State of New Jersey
Division of the Ratepayer Advocate

POSITION PAPERS
ON THE
WATER AND WASTEWATER
RESOURCES OF NEW JERSEY

PREPARED BY
RATEPAYER ADVOCATE
BLOSSOM A. PERETZ
AND THE STAFF OF THE
DIVISION OF THE RATEPAYER ADVOCATE

May 2001

"...By protecting the quantity and quality of our water supplies - through smart growth, clean-up, increased study and awareness, and better management of existing supplies - we will ensure our water supplies are safe and available for generations to come."

Acting Governor Donald T. DiFrancesco
After Adoption by the State Senate of a
Package of Clean Water Bills
March 29, 2001

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PROLOGUE

These Position Papers on the state's most fragile natural resource - water - have been prepared to provide all available information as of May 2001 on emerging federal, state and local efforts to monitor, protect, conserve and defend this precious resource as well as the water industry's efforts to continue to provide safe and reliable potable water at affordable rates.

We hope that these papers will assist you and your community in understanding the changing circumstances affecting the state's water resources, the efforts necessary to protect them and the ways in which each individual, community institution and business can work together to ensure that our state's water supply and water quality will support our vision for a healthy and prosperous future.

ACKNOWLEDGMENTS

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May 2001

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Of all our natural resources water has become the most precious...
In an age when man has forgotten his origins and is blind
even to his most essential needs for survival,
water... has become the victim of his indifference.

Rachel Carson, *Silent Spring* (Boston:Houghton Mifflin 1962) p. 39.

I. Introduction

Water is a lifeline service essential to the survival of every living thing. Public health demands a clean and safe water supply. Yet water is cumbersome, expensive, and energy-intensive to move over long distances. As a result, most water is used near the point where it is drawn and the return flow (wastewater) often is returned to the same body of water. This makes water service the most local of all public utilities.

Essentially every aspect of the water supply is regulated: the quality of water in the natural environment, permitted withdrawals and uses of that water, the way in which water can be used for human consumption, the treatment of waste water, and its eventual return to the natural environment. These regulations occur at the federal, regional, state, and local levels - often with more than one level of regulation applying to a particular activity.

In addition, because of water's status as an essential human need combined with its relative scarcity and the expense of treating and distributing water to people, water is considered to be a natural monopoly. In essence, a natural monopoly means that it is impractical and uneconomical for more than one entity to provide the product in a particular geographic market. It is clear that it applies to water because usually only one water main is under our streets providing water into our homes.

As a natural monopoly, there is one regulation that applies to the retail distribution of treated water: its price is set by the government. Around the country, there are different ways for setting the price of water. In New Jersey, there are only two. If the local government, usually a municipality, owns the distribution network, that local government establishes the price for water within its local boundaries. If the distribution network is privately owned, or if it is owned by a local government that provides service outside of its boundaries, the price and other terms of service are established by the New Jersey Board of Public Utilities (BPU).

The Ratepayer Advocate has compiled this informational book to aid in the identification and analysis of emerging water issues in New Jersey, including areas where the water industry and energy industries impact each other.

II. Challenges and Opportunities

The next several years will be mixed with challenges and opportunities for New Jersey's water industry. We would summarize these challenges and opportunities as follows:

Challenges

- Finding cost-effective ways to provide water service to communities that are served by small water systems;
- Providing safe drinking water in compliance with all health standards in a cost-effective manner;
- Ensuring that all households can afford clean, safe, and reliable drinking water;
- Preserving natural water resources of sufficient quality and quantity to provide cost-effective and safe drinking water service; and
- Managing construction of new housing to minimize the impact on drinking water systems and natural water resources.

Opportunities

- Improving the efficiency of energy usage by water utilities to reduce costs and improve the natural environment;
- Exploring innovative ways of setting water rates that meet the needs of a changing water utility industry, while protecting consumers;
- Leveraging water utilities' existing resources to provide new services to customers and to other utility service providers; and
- Engaging electricity suppliers in joint water-energy conservation programs.

The Division of Ratepayer Advocate looks forward to working with the utility industry and policy makers at the state, local, and national levels to meet these challenges and to find more effective ways to meet the needs of New Jersey's consumers. The opportunity exists to improve the operations of our water utilities in ways that simultaneously reduce the risk of investing in a water utility, enhance the quality of New Jersey's natural environment, and improve the quality and affordability of water service for consumers.

III. Overview of New Jersey's Water Industry

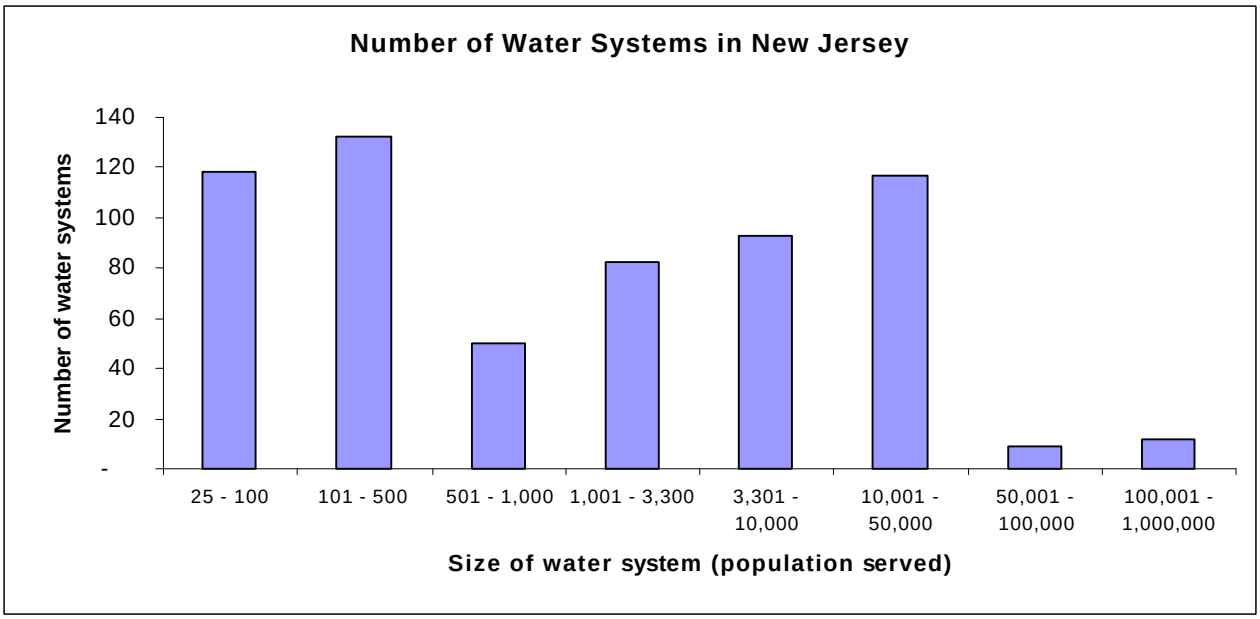
According to the U.S. Environmental Protection Agency (EPA), New Jersey has more than 600 community water systems that collectively serve 7.6 million people.[1] The U.S. Census Bureau recently reported that New Jersey's population, as of April 2000, is approximately 8.4 million people.[2] This means that more than 800,000 people in New Jersey (roughly 9.5% of the population) rely on private wells, or other sources, for their water supply.

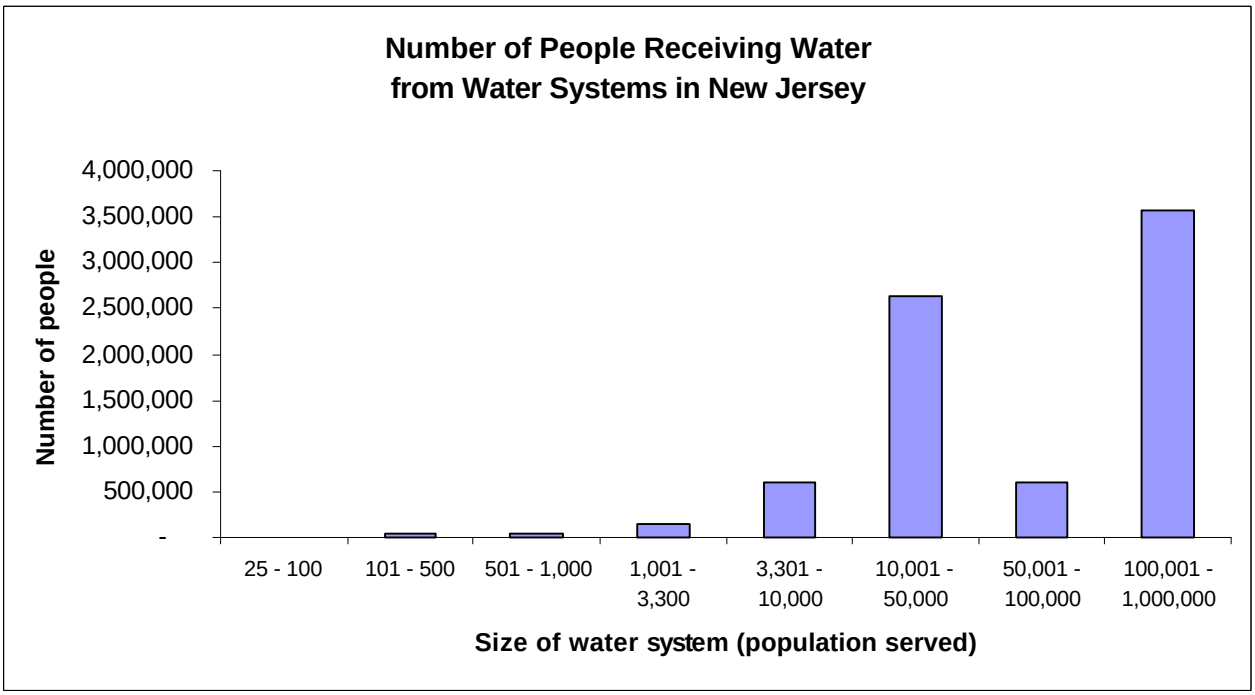
Table 1 summarizes the diversity within New Jersey's water industry. Just 21 large water systems provide the water for more than 54% of the people who receive their water from a water system. Another 117 medium-sized water systems provide service to about 35% of the people who receive piped water. The remaining 500 water systems collectively serve fewer than 800,000 people, or just over 10% of the people connected to water systems.

[1]U.S. Environmental Protection Agency, *Water Industry Baseline Handbook (Second Edition)* (March 2000).

[2]U.S. Census Bureau, "Census 2000 Data for the State of New Jersey," <http://www.census.gov/Press-Release/www/2001/tables/redist_nj.html> (released March 2001).

Table 1
Community Water Systems in New Jersey[3]





[3]Source: U.S. EPA, *Water Industry Baseline Handbook (Second Edition)* (March 2000).

New Jersey's water industry is almost evenly divided between government-owned and private investor-owned systems. Table 2 shows the mix of public and private systems by system size.

Table 2
Community Water Systems in New Jersey by Ownership Type

System Size (Population Served)	Number & Percent of Municipal Water Systems		Number & Percent of Privately Owned Systems	
25 - 100	11	3%	107	36%
101 - 500	35	11%	97	33%
501 - 1,000	23	7%	27	9%
1,001 - 3,300	63	20%	19	6%
3,301 - 10,000	73	23%	20	7%
10,001 - 50,000	99	31%	18	6%
50,001 - 100,000	7	2%	2	1%
100,001 - 1,000,000	6	2%	6	2%
Total	317		296	

Source: U.S. EPA, *Water Industry Baseline Handbook (Second Edition)* (March 2000).

Table 2 shows that most private investor-owned systems are quite small, with 80% of the systems serving fewer than 1,000 people each. In contrast, most of the government-owned systems have a larger customer base, with 80% of the systems serving more than 1,000 people each and more than one-third of the systems serving more than 10,000 people each. Simply put, very small water systems tend to serve individual real estate developments or subdivisions and are nearly all privately owned. In contrast, larger water systems tend to serve entire communities and are predominantly owned by municipal governments.

These water systems are also clearly divided in respect to the source of water (groundwater or surface water) that serves New Jersey's residents. **Groundwater** is the name for water that is drawn from underground sources through wells; while **surface water** refers to water that is drawn from above-ground sources such as rivers, lakes, and streams. Table 3 shows the source of water used by system size.

Table 3
Municipal Water Systems in New Jersey by Source Water Type

System Size (Population Served)	Number & Percent of Groundwater Systems		Number & Percent of Surface Water Systems	
25 - 100	118	23%	0	0%
101 - 500	132	25%	0	0%
501 - 1,000	47	9%	3	3%
1,001 - 3,300	76	15%	6	6%
3,301 - 10,000	74	14%	19	20%
10,001 - 50,000	69	13%	48	52%
50,001 - 100,000	4	1%	5	5%
100,001 - 1,000,000	0	0%	12	13%
Total	520	Groundwater Systems	93	Surface Water Systems

Source: U.S. EPA, *Water Industry Baseline Handbook (Second Edition)* (March 2000).

Table 3 shows that essentially all small water systems in the State (those serving fewer than 1,000 customers) rely on groundwater sources. In contrast, all the very large systems (those serving more than 100,000 people) rely on surface water sources. These differences have important implications for policy makers and consumers, particularly when new water quality or treatment regulations are proposed that would affect only groundwater sources or only surface water sources.

In 1996, the American Water Works Association (AWWA) conducted a nationwide survey for larger water systems. The survey, called Water:\Stats, contains fairly complete data for 28 water systems in New Jersey, providing water (at either wholesale or retail cost) to more than 4.4 million people.

While not representing the entire water industry in New Jersey, Table 4 summarizes the information compiled by AWWA for these 28 water systems. This table, on every element reported upon, shows the remarkable diversity within New Jersey, even among relatively large

water systems. For example, depending on where a person lived in 1996, the typical residential water bill could have varied from less than $10 per month to more than $50 per month.

Table 4
Comparison of Selected Large Water Systems in New Jersey (1996 Data)[4]

	Private Ownership	Municipal Ownership	Total
Water Systems	16	12	28
Population Served	3,069,724	1,377,238	4,446,962
Average Residential Use (gallons per year per customer)	86,385	152,678	103,687
Average Annual Bill (average residential customer)	$318	$258	$302
Range of System Sizes (retail population served)	11,000 - 750,000	11,000 - 275,000	11,000 - 750,000
Range of Average Residential Use (gallons per year per customer)	72,000 - 143,000	60,000 - 250,000	60,000 - 250,000
Range of Average Annual Bills	$174 - $500	$117 - $640	$117 - $640

Source: American Water Works Association, *Water:\Stats Database*

Regulating an industry this diverse is not easy. The wide range of ownership, rates, water consumption, and size present unique challenges for regulators, policy makers, consumers, and the industry itself. There is no "one size fits all" solution for any problem that involves the water utility industry. See **Appendix A** for a complete list of all private, investor-owned water and wastewater utilities currently operating in New Jersey.

[4]The following companies or municipal-owned water systems were used for this comparison: Brick Township Municipal Utilities Authority, Bridgeton Water Department, Elizabethtown Water Company, Freehold Borough Water Department, Gordon's Corner Water Company, Merchantville-Pennsauken Water Commission, Middlesex Water Company, Monroe Township Municipal Utilities Authority, Newark Division of Water/Sewer Utility Department, New Jersey American Water Company (10 separate listings for different parts of its system), Passaic Valley Water Commission, Pemberton Township Water Department, City of Rahway Water Department, Shorelands Water Company, Southeast Morris County Municipal Utilities Authority, Sparta Township Water Department, United Water-New Jersey, United Water Toms River, Wayne Township Water Department.

IV. The Regulation of Drinking Water Quality in New Jersey

The quality of drinking water is regulated by the New Jersey Department of Environmental Protection (DEP) and the U.S. Environmental Protection Agency (EPA). EPA and DEP have regulations governing the presence of more than 100 potential chemical and biological contaminants in drinking water, as well as dozens of prescribed methods for testing and treating drinking water.

It takes many years to establish a new national drinking water quality regulation. EPA begins the process by reviewing scientific studies and compiling data that may support a new regulation, such as drinking water disinfectants, or a change in an existing regulation such as the new standard for arsenic proposed to be released in 2002. If a regulation appears warranted, then EPA usually will involve various representatives of the water industry, the scientific community, and the public at large to participate in the process of reviewing the data. After this investigative stage, EPA must prepare an economic and public health analysis of its options. This study, called a Health Risk Reduction and Cost Analysis (HRRCA), is designed to present and evaluate the scientific and economic data that are available. In other words, a HRRCA tries to answer the questions: What would a regulation cost to implement? How many lives would be saved? What other health benefits would there be? Are there other costs or benefits that should be evaluated?

Following the HRRCA, EPA will issue a proposed regulation and provide the public with several months to evaluate the proposal and file comments. EPA then will evaluate the comments and prepare a final regulation, a process that can take several months to complete. Once the final regulation is published, water utilities will then have several years before they must comply with the new regulation. This time lag is required in order for utilities to install new equipment, change treatment processes, implement new testing procedures, and otherwise modify their operations to comply with the new requirements. During this transitional period, state agencies like DEP also must modify their regulations, reporting requirements, and enforcement procedures to cover the new regulation.

From the start of EPA's investigation to the time when utilities actually comply with a new regulation can take ten years or more. While the process of setting new regulations can be time-consuming, these delays also can help to achieve consensus and increased understanding about the hazards associated with particular contaminants. In addition, many utilities will use that time to test new technologies and operating procedures - both to improve their own operations and lower contaminant levels without having to build whole new treatment processes.

It should be emphasized that the water utility itself is the primary line of defense between consumers and potential waterborne diseases and carcinogens. Water quality regulation is based on after-the-fact reporting (a utility will take samples, test them, then report the results to DEP). But the primary responsibility for testing and treating the water, and identifying potential hazards in the water, falls on the water utility itself.

In 2000, a bitter lesson was learned as to what can happen when a water supplier fails to perform its role as the first line of defense. In May 2000, six people died in Walkerton, Ontario, Canada from e. coli contamination in the city's water supply. Local water officials apparently were aware of the contamination but failed to notify the public and health officials for a week. That week made all the difference, costing several people their lives. The local water officials were apparently also aware that there were problems with the water treatment equipment, but didn't understand the potential seriousness of those problems. A more detailed discussion of federal regulation of drinking water is provided in **Appendix B**.

A. The Regulation of the Supply of Drinking Water in New Jersey

The physical supply of water – that is, the withdrawal of water from the ground or a stream – is regulated by the New Jersey Department of Environmental Protection (DEP) and the Delaware River Basin Commission (DRBC). DRBC is a federally authorized interstate compact among the states that border on the Delaware River and its tributaries. These states are Delaware, New Jersey, New York, and Pennsylvania. DRBC has existed for 40 years and its programs include "water pollution abatement, water supply allocation, permitting, water conservation initiatives, regional planning, drought management, flood control and recreation."[5]

In order to manage the quality and quantity of water within the Delaware River Basin,[6] DRBC requires that anyone withdrawing more than 10,000 gallons per day from a well must register with the relevant state agency (DEP in New Jersey). In addition, withdrawals of more than 100,000 gallons per day must be specifically permitted by DRBC. Withdrawals of more than one million gallons per day are subject to additional requirements, and all surface water withdrawals are subject to various fees that help defray the cost of various reservoir projects within the Basin.[7]

In addition to assisting the DRBC, the NJDEP has separate authority to set standards for the quality of the state's water resources. In particular, NJDEP has developed detailed quality standards for both groundwater[8] and surface water.[9]

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[5]DRBC, Delaware River Basin Commission Overview, <http://www.state.nj.us/drbc/over.htm>, accessed on 4/3/01.

[6]The Delaware River Basin is comprised of all waterways which drain into the Delaware River starting at the river's source in upstate New York and includes the eastern border of Pennsylvania, the western border of New Jersey and Delaware.

[7]DRBC, Delaware River Basin Water Code (1996).

[8]DEP, Groundwater Quality Standards, N.J.A.C. 7:9-6.

[9]DEP, Surface Water Quality Standards, N.J.A.C. 7:9B. Note also that DEP has proposed several amendments to these standards, published in the *New Jersey Register* on December 18, 2000.

B. The Regulation of Drinking Water Rates and Services in New Jersey

The price of drinking water, and standards for providing adequate and reliable service to customers, are established by the government of each state. For privately owned utilities, rates and service standards are set by the New Jersey Board of Public Utilities (BPU or Board). Local government-owned utilities such as municipal water systems are allowed to establish their own rates and service standards, as long as they do not sell water outside of their municipal boundaries. If a local government utility does provide service outside of its boundaries, then the BPU will establish rates and service standards. A more detailed discussion of regulation of drinking water by the State of New Jersey is attached as **Appendix C**.

Under the New Jersey Water Supply Public-Private Contracting Act, government-owned utilities are authorized to enter into contracts with private companies for the provision of drinking water supply services. Under a public-private contract, the government utility continues to be responsible for setting rates for customers and establishing service standards. The services themselves, however, would be provided by a private company and that company's specific obligations would be set by contract with the municipal utility. In addition, the law permits the private company to pay a concession fee (an up-front payment) to the government utility. The private company is then permitted to recover that fee through future charges to the utility which, of course, will be passed on to consumers through the water rates. A more detailed discussion of Water and Sewer Options for Municipalities/Public-Private Partnerships can be found later in this publication.

V. Competition and Deregulation

Another factor that has greatly influenced competition within the water and wastewater industries has been provided by deregulation throughout other U.S. utilities, particularly the surge of restructuring among electric and gas utilities. The water and wastewater industries are being forced to reexamine traditionally-held assumptions as regulatory change forces competition among energy utilities. Among energy utilities we have seen previously integrated services of production, distribution and marketing *"unbundled"* to create a new area of competition. While distribution will generally remain a regulated monopoly, structured competition will enable multiple firms to compete as either producers and/or retail marketers. While water and wastewater are not as easily transportable as gas or electricity, certain water services may be able to be unbundled. Within certain regions, there have been demographic shifts from city to suburb where larger systems with reserve treatment capacity are providing more cost-effective production to these communities, as opposed to the development or upgrading of nearby smaller plants. Regulatory change supportive of such economies of scale could work to foster the encouragement of inter-utility wholesale agreements.

As a result of deregulation in this area, speculation has developed that mergers and strategic alliances may develop between newly competitive energy providers searching for customers and the water and wastewater utilities that still retain large captive customer bases. Competitive utility providers are looking to merge metering, billing, customer service, and back office operations across multiple utilities. With several pending bills in Congress proposing to lift restrictions on energy providers from expanding into other utility sectors, the potential for future utility realignment is emerging. Looking forward, the ultimate results of competition and deregulation in the water and wastewater industries have yet to be determined. We have other utility models already in place for comparison and evaluation.

A. Can Water Utilities Benefit from Restructuring and Deregulation?

Water utility regulators and consumer advocates will need to monitor carefully regulatory changes taking place in the other utility industries and determine whether these changes are appropriate for water. The industry will need to define clearly its goals and objectives for providing safe and reliable water service. Finally, the water industry will need to develop effective methods to demonstrate and communicate the water industry's uniqueness to legislators, regulators, consumers, and other stakeholders when decisions are being made about new forms of regulation.

For the nation's public utility industries – now known widely as "network" industries – change has become a constant. Not long ago, utilities were understood to be vertically integrated monopolies, whose performance was assured either through public ownership or through economic regulation. Today, portions of the telecommunications, electricity, and natural gas utilities are undergoing the last phases of a transformation from "natural" monopolies, to institutional monopolies, to unbundled service providers, to competitive enterprises. As

competition emerges, traditional economic regulatory controls are relaxed or removed from certain segments of each industry. Deregulation presents numerous challenges and opportunities to the industry that is being restructured, as well as the customers served.

Restructuring and deregulation present clear opportunities for water utilities: to enhance the value of purchased services; to find new ways to use existing resources; to form new partnerships, to play new service roles, and to identify structural options for the water industry. Restructuring and deregulation also present some significant challenges. The water industry must:

- design an appropriate regulatory framework;
- engage in strategic planning;
- ensure quality and availability of water resources;
- meet emergent customer expectations;
- cope with impacts on state and local taxes;
- develop expertise in wise purchasing; and
- assess the adequacy and reliability of electric service.

