REPORT OF THE
DEPARTMENT OF HEALTH

The Impact of the Safe Drinking Water Act Amendments of 1986 on the Commonwealth of Virginia

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

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The Impact of the Safe Drinking Water Act Amendments of 1986 on the Commonwealth of Virginia

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in cooperation with
Department of Planning and Budget
and
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Division of Consolidated Laboratory Services

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History of the Virginia Drinking Water Program

"The purity of the public water supply bears a most intimate relation to the health of the community . . . [and] . . . its vital importance to the people of Virginia cannot be too vigorously impressed." So stated Commissioner of Health, Dr. Ennion G. Williams, M.D., in his 1912 Annual Report to the Governor of Virginia. This statement from the first part of this century remains valid as we approach the next century.

In fact, Virginians have always taken the protection of our environment and drinking water supply seriously. As far back as May 24, 1610, Sir Thomas Dale, Deputy Governor for the Colony of Virginia, proclaimed that "No man, woman . . . dare to wash any unclean linnen, . . . or throw out the water or suds of fowle cloathes . . . within the Pallizadoes, or within forty foote of the same, . . . nor rench and make clean any vessel within 20 foote of the olde well . . . nor shall anyone aforesaid, within lesse than a quarter of one mile from

CASE STUDY:

Giardiasis at a Mountain Resort

During the summer of 1985, 32 persons, mostly employees or players at one of two golf courses at a popular mountain resort in Virginia were affected by an outbreak of giardiasis, a particularly severe gastro-intestinal illness caused by a protozoan, *Giardia lamblia*. An extensive epidemiological study conducted by the Virginia Department of Health revealed that the most likely source of the disease was a mountain spring that supplied water to the golf course and several nearby residences. While no *Giardia* organisms were found in the spring water itself, the spring showed signs of obvious surface water influence. An infected muskrat was trapped in a nearby stream.

Only the rapid response of the resort management by immediately shutting down the implicated spring prevented what could have been a widespread outbreak with a potentially devastating economic local impact. Public concern about drinking water quality at the resort complex could have seriously threatened the business. This resort is the largest employer in the area.

Impacts:

- 32 persons infected
- State investigation costs
- Spring source abandoned
- New source developed

the Pallizadoes, dare to doe the necessities of nature, since by these unmanly, slothfull, and loathsome immodesties, the whole fort may bee cloaked, and poisoned. . . ." (*Historical Tracts* Sec. 25, page 16, Volume III).

By the end of 1916, the General Assembly had taken action and the Board of Health had adopted Virginia's first statewide rules and regulations for the assurance of safe drinking water. Since that time the laws and regulations have been changed on numerous occasions by recodifications and amendments. As an outgrowth of this concern and action, the threat to the public health from contaminated waterworks has been greatly reduced, although not totally eliminated.

Neither Sir Thomas Dale nor even Dr. E. G. Williams could scarcely comprehend the magnitude of the improvements brought to the field of public health protection by modern technology and understanding. However, along with the great advances came new concerns. The typhoid and cholera epidemics of the past have been replaced by giardiasis (see the giardiasis case history on page 1), *Cryptosporidium*, *Legionella*, and a host of carcinogenic, mutagenic and teratogenic man-made contaminants. Furthermore, the challenge of providing safe drinking water is complicated by thousands of new man-made chemicals that may contaminate our drinking water, by the ability to measure these chemicals at trace levels often beyond our understanding of their significance, by an ever shrinking availability of source water, and by a growing demand for safe drinking water by a large population generally distrustful of both technology and government.

In 1974, the U.S. Congress, recognizing the potential magnitude of this problem, passed the first national Safe Drinking Water Act (SDWA), PL 93-523, with enforcement authority given to the U.S. Environmental Protection Agency (EPA). It was not just coincidence that many of the key definitions and provisions copied Virginia's *Public Water Supply Law* (Title 32.1, Article 2, §§ 32.1-167 ff., Code of Virginia). However, the federal law emphasized enforcement (after the violation) rather than technical assistance and cooperation (prevention). By the mid-1980s, segments of the public and Congress were expressing great concern about the EPA's administration of the Safe Drinking Water Act. In the ten years following the EPA's 1975 promulgation of national drinking water standards, only one additional contaminant had been added to the list. The 1986 Amendments to the Safe Drinking Water Act address these concerns and are the focus of this report. Renewed emphasis on enforcement and mandated standards for 83 specified contaminants highlight this landmark legislation.

Virginia's concerns for its citizenry and its desire to address its own problems and concerns has been a tradition for over 375 years. Again, Virginia finds itself at a point of critical decision making. Should Virginia continue to maintain primary enforcement responsiblity (primacy) for the SDWA? The answer this study group received to this question was a resounding "Yes!"

"Virginia must maintain primacy, not someone in Philadelphia or D.C. We need a hand-holding operation for small utility operators."

--Jesse Royall, Jr.
Sydnor Hydrodynamics
(largest small-system owner in Virginia)

"I'm convinced that Virginia must maintain primacy in order to retain the discretionary powers. When EPA runs a state program, they use no discretion."

-- Steve Koorse,
Hunton & Williams

"If we can't guarantee safe drinking water for our citizens, people are going to question what Virginia *can* do for its citizens."

-- Jack Sullivan,
American Water Works Association,
Washington, D.C.

"The small systems do not plan ahead. They operate day to day. Most of them are not aware of the SDWA amendments. We need the Health Department to mediate on our behalf with EPA."

-- Jerry Oakes,
Virginia Rural Water Association

"Virginia has traditionally had significant influence on the final content of the EPA regulations. Without primacy, you'll lose that influence."

-- Wade Miller,
Association of State Drinking Water Administrators

"EPA does not have the resources to provide technical assistance to systems. This is an important aspect of the state program that would be lost if primacy is lost."

-- Jon Capacasa,
U.S. EPA, Region III

"The bottom line for rural small system water users in the Commonwealth of Virginia is that primacy is essential to preserve public health. If Virginia loses primacy, rural moderate to low income communities will suffer most. We find this unacceptable."

-- Jason Gray,
Virginia Water Projects, Inc.

"The Association of Metropolitan Water Agencies believes that states should determine water supply policies and administer water supply programs."

-- Resolution of AMWA, 1989
(Organization of the largest water utilities in the nation)

"There are things that won't get done . . . and water will cost more if states lose primacy."

-- Brian Rourk,
U.S. EPA State Capacity Initiative

Executive Summary

The impacts of the 1986 Amendments to the Safe Drinking Water Act will be significant in Virginia. Financial impacts will be felt by state agencies, waterworks owners and consumers. The final cost of the increased oversight required by the 1986 Amendments will be borne by waterworks consumers.

This report identifies specific additional FY1990-92 biennial programmatic costs to the Health Department's Division of Water Supply Engineering and to the Division of Consolidated Laboratory Services of $6.88 million and $2.17 million, respectively. The State Corporation Commission and the Office of the Attorney General will also face other, relatively minor, programmatic costs.

In addition, waterworks owners will face an annual cost of between $51 million and $143 million for monitoring and treatment to comply with the regulations. Although these costs will be passed on to the water consumer by water utilities through higher water bills, non-utility waterworks (including a number of facilities owned by state agencies) do not obtain their revenue by selling water, and so will have to recover these costs from other sources such as taxes, assessments, General Assembly appropriations, and higher prices for goods and services.

There will be a wide range of increases in household water bills depending on the size of the water system's customer base and the nature of the treatment improvements needed for the waterworks to comply. The increase in the annual household water bills may range from $5 per year (for customers of large systems that are already in full compliance with the regulations) to $1284 per year for a household on a small system impacted by all of the existing and proposed regulations. Further increases are likely as the EPA issues more regulations in the future. The systems that face the larger costs for treatment will be identified only after monitoring begins.

A number of state agencies that own waterworks will face increased capital and operations costs to comply with the 1986 Amendments. These agencies include the Department of Corrections; the Department of Mental Health, Mental Retardation and Substance Abuse Services; the Division of Parks and Recreation; the Department of Transportation; the State Police; and the Community College system. Each agency will be required to review its operations at each waterworks to determine what improvements will be needed, if any, and what costs will be incurred. These agencies will include the costs in future budget requests to the General Assembly. Note that these costs are included in the expected annual costs to waterworks owners.

Two types of systems will be most affected by these Amendments. The first are the small systems. The treatment cost range for small systems reflects the lack of economy of scale that is available to larger systems and the limited economic base (number of customers) available to share these costs. The second type of system most affected will be that system which has multiple contaminants exceeding the standard which will require different treatment techniques for removal. The cost of treatment, in these cases, are additive.

In general, any increased costs experienced by a waterworks will be recouped through changes in water rates or changes in the price for the service or product that system provides. The cost of safe, dependable drinking water will increase. The construction cost increases may be minimized for government-owned waterworks if the Virginia Water Supply Revolving Fund (Fund) receives sufficient funds, through either direct general fund appropriations or special fees or assessments. The statute authorizing the Fund allows payback at interest rates down to zero percent; this flexibility will help minimize costs that the waterworks will incur. House Document 13 (1987) recommended that $10 million be appropriated to the Fund; presently, only an annual $100,000 is authorized.

The funds for the increased programmatic costs to state agencies must be approved by the General Assembly if Virginia is to retain primary enforcement authority (primacy). Virginia has had primacy since 1977. The funds for capital and operational improvements at state-owned waterworks must be approved, in any event, to comply with the 1986 Amendments. This study identifies, but does not recommend, possible funding sources which may be available to fund these additional costs.

Methodology

This report has been developed in response to House Joint Resolution (HJR) 335, requesting the Department of Health, with the assistance of the Division of Consolidated Laboratory Services and the Department of Planning and Budget, to study the impact of the Safe Drinking Water Act Amendments of 1986 on the Commonwealth.

The information presented in this report was gathered in several ways. Many of the cost impacts on the state had been developed through the Virginia Department of Health's six-year plan and/or through the biennium budget process. Additionally, statistics regarding waterworks were extracted from the Division of Water Supply Engineering's data base. Laboratory costs were provided by the staff of the Division of Consolidated Laboratory Services.

Much of the information relating to EPA regulations and the basis for the costs shown in Table 6 were extracted from the EPA's own estimates of the impact of the regulations as published in various editions of the *Federal Register* and in EPA publications and documents.

The information-gathering process also included presentations from individuals involved in the waterworks industry. These individuals and their affiliations, and the date of their presentation are shown below:

Mr. Wade Miller, Association of State Drinking Water Administrators, May 15, 1989
Mr. Jon Capacasa, U.S. EPA Region III, May 31, 1989
Mr. John Sullivan, American Water Works Association, May 31, 1989
Mr. Jerry Oakes, Virginia Rural Water Association, May 31, 1989
Mr. Jesse Royall, small waterworks owner/operator, June 13, 1989
Mr. Steve Koorse, Attorney, Hunton & Williams, June 13, 1989
Mr. Jason Gray, Virginia Water Project, Inc., July 19, 1989

Members of the committee represented the following state agencies and sections:

Virginia Department of Health:
- Office of Water Programs, Division of Water Supply Engineering
- Office of Finance and General Services
- Division of Sanitarian Services

Department of General Services
- Division of Consolidated Laboratory Services

Department of Planning and Budget

The HJR 335 Committee met on the following dates:

April 19, 1989
May 15, 1989
May 31, 1989
June 13, 1989
July 19, 1989

Additionally, a sub-group of this committee met on August 7-9, August 28-30 September 5, September 18, October 5, and October 30, 1989 to draft, revise and finalize the report.

Primacy in Virginia

Congress recognized the need for state governments to maintain control of their long-standing and effective, existing water supply programs, while also expanding their programs to meet the Congressionally-mandated national standards. Furthermore, Congress realized that states were in a better position to mediate and accommodate certain situations or conditions that might occur. The concept of primacy (or primary enforcement authority) is having federal standards with the application of state judgment. Virginia applied for primacy in 1976 and was awarded primacy in 1977. The Commonwealth has maintained primacy since the initial award.

Unfortunately, federal funding in support of programs administered by primacy states has not kept pace with the proliferation of federal regulations required under the 1986 Amendments to the SDWA. Virginia now finds itself in the position of having to fund an ever-increasing portion of the program which is being mandated by the Congress through the EPA. Ultimately, Virginia must ask "Why should we retain primacy?"

