WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

Author
Erik Olson

Contributors
Jonathan Kaplan
Marie Ann Leyko, Ph.D.
Adrianna Quintero
Daniel Rosenberg
Nancy Stoner
Sarah Wood

NRDC
The Earth's Best Defense

Natural Resources Defense Council
June 2003

ABOUT NRDC

The Natural Resources Defense Council is a national nonprofit environmental organization with more than 550,000 members. Since 1970, our lawyers, scientists, and other environmental specialists have been working to protect the world's natural resources and improve the quality of the human environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, and San Francisco. Visit us on the World Wide Web at www.nrdc.org.

ACKNOWLEDGMENTS

NRDC wishes to thank The Bauman Foundation, Beldon Fund, Carolyn Foundation, Richard and Rhoda Goldman Fund, The Joyce Foundation, Henry Philip Kraft Family Memorial Fund of The New York Community Trust, and The McKnight Foundation for their support for this study. We would also like to thank more than 550,000 members of NRDC, without whom none of our work would be possible. Finally, the author thanks his NRDC colleagues and the many peer reviewers for their insightful comments and highly professional assistance in polishing this report, as well as Anne, Chris, and Luke for their support and encouragement during this lengthy project.

NRDC Reports Manager
Emily Cousins

Editor
Dana Nadel Foley

Production
Bonnie Greenfield

NRDC President
John Adams

NRDC Executive Director
Frances Beinecke

NRDC Director of Communications
Alan Metrick

CONTENTS

NRDC
THE EARTH'S BEST DEFENSE

WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

June 2003

NRDC
THE EARTH'S BEST DEFENSE

WHAT'S ON TAP?
Grading Drinking Water in U.S. Cities
June 2003

Every day more than 240 million of us in this country turn on our faucets in order to drink, bathe, and cook, using water from public water systems. And as we do, we often take the purity of our tap water for granted. We shouldn't. Before it comes out of our taps, water in most cities usually undergoes a complex treatment process, often including filtration and disinfection. As good as our municipal water systems can be (and they can be very good), they also can fail—sometimes tragically. In 1999, for example, more than 1,000 people fell ill at a county fair in upstate New York after ingesting an extremely virulent strain of *E. coli* bacteria; a three-year-old girl and an elderly man died when their bodies could not fight off the pathogen.[1] This is just one incident; health officials have documented scores of similar waterborne disease outbreaks in towns and cities across the nation during the past decade.

So, just how safe *is* our drinking water? In a careful and independent study, NRDC evaluated the quality of drinking water supplies in 19 cities around the country.[2] We selected cities that represent the broadest range of American city water supplies and reviewed tap water quality data, Environmental Protection Agency (EPA) compliance records, and water suppliers' annual reports (material required by law in order to inform citizens of the overall health of their tap water; also called "right-to-know reports").[3] In addition, we gathered information on pollution sources that may contaminate the lakes, rivers, or underground aquifers that cities use as drinking water sources. Finally, we evaluated our findings and issued grades for each city in three areas:

- water quality and compliance
- right-to-know reports
- source water protection

NRDC found that, although drinking water purity has improved slightly during the past 15 years in most cities, overall tap water quality varies widely from city to city. Some cities like Chicago have excellent tap water; most cities have good or mediocre tap water. Yet several cities—such as Albuquerque, Fresno, and San Francisco—have water that is sufficiently contaminated so as to pose potential health risks to some consumers, particularly to pregnant women, infants, children, the elderly, and people with compromised immune systems, according to Dr. David Ozonoff, chair of the Environmental Health Program at Boston University School of Public Health and a nationally known expert on drinking water and health issues.

While tap water quality varies, there is one overarching truth that applies to all U.S. cities: unless we take steps now, our tap water will get worse. Two factors pose imminent threats to drinking water quality in America:

- **First, we are relying on pipes that are, on average, a century old.** The water systems in many cities—including Atlanta, Boston, and Washington, D.C.—were built toward the end of the 19th century. Not only is our water supply infrastructure breaking down at alarming rates (the nation suffered more than 200,000 water main ruptures in 2002), but old pipes can leach contaminants and breed bacteria in drinking water.
- **Second, regulatory and other actions by the Bush administration threaten the purity of American tap water.** These actions include: weakening legislative protections for

source waters, stalling on issuing new standards for contaminants, delaying the strengthening of existing standards, and cutting and even eliminating budgets for protective programs.

NRDC's study demonstrates that in order to improve water quality and protect public health, we must:

- invest in infrastructure
- upgrade treatment and distribution facilities
- improve public understanding through the efficacy of right-to-know reports
- safeguard source water.

Furthermore, we must enlist our elected officials in the solution and urge them to:

- invest in infrastructure and treatment
- strengthen and enforce existing standards
- fund programs that improve tap water quality

WATER QUALITY AND COMPLIANCE

Findings

Healthy city water supplies in this country resemble each other in three distinct ways: they have good source water protection, treatment, and maintenance and operation of the system. Every problem water supply, however, is unhealthy in its own way: it may fail in just one of the three discrete areas mentioned above, or it may have a combination of factors that contribute to the system's ailments. Fresno, for example, has no source water protection; Newark and San Francisco do not have adequate treatment systems in place; Atlanta has poor maintenance of its distribution system. Any of these factors will introduce contaminants into the water.

WATER QUALITY AND COMPLIANCE

City	2001 Grade
Chicago	Excellent
Baltimore	Good
Denver	Good
Detroit	Good
Manchester	Good
New Orleans	Good
Atlanta	Fair
Houston	Fair
Los Angeles	Fair
Newark	Fair
Philadelphia	Fair
San Diego	Fair
Seattle	Fair
Washington, D.C.	Fair
Albuquerque	Poor
Boston	Poor
Fresno	Poor
Phoenix	Poor
San Francisco	Poor

A Handful of Contaminants Found in Most Cities

NRDC observed that while tap water can contain a vast array of contaminants, a handful of particularly harmful contaminants surfaced repeatedly in our study. They include:

- lead, which enters drinking water supplies from the corrosion of pipes or faucets and can cause permanent brain damage and decreased intelligence in infants and children
- pathogens (germs) such as coliform bacteria or *Cryptosporidium*, a microscopic disease-carrying protozoan that presents health concerns, especially to individuals with weakened immune systems including HIV/AIDS patients, the elderly, children, and people who have undergone organ transplants or cancer chemotherapy or who have certain chronic diseases
- by-products of the chlorination process such as trihalomethanes and haloacetic acids, which may cause cancer and, potentially, reproductive problems and miscarriage
- several other carcinogens and other toxic chemicals, including arsenic (which is naturally occurring or derives from mining and industrial processes), radioactive radon, the pesticide atrazine (affecting the water of more than 1 million Americans),

and perchlorate from rocket fuel (present in the water supplies of more than 20 million Americans).

Few Violations, Often Weak Standards

Overall, NRDC's study revealed a relatively small number of cities that were in outright violation of national standards. This fact did not necessarily imply low *contaminant levels* but rather low *standards:* in short, the EPA has written most standards in a way that the vast majority of cities will not be in violation. For example, recent studies show that there is no safe level of cancer-causing arsenic in drinking water. Nonetheless, today's standard, in place since 1942, is 50 parts per billion (ppb). The EPA recently set a new standard at 10 ppb (which will go into effect in 2006), a level that the National Academy of Sciences has found presents a lifetime fatal cancer risk of about 1 in 333—a risk that is at least 30 times greater than what the EPA generally considers acceptable.[4] When the EPA announced it found a standard of 3 ppb was feasible, there was an outcry from water utilities and industry—and ultimately the EPA, citing treatment costs, decided not to adopt that stricter standard. Nonetheless, arsenic is still present in the drinking water of 22 million Americans, hovering at average levels of 5 ppb—half the new national standard and just one-tenth of the current national standard. Thus, the mere fact that a city may meet the federal standard for arsenic (or other high-risk contaminants with weak standards) does not necessarily mean that the water is safe.

Aging Infrastructure Causes More Spikes in Contamination

Finally, NRDC's study revealed an increase in the frequency of periodic spikes in contamination in many cities—indicating that aging equipment and infrastructure may be inadequate to handle today's contaminant loads or spills. On occasion, these risks were substantial. In recent years, for example, Atlanta, Baltimore, and Washington, D.C., issued boil-water alerts as a result of problems including spikes in turbidity (cloudiness, which may indicate the presence of disease-causing pathogens) or other potential microbial problems. And in Washington, D.C., levels of cancer-causing trihalomethanes—which potentially cause cancer, birth defects, and miscarriages—peaked at more than double the EPA standard. (It is noteworthy that while Washington, D.C., recently changed its treatment to mitigate such spikes, many other cities continue to suffer from them.) While aggressive action in each city has lowered those levels, spikes in contaminants may pose immediate health problems to particularly susceptible people.

Recommendations

NRDC makes three major recommendations to improve water quality and compliance.

First, NRDC recommends that this country invest in infrastructure to upgrade deteriorating water systems and modernize treatment techniques. Not only do old pipes break, but they can also allow bacteria and other contaminants to get into the water supply—and make people sick. Modernizing infrastructure is a costly but necessary task. New

Orleans's system, for example, needs at least $1 billion in repairs and improvements, according to city officials; Washington, D.C., is implementing a $1.6 billion capital improvement plan to improve city water and wastewater.[5, 6]

Credible estimates for upgrades and repairs that would ensure the safety of drinking water nationwide for years to come place the tab at around $500 billion.[7] In May 2002, the Congressional Budget Office came to a similar conclusion: from $232 to $402 billion in investments will be needed over the next two decades to upgrade and repair the nation's drinking water systems.[8] Specifically, NRDC recommends that:

- legislators appropriate substantial additional federal, state, and local funds to help America's neglected city drinking water systems shoulder $500 billion in water infrastructure needs nationwide
- Congress enact and fund water infrastructure legislation that at least doubles current federal support for drinking water supplies from the current level of $1.7 billion per year; a portion of this funding should be earmarked for source water protection and other cost-effective "green infrastructure" projects
- state and local governments consider raising money through bond issues and other financing mechanisms in order to fund investment
- Congress enact municipal bond reform legislation to make bonds a more efficient and attractive means to support water infrastructure projects
- water systems increase rates, which will allow them to collect sufficient funds—with support from state and federal government funding—to rehabilitate, upgrade, and fully maintain their water supply infrastructure for the long haul
- water systems adopt long-term operation and maintenance planning, and capital improvement plans, to assure that old pipes and infrastructure will be replaced and rehabilitated before the problems become crises
- Congress and water systems adopt low-income water assistance programs and lifeline rates to help lower-income residents afford water as costs increase to pay for infrastructure upgrades

Second, NRDC recommends that investment be earmarked not just for old pipes but also for upgrading drinking water treatment. Most major U.S. cities still employ the same basic water treatment technologies that have been used since before World War I—techniques that cannot remove many human-made (or human-released) chemicals that modern science, industry, mining, and manufacturing have created or released.[9] With today's technology, four state-of-the-art advanced treatment techniques are available and used in Europe and elsewhere in the world but are rarely used alone in this country and virtually never together: ozone, granulated activated carbon, ultraviolet (UV) light treatment, membrane treatment (such as reverse osmosis or nanofiltration).

Advanced treatment is most effective. For example, a new Seattle plant uses ozone and UV treatment to kill *Cryptosporidium*, and in Manchester, the use of granular activated carbon has reduced levels of synthetic organic chemicals, including trihalomethanes. A few cities are using membrane treatment to reduce salt levels or to get rid of contaminants that are difficult to treat.

NRDC recommends that cities invest in protecting and improving the quality of tap water as follows. Regarding infrastructure, we recommend that water systems:

- shift to ozone and/or UV light as primary disinfectants, which eliminate *Cryptosporidium* and other pathogens unharmed by chlorine and which reduce levels of chlorination by-products, such as trihalomethanes and haloacetic acids
- use granulated activated carbon to further reduce the levels of disinfection by-products and other synthetic organic chemicals such as pesticides and industrial chemicals
- seriously consider upgrading to membrane treatment, since it can eliminate virtually all contaminants

Regarding infrastructure, we recommend that the EPA:

- encourage upgrades to advanced treatment technologies
- invest in research and development to improve current technologies and to bring down costs
- develop incentives for water systems to adopt advanced treatment such as membranes to eliminate most contaminants from tap water

Third, NRDC recommends that the EPA strengthen and enforce existing health standards that are too weak, and draft and enforce new standards for those contaminants that remain unregulated. Specifically, we recommend that the EPA:

- issue new standards for:
  - perchlorate
  - radon
  - distribution systems
  - groundwater microbes
  - other emerging contaminants (see Chapter 5)
- strengthen existing standards for:
  - arsenic
  - atrazine/total triazines
  - chromium
  - *Cryptosporidium* and other pathogens
  - fluoride
  - haloacetic acids
  - lead
  - total trihalomethanes

Vulnerable Consumers Need to Take Special Precautions. It is critical to note that the recommendations above describe long-term solutions to improve overall drinking water quality in this country. For those people who have immediate concerns about tap water safety, NRDC brings to the fore EPA recommendations as follows: people with serious immune system problems (such as people on cancer chemotherapy or people with HIV/AIDS) should consult with their health care providers about drinking tap water in order to avoid the risk of infection from contaminated water. Pregnant women and infants may also be at special risk from certain contaminants common in many cities' tap water, such as lead, nitrates, and chlorine by-products.

RIGHT-TO-KNOW REPORTS

Findings

Citizens have a right to know whether their drinking water is safe, as mandated in the 1996 amendments to the Safe Drinking Water Act. This law required water suppliers to notify the public of dangers in tap water and inform people about the overall health of their watershed. Instead, in many cases, right-to-know reports have become propaganda for water suppliers, and the enormous promise of right-to-know reports has not been achieved.

The quality of the right-to-know reports reviewed in NRDC's study varied: some were successful tools for consumer education; some appeared to be less than direct, including Newark's, Fresno's, and Phoenix's, which buried, obscured, and even omitted findings about health effects of contaminants in city water supplies, printed misleading statements, and violated a number of right-to-know requirements. Problems NRDC observed in right-to-know reports included:

- false, unqualified, misleading, or unsubstantiated claims
  - For example, the cover pages of the 1999, 2000, and 2001 Washington, D.C., right-to-know reports included prominent and unqualified statements of safety: "Your Drinking Water Is Safe!"—even though the city had levels of chlorination by-products, lead, bacteria, and other pollutants measuring above health goals, and even though the city water supply suffered an unexplained spike in cyanide that was the highest recorded in this study.
- errors and violations of EPA right-to-know requirements
  - EPA rules require the reports to reveal known sources of pollutants in city water, such as factories or Superfund sites. None of the 19 cities surveyed named specific polluters in the right-to-know reports.
- incorrect, misleading, or buried information or data
  - For example, Newark's report buried the health warning and detailed information on the city's failure to meet EPA's action level for lead, which poses risks, especially to infants and young children.
- failure to include information on health effects
  - Nearly all cities surveyed failed to provide information on the health effects of some contaminants found at levels below EPA standards but above EPA health goals.
- failure to translate reports into other languages spoken in communities
  - Fewer than half the cities surveyed offered any kind of translation of right-to-know reports.

RIGHT-TO-KNOW REPORTS

City	2001 Grade
Albuquerque	Good
Baltimore	Good
Chicago	Good
Denver	Good
Detroit	Good
Los Angeles	Good
Manchester	Good
Philadelphia	Good
Atlanta	Fair
Houston	Fair
San Diego	Fair
San Francisco	Fair
Seattle	Fair
Washington, D.C.	Fair
Boston	Poor
Fresno	Poor
New Orleans	Poor
Newark	Failing
Phoenix	Failing

Recommendations

NRDC recommends that water systems change right-to-know report presentation, as follows:

▶ **make the documents user-friendly** by using large typeface, photos, and graphics
▶ **use plain language** and avoid jargon and acronyms
▶ **avoid sweeping and prominent claims** of absolute safety
▶ **prominently place the warnings** to especially vulnerable people on the front page of their report, set off in a box or otherwise, to capture these consumers' attention
▶ **discuss any significant water quality and compliance issues prominently in the first paragraphs of the report,** linking the information to the investment needs of the utility
▶ **candidly discuss the potential health effects of contaminants** found in their water—at least those contaminants found at levels in excess of national or state health goals, action levels, or health advisories
▶ **convey as much information as possible about the specific pollution sources** in watersheds that are or may be contributing to contamination or that are threatening to contaminate a water supply
▶ **include a map of source water,** including location and names of major pollution sources
▶ **translate right-to-know reports** into any language beyond English that is the primary language of more than 10 percent of a population, based upon 2000 Census data (see Table on page 36 in Chapter 3.

SOURCE WATER PROTECTION

Findings

Source water—the bodies of water from which a city draws its drinking water—varies in origin. Most cities get their water primarily from aboveground supplies, such as lakes and rivers; a few cities like Albuquerque and Fresno get their water primarily from groundwater—that is, underground aquifers tapped by city wells. Source waters are most frequently contaminated by:

▶ municipal sewage
▶ polluted runoff from stormwater or snowmelt in urban and suburban areas
▶ pesticides and fertilizers from agricultural fields
▶ animal waste from feedlots and farms
▶ industrial pollution from factories
▶ mining waste
▶ hazardous waste sites
▶ spills and leaks of petroleum products and industrial chemicals
▶ "natural" contamination such as arsenic or radon that occurs in water as a result of leaching or release of the contaminant from rock

Source water protection is key to strong drinking water protection. Some cities like Seattle, Boston, San Francisco, and Denver have at least some well-protected watersheds. Some cities have site-specific burdens. For example, Fresno relies upon wells, many of which have become seriously contaminated by agricultural and industrial pollution, including nitrates; Houston also relies on wells that are vulnerable to naturally occurring radioactive radon and arsenic in the region. Philadelphia's

SOURCE WATER PROTECTION

City	Rating
Seattle	Excellent
Boston	Good
Denver	Good
Manchester	Good
San Francisco	Good
Baltimore	Fair
Chicago	Fair
Los Angeles (local)	Fair
Newark	Fair
San Diego (local)	Fair
Washington, D.C.	Fair
Albuquerque	Poor
Atlanta	Poor
Detroit	Poor
Houston	Poor
Los Angeles (imported)	Poor
New Orleans	Poor
Philadelphia	Poor
Phoenix	Poor
San Diego (imported)	Poor
Fresno	Failing

river sources are vulnerable to pollution from farms, sewage, urban runoff, industry, and spills; Denver, to debris and sediment resulting from erosion after wildfires; and Manchester, to MTBE, a gasoline additive, present in the city's main water source apparently as a result of recreational boating or other gasoline use in its main watershed. The Colorado River, which serves as a major source of drinking water for Los Angeles, San Diego, Phoenix, and many other cities and towns, is contaminated by the rocket fuel perchlorate from a Kerr-McGee site in Henderson, Nevada, and by other contaminants from other pollution sources, including agriculture, urban and suburban runoff, and industry.

While most cities reviewed need stronger source water protection, some cities, including Albuquerque, Atlanta, Detroit, Fresno, Houston, Los Angeles, Manchester, Newark, Philadelphia, Phoenix, and San Diego, have serious and immediate needs for better source water protection. The antidote lies with elected officials (generally state or other officials with authority to control polluters outside of the city's limits) who control the funds and write the laws that can protect source water.

Cities can't always choose where they get their water from, but they can work with state and federal officials to improve protections. The result may be a wide spectrum of efforts to protect water sources. Seattle, for example, has implemented very extensive source water protection programs that include banning agricultural, industrial, and recreational activities in and residential use of watersheds. Other cities such as Manchester and Boston have made great strides in land acquisition and watershed management programs.

Recommendations

Water suppliers, states, the EPA, and Congress must take more aggressive action to protect source water from contamination. The first line of defense in securing drinking water safety is to ensure that the source water—lakes, rivers, or groundwater—is protected from pollution. This requires aggressive efforts by water utilities and state officials, who must identify pollution sources, such as concentrated animal feeding operations, major agricultural sources, stormwater runoff, combined sewer and sanitary sewer overflow (CSOs/SSOs), certain point sources, and more; etc.); the EPA particularly needs to take a leadership role in issuing and enforcing strong regulations. In addition, Congress needs to step in to protect the EPA's jurisdiction to control pollution of smaller streams and wetlands (see Chapter 7) and to enact stronger legislation addressing groundwater pollution, polluted runoff, CSOs/SSOs, and other poorly controlled sources. Specifically NRDC recommends that utilities work with state and federal legislators to:

- craft legislation and appropriate funding for land acquisition and easement purchases
- push for improved controls on pollution from a variety of sources
  - concentrated animal feeding operations and other agricultural sources
  - pesticide pollution from chemicals that are highly soluble and cause widespread pollution, such as atrazine and other triazines
  - stormwater runoff, combined sewers and sanitary sewer overflows, and chemical contamination from industry

BUSH ADMINISTRATION ACTIONS ENDANGER AMERICA'S DRINKING WATER SUPPLIES

Findings

In light of a targeted assault on the nation's water protection laws waged by the Bush administration, tap water quality may get worse. The Bush administration is endangering the health of our nation's tap water by:

- rolling back existing water protection laws, including
  - dismantling the Clean Water Act by proposing to slash protections for headwater streams and wetlands, cutting programs for polluted waters, and weakening restrictions on livestock waste
  - lifting the ban on mountaintop removal mining
  - relaxing sewage treatment requirements after rain and snow
  - exempting polluting industry from paying for Superfund cleanup
- undermining drinking water standards
  - halting mandated progress on new standards, such as those for *Cryptosporidium,* total trihalomethanes, haloacetic acids, radon, perchlorate, groundwater pathogens, as well as standards to control threats to distribution systems
  - failing, as mandated, to strengthen existing standards for bacteria, lead, chromium, atrazine, triazines, certain pesticides, fluoride, and other chemicals where improved public health protection is feasible
- slashing funding for water quality protection programs, including
  - the Clean Water Act State Revolving Fund, cut by $500 million (36 percent)
  - the Safe Drinking Water Act Revolving Fund, which received $150 million less than Congress authorized and does not meet current needs
  - water pollution projects, reduced from $459 million to $98 million
  - canceling the Superfund "polluter pays" program, causing serious budget shortfalls, slowing or stopping cleanups, and requiring $1.1 billion to be paid by taxpayers that would otherwise have been paid by polluters
  - the Land and Water Conservation Fund, reducing federal land acquisition by more than 50 percent

Recommendations

NRDC recommends that citizens urge legislators not to pull the plug on healthy water supplies. We must act now to protect and strengthen the legislative infrastructure we have in place. Specifically,

Congress should:

- restore the application of the Clean Water Act to all streams, wetlands, and waters in the nation
- block Bush administration efforts to weaken clean water protections from sewage and other pollutants
- fully fund the Clean Water and Drinking Water State Revolving Funds
- reinstate the ban on stream destruction from mountaintop removal mining

▶ reinstitute the Superfund "polluter pays" program by restoring the fee on the chemical industry to pay for the program
▶ restore full funding for land acquisition in the Land and Water Conservation Fund

The Bush Administration should:
▶ halt its effort to weaken sewage treatment rules
▶ abandon rulemaking to limit the scope of Clean Water Act protections
▶ implement, not undermine, the polluted waters cleanup program
▶ immediately move forward with new standards for *Cryptosporidium,* total trihalomethanes, haloacetic acids, radon, groundwater pathogens, perchlorate, and distribution system protection, and strengthen existing standards for bacteria, lead, chromium, atrazine, triazines, pesticides, fluoride, and other chemicals

NOTES

1 "1,061 Suspected *E. coli* Cases in New York Outbreak," *Infectious Disease News*, October 1999, available online at www.infectiousdiseasenews.com/199910/frameset.asp?article=ecoli.asp; CDC, "Public Health Dispatch: Outbreak of *Escherichiacoli* O157:H7 and *Campylobacter* Among Attendees of the Washington County Fair, New York," 1999. *MMWR,* 1999; 48(36)803

2 Four of the 19 cities (Fresno, Los Angeles, San Diego, and San Francisco) were presented in an earlier October 2002 California prerelease of this report, available online at www.nrdc.org.

3 Cities were selected to represent the broadest range of American city water supplies: criteria included a geographic range across the country, large cities (Los Angeles at 1.2 million) and small cities (Manchester, New Hampshire at 128,000), treatment types (unfiltered, such as Seattle, and filtered, such as Atlanta), systems that use primarily groundwater (like Albuquerque) and those that use primarily suface water (like Boston), *e.g.*

4 National Academy of Sciences, National Research Council, *Arsenic in Drinking Water: 2001 Update* (NAS, 2001).

5 "Rotting Sewer, Water Lines Tough Problems in Big Easy," *Chicago Tribune,* July 7, 2002, available online at www.win-water.org/win_news/070802article.html.

6 *2000 Drinking Water Quality Report,* Washington, D.C., Water and Sewer Authority (WASA), available online at www.WASA.com.

7 Water Infrastructure Network, "Clean Safe Water for the 21st Century," 2000, available online at www.amsa-cleanwater.org/advocacy/winreport/winreport2000.pdf.

8 Congressional Budget Office, "Future Investment in Drinking Water and Wastewater Infrastructure," May 2002, available online at www.cbo.gov/showdoc.cfm?index=3472&sequence=0&from=1.

9 See Brian Cohen and Erik Olson, *Victorian Water Treatment Enters the 21st Century*, Natural Resources Defense Council, 1995.

CHAPTER 1

BACKGROUND

From Treatment to Tap

Every day more than 240 million of us in this country turn on our faucets in order to drink, bathe, and cook. And as we brush teeth, wash hands, fill glasses, and prepare meals, we often take the purity of our tap water for granted. The truth is, we shouldn't. Before it comes out of our taps, in most cities our water undergoes a complex, elaborate, and often antiquated process of treatment, likely including filtration and disinfection designed to protect public health. But as good as our municipal water infrastructures can be—and sometimes they can be very good—they also can fail, sometimes with tragic results. The experts at the Centers for Disease Control and Prevention (CDC) have recorded hundreds of waterborne disease outbreaks caused by U.S. water supplies in the past 25 years.[1] The worst was in 1993, when more than 400,000 citizens in Milwaukee, Wisconsin, were made violently ill by a tiny parasite in their tap water called *Cryptosporidium*.[2] Several thousand Milwaukeeans were hospitalized and as many as 100 died.[3] More recently, in 1999, more than 1,000 people at a county fair in upstate New York were stricken by an extremely virulent strain of *E. coli* (the same bacteria that we have come to associate with bad meat). On that occasion, a three-year-old girl and an elderly man died of acute kidney failure when their bodies could not fight off the pathogen.[4]

So, just how safe *is* our drinking water? In a careful and independent study, NRDC evaluated the quality of drinking water supplies in 19 cities around the country.[5, 6] We reviewed tap water quality data, Environmental Protection Agency (EPA) compliance records, and water suppliers' annual reports (material required by law in order to inform citizens of the overall health of their tap water; also called "right-to-know reports"). In addition, we gathered information on pollution sources that may contaminate the lakes, rivers, or underground aquifers that cities use as drinking water sources. Finally, we evaluated our findings and issued grades for each city in three areas: water quality and compliance, right-to-know reports, and control of threats to source water.

NRDC found that although drinking water purity in most cities has improved slightly during the past 15 years, overall tap water quality varies widely from city to city. Some cities like Chicago have excellent tap water; most cities have good or mediocre tap water; yet several cities—such as Albuquerque, Fresno, and San Francisco—have water that is sufficiently contaminated so as to pose potential health risks to some consumers, particularly to pregnant women, infants, children, the elderly, and people with compromised immune systems, according to Dr. David Ozonoff, chair of the

Environmental Health Program at Boston University School of Public Health and a nationally known expert on drinking water and health issues.

NRDC found that although most urban dwellers can drink their water without acute health threats, in most cities more needs to be done to improve water quality. Futhermore, there is one overarching truth shared among all U.S. cities: unless we take steps now, our tap water will get worse. Two factors pose imminent threats to drinking water quality in America. First, we are relying on pipes that are, on average, a century old. Significant parts of Atlanta's water system, for example, were built toward the end of the 19th century. Not only is our water supply infrastructure breaking down at alarming rates (the nation suffered more than 200,000 water main ruptures in 2002), but old pipes can leach contaminants and breed bacteria in drinking water. Without immediate and significant investment in America's tap water infrastructure and treatment, drinking water quality will continue to worsen. Trillions of dollars have been spent to construct, treat, and deliver water to city taps, but there is great need for improvement. Credible estimates found that a staggering $500 billion in upgrades and repairs are needed nationally to ensure the safety of drinking water for years to come.[7] Even the usually conservative Congressional Budget Office (CBO) estimated in May 2002 that $232 to $402 billion in investments will be needed over the next two decades to upgrade and repair the nation's drinking water systems.[8] Second, regulatory and other actions by the Bush administration threaten the purity of American tap water. These actions include weakening legislative protections for source waters, stalling on issuing new standards for contaminants, delaying the strengthening of existing standards, and cutting and even eliminating budgets for protective programs.

NRDC's study demonstrates that in order to improve water quality and protect public health, we must invest in infrastructure, upgrade treatment and distribution facilities, improve public understanding through the efficacy of right-to-know reports, and safeguard source water. Furthermore, we must enlist our elected officials in the solution: we must urge them to invest in infrastructure and treatment, strengthen and enforce existing standards, and fund programs that improve tap water quality.

WATER QUALITY AND COMPLIANCE

THE "WATER TREATMENT TRAIN"

Typically, large U.S. cities that tap into surface waters (rivers or lakes) for drinking water supplies use the following treatment steps, which have generally been used since before World War I—some are centuries old:

Coagulation. The first step, after screening any large objects from the water (such as sticks or leaves), is the addition of a coagulant such as alum (aluminum sulfate). The coagulant makes the particles of suspended solids stick together in clumps.

Prechlorination. Some water systems also add chlorine or another oxidant early in the process to start disinfection and oxidize some chemicals in the water to ease their removal later. (This early use of chlorine can substantially increase the levels of chemicals called chlorination by-products, which, as discussed later, are probable human carcinogens, or cancer-causing agents, and may, according to recent studies, cause problems in fetuses exposed to them in the womb.)

Sedimentation. The water is mixed and then allowed to sit in a large basin where the coagulant takes effect, and the mud and solids gradually settle to the bottom. The clarified water is then ready for filtration.

Filtration. Next, the water is run through large filters usually made out of sand or crushed anthracite coal. This filtration process removes many of the smaller particles, including some larger microbiological parasites. Sand and anthracite are not effective for removal of many dissolved organic and inorganic chemicals (such as pesticides, many industrial chemicals, and arsenic).

Primary Chemical Disinfection, Usually Using Chlorine. Chlorine in gaseous form or in a liquid bleachlike form (hypochlorite) generally is added to kill many bacteria and viruses. Chlorination by-products start to form at this point or earlier (if chlorine was added prior to sedimentation). Some cities are now using "chloramines"—essentially chlorine plus ammonia—as a primary disinfectant because chloramines produce modestly lower levels of undesirable chlorination by-products.

Corrosion Inhibitor. Many cities add a chemical, such as lime or zinc orthophosphate, to inhibit the ability of the water to corrode the city's pipes and household plumbing. Corrosion inhibitors increase the pH (that is, decrease the acidity) of the water and often help form a film to coat the inside of the pipes so that the pipes do not corrode as quickly and so that less lead is leached from the pipes and plumbing fixtures.

Fluoride and Secondary Disinfection. Most cities add fluoride, and virtually all U.S. cities add a second dose of disinfectant, usually chlorine or chloramines (a combination of chlorine and ammonia). The secondary disinfectant is added to keep the water from becoming recontaminated with bacteria in city and household pipes after the water leaves the water treatment plant. Disinfection by-product levels generally continue to increase as the water travels through the pipes and the chlorine reacts with natural organic matter dissolved in the water.

This treatment train has served most cities fairly well for decades. It has essentially eliminated cholera and typhoid in U.S. cities and reduced levels of many other bacteria and viruses in our drinking water, saving countless lives. But as discussed below, it leaves many contaminants untouched.

HOW THE TREATMENT TRAIN FAILS

We now know that this pre–World War I–era treatment train does not remove many of the contaminants that are in our water and pose serious public health risks. For example, these antiquated treatments often do little or nothing to remove:

- many inorganic chemicals that are by-products of industry and manufacturing, such as:
  - arsenic
  - chromium
  - cyanide
  - perchlorate, a rocket fuel
- many other chemicals, such as:
  - dry-cleaning solvents like perchloroethylene (“PERC”)
  - industrial solvents, such as trichloroethylene (TCE) and dichloroethylene (DCE)
  - pesticides, such as ethylene dibromide (EDB) and atrazine
  - petroleum components, such as benzene, toluene, and xylene
- many waterborne parasites, such as *Cryptosporidium* (*Crypto*), the chlorine-resistant protozoan that sickened 400,000 people and killed as many as 100 in Milwaukee[9]

THE ROLE OF FILTRATION IN TREATMENT TRAIN EFFECTIVENESS

Water engineers have found that adjustments to treatment trains can, in some cases, improve removal of certain contaminants. For example, recent evidence indicated that improved operation of city water filters can reduce the amount of *Cryptosporidium* that gets through them, so the EPA modestly strengthened the rules for cities that filter their water.[10] Similarly, modest operational changes in some types of water treatment plants have been shown to reduce arsenic levels. (Serious arsenic contamination necessitates installation of new treatment technologies.)[11]

Several of the nation’s largest cities have water systems that remain unfiltered. These cities—including Boston and parts of San Francisco and Seattle—generally get their water from sources that are (or at least were) relatively well protected from housing, development, and industrial pollution. Increasingly, many of these unfiltered water systems are facing serious development pressures in their watersheds (the areas of land that drain into the water source). With increasing development comes greater risk of microbiological and chemical pollution. As a result, either the EPA or state government has ordered some cities with unfiltered water systems to filter their water or to improve water treatment through use of advanced disinfection technologies (such as ozone or ultraviolet light). Some experts fear that the mandate of additional treatment will result in a weakened resolve on the part of local officials to protect source water—leading to serious degradation of the cities’ source water quality and ultimately even worse tap water. Balancing these concerns is a highly controversial exercise.

Clearly, the ideal scenario is to have both strong source water protection and state-of-the-art treatment. However, most cities have neither.

THE UNIQUE PROBLEM OF GROUNDWATER WELLS

A small number of cities—such as Albuquerque, Fresno, and most cities in Florida—rely primarily upon groundwater wells for drinking water supplies. In addition, many cities that depend on surface waters use groundwater wells as reserve sources of water for times of peak demand or in case of an emergency or drought. Groundwater wells pose their own set of health risks: they are rarely treated (except for chlorination) because they have been presumed to be largely immune to the types of pollution that get into surface water.

We now know that groundwater can be and often has been contaminated by people's aboveground activities; Fresno's groundwater is a vivid example. The city's groundwater supply—through agriculture, development, industrial, and other activities above the aquifer—has become infiltrated by many pollutants, including inorganic contaminants (like nitrates from agriculture and human or animal waste) and organic contaminants (including pesticides and industrial chemicals). The aquifer is also becoming seriously depleted.

Furthermore, many groundwater wells contain naturally occurring contaminants, including radioactive contaminants like uranium and radon, as well as inorganic contaminants like arsenic. It is critical that those cities relying on groundwater—either as a primary water source or as a backup—treat their water in order to eliminate these contaminants.

INFRASTRUCTURE: OFTEN AGING AND OUTDATED

The science of drinking water treatment is an old one, but technological advances in recent decades have made delivery of pure, safe, and good-tasting water to city taps a readily achievable goal. In many cities, the water infrastructure—that is, the water collection devices, treatment plants, pumps, water mains, service lines, and other equipment that deliver water to your home—has been in place for decades; quite often, components of these systems (such as the mains) are more than a century old. As the water infrastructure outlives its useful life, it can corrode and deteriorate, and we have witnessed the results: a nationwide epidemic of burst water mains, unreliable pumps and collection equipment, and aging treatment plants that fail to remove important contaminants. With age and increased demands due to population growth, the water infrastructure problems in many cities are growing more serious, and public health is at risk.

Most cities' water supplies are in dire need of repair and upgrading. The problems associated with decay are grave: old pipes not only leak (many cities lose 20 percent or more of their water to leaks) but they can also burst, causing water pressure loss and risking serious contamination of the water supply. When water pressure drops due to pipe breaks or big leaks, bacteria and other contaminants can get into the water. Bacteria can also grow in old or poorly maintained pipes, which may harbor pathogens that can make people sick. In addition, older distribution systems often used lead in the service lines (pipes that take water from the water main to homes) or other components of the system.

Outdated drinking water treatment plants also cause serious water quality problems. For example, not only do old-fashioned treatment plants allow many contaminants to slip through, but they also *add* contaminants. Traditional chlorine primary disinfection can produce high levels of disinfection by-products when the chlorine reacts with naturally occurring organic matter in the water. These disinfection by-products have been linked to cancer and, in a series of preliminary studies, to miscarriages and birth defects.

WHO'S IN CHARGE?

For the most part, the business of water collection, treatment, and distribution is a government-run operation in this country; in most cities, it is headed by the city itself or by a public water authority. (A public water authority generally is a government entity, often created under state law, run by a board of directors that was appointed by local or state elected officials.) Some cities purchase their water from large, publicly owned wholesale water authorities. Private investor-owned companies represent a relatively small percentage of large city water systems in the United States. However, that may change: The American Water Works Company now serves 15 million people in 27 states and has recently been acquired by a German investor-owned corporation, RWE AG.[12,13] In many European nations, including France and the United Kingdom, several huge multinational private water companies own virtually all the water systems. A few years ago, Atlanta privatized its water system's operation and maintenance (O&M), but after major controversies over the adequacy of service by its private O&M contractor, United Water (owned by the huge French concern Suez Lyonnaise des Eaux), the city cancelled the private contract in early 2003. New Orleans also considered O&M privatization but, after accepting bids from several private concerns and inciting enormous local controversy, decided against it in 2002. Other cities like Seattle have turned to private companies to design, build, and operate new water treatment plants.

PUBLIC WATER SYSTEMS AND THE SAFE DRINKING WATER ACT

The Safe Drinking Water Act (SDWA), originally enacted by Congress in 1974 and signed into law by President Gerald Ford, vests the EPA with the responsibility for regulating the quality of drinking water served by "public water systems" (PWSs).[14] A PWS is defined to include any water system that serves water to more than 25 people (or 15 service connections), no matter who owns it, so PWSs run the gamut from small trailer parks to the nation's biggest cities.

MAXIMUM CONTAMINANT LEVEL GOALS

Under the SDWA, the EPA must set "Maximum Contaminant Level Goals" (MCLGs). The aim of these goals is to limit contaminants in drinking water to levels that will have no adverse effect on human health (with a margin of safety).[15] The EPA usually sets the MCLG for cancer-causing agents at 0 because no level of these contaminants is believed to be fully safe. The MCLGs are not directly enforceable.

MAXIMUM CONTAMINANT LEVELS

Once the EPA sets an MCLG for a given contaminant, it then establishes a "Maximum Contaminant Level" (MCL), which is an enforceable maximum allowable level of a contaminant in tap water. The MCL is supposed to be as close to the MCLG health goal as is feasible for large water systems.[16] In a change to the law enacted in 1996 (and opposed by many environmentalists), Congress added a provision that allows the EPA to adopt a weaker MCL for some contaminants than is feasible if the EPA administrator determines that the costs of the feasible standard are not justified by its benefits.[17] The EPA has now used this authority on a few occasions—first for uranium and most recently for arsenic. In the case of arsenic, the EPA established a weaker standard (10 parts per billion, or ppb) than was feasible (3 ppb). Thus, it is extremely important to realize that MCLs often are not fully protective of public health. They are set as a result of a political, economic, and technical balancing act, in which the EPA often sets standards that allow significant health risks—sometimes allowing as high as a 1 in 300 cancer risk (in the case of the recent arsenic standard). So while MCLs are sometimes referred to as "health standards," in fact only MCLGs are based exclusively upon health standards.

MONITORING AND REPORTING REQUIREMENTS

When the EPA sets an MCL, the agency also imposes monitoring and reporting requirements on PWSs; these vary depending on the contaminant. For example, PWSs must frequently monitor for a common contaminant such as coliform bacteria; a water system may have to test only once a year—or once every three years or even less frequently—for other contaminants. Water systems are often required to test for radioactive contaminants like radium or beta emitters only every three years. States are also authorized to waive testing entirely when they find that a contaminant is very unlikely to be found (*e.g.*, dioxin, for which many states do not require systems to test).

TREATMENT TECHNIQUES

In cases in which a contaminant cannot reliably be measured in drinking water, the EPA is authorized to issue a "treatment technique" (TT) instead of an MCL.[18] A TT requires water systems to use a certain type of water treatment to get rid of the contaminant of concern. There are just a few TTs. One (the Surface Water Treatment Rule) requires water systems that use surface water to filter their water with sand or similar media to remove waterborne parasites, or to demonstrate that they are entitled to avoid filtration because their source water is extremely high quality and very well protected from possible pollution sources.[19]

Another TT applies to lead and copper. The lead and copper rule requires water systems to test their water for these contaminants and to treat it to make their water less corrosive (to reduce lead or copper leaching). If the corrosion control does not work and lead levels remain high, the water system must eventually remove lead service lines that contribute to the lead problem.[20]

PRIMACY: RESPONSIBILITY FOR ENFORCING STANDARDS

Once the EPA has established MCLs and TTs, states are given the opportunity to take primary enforcement responsibility (or primacy) for that standard.[21] If, within a prescribed period, a state fails to show to the EPA's satisfaction that it has adopted the rule and will enforce it, the EPA itself must enforce that rule in that state. To date, all states except Wyoming have obtained primacy for current drinking water standards.

TESTING AND VOLUNTARY COMPLIANCE

Water is generally tested by the water system itself. Typically, a large water system has an in-house laboratory that tests for bacteria and other contaminants. For example, major cities are required to test for coliform bacteria more than 100 times per month. Some cities and most smaller water systems take samples of their water and send them to a state-approved laboratory for analysis. This testing and reporting of the results typically is done on the honor system—that is, the state and the EPA trust the water systems to take representative samples of their water and to send them to the lab following EPA protocols for ensuring the integrity of samples. Occasionally, state or EPA spot checks and reviews have uncovered falsified results, where the system operator was making up reported values, for example, or microwaving samples to kill bacteria.[22] In general, states lack the resources to conduct detailed audits of the accuracy and integrity of most samples and reports provided to them; thus, the EPA and states rely primarily upon voluntary compliance.

VIOLATIONS

Each year, states report more than 100,000 violations of EPA standards to the EPA.[23] While most of these violations are failures to test or to report test results (posing potential risks if contamination problems are being overlooked, intentionally or not), more than 16,000 of these are EPA standard (MCL or TT) violations. These MCL and treatment technique violations often affect water systems serving more than 30 million people per year. According to EPA data audits, this figure seriously underestimates the actual number of violations of all types, since states fail to report most violations.

If a water system is reported to be in violation of EPA standards, states are supposed to be the first line of enforcement. If a state fails to take enforcement action, the EPA is required under the SDWA to formally notify the state and the PWS of the violation; the EPA must then initiate enforcement action itself.[24] However, with the vast majority of violations (well over 90 percent)—even those known and reported to the EPA—no enforcement action is taken by the EPA or by states.[25]

Most very large city water systems have not reported serious MCL or TT violations.[26] This could be attributable simply to underreporting of violations, but NRDC's review of the records found few such cases. (We acknowledge, however, that such violations may exist but may not have been detected.) There are some cases in which large cities have violated MCLs or TTs and in which the EPA or a state has taken enforcement action. For example, several cities including Boston have been sued for violating the Surface Water Treatment Rule, and others occasionally violate other EPA standards—such as Baltimore, which violated the turbidity standard and triggered a citywide boil-water alert in 2000. A few cities have been subject to enforcement actions for violating EPA rules for testing and reporting—Phoenix, for example, which settled an EPA enforcement case for $350,000 for allegedly violating monitoring and reporting rules repeatedly.

RIGHT-TO-KNOW REPORTS

For nearly the past 30 years, concerned citizens have been working through policy avenues to assert their right to know whether their drinking water is safe. The movement began in 1974, when the SDWA included a requirement that a PWS must issue a public notice to all of its customers when it violates an EPA regulation.[27] A serious violation that poses an immediate health threat (such as a bacteria-contamination problem) is subject to virtually immediate public notice. However, a 1992 General Accounting Office (GAO) study and other information revealed that these public notices were not being issued.[28] In the rare cases when public notices were issued, they often appeared only in small print in the "legal notices" section of newspapers.[29] As a result, citizen organizations urged Congress to overhaul the public notice provision of the SDWA; furthermore, citizens pushed Congress to adopt a right-to-know provision in the SDWA that would enable citizens to be notified by PWSs about what was in their drinking water.

During Senate-floor debate on the 1996 SDWA amendments, Senator Barbara Boxer (D-CA) offered a revolutionary amendment requiring annual right-to-know reports to be sent directly to each water customer, summarizing contaminants in tap water and providing other pertinent drinking water–related information. The Senate version was ultimately defeated, but House Representatives Henry Waxman (D-CA) and Jim Saxton (R-NJ) urged the adoption of a similar amendment; it was eventually signed into law.[30] In 1998, after extensive regulatory negotiations with the water industry, states, and environmental, public health, and other groups, the EPA issued regulations implementing right-to-know requirements.[31]

- The final right-to-know rules require specific information on, among other things:
  - what contaminants are found in tap water
  - what the water source is for the system
  - any known pollution sources responsible for detected contaminants
  - details on any violations during the past year
- Under the SDWA and the EPA's rules, the water system is responsible for:
  - sending the report to all water system customers
  - for making a good-faith effort (defined in the rules) to get the report into the hands of apartment dwellers and others who do not receive water bills
- The reports are intended to be direct and understandable
  - The rules specifically provide that while systems can add nonrequired information, that information must be "consistent with, and not detract . . . from the purpose of the report"[32]
  - Tables cannot be cluttered with irrelevant information on contaminants not detected or presented with fractional decimal numbers that are hard to interpret

SOURCE WATER PROTECTION

Drinking water comes from either groundwater sources (underground formations of rock, saturated soil, or glacial deposits called aquifers that are usually porous and hold water) or from surface water sources, such as streams, rivers, or lakes. Groundwater and surface waters have their own particular sets of pollution sources. Major pollutants of city source waters include the following:

- **Municipal sewage.** Some cities have combined sewer systems, which convey stormwater runoff along with sanitary sewage and industrial waste. Runoff from particularly heavy storms can result in combined sewer overflow (CSO), which occurs when the volume of rain or snow is greater than the capacity of the stormwater management system. In such events, sewage can make its way into drinking water supplies.

▶ **Polluted runoff.** When rainwater or snowmelt runs off roads, farmland, lawns, construction areas, and logging or mining sites, for example, it picks up pollutants such as oil, animal waste, lawn pesticides and fertilizers, and other contaminants, which can end up in drinking water supplies.

▶ **Pesticides and fertilizers.** Chemicals applied to farmland or by homeowners, golf courses, and commercial establishments can run off into surface water and leach into the groundwater, contaminating supplies.

▶ **Animal waste.** Animal waste from big animal feedlots, manure piles, and land application of manure can leach into groundwater and run off into surface waters, contaminating supplies.

▶ **Industrial pollution.** By-products from the manufacturing process can leach into groundwater and pollute surface water, contaminating supplies.

▶ **Hazardous waste.** Hazardous waste sites contain chemicals than can leach into groundwater or wash into surface water, contaminating supplies.

The health effects related to these contaminants are detailed in Chapter 2. In sum, some of the most common water quality contaminants include:

Microbiological Contaminants

▶ coliform bacteria, microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water; fecal coliform and *E. coli* are a subset of this category

▶ *Cryptosporidium* (*Crypto*), a waterborne microbial disease-carrying organism that presents human health concerns, especially to individuals with weakened immune systems

▶ turbidity, cloudiness of water, which can indicate that water may be contaminated with pathogens presenting human health concerns

Inorganic Contaminants

▶ arsenic, a known and potent human carcinogen linked to a variety of diseases

▶ lead, which enters drinking water supplies from the corrosion of pipes or faucets and can cause permanent brain, kidney, and nervous system damage, as well as problems with growth, development, and behavior

▶ nitrates, from fertilizers or human or animal waste, which can cause shortness of breath, nausea, vomiting, diarrhea, and even death in infants

▶ perchlorate, which usually comes from rocket fuel spills or leaks at military facilities and harms the thyroid and may cause cancer

Organic Contaminants

▶ atrazine, a widely used pesticide, used largely on corn, that can damage major organs and may cause reproductive effects and cancer

▶ dibromochloropropane, a banned but persistent pesticide that can cause cancer, sterility, and other adverse health effects
▶ ethlyene dibromide (EDB), a pesticide that can damage the liver, stomach, adrenal glands, and reproductive organs
▶ haloacetic acids, by-products of chlorine disinfection that may cause cancer
▶ trihalomethanes, by-products of chlorine disinfection linked with cancer and (in preliminary studies) with miscarriages and birth defects

Radioactive Contaminants

▶ gross alpha radiation, which can result from the decay of radioactive minerals in underground rocks or as a by-product of the mining or nuclear industries and is known to cause cancer
▶ gross beta radiation, the product of eroding radioactive minerals or mining or surface disturbances that may mobilize radioactive minerals and a known human carcinogen
▶ radon, a radioactive gas known to cause lung cancer
▶ uranium, which is contained in minerals in the ground and sometimes released by mining or the nuclear industry and is radioactive and may cause cancer and kidney damage

ALTERNATIVES TO TAP WATER

WHAT ABOUT BOTTLED WATER?

Bottled water is big business. People who have decided to stop drinking tap water and are instead "voting with their bottles" of water are spending more than $4 billion a year. The trend is troubling: the right to drink healthy water should not be dependent on one's economic status. Furthermore, bottled water is not a panacea; testing shows that some bottled waters may contain many of the same pollutants that tap water does. In fact, at least 25 percent of the bottled water sold in the United States is derived from tap water—some of which is subject to additional treatment, some not. As NRDC showed in a 1999 study entitled *Bottled Water: Pure Drink or Pure Hype?* bottled water is not necessarily any purer or safer than tap water. For that study, NRDC hired independent, certified labs to test more than 1,000 bottles of water, including 103 of the most popular brands. Some bottled water contained arsenic, trihalomethanes, bacteria, and a variety of other contaminants. While most of the bottled water was of good quality, about one-third of the bottled waters NRDC tested contained significant contamination (that is, levels of a chemical or bacterial contaminant exceeding those allowed under state or industry standards or guidelines) in at least one test.

What's more, bottled water is certainly far more expensive than tap water: NRDC found that bottled water costs from 240 to more than 10,000 times more per gallon than tap water.

Moreover, NRDC found that the regulatory and government oversight program for bottled water is far weaker than the tap water regulatory program. In fact, the Food and Drug Administration (FDA), which has jurisdiction over bottled water, has rules for bottled water that are in many ways weaker than the EPA rules that apply to city tap water. The FDA interprets its rules as exempting from all federal regulation many brands of bottled water (water that is bottled and sold in a single state, which in some states is the majority of bottled water). Furthermore, the FDA has exempted carbonated water, seltzer water, and many other waters from the specific bottled water contamination standards that do exist, applying only vague general sanitation rules that set no specific contamination limits.

The FDA also told NRDC that it had the equivalent of less than one staff person dedicated to developing and issuing bottled water rules, and the equivalent of less than one staff person dedicated to assuring compliance with these rules. State bottled water programs also are, in most cases, virtually paper tigers, with the equivalent of less than one person's time dedicated to overseeing this industry.

Drinking bottled water is only one part of the equation. People who drink bottled water exclusively are still exposed to tap water contaminants, which are absorbed through the skin, inhaled, or ingested while showering, bathing, cooking, or washing dishes or clothes. For example, one primary way we ingest trihalomethanes and radon in tap water is not from drinking water but from inhaling air into which these contaminants evaporate—for example, while showering.[33] A study by University of Maine investigators found that a person whose home has high levels of radon in the water inhales huge amounts of radioactivity simply by taking a shower.[34] Similarly, trihalomethanes and other volatile organic chemicals have been shown to volatilize in the shower and be absorbed by the lungs when breathing.[35] While bottled water of independently confirmed high quality may be a temporary solution to known tap water contamination problems or for vulnerable people, the long-term solution to our drinking water woes is to ensure tap water safety. Bottled water is far more expensive per household than the reasonable cost of upgrading and maintaining drinking water systems.

WHAT ABOUT HOME WATER FILTERS?

Many people turn to home water filters to remove contaminants from tap water—either under the sink or on the faucet (called point-of-use filters) or whole-house filters, which are installed where the water comes into the household (called point-of-entry devices). This may make sense for pregnant women, for those especially vulnerable to water contamination, and for those whose tap water problems are exceptionally serious. People who choose to use such filters should take the following steps:

- ▶ Consult your right-to-know report to identify which contaminants are in your tap water in order to buy a filter that removes those particular contaminants.
- ▶ Test your home water for lead or make sure your filter removes lead if you have a young child at home or if you are pregnant. (Some faucets release lead, so even an under-the-counter filter may not fix the problem.) To find a state-certified lab to test household water, consumers can check with the EPA's drinking water hotline at 800-426-4791, or check the EPA's website at www.epa.gov/safewater/privatewells/labs.html.
- ▶ Remember that many contaminants are absorbed through the skin or can be inhaled, so a point-of-use device on your sink will not solve the problem for

contaminants that you breathe or absorb when you shower or bathe. Some point-of-use devices do filter water at the showerhead, however.

▶ Insist on a filter that has been independently certified to remove the specific types of contaminants that you are worried about. For example, NSF International (www.nsf.org) has standards for filters and certifies them.

▶ Make sure that you maintain your filter *at least* as frequently as is recommended by the manufacturer. Better yet, buy a contract to have it regularly checked and maintained by a certified professional. Improperly maintained filters can make water contamination problems worse. For example, potentially pathogenic bacteria can build up on some poorly maintained filters, and breakthrough can occur if the filter media are not changed or regenerated often enough, allowing high concentrations of captured contaminants to suddenly break through into the drinking water.

As we concluded with respect to bottled water, home water filters can fulfill important needs for pregnant women and vulnerable people or can serve as temporary solutions to known tap water problems. Nonetheless, the long-term solution is to ensure that tap water is safe for everyone to drink.

FOR PEOPLE WITH WEAKENED IMMUNE SYSTEMS

People who are immunocompromised should consult with their health care providers about drinking tap water. The Centers for Disease Control (CDC) recommends that people with severely compromised immune systems not drink tap water. The CDC has offered detailed recommendations specifically to people with HIV/AIDS, but they are equally applicable to anyone who is seriously immunocompromised:[36]

> *You may wish to avoid drinking tap water. Because public water quality and treatment varies in the United States, you should check with your local health department and water utility to see if they have made any recommendations for HIV-infected persons about drinking local tap water. There are three extra measures you may wish to take to ensure that your drinking water is safe: boil your water, filter your water with certain home filters, or drink certain types of bottled water. Processed bubbly drinks in cans or bottles are probably safe also. If you choose to take these extra measures, take them all the time, not just at home. If your local public health office warns you to boil your water, don't drink tap water unless you make it safe. Here are some extra measures you may wish to take to make sure your water is safe:*
>
> *1. Boiling water: Boiling is the best extra measure you may wish to take to be sure that your water is free of* Cryptosporidium *and any other germs. You yourself can see that the water was boiled and that it was stored safely. Bring your water to a rolling boil and let it boil for one (1) minute. After your boiled water cools, put it in a clean bottle or pitcher with a lid and store it in your refrigerator. Use the water as you normally would. Ice made from contaminated water can also contain* Cryptosporidium. *To be safe, make your ice from boiled water. Water bottles and ice trays should be cleaned with soap and water before you use them. Do not touch the inside*

of your water bottles or ice trays. If you can, clean your water bottles and ice trays yourself.

2. Filtering tap water: There are many different kinds of home water filters, but not all of them remove Cryptosporidium*. If you want to know if a particular filter will remove* Cryptosporidium*, call NSF at 800-673-8010. NSF is an independent testing group. If you want a list of filters that remove* Cryptosporidium*, call, write, or fax NSF and ask for their "Standard 53 Cyst Filters" list. You can reach NSF at www.nsf.org.*

NOTES

1 See, e.g., Rachel S. Barwick, M.S., Deborah A. Levy, Gunther F. Craun, Michael J. Beach, Rebecca L. Calderon, "Surveillance for Waterborne-Disease Outbreaks—United States, 1997–1998," *MMWR*, May 26, 2000, 49(SS04): 1-35; Deborah A. Levy, Michelle S. Bens, Gunther F. Craun, Rebecca L. Calderon, Barbara L. Herwaldt, "Surveillance for Waterborne-Disease Outbreaks—United States, 1995–1996," *MMWR*, December 11, 1998, 47(SS-5): 1-34; Michael H. Kramer, Barbara L. Herwaldt, Gunther F. Craun, Rebecca L. Calderon, Dennis D. Juranek, "Surveillance for Waterborne-Disease Outbreaks—United States, 1993–1994," *MMWR*, 45(SS-1)1-33, April 12, 1996, 45(SS-1): 1-33; Erik D. Olson and Diane Cameron, *The Dirty Little Secret About Our Drinking Water: New Data Show Over 100 Drinking Water Disease Outbreaks from 1986-1994, and Strong Evidence of More Widespread Problems* (NRDC, February 1995).

2 W. R. MacKenzie, et. al., "A Massive Outbreak in Milwaukee of *Cryptosporidium* Infection Transmitted Through the Public Water Supply," *New England Journal of Medicine*, 1994, 331: 161–167. The precise number of people killed by the Milwaukee outbreak is not known with certainty. Account by the *Milwaukee Journal* puts the number at more than 100, while the "official" state and local health department count was "a minimum of 50 deaths." See Marilyn Marchione, "Deaths Continued After *Crypto* Outbreak: State Report Attributes a Minimum of 50 Deaths from '93 to '95." *The Milwaukee Journal Sentinel*, May 27, 1996.