The water industry of 2010 or 2020 will look very different from the water industry of 2001. Change will occur quickly, as water utilities find themselves participating in a restructured network service industry that bears little resemblance to the monopolistic utility industry of the 19th and 20th Centuries.

B. The Consequences of Energy Deregulation on Water Resources

One of the most important consequences of increased competition in the electricity industry is the effect that it will have on water resources. Almost every commercial form of large-scale energy production requires access to large amounts of water, usually on the order of millions of gallons per day. The water is primarily used for cooling and to create steam that drives the turbines that produce electricity.

> "The production of electricity requires access to large quantities of water. Regardless of location or system size, the restructuring of the electric industry is going to have an effect on local water resources. Dozens, perhaps even hundreds, of new power plants will be built. Most of those plants will require water for cooling and to drive steam turbines. Local and state environmental regulators may see their resources stretched very thin as they try to respond to all of the siting and permit applications. Water utilities need to monitor all of these actions in their local areas to ensure that the impact of these decisions on local water utilities, and the water resources on which they rely, are being fully considered. Among the impacts are not just water quantity issues, but also the effect on water quality."[10]

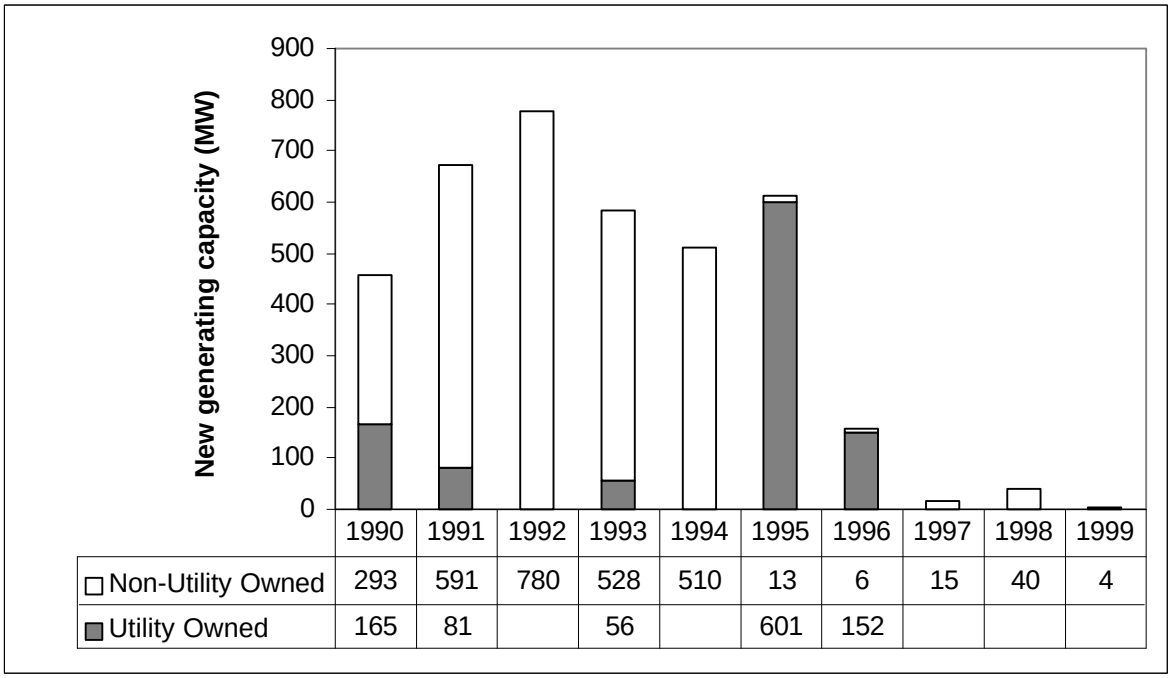
These are not hypothetical concerns. According to the PJM Interconnection, thousands of megawatts of additional power production are planned in New Jersey each year for the next few

[10]Beecher and Rubin, *supra*, p. xxi.

years.[11] While all of this capacity probably will not be built, local communities, water utilities, and others should participate in the planning process which includes evaluating the potential impact of a new plant on local and regional water resources. By way of comparison, Table 5 shows the electric generating capacity in New Jersey during the 1990s. The total, less than 4,000 megawatts in the decade, is dwarfed by the plans for new generation in the state during the next five years. Due to the introduction of competition in the energy industry, we also have to be mindful of our neighboring states whose energy needs will have an impact on our environment and water resources. For example, of the twenty one new large power plants currently proposed for New York State, the vast majority would be cited on the Hudson River or in New York City. The proposed generating facility in Rockland County will also have a direct impact on New Jersey's watersheds. State agencies, local governments, water utilities, and others must find the resources and expertise to participate in the siting and planning process for a greatly increased number of power plants.

Table 5
New Electric Generating Capacity in New Jersey - 1990-1999 (in MW)[12]

Additional pressure on water resources could come from the increased demand for so-



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Non-Utility Owned	293	591	780	528	510	13	6	15	40	4
Utility Owned	165	81		56		601	152			

[11]PJM Interconnection, LLC, "Generation Interconnection Request Queues," <http://www.pjm.com/geninter/geninter.html>, accessed on 4/4/01.

[12]"MW" or "megawatt" is a measure of electricity consumption equivalent to the use of 1,000,000 watts of power over a period of one hour.

called "green power" – that is, power that is generated in an environmentally friendly manner. According to the U.S. Department of Energy, the major source of "green power" within New Jersey is hydroelectric power. New Jersey currently has only 7 hydroelectric facilities (with a combined capacity of less than 400 megawatts), producing less than one percent of the state's electricity.[13] Any attempts to increase the utilization of these facilities, or to construct new ones, will raise important considerations for water utilities and others concerned about the quantity and quality of New Jersey's water resources.

A timely example of the link between electricity restructuring and the state's water resources is occurring as this paper is being written. Early in 2001, plans for two proposed power plants in New York State raised serious concerns among New Jersey elected officials about the impact on water supplies and flows in the Ramapo River in Bergen County. The plants, proposed for the Torne Valley in Rockland County, New York, would have a total capacity of nearly 2,000 megawatts and are just across the Bergen County, New Jersey border. In fact, the plants are within a few hundred yards of the Ramapo River which feeds the Wanaque Reservoir in New Jersey. That reservoir provides drinking water for about one-quarter of New Jersey's population. State and local officials from New Jersey, as well as residents and environmental organizations, have objected to the plants' potential impact on local water supplies, as well as on the quality of water in the Ramapo River.[14]

[13]U.S. Department of Energy, "Current Renewable Energy Projects in New Jersey," <http://www.eren.doe.gov/state_energy/states_currentefforts.cfm?state=NJ>, accessed 4/4/01.

[14]See, e.g., "N.J. Officials Fight 1,100-MW N.Y. Plant; Developer Calls Water Use Minimal," *Utility Environment Reporter* (Feb. 9, 2001), p. 13; "Utility May Trim Plans for Generator," *The (Bergen County) Record* (Mar. 23, 2001); "Bergen Battling NY Power Plants - Schuber, Mayors Say Projects Threaten Water Supply," *The Record* (Feb. 2, 2001); "N.Y. Plants Worry N.J. Governor," *Generation Week* (Mar. 14, 2001).

VI. Protecting Drinking Water Quality

More than 100 separate drinking water contaminants are regulated by the EPA and the DEP. Some of the most commonly found contaminants are as follows:

Cryptosporidium is a microscopic, disease-causing parasite that is spread through human or animal fecal matter. It causes cryptosporidiosis which can cause diarrhea, cramps and flu-like symptoms. It can be fatal for those with weak immune systems. The largest reported case of cryptosporidium was in 1993 when the disease got into the Milwaukee water supply system killing 50 people and causing 400,00 others to get ill. Cryptosporidium is resistant to chlorination. The best treatment is filtration. Large water utilities are required to test water sources monthly for the bacteria.

Giardia is spread through human or animal fecal matter. The parasite can cause the disease giardiasis, also know as beaver fever. This parasite can survive in water for one to three months, and symptoms of the disease, including diarrhea, fatigue and cramps can persist for months. Public water systems using surface water are required to disinfect water so that at least 99.9% of the parasites are killed. Chlorination is effective in killing the parasite. Boiling water also kills the parasite.

Lead occurs in water caused by old lead service lines or in-house plumbing in homes built more than 30 years ago and is a serious problem. Lead can also be found in soldered joints of copper pipes and in brass fixtures. For infants and young children, chronic exposure can cause brain damage, learning disabilities and hyperactivity. In adults lead has been linked to kidney problems, high blood pressure, anemia and nerve damage. Flushing the water lines by running the faucets for a few minutes at the start of the day can significantly lower lead levels.

Mercury There are several types of mercury. Exposure to high levels of inorganic mercury can cause kidney damage, nervous system effects, nausea and diarrhea. Inorganic mercury enters the water from natural deposits, manufacturing plants, pesticides, fungicides, old plants, factories, cemeteries, landfills, and atmospheric residue from coal generated power plants. Metallic mercury or organic mercury are hazardous contaminants that build up in fish and other animals that are eaten by people. This type of mercury presents a serious danger to people in any medium. Inorganic mercury is not as hazardous and does not present a danger when showering or bathing.

Nitrate is common in rural areas where it can enter the drinking supply from chemical fertilizer and animal manure. Nitrate is a hazard primarily to babies and pregnant women because excessive levels of nitrate in an infant's digestive tract can starve the baby's system of oxygen. In the worst case, brain damage or death can occur.

Radium is a naturally occurring radioactive substance that is present in small amounts in many water supplies. Radium was once advanced as providing a health benefit and sold in bottled water. It is now known to cause cancer. Exposure to radium has been associated with an

increased risk of bone and nasal cancers. Three types of radium are cause for concern in drinking water: Radium 224, 226 and 228. The health standard for Radium 226 and 228 is 5 picocuries per liter. No standard has been set for Radium 224 yet. Currently, public water suppliers deal with radioactive water by diluting it with uncontaminated water.

It is expected that in the next few years, additional regulations will be issued that could improve the level of public health protection from drinking water, but that also could increase the cost and complexity of providing safe drinking water in New Jersey.

The federal Safe Drinking Water Act requires the EPA to develop a list of drinking water contaminants that are being investigated and may result in future regulations. This list, officially known as the Contaminant Candidate List (CCL), was published by EPA in March 1998.[15] The EPA is required to revise the list every five years, so the next version of the list is not due until February 2003. In the interim, EPA is required to decide whether it will propose regulations for at least five contaminants on the CCL. This determination must be made by August 2001 (and every five years thereafter).[16]

In addition to any new regulations that may come from the CCL, EPA has proposed several additional regulations that may have a significant effect on New Jersey. According to a summary prepared by the American Water Works Association, the following new or changed regulations are expected this year:[17]

- Permissible arsenic levels in water
- Enhanced surface water treatment
- Disinfectants and disinfection by-products
- Methyl tertiary butyl ether (MTBE)
- Radionuclides
- Radon

A brief discussion of each of these expected regulatory actions follows. However, the details of each potential regulation are not known as of April 2001, and certainly may change before they become effective. This discussion is included to highlight possible changes that may affect both the safety of drinking water and the cost and complexity of providing that water to

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[15]U.S. EPA, "Announcement of the Drinking Water Contaminant Candidate List," 63 *Federal Register* 10273-10287 (Mar. 2, 1998).

[16]U.S. EPA, "Occurrence and Contaminant Selection," <http://www.epa.gov/safewater/standard/pp/cclpp.html>, modified 1/9/01.

[17]American Water Works Association, "2001 Regulatory Calendar," *Opflow* (Mar. 2001), pp. 12-13.

New Jersey consumers. The cost and complexity of providing clean potable water in New Jersey is at least as significant as any specific regulation adopted by the EPA.

A. Arsenic

The federal standard for arsenic in drinking water, at 50 parts per billion (ppb), has been in effect since the 1940s. Last year, EPA proposed to lower the standard to 5 ppb and asked for comments on alternatives of 3, 10, and 20 ppb.[18] In the closing days of the Clinton administration, EPA approved a final regulation for arsenic of 10 ppb, which was published shortly after President Bush took office.[19]

In March 2001, EPA Administrator Christine Todd Whitman announced that the agency was suspending the new arsenic regulation and would conduct further analysis of the costs and benefits of lowering the standard to 10 ppb. It now appears that it will be some months before EPA establishes a new arsenic standard. The agency has stated, however, that it expects the new standard to become effective in 2006.[20]

New Jersey utilities and policy makers must determine if New Jersey will be affected by a new arsenic standard. From the available data, it appears that at least some water utilities in New Jersey will need to take action to meet a new arsenic standard. While New Jersey certainly isn't the most affected state in the country, studies conducted by EPA and the U.S. Geological Survey (USGS) show that there communities in New Jersey with significant levels of arsenic in the groundwater.

USGS compiled the results of arsenic tests from a 15-year period in a comprehensive data analysis.[21] For New Jersey, the study includes more than 1,300 samples taken between 1981 and 1996 in every county in the state. The results for New Jersey are shown in Table 6.

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[18]U.S. EPA, "Notice of Proposed Rulemaking, National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring," 65 *Federal Register* 38887-38983 (June 22, 2000).

[19]U.S. EPA, "National Primary Drinking Water Regulations; Arsenic," 66 *Federal Register* 6975-7066 (Jan. 22, 2001).

[20]U.S. EPA, Office of Groundwater and Drinking Water, "Arsenic," <http://www.epa.gov/safewater/arsenic.html>, updated 4/2/01.

[21]Focazio, M.J., Welch, A.H., Watkins, S.A., Helsel, D.R., and Horn, M.A., 1999, *A retrospective analysis on the occurrence of arsenic in groundwater resources of the United States and limitations in drinking-water-supply characterizations,* USGS Water Resources Investigations Report 99-4279 (USGS 1999). Results for New Jersey were calculated by analyzing the USGS arsenic data base.

Table 6
Arsenic Concentrations in New Jersey Groundwater - 1981-1996

County	Number of Samples	None detected	Under 5 ppb	5 to 10 ppb	10 to 20 ppb	20 ppb and over	Highest arsenic (ppb)
Atlantic	114	104	6	3	1		13
Bergen	36	19	12	5			7
Burlington	71	46	25				2
Camden	87	57	28	1	1		19
Cape May	28	22	6				1
Cumberland	46	44	2				4
Essex	12	6	5	1			7
Gloucester	193	112	66	6	5	4	50
Hudson	1	1					
Hunterdon	56	23	17	12	4		17
Mercer	55	32	12	7	3	1	23
Middlesex	45	40	3	2			6
Monmouth	10	9	1				2
Morris	363	189	120	36	18		17
Ocean	96	67	29				2
Passaic	12	8	4				4
Salem	47	33	13	1			7
Somerset	17	3	6	6	2		19
Sussex	25	19	5		1		15
Union	7	4	3				2
Warren	33	30	3				2
Statewide	1,354	868	366	80	35	5	50

Source: Calculated from database used by Focazio, *et al.* (USGS 1999).

Table 6 shows that approximately 64 percent of the samples in New Jersey had no detectable level of arsenic in the groundwater. Of the 36 percent of samples that did show arsenic, only about one in every four had a level of arsenic above 5 ppb. In fact, 9 counties in the state had no arsenic results that showed a level above 5 ppb. In contrast, 8 counties had at least

one test that showed arsenic concentrations above the level of 10 ppb contained in the EPA's January regulation, with one county having a test result showing as much as 50 ppb of arsenic.

EPA developed a separate Arsenic Occurrence and Exposure Database in support of its arsenic regulation. EPA's database is limited to drinking water supplies and contains the results of more than 100,000 water samples nationwide over the period of several years. EPA's database includes the results of more than 1,900 water samples taken from New Jersey drinking water utilities. Of those, only 142 results (less than 7.5%) detected any arsenic. Table 7 summarizes the data for New Jersey water suppliers.

Table 7
Arsenic Concentrations in New Jersey Drinking Water Systems

	None detected	Under 5 ppb	5 to 10 ppb	10 to 20 ppb	20 ppb and over	Total
Number of samples	1,793	102	24	14	2	1,935
Number of water systems	410	37	13	7	2	469

Source: Calculated from US EPA's Arsenic Occurrence and Exposure Database.

It appears, then, that a more stringent arsenic regulation will affect a few water utilities in New Jersey. Those utilities are likely to be clustered in the few counties in the state that have significant arsenic concentrations in the groundwater. For those utilities that do not meet a new arsenic standard, the compliance cost will be substantial. A comprehensive cost estimate for arsenic treatment, prepared for the American Water Works Association Research Foundation, found that the total national cost for complying with an arsenic standard of 10 ppb will be approximately$495 million per year.[22] That cost would escalate dramatically if the standard is made even more stringent; such a standard of 5 ppb could result in an annual cost of more than $1.2 billion per year.

[22]Michelle M. Frey, *et al.*, *Cost Implications of a Lower Arsenic MCL* (AWWA Research Foundation 2000), p. ES-4.

B. Methyl Tertiary Butyl Ether (MTBE)

MTBE is added to gasoline, primarily in major metropolitan areas during the summer months, to reduce the level of carbon monoxide and ozone levels from automobile emissions. It has recently been discovered, however, that MTBE is finding its way into the water supply, creating serious taste and odor problems.

In the early 1990s, EPA required gasoline refiners to add MTBE to gasoline sold in New Jersey and 18 other states with air quality problems. Unfortunately, a decade later, this gasoline additive is causing environmental problems of its own, infiltrating drinking water across the United States, including hundreds of wells in New Jersey.

MTBE moves very easily through soil. In fact, it migrates into groundwater more rapidly than other chemical compounds present in gasoline. Once in groundwater, it is slow to degrade. The primary source of MTBE in ground water appears to be petroleum releases from leaking underground storage tanks, fuel pipelines, refueling facilities and accidental spills. In addition, leaks from motor boats can cause additional contamination in rivers, lakes, and reservoirs. Studies of laboratory rats show that exposures to high levels of MTBE can lead to the formation of tumors. As yet, there is no direct evidence that MTBE is carcinogenic to humans and insufficient evidence of the health risks associated with exposure to low levels of MTBE.

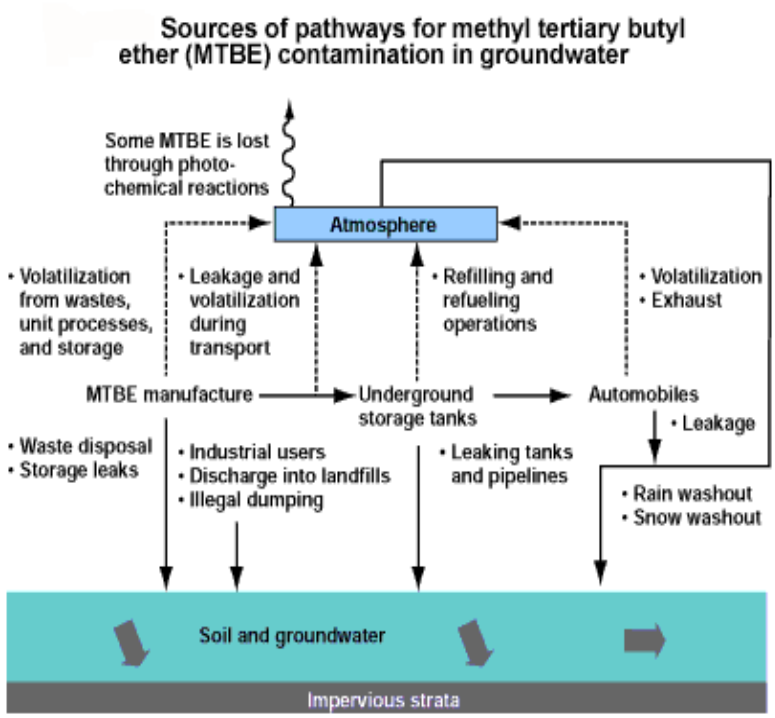
There is mounting evidence that MTBE can cause other health problems. In February 2000, the Rutgers Environmental and Occupational Health Sciences Institute released a study indicating that high levels of MTBE, 1.5 percent or more, may cause headaches, eye irritation and fatigue in some people. Only gasoline with 11 percent MTBE is currently sold in New Jersey.

In 1985, DEP started recommending that water suppliers test drinking water for MTBE. At that time, an acceptable level of MTBE was established at 700 ppb. As more was learned about the additive, DEP reduced this figure to 70 ppb. Other states, such as Maine and California, have established significantly lower MTBE standards (35 ppb in Maine and 5 ppb in California).

What Happens to MTBE In The Environment?

MTBE has been detected at low levels in ground water in numerous locations nationwide and at elevated levels in some municipal drinking water wells and reservoirs. MTBE is very soluble and once released, moves through soil and into ground water more rapidly than other chemical compounds present in gasoline. Once in ground water, it is slow to biodegrade and is more persistent than other gasoline-related compounds. The primary source of MTBE in ground water appears to be petroleum releases from leaking underground storage tanks, fuel pipelines, refueling facilities and accidental spills. In lakes and reservoirs motorized water craft are the

primary source of MTBE contamination, gasoline spills, runoff, and ground water flow contribute to a lesser degree.



How Does MTBE Affect Human Health?

Currently there is little information available about the effects of drinking water contaminated with MTBE on humans. Research over the past few years has centered on whether MTBE has the potential to cause cancer. In several studies, laboratory rats given high doses of MTBE developed leukemia, lymphomas, and testicular tumors. Two other studies found that rats forced to breath high doses of MTBE developed kidney and liver cancers. Based on these findings, the EPA has concluded that MTBE poses a potential for cancer threat to humans at high doses. However, because of uncertainties and limitations in the data, the EPA has been unable to make a confident estimation of risk at low exposure levels.

In February 2000, the Rutgers Environmental and Occupational Health Sciences Institute (Rutgers) released a study showing that MTBE can clearly cause, in some people, headaches, eye irritation and fatigue. The Rutgers researchers started with a group of 12 individuals who had complained of MTBE symptoms. They then assembled a second group of 19 subjects who had no known MTBE sensitivity. The test subjects were each placed in a room and exposed to levels of fumes comparable to those they would breathe at a gasoline station while refueling their car. Each subject was exposed to clean air, plain gasoline fumes, fumes with 11 percent MTBE and

fumes with 15 percent MTBE. Respiration and heart rates were monitored. The control group showed no significant difference in any of the test levels. The MTBE-sensitive group showed no difference with the first three low level exposures. When the fumes rose to 15 percent, so did the number of complaints of headaches, eye irritation and nausea. Even though the study conclusively showed that at, high levels MTBE can cause certain side effects, only gasoline with 11 percent MTBE is currently sold in New Jersey.

Occurrence Of MTBE In New Jersey

Generally, the levels of MTBE in the nation's ground water supply are low. However, when compared to the incidence of MTBE contamination in other states, New Jersey has a higher incidence rate. Since 1985, the NJDEP started recommending that water suppliers, including municipal water suppliers, test for MTBE. At that time, an acceptable level of MTBE was established at 700 parts per billion (ppb). However, after more was learned about the additive, the DEP reduced this figure to 70 ppb. Some jurisdictions such as Maine and California have MTBE standards of 35 ppb and 13 ppb, respectively.

An ongoing sampling of private, mostly residential wells by the Passaic County Health Department since 1991 found 202 wells were tainted with MTBE. One well registered levels of MTBE at more than 200 ppb, nearly three times the state standard. According to the EPA database between March 1997 and August 1998 public water suppliers throughout the state detected MTBE in their drinking water on 200 occasions. These included nine water companies in Bergen, Passaic, and Morris counties. In what is believed to be the first lawsuit of its kind in New Jersey, 94 south Jersey residents have sued two gasoline companies claiming that leaking underground gasoline tanks containing MTBE have contaminated their drinking water.

How Do We Remediate MTBE?

The chemical properties of MTBE make it very difficult to clean up. It moves further and faster through soil and is more soluble than other gasoline components. It does not adhere well to soil particles and does not break down easily. Even more troubling, MTBE vaporizes at 55.2 degrees Celsius or about 131 degrees F. The average home hot water heater is set at 140 degrees F or higher, therefore running hot water for a bath or hot shower, cooking or using a washer or dishwasher can vaporize MTBE from the water into the air. This makes MTBE available for inhalation as well as for drinking from cold water. There currently is no practical technology available for removing MTBE from household air. The more commonly considered strategies for removal of MTBE from drinking water sources include air-stripping, adsorption and advanced oxidation processes.