The primacy question involves two major fundamental issues: *money* and *control.* The money issue is significant. This report identifies the increased expenditures needed for Virginia to maintain primacy, in addition to the approximately $0.8 million of federal public water supply supervision grant presently received each year. Conversely, the loss of primacy would cause Virginia to lose the federal program grant. This would result in a lay-off of 14 professional and four clerical staff. While it appears that additional federal grant monies will be forthcoming, it is highly unlikely that these new monies will ever be sufficient to cover the costs to the states for the administration of the new federal regulations.

The budget bill passed by the 1989 General Assembly included sufficient sums for the Division of Consolidated Laboratory Services to perform all required SDWA testing free of charge for all waterworks owners in the state. Maintaining

primacy allows Virginia to provide this type of service to its waterworks owners. This benefits not only the owners, but also all consumers in that the cost for testing need not be amortized through water billings to the consumers. The loss of primacy would cause the laboratory program, which is a part of the total public water supply supervision program, to revert to the EPA. The state would likely discontinue the testing program. The waterworks owners would then have to bear the cost of the federally-mandated monitoring with a corresponding increase in water bills. The loss of primacy *would not*, in any way, lessen the waterworks owner's responsibilities and liabilities under the SDWA. In fact, the loss of primacy would *increase* the impact on the waterworks owner.

The second primacy issue -- control -- provides an example of this increased impact. Presently, because Virginia has primacy, it has been able to exercise control and discretion regarding the application of certain portions of the federal regulations to waterworks owners in Virginia. For example, the volatile organic chemical (VOC) rule promulgated by the EPA became effective in January 1989. Within these regulations is a requirement that certain unregulated contaminants be monitored by the waterworks owner. The total list of unregulated contaminants is really two sub-lists. The first sub-list contains 36 unregulated contaminants that must be monitored by all medium and large waterworks (population over 3300 persons) in the country. The second list, containing 15 additional unregulated contaminants, must be monitored only if required by the state. In Virginia, after consultation with the Waterworks Advisory Committee, the Department of Health determined that this additional monitoring is not required. This cost-saving policy made by the state primacy agency affected 121 waterworks owners in the Commonwealth. This savings is passed on to the consumer.

CASE STUDY:
EPA vs. State Primacy: The Pennsylvania Story

Pennsylvania is the only state that has had extensive experience under both EPA and State primacy. From 1976 through January of 1985, the EPA had primary enforcement responsibility for the SDWA in Pennsylvania; Pennsylvania's Department of Environmental Resources has had primacy since February 1985. As described by Program Director, Fred Marrocco, the EPA primacy program was largely a "paper-pushing" program with the goal of enforcing the requirements of the SDWA Regulations. It was a reactive, enforcement-oriented regulatory program: the regulations established standards, system owners had their water tested, and violators were prosecuted in one manner or another. On the other hand, the Pennsylvania state program plays a much broader role. This program is a preventive, technical service regulatory program with a stated goal "to protect the public health by ensuring adequate and safe water supplies...." The Pennsylvania program utilizes substantially more field staff in accomplishing their goals, and sets enforcement as a final option.

continued on next page

This is but one example of the types of decisions the primacy agency will be making in present and future regulations. To illustrate this point further, the Phase II (synthetic organic chemical) rule, which was proposed in the May 22, 1989 *Federal Register*, provides more than 100 opportunities for the state, as the primacy agency, to make independent decisions, rather than the EPA. This high level of state discretion will also continue into future regulations which are being drafted by the EPA. The EPA has realized that it is virtually impossible to write nation-wide regulations and that the state primacy agency is in the best position to make certain decisions. Each of these decisions will affect the cost of providing safe drinking water. If the EPA is the primacy agency, it would have no reason or justification for requiring anything less than the maximum. The activist groups concerned with public policy would settle for nothing less.

Virginia has long held that decisions affecting Virginians should be made by Virginians. These decisions are based on a balance of local needs and demands and state needs and demands. Allowing the EPA to make Virginia's drinking water decisions would remove local and state input into those decisions. Furthermore, because Virginia has been recognized as having a first class drinking water program, the Commonwealth has been represented in numerous meetings and on many committees where policies of national consequence are debated and adopted. Loss of primacy means loss of influence and the loss of national recognition of Virginia's drinking water program.

Presently the engineering staff within the Division of Water Supply Engineering offers a service that is difficult and costly to find elsewhere, particularly in the case of small waterworks. This important service is technical assistance to waterworks owners and operators. The staff engineers now spend a great deal of their time

Comparative EPA vs. State primacy numbers well illustrate the relative effectiveness of the two approaches. The numbers in the following table clearly indicate that the citizens of Pennsylvania have a significantly better quality of drinking water under the State primacy program.

EPA vs. State Primacy in Pennsylvania*

	EPA Primacy	PA Primacy	% change
Active Public Water Supplies	10,258	10,522	2.6
Persistent Violators	183	71	-61.2
Overall Compliance Rates			
Micro, MCL	85.8%	89.4%	4.2
Micro, monitoring	62.1%	82.6%	33.0
Turbidity, MCL	83.2%	86.0%	3.4
Turbidity, monitoring	62.3%	86.5%	38.8
TTHM, MCL	100.0%	100.0%	--
TTHM, monitoring	75.0%	89.7%	19.6

* Data from *Safe Drinking Water in Pennsylvania, Annual Compliance Report - Federal FY 1987* prepared by Division of Water Supplies, Bureau of Community Environmental Control, Department of Environmental Resources

working with waterworks operators in correcting problems, explaining water treatment principles, inspecting waterworks facilities and addressing complaints from consumers. These technical service contacts help operators comply with regulations and improve their operations, and often provide an informal approach to resolving violations of state and federal waterworks regulations. The ultimate result is greater assurance that the waterworks will provide safe drinking water to its consumers.

The loss of primacy will require curtailment of this service. In many cases, the state is the only source that many waterworks owners/operators have available to interpret and describe the new regulations which are being promulgated under the 1986 Amendments. Without the technical service contacts, many waterworks will be operating "by the seat of their pants," with a substantial increase in the risk of waterborne disease outbreaks.

Contrasted to the state approach of protecting public health by preventing violations before they take place, the EPA's stated emphasis is on enforcement against those who violate the regulations. The enforcement process was enhanced by Congress in the 1986 Amendments by the inclusion of provisions for administrative orders and increased penalties. In a report of fiscal 1988 enforcement activity, EPA Administrator William K. Reilly pointed to the 51% increase in civil penalties over the previous year, stating that "this shows that the EPA and the federal government generally are getting tougher on enforcement, which is the cornerstone of EPA's environmental programs." New records were set in fiscal 1988, both in the number of cases brought against violators and in the total fines collected; this trend is expected to continue, according to Administrator Reilly.

The Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was enacted by Congress in 1974 to protect the public from the health hazards associated with contaminated drinking water. The goal of the SDWA is to assure the provision of safe drinking water to Americans served by public water systems by combining the efforts of federal and state authorities. This is done by making sure that drinking water meets certain water quality standards through the application of appropriate construction standards and treatment techniques, and that it is tested regularly for the various types of contaminants that have been identified.

Under the SDWA, the EPA has the responsibility of establishing regulations defining safe drinking water quality for public water systems, and for assuring that all public water systems provide water that meets the definition of "safe." It was the intent of Congress that the primary enforcement mechanism under the SDWA would be through the various state and territory governments. To assume primary enforcement responsibility, or *primacy*, the state must adopt its own drinking water regulations that are at least as stringent as those established by the EPA and adopt appropriate administrative and enforcement procedures. Virginia was granted primacy in 1977.

Section 1413 of the Safe Drinking Water Act states "for purposes of this title, a state has primary enforcement responsibility for public water systems during any period for which the administrator determines . . . that such state:

"(1) Has adopted drinking water regulations which are no less stringent than the national primary drinking water regulations in effect under §§ 1412(a) and 1412(b);

"(2) Has adopted and is implementing adequate procedures for the enforcement of such state regulations, including conducting such monitoring and making such inspections as the administrator may require by regulation;

"(3) Will keep such records and make such reports with respect to its activities under paragraphs (1) and (2) as the administrator may require by regulation;

"(4) If it permits variances or exemptions, or both, from the requirements of its drinking water regulations which meet the requirements of paragraph (1), permits such variances and exemptions under conditions and in a manner which is not less stringent than the conditions under, and the manner in, which variances and exemptions may be granted under §§ 1415 and 1416; and

"(5) Has adopted and can implement an adequate plan for the provision of safe drinking water under emergency circumstances."

The EPA supports the efforts of primacy states with technical assistance and with financial assistance in the form of program grants. Although these grants do not cover the full cost of the states' drinking water public health program, they do provide a portion of the funding of this program. During Federal fiscal year 1989, Virginia received a program grant of $814,700, or 40% of the cost of its drinking water program.

Public Water Systems (Waterworks)

The SDWA is applicable only to the water provided to consumers by "public water systems," which are termed "waterworks" in Virginia. There are three major types of waterworks, based on the type of population served, regardless of whether owned by a governmental body or by a private entity such as an individual or a corporation. The regulations and sampling requirements vary for the different types of waterworks.

A *community waterworks* is one that has 15 or more service connections or that serves 25 or more year-round residents. Examples of community waterworks are municipal water utilities, subdivisions, mobile home parks, condominiums or large apartments, and institutions such as nursing homes and correction facilities with their own water supplies.

A *noncommunity waterworks* is one that serves a transient population of at least 25 people for at least 60 days per year. This category includes such establishments as campgrounds, motels and hotels, restaurants, and highway rest areas with their own water supplies.

A *nontransient noncommunity waterworks* is one that serves a fairly consistent non-residential population of at least 25 of the same people for at least 6 months per year. Although the consumers do not actually live at the facility, they are there on a daily basis, and consume a significant amount of their total water intake at the facility. Examples of nontransient noncommunity water systems include factories and schools with their own water supplies.

Drinking Water Regulations

As required by the 1974 SDWA, the EPA established *National Interim Primary Drinking Water Regulations*. The regulations set limits on bacteriological, chemical, radiological and physical contaminants in drinking water known to be important to public health, and establish sampling or monitoring schedules to determine the presence or absence of these contaminants in the water. Owners of waterworks must give notice to users of the water when the system fails to comply with the primary regulations or with a schedule of compliance established by the primacy agency. Under the 1974 Safe Drinking Water Act, the EPA issued primary drinking water regulations for 23 contaminants.

Immediately after presidential approval of the SDWA, the EPA contracted with the National Academy of Sciences to study the potential harmful effects of impurities in drinking water on public health. Working through the Committee on Safe Drinking Water of the National Research Council, the National Academy of Sciences published *Drinking Water and Health* in 1977. Developed within the constraints of the 1974 SDWA, this landmark publication ushered the field of drinking water regulation into the twentieth century. *Drinking Water and Health* set out the procedures for research projects to determine the health effects of exposure to a variety of compounds found in drinking water, including risks associated with long-term exposure to low levels of potentially carcinogenic substances. These procedures served as the scientific basis for revision and ratification of the *National Interim Primary Drinking Water Regulations*.

MCLGs, MCLs and SMCLs

The drinking water regulations establish standards or limits for many of the contaminants found in drinking water. Based on testing in accordance with *Drinking Water and Health*, scientists have established levels at which various substances may be present in drinking water with no adverse health effects on those consuming the water.

Maximum Contaminant Level Goals (MCLGs) are non-enforceable health goals. The EPA established numerical limits for each contaminant which represent the levels at which no adverse human health effects can be expected, based on extensive scientific research. MCLGs include an adequate margin of safety. EPA policy sets the MCLGs for all known and probable human carcinogens at zero.

Maximum Contaminant Levels (MCLs) are the enforceable standards for a contaminant, which the SDWA directs the EPA to set as close to the MCLG as feasible. Among the factors considered when determining the feasibility of a standard are the treatment technology, the treatment techniques, and the laboratory analysis methods that are available, while also considering the cost of complying. These costs, however, are based on the costs for large waterworks to comply; this is in accordance with the Congressional intent in adopting the SDWA.

Secondary Maximum Contaminant Levels (SMCLs) are federally nonenforceable standards which establish recommended limits for the aesthetic qualities of water such as taste, odor, color and appearance. Although these aesthetic qualities do not of themselves have any public health significance, they can affect the public acceptance of drinking water.

