



# The Benefits of Water and Wastewater Infrastructure

*A report compiled by the National Drinking Water Clearinghouse and  
the National Small Flows Clearinghouse*



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## **The Benefits of Water and Wastewater Infrastructure**

This report documents that the health and well-being of the American public, as well as the environment, the economy, and the future, depend on continued support and funding of water and wastewater infrastructure at all levels: federal, state, and local.

Since the Clean Water Act was passed in 1972 and the Safe Drinking Water Act was passed in 1974, the U.S. has made great strides in providing its citizens with safe, clean water. However, it is an ongoing challenge with still more work to be done.

The goal of water and wastewater infrastructure is to provide clean water. This clean water supports our nation in many ways:

- It protects the public health by controlling and eliminating waterborne diseases.
- It safeguards the environment by maintaining ecosystems that allow many species of plants, animals, and marine life to prosper and provide sustenance for humans.
- It stimulates the growth of the economy by creating jobs and accommodating new growth in communities.
- It allows U.S. citizens to enjoy a higher standard of living than most other countries because we can confidently use our water for drinking, cooking, and recreation.
- It stimulates the development of new technology as more advanced methods of treatment are needed and created.

Through a review of current literature, this report, prepared by the National Drinking Water Clearinghouse (NDWC) and the National Small Flows Clearinghouse (NSFC), briefly outlines the necessity of having continued support for water and wastewater infrastructure.

For more information on small community drinking water and wastewater systems, call the NDWC or NSFC at 1-800-624-8301.



## 1. Protecting Public Health

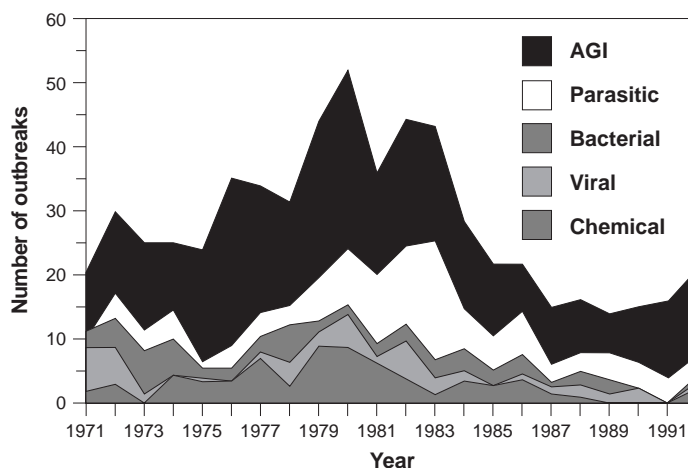
Nearly a century ago, Americans began treating drinking water, recognizing that safe drinking water is fundamental to human survival. Water is so important that “its absence was often used as an indicator of lack of life in early extraterrestrial explorations,” write Anita K. Highsmith and Sidney A. Crow in *Waterborne Diseases*, a Centers for Disease Control and Prevention publication.<sup>1</sup>

The importance of water can, indeed, be measured by its absence, and, even more critically, by its contamination. We know that if humans drink contaminated water, the result could be serious illness or even death. “Waterborne and water-related diseases are among the most serious health problems in the world today,” according to *Water Quality*, a civil engineering textbook by George Tchobanoglous, Ph.D., and Edward D. Schroeder, Ph.D.<sup>2</sup>

Consider the following facts:

- In 1991 and 1992, 17 U.S. states and territories reported 34 outbreaks of disease associated with drinking water, affecting 17,464 people.<sup>3</sup>
- Every year, 7 million cases of mild to moderate water-related illnesses occur in the U.S., resulting in 1,200 deaths.<sup>4</sup>

### Waterborne Outbreaks, by Year and Etiologic Agent—United States, 1971-1992 (Total outbreaks=609)

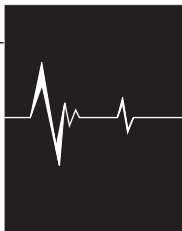


AGI=acute gastrointestinal illness of unknown etiology

Note: The rise in disease in 1981 could be attributed to a genuine increase in disease or a reflection of better reporting and epidemiologic investigation.