Banning MTBE

Fortunately at this stage, regulators have started to realize that MTBE in drinking-water sources is of major concern and is causing a problem. Some regulators suggested that MTBE use be discontinued altogether, while others are suggesting a phase out. On February 9, 2001 New Jersey's acting Governor Donald T. DiFrancesco introduced a 16-bill clean water initiative package to the New Jersey Senate. Part of this sweeping legislature includes the banning of MTBE. New Jersey Senators Peter Inverso and Jack Sinagra are also sponsors of legislation which would ban the sale of gasoline containing MTBE. According to Senator Inverso "The body of evidence surrounding MTBE points to a very serious conclusion...we must stop using it, and we must study the effects and the extent of contamination from this contaminant which is most likely seeping into the ground from underground storage tanks." In other state wide initiatives to ban MTBE, Assemblywoman Marion Crecco on May 22, 2000 introduced Assembly Resolution No. 124 which opposes the use of MTBE and urges all branches of federal and State government to work towards limiting, and eventually banning, its use. On March 23, 2000, Assemblyman Nicholas Asselta and Assemblyman Steve Corodemus introduced an Act directing the DEP to assess groundwater contamination from MTBE and determine measures necessary to mitigate and Remediate any contamination.

In addition to state initiatives, the EPA has undertaken a range of MTBE related activities. In December 1997, the EPA issued a drinking water advisory for MTBE based on consumer acceptability. While the MTBE advisory is not based on health effects, the EPA notes that keeping MTBE levels in the range of 20-40 ppb or lower for consumer acceptability reasons will also provide a large margin of safety from adverse health effects. In February 1998, the EPA included MTBE on a list of contaminants that are potential candidates for regulation under the Safe Drinking Water Act. In addition, in August 1999 the Safe Drinking Water Act directed the EPA to require that public water systems conduct monitoring for a list of unregulated contaminants. The EPA has included MTBE on the monitoring list, and public water systems are required to monitor for MTBE as of January 2001.

C. Radon and Radionuclides

On December 7, 2000, EPA published a final rule for the control of radionuclides in drinking water.[23] The rule retained most of the existing requirements for controlling the level of radiation in drinking water (those requirements were adopted in 1976). EPA did implement a new regulation for uranium (30 ppb) and it changed some of the testing requirements. Overall, EPA estimates that fewer than 900 water systems nationwide will be affected and the total cost is expected to be about $80 million per year. In fact, many systems will be required to test their water less frequently for radionuclides, resulting in a minor cost savings.

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[23]U.S. EPA, "National Primary Drinking Water Regulations; Radionuclides," 65 *Federal Register* 76707-76753 (Dec. 7, 2000).

A much more significant change is expected when EPA finalizes a new regulation for radon in drinking water proposed in November 1999.[24] The proposal would give states and utilities the option of funding radon reduction programs in air (radon is considerably more hazardous in the air than it is in drinking water) that would achieve equivalent risk reductions, which EPA terms "multimedia mitigation" programs. However, if a state or utility decides not to implement an enhanced program to remove radon from the air, then affected utilities would be required to meet a radon standard of 300 picocuries per liter (pCi/L) in drinking water. According to EPA's health analysis, its radon proposal would save fewer than 7 lung cancer cases per year nationwide. Even this estimate is somewhat questionable because of uncertainties in the data about the combined effects of cigarette smoking and radon exposure.

Nationwide, EPA estimates that the cost of reducing the level of radon in drinking water to 300 pCi/L would be more than $400 million per year. The typical cost for most affected water systems would be less than $50 per household per year, somewhat less in larger water systems, while some very small systems might face costs in excess of $100 per household per year. However, most of these compliance costs can be avoided if states or utilities adopt multimedia mitigation programs. It is much less expensive to reduce radon exposure in the air than it is to remove radon from water. EPA estimates that the costs of multimedia mitigation programs to achieve an equivalent reduction in health risks would be between $50 million and $100 million per year, or between 1/4 and 1/8 the cost of removing radon from drinking water.

EPA's analysis indicates that since most of New Jersey's groundwater has radon levels below 300 pCi/L, it is likely that most water utilities in New Jersey will not be greatly affected by a new regulation for radon.

EPA sent a final radon rule to the Office of Management and Budget (OMB) just one day before President Clinton left office. The new administration has sent the rule back to EPA for further review. At this point, it is estimated that a final radon rule might not be published until the end of 2001. The Natural Resources Defense Council, however, has given notice of its intent to file suit against EPA for failing to meet the statutory deadline for issuing a final radon rule.[25] As of April, 2001, it is unclear what will happen in respect to radon levels.

D. Disinfection By-Products and Surface Water Treatment

In 1992, EPA convened a Federal Advisory Committee to attempt to negotiate new regulations for the treatment of surface water supplies. This action was prompted by the growing body of scientific evidence that some of the chemicals used to disinfect drinking water could form carcinogenic by-products. However, reducing the level of disinfection could pose serious health

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[24]U.S. EPA, "National Primary Drinking Water Regulations; Radon-222, Notice of Proposed Rulemaking," 64 *Federal Register* 59246-59378 (Nov. 2, 1999).

[25]"Bush Sends Radon Rule Back for Review," *AWWA Mainstream* (March 2001), p. 3.

risks by increasing the level of microbiological contamination in the water. Microscopic organisms such as giardia, e. coli, and cryptosporidium can cause serious, and even fatal, illnesses, particularly in people whose immune systems are not fully functional (people who are HIV positive, organ transplant recipients, those who are undergoing chemotherapy, the elderly, and young children).

The task of the advisory committee, and ultimately of EPA itself, was to manage these trade-offs – the need to disinfect water and the need to control the level of by-products from the disinfection – in a way that will protect the health of the public in the most cost-effective manner. The result of this process was a phased approach to optimize the level of disinfection, with a phase-in period that will take 10 years or more.

The initial phase of these regulations was finalized by EPA in 1998 and will become effective in January 2002 for larger water systems and in January 2004 for smaller water systems.[26] EPA estimates that the annual, nationwide compliance cost for these regulations will be in excess of $700 million.

Moreover, it should be realized that the regulations issued in 1998 mark just the beginning of an enhanced regulatory approach for treating surface water. In 1999, EPA convened a new advisory committee to evaluate the next steps that should be taken to improve the efficiency and quality of disinfection. That committee's work concluded last year with recommendations for EPA to issue additional regulations. Around mid-2001, EPA is expected to issue proposed regulations to further enhance the level of water treatment, and to further restrict the level of disinfection by-products in drinking water. Those regulations should become final by mid-2002.[27]

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[26]U.S. EPA, "National Primary Drinking Water Regulations; Disinfectants and Disinfection Byproducts," 63 *Federal Register* 69389-69476 (Dec. 16, 1998); U.S. EPA, "National Primary Drinking Water Regulations; Interim Enhanced Surface Water Treatment,"63 *Federal Register* 69477-69521 (Dec. 16, 1998).

[27]American Water Works Association, "2001 Regulatory Calendar," *Opflow* (Mar. 2001), pp. 12-13.

VII. The Position of the Ratepayer Advocate on the Regulation of Drinking Water

"Water (is) the only drink for a wise man."
Henry David Thoreau

Current federal and state legislation made fundamental changes in the identification, reporting and monitoring of contaminants in the nations drinking water. These regulations have set limits on contaminant levels in drinking water to ensure that the water is safe for consumer consumption.

The Ratepayer Advocate supports the advances made through legislation in establishing primary drinking water standards. In addition, the Ratepayer Advocate supports the consumer right- to-know provisions of the 1996 Amendments designed to give consumers more information about the quality of their drinking water. Consumer Confidence Reports are the centerpiece of the right-to-know provisions of the 1996 Amendments. Each report provides consumers with fundamental information on the source of the water supply, the levels of contaminants detected in drinking water, information on the health effects of contaminants found in violation of drinking water standards, and information on unregulated contaminants. Consumer Confidence Reports benefit consumers, promote consumer confidence and enable consumers to make practical, knowledgeable decisions about their health and their environment.

In addition, the Ratepayer Advocate supports other provisions of the 1996 Amendments aimed at improving public information about drinking water, including the annual public water system compliance report and improved public notification in cases where a water supplier is not meeting a contaminant standard.

The Ratepayer Advocate is encouraged that through the joint efforts of the EPA and DEP partnerships in association with consumer advocates have resulted in Public Right-to-Know work groups. These partnerships can foster building blocks for collaborative initiatives. This level of public involvement can provide the framework for consensus building through public participation which ultimately can strengthen the substantive content of water legislation.

The Ratepayer Advocate supports federal and state initiatives to correct and prevent noncompliance with drinking water standards for small water systems. Capacity development which refers to the technical, financial and managerial compliance with drinking water standards is a state effort to help drinking water systems improve their finances, management, infrastructure and operations so they can provide safe drinking water consistently, reliably and cost-effectively. The EPA has released guidelines and information to states designed to help them work together with water systems to carry out capacity development provisions of the law.

Continued monitoring and reporting by the EPA and states will result in future improvements in public water systems and ultimately in the quality of the drinking water provided to the public. If we are to continue moving forward in achieving these goals we must incorporate a multi-action approach that includes providing public information, education and involvement;

providing assistance to states to help them implement the law; and providing compliance assistance and taking necessary enforcement actions where violations occur.

Due to factors that include the replacement of aging water distribution infrastructure, compliance with new federal and state drinking water regulations, and growing water demand resulting from economic development and growth, the magnitude of improvements and upgrades in the water supply industry is increasing. Water utilities face challenges in meeting future financial needs. The Ratepayer Advocate recognizes these challenges and is ready to assist regulators in pursuing and implementing effective strategies to assist the water and wastewater industries.

Some strategies already in place are the recognized need for increased conservation, the potential for competition in the billing and customer service areas in the water industry, investor owned water utilities contracting with municipal water systems to operate and manage the water system, and consolidation.

VIII. Emerging Issues in the Price of Drinking Water

The cost of providing a safe and uninterrupted supply of potable drinking water has been increasing faster than the rate of inflation for the past decade or more. For the typical household, though, water remains a bargain - costing just a fraction of a cent per gallon. There is no typical average bill for New Jersey water customers. The price of water for an average residential customer varies from municipality to municipality and based upon whether it is an investor owned water utility or a municipal owned and operated system or a Municipal Utilities Authority. Table 8 provides a sampling of the cost of water for the average residential customer.

Table 8
Cost of Water for Sampling of Average Residential Customers

Provider	Gallons Per Quarter	Avg. Quarterly Bill	Avg. Yearly Bill
Southeast Morris County Municipal Utilities Authority	18,700	$58.22	$232.88
City of Wildwood	20,196	$48.72	$194.88
Lake Valley Water Company	20,000	$71.52	$286.08
Consumers New Jersey Water Company	20,000	$73.62	$294.48
Mount Holly Water Company	18,700	$61.48	$245.92

In most of New Jersey, water remains the least expensive utility service, with most households paying less for water than they pay for telephone service or even cable television. However, there is every indication that water costs will continue to increase for the foreseeable future. The Environmental Protection Agency (EPA) estimates that during the next 20 years, water utilities throughout the country will need to invest $145 billion in order to continue providing safe and reliable service to consumers.[28] More than half of these expenditures ($81 billion) will be for rehabilitating and replacing the transmission and distribution pipes that bring treated water to customers. The remaining expenditures primarily will be for improved water treatment ($37 billion) and water storage ($17 billion).

[28]U.S. EPA, *Drinking Water Infrastructure Needs Survey: Second Report to Congress* (Feb. 2001), p. 30.

Finally, water utilities will face additional cost pressures to deal with increases in population and other increases in the demand for water. Finding cost-effective ways to meet the demands of population increases will be an important challenge for all water providers.

In the following sections, we will discuss some of the ways that conservation is being used to preserve our water resources. These same types of conservation methods can be used to meet at least some of the demands placed on those water resources by population growth. Meeting the needs of an additional million people for a safe and reliable water supply – and doing so in a cost-effective manner – will prove to be one of the significant challenges for New Jersey's water suppliers during the next two decades.

A. Affordability

During the past decade, researchers, advocates for consumers, policy makers, and regulators began to focus attention on the affordability of water service. The increase in household water bills, coupled with the prospect for further increases as new water purity regulations are implemented and aging infrastructure is replaced, make it likely that the rising cost of water service will cause concern to the public and decision makers. Unfortunately, water is not the only essential utility service that is experiencing cost increases. During the past year, energy prices throughout the country have risen significantly, driven by sharp increases in oil and natural gas prices.

These increases are having a significant impact on low-income consumers and others on fixed incomes, both in New Jersey and throughout the country. A study released on April 5, 2001, by the National Energy Assistance Directors' Association (NEADA) reviews the crisis faced by low-income households this year because of rising energy costs. NEADA reports the following for New Jersey:

> New Jersey expects to serve almost 25% more households this year (150,000 vs. 120,000). In addition, 55,182 elderly and/or disabled households with incomes over the LIHEAP eligibility limit, but under the income cap for the state funded supplemental Lifeline utility assistance program, received a one-time benefit of either $100 (electric heat) or $215 (gas, oil or propane heat). The state recently raised its income eligibility limit to 175% of poverty and is considering a number of options for the additional emergency funds received, including further expanding income eligibility.
>
> New Jersey has a moratorium on utility shutoffs that expired March 15th. As of February 28, 2001, Public Service Electric and Gas, the state's largest utility, reported residential arrearages of $271 million, an increase of 14% over last year. As of the same date, 276,715 households had received shutoff notices. This represents an increase of 6% over the same period last year.[29]

[29]National Energy Assistance Directors' Association, *State-by-State Low-Income Home Energy Assistance Program Survey Responses*,

In reviewing the cost and affordability of new regulations, EPA assumes that a household with median income can afford to spend up to 2.5 percent of its income for water.[30] However, in 1990 the median-income household in New Jersey was spending only about 0.5 percent of its income for water.[31] While no one expects water bills to increase five-fold immediately, it appears that EPA is predicting that water bills will increase significantly, raising concerns about the continued affordability of water services by consumers on fixed and limited incomes.

Some water utilities are addressing local concerns about the affordability of water through specific programs designed for their communities. These programs can range from special rates or discounts for low-income customers to conservation programs designed specifically to help low-income customers reduce their water usage and thereby make their bills more affordable.[32]

If water costs continue to increase, and particularly if costs for other essential goods and services continue to rise, it will become increasingly important for New Jersey's water utilities to implement programs to help low-income consumers afford their water bills.

For low-income households, including retired persons, increases in the cost of an essential service like water can have a very serious impact on the household. Particularly when coupled with the rising energy costs during the past year (and that, unfortunately, are likely to continue for the next few years), low-income households are facing unacceptable trade-offs – they do not have enough money to pay for rent, heat, water, electricity, telephone, food, clothing, transportation and medical care.

This conclusion is supported by a comprehensive study conducted by researchers in the Chicago area, who concluded that single mothers receiving welfare payments reported spending only $18 per month on medical care. Similarly, they reported that the average telephone bill was $31 per month, but "about one-third of the welfare-reliant mothers had their telephone disconnected or went without any phone service throughout the previous year."[33]

<http://www.neada.org/communications/press/survey.htm>, last updated 4/5/01.

[30]U.S. Environmental Protection Agency, *Variance Technology Findings for Contaminants Regulated Before 1996*, EPA 815-R-98-003 (1998).

[31]Scott J. Rubin, "A Nationwide Look at the Affordability of Water Service," *Proc. 1998 AWWA Annual Conference*, Vol. C, pp. 113-129.

[32]Margot Saunders, *et al., Water Affordability Programs* (AWWARF 1998); Janice A. Beecher, "Water Affordability and Alternatives to Service Disconnection," *Journal American Water Works Association* (Oct. 1994), pp. 61-72.

[33]Kathryn Edin and Laura Lein, *Making Ends Meet: How Single Mothers Survive Welfare and Low-Wage Work* (Russell Sage Foundation 1997).

A recent study conducted for the State of Iowa reached dramatic conclusions about the tradeoffs that low-income households make in order to pay their utility bills.[34] That study concluded that, in order to pay their home-heating bill, low-income households made the following tradeoffs:

- Over 12% went without food at some point during the month
- More than 20% went without necessary medical care (failed to see a doctor when sick, failed to fill prescriptions for medicine, failing to take the full dosage of a prescription so it would last longer)
- Nearly 10% were unable to pay their mortgage or rent, risking foreclosure or eviction
- Almost 30% did not pay other bills or incurred debt to pay the heating bill

There is every reason to believe that low-income consumers will face similar difficulties if their water bills, another essential, unavoidable utility, increase significantly.

B. Infrastructure Maintenance and Replacement

The most recent EPA Infrastructure Needs Survey estimates that during the next 20 years, water utilities throughout the country will need to invest $145 billion in order to continue providing safe and reliable service to consumers. EPA estimates that $100 billion of this amount is needed immediately. The agency explains the need for these capital expenditures as follows:

> That systems require such an enormous investment to meet their current needs reflects the age and deteriorated condition of the nation's infrastructure. Many water systems were constructed 50 to 100 years ago. Operating within resource constraints relative to their needs, some systems have adopted a reactive approach to capital investment that involves replacing or upgrading infrastructure only as it fails.[35]

Table 9 shows projected capital needs for 2000-2020, including estimates for New Jersey. To put these figures in perspective, American Water Works Company, the largest investor-owned water utility in the country, had total assets of $6 billion at year-end 2000. Thus, the level of investment estimated for the water industry is equivalent to creating a new company the size of American Water Works every year for the next 20 years.

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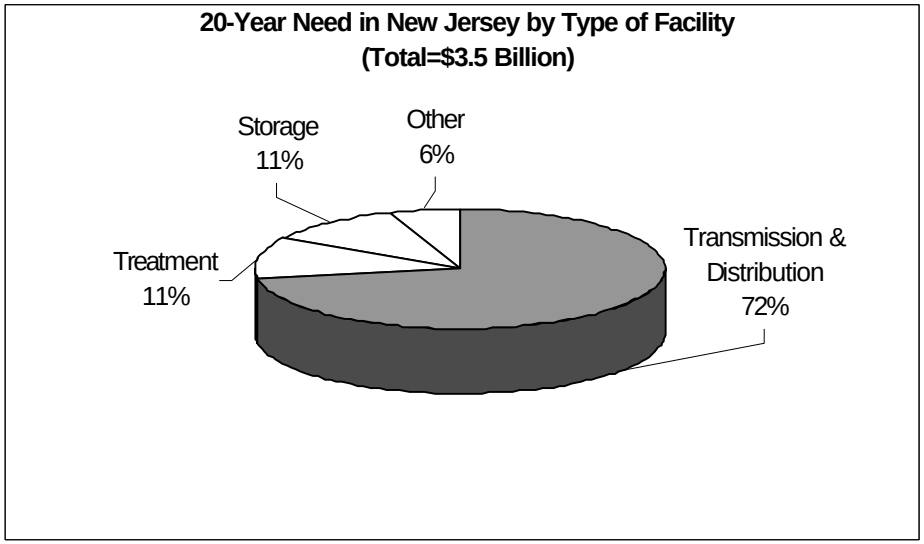
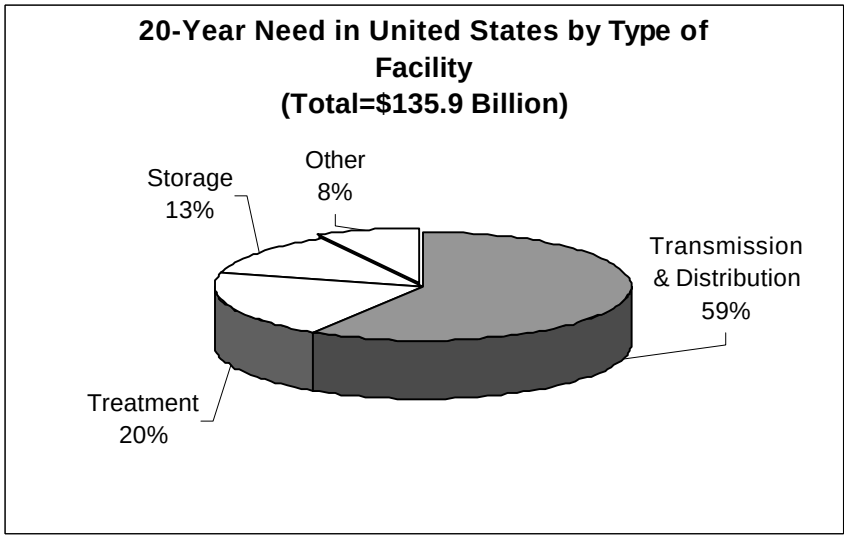
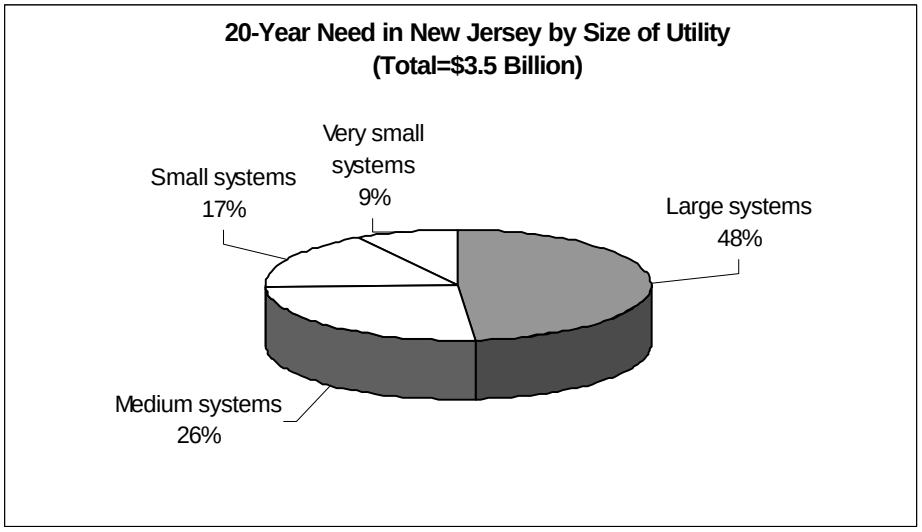
[34]Joyce M. Mercier, *et al.*, *Iowa's Cold Winters: LIHEAP Recipient Perspective* (Iowa Dept. of Human Rights, 2000).

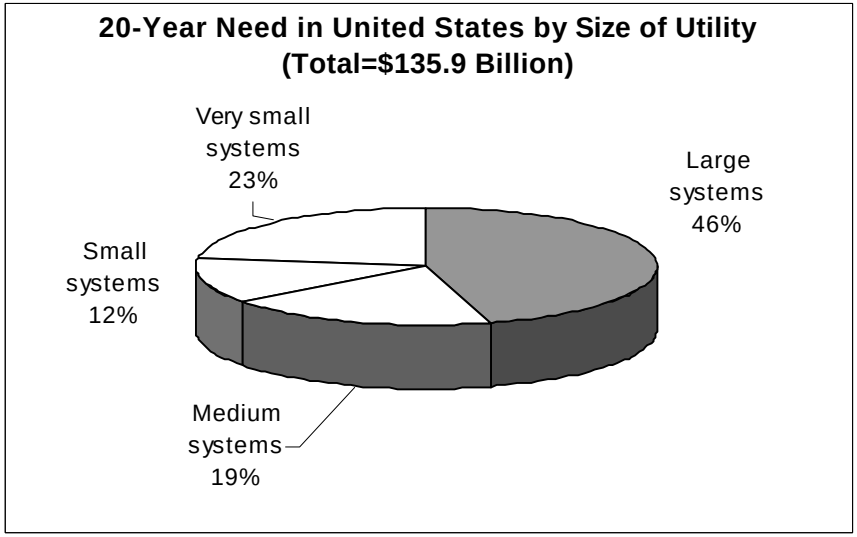
[35]*Id.*, p. 32.