EXISTING PRIMARY MAXIMUM CONTAMINANT LEVELS

Contaminant	*Level (mg/L unless noted)*
Inorganic Chemicals	
Arsenic	0.05
Barium	1
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10
Selenium	0.01
Silver	0.05
Fluoride	4.0
Organic Chemicals	
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.005
Toxaphene	0.10
2,4 D	0.10
2,4,5 TP Silvex	0.01
Total Trihalomethanes	0.10
Trichloroethylene	0.005
Carbon tetrachloride	0.005
1,2-dichloroethane	0.005
Vinyl chloride	0.002
Benzene	0.005
Para-Dichlorobenzene	0.075
1,1-Dichloroethylene	0.007
1,1,1-Trichloroethane	0.2
Radionuclides	
Radium 226, combined	5 pCi/L
Gross alpha particle activity	15 pCi/L
Gross beta particle activity	50 pCi/L
Turbidity (surface systems)	
Monthly average	1 TU
Consec. 2-day average	5 TU
Coliform bacteria	1 per 100 mL (Monthly average)

Safe Drinking Water Act Amendments of 1986

On June 19, 1986, the Safe Drinking Water Act Amendments of 1986 were enacted. The 1986 Amendments greatly increase the EPA's (and the states') responsibilities for drinking water protection. There are a number of categories of changes as a result of the 1986 Amendments.

EXISTING SECONDARY MAXIMUM CONTAMINANT LEVELS

Contaminant	*Level*
Chloride	250 mg/L
Color	15 color units
Copper	1 mg/L
Corrosivity	Non corrosive
Foaming agents	0.5 mg/L
Fluoride	2.0 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor
pH	6.5 to 8.5
Sulfate	250 mg/L
Total dissolved solids	500 mg/L
Zinc	5 mg/L

New Drinking Water Regulations

In addition to the 23 contaminants regulated by the EPA under the original SDWA, the EPA was required by Congress to enact regulations for 9 additional contaminants within one year, another 40 within two years, and still more contaminants within three years for a total of 83 new MCLs. The specific contaminants to be regulated were listed in the legislation, although the EPA was given the discretion to substitute up to seven of those contaminants with others if it found that the substitution would give greater health protection. In addition to the first 83 contaminants, the EPA is required to issue primary regulations for at least 25 more contaminants by 1991, with an additional 25 contaminants added to the list every three years. The effect of this cumulative addition of regulated contaminants is shown in Figure 1.

The 1986 Amendments also required the EPA to specify by 1988 criteria for the filtration of all surface water supplies and to specify by 1990 criteria for the disinfection of all water supplies.

New EPA Enforcement Authority

Under the 1986 Amendments, the EPA is required to issue administrative orders or begin court action against waterworks that are in violation of its regulations when primacy states do not take "timely and appropriate" enforcement action within 30 days of notification. Administrative orders do not involve any court process, and allow the EPA to levy immediate fines or other administrative penalties with little or no recourse on the part of the waterworks owner. Furthermore, the EPA was given additional enforcement authority, allowing civil penalties of as high as $25,000 per day of violation. On July 12, 1989, the EPA proposed in the *Federal Register* its procedure for issuing administrative orders. Although Virginia has an ongoing enforcement program, the EPA has issued eleven final administrative orders against waterworks in Virginia, as of August 1, 1989.

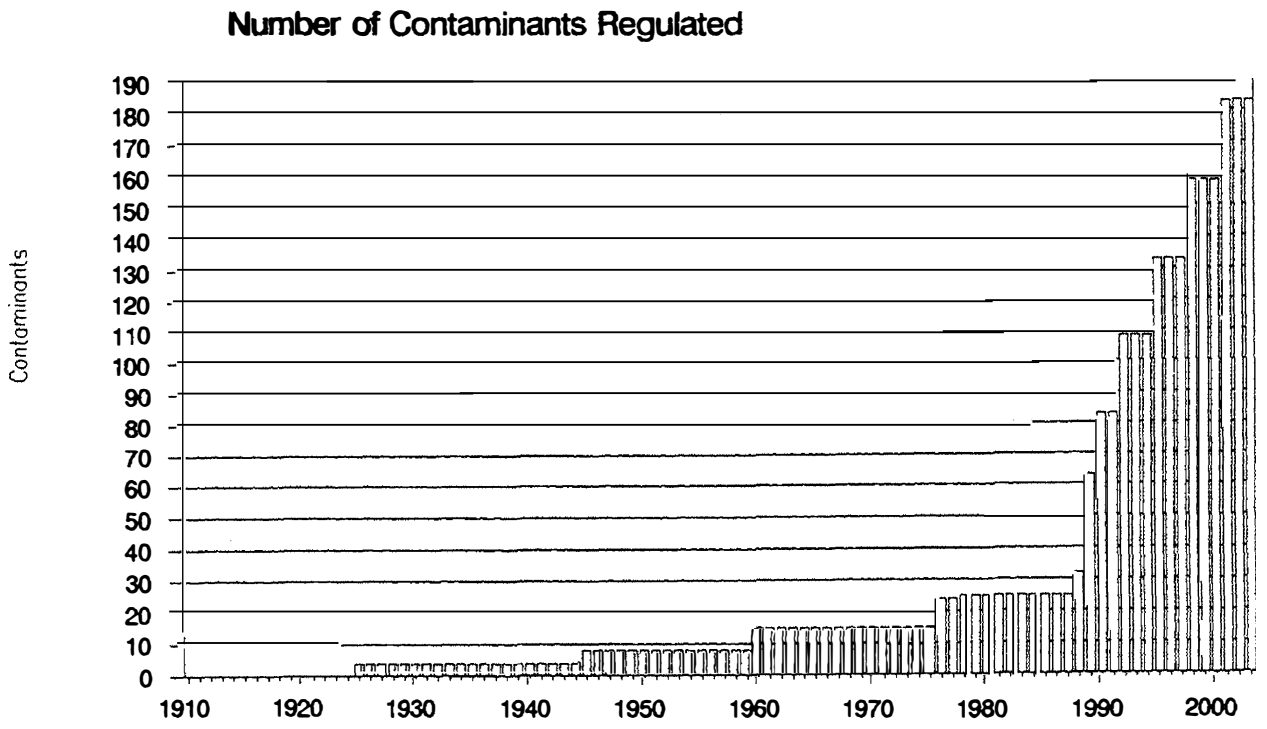


Figure 1. Cumulative addition of Federally-regulated contaminants

Public Notification

The EPA's procedures for notification of consumers of violations by the waterworks have been revised. See the *Public Notification* Section below for further details regarding the public notification provisions.

Monitoring for Unregulated Contaminants

On July 8, 1987, the EPA issued regulations under the authority of the 1986 Amendments that require the owners of waterworks to test for drinking water contaminants not yet fully regulated in drinking water. Waterworks owners must test their water at least once every five years. The regulations give the states the discretion to delete some of the contaminants from this list or to add items to it.

Lead Ban

The 1986 Amendments ban the use of lead solder, flux and piping materials from new plumbing and piping installations and repairs. Any solder containing more than 0.2 percent lead is required to carry a warning label. Virginia was a

leader in instituting a lead ban based on research done by the Department of Health in the early 1980s; a ban on lead-based solder and flux became effective here in 1986. Waterworks owners were required by June 19, 1988 to provide public notification to all users, explaining the potential sources of lead contamination and reasonable available methods of mitigating lead contamination. The EPA's regulations specified that lead bans were to be enforced at the state level, and, if the EPA determined that a state had failed to enforce the ban, the EPA could withhold up to 5% of the state's public water supply program grant.

Tampering with Public Water Systems

The 1986 Amendments provide for penalties of up to five years in prison and fines of up to $50,000 for tampering with a waterworks (three years and $20,000 for attempting or threatening to tamper).

Recent Significant Regulation Changes

In response to Congressional mandates contained in the 1986 Amendments, several new regulations have been issued or are currently under development by the EPA. These include:

Final Regulations

Fluoride MCL Change - Final Regulation Issued April 2, 1986

The MCL for fluoride is increased to 4.0 milligrams per liter (mg/L) for all waterworks. Previously, the maximum level was determined based on the average air temperature of the area served by the water system; Virginia's MCL was established at 1.8 mg/L. In Virginia, this change in the MCL has the effect of decreasing from 130 to 62 the number of waterworks with naturally-occurring fluoride levels above the MCL. The new regulation also establishes activated alumina absorption and reverse osmosis as the "best available treatment" for systems with excessive fluoride levels.

Volatile Organic Chemicals (VOCs) and Unregulated Contaminants - Final Regulation Issued July 8, 1987

With this regulation, the EPA establishes MCLs for eight volatile organic chemicals (VOCs) in community waterworks and in nontransient noncommunity waterworks. The "best available treatment" for removing VOCs is identified as

packed tower aeration and granular activated carbon.

VOC sampling began January 1988 for systems serving more than 10,000 people and January 1989 for systems serving from 3,300 to 10,000 people. Small waterworks serving fewer than 3,300 people will be required to begin sampling in January 1991.

All community and nontransient noncommunity water systems are also required to analyze for some 34 contaminants which are presently unregulated. If a system is considered "vulnerable," it will be required to sample for an additional 2 contaminants and may be required to test for another 15 chemicals, at state discretion.

Public Notification - Final Regulation Issued October 28, 1987

In this regulation, the EPA establishes new procedures for notifying the consuming public of violations of other regulations issued under the 1974 SDWA and the 1986 Amendments. It established two categories, or "tiers," of violations, with certain specific time frames for issuing public notices by radio and television, newspapers, mail, and posters, depending on the nature of the violation and the type of waterworks. It also establishes the use of mandatory specific health-effects language that must be included in all public notices for specific contaminants. Mandatory language will be required for all future regulated contaminants and will be developed for all contaminants currently regulated as well.

Surface Water Treatment Rule - Final Regulations Issued June 29, 1989

The Surface Water Treatment Rule establishes MCLGs for *Giardia lamblia* (a protozoan responsible for acute gastroenteritis), for viruses, and for *Legionella* (the organism responsible for Legionnaire's Disease); it also establishes National Primary Drinking Water Regulations for all waterworks using surface water sources or "ground water sources under the direct influence of surface water," such as springs and wells in areas with limestone caverns. The regulations include the requirement that all such waterworks must provide water filtration, and specify minimum disinfection requirements. In lieu of limits for the specified organisms, the EPA requires a treatment technique known to protect against the adverse health effects of exposure to *Giardia lamblia*, viruses, *Legionella*, and bacteria, as well as many other pathogenic organisms that are removed by filtration and disinfection.

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) became final on June 29, 1989. This rule requires that all water systems with surface water sources provide minimum treatment of filtration and disinfection prior to distributing the water to the consuming public.

The primary concern of Congress when they included this requirement in the 1986 Amendments was waterborne giardiasis, the most common waterborne disease of the 1980s. It is caused by *Giardia lamblia*, a protozoan that forms a protective cyst when exposed to the environment. Once inside the intestines of a human host, it can cause severe -- almost explosive -- diarrhea that often results in rapid dehydration. The *Giardia* organisms are carried by most warm-blooded animals, including household pets, and they can be transmitted to humans through means other than drinking water. However, water from streams, ponds, and some springs is likely to contain *Giardia* from infected animals such as deer, beavers, and muskrats. *Giardia* may be found over wide areas of Virginia, and there have been outbreaks of waterborne giardiasis in the state.

While Virginia has had language similar to the SWTR in its *Waterworks Regulations* since 1974, there are at least two areas of special concern that could have severe economic impact on Virginians. These factors are the determination of which sources are surface-influenced and the evaluation of treatment plant performance with respect to adequate treatment. The SWTR gives primacy states considerable discretion in addressing these issues on a state specific basis. Water systems in nonprimacy states will be expected to comply with the EPA's strict literal interpretation of the SWTR with no discretion.

ISSUE: Which sources are surface-influenced sources? How many sources currently classified as groundwater will be reclassified as surface-influenced?

There are 157 spring sources used by Virginia waterworks. The majority (142) of these spring sources are located west of the Blue Ridge in the Office of Water Programs' Abingdon and Lexington Regions. Most of the geology in these areas is *karst* with heavily fractured and channeled limestones and dolomites. Many of these springs have long histories of marginal water quality, with indications that the quality of the water is directly influenced by surface water. It is anticipated that approximately one-third of these western Virginia springs (47) will be reclassified as surface water sources.

Number of waterworks with spring sources by regional office service area

Abingdon	74
Lexington	68
Southeast Va.	0
Richmond	1
Danville	9
Culpeper	5
TOTAL	157

Once a spring source has been identified as "surface-influenced," the owner of the waterworks must provide filtration and disinfection treatment or must abandon the spring as a source of water. To provide a replacement well with a capacity of 100,000 gallons per day, with all necessary appurtenances and chlorination, will cost approximately $175,000, while installing a filtration and disinfection treatment facility with the same capacity will cost about $450,000. A large treatment plant with a capacity of five million gallons a day costs about $3.7 million to construct; there are several spring-fed systems in that size range.

