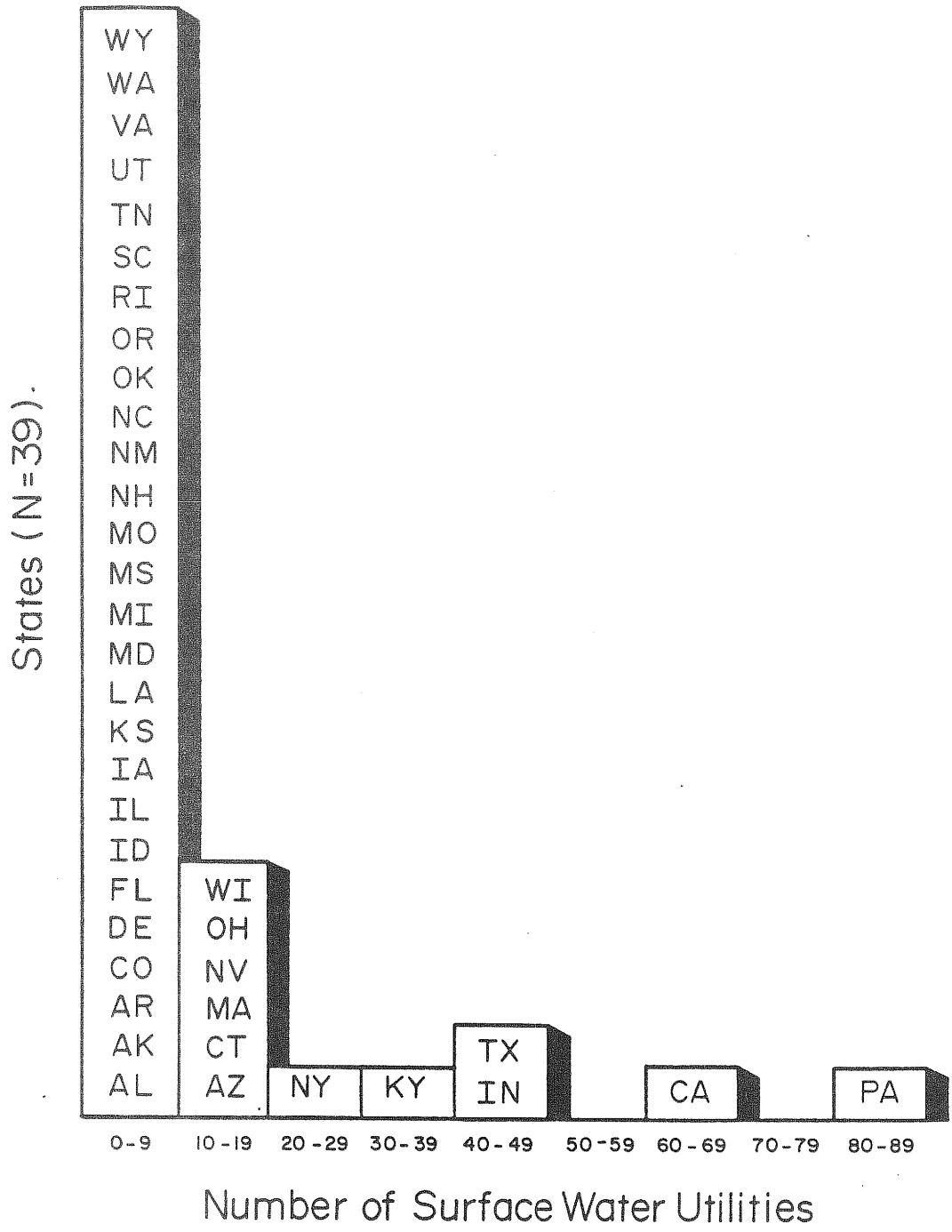
N.A. = Data not available.

[1] Georgia, Minnesota, Nebraska, and North and South Dakota do not regulate water utilities.

[2] Row total and column total differ because Kentucky was unable to provide number of utilities by population category.

[3] Includes 34 municipal water utilities under partial commission jurisdiction.

N = 40



Source: 1987 NRRI Survey of State Regulatory Commissions

Fig. 3-1. Frequency distribution of commission-regulated surface water utilities

percent of the 449 regulated water utilities using surface water. Table 3-2 shows the status of filtration by commission-regulated water utilities for five population categories. Eighty-seven (72 percent) of the 121 utilities that use surface water, but do not filter, are small utilities.

Table 3-3 shows the number of non-filtering water utilities by state. Only 11 states reported regulating water utilities that do not currently filter. In two of these 11 states (Idaho and Oregon) none of the water utilities using surface water is currently filtering. Another eight of the 11 states regulate some utilities that filter and some that do not. In the last of the 11 states (Vermont) the exact number of non-filtering systems is not known. In 18 states, all regulated surface water utilities are currently filtering, according to the survey respondents. Four other states

TABLE 3-2

STATUS OF FILTRATION BY COMMISSION-REGULATED SURFACE WATER UTILITIES, 1987

Status of Filtration	Number of Utilities Categorized by Number of People Served					Population Category Not Available	Total Number	Percent
	25-100	101-500	501-3,300	3,301-10,000	10,000+			
Filter	14	43	65	43	124	35	324	72
Do Not Filter	12	25	50	15	19	0	121	27
Do Not Know	1	1	0	0	0	0	2	.4
Information Not Available	0	1	0	0	1	0	2	.4
Total Number	27	70	115	58	144	35	449	
Total Percent	6	16	26	13	32	8		

Source: 1987 NRRI Survey of State Regulatory Commissions

N = 32

TABLE 3-3

NUMBER OF COMMISSION-REGULATED SURFACE WATER UTILITIES THAT DO NOT FILTER BY STATE, 1987

	Number of Surface Water Utilities by Number of People Served					
Commission	25-100	101-500	501-3,300	3,301-10,000	10,000+	Total
Alabama	0	0	0	0	0	0
Alaska	0	0	0	0	0	0
Arizona	0	0	0	0	0	0
Arkansas	0	0	0	0	0	0
California	1	4	1	0	0	6
Colorado	2	1	0	0	0	3
Connecticut	0	0	3	3	6	12
Delaware	0	0	0	0	0	0
Florida	0	0	0	0	0	0
Idaho	2	1	0	1	0	4
Illinois	0	0	0	0	0	0
Indiana	0	0	0	0	0	0
Iowa	0	0	0	0	0	0
Kansas	0	0	0	0	0	0
Kentucky	0	0	0	0	0	0
Louisiana	0	0	0	0	0	0
Maryland	0	0	0	0	0	0
Massachusetts	0	3	3	0	4	10
Michigan	0	0	0	0	0	0
Mississippi	0	0	0	0	0	0
Missouri	0	0	0	0	0	0
Nevada	3	2	4	0	1	10
New Hampshire	1	0	3	0	0	4
New Mexico	0	0	0	0	0	0
New York	1	4	7	1	1	14
North Carolina	0	0	0	0	0	0
Ohio	0	0	0	0	0	0
Oklahoma	0	0	0	0	0	0
Oregon	1	5	1	0	0	7
Pennsylvania	1	5	28	10	7	51
Rhode Island	0	0	0	0	0	0
South Carolina	0	0	0	0	0	0
Tennessee	0	0	0	0	0	0
Texas	0	0	0	0	0	0
Utah	0	0	0	0	0	0
Vermont	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Virginia	0	0	0	0	0	0
Washington	0	0	0	0	0	0
Wisconsin	0	0	0	0	0	0
Wyoming	0	0	0	0	0	0
Total	12	25	50	15	19	121

Source: 1987 NRRI Survey of State Regulatory Commissions

N.A. = Data not available
N = 40

were not able to give information on the status of filtration of some or all of their systems. (As noted above, seven of the states surveyed regulate no surface water utilities.)

The 11 states where there are commission-regulated water utilities that may have to install filtration are Pennsylvania (51 affected systems), New York (14), Connecticut (12), Nevada (10), Massachusetts (10), Oregon (7), California (6), Idaho (4), New Hampshire (4), Colorado (3), and Vermont (number of affected systems unknown). Pennsylvania thus accounts for 42 percent of the 121 non-filtering systems.

Using EPA estimates of the annual cost of installing filtration in the small population categories shown in table 2-4, it is possible to project the cost increases that may be experienced by the 121 companies that do not filter. The 12 companies serving populations of 25 to 100 people would incur an estimated additional cost of $10,000 annually; the 25 companies serving populations of 101 to 500, $20,000 annually; the 50 companies serving populations of 501 to 3,300, from $40,000 to $50,000 annually; the 15 companies serving populations of 3,301 to 10,000, $100,000 annually; and the 19 companies serving populations of over 10,000, at least $250,000. As noted in chapter 2, one of the 19 non-filtering companies serving populations of over 10,000 is Reno-Sparks, which table 2-4 shows as having an estimated annual cost of filtration of $4.15 million. This assumes, of course, that EPA cost estimates are correct, an assumption that may not stand the test of on-site engineering studies. It does suggest, however, that when economies of scale are considered, very few commission-regulated water utilities would experience large increases in water bills even if all the water utilities that are not currently filtering did have to install filtration.

If the 121 companies that do not filter instead obtain an exception to the filtration requirement, they still will have significant costs to bear. According to EPA estimates of the cost of obtaining an exception (see table 2-3), the twelve companies serving populations of 25 to 100 people would incur an annual cost of $3,500; the 25 companies serving populations of 101 to 500, $4,900 annually; the 50 companies serving populations of 501 to 3,300, from $8,600 to $12,700 annually; the 15 companies serving populations 3,301 to 10,000, $22,700 annually; and the 19 companies serving populations of over 10,000, would have costs exceeding $36,400.

Status of Meeting Turbidity Standards by Commission-Regulated Surface Water Utilities

Regulated water utilities that are already filtering may have to upgrade their filtration processes to meet stricter EPA standards for filtration performance. Although many commission staff were uncertain about the impact of new turbidity requirements in their states, the data from the NRRI survey suggests that many water utilities will be affected. The number of systems affected by the .5 NTU standard may be significantly less if states can successfully make determinations that their systems are achieving 99.9 percent removal/inactivation of Giardia cysts at higher turbidity levels. Such systems would have to meet a turbidity standard of at least 1 NTU 95 percent of the time.

Staff at 14 commissions that regulate water utilities with surface water sources were able to provide information on whether those utilities were currently meeting standards on turbidity. These states are Alaska, Arizona, California, Colorado, Delaware, Kentucky, Missouri, Nevada, Pennsylvania, Rhode Island, Tennessee, Virginia, Wisconsin, and Wyoming. As shown in tables 3-4 and 3-5, of the 152 systems for which the commission staff reported data on turbidity levels currently being met, half (76) currently achieve a turbidity control level of less than or equal to 1.0 NTU but greater than the .5 NTU standard. Seventy were currently meeting a level of .5 NTU or less, and six were out of compliance with the existing 1.0 NTU standard.

Using the cost data that the EPA has developed for water systems that must upgrade to meet turbidity standards (see table 2-2), the cost of turbidity upgrade can be estimated for 47 of the 82 systems that the commission staff reported currently do not meet the .5 NTU turbidity standard. The remaining 35 systems that do not meet the .5 NTU standard could not be placed in population categories, and therefore costs could not be estimated. The four systems serving 25 to 100 people might incur turbidity upgrade costs of 78 cents per thousand gallons; the 12 systems serving 101 to 500 people, 32 cents per thousand gallons; the five systems serving 501 to 3,300 people, 27 cents to 15 cents per thousand gallons; the six systems serving 3,301 to 10,000 people, seven cents per thousand gallons; and the 20 systems serving more than 10,000 people, three cents to two cents per thousand gallons.

TABLE 3-4

STATUS OF TURBIDITY LEVELS FOR COMMISSION-REGULATED SURFACE WATER UTILITIES BY STATE, 1987

Commission	Number of Regulated Utilities Meeting Turbidity Levels					
	>1.0 NTU	≤1.0 NTU and >.5 NTU	.5 NTU or less	Don't Know	N/A	Total
Alabama	0	0	0	0	0	0
Alaska	0	4	0	0	0	4
Arizona	0	8	2	2	0	12
Arkansas	0	0	0	0	0	0
California	0	10	53	0	0	63
Colorado	1	0	1	2	0	4
Connecticut	0	0	0	0	19	19
Delaware	0	0	1	0	0	1
Florida	0	0	0	0	0	0
Idaho	0	0	0	4	0	4
Illinois	0	0	0	6	0	6
Indiana	0	0	0	0	48	48
Iowa	0	0	0	0	2	2
Kansas	0	0	0	0	0	0
Kentucky	0	35	0	0	0	35
Louisiana	0	0	0	0	1	1
Maryland	0	0	0	0	2	2
Massachusetts	0	0	0	12	0	12
Michigan	0	0	0	0	0	0
Mississippi	0	0	0	0	0	0
Missouri	0	0	6	0	0	6
Nevada	1	0	0	0	11	12
New Hampshire	0	0	0	5	0	5
New Mexico	0	0	0	0	2	2
New York	0	0	0	0	20	20
North Carolina	0	0	0	0	1	1
Ohio	0	0	0	0	12	12
Oklahoma	0	0	0	7	0	7
Oregon	0	0	0	0	7	7
Pennsylvania	3	0	0	0	84	87
Rhode Island	0	2	3	0	0	5
South Carolina	0	0	0	0	1	1
Tennessee	0	0	1	0	0	1
Texas	0	0	0	0	47	47
Utah	0	0	0	0	1	1
Vermont	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Virginia	0	0	1	0	1	2
Washington	0	0	0	0	0	0
Wisconsin	1	17	1	0	0	19
Wyoming	0	0	1	0	0	1
Total	6	76	70	38	259	449

Source: 1987 NRRI Survey of State Regulatory Commissions

N.A. = Data not available.
N = 40

TABLE 3-5

SUMMARY OF STATUS OF TURBIDITY LEVELS FOR COMMISSION-REGULATED SURFACE WATER UTILITIES BY STATE, 1987

Turbidity Level	Number of Utilities Categorized by Number of People Served					Population Category Not Available	Total
	25-100	101-500	501-3,300	3,301-10,000	10,000+		
>1.0 NTU	1	1	1	0	3	0	6
≤ 1.0 NTU and >.5 NTU	3	11	4	6	17	35	76
.5 NTU or less	3	6	10	10	41	0	70
Don't Know	11	6	9	2	10	0	38
Information Not Available	9	46	91	40	73	0	259
Total	27	70	115	58	144	35	449

Source: 1987 NRRI Survey of State Regulatory Commissions

N = 32

From table 3-5 it can be seen that the larger water utilities are somewhat more likely to be already meeting the proposed .5 NTU standard. Fifty-one out of the 77 utilities serving more than 3,300 people are already in compliance with the proposed new standard. In addition, the Kentucky Public Service Commission staff respondent stated that some of the 35 surface water utilities under commission jurisdiction may be achieving the .5 NTU standard. Nineteen out of the 40 small systems, or 47.5 percent, are meeting the new standard. There was no significant difference in the percentage of small utilities versus the percentage of large ones for which the staff were able to provide information.