Source: Centers for Disease Control and Prevention

- Over the past nine years, waterborne illnesses have occurred in Pennsylvania alone as many as 23 times, sickening 7,500 people.<sup>5</sup>
- A lack of treatment or inadequate treatment accounted for the majority of water-related illness in 1991 and 1992, and 76 percent of these illnesses were associated with well water that was untreated or inadequately treated.<sup>6</sup>
- In the midwest, more than 14 million people drink water that is contaminated with herbicides—primarily atrazine, cyanazine, simazine, alachlor, and metolachlor—resulting in cancer risks that are 10 to 100 times higher than the federal benchmark.<sup>7</sup>
- More than 53 million Americans are drinking water contaminated with lead, fecal bacteria, radiation, and other pollutants and toxic chemicals.<sup>8</sup>
- 47 million Americans or one-fifth of the country’s population drink tap water with more than the EPA approved level of microorganisms.<sup>9</sup>



- 35 percent of the reported gastrointestinal illnesses among tap water drinkers were water related and could have been prevented.<sup>10</sup>
- 400,000 Milwaukee, Wisconsin, residents became ill and 104 people died in March 1993 after ingesting water contaminated with *Cryptosporidium*.<sup>11</sup>
- More than 400 cases of *Cryptosporidiosis* have occurred in New York City since January 1994.<sup>12</sup>
- Evidence of past *Cryptosporidiosis* infection can be found in 15 percent or more of the U.S. population.<sup>13</sup>
- More than 100 virus types are known to occur in human feces, and an infected person may excrete as many as one million infectious particles in one gram of feces.<sup>14</sup> Proper water and wastewater treatment will destroy these viruses.
- The effects these diseases have on society are not just measured by health risks alone. "Up to 35 percent of the potential productivity of many developing nations is lost because of these diseases. Thus the cost to the world economy is staggering."<sup>15</sup>
- The Surface Water Treatment Rule is expected to prevent 83,000 cases of illness due to waterborne diseases, according to the U.S. EPA Office of Water.<sup>16</sup>
- By implementing the Lead and Copper Rule of 1991 the EPA expects to prevent more than 600,000 children from having dangerously elevated levels of lead in their blood.<sup>17</sup>

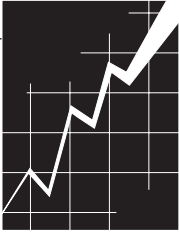
*All of these examples suggest the need to continue funding and assistance to maintain and to improve environmental infrastructure to ensure the public's health.*

### **Section 1 References:**

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- <sup>2</sup> Tchobanoglous, George, and Edward D. Schroeder. "Water Impurities and Public Health." *Water Quality*. Massachusetts: Addison-Wesley Publishing Company, 1985: 192-200.
- <sup>3</sup> Moore, Anne C., Barbara L. Herwaldt, Gunther F. Craun, Rebecca L. Calderon, Anita K. Highsmith, and Dennis D. Juranek. "Waterborne Disease in the United States, 1991 and 1992." *Journal AWWA*. Vol. 86. 1994: 87-99.
- <sup>4</sup> Olson, Erik D. *You Are What You Drink*. Natural Resources Defense Council. Washington, D.C. 1995.
- <sup>5</sup> Olson. 1995.
- <sup>6</sup> Moore, et al. 1994.



- <sup>7</sup> Environmental Working Group and Physicians for Social Responsibility. *Tap Water Blues*. Washington, D.C. 1994
- <sup>8</sup> Olson. 1995.
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- <sup>10</sup> Payment, P. A. "Randomized Trial To Evaluate the Risk of Gastrointestinal Disease Due to Consumption of Drinking Water Meeting Current Microbiological Standards." *American Journal of Public Health*. Vol. 81. 1991: 703-708.
- <sup>11</sup> Pauley, Jane, and Stone Phillips. "Troubled Water." *Dateline*. NBC News Broadcast. September 20, 1994.
- <sup>12</sup> Kerr, Kathleen. "Lethal Liquid? City Tap Water May Prove Fatal to AIDS Victims." *Newsday*. City Edition. New York, NY. June 21, 1995: 6.
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- <sup>14</sup> Tchobanoglous. 1985.
- <sup>15</sup> Tchobanoglous. 1985.
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## 2. Boosting the Economy

Investment in drinking water and wastewater infrastructure has dramatic and measurable benefits on economic development and job creation.