Total Coliform Rule - Final Regulation Issued June 29, 1989

This rule, which is closely tied to the Surface Water Treatment Rule, changes the existing regulations for total coliform bacteria (an organism used as an indicator of water contamination) which were included in the original regulations issued under the 1974 SDWA. The new rule changes the MCL, the monitoring

requirements, and the approved analytical procedures for this most-basic of water purity indicators. The rule applies to all waterworks regardless of size or water source.

Proposed Regulations

Lead and Copper Rule - Proposed March 18, 1988

In this regulation, the EPA proposes new MCLGs and National Primary Drinking Water Regulations for controlling lead and copper in drinking water. The proposed regulation will control lead and copper due to their natural occurrence in source waters and their introduction into the water by corrosion of plumbing materials in the water distribution system and consumers' homes. The proposal includes a treatment requirement for optimal corrosion control of the water to minimize the introduction of lead and copper as by-products of corrosion, an extensive monitoring program to evaluate lead and copper contamination in targeted homes, and a public education program to inform consumers how they can reduce their exposure to lead and copper.

Inorganic and Synthetic Organic Chemicals - Proposed May 22, 1989

The proposed regulation establishes new MCLGs and National Primary Drinking Water Regulations comprising MCLs or treatment techniques for 30 synthetic organic chemicals (SOCs) and 8

CASE STUDY:
Economic Impact of a Waterborne GI Outbreak

In August 1975, a waterborne outbreak of acute gastrointestinal illness (G.I.) occurred in Sewickley, Pennsylvania, an upper-middle class suburb of Pittsburgh. Sixty-one percent of the Town's 8,800 residents were ill for an average of two days. A detailed economic analysis of the impact of this outbreak was performed by the Center for Disease Control and the Alleghany County Health Department, Pittsburgh, PA. Such detailed analyses are rare and this case dealing with a waterborne disease outbreak is especially enlightening.

The cost calculations are illustrated in the following table. This brief outbreak of G.I. in a relatively small community lead to a total cost of nearly $340,000 ($683,400 in 1989 dollars) or approximately $40 per capita ($80.40 in 1989 dollars). This study clearly illustrates the importance of prevention measures directed at maintaining the safety of drinking water.

Economic Costs of a Waterborne Outbreak of Gastrointestinal Illness, Sewickley, PA - August 1975

DIRECT COSTS	*1975 Dollars*	*1989 Dollars*
Medical Care	$ 43,141	$ 86,713
Bottled Water Cost	8,694	17,475
Investigative Cost	62,911	126,451
Total Direct Costs	$114,746	$230,640
INDIRECT COSTS		
Wages/Output	$155,330	$312,213
Lost Business	68,000	136,680
Total Indirect Costs	$223,330	$448,893
Total Cost	$338,076	$679,533

inorganic chemicals (IOCs). The proposal also includes requirements for monitoring, reporting and public notification for these compounds, SMCLs for nine additional contaminants, and monitoring requirements for approximately 100 unregulated SOCs and IOCs. The EPA estimates that 2,300 water systems nation-wide will have to install expensive SOC removal technology in order to comply with the proposed MCLs for SOCs.

Future Regulations

Due to the Congressional mandates of the 1986 SDWA Amendments and the pressure of lawsuits by several environmental groups, the EPA must issue regulations on additional contaminants. According to the EPA's "Regulatory Calendar" published in the *Federal Register* on April 24, 1989, the following regulations are currently under development:

Radionuclides - Proposal Due June 1990

The EPA will propose MCLGs and National Primary Drinking Water Regulations for radionuclides in drinking water, including radium, uranium, radon, total alpha and beta particle emitters, and photon emitters. The EPA has a

CASE STUDY:
Chlordane in Roanoke Drinking Water

On October 12, 1979, a professional exterminator treating a house for termites accidentally injected chlordane (a powerful pesticide, now banned) into the household water system. The contaminated water was drawn back into the Roanoke city water main; 20 neighborhood houses were contaminated and members of nine different families became ill. Fortunately, no serious illnesses or deaths occurred.

The widespread distribution of the contaminated water might have been avoided, but the exterminator did not immediately notify officials of his accident. Once the contamination was discovered, emergency response by the City of Roanoke, by the Virginia Department of Health, and by the Division of Consolidated Laboratory Services was rapid, effective, and well coordinated, according to all reports.

Significant costs included the replacement of the City water main and interior plumbing at the houses affected, staff time and travel by State officials, and laboratory testing at the DCLS. The identifiable costs are listed in the following table. A citizen's lawsuit was filed against the City of Roanoke and the exterminating company for $14 million in actual damages plus inconvenience, loss of service, mental and physical suffering, and potential future health risks to consumers. The suit was eventually settled out of court for an undisclosed amount.

The total known cost of this incident to state and local government agencies was $9,420 per residence affected (1989 dollars).

Known Costs of the Roanoke Chlordane Incident*

	Estimated Cost		*Cost/Residence*	
	1979 Dollars	*1989 Dollars*	*1979 Dollars*	*1989 Dollars*
City of Roanoke	$108,363	$152,575	$5,160	$7,265
Virginia Dept of Health	8,200	11,540	390	550
Div. of Consolidated Lab. Services	13,480	33,700	642	1,605
Total	$130,043	$197,815	$6,192	$9,420

* A $14 million lawsuit was settled out of court without disclosure of settlement amounts. The contractor/exterminator involved went out of business following this incident.

statutory deadline of June 19, 1989 for the issuance of this regulation, but has announced in the *Federal Register* that the final rule will be issued in March 1991. The establishment of a MCL for radon in drinking water will most likely cause a severe economic impact on many waterworks in Virginia.

Disinfection, Disinfectants, and Disinfection By-Products - Proposal Due September 1991

Congress has mandated that all waterworks, regardless of source, use disinfection treatment processes. When the EPA proposes the regulations to meet this mandate, it will also place limits on the allowable concentration of the disinfectants and on the by-products created when the disinfectants react with naturally-occurring materials in the source water. The final rule is expected in September 1992. An estimated 2000 public water sources in Virginia do not presently disinfect.

Inorganic and Synthetic Organic Chemicals (Phase V) -- Proposal Due March 1990

This proposed rule will establish MCLGs and MCLs or treatment techniques for 25 additional inorganic and synthetic organic chemicals specified in the 1986 SDWA Amendments. The statutory deadline for enactment of the Phase V regulations is June 19, 1989, but the EPA does not expect to enact the final regulations until March 1991.

Administration of State Public Water Supply Law and the SDWA

Programmatic administration of the SDWA and Virginia's Public Water Supply Law is assigned to the Division of Water Supply Engineering (DWSE), which is a program under the Office of Water Programs of the Virginia Department of Health (VDH). The Division implements the public water supply supervision program through a combined field staff in the six regional offices of the Office of Water Programs. The small Central Office staff of the Division is responsible for the content of and adherence to the *Waterworks Regulations* which implement the provisions of the state Public Water Supply Law and the SDWA.

The mission of the Division of Water Supply Engineering is "to promote and to protect the public health and welfare by planning and directing activities that assure adequate water quantity and quality are provided to users of public water supply systems located in the Commonwealth." This mission is fulfilled by:

* Providing surveillance and sanitary surveys of waterworks in order to make recommendations concerning treatment practices and assure the safe and proper operation of waterworks.
* Performing technical reviews of engineering plans and specifications for new, expanded, or modified waterworks to assure compliance with minimum standards of design.
* Establishing a monitoring program of drinking water quality through bacteriological, metal, organic, inorganic and radiological analyses.
* Providing training and technical assistance to waterworks owners and operators to enable them to become more proficient in the operation of their systems.
* Providing emergency assistance during natural or man-made disasters.

* Preparing and conducting enforcement actions of violations which threaten public health.
* Providing internal training to the engineering staff to enable them to become more competent in the performance of their tasks.
* Participating in a pollution alert program to provide expeditious response to any accidental discharges of pollutants into state waters.

The Division of Water Supply Engineering is currently authorized 47 full-time equivalent positions (FTEs). This includes 35 professional positions (seven in the Central Office and 28 in the six Regional Offices) and 12 clerical positions (two in the Central Office and ten in the Regional Offices). Community and NTNC waterworks are supervised by the Division.

Noncommunity waterworks are supervised by the Division of Sanitarian Services and the sanitarians employed in the local city and county health departments. The impact of the 1986 Amendments on the manpower assigned to the noncommunity waterworks program will be negligible.

Drinking water compliance samples, collected by the waterworks in compliance with the monitoring provisions of the SDWA, are generally analyzed by the Division of Consolidated Laboratory Services (DCLS) and the Virginia Department of General Services. The DCLS is also responsible for certifying independent testing laboratories and in-house waterworks laboratories that perform some of the drinking water analysis.

Characterization of Virginia Waterworks

Waterworks Owners

Waterworks can be categorized by type of ownership, such as local government, state government, federal government and investor; all will be affected by the 1986 Amendments. Many waterworks owners are not the traditionally recognized "water utility," but rather an individual, a business, or a governmental entity that operates a waterworks as a necessary part of providing another service. Table 1 shows some examples of the kinds of waterworks owned by the different owner types.

Table 1
Waterworks Owners

Category of System Owner	*Examples of Water Systems Owned*	
	Community	*Nontransient Noncommunity*
Local governments	Cities Towns Counties Authorities Jails	Public Schools Municipal Offices
State government	Correction Centers Hospitals Colleges State Parks	Highway Shops State Police HQs Community Colleges State Parks
Federal government	Defense Installations NASA	Federal Reserve Facilities National Parks Army Corps of Engineers
Investor	Subdivisions Trailer/Mobile Home Parks Apartment Complexes Private Water Companies Boarding Schools Nursing Homes	Factories Mines Resort Hotels Day Care Centers Private Schools

Local governments are most often recognized as the owners of waterworks, and they do, indeed, operate most of the "utility" water systems -- water systems that were constructed and are operated to provide drinking water and fire protection to the citizens of the community. Cities, counties, towns, and utility authorities own and operate water utilities, which are generally classified as community waterworks (serving a residential population). In Virginia there are 514 community waterworks owned by local governments: 200 owned by authorities, 56 owned by cities, 154 owned by towns, and 104 owned by counties.

In addition, local governments also own a number of non-transient non-community (NTNC) waterworks. The majority of these are public schools in rural areas, with a few other government-owned facilities with permanent non-residential populations, such as county office complexes, that qualify as waterworks. Virginia has 382 government-owned NTNC water systems, with two owned by authorities, seven by cities, and 373 owned by counties.

State government also owns a number of waterworks, operated in conjunction with other governmental activities. There are 30 state-owned community water systems; all but three of them serve correctional centers, learning centers, and correctional field units. Of the remaining three, two serve hospitals operated by the Department of Mental Health, Mental Retardation and Substance Abuse Services and the other serves a state park that has a number of residences. Of the 22 state-owned NTNC waterworks, nine are offices and shops of the Department of Transportation, two are State Police Headquarters, seven serve community colleges, one serves a tourist attraction (Jamestown Festival Park), and the remaining three provide water for other state-owned facilities.

The federal government operates 43 waterworks in Virginia; 32 of these are community systems serving defense and NASA installations, while the remaining eleven serve National Park areas and the Federal Reserve Records Center in northern Virginia.

The owner type representing the greatest number of waterworks in Virginia is the investor -- an individual or a corporation that owns and operates the waterworks, either as a utility or in conjunction with some other business activity. There are 942 investor-owned community waterworks. A few of these are private water companies -- utilities operated by investors -- which supply water to a given area such as a city or a subdivision and which charge their customers for the water they use. The majority of the investor-owned community water systems serve

subdivisions, trailer or mobile home parks, and apartment complexes located in rural areas. Some of these waterworks do not charge the consumer for the water beyond the rent for the apartment or mobile home lot.

There are 307 investor-owned NTNC systems in Virginia. This category generally represents factories, offices, mines, and other work places located in rural areas, although it also includes other facilities with permanent non-residential populations such as resort hotels with on-site staff housing, day care centers, and private schools.

Waterworks Size

The majority of waterworks are quite small in size; many of them serve populations that are only slightly higher than the minimum size for a waterworks. Of the 1,587 active community waterworks in Virginia, 955 (60%) serve a population between 25 and 200 people; 352 of the 746 NTNC systems (47%) serve fewer than 200 people. While there are many of these "very small" waterworks, the number of people served by them is still a small percentage of the total population consuming water from public systems.