The NRRI asked commission staff members whether they believed their regulated water utilities could meet EPA's proposed turbidity standard of .5 NTU 95 percent of the time (see table 3-6). Staff members in eight states

TABLE 3-6

ABILITY OF COMMISSION-REGULATED SURFACE WATER UTILITIES TO MEET NEW TURBIDITY STANDARDS, 1987

Can Regulated Utilities Meet .5 NTU Standard?	Number of Commissions	Number of Regulated Utilities
Yes	8	85
No	7	87
Don't know	10	249
No response	8	28
Not applicable[1]	7	0
Total	40	449

Source: 1987 NRRI Survey of State Regulatory Commissions

[1] These commissions do not regulate any surface water utilities.

accounting for 85 (19 percent) of the surface water systems regulated by the commissions reported that they believe their regulated utilities could meet that standard. The states were Colorado, Connecticut, Delaware, Idaho, Kentucky, Tennessee, Virginia, and Wisconsin. The Colorado staff member explained that its utilities would be able to meet the turbidity standard because two of them are already installing a filtration system and a third has extremely high quality water. Connecticut's respondent stated that companies in the state use granular activated carbon (GAC) and have control over their surrounding shore and watershed land. Delaware, Virginia, and Wisconsin based their affirmative responses on their utilities' histories of low turbidity levels. The Idaho participant in the survey said he believed utilities using surface water could meet the new standard because they use

clear springs. A Kentucky staff member said that utilities in that state maintain a level of less than 1 NTU most of the time, with only minor violations and no continuous violations of this standard and would, therefore, be able to meet the new standard 95 percent of the time. Tennessee did not give a reason for the response.

Staff members from seven states predicted that their water systems would not be able to meet the turbidity standard; these states regulate 87 (about 19 percent) of the 449 regulated surface water utilities. The staff member from Alaska stated that filtration alone would not be adequate to meet the standard, while the Texas survey respondent believed that the increased operating or equipment requirements created by the standard might be excessive for many small utilities. Respondents in several states gave specific examples of utilities in their states that would not be able to meet the proposed standard. The Wyoming respondent noted that there would be substantial expense in trying to meet the standard during seasonal storm runoff.

Staff members from 18 commissions covering another 277 utilities did not know whether their utilities would be able to meet turbidity requirements or did not answer the question. Many of the largest states--Pennsylvania, New York, and California--were included in this category of response.

Summary

Since nationally only 449 water utilities that use surface water are regulated by the commissions, the surface water treatment rules will not have a widespread effect on jurisdictional utilities. The impact of the surface water treatment rules will be concentrated in the eight states that account for 75 percent of the regulated surface water treatment systems. Only 27 percent of the regulated water utilities using surface water are not currently filtering. Applying EPA estimates, perhaps only about half of those systems, or in the vicinity of 60 systems, would be expected to have to install filtration. For the smallest of these systems, the resulting

annual increases in water bills are expected to be about $300 a year, according to EPA estimates.[2]

On turbidity control improvements, commission staff often did not have enough information at the time of the survey to be able to predict the impact of the new rules. Where they did have information, it appears that a substantial portion of the regulated utilities is already meeting proposed turbidity requirements.

Several factors could make the surface water treatment rules more expensive than projected. First, EPA estimates are bound to be low. As pointed out in chapter 2, they (1) do not include real estate costs, (2) use a discount rate based on municipal borrowing power rather than that of private companies, and (3) are not expressed in current dollars. Second, it may be that some water systems not classified as surface water users by the commission staff are so classified under the new rules. Springs, often considered ground water sources, are considered surface water by the EPA. Third, the cost of gaining an exception is likely to be substantial and ongoing. Finally, there may be other sections of the proposed rules that increase costs to regulated surface water utilities.

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[2] This assumes a water system serving 100 people, increased costs of $10,000 a year per table 2-4, and a household size of three people.

CHAPTER 4
CASE STUDIES OF COSTS OF TREATING SURFACE WATER

Besides seeking general information on the number and size of water utilities under commission jurisdiction, the NRRI's 1987 survey asked commission staff to provide examples of regulated water utilities that had recently installed filtration or upgraded their turbidity control. Staff in only eight states were able to provide such examples. Although the cases were not clearly comparable to each other or to EPA figures, especially because of inflation, it was interesting to note that in all five cases where EPA comparisons could be made, the actual costs to the commission-regulated utilities were higher than estimated by EPA for the appropriate size category and type of treatment. In addition to the NRRI cases, this chapter includes a summary of the comments submitted to the U.S. EPA by the St. Louis County Water Company on the proposed rule. These comments give another example of the effects that the proposed surface water treatment requirements might have on a particular water company.

Case Studies of Filtration Costs

Table 4-1 summarizes information on the NRRI cases. There are several reasons why their costs are difficult to compare. For example, many water utilities use surface water for only part of their total supply; the installation of a filter would therefore not raise the cost of all of the water supplied but only that portion that was passed through the filter, and the rate increase required would depend on the percentage of water that was filtered. The method of calculating the costs of the new filtration also differed from one case to the next; some were figured only in terms of the initial investment in the plant construction, some were calculated through the increase of the total operating expenses, and for others no clear

TABLE 4-1

COST OF INSTALLING FILTRATION: RECENT CASES

State and Company Name	Number of People Served	Treatment Cost Per 1,000 Gallons Before Filtration	Treatment Cost Per 1,000 Gallons After Filtration	Difference in Cost	Percent Increase in Treatment Costs
California					
So Cal-Bay	12,800	$ .111	$ .910	$ .799	720%
So Cal-Pomona Val.	30,400	.138	2.56	2.422	1,755
Stirling Bluff	528	.297	.893	.596	201
Connecticut					
Stamford Water Co.	36,300 approximately	N.A.	N.A.: $15-16 million total for filtration plant	N.A.	N.A.
Naugatuck Div. of Connecticut Water Company	24,486 in Division alone 167,023 in whole company	N.A.	N.A.: $13,725,000 for new filtration; cost to be spread out over all customers	N.A.	N.A.
Guildford-Chester Div. of Connecticut Water Company	47,777 approximately in Division alone	N.A.	N.A.: two new filter plants added $10.2 million to the rate base over the original $7.0 million	N.A.	N.A.
Massachusetts					
Hingham Water Co.	35,789 approximately	N.A.	N.A.: total cost is approximately $7.8 million	N.A.	N.A.
North Carolina					
Duke Power Co.	13,075 approximately	N.A.	N.A.: $6,026,000 total for new treatment plant	N.A.	N.A.
Pennsylvania					
Pennsylvania Gas and Water Co.	424,172	$ .108	.91	$ .802	743
Virginia					
Virginia American Water Company - Hopewell	8,300 residential customers 800 commercial customers	.30	.35	.05	17 for residential customers only

Source: 1987 NRRI Survey of State Regulatory Commissions

N.A. = Information not available

explanation of the means of calculation was given. Cases for five companies located in three states are discussed below.

The costs given in some of these examples have been compared to the costs of treatment processes that were estimated by the U.S. EPA in its revised draft final document of April 1987 entitled Technologies and Costs for the Treatment of Microbial Contaminants in Potable Water Supplies (see table 2-1 and accompanying discussion on updating costs). The EPA figures date from 1986, as noted in chapter two. Cost figures were not adjusted for inflation using the EPA formula given on page 23. This could of course account for some discrepancies.

California

So. Cal Water Co.-Bay recently spent $1,100,000 to add an anthracite and sand pressure filter to its system and to upgrade its three existing filters; this upgrade included adding an updraft clarifier, plane sedimentation with flocculation, another anthracite filter, and THM mitigation. The Bay water system produces about 1,728,000,000 gallons of water per year, of which about 45 percent (781,100,000 gallons) is passed through the new treatment system. Based on the design flows of the old and the new treatment systems, the Bay unit went from an annual estimated treatment cost of $.111 per thousand gallons to $.910 per thousand gallons, a 719 percent increase in treatment costs which will be passed on to the 12,800 people the company serves. The EPA estimates that the total cost for direct filtration using pressure filters for a system that serves 10,001-25,000 people should be $.488 per thousand gallons (see table 2-1), and that the total cost to add flocculation to this size system should be $.037 per thousand gallons. Considering the other improvements that So-Cal Water Co.-Bay has made to its system, the EPA's estimates seem somewhat low but probably are still in the zone of reasonableness.

In another California case, So. Cal Water Co.-Pomona Valley, the filtration capacity of a multi-district filtration plant from which Pomona Valley purchases water was increased through the addition of a mixture of flocculation, sedimentation basins, and gravity sand filters. The total capital cost of these additions was $18 million, and the operation and maintenance costs are estimated at $632,000 annually. The plant has a

design flow capacity of 7,081,000,000 gallons per year. The cost of treatment of the water was calculated at only $.138 per thousand gallons of water prior to these improvements and is now calculated at $2.56 per thousand gallons of water, an increase of 1,755 percent. The 30,400 people served by the Pomona Valley system now pay an estimated annual water bill of $422. The EPA-estimated total costs for direct filtration using gravity filters preceded by flocculation for a system of Pomona Valley's size is $.468 per thousand gallons. It is difficult to compare the EPA's estimate to the actual cost data in this instance, however, because Pomona Valley is sharing the cost of the new treatment with other systems in the multi-district area and because the plant's actual and design flow capacities exceed those of the EPA's estimate.

California's Stirling Bluff Corporation did not experience the same increase in treatment costs as the above two companies. The company, which previously did not filter any of its water, recently installed GAC filtration and settling towers for its system, with a design capacity of 109,500,000 gallons per year (although the actual flow through the system amounts to only 29,200,000 gallons per year.) The company incurred an estimated treatment cost of $.297 per thousand gallons of water prior to installing the GAC filtration and now pays about $.893 per thousand gallons of water, a 201 percent increase. The 528 people served by the system pay an average annual water bill of $120.

Pennsylvania

A Pennsylvania company will also experience a substantial increase in the cost of treatment as a result of its new filtration system, according to the State Bureau of Conservation, Energy, and Energy Planning. The Pennsylvania Gas and Water Company is currently building eight new sand filtration plants in order to supplement the two plants it has used since 1959. One plant is due to be completed in 1988 and the rest by 1992, such that all of the company's water will be filtered by 1992. The company projects that the treatment cost for its water will increase from $.108 per thousand gallons to $.91 per thousand gallons (a 743 percent increase) as the eight new plants are built. The 424,172 people served by the company

currently pay an average annual water bill of $165.72, and the company was recently denied a rate increase because of its poor service.

Virginia

The Virginia American Water Company, Hopewell, is relying appropriately on its industrial customers to pay most of the costs of its new rapid sand filtration, carbon beds, and flocculation system. The company has 8,300 residential customers (about 27,390 people) and 800 commercial customers that use 85 percent of the company's water. Prior to construction of the rapid sand filtration plant, the residential customers paid $.30 per thousand gallons for treatment costs for their portion of the total 8,030,000,000 gallons produced annually by the company. To cover the initial cost of investment in the $15 million plant, the company estimates the cost of treatment for residential customers to be increased by only $.05 per thousand gallons. As of October 1987 these customers were paying an annual water bill of $134.42.

Case Studies of Turbidity Upgrade

Six states gave us information on specific companies over which they have jurisdiction that had recently upgraded or were planning to upgrade their surface water filtration systems to treat for turbidity (see table 4-2). Several of these examples give good data on the cost of the companies' current method of treatment, even though they did not provide enough information to allow us to compare the cost of one treatment system to another. Information on seven companies in four states is summarized here.

The costs of these turbidity upgrades have been compared to the EPA-estimated costs included in the proposed rule. (See table 2-2.) As seen below, the cost for turbidity upgrade in the case studies exceeded the EPA's estimates, particularly in the case of Azusa Valley Water Company. The case studies clearly do not demonstrate the assumption that the cost per thousand gallons diminishes as the size of the system increases.

TABLE 4-2

COST OF UPGRADING FILTRATION TO TREAT FOR TURBIDITY: RECENT CASES

State and Company Name	Number of People Served	Treatment Cost Per 1,000 Gallons Before Filtration	Treatment Cost Per 1,000 Gallons After Filtration	Difference in Cost	Percent Increase in Treatment Costs
California					
Azusa Valley Water Company	45,990	Annual treatment cost: $ .049	$ .354, including only cost of sedimentation basins build in 1986	$ .305	622%
Colorado					
Crystal Water Co.	420+	N.A.	N.A.: Total estimated cost of upgrade: $110,000. Chemical costs for Culligan multi-tech filter system: $ .08/1000 gallons	N.A.	N.A.
Cascade Public Service	312+	N.A.: Current price of water: $1.75/1000 gallons plus a $17.79 annual meter charge	N.A.: Price after improvements: $1.95/1000 gallons, plus meter charge, plus $11.96 for 5-7 years for construction surcharge	N.A.: Difference in price of water: $.20/1000 gallons	N.A.: Percent increase in price of water: 11/1000 gallons, plus surcharge
Indiana					
Wells-Marion	11,197	$ .48, for treatment of contaminants only, including debt service	$ .65 for contaminants only, including debt service	$ .17	35
Pennsylvania					
Shickshinny Water Company	475	N.A.: Annual bill of 1985-86: $ 77.13	N.A.: 1987 bill showing first stage of major improvements: $253.17	N.A.: Difference in annual bills: $ 176.04	N.A.: Percent increase in annual bill: 228
Rhode Island					
Pawtucket	22,000	N.A.	Maintenance cost of GAC: $.03062/1000 gallons, and $.41/lb. to rejuvenate carbon, with a 20% loss.	N.A.	N.A.

TABLE 4-2 (continued)

COST OF UPGRADING FILTRATION TO TREAT FOR TURBIDITY: RECENT CASES

State and Company Name	Number of People Served	Treatment Cost Per 1,000 Gallons Before Filtration	Treatment Cost Per 1,000 Gallons After Filtration	Difference in Cost	Percent Increase in Treatment Costs
Newport	12,000	Current cost of rapid sand filtration: $2.07/1000 gallons	N.A.	N.A.	N.A.
Woonsocket	9,300	Current cost of rapid sand filtration: $1.10/1000 gallons	N.A.	N.A.	N.A.
Wisconsin					
Oak Creek Municipal Water Co.	16,932	$ .102; 1983 O&M costs only, excludes fixed costs	$ .148; 1986 O&M costs only, excludes fixed costs	$ .046	45
Superior Water, Light & Power Co.	29,571	.0914	.8414	.75	821

Source: 1987 NRRI Survey of State Regulatory Commissions

N.A. = Information not available

Rhode Island

Rhode Island gave us information on the cost of treatment some of its companies have incurred using GAC filtration and rapid sand filtration. The Pawtucket water utility, which serves 22,000 people and has an average annual production of 3.3 billion gallons, has used GAC filtration since 1976. The current annual maintenance costs of its GAC filter, not including the costs of construction, are $.03062 per thousand gallons, plus the annual cost of rejuvenating the carbon of $.41 per pound of carbon, with an annual carbon loss of 20 percent. The Newport and Woonsocket water utilities both use rapid sand filtration and are currently switching to GAC filtration.

Newport serves 12,000 people and has an average annual water production of 5.5 billion gallons; its customers pay an average annual bill of $300. Newport estimates the cost of filtering by rapid sand filtration to be $2.07 per thousand gallons of water. Woonsocket, which serves 9,300 people and produces 4.0 billion gallons of water annually, reports a cost of treatment that is about half that of Newport's cost. Woonsocket estimates that it costs only $1.10 per thousand gallons to treat its water with rapid sand filtration, and its customers pay an average annual water bill of only $68. There are no data available regarding cost increases experienced by these three companies to allow them to be compared to the EPA's estimates of turbidity upgrade costs.

Wisconsin

Two Wisconsin companies recently changed their filtering systems from slow sand filtration to rapid sand filtration. Oak Creek Municipal Water Company, which serves a population of 16,932 and has an average annual water bill of $186.00, incurred operation and maintenance costs for its slow sand filtration system of $.102 per thousand gallons (1983 estimate), and operation and maintenance costs for its rapid sand filtration system of $.148 per thousand gallons (1986 estimate). The EPA estimates that systems serving between 10,001 and 25,000 people will spend $.03 per thousand gallons to meet the turbidity requirements. Oak Creek's cost was somewhat greater than this estimate, $.046 per thousand gallons.