3 Ibid.

4 "1,061 Suspected *E. coli* Cases in New York Outbreak," *Infectious Disease News* (October 1999), available online at www.infectiousdiseasenews.com/199910/frameset.asp?article=ecoli.asp; Centers for Disease Control and Prevention, "Public Health Dispatch: Outbreak of *Escherichia coli* O157:H7 and *Campylobacter* Among Attendees of the Washington County Fair—New York," *MMWR*, 1999, 48(36): 803.

5 Four of the 19 cities (Fresno, Los Angeles, San Diego, and San Francisco) were presented in an earlier October 2002 California prerelease of this report.

6 Cities were selected to represent the broadest range of American city water supplies: criteria included a geographic range across the country, large cities (Los Angeles at 1.2 million) and small cities (Manchester, New Hampshire at 128,000), treatment types (unfiltered, such as Seattle, and filtered, such as Atlanta), systems that use primarily groundwater (like Albuquerque) and those that use primarily surface water (like Boston).

7 Water Infrastructure Network, *Clean Safe Water for the 21st Century* (2000), available online at www.amsacleanwater.org/advocacy/winreport/winreport2000.pdf.

8 Congressional Budget Office, "Future Investment in Drinking Water and Wastewater Infrastructure," May 2002, available online at www.cbo.gov/showdoc.cfm?index=3472&sequence=0&from=1.

9 See note 2.

10 See, e.g., EPA, "Interim Enhanced Surface Water Treatment Rule," 63 Fed. Reg. 69477 (December 16, 1998), which requires large water systems (serving more than 10,000 people) to upgrade their water filter operations to improve removal of *Crypto*.

11 See EPA, "Final National Primary Drinking Water Regulation for Arsenic," 66 Fed. Reg. 6976 (January 22, 2001).

12 "About American Water Works Company" available online at www.illinoisamerican.com/aboutus/about.html.

13 See "RWE Announces Acquisition of American Water Works," January 17, 2002, available online at www.waternunc.com/gb/rwe_ag_01.htm.

14 42 U.S.C. §300f et seq.; PWS definition at id. §300f(4).

15 Ibid. § 300g-1(b)(4)(A).

16 Ibid. § 300g-1(b)(4)(B)-(D).

17 Ibid. § 300g-1(b)(6).

18 Ibid. § 300g-1(b)(7).

19 See EPA, "Surface Water Treatment Rule," codified at 40 C.F.R. §§ 141.70-141.75, described in EPA Fact Sheet on Drinking Water Contaminants available online at www.epa.gov/safewater/source/therule.html#Surface.

20 See 40 C.F.R. § 141.80-141.91, described in EPA Fact Sheet on Drinking Water Contaminants, available online at www.epa.gov/safewater/source/therule.html#Surface.

21 42 U.S.C. § 300g-2.

22 See, e.g., EPA Inspector General, "Audit Report of Region I's Enforcement of the Safe Drinking Water Act," Audit E1HWCS3-01-0023-2100291 (1993), and Erik Olson, *Think Before You Drink* (NRDC, 1993).

23 EPA, *Providing Safe Drinking Water in America: 1998 National Public Water Systems Compliance Report* (2000).

24 42 U.S.C. § 300g-3(a).

25 See note 23.

26 Ibid., and see city-by-city text of this report.

27 42 U.S.C. § 300g-2(c)(1)-(3).

28 GAO, *Drinking Water: Consumers Often Not Well-Informed of Potentially Serious Violations* (1992); Erik Olson, *Think Before You Drink* (NRDC, 1993).

29 Ibid.

30 42 U.S.C. § 300g-2(c)(4).

31 40 C.F.R. § 141.151 et seq.

32 Ibid. § 141.153(h)(5).

33 G. H. Shimokura, D. A. Savitz, E. Symanski, "Assessment of Water Use for Estimating Exposure to Tap Water Contaminants." *Environ. Health Perspectives* February 1998; 106(2): 55–9; N. I. Maxwell, D. E. Burmaster, D. Ozonoff, "Trihalomethanes and Maximum Contaminant Levels: The Significance of Inhalation and Dermal Exposures to Chloroform in Household Water." *Regul. Toxicol. Pharmacol.*, December 1991; 14(3): 297–312; J. B. Andelman, "Inhalation Exposure in the Home to Volatile Organic Contaminants of Drinking Water." *Sci. Total Environ.*, December 1985, 47: 443–60.

34 G. Bernhardt; C. T. Hess, *Acute Exposure from Radon-222 and Aerosols in Drinking Water*. Written communication (1995). Unpublished master's thesis. University of Maine.

35 See note 33. Also EPA600/R-00/096, *Volatilization Rates From Water to Indoor Air Phase II*, October 2000.

36 CDC, "Cryptosporidiosis: A Guide for People with HIV/AIDS," available online at www.cdc.gov/ncidod/diseases/crypto/hivaids.htm.

Water Quality and Compliance

Findings and Recommendations

WATER QUALITY AND COMPLIANCE

City	2001 Grade
Albuquerque	Poor
Atlanta	Fair
Baltimore	Good
Boston	Poor
Chicago	Excellent
Denver	Good
Detroit	Good
Fresno	Poor
Houston	Fair
Los Angeles	Fair
Manchester	Good
New Orleans	Good
Newark	Fair
Philadelphia	Fair
Phoenix	Poor
San Diego	Fair
San Francisco	Poor
Seattle	Fair
Washington, D.C.	Fair

To evaluate water quality and compliance, NRDC reviewed tap water quality data, Environmental Protection Agency (EPA) compliance records, and water suppliers' annual reports. Our research revealed a wide range of tap water quality throughout the 19 cities surveyed—from excellent drinking water in Chicago to poor tap water in Albuquerque, Fresno, Phoenix, and San Francisco.

FINDINGS

NRDC found that healthy city water supplies resemble each other and succeed in three discrete areas: source water protection, treatment, and maintenance and operation of the system.

Every problem water supply, however, is unhealthy in its own way: it may fail in just one of the three discrete areas mentioned above, or it may have a combination of factors that contribute to the system's ailments. Fresno, for example, has no source water protection; Albuquerque and San Francisco do not have adequate treatment systems in place; Atlanta has a poor maintenance and distribution system. Phoenix has a unique set of problems in addition to its long-standing woes: the city repeatedly failed to comply with basic water safety monitoring and reporting requirements. As a result, we don't even know what contaminants are in Phoenix's water—and this uncertainty may have health implications for people who live there.

A HANDFUL OF CONTAMINANTS FOUND IN MOST CITIES

We also observed that while tap water can contain a vast array of contaminants, a handful of particularly harmful contaminants surfaced repeatedly in our study. For example:

- **lead,** which enters drinking water supplies from the corrosion of pipes or faucets, can cause permanent brain damage and decreased intelligence in infants and children;
- **pathogens** (germs) such as ***Cryptosporidium,*** a microscopic disease-carrying protozoan that presents health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the frail elderly, children, and people

who have undergone organ transplants or cancer chemotherapy or have certain chronic diseases;

- by-products of the chlorination process such as **trihalomethanes** and **haloacetic acids** may cause cancer, and, potentially, reproductive problems and miscarriage.
- several other **carcinogens** or otherwise **toxic contaminants** also appeared in water supplies, including arsenic (from mining and industrial processes or natural processes), naturally occurring radioactive radon, the pesticide atrazine (affecting the water of more than 1 million Americans), and the rocket fuel **perchlorate** (present in the water supplies of more than 10 million Americans).

FEW VIOLATIONS, GENERALLY LOW STANDARDS

Overall, NRDC's study revealed a relatively small number of cities in outright violation of national standards. This fact does not imply low contaminant levels, but rather weak standards: in short, the EPA has written most standards in a way that most cities will not be in violation. For example, recent studies show that there is no safe level of cancer-causing arsenic in drinking water. Nonetheless, today's standard, in place since 1942, is 50 parts per billion (ppb). The EPA recently set a new standard at 10 ppb, which will go into effect in 2006. The EPA found that 3 ppb was a feasible standard, but the agency set the standard at 10 ppb because of concerns about treatment costs to water utilities. The National Academy of Sciences has found that at the 10 ppb EPA standard, the lifetime fatal cancer risk is about 1 in 333—more than 30 times higher than what the EPA says is usually the highest acceptable risk. Nonetheless, arsenic is still present in the drinking water of 22 million Americans, hovering at average levels of 5 ppb—half the new national standard and just one-tenth of the current national standard.

Many cities evaluated by NRDC failed to meet an EPA action level or exceeded a new (not-yet-enforceable) EPA standard. Among the cities with such problems were:

Albuquerque

- exceeded new national standard for arsenic (effective in 2006)
- exceeded proposed national standard for radon

Boston

- exceeded national action level for lead
- was sued by the EPA for allegedly violating the surface water treatment rule (which mandates that the supplier filter or adequately protect the watershed; the court ruled that the violation was not sufficient to force filtration)

Fresno

- apparently violated the nitrate standard (the wells in question were later taken out of service)
- seriously contaminated with numerous pesticides and industrial contaminants (EDB; PCE; TCE; DBCP; 1,1-dichloromethane; and cis-1,2-dichloroethylene)
- radon reported at levels in excess of proposed national standard

Houston

▸ exceeded new national standard (effective in 2002) for haloacetic acids but improved level in 2001 to below new standard

▸ apparently exceeded proposed standard for radon

Los Angeles

▸ exceeded proposed standard for radon in 2000

Newark

▸ exceeded action level for lead

Phoenix

▸ repeatedly violated MCLs as well as testing and reporting requirements, prompting an enforcement case

San Francisco

▸ exceeded new national standard (effective in 2002) for trihalomethanes but obtained extension of national compliance deadline

Seattle

▸ exceeded action level for lead

▸ exceeded new national standard for haloacetic acids in 2001 (levels dropped in 2002)

▸ exceeded one criterion for avoiding filtration

▸ indicated the presence of *Cryptosporidium*

MORE SPIKES, INDICATING POOR INFRASTRUCTURE

Finally, NRDC's study revealed an increase in the frequency of periodic spikes in contamination in many cities, indicating that aging equipment and infrastructure may be inadequate to handle today's contaminant loads or spills. On occasion, these risks were substantial. For example, in Washington, D.C., levels of trihalomethanes—which potentially cause cancer, birth defects, and miscarriages—peaked at more than double the EPA standard. (It is noteworthy that while Washington, D.C., recently changed its treatment to mitigate such spikes, many other cities continue to suffer from them.) With most EPA chemical standards (such as arsenic, haloacetic acids, and trihalomethanes), a spike above the EPA standard does not trigger a violation; only an average level over the standard is considered a violation. In recent years, Atlanta, Baltimore, and Washington, D.C., issued boil-water alerts as a result of turbidity peaks or other problems. While aggressive action in each city significantly lowered those levels, spikes in contaminants may pose immediate health problems to particularly susceptible people. Spikes of contaminants at levels above EPA standards included:

Atlanta spikes: turbidity, localized boil-water alerts from main breaks, haloacetic acids

Baltimore spikes: turbidity triggering citywide boil-water alert, trihalomethanes, haloacetic acids, lead
Boston spikes: trihalomethanes and haloacetic acids
Houston spikes: arsenic, radon, trihalomethanes
Los Angeles spikes: arsenic, lead, nitrates, perchlorate, trihalomethanes, haloacetic acid, radon
Manchester spikes: lead
New Orleans spikes: atrazine, turbidity
Newark spikes: haloacetic acids, trihalomethanes
Philadelphia spikes: haloacetic acids, total trihalomethanes, lead
Phoenix spikes: arsenic, di(2-ethylhexyl)phthalate (DEHP), haloacetic acids, nitrates, trihalomethanes, perchlorate
Seattle spikes: lead, turbidity, *Cryptosporidium,* haloacetic acids, trihalomethanes
Washington, D.C., spikes: coliform, cyanide, trihalomethanes, haloacetic acids, turbidity, lead

SUMMARIES FOR 2001 DATA

Albuquerque: Poor

▸ violated proposed standard for radon (though may qualify for a waiver)
▸ violated new standard (effective in 2006) for arsenic, reporting the highest levels of the contaminant found in this study. The findings present a cancer risk 40 times higher than ordinarily accepted by the EPA
▸ exceeded national health goals for many contaminants of concern, including gross alpha radiation, thallium, total coliform, fecal coliform/*E. coli*, total trihalomethanes, and haloacetic acids

Atlanta: Fair

▸ violated turbidity standard; utility reported there was no health risk
▸ experienced main breaks and several boil-water alerts
▸ reported significant levels of haloacetic acids and lead
▸ revealed poor pipe maintenance in the distribution system, resulting in widespread breaks and outages throughout the city

Baltimore: Good

▸ violated turbidity standard in 2000 but improved levels by 2001
▸ reported significant levels of lead and haloacetic acids
▸ reported spikes in total trihalomethanes

Boston: Poor

▸ failed to meet national action level for lead
▸ reported significant levels of trihalomethanes, which spiked above the national standard; no violation recorded because the EPA's standard is based on average levels
▸ sued by the EPA for allegedly not meeting Surface Water Treatment Rule require-

ment for filtration or watershed protection (court ruled violation wasn't sufficient to trigger filtration mandate)
- *Cryptosporidium* in source water
- reported continuing problems with an uncovered reservoir that may allow pathogens in the water supply

Chicago: Excellent
- tap water quality was the best in study
- reported low levels of lead, trihalomethanes, and haloacetic acids

Denver: Good
- reported moderate levels of haloacetic acids and total trihalomethanes
- reported significant levels of lead

Detroit: Good
- reported significant levels of total trihalomethanes, haloacetic acids, total coliform, and lead

Fresno: Poor
- reported significant levels of nitrates, sometimes in apparent violation
- reported significant levels of pesticides and industrial chemicals, including
  - 1,1-dichloromethane
  - cis-1,2-dichloroethylene
  - ethylene dibromide
  - trichloroethylene
  - perchloroethylene
  - dibromochloropropane
- reported significant levels of lead
- reported significant levels of gross alpha radiation
- reported significant levels of radon
- reported significant levels of arsenic

Houston: Fair
- wells violated proposed radon standards, which were the highest reported in this study
  - wells supply around 35 percent of the city's water
  - radon levels spiked to twice the national standard
  - the city may eventually qualify for a waiver of that standard
- in 2000, exceeded national standard for haloacetic acids, with the highest levels reported in this study; levels improved in 2001
- reported significant levels of trihalomethanes
- reported significant levels of arsenic, measuring higher than most cities
- reported significant levels of coliform
- violated monitoring standards

Los Angeles: Fair
▶ violated national draft safety level for perchlorate
▶ reported significant levels of total trihalomethanes and haloacetic acids
▶ reported substantial levels of arsenic
▶ reported elevated levels of radioactive and cancer-causing radon in some wells
▶ reported significant levels of nitrates in some wells
▶ reported problems with uncovered finished water reservoirs

Manchester: Good
▶ reported low levels of methyl tertiary-butyl ether (MTBE) in water supply, apparently from gasoline as a result of recreational boating in source waters
▶ reported significant levels of lead
▶ reported significant levels of trihalomethanes
▶ reported low levels of trichloroethylene

New Orleans: Good
▶ reported significant levels of trihalomethanes and haloacetic acids
▶ reported a significant peak in turbidity
▶ reported moderate levels of the pesticide atrazine

Newark: Fair
▶ exceeded national action level for lead
▶ reported significant levels of total trihalomethanes and haloacetic acids, measuring half the national standard
▶ reported problems with reservoirs, including an uncovered finished water reservoir

Philadelphia: Fair
▶ reported significant levels of trihalomethanes and haloacetic acids, approaching the national standard
▶ reported significant levels of lead, at around two-thirds of the action level
▶ reported significant activity in the watershed, including substantial levels of *Cryptosporidium* and *Giardia* in raw water
▶ medical researchers suggested recent past waterborne disease may have been associated with turbidity spikes
▶ reported generally low levels of a variety of industrial chemicals, metals, and pesticides

Phoenix: Poor
▶ reported repeated violations of monitoring and reporting requirements
▶ reported relatively high levels of arsenic
▶ exceeded draft national safe level for perchlorate
▶ reported significant spikes (above new standards) of trihalomethanes and haloacetic acids
▶ reported significant levels of nitrates, approaching national standard

▸ reported significant levels of chromium and di(2-ethylhexyl)phthalate (DEHP)
▸ settled an EPA enforcement action in 2000, which alleged numerous past MCL, monitoring, and reporting violations

San Diego: Fair

▸ exceeded draft national safe level for perchlorate
▸ reported significant levels of trihalomethanes and haloacetic acids
▸ reported significant levels of ethylene dibromide
▸ reported significant levels of lead
▸ reported significant levels of total coliform bacteria
▸ reported significant levels of radioactive contaminants, including gross alpha radiation, gross beta radiation, uranium, and low levels of MTBE

San Francisco: Poor

▸ violated the new standard for total trihalomethanes but received an extension on the deadline
▸ reported presence of *Cryptosporidium* and *Giardia*
▸ reported significant levels of lead
▸ reported significant cross-connection risk in separate potable and nonpotable supply systems

Seattle: Fair

▸ exceeded national action level for lead
▸ confirmed *Cryptosporidium*
▸ reported significant levels of haloacetic acids and total trihalomethanes in 2000, which improved in 2001
▸ reported significant turbidity spikes

Washington, D.C.: Fair

▸ violated new national standard for trihalomethanes in 2000; levels reduced in 2001
▸ reported significant spike of cyanide, the highest reported in this study
▸ reported significant levels of haloacetic acids
▸ reported significant levels of total coliform
▸ reported moderate levels of radioactive contaminants

RECOMMENDATIONS

NRDC makes four major recommendations to improve water quality and compliance.

First, NRDC recommends that this country invest in infrastructure to upgrade deteriorating water systems and modernize treatment techniques. Modernizing infrastructure is a costly but necessary task. New Orleans's system, for example, needs at least $1 billion in repairs and improvements, according to city officials;

Washington, D.C., is implementing a $1.6 billion capital improvement plan to improve city water and wastewater.[1, 2]

Credible estimate for upgrades and repairs that would ensure, for years to come, the safety of drinking water nationwide place the tab at around $500 billion.[3] In May 2002, the Congressional Budget Office came to a similar conclusion: $232 to $402 billion in investments will be needed over the next two decades to upgrade and repair the nation's drinking water systems.[4] Specifically, NRDC recommends that:

- ▶ legislators appropriate substantial additional federal, state, and local funds to help America's neglected city drinking water systems shoulder $500 billion in water infrastructure needs nationwide
- ▶ Congress enact and fund water infrastructure legislation that at least doubles current federal support for drinking water supplies from the current level of $1.7 billion per year. A portion of this funding should be earmarked for source water protection and other cost-effective green infrastructure projects
- ▶ states and local governments consider raising money through bond issues and other financing mechanisms in order to fund investment
- ▶ Congress enact municipal bond reform legislation to make bonds a more efficient and attractive means to support water infrastructure projects
- ▶ water systems increase rates, which will allow them to collect sufficient funds—with support from state and federal government funding—to rehabilitate, upgrade, and fully maintain their water supply infrastructure for the long haul
- ▶ water systems adopt long-term operation and maintenance planning, and capital improvement plans, to assure that old pipes and infrastructure will be replaced and rehabilitated before the problems become crises
- ▶ Congress and water systems adopt low-income assistance programs

Second, NRDC recommends that investment be earmarked not just for old pipes but also for upgrading drinking water treatment. Most major U.S. cities still employ the same basic water treatment technologies that have been used since before World War I—techniques that cannot remove many human-made (or human-released) chemicals that modern science, industry, mining, and manufacturing have created.[5] With today's technology, four state-of-the-art advanced treatment techniques are available and used in Europe and elsewhere in the world but are rarely used alone in this country and virtually never together:

- ▶ ozone
- ▶ granulated activated carbon
- ▶ ultraviolet (UV) light treatment
- ▶ membrane treatment (such as reverse osmosis or nanofiltration)

Advanced treatment is most effective. For example, a Seattle plant uses ozone and UV treatment to kill *Cryptosporidium*, and in Manchester, the use of granular activated carbon has reduced levels of synthetic organic chemicals including trihalomethanes. A few cities are using membrane treatment to reduce salt levels or to get rid of contaminants that are difficult to treat.

How NRDC Arrived at the Water Quality and Compliance Grades for 2001

The More Checks, the Better the Grade. See page 75 for Methodology

City	2001 Grade	No violation of currently enforceable national standards	No exceedance of action levels	No violations of proposed or final (but not yet enforceable standards	All detected contaminants with national health goals of 0 are found at less than 25% of national standard	Some detected contaminants with national health goals of 0 are found at less than 25% of national standard	No repeated water quality or compliance problems	Additional comments
Albuquerque	Poor	✔	✔					Highest arsenic in study
Atlanta orders	Fair		✔	✔		✔	✔	Multiple boil-water
Baltimore	Good	✔	✔	✔		✔	✔	Citywide boil-water order (2000)
Boston	Poor			✔		✔		Issues with lead; uncov-ered reservoirs; filtration avoidance
Chicago	Excellent	✔	✔	✔	✔	✔	✔	Best water in study
Denver	Good	✔	✔	✔		✔	✔	Moderate TTHM, lead
Detroit	Good	✔	✔	✔		✔	✔	Moderate TTHM, HAA, coliform, lead
Fresno	Poor							Worst water in study
Houston	Fair	✔	✔					Radon exceeded proposed standard
Los Angeles	Fair	✔	✔			✔		Issues with uncovered reservoirs; radon (2000); perchlorate
Manchester	Good	✔	✔	✔		✔	✔	Lead, MTBE
New Orleans	Good	✔	✔	✔		✔	✔	TTHM, HAA, turbidity, atrazine
Newark	Fair	✔		✔		✔	✔	Lead exceeded action level; issues with reservoir problems; TTHM, HAA
Philadelphia	Fair	✔	✔	✔		✔		Lead, TTHM, HAA; spills; medical articles—possible disease
Phoenix	Poor		✔			✔		Many monitoring, report-ing violations; perchlorate, nitrates, coliform, TTHMs
San Diego	Fair	✔	✔	✔		✔	✔	TTHM, HAA, lead, perchlorate
San Francisco	Poor		✔			✔	✔	Exceeded TTHM standard; lead; cross-contamination risk
Seattle	Fair	✔				✔		Lead exceeded action level; HAAs exceeded standard (2000, fixed ‘01); TTHM; turbidity; filtration avoidance issue
Washington, D.C.	Fair	✔	✔	✔		✔		TTHM, HAA, coliform, cyanide

ABBREVIATIONS: TTHM=Total Trihalomethanes; HAA: Haloacetic Acids; MTBE: methyl tert-butyl ether

Based upon our findings, NRDC recommends that cities invest in protecting and improving the quality of tap water as follows. Regarding infrastructure, we recommend that water systems:

- ▶ shift to ozone and/or UV light as primary disinfectants, which eliminate *Cryptosporidium* and other pathogens unharmed by chlorine and reduce levels of chlorination by-products, such as trihalomethanes and haloacetic acids
- ▶ also use granulated activated carbon to further reduce the levels of disinfection by-products and other synthetic organic chemicals such as pesticides and industrial chemicals
- ▶ seriously consider upgrading to membrane treatment, since it can eliminate virtually all contaminants; investment in membranes now will avoid the need to constantly change treatment approaches as more and more contaminants are identified as health threats and EPA or states regulate them

Regarding infrastructure, we recommend that the EPA:

- ▶ encourage upgrades to advanced treatment technologies
- ▶ invest in research and development to improve current technologies and to bring down costs
- ▶ develop incentives for water systems to adopt advanced treatment such as membranes to eliminate most contaminants from tap water

Third, water suppliers, states, the EPA, and Congress must increase source water protection efforts. The first line of defense to protect drinking water safety is to ensure that source water—lakes, rivers, or groundwater—is protected from pollution. This requires aggressive efforts on the part of water utilities and state officials to identify pollution sources and to take regulatory or other actions to address them. The EPA needs to take a leadership role in issuing strong regulations to address major, poorly controlled pollution sources, including:

- ▶ concentrated animal feeding operations, which contribute to surface and groundwater pollution
- ▶ major agricultural sources, which contribute fertilizer and pesticides (such as atrazine and other triazines) that cause widespread water contamination
- ▶ stormwater runoff from urban and suburban areas
- ▶ combined sewer and sanitary sewer overflows (CSOs/SSOs)
- ▶ leaking aboveground or underground storage tanks
- ▶ industrial and commercial facilities and transporters responsible for oil or other toxic spills
- ▶ toxic waste sites, such as the Henderson, Nevada, Kerr-McGee site, which has contaminated the Colorado River, and resultantly the tap water of millions of people, with the rocket fuel perchlorate
- ▶ undercontrolled point sources, including poorly constructed or poorly operated sewage treatment plants and industrial facilities with weak or expired water pollution permits

The EPA also needs to enforce more strictly existing rules and abandon efforts to weaken current rules. For example, as discussed in Chapter 4, the EPA should maintain the current polluted water cleanup rules and should not weaken sewage treatment rules. In addition, Congress needs to step in to protect the EPA's jurisdiction to control pollution of smaller streams and wetlands (see Chapter 4). Congress also should enact stronger legislation addressing groundwater pollution, polluted runoff, CSOs/SSOs, and other poorly controlled sources.

Finally, NRDC recommends that the EPA strengthen and enforce existing health standards for tap water that are too weak, and draft and enforce new standards for those drinking water contaminants that remain unregulated. Specifically, we recommend that the EPA:

- issue new standards for:
  - perchlorate
  - radon
  - distribution systems
  - groundwater microbes
  - other emerging contrmainants (see Chapter 5)
- strengthen existing standards for:
  - arsenic
  - atrazine and total triazines
  - chromium
  - *Cryptosporidium* and other pathogens
  - fluoride
  - haloacetic acids
  - lead
  - total "chlor" herbicides (e.g. acetochlor, metolachlor, methoxychlor, etc.)
  - total organophosphate pesticides
  - total trihalomethanes

VULNERABLE CONSUMERS NEED TO TAKE SPECIAL PRECAUTIONS

It is critical to note that the above recommendations are long-term solutions to improve overall drinking water quality in this country. For those people who have immediate concerns about tap water safety, NRDC brings to the fore EPA recommendations as follows: people with serious immune system problems (such as people on cancer chemotherapy or people with HIV/AIDS) consult with their health-care providers about drinking tap water in order to avoid the risk of infection from contaminated water. Pregnant women and infants may also be at special risk from certain contaminants common in many cities' tap water, like lead and chlorine by-products.

NOTES

1 "Rotting Sewer, Water Lines Tough Problems in Big Easy," *Chicago Tribune*, July 7, 2002, available online at www.win-water.org/win_news/070802article.html.

2 *2000 Drinking Water Quality Report*, Washington, D.C., Water and Sewer Authority (WASA), available online at www.WASA.com.

3 W. R. MacKenzie, et. al., "A Massive Outbreak in Milwaukee of *Cryptosporidium* Infection Transmitted Through the Public Water Supply," *New England Journal of Medicine*, 1994, 331: 161–167. The precise number of people killed by the Milwaukee outbreak is not known with certainty. Account by the *Milwaukee Journal* puts the number at more than

100, while the "official" state and local health department count was "a minimum of 50 deaths." See Marilyn Marchione, "Deaths Continued After Crypto Outbreak: State Report Attributes a Minimum of 50 Deaths from '93 to '95." *The Milwaukee Journal Sentinel*, May 27, 1996.

4 "1,061 Suspected *E. coli* Cases in New York Outbreak," *Infectious Disease News* (October 1999), available online at www.infectiousdiseasenews.com/199910/frameset.asp?article=ecoli.asp; Centers for Disease Control and Prevention, "Public Health Dispatch: Outbreak of *Escherichia coli* O157:H7 and *Campylobacter* Among Attendees of the Washington County Fair—New York," *MMWR*, 1999, 48(36): 803.

5 Four of the 19 cities (Fresno, Los Angeles, San Diego, and San Francisco) were presented in an earlier October 2002 California prerelease of this report.

CHAPTER 3

NRDC
THE EARTH'S BEST DEFENSE

WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

June 2003

RIGHT-TO-KNOW REPORTS	
City	**2001 Grade**
Albuquerque	Good
Atlanta	Fair
Baltimore	Good
Boston	Poor
Chicago	Good
Denver	Good
Detroit	Good
Fresno	Poor
Houston	Fair
Los Angeles	Good
Manchester	Good
New Orleans	Poor
Newark	Failing
Philadelphia	Good
Phoenix	Failing
San Diego	Fair
San Francisco	Fair
Seattle	Fair
Washington, D.C.	Fair

RIGHT-TO-KNOW REPORTS

Findings and Recommendations

Citizens have a right to know whether their drinking water is safe, as mandated in the 1996 amendments to the Safe Drinking Water Act. This law required water suppliers to notify the public of dangers in tap water and inform people about the overall health of their watershed. Instead, in many cases, right-to-know reports have become propaganda for water suppliers, and the enormous promise of right-to-know reports has not been achieved.

FINDINGS

NRDC's research revealed that the quality of cities' annual right-to-know reports varied widely: more than half the cities surveyed had reports that were, at the very least, partially successful tools for consumer education; however, some, like Fresno, Newark and Phoenix, were less than direct, burying, obscuring, and even omitting findings about health effects of contaminants in city water supplies, printing misleading statements, and violating a number of right-to-know requirements. In general, even the cities to which NRDC assigned grades of Good and Fair included one or more of the following problems:

- **false, unqualified, misleading, or unsubstantiated claims**
  - The cover pages of the 1999, 2000, and 2001 Washington, D.C., right-to-know reports, for example, included prominent and unqualified statements of safety: "Your Drinking Water Is Safe!"—even though the city had the highest levels of cyanide reported in this study, as well as elevated levels of chlorination by-products, lead, and bacteria, among other pollutants. Such prominent and unqualified statements undercut mandatory warnings issued later in the reports explaining that infants, children, and pregnant women may be at special risk from lead, and that immunocompromised people may be at risk from pathogens in city tap water
  - Atlanta's reports included claims that the city's water "meets" and "surpasses all EPA standards," even though the city failed the turbidity standard and had repeated boil-water orders
- **errors and violations of EPA right-to-know requirements**

▶ EPA rules require the reports to reveal known sources of pollutants in city water, such as factories or Superfund sites. None of the 19 cities surveyed named specific polluters in the annual reports.

▶ Phoenix's 2001 report incorrectly stated that the "City of Phoenix's Water Services Department met or surpassed all health and safety standards for drinking water," and that "Phoenix tested for nearly 200 substances, even though tests are necessary for only about 110 substances."[1] But it did not mention the numerous chemical monitoring violations reported by Arizona, and failed to note the past violations and $350,000 in penalties Phoenix agreed to pay in 2000.

▶ Some reports failed to cite average contaminant levels (listing only the highest level or range), making it impossible to determine whether the system was in compliance with the average-based standards.

▶ Recent Chicago reports misstated the national health goal for coliform bacteria.

▶ incorrect, misleading, buried, or omitted information or data

▶ A Fresno report buried on the fifth page a vital health warning for pregnant women and parents of infants regarding nitrates, which can be dangerous or fatal to developing fetuses and infants.

▶ A Newark report buried the health warning and detailed information on the city's exceedence of the EPA's action level for lead, which poses risks especially to infants and young children.

▶ Seattle reports buried the news that the city substantially exceeded the national action level for lead and never mentioned that the city was operating under a state bilateral compliance agreement to fix the problem.

▶ New Orleans did not provide arsenic, atrazine, barium, or cadmium data—even though these contaminants had been found in the water.

▶ A recent Chicago report buried the health warning and detailed information on lead contamination in a footnote at the bottom of a table, where it would have been unlikely to be noticed by parents of young children potentially at risk from lead.

▶ A recent Boston right-to-know report stated that the Massachusetts Water Resources Authority was not in violation of EPA standards, even though several communities exceeded the national action level for lead and the standard for coliform bacteria.

▶ A recent Houston report provided a prominent and incorrect description of arsenic's health threat and misleading information about *Cryptosporidium.*

▶ A recent Albuquerque report misstated the health concerns regarding arsenic.

▶ A recent Denver report buried mention of cancer risks from total trihalomethanes in a footnote.

▶ failure to include information on health effects

▶ Nearly all cities surveyed failed to provide information on the health effects of some contaminants—including trihalomethanes, haloacetic acids, and trichloroethylene—found at levels below EPA standards but above EPA health goals.

▶ failure to translate reports into other languages spoken in communities

▶ Fewer than half the cities surveyed offered any kind of translation of right to know reports. (See page 36 for city language data.)

SUMMARIES FOR 2001 RIGHT-TO-KNOW REPORTS

Albuquerque: Good

▶ was user-friendly (+)
▶ made no overarching claims about the safety of the water supply (+)
▶ provided helpful information on contaminants and source water protection (+)
▶ offered no names or details on specific pollution sources, or on health effects of some contaminants (–)

Atlanta: Fair

▶ was relatively user-friendly (+)
▶ made no overarching claims about the safety of the water supply (+)
▶ generally met minimum EPA right-to-know-report requirements (+)
▶ included false claim regarding how city's water "meets" and "surpasses all EPA standards" (–)
▶ provided no names or details on specific pollution sources or on health effects of some contaminants (–)

Baltimore: Good

▶ made no overarching claims about the safety of the water supply (+)
▶ offered extensive advice on minimizing lead exposure (+)
▶ had errors in key, in legend, and in method of reporting lead levels (–)
▶ provided no names or details on specific pollution sources or on health effects of some contaminants (–)

Boston: Poor

▶ was relatively user-friendly (+)
▶ included map of source waters (+)
▶ included false claim that prominently asserted on the front page in 2000 that supplier "follows, and even goes beyond, federal and state requirements"
▶ asserted in early sections of the reports "high quality tap water" despite substantial water quality problems, which were later revealed deep into report (–)
▶ failed to notify the public of exceedence of lead action level or violations of the coliform standard (outside of Boston) until deep into the report (–)
▶ failed to notify the public of inadequately disinfected water from its uncovered reservoir until late in the report (–)
▶ misleadingly headlined discussion on lead as "Good News on Lead"—even though the city had failed to meet the action level (–)
▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Chicago: Good

▶ was well formatted (+)
▶ revealed useful information (+)
▶ included warnings for vulnerable populations prominently (+)

▶ made no overarching claims about the safety of the water supply (+)
▶ misstated the EPA's health goal for coliform bacteria (–)
▶ buried important information on lead contamination in a footnote (–)
▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Denver: Good

▶ included helpful information on health risks related to lead, turbidity, and total trihalomethanes (+)
▶ included prominent and detailed discussion of *Cryptosporidium* and *Giardia* (+)
▶ included warning to immunocompromised people, which was properly and prominently placed (+)
▶ buried mention of the potential cancer risks from trihalomethanes in a footnote (–)
▶ offered no names or details on specific pollution sources and no information on health effects of some contaminants found (–)

Detroit: Good

▶ was user-friendly (+)
▶ included prominent information for people particularly vulnerable to contamination (+)
▶ avoided prominent unqualified statements about the water's safety (+)
▶ failed to disclose the level of haloacetic acids in the city's water in violation of the EPA's rules for right-to-know reports (–)
▶ reported on levels of other contaminants in ways that were unclear, without clear average levels (–)
▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Fresno: Poor

▶ offered translations of the report in Spanish and Hmong (+)
▶ listed many unregulated contaminants (+)
▶ described health effects of some key contaminants (+)
▶ buried health warnings for pregnant women regarding nitrates at elevated levels in city water (–)
▶ buried mention of city wells exceeding drinking water standards for nitrates, 1,2-DCE, cis-1,2-DCE, DBCP, EDB, and TCE (–)
▶ incorrectly asserted that Fresno did not violate enforceable standards (–)
▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Houston: Fair

▶ included prominent placement of the mandatory special alert for people who are more vulnerable to particular contaminants (+)
▶ provided a prominent and incorrect description of arsenic's health threat in 2000 (–)

▶ contained misleading information about *Cryptosporidium* found in source waters (–)
▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Los Angeles: Good
▶ was user-friendly (+)
▶ included information about treatment (+)
▶ produced four separate, area-specific reports (+)
▶ included good source water information as well as maps (+)
▶ provided special health information to vulnerable water users, including the immunocompromised and those on kidney dialysis (+)
▶ did not translate the report into any language (–)
▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Manchester: Good
▶ generally complied with EPA's regulations (+)
▶ made no sweeping or misleading declarations about the absolute safety of Manchester's water (+)
▶ revealed that water contained the unregulated contaminant MTBE from gasoline (+)
▶ noted in table but did not discuss lead levels in Manchester tap water (–)
▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

New Orleans: Poor
▶ was generally readable (+)
▶ highlighted information for people most likely to experience adverse health effects from water problems (+)
▶ did not provide legally required information on arsenic, atrazine, barium, or cadmium levels (–)
▶ included misleading language about lead in city water (–)
▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Newark: Failing
▶ made no overarching claim that the water is absolutely safe (+)
▶ met with most but not all of the EPA's requirements (–)
▶ violated federal law by not providing information on the specific levels of arsenic and haloacetic acids (–)
▶ buried information on the city's exceedence of the EPA action level for lead; failed to include all information on lead test results required by law (–)
▶ failed to mention lead-monitoring violation (–)

▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Philadelphia: Good

▶ included much important information on source water, treatment, and public involvement (+)

▶ was generally well presented and included maps and graphics of treatment (+)

▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Phoenix: Failing

▶ was not user-friendly (–)

▶ offered false assertions about compliance (–)

▶ failed to disclose monitoring violations (–)

▶ failed to provide maps of source water (–)

▶ failed to report average levels of many contaminants, as legally required (–)

▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

San Diego: Fair

▶ was relatively user-friendly (+)

▶ made no overarching claim that the water is absolutely safe (+)

▶ translated reports into Spanish and distributed upon request (+)

▶ included helpful information on two important contaminants, perchlorate and trihalomethanes (+)

▶ prominently displayed warning for immunocompromised consumers (+)

▶ failed to discuss lead and copper monitoring (–)

▶ failed to disclose levels of some regulated contaminants, including arsenic, barium, chromium, and selenium, as legally required (–)

▶ did not acknowledge presence of gasoline additive MTBE in water (–)

▶ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

▶ failed to explain treatment techniques (–)

San Francisco: Fair

▶ accurately named and described source waters (+)

▶ included an EPA- and state-required notice in more than a dozen languages alerting customers that the reports include important information (+)

▶ included unwarranted assertions that the city's water is "top quality," ignoring the high total trihalomethane level problem (–)

▶ minimized risks of *Cryptosporidium* and *Giardia* (–)

▶ failed to provide warning language for immunocompromised individuals (–)

▶ buried in a footnote important information about high lead levels (–)

How NRDC Arrived at the Right-to-Know Report Grades for 2001

The More Checks, the Better the Grade. See page 77 for Methodology

City	2001 Grade	Report generally complies with EPA right to know rules	Report is relatively user-friendly	Report includes information about unregulated contaminants substantially beyond rule requirement	Report includes more info than required on health effects of contaminants found above EPA health goals	Report includes maps showing the source water and delineates water quality in specific areas	Report maps and reveals known sources of pollutants	Report offers some translation for non-English speakers (see page 36)	Report prominently places warnings to immuno-compromised individuals	Report does not attempt to mislead consumers or put a falsely positive spin on information
Albuquerque	Good	✔	✔		✔	✔		✔		
Atlanta	Fair	✔	✔							
Baltimore	Good	✔								✔
Boston	Poor		✔			✔		✔		
Chicago	Good	✔	✔					✔	✔	✔
Denver	Good	✔	✔		✔	✔		✔	✔	✔
Detroit	Good	✔	✔						✔	✔
Fresno	Poor							✔		
Houston	Fair	✔				✔		✔	✔	
Los Angeles	Good	✔	✔	✔	✔	✔		✔	✔	✔
Manchester	Good	✔	✔					✔		✔
New Orleans	Poor		✔						✔	
Newark	Failing									
Philadelphia	Good	✔	✔			✔		✔		
Phoenix	Failing							✔		
San Diego	Fair		✔	✔	✔			✔	✔	✔
San Francisco	Fair	✔						✔		
Seattle	Fair	✔	✔			✔		✔		
Washington, D.C.	Fair	✔	✔	✔		✔		✔	✔	

▸ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Seattle: Fair

▸ generally appeared to comply with EPA rules (+)
▸ included important information about source water (including map and source water assessment information) and water treatment (+)
▸ did not describe the city's water as "absolutely safe" (+)
▸ buried the news that Seattle substantially exceeded the EPA action level for lead (–)
▸ prominently made the questionable claim that "No Compounds Were Detected at Above the Allowable Levels," despite the exceedence of the lead action level and the city's failure to meet state watershed protection criteria, which triggered a state "agreed order" to build a new treatment plant (–)
▸ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

Washington, D.C.: Fair

▸ included information on health effects of certain contaminants found at levels below the EPA's enforceable standards (+)
▸ included an explanation of how the water is treated (+)
▸ included information about lead and suggestions on how citizens can reduce it in their tap (+)
▸ included warnings for vulnerable populations (+)
▸ included prominent, unqualified, and misleading statements about the water's absolute safety (–)
▸ included misleading assertion about *Cryptosporidium* (–)
▸ offered no names or details on specific pollution sources or on health effects of some contaminants (–)

RECOMMENDATIONS

The enormous promise of right-to-know reports has not been fully achieved. NRDC recommends that water systems change right-to-know-report presentation, as follows:
▸ use large typeface, photos, and graphics.
▸ use plain language and avoid jargon and acronyms.
▸ avoid the use of sweeping and prominent claims of absolute safety for their water. These unqualified claims are not only misleading but they are also likely to discourage consumers from reading the whole report. This is a particular concern for vulnerable people such as pregnant women, young children at risk from lead, and people with compromised immune systems.
▸ prominently place the warnings to especially vulnerable people on the front page of their report, set off in a box or otherwise, to capture these consumers' attention. Too many utilities bury these mandatory warnings in the back of their reports, embedded in large blocks of uninviting text.

▶ discuss any significant water quality and compliance issues prominently in the first paragraphs of the report, linking the information to the investment needs of the utility. This candid, honest approach will persuade consumers that the utility is being forthright and will help build consumer support for raising the funds to address the problems.
▶ candidly discuss the potential health effects of contaminants found in their water—at least those contaminants found at levels in excess of EPA or state health goals, action levels, or health advisories. Citizens deserve the straight facts about the potential health effects of contaminants found in their drinking water.
▶ provide unbiased, complete information, which will fulfill citizens' right to know and encourage citizens to work with their utilities to fix the problem. Utilities that explain their water rates must rise to fund improvements in health protection will face a far more receptive public audience than systems that pretend there is no problem.
▶ convey as much information as possible about the specific pollution sources in their watershed that are or may be contributing to contamination or that are threatening to contaminate a water supply. This information will help citizens who wish to work with the water system to address those pollution sources. Not only do citizens have a right to know who is polluting or threatening their water supply, they can also be extremely helpful to the utility in its efforts to get the polluters to clean up their acts.

Languages Spoken Other Than English

In the cities listed in **bold** below, at least 10 percent of the population primarily speaks a language other than English. NRDC recommends that right-to-know reports be fully translated into appropriate languages in these cities.

City	Total population	Percentage speaking primarily language other than English*	Percentage speaking primarily Spanish*	Percentage speaking primarily Asian and Pacific languages*
Albuquerque	417,841	27.9	7.3	0.7
Atlanta	389,992	10.8	3.3	0.6
Baltimore	609,345	7.8	1.2	0.6
Boston	557,376	33.4	6.5	4.0
Chicago	2,678,981	35.5	12.5	1.6
Denver	517,349	27.0	12.1	1.2
Detroit	875,384	9.2	2.6	0.3
Fresno	388,739	39.5	12.4	5.9
Houston	1,953,631	41.3	18.6	2.2
Los Angeles	3,412,889	57.8	25.0	4.4
Manchester	99,771	19.6	1.8	1.0
New Orleans	451,739	8.3	1.4	1.0
Newark	252,719	42.6	14.6	0.3
Philadelphia	1,419,977	17.7	3.2	2.1
Phoenix	1,207,309	32.2	15.2	0.7
San Diego	1,141,742	37.4	10.5	5.3
San Francisco	745,650	45.7	6.0	16.2
Seattle	537,538	20.2	1.8	5.9
Washington, D.C.	539,658	16.8	4.7	0.8

*As percentage of total population

Source: U.S. Census Bureau, Census 2000.

▶ include a map of source water, including location and names of major pollution sources.

▶ translate their right-to-know reports into any language beyond English that is the primary language of more than 10 percent of a population, based upon 2000 Census data (see table on page 36).

NOTE

1 Phoenix Water Services Department, *2001 Water Quality Annual Report*, available online at www.phoenix.gov/WATER/qualrept.html.

CHAPTER 4

SOURCE WATER PROTECTION

Findings and Recommendations

NRDC
THE EARTH'S BEST DEFENSE

WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

June 2003

SOURCE WATER PROTECTION

City	Rating
Albuquerque	Poor
Atlanta	Poor
Baltimore	Fair
Boston	Good
Chicago	Fair
Denver	Good
Detroit	Poor
Fresno	Failing
Houston	Poor
Los Angeles (imported)	Poor
Los Angeles (local)	Fair
Manchester	Good
New Orleans	Poor
Newark	Fair
Philadelphia	Poor
Phoenix	Poor
San Diego (imported)	Poor
San Diego (local)	Fair
San Francisco	Good
Seattle	Excellent
Washington, D.C.	Fair

Source water—the bodies of water from which a city draws its drinking water—varies in origin. Most cities get their water primarily from aboveground supplies, such as lakes and rivers; a few cities like Albuquerque and Fresno get most of their water primarily from groundwater—that is, underground aquifers tapped by city wells. City source waters are most frequently contaminated by:

- municipal sewage
- polluted urban runoff from stormwater or snowmelt
- pesticides and fertilizers from agricultural fields
- animal waste from feedlots and farms
- industrial pollution from factories
- mining waste
- hazardous waste sites
- spills and leaks of petroleum products and industrial chemicals
- "natural" contamination, such as arsenic or radon that occurs in water as a result of leaching or release of the contaminant from rock

Source water protection has often been overlooked by many city water systems for years, and most cities have done little or nothing to protect source waters. Nonetheless, source water protection is key to strong drinking water protection. Typically, water experts seek what they call multiple barriers to contamination:

- strong protection against pollution of the source water
- effective drinking water treatment at the water treatment plant
- effective and safe management of the distribution system

FINDINGS

Some cities like Seattle, Boston, San Francisco, and Denver have at least some well-protected watersheds. Some cities have site-specific burdens. For example, Fresno relies upon wells, many of which have become seriously contaminated by agricultural and industrial pollution, including nitrates; Houston also relies on wells that are vulnerable to naturally occurring radioactive radon and arsenic in the region. Philadelphia's river sources are vulnerable to pollution from farms, sewage, urban runoff, industry, and spills; Denver, to debris and sediment resulting from erosion after wildfires; and Manchester, to MTBE, a gasoline additive, present in the city's main water source apparently as a result of recreational boating or other gasoline use in its main watershed. The Colorado River, which serves as a major source of drinking water for Los Angeles, San Diego, Phoenix, and many other cities and towns, is contaminated by the rocket fuel perchlorate from a Kerr-McGee site in Henderson, Nevada, and by other contaminants from other pollution sources including agriculture, urban and suburban runoff, and industry.

While most cities reviewed need stronger source water protection, some cities, including Albuquerque, Atlanta, Detroit, Fresno, Houston, Los Angeles, Manchester, Newark, Philadelphia, Phoenix, and San Diego, have serious and immediate needs for better source water protection. The antidote lies with elected officials (generally state or other officials with authority to control polluters outside of the city's limits), who control the funds and write the laws that can protect source water.

Cities can't always choose where they get their water from, but they can work with state and federal officials to improve protections. The result may be a wide spectrum of efforts to protect water sources. Seattle, for example, has implemented very extensive source water protection programs that include banning agricultural, industrial, and recreational activities in and residential use of watersheds. Other cities, such as Manchester and Boston, have made great strides in land acquisition and watershed management programs.

SUMMARIES OF SOURCE WATER PROTECTION GRADES FOR 2001

Albuquerque: Poor

City groundwater is becoming seriously depleted and contaminated with pollutants from septic tanks, abandoned wells, toxic chemical and waste spills and leaks, and waste disposal sites, including Superfund sites, among other sources.

Atlanta: Poor

The city's water supply is threatened by polluted runoff as well as by 1,400 identified potential point source polluters, *i.e.* polluters potentially discharging from a specific location such as a factory or treatment plant or a handler of hazardous chemicals or petroleum.

Baltimore: Fair

In addition to conventional pollution sources—including point sources, as well as agricultural runoff containing nitrogen, pesticide, and sediment—Baltimore's water supply is vulnerable to atmospheric deposition of nitrogen and phosphorous.

Boston: Good

Boston has made major efforts to protect its watersheds. Substantial parts of the city's watersheds are, however, threatened by development, and there is some current risk of contamination from agriculture, septic systems, recreation, and runoff from local development.

Chicago: Fair
Even though the health of Lake Michigan has improved, it is still vulnerable to discharge from factories and runoff from urban and suburban areas.

Denver: Good
While Denver received a good score, the city water supply remains vulnerable to debris from wildfires as well as to sediment from floods.

Detroit: Poor
The Detroit River and Lake Huron are particularly vulnerable to runoff from suburban and urban areas, combined sewer overflow (including sewage, agricultural pollution, spills, and leaks of hazardous chemicals and petroleum), and point source pollution from industry, such as the automobile and petrochemical industries.

Fresno: Failing
The city supply is Fresno Sole Source, a large, unconfined groundwater aquifer. In this city, groundwater contamination is a serious problem, as it is highly susceptible to contamination from agriculture, urban, and suburban runoff, and percolation (gradual recharge of groundwater by contaminated surface water) when dissolved contaminants from these sources seeps into the groundwater.

Houston: Poor
The San Jacinto and Trinity Rivers are threatened by pathogen and pesticide pollution, among other conventional contaminants, from point source polluters and from urban and suburban runoff.

Los Angeles: Poor for imported water; Fair for local water
Approximately 41 percent of Los Angeles water comes from the Los Angeles Aqueduct, which uses largely undeveloped watersheds in the eastern Sierra (which are threatened). Around 47 percent of Los Angeles water comes from the Sacramento-San Joaquin Delta, which is severely threatened, and from the Colorado River, which is contaminated by runoff and by point sources (such as the Kerr-McGee plant in Nevada, which has contaminated the river and Los Angeles water with perchlorate). About 12 percent of Los Angeles water comes from wells in the San Fernando Basin, which is vulnerable to surface contamination. Finally, Los Angeles holds its water in four reservoirs that are uncovered, posing another threat.

Manchester: Good
Lake Massabesic, the city's primary watershed, hosts a significant amount of boating activity—and thus gasoline (read: MTBE) contamination. While the lake is otherwise fairly well protected, spills, leaks, and runoff of oil, gasoline, and other chemicals from recreational activity and upstream uses pose contamination problems.

New Orleans: Poor

The city's source water, the Mississippi River, is vulnerable to innumerable sources of industrial and agricultural pollution.

Newark: Fair

The Passaic River, the city's source, was given a national rating of 6—the worst possible rating—from the IWI, the EPA's Index of Watershed Indicators, as a result of hazardous waste facilities and manufacturing, especially in downstream areas. While the upstream areas of Newark's Pequannock and Wanaque watersheds, which feed into the Passaic, are largely forested and fairly well protected, there are some potential pollution sources as well as significant development pressure.

Philadelphia: Poor

The city's water sources are threatened by contamination from conventional point sources (such as treated and untreated sewage, spills, acid mine drainage, and agricultural, urban, and suburban runoff); furthermore, the city does not control its watersheds, and the state does not adequately regulate pollution of these waters.

Phoenix: Poor

Phoenix obtains most of its source water for drinking water (90 percent) from the Salt, Verde, and Colorado Rivers, which are very vulnerable to serious depletion and to contamination and have significant industrial and other point source polluters, urban and suburban runoff, and agricultural pollutants. The remaining source water for Phoenix's drinking water comes from deep groundwater wells, which are declining in quality and quantity.

San Diego: Poor for Imported Water; Fair for Local Water

About two-thirds of San Diego water is imported water from the Colorado River system; it travels largely unprotected through farms, towns, and mining sites and is therefore quite vulnerable to contamination. Another portion of imported water comes from the Sacramento-San Joaquin Delta in northern California, which is a threatened supply. Finally up to 20 percent of the water is local, captured in reservoirs and is relatively well protected, though urban and suburban sprawl and runoff pose potential threats.

San Francisco: Good

Eighty-five percent of the city's water comes from the Hetch Hetchy watershed near Yosemite National Park and is therefore very well protected. The remaining water provided by the Alameda and Peninsula watersheds is also fairly well protected. Nonetheless, it remains vulnerable to contamination.

Seattle: Excellent

The city's two sources of drinking water, the Cedar River and the South Fork of the Tolt River, are not likely to become polluted, and the water utility has undertaken extensive source water protection efforts.

Washington, D.C.: Fair

The Potomac River, the city's source, is vulnerable to many point pollution sources; it recently has been listed as one of the most threatened rivers in the nation.

RECOMMENDATIONS

In order to ensure the safety of drinking water sources, NRDC urges utilities to be at the forefront of protection efforts. The argument that source water protection is beyond a utility's control is simply not valid; water utilities can aggressively pursue polluters of their water supply through both political and legal means. For example, utilities can urge state or federal lawmakers to craft legislation to acquire interests in land. Manchester has made great strides in source water protection through land acquisition. The city's waters were ranked a 6 by EPA's Index of Watershed Indicators (IWI), the lowest possible score. But the city purchased much land surrounding source waters and adopted a watershed management program; for this reason, NRDC ranked the city's threat to source water as Fair. Utilities can also push for improved controls on pollution from a variety of sources: concentrated animal feeding operations and other agricultural sources, stormwater runoff from cities and suburbs, combined sewers and sanitary sewer overflows, and chemical contamination from industry.

In sum, water utilities and their consumers have a very strong common interest in source water protection. By publicly identifying threats to source water and by working with the public and elected officials to address these threats, water utilities will not only help their own customers but will also make a major contribution to public health and environmental protection.

NRDC recommends that utilities work with state and federal legislators to:

- craft legislation and appropriate funding for land acquisition and conservation easements
- push for improved controls on pollution from a variety of sources:
  - concentrated animal feeding operations and other agricultural sources
  - pesticide pollution from chemicals that are highly soluble and cause widespread pollution (such as atrazine and other triazines)
  - stormwater runoff from cities and suburbs
  - combined sewer and sanitary sewer overflows
  - chemical contamination from industry

HOW CITIZENS CAN HELP

An informed, activated public is a utility's strongest ally in the effort to improve pollution prevention and source water control. To get involved:

- Attend meetings of your local water supplier. Check the right-to-know report or call and ask for dates, times, and locations.
- Learn more from these groups:
  - Clean Water Action, www.cleanwater.org
  - Campaign for Safe and Affordable Drinking Water, www.safe-drinking-water.org

- NRDC, www.nrdc.org
- Clean Water Network, www.cwn.org.

▶ Reduce the amount of water you use.

- Plant drought-resistant plants or "xeriscape" (use plants that need little or no watering).
- Use low-flow showerheads and shorten your shower time.
- Don't spray down your driveway to clean it.
- Minimize the number of times (and how long) you water your lawn.
- Consider installing low-flush toilets.

▶ Avoid using pesticides in the home or yard, or storing pesticides in the home. Consumer pesticide use in the home leads to runoff into water resources.

▶ Buy organic foods, if possible. Purchasing organically grown food helps prevent the drinking water source contamination from pesticide and herbicide runoff that results from conventional agricultural practices.

CHAPTER 5

Common Tap Water Contaminants

Health Effects, Treatment, and Recommendations

WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

June 2003

NRDC's review of city tap water quality revealed that there are several contaminants that occur with surprising regularity in tap water throughout America's cities, regardless of location—such as chlorination by-products, lead, and total coliform bacteria. Other contaminants, such as industrial chemicals, may occur less frequently but still pose major health concerns. This chapter summarizes the health concerns for and sources of many of the most common tap water contaminants.

CRYPTOSPORIDIUM

HIGH CONCERN
BOSTON
HOUSTON
PHILADELPHIA
SEATTLE
SOME CONCERN
ATLANTA
LOS ANGELES
SAN DIEGO
SAN FRANCISCO
WASHINGTON, D.C.

MICROBIOLOGICAL CONTAMINANTS

Cryptosporidium

National Standard

Treatment Technique (TT)

National Health Goal (MCLG)

0—no known fully safe level

Cryptosporidium (*Crypto*) is a microbial, waterborne protozoan. It has long been known to be a parasite in humans and animals, including cattle, and is shed in feces after reproducing by the millions in the host's intestines.[1] *Crypto* forms a particularly robust, hard-shelled cyst that can withstand temperature extremes and even survive a dousing with pure chlorine bleach.

Health Effects

Crypto's health effects include severe diarrhea for up to two weeks in otherwise healthy people, nausea, abdominal cramps, and fever. Currently, no antibiotics or other medical treatments are available to kill *Crypto*.[2] *Crypto* poses significant public health concerns, especially to individuals whose immune systems are weakened, including people living with HIV/AIDS, the elderly, young children, chemotherapy patients, and organ transplant patients.[3] Indeed, individuals who are immunocompromised can and do die from *Crypto* infection.

In 1993, high levels of *Crypto* got through the filters and treatment process at a water treatment plant in Milwaukee, Wisconsin. The plant did use poorly operated filtration and chlorine disinfection and was apparently in full compliance with all

EPA rules then in place. More than 400,000 people in Milwaukee became sick, several thousand of whom were hospitalized and approximately 100 of whom eventually died. The outbreak was the largest documented waterborne disease occurrence in U.S. history, but it is not the only such experience on record.[4]

In the wake of the Milwaukee incident and several other *Crypto* outbreaks, the EPA negotiated a new set of rules with industry, NRDC, health groups, state and local governments, and others that will gradually reduce the risk of such outbreaks. The new rules require improved drinking water treatment and stricter controls on turbidity (cloudy water) that can indicate poor filter performance.