At the opposite extreme, there are a few very large waterworks (each serving a population over 50,000) which serve the vast majority of consumers. Only 15 systems (1% of the community waterworks) provide water for 60.3% of Virginia's 4.9 million public water consumers, while 1446 systems (91% of the waterworks) serve only 9.4% of the population. This dichotomy is shown in Figure 2 at the top of the next page.

Many of the EPA regulations issued under the SDWA and the 1986 Amendments have provisions that are dependent upon the size of the waterworks. In addition, the EPA's estimates of the economic impact of each rule on the waterworks is usually dependent upon waterworks size due to the economy of scale that accrues to larger systems. There is no uniformity among the many rules as to the service population that represents the break points among the different population classes. Although the EPA uses as many as six different population groupings, this report will use three size ranges for the determination of waterworks costs for implementing the regulations: *small systems* are those waterworks serving up to 3,300 people, *medium systems* serve from 3,301 to 10,000 people, and *large systems* serve populations larger than 10,000 people.

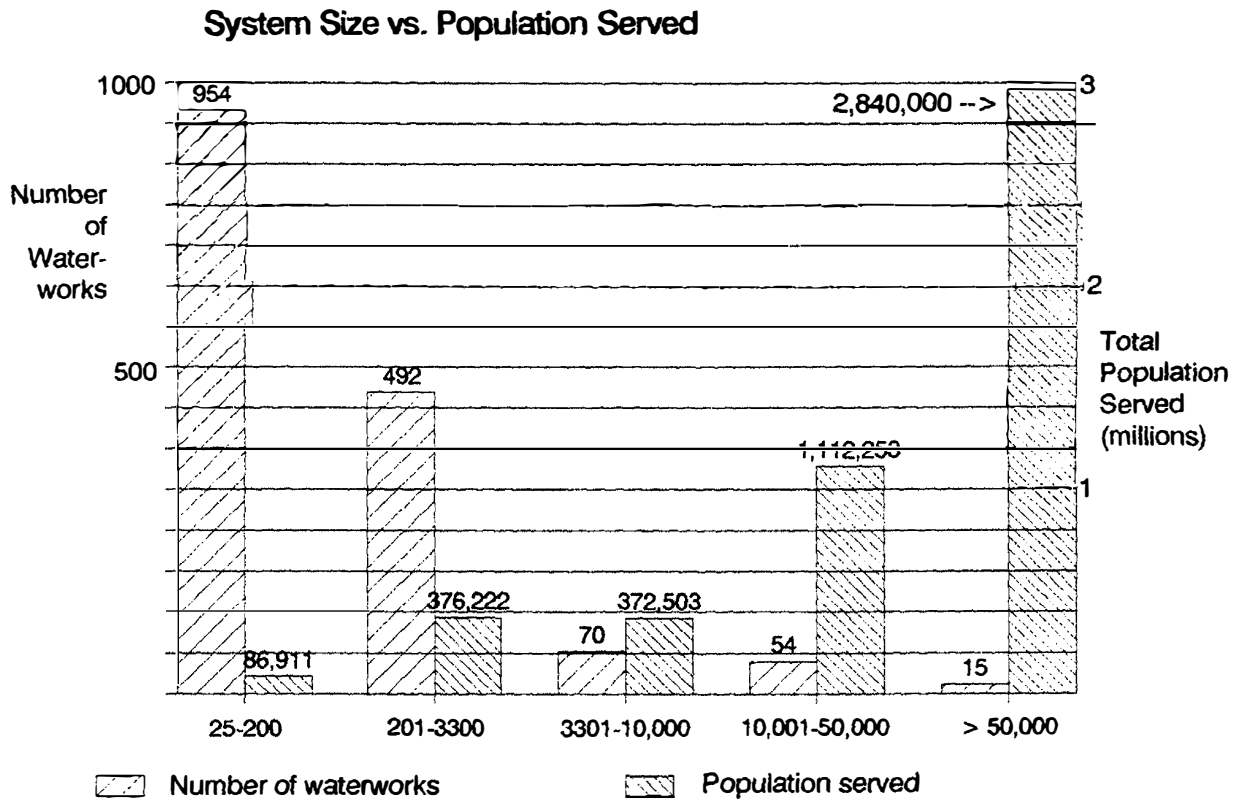


Figure 2. Most of the people are served by a few large water systems

Table 2 shows the breakdown of the number of community and nontransient noncommunity waterworks falling into each size category, based on the type of owner.

Table 2
Public Waterworks by Size and Owner

Owner category	*Number of Waterworks by Size* *Small*	*Medium*	*Large*	*Total*
Community Waterworks				
Local Government				
Authority	175	9	16	200
City	18	10	28	56
Town	112	34	9	154
County	88	7	8	104
Total local government	*393*	*60*	*61*	*514*
State Government	29	1	0	30
Federal Government	20	7	5	32
Investor	937	2	3	942
Other	69	0	0	69
Total Community Waterworks	**1,448**	**70**	**69**	**1,587**
Nontransient Noncommunity Waterworks				
Local Government				
Authority	2	0	0	2
City	7	0	0	7
Town	0	0	0	0
County	373	0	0	373
Total local government	*382*	*0*	*0*	*382*
State Government	21	1	0	22
Federal Government	8	2	1	11
Investor	305	2	0	307
Other	24	0	0	24
Total Nontransient Noncommunity Waterworks	**740**	**5**	**1**	**746**
Total All Waterworks	**2,188**	**75**	**70**	**2,333**

State Agencies Affected By 1986 Amendments

Virginia Department of Health, Division of Water Supply Engineering

The DWSE will be the subunit of state government which will be most affected by the EPA regulations promulgated under the 1986 Amendments. An extensive analysis of additional resource needs has been made for both the community and nontransient noncommunity portions of the program. Resource needs for each portion are described below. Each of these is in addition to present workload.

I. Community Waterworks

A. Review of Engineering Plans and Specifications

1.. An additional 1027 sets of plans and specifications will be reviewed. These reviews are necessary because:

a. The current plan backlog is retarding waterworks development and economic growth within the Commonwealth

b. It is expected (from historical information) that 10% of the existing community waterworks will violate each of the VOC, SOC and IOC rules

c. Some of the 157 existing spring sources will require complete treatment

d. The Total Trihalomethane rule will be extended to all surface water systems (presently, only surface water systems serving over 10,000 persons are regulated)

e. A case-by-case determination and plan review will be required by the DWSE to determine which of the 1587 community waterworks not presently disinfecting will need to install disinfection

f. A vulnerability (well head) inspection will be required at each of the estimated 2000 wells serving community waterworks

g. Increased construction inspections will be needed to assure the approved waterworks facilities are properly constructed

2. A total of 17.53 additional FTEs are required for the engineering plan and specification review of community waterworks

B. Technical Services

1. An additional 4600 technical assistance requests will be fulfilled. These responses will provide technical assistance on:
   a. VOCs
   b. SOCs
   c. IOCs
   d. TTHMs
   e. Mandatory filtration
   f. Mandatory disinfection
   g. Corrosion
   h. Secondary contaminant violations
   i. Radioactivity
2. Increased technical assistance also includes:
   a. Making necessary changes to the inventory as a result of a changing EPA data base
   b. An increase in the sanitary survey frequency to assist in proper operation of the facility and to try to prevent problems before they arise
   c. Providing increased assistance to waterworks with existing problems
   d. Providing increased assistance to waterworks owners in understanding the complex and frequently-changing provisions of the new regulations
   e. Responding to increased number of complaints from the public. This increase will result from the increased number of contaminants identified in the water supply systems
   f. Increased emphasis on cross-connection prevention
   g. Frequent revision of the *Waterworks Regulations*
   h. Increased attendance at public meetings to explain the technical requirements of the revised regulations
3. A total of 13.66 additional FTEs are required for the technical assistance portion of the community waterworks program

C. **Enforcement**

1. A significant increase in the number of violations will occur as a result of the four-fold increase in the number of contaminants which must be monitored and MCLs which must be complied with. It is anticipated that an additional 2749 violations will be occurring. In order to return these waterworks to compliance, the following enforcement-related activities must be accomplished:
   a. Review of variance and exemption requests from community waterworks owners
   b. Increase in the number of public notifications that are required to be given by the community waterworks owner to the system's consumers
   c. Follow-up on each public notification to assure and to report that it has been given
   d. Provide increased enforcement presence at community waterworks which are likely to become violators
   e. Increase the number of formal enforcement actions (i.e., civil actions taken by the Attorney General's Office)
2. A total of 7.72 additional FTEs are needed to minimize the number of violations yet take appropriate enforcement action when necessary against community waterworks

D. **Training**

1. New regulations will require increased training of waterworks owners, operators, consulting engineers, existing Health Department employees and new Health Department employees
2. A total of 3.36 additional FTEs are needed to perform this increased community waterworks training

E. **Regional Office Administrative Time**

1. The administration of the new regulations for community waterworks will require administrative time in each regional office
2. A total of 2.14 additional FTEs are needed to perform the administration of the community waterworks program

II. Nontransient Noncommunity (NTNC) Waterworks

A. **Review of Engineering Plans and Specifications**

1. An additional 612 sets of plans and specifications will be reviewed. These reviews are necessary because:

a. Plans for NTNC waterworks will be reviewed by the DWSE. In the past, these did not generally receive an engineering review
b. It is expected that 10% of the existing NTNC waterworks will violate each of the VOC, SOC and IOC rules
c. A case-by-case determination and plan review will be required by the state to determine which of the 746 NTNC waterworks not presently disinfecting will need to install disinfection as required by future federal regulations
d. A vulnerability (well head) inspection will be required at each of the estimated 1000 wells serving NTNC waterworks
e. Increased construction inspections will be needed to assure the approved waterworks facilities are properly constructed

2. A total of 9.36 additional FTEs are required for the engineering plan and specification review of NTNC waterworks

B. **Technical Services**

1. Because the NTNC waterworks have not been regulated previously, it is anticipated that 1930 technical assistance requests will be fulfilled. These responses will provide technical assistance on:
   a. VOCs
   b. SOCs
   c. IOCs
   d. TTHMs
   e. Mandatory disinfection
   f. Corrosion
   g. Secondary contaminant violations
2. Increased technical assistance also includes:
   a. Performing sanitary surveys at all NTNC waterworks. These waterworks have not been previously inspected by the DWSE
   b. Responding to complaints from the public. Because NTNC waterworks have not been regulated in the past, a significant number of complaints is expected
   c. Developing cross-connection control programs for each of the NTNC waterworks
   d. Attending meetings with NTNC owners to explain the requirements of the *Waterworks Regulations*

3. A total of 5.09 additional FTEs are required for the technical assistance portion of the NTNC waterworks program

C. **Enforcement**

1. The number of violations at NTNC waterworks will be significant. These waterworks have not been regulated before and the compliance with and the monitoring for the large number of contaminants will create a high level of noncompliance. It is anticipated that 1530 violations will be occurring. In order to return these waterworks to compliance, the following enforcement-related activities must be accomplished:
   a. Review of variance and exemption requests from NTNC waterworks owners
   b. Issuance of waterworks operation permits to NTNC waterworks which have not previously received permits
   c. Issuance of public notifications by the NTNC waterworks owner to the system's consumers
   d. Provide enforcement presence at NTNC waterworks which are likely to become violators
   e. Take formal enforcement actions (i.e., civil actions taken by the Attorney General's Office)
2. A total of 5.26 additional FTEs are needed to implement the enforcement portion of the NTNC program

D. **Training**

1. The application of the new regulations to the NTNC waterworks which have been virtually unregulated in the past will require extensive training of the NTNC waterworks owners and new Health Department employees
2. A total of 0.11 additional FTEs are needed to perform the NTNC waterworks training

E. **Regional Office Administrative Time**

1. The administration of the new regulations for NTNC waterworks will require administrative time in each regional office
2. A total of 2.02 additional FTEs are needed to perform the administration of the NTNC waterworks program

III. Summary of Professional FTE Requirements in the Regional Offices

See Table 3

Table 3
Summary of Additional Professional FTE Requirements in Regional Offices

Program Area	*Community Waterworks*	*Nontransient Noncommunity Waterworks*
Engineering plan review	17.53	9.36
Technical services	13.66	5.09
Enforcement	7.72	5.26
Training	3.36	0.11
Regional office administration	2.14	2.02
Subtotal	44.41	21.84
Total Regional Office Professionals Required		66.25

Using the Department of Health Budget Guidance, a ratio of 3 professional staff / 1 clerk yields a clerical need of 22 FTEs (66 / 3).