The Superior Water, Light, and Power Company of Wisconsin at the time of the NRRI survey had a rate case pending before the Public Service Commission of Wisconsin that included the cost of new filtration. This company serves 29,571 people and has a projected 1988 sales of 1,991,979 gallons. (No figures were available on the company's production.) Prior to construction of the new treatment plant, the company spent a total of $.0684 per ccf, or $.0914 per thousand gallons, for the treatment of its water, which amounts to only about three percent of the entire production costs. (A representative of the Public Service Commission of Wisconsin explained that the company was not making use of its slow sand filtration treatment capabilities.)

This treatment cost was broken down into four components: operation and maintenance costs of $.0371 per ccf, depreciation expenses costs of $.0101 per ccf, taxes of $.0086 per ccf, and return on investment costs of $.0126 per ccf. The company now expects to spend a total of $.6294 per ccf, or $.8414 per thousand gallons, on the cost of water treatment, which will be about 40 percent of the total cost of production. This treatment cost is again broken down into four components: operation and maintenance costs of $.0788 per ccf, depreciation expenses of $.0791 per ccf, taxes of $.1545 per ccf, and return on investment costs of $.3170 per ccf. As seen above, the most dramatic rises in costs took place in the taxes component, which experienced a 1,696 percent increase, and the return on investment component, which experienced a 2,416 percent increase. The company was unable to project how much this cost increase was going to affect the individual customer's bill, since costs are allocated differently across different types of customers.

The EPA-estimated cost for turbidity upgrade for a system of Superior's size is just $.02 per thousand gallons, but Superior experienced an increase of $.75 per thousand gallons, possibly because it was not using (or paying for) slow sand filtration prior to building its new treatment plant.

Indiana

The Wells-Marion water utility in Indiana, which serves a population of 11,197, has made several improvements to its treatment system. It installed new aerators to oxidize iron, improved its filters by putting in a new backwash and new carbon dioxide systems to recarbonate, converted its existing clarifiers to second stage settling basins, and added softening units. The company estimates that its total cost of treatment, including debt service, prior to these improvements was $.56 per thousand gallons, of which $.08 per thousand gallons paid for softening. The estimated new cost of treatment, including debt service, is $.70 per thousand gallons, of which $.05 per thousand gallons is for softening. Thus the cost of treatment for water quality other than softening will have increased by $.17 per 1,000 gallons. This cost increase is significantly higher than the $.03 per thousand gallons that the EPA estimates to be the cost of turbidity upgrade in that size category.

California

California's Azusa Valley Water Company provides a good example of the cost increase experienced by a company that recently installed additional turbidity control measures. In 1986, Azusa built sedimentation basins to control turbidity for a design and an actual water flow of 2,737,500,000 gallons per year, at an estimated total cost of $900,000. Prior to building the sedimentation basins, the company spent about $0.049 per thousand gallons on treatment. Now it spends approximately $0.354 per thousand gallons on treatment, an increase of 622 percent. Azusa serves 45,990 people and has an average annual bill of $121. The EPA's estimated upgrade costs of $.02 per thousand gallons for a company of this size are below the costs that Azusa actually experienced.

Comments of the St. Louis County Water Company

The St. Louis County Water Company, an investor-owned utility that serves about one million people in St. Louis Co., Missouri, has submitted comments to the EPA expressing strong disagreement with certain portions of the EPA's proposed rule.[1] The company states that the EPA's new regulations will require it to increase its capital expenditure by over $300 million, causing a $143 (109 percent) increase in the annual residential bill. The company believes that the EPA should have gathered more evidence from actual field performance data for use in establishing the requirements for disinfection and filtration of surface water, and for monitoring for total coliforms. The company has therefore used itself as an example of actual field performance of surface water treatment and has compared the EPA's proposed requirements with the treatment and monitoring methods the company is currently using. The company has found several EPA requirements that it believes will cause the company's costs of providing water to increase without any commensurate increase in the protection afforded to its

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[1] St. Louis County Water Company, "Comments on the November 1987 Proposed Surface Water Treatment Rule and the Coliform Rule," unpublished, January 1988.

customers. The EPA is currently considering modification of its proposed rule in all four of these cases.

Conclusions

The case studies derived from the NRRI survey of the commissions on surface water treatment and the St. Louis County Water Company comments suggest that EPA estimates of costs of surface water treatment may be low. Based on this limited data base alone, such a conclusion is tentative but is buttressed by facts about the basic methodology the EPA used in estimating national treatment costs. Real estate costs were not factored into the EPA estimates, for example, because they are highly variable. The interest rate used in computing the cost of capital was a "risk free" calculation used for the public sector, not a realistic estimate of the rate at which companies can borrow. The EPA cost estimates are two years behind the actual market prices for equipment, materials, and labor that regulated water systems are facing now and will face when they install new surface water treatment. Thus, a commission might want to use a particular EPA cost estimate as a starting point for questioning in assessing utility cost estimates. But actual costs can be realistically expected to be higher than predicted by the EPA.

CHAPTER 5
WATER CONSUMPTION AND RANGE OF ANNUAL WATER BILLS

The primary emphasis of the NRRI survey and this report is on the impact of proposed surface water treatment rules and possible affordability criteria on the commissions and their jurisdictional water utilities. As additional aids to assessing the impact of the SDWA, the Water Committee asked the NRRI to gather information on water consumption and bills. In computing cost impacts of SDWA provisions, the EPA uses national estimates of these variables. It was felt that the EPA figures might be a rough approximation for the nation as a whole, but that there is huge variation in water consumption and bills and, thus, variation in the impact of rate increases needed to meet SDWA standards. The responses of the survey participants bore out this supposition.

Residential Water Consumption

Average annual residential consumption of water in the United States is commonly estimated at 100,000 gallons. The guidance manual accompanying the proposed surface water treatment rules uses 146,000 gallons for this figure in its examples on exemptions.[1] This assumes four people per household consuming 100 gallons a day. Each cent per 1,000 gallons of treated water is equivalent to $1.50 per year per household in additional cost, under these assumptions. EPA suggests that cost estimates would have to be adjusted for actual usage.

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[1] Malcolm Pirnie, Inc., and CWC-HDR, Inc., Guidance Manual for Compliance With the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources, op. cit., 9-2.

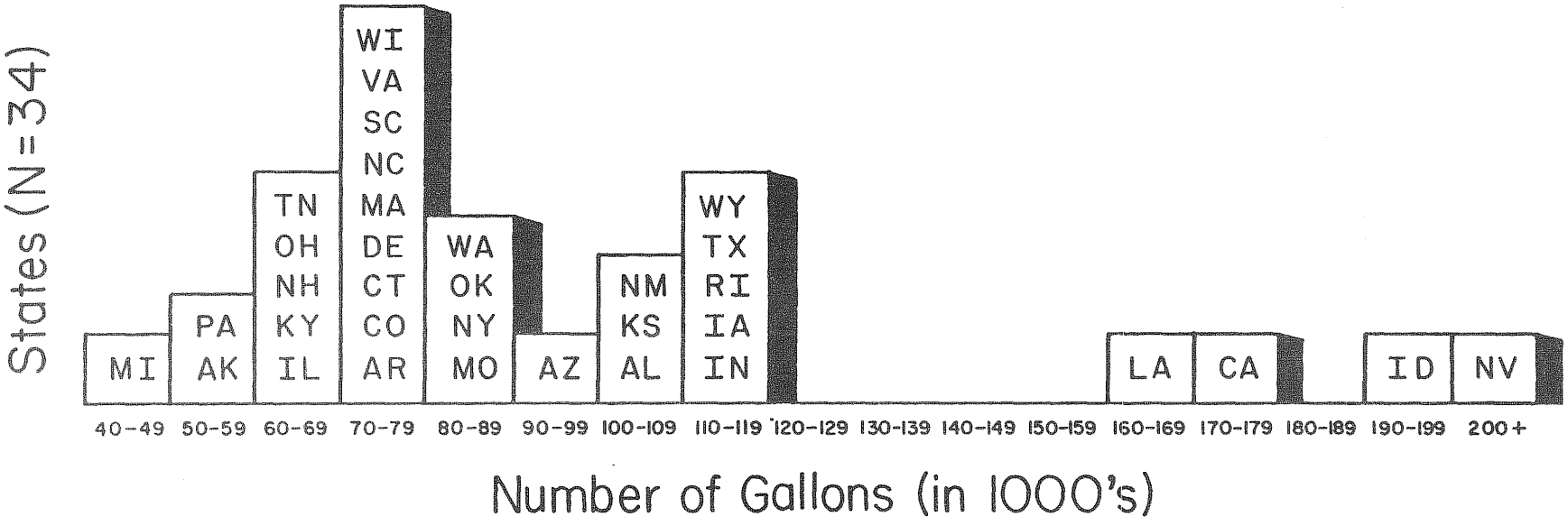
The NRRI asked survey participants to provide estimates of average annual residential use in their states and the basis for the calculations. All but five of the 39 states contributing to the survey results were able to provide us with this information.

The estimates given by the staff of average annual residential consumption of water in their states ranged from a low of 40,000 gallons per year per residence in Michigan to a high of 240,000 gallons per year per residence in Nevada. Figure 5-1 shows the staff estimates of annual residential water use by state. As shown in table 5-1, the modal number of gallons used was between 70,000 and 79,000, with nine states in that category. Twenty-two states suggested usage below 100,000 gallons and only 12 above it. Only four states suggested usage was greater than 120,000 gallons a year per residence. The median for gallons used, as reported by state commission staff members, was 79,000 gallons. The states with higher water consumption estimates are primarily those where there is relatively little rainfall, especially the southern and western states. The median gallons used for western states was 102,250 (N=12); for eastern states, 74,336 (N=22). The state of Washington in particular demonstrates the difference between a dry area and a wet area in terms of water consumption; Washington reported annual water consumption of 100,000 gallons for the eastern half of the state and 72,000 for the western half.

The fact that residential use is lower in many areas than taken into account in the EPA average means that EPA extrapolations to household water bills based on cents per 1,000 gallons of additional treatment may result in excessively high estimates.

Range of Annual Water Bills

The EPA estimates that current annual water bills for residential customers of small water utilities are $100 to $150 nationally. The NRRI survey asked whether the respondents thought the EPA estimate was correct for both jurisdictional ground water and surface water utilities serving fewer than 3,300 people. If they did not think so, respondents were asked to give what they thought were better estimates for both small, privately owned systems and small, publicly owned systems under commission jurisdiction and the bases for their estimates. In addition, the staff



Source: 1987 NRRI Survey of State Regulatory Commissions

Note: Staff of six commissions gave estimated ranges which overlapped the gallonage categories used here. The midpoint of the range was used to categorize these commissions.

Fig. 5-1. Commission staff estimates of annual residential water use for commission-regulated utilities by state

TABLE 5-1

COMMISSION STAFF ESTIMATES OF ANNUAL RESIDENTIAL WATER USE FOR COMMISSION-REGULATED UTILITIES, 1987

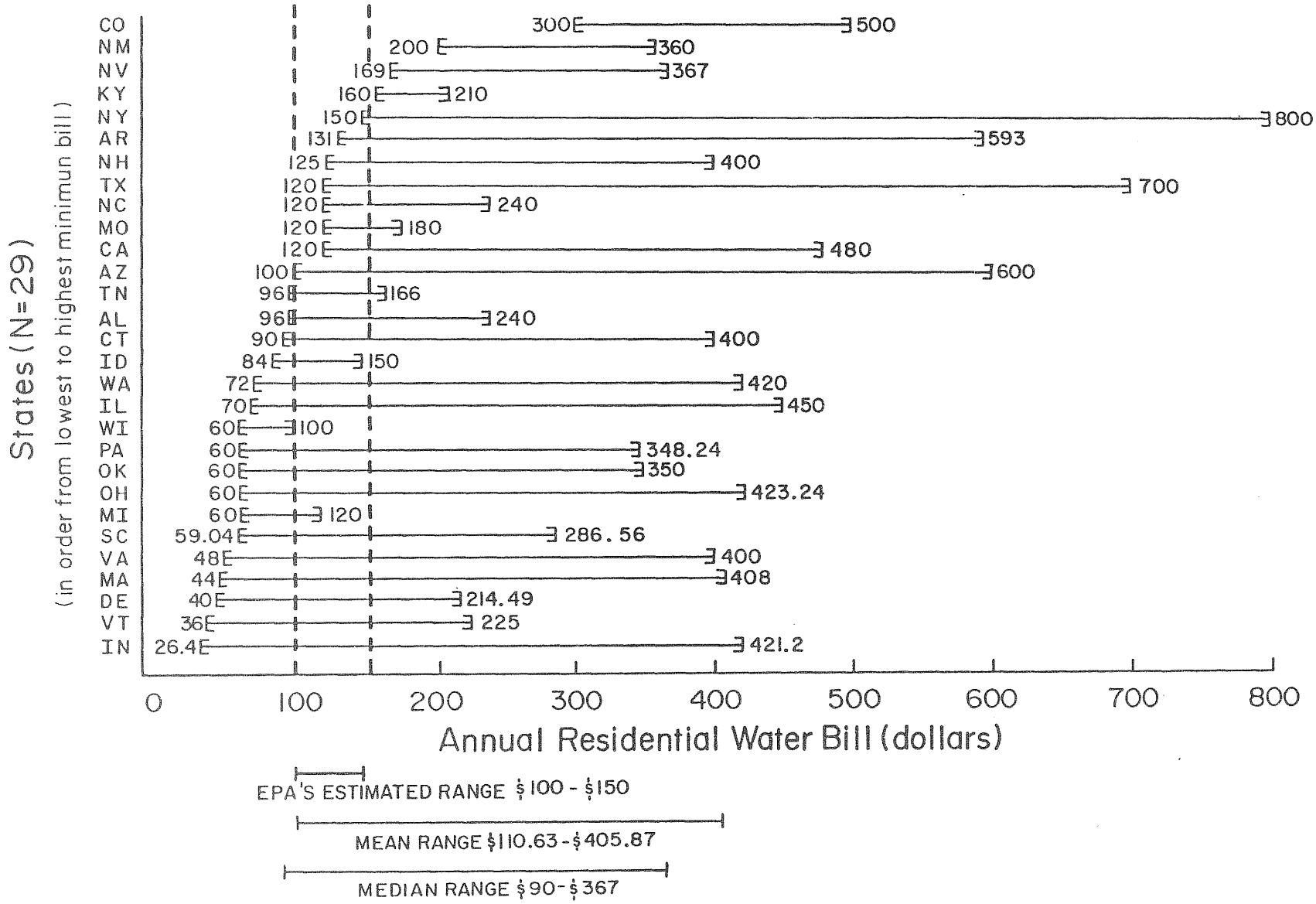
Gallons of Annual Residential Water Use (000s)	Number of Commissions[1]
40 - 49	1
50 - 59	2
60 - 69	5
70 - 79	9
80 - 89	4
90 - 99	1
100 - 109	3
110 - 119	5
> 120	4
Total	34

Source: 1987 NRRI Survey of State Regulatory Commissions

[1] Staff of six commissions gave estimated ranges which overlapped the gallonage categories used here. The midpoint of the range was used to categorize these commissions.

members were asked to state the range of annual water bills for small water systems under their commission's jurisdiction.

It is obvious from figure 5-2 that the ranges in annual residential water bills reported by the commissions are much greater than the $50 range used by EPA. Taking the means of the low ends of the reported ranges and the means of the high ends gives an average range of $111 to $406 (and a median range of $90 to $367). There are many commission-regulated water systems charging less than the average used by EPA and many that are charging much more. Twenty-six states (90 percent of the respondents) reported upper limits to their ranges that exceeded the EPA's upper limit of $150. Seventeen (59 percent) reported lower limits less than EPA's $150.



Source: 1987 NRRI Survey of State Regulatory Commissions

Fig. 5-2. Range of annual bills for residential customers of small commission-regulated water utilities, 1987.