Many more waterborne *Crypto* outbreaks have occurred in the United States, England, and elsewhere in the world.[5] Tests of healthy adult human volunteers found that even a single *Crypto* cyst carries a risk of infection. The more cysts in a glass of drinking water, the higher the risk that people will become infected.[6] Because a single cyst may cause infection, the EPA has established a Maximum Contaminant Level Goal (MCLG, or health goal) for *Crypto* of 0.[7]

Occurrence and Treatment

Crypto is found in most surface water supplies in the United States; surveys have found it in more than 80 percent of the U.S. surface waters tested.[8] However, *Crypto* is difficult to detect in water, and testing methods available cannot identify with certainty whether the *Crypto* that is detected is viable—that is, that it can actually make people ill.[9] In addition, the current testing methods are especially poor at detecting the kind of low-level *Crypto* concentrations that might be expected in finished, or treated, drinking water. Therefore, experts say it is incorrect to assume that *Crypto* is not present in treated drinking water simply because it has not been detected.[10]

All large- and medium-size water utilities that use surface water must monitor for *Crypto*, report results in their right-to-know reports and use advanced treatment if they find significant levels. Chlorine disinfection of drinking water is ineffective in killing *Crypto*. Indeed, only very finely tuned filtration or state-of-the-art disinfection using ozone or intense ultraviolet light will kill *Crypto* once it is in water supplies.[11] Of course, the best approach is to prevent *Crypto* from getting into drinking water sources in the first place, and that requires the adoption of strong source water protection programs. However, even cities with strong source water protection—including the use of completely undeveloped watersheds—find *Crypto* at low levels in their source water, possibly from wildlife or from humans using the watershed for recreation. Low levels of *Crypto* from protected watersheds pose far lower risks than high levels such as those found downstream from concentrated animal feeding operations or other major pollution sources. Nevertheless, they still pose a risk if not dealt with through treatment. However, if filtration is operating properly and is optimized, it will reduce *Crypto* levels.

In the wake of the above, EPA has adopted an "Interim Enhanced Surface Water Treatment Rule" for cities serving more than 10,000 people that filter surface water. The rules went into effect in January 2002, and they require water filtration plants to optimize the way they operate filters and to keep turbidity levels down, demonstrating filter efficiency (see turbidity section below).[12]

Recommendations for People with Weakened Immune Systems

People who are immunocompromised or are concerned about the possibility that *Crypto* may be in their water should consult with their health care provider about finding a safe source of drinking water. The Centers for Disease Control and Prevention (CDC) recommends that people with severely compromised immune systems may wish to avoid drinking tap water. The CDC has offered detailed recommendations specifically to people with HIV/AIDS, but they are equally applicable to anyone who is seriously immunocompromised. Those recommendations are quoted in full on page 13.

TOTAL COLIFORM BACTERIA

HIGH CONCERN
BOSTON
DETROIT
WASHINGTON, D.C.
SOME CONCERN
ALBUQUERQUE
ATLANTA
CHICAGO
DENVER
FRESNO
HOUSTON
LOS ANGELES
MANCHESTER
NEW ORLEANS
NEWARK
PHOENIX
SAN DIEGO
SAN FRANCISCO
SEATTLE
LITTLE OR NO CONCERN
PHILADELPHIA

Total Coliform Bacteria

National Standard (MCL)

5% maximum in any month[13]

National Health Goal (MCLG)

0—no known fully safe level

Total coliform bacteria is a broad class of bacteria, many of which live in the intestines of humans and animals. It is a microbial contaminant whose presence is a potential indicator that disease-causing organisms may be in tap water.

Health Effects

While most coliform bacteria are themselves harmless, their presence is a sign that the water may contain fecal pathogens, including noncoliform pathogens such as other forms of bacteria, viruses, or protozoa. Exposure to disease-carrying pathogens potentially indicated by the presence of coliform bacteria may cause infection, resulting in diarrhea, cramps, nausea, jaundice, headaches, and fatigue.[14] Some coliform bacteria, such as *Escherichia coli* (*E. coli*), are dangerously infectious organisms that can cause serious infections in exposed people. It was this type of coliform that caused the infamous Jack in the Box hamburger poisoning incidents in 1999, in which four children were killed and 700 sickened.[15] In an *E. coli* disease outbreak in 1989 caused by contamination in the Cabool, Missouri, drinking water supply, four people died while 243 were sickened—but the incident generated virtually no publicity.[16] More recently, two people died, including a three-year-old girl, at least 65 were hospitalized, and an estimated 1,061 were confirmed to have become ill as a result of the same strain of *E. coli*, when drinking water was contaminated at a county fair in upstate New York in 1999.[17] Again, the incident generated some publicity, but hardly the nationwide attention caused by the hamburger incidents.

Occurrence, Treatment, and the Total Coliform Rule

The EPA says that “the presence of coliform bacteria in tap water suggests that the treatment system is not working properly or that there is a problem in the pipes.”[18] The EPA therefore has adopted the Total Coliform Rule (TCR), which set the health goal for total coliform at 0. The EPA found that “since there have been waterborne disease outbreaks in which researchers have found very low levels of coliform, any level indicates some health risk.”[19] To avoid or eliminate microbial contamination, water systems may need to repair their disinfection or filtration processes, flush or upgrade pipes from treatment plants to customers (their distribution system), and adopt source water protection programs to prevent contamination. The EPA's TCR says that when water system tests reveal that more than 5 percent of monthly samples contain coliforms, system operators are required to report that violation to their state and the public.[20] If a water system finds that any sample contains total coliform, the TCR requires it to collect "repeat samples" within 24 hours.[21] When a sample tests positive for total coliforms, it must also be analyzed for fecal coliforms and *E. coli*.[22] If fecal coliform or *E. coli* are found, the incident is deemed an "acute violation," triggering a requirement that the system rapidly notify the state and the public, because such a violation "represents a direct health risk," according to the EPA.[23] Big city water systems are required to test for coliform far more often than small systems. Water suppliers serving fewer than 1,000 people may test once a month or less frequently, but systems with 50,000 customers must test 60 times per month, and those with 2.5 million customers must test at least 420 times per month.[24]

Recommendations for People with Weakened Immune Systems

People with weak immune systems, including some infants, elderly people, organ transplant or cancer chemotherapy patients, and people living with HIV/AIDS, are at special risk from the pathogens whose presence may be indicated by total coliform.[25] In some cases, immunocompromised people can die from consuming water containing dangerous bacteria.[26]

Total coliform violations are a common trigger for boil-water orders issued in the United States. When total coliform levels are repeatedly high in a public water system, it is an indication that the system may pose serious risks, particularly to people with immune system problems. The CDC has offered detailed recommendations specifically to people with HIV/AIDS, but they are equally applicable to anyone who is seriously immunocompromised. The recommendations made by CDC regarding immunocompromised people taking action to avoid *Crypto* are equally applicable to water that has a high risk of *E. coli* or other pathogen contamination that may be indicated by boil-water alerts or total coliform violations. Those recommendations are quoted in full on page 13.

Turbidity (Cloudiness)

TURBIDITY
HIGH CONCERN
ATLANTA
BALTIMORE
NEW ORLEANS
SAN FRANCISCO
SOME CONCERN
PHILADELPHIA
SEATTLE

National Standards (TT) (in Nephelometric Turbidity Units, or NTU)

Filtered water
0.5 NTU, 95% of the time (through 2001)
0.3 NTU, 95% of the time (as of 2002)
1 NTU, 100% of the time (as of 2002)
Unfiltered water
5 NTU maximum, 100% of the time

Turbidity is a measure of the cloudiness of water, often the result of suspended mud or organic matter, and may sometimes indicate that the water is contaminated with *Cryptosporidium* or other pathogens. In addition, turbidity can interfere with disinfection of the water because it can impede the effectiveness of chlorine or other chemical disinfectants.

Health Effects

According to the EPA, "higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites, and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches."[27] Indeed, it was a spike in the level of turbidity at a Milwaukee treatment plant that indicated the city had a serious problem with its drinking water just before the 1993 *Crypto* outbreak that sickened 400,000 and killed approximately 100 people.[28] It is important, therefore, to remember that disease-carrying organisms that may be present during turbidity spikes can pose special, even mortal, threats to people with weakened immune systems.

Treatment and Regulation

From 1989 until 2002, the EPA had a lax standard for turbidity in filtered drinking water, allowing up to 5 NTU as a maximum and requiring only that water systems maintain 0.5 NTU 95 percent of the time. (Most cities take samples every hour or every few hours.[29]) The laxity of this old standard was made all too clear by the Milwaukee outbreak. According to some investigators, although Milwaukee had a spike in turbidity, it reportedly did not violate the EPA standard during the outbreak.[30] In 1998, after an extensive set of regulatory negotiations among the EPA, the water industry, NRDC, health groups, and others, the EPA issued the Interim Enhanced Surface Water Treatment Rule, establishing a new turbidity standard for large filtered water systems serving more than 10,000 people. Under the new rules, which went into effect in 2002, large filtered systems can never exceed 1 NTU (down from the previous maximum of 5) and must achieve a limit of 0.3 NTU or less in at least 95 percent of its samples. In 2000, regulatory negotiators agreed to a rule to reduce *Crypto* and turbidity problems in smaller filtered systems; NRDC holds that this rule was legally required to have been issued, but the Bush administration has failed even to publish the proposal in *The Federal Register.*[31] Because the rules for unfiltered surface water systems have not been updated, unfiltered systems need only meet the old and outdated 5 NTU maximum limit, the Milwaukee experience notwithstanding.

Recommendations for People with Weakened Immune Systems

Like coliform violations, turbidity violations often trigger boil-water orders. When turbidity levels are repeatedly high in a public water system, it is an indication that the system's filters are not being well operated or maintained or, if the system is unfiltered, that its source water is not as well protected as it should be. Whichever is the case, the circumstance may pose serious risks, particularly to people with immune system problems. The recommendations made by CDC regarding immunocompromised people taking action to avoid *Crypto* are equally applicable to water that has a high risk of significant turbidity spikes and violations. Those recommendations are quoted in full on page 13.

INORGANIC CONTAMINANTS

Arsenic

National Standard (MCL)

50 ppb (average) through 2005

10 ppb (average) effective in 2006

National Health Goal (MCLG)

0—no known fully safe level

Arsenic in drinking water supplies comes from mining, industrial processes, past use of arsenic-containing pesticides, and natural leaching or erosion from rock. Recent studies indicate that heavy pumping of groundwater can actually increase arsenic levels in some cases, perhaps because the pumping allows oxygen to reach the arsenic source, permitting oxidization and mobilization of the poison.

ARSENIC

HIGH CONCERN
ALBUQUERQUE
HOUSTON
PHOENIX

SOME CONCERN
FRESNO
LOS ANGELES

LITTLE OR NO CONCERN
DETROIT
NEW ORLEANS

Health Effects

Arsenic is toxic to humans and causes cancer, and for this reason, no amount of arsenic is considered fully safe. Many scientific studies, including no fewer than seven reviews of the problem by the National Academy of Sciences (NAS), have determined that arsenic in drinking water is known to cause cancer of the bladder, skin, and lungs; likely causes other cancers; and is responsible for a variety of other serious health ailments. The NAS reviews culminated in the important recent reports *Arsenic in Drinking Water* (issued in 1999) and *Arsenic in Drinking Water: 2001 Update*, which counter the long-standing water utility and industry arguments that arsenic in tap water poses no significant threat.[32,33] The NAS found in its 2001 report that a person who drinks two liters of water a day containing 10 ppb arsenic—the new EPA standard—has a lifetime total fatal cancer risk greater than 1 in 333 (that is, about 1 in 333 people who drink water containing this level of arsenic will die of arsenic-caused cancer).[34] The EPA traditionally has allowed no greater than a 1 in 10,000 lifetime fatal cancer risk for any drinking water contaminants. In other words, the risk level allowed by the new arsenic standard is more than 30 times higher than what the EPA traditionally allows in tap water. NAS's risk estimates were more than 10 times higher than the estimates the EPA used to justify its new January 2001 standard (see below). This 2001 NAS report's staggering findings likely would have been major news across the nation, but they were released on September 11, 2001.[35]

Treatment and Regulation

Arsenic can readily be removed from drinking water with off-the-shelf treatment technology, including activated alumina and membrane treatment.[36] According to the EPA, the cost of using current, easily available treatment for arsenic is less than $2 per household per month for city water customers.[37] A working group of the National Drinking Water Advisory Council, appointed by the Bush administration in 2001 to review these EPA estimates (in light of industry allegations that the EPA had grossly underestimated arsenic treatment costs), found the EPA's estimates "credible" and noted that newer technologies, such as granular ferric hydroxide and other cutting-edge treatments may bring even these already quite affordable costs of treatment down.[38] More than 60 years ago, in 1942, the Public Health Service issued a 50 ppb arsenic guideline. The EPA adopted that guideline in 1975, and this extremely lax tap water standard remains applicable today.[39] After the EPA missed at least three statutory deadlines to update the standard, and after NRDC sued the EPA to get the agency to move forward with issuing a new arsenic rule, the Clinton administration finally adopted the new arsenic standard (a Maximum Contaminant Level) of 10 ppb in January 2001.[40] That standard becomes effective in 2006.

However, upon taking office, the Bush administration suspended the EPA's new arsenic standard, responding to pleas from the mining industry and utilities and arguing that the EPA had overestimated arsenic's risks and underestimated the rule's costs. A public outcry ensued, and the NAS issued a study, at the Bush administration's behest, finding that the EPA had actually underestimated cancer risks tenfold.[41] The NAS's finding ought to have led to a standard lower than 10 ppb, but the Bush administration moved hurriedly to ratify the Clinton administration standard instead.

NRDC and many public health and medical group activists recommend a standard of 3 ppb because it is the lowest level deemed achievable by the EPA in using existing treatment technology. The NAS found that arsenic in tap water, even at 3 ppb, poses a cancer risk of about 1 in 1,000[42]—which is 10 times higher than what the EPA traditionally allows for any single tap water contaminant; this is a significant concern for human health.

CHROMIUM
SOME CONCERN
LOS ANGELES
PHOENIX
SAN DIEGO

Chromium

National Standard (MCL)

100 ppb (average)

National Health Goal (MCLG)

100 ppb

Chromium is a naturally occurring metal used in industrial processes, including metal plating for chrome bumpers and making stainless steel, paint, rubber, and wood preservatives.[43]

Health Effects

Health effects from human exposure to chromium range from skin irritation to damage to kidney, liver, and nerve tissues. A heated debate has taken shape recently over whether states and the EPA should adopt a separate standard for Chromium VI (hexavalent chromium), a form of chromium known to cause cancer when inhaled. The EPA has refused so far to consider it a carcinogen when it is consumed in tap water.[44]

Treatment and Regulation

The EPA has found that chromium can be removed from drinking water through coagulation/filtration, ion exchange, reverse osmosis, and lime softening.[45]

Cyanide

National Standard (MCL)

200 ppb (average)

National Health Goal (MCLG)

200 ppb

A well-known poison, cyanide is a nitrogen-carbon compound.[46] Cyanide is used in various forms in mining, steel and metal manufacturing, and to make resin, nylon, and other synthetic fibers.[47] Also, chlorination treatment of some wastewater can create cyanide, according to the EPA.[48]

CYANIDE

SOME CONCERN
WASHINGTON, D.C.

Health Effects

The EPA says short-term exposure to cyanide at levels above the standard can cause rapid breathing, tremors, and other neurological effects, and long-term exposure can cause weight loss, thyroid effects, and nerve damage.[49]

Treatment and Regulation

Cyanide can be removed from drinking water with reverse osmosis membranes and ion exchange. In some cases, chlorine will assist in its removal.

Lead

National Standard (TT)

15 ppb (action level, at 90th percentile)[50]

National Health Goal (MCLG)

0 ppb—no known fully safe level

Lead is a heavy metal that generally enters drinking water supplies from the corrosion of pipes, plumbing, or faucets.

LEAD

EXCEEDS ACTION LEVEL
BOSTON
NEWARK
SEATTLE
HIGH CONCERN
BALTIMORE
LOS ANGELES
MANCHESTER
PHILADELPHIA
WASHINGTON, D.C.
SOME CONCERN
ATLANTA
CHICAGO
DENVER
DETROIT
FRESNO
HOUSTON
PHOENIX
SAN DIEGO
SAN FRANCISCO
LITTLE OR NO CONCERN
NEW ORLEANS

Health Effects

Lead is a major environmental threat and is often referred to as the number one environmental health threat to children in the United States. No amount of it is considered safe.[51] Infants, young children, and pregnant women's fetuses are particularly susceptible to the adverse health effects of lead. Lead poisoning can cause permanent brain damage in serious cases, and in less severe cases can cause children to suffer from decreased intelligence and problems with growth, development, and behavior. Lead can also increase blood pressure, harm kidney function, adversely affect the nervous system, and damage red blood cells.[52]

One way lead enters drinking water supplies is from the corrosion of water utility pipes in the distribution system—the system of pipes through which water reaches consumers' homes from the water utility, including water mains and their connectors, service lines (between the main and the home), goosenecks (which connect service lines to the main), and water meters. Lead can also leach from pipes or faucets in homes, schools, and businesses.

Treatment and Regulation

The easiest way for cities to reduce lead levels in tap water is to treat their water using corrosion control. This approach involves adjusting the water's pH upward—that is, making it less acidic—by adding a chemical such as lime and thereby decreasing the likelihood of lead leaching from pipes. Many water utilities also add an orthophosphate, such as zinc orthophosphate, that forms a thin coating on the inside of utility and household pipes, thus reducing corrosion. The EPA's lead and copper rule requires city water systems to reduce lead levels at the tap by optimizing corrosion control for their water, which reduces its ability to corrode pipes and therefore to leach lead into tap water.

The EPA has also adopted an action level standard for lead that is different from the standard for most other contaminants.[53] Water utilities are required to take many samples of lead in tap water, including some samples at identified high-risk homes—those that are likely to have high lead because they are old and have lead plumbing components, or in the case of homes built after 1982, because they have lead-soldered copper pipes likely to be heavy lead leachers.[54] The actual number of required samples is determined by system size; a large city generally must take at least 100 samples. If the amount of lead detected in the samples exceeds 15 ppb at the 90th percentile—which is to say that 10 percent or more of taps tested have 15 ppb or more of lead—then the amount is said to exceed the action level. A water system that exceeds the action level is not necessarily in violation, but additional measures are required, such as chemical treatment to reduce the water's ability to corrode pipes and thus its ability to leach lead from pipes. If such chemical treatment does not work, the water system must then replace lead portions of its distribution system, including lead service lines and goosenecks owned by the water system, if they are still contributing to the lead problem.

In addition, Congress amended the Safe Drinking Water Act (SDWA) to ban high-lead solder (more than 0.2 percent lead) and high-lead plumbing (over 8 percent lead), but this plumbing can still contribute significantly to lead contamination of tap water.[55] An NSF standard for lead in plumbing, adopted by most states, is supposed to help on this front, but testing by NRDC and others has found lead leaching at high levels from faucets and water meters since Congress amended the SDWA. NRDC sued the faucet and water-meter manufacturers under a stricter California law (Proposition 65) and agreed to a settlement to phase out lead from faucets and water meters.

NITRATE
HIGH CONCERN
FRESNO
PHOENIX
SOME CONCERN
PHILADELPHIA
LITTLE OR NO CONCERN
LOS ANGELES

Nitrate

National Standard (MCL)

10 ppm (two-sample average within 24 hours)

National Health Goal (MCLG)

10 ppm

Nitrates are the product of fertilizers and human or animal waste. Elevated levels of nitrates in water generally result from agricultural runoff from dairy and cattle farms or concentrated animal feeding operations, and from fields heavily fertilized with inorganic nitrogen fertilizer or overfertilized with manure.[56] High levels of nitrate contamination also can come from septic tanks and sewage.[57]

Health Effects

Infants who drink water containing excessive nitrates for even a short period of time can develop blue baby syndrome, in which nitrate poisoning prevents their blood from holding oxygen.[58] Shortness of breath, nausea, vomiting, diarrhea, lethargy, loss of consciousness, and even death can result from infants' exposure to high levels of nitrates in water.[59] Pregnant women are also particularly vulnerable to high nitrate levels in drinking water, again because it can affect the ability of their blood to carry oxygen.[60] The medical literature continues to report deaths and serious illnesses of infants fed formula made with nitrate-contaminated water.[61] In addition, recent literature suggests that pregnant women who drink nitrate-contaminated water can have miscarriages possibly caused by the contaminant.[62] Moreover, a comprehensive study conducted by the California Birth Defects Monitoring Program discovered an association between nitrate exposure and increased risk of neural tube defects.[63] The study found that pregnant women whose drinking water contained nitrates above the regulatory standard faced a fourfold increase in the risk of anencephaly—absence of the brain—in their developing fetus.

In addition to these short-term effects, several chronic effects of elevated nitrate levels have also been observed. According to the EPA, drinking water containing nitrates at levels above the Maximum Contaminant Level (MCL) for a prolonged period has "the potential to cause . . . diuresis, increased starchy deposits, and hemorrhaging of the spleen."[64] In addition, indications are that breakdown products of nitrates called N-nitrosamines and compounds that form when nitrates react with pesticides with which they commonly co-occur (the nation's most used pesticide, the corn herbicide atrazine, among them) may cause cancer.[65]

Treatment and Standard

The EPA set the MCLG and MCL for nitrate at 10 ppm. Because it is an acute toxin, no long-term averaging is allowed; one confirmation sample, taken within 24 hours of a sample showing a level over 10 parts per million, is allowed. The EPA's nitrate standard remains controversial. Many European and other nations have adopted a standard allowing less than half the nitrates the EPA permits.[66] While a National Academy of Sciences review conducted in 1995 concluded that the EPA's 10-parts-per-million health goal and standard were protective of health,[67] that conclusion may not be justified in light of emerging evidence of nitrates' possible reproductive and other toxicity and nitrosamines' potential cancer risks.[68] Clearly, the current EPA nitrate MCL and MCLG leave virtually no margin of safety, since blue baby syndrome has been observed in infants who drink water containing nitrates at 12 parts per million or possibly lower concentrations.[69]

PERCHLORATE
HIGH CONCERN
LOS ANGELES
PHOENIX
SAN DIEGO

Perchlorate

National Standard (MCL)

None established

National Draft Safe Level ("Drinking Water Equivalent Level" or DWEL)[70]

1 ppb

Perchlorate is an inorganic contaminant that usually comes from rocket fuel spills or leaks at military facilities. Perchlorate contaminates the tap water of much of southern California via the Metropolitan Water District's Colorado River Aqueduct. It also is in the water of Phoenix, Las Vegas, and many other cities and towns reliant upon the Colorado River for their water. The source of the Colorado's contamination is reportedly a Kerr-McGee site in Henderson, Nevada, where perchlorate was manufactured and whose waste leaks into the Colorado River.[71] Perchlorate also contaminated water sources for many other towns and cities across the nation, where it has been manufactured or used at military bases or in commercial applications. In addition to its heavy use in rocket fuel, perchlorate is also used, in far lower quantities, in a variety of products and applications, including electronic tubes, automobile air bags, leather tanning, and fireworks.[72]

Health Effects

Perchlorate harms the thyroid and may cause cancer.[73] According to the EPA, perchlorate:

> *disrupts how the thyroid functions. In adults, the thyroid helps to regulate metabolism. In children, the thyroid plays a major role in proper development in addition to metabolism. Impairment of thyroid function in expectant mothers may impact the fetus and newborn and result in effects including changes in behavior, delayed development, and decreased learning capability. Changes in thyroid hormone levels may also result in thyroid gland tumors. [The EPA finds that] perchlorate's disruption of iodide uptake is the key event leading to changes in development or tumor formation.*[74]

Standard

There is no national standard for perchlorate. In early 2002, the EPA proposed a reference dose, (a level the EPA says is safe) and with that as a basis, estimated that the "drinking water equivalent level" (DWEL)— essentially the highest safe dose in tap water—should be 1 ppb. The EPA appears reluctant to establish a permanent standard of any sort, however. It now maintains that it does not yet know enough to warrant establishing a standard and will continue studying the problem.[75, 76] In the meantime, as many as 20 million Americans (or more) have perchlorate in their tap water, a circumstance that the EPA's own draft risk assessment acknowledges is an unacceptable risk.

THALLIUM
SOME CONCERN
ALBUQUERQUE

Thallium

National Standard (MCL)

2 ppb (average)

National Health Goal (MCLG)

0.5 ppb

Thallium is a trace metal often associated with copper, gold, zinc, and cadmium and is found in rock and in ores containing these other commercially used metals.[77] Thallium is used principally in electronic research equipment.[78] The EPA reports that thallium pollution sources include gaseous emissions from cement factories, coal burning power plants, and metal sewers.[79] The chief source of thallium in water is ore processing—the metal leaches out during processing.[80]

Health Effects

High exposure to thallium for a short period can cause gastrointestinal irritation and nerve damage.[81] Of even greater concern are the long-term effects of exposure over time, even at lower levels (but still above the EPA standard): changes in blood chemistry; damage to the liver, kidney, intestines, and testicles; and hair loss.[82]

Treatment

Thallium can be removed from tap water with activated alumina, ion exchange, or reverse osmosis.

ORGANIC CONTAMINANTS

Atrazine

National Standard (MCL)

3 ppb (average)

National Health Goal (MCLG)

3 ppb

ATRAZINE
SOME CONCERN
NEW ORLEANS
PHILADELPHIA

Atrazine is among the most widely used pesticides in this country, applied to corn and other crops to protect from broad-leaved and grassy weeds.[83] Atrazine enters source waters through agricultural runoff, and also volatilizes, or evaporates, and is then redeposited with rain.[84] It is among the most commonly detected pesticide in drinking water, particularly during spring runoff season throughout most of the Mississippi River basin and virtually anywhere else that corn is grown.[85]

Health Effects

Atrazine is an animal carcinogen.[86] According to the EPA, short-term human exposure to atrazine may cause prostate cancer; congestion of the heart, lungs, and kidneys; low blood pressure; muscle spasms; weight loss; and damage to the adrenal glands.[87] Over the long term, the EPA reports, atrazine may cause weight loss, cardiovascular damage, retinal and some muscle degeneration, and possibly cancer.[88] In addition, as noted above, atrazine is a known endocrine disrupter, meaning that it interferes with the body's hormonal development and may cause cancer of the mammary gland.[89]

Treatment and Standard

Atrazine can be removed from tap water through the use of granular activated carbon, powdered activated carbon, or reverse osmosis.

The EPA recently reversed its previous judgment of atrazine's hazards and downgraded it from a "probable" to a "possible" carcinogen in humans, but new evidence collected about its link to prostate cancer in workers and its ability to harm the reproductive system as an endocrine disrupter have called the EPA's actions into question.[90] The EPA determined in 2002 that the chemical cousins triazine pesticides—atrazine, simazine, and propazine, and several of their degradates—all share a "common mechanism of toxicity," which is to say that they all poison the body in the same way.[91] However, the EPA has yet to take action to reduce allowable tap water or other exposure levels to these chemicals in combination. Moreover, in an early 2003 EPA announcement, the agency said that it would continue to allow atrazine to be used even if it causes serious drinking water comtamination, well above EPA tap water standards.

CIS-1,2-DICHLOROETHYLENE
LITTLE OR NO CONCERN
FRESNO

Cis-1,2-Dichloroethylene

National Standard (MCL)
70 ppb (average)
National Health Goal (MCLG)
70 ppb

Cis-1,2-Dichloroethylene is a volatile organic chemical that reaches drinking water supplies as discharge from industrial chemical factories.

Health Effects

Cis-1,2-Dichloroethylene is linked with liver and nervous system problems.[92]

Treatment and Standard

The federal Maximum Contaminant Level (MCL) and health goal for the chemical are both 70 ppb, with averaging allowed.

DBCP
SOME CONCERN
FRESNO

Dibromochloropropane (DBCP)

National Standard (MCL)
200 ppt (average)
National Health Goal (MCLG)
0—no known fully safe level

DBCP is a banned pesticide still detected in some cities' tap water.

Health Effects

DBCP has been shown to cause cancer, kidney and liver damage, and atrophy of the testes leading to sterility.[93]

Treatment and Standard

DBCP can be removed from water with granular activated carbon, reverse osmosis, and certain other treatments. The enforceable standard is an average of 200 parts per trillion. DBCP has been shown to cause cancer, kidney and liver damage, and atrophy of the testes leading to sterility.

Dichloromethane (DCM)

DCM
SOME CONCERN
PHILADELPHIA

National Standard (MCL)
5 ppb (average)
National Health Goal (MCLG)
0—no known fully safe level

Dichloromethane (DCM) is an industrial chemical used as a paint remover, solvent, and cleaning agent; as a fumigant for strawberries and grains; and to extract substances from food.[94] It is sometimes discharged by the pharmaceutical and chemical industries.[95]

Health Effects

The EPA has found that exposure to dichloromethane over a relatively short term at levels exceeding the EPA's standard potentially causes damage to the nervous system and to blood.[96] Over the long term, the EPA says, dichloromethane has the potential to cause liver damage and cancer.[97]

Treatment

DCM can be removed from drinking water by granular activated carbon in combination with packed tower aeration or by reverse osmosis.

2,2-Dichloropropane (2,2-DCP)

2,2-DCP
LITTLE OR NO CONCERN
FRESNO

National Standard (MCL)
None
National Health Goal (MCLG)
None

2,2-Dichloropropane (2,2-DCP) is a volatile organic chemical that evaporates at room temperature and is found in a few drinking water supplies, most of which are reliant on groundwater sources. It was once used as a soil fumigant by the farming industry.

Health Effects

Although its isomer 1,2-dichloropropane is linked to liver problems and cancer, NRDC has been unable to find specific studies on the health effects of low level exposure to the chemical.

Treatment and Standard

2,2-DCP can be removed from water with activated carbon in combination with packed tower aeration.

Di-(2-Ethylhexyl)phthalate (DEHP or Phthalate)

DEHP
SOME CONCERN
PHILADELPHIA
PHOENIX
WASHINGTON, D.C.

National Standard (MCL)
6 ppb (average)
National Health Goal (MCLG)
0—no known fully safe level

Di-(2-Ethylhexyl)Phthalate (DEHP) is a plasticizing agent used widely in the chemical and rubber industries. It is also contained in many plastics.[98]

Health Effects

The EPA has listed it as a probable human carcinogen, but it also causes damage to the liver and testes. As a result, the agency set a health goal of 0 for DEHP.[99]

Treatment and Standard

DEHP can be removed from drinking water with granular activated carbon or reverse osmosis.

EDB
SOME CONCERN
FRESNO
SAN DIEGO

HAAs
HIGH CONCERN
ATLANTA
BALTIMORE
BOSTON
HOUSTON
LOS ANGELES
NEWARK
PHILADELPHIA
SAN DIEGO
WASHINGTON, D.C.
SOME CONCERN
ALBUQUERQUE
CHICAGO
DETROIT
MANCHESTER
NEW ORLEANS
PHOENIX
SAN FRANCISCO
SEATTLE
LITTLE OR NO CONCERN
CHICAGO
DENVER

TTHMs
VIOLATION
SAN FRANCISCO
HIGH CONCERN
BOSTON
HOUSTON
LOS ANGELES
MANCHESTER
NEWARK
PHILADELPHIA
PHOENIX
SAN DIEGO
SEATTLE
WASHINGTON, D.C.
SOME CONCERN
ALBUQUERQUE
ATLANTA
BALTIMORE
DENVER
DETROIT
NEW ORLEANS
LITTLE OR NO CONCERN
CHICAGO
FRESNO

Ethylene Dibromide (EDB)

National Standard (MCL)

50 ppt (average)

National Health Goal (MCLG)

0—no known fully safe level

Ethylene Dibromide (EDB) is used as an additive in gasoline, as a pesticide, in waterproofing preparations, and as a solvent in resins, gums, and waxes.[100]

Health Effects

The EPA has found EDB to "potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: damage to the liver, stomach, and adrenal glands, along with significant reproductive system toxicity, particularly the testes."[101] The EPA also says that "EDB has the potential to cause the following effects from a lifetime exposure at levels above the MCL: damage to the respiratory system, nervous system, liver, heart, and kidneys; cancer."[102]

Treatment

EDB can be removed from water with granular activated carbon or reverse osmosis.

Haloacetic Acids (HAAs)/Total Trihalomethanes (TTHMs)

HAAs National Standard (MCL)

60 ppb (average) (effective 2002; no previous standard)

HAAs National Health Goal (MCLG)

0—no known fully safe level[103]

TTHMs National Standard (MCL)

80 ppb (average) (effective 2002)

100 ppb (average) (effective through 2001)

TTHMs National Health Goal (MCLG)

0—no known fully safe level[104]

Total trihalomethanes (TTHMs) and haloacetic acids (HAAs) are volatile organic contaminants often referred to as disinfection by-products, or DBPs. TTHMs and HAAs are chemical contaminants that result when chlorine used to disinfect drinking water interacts with organic matter in the water. TTHMs consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. HAAs regulated by the EPA include five related chemicals: monochloroacetic acid, dichloroacetic acid, trichloracetic acid, monobromoacetic acid, and dibromoacetic acid. TTHMs are used as an indicator of a complex soup of other potentially risky DBPs or "chlorination by-products."

Health Effects

More than a dozen epidemiological studies of people who drank water containing chlorination by-products have linked the chemicals to bladder cancer, and several studies indicate likely links to colorectal, pancreatic, and other cancers.[105] National Cancer Institute epidemiologists found links to brain cancer recently, and a link to childhood leukemia has been noted in a recent Canadian epidemiological study.[106,107] The EPA has classified some individual TTHMs as probable human carcinogens.

Recent studies have also found that some pregnant women exposed to DBPs in tap water may have a higher risk of problems with their babies, even after relatively brief periods of exposure to spikes of the chemicals. The most significant concerns raised by studies of pregnant women have been about findings of associations between elevated levels of chlorination by-products (including TTHMs) and low birth weight, preterm delivery, spontaneous abortions (miscarriages), stillbirths, and birth defects (central nervous system, major cardiac, oral cleft, respiratory, and neural tube defects).[108] For example, one study in California found a significant association between women who drank more than six glasses of water a day containing more than 75 ppb TTHMs and miscarriages by those women.[109] Lab studies on animals and studies of pregnant women exposed to chlorination by-products have also found an association between TTHMs and low birth weight.[110] The evidence that chlorination by-products cause miscarriages, birth defects, low birth weight, or other reproductive problems is not conclusive but raises major concerns worthy of preventative action to reduce or eliminate exposure to these chemicals. As one recent scientific review concluded, several studies have "shown associations for DBPs and other outcomes such as spontaneous abortions, stillbirth, and birth defects, and although the evidence for these associations is weaker, it is gaining weight."[111]

Treatment and Standard

Two TTHMs (bromoform and bromodichloromethane) and dichloroacetic acid have health goals of 0 because of cancer risks. In addition, the EPA promulgated and then withdrew after a court decision a 0 health goal for chloroform. It has not yet issued a new goal for chloroform. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane or one haloacetic acid in tap water without some level of the others, NRDC lists the health goal for TTHMs and HAAs as 0. In 1979, the EPA announced an "interim" tap water standard for TTHMs of 100 ppb that allows systems to test across their distribution systems every quarter, averaging the levels across time and across the distribution system, and that exempts systems serving fewer than 10,000 people.[112] After complaints that the interim standard was too lax, the EPA said it would promptly review it. After many years of debate, and a 1994 agreement in a regulatory negotiation among the EPA, the water industry, NRDC, other health and consumer groups, states, and others, the EPA agreed to issue a "Stage 1 DBP Rule" that would strengthen the standard to 80 ppb and set a 60 ppb standard for HAAs.[113] The EPA published the final rule embodying that agreement in 1998. The EPA also agreed in the regulatory negotiations to propose a reduction to 40 ppb TTHMs and 30 ppb HAAs as a "Stage 2 DBP Rule," which is legally overdue.[114]

Following a subsequent regulatory negotiation among most of the same parties, the EPA agreed to rework how the standards would be measured, putting much more emphasis on reducing peak TTHM and HAA levels, due to concerns about reproductive hazards, but left the actual MCL numbers in place.[115] The new standard would have the effect of substantially reducing the highest peaks in DBPs, and would also, the technical experts agreed, substantially reduce the average levels of DBPs in those systems, smoothing out their peak levels.[116] The EPA has missed the deadline for issuing that new standard, and in fact has not even published the proposal in *The Federal Register*.

HEX
LITTLE OR NO CONCERN
PHILADELPHIA

Hexachlorocyclopentadiene (HEX)

National Standard (MCL)

50 ppb (average)

National Health Goal (MCLG)

50 ppb

Hexachlorocyclopentadiene is an industrial chemical used to make other chemicals, including pesticides, flame retardants, resins, dyes, pharmaceuticals, and plastics.[117]

Health Effects

According to the EPA, short-term exposure to high levels of HEX causes gastrointestinal distress and liver, kidney, and heart damage. Prolonged exposure, again according to the EPA, has the potential to cause long-term damage to the stomach and kidneys.[118]

Treatment and Standard

HEX can be removed from tap water with granular activated carbon combined with packed tower aeration or by reverse osmosis.

MTBE
SOME CONCERN
MANCHESTER
LITTLE OR NO CONCERN
SAN DIEGO

Methyl Tertiary-Butyl Ether (MTBE)

National Standard (MCL)

None

National Health Goal (MCLG)

None

EPA Health Advisory

20–40 ppb (based on taste and odor concerns; the EPA says safe health level is higher)

MTBE is a fuel additive, commonly used in the United States to reduce carbon monoxide and ozone levels caused by auto emissions[119] Because of its widespread use, reports of MTBE detections in the nation's groundwater and surface water supplies are increasing.[120] MTBE gets into water supplies from leaking underground or aboveground storage tanks, spills, pipeline leaks, refineries, inefficient boat and other watercraft engines, runoff from streets, and even atmospheric deposition.[121]

Health Effects

For several years running, the EPA has maintained that it is currently studying the implications of setting a drinking water standard for MTBE. There are numerous animal studies showing possible cancer and other adverse health effects of MTBE.[122]

Treatment and Standard

The EPA has yet to make a commitment to issue a standard and has not promised to make a decision on a standard at any specific date. The EPA says that concentrations in the range of 20 to 40 micrograms per liter (or ppb) are the most people can tolerate because of the very bad turpentine-like or gasoline-like taste and odor of the water.[123] The health effects of these low levels are uncertain, according to the agency, since the limited testing of the chemical has shown that the taste and odor threshold "is lower than the range of exposure levels in which cancer or noncancer effects were observed in animal tests, though low doses may pose a cancer risk."[124]

Pentachlorophenol (Penta)

PENTA
SOME CONCERN
PHILADELPHIA

National Standard (MCL)

1 ppb (average)

National Health Goal (MCLG)

0—no known fully safe level

Pentachlorophenol is a common preservative used on telephone poles, railroad ties, and other wood.[125]

Health Effects

The EPA reports that short-term exposure to high levels may cause central nervous system problems, while long-term exposure has the potential to cause reproductive problems and damage to liver and kidneys, in addition to cancer.[126]

Treatment and Standard

Penta can be removed from tap water with granular activated carbon or reverse osmosis. Because it is a probable carcinogen, the health goal for penta is 0.[127]

Simazine

SIMAZINE
SOME CONCERN
PHILADELPHIA

National Standard (MCL)

4 ppb (average)

National Health Goal (MCLG)

4 ppb

A chemical cousin of atrazine, simazine is widely used in agriculture as a pre-emergence herbicide for control of broad-leaved and grassy weeds.[128] Its major use is on corn, where it is often combined with atrazine.[129] It is also used on a variety of deep-rooted crops, including artichokes, asparagus, berries, broad beans, and citrus, and on noncrop areas such as farm ponds and fish hatcheries.[130]

Health Effects

The EPA says that high levels of simazine exposure over a short term can cause weight loss and changes in blood. The EPA determined in 2002 that the chemical cousins triazine pesticides—simazine, atrazine, and propazine, as well as several of their degradates—all share a "common mechanism of toxicity," which is to say that they all poison the body the same way[131]

Treatment and Standard

The EPA says that prolonged exposure to elevated levels of simazine above the MCL have the potential to cause tremors; damage to the testes, kidneys, liver, and thyroid; gene mutations; and cancer.[132] The EPA has yet to take action to reduce the allowable levels of simazine in tap water or elsewhere. Simazine can be removed from tap water with granular activated carbon or reverse osmosis.

PERC
SOME CONCERN
FRESNO

Tetrachloroethylene (Also Called Perchloroethylene, PCE, or PERC)

National Standard (MCL)

5 ppb (average)

National Health Goal (MCLG)

0—no known fully safe level

Tetrachloroethylene is used in dry cleaning and industrial metal cleaning or finishing.[133] It enters the water system via spills or releases from dry cleaners or industrial users, waste dumps, leaching from vinyl liners in some types of pipelines used for water distribution, and in some cases during chlorination water treatment.[134]

Health Effects

Prolonged consumption of water contaminated by PERC can cause liver problems and may cause cancer.[135]

Treatment and Standard

PERC can be removed from tap water with granular activated carbon in combination with packed tower aeration.

TOLUENE
SOME CONCERN
PHILADELPHIA

Toluene

National Standard (MCL)

1 ppm (1,000 ppb) (average)

National Health Goal (MCLG)

1 ppm (1,000 ppb)

Toluene is a volatile organic chemical with a sweet odor.[136] A component of gasoline and other petroleum fuels, it is used to produce benzene and urethane, as well as in solvents and thinners, and is released in wastewaters or by spills on land during the storage, transport, and disposal of fuels and oils.[137] According to the EPA's Toxic Chemical Release Inventory, toluene releases to land and water totaled more than 4 million pounds from 1987 to 1993, primarily from petroleum refining.[138]

Health Effects

Short-term exposure to toluene at high doses can cause minor nervous system disorders such as fatigue, nausea, weakness, and confusion.[139] Longer-term exposure to lower levels (but over the MCL) can cause more pronounced nervous disorders such as spasms, tremors, liver and kidney damage, and impairment of speech, hearing, vision, memory, and coordination.[140]

Treatment and Standard

Toluene can be removed from tap water with granular activated carbon in combination with packed tower aeration.

Trichloroethylene (TCE)

TCE
SOME CONCERN
FRESNO
MANCHESTER

National Standard (MCL)

5 ppb (average)

National Health Goal (MCLG)

0—no known fully safe level

Trichloroethylene (TCE) is a colorless liquid used as a solvent to remove grease from metal parts. It is present in many underground water sources and surface waters as a result of the manufacture, use, and disposal of TCE at industrial facilities across the nation.[141]

Health Effects

TCE is a likely carcinogen, and people exposed to high levels of trichloroethylene in their drinking water may experience harmful effects to their nervous system, liver and lung damage, abnormal heartbeat, coma, and possibly death.[142]

Treatment and Standard

TCE can be removed from tap water with granular activated carbon in combination with packed tower aeration.

Trihalomethanes: See Haloacetic Acids, Above

Vinyl Chloride

VINYL CHLORIDE
HIGH CONCERN
PHILADELPHIA

National Standard (MCL)

2 ppb (average)

National Health Goal (MCLG)

0—no known fully safe level

Vinyl chloride is used in the manufacture of cars, electrical wire insulation and cables, piping, industrial and household equipment, and medical supplies, and is also heavily used by the rubber, paper, and glass industries.[143]

Health Effects

Long-term exposure, according to the EPA, can cause cancer and liver and nervous system damage.[144]

Treatment and Standard

Vinyl chloride can be removed from drinking water with granular activated carbon in combination with packed tower aeration, or by reverse osmosis. The EPA has found that relatively short-term exposure to vinyl chloride at levels above the current standard of 2 ppb potentially causes damage to the nervous system.

RADIOACTIVE CONTAMINANTS

GROSS ALPHA RADIATION

SOME CONCERN
ALBUQUERQUE
FRESNO
LOS ANGELES
SAN DIEGO
WASHINGTON, D.C.

Gross Alpha Radiation

National Standard (MCL)

15 pCi/L (average)

National Health Goal (MCLG)

0—no known fully safe level

Alpha particle radiation generally results from the decay of radioactive minerals in underground rocks and is sometimes a by-product of the mining or nuclear industries.

Health Effects

Alpha particle radiation causes cancer.[145]

Treatment and Standard

The best available treatment for alpha emitters other than radon or uranium is reverse osmosis membrane filtration (RO).[146] The RO membrane removes virtually all contaminants, including *Crypto* and other microbes, most industrial or agricultural synthetic chemicals, radioactive contaminants, and even most inorganic contaminants, including arsenic. The resulting water is almost entirely pure.

GROSS BETA RADIATION

SOME CONCERN
LOS ANGELES
SAN DIEGO
WASHINGTON, D.C.

Gross Beta Radiation

National Standard (MCL)

50 pCi/L (average)

National Health Goal (MCLG)

0—no known fully safe level

Beta particle and photon emitter radiation generally results from the decay of radioactive minerals in underground rocks and is sometimes a by-product of nuclear testing or the nuclear industry.

Health Effects

Beta particle and photon emitter radiation causes cancer.[147]

Treatment and Standard

The best available technologies for removing beta radiation or photon emitters is ion exchange or reverse osmosis (RO). As noted above, RO removes virtually all other contaminants as well.

Radon

National Standard (MCL) (proposed)

300 pCi/L (averages)

alternate MCL of 4,000 pCi/L where approved multimedia program is in place (average)

National Health Goal (MCLG) (proposed)

0—no known fully safe level

Radon is a radioactive gas that results from the natural radioactive breakdown of uranium in the ground. Communities that depend on groundwater can often encounter radon gas in their drinking water, and in the United States, more than 81 million people's drinking water comes from groundwater.

RADON

VIOLATION (PROPOSED STANDARD)

ALBUQUERQUE
HOUSTON
FRESNO

HIGH CONCERN

LOS ANGELES

Health Effects

Radon is known to cause lung cancer. No amount of it is considered fully safe in tap water; indeed, a single particle of radon can cause cancer.[148] The EPA estimates that radon in drinking water causes approximately 168 deaths from lung and stomach cancers each year—89 percent from lung cancer caused by breathing radon released to the indoor air from water and 11 percent from stomach cancer caused by consuming water that contains radon.[149] In fact, radon is the second leading cause of lung cancer deaths in the United States after smoking, causing what the NAS has estimated is a total of 20,000 lung cancer deaths per year. Most of these lung cancers are due to radon seepage from soil into basements and through floor slabs, underscoring the importance of radon testing for basements.[150] But radon in tap water is a threat as well.

Treatment and Standard

Radon is easily removed from tap water through simple aeration of the water—bubbling air through water in a packed tower. The EPA's estimated cost per household for customers living in a big city for this simple but life-preserving step: $9.50 per year.[151] Some water industry representatives argue that since more people die from basement seepage of radon, worries about radon in tap water are misplaced. Congress relied on this argument in establishing a new radon provision in the 1996 Safe Drinking Water Act amendments. That provision requires the EPA to set a new radon MCL, using the usual standard-setting approach, by August 2001. However, acceding to the industry argument that basement seepage is worse than tap water radon, Congress also adopted a provision in the 1996 law that allows the EPA to set an alternate, weaker MCL applicable in cities or entire states that adopt a multimedia mitigation program (MMM) designed to reduce exposure to radon from seepage into basements or across building slabs. In November 2000, the EPA proposed a radon rule that included a 300 pCi/L MCL and an "alternate" MCL of 4,000 pCi/L. But more than a year after the August 2001 deadline, the EPA still has not issued a final radon rule.

At the EPA's proposed 300 picocuries-per-liter (pCi/L) maximum contaminant level (MCL), the lifetime risk of contracting fatal cancer is about 1 in 5,000—twice what the EPA traditionally says is the highest allowable cancer risk for any drinking water contaminant.[152] At 4,000 pCi/L, an "alternate" MCL that the EPA proposes to apply to some communities' water, the fatal cancer risk is about 1 in 370—a cancer risk that is 27 times higher than what the EPA usually says is acceptable in tap water. NRDC is concerned that even at 300 pCi/L in tap water, the NAS and the EPA both agree that the cancer risks are larger than what the EPA traditionally allows. It is true that radon also seeps into some people's basements and that more people die from that source than from radon in tap water. That is no argument for compounding the problem by permitting unacceptable levels of radon in tap water, particularly when fixing the tap water problem is readily within the capacities of water utilities (unlike basement radon) at a modest cost.

TRITIUM
SOME CONCERN
WASHINGTON, D.C.

Tritium

National Standard (MCL)

20,000 pCi/L (average) (Part of 4 millirem beta and photon emitter standard)

National Health Goal (MCLG)

0—no known fully safe level

The EPA says tritium:

> *forms in the upper atmosphere through interactions between cosmic rays (nuclear particles coming from outer space) and the gases composing the atmosphere. Tritium can be deposited from the atmosphere onto surface waters via rain or snow and can accumulate in groundwater via seepage. Tritium is also formed from human activities. . . . Natural tritium tends not to occur at levels of concern, but contamination from human activities can result in relatively high levels. The man-made radionuclides, which are primarily beta and photon emitters, are produced by any of a number of activities that involve the use of concentrated radioactive materials.*

These radioactive materials are used in various ways in the production of electricity, nuclear weapons, nuclear medicines used in therapy and diagnosis, and various commercial products (such as televisions or smoke detectors), as well as in various academic and government research activities. Release of man-made radionuclides to the environment, which may include drinking water sources, are primarily the result of improper waste storage, leaks, or transportation accidents.[153]

Health Effects

Tritium is a radioactive form of hydrogen that causes cancer. A beta particle emitter, no level of exposure to it is considered safe.

Treatment and Standard

The EPA says that beta emitters (such as tritium) are removed using ion exchange and reverse osmosis.

Uranium

URANIUM
SOME CONCERN
LOS ANGELES
LITTLE OR NO CONCERN
SAN DIEGO

National Standard (MCL)

30 micrograms/liter (which EPA assumes to be equivalent to 30 pCi/L) (enforceable December 2003)

National Health Goal (MCLG)

0—no known fully safe level

Uranium is released from minerals in the ground, often as the result of mining or as a by-product of the nuclear industry.

Health Effects

Uranium is radioactive and causes cancer when ingested.[154] In addition, the EPA has determined that uranium also causes serious kidney damage at levels above the MCL.

Treatment and Standard

The EPA acknowledges that uranium poses a cancer risk at levels below its established MCL of 30 pCi/L, but the agency argues that the benefits of reducing uranium contamination of water are outweighed by the costs. That, at least, was the conclusion of the EPA's cost-benefit analysis, in which it calculated costs to all U.S. water systems, including small systems where per-customer costs can be considerably higher than for larger systems. The cancer risk at 30 pCi/L is about 1 in 10,000, the highest cancer risk the EPA usually allows in drinking water, and about 100 times higher than the 1 in 1,000,000 risk the EPA allows for carcinogens under the Superfund or pesticide programs.[155] Uranium is removed from water by many technologies, according to the EPA, including job exchange, lime softening, reverse osmosis, and enhanced coagulation followed by filtration.

NOTES

1 For general background information on *Crypto*, see Centers for Disease Control, "Parasitic Disease Information: *Cryptosporidiosis*," available online at www.cdc.gov/ncidod/dpd/parasites/cryptosporidiosis/factsht_cryptosporidiosis.htm. For more detailed information, see, "*Cryptosporidium* and Water: A Public Health Handbook," (CDC, 1997). Available online at www.cdc.gov/ncidod/diseases/crypto/crypto.pdf.

2 Ibid.

3 See CDC, "Parasitic Disease Information: *Cryptosporidiosis*," available online at www.cdc.gov/ncidod/dpd/parasites/cryptosporidiosis/factsht_cryptosporidiosis.htm. See also, CDC, "*Cryptosporidiosis*: A Guide for People with HIV/AIDS," available online at www.cdc.gov/ncidod/diseases/crypto/hivaids.htm.

4 W. R. MacKenzie, et al., "A Massive Outbreak in Milwaukee of *Cryptosporidium* Infection Transmitted Through the Public Water Supply," *New England Journal of Medicine* (1994), 331: 161–167. The precise number of people killed by the Milwaukee outbreak is not known with certainty. Account by the *Milwaukee Journal* puts the number at more than 100, although the "official" state and local health department count was "a minimum of 50 deaths." See Marilyn Marchione, "Deaths continued after *Crypto* outbreak: State report attributes a minimum of 50 deaths from '93 to '95." *The Milwaukee Journal Sentinel*, (May 27, 1996).

5 See MacKenzie et al. supra; Erik Olson, *The Dirty Little Secret About Our Drinking Water: New Data Show Over 100 Known Drinking Water Disease Outbreaks in the U.S. From 1986–1994, and Strong Evidence of More Widespread, Undetected Problems*." (NRDC, 1995).

6 H. L. Dupont, C. L. Chappell, C. R. Sterling, P. C. Okhuysen, J. B. Rose, W. Jakubowski (1995). "The Infectivity of *Cryptosporidium parvum* in Healthy Volunteers," *New England Journal of Medicine*, 332(13): 855–859. "Human *Cryptosporidiosis* in Immunocompetent and Immunodeficient Persons: Studies of an Outbreak and Experimental Transmission," *New England Journal of Medicine*, 308(21): 1252–1257.

7 Environmental Protection Agency, "National Primary Drinking Water Regulations: Interim Enhanced Surface Water Treatment Rule," 63 Fed. Reg. 69477–69521 (December 16, 1998).

8 See EPA, "National Primary Drinking Water Regulation: Long Term 2 Enhanced Surface Water Treatment Rule, Draft," page 75 Table III-5, available online at www.epa.gov/safewater/lt2/lt2_preamble.pdf; M. W. LeChevallier and W. D. Norton, "*Giardia* and *Cryptosporidium* in Raw and Finished Water," *Journal AWWA* (1995), 87: 54–68.

9 Ibid.

10 See, e.g., EPA, "National Primary Drinking Water Regulation: Long Term 2 Enhanced Surface Water Treatment Rule, Draft," pg. 73 (". . . it is expected that *Cryptosporidium* oocysts were present in many more samples and were not detected due to poor recovery rates and low volumes analyzed. The observed data do not account for the ICR Method's low recovery efficiencies. Adjusting for recovery would increase the estimated occurrence several-fold"), available online at www.epa.gov/safewater/lt2/lt2_preamble.pdf.

11 Ibid.

12 EPA, "National Primary Drinking Water Regulations: Interim Enhanced Surface Water Treatment Rule," 63 Fed. Reg. 69477–69521 (December 16, 1998).

13 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

14 The information on health effects of coliform is derived from EPA, "Total Coliform Rule," 54 Fed. Reg. 27544–27568, (June 29, 1989); EPA, "Total Coliform Rule," available online at www.epa.gov/safewater/source/therule.html#Total, and EPA, "Total Coliform Rule: A Quick Reference Guide," available online at *Total Coliform Rule: A Quick Reference Guide* PDF file (816-F-01-035, September 2001).

15 "*E. coli* Death Toll Rises," available online at abcnews.go.com/sections/us/DailyNews/ecoli990911.html.

16 D. L. Swerdlow, B. A. Woodruff, R. C. Brady, P. M. Griffin, S. Tippen, H. Donnel Jr., E. Geldreich, B. J. Payne, A. Meyer Jr., J. G. Wells, K. D. Greene, M. Bright, N. H. Bean, and P. A. Blake. "A waterborne outbreak in Missouri of *Escherichia coli* O157:H7 associated with bloody diarrhea and death," *Annals of Internal Medicine*, 1992, 117(10): pg. 812–819.

17 "1,061 Suspected *E. coli* Cases in New York Outbreak," *Infectious Disease News*, October 1999, available online at www.infectiousdiseasenews.com/199910/frameset.asp?article=ecoli.asp; CDC, "Public health dispatch: Outbreak of *Escherichia coli* O157:H7 and *Campylobacter* among attendees of the Washington County Fair—New York," *MMWR*, 1999, 48(36): 803.

18 EPA, "Total Coliform Rule," available online at www.epa.gov/safewater/source/therule.html#Total.

19 Ibid.

20 40 C.F.R. 141.21 & 141.63.

21 Ibid.

22 See note 18.

23 Ibid.

24 40 C.F.R. 141.21.

25 EPA, "Total Coliform Rule," 54 Fed. Reg. 27544-27568, June 29, 1989; EPA, "Total Coliform Rule," available online at www.epa.gov/safewater/source/therule.html#Total, and EPA, "Total Coliform Rule: A Quick Reference Guide," (available online at *Total Coliform Rule: A Quick Reference Guide* PDF file (816-F-01-035, September 2001).

26 Ibid.

27 EPA, "Fact Sheet: National Primary Drinking Water Regulations" (2002), available online at www.epa.gov/safewater/mcl.html.

28 See W. R. MacKenzie, et al., "A Massive Outbreak in Milwaukee of *Cryptosporidium* Infection Transmitted Through the Public Water Supply," *New England Journal of Medicine*, 1994, 331:161–167. As noted above, a precise number of people killed by the Milwaukee outbreak is not known with certainty, but the *Milwaukee Journal* puts the number at more than 100, although the "official" state and local health department count was "a minimum of 50 deaths." See Marilyn Marchione, "Deaths continued after *Crypto* outbreak: State report attributes a minimum of 50 deaths from '93 to '95," *The Milwaukee Journal Sentinel*, May 27, 1996.

29 EPA, "National Primary Drinking Water Regulations: Interim Enhanced Surface Water Treatment Rule," 63 Fed. Reg. 69477-69521 (December 16, 1998).

30 See W. R. MacKenzie, et al., "A Massive Outbreak in Milwaukee of *Cryptosporidium* Infection Transmitted Through the Public Water Supply," *New England Journal of Medicine*, 1994, 331:161–167.

31 See EPA, "National Primary Drinking Water Regulation: Long Term 2 Enhanced Surface Water Treatment Rule, Draft," page 75 Table III-5, available online at www.epa.gov/safewater/lt2/lt2_preamble.pdf.

32 Available online at www.nap.edu/catalog/6444.html.

33 National Academy of Sciences, National Research Council, *Arsenic in Drinking Water: 2001 Update* (National Academy Press, 2001), available online at www.nap.edu/catalog/10194.html.