Additionally, because program policy, procedure development, and budgeting are performed in the Central Office, the Division of Water Supply Engineering will require a minimum additional professional staff of 6 FTEs. These professionals will develop program policy and procedure, review and comment on proposed federal regulations, revise the state's *Waterworks Regulations*, develop and maintain an automated data system to keep accurate records for program management and reporting to the EPA, provide and coordinate technical assistance to the Regional Offices, and assist in enforcement actions and coordinating with the Attorney General's Office.

Again, using the Department's Budget Guidance, the DWSE will need to add two clerical FTEs in the Central Office.

Table 4
Summary of DWSE Additional FTE Requirements

Location	*Professional*	*Clerical*	*Total*
Regional Offices	66	22	88
Central Office	6	2	8
Total	72	24	96

The overall staffing needs for the DWSE are summarized in Table 4.

The increases identified for this program will be phased in during the FY1990-92 biennium. For the first year of the biennium, an additional 53.00 FTEs will be needed at an additional cost of $2,566,890. The second year of the biennium will require the remaining 43.00 FTEs added to the program with an incremental cost increase of $1,748,515. The total cost for the second year of the biennium will be $4,315,405.

Department of General Services, Division of Consolidated Laboratory Services (State Lab or DCLS)

The Division of Consolidated Laboratory Services (DCLS) analyzes water samples from a variety of clients, including local governments, state agencies, municipal waterworks, and privately-owned waterworks such as trailer parks that are subject to the Safe Drinking Water Act. The DCLS Bureau of Microbiological Sciences, with laboratories in Richmond, Luray and Abingdon, analyzed approximately 37,310 samples during Fiscal Year 1989 to meet the current requirements of the SDWA. The cost for microbiological analysis for waterworks was $317,135.

The DCLS Bureau of Chemistry analyzed 12,800 samples during FY 1989, at a total cost of $441,650 ($365,000 for personnel and $76,650 for maintenance and operation). When added to the costs for microbiology, the DCLS is currently spending $787,785 for SDWA analyses.

The cost of operating the DCLS laboratories and the workload of the DCLS Bureaus will be affected by several factors as a result of the 1986 Amendments to the SDWA.

The 1989 Virginia General Assembly directed the DCLS to discontinue charging fees for service to any waterworks to perform analyses required by the Virginia *Waterworks Regulations*. During FY 1989, only municipally-owned waterworks were exempt from the fee for service; this change will have the effect of encouraging many waterworks that were paying independent certified laboratories for their analyses to send their samples to the DCLS laboratories for analysis at no charge.

A second factor is the increase in the number and type of analyses required, the increased volume of samples, increased retesting required of supplies that test positive for coliform indicator organisms, and additional testing for fecal coliform

bacteria in positive samples. The DCLS estimates that 26,000 additional bacteriological samples and 2,200 chemical samples will be tested each year to meet the new requirements of the 1986 Amendments. In addition, monitoring of the effectiveness of chlorine or other chemical treatment of surface water supplies to eliminate *Giardia* and viruses will be required.

Third, the newly regulated NTNC waterworks will increase the number of systems using DCLS services. DCLS expects an increase of 6,000 microbiological samples and 2,000 chemical samples per year from NTNC waterworks.

In order to handle the increased workload, microbiology has submitted an addendum request for 4 new full-time equivalent (FTE) positions and new equipment to perform the increased workload. This will cost $118,225 the first year of the 1991-92 biennium and $115,360 the second year. Chemistry has also submitted an addendum request for new equipment and 3 new FTE positions at a cost of $259,242 the first year of the biennium and $103,510 the second year.

In summary, DCLS expects its costs to increase from $787,785 in FY 1989 to $1,165,252 during FY 1991, decreasing slightly to $1,006,655 in FY 1992.

State Attorney General's Office (AG)

While detailed impact cost determinations were not made for the State Attorney General's Office, it is important to note items which will have an effect on that agency. These include:

a. *Increased number of violations*. The AG's Office is not generally involved with the day-to-day enforcement activities of the DWSE. However, as the number of violations increases, additional legal consultation between the AG's staff and the DWSE staff will be needed. Increased time for AG review of legal correspondence and approval of consent orders between the waterworks owner and the State Health Commissioner can be expected.

b. *Increased formal enforcement*. With the increase in noncompliance, a parallel increase of legal referrals from the State Health Commissioner to the AG's Office is likely. The needs analysis identifies an additional 79 referrals annually for civil action.

c. *Frequent revision of the Waterworks Regulations*. Due to the 1986 Amendments to the SDWA, the EPA will be proposing and promulgating new regulations for drinking water. In order to maintain primacy, Virginia will have to incorporate

the federal changes into the *Waterworks Regulations* in an "as stringent as" manner. The primacy regulations proposed by the EPA on August 2, 1988 require state AG "sign-off" on revised state regulations. The review of these revised regulations will require considerable time on the part of the AG's staff.

State Corporation Commission (SCC)

No detailed cost estimates were made for the cost impact of the 1986 SDWA Amendments on the State Corporation Commission. It should be noted, however, that the water rates charged by a limited number of waterworks are under the control of the SCC. As the costs of complying with the regulations increase for these systems, it can be expected that they will be petitioning the SCC more often to increase their water rates. This increase in review of petitions and hearings will affect the staff of the SCC.

Table 5
Summary of FTE and Budget Requirements

Year	*Agency*	*FTEs*	*$ (millions)*
1990-91	VDH	53	2.567
	DCLS	7	0.377
	Total	60	2.944
1991-92	VDH	43	1.749
	DCLS	0	0.000
	Total	43	1.749
Grand total		103	4.693

NOTE: FY 1991-92 figures indicate increases above FY 1990-91

Existing Shortfalls Within the State's Current Drinking Water Program

Because the DWSE has been level funded for the past several biennia, because public demands have increased substantially, and because new federal regulations have become effective, the DWSE has had to rearrange its priorities, reduce its inspection frequencies, or even eliminate certain program activities. Examples include:

a. Frequency of Sanitary Surveys

The primary and most effective contact point between the Office of Water Programs field engineer and the waterworks owner is the routine sanitary survey or water supply inspection. These facility visits have traditionally allowed for a constructive exchange of technical information during a detailed inspection of the physical plant, laboratory, and system records. The constructive technical assistance achieved during these inspections has traditionally contributed to a positive relationship between the field engineers and the waterworks owners and operators.

Until 1985, all community waterworks were visited at least annually, with those systems having surface water sources (which systems tend to be more technically complicated than groundwater systems) receiving quarterly inspections. In 1985, this frequency was reduced to one inspection every 18 months for most systems and to one inspection every six months for systems with surface water sources. Beginning in July 1989, a further reduction was made, to one inspection every two years for groundwater source systems, in order to have enough manpower to handle the new workload by regulation of nontransient noncommunity waterworks. Surface water source systems remain on a two inspections per year schedule. Unfortunately, current statistics indicate that, for at least one half of the

state, it will be impossible to maintain even this reduced schedule. With fewer in-person contacts, the quality of the surveillance program as well as the networking between the DWSE staff and the waterworks owners is declining.

b. Enforcement

Annually, there are over 1,100 violations of the *Waterworks Regulations*. These violations may be major or minor; they may be violations requiring public notification (a violation of a parallel federal regulation) or they may be sporadic or continuous violations at specific systems. The fact that this large number of violations exists is a reflection of the state's insufficient resources to work with these systems to prevent these violations. Once the violation occurs, it generally requires more state resources to return the system to compliance than it would have taken to have worked with the system to avoid the violation altogether.

Furthermore, when a waterworks violates a state regulation which has a federal parallel, federal law requires the state to take "timely and appropriate" action. "Timely and appropriate" has been interpreted by some to mean that a legally binding consent agreement must be reached on *each* violation. The EPA and the states have been severely criticized by the National Wildlife Federation in its 1987 report and 1988 update entitled *Danger on Tap -- the Government's Failure to Enforce the Federal Safe Drinking Water Act*. The National Wildlife Federation has notified the EPA of its intent to sue the EPA for its failure to enforce its regulations.

As a result of the 1986 Amendments and, perhaps, the National Wildlife Federation report, the EPA has taken a much firmer stance on enforcement. Unfortunately, Virginia does not have sufficient resources to address all violations in the manner required by federal law or desired by the National Wildlife Federation. We have, however, with the concurrence of the EPA, agreed to focus our limited resources on those violators within the Commonwealth which are most significant. As resolution of these significant violations occur, additional systems receive increased attention. However, because the Commonwealth cannot address every violation, the EPA has been issuing notices of violations, proposed administrative orders, and final administrative orders to waterworks selected by the EPA within the state. The EPA has issued 27 notices of violation and eleven final administrative orders to waterworks in Virginia

Until sufficient resources are made available to permit the state to take timely

and appropriate action, the EPA will continue to interject itself in enforcement actions in Virginia.

c. Plan Review

The *Virginia Public Water Supply Law* (§ 32.1-167 through § 32.1-176) requires that all waterworks construction receive prior approval. The wisdom of this long-standing requirement has been illustrated time and again as new drinking water standards are proposed by the EPA. Most Virginia waterworks are only slightly affected by these changes when compared to many other states. Unfortunately, the plan review and approval process is time consuming. Increasing numbers of plan submittals involving increasingly complex designs, combined with the current or decreasing number of staff positions to perform the reviews, has resulted in a greatly increased backlog of plans in the review process.

Prior to calendar year 1986, the DWSE maintained a backlog of no more than 100 projects. Since that time, the backlog has tripled to approximately 300 projects (see Figure 3). Such heavy backlogs tend to feed on themselves by overwhelming and demoralizing the field engineers responsible for project review. In the construction industry, "time is money ,"and significant delays in

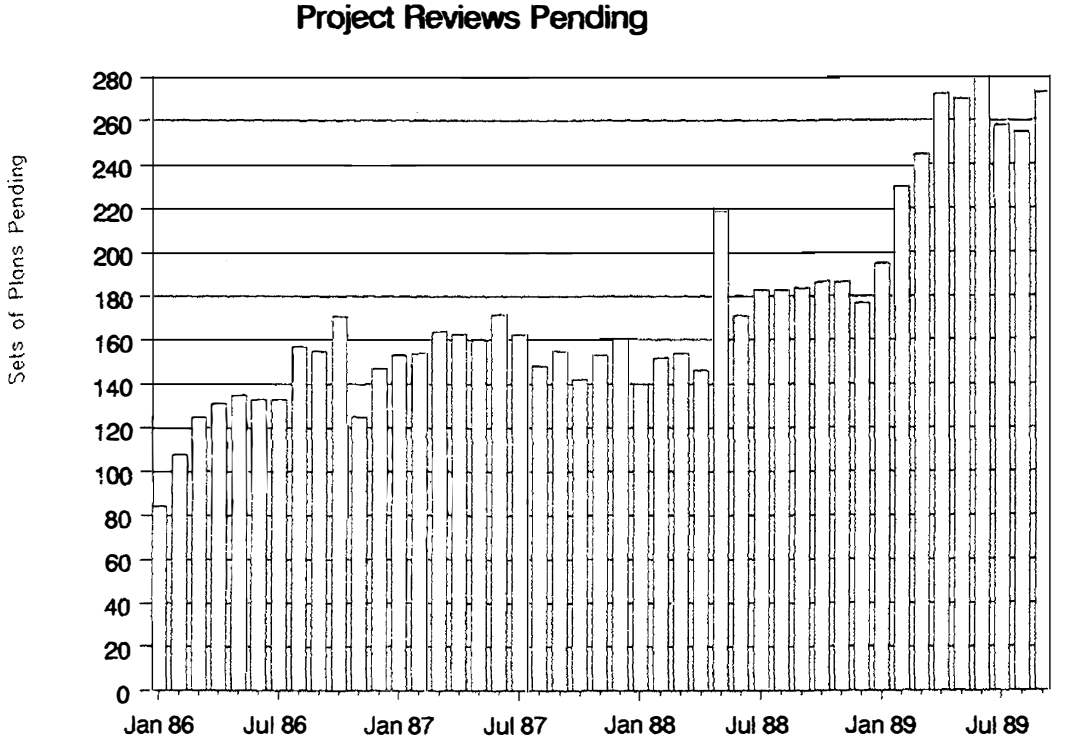


Figure 3. The number of backlogged plans is increasing

Table 6

Status of Implementation of EPA Regulations in Virginia

Federal Regulation	*Effective Date*	*Required State Promulgation Date*	*Status*
Fluoride	Apr 2, 1986	Oct 2, 1987	Returned from AG's Office on September 22, 1989 for technical revisions
VOCs	Jul 8, 1987	Jan 8, 1989	Returned from AG's Office on September 22, 1989 for technical revisions
Public Notification	Oct 28, 1989	Apr 28, 1989	Returned from AG's Office on September 22, 1989 for technical revisions
Surface Water Treatment / Coliform	Jun 29, 1989	Dec 29,1990	Referred to Waterworks Advisory Committee on August 17, 1989

review are not acceptable. Each set of backlogged plans represents approximately $525,000 in construction monies. A backlog of 280 sets of plans is delaying approximately $147.1 million in new waterworks construction activity; the delay in waterworks construction may be contributing to further delays in residential, commercial and industrial development in the areas served by these waterworks. Manpower from other program elements such as surveillance, technical assistance and enforcement has been diverted to the project review element to the extent possible. The project review workload has increased significantly but the manpower has remained static.

d. Promulgation of Virginia Regulations

A key element in maintaining primacy is the federal requirement that a state must have in place enforceable regulations at least as stringent as the comparable federal regulations. Generally, an implementation time period of 18 months is allowed. Table 6 illustrates Virginia's status as of August 1989.