It is interesting to note the difference in the upper and lower limits of the ranges from one state to the next. Some states have upper and lower limits to their ranges that differ up to $500 or more, while some states have ranges that are less than $100.

The wide differences in water bills reported by the survey participants do not necessarily mean that the EPA choice of a range is a poor one. Since we do not know from our survey the number of utilities involved and the particular amounts the utilities are charging, there is no way of judging the overall accuracy of the EPA's estimate. Most of the 29 states that reported the range of annual water bills for small water systems under their jurisdiction gave a range that fell at least partially within the range that the EPA has estimated. No state gave a range that fell completely below the EPA's range, and only four states, Colorado, Kentucky, Nevada and New Mexico, indicated ranges that are completely above the EPA's.

Respondents in ten states said that they believe that the EPA estimate of annual water bills for small utilities is correct. Staff members from 23 other states believe that the estimate is not correct. Three respondents said they did not know whether the EPA estimate was right, and four did not answer the question.

Staff members in 18 states estimated that the average annual water bills for small, privately owned systems under commission jurisdiction exceeded the EPA's estimated upper limit. All but one of these 18 states also disagreed with the EPA's estimate of current water bills for small water utilities. Respondents from three states estimated that the annual water bills of small, privately owned utilities are within the range estimated by EPA. Table 5-2 summarizes the estimates given by the commissions for small, privately owned water utilities.

The NRRI asked those commission staff members in states that regulate publicly owned water utilities to estimate their annual residential bills separately. There were too few responses to draw conclusions from this question. Arkansas and Connecticut reported lower bills for publicly owned water utilities ($246 for private companies and $186 for public ones for Arkansas; $200 and $100 for Connecticut). The Kentucky staff member estimated $160 for private companies and $210 for public ones. Oklahoma reported an estimate for publicly owned systems of $175 but did not offer an estimate of private company bills. Wisconsin estimated a range of $80 to

TABLE 5-2

COMMISSION STAFF ESTIMATES OF AVERAGE BILLS
FOR SMALL WATER UTILITIES, 1987

Estimated Annual Average Residential Water Bills for Small Privately Owned Water Utilities Under Commission Jurisdiction	Number of Commissions[1]
< $100	0
$100-150	2
$151-200	10
$201-250	2
$251-300	4
$301-350	0
$351-400	2
> $400	1
Total	21

Source: 1987 NRRI Survey of State Regulatory Commissions

[1] Staff of three commissions gave estimated ranges that overlapped the dollar categories used here. The midpoint of the range was used to categorize these commissions.

N = 21

$100 for publicly owned utilities but did not estimate the bills of privately owned utilities.

A 1982 survey of the operating and financial characteristics of community water systems indicated that privately owned systems receive on the average more revenue per gallons delivered to residential customers than

publicly owned systems receive.[2] Thus it could be hypothesized that some of the differences in water bills evident in the NRRI survey may be attributable to higher charges by private water companies than public systems; however, there is not enough data available about the individual regulated water companies included in this survey to test this assumption.

Conclusion

One can conclude from the information provided by the commission staff that rates of some water companies are more than what the EPA considers to be the national average. Many companies would suffer a lower percentage change from SDWA requirements than calculated by the EPA but a higher total bill. Residential consumption, on the other hand, is lower in many states than the estimated average. Increases in water bills might be less in these cases than forecasted by EPA because such increases are extrapolated from costs of treatment in cents per 1,000 gallons produced.

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[2] Temple, Barker and Sloane, Inc. Descriptive Summary: Survey of Operating and Financial Characteristics of Community Water Systems. Prepared for the Office of Drinking Water, U.S. EPA, Oct. 7, 1982.

CHAPTER 6

EPA REQUIREMENTS AND NRRI SURVEY RESULTS ON AFFORDABILITY

The SDWA Amendments of 1986 take into account the possibility that the installation of new treatment to meet some SDWA standards may be too costly for some communities. This constraint, often referred to as the "affordability" of meeting the standards, comes into SDWA implementation in three ways. The first is as one of many factors in decisions on maximum contaminant levels (MCLs) of the 83 contaminants to be limited under the SDWA. The second is in EPA decisions on the applicability of best available treatment (BAT) to meet MCLs across the United States for the purpose of deciding on variances. The third is in exemptions for specific localities.

State commissions have limited concern with the first two aspects of affordability but a profound interest and possibly a central role to play in approval or denial of exemptions. A request for an exemption is initiated by a utility in an application to the state primacy agency. The state primacy agency makes the determination approving or denying the exemption. But these decisions redound on the commissions. When exemptions are not granted or not requested when they might be, the commissions will be left to decide under their own statutory requirements what rates are just and reasonable in the light of costs of treatment to meet SDWA standards. Rather than being presented with a fait accompli, a commission may wish to consider how its requirements and expertise can be built into the exemption process, so that commission assessments of affordability have an impact on whether or not an exemption is granted.

In this chapter the statutory requirements on affordability and EPA's interpretation are reviewed, along with a report on what commission staff have said on the subject. In the next chapter problems in defining and measuring affordability are discussed.

Statutory Requirements and EPA Interpretation

The SDWA allows costs to be taken into account in deciding how close MCLs can feasibly be to maximum contaminant level goals (MCLGs). For non-carcinogens, MCLs and MCLGs are the same. But for carcinogens cost is one factor used to set the MCL as close to the MCLG of zero as is possible. In addition, in setting a nationally applicable best available treatment (BAT) for each MCL, EPA can make an across-the-board ruling as to whether water systems below a specified size are simply too small to be able to afford a treatment technology. BAT may be different for different size categories. It was the intent of Congress that EPA "selects and applies that technology which can be afforded by the largest public water systems to spread the cost of the treatment technology over a large number of consumers."[1] The EPA has interpreted Congressional intent to find that by implication, smaller systems which could not spread the costs of expensive new treatment over a large customer base would not have to use that technology. This is to be taken into account in deciding whether to issue a variance when a water system cannot meet a MCL with application of the BAT appropriate to its size category.

The EPA has already made a finding on BAT for small systems for one set of contaminants. In regulations on volatile organic chemicals promulgated July 8, 1987, EPA specified granular activated carbon as BAT and then discussed whether it would be affordable to small systems. The conclusion was that it would be. For surface water treatment, EPA does not have to name a best available treatment, so the proposed rules do not say what is or is not affordable for large or small systems. Regulations to be proposed in the near future on organic and inorganic chemicals and on radionuclides may contain discussions and rulings on affordability limits for BAT by size of system.

Finally, even if a BAT ruling does not exempt a utility from meeting a standard, it may still qualify for an individual exemption, at least

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[1] U.S. Congress, Senate, Senator Durenberger speaking on the Safe Drinking Water Act Amendments Conference Report, 99th Cong., 1st Session; Congressional Record, vol. 132, May 21, 1986.

temporarily. On the individual system level, the SDWA mentions "economic factors" as possible grounds for an exemption. Exemptions under Section 1416 of the SDWA Amendments may be granted by the state primacy agency from meeting MCL or treatment technique requirements, or both, if:

> (1) due to compelling factors, (which may include economic factors), the public water system is unable to comply with such contaminant level or treatment technique requirement;
>
> (2) the public water system was in operation on the effective date of such contaminant level or treatment technique requirement, or, for a system that was not in operation by that date, only if no reasonable alternative source of drinking water is available to such new system; and
>
> (3) the granting of the exemption will not result in an unreasonable risk to health.[2]

For water systems larger than 500 connections (about 1,500 people), an exemption includes a schedule for compliance. A three-year extension may be granted under certain circumstances. Systems with fewer than 500 connections (the majority of those under commission jurisdiction) and which need financial assistance for the necessary improvements may receive additional two-year extensions.

At the time of the NRRI survey, EPA was informally proposing that median family income be used as the basis of a decision rule on what can be afforded in the way of new treatment under the SDWA. A maximum total bill of two percent of the median national family income, or about $550, was suggested, and a maximum increase of one percent of median income, or about $275. If installation of BAT could be expected to cost more than these amounts for a particular size category of public water systems, the BAT would be considered unaffordable and the systems would not be required to install it. Similarly, on a local level, the one percent and two percent of median local family income would be used to judge whether an exemption was justified or whether additional treatment to meet SDWA standards was affordable.

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[2] 42 CFR 300g-5.

Since suggesting the median income standards of affordability, EPA has called it into question, on the basis that it may be a poor public policy choice to use this single criterion in making judgments on what people can pay for improved treatment of drinking water. An October 1987 draft of the guidance manual for surface water treatment[3] did not include a median income standard. The revised guidance manual says that economic factors or lack of qualified operators might be factors compelling exemption from the surface water treatment rules. In an example of a hypothetical small water utility that does not filter, the guidance manual projects an increased cost of $416 per household for conventional treatment. The costs are derived from the EPA's cost and technology document (see table 2-1). They assume a household water use of 146,000 gallons per year. The guidance manual states:

> The incomes of people in the community and the current water bills can be reviewed by the primacy agency to determine if an undue economic hardship is incurred by these treatment methods. Upon determination that an economic hardship is incurred, the primacy agency may grant an exemption from filtration, provided that no other water source meeting the standards is available at a lower cost, and that the system can assure the protection of the health of the community.[4]

Thus, the revised guidance manual does allow for current water bills as well as income to be reviewed in deciding an exemption and allows for consideration of local circumstances.

In informally proposing the limit of two percent and one percent of income for total water bills and increases in water bills, EPA offered several arguments it said supported these figures. First, the EPA pointed out that some customers have been willing to pay as much as $500 for water or for point-of-use devices or bottled water. Second, the EPA noted that the proportion of income being spent on other utility services is higher than for water. Third, the EPA reported that the Arizona Public Utility

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[3] Malcolm Pirnie, Inc., and CWC-HDR, Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources, op. cit.

[4] Ibid., 9-4.

Commission has said that in a worst case situation, consumers should not pay more than $1,000 for water.[5] These facts were the only ones put forward to support the argument for using two percent of median income as a guideline. There was no support for the argument that increases should be half of the total limit on median income and no support for choosing median income as an indicator in the first place.

Results of NRRI Survey on Affordability

The NRRI survey of the state commissions in the fall of 1987 revealed a high level of resistance among state staff members to severe increases in rates to cover SDWA costs and a skepticism about the median-income test as a measure of affordability. In the NRRI survey, staff members were asked to respond to the then current EPA proposals on affordability, saying what they believed would be affordable total annual bills and increases, commenting on the rationale and impact of the EPA's proposal, and proposing their own alternatives to an affordability standard. The responses suggest that EPA and the primacy agencies would have a difficult road ahead of them convincing public utility commission staff to support higher rates based on a median income criterion.

Commission staff members participating in the NRRI survey objected to the dollar amount of water bills implied by the EPA's informal proposal on affordability calling for a median-income test, to the criteria on which the possible standard was based, and to the logic offered by EPA in justifying the standard. Commission staff would allow total bills of about half the amount implied by the two percent median income standard. They foresaw rate shock and other undesirable consequences to regulated utilities and to the commissions from increases of the magnitude that EPA was suggesting was acceptable. Many of the staff respondents expressed a belief that residential water users in their states were already paying a price for water that was at the upper limit of the range of affordability and thus could not afford to pay more. In a qualitative survey, such as the NRRI

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[5] U.S. Environmental Protection Agency, Proposed Rules on Filtration and Disinfection, Draft, May 22, 1987, 51.

survey, that allowed for many variations within a single general response, to say that there was consensus would be too strong a conclusion, but it appears that it was the sense of the survey responses that, if there must be increases, the affordability of both individual increases and total water bills should be measured by their relationship to existing local bills. Those staff members who would consider income of an area, rather than existing bills, called for tying an affordability standard to the low-income range rather than the median.

Staff of many commissions provided helpful comments on affordability which we have tried to summarize here. The staff members of the Tennessee commission submitted a lengthy, cogent argument, reproduced here as appendix B.

Total Affordable Bills

Staff estimates of total affordable annual bills ranged from a low of $100 to a high of $600, with a mean of $288 (median $275). On average, the commission staff was thus calling for maximum bills that would be half of what the EPA was suggesting (see table 6-1 for a summary of staff estimates). This result suggests a strong hesitancy among the commissions to approve sharply higher rates.

In commentary provided about possible total annual bills, the emphasis by commission staff was on tying an affordable bill to existing rates, whether by relying on an existing average, an existing maximum, or a percentage increase over existing bills.

Only one commission staff member suggested using median income as a guideline in any way. He suggested using a "traditional" half a percent of median family income applied in his state. Five survey participants considered the existing average water bills in their states to be the maximum affordable. Two staffers suggested using the existing average plus an increase. One put the limits of that increase at five percent; the other suggested 20 percent. Several states said the maximum existing rate in their states was the maximum affordable. Two commission staff respondents suggested that existing quality of service be taken into account in deciding what maximum bills should be allowed.

TABLE 6-1

COMMISSION STAFF ESTIMATES OF AFFORDABLE TOTAL ANNUAL WATER BILLS FOR RESIDENTIAL CUSTOMERS, 1987

Estimated Affordable Total Annual Water Bill for Residential Customers	Number of Commissions[6]
$100-199	7
$200-299	7
$300-399	8
$400-499	2
$500-599	1
$600-699	1
Total	26

Source: 1987 Survey of State Regulatory Commissions

N = 26

Five commission staffers suggested that the affordable bill should be tied in some way to the economic situation of people in a particular area, but did not say median income should be used as the indicator. People receiving Aid to Dependent Children and others living on fixed incomes should be considered in deciding what maximum is affordable, said some of the staff members. General economic conditions, such as local recession, should be considered, suggested others.

Three commission respondents indicated that public acceptability would need to be taken into account in some way in assessing affordability. One staff member spoke of a "political threshold" above which bills could not go. Public acceptability was of course implied in many of the recommendations for sticking with existing average or maximum bills. It also may have been implied in the response from one staff member in a major

[6] For the six commissions which gave ranges overlapping these categories, the midpoint of the range was used to categorize their estimates.

eastern state who quoted his chairman as saying $1 a day, or $365 a year should be the limit.

A utility's service quality was noted as a criterion in deciding whether rates should be increased. And the availability of substitute water through individual wells was mentioned by one staff member as setting the upper limit on water price.

Affordable Increases in Water Bills

Only one respondent agreed that one percent of median national income was an acceptable standard of affordability for increased water rates. Most others spoke in terms of dollar increases or percentage increases over existing rates, although two staff spokesmen said no increase is affordable in their states. One commission staff member suggested that an increase of half of the existing maximum rate, or $100, would be affordable. Another survey participant proposed an increase up to the $25 a month that she believed would be the maximum acceptable total bill in her state.

Several commission staff members suggested specific percentage increases in bills that they felt would be acceptable. The suggestions were two percent, two to three percent, 12.5 percent, 20.61 percent, 25 percent, and 30 percent. The two percent estimate was based on a reading of what people on poverty incomes could afford. The estimate of 20.61 percent was based on the average percentage increase granted to a water company over the last five years in that state.

Three commissions did not mention specific dollar or percentage increases, but noted that customer impact should be considered, with incremental increases that avoided rate shock.

One staff member said management of the company and the timeliness of their filing for rate increases in the past should be taken into consideration in allowing any drastic increase.

Rationale of EPA Standard

The participants in the NRRI survey were asked to comment on the rationale for the EPA proposal. Only one staff member said it was "not

unreasonable." Two respondents said local rather than national averages would be appropriate. A third remarked that the use of a national average would be reasonable if a state were at or above the median but not if it was below. Another respondent warned against setting a price of $550 for drinking water and then seeing how much treatment that would buy.

Several respondents noted differences in the cost of water for arid versus humid states and said that tying affordability to income would not make sense since water simply costs more in some areas than others.