34 Total cancer risk figures are taken from the National Academy of Sciences' report *Arsenic in Drinking Water: 2001 Update* (2001); for a plain-English explanation of the Academy's arsenic cancer risk figures, see NAS's September 11, 2002, press release, available online at www4.nationalacademies.org/news.nsf/isbn/0309076293?OpenDocument. EPA's maximum acceptable cancer risk is 1 in 10,000.

35 See NAS's September 11, 2002, press release, available online at www4.nationalacademies.org/news.nsf/isbn/0309076293?OpenDocument.

36 EPA, National Primary Drinking Water Regulation for Arsenic, 66 Fed. Reg. 6976, at 6981 (January 22, 2001).

37 Ibid, at 7011, Table III E-2.

38 See Report of the Arsenic Cost Working Group to the National Drinking Water Advisory Council, August 14, 2001, available online at www.epa.gov/safewater/ars/ndwac-arsenic-report.pdf.

39 For a review of the history of the arsenic standard and the health effects of arsenic, see Paul Mushak, et al. *Arsenic and Old Laws* (NRDC, 2000).

40 EPA, National Primary Drinking Water Regulation for Arsenic, 66 Fed. Reg. 6976, at 6981 (January 22, 2001).

41 NAS, National Research Council, *Arsenic in Drinking Water: 2001 Update* (National Academy Press, 2001), available online at www.nap.edu/catalog/10194.html.

42 Ibid.; see also NAS's September 11, 2002, press release, available online at www4.nationalacademies.org/news.nsf/isbn/0309076293?OpenDocument.

43 EPA, Consumer Fact Sheet: Chromium, available online at www.epa.gov/safewater/dwh/c-ioc/chromium.html.

44 See EPA, "National Primary Drinking Water Regulations; Announcement of the Results of EPA's Review of Existing Drinking Water Standards and Request for Public Comment; Proposed Rule," 67 Fed. Reg. 19030, at 19057-58 (April 17, 2002).

45 See note 43.

46 EPA, "Consumer Fact Sheet: Cyanide," available online at www.epa.gov/safewater/dwh/c-ioc/cyanide.html.

47 Ibid.

48 Ibid.

49 Ibid.

50 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some high-risk homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

51 See EPA, "Consumer Fact Sheets on Lead," www.epa.gov/safewater/Pubs/lead1.html and www.epa.gov/safewater/standard/lead&co1.html, and IRIS summary for lead available online at www.epa.gov/iris/subst/0277.htm.

52 Ibid.

53 40 C.F.R. §141.80-141.91.

54 Ibid.; for a review of the sampling and monitoring requirements as amended by the "lead and copper rule minor revisions," see EPA, "Lead and Copper Rule Minor Revisions: Fact Sheet for Public Water Systems Serving More than 50,000 Persons," available online at www.epa.gov/safewater/lcrmr/largefs.pdf.

55 SDWA§ 1417.

56 Ibid; see also EPA, "Nitrates." Fact sheet available online at www.epa.gov/safewater/dwh/c-ioc/nitrates.html.

57 Ibid.

58 The information regarding the health effects of nitrate are derived from NAS, National Research Council, *Nitrate and Nitrite in Drinking Water,* 1995, available online at www.nap.edu/catalog/9038.html), and EPA, "Nitrates." Fact sheet available online at www.epa.gov/safewater/dwh/c-ioc/nitrates.html).

59 Ibid.

60 Ibid.

61 See, e.g., L. Knobeloch, B. Salna, A. Hogan, J. Postle, H. Anderson, "Blue babies and nitrate-contaminated well water," *Environmental Health Perspectives (*July 2000), 108(7): 675–8.

62 "Spontaneous abortions possibly related to ingestion of nitrate-contaminated well water—LaGrange, Indiana, 1991–1994," *MMWR* (1996), 45(26): 569–572.

63 L. A. Croen, K. Todoroff, G. M. Shaw, "Maternal exposure to nitrate from drinking water and diet and risk for neural tube defects," *American Journal of Epidemiology*, 2001, 153(4).

64 EPA, "Nitrates." Fact sheet available online at www.epa.gov/safewater/dwh/c-ioc/nitrates.html.

65 See L. Knobeloch, B. Salna, A. Hogan, J. Postle, H. Anderson, "Blue babies and nitrate-contaminated well water," *Environmental Health Perspectives*, July 2000, 108(7): 675-8; see also EWG, *Pouring It On: Nitrate Contamination of Drinking Water* (1995), available online at www.ewg.org/reports/Nitrate/NitrateHealth.html.

66 For a list of stricter standards overseas, see EWG, *Pouring It On: Nitrate Contamination of Drinking Water* (1995), available online at www.ewg.org/reports/Nitrate/NitrateHealth.html.

67 NAS, National Research Council, *Nitrate and Nitrite in Drinking Water* (1995), available online at www.nap.edu/catalog/9038.html.

68 See note 56 (noting emerging evidence that nitrate exposure may pose miscarriage and reproductive risks, cancer risks, thyroid risks, and diabetes risks, and that even exposure as low as 12 ppm has been linked to blue baby syndrome); EWG, *Pouring It On: Nitrate Contamination of Drinking Water* (1995), available online at www.ewg.org/reports/Nitrate/NitrateHealth.html (noting evidence of chronic risks not considered by NAS).

69 Ibid.

70 A drinking water equivalent level is the presumed level of perchlorate that one would need to consume in tap water to reach the Reference Dose—the maximum safe level. See EPA, "Perchlorate," fact sheet available online at www.epa.gov/safewater/ccl/perchlor/perchlo.html.

71 MWD is well aware that this Henderson facility is the source of this perchlorate. See MWD, "In the News: Perchlorate," available online at www.mwdh2o.com/mwdh2o/pages/yourwater/ccr02/ccr03.html; MWD press release, "Water Officials Report Significant Progress in Perchlorate Removal," April 17, 2002. This release puts an unduly optimistic face on the problem, since MWD is well aware that the cleanup of the facility remains problematic and partially unsuccessful. See also Environmental Working Group, *Rocket Science* (2001), available online at www.ewg.org/reports/rocketscience.

72 See California Department of Health Services, "Perchlorate in Califrona Drinking Water," available online at www.dhs.cahwnet.gov/ps/ddwem/chemicals/perchl/perchlindex.htm; see also EWG, *Rocket Science* (2001), available online at www.ewg.org/reports/rocketscience/.

73 Ibid.; see also California Office of Environmental Health Assessment, Draft Public Health Goal for Perchlorate in Drinking Water (March 2002), available online at www.oehha.org/water/phg/pdf/PHGperchlorate372002.pdf.

74 EPA, "Perchlorate," fact sheet available online at www.epa.gov/safewater/ccl/perchlor/perchlo.html.

75 See EPA, "Perchlorate," fact sheet (2002) (perchlorate was listed on the contaminant candidate list in 1998, and study is continuing), available online at www.epa.gov/safewater/ccl/perchlor/perchlo.html; see also EPA, "Announcement of Preliminary Regulatory Determinations for Priority Contaminants on the Drinking Water Contaminant Candidate List," 67 Fed. Reg. 38222 (June 3, 2002) (no regulatory determination made for perchlorate), available online at www.epa.gov/ogwdw/ccl/pdf/prelimreg_fr.pdf.

76 See note 74.

77 EPA, "Consumer Fact Sheet: Thallium," available online at www.epa.gov/safewater/dwh/c-ioc/thallium.html.

78 Ibid.

79 Ibid.

80 Ibid.

81 Ibid.

82 Ibid.

83 EPA, "Consumer Fact Sheet: Atrazine," available online at www.epa.gov/safewater/dwh/c-soc/atrazine.html.

84 USGS data, cited in NRDC, *Atrazine: An Unacceptable Risk to America's Children & Environment* (June 2002).

85 Ibid.

86 Ibid.; see also note 84.

87 See note 83.

88 Ibid.

89 See NRDC, *Atrazine: An Unacceptable Risk to America's Children & Environment* (June 2002).

90 Syngenta's prostate cancer data and other atrazine data are summarized in NRDC, *Atrazine: An Unacceptable Risk to America's Children & Environment* (June 2002).

91 EPA, "Common Mechanism of Action Determination for the Triazines," summary available online at www.epa.gov/pesticides/cumulative/triazines/newdocket.htm.

92 EPA, "Consumer Fact Sheet on 1,2-Dichlorethylene," available online at www.epa.gov/safewater/dwh/c-voc/12-dich2.html.

93 Health effects and other general information on DBCP derived from EPA, "Consumer Fact Sheet on Dibromochloropropane," available online at www.epa.gov/safewater/dwh/c-soc/dibromoc.html.

94 Information derived from EPA, "Consumer Fact Sheet on Dichloromethane," available online at www.epa.gov/safewater/dwh/c-voc/dichloro.html.

95 Philadelphia Water Department, "Drinking Water Quality 2001," available online at www.phillywater.org/wqr2001/wqr2001.htm. Last visited September 15, 2002. Published April 2002.

96 Information derived from EPA, "Consumer Fact Sheet on Dichloromethane," available online at www.epa.gov/safewater/dwh/c-voc/dichloro.html.

97 Ibid.

98 EPA, "Consumer Fact Sheet on DEHP," www.epa.gov/safewater/dwh/c-soc/phthalat.html.

99 Ibid.

100 EPA, "Consumer Fact Sheet on Ethylene Dibromide," available online at www.epa.gov/safewater/dwh/csoc/ethylene.html.

101 Ibid.

102 Ibid.

103 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloactetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

104 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

105 See, e.g., K. P. Cantor, C. F. Lynch, M. E. Hildesheim, M. Dosemeci, J. Lubin, M. Alavanja, G. Craun. "Drinking water source and chlorination by-products. I. Risk of bladder cancer," *Epidemiology (*January 1998), 9(1): 21–28; M. E. Hildesheim, K. P. Cantor, C. F. Lynch, M. Dosemeci, J. Lubin, M. Alavanja, G. Craun. "Drinking water source and chlorination by-products. II. Risk of colon and rectal cancers," *Epidemiology (*January 1998), 9(1) 29-35; W. D. King, L. D. Marrett, C. G. Woolcott, "Case-control study of colon and rectal cancers and chlorination by-products in treated water," *Cancer Epidemiol. Biomarkers Prev., (*August 2000), 9(8): 813-8; C. B. Jsselmuiden, C. Gaydos, B. Feighner, W. L. Novakoski, D. Serwadda, L. H. Caris, D. Vlahov, G. W. Comstock, "Cancer of the pancreas and drinking water: a population-based case-control study in Washington County, Maryland," *Am. J. Epidemiol. (*October 1, 1992), 136(7): 836–42. For a review of this issue, see Erik Olson, et al., *Trouble on Tap* (NRDC, 1995); Erik Olson, et al., *Bottled Water: Pure Drink or Pure Hype?* (NRDC, 1999), available online at www.nrdc.org/water/drinking/bw/bwinx.asp; and EPA draft, "Preamble for Stage 2 Disinfection By-products Regulation," available online at www.epa.gov/safewater/mdbp/st2dis-preamble.pdf.

106 K. P. Cantor, C. F. Lynch, M. E. Hildesheim, M. Dosemeci, J. Lubin, M. Alavanja, G. Craun, "Drinking water source and chlorination by-products in Iowa. III. Risk of brain cancer," *Am. J. Epidemiol. (*September 15, 1999), 150(6): 552–60.

107 C. Infante-Rivard, E. Olson, L. Jacques, P. Ayotte, "Drinking water contaminants and childhood leukemia," *Epidemiology (*January 2001,) 12(1): 13-9.

108 See M. J. Nieuwenhuijsen, M. B. Toledano, N. E. Eaton, J. Fawell, P. Elliott, "Chlorination disinfection by-products in water and their association with adverse reproductive outcomes: a review." *Occupational and Environmental Medicine (*February 2000), 57(2): 73-85; F. Bove, Y. Shim, P. Zeitz, "Drinking water contaminants and adverse pregnancy outcomes: a review," *Environmental Health Perspectives (*February 2002), (110 Suppl. 1):61–74.

109 K. Waller, S. H. Swan, et al., "Trihalomethanes in drinking water and spontaneous abortion," *Epidemiology, (*March 1998), 9(2): 134–140; S. H. Swan, K. Waller, et al., "A prospective study of spontaneous abortion: relation to amount and source of drinking water consumed in early pregnancy," *Epidemiology (*March 1998), 9(2): 126–133.

110 M. J. Nieuwenhuijsen, M. B. Toledano, N. E. Eaton, J. Fawell, P. Elliott, "Chlorination disinfection by-products in water and their association with adverse reproductive outcomes: a review," *Occupational and Environmental Medicine (*February 2000), 57(2): 73–85.

111 Ibid.

112 See Interim National Primary Drinking Water Regulation for Trihalomethanes, 44 Fed. Reg. 68624 (1979).

113 EPA, "National Primary Drinking Water Regulations: Disinfectants and Disinfection By-products," 63 Fed. Reg. 69389 (December 16, 1998).

114 Ibid.

115 EPA draft, "Preamble for Stage 2 Disinfection By-products Regulation," available online at www.epa.gov/safewater/mdbp/st2dis-preamble.pdf.

116 Ibid.

117 EPA, "Consumer Fact Sheet on: Hexachlorocyclopentadiene" available online at www.epa.gov/safewater/dwh/c-soc/hexachl2.html.

118 Ibid.

119 EPA, "MTBE in Drinking Water," available online at www.epa.gov/safewater/mtbe.html.

120 Ibid.

121 Ibid.

122 Ibid; Toccalino, P., "Human Health Effects of MTBE: A Literature Summary," USGS, available on the Web at http://sd.water.usgs.gov/nawqa/vocns/mtbe_hh_summary.html; citing inter alia Agency for Toxic Substances and Disease Registry, 1996, Toxicological profile for methyl t-butyl ether (MTBE): Atlanta, GA, U.S. Department of Health and Human Services, Public Health Service, August 1996, 268 p., http://atsdr1.atsdr.cdc.gov/toxprofiles/tp91.html; Health Effects Institute, 1996, The potential health effects of oxygenates added to gasoline. A review of the current literature. A special report of the Institute's oxygenates evaluation committee: Cambridge, MA, Health Effects Institute, April 1996, www.healtheffects.org/Pubs/oxysum.htm; National Institute of Environmental Health Sciences, 2002, MTBE (in gasoline): National Institute of Environmental Health Sciences, March 13, 2002, www.niehs.nih.gov/external/faq/gas.htm; National Research Council, 1996, Toxicological and performance aspects of oxygenated motor vehicle fuels: Washington, D.C., National Academy Press, 160 p.; National Science and Technology Council, 1996, Interagency assessment of potential health risks associated with oxygenated gasoline: Washington, DC, National Science and Technology Council, Committee on Environment and Natural Resources, February 1996. www.ostp.gov/NSTC/html/MTBE/mtbe-top.html; Office of Science and Technology Policy, 1997, Interagency assessment of oxygenated fuels: Washington, DC, Office of Science and Technology Policy, National Science and Technology Council, Executive Office of the President of the United States, June 1997, 264 p., www.epa.gov/oms/regs/fuels/ostpfin.pdf..

123 EPA, "Fact Sheet: Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MTBE)," available online at www.epa.gov/waterscience/drinking/mtbefact.pdf.

124 Ibid.

125 EPA, "Consumer Fact Sheet: Pentachloropehenol," available online at www.epa.gov/safewater/dwh/csoc/pentachl.html; see also EPA, "Technical Fact Sheet on Pentachlorophenol," available online at www.epa.gov/safewater/dwh/t-soc/pentachl.html.

126 Ibid.

127 Ibid.

128 EPA, "Consumer Fact Sheet on Simazine," available online at www.epa.gov/safewater/dwh/c-soc/simazine.html.

129 Ibid.

130 Ibid.

131 EPA, "Common Mechanism of Action Determination for the Triazines," summary available online at www.epa.gov/pesticides/cumulative/triazines/newdocket.htm.

132 See note 130.

133 EPA, "Consumer Fact Sheet on Tetrachloroethylene," available online at www.epa.gov/safewater/dwh/cvoc/tetrachl.html.

134 Ibid.

135 Ibid.

136 EPA, "Consumer Fact Sheet on Toluene," available online at www.epa.gov/safewater/dwh/c-voc/toluene.html.

137 Ibid.

138 Ibid.

139 Ibid.

140 Ibid.

141 EPA, "Consumer Fact Sheet on Tetrachloroethylene," available online at www.epa.gov/safewater/dwh/cvoc/trichlor.html.

142 Ibid.; see also Agency for Toxic Substances and Disease Registry, "ToxFAQs—Trichloroethylene (TCE)" (September 1997), available online at www.atsdr.cdc.gov/tfacts19.html.

143 Information derived from EPA, "Consumer Fact Sheet on: Vinyl Chloride," available online at www.epa.gov/safewater/dwh/c-voc/vinylchl.html.

144 Ibid.

145 See EPA fact sheets on radionuclides for information on health effects and sources, available online at www.epa.gov/safewater/hfacts.html#Radioactive; and available online at www.epa.gov/safewater/rads/technicalfacts.html.

146 EPA, "National Primary Drinking Water Regulation: Radionuclides," 65 Fed. Reg. 76707, at 76722 (December 7, 2000).

147 EPA, "Proposed National Primary Drinking Water Regulation: Radon," 64 Fed. Reg. 59245 (November 2, 1999).

148 The information in the radon section is derived from NAS, National Research Council, *Risk Assessment of Radon in Drinking Water,* 1999, available online at http://books.nap.edu/books/0309062926/html/index.html), and from EPA, "Radon in Drinking Water Fact Sheet," available online at www.epa.gov/safewater/radon/proposal.html.

149 Ibid.

150 NAS, *Risk Assessment of Radon in Drinking Water, supra.*

151 See note 147, at 59328 Table XIII.11.

152 See note 147, at 59270 Table VII.1.

153 EPA, "Implementation Guidance for the Radionuclides Rule," at page IV-8 (draft, January 2002), available online at www.epa.gov/safewater/rads/fullradsimpguide.pdf.

154 Health effects information is derived from EPA's final rule issued in December 2000, 65 Fed. Reg. 76708, (December 7, 2000), available online at www.epa.gov/safewater/rads/radfr.pdf.

155 EPA, "Final Radionuclides National Primary Drinking Water Regulation," 65 Fed. Reg, 76708, page 76715, (December 7, 2000).

CHAPTER 6

What's the Score?

NRDC's Grading Methodology

NRDC
THE EARTH'S BEST DEFENSE

WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

June 2003

In developing a grading system for drinking water quality and right-to-know reports, NRDC worked closely with the steering committee of the Campaign for Safe and Affordable Drinking Water, an alliance of more than 300 public health, environmental, medical, consumer, and other groups. Once NRDC had evaluated the water systems and assigned an initial round of grades, it sent draft reports on each city out for peer review. Based on comments from that review, NRDC fine-tuned our grading system.

WATER QUALITY AND COMPLIANCE GRADES

NRDC chose public water systems in 19 cities around the nation and assigned each system a water quality and compliance grade.[1] A water system that was in compliance with national health standards (that is, enforceable maximum contaminant levels [MCLs] and substantive Treatment Technique requirements [TTs]) under NRDC's grading system earned a grade of Fair. If, in addition to complying with these standards, the utility met additional criteria, it earned a higher grade.

Specifically:

1. If the utility does not exceed any current, proposed, or final (but not yet enforceable) drinking water standards (that is, MCLs or TTs); does not exceed any action levels for lead and copper; and if all of the utility's detected contaminants whose health goals are 0 are found at less than 25 percent of the national standards, then that utility may earn an Excellent.

2. If the utility does not exceed any current, proposed, or final but not yet enforceable drinking water standards (that is, MCL or TT); does not exceed any action levels for lead and copper; and all contaminants are substantially below, but above 25 percent of, the national standard, then that utility may earn a Good. For example, a city may be in compliance with all current and proposed standards but have levels of a cancer-causing contaminant like trihalomethanes (some of which have a health goal of 0 because any exposure poses a cancer risk) at less than half of the EPA standard. Such a water system would get a Good.

NRDC'S GRADING SYSTEM FOR WATER QUALITY AND COMPLIANCE
See page 24 for city-specific grades.

Excellent. Excellent drinking water.
- ▶ No violation of current national standards
- ▶ No exceedance of action levels
- ▶ No violations of proposed or final (but not yet enforceable) national standards
- ▶ All detected contaminants whose national health goals are 0 are found at less than 25 percent of the national health standard

Good. Generally high-quality drinking water.
- ▶ No violation of current national standards
- ▶ No exceedance of action levels
- ▶ No violations of proposed or final (but not yet enforceable) national standards
- ▶ All detected contaminants whose national health goals are 0 are found at substantially less than the national standard but more than 25 percent of that standard

Fair. Drinking water quality and compliance is satisfactory overall but has problems.
- ▶ No violations of current national standards
- ▶ One or more violation of a proposed national standard that is not yet final
- ▶ One exceedance of an action level

Poor. Drinking water quality and compliance with standards has serious problems and barely passes.
- ▶ Violations of a combination of more than one action level proposed standard
- ▶ One or more violations of new (but not yet legally enforceable) standard
- ▶ Other serious and repeated water quality and compliance problems (such as frequent well closures due to serious contamination)

Failing. Drinking water quality and compliance with standards is of high concern.
- ▶ A violation of a currently enforceable national standards

3. If the utility is in compliance with national standards, but violates a proposed standard, or violates an action level, then it earns a Fair. For example, a system that is technically in compliance with all current EPA standards but has a problem with lead that causes it to exceed the EPA action level would get a Fair. If a utility did not meet the core criteria, it earned a grade lower than Fair.

4. If a utility violates a final (but not yet enforceable) standard or has a combination of more than one violation of an action level or a proposed standard but does not violate a currently enforceable standard, it receives a Poor. In addition, if a system is found to violate a substantive requirement of a treatment technique that presents a potential risk but not an imminent health threat, it can get no better than a Poor. Thus, if a system violated the new but not yet enforceable arsenic standard, and also exceeded the EPA action level for lead, it would get a Poor.

5. If a utility violates a current national standard, then it receives a Failing grade. Thus, for example, a system that violates the EPA treatment standard for turbidity (cloudiness of the water that indicates possible pathogen contamination) and is forced to tell its customers to boil their water would get a Failing grade. One important caveat to this structure: If a utility's contamination levels are low enough that they do not violate a national standard but high enough that they exceed a level that the EPA has deemed fully safe (through its health goal or Maximum Contaminant Level Goal), the utility can be downgraded, even though it is technically in compliance. Thus, NRDC's standards for judging drinking water quality may differ from those of the EPA, state officials, and water utilities. Utilities may complain that they should be graded with an Excellent simply for being in compliance. NRDC disagrees. NRDC believes that a water system in technical compliance with current enforceable drinking water standards and action levels deserves some credit, but to demonstrate more than mediocre performance and water quality, a system must go beyond the legal minimum. It must provide excellent water that does not pose health risks to its consumers, whether or not the system is technically in violation. Many EPA standards allow unnecessary health risks because they are old and have not been updated, or because in issuing the standards the EPA has weighed compliance costs too heavily, in NRDC's view, and has allowed the public to be placed at an unnecessary risk.

RIGHT-TO-KNOW REPORT GRADES

Public water utilities are required to produce annual right-to-know reports (also called consumer confidence reports or water quality reports) under the Safe Drinking Water Act Amendments of 1996. The purpose of the right-to-know reports is to inform Americans about the quality of their drinking water and the health risks to which they may be exposed by drinking tap water. The reports are also intended to provide information on the threats to source water and on known polluters of that source water, as well as information on how citizens can get involved in protecting their drinking water.

The EPA issued regulations providing guidelines for the minimum amount of information that must be included in the reports. The first round of reports was released in October 1999 (summarizing 1998 data), and since then reports have been required to be issued for each year no later than July 1 of the following year. Each report summarizes data on water quality for the previous calendar year.

NRDC's study is based on 2000 and 2001 right-to-know reports, released in mid-2001 and mid-2002, respectively. In our research, we assigned each water utility a right-to-know report citizenship rating. The criteria for this rating are:

1. Form and readability, including compliance with EPA rules regarding format.

2. Content, particularly disclosure of health risks, including compliance with EPA rules regarding content, and EPA recommendations regarding disclosure of pollution sources.

3. Translation of the right-to-know report when more than 10 percent of the population is non-English speaking. (See page 36 for city language data.)

NRDC'S GRADING SYSTEM FOR RIGHT-TO-KNOW REPORTS
See page 34 for city-specific grades.
Excellent. Excellent right-to-know report.
▶ Report complies with all EPA right-to-know rules, includes significant information about unregulated contaminants and health effects of all contaminants found at levels above EPA's health goals, and lists and maps major specific sources of pollution of its source water
Good. Generally high-quality right-to-know report.
▶ Report complies with all EPA rules and includes at least two of the following: (a) significant information about unregulated contaminants, (b) health effects of at least some contaminants found at levels above the EPA's health goals, or (c) lists and maps major specific sources of pollution of its source water
▶ Other significant nonrequired information (such as full translation for non-English speakers, plus other special efforts to educate consumers) can also earn a Good
Fair. Right-to-know report is satisfactory overall.
▶ Report basically complies with EPA rules but does not go significantly beyond those minimum requirements
Poor. Report has serious problems and barely passes.
▶ Report is not in full compliance with EPA rules but does not contain major violations of EPA right-to-know rules nor appear to mislead consumers seriously
Failing. Report is of high concern.
▶ Report has major flaws that substantially violate EPA rules and/or that

As with the drinking water compliance and water quality grades, NRDC believes that while mere compliance with the EPA's regulations is commendable and deserves some credit, water systems should go beyond the minimum requirements to fully educate and be honest with their consumers. NRDC's grading system, summarized in Table 2, reflects that view.

A report that complies with all EPA rules and includes three essential pieces of information—including information about the health effects of all contaminants found at levels above the EPA's health goals, information about any other unregulated contaminants found, and lists and maps of major specific sources of pollution of its source water—earns an Excellent. A report that complies with all EPA rules and includes two of three essential pieces of information listed above or significant non-required information earns a Good. A report that complies with EPA rules but does not go significantly beyond those minimum requirements earns a Fair. A report that is not in compliance with EPA rules, but does not appear to mislead consumers intentionally, gets a Poor. A system with major flaws in its report that substantially violates EPA rules, or that affirmatively misleads consumers, gets a Failing grade.

SOURCE WATER PROTECTION GRADE

NRDC used a variety of information sources to evaluate the threats to source water quality, including EPA databases, water system source water assessments, independent

NRDC'S GRADING SYSTEM FOR SOURCE WATER PROTECTION

Excellent. Source water is extremely well protected and has no significant pollution sources.

- The source water is in consolidated ownership
- Development is banned or all but banned in the watershed
- No significant pollution sources have been identified in the watershed

Good. Source water is protected by significant and active source water protection program, but some potential pollution sources may exist.

- Most of the watershed or recharge area for the source water is subject to substantial use restrictions
- Development is minimal
- No significant pollution sources are routinely, substantially degrading water quality

Fair. Source water has some protections but no significant and active source water protection program.

- The protection of the watershed is primarily due to state and federal laws such as the Clean Water Act, with little special watershed protection beyond such protections
- Some significant potential pollution sources
- Water has not degraded to the point of requiring routine advanced treatment

Poor. Source water is not well protected, and there is clear evidence of substantial source water pollution.

- There are minimal source water protections with indications of potentially serious pollution problems, such as major poorly controlled waste sites, frequent spills, or serious runoff or sewer overflow problems

Failing. Source water is largely unprotected and has serious contamination problems.

- Source water protections, if any, have largely failed to prevent serious contamination of the source water by significant pollution sources
- Source water contamination is so serious that the water system must routinely

organizations' studies of source water threats, and the EPA's Index of Watershed Indicators (IWI) database.

The IWI is a useful tool for determining threats to drinking water sources, and NRDC researchers used its basic grading system to establish numeric grades for threats to source water. The IWI database is a general compilation of indicators, or measures, of the health of water resources in the United States. Measuring watershed health is helpful to gaining a better understanding of how drinking water resources are affected by pollution and other factors. The index is composed of condition and vulnerability indicators. The EPA compiled and analyzed data for each indicator in order to determine an overall index score for the relevant watershed.

NRDC used the IWI database score for its Source Water Protection rating and information in EPA's environmapper database, unless more detailed and up-to-date data were available. In addition, NRDC downgrades that score if a known source of contamination has historically threatened or currently threatens a city's source water for drinking.

The overall IWI index scores range from 1 (few or no problems) to 6 (serious problems). The IWI data is dated from 1990 to 1998, depending on the indicator. As this report was going to press, the EPA removed the readily accessible public version of the IWI from its website, claiming that it was outdated. However, there is no more recent national database available; IWI remains the most comprehensive national database on watershed threats. NRDC's investigation focused on three indicators: (1) sources of drinking water; (2) agricultural runoff potential; and (3) urban runoff potential. In addition, if other significant information about threats to source water was available, NRDC took that information into account in issuing the final grade.

NRDC combined these multiple data sources to assign a grade for source water protection and the vulnerability of source water to pollution.

NOTE

1 An October 2002 California prerelease of this study graded tap water quality in Fresno, Los Angeles, San Diego, and San Francisco.

NRDC
THE EARTH'S BEST DEFENSE

WHAT'S ON TAP?

Grading Drinking Water in U.S. Cities

June 2003

Tap Water at Risk

Bush Administration Actions Endanger America's Drinking Water Supplies

Relying on a water supply system that is, on average, a century old, the health of America's tap water is precarious at best. However, if the Bush administration is successful in its targeted assault on the nation's water protection laws, tap water quality will assuredly get worse. Through rollbacks of existing water protection laws, through delays in issuing new and strengthening existing standards, and in budget proposals that slash funding for water quality and protection programs, the administration is further endangering the health of our nation's tap water. We must act now to protect and to strengthen the legislative infrastructure we have in place: citizens must urge legislators not to pull the plug on healthy water supplies.

ATTACKING THE NATION'S WATER PROTECTION LAWS

As we examine drinking water quality in 19 cities across the country, it is critical to remember that the quality of tap water across America is profoundly influenced by the overall health of one contiguous system of interconnected waterways—the complex hydrologic spectrum, which includes streams, rivers, ponds, lakes, wetlands, and groundwater aquifers. Tap water comes from one of two places along this spectrum: surface water (lakes and rivers) and groundwater (underground aquifers tapped by city wells). The healthier these waterways, the better the quality of our tap water.

Unfortunately, the Bush administration has targeted for dismantlement the laws that protect these waters, and it has proposed sharp cuts in federal funds to clean up and protect America's waterways. The result: more water pollution and fewer cleanup efforts, which will exacerbate source water and groundwater pollution. Ultimately, the quality of U.S. tap water will be profoundly diminished.

Dismantling the Clean Water Act

One of the nation's premier environmental laws, the 1972 Clean Water Act has successfully protected U.S. waterways for more than 30 years. During this time, Congress and numerous courts have continued to reaffirm the role of this landmark environmental law, holding that the Clean Water Act protects *all* waters of the

United States from pollution. It has been a success. The Clean Water Act has made America's rivers, lakes, and estuaries cleaner and healthier, and it has made many of our waterways fishable and swimmable. The work is far from over: today, fewer than half of all waterways surveyed still do not meet water quality standards.[1] The task before us must be to press on and to enforce the Clean Water Act, which has served our country well.

Instead, however, at the behest of developers, agribusiness, and the mining, oil, and gas industries, the Bush administration is chipping away at key provisions of the Clean Water Act that affect America's waterways. On January 15, 2003, the Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps) initiated a rulemaking to limit the number of waterways protected by the Clean Water Act. The waters most affected by this action are headwater streams, seasonal waters, wetlands, and natural ponds—so-called "isolated" wetlands and waters that lack a direct surface connection to "navigable" waters but which are essential nonetheless to the overall health of the hydrologic system. These waterways replenish groundwater supplies, filter drinking water sources, absorb floodwaters, and provide essential wildlife habitat, including the breeding habitat used by more than half the ducks in North America. Indeed, about one-third of the water in the nation's rivers and streams originates as groundwater, and much of this groundwater is replenished from such isolated wetlands and ponds.

The EPA has estimated that the rulemaking could eliminate Clean Water Act protections for as much as 20 percent of America's wetlands.[2] Furthermore, the rulemaking undermines a key goal of the Clean Water Act—ensuring the chemical, physical, and biological integrity of our nation's waterways—by exposing currently protected waters to dumping, filling, oil spills, and other pollution discharges.

A Supreme Court Decision as Scapegoat. The basis for the EPA and Corps rulemaking is a 5–4 Supreme Court decision handed down on January 9, 2001, that hinged on the definition of "navigable" waters under the Clean Water Act. The lawsuit was brought by the Solid Waste Agency of Northern Cook County (*SWANCC*) against the Corps when the Corps blocked, using its authority under the Clean Water Act, construction of a landfill planned on the site of a 17-acre tract of seasonal pond. Ultimately, the Supreme Court ruled in *SWANCC*'s favor, saying that the Corps had overstepped its authority because it had determined that the waters in question were shown to be protected by the Clean Water Act solely based on their use by migratory birds.[3] The Court ruled that without a more clearly demonstrated connection to navigable waters, the Corps should not have regulated such wetlands. The Bush administration, egged on by industry and developers, has seized on the *SWANCC* decision as an excuse to propose a substantial narrowing of the reach of the Clean Water Act. It is mounting a two-pronged attack: first on wetlands and second on nonnavigable headwaters and other streams.

Target: Wetlands. Today, America loses from 50,000 to 100,000 acres of wetlands each year to development. Wetlands are a crucial link in the hydrologic chain, performing two essential functions that improve the quality of surface water and groundwater supplies—and ultimately tap water. Wetlands act as pollution filters, transforming and reducing the flow of sediments, nutrients, heavy metals, and other contaminants.[4] At the same time, wetlands act as water regulators: in floods, wetlands store excess water and slowly replenish groundwater supplies; in droughts, wetlands discharge water to adjacent streams.[5] For example, shallow ponds found in the southwestern United States (called "playas") filter 20 to 80 percent of collected water to the Ogallala or Great Plains aquifer, which provides drinking water to the citizens of many states.[6, 7]

Wetlands protections were the first component of the Clean Water Act to be jettisoned by the Bush administration—and the planned rulemaking will assuredly accelerate the pace. The rulemaking will have a direct and negative impact on the health of drinking water supplies. When wetlands are left unprotected, they can become pathways for contaminants that ultimately end up in tap water. The aforementioned Ogallala aquifer provides a stark example: in its unprotected playas, nitrates (which can cause miscarriages and death in infants) infiltrated the drinking water supply.[8]

Target: Headwaters and Other Small Streams. Wetlands are one target of an administration intent on eviscerating the Clean Water Act; headwaters—streams, tributaries, creeks, and other waters upstream that largely determine the health of more substantial waterways downstream—are another. Many small streams directly supply drinking water because segments have been diverted to create reservoirs for drinking water and other purposes.[9] Other small streams serve as conduits for snowmelt, precipitation, and groundwater discharge, feeding larger rivers that serve as drinking water sources.[10] In fact, between 60 and 80 percent of the water that feeds larger rivers comes from small streams (most of the rest is from groundwater).[11] For example, in many western states, seasonal streams predominate: they account for 72 percent of Colorado's stream miles, 97 percent of Arizona's total stream miles, and 91 percent of New Mexico's total stream miles.[12, 13, 14]

Headwaters also help dilute pollution, runoff, nutrients, and organic matter downstream, thereby protecting drinking and other water quality.[15] Studies have shown that water quality is more affected by the disturbance of headwater wetlands than downstream wetlands.[16] Headwaters and their riparian areas also absorb floodwater, thereby regulating its downstream volume and velocity.[17] If this function is compromised, erosion can result, which ultimately can harm downstream drinking water sources.[18] Degraded headwaters that cause serious erosion can produce highly turbid (cloudy) and polluted water downstream, potentially interfering with or bypassing drinking water treatment and triggering increased treatment costs.

The Bush administration is considering changes that abandon protections for headwaters and other small streams. Exempting so-called isolated and nonnavigable waters from Clean Water Act protection would result in reduced groundwater recharge capacity, reductions in water quantity, and greatly degraded water quality with increased levels of nutrients, sediments, heavy metals, and other contaminants in our drinking source waters. Safe and affordable drinking water is at risk if headwaters, wetlands, and seasonal streams lose Clean Water Act protection since these waters help keep drinking water clean and plentiful.

Relaxing Standards That Limit Daily Pollution Loads. Another component of the Clean Water Act that the administration plans to unravel is a key provision governing cleanup of polluted waters, the total maximum daily load (TMDL) program. The TMDL program requires states and the EPA to identify polluted waterways, rank them for priority attention, and develop pollution limits for each water body. The administration has significantly weakened the TMDL rule to delay cleanup efforts, to make it more difficult to implement cleanup plans, to make it easier for states to remove waterways from the cleanup list, and to make it more difficult for additional waterways to be added to the list. As a result, source waters will be degraded, which ultimately will threaten the safety of drinking water. These changes would directly affect the 218 million Americans who live within 10 miles of a polluted river, lake, or coastal water body.

Weakening Restrictions on Livestock Waste

Large concentrated animal feeding operations (CAFOs) now dominate animal production across the country and produce a staggering 220 billion gallons of manure annually—nearly 1,000 gallons of manure for every man, woman, and child in the nation. These factory-size hog, dairy, chicken, and cattle farms routinely dump massive amounts of animal manure into waterways, killing fish, spreading disease, and seriously degrading water quality. Animal waste then often leaches into groundwater supplies from storage lagoons and fields that are saturated with overapplied animal manure—and ultimately contaminates drinking water.

In December 2002, the Bush administration finalized its new rule governing disposal of livestock waste: the rule guts the Clinton EPA's proposal prohibiting discharges of animal waste to groundwater and requiring groundwater monitoring. Instead, the new EPA regulations allow factory farms to draft their own pollution management plans without review or approval by the state or the EPA, relieve agribusiness corporations from liability for environmental damage, eliminate measures to update technology standards to combat pollution, and limit public participation and access to information.[19]

As a result, factory farms will continue fouling the nation's waterways with animal waste pollution, and the public—not the polluter—will pay the price for contaminated drinking water. Because groundwater is the primary source of drinking water for people living in rural communities, the Bush administration's decision will directly harm human health. Drinking water that contains elevated concentrations of nitrate from animal waste can cause very serious health effects, including spontaneous miscarriages and blue baby syndrome (from excessive nitrates in drinking water, which can cause death in infants). Moreover, contrary to what many experts believed, some microscopic parasites can travel through the groundwater and contaminate wells or surface waters; indeed, recent major waterborne disease outbreaks have been caused by animal waste–contaminated water reaching water supply wells and sickening hundreds of people.[20]

Lifting the Ban on Dumping Mining Waste

Responding to mining industry pressure, the Bush administration recently reversed a 25-year-old rule that prohibited dumping mining waste and other industrial solid waste into U.S. waterways. As a result, hard rock mining waste—which is often laden with toxic heavy metals such as arsenic, lead, and cadmium—can now be classified as fill material and dumped directly into streams, wetlands, and other waters. These toxic discharges could severely compromise water quality and eventually drinking water downstream. Coal mining wastes, construction and demolition debris, used tires, and plastic waste may now be permitted for disposal in the nation's waters as well.

Relaxing Sewage Treatment Requirements After Rain and Snow

A storm can wreak havoc with sewage treatment plants as rain or snowmelt seeps into pipes and overloads the system. Sewage treatment plants filter and treat water, but some contaminants still can get through the safety net and work their way downstream, eventually to waterways and drinking water supplies, where they can make people sick with nausea and vomiting. Pathogens such as *Giardia* and *Cryptosporidium*, for example, cause the majority of waterborne disease outbreaks in the United States because they are not effectively removed by filtration and chlorination. Academic experts have estimated that 7.1 million cases of mild to moderate and 560,000 cases of moderate to severe infectious waterborne disease come from contaminated drinking water in the United States each year; many of the microscopic parasites causing these diseases enter water supplies through polluted runoff. Children, the elderly, and those with compromised immune systems are most likely to become sick or even to die from infectious waterborne diseases.[21]

In the spring of 2003, the EPA will release a draft policy that relaxes sewage treatment requirements after rainfall or snowfall. The EPA's approach violates Clean Water Act sewage treatment requirements and does not provide effective treatment for viruses, parasites, or pathogens such as *Giardia* or *Cryptosporidium*, which can contaminate drinking water sources and also can make recreational swimmers sick with nausea and vomiting. *Giardia* and *Cryptosporidium* cause many waterborne outbreaks in the U.S. because they sometimes are not effectively removed by drinking water filtration or chlorination.

Exempting the Pollution Industry for Paying for Superfund Cleanup

In the event of industrial pollution, polluters are generally required by law to pay for cleanup. But in the event that the responsible polluter cannot be determined, has gone bankrupt, or has disappeared, the EPA is left to foot the bill for cleanup. To offset those costs, the EPA established a Superfund Hazardous Waste Cleanup Program, funded by user fees that are paid by the chemical, petroleum, and manufacturing industries. These user fees also pay for the EPA and the Justice Department to take enforcement actions against polluters who refuse to pay their share of toxic waste cleanups.

When these fees recently expired, the Bush administration announced that it would not seek to renew them—which seriously undermined the government's ability to study waste sites, to force polluters to clean them up, or to sue or to prosecute uncooperative polluters. Drinking water treatment technologies in most cities are ill-equipped to remove the kinds of industrial chemicals released by hazardous waste dumps; without the infusion of funds from the Superfund Hazardous Waste Cleanup Program to clean up toxic waste sites before they pollute groundwater, lakes, and streams, source waters used for drinking water will suffer more chemical pollution. (For more on budget-related issues on Superfund cleanup, see page 87.)

UNDERMINING WATER STANDARDS

To protect public health, the EPA is legally mandated to improve tap water quality by issuing new and by strengthening existing standards on contaminants in drinking water. However, the Bush administration effectively shut down EPA progress on this front, thwarting the effectiveness of its own agency, impairing drinking water, and endangering the public health of Americans.

The Saga Surrounding the Arsenic Standard

Perhaps the starkest example of administration stalling in issuing new health protection standards for drinking water was the arsenic rule. Arsenic is one of the most dangerous contaminants found in tap water; it is also one of the most ubiquitous, present in the water supplies of 22 million Americans, at levels averaging more than 5 parts per billion (ppb).[22] The EPA spent more than two decades studying the effects of arsenic in drinking water and finally, in January 2001, issued a new standard setting arsenic levels at 10 ppb—a significant improvement from the rule set in 1942 at 50 ppb. The EPA estimated that 13 million people in the United States drink water containing more arsenic than allowed under the new EPA standard. However, in January 2002, the Bush administration, backed by mining, chemical, and some water utility industry lobbyists, blocked the new standard, requiring more research. Meanwhile, the 1942 standard remained in effect.

Many scientific studies, including no fewer than seven reviews by the National Academy of Sciences (NAS), determined that arsenic in drinking water is known to cause cancer of the bladder, skin, and lungs; that arsenic likely causes other cancers; and that arsenic is responsible for a variety of other serious health ailments. In fact, a 2001 NAS report found that a person who drinks two liters of water a day containing 10 ppb arsenic—the new EPA standard—has a lifetime total fatal cancer risk greater than 1 in 333. That risk level is more than 30 times higher than what the EPA traditionally allows in tap water.[23] The findings of the 2001 NAS report likely would have been major news across the nation, but they were released on September 11, 2001.[24] Nonetheless, NRDC pushed hard to focus public and media scrutiny on the matter, and ultimately the Bush administration's delay and suspension of the arsenic in drinking water rule was reversed.

Halting Progress on New Contaminant Standards

The arsenic rule was just one example among many of the administration's failure to implement a safe and comprehensive drinking water program. Specifically, the

Safe Drinking Water Act (SDWA) required the administration to determine by August 2001 whether to issue a standard for at least five contaminants in tap water that remain unregulated. But in June 2002, nearly a year later, the Bush administration issued a surprising *Federal Register* notice: after six years of EPA study, the administration announced that it had not found enough information to issue standards for any drinking water contaminants that remained unregulated. In finding that there was insufficient evidence to regulate any new contaminants, the EPA rebuffed pleas from public health and other groups to issue controls on many emerging high-risk contaminants. These include:

- **Parasites and chlorine by-products.** Final "Stage 2" rules for *Cryptosporidium* and cancer-causing chlorine by-products are required by the SDWA to be issued by May 2003. A major negotiation involving the EPA and all interested parties reached a consensus proposal for the standard in 2000, but the Bush administration has now halted progress. In fact, it has not even published the proposed rules—which were required by May 2002.
- **Radioactive radon.** The SDWA required the EPA to issue a standard for radon by August 2001, in order to protect the tens of millions of Americans who have radioactive and cancer-causing radon in their tap water. The Bush administration has stopped progress on radon and has not even proposed a rule.
- **Groundwater disinfection.** Although groundwater is the source of water for nearly half of all Americans, EPA rules do not require any disinfection. At present, only surface water must be treated. Many people have become ill in disease outbreaks in groundwater supplies that have not been disinfected. Congress, therefore, required the EPA to issue a new rule for groundwater disinfection as soon as possible, but no later than May 2003. The Bush EPA privately admits that it will not come close to meeting this deadline; a proposed rule issued in 2000 by the Clinton EPA was attacked by the water industry and states, and since, the final rule has languished.
- **The rocket fuel perchlorate.** Perchlorate (PERC), an inorganic contaminant that usually comes from rocket fuel spills or leaks at military facilities, harms the thyroid and may cause cancer. More than 10 million Americans drink tap water containing PERC at levels higher than what the EPA considers safe. But today, as a result of administration stalling and fierce debate between the EPA and the Pentagon over what levels constitute dangerous exposure, the substance remains only partly regulated.

Refusing to Strengthen Existing Standards

Congress ordered the EPA to review under the SDWA the adequacy of all existing tap water rules by August 2001. But the Bush administration recently announced that all of the approximately 80 current tap water standards in existence—many of which have remained unchanged for decades—are sufficiently protective of public health. In spite of the fact that recent data demonstrated higher risks for many contaminants than were previously recognized, the administration asserted that there is no need for a change in standards—effectively ignoring scientific studies showing that many of its current tap water standards are inadequately protective.[25] These include:

- **Lead, chromium, and atrazine and triazine herbicides,** as well as other chemicals that new data prove to be more dangerous than was previously believed. For example, the EPA itself decided in 2001 that triazine herbicides—including the nation's most widely used pesticide, atrazine—act as a common poison and that therefore a single standard should be set for the total (cumulative) exposure to these triazine herbicides in food. Under the Bush administration, however, the EPA decided not to issue any new standard for these chemicals in tap water.
- Classes of pesticides that can be toxic when consumed in small quantities, including **organophosphates, carbamates, and chlor herbicides.** In 2001, the EPA concluded that these pesticides should be controlled as a family with a single cumulative standard, but no standards have been set.
- Other chemicals, from **fluoride to chromium,** which are more toxic than was previously believed. New data collected by academic researchers, EPA scientists, and in some cases even industry-funded scientists demonstrate that these chemicals are more harmful than was previously believed, but the Bush administration disregarded these findings; instead, it opted to do nothing to strengthen or to broaden its standards for these chemicals.

SLASHING FUNDING FOR WATER QUALITY

In the new budget for fiscal year 2004, the Bush administration slated a $1.6 billion (5.5 percent) cut for environmental spending compared to FY 2002. Therefore, it is no surprise that the administration's weak commitment to water quality and protection is directly reflected in recent budget figures for key programs.

- In the budget for FY 2004, the Bush administration has proposed a cut of more than 32 percent to $1.798 billion—a loss of $861 million.
- The largest single area to be reduced is the Clean Water Act State Revolving Fund (CWASRF), which lends money to states to pay for sewage plants. Bush's budget for CWASRF would decline by $500 million—from $1.350 billion in FY 2002 to only $850 million in FY 2004.
- The Safe Drinking Water Act State Revolving Fund, which supports construction of purification facilities, would remain unchanged at $850 million—still far below annual needs and $150 million below the authorized level.
- A significant slash in funding for one particular category of water pollution projects will push it perilously close to extinction. Funding for this family of projects—which addresses particular needs in specific places and includes a range of activities such as water treatment, sewage control, and nonpoint pollution—would be reduced from $459 million to a mere $98 million.
- As discussed earlier, the administration has largely abandoned the principle of polluter pays. While the Superfund cleanup program would grow from $1.31 billion in FY 2002 to $1.39 billion in FY 2004, a hefty $1.1 billion would be borne by taxpayers

due to the failure of the administration to reinstate the polluter pays user fee. Even the administration has admitted that today, in light of the recent expiration of the Superfund user fee on industry, polluters are paying for only about 70 percent of Superfund site cleanup costs; the government (*i.e.,* taxpayers) is stuck with the rest of the tab. These figures will only get worse now that the polluter tax-based Superfund is exhausted of funds, and since the administration has refused to support the reinstatement of the polluter tax. Meanwhile, the oil industry enjoys an exemption from liability at these sites, ensuring that it will never be held responsible for its toxic pollution even though it no longer contributes to the Superfund tax. The lack of cleanup of such toxic waste sites can and has lead to pollution of drinking water source waters.

▸ Despite the president's promises to "fully fund the LWCF [Land and Water Conservation Fund]," his budget proposes cutting 50 percent of the fund's core federal land acquisition programs, from $429 million in FY 2002 to $187 million for FY 2004. The Land and Water Conservation Fund was established in 1964 to protect important natural areas. The annual $900 million income for this trust is largely generated by revenues from oil and gas drilling in the Outer Continental Shelf, and these monies are earmarked to pay for land acquisition and important water and land resource protections—many of which serve as the headwaters and important components of rivers and lakes that serve as drinking water sources. Although LWCF has never received its full authorization of $900 million annually, it has worked well for decades. Bush's budget betrays this fund, raiding it to pay for 15 other extraneous programs while claiming to fully fund the LWCF. In reality, it slashes at the core of LWCF.

RECOMMENDATIONS

Important actions are needed to counter the Bush administration's efforts to dismantle or cut drinking water and source water protection programs. In order to:

Retain Legislation That Protects Drinking Water Sources

▸ The administration should renounce its proposal to substantially narrow protections for wetlands and headwaters and other small streams under the Clean Water Act; it should implement the existing TMDL progam; and Congress should overturn the *SWANCC* decision that narrowed the applicability of the CWA for certain wetlands.

▸ The EPA or Congress should overhaul the Bush EPA's rule for factory farms by adopting clear prohibitions on groundwater and surface water contamination.

▸ The Bush administration should reinstate the EPA's 25-year-old rule against dumping mining waste into streams—particularly during mountaintop removal mining.

▸ The administration should not adopt its new policy relaxing sewage treatment requirements after rainfall or snowfall.

▸ The Bush administration should work with Congress to assure the reinstatement of the Superfund polluter tax. It should also commit to full funding for EPA and Justice Department enforcement and implementation of the toxic waste cleanup program.

Issue New and Strengthen Existing Standards Protecting Public Health

▶ The administration should establish new tap water standards for *Cryptosporidium*, cancer-causing by-products of chlorination, groundwater disinfecton, radon, perchlorate, and other emerging contaminants.

▶ The EPA should revise the old, weak standards for long-regulated contaminants, including strengthening the standards for arsenic, lead, chromium, atrazine/triazines, and organophosphate insecticides.

Maintain Funding for Water Quality and Protection Programs

▶ The administration should work with Congress to assure full funding for environmental protection, including sufficient funding to ensure strong water enforcement, full funding for the State Revolving Funds and clean water and drinking water programs, and full funding for the Land and Water Conservation Fund, as promised by President Bush during the election campaign.

NOTES

1 Statement of G. Tracy Mehan III, Assistant Administrator for Water, U.S. Environmental Protection Agency before the Committee on Environment and Public Works, United States Senate, October 8, 2002.

2 Jehl, D., "U.S. Plan Could Ease Limits on Wetlands Development," *The New York Times,* January 11, 2003.

3 Administration officials launched the dismantlement process in response to a January 2001 Supreme Court decision, *Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers*, 121 S.Ct. 675 (2001) (*SWANCC*). A 5-4 majority held that the Corps could not protect intrastate, isolated, nonnavigable ponds solely based on their use by migratory birds. However, the ruling did not invalidate existing Clean Water Act rules. In fact, the Department of Justice has argued in numerous cases that the *SWANCC* decision does not necessitate any additional restriction of the scope of the Clean Water Act.

4 Maryland's Nonpoint Source Pollution Prevention Programs, Department of Natural Resources, Annapolis, Maryland, www.dnr.state.md.us/bay/czm/nps.whatisnps.html, and untitled, undated document by Region 3, Water Protection Division, the Mid Atlantic states, U.S. Environmental Protection Division, www.epa.gov/reg3wapd/nps/pdf/wetlands.pdf., visited Janaury 20, 2003.

5 "Nontidal Wetlands and Their Values," Water Management Administration, Maryland Department of the Environment, Baltimore, Maryland, undated document, www.mde.state.md.us, visited January 15, 2003.

6 Hawks Aloft, Inc., First Final Draft Bird Conservation Plan, Partners in Flight, Draft Land Bird Conservation Plan, New Mexico State Plan, Version 1.0, Albuquerque, New Mexico, March 31, 2000.

7 Don Whittemore, "Geologists Project Life of Ogallala Aquifer," press release from the University of Kansas, July 12, 2001, Lawrence, Kansas; Kathy Muller Ogle and Laura L. Hallberg, "Hydrogeologic and Geochemical Characteristics of the Ogallala and White River Aquifers, Cheyenne, Wyoming," Water-Resources Investigations Report 00-4188, U.S. Geological Survey, undated document at http://water.usgs.gov/pubs/wri/wri004188/htms/report.htm, visited February 28, 2003; and Mavis Belisle, "Plutonium Pits, Pantex, and the Ogallala Aquifer," *Synthesis/Regeneration 9*, The Peace Farm, Panhandle Greens, Texas, Winter 1996.

8 Alan Fryar, et. al., "Nitrogen Buildup and Denitrification Processes Beneath Playa Lakes in the Texas High Plains," Abstract, *New Waves,* Volume 8 Number 2, July 1995, http: //twri.tamu.edu/twripubs/NewWaves/v8n2/abstract-5.html.

9 U.S. Fish and Wildlife Service, "The Value of Headwater Streams: Results of a Workshop," State College, Pennsylvania, April 13, 1999, Pennsylvania Field Office, State College, Pennsylvania, April 2000.

10 Ibid.

11 Ibid.

12 Theo Stein, "Oversight of Wetlands Might Shift; Critics Decry Federal Proposal," *Denver Post*, January 12, 2003.

13 Arizona Department of Environmental Quality, "The Status of Water Quality in Arizona—2002," Volume 1, Arizona's Integrated 305(b) Assessment and 303(d) Listing Report, Phoenix, Arizona, EQR02-04, 2002.

14 New Mexico Water Quality Commission, "Water Quality and Water Pollution Control in New Mexico, 2002," Santa Fe, New Mexico, Appendix A, www.nmenv.state.nm.us/swqb/305(b)/2002/.

15 Russell Cohen, "Fact Sheet: The Importance of Protecting Water Quality in Intermittent and Other Smaller Brooks and Streams," Riverways Program, Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement, January 8, 2003.

16 Carl Hershner, et al., "Wetlands in Virginia," Special Report, Center for Coastal Resource Management, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, Virginia, January 2000, No. 00-1.

17 Russell Cohen, "Fact Sheet: The Importance of Protecting Water Quality in Intermittent and Other Smaller Brooks and Streams," Riverways Program, Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement, January 8, 2003.

18 Letter to the U.S. Army Corps of Engineers from Dr. Judy Meyer, Distinguished Research Professor, Institute of Ecology, University of Georgia, Athens, Georgia, et.al., re: Comments to the Army Corps of Engineers Proposal to Reissue and Modify Nationwide Permits, October 5, 2001.

19 This rule is yet another example of how contributors to the Bush-Cheney campaign are getting what they paid for. During the 2000 election, the Bush-Cheney campaign received $2,636,625 from agribusiness, including $647,285 from the dairy, livestock, and poultry and egg industries. President Bush received more livestock industry contributions ($506,085) in the 2000 election campaign than any other federal candidate received between 1990 and 2000. (Source: www.opensecrets.org)

20 See, for example, "1,061 Suspected *E. coli* Cases in New York Outbreak," *Infectious Disease News,* (October 1999), available online at www.infectiousdiseasenews.com/199910/frameset.asp?article=ecoli.asp; Centers for Disease Control, "Public Health Dispatch: Outbreak of *Escherichiacoli* O157:H7 and *Campylobacter* Among Attendees of the Washington County Fair, New York," 1999; *MMWR,* 1999, 48(36)803; Rachel S. Barwick, M.S., Deborah A. Levy, Günter F. Craun, Michael J. Beach, Rebecca L. Calderon, "Surveillance for Waterborne-Disease Outbreaks—United States, 1997–1998," *MMWR*, May 26, 2000, 49(SS04):1-35; Deborah A. Levy, Michelle S. Bens, Gunther F. Craun, Rebecca L. Calderon, Barbara L. Herwaldt, "Surveillance for Waterborne-Disease Outbreaks—United States, 1995–1996," *MMWR*, December 11, 1998, 47(SS-5):1–34; Michael H. Kramer, Barbara L. Herwaldt, Gunther F. Craun, Rebecca L. Calderon, Dennis D. Juranek, "Surveillance for Waterborne-Disease Outbreaks—United States, 1993–1994," *MMWR*, 45(SS-1)1-33, April 12, 1996, 45(SS-1):1-33; Erik D. Olson and Diane Cameron, *The Dirty Little Secret About Our Drinking Water: New Data Show Over 100 Drinking Water Disease Outbreaks from 1986–1994, and Strong Evidence of More Widespread Problems* (NRDC, February 1995).

21 R. Levin and W. Harrington, "Infectious Waterborne Disease and Disinfection By-products in the U.S.: Costs of disease," *Assessing and Managing Health Risks from Drinking Water Contamination: Approaches and Applications,* edited by E. Reichard and G. Zapponi, IAHS Publication No. 233, proceedings of an international symposium held at Rome, Italy, September 13–17, 1994.