Almost every business benefits directly from the availability of a safe and reliable community water source. For example:

- A hotel uses about 39 gallons of water per guest each day, an office needs about 14 gallons per employee each day, an automobile service station uses an average of about 10 gallons per vehicle served.<sup>1</sup>
- Industrial operations use even more water, with a meat products plant, for instance, using 1,081 gallons of water per day per production employee.<sup>2</sup>
- Other industries, notably fishing and tourism, benefit from the cleaner environment resulting, at least in part, from the presence of proper wastewater treatment infrastructure.

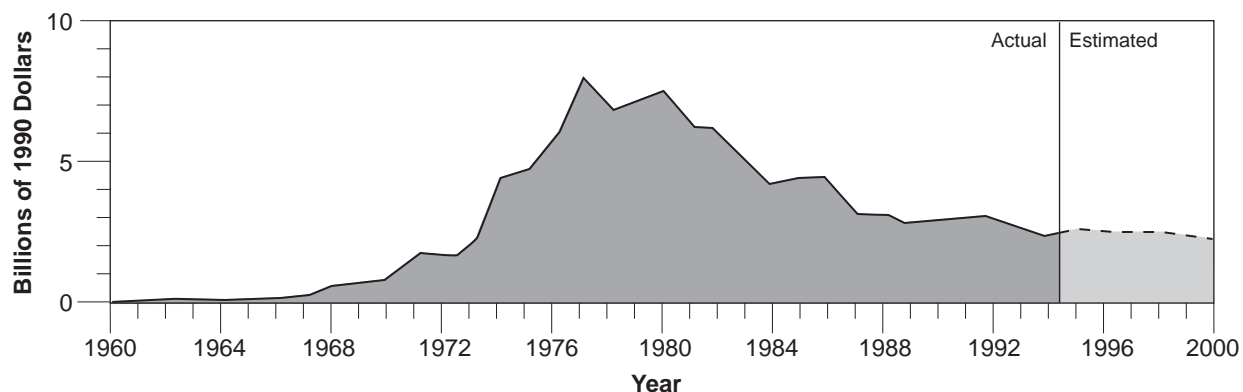
### Economic Development Impact

The role of adequate drinking water supply and wastewater treatment in local economies and the national economy is sometimes overlooked.<sup>3</sup>

This investment's immediate and long-term impact on the private sector can be dramatic. An increased investment in public-sector drinking water and wastewater infrastructure:

- brings higher private-sector profits,
- spurs additional private investment in plant and equipment, and
- improves growth in private-sector labor productivity.<sup>4</sup>

### 40 Years of Federal Infrastructure Spending



When adjusted for inflation, federal spending for drinking water and wastewater infrastructure peaked in the late 1970s and early 1980s and has gradually decreased since then. The estimated spending for 1995-2000 plotted on this chart is based on President Clinton's budget proposal.

Source: Congressional Budget Office



For instance, many industries can meet their water and wastewater needs from public utility systems more cheaply than they could with their own systems. This could result in higher profits for the industries as well as lower prices charged for the goods produced.<sup>5</sup> Infrastructure spending can also increase productivity by enabling more efficient use of capital stock and promoting increases in capital investment per employee.<sup>6</sup>

In addition to improving private profitability and increasing wages, public spending for water and wastewater facilities subsequently yields higher tax revenues to government.<sup>7</sup> "In fact, a one-time \$2.5 billion investment in water and wastewater facilities . . . is self-financing in the space of less than a decade."<sup>8</sup>

Conversely, insufficient investment in drinking water and wastewater infrastructure can have the opposite effect, acting as a drag on the private economy.

If a community does not have adequate drinking water and wastewater infrastructure in place, it will have difficulty attracting business or industry. Inadequate infrastructure in a community could also lead to the loss of existing business activity or the inability of existing businesses to expand operations.

### **Job Creation**

As a rule of thumb, 40,000 to 50,000 jobs are created for every \$1 billion spent on infrastructure.<sup>9</sup>

A report completed for the National Utility Contractors Association (NUCA) states that the number of jobs created by drinking water and wastewater projects is greater than the number for public works projects in general. "Every \$1 billion investment in water and sewer projects generates as many as 57,400 jobs," the report states.<sup>10</sup>

The NUCA report differentiates between direct construction jobs, construction-related jobs (indirect employment), and jobs created as part of the multiplier effect spawned by construction (induced employment). The 57,400 jobs figure represents the estimate of jobs created either directly, indirectly, or "induced" for each \$1 billion invested.