The argument that water can cost more since electricity, gas, and telephone service take more of a family's income was criticized by two staff members. One said other utility services are entirely different from water; the other remarked that water is more of a necessity than other utilities.

Impact of Affordability Standard

The NRRI survey asked staff members to assess the impact of the proposed affordability standards on customers, utilities, and the commissions. Many respondents predicted rate shock and a consequent public outcry if the rate levels suggested by EPA came to pass. But a couple of the staff members said customers would be willing to pay more if they felt they were getting something for their money. For the utilities, the staff members predicted a variety of consequences, especially for smaller companies. Difficulty in financing SDWA improvements, decreased returns, and limitations on capital improvements not related to water quality were among the results foreseen. Some commission staff members predicted company failures and mergers. For the commissions, increases in the number and cost of rate cases and more customer complaints were cited as the major consequences of a high affordability limit.

Impact on Customers

Several respondents felt that, in the words of one staff member, the increased water rates implied by the standard would be "a hard pill to swallow." Another said the standard implied "excessive and unbearable increases" for families with fixed incomes. A respondent from a western

state remarked that $275 would be almost a 100 percent increase, which "might be affordable in a total budget, but the uproar would be tremendous."

Two staff members mentioned other utility bills in talking about the impact on customers of increased water bills. One said the proposed standard would disregard the already high cost of other utility services. Another said consumers would "feel trapped" if water bills started to shoot up the way electricity bills have.

Two staffers said the rate shock implied by the standard could be followed by water conservation and possibly a search for alternative source of water.

Some staff respondents, however, did not predict severe effects from the application of the standard. Two of them remarked that consumers are willing to pay more for water service if they truly see a need for it. The westerner said that in his state the standard could actually keep rates down if it were strictly applied.

An eastern staff member remarked that people are likely to compare rates in adjoining areas to form their perceptions of how justifiable rate increases are.

Impact on Jurisdictional Water Utilities

Discussing the impact of the proposed affordability standard on regulated utilities, commission staff members mentioned many possible consequences of the investments that would be needed to meet SDWA requirements. Three staff respondents noted the heavier burden of meeting SDWA requirements for smaller water utilities.

Company failures were predicted by several respondents. Several staff members foresaw a "death spiral" where rate increases would lead to customers leaving a system which in turn would lead to the costs being spread to fewer customers which would lead to more customers leaving the system and new, higher rates. One staff member foresaw public pressure for takeovers by local government agencies.

Decreased returns were mentioned by survey participants as consequences of the affordability criterion. One eastern staff member suggested that decreased returns could result if the affordability cap exceeded actual costs, including costs of meeting SDWA requirements. A western respondent

said, similarly, that the affordability criterion could actually limit increases needed to cover SDWA requirements when rates were high for other reasons.

The possibility that investment in water quality improvements could limit water utilities in making improvements other than to SDWA-mandated water quality standards was raised by two commissions. A staff member from one of these commissions said larger utilities would have to rearrange their priorities.

Other consequences to the utilities that were mentioned were increased rate cases (with their consequent expenses) and increased customer complaints.

Impact on Commissions

Not surprisingly, more customer complaints and increased rate case proceedings were the most common consequences to the commissions that were foreseen by the survey respondents. Thirteen commissions mentioned one or both of these results. A respondent from a midwestern state added that there could be more proceedings for company abandonment and receivership as well as rate cases. Two staff members predicted an increased workload of rate case personnel. One added that the costs of regulation would increase because of the additional personnel and hearing time needed for rate cases. A western staff member said that the limit could be difficult to enforce if a utility had already spent the money to upgrade and rates already averaged about two percent of income.

Alternative Standard of Affordability

The NRRI survey asked staff members to propose an acceptable alternative standard of affordability. Eighteen commission staff offered such alternatives. Only one replied in terms of median income and that was 1/2 percent as a total bill.

Several commissions stressed that in their view a state and even local standard was preferable to a national one. One respondent suggested that there be a standard for each state based on sliding scales of average residential bills, company size, and other factors.

A few commissions suggested that an affordability standard be based on existing water bills or water use. Among the proposals were:

- The inflation rate for the national average of existing metered residential water use
- The current level of local water rates
- 50 percent of the national average residential annual water bill
- Not more than 200 percent of the existing maximum rate on the system
- 50 percent, phased in over time

Although many of the respondents who proposed alternative affordability standards suggested using percentages to establish the limits of increased water bills, one western respondent suggested that affordability limits be set in dollars rather than percentages. Another suggested using temporary surcharges. Thus a time limit as well as any other limitations would be built into the affordability criterion.

Conclusion

The state primacy agencies are charged by the SDWA with making determinations on exemptions. But for commission-regulated water utilities, a decision by the commission that additional treatment costs can or cannot be allowed in rates clearly should be crucial to the primacy agency's decision on whether a water system can or cannot comply with an MCL or treatment requirement. The results of the NRRI survey of the commissions on affordability suggest a concern about rate increases due to meeting new drinking water requirements, whether using a median-income standard or any other approach. The EPA and the primacy agencies may face tough questions in justifying requirements for commission-regulated utilities to add expensive treatment.

CHAPTER 7
SOME THOUGHTS ON THE CONCEPT OF AFFORDABILITY

In the previous chapter we reviewed statutory requirements on affordability and some observations of commission staff on the subject. In this chapter we step back to reflect on the meaning of "affordability" as it pertains to the SDWA and commission actions relating to SDWA implementation. Problems in defining and measuring affordability are discussed and some general approaches suggested. The chapter is not meant to be a scholarly public choice analysis but merely to provide some commentary on a very practical matter of policy.

In particular, we look for approaches to several central issues in defining and implementing cost limitations in the SDWA. First we consider the connotations of the concept of affordability and how they are likely to affect the perceptions of policy makers attempting to define the term in practice. It is argued here that there may be some confusion between people's willingness to pay, one connotation of "affordability," with their ability to pay, a second major connotation, and that this can lead to public choices that may appear equitable in the short run but will not take into account the full costs of providing safe drinking water in the long run.

A second question discussed here is whether there is an upper limit to the price of water under the current federal regulatory agenda. It is argued that the availability of substitutes to publicly supplied drinking water indeed sets such limits.

Ambiguities in the EPA's approach to cost-benefit analysis are a third issue discussed. It is argued that commissions must, in the absence of federal guidance, be prepared to weigh benefits against costs in their own regulatory process. Ideally, limits on costs of water, or affordability, cannot be ascertained empirically without comparing marginal benefits to marginal costs in the context of existing local water service. Commissions cannot be placed in the position of assessing health benefits. They are not the experts in this area. But they cannot ignore the value of health

benefits compared to the rates which consumers must pay to achieve SDWA standards. They can significantly influence whether or not the primacy agency will grant an exemption. The active participation in the commission regulatory process of representatives of the state primacy agency, through formal testimony and informal cooperation, will be necessary to ensure proper consideration of health benefits.

Although it is individuals and not water companies that must ultimately bear the burden of increased rates to pay for SDWA improvements, it is argued here that, aside from the ability to pay of their customers, many small, regulated water companies lack the managerial capacity and the operational track record to secure financing for those improvements. Increased availability of financing mechanisms for such utilities might improve their situation, but for many, compliance with the SDWA may be out of reach. Many small water utilities are simply unable to raise capital. As a recent survey of small private water utilities in California revealed, many small companies need large plant improvements such as chlorinators or water storage tanks but do not have the money to invest in such equipment.[1] A slow transition to SDWA compliance, conversion to a regional water utility or to alternative sources of water, or a transition to public ownership may be needed to serve the customers of such utilities.

Willingness to Pay and Ability to Pay

In considering approaches to meeting the cost of complying with the SDWA, it is useful to distinguish between consumers' willingness to pay and their ability to pay for treatment to reduce contamination of drinking water.[2] The word "affordability" connotes both willingness and ability to pay, but the two ideas are very different. Willingness to pay has to do with consumer preferences for purchasing goods or services at particular

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[1] California Public Utilities Commission, Commissioner Advisory and Compliance Division, Water Utilities Branch, Status of Small, Privately Owned Water Utilities in the State of California, December 1987.

[2] John Cromwell, "Higher Water Rates and Consumer Willingness to Pay," paper delivered at Annual Conference of Association of State Drinking Water Administrators," Charleston, South Carolina, February, 1988.

prices. Ability to pay, we suggest, has to do with the budget they have for making those choices. In a free market, consumer preferences are revealed in actual purchases within budget constraints. In a regulated market, decisions on an equitable allocation of economic burden, which has to do with ability to pay, often are made in an an atmosphere of bluff and uncertainty that may have more to do with what people think they can afford than what they actually can. Although willingness to pay and ability to pay should not be confused, there is no magic demarcation point for either one above which water rates should not go and below which increases in the cost of water are affordable.

Willingness to Pay

If there is no change in the good or service being sold, the primary determinant of willingness to pay is what the consumer is already being charged. Particularly for a necessity without substitutes, he is simply not going to want to pay more for the same service. State regulatory commissions are familiar with this reaction. Commissions have been the forum in recent years for arduous, often acrimonious debate on public acceptability of higher rates. In the 1970s electricity rates skyrocketed. In the 1980s there is some fear that local telephone rates might do the same.

In considering the prospects of higher rates for water, commissioners and commission staff are bound to be sensitive to the prospects of taking on the role of "point men" in a new battle for public acceptance of higher rates. And in responding to questions on what is affordable, it is not surprising that the commissions talked in terms of deviations from existing water bills, a measure of willingness to pay, rather than in terms of ability to pay. The federal EPA and state primacy agencies should be aware of the commissions' reluctance to be the final decision makers for vastly higher water rates which consumers and their representatives oppose. The commissions are required under their state laws to assure affordable rates based on prudently incurred costs. They are likely to scrutinize proposals for SDWA improvements for affordability in terms of willingness to pay.

At the same time, commissioners and commission staff are well aware of their responsibilities to approve prudent investment to meet SDWA

requirements. In fulfilling this responsibility, they can look to several aspects of willingness to pay that may make some costs of the SDWA less difficult and more palatable than has been feared. First of all, unlike electricity and telephone service, where consumers were being asked to pay a lot more for exactly the same product, it is not clear that consumers will feel that way in buying water treatment improvements to meet SDWA requirements.

A large segment of the population may already believe that removal of risks of contaminants is worth the price. A recent AWWA study found that consumers may be willing to pay quite a bit more for reduced risks of ill health caused by drinking water.[3] A random national sample of households that pay for their water directly was asked to evaluate the cost of their tap water. The resulting regional ratings for the most part were in the "very inexpensive" to "somewhat inexpensive" ranges. Only 12.3 percent of the households considered their water expensive. (Twenty percent responded with a "don't know" or "no answer.")[4] About half of the consumers in the sample said they feared harmful contaminants in their water to the extent that they would pay for their removal.[5] Whether these findings stand up in actual situations where ratepayers are called on to put up real money for the improved treatment is of course uncertain. There may well be cases where a substantial body of ratepayers feels they have always been drinking the local water and haven't gotten sick yet and don't see why they should have to pay more.

For commission-regulated water utilities the regulatory process will be the arena in which public concerns and the public interest in particular communities will be revealed. Over time, the level of public acceptance can change through honest, informed public debate.

While the commission staff responding to the NRRI survey frequently voiced opposition to large percentage increases in water bills, such increases have been approved in many cases. An examination of recent water

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[3] Audits and Surveys, Inc., Public Attitudes Toward Drinking Water Issues, final report submitted to American Water Works Association Research Foundation, December, 1985.
[4] Ibid., 38-39.
[5] Ibid., 51.

rate cases suggests that revenue increases of between 15 percent and 20 percent are quite routine. Increases as high as 54 percent,[6] 75 percent,[7] and even 180 percent[8] have been approved. A review of water rate cases in Pennsylvania between January 1985 and February 1988 revealed 44 cases out of 129 decided cases in which revenue increases of greater than 25 percent were approved. Revenues more than doubled in six of these cases.

It should also be noted that, while commissions must consider the affordability of rates, a fundamental commission responsibility is to structure rates that recover costs. It is frequently argued that water is simply not being priced at its real cost. This is perhaps most often true of municipal water utilities where it is often asserted that there is frequently an effort to hold rates down, with the result that maintenance is neglected and perhaps some costs are absorbed by the general fund rather than passed on to ratepayers. But it has also been suggested that in our industrial society both public and private water utilities have been inadequately accounting for the costs of waterborne disease, particularly disease that does not become evident until decades of exposure have gone by. This is one of the premises of the SDWA which aims at reducing future costs to society of diseases such as cancer by paying now to reduce the level of carcinogens and other contaminants in our water. Thus the true cost of water may in many cases not bear a strong enough relationship to what consumers are already paying.

Another cautionary note for the commissions is that safe drinking water has been considered in this country a public good, largely because it is tied to the protection of public health. Water service has elements of a natural monopoly, like other utility services, but is different because of externalities associated with it. All the consumers of water benefit from prevention of waterborne disease. That is a major reason why, unlike the energy utilities and telephone, water has been for the most part provided by

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[6] Connecticut Department of Public Utility Control, Stamford Water Co., DPUC Docket No. 85-03-11, Nov. 12, 1986.
[7] Maryland Public Service Commission, Pomonkey Water Co., PSC Case No. 7949, May 19, 1986.
[8] Connecticut Department of Public Utility Control, Old Newgate Ridge Water Co., DPUC Docket No. 86-07-12, Dec. 9, 1986.

public entities, often not under regulatory commission jurisdiction. The importance of a community's drinking water for public health is exactly what the SDWA addresses.

A final consideration in looking at willingness to pay is the timespan over which rate increases are made. Willingness to pay, it can be argued, is a short-run problem. It can be a severe short-run problem, but over time, if the public policy process has dictated that improvements to a water supply system must be accomplished, consumers generally can adjust to the new level of higher rates. This has proven true of electric rates. There is nothing to suggest that water rates are any different.

Commissions have evolved a whole battery of means for dealing with rate shock, including construction work in progress, allowance for funds used during construction, various phase-in plans, and variations in amortization and depreciation rates. Commissions faced with approving higher new rates for water will likely consider these mechanisms for slowing down the actual impact of higher rates and thus allowing more time for adaptation.

Ability to Pay

In the long run the aspect of affordability that concerns both the commissions and the EPA is ability to pay more than willingness. Since this is a matter of equity, it is bound to be a slippery issue.

Median Income as a Test of Ability to Pay

Historically, for welfare payments, social services, or other government programs where resources are redistributed, a means test is often used to target needy individuals or geographical areas. For water quality improvements, a means test would attempt to assess the resources available within a community to fund new public works. The median income of a community is an intuitively valid indicator of one community's ability to pay relative to others. As an index of affordability it has the advantages of being simple, understandable, and easily measured. At the level of setting BAT, a simple limit on the proportion of median income that could be devoted to water treatment improvements could rule out some obvious

unaffordable solutions. And at the level of exemptions it could establish a presumption of inability to pay for some communities.

But as the sole, final test of ability to pay, a measure of median income will not do. At the very least, an income test should be adjusted to take into account communities with large, non-residential customers. The median income test takes cognizance only of residential rates. For most means tests it makes sense to consider only individual or family income. The presence of industry will be reflected in community wage levels. But in utility service, some of the costs of improvement can be applied directly to the large user. They are expected to foot the portion of the bill representing the costs of serving them. Commercial and industrial users can thus be taken into account in assessing economic hardship for the purpose of deciding on SDWA exemptions. Commissions, of course, need to be sensitive to avoidance of cross subsidies in these cases.

It can also be argued that the median income test might not adequately take into account the distribution of income within a community. By definition, the median is a point at which half the population is above and half below some distribution of data points. There are presumably communities where a substantial minority of people are in the very lowest income brackets so that they are in essence underrepresented by the median. This suggests that the percentage of residents below the poverty line be included as an indicator of economic hardship for a community. In a large city, where costs can be spread across millions of people and amount to only a few dollars a year, this may not be an important consideration. In a small town median income is more likely to reflect pockets of poverty, and in a medium-sized city such an adjustment may be significant.