22 P. Mushak, M. McKinzie, and E. Olson, *Arsenic and Old Laws*, NRDC, 2001.

23 National Academy of Sciences, National Research Council, *Arsenic in Drinking Water: 2001 Update* (National Academy Press, 2001), available online at www.nap.edu/catalog/10194.html.

24 Total cancer risk figures are taken from the National Academy of Sciences' report *Arsenic in Drinking Water: 2001 Update,* 2001; for a plain-English explanation of the Academy's arsenic cancer risk figures, see NAS's September 11, 2002, press release, available online at www4.nationalacademies.org/news.nsf/isbn/0309076293?OpenDocument. EPA 's maximum acceptable cancer risk is 1 in 10,000.

25 The one possible exception was for coliform bacteria, which the administration said it would consider revising—perhaps due to a 1998 signed EPA agreement reached in a regulatory negotiation that EPA would overhaul the coliform rule, and perhaps also due in part to industry pressure to weaken the rule.

ALBUQUERQUE, NM

Albuquerque Earned a Water Quality and Compliance Grade of Poor for 2000 and 2001

City tap water has significant problems with arsenic and radon.

▶ In many parts of the city's water system, current levels of **arsenic,** a known and potent human carcinogen, exceed the new national arsenic standard (adopted in 2001, enforceable in 2006). Levels in arsenic in the city present a fatal cancer risk, according to National Academy of Sciences, estimates—more than 40 times higher than what the EPA generally considers acceptable.

▶ In some areas of the city, levels of **radon,** a radioactive gas known to cause lung cancer, exceed the proposed national radon standard. While Albuquerque may eventually qualify for a waiver of this standard, this radon level presents a significant cancer risk.

▶ A few **other contaminants** were found in city water, sometimes at levels above national health goals for tap water but below enforceable standards. These included:

- ▶ **gross alpha radiation,** known to cause cancer
- ▶ **thallium,** which can cause damage to nerves, liver, kidney, intestines, and testicles
- ▶ **total coliform bacteria,** microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water
- ▶ **fecal coliform/*E. coli*,** a subset of total coliform bacteria that can be a sign of human or animal wastes in tap water
- ▶ **total trihalomethanes,** by-products of chlorine disinfection that may cause cancer, miscarriages, and birth defects
- ▶ **haloacetic acids,** by-products of chlorine disinfection that may cause cancer

ALBUQUERQUE
System Population Served **445,000**[1]
Water Quality and Compliance **2000▶Poor** **2001▶Poor**
Right-to-Know Report—Citizenship **2000▶Fair** **2001▶Good**
Source Water Protection **Poor**
REPORT CARD

Albuquerque's Right-to-Know Reports Earned Grades of Fair for 2000 and Good for 2001

▶ The reports were user-friendly and included important information on radon in the water supply. However, the reports, particularly in 2000 with respect to arsenic, understated the significance of some problems with the city's water.

Albuquerque Earned a Source Water Protection Grade of Poor for 2000 and 2001

▶ The city's groundwater is becoming seriously depleted, and various contaminants, including those from Superfund sites in and near the city, are problems.

KEY CONTAMINANTS IN ALBUQUERQUE'S WATER

The following contaminants have been found in Albuquerque's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria[2]

National Standard (MCL)
5% maximum in any month[3]

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels
1% in highest month, total coliform positive

2001 Levels
1% in highest month, total coliform positive

LEVELS PRESENT SOME CONCERN

Fecal Coliform/E. coli

National Standard (MCL)
0 confirmed fecal coliform/*E. coli*

National Health Goal (MCLG)
0—no known fully safe level

2001 Levels
2 samples (of 2,550) positive for fecal coliform/*E. coli*—neither confirmed on retest

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. On rare occasion, coliform bacteria are found in Albuquerque's water. The highest reported level in any month was just less than 1 percent, meaning that 1 percent of samples taken were found to contain total coliform bacteria. The federal standard allows up to 5 percent total coliform–positive samples per month. The health goal for any type of coliform bacteria is 0.

Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes containing germs that can cause diarrhea, cramps, nausea, headaches, or other symptoms; they may pose a special health risk for infants, young children, and people with severely compromised immune systems. In two cases in 2001, fecal coliform or *E. coli* were found in taps serving the city's water; however, neither finding was duplicated in subsequent retests, so the water reportedly did not violate the standard.

No other evidence of a serious bacteria problem in Albuquerque's water has emerged. Total coliform's presence in the city's pipes, however, may be an indication of possible regrowth of bacteria in the distribution system that could signal future problems if not addressed with aggressive operational controls and possibly with pipe rehabilitation or replacement.

INORGANIC CONTAMINANTS

Arsenic

National Standard (MCL)
50 ppb (average) effective through 2005
10 ppb (average) effective in 2006

National Health Goal (MCLG)
0—no known fully safe level

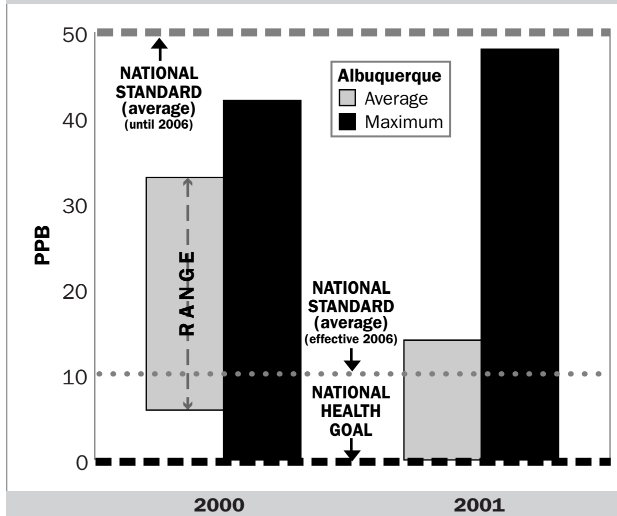
2000 Levels[4]
Average: 6–33 ppb, depending on area of city
Range: nondetectable to a high of 42 ppb

2001 Levels[5]
Average: 14 ppb; in some areas, the average is higher; in others, lower
Range: nondetectable to a high of 48 ppb

LEVELS PRESENT HIGH CONCERN

Arsenic—the product of mining, industrial processes, past use of arsenic-containing pesticides, and natural leaching or erosion from rock—is a known and potent human carcinogen that has been linked to a variety of other diseases. The National Academy of Sciences has

ARSENIC LEVELS



estimated that a person who drinks two liters of water a day containing 14 ppb of arsenic (Albuquerque's average level) has a lifetime fatal total cancer risk of about 1 in 220.[6] That risk is more than 40 times higher than what the EPA traditionally allows (1 in 10,000 cancer risk). Albuquerque has long known it has a problem with arsenic but fought against the EPA's efforts to set a safer standard for this known cancer-causing contaminant. Albuquerque, in fact, was one of only two big cities in the United States—the other was El Paso, Texas—to sue the EPA in 2001 when the agency reduced the standard for arsenic to 10 ppb; that suit is still ongoing, but Albuquerque backed out of the case in late 2002. Albuquerque does not mention its suit or fight against the EPA's arsenic standard in the 2001 right-to-know report to its citizens.

ORGANIC CONTAMINANTS

Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[7]

2000 Levels[8]
Maximum: 16 ppb
Average: 3 ppb

LEVELS PRESENT SOME CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems.[9] The highest level reported by Albuquerque in 2000 (16 ppb) does not approach the levels at which preliminary studies have suggested links to miscarriages or fetal development problems.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)
0—no known fully safe level[10]

2000 Levels[11]	Average	Maximum
	5–7 ppb	26 ppb (2000)[12]

LEVELS PRESENT SOME CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. The highest level reported by Albuquerque in 2000 (26 ppb) does not approach the levels at which preliminary studies have shown links to miscarriages or fetal development problems.

RADIOACTIVE CONTAMINANTS

Radon

National Standard (MCL) (proposed)
300 pCi/L (average)
Alternate MCL of 4,000 pCi/L where approved multimedia program is in place (average)

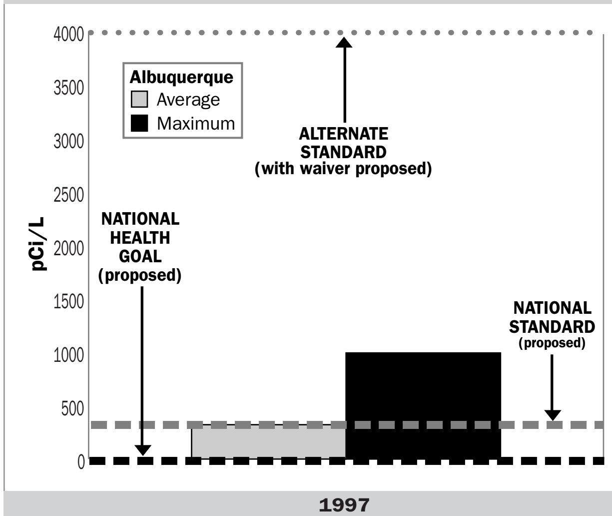
National Health Goal (MCLG) (proposed)
0—no known fully safe level

1997 Levels (most recent data reported)[13]	Average	Maximum
	321 pCi/L system-wide 149–605 pCi/L depending on location in city[14]	992 pCi/L

VIOLATION OF PROPOSED STANDARD

Radon, which results from the natural radioactive breakdown of uranium in the ground, is a radioactive gas known to cause lung and internal organ cancers. Radon levels in some areas of the city exceed the EPA's proposed radon standard, which is not yet finalized. Albuquerque has indicated it will ask for what amounts to a waiver of the proposed standard, taking advantage of a provision setting a much weaker standard for cities with indoor air radon programs (called "multimedia mitigation" programs) in place. While generally radon

RADON LEVELS



is a bigger health concern when it presents itself as gas seeping in from basements, the presence of radon in Albuquerque's drinking water is significant and presents a health risk. According to National Academy of Sciences' estimates, the cancer risk of drinking and showering in water containing 300 pCi/L of radon—a level that is less than average in Albuquerque—is about 1 in 5,000, which is twice the EPA's usual maximum acceptable cancer risk.[15]

OTHER CONTAMINANTS

A few other contaminants were found in city water, sometimes at levels above EPA health goals for tap water but not above enforceable standards. These included:

▶ **Thallium**, a trace metal that can cause damage to nerves, liver, kidney, intestines, and testicles, was found at a high of 1 ppb and an average below detection, compared to the national standard of 2 ppb and the national health goal level of 0.5 ppb.

LEVELS PRESENT SOME CONCERN

▶ **Gross alpha radiation**, known to cause cancer, was found at an average of 3 pCi/L and a of high 6 pCi/L, compared to the national standard of 15 pCi/L and national health goal of 0.

LEVELS PRESENT SOME CONCERN

▶ **1,1-dichloroethane**, an industrial solvent and degreaser, was found at a low level (0.5 ppb) in a city well near the San Jose Superfund site. The city reports that it is conducting frequent monitoring of the well due to its proximity to the Superfund site. There is no standard for this chemical in tap water.

LEVELS PRESENT SOME CONCERN

ALBUQUERQUE'S RIGHT-TO-KNOW REPORTS

Albuquerque's right-to-know reports earned grades of Fair for 2000 and Good for 2001.

On the good-citizen side of the ledger:

▶ The format of the reports and their tables was relatively user-friendly.

▶ They included maps showing the source water and what areas receive water of various qualities.

▶ They revealed information on unregulated contaminants found in the city's water, including revealing detections of **1,1-dichloroethane** in a well near the San Jose Superfund site.

▶ They admitted the presence of radon and that it is a known human carcinogen.

▶ They included useful information on source water protection, system rehabilitation, and treatment.

▶ They included some information translated into Spanish.

On the could-be-a-better-citizen side of the ledger:

▶ The 2000 right-to-know report, published in 2001, downplayed arsenic's cancer risks, incorrectly asserting that "at present, no studies of low levels of exposure have indicated a health hazard exists."[16] In fact several studies, National Academy of Sciences reports, published risk assessments, and EPA health assessments have found that arsenic at low levels of exposure presents serious health risks. The same Albuquerque report also incorrectly asserted that "Congress is now considering repealing the new [arsenic] standard."[17] Quite the contrary was true: Congress voted in 2001 to block the EPA from weakening the new 10 ppb arsenic standard. Albuquerque's report for 2001, issued in 2002, did not repeat these incorrect statements.[18]

▶ The supplier did not mention the lawsuit the city filed in 2001 against the EPA when the agency set a safer standard (10 ppb) for arsenic, nor did it mention Albuquerque's long fight against the EPA's adoption of that standard.

▶ The 2000 report stated, "When you drink Albuquerque tap water, you're drinking high quality water."[19] In fact, Albuquerque's water contains more arsenic and radon than pending or proposed EPA standards allow. The 2001 report did not repeat this statement; rather, it simply asserted that city water meets and always has met all current state and federal drinking water standards.[20]

▶ While both years' reports commendably included a map of the aquifer serving the city, neither one included any map or other specific information providing the names of pollution sources that may threaten Albuquerque's water supply. EPA rules require the reports to reveal known sources of pollutants in city water, such as factories or Superfund sites.

▶ The reports also did not provide information on the health effects of some contaminants found at levels below EPA standards but of potential health concern. These included thallium, radionuclides, and disinfection by-products. Although not legally required, this information would have assisted residents to protect their health and to fight for better protection of their water.

THREATS TO ALBUQUERQUE'S SOURCE WATER

Albuquerque Earned a Source Water Protection Rating of Poor

Albuquerque's groundwater supply, the Santa Fe Group Aquifer, underlies the Middle Rio Grande valley. The aquifer is becoming seriously depleted, and its quality is threatened by septic tanks, abandoned wells, toxic waste spills, and waste disposal sites.[21] In addition, some contaminants increase in concentration as the aquifer is depleted. Also, the city is hoping to use a Rio Grande surface water diversion in the next few years in order to tap its San Juan/Chama river entitlement delivered over the Continental Divide. The Upper San Juan system is seriously threatened with pollution.[22]

Albuquerque has three hazardous waste sites on the Superfund National Priority List (NPL) for cleanup, due at least in part to groundwater contamination threats. Two Superfund sites are in Albuquerque's predominantly Latino community of San Jose—the South Valley site and the Atchison, Topeka & Santa Fe (AT&SF) Railroad site.[23] At the South Valley site, two Albuquerque municipal wells and 20 private wells were closed because of organic solvent contamination in the 1980s.[24] Tests revealed both shallow and deep groundwater contamination, and a Superfund cleanup is ongoing.[25] Nearby is the AT&SF Superfund site, an abandoned wood-preserving facility with serious arsenic, lead, and creosote contamination. There, the uppermost portion of the drinking water source, the Santa Fe aquifer, is contaminated with creosote contaminants.[26] Within four miles of the site are 15 Albuquerque city wells, 3 Kirtland Air Force Base wells, and 148 private wells that collectively serve more than 43,000 people.[27] A citizens' group called the San Jose Community Awareness Council, working with the Southwest Organizing Project, has been fighting for cleanup of the South Valley and AT&SF sites for more than a decade.[28]

Under downtown Albuquerque, the so-called Fruit Avenue Plume Superfund site is a large mass, two-thirds of a mile long and more than 500 feet deep, of trichloroethylene (TCE)–contaminated groundwater, presumed to be the result of a now-closed dry-cleaning operation.[29] Approximately 187,000 people drink water from wells within a four-mile radius of this site.[30] Two hospital wells were seriously contaminated with TCE, and two city of Albuquerque wells are one to one and three quarter miles from the plume; one of those wells (Yale 1) recently showed trace TCE contamination.[31]

In addition, a number of other waste and underground tank contamination sites are in the city. The State of New Mexico has sued Sandia Labs and General Electric over potential toxic contaminant threats to the groundwater.

PROTECTING ALBUQUERQUE'S DRINKING WATER

Following are approaches to treating Albuquerque's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Arsenic. A number of treatment techniques are available to the city to reduce arsenic levels substantially and at a reasonable cost. The EPA estimates that a city the size of Albuquerque can treat its arsenic for less than $2 per household per month.[32] The EPA's arsenic cost estimates were found "credible" in August 2001 by an industry-dominated advisory committee created by the Bush administration, which included one of Albuquerque's key water consultants.[33] Among available treatment options are activated alumina and ion exchange with brine recycle; indeed, ion exchange has already been tested by Albuquerque. Another technology that has already been pilot-tested in Albuquerque and that could lower costs is microfiltration membranes used following chemical treatment/coagulation with ferric chloride.[34] The latter technique reduced Albuquerque's arsenic level to fewer than 2 ppb.[35] Other newer, lower-cost technologies are also becoming available, potentially including "specific anion nano-engineered sorbents," or SANS, a technology developed by Sandia Labs in Albuquerque that is slated for testing in Albuquerque.[36]

Albuquerque has been at the forefront of the fight against the national arsenic standard, arguing at various times that a new EPA standard will cost the city "$190 million to $380 million" (July 2000), or "$250 million" (April 2001), and more recently "as much as $150 million" (November 2001).[37, 38, 39] The city's most recent right-to-know report admits that the arsenic treatment cost will be $30 to $40 million if Albuquerque is allowed to access and blend Rio Grande river water with groundwater.[40] Even without resorting to Rio Grande water, according to one of Albuquerque's water consultants, CH2M Hill, the city's treatment cost will be just $40 to $60 million if the city is able to use microfiltration with ferric chloride treatment.[41] Moreover, the SANS technology, if effective, could drop the cost even further.

Radon. The EPA has found that radon levels in tap water are very inexpensive to reduce using "aeration," a technology that essentially bubbles air through the water. The cost per household is less than $0.80 per

ALBUQUERQUE

City of Albuquerque Public Works Department
Water Utility Division
P.O. Box 1293
Albuquerque, NM 87103
505-857-8260
www.cabq.gov/waterquality/index.html

WATER UTILITY INFORMATION

month for families served by a utility the size of Albuquerque's, according to the EPA.[42]

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

- **Attend meetings of the local water supplier,** the Albuquerque Public Works Department's Water Utility Division. Check the right-to-know report or call and ask for dates, times, and locations.
- **Get involved in source water assessment and protection efforts** by contacting the utility or find a state government contact by calling the Safe Drinking Water Hotline at 800-426-4791.

Peer reviewers for the Albuquerque report included Dr. Linda Greer, NRDC, and Andrew Kelton, Amigos Bravos (Taos, New Mexico).

NOTES

1 Environmental Protection Agency, Safe Drinking Water Information Database.

2 "Albuquerque 2000 Water Quality Report," p. 8; see also note 5.

3 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

4 Pp. 6–7 (compliance samples taken directly from wells). In certain cases, treatment may slightly reduce these levels. Albuquerque reports averages of 2 ppb to 29 ppb in the distribution system after treatment, depending upon the location, but says these were not formal EPA-required compliance samples, so we do not rely upon them. Ibid., p. 11.

5 See note 2, "Albuquerque 2001 Water Quality Report," page 2.

6 National Academy of Sciences, National Research Council, *Arsenic in Drinking Water: 2001 Update* (National Academy Press, 2001, available online at www.nap.edu/catalog/10194.html The accompanying press release, also available on the website, simply explains the NAS risk calculations. In providing Albuquerque's cancer risk estimate, NRDC has simply interpolated between the NAS's 10 and 20 ppb risk estimates.

7 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacettic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

8 "Albuquerque 2001 Water Quality Report," April 2002, p. 3; date of detection not reported, but presumed to be 2000 (EPA rules generally require reporting of previous calendar year's testing data unless otherwise indicated).

9 Health effects information on disinfection by-products is summarized from NRDC, *Trouble on Tap* (1995); NRDC, *Bottled Water: Pure Drink or Pure Hype?* (1999), available online at www.nrdc.org/water/drinking/bw/bwinx.asp, and EPA, draft Preamble for Stage 2 Disinfection By-products Regulation, available online at www.epa.gov/safewater/mdbp/st2dis-preamble.pdf.

10 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

11 "Albuquerque 2000 Water Quality Report," April 2001.

12 A maximum level of trihalomethanes of 5.2 ppb was reported in Albuquerque's 2001 right-to-know report. Based upon the previous year's data, it appears that this was the highest quarterly average for 2001, not the actual maximum level recorded; EPA's rules have been interpreted by many water systems to authorize reporting the highest quarterly average trihalomethane level as the maximum.

13 See note 8.

14 "Albuquerque 2001 Water Quality Report," April 2002, p. 3.

15 National Academy of Sciences cancer risk estimates, cited in EPA, Proposed Radon in Drinking Water Rule, 64 Fed. Reg. 59246, 59270 (Table VII.1) (November 2, 1999).

16 "Albuquerque 2000 Water Quality Report," April 2001, p. 11.

17 "Albuquerque 2000 Water Quality Report," April 2001, p. 11.

18 "Albuquerque 2001 Water Quality Report," April 2002.

19 "Albuquerque 2000 Water Quality Report," April 2001, p. 1.

20 "Albuquerque 2001 Water Quality Report," April 2002.

21 Doug Earp, Jeanne Pestlethwait, and Jean Witherspoon, "Albuquerque's Environmental Story: Environment Topic: Water," available online at www.ci.albuquerque.nm.us/aes/s5water.html; Albuquerque Water Quality Report, April 2001, pp. 2–3.

22 EPA, Index of Watershed Indicators, Upper San Juan River, available online at www.epa.gov/iwi/hucs/14080101/score.html#.

23 EPA Region 6, National Priority List Fact Sheet, AT&SF Railroad (Albuquerque) Site (November 2001); EPA Region 6, National Priority List Fact Sheet: South Valley Site (November 2001); Delores Herrera, "Albuquerque's Environmental Story: Environment Topic: Environmental Justice," available online at www.ci.albuquerque.nm.us/aes/s5enjus.html, (1996).

24 EPA Region 6, National Priority List Fact Sheet: South Valley Site (November 2001).

25 Ibid.

26 EPA Region 6, National Priority List Fact Sheet, AT&SF Railroad (Albuquerque) Site (11/01).

27 Ibid.

28 Delores Herrera, "Albuquerque's Environmental Story: Environment Topic: Environmental Justice," available online at www.ci.albuquerque.nm.us/aes/s5enjus.html (1996).

29 EPA Region 6, National Priority List Fact Sheet, Fruit Avenue Plume Superfund Site (November 30, 2001).

30 Ibid.

31 Ibid.

32 EPA, Final Arsenic National Primary Drinking Water Regulation, 66 Fed. Reg. 6976, 7011 (Table III.E.2) (January 22, 2001).

33 National Drinking Water Advisory Council, "Arsenic Costs Work Group, Report of the Arsenic Cost Working Group to the National Drinking Water Advisory Council," p. 2 (August 14, 2001).

34 City of Albuquerque, "Arsenic Removal," available online at cabq.gov/waterresources/arsenicremoval.html; EPA, "Arsenic in Drinking Water Treatment Technologies: Removal" (available online at epa.gov/safewater/ars/treat.html).

35 EPA, ibid, at 3.

36 S.J. Ludescher, "Sandia Process Traps Arsenic Cheaply," *Albuquerque Tribune,* p. A1 (May 29, 2001); Sandia National Laboratories, "Sandia Arsenic Catchers Could Help Communities Supply Safer Drinking Water Affordably," News Release, May 24, 2001 (available online at www.sandia.gov/media/NewsRel/NR2001/sanssorb.htm).

37 "Albuquerque 1999 Water Quality Report," July 2000.

38 S.J. Ludescher, "Sandia Process Traps Arsenic Cheaply," *Albuquerque Tribune,* p. A1 (May 29, 2001) (citing estimate from "city officials").

39 Ollie Reed, "Arsenic Ruling May Cost City Millions," *Albuquerque Tribune,* p. A1 (November 1, 2001) (quoting Water Resources Manager John Stomp).

40 "Albuquerque Water Quality Report," April 2001, p. 11; Stomp confirmed this $30 to 40 million figure in November 2001. Ollie Reed, "Arsenic Ruling May Cost City Millions," *Albuquerque Tribune,* p. A1 (November 1, 2001).

41 Steve Shoup, "City to Test Reducing Arsenic in Water," *Albuquerque Journal,* p. A1 (November 10, 2000).

42 EPA, Proposed Radon in Drinking Water Rule, 64 Fed. Reg. 59246, 59328 (Table XIII.11) (November 2, 1999).

ATLANTA, GA

Atlanta Earned a Water Quality and Compliance Grade of Fair in 2000 and in 2001

The city water supply failed the national turbidity standard and has levels of haloacetic acids, total coliform bacteria, and lead that are of concern, although they do not violate national standards.

▶ **Haloacetic acids,** by-products of chlorine disinfection that may cause cancer, occur at levels just below a new standard that became effective in January 2002.

▶ Up to 2.4 percent of monthly water samples in 2001 contained **total coliform bacteria,** microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Levels were of concern but did not violate the national standard.

▶ Tests of the city's water found **lead** in 7.5 percent of tested homes' tap water at levels that exceeded the national action level. Although findings represent a health risk to the homes affected, up to 10 percent of homes are allowed to exceed the national action level, and therefore no violation occurred. Lead can cause permanent brain and nervous system damage as well as problems with growth, development, and behavior.

▶ For three months of 2000 and 2001, United Water Services Atlanta did not meet the national standard for **turbidity**—cloudiness that can indicate that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns. United reports that the turbidity was caused not by contamination but by treatment chemicals and presented no health risk.

ATLANTA
System Population Served **Nearly 1 million[1]**
Water Quality and Compliance **2000▶Fair** **2001▶Fair**
Right-to-Know Report—Citizenship **2000▶Fair** **2001▶Fair**
Source Water Protection **Poor**
REPORT CARD

Noteworthy

▶ In general, Atlanta's water system needs **substantial rehabilitation**. Some segments of it are a century old.

Atlanta's Right-to-Know Reports Earned a Grade of Fair for 2000 and 2001

▶ The reports were relatively user-friendly and generally met the minimum requirements of the EPA's right-to-know report rule, while making no overarching claims that the water is absolutely safe. However, the reports had some shortcomings, including a false claim that the city's water "meets" and "surpasses all EPA standards," even though Atlanta apparently failed to meet the EPA's turbidity standard in 2000–2001.

Atlanta Earned a Source Water Protection Grade of Poor

▶ Major threats to the city's water supply include polluted runoff from urban, suburban, and agricultural areas; new development, which can cause sedimentation and erosion; and more than 1,400 identified potential point source polluters, including hundreds of fuel and hazardous waste facilities and more than 100 large industries using hazardous chemicals.[2]

KEY CONTAMINANTS IN ATLANTA'S WATER

The following contaminants have been found in Atlanta's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Cryptosporidium (Crypto)

National Standard (MCL)
Treatment Technique (TT)

Draft Proposed New National Standard[3]
<7.5 organisms/100 liters (average); no additional treatment
7.5–100 organisms/100 liters (average); some additional treatment (>90% *Crypto* kill)
100–300 organisms/100 liters (average); significant additional treatment (>99% *Crypto* kill)
>300 organisms/100 liters (average); advanced treatment (>99.7% *Crypto* kill)

National Health Goal (MCLG)
0—no known fully safe level

National Requirements
Most large- and medium-sized water utilities that use surface water are required to monitor for *Crypto* and report results in their right-to-know reports; they eventually may be required to use advanced treatment if significant levels are found.

1997 Levels[4]	Low	Maximum
Untreated (raw) water	nondetectable	1,923 cysts per 100 liters
Treated (finished) water	nondetectable	

LEVELS PRESENT SOME CONCERN

Cryptosporidium (*Crypto*) is a waterborne microbial disease that presents human health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the elderly, children, and people who have undergone organ transplants. Under a negotiated EPA rule that is out in draft proposed form and is soon scheduled to be proposed formally in *The Federal Register,* water utilities that find significant levels of *Crypto* will have to use more effective treatment to kill the pathogen.

United Water Services (UWS) Atlanta is forthright about the health implications of *Crypto*.[5] Testing has found *Crypto* in the source water from the Chattahoochee River at the point where it is brought into the city's water treatment plants. Levels of *Crypto* in the raw water (that is, before treatment) for Atlanta's treatment plants have sometimes been quite high—up to 1,923 cysts per 100 liters (measured in 1997).[6] UWS Atlanta says it has not found *Cryptosporidium* in its finished (treated) drinking water. This finding is not unusual, however, because methodological problems make it all but impossible to actually detect the pathogen in *treated* drinking water; generally, only higher levels in untreated water are detectable.

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[7]

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels[8]
2% in highest month, total coliform positive

2001 Levels[9]
2.4% in highest month, total coliform positive

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Coliform bacteria are on occasion found in Atlanta's finished tap water. The highest reported level in any month was 2.4 percent, meaning that 2.4 percent of samples taken were found to contain total coliform bacteria. The federal standard allows up to 5 percent total coliform–positive samples per month. The health goal for any type of coliform bacteria is 0. So while the coliform bacteria finding in Atlanta is not viewed as serious, it may indicate some regrowth of bacteria in the water mains after the water leaves the treatment plant. Some studies suggest that serious regrowth problems may allow disease-causing pathogens to subsist in pipes. Rehabilitation and renewal of the water distribution system will help Atlanta's century-old system address bacterial problems in pipes and prevent them from becoming more serious.

Turbidity

National Standard (TT) (in Nephelometric Turbidity Units, or NTU)
Filtered water
0.5 NTU 95% of the time (through 2001)
0.3 NTU 95% of the time (effective in 2002)
1 NTU 100% of the time (effective in 2002)
Unfiltered water
5 NTU maximum, 100% of the time

2000 Levels[10]

September	93.6% of samples <0.5 NTU
November	94.3% of samples <0.5 NTU

2001 Levels

January	90% of samples <0.5 NTU

LEVELS PRESENT HIGH CONCERN

Turbidity is a measure of the cloudiness of water and is used as an indicator that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns. In addition, turbidity can interfere with water disinfection because it can impede the effectiveness of chlorine or other chemical disinfectants. UWS Atlanta's water supply did not meet the national standard for turbidity during three separate months in 2000 and 2001: September and November 2000 and January 2001. UWS Atlanta says that the excessive turbidity was the result of chemicals added to the water, not from mud or other contamination problems, that the problem is now fixed, and that these exceedances were not violations. The EPA's rules, however, include no exemption for added chemicals, and excessive turbidity of any sort can interfere with effective monitoring. However, the state of Georgia apparently did not report these as violations to the EPA, so they do not appear in the EPA's violations database. The problem apparently was remedied in 2001, and the system has reported no turbidity problems since January 2001.

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[11]

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels[12]
9.2 ppb at the 90th percentile home; 3 out of 51 (6%) homes tested exceeded national standard

2001 Levels[13]
5 ppb at the 90th percentile home; 4 out of 53 (7.5%) homes tested exceeded national standard

LEVELS PRESENT SOME CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function, and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. Though not sufficiently widespread to trigger an exceedance of the national standard, elevated levels of lead in many homes in Atlanta (7.5 percent of homes tested in 2001) may present health concerns for those affected. Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

Haloacetic Acids

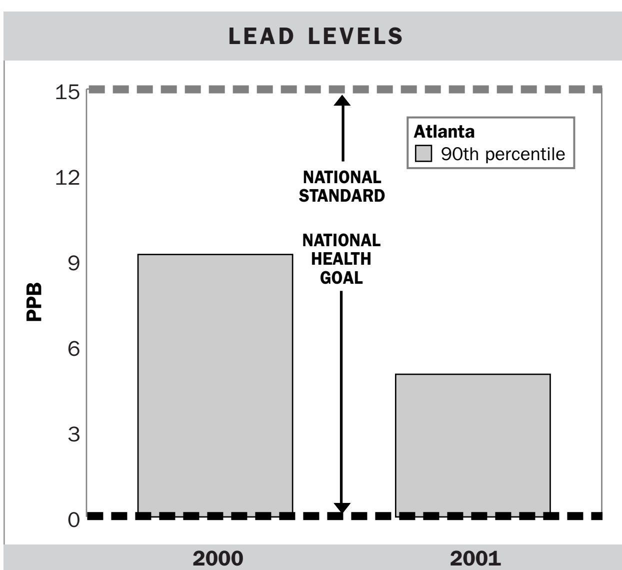
National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

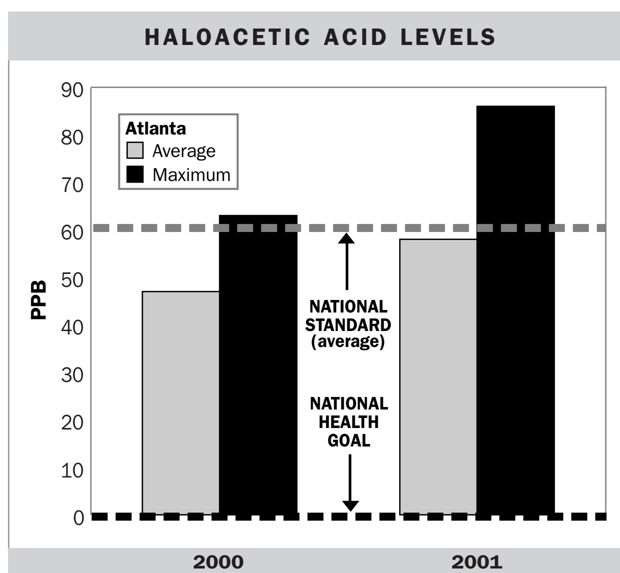
National Health Goal (MCLG)
0—no known fully safe level[14]

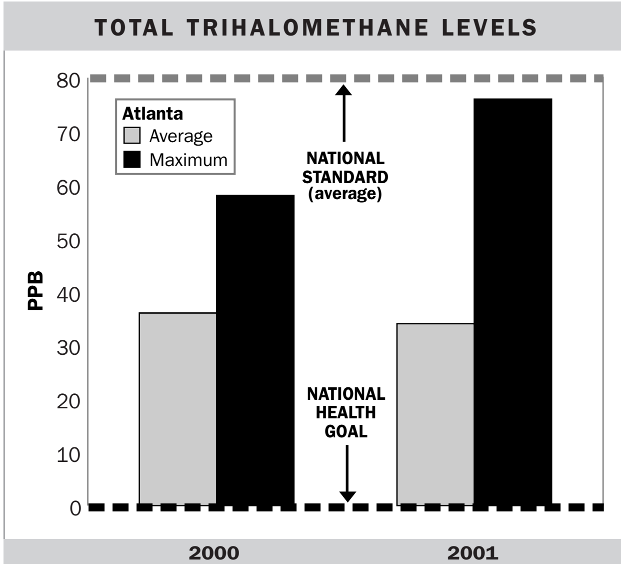
	Average	Maximum
2000 Levels[15]	47 ppb	63 ppb
2001 Levels[16]	58 ppb	86 ppb

LEVELS PRESENT HIGH CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Atlanta's haloacetic acid levels in 2001 were just barely below the national standard that took effect in January 2002. As discussed in Chapter 5, the EPA standard is not based exclusively upon health but rather on a weighing of health risks versus treatment options, costs, and other considerations. Atlanta's elevated levels of haloacetic acids represent a health concern.







Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)
0—no known fully safe level[17]

2000 Levels[18]	Average 36 ppb	Maximum 58 ppb
2001 Levels	Average 34 ppb	Maximum 76 ppb

LEVELS PRESENT SOME CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. The levels in Atlanta's water average less than half of the national standard and are potentially of less concern than are haloacetic acids.

ATLANTA'S RIGHT-TO-KNOW REPORTS

Atlanta's Right-to-Know Reports Earned a Grade of Fair in 2000 and 2001

On the good-citizen side of the ledger:

▸ The 2000–2001 reports generally met the minimum requirements of the EPA's right-to-know report rule.

▸ The reports made no overarching claim that the water is absolutely safe.

▸ The format of the reports was relatively user-friendly.

On the could-be-a-better-citizen side of the ledger:

▸ The reports asserted that the system "meets" and "surpasses all EPA standards," when Atlanta apparently did not meet the turbidity rules. UWS Atlanta contends that problem was not due to contamination; nevertheless, its monitoring data show that the turbidity requirements were not met.

▸ The reports included neither maps nor detailed narratives noting the specific polluters in the watershed. EPA rules require water systems to include information on known polluters in their watersheds in their right-to-know reports.

▸ The reports also do not provide information on the health effects of some contaminants found at levels below EPA standards but above EPA health goals, such as haloacetic acids. Although not legally required, this information would assist local citizens in protecting their health and in fighting for better protection of their water.

THREATS TO ATLANTA'S SOURCE WATER

Atlanta Earned a Source Water Protection Rating of Poor for 2000 and 2001

EPA's Index of Watershed Indicators (IWI) has ranked the source waters of the city's water supply, the Upper Chattahoochee River, as a 6, the worst possible rating.[19] The IWI ranking describes the river's water as having "more serious problems" and "high vulnerability" to contamination.

The city of Atlanta and the Atlanta Regional Commission conducted an assessment of the vulnerability of the system's source water to pollution and made findings publicly available at www.atlantaregional.com/swap/. The source water assessment identified nonpoint sources of pollution as a major concern and also discussed hundreds of potential point sources of pollution in the watershed—without naming them in the publicly available document. A table from that assessment appears on page 102.

Urban sprawl is among the sources of pollution discharge into the Chattahoochee; it causes urban and suburban polluted runoff, as well as polluted runoff from agricultural sources and point source

Chattahoochee River Water Supply Watershed Inventory of Potential Point Sources of Pollution

Potential Pollutant Source Facilities	Number of Facilities
Agriculture	24
Airports	4
Asphalt Plants	4
Electric Substations	30
Fuel Facilities	438
Garbage Transfer Stations	6
Hazardous Waste Facilities	558
Junk/Scrap/Salvage Yards	18
Landfills	17
Large Industries Which Have Federal Categorical Standards	11
Large Industries Which Utilize Hazardous Chemicals	121
Land Application Site (LAS) Permit Holders	5
Lift Stations	78
Mines	14
NPDES Permit Holders	23
Recycling Centers	15
Water Treatment Plants	13
Wastewater Treatment Facilities	1
Oil/Gas Pipelines Crossing Streams	49
Total	**1,429**

Source: Atlanta Regional Commission, “Source Water Assessment Project: An Assessment of Potential for Pollution of Surface Drinking Water Supply Sources: City of Atlanta Water Department Drinking Water Supplied from the Chattahoochee River Watershed” (December 2001).

pollution from industries. Some of these point sources are shown on the map below. According to some experts, the two greatest threats to the water quality in the Chattahoochee watershed are sedimentation and erosion from development in vulnerable areas of the watershed and increased amounts of polluted runoff, as forested woodlands are transformed into impermeable roads, parking lots, buildings, and other associated structures.

According to the *Chattahoochee RiverKeeper*, while nonpoint source pollution is the biggest problem for the river, “in the upper Chattahoochee River basin (Helen to West Point Dam), 159 municipalities and industries are permitted to discharge specific levels of pollutants into the river.”[20]

PROTECTING ATLANTA’S DRINKING WATER

Following are approaches to treating Atlanta’s drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Atlanta could reduce its relatively high levels of disinfection by-products by using ozone or ultraviolet (UV) light as a primary disinfectant, instead of chlorine/hypochlorite. Ozone is a gas that can be created at the treatment plant and captured after use so it does not cause air pollution. It can be bubbled through the water to kill pathogens. As an alternative, UV light also can be created at the plant using special lightbulbs. Both ozone and UV are extremely effective at killing all pathogens in tap water, including chlorine-immune organisms like *Cryptosporidium*. UV creates no known disinfection by-products, and ozone creates lower amounts of most harmful by-products of concern than chlorine does.

As an interim step, Atlanta could reduce its by-products somewhat by switching to chloramines as a residual disinfectant rather than just sodium hypochlorite. It would still need chloramines in its pipes even after switching to ozone or UV. The city could also further reduce these contaminants by using activated carbon, which would remove the organic matter that reacts with the disinfectant to create by-products. In addition, although Atlanta reports that it has never found viable *Cryptosporidium* in its finished drinking water, ozone or ultraviolet light would offer a measure of additional assurance that *Crypto* poses no risk to residents.

Moreover, rehabilitation and renewal of the water distribution system, which suffers from deferred maintenance, is needed.

Until January 2003, Atlanta was the largest U.S. city to privatize its water. For four years, United Water Services Atlanta ran the city’s water services. But when citizens and government officials, including Atlanta Mayor Shirley Franklin, raised concerns about Atlanta’s tap

ATLANTA

United Water Services Atlanta
Operations Department, 651 14th Street, N.W.
Atlanta, GA 30318
One-Call Customer Service Center at 404-658-6500
www.unitedwater.com/atlanta.htm.

WATER UTILITY INFORMATION

water—including alleged poor customer service, localized boil water orders, failure to promptly and adequately respond to water main breaks, widespread meter problems, complaints about muddy or discolored water, among other issues—the city canceled its contract.[21, 22] United Water said that it was losing money on the deal and that most of these problems stemmed from long-term deferred maintenance from before the firm took over.[23]

United Water had planned to launch a rehabilitation and renewal effort, and now this problem will be the city government's responsibility. Such rehabilitation will help prevent bacterial problems and water main breaks in the city's nearly century-old system from becoming more serious.

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

- **Work for strong protections of the Chattahoochee River,** including enforcement of current polluter permits and restrictions, stricter controls on development in sensitive areas of the watershed, and buffer strips along the river and its tributaries.
- **Learn about the sources of pollution in Atlanta's watershed** by checking the source water assessment at www.atlantaregional.com/swap/ or by contacting Matthew Harper at the Atlanta Regional Commission, 40 Cortland Street, N.E., Atlanta, GA 30303.
- **Get involved in source water protection efforts** by contacting Sue Grunwald, Georgia Environmental Protection Division, 404-656-4807.
- **Learn more from:**
  - The Upper Chattahoochee RiverKeeper, http://ucriverkeeper.org

Peer reviewers of the Atlanta report included Erica Frack, M.D., M.P.H., Department of Family and Preventative Medicine, Emory University School of Medicine; Linda Greer, Ph.D., senior scientist, NRDC; Darcie Boden, Upper Chattahoochee RiverKeeper; Jennifer Giegerich, Georgia PIRG; and Dr. Curtis Hollabaugh, professor, State University of West Georgia.

NOTES

1 According to Atlanta's right-to-know report, the Atlanta water system serves "nearly 1 million residents in the Atlanta metropolitan area." The Environmental Protection Agency Safe Drinking Water Information System (SDWIS) reports that Atlanta serves 650,000 people but apparently does not count some people who live outside of the city who are served. The EPA's data are available online at http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=507527&pwsid=GA1210001&state=GA&source=Surface%20water%20&population=650000&sys_num=0 (visited March 29, 2002).

2 Atlanta Regional Commission, "Source Water Assessment Project: An Assessment of Potential for Pollution of Surface Drinking Water Supply Sources: City of Atlanta Water Department Drinking Water Supplied from the Chattahoochee River Watershed" (December 2001), available online at www.atlantaregional.com/SWAP/; Chattahoochee RiverKeeper, "Chattahoochee River Facts," available online at http://ucriverkeeper.org/mmnavind.htm.

3 See EPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) Preproposal Draft Regulatory Language For Stakeholder Review, posted at www.epa.gov/safewater/mdbp/st2dis.html The 1, 2, and 2.5 minimum log removal requirements are converted into percentage removals for simplicity. This rule has not been formally proposed in *The Federal Register*, but was agreed to by EPA, NRDC, public health groups, cities, and the water utility industry. See *Ibid* for the "FACA Stakeholder Agreement in Principle."

4 See EPA ICR Database for Atlanta, available online at www.epa.gov/enviro/html/icr/utility/report/GA1210001961004132938.html.

5 United Water states:

> *When ingested,* Crypto can *cause symptoms such as nausea, diarrhea and abdominal cramps. Most healthy individuals are able to overcome the disease within a few weeks. However, immunocompromised people have more difficulty and are at greater risk of developing severe, life-threatening illnesses. Immunocompromised individuals are encouraged to consult their doctor regarding appropriate precautions to prevent infection.* Cryptosporidium *must be ingested for it to cause disease, and it may be spread through means other than drinking water."*

United Water Services Atlanta, "2000 Water Quality Report" (2001).

6 See, EPA ICR Database for Atlanta, available online at www.epa.gov/enviro/html/icr/utility/report/GA1210001961004132938.html.

7 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

8 United Water Services Atlanta, "2000 Water Quality Report" (2001).

9 United Water Services Atlanta, "2001 Water Quality Report" (2002).

10 United Water Services Atlanta, "2000 Water Quality Report" (2001); United Water Services Atlanta, "1999 Water Quality Report" (2000).

11 The action level standard for lead is different than the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

12 See note 8.

13 See note 9.

14 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

15 See note 8.

16 See note 9.

17 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

18 United Water Services Atlanta, "2000 Water Quality Report" (2001); United Water Services Atlanta, 1999 Water Quality Report (2000).

19 See EPA, IWI, available online at www.epa.gov/iwi/hucs/03130001/score.html.

20 *Chattahoochee RiverKeeper*, "Chattahoochee River Facts," available online at http://ucriverkeeper.org/mmnavind.htm.

21 Rick Brooks and Carrick Mollenkamp, "Companies: Suez Unit, Atlanta Quit Privatization Contract," *Wall Street Journal Europe,* January 27, 2003; D.L. Bennett, "Atlanta, Water Firm Split: Pact Dissolved After 4 Contentious Years," *Atlanta Journal-Constitution,* January 25, 2003.

22 D.L. Bennett and Julie Hairson, "Atlanta May Throw Out United Water: Privatization Has Not Met City Officials' Expectations," *Atlanta Journal-Constitution,* January 19, 2003; Rick Brooks and Carrick Mollenkamp, "Companies: Suez Unit, Atlanta Quit Privatization Contract," *Wall Street Journal Europe,* January 27, 2003; D.L. Bennett, "Atlanta, Water Firm Split: Pact Dissolved After 4 Contentious Years," *Atlanta Journal-Constitution,* January 25, 2003; Marianne Lavelle and Joshua Kurlantzick, "The Coming Water Crisis: Many Billions Will Be Needed to Quench America's Thirst, But Is Private Business the Answer?" *US News & World Report,* pp. 22–30, August 12, 2002; "North Atlanta Must Boil Water," *Atlanta Journal-Constitution,* July 6, 2002.

23 See notes 21–22.

BALTIMORE, MD

Baltimore Earned a Water Quality and Compliance Grade of Failing for 2000 but Improved to Good in 2001

The city failed to meet turbidity standards in 2000 but improved performance in 2001. The city also had levels of lead, haloacetic acids, and total trihalomethanes that approached but did not exceed national standards, presenting health concerns.

▶ Baltimore violated the national **turbidity** standard in February 2000 and was forced to issue an unusual city-wide boil-water alert. Turbidity, cloudiness, can indicate that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns. This potentially serious health risk is the reason Baltimore received a failing water quality grade. Baltimore had no reported violations in 2001 and substantially improved its performance for turbidity and certain other contaminants, earning a grade of Good.

▶ In 2000 and 2001, Baltimore came close to exceeding the national standard for **lead**. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior.

▶ Though still below the national standard, average levels of **haloacetic acids,** by-products of chlorine disinfection that may cause cancer, may still present health risks because national standards for these chemicals are not fully health protective.

BALTIMORE
System Population Served **1,600,000[1]**
Water Quality and Compliance **2000▶Failing** **2001▶Good**
Right-to-Know Report—Citizenship **2000▶Fair** **2001▶Good**
Source Water Protection **Fair**
REPORT CARD

▶ Although average levels measured below national standards, we noted in 2001 a spike in levels of **total trihalomethanes**, by-products of chlorine treatment in drinking water, linked with cancer, miscarriages, and birth defects.

Baltimore's Right-to-Know Reports Earned a Grade of Fair in 2000 and Good in 2001

▶ The reports included extensive information about the turbidity violation as well as advice on minimizing lead exposure. But the Web report in 2000 violated EPA rules by listing only the peak and the range of levels of contaminants, and the 2000 and 2001 reports included a number of errors and violations of EPA right-to-know requirements.

Baltimore Earned a Source Water Protection Grade of Fair

▶ The city's water sources have moderately high vulnerability to pollution from agricultural and urban runoff, a high vulnerability to pollution from population growth, and significant atmospheric deposition of nitrogen and phosphorous.

KEY CONTAMINANTS IN BALTIMORE'S WATER

The following contaminants have been found in Baltimore's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Turbidity

National Standards (TT) (in Nephelometric Turbidity Units, or NTU)
Filtered water
0.5 NTU 95% of the time (through 2001)
0.3 NTU 95% of the time (effective in 2002)
1 NTU 100% of the time (effective in 2002)
Unfiltered water
5 NTU maximum, 100% of the time

2000 Levels
8 NTU maximum

2001 Levels
0.4 NTU maximum

2000 LEVELS PRESENT VIOLATION
2001 LEVELS PRESENT HIGH CONCERN

Turbidity is a measure of the cloudiness of water and is used as an indicator that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns. In addition, turbidity can interfere with water disinfection because it can impede the effectiveness of chlorine or other chemical disinfectants. In February 2000, the water at Baltimore's Ashburton Filtration Facility measured 8 units of turbidity, exceeding the national standard. The spike presented a potentially serious health risk, forcing the city to issue a citywide boil-water order to its consumers. In 2001, the city substantially improved its record, with a high turbidity level of 0.4 NTU.

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[2]

National Health Goal (MCLG)
0—no known fully safe level

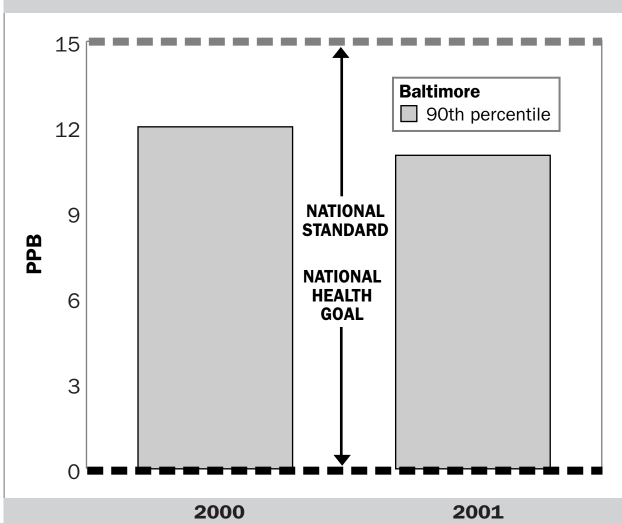
2000 Levels[3]
12 ppb at the 90th percentile home; no violation

2001 Levels[4]
11 ppb at the 90th percentile home; three homes tested exceeded the 15 ppb national standard; no violation

LEVELS PRESENT HIGH CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior, as well as adversely affect blood pressure, red blood cells, and kidney and nervous system function. Although Baltimore appears to have met the EPA lead rule's requirement that no more than 10 percent of homes tested can exceed the action level of 15 ppb, Baltimore's 11 to 12 ppb test result indicates that many residents may be consuming unnecessarily high lead levels, a particular concern for children and pregnant women. Consumers, particularly those with infants or young children who are more susceptible to lead, may want to test their water for lead (call the Drinking Water Hotline, 800-426-4791, to find a lab) or may want to flush their faucet of lead by running it for a minute or so before drinking from it or making a baby bottle with the water (save the water for plants or other uses).

LEAD LEVELS



ORGANIC CONTAMINANTS

Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective 2002; no previous standard

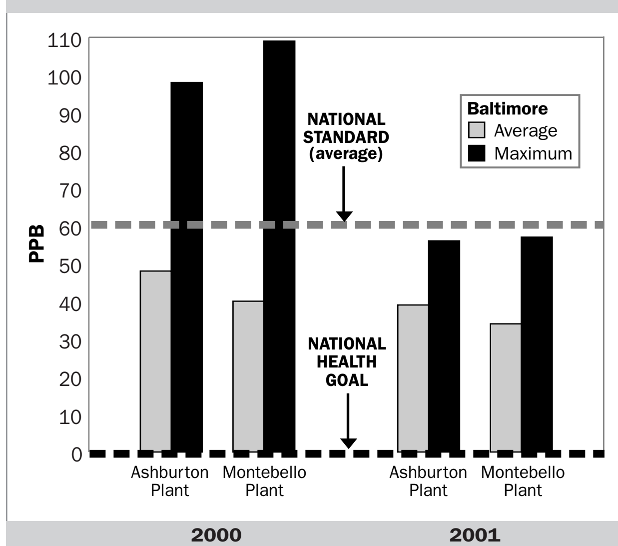
National Health Goal (MCLG)
0—no known fully safe level[5]

2000 Levels[6]	Average	Maximum
Ashburton Plant	48 ppb	98 ppb
Montebello Plant	40 ppb	109 ppb

2001 Levels[7]	Average	Maximum
Ashburton Plant	39 ppb	56 ppb
Montebello Plant	34 ppb	57 ppb

LEVELS PRESENT HIGH CONCERN

HALOACETIC ACID LEVELS



Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Baltimore's levels averaged below 40 ppb in 2001, lower than the city's 2000 levels, and lower than a new 60 ppb EPA standard that became effective in 2002. Occasional haloacetic acid level spikes in Baltimore's water exceed the new standard, although no violation is threatened because the standard is based on average, not peak, levels. As discussed in Chapter 5, the EPA standard is not based exclusively upon health but rather is based on a weighing of treatment options, costs, and other considerations versus health risks. Baltimore's elevated levels of haloacetic acids present a serious health concern.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

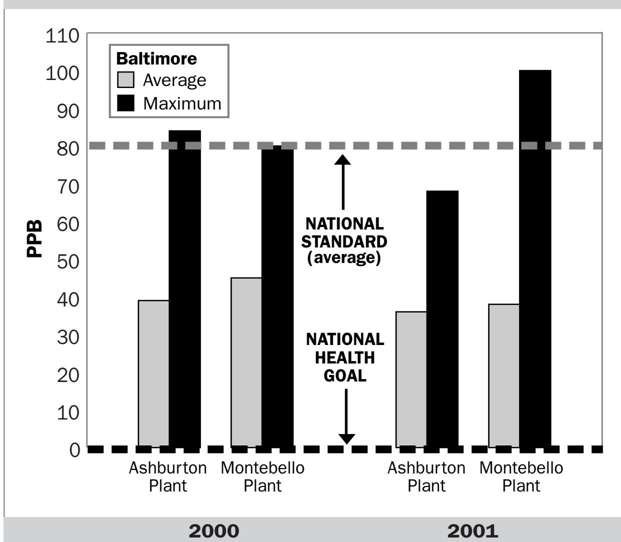
National Health Goal (MCLG)
0—no known fully safe level[8]

2000 Levels[9]	Average	Maximum
Ashburton Plant	39 ppb	84 ppb
Montebello Plant	45 ppb	80 ppb
2001 Levels[10]	Average	Maximum
Ashburton Plant	36 ppb	68 ppb
Montebello Plant	38 ppb	100 ppb

LEVELS PRESENT SOME CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. As discussed in Chapter 5, the EPA standard is not based exclusively upon health but rather on a weighing of treatment options, costs, and other considerations versus health risks. Baltimore's levels of trihalomethanes (particularly the occasional high spikes above the standard) are of some health concern but do not constitute a violation. The standard is based on average levels, and the city's averages are well below the new EPA standard.

TOTAL TRIHALOMETHANE LEVELS



BALTIMORE'S RIGHT-TO-KNOW REPORTS

Baltimore's Right-to-Know Reports Earned a Grade of Fair in 2000 and Good in 2001

On the good-citizen side of the ledger:

- The 2000 report made extensive note of the EPA's health effects information in discussing the city's violation of turbidity.
- The report offered a variety of good information on the website and gave advice on minimizing lead exposure by flushing home taps and on not using hot water from the tap.

On the could-be-a-better-citizen side of the ledger:

- The Web report for 2000 violated EPA rules by listing the peak and the range of levels of contaminants (such as haloacetic acids and trihalomethanes) but not average levels. As a result, it was impossible for consumers to determine whether Baltimore complied with the EPA's standards, which are based on average levels. Baltimore fixed the problem in its 2001 report.
- Neither year's report specified the number of samples taken for lead analysis, so the information that three samples exceeded EPA's action level in 2001 was impossible to interpret. The report included several other errors:
  - The values for the highest levels detected of arsenic, chromium, and lead were reported in the 2000 report in parts per million, while the health goals and the EPA standards were listed in parts per billion. This violates EPA reporting rules, and for the average consumer, comparison would be difficult. This problem was fixed in the 2001 report.

- ▸ In the "Key to Abbreviations," the legend for ppb was incorrect in 2000.
- ▸ The 2001 Web version of the report included no key abbreviations, no glossary, and no explanations of units. This violates EPA right-to-know report rules.
- ▸ The values for nitrates in the 2000 Web report did not match values in the copy mailed to consumers.
- ▸ Some key information in data tables was truncated and unreadable on the Web, including information on the sources of some contaminants in the 2001 report and information on the contaminants in the 2000 report.

▸ The reports included neither maps nor any detailed narrative noting the specific polluters in the watershed. EPA rules require the reports to name any specific polluters known by the water system.

▸ The reports also did not provide information on the health effects of some contaminants found at levels *below* EPA standards but *above* EPA health goals. Although not legally required, this information would have assisted citizens in protecting their health and in working for better drinking water.

THREATS TO BALTIMORE'S SOURCE WATER

Baltimore Earned a Source Water Protection Grade of Fair

Baltimore's water supply relies on surface water from rainfall and snowmelt, collected and stored in reservoirs outside the city. Three major impoundments (the Liberty, Loch Raven, and Prettyboy Reservoirs) derive water from two water sources (Gunpowder and Patapsco Watersheds) and one river (the Susquehanna). Water from the Liberty Reservoir and upstream sources is treated at the Ashburton Water Filtration Plant, while water from Loch Raven and Prettyboy Reservoirs is treated at the Montebello plant.

EPA's Index of Watershed Indicators has determined that the Gunpowder and Patapsco Watersheds have less serious contamination problems but is highly vulnerable to contamination. The watersheds received an overall index rating of 4, on a scale of 1 to 6, with 6 being the worst rating.[11] (For more information on the Index of Watershed Indicators and other data sources, please refer to the discussion of NRDC's grading methodology for its Source Water Protection grade.) In particular, the Gunpowder and Patapsco Watersheds are highly susceptible to contamination from urban runoff–pollution that occurs when water passes through an urban environment, picking up particles, dirt, and chemicals, and flows into the water resources of the area.