Table 9 - Projected Capital Needs for the Water Industry 2000-2020









How the capital will be raised to pay for system rehabilitation, replacement, and improvement is a serious question, particularly for small water systems. The National Research Council, in its study of small water systems, describes the problem this way:

> Adding to the financial difficulties of small non-metropolitan communities, lenders are less willing to loan to rural communities than to metropolitan ones because of the increased effort needed to monitor smaller loans relative to the profits they generate. …A shortage of loan capital is an especially significant problem for privately owned small water systems because they are not eligible to receive the government grants available to some publicly owned systems.[36]

In 1996, Congress created a State Revolving Fund (SRF) to provide loans for drinking water improvement projects. The SRF can be an important source of funding, but it is not designed to meet needs of the magnitude that EPA has identified. In its first four years of operation, the SRF funded a total of 1,153 project nationwide, with total funding of $2.8 billion. Of that amount, 31 projects were in New Jersey, with total funding from the SRF of $77.3 million.[37] While the funding provided by the SRF certainly is important, it does not come close to meeting the estimated national need of more than $6 billion per year for the next 20 years.

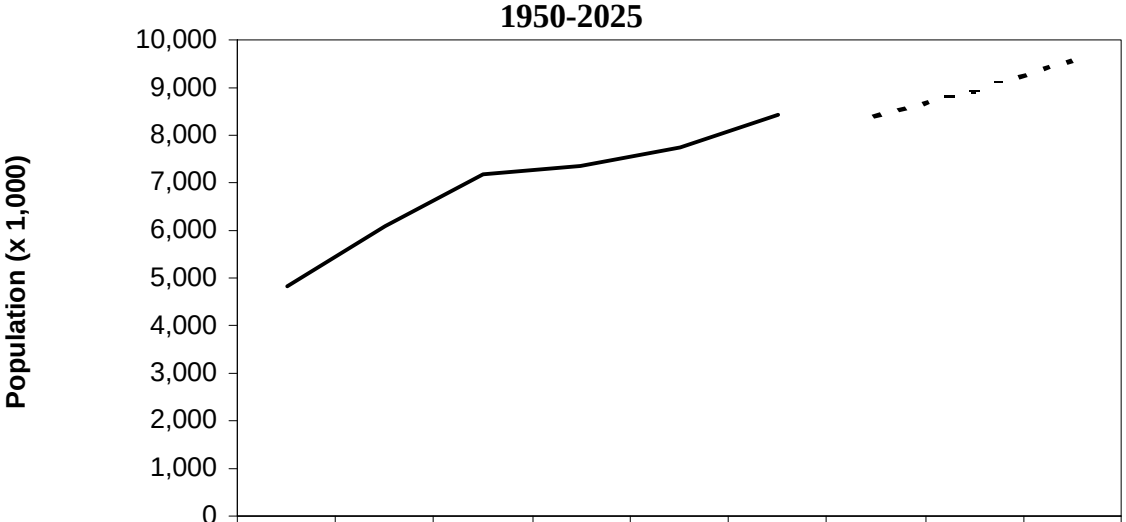
[36]National Research Council, *Safe Water from Every Tap: Improving Water Service to Small Communities* (National Academy of Sciences, 1997), p. 25.

[37]U.S. EPA, *DWSRF National Information Management System,* <http://www.epa.gov/ogwdw000/dwsrf/dwnims.html>, updated 3/6/01.

C. Growth of Demand in New Jersey

New Jersey's population has almost doubled since 1950.[38] The Census Bureau estimates that the state's population will increase by another million people or more over the next 20 years.[39] Table 10 shows the growth trend in the state's population since 1950.

Table 10
New Jersey Population
1950-2025



	1950	1960	1970	1980	1990	2000	2005	2015	2025
Actual	4,835	6,067	7,171	7,365	7,730	8,414			
Projected							8,392	8,924	9,558

This population growth places increased pressure on water utilities to find cost-effective ways to provide water to these new residents. In the past, the answer to population growth was to build – larger reservoirs, drill more wells, increase the size of transmission mains, and so on. We now recognize that building more is not always the answer. In many parts of New Jersey, there are restrictions on the amount of water that can be safely withdrawn from the natural environment. Anywhere in the state, the cost of enlarging a reservoir or treatment plant or drilling new wells continues to increase dramatically. It can no longer be assumed that simply building more is the best way to meet the needs of a significant increase in population.

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[38]U.S. Census Bureau, *Decennial Census Population and Housing Counts,* <http://www.census.gov/population/www/censusdata/pop-hc.html>, revised 11/8/00.

[39]U.S. Census Bureau, *Projections of the Total Population of States: 1995 to 2025* (1996), <http://www.census.gov/population/projections/state/stpjpop.txt>.

IX. The Position of the Ratepayer Advocate on Rising Water and Sewer Costs

How can consumers be protected from the impact of rising water and sewer costs? The Ratepayer Advocate supports initiatives such as additional federal and state funding programs coupled with affordability and conservation programs offering varied approaches to mitigating the impact of rising water and sewer costs and other issues of consumer affordability. There are several financial loan programs available to both investor owned and municipal water utilities sponsored by the U.S. Environmental Protection Agency (EPA) and the NJ Department of Environmental Protection (DEP). The EPA administers the Drinking Water State Revolving Fund which allocates funds to each state for upgrading and improving water system infrastructure. In New Jersey, these funds are administered by the DEP through the Environmental Infrastructure Trust Fund. The EPA also administers the State Revolving fund for wastewater systems known as the Clean Water State Revolving Fund. Another financing option is through the U.S. Department of Agriculture's Rural Utility Service. The Rural Utility Service provides grants and loans to qualified small water and wastewater systems.

Low-income customers are now less able to afford water services. Affordability has emerged as an issue for the water ratepayer in much the same way as affordability rates became a social policy issue in the energy sector. Steadily escalating water rates place a special burden upon lower-income households usually without the benefit of corresponding increases in household income.

A viable option is for the federal government to continue funding to help state and local governments with water and sewer systems infrastructure expenses and to help water systems meet the environmental requirements of the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA).

Another option is for the water industry, regulators, local and state governments and consumer advocates to look at specific affordability programs and other protections which give low-income water customers minimal rights before termination of service. The Ratepayer Advocate believes that all stakeholders can work together in developing new and innovative alternatives to deal with affordability. We can examine components such as payment arrangements, health-based moratoriums, temporary service guarantees, budget billings, percentage of income payment plans and incentive based assistance programs.

In addition, consumers can lower rates through conservation. Conservation strategies, discussed in more detail later in this paper, can lower costs for ratepayers without impairing the quality of service. Public education programs on pricing can show consumers how to save money on their water bills by employing conservation efforts. Education may be an effective way to motivate customers to reduce waste, use water wisely and save money.

X. Water Conservation in New Jersey

> *Water conservation is a critical element for managing water resources. Through conservation, we can meet public health and environmental needs, and still have sustainable infrastructure development and a viable water industry.*[40]

Water is the most valuable resource in the world. The drought of August 1999 in New Jersey forced the residents of the state to recognize that an abundant supply of water is no longer guaranteed. Demand for water is on the rise. New Jersey water resources are constantly strained by the competing needs of the growing population, agriculture, industry, and recreation. In addition, pollution, declining water tables, and prolonged drought conditions are shrinking New Jersey's usable supply of potable water.

In order to meet the needs of existing and future populations and to ensure that habitats and ecosystems are protected, water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential in order to achieve these objectives.

Efficient water use can have major environmental, public health and economic benefits by improving water quality, maintaining aquatic ecosystems and protecting drinking water resources. Water efficiency is a way of addressing water quality and quantity goals. The efficient use of water can also prevent pollution by reducing wastewater flows, recycling industrial process water, reclaiming wastewater and using less energy.

The New Jersey Department of Environmental Protection (DEP) regulates water quantity in accordance with the Water Supply Management Act of 1981.[41] New Jersey uses a system of riparian rights allowing for ground and surface source withdrawals exceeding 100,000 gallons per day on a statewide basis. The potential impact of withdrawals on upstream and downstream users are examined by the DEP which is authorized to issue rules and regulations to establish minimum water levels and flows as necessary to preserve water quality and quantity. In some cases, inter-basin transfers may be limited. For example, transfers of water more than ten miles from the Pinelands National Reserve are prohibited. Groundwater withdrawals can also be restricted during critical shortages.

Water quantity regulation tends to emphasize watersheds. New Jersey has 20 watersheds (see Figure 1). Several have been designated as highly vulnerable in terms of water quality. In

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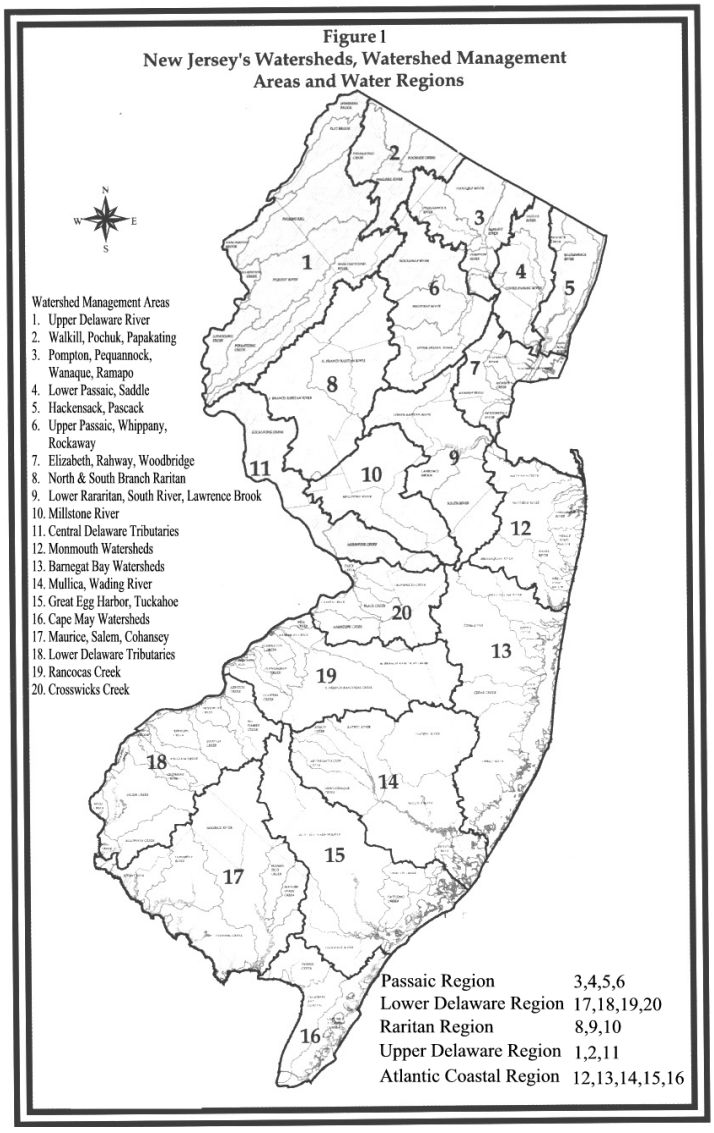
[40]Felicia Marcus, Regional Administrator, Water Division Region IX-Publication Number:EPA 909-F-98-001.

[41]N.J.S.A. 58:1A-1, *et seq.*

the undeveloped areas of the state, surface water quality is considered excellent.[42] While the state's estuaries and coastal waters are in reasonable condition, all of the state's lakes are considered to be either threatened or actively deteriorating. Ground water supplies are ample, but some areas are seriously threatened by naturally occurring contaminants, pollutants, and over-pumping. The state is addressing water issues through a National Environmental Performance Partnership System and also plans to implement watershed management plans.



[42]U.S. Environmental Protection Agency, *Surf Your Watershed*, [http://www.epa.gov/305b/98report/nj.html].

New Jersey is a signatory to the Delaware River Basin Compact, along with the United States government, Delaware, New York, and Pennsylvania.[43] The compact was signed in October 1961 and created the Delaware River Basin Commission (DRBC), which is jointly funded by the signatories to provide a centralized and unified approach to managing regional water resources. The DRBC is considered uniquely innovative and effective as an interstate regulator. The commission's programs include: water pollution abatement, water supply allocation, regulatory review (withdrawal permitting), water conservation, regional planning, drought management, flood control and recreation. States in the compact must have a drought contingency plan.

The DRBC issues permits for ground and surface withdrawals exceeding 100,000 gallons per day using a 30-day average. A threshold of 10,000 gallons per day can be used for protected areas, which are designated by the commission. Permitting activity has increased with economic growth. The permits provide maximum daily and monthly withdrawal levels. DRBC has enforcement and fining authority, and also uses local agencies for enforcement. Special emergency powers include the ability to reduce diversions and impose restrictions on usage. The commission also imposes some water quality standards (toxic parameters). The agency is moving toward a watershed-based analytical approach, as compared to functional permitting.

A. Water Supply Shortages

Water supply shortages can be caused by natural or manmade occurrences. Natural weather patterns affect both water supplies and demand. During periods of low precipitation, demand rises just as supplies are diminished. Although water is highly renewable, individual sources can be depleted or spoiled beyond their capacity to renew. Environmental pollution is an obvious threat to water resources. Scientists also are increasingly concerned about the effects of global climate change on the quality and availability of water supplies.

Droughts are an inevitable part of the hydrologic cycle, and something for which all water utilities must be prepared. The conclusion of a drought is much easier to define than its onset. Unfortunately, the attention paid to drought management often wanes when the drought ends. The state's recent drought experience is depicted in Figure 2, when reservoir levels dropped significantly below average in both 1998 and 1999.

[43]Paul G. Foran, Janice A. Beecher, and Larry J. Wilson. *Survey of Eastern Water Law. A Report to the Illinois Department of Natural Resources* (1995).

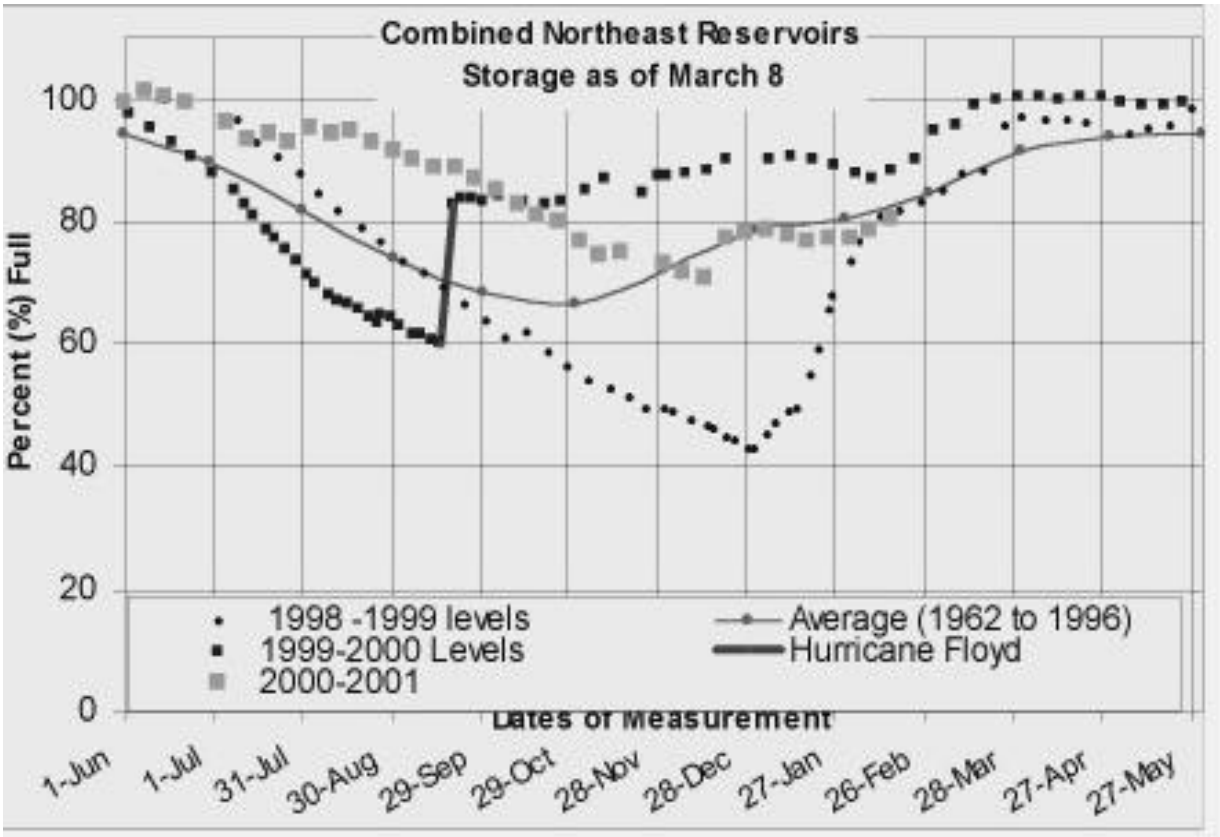


Figure 2: Northeast New Jersey Water Reservoirs
Source: New Jersey Department of Environmental Protection [http://www.state.nj.us/dep/drought/reservoir.html].

In New Jersey, drought-related water emergencies were declared in September 1995, April 1985, and September 1999. The DEP is authorized to adopt an Emergency Water Supply Allocation Plan, which prioritizes water-use restrictions. Different levels of drought are used to trigger different water-use restrictions. The restrictions concern discretionary uses, including watering lawns, washing vehicles, washing streets and sidewalks, serving water in restaurants (except as requested), and flushing and other maintenance uses (except as needed to protect public health).[44]

Shrinking drinking water resources and drought conditions are a national problem in the United States. For example, states as widely separated as Florida, Arizona and even the supposedly soggy Pacific Northwest are all experiencing severe droughts in the early part of 2001. Each state faces different challenges as they try to cope with the lack of water, but their efforts represent a wide range of priorities and policies.

[44]NJ DEP, Administrative Order No. 1999-08, <http://www.state.nj.us/infobank/circular/ao99-08.htm>

The Governor of Washington, Gary Locke, has declared a drought emergency in his state, which is facing the most severe drought in the region since 1977. While Washington has not yet imposed any mandatory water use restrictions or authorized any emergency wells for farmers, the drought has strained salmon recovery efforts and severely hampered the state's energy supply, which relies to a large extent on hydropower. Much of the debate in Washington is between the agricultural and business community on one hand, and conservationists and fisheries on the other. Farmers need access to groundwater for irrigation, but groundwater is also needed to maintain stream flows important to salmon restoration and the state's tourism industry. Businesses have been socked by higher energy costs as hydropower resources have literally dried up, a condition exacerbated by the removal of some dams to allow for salmon spawning. The most extreme drought mitigation measure being contemplated in Washington at this time is the opening of a special state drought account to purchase water rights from water-rich basins for transfer to drought-stricken basins.

In Arizona, former governor Bruce Babbitt recently helped finalize a pact among California, Nevada and Arizona to "bank" a portion of each state's Colorado River allocations in the deep Arizona aquifers. Among the issues still to be played out in the Arizona plan is what California and Nevada will have to pay Arizona for storage and delivery of "banked" water, as well as other market forces as the Southwest starts to realize the real cost of creating large farms and suburban communities out of what are, essentially, deserts. The Arizona banking plan contemplates diverting "raw" or natural water from the Colorado River to aquifer injection sites, where it is treated before it is deposited into the aquifer.

Florida, like Washington, faces its worst drought in decades this spring, but parts of Florida are already into their fourth year of drought with the driest months of 2001 still to come.[45] Florida Governor Jeb Bush is pushing an emergency plan that would involve capturing rain water in hundreds of wells and injecting that water into aquifers, rather than allowing the rain water to run off into the ocean. Critics of the plan point out that unlike other "water banking" plans, which treat the water before banking it, Florida's plan intends to inject untreated and potentially contaminated water into aquifers. Backers of the plan counter that any water withdrawn from the aquifer will be treated anyway, and many of the supposed contaminants will either die or be filtered out by natural processes underground. Governor Bush, in particular, contends that the EPA's requirements that any aquifer injections be done with only treated water would require Florida to treat its water twice, at a greatly inflated cost that could prevent the emergency plan from having its desired effect. However, other experts insist that many questions about the Florida plan remain unanswered and the plan is, at best, a gamble with some of Florida's already scarce drinking water. *Id.*

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[45]"Florida, Low on Drinking Water, Asks E.P.A. to Waive Safety Rule," New York Times, Douglas Jehl, April 13, 2001; "Washington Governor Declares Drought Emergency," U.S. Water News Online, April 2001.

As can be seen by these situations, management of water resources is an issue that excites emotions and stirs a variety of interests. As the pressures on water supplies around the country mount, more and more interested groups will join the debate over the best plans. What the events in Washington, Arizona and Florida show is that the lessons of conservation and long-term management must be learned and implemented in advance of a crisis, or emergency issues could outweigh concerns over (and the luxury of) cautious stewardship.

In contrast, floods can also create an immediate crisis for a water utility. A major flood can take an entire treatment facility out of service, as well as compromise storage and distribution facilities. A September 1999 flood of the Raritan River forced Elizabethtown Water Company and its subsidiaries to issue a boiled water warning and to close one of the Company's primary water treatment plants.

The time to prepare for droughts, floods, and other emergencies, of course, is before they occur. It is important for policymakers and water providers to have a clear understanding of water-use priorities and management activities that must be implemented in the course of an emergency.

B. Water Demand Patterns in New Jersey

Growth in the demand for water is generally associated with increased population or activity. However, per-capita water use in the United States generally and in most localities has been flat or declining. Between 1990 and 1996 while New Jersey experienced population growth of 3 percent, water withdrawals grew by only 2 percent.[46] The reason for the decline is increased efficiency and conservation. The industrial sector has reduced the "input" cost of water as matter of good business practice. Water-efficient technologies, including reuse and recirculation, have facilitated this trend. For the residential and commercial sectors, water-efficiency standards have reduced water consumption for new developments and renovated properties. In addition, more conservation conscious customers have adopted water-conserving behaviors. Increasing prices and drought awareness have contributed to this effect.

Reduced per capita consumption means that water utilities must spread rising costs over existing levels of demand. The result can be dramatic increases in rates for customers. Unfortunately, cost savings through efficiency and conservation are unlikely to offset the industry's substantial fixed costs to mitigate these effects. However, changes in price will affect overall demand levels and the associated revenue to water providers.

[46]Delaware River Basin Commission [http://www.state.nj.us/drbc/wateruse/sld020.htm].

XI. Efficiency and Conservation

> *"To waste, to destroy our natural resources, to skin and exhaust the land instead of using it so as to increase its usefulness, will result in undermining in the days of our children the very prosperity which we ought by right to hand down to them amplified and developed."*
>
> Theodore Roosevelt

Water conservation is defined as any "beneficial" reduction in water use, water losses, or water waste. Beneficial is defined as existing when the incremental benefits outweigh incremental costs of conservation. Indeed, the benefits of efficiency and conservation have risen along with the rising cost of water resources, treatment, and distribution.

Water efficiency and conservation begin on the supply side. Many older water systems experience high levels of leakage – sometimes greater than 30 percent of total production. The term "unaccounted-for water" has been used to describe the difference between water produced and water sold. In the modern water industry efforts are being made to account for all of the water, whether metered and sold, given away, used for maintenance processes, or lost in distribution. Methods of water accounting and benchmarking are available to help systems improve their water accounting. The potential operational savings from leak detection and control are significant. Other improvements to system operations also improve efficiency and can save water, energy, and chemical resources.

Conservation is equally important on the demand side. Efficiency standards for water using fixtures (toilets, urinals, faucets, and showerheads) were adopted under the 1992 Energy Policy Act. Efficient fixtures reduce water usage by about 30 gallons per day for a 2.5 person household (about ten percent of total water usage). Water-conserving behavior can also reduce indoor and outdoor usage. Reductions in hot-water usage can help households reduce their energy bills. Although outdoor usage is more discretionary, changes in irrigation usage and other practices can be particularly effective.

End-use water conservation can be accomplished through a combination of price and non-price programs. Price is a necessary but not necessarily sufficient stimulus for conservation because water demand is generally not price responsive (particularly for indoor use), which means that most people will not dramatically change their water consumption when the price changes. Although usage response to change in price is quite limited, combining price with public education and other programs can be effective in changing water-usage patterns. Conservation programs targeted to the needs of low-income households are particularly beneficial in helping keep water bills more affordable.