From the time of final Attorney General endorsement it is anticipated that an additional six months will be needed to promulgate final regulations in compliance with the Virginia Administrative Process Act. The EPA has not indicated the point at which they would take action against the state for not complying with the primacy requirements, such as withholding program grant monies, due to implementation delays.

Impact on Waterworks Owners and Customers

The SDWA Amendments will have a number of significant impacts on the owners of waterworks in Virginia. Ultimately, the impact will appear as increased costs to the waterworks owner, which will be passed on to the water consumer through higher water bills, tax increases, higher rent, or higher costs for goods and services.

The management and operating personnel will be required to familiarize themselves with hundreds of pages of complex federal and state regulations before they can determine if the system's water meets all of the standards. Many (especially the owners of small water systems) will find it necessary to hire outside consultants to assist them in assessing their systems for compliance and for guidance in meeting all of the requirements.

There will be a significant increase in the frequency of sampling required, including requirements for sampling for a large number of unregulated contaminants. As noted previously, the DCLS will perform all compliance sample analyses at no cost to the waterworks owner, but it remains the responsibility of the owner to collect the samples according to the schedules in the regulations and to ship them to the lab. Each new regulation includes monitoring requirements, at various frequencies that are dependent on the contaminant, the vulnerability of the system to contamination, and the service population. Because of the extremely small concentrations being tested for, some of the samples must be collected using detailed techniques to avoid results that might falsely indicate contamination. Many system owners will find it necessary to hire additional personnel or consultants to collect the required samples, and to use an outside consultant to interpret the sampling schedules and the monitoring results.

Systems not in compliance with one or more of the MCL requirements will have to modify their treatment processes or add treatment to presently untreated

supplies to produce water that meets the standards. Treatment modifications could be as simple as increasing the dosage of a treatment chemical, or as complex as requiring construction of new treatment facilities. Some waterworks may even be required to abandon their existing water sources and construct totally new supplies.

New technologically-advanced treatment equipment will require more highly skilled operators. Older equipment will require more careful attention by operators to obtain performance beyond what was expected when it was installed. As the skill requirements increase, the owners can expect operators' salaries to increase. Maintenance of the treatment and laboratory equipment will also become more important to maintain compliance with the stringent standards being issued under the 1986 Amendments.

All of these impacts will show up as additional costs to the waterworks owner: equipment costs, construction costs, increased payroll costs, increased energy usage, the costs of supplies and treatment chemicals, increased maintenance, etc. The owners will be forced to pass these costs on to the consumer -- either to the water consumer in the case of a utility or to the consumer of the goods and services produced by the owner (for example, higher rents, increased product prices, etc.).

The cost of implementing the 1986 SDWA Amendments will be staggering to waterworks owners and customers. One system owner reported that his operational cost had doubled in the last ten years. He indicated that, with the implementation of the SDWA Amendments, the operation cost would double again. He noted that this cost increase did not include capital costs because of the uncertainty of the final regulations. All of these cost increases will be passed on to consumers.

It is difficult to determine the actual cost of the regulations to any particular waterworks or to any group of systems without a detailed study of existing operations at each system. The increased costs for treatment are highly site-specific, and will depend on the actual improvements needed; not all waterworks will need to construct new facilities to comply with the new regulations.

The EPA has included with each new regulation an estimate of the costs to waterworks that would be in violation of the rule. In most cases, these estimates have included capital costs for new facilities and equipment, increased monitoring and operating costs, and maintenance costs for new equipment. Each

regulation's costs are addressed separately, with no attempt to identify the costs to waterworks impacted by more than one regulation. The EPA has recognized that smaller systems will face the greatest cost impact by virtue of the smaller customer base to share the costs and the lack of economy of scale enjoyed by larger systems. In addition, smaller systems also must face the higher costs of financing improvements in the form of higher interest rates on bonds, and higher underwriting and administrative costs. These higher financing costs are not addressed in the EPA estimates.

A summary of the EPA's estimates of the costs to be passed on to the citizens of Virginia by waterworks owners is included as Table 7.

The EPA estimates the current annual cost of water ranges from $100 to $150 per household per year. Another study (by the National Regulatory Research Institute) has found the cost range to be from $48 to $400 per household per year in Virginia. As shown in Table 7, Virginia's water bills could increase from $0.02 to $1,284 per household per year depending on the system size, contaminant to be monitored and/or removed and the treatment technology installed. Again, the table shows the highest cost will be borne by the customers of Virginia's smallest water systems. At the high end of the range, water bills could increase four-fold or more over current levels.

System owners' costs will increase due to the new regulations. These costs result from capital improvements, power costs, maintenance, additional operators, additional training, and additional monitoring. The right-hand column of Table 7 lists the total cost impact of the regulations to be passed on to consumers by waterworks in Virginia. Using Health Department estimates of the number of systems that will be impacted by each regulation, the regulations will cost from $51 to $143 million annually statewide.

Table 7
Cost of Compliance with EPA SDWA Regulations[1]

Rule[3]	*System Size*[4]	*Cost/Household/Year ($)*[2] *Monitoring*	*Treatment*	*Est. No. of Systems Impacted*[5]	*Total Cost of Rule to Consumers ($)*
Fluoride	Small	No impact	57 - 206	65	311,000 - 1,125,000
	Med.	No impact	36 - 140	0	0
	Large	No impact	25 - 96	0	0
SOCs and VOCs (final); SOC (Ph 2) (proposed)	Small	1 - 11	43 - 702	310	1,146,000 - 18,570,000
	Med	1	22 - 43	9	335,000 - 642,000
	Large	1	11 - 22	8	1,413,000 - 2,708,000
IOCs (proposed)	Small	1	38 - 694	174	570,000 - 10,158,000
	Med.	1	5 - 179	2	19,000 - 583,000
	Large	1	1 - 168	2	59,000 - 4,975,000
Filtration & Disinf. (final)	Small	2	98 - 1,284	247	2,075,000 - 26,682,000
	Med.	2	77 - 120	10	1,280,000 - 1,976,000
	Large	2	68 - 108	0	0
Coliforms (final)	Small	21	No impact	2,188	3,860,000
	Med.	1	No impact	75	122,000
	Large	1	No impact	70	1,030,000
Lead and Copper (proposed)	Small	0.31 - 0.91	232 - 769	705	13,757,000 - 45,594,000
	Med.	0.20	104	24	4,051,000
	Large	0.02	62	23	20,998,000
Total Statewide Costs of Monitoring and Treatment					**51,026,000 - 143,074,000**

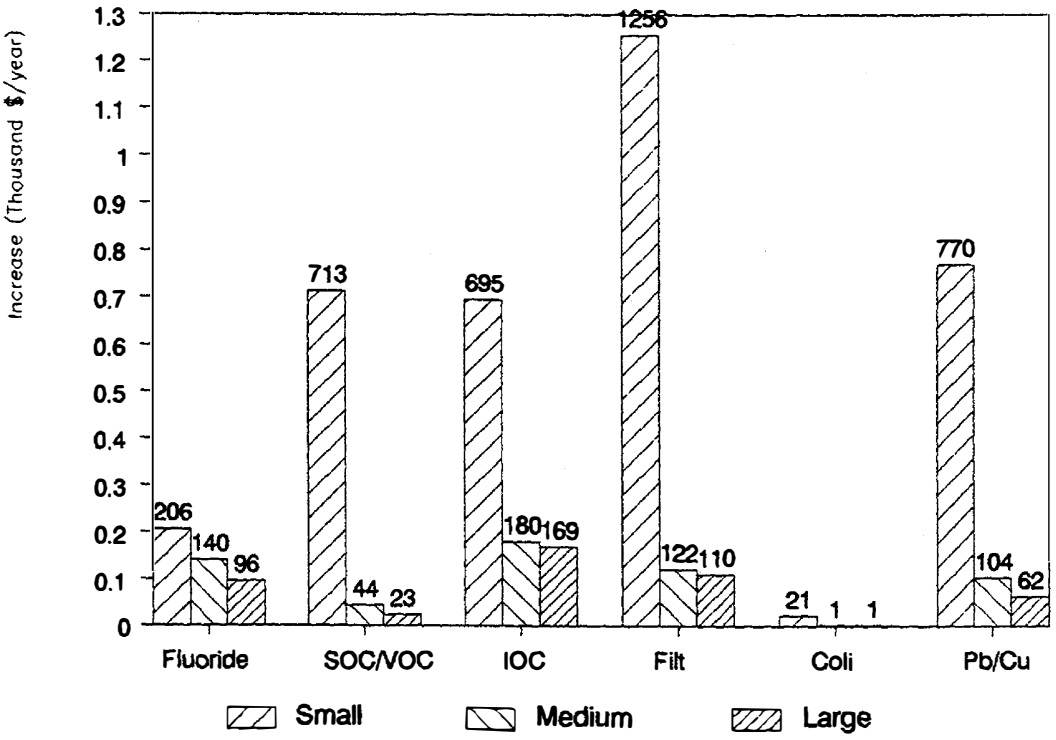
NOTES:

1. Does not include any costs related to future EPA regulations as discussed on page 23 of this report
2. EPA estimates from final and proposed rules
3. SOCs = Synthetic Organic Chemicals
   VOCs = Volatile Organic Chemicals
   IOCs = Inorganic Chemicals
4. Average number of households per system in Virginia:

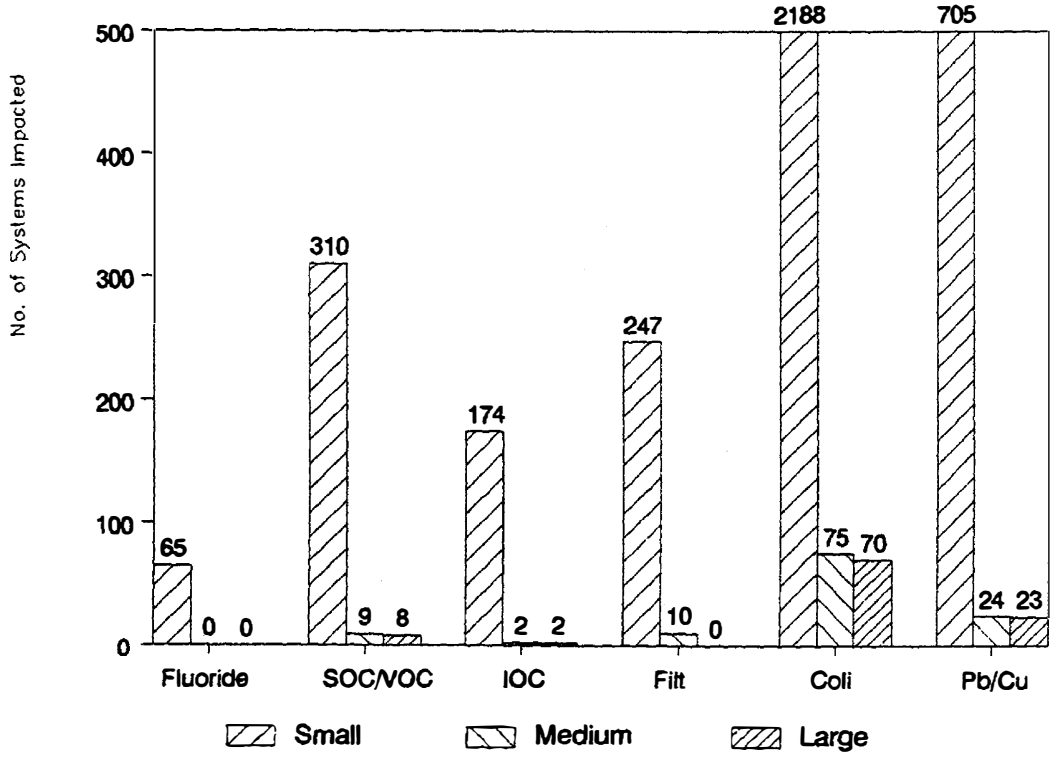
Small	($\leq$ 3,300 people)	84
Medium	(3,301 - 10,000)	1,620
Large	(> 10,000 people)	14,720

5. Virginia Department of Health estimates

Est. Max Increase in Annual Water Bills



Virginia Water Systems Impacted



Conclusions and Recommendations

This report focuses on four issues facing Virginia with respect to its public drinking water program. These are primacy, regulation, small systems and money.