Part of the problem of avoiding burdening people with poverty level incomes with severely higher rates might be dealt with by commissions through lifeline rates. Commissions may want to consider such rates where exemptions for the whole community are undesirable, but rate increases caused by SDWA requirements would represent too large a percentage of family income. Lifeline rates for water may not have the same urgency as for electricity, however. Poor people tend to use proportionately more energy for heating than richer people because their housing "leaks" heat. But people in lower income brackets use less water than people with higher incomes. They do not have swimming pools to keep filled, automobiles to

wash, or lawns and gardens to sprinkle. Thus, in water rate design, properly designed inverted block rates may have the effect of lifeline rates in other utility sectors.

Although relative median income is probably not a bad measure of ability to pay, it is impossible to define affordability by a specific percentage of median income spent on water, just as it is impossible to define willingness to pay in terms of a precise, nationally applicable percentage increase in water bills. As pointed out by respondents to the NRRI survey, such a demarcation would in effect put a cap on treatment costs for water that is already high priced and does not meet SDWA standards and give an incentive for installing costly systems in areas with water that is currently inexpensive. Just because a community is already paying a high price for water does not mean it should be exempted from meeting health standards; and just because another community is paying less for water does not mean they can pay more.

The Upper Limit of Ability to Pay

In attempting to specify a limit on water bills in terms of percentage of median income, the EPA was looking for an upper limit on ability to pay. But setting such a number quickly becomes an exercise in establishing willingness to pay rather than ability. For example, in the original EPA suggestion, water expenditures were compared to those for other utility service. It was argued that water bills can go up since energy bills consume on average a higher proportion of income. It is certainly possible to say, as a kind of "selling point," that people can pay as much for one necessity as another. One can argue perhaps even more easily that people should have no qualms about paying as much for necessary water as for the luxury of cable television, which costs $30-$50 a month in some areas. But many people still probably compare water prices to "free" air. In any of these cases one is venturing into the idiosyncrasies of people's perceptions of value, based on historic prices and thus more on willingness than ability to pay.

If water were extremely scarce, people would be prepared to devote tremendous portions of their income to it. As on the imaginary planet Dune, water would be mined, distilled, preserved, cherished, and fought over.

The finest minds of an industrial society with a shortage of potable water would be devoted to technological innovation to improve and increase the production of water.

Luckily, in the United States one does not have to resort to using extremes to estimate the upper limits of the cost of high quality drinking water. One way to approximate the upper limit is to look at the prices of substitutes for centrally provided and treated drinking water. These include bottled water, point-of-use devices, drilling an individual well, and breaking up a small system into systems serving fewer than 25 people.

EPA considers bottled water and point-of-use devices undesirable as a community-wide means of protecting public health. This is because of the difficulty of assuring that everybody drinks only the bottled water or used only water from the tap that has been fitted with a point-of-use device. But with adequate safeguards and public education, it might be more cost-beneficial for households to purchase bottled water or to pay a one-time cost of installation for a point-of-use device than to have centrally provided treatment.

The SDWA limits regulation of drinking water to communities with 25 or more people. If a family decides to move off the system by drilling an individual well, the EPA has lost the ability to enforce the use of the simplest disinfection practices, along with any expensive new treatment. The cost of drilling a well in the United States can be very low and can be amortized over several years. Where geological conditions make it inexpensive to drill an individual well, some people might choose this bypass option rather than paying higher water bills from the central system.

Similarly, if a small water system decides to avoid regulation by breaking up into systems serving fewer than 25 people, the EPA and its primacy agencies have lost the ability to make sure that a group does not completely neglect water treatment, thus not only putting themselves at risk of infection but risking the spread of communicable disease beyond that group. The costs of a utility doing this cannot be easily specified but could be very low if water were already being distributed from several existing wells and all that needed to be done was the paperwork of dividing a company into several separate companies. This may already be occurring in some states. It should be a very real concern to EPA that all the leverage of environmental regulation not be lost for the smallest water systems in an

effort to impose more stringent regulation. The risk of a person or persons going "off the system" is, of course, not one the EPA will likely take into account explicitly in formulating criteria for exemptions, since it would encourage such evasions of the law.

Weighing Costs Against Benefits

Welfare economics suggests that spending for a social program should proceed to the point where marginal social benefits equal marginal social costs. To ignore one side of this equation is to make public policy decisions in a vacuum. In playing their role in implementation of the SDWA Amendments of 1986, public utility commissions must attempt to elicit from the state primacy agencies an assessment of the benefits that would flow from capital improvements for water treatment and weigh those benefits in making rulings on rates that might or might not lead to the granting of an exemption. Decisions on exemptions by the primacy agencies clearly call for at least a qualitative assessment of costs versus benefits, and this is reflected in the language on exemptions of the statute itself.

In attempting to make such decisions, commissions are not likely to get clear guidance from the federal government, largely because of conflict between a Congress determined not to be thwarted this time in implementation of strong health standards for drinking water and an executive branch determined to hold down the costs of federal regulation. Congress has said that cost-benefit analysis is not to determine the extent of implementation of the SDWA. Accomplishments under the SDWA have been minimal since 1974, and Congress in the 1986 Amendments did not want to allow its will to be bogged down in a quagmire of cost-benefit analyses. The avowed approach is thus to have pure water at almost any cost.

The EPA's approach to implementation of the SDWA is explainable as an attempt to steer a course between Congressional intent and the policy goals of the Reagan Administration. The result is an odd, ambiguous, and sometimes ambivalent set of actions. Witness the EPA treatment of compliance with Executive Order 12291. The order is an Administration effort to mitigate the costs of federal regulation by requiring a regulatory impact analysis for agency actions with significant economic effects. EPA is preparing such an analysis for each segment of implementation of the

SDWA. But these cost-benefit analyses are considered by EPA to be only one tool in making decisions on the SDWA. Thus far, for volatile organic chemicals and surface water treatment, they have not resulted in any explicit limitations on implementation. In the proposed surface water treatment regulations, it is interesting to note that the cost-benefit analysis showed net losses for the three smallest categories of water utilities. No mention of this result was made in the proposed rules.

Despite the outward show of avoidance of a weighing of costs against benefits, the EPA has made some concessions to the need to assure that there is a net value to its actions. In setting MCLs, the EPA does take cognizance of decreasing marginal benefits in health and lives lost from increasing treatment levels. For the purpose of guidance on variances, EPA has considered "affordability" at the level of national decisions on BAT for smaller water systems.

In the section of the Amendments dealing with exemptions it may be argued that there is an implicit recognition of the need to take benefits as well as costs into account. The law says that both factors such as economic hardship and the impact on public health are to be considered in granting exemptions. Presumably if an MCL that is is not being met is for one of the less dangerous contaminants or an MCL is almost being met but would cost a significant amount to achieve, this might be considered in deciding whether to grant an exemption. This could amount to something approximating at least a qualitative cost-benefit analysis.

Companies' Ability to Pay

In all of the preceding discussion, the emphasis has been on ability to pay by the customer, since the ability of regulated companies to finance improved water treatment ultimately depends on the ability to pass on the higher costs to customers. Affordability for a regulated company is dependent on affordability for the community. It is the responsibility of the commissions to see that compliance expenditures are passed on if they are the result of prudent investment.

However, it is common knowledge in the field of water utility regulation, whether regulation of water quality or of price, that there is a hard core of small water utilities that are not now providing adequate,

minimal service, much less pristine water using advanced technology. If a company is poorly managed and is already giving poor service, it is unlikely that it can in a single leap upgrade service both to meet basic state commission requirements and SDWA treatment, even if it appears that the community can ultimately afford to pay for high quality water treatment. There may be cases where a long lead time will be needed for communities to catch up to the SDWA standards.

The ability of the companies to obtain financing for SDWA improvements is part and parcel of the commission regulatory process. If a commission decides that rates can be raised sufficiently to cover increased capital costs due to SDWA improvements, a company will be more able to secure financing and thus meet the SDWA standards. If a commission decides those costs are too high or imprudent, the company may not be able to finance the improvements. The state primacy agencies make the ultimate decisions on exemptions from MCLs. But if a commission is resistant to "necessary" rate hikes, that becomes an argument the company can make before the primacy agency for economic hardship and thus for an exemption.

Financing Water Quality Improvements

If water companies are going to be able to finance SDWA improvements, the resources available to them will somehow have to be expanded. Loan programs are currently available to privately owned water companies in Pennsylvania and New Jersey. State commissions may wish to look into developing such programs in their own states.

One can also argue that there is a federal role to be played in financing water quality improvements. After all, the proposed affordability test for SDWA construction is something of a means test stood on its head. Usually a means test is intended to identify people or communities that need special assistance. In the case of the SDWA, the test is aimed at identifying those who will not be able to achieve a public health goal. The communities that cannot meet SDWA standards because they are too poor are in effect written off. If a community is found to face economic hardship that prevents meeting national standards for safe drinking water, a case can be made that federal assistance should be available to fund the necessary capital improvements. At a minimum, the section of the SDWA authorizing

technical assistance to small systems could be funded. Other funding sources should be developed. One alternative could be to make funds available to private companies through the Farmers Home Administration.

Commission Obligations in Review of Expenditures to Meet SDWA Requirements

State regulatory commissions have several responsibilities under their own governing statutes that apply to review of expenditures by regulated water utilities to meet SDWA requirements. Some costs of capital improvements to meet SDWA standards might be assigned by commissions to water company stockholders under any of these regulatory tests.

Plant that is included in the rate base must be "used and useful" in the public service. Commissions are unlikely to question the health standards of the SDWA, but can still look for overdesign of treatment facilities that makes them surpass the standards. Such plant might not be allowed in the rate base under the used and useful test.

In judging whether an investment in plant is prudent, commissions take into account "the franchise obligations to provide all the service demanded, to ensure adequate and reliable service, and to provide service at a reasonable price."[9] The prudence test has emerged in the 1980s as a means of reviewing investment decisions and construction cost overruns in the electric and gas industries. Under the prudence test, a regulated utility must have made a reasonable decision under the circumstances known at the time of the investment. Some commissions might consider review of investment decisions in the water utility industry if a strong doubt about prudence is raised when the plant is ready to be put into the rate base. Commissions cannot find that it was imprudent to meet SDWA standards. Among other things, that would invite federal preemption. They can, however, find that there were more efficient, lower cost means of meeting standards that were known at the time of the investment decision and should have been considered.

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[9] Robert E. Burns, et al., The Prudent Investment Test in the 1980s (Columbus, Ohio: The National Regulatory Research Institute, 1985), iii.

Finally, commissions are usually required by their state statutes to assure that rates are just and reasonable. In order to protect ratepayers from rate shock, commissions may choose to phase in higher rates over a period of years.

Commission and Primacy Agency Cooperation

More than once in this report we have emphasized the importance of commissions working closely with state health or environmental agencies designated as primacy agencies under the SDWA to decide on SDWA exemptions. The decentralized nature of risk management inherent in the exemption process means an optimal result is likely to occur only when there is such cooperation.[10]

It is possible for a water utility to request from the state primacy agency either an exemption from SDWA standards or approval of expensive new treatment with neither the utility nor the agency ever consulting the commission. If an exemption is granted without commission consultation, the primacy agency has deprived itself of the use of commission expertise in the financial aspects of the water utility business. Perhaps the commission could have provided an idea for an avenue for financing that would have made the exemption unnecessary. Furthermore, there may be cases where lending institutions refuse to provide financing to a water company because they are not certain that the regulatory commission will approve higher rates sufficient to cover the interest and capitalization of the loan. Lack of financing thus becomes an argument the company can make to the primacy agency in requesting an exemption, when it may be that the commission would have granted the higher rates.

If the primacy agency approves new treatment without consulting the commission, the commission is likely to be presented later in a rate case with a company request to allow SDWA improvements in the rate base, add to operating expenses for the new treatment, and, thus, to raise rates to cover

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[10] David Berry and J. Andrew Stoeckle, "Decentralized Risk Management: The Case of Drinking Water," Journal of Environmental Management, 22, 1986, 373-388.

the additional costs. The commission in such a situation can look for "gold plating" of rate base that should be disallowed and consider ways to phase in higher rates called for by that investment which it finds prudent. But such a commission has lost leverage in mitigating the impact of the SDWA on its jurisdictional utilities. Further, it risks being the government entity that has to explain to customers, long after there was a chance to change the type or extent of treatment installed, that their rates are going up.

Many commissions are probably loath to engage in a preapproval process or its equivalent. Such processes are not traditional in most states. And, practically speaking, many commissions may lack the staff to review SDWA construction proposals at the stage where an exemption might be considered by the primacy agency. Commission participation in the exemption process as a cooperative effort with the state primacy agency would, however, be advantageous to all parties. For the regulated utilities it would reduce uncertainty about the actions of the commission. For primacy agencies it would add to the likelihood of making a correct decision on the granting of an exemption. For water utility customers it would ensure early consideration of cost-effectiveness and, thus, additional assurance that SDWA standards will be met efficiently. For the commissions, it would smooth the path to public acceptance and aid in fulfilling their responsibility to assure that rates remain as affordable as possible.

At least one formal cooperative effort by a primacy agency and commission has already been implemented. The California PUC and California Department of Health Services have developed a memorandum of understanding that can serve as a model for other commissions and primacy agencies in their implementation of all SDWA requirements, including exemptions under section 1416. The California memorandum is reproduced in appendix C.

The major contribution of the California memorandum of understanding is identification of the separate responsibilities of the Commission and the primacy agency. The Department of Health Services is responsible for (1) evaluation of public water systems to identify health deficiencies and the status of compliance with the SDWA, (2) identification of alternative cost-effective corrective actions and its own recommended action, (3) review and approval of plans and specifications for water quality improvements, (4) inspection of water quality improvement projects during and after

construction, (5) sharing project status reports with the PUC, and (6) participating in appropriate PUC public meetings and evidentiary hearings.

For its part, the PUC is responsible for (1) determining the type of rate relief needed to finance water quality improvement projects, (2) arranging public meetings and evidentiary hearings, (3) informing the Department of Health Services of meetings and hearings where water quality problems will be discussed so that the Department can prepare and participate, and (4) providing analysis of the financial impacts, if any, of water system improvement projects on both customers and water companies.

The Commission and Department are to designate project managers from each agency to coordinate their responses to individual system water quality problems for which an improvement project is necessary. The chiefs of the appropriate divisions in each agency are to meet at least twice a year to review progress towards improving water quality in the state and resolve issues raised by their staffs.

Conclusion

Much of what has been discussed here in EPA's approach represents a tension between attempting to design a national solution, nationally enforceable, and the reality that local situations will largely dictate who gets exemptions and who must immediately comply with SDWA standards. The SDWA Amendments must be uniformly applied, yet must allow for local differences. There is no easy way out of this conflict. It is inherent to public administration. EPA seems to be aware that it cannot create an all-purpose affordability criterion. Public utility commissions can play a pivotal role in determining affordability for jurisdictional water utilities.

Commissions worry that they will end up taking the blame from consumers for raising rates unacceptably to pay for SDWA improvements. If it is to run smoothly, the process of determining affordability must ultimately be a cooperative effort among the commissions, state primacy agencies, consumer groups, and the regulated utilities to determine the best choice among alternative implementation approaches. This is a process of education of the public and of the formal parties, including the commissions themselves, that can result in feasible, acceptable policy decisions.