A. Joint Water-Energy Conservation Programs

In 1992, Congress passed the Energy Policy Act. Included among the many provisions directed at energy consumption are requirements for the manufacture and sale of low-flow plumbing fixtures.[47] The Act also encourages both federal agencies and the private sector to improve the efficiency of water consumption.

These provisions affecting water were included in an energy act because Congress recognized that an enormous amount of energy is needed to treat, pump, and heat water. An analysis by the Electric Power Research Institute estimates that it takes between 1,400 and 1,800 kilowatt-hours of electricity to pump and treat 1 million gallons of water.[48] This estimate does not include the additional energy used by the consumer for water heating. The Department of Energy reports that the typical household uses approximately 20 million BTU per year (the equivalent of approximately 5,860 kilowatt-hours of electricity) to heat water.[49]

Recognizing the energy-intensive nature of water treatment, distribution, and heating, some energy and water utilities undertook joint water conservation programs during the 1980s. Some wastewater utilities were also involved in these programs, as well, given the significant energy costs often associated with wastewater treatment. However, with the restructuring of the energy industry, energy utilities have greatly reduced their expenditures on conservation programs. Water utilities, then, are left with the choice of either abandoning these joint conservation programs or picking up all of the cost themselves, which may not be feasible.

As water utilities consider the effect of changes in electric utility conservation and efficiency programs, like scaled back or eliminated conservation programs, they may find it more difficult to promote the benefits of the efficient use of water resources. Water utilities should monitor what is happening in both the regulated and competitive markets and protect their interests by preserving high-quality water resources in sufficient quantity to meet the needs of their customers.[50]

A review of conservation expenditures by New Jersey's electric utilities shows the current trend. Table 11 shows a dramatic decline in energy conservation expenditures by Conectiv (formerly known as Atlantic City Electric Company) and GPU Energy (formerly known as Jersey

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[47]42 U.S.C. § 6293

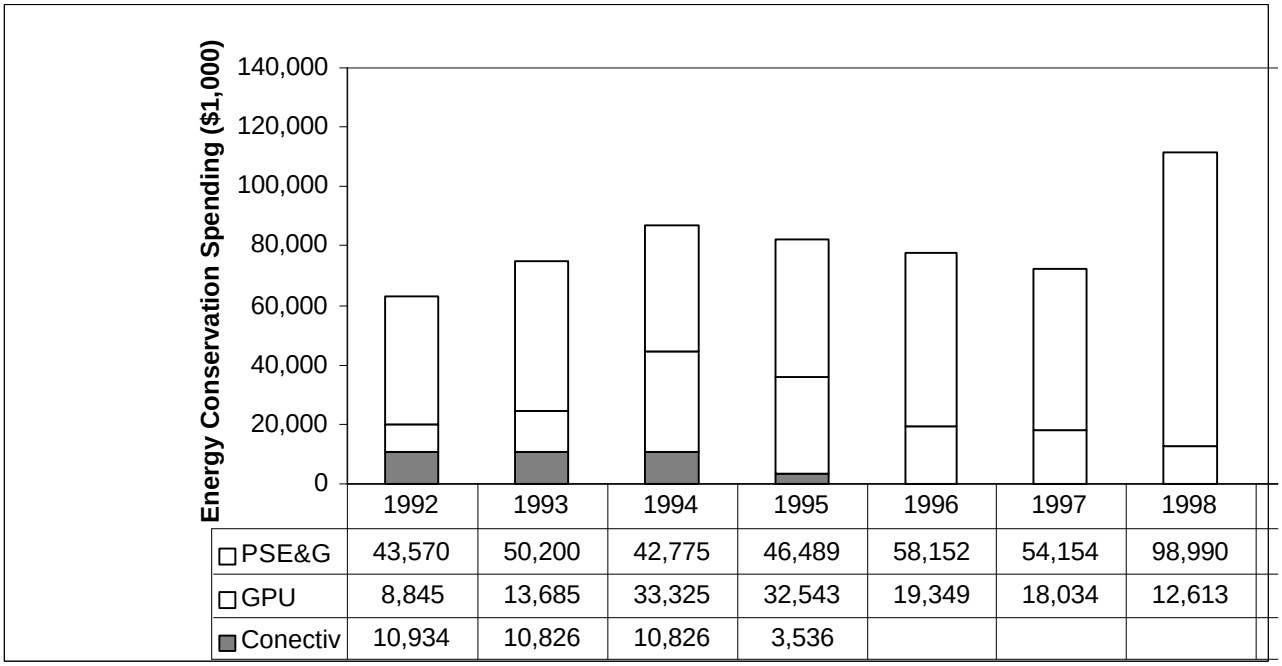
[48]Franklin L. Burton, *Water and Wastewater Industries: Characteristics and Energy Management Opportunities* (EPRI 1996), p. 3-30.

[49]U.S. Department of Energy, *1997 Residential Energy Consumption Survey*, <http://www.eia.doe.gov/emeu/recs/>, accessed 4/4/01.

[50]Beecher and Rubin, *supra*, p. xxi.

Central Power & Light), but a significant increase by Public Service Electric and Gas (PSE&G). Thus, while overall expenditures have increased in New Jersey (opposite the nationwide trend),[51] two of the three major state energy providers have greatly reduced their expenditures on conservation and other demand-side management programs.

Table 11
Energy Conservation Expenditures in New Jersey - 1992 -1999 (x $1,000)



	1992	1993	1994	1995	1996	1997	1998
PSE&G	43,570	50,200	42,775	46,489	58,152	54,154	98,990
GPU	8,845	13,685	33,325	32,543	19,349	18,034	12,613
Conectiv	10,934	10,826	10,826	3,536			

In summary, water utilities and policy makers should carefully monitor both the overall level of expenditures by energy utilities on conservation programs, particularly those that involve reducing hot water consumption.

[51]The Department of Energy shows a sharp decline in electric utility demand-side management expenditures after 1994. U.S. Department of Energy, *Annual Energy Review* and *Electric Utility Demand Management Summary 1998*.

B. Integrating Conservation Into Water Supply Planning

In 1998 the EPA issued guidelines for water conservation plans for public water systems. States can require water systems to submit a water conservation plan consistent with the EPA as a condition of receiving a loan under the Drinking Water State Revolving Fund.

A carefully planned and implemented long-term conservation program can reduce water consumption by 10-20 percent over a 10 -20 year period. Conservation in this range has the potential to meet current and future water demands.

There are also quantifiable benefits to water utilities from conservation. First, operational and maintenance expenses are reduced because of lower pumping energy and less chemical use in water acquisition, treatment and disposal.

In addition, decreasing water demand can postpone construction of water treatment plants and accompanying distribution systems. Comparing current water supply with projected demand helps to identify future needs for conservation or increased supply. Equally important advantages include reduced environmental effects and increased social benefits. Environmental benefits from less water use include reduced pollution from construction of water treatment and transmission and distribution facilities and increased water for other uses (*e.g.*, fish and wildlife habitat and other in-stream uses).

Social or community benefits chiefly relate to maintaining or increasing environmental health by reducing water demand. Social benefits include fewer negative aesthetic effects, such as construction of large unsightly water treatment facilities, and fewer potential social equity issues (*i.e.* low income consumers) associated with increased water bills to pay for new water treatment and distribution facilities.

While many water conservation elements are transferable among locations, water conservation programs should be tailored individually for the most effective programs for a particular service area. Factors such as differences in climate, geography, state institutions, and laws support the need for a prudent approach in which water efficiency programs are tailored for specific locales.[52]

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[52]*Integrating Conservation Into Water Supply Planning*, William O. Maddaus, Gwendolyn Gleason, John Darmody; *Journal*-American Water Works Association, Nov 1996, pgs 57-67.

C. Integrating Conservation in Homes and Businesses

Although water comes out of taps and goes down drains, it is not a one-way trip. Water continually cycles through the environment, and both water treatment and use rely on this cycle. This cycle is of particular importance for water conservation in the natural environment. The less water we use, or abuse, the less we degrade this valuable resource. Water conservation can protect the water resources for the people of New Jersey well into the future. There are immediate steps that can conserve water in and around homes and businesses.

Home Water Usage at Various Times of the Day

Some water companies charge more for use at peak hours of the day. Consider changing your water usage schedule.

- Lowest rate of water use – 11:30 p.m. to 5:00 a.m.
- Sharp rise/high use - 5:00 a.m. to Noon. (Peak hourly use from 7:00 a.m. to 8:00 a.m.)
- Moderate use – Noon to 5:00 p.m. (Lull around 3:00 p.m.)
- Increasing evening use – 5:00 p.m. to 11:00 p.m. (Second minor peak, 6:00 p.m. to 8:00 p.m.)

Table 12 shows that, compared to other countries, even other developed nations, the United States uses the most water per person (per capita). In the United States, a great deal of water is used for lawn and garden sprinkling, automobile washing, kitchen and laundry appliances, garbage disposals, clothes washers, and automatic dish washers. Introducing some or all of the following suggestions into residential water usage can result in savings and resource conservation.

Table 12 [53]
Water Consumption per Capita

Country	Annual Water Use Per Capita in Gallons	% of Use for Residential Needs	% of Use for Industrial/ Agriculture Needs
United States	525,000	10	90
Canada	310,000	13	87
Belgium	221,000	6	94
India	132,000	3	97
China	122,000	6	94
Poland	112,000	14	86
Nicaragua	72,000	18	82
Malta	16,000	100	0

Conserving Water in the Kitchen

Here are some steps that can add up to big water savings in the kitchen.

- Take foods out of the freezer early and place in refrigerator to allow plenty of time for thawing. Thawing frozen goods under a running tap wastes water.
- Clean fruits and vegetables in a partially filled sink and rinse them quickly.
- When boiling vegetables, use only enough water to cover the foods. Steaming uses even less water while conserving more nutrients.
- Chill tap water in the refrigerator for drinking.
- Fill the dishwasher completely before you turn it on.

[53]Van Der Leeden, F., F.L. Troise, and D.K. Todd. *The Water Encyclopedia*, Lewis Publishers, Inc., Second Ed. (1990).

- Turn taps off tightly but gently so they don't drip. Repair any leaks in and around taps and faucets without delay.

- Install a water efficient faucet aerator to reduce water flow.

Conserving Water In the Bathroom

The bathroom accounts for about 65% of the water used inside the home. Since the most water is wasted there, potential water savings can be greatest and easiest to achieve.

- 10 to 20 gallons of water can be saved when shaving by filling the basin instead of letting water run continuously.

- Turn off the tap while brushing teeth, and use short bursts of water for rinsing.

- Install a high-pressure, low flow showerhead.

- Quick showers use less hot water than baths in a full tub. If baths are preferred, ½ full should be enough. When taking a bath, put in the plug and let the hot water run until it gets hot before adjusting the temperature with cold water.

- When purchasing a new toilet, consider one that uses less than the five to seven gallons of water a conventional toilet uses or instead of purchasing a new toilet, fill a plastic 2 liter soda bottle with water and place it in the tank to decrease the amount of water stored and flushed in the toilet.

- Flush the toilet only when necessary. Never use it as a wastebasket and never flush paints, solvents or other chemicals down the toilet.

Conserving Water In the Utility Room

An automatic clothes washer uses from 150 to 250 gallons of water per cycle accounting for about 20% of total indoor water use. Water consumption for clothes washing can be reduced and energy costs lowered by planning ahead.

- When selecting a washing machine, choose one with conservation features, such as a load size selector and variable water control. Adjust the amount of water according to the size of the wash load or let laundry accumulate until there is a full load before starting the machine.

- Insulate hot water tanks and hot water pipes to reduce water-heating costs and save water; insulation keeps the water hotter longer and wastes less water.

Conserving Water by Repairing Leaks

Periodically check for water leaks in and around the house. Check the plumbing system by locating the water meter and recording the reading before bed time. Read it again early in the morning before any water use. Compare the two readings. If there is a difference, there is a leak that needs repair.

Leaking faucets are secret and very large water wasters. The steady drip of a leaking faucet can waste as much as 20 gallons of water per day. The problem is often a worn-out washer, costing only pennies to replace. A more serious type of leak can occur in toilet tanks. A toilet that continues to run after flushing can waste as much as 200 gallons of water a day. Toilet run-on may mean that the flush or flapper valve isn't sitting properly in the valve seat at the bottom of the tank and, an inexpensive item, may need replacing. Test for a leaking toilet by adding food coloring to the water in the tank. If colored water appears in the bowl after 30 minutes, there is a leak.

Conserving Water Outdoors

During the summer months, the biggest drains on water resources are lawns and gardens. The careful selection of the right plants, coupled with wise watering habits, can significantly reduce outdoor water use without affecting the beauty of the landscape.

- Good planning can result in excellent landscaping with limited maintenance and water requirements. Take advantage of the natural climate conditions by grouping plants with similar water needs together.
- Check the watering needs of plants, noting areas that are hot, dry, shady or damp.
- Grow grass only in those areas where it provides functional benefit. Whenever possible, substitute less water-demanding additions to enhance the landscape, such as ground covers, mulches, rocks and wood.
- A timed sprinkler system saves water and reduces water waste. Consider a timer with a moisture sensor, to compensate for changing weather conditions.
- Soil enhanced with organic matter allows for better water absorption and water-holding capacity.
- Water early in the morning or late in the evening rather than the hottest part of the day.

Water Recycling and Reuse: An Additional Water Source

The recycling of aluminum cans, glass bottles, and newspapers is a common practice. It is also emerging in water recycling. Water recycling involves reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing and replenishing ground water basins. The term is used synonymously with water reclamation and water reuse.

There has been some public opposition to reuse of water that has been reclaimed from municipal wastewater, or sewage. Where the earth has recycled and reused water for millions of years, water recycling generally refers to projects that use technology to speed up these natural processes.

D. Recycled Water: Safety Issues

Recycled water can be used for most purposes, as long as it is adequately treated to ensure water quality appropriate for the use. When not properly treated, health problems can arise from drinking water including recycled water containing disease-causing organisms or other contaminants.

Recognizing the growing importance of the safety issues effecting recycled water, in 1992 the EPA issued a summary of state requirements and guidelines for the treatment and uses of recycled water.[54] State and federal regulatory oversight is emerging and providing a framework to ensure the safety of the many water recycling initiatives developing across the country. Likewise, on February 15, 2001, the New Jersey Senate passed a Joint Resolution establishing a Wastewater Reuse Study Commission. This Commission will investigate the feasibility of the reuse of wastewater for irrigation purposes, dust control, fire-fighting and other non-potable uses in New Jersey.

Currently, around the United States, recycled water is being used for nonpotable (not for drinking) purposes such as agriculture, landscape, public parks and golf course irrigation. Other nonpotable uses include cooling water for power plants and oil refineries, industrial process water for facilities such as paper mills and carpet dyers, toilet flushing, dust control, construction activities, concrete mixing and artificial lakes.

In addition to providing a dependable controlled water supply, water recycling provides environmental benefits. Plants, wildlife and fish depend on sufficient water flows to their habitats. The lack of adequate flow, as a result of diversion for agricultural, urban and industrial purposes, can cause deterioration of water quality and ecosystem health. Water users using recycled water can free considerable amounts of water for the environment and increase flows to vital ecosystems.

In some cases recycled water can be used to eliminate or decrease wastewater discharge into the ocean or streams. For example, in 1997 high volumes of treated wastewater were discharged from the San Jose/Santa Clara Water Pollution Control Plant into the San Francisco Bay and threatened the area's natural salt water marsh. To correct this problem, a $140 million recycling project was completed which has the capacity to provide 21 million gallons per day of recycled water for use in irrigation and industry.

Other benefits of recycling include creation or enhancement of wetlands and riparian habitats that have been impaired or dried up from water diversion. Water flow can be augmented

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[54]*Water Recycling and Reuse: The Environmental Benefits*; www.epa.gov/region09/water/recycling/index.html

with recycled water to sustain and improve the aquatic and wildlife habitat. Additionally, water recycling can reduce and prevent pollution. In some instances pollutants, when discharged in to a body of water, can be beneficially reused for irrigation. Application of recycled water for agricultural and landscape irrigation can provide an additional source of nutrients and lessen the need for synthetic fertilizers.

As water demands and environmental needs grow, water recycling must be considered when planning overall water supply. It can provide environmental benefits and help to conserve and manage our vital water resources.

XII. Wastewater Recycling

The average New Jersey resident generates about 75 to 100 gallons of wastewater a day which in the aggregate totals hundreds of millions of gallons.[55] This large volume of treated municipal wastewater must be either disposed of or recycled. Generally, treated wastewater is discharged into bays or the ocean, where it is diluted. As available water dwindles and the drought conditions occur, attention becomes focused on protecting and conserving potable water supplies. The reuse of wastewater is increasingly being considered. "Wastewater reuse", "recycled water" and "reclaimed water" are all terms describing water which, as a result of treatment, is suitable for a beneficial use or a controlled use that would not otherwise be possible. Reclaimed wastewater, once considered unacceptable, is now a marketable commodity desired by commercial entities, municipalities, county parks, various recreation departments, and residential developments. Besides the obvious environmental benefits, wastewater treatment plant owners also offset operational costs by selling wastewater rather than disposing of it.

A. Defining Wastewater Reuse

Some public health authorities have been reluctant to support the augmentation of water supplies with reclaimed municipal wastewater. Many consider only natural water derived from the most protected and pristine sources appropriate as drinking water supplies. This principle was derived before there was a clear understanding of drinking water contaminants, when purely natural processes (such as dilution in rivers and natural filtration by soils), rather than technology, were relied upon to produce suitable drinking water. These assumptions were developed when the U.S. population was smaller, and when pristine water supplies were more available.

While pure drinking water sources are still the ideal sought by most municipalities, the U.S. population has expanded, requiring many large cities to take water from sources exposed to contaminants. As high-quality water sources become more scarce, communities are turning to a number of options, including water conservation, nonpotable water reuse, and investment of money in the treatment of water supplies that are of poorer quality but more readily available.

When discussing the reuse of treated municipal wastewater it is useful to distinguish between "indirect" and "direct reuse" and between "planned" and "unplanned" potable reuse.

Indirect potable water reuse is the abstraction, treatment, and distribution of water for drinking from a natural water source that is fed in part by the discharge of wastewater effluent.

Planned indirect potable water reuse is the purposeful augmentation of a water supply source with reclaimed water derived from treated municipal wastewater. The water receives additional treatment prior to distribution. For example, reclaimed water might be added to water which is already in a reservoir or underground aquifer and the mixture withdrawn for subsequent treatment at a later time.

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[55] *DEP's Water Rules, Waste Discharge Not That High*, Asbury Park Press, August 31, 2000.

Unplanned indirect potable reuse is the unintentional addition of wastewater (treated or not) to a water supply that is subsequently used (usually by downstream communities) as a water source, with additional treatment prior to delivery.

Direct potable water reuse is the immediate addition of reclaimed wastewater to the water distribution system. This practice has not been adopted by, or approved for, any water system in the United States. The only documented case of an operational direct potable reuse system is in Windhoek, Nambia, in Southern Africa. For 30 years, this facility has been used intermittently to forestall water emergencies during drought conditions.[56]

B. How Reclaimed Wastewater is Treated

With planned indirect potable reuse, storage between treatment and consumption allows time for mixing, dilution, and natural physical, chemical, or biological processes to purify the water. The wastewater generally is treated as it would be in a conventional municipal wastewater treatment plant, then subjected to various treatment processes.

Conventional wastewater treatment begins with preliminary screening and grit removal to separate sands, solids, and rags that settle in channels and interfere with treatment processes. Primary treatment follows preliminary screening and usually involves gravity sedimentation. Primary treatment removes slightly more than one-half of the suspended solids and about one-third of the biochemical oxygen demand as well as some nutrients, pathogenic organisms, trace elements, and toxic compounds.

Secondary treatment usually involves a biological process. Microorganisms in suspension attached to media, or in ponds or other processes are used to remove biodegradable organic material. Part of the organic material is oxidized by the microorganisms to produce carbon dioxide and other end products, and the remaining organic material provides the energy and materials needed to support the microorganism community. Secondary treatment processes can remove up to 95 percent of the biochemical oxygen demand and suspended solids as well as significant amounts of heavy metals and organic compounds. After these processes are completed the reclaimed water, depending on its purity, is ready for various reuse options.

C. Uses of Reclaimed Water

Application of municipal wastewater for agricultural and other land uses has been practiced in some communities since the advent of modern wastewater management some 150 years ago.[57] Irrigation of food crops with treated municipal wastewater has been effectively and safely practiced in the United States on a limited basis. The public has generally accepted the concept of wastewater irrigation when part of a larger and more comprehensive water

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[56] *Issues in Potable Reuse: The Viability of Augmenting Drinking Water Supplies with Reclaimed Water* (The National Academy Press 1998).

[57] *Issues in Potable Reuse: The Viability of Augmenting Drinking Water Supplies with Reclaimed Water* (The National Academy Press 1998).

conservation program. Nevertheless, reclaimed water in the United States probably contributes less then one percent of water to agricultural irrigation, mainly because the practice is limited both by regional demands and the distance of suitable agricultural land from municipal wastewater treatment plants.[58] But there are many urban uses for reclaimed nonpotable water.

Landscape Irrigation	Distributed for irrigation of parks, golf courses, baseball/soccer/football fields, highway medians, cemeteries, and residential lawns.
Agricultural Irrigation	Can safely be used to irrigate pastureland and some crops.
Industrial Uses	Industrial facilities and power plants can use reclaimed water for cooling equipment, parts washing and cleaning, equipment operation and various other manufacturing.
Fire Protection	For use by fire trucks, hydrants and sprinkler systems for firefighting.
Toilets	For flushing toilets in industrial and commercial applications if piping systems are kept separate.
Aesthetic Fountains	For use in decorative ponds, fountains, and other landscaping features.
Construction Uses	For dust control, reclaimed water can be sprinkled at construction sites, landfills, and quarries and making concrete.
Miscellaneous	Use as a water supply for commercial laundries, for vehicle washing, to flush sanitary sewers and reuse water lines, and to manufacture ice for ice rinks.

D. Health Issues Arising from Reuse

It is generally accepted that planned, indirect potable reuse is a viable application of reclaimed water. When used however, there must be careful, thorough assessments including contaminant monitoring, health and safety testing, and system reliability evaluation. Sanitary engineering and preventive medical practices have combined to a point where waterborne outbreaks of epidemic proportions should be controllable. Current potable reuse projects and studies have demonstrated the capacity to produce reclaimed water of excellent measurable quality and system reliability. In communities using reclaimed water when thorough analytical testing, toxicological testing, and epidemiological studies have been conducted, no significant

[58] *Id.*.

health risks have been identified,[59] suggesting that reclaimed water can be used safely to supplement raw water supplies if they are subjected to proper treatment in a drinking water plant. While no reuse option can guarantee complete safety, the use of existing federal guidelines and regulations can limit risks to consumers.

E. Wastewater Recycling in New Jersey

Due to constant water supply shortage problems, Arizona, California, Florida, and Texas are at the forefront of water reuse programs. New Jersey is also considering recycled wastewater programs. For example, the Ocean County Utilities Authority deposits approximately 50 million gallons of treated water from the sewage treatment plants in Brick, Berkely and Stafford. Recently, however there has been a call to divert some of the treated wastewater back into streams, rivers and underground water supplies, some of which are drinking water sources, to help cope with the shortage of water.[60]

Currently, there are several successful water reclamation programs throughout the state. In an attempt to use reclaimed water to recharge aquifers, the City of Perth Amboy designed a system of two open-water recharge reservoirs to supplement recharge of the ground water aquifers the city relies on to supply drinking water. The primary goal is to increase pumping in order meet increasing demand and to inhibit salt water intrusion.[61] In another example, in the Township of Evesham, the Municipal Utilities Authority received approval to distribute reclaimed water to a nearby golf course for public access spray irrigation. They are also authorized to spray irrigate the surrounding facility site and are contemplating the irrigation of other properties such as parks and school properties.[62]

To pursue any potential benefits from using recycled wastewater for irrigation purposes, dust control, fire fighting, and other non-potable uses, New Jersey State Senators James S. Cafiero and Robert W. Singer on February 15, 2001 introduced Senate Joint Resolution no. 29 which establishes the "Wastewater Reuse Study Commission" to be composed of nine members, the Commissioner of Environmental Protection, or a designated representative; and eight members of the public to be appointed by the Governor. The Study Commission is charged with making recommendations to the Governor and Legislature for using wastewater for non-potable uses.