Drinking water and wastewater infrastructure investment has enhanced economic development in hundreds of communities across the country. Some examples include:

- Three small communities were able to merge their wastewater treatment systems with the help of the South Carolina Rural Development Council. The effort increased industrial capacity and helped create nearly 3,000 jobs.<sup>11□</sup>
- The Pennsylvania Infrastructure Investment Authority (PENNVEST) has helped create nearly 50,000 construction jobs and 16,000 permanent jobs since 1988 through a \$1.6 billion investment in sewer, drinking water, and stormwater control infrastructure. Funding was provided by the state and federal government and interest from loans



issued to Pennsylvania communities. Among the projects funded was a wastewater treatment facility upgrade near Pittsburgh that allowed a television manufacturing plant to open, employing 700 people directly or indirectly.<sup>12</sup>

- The wastewater treatment plant in Cokato, Minnesota, was unable to handle the commercial and residential sewage being generated. The state banned any future industrial, commercial, or residential connections to the wastewater system until improvements were made. The state and the Economic Development Administration contributed funding to upgrade the plant and avoid having commerce scaled back to meet sewage limits.<sup>13</sup>

*In addition to the environmental and public safety benefits of funding drinking water and wastewater infrastructure, strong economic advantages are realized as well.*

### Section 2 References:

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- <sup>2</sup> Wade, William W., Julie A. Hewitt, Matthew T. Nussbaum. *Cost of Industrial Water Shortages*. Spectrum Economics, Inc. October 25, 1991.
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- <sup>5</sup> *America's Environmental Infrastructure*. 1990.
- <sup>6</sup> *A Report on Clean Water Investment and Job Creation*. Prepared by Apogee Research, Inc., for the National Utility Contractors Association. March 20, 1992.
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- <sup>8</sup> *A Report on Clean Water Investment and Job Creation*. 1992.
- <sup>9</sup> "Infrastructure May Be Used To Stimulate Economy." *Engineering Times*. January 1993: 13.
- <sup>10</sup> *A Report on Clean Water Investment and Job Creation*. 1992.
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## 3. Preserving the Environment

Since Earth Day 1970, Congress has passed numerous environmental laws, including the Clean Air and Clean Water acts, the Endangered Species Act, the Toxic Substances Control Act, and the Surface Mining Control and Reclamation Act, as well as the Safe Drinking Water Act.

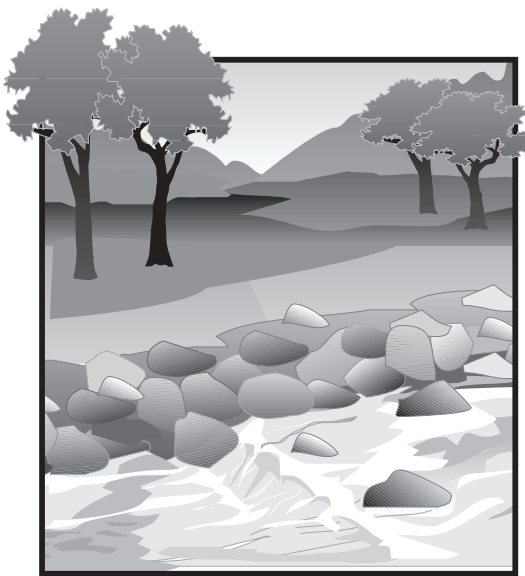
Between 1972 and 1985, the federal government spent more than \$40 billion on the wastewater treatment Construction Grants Program. Approximately 4,500 wastewater treatment facilities and sewer systems were built or upgraded through this federal assistance and another 2,500 construction projects, costing more than \$8 billion, were underway.<sup>1</sup>

According to a recent United Press International report, nearly two thirds of the nation's water bodies supported swimming and fishing in 1992, compared to one third in 1972.<sup>2</sup> This is one result of the government's investment of billions of dollars in infrastructure.