CHAPTER 8
SUMMARY AND COMMENTARY

Surface water treatment rules and standards for affordability are two important areas of implementation of the SDWA for state regulatory commissions and their jurisdictional water utilities. The NRRI survey of the state regulatory commissions conducted in the fall of 1987 found that few commission-regulated water utilities are likely to have to install brand new filtration plants, but those that do will probably have costs higher than predicted by EPA. Many more commission-regulated utilities may be affected by the new turbidity requirements. These costs could be a "sleeper" in the new regulations. The survey also found that EPA, in trying to generalize nationally about water use, water bills, and what customers are willing to pay for water, is making assumptions that often do not fit local situations. In all these areas, local considerations need to be built into whatever procedures and policies are used to effect the goal of obtaining high quality drinking water.

Surface Water Treatment

The major cost of the new EPA regulations will be for new filtration systems, although paying for changes in disinfection requirements may also impose substantial costs on some larger systems. The NRRI survey found that only 121 regulated systems using surface water (51 of them in Pennsylvania) are not currently filtering their drinking water. Although there may be others in the five states that did not participate in the survey, the responses suggest that this particular EPA regulation will not result in widespread increases in water bills for jurisdictional water utilities. Not all of the 121 systems are likely to end up having to install filtration either. Some will be able to shift to ground water sources, a process that has already been occurring in some states, such as Connecticut. Others will be able to receive exceptions to the surface water treatment criteria on the

basis of the existing purity of the water, if they can meet strict requirements, especially for watershed control. Gaining an exception can also be expensive, but considerably less so than the alternative of installing filtration. Still other systems are likely to qualify for exemptions on the basis of economic hardship.

The picture is less clear when new turbidity requirements are considered, particularly since revisions to the proposed regulations which took place after the survey allow more flexibility in state implementation. From the survey it did not appear that commission staff, overall, are very certain of the impact of the new .5 NTU standard. The figures that do exist look good: Of the 152 systems for which the staff reported data, only six were out of compliance with the existing standard and 70 (nearly half) were already meeting the .5 NTU standard. But staff at only 14 commissions were able to report such data. Staff members in eight states predicted that surface water systems could meet the new standard, but seven said they could not. Staff members from 18 commissions did not know whether regulated surface water utilities in their states could meet the standard or did not respond to this question. From the case studies that were reported, it appears that where a utility does have to upgrade filtration, the costs could be substantial and above EPA estimates, depending on the impact of inflation and other variables.

Water Consumption and Water Bills

Both residential consumption of water and water bills are subject to much more variation than EPA estimates that are being used to judge the impact of new regulations. Average annual water usage reportedly ranges from 40,000 to 240,000 gallons a year, where the EPA suggests assuming 146,000 gallons a year. Similarly, EPA estimates current water bills for small utilities at $100 to $150 a year. Yet the ranges in annual residential water bills reported by commission staff were much greater than $50. The average low end of the ranges was $111 and the average high end, $406. Thus, although we do not have data for the number of water utilities at particular billing levels, it appears that there are some commission-regulated water utilities that are charging less than the EPA average and many that are charging much more. It could be hypothesized that some of the

difference may be attributable to higher charges by private water companies than public systems, but there were not enough data to test this assumption from the survey.

Survey Results on Affordability

Commission staff members participating in the NRRI survey disagreed with (1) the dollar amount of water bills implied by the EPA's informal proposal on affordability current at the time of the survey, (2) the criteria on which the possible standard was based, and (3) the logic offered by EPA in justifying the standard. EPA's proposal would have allowed water bills up to $550 on average nationally. Commission staff, on average, would allow total bills that are about half of that amount.

Many of the staff respondents would not support increases above the high end of bills already being paid by residential water users in their states, suggesting that commissions are likely to scrutinize the costs of SDWA improvements very critically. Many commission staff members participating in the survey predicted severe consequences for ratepayers, regulated companies, and the commissions from increases as high as the EPA was suggesting would be acceptable. They warned of an uproar from customers and economic hardship, particularly for low income ratepayers. A few respondents envisioned company failures, decreased returns, and limitations on capital improvements not mandated by EPA, as well as difficulty for many small companies in obtaining financing. For the commissions themselves, staff predicted more rate cases and more customer complaints. Given these possible consequences, it is not surprising that the commissions would be hesitant to approve substantial increases in water rates without the soundest justification.

While EPA was suggesting that median income might be an equitable measure of the affordability of new treatment under the SDWA, commission staff overwhelmingly would tie any increases and ultimate water bills to existing local bills. The cost of water differs in humid and dry areas of the country, it was pointed out. There are other factors that affect the cost of supplying water service. To tie water rate increases strictly to median income would result in the peculiar situation of leaving some service areas with tremendous leeway to raise bills to pay for SDWA improvements,

while others would in effect be saddled with an affordability cap that allowed little improvement.

The commission staff suggested a variety of ways of deviating from existing bills. Percentage increases from existing average bills or existing maximums were suggested most often. None of the suggestions is inherently more justifiable than the others. What they have in common is a perception on the part of the respondent of what would be saleable in his or her state. The importance of public acceptability of increased rates is something that commissioners and commission staff are very familiar with. One might well assert that customers do not compare one type of utility bill with others in deciding what they are willing to pay and certainly do not consider the proportion of their median income that is going to various goods and services. The staff proposals on affordability assume that customers react to changed prices primarily by what they are used to paying. Thus the deviation between what customers have been paying for water and what they are being asked to pay becomes the primary consideration in setting new rates.

As pointed out by some of the survey respondents, customers are often willing to pay substantially more for water if they believe they are getting value for their money. Hence, it becomes important to involve customers early in the decision-making process to consider water treatment improvements. In fact, state primacy agencies, public utility commissions, companies, and customers should all be involved early and actively in this process.

Although the emphasis in commission staff responses on affordability was on the importance of the existing level of personal expenditures for water, several other factors were noted. General income levels were not considered appropriate for deciding what increases in water bills could be absorbed by customers, but several respondents mentioned that the low end of the income spectrum should be looked at. An affordability standard that attempted to take into account low income customers might use the weighted average of Social Security payments plus Aid to Dependent Children payments and other similar payments for an area and add on a percentage increase based on that figure. Or the proportion of customers on fixed incomes might be taken into account once median income is computed and the percentage increase that would be acceptable adjusted downward if such a proportion was

exceptionally high. Similarly, to better measure local economic health, an affordability criterion might take into account the local percentage of unemployment as it differs from the national one and forecasted economic growth for the area to be affected by improved water treatment.

Whether or not existing utility service and management were adequate was considered an important factor in allowing rate increases by a couple of commissions. Commissions may be loath to grant rate increases to water utilities that already have a poor track record and insist on other improvements as conditions for allowing rate increases to finance SDWA requirements.

The local price of drilling an individual well was suggested as another factor to consider in developing a standard of affordability. Utilities serving fewer than 25 people or having fewer than 15 service connections are not regulated under the SDWA. Customers who conclude that increased water bills are simply too much to bear thus have the option of escaping SDWA jurisdiction by developing their own source of water. One staff member from a western state mentioned just such an occurrence recently as a result of increased rates. A customer there is now using rain water as his source of supply. To have customers move off the system may not be a desirable result of SDWA costs either from the point of view of public health or economic efficiency. Thus, for small systems, the EPA might wish to consider the likelihood that ratepayers would vote with their feet if rates went too high and substitute totally unregulated supplies for ones where there might be assurance of meeting water quality requirements at least in part.

Considerations on Affordability

Commission staff articulated a number of important issues on affordability in the NRRI survey. Some additional considerations on affordability that were not touched on in the survey include the distinction between willingness to pay and ability to pay for improved water treatment under the SDWA, the relationship of costs and benefits to meeting SDWA standards, affordability for regulated companies as well as their customers, and the relationship of the actions of state primacy agencies to those of the commissions.

It is possible to confuse people's willingness to pay, one connotation of "affordability," with their ability to pay. Willingness to pay has to do with people's preferences for purchasing goods or services at particular prices. It may be most influenced by what consumers are already paying for those goods or services. Ability to pay, on the other hand, has to do with the budget that consumers have to make choices of purchases. Existing water bills are more a baseline for customers' willingness to pay more for water than their ability to do so, a distinction which should be taken into account in formulating a policy on affordability.

Economics and common sense dictate that spending for a social program should equate benefits with costs. Although the SDWA to some extent calls for a presumption that benefits of meeting standards will equal or exceed costs, decisions on exemptions clearly call for at least a qualitative assessment of costs versus benefits.

One affordability problem not taken into account in the SDWA is the distinction between ability to pay for regulated utilities and their customers. Financing for improved water treatment ultimately depends on the ability to pass on higher costs to customers. But there are many small private water companies that are not providing good water service now and are unlikely to be able to secure loans to meet SDWA requirements. To bring such companies into compliance with the SDWA is likely to require expansion and diffusion of what few funding mechanisms exist for them and perhaps some innovative regulatory approaches.

One such novel regulatory approach for many commissions would be a preapproval process or otherwise formalized process of cooperation with the state agency responsible for implementing the SDWA in reviewing SDWA projects. Such cooperation is highly useful to smooth the process of making decisions on meeting SDWA standards for commission-regulated companies and assure that rates are kept as affordable as possible.

Looking to the Future

Most of the local impact of the SDWA amendments is several years away. Only the standards on volatile organic chemicals are final. The criteria for surface water treatment have been delayed. Publication of proposed regulations for synthetic organic chemicals and inorganic chemicals is

expected shortly, making it impossible to meet the statutory deadline of June 1988 for establishing final MCLs on these contaminants. Proposed rules on radionuclides are expected in the summer of 1988.

For the commissions, however, it is not too early to prepare to meet the challenges of the SDWA amendments. It is hoped that the extensive information provided in this report on surface water treatment and affordability will help commissions to fashion a proactive stance in meeting their responsibilities for SDWA implementation.

APPENDIX A

This appendix is the NRRI survey instrument mailed in September 1987 to staff members at the 45 commissions that regulate water utilities.

September 1987

NARUC WATER COMMITTEE/NRRI SURVEY OF THE IMPACT OF U.S. EPA SURFACE WATER TREATMENT RULES

The NARUC Water Committee and the NARUC Staff Subcommittee on Water are developing comments on surface water treatment rules. The U.S. Environmental Protection Agency (EPA) is preparing the rules under the 1986 Amendments to the Safe Drinking Water Act (SDWA). In order to have realistic data on which to base comments, the Water Committee, with the help of the NRRI, has developed this survey. The survey is intended, insofar as possible, to help predict the impact of the new rules on water utilities regulated by the commissions and to elicit commission reaction to proposed EPA criteria for deciding when a water system can afford to upgrade treatment to meet EPA requirements.

We realize that comprehensive data may not exist on the costs of the proposed rules for every state.

You may want to consult with staff of the agency in your state that is responsible for enforcement of the SDWA to answer some of the questions in this survey. But please do not send the survey to another agency to answer; just answer those questions that you can.

If you know of particular cases where the impact of the SDWA surface water treatment rules can be quantified, please include information on them. We can use these cases to provide specific examples of the impact of the proposed surface water treatment rules on water utilities subject to commission jurisdiction.

Please return the completed survey by October 19 to **Dr. Vivian Witkind Davis, Senior Research Associate, 1080 Carmack Road, Columbus, Ohio, 43210.** We need your help to successfully represent NARUC's view on changes in surface water treatment requirements.

Name _____

Title _____

Commission _____

Phone _____

SECTION 1: NUMBER OF WATER UTILITIES USING SURFACE WATER

1. How many water utility systems under the jurisdiction of your commission use surface water sources?

Number of Water Utility Systems Using Surface Water
(classified by number of people served)*

25-100**	101-500	501-3300	3301-10,000	10,000+

SECTION 2: FILTRATION

The U.S. EPA will be setting criteria that will require many water utilities using surface water sources that do not currently filter their water to begin doing so.

2. Of the water utility systems under your commission's jurisdiction that use surface water, what is the current status of their use of filtration?

Status of Filtration of Surface Water	Number of Water Utility Systems Using Surface Water (classified by number of people served)				
	25-100	101-500	501-3300	3301-10,000	10,000+
Filter					
Do not filter					
Don't know					

---

* If you only have data on annual revenues rather than number of people, estimate the number of utilities in each category by assuming a population of 100 implies revenues of $5,000 per year; 500 people, $23,000 per year; 3,300 people, $150,000 per year; and 10,000 people, $455,000 per year. This assumes residential consumption of 100,000 gallons per year and a cost of water of $1.50 per 1,000 gallons, or an annual residential water bill of $150 per year per hookup, with an average of 3.3 people per residence. If you use a different way than this of estimating people from annual revenues, please explain your method in an attachment.

** Under the SDWA, water utilities serving less than 25 people are not regulated.

3. Please provide a few examples of water utilities under commission jurisdiction that have recently installed new filtration or are likely to install new filtration in the near future. Attach documentation as appropriate.

	Water utility name	Number of people served	Current cost of treatment per 1,000 gallons	Current annual water bill per residential connection	Estimated cost of new filtration per 1,000 gallons
(a)					
(b)					
(c)					

SECTION 3: TURBIDITY

The EPA is proposing lowering allowable turbidity levels from the current 1.0 NTU to .5 NTU 95 percent of the time for systems using conventional treatment or direct filtration. Under the proposal, turbidity measurements must be made every four hours that the system is in operation and no more than five percent of the measurements in one month can exceed .5 NTU.

4. Of the water utility systems under your commission's jurisdiction that use surface water, what performance levels of turbidity control are currently being achieved?

Status of Turbidity Levels	Number of Water Utility Systems Using Surface Water (classified by number of people served)				
	25-100	101-500	501-3300	3301-10,000	10,000+
Greater than 1.0 NTU					
≤ 1.0 NTU and > .5 NTU					
.5 NTU or less					
Don't know					

5. Please provide a few examples of water utilities under commission jurisdiction that have recently upgraded treatment for turbidity control or are likely to have to upgrade treatment to meet the proposed standard for turbidity control of .5 NTU. Attach documentation as appropriate.

	Water utility name	Number of people served	Current cost of treatment per 1,000 gallons	Current annual water bill per residential connection	Estimated cost of upgraded turbidity control per 1,000 gallons
(a)	_____	_____	_____	_____	_____
(b)	_____	_____	_____	_____	_____
(c)	_____	_____	_____	_____	_____

6. In your judgment, would water utilities in your commission's jurisdiction that use surface water be able to meet the proposed requirement of .5 NTU 95 percent of the time?

Yes _____ No _____ Don't know _____

Why? _____

_____

_____

SECTION 4: RESIDENTIAL CONSUMPTION OF WATER

U.S. EPA uses 100,000 gallons as the average annual residential consumption of water in the United States.

7. Please provide an estimate of average annual residential consumption of water in your state.

_____ gallons per year per residence

8. What is the basis for your estimate in question 7?

Basis of estimate: _____

_____

SECTION 5: WATER RATES

U.S. EPA estimates that current annual water bills for residential customers of small water utilities (less than 3,300 people served or less than 1,000 connections) are $100-$150 nationally.

9. In your judgment is the U.S. EPA estimate of annual water bills correct for the average small water utility under your commission's jurisdiction using either surface water or groundwater?

   Yes _____ No _____ Don't Know _____

10. What is the range of annual water bills for small water systems under your commission's jurisdiction using either surface or groundwater?

    Range from $_____ to $_____ annually per residence

11. If the U.S. EPA estimate of current average annual water bills is not in your judgment correct, what is a better estimate of costs to residential users served by small (less than 3,300 people served) systems?

    $_____ per year for a residential customer of a privately owned system under commission jurisdiction

    $_____ per year for a residential customer of a publicly owned system under commission jurisdiction (if applicable)

12. If you answered question 11, what is the source of your estimate?

    Source of estimate: _____

    _____

    _____

SECTION 6: AFFORDABILITY***

Attached to this survey is the U.S. EPA proposal on additional treatment costs that EPA would consider affordable to customers of water utilities affected by the surface water treatment requirements and other requirements of the SDWA. The EPA is proposing that the total water bill for consumers not exceed two percent of the median national family income, or approximately $550 per year, and that the increase in a family's water bill associated with a new EPA regulation not exceed one percent of the median national family income, or approximately $275 per year.