The watersheds are also affected by agricultural runoff, with a potential for nitrogen, pesticide, and sediment runoff from farm fields into the rivers and streams that serve as the city's water supply. In addition, a state monitoring waiver has apparently been issued for certain pesticides used in the watershed, with the result that concentrations of these chemicals are not documented in the public record.

Similarly, the Susquehanna River is also threatened by a variety of point and nonpoint pollution sources, including agriculture, runoff from urbanization, sewage, and industry sources. The EPA's IWI has ranked it as a 4 on the 1 to 6 scale, based upon these threats.[12]

PROTECTING BALTIMORE'S DRINKING WATER

Following are approaches to treating Baltimore's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Baltimore's treatment plants process river water using several methods:

▸ prechlorination—dosing the water with chlorine prior to other treatment

▸ coagulation—adding a chemical to help the mud and suspended matter in the water clump together

▸ flocculation—stirring the water to encourage clumping

▸ sedimentation—allowing clumps to settle to the bottom

▸ filtration—running the water through sand to filter out some remaining suspended solids

▸ fluoridation—adding fluoride

▸ postchlorination—adding chlorine after other treatments to ensure that some chlorine is in the water and in the pipes to prevent recontamination

▸ corrosion control treatment—adding a chemical to make the water less acidic so that it will not leach lead and other metals from the pipes

Baltimore could reduce disinfection by-products somewhat by switching to chloramines, a process by which ammonia is added to the water immediately after chlorine, instead of the current practice of adding chlorine alone. This approach could also improve the taste and odor of the water. Unlike chlorine, chloramines are considered less reactive and do not form as many disinfection by-products.

Contaminant levels could be further reduced with additional treatment. For example, enhanced coagulation, use of granular activated carbon—essentially the same concept as charcoal in a fish tank filter—and/or the use of such alternative disinfectants as ozone or ultraviolet light could reduce disinfection by-product levels further. Moreover, ozone or ultraviolet light are far more effective than chlorine at killing such disease-causing pathogens as *Cryptosporidium*. Such synthetic organic chemicals as pesticides and disinfection by-products could be substantially reduced with granular activated carbon, which some cities have installed to improve water quality, taste, and odor at a cost of about $25 per household per year.

One option for reducing lead levels in Baltimore's tap water is improved and optimized corrosion inhibitors. Current corrosion inhibitors still allow significant lead leaching. Another alternative is strategic replacement of lead service lines in areas with serious lead problems.

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

BALTIMORE

City of Baltimore, Department of Public Works
The Abel Wolman Municipal Building
200 North Holliday Street, Room 300
Baltimore, MD 21202
410-396-3500
www.baltimorecity.gov/government/dpw/water.html

WATER UTILITY INFORMATION

▸ **Attend meetings of the Baltimore Department of Public Works** for citizens on local water issues. Ask for dates, times, and locations.

▸ **Get involved in source water assessment and protection** efforts by contacting the Department of Public Works.

▸ **Learn more from these groups:**
- Clean Water Action, www.cleanwater.org
- Clean Water Network, www.cwn.org

Peer reviewers of the Baltimore summary included Brenda Afzal, Environmental Health Education Center, University of Maryland, School of Nursing, Baltimore; and Linda Greer, Ph.D., senior scientist, NRDC.

NOTES

1 The Environmental Protection Agency, Safe Drinking Water Information Database.

2 The action level standard for lead is different than the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

3 Baltimore City Department of Public Works, "Water Quality Report for 2000."

4 Baltimore City DPW, "Water Quality Report for 2001."

5 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0. This one is better and more technically correct.

6 See note 3.

7 See note 4.

8 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

9 See note 3.

10 See note 4.

11 EPA, IWI, available online at www.epa.gov/iwi/hucs/02060003/score.html.

12 EPA, IWI, available online at www.epa.gov/iwi/hucs/02050003/score.html.

Boston, MA

Boston Earned a Water Quality and Compliance Grade of Poor in 2000 and 2001

The city has ongoing problems with uncovered reservoirs and is in dispute with the EPA over filtration for pathogens; in addition, Boston's water exceeded the national action level for lead in its unfiltered water, and contains *Cryptosporidium.* The city also reported high levels of total trihalomethanes—presenting major health concerns.

▶ In 2001, Boston's water failed to meet the national action level for **lead**. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. Boston's tap water lead levels have been reduced somewhat in recent years, but they remain a serious health concern.

▶ Levels of **total trihalomethanes**—by-products of chlorine treatment in drinking water that are linked with cancer and, potentially, miscarriages and birth defects—averaged about 84 percent of the EPA's new standard and occasionally spiked to levels above the new standard. No violation was recorded because the EPA's standard is based on average levels.

▶ ***Cryptosporidium*** (*Crypto*) may also be a concern. *Crypto* is a waterborne microbial disease-carrying pathogen that can present health risks, especially to individuals with weakened immune systems. It has been found in Boston's watersheds, reservoirs, and, according to preliminary results, at low levels in parts of the distribution system (pipes).[2]

BOSTON
System Population Served **574,283**[1]
Water Quality and Compliance **2000▶Poor** **2001▶Poor**
Right-to-Know Report—Citizenship **2000▶Poor** **2001▶Poor**
Source Water Protection **Good**
REPORT CARD

Noteworthy

▶ Whether Boston's source water protection is adequate to protect public health is a matter of controversy. Boston and its wholesale water supplier, the Massachusetts Water Resources Authority (MWRA) have been locked in a long-running dispute with the EPA over whether the city must filter its drinking water. The EPA says that Boston violated federal rules requiring either filtration or full protection of its watersheds from pathogens. A court ruled in 2001 that while the EPA was correct that the MWRA/Boston had previously violated EPA rules, the past violation was insufficient to automatically trigger mandatory filtration.[3]

▶ Boston uses an uncovered reservoir to hold treated ("finished") tap water, which can become contaminated with disease-causing pathogens. Boston says "a small percentage" of this water is inadequately disinfected, representing a violation of state rules and necessitating the posting of public notices that say, "inadequately treated water may contain disease-causing organisms."[4] Boston promises to fix the problem by late 2003.

Boston's Right-to-Know Reports Earned a Grade of Poor in 2000 and 2001

▶ The MWRA's recent right-to-know reports are relatively user-friendly and avoid previous statements assuring customers that the water is "safe." However, the 2000 report prominently asserted on the front page, "MWRA follows, and even goes beyond, federal and state standards." To the contrary, several MWRA-supplied towns exceeded the EPA action level for lead; many MWRA-supplied towns violated the coliform bacteria standard; and the EPA listed the MWRA as being in violation of U.S. standards requiring filtration or source water protection in 2000.

Moreover, in 2001, the MWRA was required to notify the public of inadequately disinfected water from its uncovered reservoir. No representation was made in the 2001 report that there were no violations, but the exceedance of the lead action level and the

MWRA's violations of the coliform standard (outside Boston) were not noted until deep into the report. Furthermore, the section of the 2001 report that discussed Boston's failure to meet the EPA's lead action level was headlined "Good News on Lead."

Boston Earned a Source Water Protection Grade of Good

▶ There are active and largely effective watershed protection efforts in the Boston watersheds. However, development pressures, nonpoint source pollution (*e.g.*, agricultural runoff and septic systems), and recreational use pose risks in parts of the watersheds serving the city, particularly the Wachusett. The EPA has ranked the entire Chicopee Watershed, which includes the Quabbin Reservoir, as a 6 on a watershed threat scale from 1 (low threat) to 6 (high threat).[5] Taken as a whole, NRDC has ranked the overall watershed as Good, based upon the EPA's assessments, the watershed's vulnerability, some pollution sources, and active and largely effective watershed protection efforts in much of the area.

Noteworthy

▶ **Boston and the MWRA have $1.7 billion in drinking water protection and improvement underway.** The MWRA's Integrated Water Supply Improvement Program is a 10-year, $1.7 billion series of projects, "to protect watersheds and build new water treatment and transmission facilities." The effort is more than halfway completed, and the 10-year plan is scheduled to be completed by 2004. Thereafter, from 2004 to 2011, hundreds of millions of dollars are slated for additional capital improvement projects to upgrade the Boston and MWRA water supply system. Among the major components are:

- **The MetroWest Water Supply Tunnel.** This nearly finished project will add a 17-mile-long tunnel to connect the Walnut Hill treatment plant to greater Boston, to back up the aging Hultman Aqueduct, constructed in 1941.
- **Water Storage Tanks.** The MWRA is building covered storage tanks to replace open finished tap water reservoirs in order to reduce risk that contaminants will get into the water, as required by state rules; their completion is expected by 2004.
- **Pipeline Rehabilitation.** The MWRA and local water departments are replacing, cleaning, and relining older pipes that are crumbling, likely to burst, or filling with sediment.
- **Walnut Hill Water Treatment Plant.** This drinking water treatment plant is supposed to be completed in 2004, when it will consolidate treatment steps and put ozone disinfection into place for Boston.

KEY CONTAMINANTS IN BOSTON'S WATER

The following contaminants have been found in Boston's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Cryptosporidium

National Standard (MCL)
Treatment Technique (TT)

Draft Proposed New National Standard[6]
<7.5 organisms/100 liters (average); no additional treatment
7.5–100 organisms/100 liters (average); some additional treatment (>90% *Crypto* kill)
100–300 organisms/100 liters (average); significant additional treatment (>99% *Crypto* kill)
>300 organisms/100 liters (average); advanced treatment (>99.7% *Crypto* kill)

National Health Goal (MCLG)
0—no known fully safe level

National Requirements
Most large- and medium-size water utilities that use surface water are required to monitor for *Crypto* and report results in their right-to-know reports; they eventually may be required to use advanced treatment if significant levels are found.

Levels[7]
The MWRA monitors for *Cryptosporidium* in Boston's intakes and Quabbin Reservoir before treatment; it also occasionally monitors the water transmission system. In addition, the Metropolitan District Commission (MDC) tests for protozoa in source waters. The test results are summarized below:

1995–1998 Quabbin System[8]
Watershed:
50% contained presumed *Crypto*
8% contained confirmed *Crypto*
Reservoir:
36% contained presumed *Crypto*
27% contained confirmed *Crypto*

Water at Chicopee Valley Aqueduct (CVA) Intake to Water System:
6% contained presumed *Crypto*
0% contained confirmed *Crypto*

2000 Wachusett System[9]
Watershed:
5%–21% contained presumed *Crypto*
0% contained confirmed *Crypto*

1999–2002 Cosgrove Intake[10]
Water at Cosgrove Intake
0% contained presumed *Crypto*
0% contained confirmed *Crypto*

Water in Distribution System (preliminary)[11]	Average	Maximum
	1 oocyst/ 1000 liters	>10 oocysts/ 1000 liters

LEVELS PRESENT HIGH CONCERN

Cryptosporidium (Crypto) is a waterborne microbial disease that presents human health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the elderly, children, and people who have undergone organ transplants. When water utilities find significant levels of *Crypto,* they must eventually use advanced treatment.

From the data released by the MWRA, it does not appear that the utility will meet the EPA's preliminary criteria for levels, triggering additional treatment requirements. The public health implications of the MWRA system's *Crypto* and other microbiological findings in the Quabbin and Wachusett systems and the distribution system are highly controversial. The finding of low levels of *Crypto* and other microbes in water samples are cause for some concern, according to some health experts, including Dr. David Ozonoff of Boston University's School of Public Health. In addition, in light of methodological difficulties that make it extremely difficult to find and confirm the viability of *Crypto,* little reassurance can be taken from the fact that the MWRA found no *Crypto* at its intakes. Because the MWRA's water is not filtered and is not currently treated to kill *Crypto,* Boston and MWRA officials are essentially contending that the watershed protections they have adopted—and the time of travel, dilution, and perhaps current treatment, taken together—reduce the risks of *Crypto* to acceptable levels. They argue that the water supply currently is relatively safe and that it will be safer still when a new ozone treatment plant is put on-line in 2004. The EPA and cited experts do not share Boston's confidence; they maintain that filtration is the only way to assure safety. But the EPA lost its lawsuit to force such filtration.

Total Coliform Bacteria

National Standard
5% maximum in any month[12]

National Health Goal
0—no known fully safe level

2000 Levels in Boston
2% highest month, total coliform positive[13]

2001 Levels in Boston
0.4% highest month, total coliform positive[14]

LEVELS PRESENT HIGH CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Coliform bacteria are sometimes found in Boston's water, but the city reports that it has been in compliance with the EPA's total coliform rule since its violation in 1996. The federal standard allows up to 5 percent coliform-positive samples per month, so the coliform bacteria finding in Boston—at levels well below this standard—is not viewed as a serious health threat to consumers. However, the finding of any coliform in the city's distribution systems is a possible indication that modest regrowth of bacteria or biofilm may still be occurring in the city's pipes. The Boston Water & Sewer Commission has been operating under an

Year 2000 Data—Total Coliform Results[15]

Community	Highest % of Positve Samples and Month	Violations of EPA's 5% Limit
Boston	2.0% (July)	No
Cambridge	1.1% (July)	No
Framingham	4.6% (July)	No
Malden	2.9% (August)	No
Marlborough	2.4% (May)	No
Needham	2.2% (March)	No
Revere	3.5% (September)	No
Somerville	9.2% (September)	Yes
Southborough	1 of 13 (March)	No
Swampscott	6.1% (August)	Yes
Wellesley	7.0% (December)	Yes
Weston	3.7% (July)	No
Winthrop	1.4% (November)	No

Year 2001 Data—Total Coliform Results[16]

Community	Highest % of Positve Samples and Month	Violations of EPA's 5% Limit
Boston	0.4% (April and November)	No
Cambridge	2.5% (July)	No
Framingham	3.7% (January)	No
Marlborough	2.0% (January)	No
Northborough	25.0% (July)	Yes
Somerville	1.2% (July)	No
Southborough	1 of 16 (August)	No
Wakefield	4.0% (September)	No
Wellesley	2.4% (June)	No
Weston	8.3% (July)	Yes
Winthrop	10.0% (July)	Yes

administrative consent order since 1996 to address past coliform and regrowth problems. Because Boston's coliform levels reportedly have been in compliance in its distribution system, coliform issues did not adversely affect Boston's water quality and compliance grade in this report. In 2000 and 2001, other MWRA-supplied cities did have coliform violations, however (see tables above) NRDC researchers did not count these exceedances outside of city limits against Boston's grade.

Treated Tap Water Reservoir Is Unprotected

Boston uses one finished (treated) water reservoir, which remains uncovered and thus unprotected—the Norumbega, in which drinking water can become contaminated with potentially disease-causing pathogens; in some cases, the water is not adequately disinfected to kill those bacteria. The Norumbega Reservoir violates regulations requiring that the water must be covered or treated, and therefore the state forced Boston and the MWRA to issue public notices of violation in 2001–2002. The notices stated that a small percentage of water coming from the Norumbega Reservoir violates standards and that this "inadequately treated water may contain disease-causing organisms. These organisms include bacteria, viruses, and parasites, which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches."[17]

By December 2003, a covered tank will replace the reservoir so that this problem may be resolved.[18]

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[19]

National Health Goal (MCLG)
0—no known fully safe level

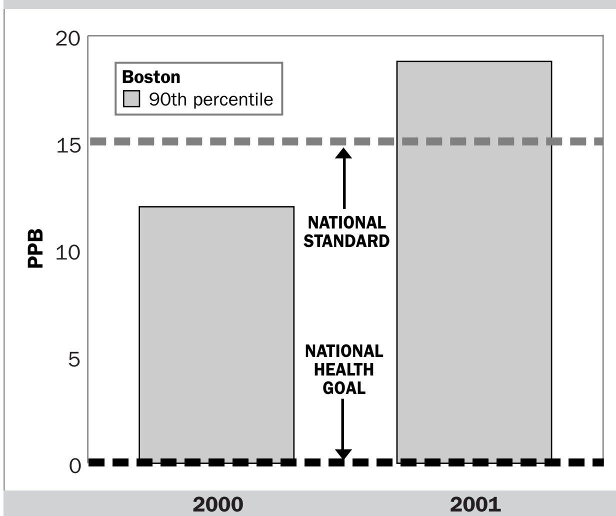
2000 Levels in Boston[20]
12 ppb or less at the 90th percentile home

2001 Levels in Boston[21]
18.8 ppb at the 90th percentile home—*exceeds EPA action level*
52 of 442 (11.7%) homes tested exceeded national standard, failing the action level

EXCEEDS ACTION LEVEL

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior, as well as adversely affect blood pressure, red blood cells, and kidney and nervous system function. The MWRA admits that in 1993, it "had the unfortunate distinction of having some of the highest measured first flush lead samples in the nation."[22] Indeed, a scientific study published in 1999 found that men in Boston who drank a glass or more a day of water containing elevated lead levels (more than 50 ppb) in the 1970s continued to have high lead levels in their bones 20 years later.[24] This

LEAD LEVELS



Lead Levels in Boston Metro Area Drinking Water—Year 2000[23]

Participating Communities	Number of Sampled Homes That Met AL of 15 ppb	90% of Homes Were Below This Number (Compare to AL of 15 ppb)
Arlington	12 of 15	19 ppb
Bedford (mixed)	23 of 23	6 ppb
Belmont	13 of 15	15 ppb
Boston	25 of 25	12 ppb
Brookline	15 of 15	7 ppb
Cambridge	60 of 60	5 ppb
Canton (mixed)	34 of 34	8 ppb
Chelsea	14 of 15	9 ppb
Everett	14 of 15	12 ppb
Framingham	11 of 15	27 ppb
Lexington	11 of 15	31 ppb
Lynnfield W.D.	7 of 8	13 ppb
Malden	13 of 15	15 ppb
Marblehead	14 of 15	8 ppb
Marlborough (mixed)	29 of 30	7 ppb
Medford	12 of 15	25 ppb
Melrose	14 of 15	5 ppb
Milton	14 of 15	13 ppb
Nahant	8 of 9	7 ppb
Needham (mixed)	58 of 60	7 ppb
Newton	13 of 15	22 ppb
Norwood	7 of 15	30 ppb
Peabody (mixed)	25 of 30	31 ppb
Quincy	12 of 12	8 ppb
Revere	12 of 12	6 ppb
Saugus	13 of 15	15 ppb
Somerville	8 of 11	18 ppb
Southborough	15 of 18	21 ppb
Stoneham	13 of 14	7 ppb
Swampscott	15 of 15	9 ppb
Wakefield (mixed)	12 of 60	31 ppb
Waltham	15 of 15	4 ppb
Watertown	13 of 15	14 ppb
Wellesley	56 of 60	6 ppb
Weston	18 of 20	11 ppb
Winchester (mixed)	27 of 30	11 ppb
Winthrop	12 of 15	40 ppb
Woburn (mixed)	12 of 16	24 ppb

Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow. **Maximum Contaminant Level Goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety. The MCLG for lead is 0. **Mixed:** Community partially supplied by MWRA and mixed with local water supply. **ppb:** Parts per billion. Note: Cambridge, Canton, Wakefield and Woburn data are from 1999 or earlier as 2000 sampling was not required.

past exposure may present specific health concerns because lead in bone can be mobilized with aging, particularly in menopausal and postmenopausal women whose bodies may mobilize stored bone lead as hormonal changes occur; this in turn may advance health effects.

Lead is present in Boston tap water because it leaches from pipes and water fixtures at any point between the source water in western Massachusetts and the tap. Water corrosivity hastens the leaching process. Fortunately, with improved treatment to control corrosivity, lead levels in city tap water have dropped in recent years. Recent tests show MWRA treatment apparently has brought down lead levels within the Boston city limits substantially since the early 1990s.

However, according to MWRA data, Boston still failed the EPA action level for lead in 2001. As noted in the chart at left, some areas just outside Boston also served by the MWRA exceeded the lead action level in 2000 (Arlington, Framingham, Lexington, Medford, Newton, Norwood, Peabody, Somerville, Southborough, Wakefield, Winthrop, and Woburn). NRDC researchers did not account for these exceedances in determining Boston's grade.

Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

Haloacetic Acids (HAA)

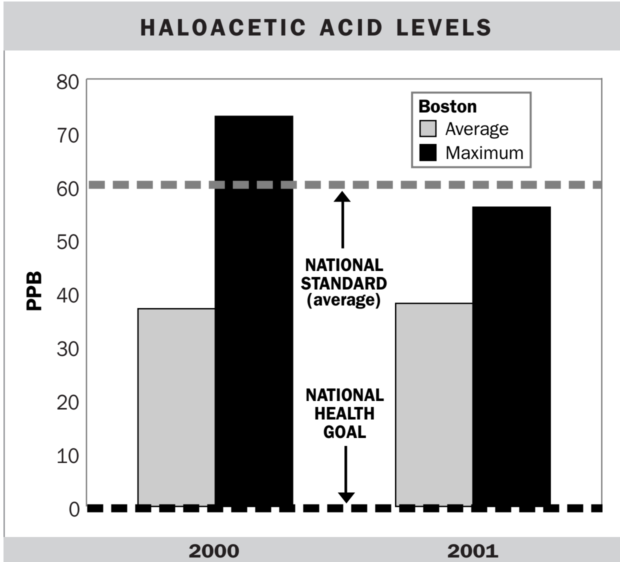
National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

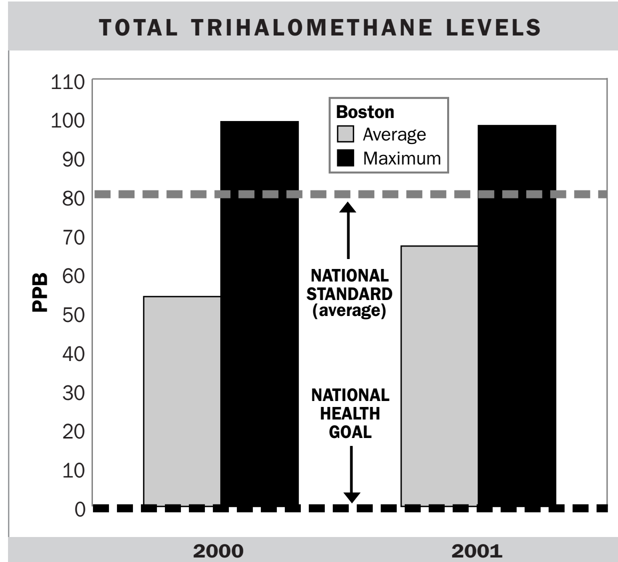
National Health Goal (MCLG)
0—no known fully safe level[25]

	Average	Maximum
2000 Levels[26]	37 ppb	73 ppb
2001 Levels[27]	38 ppb	56 ppb

LEVELS PRESENT HIGH CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Boston's haloacetic





acid levels averaged about half the new national standard, which went into effect in January 2002.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG):
0—no known fully safe level[28]

2000 Levels[29]	Average 54 ppb	Maximum 99 ppb
2001 Levels[30]	Average 67 ppb	Maximum 98 ppb

LEVELS PRESENT HIGH CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. Boston has relatively elevated levels of TTHMs in its drinking water during some parts of the year. The highest levels detected in 2000–2001 spiked above today's new standard of 80 ppb, which went into effect in January 2002. However, even if the new national standard had been enforceable at the time, Boston's levels would not have constituted a violation because the city average was below the standard. That said, the presence of significant TTHM levels is a concern because any substantial exposure poses a risk. As discussed in Chapter 5, the national standard is not based exclusively upon health but rather on a weighing of treatment options, costs, and other considerations versus health risks. Because Boston has committed to installing ozone as a primary disinfectant in 2004, levels of chlorination by-products are likely to decrease.

BOSTON'S RIGHT-TO-KNOW REPORTS

Boston's Right-to-Know Reports Earned a Grade of Poor for 2000 and 2001

On the good-citizen side of the ledger:

▸ The format of the city's right-to-know reports and tables was relatively user-friendly.

▸ Maps showing sources of drinking water and treatment plant locations were colorful and easy to read.

▸ The reports included directions in Spanish and 14 other languages urging consumers who do not speak English to get a translation or to speak to someone who understands it; some reports were fully translated into Spanish.

▸ The front pages of the 2000 and 2001 reports commendably avoided the 1999 report's prominent and overarching assertion reassuring customers that their water was "safe" without qualification. The 2000 report noted many comments from the public objecting to that statement as misleading. Commentators observed that the 1999 assertion of safety probably kept many people from reading the rest of the report, including people with weakened immune systems who were warned only deep into the report that the water might not be safe for them.

On the could-be-a-better-citizen side of the ledger:

▸ A sweeping assertion of water safety in the 1999 report reappeared in the 2001 online report's FAQ section, stating that "even if you don't read beyond this page, we want to assure you that your water supply is safe."[31] This statement may stop many readers from carefully reviewing the report, which warns vulnerable people about special risks they face and notes that Boston and surrounding areas failed to meet the lead action level.

▸ The first page of the 2000 report asserted, "no MWRA-served community violated the standards set by the U.S. EPA." In fact, according to the EPA, the MWRA violated standards requiring filtration or source water protection in 2000, although the court declined to order the MWRA to filter. Also, many MWRA-served communities exceeded the EPA action level for lead, while others violated the EPA standard for total coliform bacteria. Although violating the EPA surface water treatment rule and exceeding the lead action level did not constitute maximum contaminant level violations, the flat and prominent statement that the MWRA did not violate any EPA standards may nonetheless have misled many consumers.

▸ The 2001 report noted that lead levels in Boston had dropped since 1992 but did so under the headline, "Good News on Lead"—in the same year that Boston failed to meet the EPA's action level for lead.

▸ The reports included neither maps nor any detailed narratives noting known or potential specific polluters in the watershed who may contribute to the contamination of the water supply. EPA rules require utilities to name known sources of any specific contaminant found in their tap water.[32] Even where this is not required or if the specific polluter cannot be tied with assurance to a specific contaminant, EPA rules encourage water systems to highlight significant sources of contamination in the watershed. The Metropolitan District Commission's (MDC) extensive reviews of the MWRA's source water have identified certain specific businesses and activities that are known or suspected to release pollutants into the source water, but none of these specific sources are discussed in the right-to-know reports.[33] For example, the MDC noted in a recent report that the greatest threat to the water supply posed by agricultural activities is from animal waste possibly containing pathogens; the report went on to state that the MDC had to initiate enforcement action to control overgrazing and remove an uncovered manure pile near a tributary of the water supply. The MDC also notes several other specific areas where construction, development, septic systems, and other sources are known or potential polluters of the source water.[34]

▸ The reports failed to provide information on the health effects of some contaminants—such as TTHMs—found at levels below EPA standards but above EPA health goals. Although not legally required, this information would assist local citizens in protecting their health and in fighting for better protection of their water.

▸ The reports would have been improved by the inclusion of descriptions of the source water assessment procedure for Boston's drinking water, as well as information on how to get involved and learn more.

▸ The required statement for people with special health concerns about important health information should have been prominently displayed on the report's first page.

THREATS TO BOSTON'S SOURCE WATER

Boston Earned a Source Water Protection Grade of Good

Boston's water comes from western and central Massachusetts and is stored in reservoirs fed by watersheds that are protected to varying degrees. Unlike most major cities in the United States, Boston's water is not treated with coagulants to remove dirt and particles. Neither is it filtered.

The Metropolitan District Commission's Division of Watershed Management (DWM) has had a watershed protection plan for the Wachusett Reservoir and Quabbin Reservoir/Ware River watershed since 1991. According to the DWM, 75 percent of the Quabbin, 57 percent of the Ware, and 52 percent of the Wachusett are protected open space.[35] Working with partner groups, MDC adopted watershed protection regulations and best management plans applicable to many potential pollution sources, completed detailed sanitary surveys and source water assessments, worked with others to protect the watershed through acquisition of property and easements, and now actively inspects, monitors, and patrols the watershed to find pollution sources.

The water faces development pressures, nonpoint source pollution in the form of agricultural runoff and septic systems, spills, wildlife-related contamination problems from geese and other sources, and recreational use issues in parts of the three watersheds, particularly the Wachusett. The DWM has been seeking to identify and address many of these problems.

The EPA has ranked the whole Chicopee Watershed, in which the Quabbin Reservoir is located, as a 6 on a watershed threat scale from 1 (low) to 6 (high).[36] Development pressure and runoff are the threats, according to the EPA, warranting a rating of "more serious" water quality threats and "high vulnerability" to contamination. However, the immediate area around the Quabbin is mostly protected open space. Aggressive land acquisition and source water protection programs are reducing current and potential pollution threats.

The Ware River, on the other hand, is part of a watershed the EPA ranks as a 1 on the same scale, based on good water quality and low vulnerability.[37]

NRDC has ranked overall watershed protection, therefore, as Good, based upon the MDC's and MWRA's active and largely effective watershed protection efforts in much of the area, the EPA's and MDC's assessments and discussion of potential vulnerability, and the existence of some pollution sources in parts of the watersheds.

PROTECTING BOSTON'S DRINKING WATER

Following are approaches to treating Boston's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Boston's disinfection by-product levels are fairly high compared to many cities and could be reduced with improved treatment. For example, use of activated carbon or of an alternative primary disinfectant such as ozone or ultraviolet light would reduce by-product levels. Boston has publicly announced plans to use ozone at a new treatment plant in Walnut Hill, slated for completion in 2004. This step, particularly assuming the continued use of chloramines instead of chlorine as a residual disinfectant, should substantially reduce disinfection by-product levels.

In addition, preliminary unpublished results show fairly low levels of *Cryptosporidium* in Boston's *finished* drinking water, and it is well documented that *Crypto* and other microbial contaminants are sometimes found in some of the city's source waters and reservoirs (though apparently not at its Cosgrove water intake). This is one reason, together with concerns about bacteria and certain other issues, that the EPA sued the MWRA to require filtration of its water. Ozone, the primary disinfectant to be used at the planned Walnut Hill treatment plant, or ultraviolet light would somewhat reduce *Crypto* levels. The court found that the ozone plant plus watershed protections were sufficient, but the EPA and other experts disagreed and urged that filtration was necessary in order to protect public health.

Violations and Litigation in Boston

Boston and the MWRA have been locked in a long-running dispute with the EPA over whether the city must filter its drinking water. According to the EPA, Boston violated federal rules requiring either filtration or full protection of its watersheds from pathogens (germs).[38] The MWRA fought the EPA in court, arguing that its water is clean and that a planned treatment at the new Walnut Hill Water Treatment Plant, scheduled to be in place by 2004, will adequately protect public health. The new plant will use ozone to disinfect but will not filter the water—which the EPA deems is necessary. The EPA believes that filtration is needed as an additional barrier to waterborne disease and will ensure full removal of some pathogens, including *Crypto*, which may not be killed by ozone.

Recent court rulings have sided with the MWRA, finding that while it had violated the EPA's filtration requirements and while filtration together with disinfection would constitute superior treatment, the MWRA is not at fault: the court stated that the water is fairly clean, filtration would be expensive, and the planned treatment and pipe cleanup should bring waterborne risks to an acceptable level.[39] The court also found a threat of bacterial "regrowth" posed by ozonation but noted that the threat could be addressed more effectively through pipe rehabilitation, flushing, and corrosion control than through filtration. The court also accepted the MWRA's argument that the installation of a $180 million filtration system would undermine the MWRA's efforts to take on other projects (such as pipe replacement) that would be needed with or without the presence of a filtration system. Regarding watershed protection, the court said that the MWRA's purchase of lands close to the Wachusett Reservoir had helped to create a barrier against human-made contamination and that filtration would reduce popular support for maintaining strict environmental protection of the protected areas. The court of appeals affirmed in 2001.

Despite this ruling, the EPA and some public health experts continue to believe that Boston should filter its water to prevent waterborne disease. They note that Boston has in the past violated the EPA's criteria for avoiding filtration (most recently in 1999) and contend that the MWRA "ozone-only" approach could miss some pathogens and could allow bacteria to regrow in the pipes.[40]

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

BOSTON
Boston Water & Sewer Commission 980 Harrison Avenue Boston, MA 02119 617-989-7000 Boston Water & Sewer Commission: www.bwsc.org Mass. Water Resource Agency:
WATER UTILITY INFORMATION

- **Attend meetings of the Boston Water & Sewer Commission** (see contact information, this page). Check the right-to-know report and website, or call and ask for dates, times, and locations.
- **Get involved in source water assessment and protection** efforts by contacting the utility or find a state government contact by calling the Safe Drinking Water Hotline at 800-426-4791.
- Learn more from these groups:
  - Clean Water Action in Boston, 617-338-8131; e-mail bostoncwa@cleanwater.org
  - Clean Water Network, www.cwn.org, cleanwater@igc.org.

Peer reviewers of the Boston report included Dr. Jeffrey Griffiths, Tufts University School of Medicine; Iris Vicencio-Garaygay, MASSPIRG; and John McNabb, Clean Water Action—Massachusetts.

NOTES

1 Safe Drinking Water Information System, U.S. EPA database, available online at http://oaspub.epa.gov/enviro/, last visited on April 26, 2002.

2 Metropolitan District Commission, Division of Watershed Management (MDC/DWM), *Watershed Protection Plan Update: Quabbin Reservoir Watershed and Ware River Watershed*, pp. 2–46 (December 2000); Metropolitan District Commission, Division of Watershed Management, "Watershed Protection Plan Update for Metropolitan Boston Water System: Wachusett Reservoir" (1998); letter from Stephen Estes-Smargiassi, MWRA to Erik Olson, NRDC, August 12, 2002 and attachments.

3 Environmental Protection Agency, Safe Drinking Water Information System, available online at http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=655489&pwsid=MA3035000&state=MA&source=Purchased%20surface%20water%20&population=574283&sys_num=0. See also the district court's two written opinions indicating that the MWRA was not in compliance with the filtration avoidance requirements, *United States v. Massachusetts Water Resources Authority*, 48 F. Supp. 2d 65 (D. Mass. 1999) (district court had equitable discretion not to order filtration remedy for drinking water act violation); *United States v. Massachusetts Water Resources Authority*, 97 F. Supp. 2d 155 (D. Mass. 2000) (declining to order filtration remedy based on equities of the case).

4 MWRA, "2001 Report on Your Tap Water," [right-to-know report], p. 7 (2002), Legal Notice on Norumbega Reservoir (2002).

5 EPA, Index of Watershed Indicators (IWI) database, Chicopee Massachusetts, watershed, available online at www.epa.gov/iwi/hucs/01080204/score.html.

6 See EPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) Preproposal Draft Regulatory Language for Stakeholder Review, posted at www.epa.gov/safewater/mdbp/st2dis.html The 1, 2, and 2.5 minimum log removal requirements are converted into percentage removals for simplicity. This rule has not been formally proposed in *The Federal Register* but was agreed to by the EPA, NRDC, public health groups, cities, and the water utility industry. See *Ibid* for the "FACA Stakeholder Agreement in Principle."

7 The MWRA has collected C*rypto* and *Giardia* data regularly in its source waters and at its Cosgrove and CVA intakes since 1994. Letter from Stephen

Estes-Smargiassi, MWRA, to Erik Olson, NRDC, August 12, 2002, and attachments. These data are only occasionally included in publicly released water quality data reports. See, *e.g.*, MWRA, "Water Quality Updates," available online at www.mwra.state.ma.us/water/html/qual3.htm. See also, Metropolitan District Commission, "Water Quality Report 2001: Wachusett Reservoir and Watershed" (2002), p. 20, mentioning that the MDC did not monitor in 2001 for *Crypto*.

8 Metropolitan District Commission, Division of Watershed Management (MDC/DWM), *Watershed Protection Plan Update: Quabbin Reservoir Watershed and Ware River Watershed* pp. 2–46, Table 2-12 (December 2000).

9 Metropolitan District Commission, "Water Quality Report 2000: Wachusett Reservoir and Watershed," p. 22 (2001).

10 MWRA, "Cosgrove Intake *Giardia* and *Cryptosporidium* Results, oocysts/100L," (data for January 1999–July 2002), attached to letter from Stephen Estes-Smargiassi, MWRA, to Erik Olson, NRDC, August 12, 2002.

11 Letter from Stephen Estes-Smargiassi, MWRA, to Erik Olson, NRDC, August 12, 2002.

12 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

13 MWRA, "2000 Report on Your Tap Water" [right-to-know report], "Total Coliform Results" table.

14 MWRA, "2001 Report on Your Tap Water" [right-to-know report], "Total Coliform Results" table.

15 See note 13.

16 See note 14.

17 MWRA, "2001 Report on Your Tap Water" [right-to-know report], p. 7 (2002); MWRA, Legal Notice on Norumbega Reservoir (2002).

18 MWRA, Legal Notice on Norumbega Reservoir (2002).

19 The action level standard for lead is different than the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

20 MWRA, "2000 Report on Your Tap Water" [right-to-know report], "Lead Results" table.

21 MWRA, "2001 Report on Your Tap Water" [right-to-know report], "Lead and Copper Results" table.

22 Letter from Stephen Estes-Smargiassi, MWRA, to Erik Olson, NRDC, dated August 13, 2001.

23 See note 20.

24 Serrano, PV, Sparrow, D, Hu, H, "Relationship of Lead in Drinking Water to Bone Lead Levels Twenty Years Later in Boston Men: The Normative Aging Study," *Journal of Occupational Environmental Medicine*, May 1999; 41(5), p. 349–55.

25 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

26 MWRA, "2000 Report on Your Tap Water" [right-to-know report], "Reservoir Water Test Results—After Treatment" table.

27 MWRA, "2001 Report on Your Tap Water" [right-to-know report], "Reservoir Water Test Results—After Treatment" table.

28 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

29 See note 26.

30 See note 27.

31 BWSC, "FAQs," available online at www.bwsc.org/tab_menus/frameset4.htm.

32 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments, and should be used when available to the operator." While EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution and where the water system is aware of the pollution source, the rules require that the polluter to be identified.

33 See, *e.g.*, Metropolitan District Commission, Division of Watershed Management, "Watershed Protection Plan Update: Quabbin Reservoir Watershed and Ware River Watershed" (2000).

34 Ibid.

35 Metropolitan District Commission, Division of Watershed Management, "Watershed Protection Plan Update for Metropolitan Boston Water System: Wachusett Reservoir" (1998); Metropolitan District Commission, Division of Watershed Management, "Ware River Watershed: MDC/DWM Public Access Management Plan Update" (2000); Metropolitan District Commission, Division of Watershed Management, "Watershed Protection Plan Update: Quabbin Reservoir Watershed and Ware River Watershed" (2000).

36 See note 5.

37 EPA, Index of Watershed Indicators (IWI) database, Nashua watershed, available online at www.epa.gov/iwi/hucs/01070004/score.html.

38 See note 3.

39 *United States v. Massachusetts Water Resources Authority*, 256 F.3d 36 (1st Cir. 2001), affirming *United States v. Massachusetts Water Resources Authority*, 48 F. Supp. 2d 65 (D. Mass. 1999) (district court had equitable discretion not to order filtration remedy for drinking water act violation); *United States v. Massachusetts Water Resources Authority*, 97 F. Supp. 2d 155 (D. Mass. 2000) (declining to order filtration remedy based on equities of the case).

40 See EPA Briefs filed in *U.S. v. MWRA*, note 39; EPA, "Statement from EPA Spokesman Payton Fleming Regarding MA-DEP Decision," (November 13, 1998), available online at www.epa.gov/region1/pr/1998/111398.html; EPA, "MWRA Filtration Point-Counterpoint" (1997), available online at www.epa.gov/NE/pr/1997/qanda.html.

CHICAGO, IL

Chicago Earned a Water Quality and Compliance Grade of Excellent in 2000 and 2001

Contaminants present were found at levels averaging less than 25 percent of national standards.

▶ There were no recent reported violations of current, pending, or proposed national standards.

▶ **Trihalomethanes and haloacetic acids,** by-products of chlorine disinfection that may cause cancer, were found in Chicago's water but at an average of less than 25 percent of the new national standard.

▶ **Lead** was found in Chicago's water system but at relatively low levels. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior.

Chicago's Right-to-Know Reports Earned a Grade of Good for 2000 and 2001

▶ The reports were well formatted, revealed useful information, included warnings for vulnerable populations prominently, and made no overarching claims about the safety of the water supply.

▶ However, the reports misstated the EPA's health goal for coliform bacteria, thus making coliform levels in Chicago's water appear less troubling, and buried important information on lead contamination in a footnote.

CHICAGO
System Population Served **2,783,726[1]**
Water Quality and Compliance **2000▶Excellent** **2001▶Excellent**
Right-to-Know Report—Citizenship **2000▶Good** **2001▶Good**
Source Water Protection **Fair**
REPORT CARD

Chicago Earned a Source Water Protection Rating of Fair

According to the EPA's Index of Watershed Indicators (IWI), the Chicago area's stretch of Lake Michigan scored a 5 out of 6 (1 is least threatened, 6 most threatened). In the EPA's words, the "IWI score . . . describes the health of the aquatic resources for this watershed. A score of 5 indicates more serious water quality problems—low vulnerability to stressors such as pollutant loadings."[2] Lake Michigan receives wastewater from sewage treatment plants and industries, and runoff from agriculture (all generally far from Chicago's intakes), as well as runoff from urban and suburban areas. The quality of water in Lake Michigan has improved in the past 20 years, and the waters off the Illinois shoreline are considered to be in better condition than they have been in the past. While many pollution sources continue to discharge and run off into the lake, dilution and better pollution control have improved the lake's water quality in the Chicago area, contributing to a source water protection grade of Fair.

Noteworthy

▶ The city Department of Water has identified $620 million in capital improvements needed over the next five years to keep the city's water flowing reliably and of high quality.[3] Among the major projects are the replacement of 50 miles of water mains per year, rehabilitation and upgrade of the city's Jardine and South water purification plants, and upgrading a dozen neighborhood pumping stations to assure constant water pressure. The city claims that its aggressive pipe replacement program has saved 120 million gallons per day in reduced leakage from old, crumbling, and leaky pipes.[4]

KEY CONTAMINANTS IN CHICAGO'S WATER

The following contaminants have been found in Chicago's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month, total coliform positive[5]

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels
1% in highest month, total coliform positive

2001 Levels
2% in highest month, total coliform positive

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Coliform bacteria on rare occasion are found in Chicago's water, at levels well below the national standard but nevertheless above the EPA's health goal. That said, even low levels of coliform could indicate bacteria regrowth in the city's distribution system. If unchecked, regrowth can become a serious problem in older water distribution systems, spurring degradation of water quality and potentially providing harborage for pathogens in the pipes. Chicago says it is in the process of a major infrastructure replacement program, replacing 50 miles of pipe per year. This would help reduce the risk of such distribution system problems.

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[6]

National Health Goal (MCLG)
0—no known fully safe level of lead

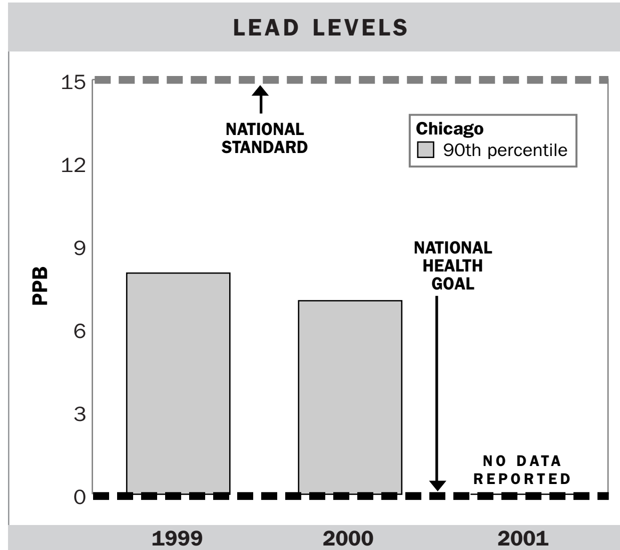
1999 Levels[7]
8 ppb at 90th percentile home, one home tested exceeded national standard

2000 Levels[8]
7 ppb at 90th percentile home, 0 homes tested exceeded national standard

2001 Levels
No data reported[9]

LEVELS PRESENT SOME CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior, as well as adversely affect blood pressure, red blood cells, and kidney and nervous system function. At one point, Chicago's plumbing code actually *required* lead service lines, so



the city's past problems with lead are not surprising. In 1993, for example, Chicago's water exceeded the 15 ppb EPA action level for lead, and the city was required to improve its corrosion control program under the EPA's Lead and Copper Rule. It now appears, assuming that monitoring was conducted correctly and targeted high-risk homes as required, that the improved corrosion control efforts of Chicago were successful.

Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

Haloacetic Acids

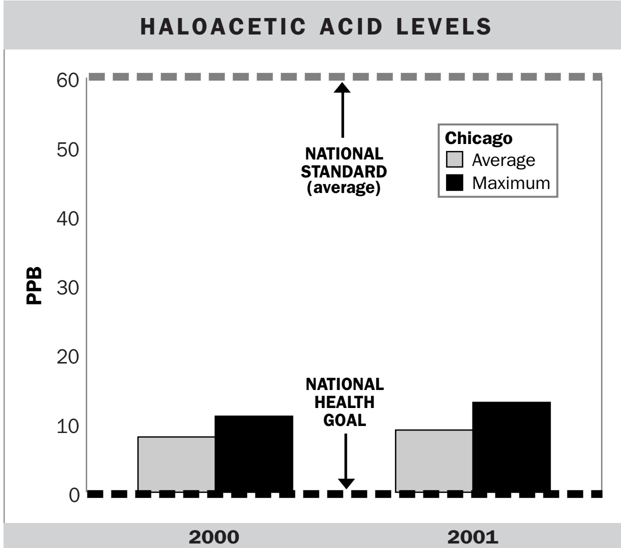
National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[10]

	Average	Maximum
2000 Levels[11]	8 ppb	11 ppb
2001 Levels[12]	9 ppb	13 ppb

LEVELS PRESENT SOME CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Haloacetic acids



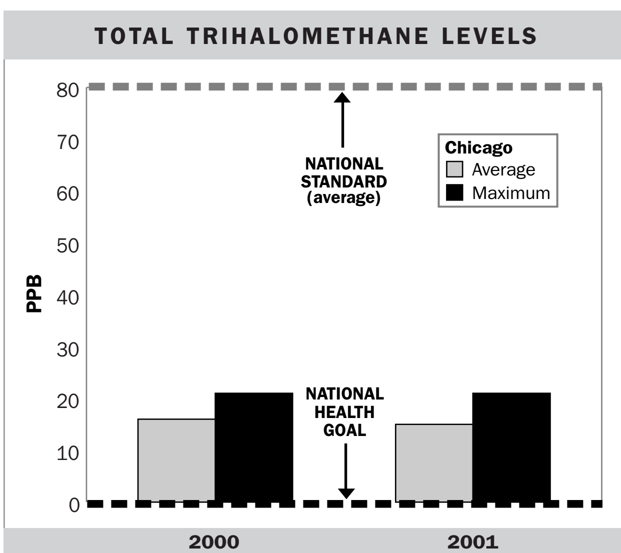
have been found in Chicago's water at levels well below the national standard but above the national health goal and do not appear to present major health concerns.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)
0—no known fully safe level[13]

2000 Levels	Average 16 ppb	Maximum 21 ppb
2001 Levels	Average 15 ppb	Maximum 21 ppb



Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects at elevated levels. Levels of TTHMs were found in Chicago's water at levels below the national standard and below the levels found to be linked to reproductive problems in preliminary studies, though still above the national health goal of 0. From what is known, Chicago's TTHM levels do not appear to present major health risks.

CHICAGO'S RIGHT-TO-KNOW REPORTS

Chicago's Right-to-Know Reports Earned a Grade of Good for 2000 and 2001

On the good-citizen side of the ledger:

▶ The format of the 2000 and 2001 reports and tables was relatively user-friendly.

▶ The reports revealed information on unregulated contaminants found in the city's water.

▶ They placed the warning for vulnerable populations prominently and early in the report.

▶ They included useful information on system rehabilitation and treatment.

▶ They made no overarching claim that the water is absolutely safe.

▶ They provided information on the source water assessment process and how to get involved.

On the could-be-a-better-citizen side of the ledger:

▶ The 2001 report buried the health warning and detailed information on lead contamination in a footnote at the bottom of a table, where it would have been unlikely to be noticed.

▶ The reports erroneously stated that the health goal, or MCLG, for coliform bacteria is a maximum of 5 percent coliform positive in any month; furthermore, the reports favorably compare Chicago's water to that health goal, stating that the water contained 1 to 2 percent coliform in the worst months. In fact, the health goal for coliform is 0, not 5 percent—and Chicago exceeded the MCLG, although it did not exceed the enforceable 5 percent standard.[14]

▶ Similarly, the reports erroneously state "N/A" (not applicable) for the MCLGs for the chlorination by-products bromodichloromethane and bromoform, both of which have health goals of 0, and both of which were found at fairly low levels in Chicago's tap water.[15]

▶ The 1999 right-to-know report buried information on a turbidity spike that occurred in November 1999. The Illinois EPA directed Chicago to mention the spike in its right-to-know report, but the information was only included in passing in a table with no explanatory information. In Milwaukee in 1993, a turbidity spike was associated with a major disease outbreak, but in Chicago, no such health threat was apparent. Nonetheless, Chicago minimized the importance of the turbidity spike, which could have threatened the health of a number of citizens, particularly the young, the elderly, cancer patients, and the immunocompromised.[16] This pre-2000 problem did not affect the grade for Chicago in 2000–2001.

▶ The reports included only one sentence translated into Spanish and no information in any other language. The percentage of Chicagoans who speak little or no English is growing. About 12.5 percent of Chicago residents speak primarily Spanish.[17] Chicago's one-sentence translation may have met minimum requirements, but the city could have done more to communicate with non-English speakers.

▶ Chicago included no maps showing source water or specific local sources of pollution. EPA rules require utilities to name known sources of any specific contaminant found in tap water.[18] In cases in which this is not required, or in the event that a specific polluter cannot be linked to a specific contaminant, EPA rules encourage water systems to highlight significant sources of contamination in the watershed.

▶ The reports failed to include explanations of the health effects of some contaminants found at levels above national health goals, including certain chemicals linked to cancer and possibly reproductive problems—for example, trihalomethanes. Although not legally required, this information would assist citizens in protecting their health and in fighting for better drinking water protection. Chicago's unusually low levels of disinfection by-products (as compared to levels in most U.S. cities) make this requirement less urgent than elsewhere.

THREATS TO CHICAGO'S SOURCE WATER

Chicago Earned a Source Water Protection Rating of Fair

According to the EPA's Index of Watershed Indicators (IWI), the Chicago area's stretch of Lake Michigan scored a 5 on a scale of 1 to 6, where 1 is least threatened and 6 most threatened. In the EPA's words, "The overall IWI score . . . describes the health of the aquatic resources for this watershed. A score of 5 indicates more serious water quality problems—low vulnerability to stressors such as pollutant loadings."[19] Lake Michigan receives wastewater from sewage treatment plants and industries, and runoff from agriculture (all generally far from Chicago's intakes), as well as runoff from urban and suburban areas. As the Chicago right-to-know reports noted, the quality of water in Lake Michigan has improved in the past 20 years, and the waters off the 63 miles of Illinois shoreline are considered to be in better condition than they were in the past.

A combination of actions substantially improved Lake Michigan's water quality around Chicago. Although some pollution sources continue to discharge and run off into the lake, nonetheless much of the Chicago area pollution no longer reaches the lake as a result of improved pollution control, dilution, reversal of the flow of the polluted Chicago River in 1900, and the diversion of most suburban waste from the lake via two canals completed a century ago. Unfortunately for cities downstream, however, much of this pollution is exported to the Mississippi.[20]

PROTECTING CHICAGO'S DRINKING WATER

Following are approaches to treating Chicago's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Chicago's disinfection by-product levels are relatively low compared to those in many cities relying on surface waters; still, they could be further reduced by additional or alternative treatment. For example, activated carbon and/or the use of an alternative primary disinfectant such as ozone or ultraviolet light could further reduce by-product levels. Chloramines could be used as an alternative residual disinfectant instead of chlorine to further reduce by-products. In addition, although Chicago claims never to have found viable *Cryptosporidium* in its finished drinking water, ozone and ultraviolet light would offer a measure of additional assurance against *Crypto*, since these disinfection technologies are far more effective than is chlorine (the disinfectant used by Chicago).

Current and Future Threats to Source Water

Chicago and the state of Illinois have not yet completed a required source water assessment for Chicago and must do so by 2003. However, as is indicated in the map of potential sources of water pollution in the region, industrial polluters, hazardous waste dumps, sewage treatment plants, urban runoff, and other potential sources of water pollution are near enough to pollute the lake. Still, most major dischargers either do not discharge into Lake Michigan or do so at a significant distance from the city's drinking water intakes.

The reversal of the flow of the Chicago River many decades ago, undertaken to reduce the pollution reaching Lake Michigan, has reduced local sources of pollution, although communities downstream along the Chicago River have been put at risk as a result. Significant problems can arise on the rare occasions when locks must be opened after heavy rains, allowing a backflow of pollution into the lake, but this is rare.[21] The city tries to compensate for such events by increasing chlorination of the water. The downside of this measure is increased levels of chlorine and chlorination by-products in the water.[22]

CHICAGO
Richard Rice Chicago Department of Water 1000 East Ohio Street Chicago, IL 60611 312-744-6635 www.cityofchicago.org/water
WATER UTILITY INFORMATION

Complacency about the quality of lake water is ill-advised. For example, in 1993, in Milwaukee—which also relies on intakes in Lake Michigan—400,000 residents were sickened by *Cryptosporidium* from their tap water, which somehow became contaminated with the parasite.

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

▶ **Attend meetings of the Chicago Department of Water** (see contact information, this page). Ask for dates, times, and locations.

▶ **Get involved in source water assessment and protection efforts** by contacting the Chicago Water Department or Anthony Dulka, Illinois EPA, Bureau of Water, Groundwater Section, 217-785-4787.

▶ **Learn more from these groups:**
- Citizens for a Better Environment, 312-346-8870
- Clean Water Network, www.cwn.org

Peer reviewers of the Chicago report included Albert Ettinger, Environmental Law & Policy Center, Chicago, and Dr. Linda Greer, senior scientist, NRDC.

NOTES

1 Environmental Protection Agency, Safe Drinking Water Information System (SDWIS), Chicago report, available online at www.epa.gov/safewater/dwinfo/il.htm, visited March 13, 2002.

2 EPA Index of Watershed Indicators, at www.epa.gov/iwi/hucs/07120003/score.html (visited March 13, 2002).

3 "Chicago 2000 Water Quality Report."

4 Ibid.

6 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

6 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule,

a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

7 "Chicago 1999 Water Quality Report."

8 "Chicago 2000 Water Quality Report."

9 "Chicago 2001 Water Quality Report."

10 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloactetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

11 See note 6.

12 See note 7.

13 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

14 The 0 MCLG for coliform is found at 40 C.F.R. §141.52(4).

15 The 0 MCLGs for bromodichloromethane and bromoform are found at 40 C.F.R. §141.53.

16 See letter from Roger Selburg, Illinois EPA, to Ellen Flanagan, deputy commissioner, Chicago Water Department, December 20, 1999, and attachments.

17 See "Languages Spoken Other Than English," table on page TK. According to a recent *Chicago Tribune* article, "The number of Illinoisans at least 5 years old who speak Spanish at home jumped from about 728,000 in 1990, or 6.8 percent, to more than 1.2 million in 2000, about 11 percent of the population, the new data revealed. . . . Nearly 6 percent of Illinois residents spoke Polish, German, Russian, or some other European language at home, while 2 percent spoke an Asian or Pacific Island language, data showed." David Mendell and Achy Obejas, "English on Wane in Illinois Households: Census Cites Rise of Other Languages" (August 6, 2001).

18 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution and where the water system is aware of the pollution source, the rules require that polluters to be identified.

19 See note 2.

20 For a brief history of the reengineering of the Chicago River, and the diversion of area sewage from Lake Michigan into the Mississippi, see Chicago Public Library, "1900: Flow of the Chicago River Reversed," available online at www.chipublib.org/004chicago/timeline/riverflow.html.

21 Personal communication with Albert Ettinger, Environmental Law & Policy Center, May 29, 2002.

22 Ibid.

DENVER, CO

Denver Earned a Water Quality and Compliance Grade of Good in 2000 and 2001

The city had moderate levels of some contaminants, but they generally measured well below national standards.

▶ Denver had no recent reported violations of current, pending, or proposed national standards.

▶ Denver's water contains moderate levels of **haloacetic acids** (HAAs) and **total trihalomethanes** (TTHMs), by-products of chlorine disinfection that may cause cancer. Denver uses chloramines as a disinfectant to keep TTHM and HAA levels down. Still, disinfection by-product levels prevented Denver from getting better than a Good grade for its water quality.

▶ About 2 percent of high-risk Denver homes tested exceeded the national standard for **lead**. Findings do not represent a violation, but they do mean that a significant number of local residents likely have substantial amounts of lead in their tap water. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior.

Denver's Right-to-Know Reports Earned a Grade of Good

▶ The reports included helpful information on health risks related to lead, turbidity, and total trihalomethanes; its discussion of *Cryptosporidium* and *Giardia* was prominent and detailed; and its warning to immuno-compromised people was properly placed in a prominent location at the beginning of the reports. However, the reports included no information on specific known or potential polluters in Denver's watershed and buried mention of the potential cancer risks from trihalomethanes in a footnote.

DENVER
System Population Served **1 million[1]**
Water Quality and Compliance **2000▶Good** **2001▶Good**
Right-to-Know Report—Citizenship **2000▶Good** **2001▶Good**
Source Water Protection **Good**
REPORT CARD

Denver Earned a Source Water Protection Rating of Good

▶ The EPA's Index of Watershed Indicators gives Denver's major water sources its best rating of 1 on its scale ranging from 1 (lowest threat and vulnerability) to 6 (highest threat and vulnerability). However, according to local experts, a significant threat to Denver's watershed looms: fire and resulting debris and sediment from floods, which can muddy and contaminate the city's water reservoirs.[2] NRDC rated the watershed threat as Good, based upon the up-to-date source water threat information.