Today, 62 percent of U.S. waters meet state water quality standards, compared to 36 percent meeting less comprehensive standards in 1972.<sup>3</sup>

Clearly, federal legislation and infrastructure funding have gone a long way toward halting environmental degradation, and in many cases have turned it around. But, this is still not enough:

- In 1988, the U.S. EPA reported that groundwater in 32 states was contaminated with 74 different agricultural chemicals, including one, the herbicide atrazine, that is classified as a potential human carcinogen.<sup>4</sup>
- 70 million tons of atrazine a year are used on cornfields in the Mississippi basin, and 1.5 million pounds of runoff now flows into the drinking water of 20 million people.<sup>5</sup>



- At least 136 active ingredients in pesticides have been found to cause cancer in humans or animals . . . 79 are still being used on U.S. food crops.<sup>6</sup>
- The U.S. EPA reported in April 1992 that contaminated runoff from farms, streets, and lawns has yet to be even partially controlled.<sup>7</sup>
- A U.S. EPA analysis of more than half a million miles of rivers (about one-third of the national total) found nearly 50 percent of the river miles were too polluted to support their intended uses for recreation, drinking water, or fisheries.<sup>8</sup>



- U.S. EPA Administrator Carol Browner said, “Nearly half of our country’s rivers, lakes, and creeks are still polluted or threatened, and we have serious and increasing problems with our drinking water supplies.”<sup>9</sup>
- Thousands of small communities that are not in compliance with either the Clean Water Act or the Safe Drinking Water Act cannot build the necessary projects to come into compliance without substantial federal assistance, but federal funding for such projects has been cut in half since the 1970s.<sup>10</sup>
- The U.S. EPA estimated in 1985 that another 6,600 new or upgraded wastewater treatment facilities were needed to meet the secondary treatment standard. Moreover, another \$109 billion would be required to do the job.<sup>11</sup>
- This year, the conservation group American Rivers classified the Mississippi and the Missouri rivers among the nation’s most endangered rivers.<sup>12</sup>
- In 1994, Canada’s Environmental Minister Sheila Copps pledged to spend \$150 million over six years to clean up the Great Lakes. Copps said the Great Lakes 2000 clean-up program, which has already allocated \$600 million in the fight against pollution, will adhere to recommendations made by the International Joint Commission, the Canada-U.S. agency charged with overseeing Great Lakes water quality issues. A major component of spending is aimed at “virtual elimination” of 11 persistent toxic chemicals including PCBs (polychlorinated biphenyls) and DDT. Copps called on the U.S. government for a similar pledge to solve the Great Lakes Pollution problem.<sup>13</sup>

*It is our responsibility to the generations of the twenty-first century and beyond to continue to conserve the resources they are heir to, and to protect the environment over which we have stewardship.*

### Section 3 References:

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- <sup>4</sup> Carson, Rachel. Sen. Al Gore’s 1994 introduction to *Silent Spring*. New York: Houghton Mifflin Company. 1962: xxii and xxiii.
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## 4. Preserving Standard of Living

Most U.S. citizens enjoy a better standard of living than residents of many other countries around the world. Fresh, clean water is an important component by which we measure our quality of life. Imagine the impact of not having clean water to drink, cook food with, bathe in, wash our clothes with, swim in, and go boating on. This is a reality in many countries that lack appropriate water and wastewater infrastructure.

Although more than 250 million Americans depend on fresh water in rivers, lakes, streams, and groundwater supplies for their everyday needs, we often take our clean water supply for granted.

### Basic Needs

Sadly, there are still millions of U.S. citizens who cannot take clean water for granted because they lack access to safe water for drinking, cooking, or bathing, according to information gathered by the USDA's Rural Utilities Service.

- "There are approximately 7.1 million rural households that are without clean and/or safe drinking water, or that are being served by a community water facility that does not meet safe drinking water standards," states a recent Rural Utilities Service survey.<sup>1</sup>
- According to the 1990 Census, 400,000 households have no in-house water supply or suffer from such severe water quality and dependability problems that their in-house water is seldom drinkable, states the Rural Utilities Service's *Water 2000: A Plan for Action*.<sup>2</sup>
- Virginia alone has nearly \$5 billion worth of water and sewer needs that should be met by the year 2005, said a 1988 comprehensive report by the Virginia Water Project Inc.<sup>3</sup>
- Wilma Warren, executive director of the Virginia project, said the \$5 billion figure includes upgrading onsite and public infrastructures between 1986 and 2005, but does not include the cost of actual construction of bathrooms in individual homes.<sup>4</sup>

### Recreational Activities

"Millions of Americans swim, relax, fish, and boat in our nation's lakes, rivers, bays, and oceans. In 1993, Americans made more than 180 million visits to ocean, bay, and Great Lakes beaches, and each year Americans take more than 1.5 billion trips to enjoy the water—at least six trips per person."<sup>5</sup>