13. For your commission and your state, what do you think would be an affordable total annual water bill?

$_____

Why? _____

_____

_____

14. For your commission and your state, what do you think would be an affordable increase in the annual family bill for drinking water to meet SDWA requirements in a given year?

$ _____

Why? _____

_____

_____

15. What comments do you have on the rationale of the proposed standard of affordability? (See the attached EPA proposal for EPA's justification of the proposed standard.)

_____

_____

_____

_____

*** If the space provided here to comment on affordability is insufficient, please attach additional comments as necessary.

16. What comments do you have on the impact of the proposed standard of affordability?

Impact on consumers: _____

_____

Impact on jurisdictional water utilities: _____

_____

Impact on the commission: _____

_____

17. If you can suggest an alternative standard of affordability to the one EPA is proposing, please describe it here:

_____

_____

_____

_____

18. What is the rationale for your proposed alternative to EPA's standard of affordability?

_____

_____

_____

_____

SECTION 7: CONTACTS

19. Who at your agency should receive from the U.S. EPA mailings in connection with proposing and promulgating regulations under the SDWA?

You? Yes _____ No _____

If not you, who?

Name _____

Title _____

Phone _____

20. Who at your commission should we contact for further information on implementation of the SDWA?

You? Yes _____ No _____

If not you, who?

Name _____

Title _____

Phone _____

21. Who should we contact for further information at the agency in your state responsible for enforcing the SDWA?

Name: _____

Title: _____

Name of Agency: _____

Phone: _____

22. Check here if you would like to have a complete copy of EPA's proposed regulation on surface water treatment: _____

If you have any questions on this survey, please call Dr. Vivian Witkind Davis at (614) 292-9404.

Thank you for your help.

U.S. ENVIRONMENTAL PROTECTION AGENCY PROPOSED CRITERIA ON AFFORDABILITY

(Extracted from U.S. EPA, Proposed Rules on Filtration and Disinfection, Draft, May 22, 1987, pp. 50-52)

"The passage of the 1986 Amendments mandated a significant increase in the number of contaminants to be regulated with a potential increase in cost to be borne by individual water supplies in meeting the additional standards. For this reason, EPA decided to carefully evaluate the issues relating to at what point the installation of an additional treatment would be unaffordable by the consumer.

"Since 1950, water and sewage combined has taken approximately one-half of one percent of national median family income. Costs for electric (2.7%), natural gas (2.3%), and telephone (1.9%) are significantly higher than water and sewage in 1984. These utilities consume a significantly higher percentage of national median family income than does drinking water.

"Consumers have paid up to $500 per year to purchase bottled water or to install point of use devices in addition to their regular water bills. The addition of $500 to purchase bottled water or the installation of point-of-use devices results in drinking water costs of approximately 2% of the 1984 national median family income of $26,433. Factoring in the cost of obtaining drinking water from a public water supply increases the total cost borne by those consumers who elect to purchase bottled water and/or install point-of-use devices.

"The Arizona Public Utility Commission has indicated that in the worst case, consumers should not pay more than $1,000 per year for drinking water. At that rate, consumers would pay approximately 4% of the 1984 national median family income.

"Based upon EPA's 1980 Survey of Financial and Operating Characteristics, consumers in 0.8% of community public water supplies are paying in excess of $550 annually.

"The 2% rate that some consumers have actually paid, and the 4% rate that at least one public utility commission indicates is the limit on what consumers can afford to pay, establish the boundaries of consideration.

"Using those boundaries, EPA has decided that the total water bill should not exceed the 2% rate that some consumers are willing to pay to

obtain drinking water. That is, the total drinking water bill should not exceed 2% of national median family income.

"The maximum on what consumers should pay for drinking water does not factor in the increase in drinking water costs associated with the imposition of a new regulation. EPA believes that a new regulation should not increase the drinking water bill more than half of the maximum. That is, the increase in the drinking water bill should not exceed 1% of national median family income.

"Those two percentages will be used for regulatory setting purposes to determine which treatment techniques are BAT in various size classes of water supplies.

"Nationally, the application of these percentages based upon the 1984 national median family income of $26,433 indicates that the increase in water bill associated with a regulation should not exceed $275 (approximately 1% of national median family income) and the total water bill should not exceed $550 (approximately 2% of the national median family income).

"EPA suggests that primacy agents should use the 1% and 2% as guidelines as they evaluate individual requests for exemptions based upon economic considerations. Primacy agents may wish to apply the guidelines to median family incomes of the community that the water supply serves.

"As additional regulations are proposed, EPA will consider the cumulative impact of the regulations."

obtain drinking water. That is, the total drinking water bill should not exceed 2% of national median family income.

"The maximum amount consumers should pay for drinking water does not factor in the increase in drinking water costs associated with the imposition of new regulations. EPA believes that a new regulation should not increase the drinking water bill more than half of the maximum. That is, the increase in the drinking water bill should not exceed 1% of national median family income.

"Those two percentages will be used for regulatory setting purposes to determine which treatment techniques are the best available treatment (BAT) in various sizes and classes of water supplies.

"Nationally, the application of these percentages based upon the 1984 national median family income of $26,433 indicates that the increase in water bill associated with a regulation should not exceed $275 (approximately 1% of national median family income) and the total water bill should not exceed $550 (approximately 2% of the national median family income).

"EPA suggests that the lead state agencies-primacy agents should use the 1% and 2% as guidelines as they evaluate individual requests for exemptions based upon economic considerations. Primacy agents may wish to apply the guidelines to median family incomes of the community that the water supply serves.

"As additional regulations are proposed, EPA will consider the cumulative impact of the regulations."

APPENDIX B

This appendix contains comments of staff of the Tennessee Public Service Commission on affordability. The question was "What comments do you have on the rationale of the proposed standard on affordability?"

ATTACHMENT

QUESTION 15

The Tennessee Public Service Commission believes that the Environmental Protection Agency's (EPA) approach described is wrong.

First, it assumes that people allocate their money in relationship to that which is most necessary. If that be the case, perhaps we should compare the cost of water to the cost of housing or food as opposed to other utilities. After all, what purchase is more important than the water we drink?

Second, if everyone could afford water purification devices or bottled water, we are sure most people would buy them. The point is that these options are perceived as too expensive for most people.

Third, a "what people can afford" approach does not take into account the cost. Logically, we should be asking ourselves what levels of water purification can be purchased at what prices. Cost economy should be emphasized.

In the real world, people are simply not willing to pay greatly increased prices even for pure water. We have seen people urge the Commission to permit the operation of a water company which provided admittedly impure water even though they knew the water was relatively unsafe.

These people did not want the purer water from a nearby system because they would have to pay the cost of tap fees and higher rates per month. If the cost of providing water

that meets a certain standard is too great, people will often get their water from clearly substandard sources. This is particularly true of people living in rural or urban fringe areas where it is often difficult to get water companies to extend service.

Many rural areas of Tennessee are depressed economically. Unemployment is high. These people simply cannot afford to spend as much for water as they do for telephone service and electricity. About 10% of Tennessee's households do not have telephone service. We believe that proportion holds true for the nation as a whole, while more and more telephone service is perceived as a necessity.

In our opinion, the most logical approach is to make some assessment of the cost of upgrading a water system from the current standard to the new standard proposed. Take into account the additional expenditures which must be incurred to meet the standards for a typical company. Take into account the increased cost per month to keep the company in compliance. Then make some assessment of the cost per customer.

Do not ignore the variables. Costs differ in the various regions of the nation. Costs will be greater per customer for small companies. These differences should be addressed.

EPA might want to consider raising standards in phases. Set target dates for increasingly strict standards until the desired standard is in place.

It would be of interest how many water companies currently meet the standards EPA proposes at the current time. That fact should indicate the magnitude of the problem. Perhaps problems exist concerning only a small proportion of the companies serving a small percentage of the population. On the other hand perhaps the problem is great in that a substantial number of water companies do not now comply with higher standards. In this event, the phased-in approach would be more logical.

In Tennessee we regulate one large water utility using surface water in Chattanooga. It already exceeds the .5 NTU 95% of the time. Therefore no additional costs would be incurred to meet the standard. The Commission has no jurisdiction over municipal water systems or utility districts which supply the vast amounts of water to our citizens. A quick telephone check with the municipal systems in Nashville and Knoxville indicate that both are exceeding the .5 NTU 95% of the time presently. The Memphis system has an underground water source.

Under normal circumstances the Commission sets water rates based upon cost of service plus a fair return to the investors. EPA seems to want to establish a price of $550 per year for drinking water and see how much purification that would buy. EPA's estimate of typical annual water bills of $100 to $150 is correct. The $550 price would quadruple the price based upon a flimsy comparison of 2% to 3% of annual income for each of the other utilities of

gas, electricity, and telephone service and the fact .8% of community water systems charge in excess of $550 per year and that some consumers pay up to $500 per year for bottled water. We find these to be rather weak justification for the proposed changes. It was pointed out that the Arizona Commission had indicated that in a worst case situation that consumers should not pay more than $1,000 per year (4% of the national medium income) for drinking water. One might try to use that as an upper limit. We would remind the EPA of regional differences and the fact that Arizona is a desert state. Its higher utility costs for water can be offset by lower winter fuel bills. In other parts of the nation, summer air conditioning is not needed.

In Summary, the approach is wrong. One should determine the cost to produce various levels of water purity and then determine how it can be phased in overtime, if extreme. As the settling and filtering of turbidity out of raw water usually takes place at a single location one wonders how to allocate new improved filtration equipment. Industries that would not need the level of purity might still have to bear allocated costs of better filtration equipment. A 10% rate hike request in Chattanooga customarily brings a storm of protest and intervention by industries. Doubling or quadrupling charges could force some off the system or out of business.

APPENDIX C

This appendix is the memorandum of understanding between the California Department of Health Services and the California Public Utilities Commission entitled On Maintaining Safe and Reliable Water Supplies for Regulated Water Companies in California.

MEMORANDUM OF UNDERSTANDING

DEPARTMENT OF HEALTH SERVICES
and
PUBLIC UTILITIES COMMISSION

ON MAINTAINING SAFE AND RELIABLE WATER SUPPLIES
FOR REGULATED WATER COMPANIES IN CALIFORNIA

The Department of Health Services (DHS) and the Public Utilities Commission (PUC) recognize that it is their joint goal to ensure that California water companies regulated by PUC are economically maintaining safe and reliable water supplies. This Memorandum of Understanding (MOU) sets forth those policies and procedures to which DHS and PUC commit themselves towards achievement of that goal.

OBJECTIVES

The common objectives of the program, as they relate to public water systems subject to regulation by PUC and DHS, are as follows:

1. To monitor the systems to assure that safe and reliable water supplies are being maintained in accordance with applicable drinking water standards.

2. To identify contaminants and determine system improvements, including alternatives, necessary to provide safe and reliable water supplies.

3. To assure that system improvement projects, necessary to upgrade supplies to meet standards, are selected on the basis of priority and only after reasonable alternatives have been defined and and cost-effective analyses performed to arrive at a cost-effective solution.

4. To establish mutually agreed upon priorities for necessary system improvements.

PRINCIPLES OF AGREEMENT

For the purpose of this agreement, DHS and PUC agree that their staffs shall abide by the following principles:

1. To the extent its resources permit, DHS shall be responsible for evaluating and determining all technical aspects of monitoring water quality and identifying contaminants, and for identifying the various potential improvements necessary to provide safe and reliable water supplies. DHS will also recommend its preferred solution. PUC shall be responsible for evaluating fire flow requirements and for making recommendations on the financial and rate making aspects associated with implementing the improvements identified by DHS to provide safe and reliable water supplies.

2. The staffs of the two agencies shall endeavor to keep each other fully informed of their respective activities and to assist each agency in carrying out its responsibilities.

3. Both agencies shall exchange all information available regarding water companies that are experiencing water quality and/or water availability problems. The information about the problems should include, but is not limited to:

   a. All communications with utilities;
   b. Orders;
   c. Decisions;
   d. Regulations and Policies;
   e. Proposed new water systems;
   f. Permits; and
   g. Reports, investigations, etc.

4. The PUC will notify DHS of all requests for rate increases from public water systems and shall routinely provide DHS with schedules of hearings. DHS will provide technical input to PUC as necessary and appropriate in PUC proceedings. This may include testimony before the PUC.

5. Identified system improvements necessary to provide safe and reliable water supplies should consider:

   a. Protection of public health;
   b. Short and long term benefits;

c. Cost effectiveness;

d. Cost to customers; and

e. Ability of customers to pay.

6. Each agency shall endeavor to provide appropriate assistance in necessary enforcement actions taken against individual water systems.

AGENCY RESPONSIBILITIES

The intent of this MOU is to identify the separate and distinct responsibilities of DHS and PUC. The following represents a general description of the roles and responsibilities of each of the respective agencies relating to water companies under PUC jurisdiction. Each agency agrees to adopt and implement policies and procedures necessary to administer its respective duties. These policies and procedures shall be coordinated between the agencies.

1. DHS shall be responsible for the following:

a. Evaluation of public water systems to identify public health deficiencies and determine compliance with the Safe Drinking Water Act.

b. Identification of alternative cost effective corrective actions necessary to upgrade water supplies to meet standards, and recommendation of its preferred solution.

c. Review and approval of plans and specifications and issuance of domestic water supply permits for improvements.

d. Inspection of water quality improvement projects both during and after construction, and sharing project status reports with PUC.

e. Participation at appropriate PUC public meetings with customers and/or evidentiary hearings where water quality matters raised by DHS or any other person are to be discussed.

2. PUC shall be responsible for the following:

a. Determination of the type of rate relief needed to finance necessary system improvement projects for other than Safe Drinking Water Bond Act loan projects, which by existing policy are required to be paid off by a surcharge on customer bills.

b. Arrange public meetings with customers and/or evidentiary hearings to ensure that customers are made aware of the need for system improvement projects and the impacts the projects will have on rates.

c. Promptly inform DHS of PUC public meetings with customers and/or evidentiary hearings where water quality problems will be discussed so that DHS may prepare and participate.

d. Provide analyses of the financial impacts, if any, of

system improvement projects on both customers and water companies.

PROJECT COORDINATION

1. DHS and PUC will designate project managers for their respective agencies when water quality and/or water availability problems exist and an improvement project is necessary. The project managers will be the principal contact persons for their agencies on a particular project.

2. Whenever a potential conflict regarding a specific project is identified, each agency will examine the alternative solutions available for upgrading water supplies and then meet to thoroughly discuss the issues involved and attempt to come to an agreement before announcing a position. If an agreement can not be reached after consultation between the Chief of the Sanitary Engineering Branch of DHS and the Chief of the Water Utilities Branch of PUC, DHS and PUC staff may advocate separate positions. Notwithstanding such disagreements, this MOU shall remain in effect.

3. There should be a complete exchange of information between DHS and PUC through the project managers. Each agency will set forth where and to whom material shall be sent. Copies of all correspondence between an agency and other parties concerning a water system improvement project shall be sent to the project manager of each agency until project completion.

4. The Chief of the Sanitary Engineering Branch of DHS and the Chief of the Water Utilities Branch of PUC, with designated members of their staff, shall meet as necessary but at least semi-annually to review progress of the water quality improvement effort in California and resolve any issues which have been identified by staff.

AMENDMENTS

This MOU may be amended by mutual agreement of DHS and PUC. It shall remain in effect until DHS and/or PUC decide otherwise.

Approved:

Director
Department of Health Services

Date: February 9, 1987

Approved:

Executive Director
Public Utilities Commission

Date: December 9, 1986

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