F. Sewage Treatment Process

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[59] *Issues in Potable Reuse, supra,* Executive Summary.

[60] Kirk Moore, *Officials Says Wastewater Re-use Critical*, Asbury Park Press, June 22, 2000.

[61] North Carolina AWWA/WEA Reclaimed Water Conference, *Strategic Management Implications of Water Reclamation and Reuse on Water Resources*, April 10, 1996.

[62] New Jersey DEP, *Effluent Reuse Program.* http://www.state.nj.us/dep/dwq/reuseff.htm.

There is a seven stage sewage treatment process:

SEVEN STAGE TREATMENT PROCESS

• SCREENING	Remove large items from the wastewater.
• SETTLING	Take out grit (sandy particles). Move wastewater to a tank. Let particles settle out and fall to the bottom for removal.
• AERATION	Add bacteria to the sewage (sludge). Add oxygen to stimulate the activity of these oxygen-using (aerobic) bacteria. The mixture of sewage and bacteria is called activated sludge. The bacteria eat the harmful organic material. The end products of this process are carbon monoxide, water and secondary sludge.
• SETTLING	In the second settling tank, even more sediment settles out of the wastewater.
• SLUDGE DIGESTOR	Secondary sludge goes into a digestor. Add non-oxygen-using (anaerabic) bacteria. They break down the sludge over a 15-day period, turning it into a soil-like substance..
• SLUDGE DRYING	Dry out the wet sludge, making it easier to dispose of.
• CHLORINATION	Add chlorine to remaining waste water. Wastewater can now return to the environment.

Conclusions

Water recycling has proven to be effective and successful in creating a new and reliable water supply, without compromising public health when monitored appropriately. Nonpotable reuse is a widely accepted practice that will continue to grow. In many parts of the United States, the uses of recycled water are expanding to accommodate the needs of the environment and growing water supply demands. Advances in wastewater treatment technology and health studies of indirect potable reuse have led many to predict that planned indirect potable reuse will soon become more common.

While water recycling may be a sustainable approach and may be cost-effective in the long term, the treatment of wastewater for reuse and the installation of distribution systems can be quite expensive in the short term. Public perception also may make it difficult to implement water recycling projects as people might think they are drinking the same water that they flush down the toilet. It is therefore imperative that public education programs to address concerns and keep the public informed about the wastewater recycling process begin as soon as possible.

As water demands and environmental needs grow, water recycling can make a greater contribution to our overall water supply. By carefully planning, water recycling, along with water conservation, can help us to preserve and manage the State's vital water resources.

XIII. The Position of the Ratepayer Advocate on Water Conservation

The Ratepayer Advocate supports conservation initiatives that ensure the efficient use of the State's limited water resources. Efficient water use benefits natural resources by maintaining as much water as possible in the natural environment. It also benefits water utilities and local governments by lowering water demands that may require costly new source development projects.

The Ratepayer Advocate encourages the promotion of conservation programs that can result in customer cost savings by extending water supplies, and also reducing utility operating costs which can be passed on to customers. Conservation also leads to energy use reduction by customers and utilities resulting in further savings and reducing greenhouse gas emissions and can improve water quality, maintain ecosystems, and protect water resources.

Recognizing the infrastructure needs of public water systems, strategic use of water conservation can help to extend the value and life of infrastructure assets used in both water supply and wastewater treatment. Therefore, federal and state water use programs should provide technical assistance and information which concentrates on 1) improved operation and maintenance practices, 2) advanced scientific and technological study, 3) industry market incentives, and 4) public education.

As water demands and environmental needs grow, conservation will play a greater role in our overall water supply. Four basic methods of saving water should be integrated into every consumer's daily practices:

- **Economize** Water, once abundant and inexpensive, has lead consumers to use more water than necessary. We must become conscious of the amounts of water used and find ways to reduce usage.
- **Repair Leaks** Water leaks constitute about 5% of the nation's water usage. Even a slow drip can waste 15 gallons of water per day, 5,475 gallons per year. The majority of leaks are easy to detect and to fix.
- **Install Water-Saving Devices** Many devices on the market are relatively inexpensive (aerators, flow regulators, displacement devices) and simple ways to reduce water usage.
- **Recycled/Reused Water** Water can be recycled to maximize conservation. Water recycling has proven to be effective and successful in creating an additional water supply, without compromising public health. Nonpotable reuse is a widely accepted practice with potential for growth to meet the needs of the environment and growing water supply demands.

The need for conservation planning is vital. Because of the competing uses for water, now and in the future, public water systems and consumers must learn to use the resource more efficiently.

XIV. Preparing for Drought in the 21st Century

> *The definition of what drought is and what drought is not has profound implications for the environment and all segments of society, yet it may be different for each... Many attempts have been made to develop a comprehensive and meaningful definition. A generic starting point is... Drought is a persistent and abnormal moisture deficiency having adverse impacts on the environment, vegetation, animals, or people.*[63]

A. Defining Drought

Drought occurs somewhere at some time every year in the United States. It can and does extend over long periods and large area, and it usually brings hardship.

Every time drought occurs, many of the same issues are raised. Principally, how much damage was inflicted, on whom, and where? Who will pay for the cost of the damage? How can we prevent or at least reduce damages and what are future costs?

For years, the public, farmers, public land managers, scientists, economists, business owners, conservationists, wildlife manages, municipalities, counties, states and the federal governments have grappled with the far-reaching consequences of drought.

Drought can be defined as a persistent and abnormal moisture deficiency which has adverse impacts on the environment, vegetation, animals, or people. The public perceives drought as a serious departure from normal water conditions which require a public response to reduce negative impacts. For that reason, public declarations of drought are often triggered by specific and well-defined conditions. Experts use five standards to assess drought conditions: stream flows, precipitation, reservoir storage levels in a variety of locations, groundwater elevations throughout the affected region and soil moisture. By looking at these parameters to assess drought conditions, a locality is able to determine what phase of drought preparedness is warranted, the estimated costs and duration.

In reality, conditions that trigger a drought can be looked at differently, depending on the situation. For example, two months without rainfall during the growing season may result in serious drought conditions for farmers and homeowners in the eastern half of the country. The same dry period may be normal for those living in the West, where water users may be more concerned with reservoir levels.

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[63] *Preparing For Drought In The 21st Century,* Report by the National Drought Policy Commission; *www.fsa.usda.gov/drought/finalreport/*.

In addition, the definition of drought has different functions depending on the goals to be achieved. For the purpose of planning, water officials need fact-based information to help define strategies to lessen the potential impact of drought. The declaration that *"this is a drought"* triggers certain actions such as restrictions on the availability of water to users and activation of government response programs. Many states and local governments include drought in their comprehensive water management, land-use, and long -term planning strategies. These government entities know best about regional and local resources; priorities and how to communicate with their constituencies to stimulate them into action.

Notably, until 1998, there was no comprehensive federal drought policy. Until this time, there was no uniform approach to reduce the impacts of drought on a national level. Despite the major role that the federal government played in responding to drought events, there was no single federal agency in a lead or coordinating position regarding drought. States found themselves having to deal individually and separately with each federal agency involved in drought assistance. Crisis management, as opposed to planning and proactive mitigation measures has characterized both federal and state response to drought emergencies.

B. National Drought Policy Act 1998

In July 1998, the National Drought Policy Act (P.L. 105-199) was promulgated. This law established an advisory commission to provide advice and recommendations to Congress on the creation of an integrated, coordinated federal policy designed to prepare for and respond to serious drought emergencies. This law recognized the need to prepare for and lessen the severe impact of drought on American people and on the environment.

The National Drought Policy Commission (Commission) was tasked with formulating national drought policy based on preparedness, mitigation and risk management, rather than on crisis management. The Act also directed the Commission to come up with a systematic process similar to those for other natural disasters and to integrate federal drought programs with ongoing state and local programs.

The Commission provided Congress with five guiding principles which now comprise our national drought policy.[64]

2 **Incorporate planning, implementation of plans and proactive mitigation measures, risk management, resource stewardship, environmental considerations, and public education as key elements of effective drought policy.**

The Commission urged Congress to endorse preparedness as a key element to reduce the impact of drought on individuals, regions, states and local communities. Fact finding supported the conclusion that most levels of federal and state governments and the private sector were not prepared for drought. Coordinated

[64]*Preparing For Drought In The 21st Century,* Report by the National Drought Policy Commission; *www.fsa.usda.gov/drought/finalreport/*. at pgs 35-42.

drought preparedness programs are now endorsed which result in less need for *ad hoc* future emergency financial aid and other assistance. Basic components of preparedness include long-term planning, implementation of mitigation measures, risk management, resource stewardship, environmental considerations and public education.

- **Improve collaboration among scientists and managers to enhance the effectiveness of observation networks, monitoring, prediction, information delivery and applied research and to foster public understanding of and preparedness for drought.**

  The value of observation networks, monitoring, prediction, information gateways and delivery and research to drought preparedness are essential. There is now a coordinated formal process in place to ascertain the needs and expectations of multi-disciplinary and geographically diverse networks. Prioritizing recommendations and research that address the impacts of drought on non-irrigated systems, aquatic ecosystems, wildlife and other aspects of the natural environment, including the potential negative impacts of drought mitigation measures. This coordinated effort includes cooperation with states, local research scientists, consumer groups and other private entities.

- **Development and incorporation of comprehensive insurance and financial strategies into drought preparedness plans.**

  In the past, the federal government has been asked to appropriate emergency relief of at least $500 million a year on average. Drought assistance to farmers and consumers was usually pieced together from various sources or was simply not available. Current national drought policy promotes and encourages practical and prudent insurance and financial strategies in response to widespread drought situations. Through partnerships with states, local governments and the private sector, information and training on various financial strategies is now being provided to reduce the country's vulnerability to drought.

- **Maintain a safety net of emergency relief that emphasizes sound leadership of natural resources and self help.**

  This includes efforts at drought preparedness and risk management that is effective and timely. A single procedure to trigger, in a timely fashion, all national disaster programs has been adopted, together with a recommendation that emergency assistance acknowledge, encourage and reward natural resource leadership and self-help coming from states without discriminating against states that are truly in need.

2 **Coordinate drought programs and response effectively, efficiently, and in a customer-oriented manner.**

Analysis of past responses to major droughts indicated a need for better coordination of initiatives between states, local government, departments and agencies. It is now national policy that long -term drought policy be responsible for timely and efficient delivery of existing drought programs, services and funding; immediate drought assessments to determine the most pressing need, coordination and implementation of drought assistance; and advocacy of drought-related education training programs with emphasis on public sector programs.

C. New Jersey Drought Management Program

The Water Supply Administration, part of the New Jersey Department of Environmental Protection is responsible for developing a long term drought management program in New Jersey. This program is administered as needed in response to periods of abnormally low precipitation. The drought management program is administered in conjunction with statewide water supply planning initiatives. The primary focus of statewide water supply planning, is to make recommendations on a range of alternatives that should be evaluated to ensure that the State's water supplies could withstand foreseeable drought and/or other emergent situations. Under statewide water supply planning water supply management is an important component. Water supply management refers to balancing water allocations among water users and water uses, and improving coordination among water users to stretch supplies during periods of drought. Water supply management occurs in several watersheds throughout the State. In these watersheds, the amounts of water required of aquatic systems are calculated so that water supply plans can be developed to ensure adequate water availability for both human use and natural systems. This program ensures the public that with efficient watershed management water systems are capable of adequately enduring the rigors of drought.

D. Knowing the Rules in Drought Emergency

At the time of an official drought, emergency water restrictions are imposed on all New Jerseyans. Typical elements of statewide water restrictions may include:

Lawn watering is prohibited, with the following exceptions:

- Newly seeded or sodded grass may be watered for 20 days from the date of planting, but only for up to 45 minutes between proscribed hours.
- Grass may be watered up to five days after fertilizer, pesticide, or herbicide is applied, but only up to 45 minutes between proscribed hours.
- The watering of plants, trees, shrubs and vegetable gardens is prohibited by any means other than by bucket, can or hand- held hose equipped with a nozzle that shuts off automatically when dropped.

Agricultural Water Use

- Food crops are exempted from all restrictions.
- Sod farms and nurseries can water fields and containers with sprinklers between proscribed hours.
- Retail outlets can water between proscribed hours.

Washing Cars

- No motor vehicles may be privately washed, except ambulances and fire trucks, unless there is a public health threat certified by the municipal department of health.
- Commercial car washes may remain open, but must meet certain requirements.

Food Service

- No water can be served in restaurants, clubs or eating establishments unless specifically requested by the patron.

Recreational water use is prohibited, except:

- Golf course greens and tees may be watered with sprinklers or other mechanical means within prescribed hours.
- Clay tennis courts may be watered by sprinklers for no more than 10 minutes once each day between prescribed hours.
- Partially filled pools cannot be drained for maintenance.
- Outdoor use of water for ornamental purposes, including fountains, artificial waterfalls and reflecting pools, is prohibited.

Municipal Water Use

- Using water to sweep or wash the streets, driveways, sidewalks or paved areas is prohibited, except for towns that use non-potable water or if the town certifies that a public health threat exists.
- Flushing sewers or fire hydrants is prohibited, except for public health or safety reasons.

XV. The Position of the Ratepayer Advocate on Drought Preparedness

The Ratepayer Advocate supports preparedness measures that integrate comprehensive drought planning and proactive mitigation measures to lessen the impact of drought on New Jersey consumers, the State and our environment.

Effective drought plans should incorporate clearly identified objectives and performance standards and a clear exposition of the vulnerability of particular regions within the State to drought based on past and current water resources infrastructure and water uses.

An effective drought plan should be flexible, taking into consideration water allocation among users and water uses, and alternate or supplemental sources of water. Also to be considered are environmental impacts and mitigation of drought's impact on the environment through training, incentives, technical assistance, research and public education. Effective plans should consider the allocation of water to meet the need to protect the environment and to meet consumer needs.

Workgroups consisting of industry personnel, state, local, and county governments, and consumer advocacy groups should take an active role in developing the tools and strategies for formulating and carrying out appropriate drought preparedness strategies. Proactive involvement such as identification of back-up water supplies, review of drought related data identifying regional drought patterns, conservation options when marshaled, interpreted and disseminated before an emergency can reduce vulnerability to drought events.

Also, the importance of continued research should not be forgotten.. Drought related research is essential in the production of high-quality innovations and technology that lead to improved drought preparedness. Further research involving monitoring and prediction programs that focus on weather patterns, climate observations, soil conditions and streamflow measurements are critical in alerting the public to impending drought.

Lastly, a key element in drought preparedness is public education and awareness. Education programs such as workshops, newsletters, public service announcements, press releases, town hall meetings, utility bill stuffers all provide communication links among federal, state, local governments, consumers and consumer advocates. These links assist in increasing awareness of the value of preparedness and work to reduce the costly impacts of droughts.

XVI. Water and Sewer Options for Municipalities: Public-Private Partnerships

Competition has become a substitute for regulation...Where regulation is impossible, competition can bring the benefits that regulation would have brought.

Wilcox, *Public Policy Towards Business*, p.540.

Privatization is being advanced as one way to increase competition and achieve more cost-effective infrastructure improvements in the water and wastewater industries. Estimated cost savings range from fairly small to a significant savings of between 40 to 50 percent. Public/ private partnerships is a broader term encompassing full privatization as well as other innovative ways through which water utilities can increase their competitiveness. By partnering with the private sector, it is possible for a city to realize significant operational cost savings and to attract private capital investment for needed infrastructure development.

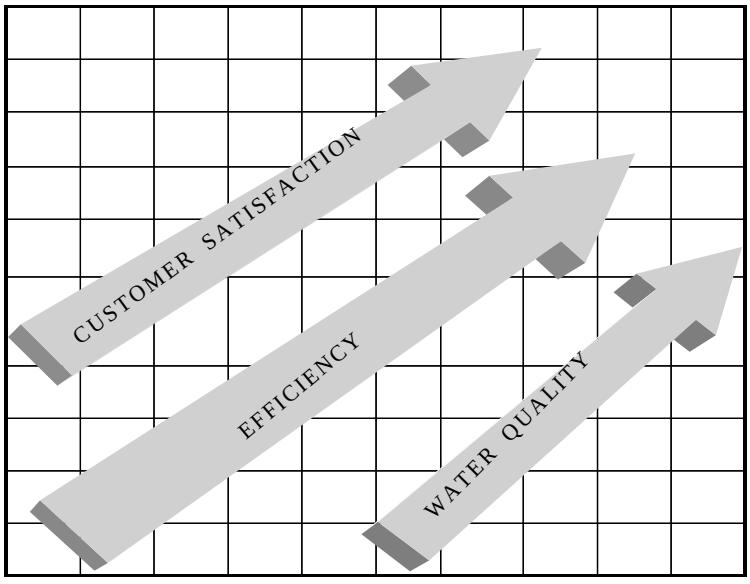
Privatization is an old idea. It dates back to the nineteenth century when toll roads and bridges, as well as many water utilities, were privately owned and operated. Today, public utilities are considering ways privatization can be integrated throughout its infrastructure, from limited contract work (e.g., meter reading) to fully private construction, ownership and operation of a treatment plant and distribution system.

Privatization is seen as one way utilities can increase customer satisfaction, efficiency and water quality.

Private firms offering these services have ranged from local operation and maintenance companies to massive international corporations.

Why Privatize?

Municipalities are embracing "privatization" because they have become overextended. Mirroring major corporations of the 60's and 70's, which took over dozens of unrelated businesses and became conglomerates, governments over the past 60 years have expanded into dozens of business areas in which they have no comparative



advantage. Corporate restructuring in the 80's led to dramatic downsizing and productivity increases. Spinoff divisions of large corporations have become far more successful independent of their corporate parent. Modern government has evolved and the same type of restructuring is emerging in the water and wastewater industries.

Competitive focus on innovation, speed, cost of service and quality are all factors that must be considered in conjunction with public health which is the primary obligation of any water/wastewater utility.

Privatization is being advanced as a way to increase competition and achieve more cost-effective infrastructure improvements in public utilities. Like other public services targeted for privatization, much of what is occurring in the water and wastewater industries is being driven by the promise of overall cost savings and the prospect of cash up front. Privatization can turn a municipality's hidden equity into cash. This is cash that can be put to use for other beneficial community needs, or that can be invested for long-term revenue objectives. Other factors influencing privatization include the ability of less bureaucratic private firms to quickly implement more flexible labor and operating practices; and the increased ability of large firms to leverage technology and state-of-the-art practices because of their sophistication and economies of scale in research and development. Also, private corporations are better able to achieve savings in construction and/or capital financing because they are unrestrained by the public bidding process and debt issuance requirements of local finance laws.

Other considerations contributing to increasing privatization include more stringent federal environmental and public health regulatory standards coupled with technological change. For example, new drinking water requirements phasing in at the start of year 2000 under the 1996 Amendments to the SDWA toughens standards for guarding against bacteria and other microbial contaminants. Many utilities will need to significantly upgrade their treatment processes to meet these requirements, in some cases switching from chlorination to more complex and less familiar technologies. Such additional costs are over and above the cost already required to renew and replace existing treatment facilities and distribution systems. In the face of such potentially costly requirements for major system upgrades and demands for increased technical and management sophistication, many public utilities are looking at privatization as a competitive alternative.

A. Privatization Alternatives

1. Divestiture or Asset Sales

As the water and wastewater industries become increasing competitive various alternatives emerge for integration of private strategies in the public domain.

The first alternative is divestiture or asset sales. This form of privatization takes place with the sale of the public enterprise. The first countries to utilize divestiture as a tool of privatization were Chile in the 1970s and Britain in the early 1980s.

In the United States in 1992 federal barriers were removed that allowed state and local infrastructure facilities funded in part by federal grants to sell or lease part or all of their facilities. It is estimated that $227 billion of city and state utility infrastructure is available for private-sector purchase, including 2,000 state and municipal electric utilities worth $17 billion; 800 gas utilities worth $2 billion; 35,000 water systems worth $24 billion, and 15,000 wastewater systems worth $31 billion.[65]

Benefits of divestiture or asset sales include the one-time windfall from the sale which can be used to pay off debt and save interest charges, or to invest in other needed infrastructure. Another benefit is the replacing of government management with business management. It is contemplated that private sector management could lead to more efficiency, higher operation productivity and possible elimination of current or future subsidies, which is a long term benefit to tax payers. In addition, an investor owned facility could go on the tax roll, paying local property tax as well as state and federal corporate income taxes, which provides ongoing permanent fiscal relief to the public entity.

We are likely to see continued incremental growth in asset sales among communities with small systems adjacent to large and sophisticated investor-owned utilities. For example, this strategy was utilized in 1996 by both United Water Resources to acquire two small New Jersey systems to gain approximately 40,000 new customers and by Consumers Water Company, who purchased three local systems. Also, in 1997, the Philadelphia Suburban Corporation acquired eight systems adding over 17,000 new customers.

2. Infrastructure Franchises

The second type of privatization is a long-term franchise under which the private sector provides the water/wastewater infrastructure that would otherwise be provide by the public entity. For example, a long-term franchise to provide water and/or wastewater treatment services is given to an investor-owed service provider, who can take this piece of paper to the capital markets and raise the funds to build the facility, with the revenues from user charges paying off the bonds and providing a return to the equity investors.

Large water supply modernization projects are under way in several countries, utilizing long-term franchises. An international consortium has committed $4 billion to expand and modernize the water system of Buenos Aires, including the installation of water meters in the city. Likewise, in the United States, serious interest has been shown in privately financed and operated additions to water and wastewater systems.

Proponents of infrastructure franchises advance a number of benefits from substituting private capital, expertise and management for public sponsorship. First, obtaining new infrastructure through franchises requires no capital outlay by the public sector. This means not using up limited bonding capacity on projects which the private capital markets are willing to

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[65]Robert W. Poole, Jr., *Privatization and Public Utilities*(Water Magazine, Vol 36, Num 4, 1996) at pg. 27.

finance. This lessens government indebtedness and has the potential to boosters a municipality's credit rating.

Second, a private consortium can develop a large infrastructure project in less time than government's traditional procurement processes permit. Under a design-build approach private investors utilize a single team that works together throughout the project, rather than the typical public process of separate competitive bidding for the design phase and the construction stage. The design-build approach compresses the overall schedule, reducing change-orders during construction, which reduces overall development costs.

Third, a major benefit of the private franchise is the transfer of risk from taxpayers to investors. Public projects can be very costly and can end up in the red due to unrealized service projections and/or stagnate build-out. Privatization can shift the risks. Private investors, rather than the taxpayers, bear the risks and the costs when an infrastructure project does not reach economical fruition. Privatization offers the water and wastewater industries a competitive challenge by looking to private sources to operate in a cost-effective manner while providing high quality drinking water and meeting customer service expectations.

3. Competitive Outsourcing

The third major type of privatization is for the public sector to decide whether it is more cost-effective to produce the service in-house or to outsource it to a private resource. Competitive outsourcing has become an established way of doing business in both state and local governments. Specific water/wastewater services that can be outsourced can include meter reading, laboratory analyses, billing and revenue collection. A major service typically provided by private outsourcing is the operation and maintenance of a specific component of a water system, e.g., a water treatment plant. Recently, this option over the last few years has received increased consideration in the water and wastewater industries. The actual ownership of the facility is left in the public domain.

Under this option, contract lengths and provisions have varied significantly. For example, in the water industry, Buffalo, New York adopted a five year contract (with a five year renewal option) in 1997 with American Anglian Environment Technologies (AAET) for full-system operation. AAET projected to save Buffalo $23 million over the first five years (a 30% pre-contract operating savings), guaranteed no layoffs and continued civil service status for the municipal employees of the system. In the wastewater industry, Milwaukee entered into a 10 year agreement in 1998 to serve 1.2 million customers, projecting to save $145 million over the contract period.

There have been long term privatization initiatives. In North Brunswick, New Jersey, a 20 year franchise agreement was negotiated for both the water and wastewater systems of the township. This agreement included an up-front payment of $30 million, $24 million of which was used to retire existing system debt and concession fees throughout the contract term.