Noteworthy

▶ Denver has projected that the city needs $363.5 million in water supply system capital improvements in coming years, including a major water reclamation project, new conduits and storage, improvements to the Marston Plant 1, including a new filter plant, and other improvements to address aging portions of the system and to improve water quality, water production efficiency, and safety.[3] In addition, upgrades are needed for the Marston Water Quality Lab and for the Foothills plant disinfection system and clear water basin.

KEY CONTAMINANTS IN DENVER'S WATER

The following contaminants have been found in Denver's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[4]

National Health Goal (MCLG)
0—no known fully safe level

2001 Levels
1% in highest month, total coliform positive[5]

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Denver's levels of total coliform are relatively low and not likely to be of serious concern to healthy people. However, the presence of coliform in the Denver distribution system may be an indication that regrowth of bacteria is occurring in the city's pipes. If unchecked, regrowth can become a serious problem, spurring degradation of water quality and potentially harboring pathogens in the pipes.

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[6]

National Health Goal (MCLG)
0—no known fully safe level

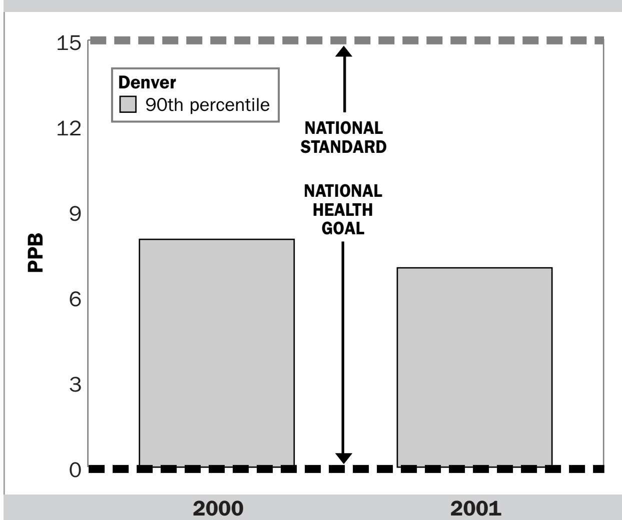
2000 Levels
8 ppb at 90th percentile level; 2% of homes tested exceeded national standard[7]

2001 Levels
7 ppb at 90th percentile; 2% of homes tested exceeded national standard[8]

LEVELS PRESENT SOME CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior, as well as adversely affect blood pressure, red blood cells, and kidney and nervous system function. Denver's lead levels are generally well below the national standard, and only a small number of Denver homes—about 2 percent of high-risk homes tested—have lead levels above the EPA's action level. Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

LEAD LEVELS



ORGANIC CONTAMINANTS

Haloacetic Acids

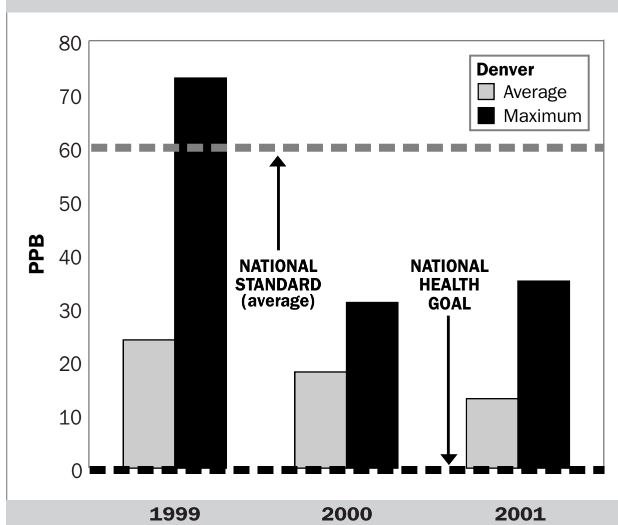
National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[9]

	Average	Maximum
1999 Levels[10]	24 ppb	73 ppb
2000 Levels[11]	18 ppb	31 ppb
2001 Levels[12]	13 ppb	35 ppb

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Since 1999, Denver's HAA peak levels appear to have dropped as

HALOACETIC ACID LEVELS



significantly as the TTHM levels did. As with TTHMs, some of this reduction in peak levels is a result of Denver Water's tightening of operations and treatment system modifications. However, some of the reduction in peaks may also have been due to changes in how the data were collected and reported.[13] Whatever the exact levels are, it is clear that average HAA levels are relatively low—less than half the national standard, even according to the 1999 measurements.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

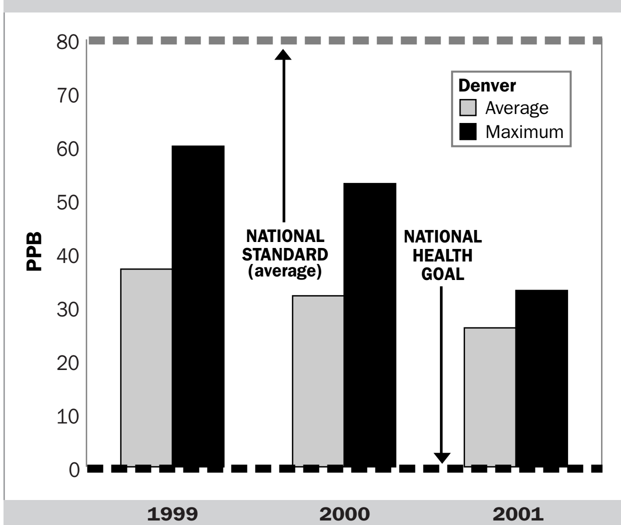
National Health Goal (MCLG)
0—no known fully safe level[14]

1999 Levels[15]	Average 37 ppb	Maximum 60 ppb
2000 Levels[16]	Average 32 ppb	Maximum 53 ppb
2001 Levels[17]	Average 26 ppb	Maximum 33 ppb

LEVELS PRESENT SOME CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. Based on publicly available data, Denver's TTHM levels appear to have dropped significantly since 1999, when peak levels were reported at 60. While some of this reduction is a result of Denver Water's tightening of operations and treatment system modifications, it is also possible, according to a Denver Water expert, that some of the reduction was due to modest changes in how the data were collected and reported by Denver Water, its contract lab, and the state of Colorado during the relevant years.[18] In any event, Denver's TTHM levels are fairly low, and even the peaks are relatively low compared to many U.S. water systems.

TOTAL TRIHALOMETHANE LEVELS



DENVER'S RIGHT-TO-KNOW REPORTS

Denver's Right-to-Know Reports Earned a Grade of Good for 2000 and 2001

On the good-citizen side of the ledger:

▶ The report described, with diagrams, specifics on how the water is treated.

▶ The report included a helpful map of the sources of Denver's water.

▶ Information on health risks resulting from exposure to lead, turbidity, and total trihalomethanes was provided, even though the latter is not legally required. The discussions of *Crypto, Giardia,* and turbidity were prominent and detailed.

▶ The warning to immunocompromised people was properly placed in a prominent location at the beginning of the reports.

On the could-be-a-better-citizen side of the ledger:

▶ The 2000 and 2001 reports included no information on specific known or potential polluters in Denver's watershed, nor do the included maps indicate the locations or types of such polluters. The EPA rules require utilities to name known sources of any specific contaminant found in their tap water.[19] Even where this is not required, or where the specific polluter cannot be tied with assurance to a specific contaminant, the EPA rules encourage water systems to highlight significant sources of contamination in the watershed.

▶ The reports mentioned the potential cancer risk from trihalomethanes, even though the warning was not required (Denver's levels were below the national standard). However, the information was buried in a footnote, and the report suggested such risks were present only "at or beyond regulated levels"—an incorrect assertion, since low levels still carry some cancer risk. The EPA established a health goal of 0 for some trihalomethanes because there is a cancer risk at any level. Also, the reports do not provide information on the health effects of some other contaminants found at levels below EPA standards but above EPA health goals—such as haloacetic acids and some radioactive contaminants, which are found at low levels in Denver's water. Although not legally required, this information would have assisted local residents in protecting their health and their water.

THREATS TO DENVER'S SOURCE WATER

Denver Earned a Source Water Protection Grade of Good

In its Index of Watershed Indicators, the EPA ranks Denver's South Platte Headwaters and Upper South Platte as 1 on a source water threat scale that ranges from 1 to 6, with 1 representing the highest quality water with the lowest contamination threat.[20] The Moffat source, a portion of the Colorado River headwaters including part of the Fraser River and a few tributaries, also ranks a 1.[21] The Moffat source's South Boulder Creek, and the east-of-the-divide watersheds feeding into the St. Vrain River, also earned ratings of 1.[22]

However, according to local experts, a significant threat to Denver's watershed looms: fire and resulting debris and sediment from floods, which can muddy and contaminate the city's water reservoirs.[23] Fires can denude and destabilize soils in the watershed, causing potentially serious erosion. Streams then can carry into reservoirs large amounts of fine particles, soil, and debris from these hard-hit areas, complicating treatment and clogging a reservoir with sediment, flotsam, and jetsam. According to Donald Thompson of Denver Water's Citizen Advisory Council, "Denver has good control of the watersheds or makes use of watersheds that are in public control, but fire doesn't respect land ownership, and a fire a couple of years ago basically closed down half of the Denver system. The following floods filled one of their reservoirs with a 10- or 15-year amount of debris."[24] Denver reportedly has reservoir capacity to meet a drought for a three-year period.[25] Taking this information into account, NRDC has rated the watershed as Good regarding source water protection.

PROTECTING DENVER'S DRINKING WATER

The following are approaches to treating Denver's drinking water and information on how residents can help protect their local water.

Current Methods of Treatment[26]

Denver Water has three treatment plants. Denver's treatment process involves several steps: coagulation, sedimentation, filtration through layers of sand, coal, or both sand and coal, corrosion control, chloramine disinfection, and fluoridation.

Denver could reduce disinfection by-products (TTHMs and HAAs) and other contaminants with additional treatment. For example, enhanced coagulation, activated carbon, and/or the use of an alternative primary disinfectant such as ozone or ultraviolet light could reduce disinfection by-product levels further. Moreover, ozone or ultraviolet light are far more effective at killing *Cryptosproridium* and some other resistant microbes than is chlorine. Synthetic organic compounds, such as herbicides and pesticides, as well as disinfection by-products, are substantially reduced through the use of granular activated carbon (GAC). Some cities have installed GAC at a cost of about $25 per household per year and have improved water quality, taste, and odor.

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

DENVER

Denver Water Board[27]
1600 West 12th Avenue
Denver, CO 80254
303-628-5973
www.water.denver.co.gov

WATER UTILITY INFORMATION

▶ **Attend meetings of the Denver Water Board** (contact information below). Ask for dates and locations.

▶ **Get involved in the Denver Water Citizens Advisory Council.** Contact Joe Sloan, Denver Water, 303-628-6320, or joseph.sloan@denverwater.org.

▶ **Get involved in source water assessment and protection efforts.** Call Denver Water.

▶ **Learn more from:**

- ▶ Clean Water Network, www.cwn.org

Peer reviewers for the Denver report included Gary Steinberg, Clean Water Fund; Robin Hubbard, Colorado PIRG; Joan Steelman, Sierra Club, Colorado; and Dr. Linda Greer, senior scientist, NRDC.

NOTES

1 Environmental Protection Agency, Safe Drinking Water Information System.

2 Personal Communication with Donald Thompson, Member, Denver Water Citizen Advisory Council, April 29, 2002.

3 "Larger Cities Report Capital Improvement Needs," *WaterWorld,* December 2001, available online at www.pennnet.com.

4 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

5 Denver Water, "Water Quality Report 2002" (covering calendar year 2001 data).

6 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

7 Denver Water, "Treated Water Quality Roundup," available online at www.water.denver.co.gov/waterquality/wtrqualityframe.html.

8 See note 4.

9 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

10 See note 7.

11 Denver Water, "2001 Treated Water Quality Roundup," available online at www.water.denver.co.gov/waterquality/wtrqualityframe.html.

12 Denver Water, "Water Quality Report 2002" (covering calendar year 2001 data).

13 Denver Water, "Water Quality Report 2000."

14 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

15 See note 13.

16 Denver Water, "2001 Treated Water Quality Roundup," available online at www.water.denver.co.gov/waterquality/wtrqualityframe.html.

17 See note 3.

18 Personal communication with Maria Rose, Denver Water, August 8, 2002.

19 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution and where the water system is aware of the pollution source, the rules require that polluters to be identified.

20 See EPA IWI for Upper South Platte, available online at www.epa.gov/iwi/hucs/10190002/score.html, and for the South Platte Headwaters, available online at www.epa.gov/iwi/hucs/10190001/score.html.

21 EPA IWI, available online at www.epa.gov/iwi/hucs/14010001/score.html.

22 EPA IWI, available online at www.epa.gov/iwi/hucs/10190005/score.html.

23 See note 2.

24 Ibid.

25 Ibid.

26 See note 8.

27 Ibid.

DETROIT, MI

Detroit Water and Sewerage Department serves Detroit and 127 southeastern Michigan communities.

Detroit Earned a Water Quality and Compliance Grade of Good for 2000 and 2001

The city had relatively few contaminants at comparatively low levels.

▶ No violations were reported for Detroit in 2000 or 2001. Some contaminants were detected in Detroit tap water at levels below the EPA's enforceable standards but still of potential concern. These include:

- ▶ **total trihalomethanes,** by-products of chlorine treatment in drinking water that are linked with cancer and possibly miscarriages and birth defects
- ▶ **haloacetic acids,** by-products of chlorine disinfection that may cause cancer
- ▶ **total coliform bacteria,** microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water
- ▶ **lead,** which can cause permanent brain, kidney, and nervous system damage, as well as problems with growth, development, and behavior

Detroit's Right-to-Know Reports Earned a Grade of Good for 2000 and 2001

▶ The reports were readable, included prominent information for people particularly vulnerable to contamination, and avoided unqualified statements about the water's safety. But they inexplicably failed to disclose the level of haloacetic acid in the city's water, an apparent violation of the EPA's rules for right-to-know reports, and reported on levels of other contaminants in ways that were unclear.[2]

DETROIT
System Population Served **4.2 million[1]**
Water Quality and Compliance **2000▶Good** **2001▶Good**
Right-to-Know Report—Citizenship **2000▶Good** **2001▶Good**
Source Water Protection **Poor**
REPORT CARD

Detroit Earned a Source Water Protection Grade of Poor

▶ The Detroit River and Lake St. Clair, the sources of tap water for the city of Detroit and nearby suburban communities, are particularly vulnerable to point source pollution, spills, and urban runoff. Lake Huron, another source of Detroit drinking water, is also vulnerable to contamination, although the water quality is generally fairly good.

Noteworthy

▶ Aging water pipes in Detroit leak more than 35 billion gallons of water each year, costing city residents more than $23 million each year.[3] In response to this and other problems of the city's aging water infrastructure, the Detroit Water and Sewerage Department (DWSD) has proposed a capital improvement program for water and sewage system projects that will total $4.3 billion over the next five years.[4] The drinking water projects through 2006 alone total $871 million.[5] This program focuses on maintaining the "quality of water provided to residents; improving water system reliability by replacing aging infrastructure to reduce the growing incidence of main breaks; ensuring environmental protection for all Detroit-area residents through upgraded treatment facilities; improving employee safety through system modifications; and increasing efficiency of services to all customers by taking advantage of new technology."[6] Among the major projects in the capital improvement program include completion of the Water Works Park II Treatment Plant; replacement of aging water mains; department-wide instrumentation and systems upgrades to water facilities; rehabilitation and upgrades of pump stations and reservoirs; upgrades of drinking water treatment plants, including plans to use ozone to better control *Cryptosporidium*; upgrades of other equipment and buildings; and upgrades of computer systems that control the water system.[7]

KEY CONTAMINANTS IN DETROIT'S WATER

The following contaminants have been found in Detroit's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

Detroit's Violations History

Since 1995, Detroit has had no reported monitoring or health-based drinking water violations. However, during the period from May 1991 to August 1995, and then again in July 1998, Detroit's public water system demonstrated a pattern of total coliform bacteria–*monitoring* violations. In most cases, the city failed to collect the required number of bacteria samples. In other instances, as recently as 1998, the city failed to retest large numbers of positive coliform bacteria results within 24 hours, as required.[8] Some of these violations, including the 1998 instance, were not reported in the EPA's compliance database, called SDWIS-Fed.[9] NRDC urges the EPA to correct these inaccuracies as soon as possible so that public citizens may access correct information about their drinking water online.

While Detroit has not had a reported health or monitoring violation since 1998, the city's noticeable pattern of past monitoring violations is a concern. Monitoring the drinking water supply for contaminants is an essential element of maintaining healthy drinking water because it provides the data that confirms safety. Routine checks and recording of contaminant levels may highlight for system administrators patterns of contaminant levels that indicate future drinking water quality problems.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

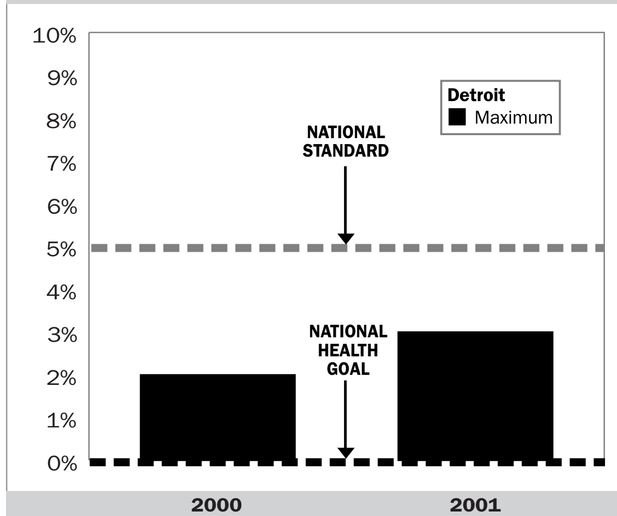
National Standard (MCL)
5% maximum in any month[10]

National Health Goal (MCLG)
0—no known fully safe level

1998 Levels
Monitoring violation for failure to monitor adequately for total coliform bacteria

2000 Levels
2% in highest month, total coliform positive[11]

TOTAL COLIFORM BACTERIA LEVELS



2001 levels
3% in highest month, total coliform positive[12]

LEVELS PRESENT HIGH CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. The DWSD has failed several times in the past to monitor for total coliform bacteria in accordance with EPA rules, most recently in 1998.

INORGANIC CHEMICALS

Arsenic

National Standard (MCL)
50 ppb (average) effective through 2005
10 ppb (average) effective in 2006

National Health Goal (MCLG)
0—no known fully safe level

2000–2001 Levels
Not detected; high levels found in other areas nearby in southeastern Michigan

LEVELS PRESENT LITTLE OR NO CONCERN IN DETROIT

LEVELS PRESENT HIGH CONCERN IN NEARBY AREAS IN SOUTHEASTERN MICHIGAN

Arsenic—the product of mining and industrial processes, past use of arsenic-containing pesticides, and natural leaching or erosion from rock—is a known and potent human carcinogen that has been linked to a variety of other diseases. Arsenic is found most commonly in groundwater supplies. Because tap water served by the DWSD comes from surface water, the chemical was not detected in Detroit's drinking water. Nonetheless, arsenic contamination is a major concern for smaller water systems in southeastern Michigan outside Detroit that rely on groundwater supplies—particularly those towns on the "thumb" of Michigan, in Genesee, Huron, Ingham, Lapeer, Livingston, Oakland, Saginaw, Sanilac, Shiawassee, Tuscola, and Washtenaw Counties. More specific information on these counties' arsenic readings is available in their respective right-to-know reports.

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[13]

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels[14]
7 ppb at the 90th percentile home; 2 of 101 homes tested exceeded national standard[15]

2001 Levels[16]
6 ppb at the 90th percentile home; 1 of 57 homes tested exceeded national standard

LEVELS PRESENT SOME CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior, as well as adversely affect blood pressure, red blood cells, and kidney and nervous system function. Although Detroit routinely exceeded the drinking water action level for lead in the early 1990s, a concerted effort by the DWSD has brought levels down to well below the national standard.[17] Because most homes tested in the DWSD service area were well below action level of 15 ppb and because only about 1 to 2 percent of high-risk homes exceeded the action level, lead-related health effects are expected to be very rare in Detroit. Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[18]

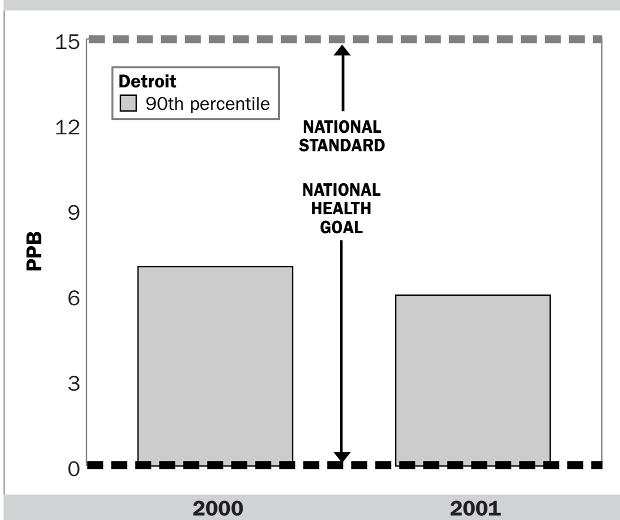
1997–1998 Levels	Average	Maximum
	6 ppb	14 ppb

At the treatment plant, the most recent year for which results are published.[19] (Note that these figures likely understate tap levels.)

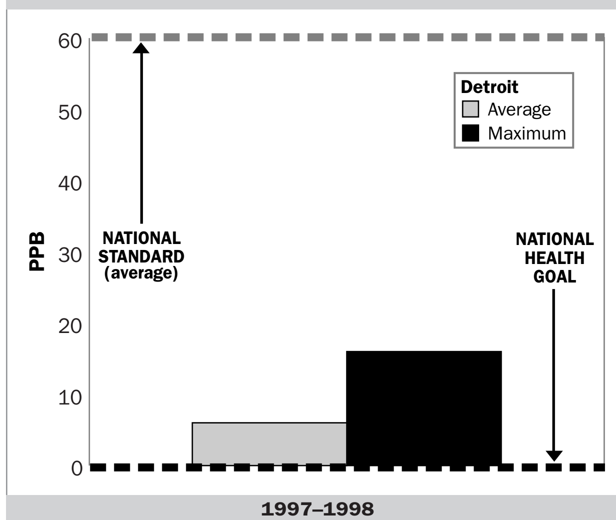
LEVELS PRESENT SOME CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Detroit has failed to publish any recent HAA data and included none at all

LEAD LEVELS



HALOACETIC ACID LEVELS



in its 2001 right-to-know report, in apparent violation of EPA regulations.[20] The 2000 report included only 1997 and 1998 data, and even that data was collected at the treatment plant, before the water went out into the distribution system resulting in a likely understatement of the actual HAA levels in the water that customers drink. (HAA levels tend to increase as chlorine continues to react with organic matter in the water.) Still, the levels appear likely to be well below the new national standard for HAAs.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

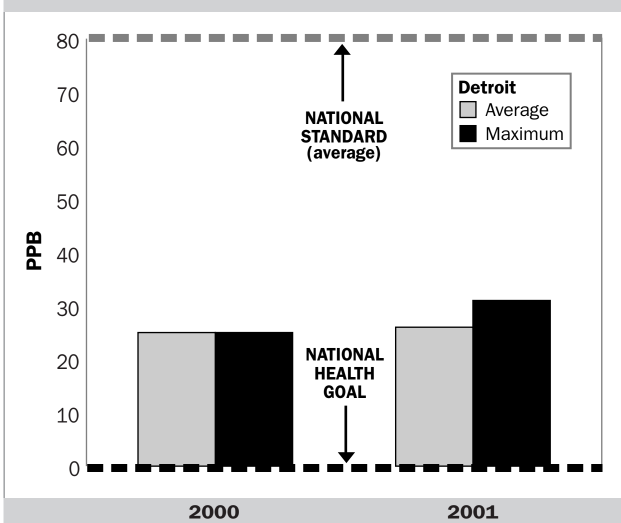
National Health Goal (MCLG)
0—no known fully safe level[21]

2000 Levels[22] (see discussion below)	Highest Running Annual Average	Maximum
	25 ppb	25 ppb
2001 Levels[23] (see discussion below)	Highest Running Annual Average	Maximum
	26 ppb	31 ppb

LEVELS PRESENT SOME CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. Detroit's reporting of TTHM levels, summarized above, is confusing, because the DWSD does not appear to report the actual annual averages or actual peak single sample maximums. Instead, the DWSD reports only the "highest level detected," which is explained in a note to be "the highest running annual average" and the "range of detection." Although the presence of any TTHMs poses some cancer risk, the levels reported in DWSD water are well below the new EPA standard of 80 ppb.

TOTAL TRIHALOMETHANE LEVELS



DETROIT'S RIGHT-TO-KNOW REPORTS

Detroit's Right-to-Know Reports Earned a Grade of Good for 2000 and 2001

On the good-citizen side of the ledger:

- The reports were readable and colorful. The 2000 report included a vivid map and narrative on the utility's source water for drinking water.
- The reports prominently displayed special information for people especially vulnerable to contamination, as well as information on the risks from lead in tap water.
- The reports avoided unqualified statements of safety.
- The reports included specific information on how citizens can participate in decisions and meetings affecting the Detroit water supply.

On the could-be-a-better-citizen side of the ledger:

- Average and peak levels of TTHMs and some other contaminants were not clearly identified in the table, which lists "highest level detected" and "range of detection" but nothing labeled as average. The EPA's rules require averages and single location peaks of TTHMs to be reported. A note in the 2001 report confusingly says that the "level detected is the highest running annual average," without explaining whether this is a system-wide average or a single location average.
- The reports included no information on specific known or potential polluters in Detroit's watershed. Nor did maps indicate locations or types of polluters. EPA rules require utilities to name known sources of any specific contaminant found in their tap water.[24] Even where this is not required or where the specific polluter cannot be tied with assurance to a specific contaminant, EPA rules

encourage water systems to highlight significant sources of contamination in the watershed.

▶ The reports did not provide information on the health effects of some contaminants found at levels below EPA standards but above EPA health goals, such as trihalomethanes and haloacetic acids.

▶ The 2000 report failed to include any definition of the abbreviation *ppb,* for parts per billion, a unit used in the regulation of drinking water contaminants and often used in the Detroit report.

▶ The right-to-know reports failed to clearly articulate the methods used to treat drinking water.

THREATS TO DETROIT'S SOURCE WATER

Detroit Earned a Source Water Protection Grade of Poor

Detroit's watershed is highly vulnerable to contamination.[25] The EPA Index of Watershed Indicators (IWI) database indicates that Detroit's watershed, which contains Detroit's drinking water sources (Lake St. Clair, the Detroit River, and Lake Huron), is seriously impaired and slightly vulnerable to more contamination.[26, 27, 28] Although the database is outdated, it remains one of the only EPA resources available that can assess possible threats to source water.

Detroit's drinking water sources are particularly susceptible to contamination from urban runoff, a type of pollution that occurs when water passes through an urban environment and picks up particles, dirt, and chemicals and flows into the water resources of the area. According to IWI's most recent data (1990), 46 percent of the watershed's land area is more than a quarter impervious—which is to say that water cannot readily penetrate at least 46 percent of the land area in the watershed.[29] As it travels along streets and other hard surfaces, runoff becomes increasingly polluted; the result is that Detroit's drinking water sources are likely to experience a heavy loading of pollutants from urban runoff.

Furthermore, Detroit's watershed is likely to be contaminated by agricultural pollutants, as indicated by the vulnerability indicator of agricultural runoff potential. This indicator is a composite of nitrogen runoff, pesticide runoff, and sediment delivery to surface waters. From 1990 to 1995, IWI estimates a moderate potential impact from agricultural runoff on Detroit's watershed.[30] Pesticide and nitrogen runoff have the potential to pollute Detroit's drinking water sources, and sediment delivery to rivers and streams is determined to be moderate.

Under federal law, the DWSD must complete a source water assessment (SWA) by 2003. The SWA examines all of sources of drinking water and the quality of those source waters and will be an important tool in protecting source water. Protecting drinking water at the source is the most effective way to prevent contamination.

Current and Future Threats to Source Water

The Detroit area faces several threats to drinking water sources. The Detroit River is the source of water for all Detroit customers, and the DWSD takes in water from the river through two intakes near the mouth of Lake St. Clair and one farther south near Lake Erie.[31] (Another DWSD intake brings water in from Lake Huron and provides it to the DWSD's Lake Huron treatment plant in St. Clair County, north of Port Huron. After treatment, that water serves the area north of Detroit.[32])

The Detroit area is both a major industrial center and a major agricultural area. Both produce pollution affecting the quality of source waters.

The Detroit Metro Area League of Women Voters has completed an excellent detailed review of the city's drinking water and the local sources of water pollution.[33] We summarize many of the league's findings here.

The Detroit River is vulnerable to point source pollution, spills, and urban runoff. The quality of the Detroit River varies, depending upon the location, mixing, and other variables. The river receives pollution from upstream loadings (from Lake St. Clair and even Lake Huron) and more significantly from the heavily polluted Rouge River, as well as industry along its banks.[34]

Among the biggest upstream sources of pollution are petrochemical industries in Sarnia on the Canadian side of the St. Clair River. Along the Detroit River, the Detroit and Windsor sewage plants, storm sewers, combined sewer overflows, and chemical and auto plants are among the biggest polluters.[35]

The Detroit sewage plant, which discharges near Zug Island, is one of the biggest in the world and is the largest single polluter of the river. Detroit's sources of drinking water are affected by a combined sewer overflow (or CSO) contamination problem. Combined sewer overflows occur during wet weather, when large volumes of rainwater runoff from streets are captured by storm sewers and then combine with waste from "sanitary" sewers containing human waste.[36] The excess untreated or poorly treated sewage flows into the Detroit and Rouge Rivers, taking with it human waste and many other contaminants. To deal with the problem, the Detroit Water and Sewerage Department developed a Long Term CSO Control Plan, which was submitted to the Michigan Department of Environmental Quality in 1996 and covers activities through 2005. According to DWSD materials, the plan commits to reduce overflow into source water, including rainwater control methods, in-system storage, plant expansion, and end-of-pipe treatment.[37] At this time, the success of this plan is unclear.

In addition to the CSO problem, the Detroit League of Women Voters' study raised serious concerns about the adequacy of the monitoring and enforcement of the "pretreatment program" that is supposed to control the 700 or more industrial users who send their waste to the Detroit plant.[38]

As a result of these pollution sources, the Detroit River from Lake St. Clair to Zug Island, where the Rouge River enters the Detroit, is sometimes polluted—especially when chemical or oil has been spilled or when polluted sediments from Lake St. Clair are resuspended by temperature changes. Usually, however, the river is not seriously degraded along this stretch. That said, the Detroit River's quality rapidly deteriorates along the U.S. shoreline, roughly from Zug Island downstream to Lake Erie, and the Trenton Channel is seriously polluted.[39]

PROTECTING DETROIT'S DRINKING WATER

The following are approaches to treating Detroit's drinking water and information on how residents can help protect their local water.

Detroit Water and Sewerage is the third largest water and sewer utility in the United States and provides drinking water to 43 percent of the state's population and 127 communities in southeastern Michigan.[40] In the public water system's five treatment plants, chlorine disinfection, flocculation, fluoridation, and filtration are used to treat water before it is sent into the distribution system and to residents' taps.[41] Detroit reported in its 2000 right-to-know report that it intends to upgrade its water treatment and to install a new $275 million ozonation facility by 2003. This facility could substantially reduce the levels of such troublesome disinfection by-products as trihalomethanes and haloacetic acids. In addition, ozone is an extremely effective disinfectant in killing the parasite *Cryptosporidium,* which is resistant to chlorine.

Activated carbon and other treatments could essentially eliminate many organic chemicals found in the city's water, including the precursors to disinfection by-products such as trihalomethanes or haloacetic acids. Other cities, such as Cincinnati, Ohio, have installed this technology at a cost of about $25 per household per year.

In 1994, NRDC published a report on threats to public health as a result of outdated drinking water treatment and distribution systems. NRDC found that ancient distribution systems are often the cause of waterborne disease outbreaks and that the threat to public health would be greatly reduced if water systems were upgraded with more efficient technology.[42] As noted above, Detroit subsequently launched a $4.3 billion construction effort to improve the city's water treatment and infrastructure, which will at least in part address these problems.[43]

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

DETROIT

Detroit Water and Sewerage Deptartment[44]
County Served: Wayne
735 Randolph Street
Detroit, MI 48226
313-964-9570 (Public Affairs Division)
www.dwsd.org

WATER UTILITY INFORMATION

▶ **Contact Detroit Water and Sewerage,** 313-964-9570, to see what can be done to protect source water and drinking water.

▶ **Attend meetings of the Detroit Water and Sewerage Department** (contact information below). Check DWSD's right-to-know report for public meeting dates, times, and locations. DWSD has produced several fact sheets and public education materials on the combined sewer overflow problem. Be sure to ask for those materials in addition to the right-to-know report.

▶ **Get involved in source water assessment and protection efforts** by contacting Clean Water Action in Michigan, 517-203-0754, or the Clean Water Network, 202-289-2395 or cleanwater@igc.org.

Peer reviewers for the Detroit report included Cyndi Roper, Clean Water Action, and Dr. Linda Greer, senior scientist, NRDC.

NOTES

1 Detroit Water and Sewerage Department, "2001 Consumers Annual Report on Water Quality."

2 See 40 C.F.R. §141.153(d)(1)(ii) & (iii).

3 "Leaky Water Pipes Create Heavy Water Loss, Cost for Detroit," *US Water News Online* (August 1, 2002), available online at www.win-water.org/win_news/080102article.html.

4 Detroit Water and Sewerage Department, "Fact Sheet: Working Around the Clock to Provide Excellence in Water and Sewer Service!" (January 2003), available online at www.dwsd.org/about/fact_sheet.pdf.

5 City of Detroit Budget Department, *Proposed Capital Agenda for the Period 2001–02 to 2005–06* at p. 294, available online at www.ci.detroit.mi.us/budget/Capital Agenda Part3.pdf.

6 DWSD *Fact Sheet,* note 3 above.

7 City of Detroit *Proposed Capital Agenda,* note 4 above, at p. 294.

8 City of Detroit Department of Water and Sewerage, "Notice of Violation of Water Quality Monitoring Requirements," *The Detroit Legal News,* July 9, 1998.

9 Safe Drinking Water Information System (SDWIS-Fed), USEPA database, available online at http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=410636&pwsid=MI0001800&state=MI&source=Surface%20water%20&population=944985&sys_num=0.

10 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

11 Detroit Water and Sewerage Department, "2000 Consumers Annual Report on Water Quality," p. 5.

12 Detroit Water and Sewerage Department, "2001 Consumers Annual Report on Water Quality," p. 8.

13 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

14 Detroit Water and Sewerage Department, "2000 Consumers Annual Report on Water Quality," pp. 10–11.

15 The action level standard for lead is different than the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water distribution system. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile, meaning that 90 percent of samples have 15 ppb or less lead, the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, such additional measures as chemical treatment are required. If those measures do not work, the system may have to replace lead portions of its distribution system.

16 Detroit Water and Sewerage Department, "2001 Consumers Annual Report on Water Quality," pp. 6 and 8.

17 Letter from Federick R. Scarcella, P.E., Division of Water Supply, Bureau of Environmental and Occupational Health, State of Michigan Department of Environmental Quality, to Detroit Water and Sewerage Department, regarding lead and copper monitoring, August 19, 1992. Certified lead and copper reporting lab sheets dated July 8, 1992, are attached.

18 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

19 Detroit Water and Sewerage Department, "2000 Consumers Annual Reports on Water Quality," p. 8, and "1999 Consumers Annual Report on Water Quality," p. 8.

20 See note 2.

21 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

22 Detroit Water and Sewerage Department , "2000 Consumers Annual Report on Water Quality," p. 8. Please note that parts per billion values were rounded up to the nearest whole number.

23 See note 5.

24 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While the EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution and where the water system *is* aware of the pollution source, the rules require that polluters be identified.

25 Index of Watershed Indicators, USEPA database, available online at www.epa.gov/iwi/hucs/04090004/score.html, visited October 15, 2001.

26 For Lake St. Clair's IWI rating see, for example, www.epa.gov/iwi/hucs/04090002/score.html.

27 Index of Watershed Indicators, USEPA database, see www.epa.gov/iwi/hucs/04090004/score.html

28 Index of Watershed Indicators, USEPA database, see, for example, www.epa.gov/iwi/hucs/04080103/score.html and www.epa.gov/iwi/hucs/04080102/score.html

29 See note 17.

30 Index of Watershed Indicators, USEPA database. Available online at: www.epa.gov/iwi/hucs/04090004/score.html.

31 Detroit Water and Sewerage Department , "2000 Consumers Annual Report on Water Quality," p. 4.

32 Ibid.

33 Detroit Metro Area League of Women Voters, Drinking Water Project Committee, "The Detroit Water System: A Citizen's Look at Drinking Water in Southeastern Michigan" (1989).

34 Ibid.

35 Ibid.

36 For more general information on combined sewer overflows, please refer to NRDC's CSO fact sheet, available online at www.cwn.org, visited October 15, 2001.

37 *Reducing Detroit's Combined Sewer Overflows,* Detroit Water and Sewerage Department Combined Sewer Overflow Control Project, May 1999.

38 Detroit Metro Area League of Women Voters, Drinking Water Project Committee, "The Detroit Water System: A Citizen's Look at Drinking Water in Southeastern Michigan" (1989).

39 Ibid.

40 Detroit Water and Sewerage Department, "2001 Consumers Annual Report on Water Quality," p. 5, "Working Around the Clock to Provide Excellence in Water and Service!" Provided to NRDC by DWSD in August 2001.

41 Data sheets on Northeast, Southwest, Lake Huron, and Springwells Treatment Plants. Provided by DWSD. Dated January 2001, February 1997, September 1997, and September 1997, respectively.

42 Cohen, B., and Olson, E., *Victorian Water Treatment Enters the 21st Century: Public Health Threats from Water Utilities' Ancient Treatment and Distribution Systems,* Natural Resources Defense Council, 1994.

43 "Water Woes: Detroit Water Department in Midst of $4.3 million construction effort," OnDetroit Section, p. 6, *The Detroit News*, May 2, 2001.

44 Detroit Water and Sewerage Department, "2000 Consumers Annual Report on Water Quality."

Houston, TX

Note: This city summary focuses on the main drinking water system located in Harris County in Houston. There are at least four other municipal systems serving the Houston area, but these were not included in the analysis (except where indicated).

Houston's Main Drinking Water System Earned a Water Quality and Compliance Grade of Poor in 2000 and Fair in 2001

Arsenic, haloacetic acids, and total trihalomethanes were found in Houston's groundwater at levels of concern; radon at levels of serious concern.

▶ Houston had no reported violations of currently enforceable national standards in 2000–2001, other than a monitoring violation in 2001.[1]

▶ **Haloacetic acids (HAAs) and total trihalomethanes (TTHMs),** by-products of chlorine disinfection that may cause cancer and reproductive and other health problems, occurred at levels of concern in Houston. HAA levels reported in 2000 (measured in 1998) were higher than is permitted under a new national standard that went into effect in 2002; levels improved in 2001.

▶ **Radon,** a radioactive gas known to cause cancer, is a serious concern in Houston's wells, where average radon levels are more than double the proposed national standard. However, because radon is a gas, Houston contends (without providing data) that the radon dissipates before it reaches the tap.

▶ Drinking water in Houston's wells contained average **arsenic** levels of half the new national standard, but arsenic levels in some wells peaked at nearly double the new national standard (effective in 2006). Arsenic—the product of mining and industrial processes, past use of arsenic-containing pesticides, and natural leaching or erosion from rock—is a known and potent human carcinogen that has been linked to a variety of other diseases.

▶ About 2 to 3 percent of Houston's peak monthly samples contained **total coliform bacteria,** microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. The national standard allows up to 5 percent.

▶ Houston had a **monitoring violation** in 2001 because the city water system did not take enough test samples; the city also failed to report the infraction.

HOUSTON
System Population Served **2,354,040**[2]
Water Quality and Compliance **2000▶Poor** **2001▶Fair**
Right-to-Know Report—Citizenship **2000▶Poor** **2001▶Fair**
Source Water Protection **Poor**
REPORT CARD

Houston's Right-to-Know Reports Earned a Grade of Poor for 2000 and Fair for 2001

▶ The reports included prominent placement of the mandatory special alert for people who are more vulnerable to particular contaminants, they included information on unregulated contaminants, and they included a sentence in Spanish urging Spanish-speaking consumers to obtain more information in their native tongue from the city.

▶ The 2000 report provided a prominent and incorrect description of arsenic's health threat, and both reports offered misleading information about *Cryptosporidium,* which has been found in Houston's source water.

Houston Earned a Source Water Protection Rating of Poor

▶ Two-thirds of the drinking water provided to Houston residents comes from the San Jacinto and Trinity Rivers. These rivers are vulnerable to pathogen and pesticide pollution, urban runoff, and agricultural runoff. Houston's groundwater supplies the balance of the water supply, and it is also, in some cases, vulnerable to contamination.

Noteworthy

▶ Houston has identified $680 million in drinking water projects that are needed over the next five years to assure continued adequate water quality and supply in the city. Among the major necessary projects are a $140 million upgrade in surface transmission lines, $119 million for water main refurbishments, and $101 million for expansions, upgrades, and optimization of two drinking water treatment plants. Other projects include construction and rehabilitation of storage tanks.[3]

KEY CONTAMINANTS IN HOUSTON'S WATER

The following contaminants have been found in Houston's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Houston's Drinking Water Monitoring Violation for Potential Indicator of Microbial Problems

Under the EPA's Surface Water Treatment Rule (SWTR), Houston is required to sample regularly a variety of parameters in its water to ensure that filters are working properly and to verify removal of microbial disease-causing organisms like *Giardia* and *Cryptosporidium.* In June 2001, Houston incurred a routine monitoring violation of the SWTR; the city then failed to report that violation, which constitutes yet another violation (a public notice violation).[4] A minor SWTR monitoring violation occurs when the water system takes at least 90 percent of required water samples but fails to take the full number required under the rule. Houston had no other recent reported violations of current, pending, or proposed standards.[5]

Cryptosporidium

National Standard (MCL)
Treatment Technique (TT)

Draft Proposed New National Standard[6]
<7.5 organisms/100 liters (average); no additional treatment
7.5–100 organisms/100 liters (average); some additional treatment (>90% *Crypto* kill)
100–300 organisms/100 liters (average); significant additional treatment (>99% *Crypto* kill)
>300 organisms/100 liters (average); advanced treatment (>99.7% *Crypto* kill)

National Health Goal (MCLG)
0—no known fully safe level

National Requirements
Most large- and medium-size water utilities that use surface water are required to monitor for *Crypto* and report results in their right-to-know reports; they eventually may be required to use advanced treatment if significant levels are found.

1997–1998 levels
Source water (before treatment)
0—185 oocysts/100 liters[7]

Tap Water (Finished, After Treatment)
No confirmed occurrences[8]

LEVELS PRESENT HIGH CONCERN

Cryptosporidium (*Crypto*) is a waterborne microbial disease-carrying pathogen that presents health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the elderly, children, and people who have undergone organ transplants. Under a negotiated EPA rule that is out in draft proposed form and is soon scheduled to be proposed formally in *The Federal Register,* water utilities that find significant levels of *Crypto* will have to use a more effective treatment to kill the pathogen.

Houston generally reported finding no *Crypto* in its source water during 18 months of monthly monitoring in 1997 and 1998—with the important exception of a high finding of 185 oocysts/100 liters in August 1997. *Crypto* is extremely difficult to detect in finished (treated) drinking water, so it was no surprise that the city has not found *Crypto* in its treated water. The detection of *Crypto* at such an elevated level in the city's source water is of concern; more comprehensive monitoring (particularly more frequent and targeted monitoring at times of maximum likelihood of occurrence) is warranted. While well-calibrated filtration is likely to remove most *Crypto*, additional steps—such as use of a disinfectant like ozone or ultraviolet light—would reduce the chances of any problem in the event of a filtration plant breakdown.

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[9]

National Health Goal (MCLG)
0—no known fully safe level

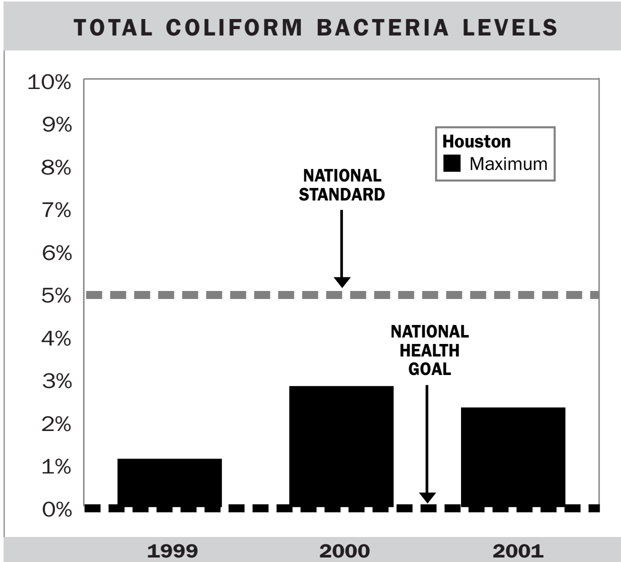
1999 Levels
1.1% in highest month, total coliform positive[10]

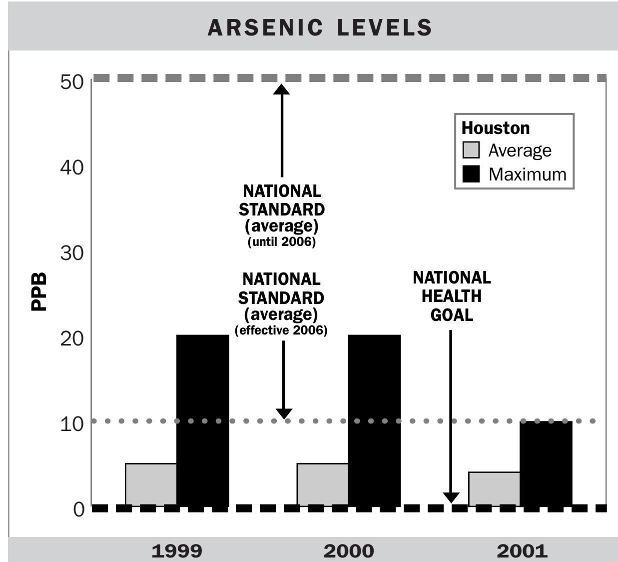
2000 Levels
2.8% in highest month, total coliform positive[11]

2001 Levels
2.3% in maximum month, total coliform positive[12]

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-





causing organisms may be present in tap water. Nearly 3 percent of Houston's monthly samples contained total coliform bacteria during the peak month in 2000; the EPA's standard allows up to 5 percent. So while the findings did not exceed the standard, they still indicate possible problems with regrowth of bacteria in Houston's water mains. In the Spanish Cove area, more than 16 percent of samples contained coliform; this finding would have represented a violation were this a free-standing water system.

INORGANIC CONTAMINANTS

Arsenic

National Standard (MCL)
50 ppb (average) effective through 2005
10 ppb (average) effective in 2006

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels	Average 5 ppb	Maximum[13] 20 ppb (groundwater)
2000 Levels	Average 5 ppb	Maximum[14] 20 ppb (groundwater)
2001 Levels	Average 4 ppb	Maximum[15] 9.9 ppb (groundwater)

LEVELS PRESENT HIGH CONCERN

Arsenic—the product of mining and industrial processes, past use of arsenic-containing pesticides, and natural leaching or erosion from rock—is a known and potent human carcinogen that has been linked to a variety of other diseases. While most or all areas within the city limits of Houston apparently will be able to comply with the EPA's new arsenic standard, a survey by the *Houston Chronicle* indicated that 36 of 123 Houston-area water systems (generally outside city limits) need to lower their arsenic levels to be in compliance with the new standard.[16] Arsenic was not detected in Houston's surface water supplies, which provide two-thirds of the city's water.

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[17]

National Health Goal (MCLG)
0—no known fully safe level

1999 levels (most recent data reported)[18]
5 ppb at the 90th percentile home; one home tested exceeded the national standard

LEVELS PRESENT SOME CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. Although in general lead in tap water does not appear to be a serious problem in Houston, parents of young infants and children may wish to have their tap water tested for lead, since levels can vary enormously from house to house, depending upon local water service lines, meters, household plumbing, and other factors. To find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[19]

1998 Levels[20]	Average
East Plant I & II (surface water)	57.3 ppb
East Plant III (surface water)	60.5 ppb
Southeast Plant (surface water)	34.6 ppb
Katy Addicks Plant (groundwater)	5.4 ppb

2001 Levels[21]	Average
East Plant I & II (surface water)	30.5 ppb
East Plant III (surface water)	31.4 ppb
Southeast Plant (surface water)	32.3 ppb
Katy Addicks Plant (groundwater)	7.2 ppb

LEVELS PRESENT HIGH CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Chlorinated surface water in Houston appeared to have haloacetic acid at levels of concern until 2001. In 1998, drinking water entering the Houston distribution system from East Plants I and II contained average levels of haloacetic acids above the new maximum allowable amount, which was finalized in 1998 but first enforceable in 2002. By 2001, the HAA levels apparently were reduced to about half of the new standard. At these levels, there is much less concern about possible health effects, although according to the EPA there is still some cancer risk from some HAAs at any level above 0.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

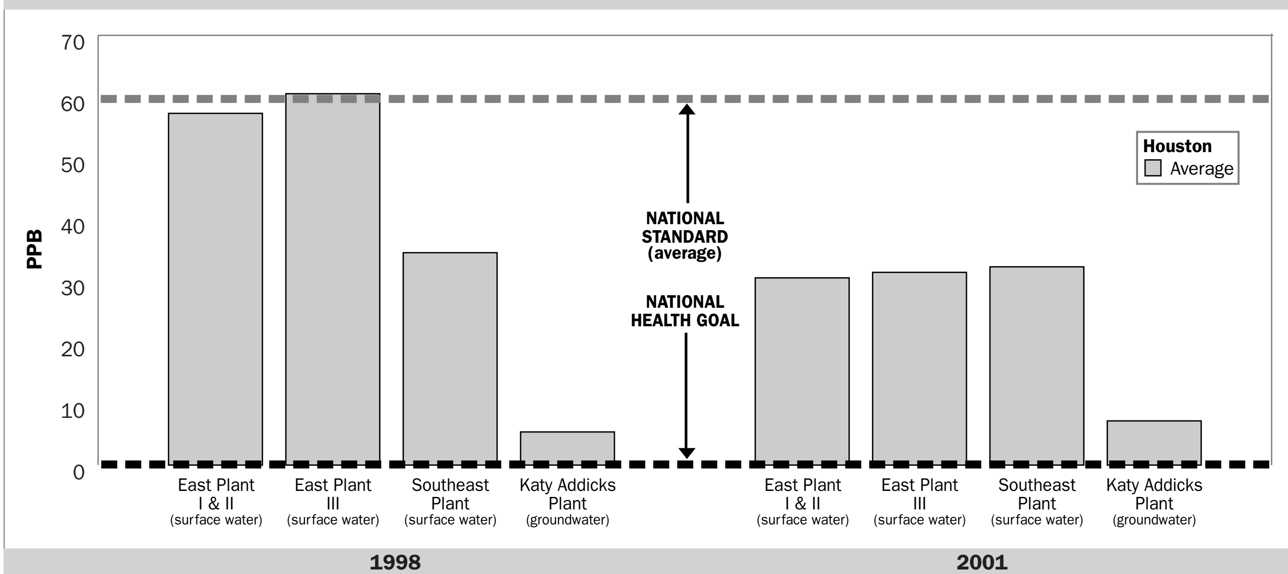
National Health Goal (MCLG)
0—no known fully safe level[22]

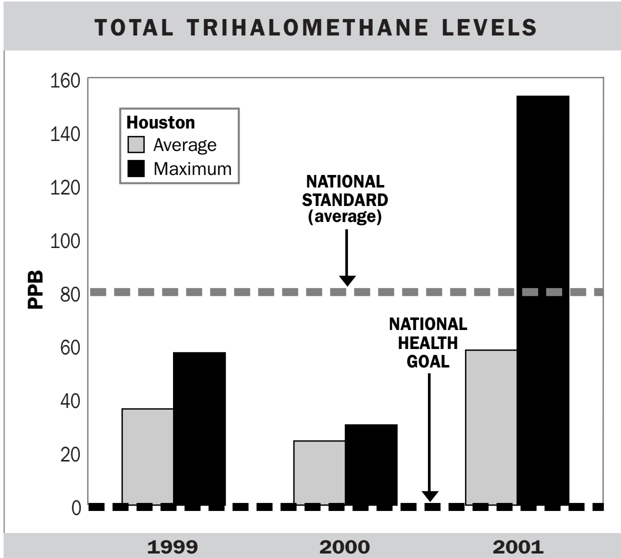
	Average	Maximum
1999 Levels	36 ppb[23]	57 ppb[24]
2000 Levels	24 ppb[25]	30 ppb[26]
2001 Levels[27]	58 ppb[28]	153 ppb

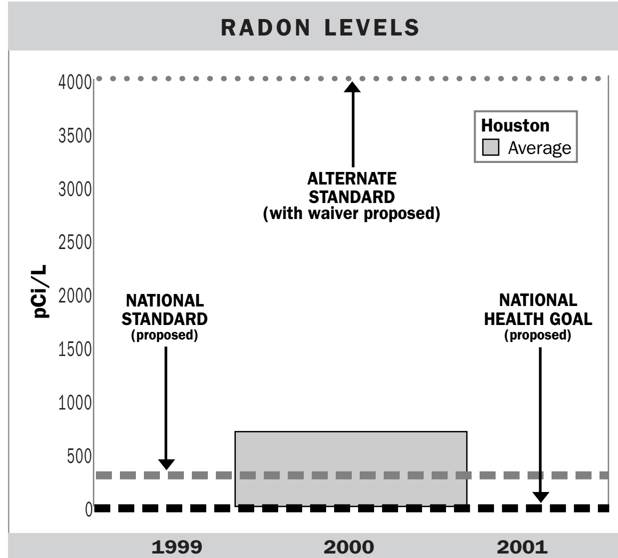
LEVELS PRESENT HIGH CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. Houston's disinfection

HALOACETIC ACID LEVELS







by-product levels are similar to the levels in many cities that use surface waters and do not violate the EPA's new standard, which is based on average levels. However, at times TTHMs have spiked to high levels—reportedly as high as 153 ppb in 2001—that are nearly double the new health standard and present possible health concerns.

RADIOACTIVE CONTAMINANTS

Radon

National Standard (MCL) (proposed)
300 pCi/L (average)
Alternate MCL of 4,000 pCi/L where approved multimedia program is in place (average)

National Health Goal (MCLG) (proposed)
0—no known fully safe level

2000 Levels
Average: 700 pCi/L at wellhead[29]

VIOLATION OF PROPOSED STANDARD

Radon, which results from the natural radioactive breakdown of uranium in the ground, is a radioactive gas known to cause lung and internal organ cancers. Houston's radon levels in well water average more than twice the EPA's proposed standard. The city provided no information on radon levels in tap water but contends that levels at the tap will be "significantly lower" than the national standard due to radon decay (wherein radon theoretically dissipates after it is pumped up from wells and before it reaches taps). Houston apparently intends to comply with a weaker alternative standard, which allows tap water to exceed the regular standard in water systems that have programs to mitigate radon exposure from other sources—in basements, for example. Even with lower levels, EPA data indicate that radon at half its current level in Houston's water (350 pCi/L) would nonetheless pose significant cancer risks.

HOUSTON'S RIGHT-TO-KNOW REPORTS

Houston's Right-to-Know Reports Earned a Grade of Poor for 2000 and Fair for 2001

On the good-citizen side of the ledger:

▶ The reports included prominent placement of the mandatory special alert for people who are more vulnerable to contaminants like *Cryptosporidium*. Houston went beyond the required language to capitalize important words, such as *immunocrompromised persons, organ transplants,* and others.

▶ The reports included bolded language encouraging the public to copy the report and landlords to post the reports in prominent places.

▶ The report included a sentence translated into Spanish urging Spanish-speaking consumers to obtain more information in their native tongue from the city.

▶ The reports contained information on unregulated contaminants.

▶ Reports from current and past years are available on the Internet, as required.

On the could-be-a-better-citizen side of the ledger:

▸ Houston prominently and incorrectly stated on the first page of its 2000 report that "EPA is reviewing the arsenic standard recognizing that while *traces of arsenic in the diet are beneficial*, chronic exposure to concentrations *greater than* the maximum contaminant level (MCL) may cause health problems. [Emphasis added.]" In fact, both the National Academy of Sciences (NAS) and the EPA have rejected the discredited industry contention that "traces of arsenic in the diet are beneficial" to humans. In addition, both the EPA and the NAS have found that concentrations of arsenic *below* the currently enforceable MCL cause health problems—not just levels *greater than* the MCL. This misleading statement contributed to Houston's Poor grade in 2000. In 2001, Houston dropped the misleading information on arsenic and instead included EPA-required language, helping the grade improve to Fair that year.

▸ The 2000 and 2001 reports both stated, "Since 1993, we have been routinely monitoring our rivers and treated water leaving our filtration plants for [*Crypto* and *Giardia*]. To date, we have detected no confirmed occurrences of either of these in any of our drinking water." [30] However, Houston avoided informing customers of the following: that it had detected *Crypto* in its source waters, that it is difficult to detect or confirm *Crypto* in treated water, and that water filtration, while helpful in reducing *Crypto* if optimized, does not necessarily achieve complete *Crypto* control.[31]

▸ The map of water service areas was imprecise and difficult to read, making it difficult for customers to know where their water comes from and what the quality of their water is. The reports included no maps of source waters and no information on specific known or potential sources of pollution or of any specific polluters.