Primacy

From presentations before the HJR 335 committee, it is apparent that the drinking water industry strongly supports the retention of primacy by the state. All aspects of the industry, from the owners to the consumers, feel they will benefit if primacy is retained and suffer if primacy is lost.

Regulations

The SDWA is the law of the land. All public water systems must conform with the federal regulations. The question is one of whose regulations and who will assure compliance. As stated above, those most deeply involved with this industry believe that it is in the state's best interest to retain primacy. Furthermore, recent federal regulations have recognized the importance of state flexibility by incorporating many opportunities for state discretion. With guidance from the waterworks industry, the Commonwealth can make use of this discretion to provide maximum flexibility and maximum health protection.

Small Systems

Clearly, small systems are most affected by the new regulations and have the greatest impact on the state's oversight program. There are two major reasons for this. First: the large number of small systems. As presented in this report, small systems represent over 90% of the total systems under state surveillance. With many more site-specific decisions being required or allowed by the new federal regulations, a huge portion of the additional resources will be devoted to providing services to small systems.

Secondly, most violations occur at these small waterworks. Unfortunately, it is these small systems which most frequently experience the lack of resources (money and qualified staff) and systems management expertise. This, coupled with aging infrastructure, underdesigned and undersized systems, unexpected encounters with the increasing number of regulated compounds and the necessity to jury-rig antiquated equipment further emphasizes the small system problem. Furthermore, some small systems are owned by persons who are in an entirely different business (e.g. real estate developers, apartment owners, trailer park owners, etc.) and find the ownership of the waterworks to be a nuisance. Therefore, the DWSE encounters great difficulty in obtaining a commitment from the owners to make the necessary corrections. In situations like this, the degree of public health protection being provided to consumers may be marginal.

Because of the nature of small systems, states find themselves in a position of trying to prevent the proliferation of new small systems and trying to stabilize existing, poorly operated small systems. States have attempted to deal with small systems in innovative ways. Some of these methods, if desirable, could be implemented rather easily in Virginia; others may require the grant of legislative authority to the Department of Health or other appropriate agency. The suggested methods listed below are complementary and are not meant to be mutually exclusive.

1. Permitting

Virginia, like most other states, requires the issuance of construction and operation permits to ensure that new waterworks comply with minimum design, material, and operations standards. Several states include in their plan-approval process additional controls which require financial, operational and management evaluations before approval is given. In Connecticut, this is achieved through the issuance of a Certificate of Public Convenience and Necessity to all waterworks. Maryland requires investor-owned systems to deposit funds in escrow.

2. Encouraging Interconnections with Existing Systems

Most states require or encourage new small waterworks to physically connect with a nearby waterworks when feasible. In Virginia, small systems have been encouraged to connect to nearby systems. Unfortunately, particularly in the western part of Virginia, the factors of distance and terrrain make interconnection practically impossible. In at least one state, it is the state which decides the

feasibility question. In Georgia, the state's regulations require connection of the new waterworks to an existing system if it is within a specified distance (e.g. 500 feet).

3. Satellite Management or Ownership

A satellite system is an arrangement by which a larger waterworks agrees to assume ownership, management, or operational responsibilities of a small waterworks. This approach has been successful, on a limited scale, in Virginia. Typically, a sanitary district or water authority has been the instrument under which the satellite concept has been successful. We have also seen some investors practice this satellite principle. Some states require satellite management where feasible. In Maryland, the state appoints a quasi-public agency to provide contract operation and maintenance when a waterworks is found, by the state, to potentially threaten public health.

4. Financial Assistance and Incentives and Water Supply Planning

Area-wide water supply planning can be used to discourage new small waterworks by identifying alternative methods of water supply to existing or planned development areas. In Virginia, the task of developing statewide water supply plans exists in the State Water Control Board. While the Water Control Board has developed the required plans, limited success has been achieved at the local level. Perhaps some local governments do not feel themselves to be a part of the planning effort. Some states institute water supply planning at the county level. Because the costs of such planning are high, state funds could be provided to assist counties in the securing of professional water supply consultants.

Funding through the Virginia Water Supply Revolving Fund could help all waterworks, expecially the small ones. The Fund would allow access to lower financing costs that would encourage more long-range planning by waterworks owners.

5. Increased Technical Assistance

Virginia is very fortunate in that it has four organizations which are specifically geared toward providing technical assistance to public water systems (especially small systems). These are: The Virginia Department of Health, Division of Water Supply Engineering; The Virginia Section of the American Water Works Association; The Virginia Rural Water Association; and The Virginia Water Project, Inc.

During state fiscal year 1989, the DWSE expended almost 8 man-years in performing sanitary surveys within the Commonwealth. Part of the sanitary survey process involves providing technical assistance to the waterworks operator/owner. Also, during this same time period, over 2.5 man-years was offered by the DWSE in providing technical assistance separate from the sanitary survey process. All of the professional field staff are graduate engineers. In addition, the DWSE provided almost two man-years in the training of waterworks personnel.

The Virginia Section of the American Water Works Association represents the technical and professional sectors of the water supply industry in Virginia. Presently there are 1155 individual members and 102 organizational members. Sixty-nine of the 102 organization members are waterworks utilities. The Virginia Section is in the process of developing particular technical assistance packages designed to assist small systems.

The Virginia Rural Water Association provides training, technical assistance, and representation to waterworks in communities with fewer than 10,000 people. This nonprofit organization provides its services for free to communities. Presently the Association has one full-time circuit rider and an executive director.

The mission of the Virginia Water Project, Inc., is to provide access to safe drinking water and sanitary wastewater facilities for all low-income rural Virginia residents at an affordable cost. The Water Project is a nonprofit agency. The Project is fortunate to be staffed with people of varied backgrounds in addition to providing technical assistance. The Project helps waterworks owners/operators develop the managerial systems necessary to provide effective and responsive service to their customers.

Potential Drawbacks

As with any control efforts, the methods described above may solicit varied responses. Possible adverse responses could include:

* Opposition from property owners, who might argue that limiting the creation of new small waterworks would restrict land development, thereby depriving them of maximum use of their property.
* Efforts to control the establishment of small waterworks may, in fact, become an obstacle to the provision of safe drinking water to isolated rural areas of the Commonwealth.

* Increased control of small systems could generate considerable opposition which may lead to an increase of water systems which operate just outside of the legal definitions and requirements.

Still, Virginia must find a way to be responsive, yet firm, to small systems so that regulatory actions are minimized and public health protection is maximized.

Money

In general, any increased costs experienced by a waterworks will be recouped through changes in water rates or changes in the price for the service or product that system provides. The cost of safe, dependable drinking water will increase. The construction cost increases may be minimized for government-owned waterworks if the Virginia Water Supply Revolving Fund (Fund) receives sufficient funds, through either direct general fund appropriations or special fees or assessments. The statute authorizing the Fund allows payback at interest rates down to zero percent; this flexibility will help minimize costs that the waterworks will incur. House Document 13 (1987) recommended that $10 million be appropriated to the Fund each year; presently, only an annual $100,000 is authorized.

The funds for the increased programmatic costs to state agencies must be approved by the General Assembly if Virginia is to retain primacy. The funds for capital and operational improvements at state-owned waterworks must be approved, in any event, to comply with the 1986 Amendments. This study identifies, but does not recommend, possible funding sources which may be available to fund these additional costs. These are:

1. *General Fund*: direct budget appropriation.
2. *Congress*: direct budget appropriation (Note: Congress, with Presidential support, appears to be ready to add $7 million to the coming budget for Water Supply Program grants. This would translate into approximately $200,000 for Virginia).
3. *Permit Fees - Construction*: The DWSE issues approximately 175 construction permits each year representing $92 million in waterworks construction. A project review fee based on project value could be implemented.
4. *Permit Fees - Operation*: There are 2,333 community and NTNC waterworks in Virginia. Each is required to have an Operation Permit. An annual permit fee (either a flat fee or one prorated by population served) could be

implemented.

5. *Water Use Fees*: Fees could be established for water users based on either the quantity of water used, the size of the waterworks, or on a per-service connection basis.
6. *Raw Water Withdrawal Fees*: A fee based on the quantity of water withdrawn from the state's surface and groundwater resources could be implemented.
7. *Contractor Tax*: An add-on tax or fee could be imposed on contractors (well driller, pump installers, construction companies) as a part of their license renewal fee.
8. *Driller Rig Fee*: A fee could be added to the cost of licensing drill rigs as motor vehicles.
9. *Fines or Settlements*: Fines or settlements collected as a result of enforcement actions against violators of water regulations could be specifically directed to the water supply program.
10. *State Lottery Proceeds*
11. *Virginia Tax Form*: A check-off box could be provided on Virginia tax forms for money designated for water supply improvements

It should be noted that some of these possible funding sources may be very limited in the amount of revenue they generate while others may have the potential to generate a large amount of revenue and could also serve as a source of funds for such programs as the public water supply supervision program, the Virginia Water Supply Revolving Fund, etc.

Additional Material Available for Review

The scope of the Drinking Water Program and EPA regulation of drinking water is far greater that can be adequately covered in a single report. The following additional background information is available for review at the office of the Division of Water Supply Engineering, Office of Water Programs, Virginia Department of Health, 109 Governor Street, Room 924, Richmond, Virginia 23219 (contact Allen Hammer, Director, at 804/786-5566).

* *State Costs of Implementing the 1986 Safe Drinking Water Act Amendments, Results and Implications of the 1988 Association of State Drinking Water Administrators' Survey of State Primacy Program Resource Needs*; prepared by Association of State Drinking Water Administrators and the Environmental Protection Agency; July 20, 1989

* *Danger on Tap, the Government's Failure to Enforce the Federal Safe Drinking Water Act*; Environmental Quality Division, National Wildlife Federation; 1987.

* *Danger on Tap, the Government's Failure to Enforce the Federal Safe Drinking Water Act*; Environmental Quality Division, National Wildlife Federation; FY 1988. Update.

* *Future Directions, the Virginia Department of Health, Six-Year Plan*; December 16, 1987.

* *Report on: A Peer Review of the Virginia Drinking Water Program*; Association of State Drinking Water Administrators; June 16, 1989.

* *The State of the States 1989*; Renew America.

* *Ensuring the Viability of New, Small Drinking Water Systems, a Study of State Programs*; U.S. Environmental Protection Agency; April 1989.

* *Water for Tomorrow, A Report on Water and Wastewater Needs in Virginia*; Virginia Water Project, Inc.; October 1988.

* Various EPA Regulations as published in the *Federal Register*, including:

04/02/86	Fluoride
09/30/86	Radionuclides
07/08/87	Volatile Organic Chemicals
11/25/87	SOCs and Monitoring for Unregulated Contaminants
12/11/87	SOCs and Monitoring for Unregulated Contaminants
10/28/87	Public Notification
12/11/87	Public Notification
02/26/88	Substitution List
02/19/88	Analytical Techniques
08/02/88	Primacy
08/18/88	Lead and Copper
09/30/88	Lead Prohibition and Public Notification Requirement Policy
09/15/88	Correction of Lead and Copper
04/10/89	Lead Contamination in School Drinking Water Supplies
04/10/89	Drinking Water Coolers
05/12/89	Citizen Suits Under SDWA
05/22/89	IOCs and SOCs (Phase II Regulations)
06/29/89	Filtration, Disinfection, Turbidity
06/29/89	Total Coliforms (including Fecal)
07/12/89	Administrative Enforcement Regulations
07/17/89	Analytical Techniques-Coliform