For municipalities strapped for cash, such substantial up-front payments are attractive and become the source of sorely needed revenue to meet operating expenses without increasing property taxes. In addition, competitive outsourcing can save money through economies of scale, since it may be more cost-effective for a small city or town to contract with a private utility provider that serves a number of service areas, as opposed to the city or town providing the utility service.

More importantly, it has been shown that competition works better than monopoly. Industries that have a permanent, guaranteed monopoly for providing a service lack the incentive for continually rethinking how to best integrate people, procedures and technologies to do the work more productively and cost-effectively. In contrast, such incentive is fostered in industries in which providers must regularly compete to be the service provider.

B. Municipal Privatization

There are several reasons why a municipality may consider privatization. Privatization allows a municipality to reduce operation and maintenance costs and to decrease its labor force by transferring the responsibility to operate and maintain the water system to another provider.

In addition, needed repairs, maintenance and compliance upgrades to the municipality's water infrastructure, which may have been deferred because of budgetary shortfalls, could be realized by requiring the acquiring provider to make specific upgrades to the infrastructure in exchange for the right to operate the water system.

Finally, the potential exists for municipalities that privatize their water systems to receive large up-front payments as an inducement to enter into such an arrangement. A large up-front payment and/or scheduled payments over a period of time help cash-deficient municipalities to meet current and future operating expenses without the necessity of increasing property taxes. However, it should be noted that this up-front payment or concession fee is typically paid back by the municipality through a management service fee and usually includes the pay back of interest on the concession fee.

C. The Privatization Process

Generally, municipalities who want to privatize their water system will issue requests for qualifications and proposals to determine which water provider would provide the most comprehensive services in exchange for the right to operate the municipality's water system. Relevant items that are typically made part of any discussion and/or included in any agreement are:

- the duration of the agreement;
- the proposed schedule of payments to be made by the operating provider to the municipality;
- the allocation of responsibility for operating and maintaining the municipal water system;

- the proposed capital improvements and upgrades to be made to the infrastructure;
- the amount of water system revenues to be retained by the operating provider;
- the rates to be charged to the users of the system; and
- any tax consequences of any outstanding debt issued by the municipal water system (e.g. tax-exempt status may be lost).

D. Statutory Authority for Water System Privatization in New Jersey

Statutes have been enacted in New Jersey to assist municipalities in achieving efficiencies in water and wastewater outsourcing to another public and/or private entity. A brief summary of some relevant statues are highlighted below:

County Improvement Authorities Law, N.J.S.A. 40:37A-44, et seq.

This statute empowers county improvement authorities to provide "public facilities" to municipalities. The term public facility has been interpreted broadly to include everything from a courthouse to a parking garage. In addition, the statute specifically empowers municipalities, "without any referendum or public or competitive bidding, to sell, lease, lend, grant or convey to an ([improvement] authority, or to permit an [improvement] authority to use, maintain or operate as part of any public facility any real or personal property which may be necessary or useful and convenient for the purposes of the [improvement] authority." The municipality may convey the property to the improvement authority on any such terms and conditions that may be approved by the municipality and the improvement authority.

Similarly, the statute authorizes local governmental units to enter into agreements with an improvement authority for the use of the improvement authority's public facilities. These provisions are critical to the execution of water privatization transactions, because improvement authorities typically do not possess the personnel or technical expertise necessary to operate a water system. Therefore, if a municipal water system is sold/leased to an improvement authority, another governmental unit would probably have to be retained to maintain and operate the municipality's water system.

Municipal and County Utilities Authorities Law, N.J.S.A. 40:14B-1, et seq.

This Act enables utility authorities to provide retail water services to municipalities. Specifically, this law authorizes a utility authority to "acquire, construct, maintain, operate or improve works for the accumulation, supply or distribution of water." The statute further provides that a utility authority may "produce, develop, purchase, accumulate, distribute and sell water and water services, facilities, and products" either within or outside its district. Utility authorities under this statute are also authorized to impose service charges for the use of their water and to issue bonds to finance the cost of acquiring a water system. With respect to the rates charged by the utility authorities for use of their water, the enabling legislation requires rates to be as nearly uniform throughout the district as possible.

County and Municipality Water Supply Act, N.J.S.A. 40A:31-1, et seq.

This Act authorizes local governments (including municipalities), either separately or in combination with another local governmental unit, a private water company, or the state to acquire, construct, maintain and operate a water supply facility.

Local government units are given broad powers including the right to: 1) acquire water supply facilities and to operate, manage and control these facilities; 2) purchase any real estate or personal property deemed necessary for the acquisition of water supply facilities or for the efficient operation of any such facilities; 3) enter into all agreements necessary or incidental to the performance of the local unit, private corporation, co-partnership, association or individual providing for, or relating to, water supply, which contracts may provide for the furnishing of water supply services either by or to the local unit, or the joint construction or operation of water supply facilities; and 5) fix and collect rates, fees, rents and other charges in accordance with the statute.

The Interlocal Service Act, N.J.S.A. 40:8A-1, et seq.

The Interlocal Service Act allows local government units (including municipalities, counties, and regional authorities) to pool their resources and provide joint services within their respective jurisdictions. The purpose of the statute is to promote economy and efficiency in government by enabling local units to consolidate governmental services under the auspices of one or more local units. Specifically, the statute provides that "any local unit...may enter into a contract with any other local unit for the joint provision within their several jurisdictions of any service which any party to the agreement is empowered to render within its own jurisdiction."

In addition the statute provides that "local governments can enter into contracts to provide jointly, or through the agency of one or more of them on behalf of any or all of them, any service...which any of the parties on whose behalf such services are to be performed may legally perform for itself." (An important caveat, however, is that each party to the agreement must independently possess the statutory authority to provide retail water services within its own jurisdiction. Then, if a municipality proposes to outsource its water facility to another public entity pursuant to the Interlocal Service Act, the municipality must ensure that the other public entity is statutorily enabled to operate a retail water facility.)

New Jersey Water Supply Public-Private Contracting Act, N.J.S.A. 58:26-19 et seq.

This Act permits a municipality to retain a private water company to provide water supply services to the municipality. Pursuant to the Act the duration of the agreement between the municipality and the private provider can be for a period of up to 40 years.

One important feature of the Act is that it allows the private provider to pay the municipality a "concession fee". A concession fee is an up-front payment made by the private water provider to the municipality which is designed to provide a monetary inducement for the municipality to enter into the transaction.

The aforementioned New Jersey statutes provide a number of options for the sale or lease of a municipality's water system to both private water providers or another public entity. Municipal privatization will not depend upon one set of circumstances. Municipal policy makers are encouraged to undertake additional research of relevant laws governing such partnerships, and to consider flexible approaches in achieving future efficiencies in water and wastewater services.

XVII. The Position of the Ratepayer Advocate on Water Privatization and Public/Private Partnerships

The Ratepayer Advocate supports a more competitive water and wastewater industry offering improved quality and service at reduced costs and rates for the consumer. Competition is an important element of the U.S. economy and privatization has always played a part in the evolution of water utilities in this country. Over the past decade, competition aimed at improving efficiency and cost control has resulted in many publicly owned and operated drinking and wastewater systems undergoing restructuring and revised management practices. In the water and wastewater industries, the competitive focus on innovation, speed, cost consciousness, service and quality must be balanced with obligations for protection of public health, reliability, improved customer service and reduced cost.

Protection of the public health must remain the primary focus of a water/wastewater utility's. Any contemplated competition or integration of private sector strategies into the public domain must keep the overall objective of public health protection in the forefront.

Reliability is another component of good service. In opening water utilities to competition, safeguards must be put into place guaranteeing that competitors' systems and facilities reliably and consistently satisfy water users' needs.

We must also look at customers - those who pay the cost for the utility service. Customers demand continued improvement in the level of service and water quality. We must encourage competition that fosters innovation; and that embraces modern technology in the areas of instrumentation, data management, communication, as well as modernization of plant and maintenance equipment. Responsibilities will change, and labor skill levels will likely need to be enhanced. Public utilities can increase their own competitiveness by outsourcing for special services. Outside resources can play a key role in developing and implementing management changes and plant efficiencies.

In addition, we must examine the cost of service to customers. Generally, customers want to see a reduced cost of service reflected in their monthly bill. Customers are unwilling to accept a lower level of services in exchange for reduced cost and demand higher levels of service at a lower cost. Investment in technology will be necessary to achieve more efficient use of plant resources and labor, if customers are going to realize any long-term savings.

Which way is best? There is no single answer that is based on one set of circumstances. Competition allows us to consider public/private partnerships and the many other choices along the continuum from a cooperative, a homeowners association, a water authority, to an entirely publicly owned or entirely privately owned partnership. At the end of the day, the main issue is how to best satisfy demand for the production of high-quality water and better customer service at no increased cost to ratepayers. Competition can be the driving force that raises the performance standard in the water and wastewater industries. Through competition water utilities are now challenged to operate more cost effectively while providing high quality drinking water and meeting customer service expectations.

Lastly, when considering instituting some form of private involvement the public sector must consider such items as preventive maintenance, disaster preparedness, and seismic improvements. These are all items that are generally addressed by public-sector water utilities. How well a private firm will handle emergencies and whether it will employ enough personnel to deal efficiently with an emergency must become part of any partnership agreement.

The introduction of competition into the water and wastewater industries can become an effective tool to assist public entities in achieving efficiencies in water and wastewater services, which potentially could result in lower costs to ratepayers.

XVIII. The Relationship Between the Water and Energy Industries

The water and energy industries, particularly the electric industry, are closely linked to each other. The Electric Power Research Institute estimates that the water industry consumes about 3 percent of all of the electricity generated in the United States.[66] This makes the water industry the third largest industrial consumer of electricity in the country, behind only the chemical and primary metal (e.g., steel, aluminum, copper) industries.[67]

Similarly, the energy industry is equally dependent on water. With rare exceptions, you cannot produce electricity without access to significant amounts of water. In fact, one of the major factors considered when siting a new power plant is the adequacy of the water supply. A recent study of the impact of deregulation on the water industry highlights many instances where the impact on water supplies has been the major factor in local opposition to new power plants.[68]

These concerns about the impact on local water supplies are not limited to arid states of the west and southwestern United States. Proposed power plants in "water-rich" states like Illinois, Pennsylvania, and New York have raised concerns about the available water supply. In fact, as this paper is being written, two proposed power plants in New York State have raised serious concerns among New Jersey officials about the impact on water supplies and flows in the Ramapo River in Bergen County.[69]

It is increasingly clear that you cannot discuss the future of the water industry without also considering changes in the energy industry. Dramatic changes in prices or the quality of service by electric and gas utilities will have an immediate impact on the water industry. Similarly, changes in water and wastewater regulations will have an immediate impact on the energy industry. If you want to encourage the construction of new power plants you must be aware that one of the major impacts will be on water supplies in the area. If you want to encourage water utilities to change their treatment technology you must be aware that some of the newer technologies are highly energy intensive and could lead to dramatic changes in local and regional

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[66]Franklin L. Burton, *Water and Wastewater Industries: Characteristics and Energy Management Opportunities* (Electric Power Research Institute 1996), p. ES-1.

[67]Janice A. Beecher and Scott J. Rubin, *Deregulation! Impacts on the Water Industry* (American Water Works Association Research Foundation 2000), p. 77.

[68]Beecher and Rubin, *supra*, pp. 161-62.

[69]"N.J. Officials Fight 1,100-MW N.Y. Plant; Developer Calls Water Use Minimal," *Utility Environment Reporter* (Feb. 9, 2001), p. 13.

energy usage patterns. For example, one researcher estimates that using ozone to treat water can be twice as expensive as using chlorine, 75 percent of the cost increase for electricity.[70]

On the other hand, the water industry is distinguishable from the electric industry in several important respects.[71] The cost profile of the water industry, along with other important features, makes economic deregulation less desirable or probable. Nonetheless, advocates of less regulation and more use of market forces in the water sector can be found. Among those advocating for less regulation of the water industry is the New York Society of Security Analysts who, at their December 12, 1999 meeting, included a presentation on "When and How Will Deregulation Come to the Water Industry" by the Honorable Henry M. Duque of the California Public Utilities Commission. Also advocating for deregulation is Azurix, a subsidiary of Enron Corp., which owns and operates water systems around the world. Closer to home, United Water Resources, the parent company of United Water-New Jersey, prides itself as a leader in the field of public-private partnership contracts with many large cities around the United States. These advocates believe many aspects of energy deregulation, such as billing and customer services, can be deregulated in a competitive environment in the water industry.

These papers are intended to provide information on the water industry and the relationship of the energy industry to water costs and services to those who make policy on behalf of the public, including legislators, municipal officials and regulators; to stimulate and encourage informed public debate and discussion on issues affecting all water customers; and to explore ways for water providers to continue to provide their customers with safe, reliable, uninterrupted, and affordable services.

A. Emerging Water-Energy Interactions

The restructuring of the electricity and natural gas industries, in New Jersey and throughout the country, will have a profound impact on water utilities. The effects of energy industry restructuring will be felt by water utilities because water utilities are (1) sizeable energy users, (2) competitors for the use of water resources, and (3) companion providers of essential services. Power generating plants use millions of gallons of water to cool their turbines. With the recent deregulation of the energy industry, companies from all over are applying to build power generating stations in the New York/New Jersey region, especially along the Hudson River. The Hudson River is already home to Indian Point 2 and 3, Lovett, Bowline, Roseton, Danskammer and Albany generating stations. Not only is the Hudson River a prime location, electric generating companies have proposed to construct power generating plants in Thorne Valley located in Rockland County which is adjacent to New Jersey's northern border. A book

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[70]John Douglas, "Electrotechnologies for Water Treatment," *EPRI Journal* (March 1993), p. 9.

[71]Janice A. Beecher, *The Water Industry Compared: Structural, Regulatory, and Strategic Issues for Utilities in a Changing Context*. A report prepared for the National Association of Water Companies (NAWC 1998).

sponsored by the American Water Works Association Research Foundation has been published about the effects on the water industry of restructuring and deregulation in the energy industries.[72]

This section will focus on three particular ways in which the interaction between water and energy utilities is changing, including some of the major effects on water utilities from energy deregulation, how energy deregulation will affect water resources, and the potential for joint conservation programs between water and energy providers.

B. Impact of Energy Deregulation on Water Utilities[73]

The question is not whether water utilities will be affected by utility deregulation but when and how. The structural and regulatory transitions underway in the telecommunications and energy industries are the most pervasive in their histories. Although the water industry demonstrates many unique technical, economic, and institutional features, these forces of change still are affecting water utilities, customers, and regulators.

Deregulation will affect all water utilities – large and small, urban and rural, publicly owned and privately owned. While every potential impact on every type of water system cannot be anticipated, careful analysis suggests ways in which different types of water systems will be affected by deregulation. Despite the degree of uncertainty about the precise outcome of restructuring, the movement to restructure and partially deregulate the utility sectors could have a profound impact on the water industry in several key areas.

The deregulation movement will effect all types of water utilities regardless of ownership. Over the long term, deregulation could have most relevance to the regulated, investor-owned component of the industry. The traditional modes and tools of economic regulation by state public utility commissions are being replaced by market forces and performance-based mechanisms of oversight. While these alternatives are designed for the other utility sectors, the broader movement to restructure utility markets and transform regulation is far-reaching. Jurisdictional water utilities will be affected by changes in commission philosophies and policies, even though a general consensus exists that water is different from other utilities in at least some important respects.

C. Water and Energy Use

Water utilities consume significant amounts of energy. The restructuring of energy markets is focusing attention on how water utilities buy, use, and manage energy resources. How restructuring will affect any individual water utility depends on a combination of factors: the market in which it operates, the technologies it employs, and – perhaps most importantly – the choices made by utility managers.

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[72]Janice A. Beecher and Scott J. Rubin, *Deregulation! Impacts on the Water Industry* (American Water Works Association Research Foundation 2000).

[73]This section relies on the Executive Summary from Beecher and Rubin, *supra.* It is reprinted with the permission of the authors.

As all water utilities are electricity customers, they will be affected by changes in electricity markets. Changes in the electricity sector are focusing attention on how water utilities manage energy needed for the production of water. Restructuring presents an opportunity to combine technical and management strategies to enhance operations, improve service, and lower costs. But electricity restructuring could present a potential threat to reliability. Energy intensive water operations require reliable electricity service to ensure reliable water service. The reliability issue should cause water utility managers to evaluate operations and plan for potential disruptions that might result from restructured electricity markets. More detailed water industry standards and guidance may be needed in this area.

D. Deregulation and the Costs of Water

The impact of deregulation on utility operations will in turn affect water utility finances and require new management strategies. All water utilities, regardless of size or ownership, should carefully evaluate the potential to achieve energy savings by improving the efficiency of existing processes or by investing in new equipment that can greatly reduce energy costs. Changes in pricing and procurement practices could affect utility revenues. In addition, the significant effects of changes in utility taxation that might result from restructuring should be monitored carefully by all water utilities.

Water utilities also should carefully evaluate the different energy pricing and service options that will become available, including opportunities for aggregation. Aggregation should be approached cautiously to ensure that the interests of the water utility are well served. Water utility managers also should be aware of opportunities that may emerge for them to provide other utility-related services, such as billing, metering, and energy aggregation. Strategic planning can help water utilities respond effectively to these challenges.

E. Consumer Issues

Consumer issues are at the very heart of restructuring and deregulation. Any proposal to deregulate an industry starts with the premise that the free market can do a better job than government regulation in meeting the needs of consumers. In addition to any other benefits that might be achievable by deregulation, consumer benefits must be of paramount importance. Indeed, it is hard to imagine a deregulation plan being adopted by state legislature if it didn't promise benefits for consumers. Anticipated benefits could include lower prices, better service, and more choices, among others.

Consumer expectations from utilities are changing. Water utilities need to consider the potential for change, look for signs that changes are occurring in their area, and develop strategies to respond to the needs of their consumers. In addition, water utilities should closely monitor changes that are occurring in the delivery of utility services, particularly in the area of competitive billing and metering services. Opportunities may arise for water utilities to reduce expenses, improve efficiency, or to develop new service offerings. Finally, water utilities also need to be aware that consumer protection requirements and standards are changing in other utility industries because of deregulation. These changes may effect the water industry, which could require significant changes in the way in which water utilities interact with their customers.

Federal and state regulations require all water suppliers to provide their customers with a detailed annual report regarding the status of their water quality. Pursuant to the federal Safe Drinking Water Act, water systems are required to annually mail their customers a "Consumer Confidence Report" listing the type and levels of contaminants in the drinking water. 42 U.S.C.A. Sec. 300g-3(4)(A). The New Jersey DEP has adopted and incorporated these regulations into the NJ Safe Drinking Water Act, N.J.S.A. 58:12A-12.2. All water customers in the state should have received their first annual Consumer Confidence Report; if you have not, contact your water utility to obtain a copy.

F. Structural Changes in the Water Industry

While water has several characteristics that distinguish it from the telecommunications, electric, and natural gas industries – and change comes slowly – the pressure to change is significant and the signs of change are undeniable. Rising costs are bringing attention to the need for greater efficiency, better management, and technological innovation. Broader market forces are bringing attention to structural alternatives for the water sector, including consolidation, privatization, and methods for exchanging water. The deregulation movement accounts for at least some of the structural changes underway in the water sector.

How deregulation is affecting the structure of the water industry may be subtle but it is potentially profound. Deregulation is a contributing factor to changes in the ownership character of the industry including the trend to mergers and acquisitions,[74] the expansion of water utilities into new service areas, the evolution of corporate structures and cultures, and convergence.[75] Water systems are faced with the challenge of trying to respond effectively to these changes. No doubt, both internal and external forces will shape the future structure of the water industry.

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[74]*I/M/O the Joint Petition of Lyonnaise American Holding, Inc. and United Water Resources for Approval of a Change in Ownership and Control of the New Jersey Operating Utilities*, BPU Docket No. WM99110853; *I/M/O the Joint Petition of E'Town Corporation and Certain Subsidiaries of E'Town and Thames Water Holdings Incorporated for Approval of a Change in Control of New Jersey Public Utilities Controlled and Owned by E'Town Corporation*, BPU Docket No. WM99120923.

[75]Convergence is the potential for gas, electric, telecommunications and cable and internet products and services to be offered by one utility or one utility in conjunction with one non-regulated company, as a new enterprise, a joint venture, or as a result of the merger of several companies.

G. The Differences Between the Water and Energy Utilities

- water is a liquid which weighs 8.33 lbs. per gallon versus natural gas which is extremely light and electric and telecommunications transmissions are weightless;
- the transmission of water is subject to the laws of gravity versus gas and electricity which can easily travel in all directions;
- it is comparatively easy to move natural gas or electricity over long distances while it is extremely expensive to move water even over short distances; and
- the natural composition of electricity and natural gas is left unchanged when transported to customers for use while the quality of water, depending on where it was obtained, varies greatly from region to region, even from town to town, and the manner in which water has been chemically treated varies greatly from utility company to utility company.

H. The Uniqueness of the Water Industry

One of the challenges for the water industry will be to ensure that alternative regulatory structures and methodologies understand the unique needs of the water industry. A regulatory approach that might work for an open-access distribution network, which appears to be the direction in which energy and telecommunications are moving, will not necessarily work for a closed-access supply, transmission, and distribution water system. Despite persistent market failures, monopoly power, and social concerns, a degree of pressure to "deregulate" water may materialize. Indeed, a form of *de facto* deregulation occurs when regulation is ineffective or when regulated investor-owned water utilities are displaced by unregulated contract arrangements between private providers and publicly owned systems. For example, in 1996 Jersey City entered into a public-private contract with United Water New Jersey for United Water to operate the city's water system. Under the contract the city retains full ownership of the system, however, United Water manages, operates, maintains and makes all repairs to the city's water supply system. Billing and collection services are also being provided by United Water. The city will also receive 30,000 new water meters by December 31, 2002.

XIX. Conclusion

The water industry has begun to define its role for the future. New water legislation has redefined the quality of service the industry should provide. In addition, privatization has widened competition and established core competencies . The water industry appears to be the last true regulated monopoly still dependent on traditional rate making regulation.

There is no doubt that the water industry will continue to grow and generate regulated rates of return that will appeal to investors who want the continued payment of stable or increasing dividends. Capital requirements will remain onerous, due to the need to build new systems, rehabilitate old ones, and put in place new environmental controls.

Small systems are not going to be able to provide services or raise money as efficiently as larger entities, therefore consolidation will play an important role in the future of the water industry. We will see consolidation occurring through the purchase of smaller systems by larger systems, merger of government agencies, joint operating contracts that put effective control of a number of entities into the hands of a nonowner.

The Ratepayer Advocate trusts that these position papers lay the foundation for the mapping out of future strategies by industry stakeholders and promote divergent views as to valuation and future opportunities. The water industry in the future will likely see:

- An increase in competition: Due to the recent deregulation of the energy industry, there maybe some areas such as billing, collection and customer services, that can be utilized by the water industry in hopes of lowering costs. Also, more and more investor owned utilities are contracting with municipal water systems to operate and manage the municipality's water utility. With increased size comes increased revenues, utilities are aggressively pursuing taking over smaller water systems to expand their service territories and increase their profits.

- Technology playing a dominant role in industry evolution: With the public's demand for clean, potable water, increased environmental standards will cause the water industry to implement these more stringent regulations which may require reliance upon new, more costly technologies.

- Ratepayers will continue to become more knowledgeable regarding water issues and their options: In the not too distant past, water was one of those essential products that was very inexpensive. Currently, due to the replacement of aging mains and pipes and testing and removing much more contaminants, the cost of water has sky-rocketed. As a result, consumers are becoming more aware of their escalating water bills as well as their usage patterns.

- Convergence of industry sectors and utility services will widen: Energy and or telecommunications utilities, whose operations and customer bases far exceed the water industry's will market their computer billing and collection services as well as state of the art customer service interfaces across all utility sectors.

- Market-based solutions will prevail over imposed solutions: The industry will need to respond to what people are willing to pay in order to receive essential lifeline services such as water. Regulators need to work with industry, federal and state legislators as well as local community leaders and the public to craft solutions that benefits everyone.