According to a recent report by the Natural Resources Defense Council, 2,300 beaches had swimming advisories or were closed during 1994 due to sanitary sewer overflows, stormwater runoff, combined sewer overflows, polluted runoff, and sewage treatment malfunctions.<sup>6</sup>

“We depend on clean and healthy water for food, enjoyment, recreation, and jobs. We take billions of trips and spend billions of dollars enjoying our waters. And—proudly—we have spent billions of dollars cleaning up our waters. But the job is far from over and we must continue to protect the waters that sustain us.”<sup>7</sup>

*Continued assistance for water and wastewater infrastructure is necessary for all U.S. citizens to have access to clean water and enjoy a good standard of living.*

#### Section 4 References

- <sup>1</sup> Carter, Benjamin K., and Mildred McGlothlin. “Water 2000—Meeting the Needs of Rural America.” *National Rural Water Association Magazine*. Winter 1994/1995: 18-19.
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# Technology Development

## 5. Developing New Technologies

As our country's population continues to flourish, so too must technology and research to support that growth as precious environmental resources become limited. There is no resource more essential to all of life than water.

### Keeping Pace

Our nation's water and wastewater industry (manufacturers, water utilities, engineering, technology, and research) revenues totaled \$64 billion in 1994 and competes with an intense global market.<sup>1</sup> Unfortunately, the U.S. water industry is falling behind the front runners in the global market because the country's priorities are changing as environmental expenses increase.

- The share of total environmental expenditures spent on water purification and wastewater treatment has been falling from 48 percent in 1972 to a projected 35 percent in 2000.<sup>2</sup>
- America's wastewater infrastructure received a "C" on a national report card in 1988, and little has changed since then, reports the Associated General Contractors of America.<sup>3</sup>
- Since 1988, U.S. EPA surveys indicate the capital investment necessary for the needs of publicly owned wastewater treatment facilities has grown 67 percent, from \$76.2 billion to \$127 billion over the next 20 years.<sup>4</sup>
- Cities will spend a projected \$2 billion in 1996 and more than \$11 billion over the next five years on their municipal drinking water systems, while they will spend \$3 billion on wastewater systems in 1996 and more than \$13 billion over the next five years.<sup>5</sup>

### New Environmental Concerns

The U.S. has developed water treatment methods that make drinking water fresh and pure. However, the Centers for Disease Control and Prevention warns that global changes have occurred that threaten the environment with both pathogenic microorganisms and toxic chemicals.<sup>6</sup> Because of these changes, we must continue to build and upgrade environmental infrastructure.

- Technology must allow for an improvement in the area of new disinfectant solutions to determine their effectiveness against chlorine resistant microbes.<sup>7</sup>
- Advancement in technology needs to be further explored to control difficult to detect microorganisms like *Giardia* and *Cryptosporidium* that are present in more than 65 percent of surface waters in the U.S., and can often survive high levels of chlorine treatment.<sup>8</sup>
- More research needs to be done to detect the remaining 120 or more disease causing organisms thought to be present in water.<sup>9</sup>



- Safer and more affordable alternatives to chlorine treatment like ultraviolet radiation, ozone, and microfiltration are becoming a reality because of federally funded programs that promote research to explore less expensive and more effective alternatives for cleaning up our country's water sources.<sup>10</sup> (Chlorination, the leading process for disinfecting water supplies, has been linked to harmful side effects including possible adverse birth defects.)
- As regions of the country begin to deplete a quickly diminishing water supply, technology will be needed for water reuse programs that are becoming a growing trend in states such as California and Florida.<sup>11</sup>

*Through programs like the U.S. EPA's Environmental Technology Initiative and other technological advancement programs, Congress has made great strides in promoting technological opportunities in the water industry. Continued investment will help insure that the U.S. will be able to compete in the global water industry.*

### Section 5 References

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- <sup>2</sup> "Slower Growth Ahead for Water Industry." *Industries In Transaction*. Vol. 22, No. 9. January 1995.
- <sup>3</sup> "Slants and Trends." *Sludge*. Vol. 20, No. 4. February 14, 1995.
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- <sup>9</sup> "Chlorine Institute Responds To Study Purporting Link Between Drinking Water and Birth Problems." PR Newswire. December 17, 1992: 217.
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