Appendix B

FEDERAL REGULATION OF DRINKING WATER

A Primer on the Safe Drinking Water Act

The United States has one of the safest public drinking water supplies in the world. However, each year up to 1.3 million people contract water-related diseases and, of those, between 50 and 1,200 people die.[1] Yet most of us take the safety of our drinking water for granted. As such the federal government has become a key player in the preservation of our water resources. In 1974 Congress passed the Safe Drinking Water Act (SDWA) which established national standards for drinking water quality. This landmark legislation has provided the statutory basis for states to adopt, implement and enforce drinking water standards. It is within this regulatory framework that states are able to ensure that the public water systems in their jurisdictions provide residents with safe drinking water.

Pre-1974: Drinking Water Protection Before the SDWA

Prior to 1974, the safety of the water supply was viewed primarily as a state responsibility. The history of public water supply in the United States can be traced to the late 1700s and early 1800s. For example, in 1822 the entire City of Philadelphia was supplied by a water distribution system. By 1860, over 400 water systems served major cities and towns, and that number grew to over 3,000 by 1900. However, many of these systems did not supply safe water and often were the source of major disease outbreaks often resulted from biological contamination of the water. The ability to collect and deliver water had out paced understanding of the health implications of a contaminated water supply and the knowledge to remedy the problem.

The problem of biological contamination of drinking water began to be addressed by individual states as knowledge and technology developed. Many state boards of health were established in the second half of the nineteenth century. Understanding the causes of diseases such as cholera and typhoid led to improved wastewater disposal practices. Developments in water treatment technology such as filtration and disinfection led to dramatic decreases in water-related disease outbreaks. Nonetheless, these developments and their applications were slow and uneven among the states and substantial problems continued well into the twentieth century.

The initial efforts of the federal government directed toward the health aspects of the water supply grew out of concern for the spread of communicable diseases. Intending to prevent the introduction of infectious or contagious diseases into the United States, legislation was passed in 1890 to prevent the spread of contagious diseases from one state to another. As this program developed, attention eventually came to focus on water supply, initially focusing on vessels used in waterborne commerce and finally with respect to all interstate carriers.

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[1] *25 Years of the Safe Drinking Water Act: History and Trends*; EPA-Office of Ground Water and Drinking Water, 1999; pg 1. *URL:http://www.epa.gov/safewater/sdwa25/sdwa.html*

A milestone in the history of federal drinking water protection was the adoption in 1914 of drinking water standards for common carriers engaged in interstate commerce. These standards were adopted by the Secretary of the Treasury following a study performed by a special commission. The standards, which were administered by the Public Health Service, came to be known as the PHS standards. These standards were limited and only specified limits for bacterial impurities in drinking water. The standards did not address physical properties or chemical impurities of drinking water.

Although legally applicable only to water suppliers serving interstate carriers, these standards came to be widely applied to public drinking water supplies in general. The methods of laboratory analysis and the practices of state health officials relying on these standards were not applied uniformly and demonstrated wide divergences. Partly as a result of wide variations in application, the standards were revised and expanded in 1925, 1946 and 1962. For example, the 1946 changes included addition of language to facilitate uniform application of the standards to all public water supplies. Nonetheless application beyond the original coverage remained voluntary. The revisions of the PHS standards continued the general trend of expanding the list and the limits of harmful contaminants in drinking water.

Drinking water quality over the first half of the twentieth century had undergone substantial improvement. Many once-common diseases had been virtually eliminated, leading to general confidence in the safety of public water systems. But, this confidence began to erode early in the second half of the century. Concern about pesticides and a wide range of chemicals with unknown long-range effects, together with lingering episodes of waterborne disease, caused doubt concerning the adequacy of drinking water management programs. The final evidence of the deficiencies of the water supply industry came from a 1970 PHS study reporting the results of an investigation of 969 public water supply systems. In the report, thirty-six percent of tap water samples collected exceeded one or more PHS standards for bacteriological or chemical contaminants. The report also found that physical facilities were often inadequate, with fifty-six percent reporting to have deficiencies of some kind.

The existence of widespread deficiencies emphasized the inherent limitation of the existing PHS standards. The standards only mandated the prohibition of noncomplying water sources on interstate carriers and legally could not be enforced against providers of water to local populations, and moreover had no regulatory status with respect to water suppliers not serving carriers. Although some voluntary application in state programs had occurred, only fourteen states had officially adopted the standards by 1971. Also, the range of contaminants covered was limited. The substances covered had expanded since the initial creation for bacterial contaminants, but the legitimacy of the expansion to include chemicals had been called into question since prevention of infectious diseases was the bases for the creation of the standards.

Recognizing the deficiencies of the then existing PHS standards and the general state of programs for protecting the public from unsafe drinking water motivated Congress to pass federal legislation applicable to Public Water Suppliers (PWS). As such, the Safe Drinking Water Act was enacted by Congress and signed into law in 1974.

1974-1986: The Original SDWA

The SDWA differed substantially from previous federal drinking water programs due to its application to all PWS that served more than 25 persons or had more than 15 connections. However, like previous federal drinking water programs the SDWA continued to ensure safe drinking water by enforcing performance standards for PWS and specifying legal limits on harmful contaminants. The new performance standards promulgated by the SDWA were incorporated into national primary drinking water regulations (NPDWRs), which covered substances in water with potential adverse health effects on humans. Additionally, the act incorporated national secondary drinking water regulations (NSDWRs) which covered substances in water with potential adverse human welfare effects like problems in the appearance or odor in water. The NSDWRs took the form of performance standards and were not enforceable by the federal government. It must be noted that the NSDWRs received very little attention in the SDWA due to the fact that the contaminants in this category had no effect on human health as compared to NPDWRs.

NPDWRs were issued in two forms, interim and revised. Interim NPDWRs were issued quickly while the revised NPDWRs were developed over a longer period of time through a more comprehensive approach. The interim regulations were based largely on updated Public Health Standards first developed in 1914. In addition to the interim and revised standards, the EPA administrator was given a mandate to develop regulations for any contaminant that may have an adverse human health effect.

NPDWRs were also issued as performance standards and were established at two levels. The first, known as “recommended maximum contaminant levels (RMCLs) were set at levels that prevented the occurrence of known or probable adverse effects on human health. The RMCLs had a safety margin built in. The RMCLs established health based goals without consideration to question of technological or economic feasibility. These state of the art goals were not be legally enforceable. The second level of standard, called “Maximum Contaminant Levels” (MCLs) were to be incorporated in considerations of technological and economic feasibility. MCLs were to be legally enforceable after final promulgation as regulations. NPDWRs were also authorized to be developed in a second form in cases where the measurement of contaminant levels was not technologically or economically feasible.

Recognizing that compliance with NPDWRs would not be feasible or necessary in all cases, the initial SDWA contained provisions for variances and exemptions. Variances allowed exceptions to compliance with MCLs where source water characteristics made compliance through the use of available technology impossible. But, variances and exemptions could not be issued if there was an unreasonable risk to human health. Variances and exemptions were seen as necessary measures for small systems with special compliance problems in with the SDWA.

These mechanisms represent one of the few concessions made to small water systems in the original form of the legislation.

The 1974 SDWA, in addition to providing for NPDWRs to control waterworks operation, incorporated other strategies for assuring the safety of drinking water. One prime example was the addition of measures to protect underground sources of drinking water against certain kinds of water disposal practices. This became known as the underground injection control (UIC) program. Inclusion of the UIC program in the SDWA was in response to the lack of federal controls over ground water pollution. The existence of increasingly stringent controls over waste disposal involving discharge of effluent into the atmosphere or surface waters was seen as creating an incentive for underground disposal where federal controls were largely missing. However, by focusing on injection well operations, the program excluded many other potential sources of ground water contamination.

Administration of the SDWA was designed to be a joint enterprise between federal and state government, following the approaches already employed in legislation as the Clear Air Act and Clean Water Act (CWA). The SDWA allowed a state to assume primary enforcement authority through application to EPA. An EPA delegation of primacy had to be based on a determination that the applicant state had adopted drinking water regulations at least as stringent as the federal regulation and was in compliance with other requirements.

1986-1996: SDWA Amendments of 1986

The passage of the SDWA in 1974 was accompanied by the expectation that drinking water standards could be adopted quickly. The next decade however, saw slow progress in creating new regulations. Although the SDWA was amended slightly in 1977, 1979 and 1980, the most significant changes to the 1974 law occurred when the SDWA was reauthorized in 1986.

During the mid-1980s, Congress was frustrated by the slow pace at which the EPA was developing new regulations; only 23 contaminants had been regulated between 1975 and 1985. Fluoride, one of the 18 contaminants for which an interim standard was promulgated in 1975, was the only one of the 18 standards revised before the 1986 Amendments.

Highlights of the 1986 SDWA Amendments

- EPA required to set MCLGs and MCLs for 83 named contaminants (which included the original national interim primary drinking water contaminants promulgated in 1974).
- EPA required to establish regulations beyond the 83 specified contaminants, within certain time frames (e.g., beginning in 1991 responsible for regulating 25 additional contaminants every three years).
- Required the disinfection of all public water supplies.

- Established filtration requirements for all water systems drawing their water from surface sources.
- EPA authorized to develop additional programs that protected ground water supplies.
- Established monitoring requirements for unregulated contaminants which states were required to report on every five years so that the EPA could decide whether or not to regulate those contaminants.
- Implemented a ban on lead-based solder, pipe and flux materials in distribution systems.
- Specified a *"best available technology"* standard for treating each contaminant and MCL was set by the EPA.

Congress also wanted to rectify major deficiencies in the implementation of programs established by the SDWA. Of particular concern was the fact that disease-causing microbes contamination had not been sufficiently controlled under the Act. Also during the early 1980s, synthetic chemicals of industrial and agricultural origin were being detected with increasing frequency, especially in ground water sources. Some surface water sources were also being contaminated by industrial and municipal wastes, but many were showing improvements in water quality due to the increased application of pollution controls, such as waste water treatment plants.

Finally, the 1986 Amendments made special provision to assist small PWSs in complying with the SDWA. A sum of ten million dollars was authorized for the provision of technical assistance to small systems in achieving and maintaining compliance. Additionally, special considerations for small systems were incorporated into various provisions. Lastly, criteria for determining eligibility for variances were modified to take water system size into account, thereby increasing the opportunity for small systems to obtain variances.

The 1996 SDWA Amendments

The 1996 Amendments continued and expanded certain trends evident in the 1986 Amendments while reversing others. The 1996 Amendments created new standards for prioritizing contaminants based on data about: the adverse health effects of the contaminant, the occurrence of the contaminant in public water systems, and the estimated reduction in health risk that would result from regulation. The 1996 Amendments also increased requirements for researchers to give the EPA more sound scientific data on which to base regulatory decisions. For each proposed regulation, the EPA had to conduct an analysis of the cost to water suppliers and benefits to public health, including people with weakened immune systems. Under the 1996 Amendments, public health protection remained the primary basis for deciding the levels at which drinking water standards were set.

Another important Amendment in 1996 was the addition of more source water protection measures. Among new measures were a source water assessment programs and a source water

quality protection program. For protection of source waters, states were authorized to create programs under which local government or owners of community water systems could petition for state assistance in creating voluntary agreements for source water protection. Another source-protection measure consisted of provision for EPA administered financial aid to states for development and implementation of comprehensive ground water protection programs. Grants were also authorized for source water quality protection activities consistent with nonpoint source pollution management programs under the CWA.

Perhaps the most significant change in the 1996 Amendments was the introduction of a variety of measures intended to facilitate PWS compliance with the Act. Realizing that the 1986 Amendments did not go far enough to address the problems facing small systems, the 1996 Amendments addressed the special compliance problems by including differing forms of assistance and special provisions that modified many of the SDWA's stipulations as they apply to small systems. The new Amendments sought to address the problem that standards under the old law were based on the affordability of treatment technology to large systems and were inflexibly applied to small systems who's economic capabilities were usually challenged. The new Amendments helped to ensure that small systems would be able to provide the greatest level of drinking water protection they could realistically afford, while maintaining a national baseline of protection that people expected.

Finally, the changes in the 1996 Amendments were made to reflect the fact that drinking water protection was grounded on both government and water system accountability. Moreover, emphasis was placed on public awareness and involvement. Right to know provisions in the Amendments gave consumers information needed to made health decisions thus increasing participation in drinking water decisions and promoting accountability of the water system at he state and federal level. Moreover, the much-anticipated new requirement for systems to prepare consumer confidence reports became law and the 1996 Amendments specified that the public should be provided data, analyses or implementation strategies developed under new SDWA programs. The consumer information provision heralded a new era of public involvement in safe drinking water, founded on the idea that the understanding and support of the public will be vital to address and prevent any threat to drinking water quality in the years to come.

Highlights 1996 SDWA Amendments

Consumer Confidence Reports

Every community water system must provide its customers with an annual water quality report starting in 1999. The reports tell customers about the source of their water supply, the level of any regulated contaminants detected in their water, and the health effects of contaminants detected above the safety limit.

Source Water Assessments

No later than 2003, states will be examining each of the nation's drinking water sources to identify contamination threats and determine how susceptible drinking water sources are to contamination. Communities may assist their state and water system in conducting the assessments and the states must make the results of the assessments available to the public.

Drinking Water State Revolving Fund(DWSRF)

This federal grant program provides money for states, who, in turn, provide loans to water systems to upgrade their facilities and ensure compliance with drinking water standards. A portion of each state's federal grant money can be set aside for several specific purposes, including acquiring land to buffer drinking water sources from contamination and funding other local protection activities. Each year, every state develops an intended use plan for how it intends to use all funds, including a list of water systems that will be receiving loan assistance to upgrade their treatment facilities. This list is available to the public, and states are required to seek public input into the development of their intended use plan.

State Capacity Development Strategies

By October 2000, states must develop strategies to ensure that all public water systems have the technical, financial and managerial capability to ensure that safe drinking water is provided to their customers. States are required to involve the public in the development of these strategies, and to make the final strategy available to the public.

Public Notification Improvements

Public water systems must notify their customers when they violate a drinking water standard. The rule prescribes the form, manner and timing of the notices to the relative risk to health.

Public-Accessible Drinking Water Contaminant Databases

EPA has collected information from water systems on the occurrence of contaminants in drinking water to assist in its decision-making about which contaminants to regulate in the future and which standards for regulated contaminants to reexamine.

Annual Compliance Report

Every year states must publish a report listing systems in their jurisdiction with violations of federal drinking water standards. EPA must summarize this information in a national report and make it available to the public.

Health Care Provider Outreach and Education

EPA and the U.S. Centers for Disease Control and Prevention(CDC) must jointly establish a national health care provider training and public education campaign to inform both the professional health care provider community and the general public about waterborne disease and the symptoms that may be caused by infectious agents.

The Future of the SDWA

The SDWA program, despite a more than 25 year history must be viewed as a young program in terms of its degree of implementation. The legislation continues to change substantially as more NPDWRs are added as harmful substances. The SDWA still has various problems that must be resolved. There still remains a waterborne disease problem and chemical substances continue to contaminate our source water. However, recognition of these problems should be balanced by the acknowledgment of the significant progress made toward understanding and resolving drinking water safety issues. The existing SDWA is designed to develop new information in areas where understanding is limited and provides a system to turn information into viable programs. The SDWA has shifted its focus toward drinking water source protection and is moving away from being a solely consumer protection. This shift to a more environmental protection orientation will create a more holistic perspective than existed in its previous approach in focusing on solely water treatment and enforcement of performance stands.

One last evolutionary shift is the decentralization of authority by the federal government and greater state autonomy. The average state is relatively large in geographical area and has a substantial range of environmental management powers, both under state constitutions and laws. The SDWA and other federal environmental programs have increasingly recognized the managerial potential of the states and their ability to respond to the diversity of local conditions. The trend toward greater utilization of the unique management position of the states will likely continue and further expand state autonomy in SDWA implementation.

The Clean Water Act

The Clean Water Act 1977 (CWA) amended the 1972 Federal Water Pollution Control Act, which established the framework for regulating the discharge of pollution into U.S. waters. The CWA is the primary piece of legislation governing sewage discharge (as well as industrial waste water dischargers). Its focus is on the protection of surface waters only, not ground water. Aggressive enforcement of the CWA reduces the contaminant discharge that would otherwise have to be removed by a drinking water treatment facility to protect public health.

The CWA requires states and authorized Native American tribes to set water quality standards which consist of two parts: (1) states and tribes assign "*designated uses*" to each of the water bodies in their jurisdiction, such as serving public drinking water sources, providing fish and shellfish for safe human consumption , and allowing recreational activities like swimming; (2) states and tribes must then set water quality criteria (e.g., maximum pollutant concentrations) to support the *designated uses*.

If pollutant standards are not met for all or part of a water body, the state must establish a "total maximum daily load" (TMDL) for the pollutant. The TMDL is the maximum amount of a pollutant that a water body can receive and still meet water quality standards. The TMDL is allocated among individual dischargers of the pollutant.

The reporting mechanism of the CWA requires states to survey, assess and report on the degree to which their surface waters support designated uses. In 1998 there were about thirty-eight states reporting water bodies supporting public drinking water use. The source water

assessments mandated by the SDWA to be completed no later than 2003 should strengthen reporting from the states.

Issues Facing Small Water Systems [2]

The original SDWA and its amendments in 1986, concentrated on developing and implementing a regulatory scheme that focused on monitoring and treatment. Generally, it was believed that water systems would make the changes necessary to comply with the new regulations. However, certain systems (those serving 3,300 or fewer people) were faced with unique challenges characteristic only to small systems. By the early 1990s, it was obvious that small systems were having difficulty keeping up with the rapidly expanding SDWA mandated regulations.

Small water systems were faced with unique challenges. Consolidation of systems had not occurred to the degree anticipated at a time when there was a significant need for basic infrastructure repair and replacement for small systems. In addition small systems lacked sufficient customer base among whom to spread costs, or what is also referred to as economies of scale. Small systems were faced with fewer customers which in some instances meant less revenue for infrastructure improvements, repayment of loans and hiring operators and other staff with technical expertise.

Compared to large systems, small systems were having a harder time obtaining access to outside capital to finance needed infrastructure improvements. Additionally, large systems tended to have a higher percentage of industrial, commercial and agricultural customers, whereas small systems served primarily residential customers, who, as a group, traditionally were less able to pay substantial amounts for water. Small systems in less populated rural communities were typically servicing residents with lower incomes, higher unemployment rates, and larger populations of aged residents.

The 1996 Amendments advanced initiatives which sought to promote small system compliance and address small system problems by ensuring that systems had the necessary underlying technical, management and financial capacity. Specifically, the concept of *"capacity development"* emerged which included elements of prevention, compliance and public participation. It incorporated all existing state drinking water program activities, and required states to ensure that no new systems be created that lacked capacity to meet current drinking water standards. States under the *capacity development* concept were also required to develop a strategy to address capacity issues affecting systems within the state.

The loan fund established by the 1996 Amendments was one way assistance to small and disadvantaged communities was provided. The fund also provided aid to programs that encouraged pollution prevention as a tool for ensuring safe drinking water. Portions of the loan fund are currently being used by states to administer specific aspects of the drinking water

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[2] *25 Years of the Safe Drinking Water Act:History and Trends*; EPA-Office of Ground Water and Drinking Water, 1999; pgs 32, 33, 34.

program, such as assessing source water quality, certifying treatment plant operators, and implementing capacity development programs.

In addition, the 1996 Amendments assisted small systems in another way. When setting new drinking water standards, the EPA must identify technologies that achieve compliance and are affordable for systems serving fewer than 10,00 people. When such technologies cannot be identified, the EPA must identify affordable technologies that maximize contaminant reduction and protect public health.

Appendix C

STATE REGULATION OF DRINKING WATER

New Jersey Safe Drinking Water Act (N.J.S.A. 58:12A-1 et seq.)

The New Jersey Safe Drinking Water Act (NJSDWA) became law in September 1977 (***N.J.S.A.*** 58:12A-1 ***et seq***). The Department of Environmental Protection - Water Supply Administration is the agency responsible for administering the federal SDWA and NJSDWA. All regulations promulgated by the federal EPA are automatically adopted as New Jersey regulations. In January 1984, significant amendments to the NJSDWA were signed into law. These amendments (P.L. 1983, c.443) required all public community water suppliers to be periodically tested for a specified list of organic chemicals. The amendments also required the development of standards for these contaminants. The quality standards adopted into regulation by both the federal and state governments are the minimum considered necessary for the maintenance of public health.

Goals and Objectives of the New Jersey Safe Drinking Water Act

- **To ensure that drinking water supply systems meet the Federal and New Jersey Safe Drinking Water Standards.**
- **To ensure that surface and ground water diversions do not exceed the sustainable yield of available water resources.**
- **To protect the ground water resources of the state through proper well drilling activities.**
- **To help protect the surface and ground water sources of the state through development and implementation of New Jersey's source water assessment plan and watershed planning and management strategies.**
- **To administer the Drinking Water State Revolving Fund and other funds to finance the costs of drinking water infrastructure improvements needed to achieve or maintain compliance with the Safe Drinking Water Act, and to implement other drinking water initiatives.**
- **To ensure the proper construction, operation and management of drinking water supply systems.**
- **To help identify water supply needs and issues and develop plans for their resolution.**
- **To ensure the proper response to water supply drought emergencies.**

Compliance With Safe Drinking Water Standards

Public health protection is the primary objective for the promulgation of safe drinking water standards. One of the major goals of both the EPA and the DEP is to ensure that drinking water is safe for all consumers. The SDWA Amendments mandated that the EPA provide the public with information regarding state reporting of public water systems within their jurisdiction compliance with drinking water standards. The EPA, since the passage of the 1996 Amendments, has undertaken to report on compliance activities of states in an effort to capitalize on the regulatory opportunities provided under the Amendments including: promoting public information, education and involvement; helping small systems to identify deficiencies resultant in providing safe drinking water; focusing safety standards on the most serious health risks; exercising new enforcement initiatives and undertaking states' assistance activities.

For the most part, the EPA has reported that the nation's drinking water is generally safe. The vast majority of people in the country received water from public water systems with no reported violations of maximum contaminant levels (MCLs). Some of the most notable findings of the EPA are:

- The country's drinking water is generally safe. Eighty-six percent of the country's population served by community water systems drank water from systems that reported no violations of any health-based drinking water standards. Violations reported were for non-compliance with rules which protect against microbiological contamination of drinking water.
- Most of the violations by public water systems were for significant failure to monitor and report results to the states. While monitoring and reporting violations do not necessarily indicate a health risk, if a system fails to monitor it may not be aware of the potential health risk posed by a contaminant which may be present, but undetected.
- Most violations are reported in small water systems that serve fewer than 3,300 people**.** However, the relatively low number of violations reported by larger systems should be viewed in relation to the larger population served by these systems.
- There were no reported violations of variances and exemptions issued by states.

The 1996 Amendments provided states with the authority to move quickly to meet the national goal of public health protection. States engage in a variety of activities to insure compliance, including formal enforcement actions, informal actions, and compliance and technical assistance to aid public water systems to remain in and return to, compliance. In addition, all States have operator certification programs that require public water system operators to be licensed by the appropriate regulatory authorities.

State compliance efforts may include:

- Conducting on-site visits and sanitary inspection of the water sources, facilities, equipment, operations and maintenance to evaluate the adequacy of these elements for producing and distributing safe drinking water.
- Assisting systems in identifying deficiencies and investing in proactive remedies.
- Providing financial assistance for system improvements through the Drinking Water State Revolving Fund.
- Reviewing water system plans and specifications.
- Conducting training sessions.
- Sponsoring public information meetings, publishing newsletters, and bulletin on related issues.

State informal enforcement Action may include:

- Compliance reminder letters or notices of violations.
- Site Visits.
- Telephone calls.

State formal enforcement action may include:

- Citations
- Administrative Orders
- Civil Action
- Criminal Action

In conclusion, states undertake a variety of formal and informal activities to return violating systems to compliance and to ensure that the public has safe drinking water. Unless there is an immediate health risk, formal enforcement actions may be initiated months after the violation is detected and reported. The reason for the delay is that, when appropriate, states may undertake a variety of informal actions and compliance assistance measures to facilitate public water systems returning to compliance as quickly as possible.