▸ Houston's right-to-know reports included no health risk information on contaminants found at levels above the EPA health goals. Although not legally required, such information would help local citizens to protect their health and fight for better protection of their water.

▸ The reports repeatedly implied that the water poses no health risks. For example, the phrases, "None were above the MCL" and "Presence of contaminants does not necessarily indicate that water poses a health risk" were prominently displayed in the 2000 report in at least four different places, including in the titles of the tables.

▸ The reports contained no information on how drinking water is treated.

▸ The tables are difficult to read because the typeface is extremely small.

THREATS TO HOUSTON'S SOURCE WATER

Houston Received a Source Water Protection Grade of Poor

Most of the drinking water provided to Houston residents comes from the San Jacinto and Trinity Rivers, both of which are threatened by pathogen and pesticide pollution, urban runoff, and agricultural runoff.

The EPA's Index of Watershed Indicators (IWI) has determined that a major Houston-area watershed, the Buffalo-San Jacinto Watershed, has serious contamination problems and is vulnerable to contamination. The watershed received an overall index rating of 5, on a scale of 1 to 6, where 6 is the worst possible rating. This watershed includes the San Jacinto River but not the Trinity.[32] Groundwater–source water data is not included in the EPA's IWI profile. In addition, the database is outdated. Still, it is one of the few EPA resources available to assess possible threats to its source water for drinking water.

The IWI identifies a partial source of water impairment for the years 1990 to 1999. According to IWI data, pathogens and pesticides from municipal public sewer systems and urban runoff are the most prevalent causes of pollution in area rivers, including the San Jacinto. Five to 25 percent of ambient groundwater and surface water samples have chemical levels exceeding one-half of the drinking water standard during the years 1990–1998.[33]

Second, the Buffalo-San Jacinto Watershed is highly susceptible to contamination from urban runoff (which occurs when water passes through an urban environment, picking up particles, dirt, and chemicals, and then flows into area water resources). Much of the land area has been paved and causes a lot of runoff.[34]

Drinking water sources within the watershed are also likely to be affected by agricultural runoff, which can cause microbial, nitrogen, and other nutrient problems and pesticide contamination.[35]

Houston is not the only city that uses Trinity River water for drinking water; Dallas–Forth Worth relies on the upper Trinity as well. Because so many people rely on this river, the Trinity River Authority estimates that it "is the most strategically important water body in Texas."[36] According to the IWI data, the river's watershed area receives an overall index rating of 5.[37] Pathogens and organic material probably resulting from urban runoff and municipal users have affected the water bodies surveyed within this cataloging unit.[38]

PROTECTING HOUSTON'S DRINKING WATER

The following are approaches to treating Houston's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Before surface water enters the distribution system, Houston uses a process of sedimentation, coagulation, filtration with granular activated carbon (GAC), and disinfection, with chlorine as the primary disinfectant. Houston disinfects groundwater sources for drinking water with chlorine.[39] The city operates four treatment plants.

Houston's chlorination by-product levels could be reduced with improved treatment. For example, enhanced coagulation, more effective use of GAC, and the use of an alternative primary disinfectant such as ozone or ultraviolet light could reduce by-product levels further. Membrane treatment would remove not only the precursor compounds necessary for creating these disinfection by-products, but it also would remove virtually all other major chemical contaminants (such as arsenic) found in Houston's water. Furthermore, switching to chloramines instead of chlorine as a secondary disinfectant in the distribution system would modestly reduce chlorination by-products.

Ozone or ultraviolet light would offer a measure of additional assurance that *Crypto* poses no risk to Houston residents since these disinfection technologies are far more effective than chlorine is at killing these and certain other resistant parasites.

A number of treatment techniques are available to Houston that would substantially reduce its arsenic levels at a reasonable cost. Among the options are activated alumina and ion exchange with brine recycle. Another technology is microfiltration membranes used after chemical treatment/coagulation with ferric chloride.[40] Other newer, lower-cost technologies are also becoming available, such as "specific anion nanoengineered sorbents" or granular ferric hydroxide.[41,42]

The EPA has found that radon levels in tap water are very inexpensive to reduce using aeration, a technology that essentially bubbles air through the water. The cost per household is less than $0.80 per month for families served by a large utility the size of Houston's, according to the EPA.[43]

Houston's Capital Improvement Plans

Houston's drinking water operations had a projected $181 million budget in fiscal year 2001.[44] Houston has several water capital improvements in planning stages, including upgrading and optimizing a surface water treatment plant, replacing water wells, rehabilitating ground storage tanks, repairing water mains, corrosion prevention and rehabilitation measures, and groundwater wellhead protection. The five-year projected capital budget for drinking water is estimated by the city to be $680 million.[45]

For fiscal year 2002, Houston has a projected budget of $1 million for the implementation of water conservation measures required by regulations. However, Houston has allocated few funds to water conservation implementation measures in the future; furthermore, it appeared that no funds were allocated for FY 2003 through FY 2006.[46] Considering that groundwater sources are in decline and surface water supplies are polluted and must be treated, water conservation should be a high priority for Houston.

Water Wars: Growing Demand Will Plague Source Waters

In the past, Houston depended on groundwater for roughly 80 percent of its drinking water, but groundwater aquifers have begun to decline seriously from overuse, causing land to sink in some areas.[47] Today, 67 percent of drinking water comes from surface water sources and the rest from groundwater sources.[48] The groundwater sources are at risk of contamination and are threatened by infiltration of polluted surface water, land disposal of wastes, dumps, stockpiles, feedlots, pesticides and fertilizers, urban runoff, aboveground storage tanks, septic tanks, holding ponds, landfills, leakage from underground storage tanks, and mines.[49]

Severe cases of groundwater contamination have emerged in Harris County. Residents living in subdivisions built on top of or next to old industrial sites have complained of particle-filled and foul-tasting water, as well as illnesses that may be linked to contamination. For example, high levels of chlorides and benzene (more than 16 and 60 times allowable levels, respectively) were found in the drinking water wells of Bordeaux Estates, a neighborhood bordering a gas plant and abandoned oil wells. Residents there have reportedly developed thyroid problems and cancerous growths and have experienced extreme itchiness all over their bodies.[50]

In 2001, NRDC asked the city of Houston for information on any known sources of impairment to Houston's surface and ground source waters, but the most recent document the city supplied was more than 10 years old.[51]

The system takes drinking water from several surface water sources: the Trinity River via Lake Livingston and the San Jacinto River via Lake Houston and Lake Conroe. Water rights to these rivers are owned by the state of Texas, and the lakes used for drinking water are actually human-made reservoirs constructed to hold captured river water specifically for the purpose of human consumption. Maintenance of these lakes is apparently funded with revenue from consumer water bills. Lake Livingston is under the shared ownership of the city of Houston and the Trinity Water Authority and is "completely financed by city of Houston water bills." [52] The San Jacinto River Authority and the city own rights to Lake Conroe.

The future use of these reservoirs is part of a regional debate on how Houston will be able to meet future demands for drinking water without increasing the strain on source waters. The demand for water is expected to increase as the Houston area continues to develop. Some areas, such as the west side, where most population growth is predicted, are expected to have a "severe shortage of water" in the future.[53] Conservation, reclamation (reusing wastewater after treatment), and building new reservoirs are options under consideration.

Source Water Protection Program

Houston and the state of Texas have not yet completed their source water assessment for Houston, which must be finished by 2003. However, the Texas Natural Resources Conservation Commission (TNRCC) published its lengthy action plan in February 1999 and discussed in detail several phases in which the source water assessments will be undertaken. In the first phase, initial assessments will be completed. [54] These assessments will be updated in the second phase. The commission had planned that by 2001, 55 percent of Texas residents receiving drinking water from public systems would be served from sources protected from degradation by a source water protection program.[55] The TNRCC "outsourced" to the Texas Rural Water Association its source water protection activities and asserts that 65 percent of the public water systems in the state had source water protection strategies by 2001.[56] However, detailed data are not available to verify whether any actual on-the-ground improvement in water quality or reduced water pollution has been achieved due to this activity. At the conclusion of the assessments, the commission and the city of Houston are required to share the results with the public.

Aside from the federally mandated source water assessment, Houston has other protection measures in place, including a wellhead protection program and a water conservation plan. Of course, water conservation goes hand in hand with source water protection. The Houston city council adopted a formal water conservation plan in 1998 that reportedly touches on current and future conservation measures.[57]

HOUSTON

Senior Assistant Director Roger W. Hulbert[58]
Water Production Branch
City of Houston
Department of Public Works and Engineering
611 Walker Street, 21st Floor
Houston, Texas 77002
713-837-0600
www.ci.houston.tx.us/pwe/utilities/index.htm

WATER UTILITY INFORMATION

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

- **The Water Conservation branch of Houston's Public Utilities Department distributes conservation kits** to Houston residents who are concerned about saving water. Contact the Water Conservation Branch, 713-837-0473, to request a kit.
- **Attend meetings of your local water supplier**, the City of Houston Department of Public Works and Engineering. Check the right-to-know report or call about meeting dates, times, and locations.
- **Get involved in source water assessment and protection efforts** by contacting the water department or find a state government contact by calling the Safe Drinking Water Hotline at 800-426-4791.
- **Learn more from these groups:**
  - Clean Water Action in Houston, Texas, www.cleanwateraction.org/tx/index.htm, 713-529-9426, txcwa@cleanwater.org
  - Clean Water Network, www.cwn.org, cleanwater@igc.org

Peer reviewers for the Houston report included Sparky Anderson, Texas Clean Water Action.

NOTES

1 Safe Drinking Water Information System (SDWIS). U.S. Environmental Protection Agency database. Available online at: http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=620605&pwsid=TX1010013&state=TX&source=Surface%20water%20&population=2354040&sys_num=0. Last visited April 23, 2002.

2 Ibid.

3 "Larger Cities Report Capital Improvement Needs," *WaterWorld*, December 2001, available online at www.pennet.com.

4 See note 1.

5 Ibid.

6 See, EPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) Preproposal Draft Regulatory Language for Stakeholder Review, posted at www.epa.gov/safewater/mdbp/st2dis.html. The 1, 2, and 2.5 minimum log removal requirements are converted into percentage removals for simplicity. This rule has not been formally proposed in *The Federal Register,* but was agreed to by the EPA, NRDC, public health groups, cities, and the water utility industry. See *Ibid* for the "FACA Stakeholder Agreement in Principle."

7 Houston ICR Monitoring Data, as reported in EPA Information Collection Rule Database, www.epa.gov/enviro/html/icr/utility/report/TX1010013960929085044.html.

8 City of Houston Department of Public Works and Engineering, "Water Quality Report 2001," available online at www.ci.houston.tx.us/pwe/utilities/01report.pdf; City of Houston Department of Public Works and Engineering. Also "Water Quality Report 2000," available online at www.ci.houston.tx.us/pwe/utilities/00report.pdf.

9 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

10 City of Houston Department of Public Works and Engineering, "Water Quality Report 1999," available online at www.ci.houston.tx.us/pwe/utilities/99report.pdf.

11 City of Houston Department of Public Works and Engineering, "Water Quality Report 2000," available online at www.ci.houston.tx.us/pwe/utilities/00report.pdf .

12 City of Houston Department of Public Works and Engineering, "Water Quality Report 2001," available online at www.ci.houston.tx.us/pwe/utilities/01report.pdf.

13 See note 5.

14 See note 6.

15 See note 7.

16 Feldstein, Daniel and Bill Prewitt. "The Water Puzzle: Arsenic and Old Standards: What's Livable?" *The Houston Chronicle,* November 5, 2000, Section A, p. 1.

17 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

18 See note 6.

19 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

20 City of Houston Department of Public Works and Engineering, "Water Quality Report 2000," available online at www.ci.houston.tx.us/pwe/utilities/00report.pdf. Note that the levels are for year 1998.

21 See note 8.

22 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

23 See note 8.

24 Ibid.

25 See note 6.

26 Ibid.

27 See note 7.

28 See note 6.

29 Ibid.

30 City of Houston Department of Public Works and Engineering, "Water Quality Report 2001," available online at www.ci.houston.tx.us/pwe/utilities/01report.pdf. City of Houston Department of Public Works and Engineering, "Water Quality Report 2000," available online at www.ci.houston.tx.us/pwe/utilities/00report.pdf.

31 See note 7.

32 Index of Watershed Indicators, U.S. EPA database, available online at www.epa.gov/iwi/hucs/12040104/score.html, last visited April 23, 2002.

33 Ibid.

34 Ibid.

35 Ibid.

36 Trinity River Authority, available online at www.trinityra.org/abouttour1.htm, last visited April 22, 2002.

37 Index of Watershed Indicators, U.S. EPA database, available online at www.epa.gov/iwi/hucs/12030105/score.html, last visited April 22, 2002.

38 Ibid.

39 Personal communication with Connie Henriques, with the City of Houston Department of Public Works and Engineering, April 17, 2002.

40 EPA, "Arsenic in Drinking Water Treatment Technologies: Removal," available online at epa.gov/safewater/ars/treat.html. Report of Arsenic Cost Working Group of the National Drinking Water Advisory Council, August 14, 2001, available online at www.epa.gov/safewater/ars/ndwac-arsenic-report.pdf. City of Albuquerque, "Arsenic Removal," available online at www.cabq.gov/waterresources/arsenicremoval.html.

41 S.J. Ludescher, "Sandia Process Traps Arsenic Cheaply," *Albuquerque Tribune*, p. A1, May 29, 2001; Sandia National Laboratories, "Sandia Arsenic Catchers Could Help Communities Supply Safer Drinking Water Affordably," News Release, May 24, 2001, available online at www.sandia.gov/media/NewsRel/NR2001/sanssorb.htm.

42 See, *e.g.*, Report of Arsenic Cost Working Group of the National Drinking Water Advisory Council, August 14, 2001, available online at www.epa.gov/safewater/ars/ndwac-arsenic-report.pdf.

43 EPA, Proposed Radon in Drinking Water Rule, 64 Fed. Reg. 59246, 59328 (Table XIII.11) (November 2, 1999).

44 City of Houston, PWE, Water Production Branch, www.ci.houston.tx.us/pwe/utilities/index.htm, last visited April 23, 2002.

45 "Larger Cities Report Capital Improvement Needs," *WaterWorld,* December 2001, available online at www.pennet.com.

46 Water Capital Improvement Program, proposed FY '02–'06 CIP, revised August 31, 2001, City of Houston.

47 Feldstein, Dan, "The Water Puzzle: Region Faces Challenge of Meeting Demand." *The Houston Chronicle,* August 13, 2000, Section A, p. 1.

48 See note 6.

49 Cross, Brad L., Terry, David P., and Billings, Valerie R., "A Public Water Supply Protection Strategy," July 1991, City of Houston, Table 1: Sources of Water Quality Degradation, pp. 3+.

50 Tingle, Teresa, "Subdivisions Complain of Wells' Troubled Water; Residents Say Contamination Makes Them Sick," *The Houston Chronicle*, March 17, 2002, Section A, p. 37.

51 Cross, Brad L., Terry, David P., and Billings, Valerie R., "A Public Water Supply Protection Strategy," July 1991, City of Houston.

52 Feldstein, Dan, "The Water Puzzle; Regional Water Plan Draws Criticism; Environmentalists, Lake Residents Voice Fears over Reservoir Levels," *The Houston Chronicle*, September 22, 2000, Section A, p. 29.

53 "Our Water Resources," *The Houston Chronicle*. August 15, 2000, available online at www.chron.com/cs/CDA/story.hts/graphics/634231, last visited April 22, 2002.

54 Source Water Assessment and Protection Program Strategy, prepared by Source Water Assessment and Protection Team, Public Drinking Water Section, Water Utilities Division, February 1999.

55 Ibid.

56 See Texas Natural Resources Conservation Commission, "Source Water Protection Outsource Initiative," available online at www.tnrcc.state.tx.us/permitting/waterperm/pdw/swap/swpcon.html

57 Little information was available on the conservation plan via Houston's website, nor did Houston provide NRDC with a copy of the plan in response to a written request for drinking water information.

58 See note 6.

Manchester, NH

Manchester Earned a Water Quality and Compliance Grade of Good in 2000 and 2001

While the city had contaminants at levels of concern, it was a narrow range; furthermore, the city uses particularly advanced treatment techniques for a city of its size.

▶ Manchester had no recent reported violations of current, pending, or proposed national standards.

▶ Taps from some homes in Manchester produced high levels of **lead,** which can cause permanent brain, kidney, and nervous system damage as well as problems with growth, development, and behavior. The city did not, however, violate EPA's lead rule requirements.

▶ Manchester's water contains significant, though not unlawfully high, levels of **total trihalomethanes** (TTHMs), by-products of chlorine treatment in drinking water linked with cancer and, possibly, to miscarriages and birth defects.

▶ Manchester's water contains low levels of the gasoline additive **methyl tertiary-butyl ether** (MTBE), which can cause testicular cancer, kidney cancer, lymphoma, and leukemia in animals. The levels are present apparently due to boating activity on Lake Massabesic, Manchester's predominant watershed. While the levels do not approach any standard, deterioration of water quality due to gasoline pollution is a concern.

▶ Manchester detected the industrial chemical and potential carcinogen **trichloroethylene** (TCE) in its water at levels exceeding the national health goal but below the binding national standard. TCE can damage the nervous system, liver, and lungs and can cause abnormal heartbeat.

MANCHESTER
System Population Served **128,000[1]**
Water Quality and Compliance **2000▶Good** **2001▶Good**
Right-to-Know Report—Citizenship **2000▶Fair** **2001▶Good**
Source Water Protection **Good**
REPORT CARD

Noteworthy

▶ In general, Manchester uses fairly advanced treatment techniques—specifically, granular activated carbon, a technology uncommon in a system of Manchester's size.

Manchester's Right-to-Know Reports Earned Grades of Fair for 2000 and Good for 2001

▶ Both reports generally complied with EPA's regulations, and the 2001 report, unlike the 2000 report, made no sweeping or misleading declarations about the absolute safety of Manchester's water.

▶ The reports did not discuss lead levels in Manchester tap water or include maps or detailed discussions noting specific polluters in the watershed.

Manchester Earned a Source Water Protection Grade of Good

▶ The EPA's Index of Watershed Indicators (IWI) has ranked the entire watershed as a 6 on a scale from 1 (low threats) to 6 (high threats). Manchester has purchased much of the land surrounding its source waters and adopted a watershed management program, though there remain some upstream polluters, and recreational activity on the source water has caused some gasoline (MTBE) contamination of the source water. NRDC has therefore ranked source water protection as Good.[2]

Noteworthy

▶ Manchester needs millions of dollars in investments to upgrade water plants and pipes. Manchester has relied upon its treatment plant at Lake Massabesic since 1974. In the words of the Manchester Water Works, however, "27 years old, this facility is now in need of major renovations to continue its reliable service, to improve its capacity, and to achieve higher levels of water purification."[3] The city promises this work will improve "the quality and aesthetics of their tap water." In addition, the city has many miles of water pipelines that must be replaced or rehabilitated, as well as additional water infrastructure improvements.

KEY CONTAMINANTS IN MANCHESTER'S WATER

The following contaminants have been found in Manchester's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[4]

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels
1% in highest month, total coliform positive[5]

2001 Levels
1% in highest month, total coliform positive[6]

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Manchester's levels of coliform bacteria are not likely to constitute a serious threat to healthy consumers. The occasional detection of coliform in Manchester's pipes is a potential indicator that some regrowth of bacteria may be occurring in the city's distribution system.

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[7]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels[8]
14.7 ppb at 90th percentile home
Maximum: 14.7

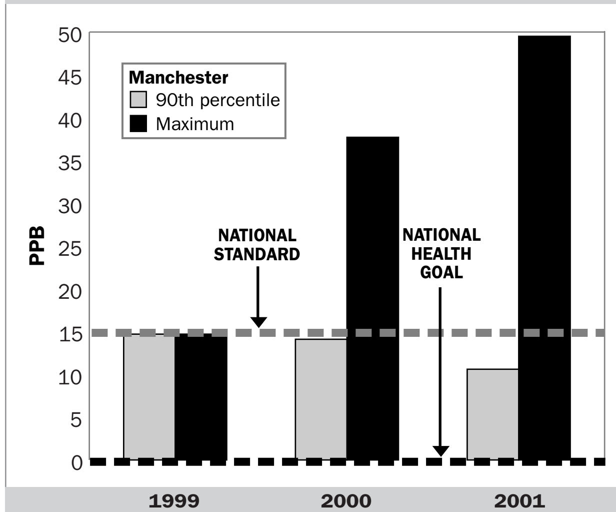
2000 Levels[9]
14.1 ppb at 90th percentile home
Maximum: 37.7 ppb

2001 Levels[10]
10.6 ppb at 90th percentile home
Maximum: 49.5 ppb

LEVELS PRESENT HIGH CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in

LEAD LEVELS



infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. In each of the last three years, 9 of 10 homes tested were barely below the EPA's action level. With peak lead levels in some homes as high as 49.5 ppb, and with many homes at levels well in excess of 15 ppb, lead levels are of serious concern in Manchester. Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

Haloacetic Acids

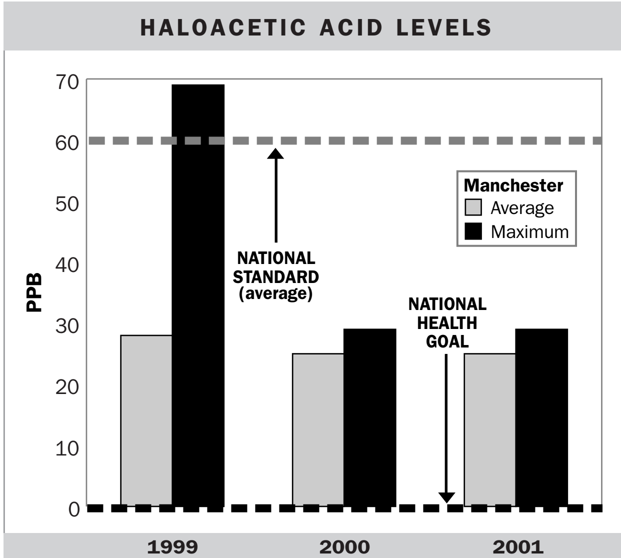
National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[11]

	Average	Maximum
1999 Levels[12]	28 ppb	69 ppb
2000 Levels[13]	25 ppb	29 ppb
2001 Levels[14]	25 ppb	29 ppb

LEVELS PRESENT SOME CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially,



reproductive and other health problems. Manchester's levels averaged less than half the new EPA standard.

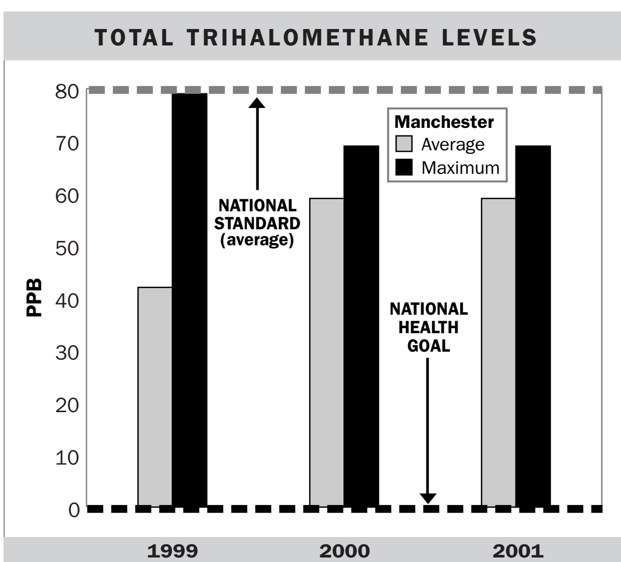
Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)
0—no known fully safe level[15]

1999 Levels[16]	Average 42 ppb	Maximum 79 ppb
2000 Levels[17]	Average 59 ppb	Maximum 69 ppb
2001 Levels[17]	Average 59 ppb	Maximum 69 ppb

LEVELS PRESENT HIGH CONCERN



Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. TTHMs are a health concern for Manchester, in 2001 averaging about 74 percent of the new EPA standard that went into effect in 2002.

Methyl Tertiary-Butyl Ether (MTBE)

National Standard (MCL)
None established

National Health Goal (MCLG)
None established

National Health Advisory
20–40 ppb (based on taste and odor concerns; the EPA says safe health level is higher)

Levels Detected (2001)
0–0.9 ppb

LEVELS PRESENT SOME CONCERN

Methyl tertiary-butyl ether (MTBE)—a gasoline additive that gets into drinking water through discharges from chemical or petroleum factories, gasoline spills, or leaks from underground or aboveground fuel storage tanks—has been found in animal studies to cause testicular cancer, kidney cancer, lymphoma, and leukemia. Manchester's water contains low levels of MTBE apparently due to boating activity on Lake Massabesic, Manchester's source water. The levels reported do not approach any standard but do indicate the possibility of more serious contamination with other gasoline constituents; continued deterioration of water quality due to gasoline pollution is a concern.

Trichloroethylene (TCE)

National Standard (MCL)
5 ppb (average)

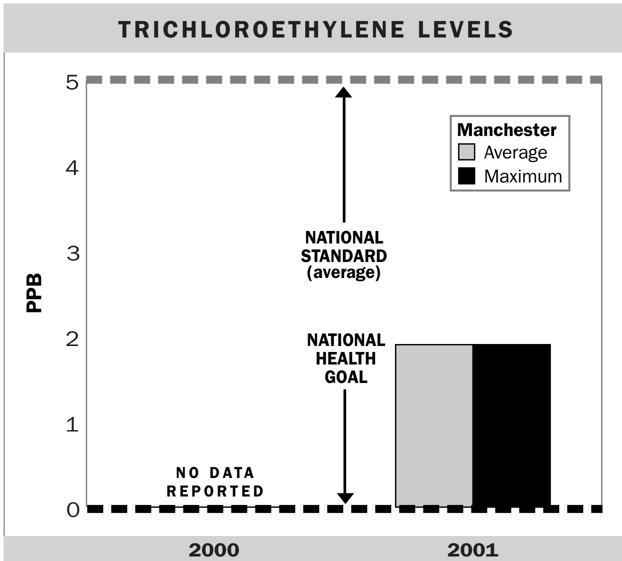
National Health Goal (MCLG)
0—no known fully safe level

2000 Levels[19]
None reported

2001 Levels[20]	Average 1.9 ppb	Maximum 1.9 ppb

LEVELS PRESENT SOME CONCERN

Trichloroethylene, a solvent used to remove grease from metal, can damage the nervous system, liver, and lungs and can cause abnormal heartbeat, coma, and



possibly death. While Manchester's levels were less than half the EPA standard, the finding could presage possible future problems with city water.

MANCHESTER'S RIGHT-TO-KNOW REPORTS

Manchester's Right-to-Know Reports Earned Grades of Fair for 2000 and Good for 2001

On the good-citizen side of the ledger:

▶ Both reports generally complied with the EPA's regulations for right-to-know reports.

▶ The 2001 report made neither sweeping nor misleading declarations about the absolute safety of Manchester's water, unlike the 2000 report.

▶ The reports included information on unregulated contaminants, such as MTBE.

▶ The 2000 report included a good illustration of Manchester's treatment steps for water purification, and the 2001 report included detailed tips on how to conserve water and a discussion of plans to upgrade the water treatment plant.

On the could-be-a-better-citizen side of the ledger:

▶ The 2000 report misleadingly states in large bold type: "Is the Water Safe? Absolutely!" The sweeping statement may have discouraged many consumers, including immunocompromised individuals, from reading the entire report. The promise of absolute safety undermines the less prominent mandatory notice later in the report that some vulnerable people may be at greater risk than the general population and understates the lead threat to children under six.

▶ The reports did not discuss lead in Manchester's tap water, though they did report elevated levels of lead in a table. The reports did not detail the health effects of lead contamination and offered no suggestions on how consumers could protect themselves and their children from the contaminant. These failings are cause for concern because Manchester's water has hovered close to the EPA action level for lead. Many families in the city with children under six are likely to have significant lead levels in their tap water.

▶ The reports include neither a map nor any detailed discussion of the specific polluters in the watershed. For example, no specific mention is made of the likelihood that recreational powerboats used on Lake Massabesic could be the source of the gasoline component MTBE in the city water supply. EPA rules require utilities to name known sources of any specific contaminant.[21] Even where EPA rules do not require such specific notice about a specific polluter or where the specific polluter cannot be tied with assurance to a specific contaminant, EPA rules encourage water systems to highlight significant sources of contamination in the watershed.

▶ The reports also did not provide information on the health effects of some contaminants found at levels below EPA standards but above EPA health goals, including trihalomethanes, haloacetic acids, and trichloroethylene. Although not legally required, this information would assist local citizens in protecting their health and in fighting for better protection of their water.

THREATS TO MANCHESTER'S SOURCE WATER

Manchester Earned a Source Water Protection Grade of Good

Manchester's water comes from Lake Massabesic and from small ponds and reservoirs in Auburn, Hooksett, and Candia that feed the lake. The EPA's Index of Watershed Indicators (IWI) has determined that the area surrounding Manchester's Lake Massabesic watershed has contamination problems and is highly vulnerable to contamination; the EPA has given the area an IWI index rating of 6 on the on a 1 to 6 scale, with 6 as the worst rating.[22]

Available data on Manchester's source water quality, including the IWI database, indicate that the watershed is highly vulnerable to contamination. Such condition indicators as fish consumption advisories, aquatic life support in water, decrease in wetlands, and quality of the drinking water contribute to this rating.

In order to protect source water quality, Manchester Water Works (MWW) owns about 8,000 acres of the property bordering on Lake Massabesic and surrounding ponds. In addition, MWW has adopted a watershed management program to protect the lake and its watershed.

In describing its source water protection efforts, MWW explains,

> *Watershed management . . . includes an active forestry program, and under the direction of a professional forester, the Manchester Water Works annually harvests about 500,000 board feet of timber. The purpose of this program is to develop the best tree cover for the forest environment and promote controlled water retention and runoff.*
>
> *Control of recreation is another component of sound watershed management. Our watershed officers . . . regulate watershed activities. They also provide the public with educational information about the watershed, as well as assistance should trouble or emergencies arise."*[23]

The MWW rules[24] for watershed protection prohibit swimming and contact with water but allow powerboats to be used on the lake, although powerboat racing and jet skis are banned. Powerboating carries the threat of gasoline contamination of the water supply.

While urban and agricultural runoff are thought to be only moderate indicators of vulnerability, collectively they may pose a threat to Manchester's water supply. Urban runoff occurs when water passes through an urban environment, picking up particles, dirt, and chemicals, and flows into area water resources. Similarly, agricultural runoff is composed of nitrogen and pesticide residue, as well as sediment delivery from farmlands to rivers and streams. Both are the direct result of population increases in the watershed, and both jeopardize the water supply.

In conclusion, although the EPA's IWI has ranked the general area as a 6 on its 1 to 6 threat scale, NRDC has concluded that this ranking does not fully account for the protections in place immediately around Manchester's water supply. NRDC believes that because much of the immediate area around Lake Massabesic is largely protected from development and many pollution sources, it has good source water protection.

For further information, see http://map2.epa.gov/scripts/.esrimap?name=iwi2&Cmd=Redraw&CmdOld=Identify&threshold=0.3&zoomFactor=1&layersCode=111000000111111101011&queryCode=0&IWIColor=IWI-0&fipsCode=10250004&click.x=352&click.y=119&IndexMap=on&Left=-71.4401017992824&Bottom=42.9438216918266&Right=-71.3242043027408&Top=43.0307448142328.

PROTECTING MANCHESTER'S DRINKING WATER

The following are approaches to treating Manchester's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Manchester draws its water from Lake Massabesic and sends it to a treatment plant, where it is mixed with coagulating chemicals so as to cluster fine particles for their ultimate removal by flocculation, sedimentation, and sand filtration. The water is then sent through carbon filters containing granular activated carbon (GAC) to remove dissolved organic matter, pesticides, viral particles, and carcinogenic compounds.[25] This carbon filtration step is fairly advanced and unusual for a water system of Manchester's size. That said, it is somewhat surprising that GAC has not reduced levels of chlorination by-products, such as trihalomethanes, more than it has. It is possible that changing the point of chlorination, or allowing more "empty bed contact time" of the GAC (that is, allowing more time for the water to be in contact with the carbon, so the carbon has more of a chance to adsorb organic matter), could further reduce levels of trihalomethanes and other by-products.

Finally, the water flows into a clear well, where chlorine is added to control bacterial growth. Zinc orthophosphate is also added to inhibit corrosion in the distribution system and in household pipes.

Manchester's water treatment reflects concern for the removal of lead and organic (and possibly carcinogenic) compounds, but its process may still not be sufficient to eliminate these contaminants. Treatment options to reduce lead levels of tap water require further optimization of corrosion control and, if necessary, a program for replacement of outdated lead service lines and other components of the distribution system. In some cases, replacement of lead-containing household plumbing may be required to resolve the issue.

Other treatment options include use of ozone or ultraviolet light as a primary disinfectant instead of chlorine. These options would improve the effectiveness of disinfection against *Cryptosporidium* and other chlorine-resistant microbes in the source water and reduce chlorination by-products in the water. Ultraviolet light is a particularly attractive option, as it creates no by-products. In addition, the use of chloramines instead of free chlorine as a residual or secondary disinfectant in the distribution system would reduce levels of chlorination by-products.

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

- **Attend meetings of your local water supplier, the Manchester Water Works.** Call 603-624-6494 and ask for dates, times, and locations.

MANCHESTER
Manchester Water Works 281 Lincoln Street 603-624-6494 www.ci.manchester.nh.us/water.htm
WATER UTILITY INFORMATION

- **Get involved in source water assessment and protection efforts** by contacting the utility or find a state government contact by calling the Safe Drinking Water Hotline at 800-426-4791.
- **Learn more from these groups:**
  - New Hampshire Clean Water Action at 603-430-9565
  - Clean Water Network, www.cwn.org

Among the peer reviewers for the New Hampshire report was Doug Bogen, Clean Water Action New Hampshire.

NOTES

1 Environmental Protection Agency, Safe Drinking Water Information Database.

2 EPA IWI, see www.epa.gov/iwi/hucs/01070002/score.html.

3 Manchester Water Works, "2002 Water Quality Report," available online at http://216.204.100.81/CityGov/WTR/files/C343C7A4AF304CD1A198C09E9063A868.pdf.

4 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

5 Manchester Water Works, "2001 Water Quality Report," available online at http://216.204.100.81/CityGov/WTR/files/AF2BE156B5564A62870ABD170ADC3025.pdf.

6 Manchester Water Works, "2002 Water Quality Report," available online at http://216.204.100.81/CityGov/WTR/files/C343C7A4AF304CD1A198C09E9063A868.pdf.

7 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

8 Manchester Water Works, "2000 Water Quality Report."

9 See note 3.

10 See note 4.

11 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

12 See note 6.

13 See note 3.

14 See note 4.

15 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

16 See note 6.

17 See note 3.

18 See note 4.

19 See note 4.

20 See note 4.

21 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While the EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution, and where the water system is aware of the pollution source, the rules require that polluters be identified.

22 See note 2.

23 Manchester Water Works: Watershed (online fact sheet), available online at http://216.204.100.81/CityGov/WTR/Wtrshed/Home.html.

24 See MWW Rules, available online at http://216.204.100.81/CityGov/WTR/wtrshed/Rules.html.

25 Information on treatment is derived from Manchester Water Works, http://216.204.100.81/CityGov/WTR/files/AF2BE156B5564A62870ABD170ADC3025.pdf.

NEW ORLEANS, LA

New Orleans Earned a Water Quality and Compliance Grade of Good for 2000 and 2001

▶ New Orleans had no recent reported violations of current, pending, or proposed national standards during 2000 or 2001, according to available information.

▶ New Orleans water contains by-products of chlorine disinfection that may cause cancer and, potentially, reproductive and other health problems—including **trihalomethanes** and **haloacetic acids,** found at levels below national standards but substantially above national health goals, particularly on the West Bank in 2001.

▶ In 2001, New Orleans had a peak turbidity level that approached the new national standard; **turbidity** is a measure of the cloudiness of water and is used as an indicator that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns.

▶ New Orleans occasionally has elevated levels of the pesticide **atrazine,** which can damage major organs and cause reproductive problems and cancer.

Noteworthy

▶ New Orleans city officials estimate major problems with aging pipes and infrastructure will necessitate "at least $1 billion in repairs and improvements."[1] Where that money ultimately comes from is not entirely certain, according to the executive director of the water and sewerage board.[2]

▶ An unsuccessful effort by the city to contract out management of the water system generated substantial controversy. It resulted in a successful ballot measure requiring voter approval for private contracts in excess of $5 million.[4] Ultimately, the privatization effort failed in 2002.

NEW ORLEANS
System Population Served **564,620[3]**
Water Quality and Compliance **2000▶Good** **2001▶Good**
Right-to-Know Report—Citizenship **2000▶Poor** **2001▶Poor**
Source Water Protection **Poor**
REPORT CARD

New Orleans's Right-to-Know Reports Earned Grades of Poor for 2000 and 2001

▶ The reports were generally readable and highlighted information for people most likely to experience adverse health effects from water problems.

▶ The reports did not provide required information on arsenic, atrazine, barium, or cadmium levels; included misleading language about lead in city water; included no information about specific sources of pollution as the EPA requires; and did not discuss the health effects of regulated contaminants found at levels in excess of health goals.

New Orleans Earned a Source Water Protection Rating of Poor

The city's source water, the Mississippi, is vulnerable to innumerable sources of industrial and agricultural pollution.

KEY CONTAMINANTS IN NEW ORLEANS'S WATER

The following contaminants have been found in New Orleans's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Cryptosporidium

National Standard (MCL)
Treatment Technique (TT)

Draft Proposed New National Standard[5]
<7.5 organisms/100 liters (average); no additional treatment
7.5–100 organisms/100 liters (average); some additional treatment (>90% *Crypto* kill)
100–300 organisms/100 liters (average); significant additional treatment (>99% *Crypto* kill)
>300 organisms/100 liters (average); advanced treatment (>99.7% *Crypto* kill)

National Health Goal (MCLG)
0—no known fully safe level

National Requirements
Most large- and medium-size water utilities that use surface water are required to monitor for *Crypto* and report results in their right-to-know reports; they eventually may be required to use advanced treatment if significant levels are found.

1998 Levels
Maximum: 0.1 oocysts/100 liters in 1 of 12 monthly tap water samples[6]

1999–2001 Levels
No confirmed occurrences in finished tap water; no data provided on source water[7]

Cryptosporidium (*Crypto*) is a waterborne microbial disease that presents human health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the elderly, children, and people who have undergone organ transplants. New Orleans began testing for *Cryptosporidium* before it was required to do so, but more testing is needed to determine *Crypto* risks.

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[8]

National Health Goal
0—no known fully safe level

1999 Levels[9]
East Bank: 1.1% in highest month, total coliform positive
West Bank: 0% in highest month, total coliform positive

2000 Levels[10]
East Bank: 0% in highest month, total coliform positive
West Bank: 1.3% in highest month, total coliform positive

2001 Levels[11]
East Bank: 0.5% in highest month, total coliform positive
West Bank: 1.2% in highest month, total coliform positive

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. The federal standard allows up to 5 percent total coliform-positive samples per month. The health goal for any type of coliform bacteria is 0. So while the coliform bacteria finding in New Orleans is not viewed as serious, it may indicate some regrowth of bacteria in the water mains after the water leaves the treatment plant. Some studies suggest that serious regrowth problems may allow disease-causing pathogens to subsist in pipes. Rehabilitation and renewal of the water distribution system will help New Orleans's century-old system ensure that bacterial problems in its pipes are addressed and prevented from becoming serious.

Turbidity

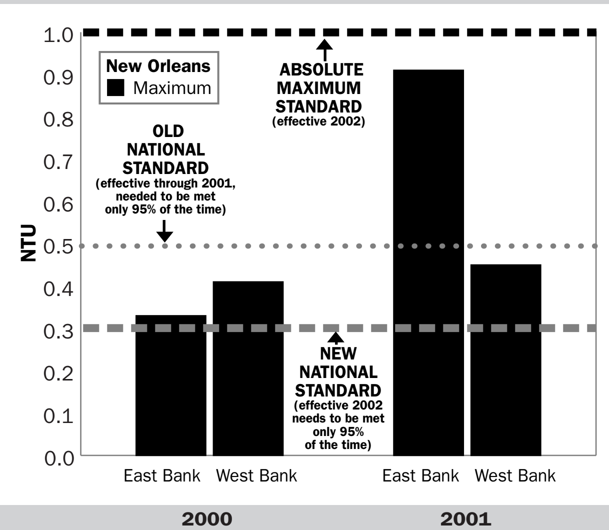
National Standard (TT) (in Nephelometric Turbidity Units, or NTU)
Filtered water
0.5 NTU 95% of the time (through 2001)
0.3 NTU 95% of the time (in 2002)
1 NTU 100% of the time (in 2002)
Unfiltered water
5 NTU maximum, 100% of the time

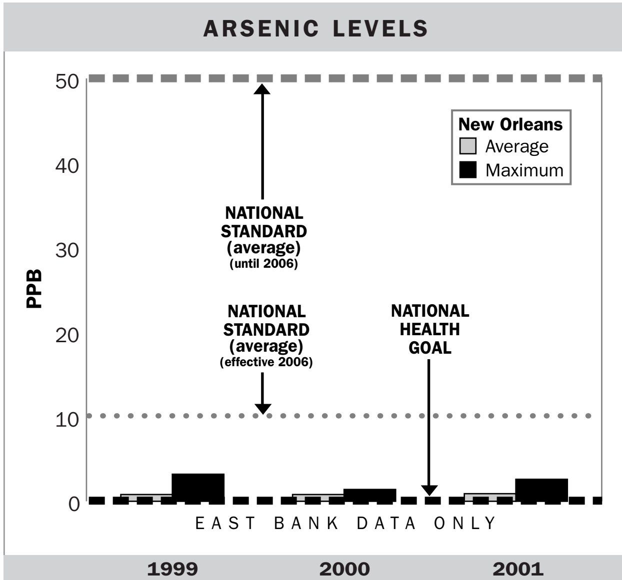
2000 Levels[12]	Maximum
East Bank	0.33 NTU
West Bank	0.41 NTU
2001 Levels[13]	Maximum
East Bank	0.91 NTU
West Bank	0.45 NTU

LEVELS PRESENT HIGH CONCERN

Turbidity is a measure of the cloudiness of water and is used as an indicator that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns. In addition, turbidity can interfere with water disinfection because it can impede the effectiveness of chlorine or other chemical disinfectants. New Orleans had a peak turbidity level extremely close to the new EPA standard. New Orleans's turbidity levels must be carefully monitored to be sure that filtration performance stays high and turbidity levels low to avoid potential problems with *Crypto* or other organisms in tap water.

TURBIDITY LEVELS





INORGANIC CONTAMINANTS

Arsenic

National Standard (MCL)
50 ppb (average) effective through 2005
10 ppb (average) effective in 2006

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels[14]	Average	Maximum
East Bank	0.8 ppb	3.2 ppb
2000 Levels[15]	Average	Maximum
East Bank	0.8 ppb	1.4 ppb
2001 Levels[16]	Average	Maximum
East Bank	0.9 ppb	2.6 ppb

Arsenic—the product of mining and industrial processes, past use of arsenic-containing pesticides, and natural leaching or erosion from rock—is a known and potent human carcinogen that has been linked to a variety of other diseases. While the average arsenic level in the city's treated water is below the new EPA standard, it still poses a cancer risk of about 1 in 1,000, according to the National Academy of Sciences.[17]

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[18]

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels[19]

East Bank	0 ppb at the 90th percentile home
West Bank	1 ppb at the 90th percentile home

2001 Levels[20]

East Bank	0 ppb at the 90th percentile home Maximum 5 ppb
West Bank	0 ppb at the 90th percentile home Maximum 0 ppb

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. New Orleans's water is relatively hard, a characteristic that impedes the corrosion of pipes, which can leach lead. New Orleans's reported lead level is among the lowest of any major city reviewed for this report.

Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

Atrazine

National Standard (MCL)
3 ppb (average)

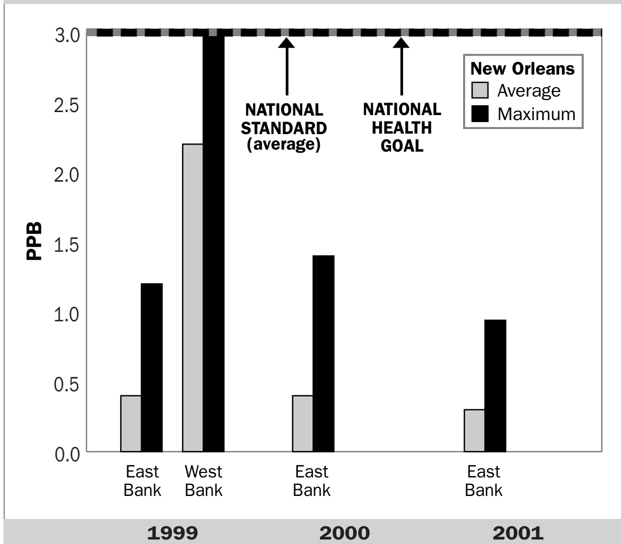
National Health Goal (MCLG)
3 ppb

1999 Levels[21]	Average	Maximum
East Bank	0.4 ppb	1.2 ppb
West Bank	Average 2.2 ppb[22]	Maximum 3 ppb
2000 Levels[23]		
East Bank	Average 0.4 ppb	Maximum 1.4 ppb
2001 Levels[24]	Average	Maximum
East Bank	0.3 ppb	0.94 ppb

LEVELS PRESENT SOME CONCERN

Atrazine, a pesticide, poses health risks that include damage to major organs, potential reproductive problems, and possibly cancer.[25, 26] Atrazine levels in New Orleans's tap water peaked at the national standard in 1999, but the annual average that year was below the national standard. Atrazine levels were lower in 2000 and 2001.

ATRAZINE LEVELS



Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

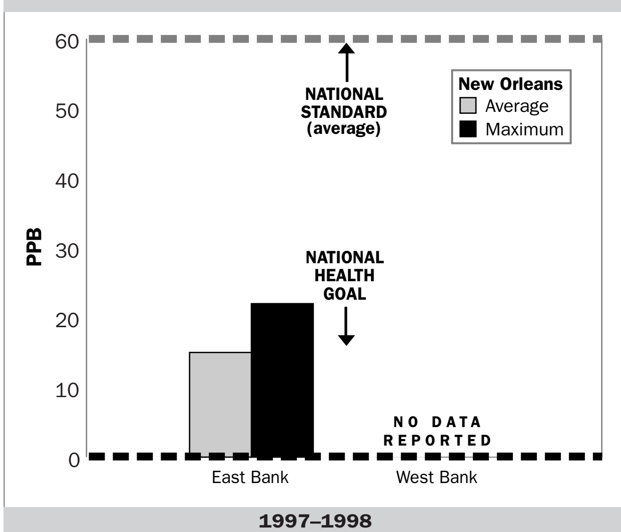
National Health Goal (MCLG)
0—no known fully safe level[27]

1997–1998 Levels[28]	Average	Maximum
East Bank	15 ppb	22 ppb
West Bank	No data[29]	

LEVELS PRESENT SOME CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. New Orleans's haloacetic acid levels in 2001 were below the national standard that went into effect in January 2002. As discussed in Chapter 5, the EPA standard is not based exclusively upon health but rather is based on a weighing of health risks versus treatment options, costs, and other considerations. New Orleans's haloacetic acid levels are lower than those of many other cities reviewed in this report and, based upon the limited data provided, do not appear to present a major health concern.

HALOACETIC ACID LEVELS



Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

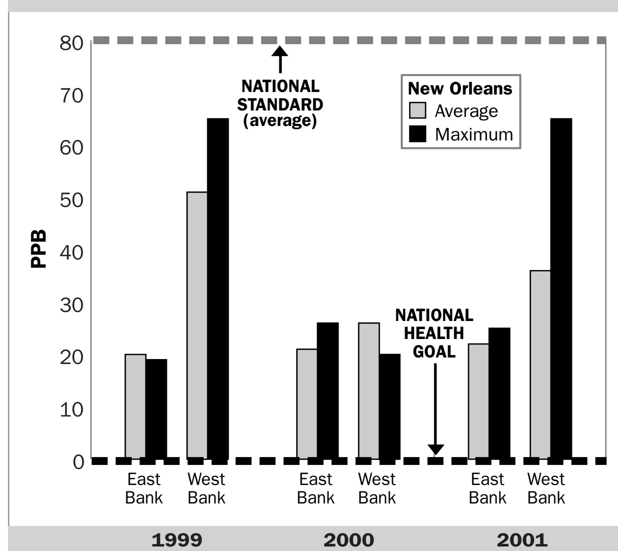
National Health Goal (MCLG)
0—no known fully safe level[30]

1999 Levels[31]	Average	Maximum
East Bank	20 ppb	19 ppb
West Bank	51 ppb	65 ppb
2000 Levels[32]	Average	Maximum
East Bank	21 ppb	26 ppb
West Bank	26 ppb	20 ppb[33]
2001 Levels[34]	Average	Maximum
East Bank	22 ppb	25 ppb
West Bank	36 ppb	65 ppb

LEVELS PRESENT SOME CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interact with organic matter in the water—are linked with cancer and, potentially, to miscarriages and

TOTAL TRIHALOMETHANE LEVELS



birth defects. New Orleans's TTHM levels in 2001 were below the national standard that went into effect in January 2002. The EPA standard is not based exclusively on health but rather is based on a weighing of health risks versus treatment options, costs, and other considerations. New Orleans's TTHM levels are lower than those in many other cities reviewed in this report and do not appear to present a major health concern based upon the limited data provided (although the 1999 and 2001 peaks in West Bank water may be of some concern for pregnant women).

NEW ORLEANS'S RIGHT-TO-KNOW REPORTS

New Orleans's Right-to-Know Reports Earned a Grade of Poor for 2000 and 2001

On the good-citizen side of the ledger:

▶ The reports were generally readable and highlighted information for people most likely to experience adverse health effects from water problems.

On the could-be-a-better-citizen side of the ledger:

▶ The reports did not reveal levels of arsenic, atrazine, barium, and cadmium in city water. This is a violation of the EPA's right-to-know report rules. The failure to note arsenic and atrazine levels was of particular concern. Although the city's levels are not in violation of standards, they still present a cancer risk, and citizens would be better able to protect themselves if the right-to-know reports informed them of the pollutants' presence.

▶ The 2001 report implied that no lead was found in New Orleans tap water, stating, "Amounts detected . . . Lead: 0," and in a highlighted statement: "Is there lead in New Orleans's Tap Water? No lead was present in the treated water leaving our treatment plants." The report went on to assert that "it is not expected that water would pick up lead while traveling through pipes." Later the report stated, "Some homes may have lead levels higher than what is indicated by the results shown in the table if they have plumbing with lead solder or brass faucets containing lead." The report never acknowledged that once water arrives at consumers' taps—where EPA rules require lead testing—the substance has been found in the city's own tests. In 2001, for example, some tested homes had lead levels as high as 5 ppb.[35] While EPA rules can be read to require that cities report only the 90th percentile lead level and the number of homes exceeding the action level for lead, New Orleans's report could have misled consumers to believe that no lead is found in tap water in New Orleans.

▶ The reports lacked maps showing New Orleans's source of drinking water or mapped or textual explanation of specific sources of pollution in New Orleans's source water. EPA rules require utilities to name known sources of any specific contaminant found in their tap water.[36] Even where EPA rules do not require such specific notice about a specific polluter, or where the specific polluter cannot be tied with assurance to a specific contaminant, EPA rules encourage water systems to highlight significant sources of contamination in the watershed.

▶ The reports did not discuss the health effects of certain regulated contaminants found at levels in excess of health goals. For example, no health effects information was provided on chlorination by-product chemicals or on radioactive contaminants. While EPA rules do not require such information, it would have been helpful to consumers.

THREATS TO NEW ORLEANS'S SOURCE WATER

New Orleans Earned a Source Water Protection Grade of Poor

The EPA's Index of Watershed Indicators (IWI) reports that New Orleans's watershed, the Lower Mississippi, has serious contamination problems and that it received an overall index rating of 5, on a 1 to 6 scale, with 6 as the worst rating.[37] Several forms of pollution are at work in this watershed, earning the city a Poor rating for source water protection.

According to the EPA, less than 20 percent of the watershed is of high enough quality to meet state-designated uses. In addition, serious conventional water pollution problems, loss of wetlands that cushion pollution loadings, and substantial numbers of major industrial polluters and sewage treatment plants discharging into the river upstream all contribute to serious risks of contamination of the Lower Mississippi.[38]

Second, the Mississippi watershed is highly susceptible to contamination from urban runoff, pollution that occurs when water passes through an urban environment, picking up particles, dirt, and chemicals before flowing into the area's water resources.

Finally, the Mississippi is affected by agricultural runoff. The EPA's "vulnerability indicator" for agricultural runoff potential shows a significant level of potential impact, with a moderate potential for nitrogen, pesticide, and sediment delivery from farm fields to rivers and streams.

PROTECTING NEW ORLEANS'S DRINKING WATER

The following are approaches to treating New Orleans's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

New Orleans could reduce disinfection by-products and other contaminants with additional treatment. For example, enhanced coagulation, activated carbon, and/or the use of an alternative primary disinfectant such as ozone or ultraviolet light could reduce disinfection by-product levels further. Moreover, ozone or ultraviolet light are far more effective than chlorine is at killing *Cryptosproridium* and some other resistant microbes. Synthetic organic compounds such as atrazine and other herbicides and pesticides, spills of petroleum products or other chemicals, as well as disinfection by-products are substantially reduced by the use of granular activated carbon (GAC). Some cities have installed GAC at a cost of about $25 per household per year and have improved water quality, taste, and odor.

NEW ORLEANS

Sewerage and Water Board of New Orleans[39]
625 St. Joseph Street
New Orleans, LA 70165
504-865-0420
www.swbnola.org

WATER UTILITY INFORMATION

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

- **Attend meetings of the local water supplier,** the Sewerage and Water Board of New Orleans. Check the right-to-know report or call and ask for dates, times, and locations.
- **Get involved in source water assessment and protection** efforts by contacting the utility or find a state government contact by calling the Safe Drinking Water Hotline at 800-426-4791.
- **Learn more from these groups:**
  - Louisiana Environmental Action Network (LEAN) at 225-928-1315
  - Mississippi River Basin Alliance's New Orleans Office at 504-588-9008
  - Clean Water Network, www.cwn.org

Peer reviewers for the New Orleans report included Wilma Subra and Willie Fontenot.

NOTES

1 "Rotting Sewer, Water Lines Tough Problems in Big Easy," *Chicago Tribune*, July 7, 2002, available online at www.win-water.org/win_news/070802article.html.

2 Ibid.

3 U.S. Environmental Protection Agency Safe Drinking Water Information Database (SDWIS), visited January 31, 2001, available online at www.epa.gov/enviro/html/sdwis/.

4 See Public Citizen, "Press Release: New Orleans Privatization Bid Rejected," October 16, 2002, available online at www.citizen.org/pressroom/release.cfm?ID=1241; Sewerage and Water Board of New Orleans, RFQ/RFP and associated materials, available online at www.swbno.org/rfq-rfp/CoverPage.htm.

5 See, EPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) Preproposal Draft Regulatory Language For Stakeholder Review, posted at www.epa.gov/safewater/mdbp/st2dis.html. The 1, 2, and 2.5 minimum log removal requirements are converted into percentage removals for simplicity. This rule has not been formally proposed in *The Federal Register*, but was agreed to by EPA, NRDC, public health groups, cities, and the water utility industry. See Ibid for the "FACA Stakeholder Agreement in Principle."

6 "A Report on the State of Tap Water in New Orleans: Quality Water 1999," Sewerage and Water Board of New Orleans, 2000.

7 "A Report on the State of Tap Water in New Orleans: Quality Water 2001," Sewerage and Water Board of New Orleans, 2002.

8 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

9 See note 6.

10 "Quality Water 2000," Sewerage and Water Board of New Orleans, 2001.

11 See note 7.

12 "A Report on the State of Tap Water in New Orleans: Quality Water 2000," Sewerage and Water Board of New Orleans, 2001.

13 See note 7.

14 Sewerage and Water Board of New Orleans, 1999 Results for New Orleans East Bank Distribution System Samples (FILE: 1999_DIST.XLS), obtained by NRDC under open records request.

15 Sewerage and Water Board of New Orleans, 2000 Results for New Orleans East Bank Distribution System Samples (FILE: 2000_DIST.XLS), obtained by NRDC under open records request.

16 Personal communication with Chris Holly, Sewerage and Water Board of New Orleans, August 23, 2002.

17 National Academy of Sciences, National Research Council, *Arsenic in Drinking Water: 2001 Update* (2001), available online at www.nap.edu/books/0309076293/html/. For a summary of the report, see http://www4.nationalacademies.org/news.nsf/isbn/0309076293?OpenDocument.

18 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

19 "Quality Water 2000," Sewerage and Water Board of New Orleans. 2001. Please note that these data are from 1998, when the last lead survey required by law occurred.

20 Personal communication with Chris Holly, Sewerage and Water Board of New Orleans, August 23, 2002.

21 See note 14.

22 See note 6.

23 See note 15.

24 See note 16.

25 EPA, Consumer Fact Sheet: Atrazine," available online at www.epa.gov/safewater/dwh/c-soc/atrazine.html.

26 Ibid.

27 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

28 "A Report on the State of Tap Water in New Orleans: Quality Water 1999," Sewerage and Water Board of New Orleans, 2000 (the report does not identify the year of the testing but says these data were from the Information Collection Rule monitoring, which under the rule was conducted in 1997–1998).

29 According to the right-to-know report, monitoring data was only collected for the East Bank of New Orleans due to population size.

30 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

31 See note 6.

32 See note 12.

33 While it may seem wrong that the average for the West Bank was higher than the maximum level, New Orleans says that this figure is correct. It is an anomaly created because the EPA allows water systems to report as the "average" the highest running annual average. The running annual average for 2000 included data from 1999 that was higher than the 2000 levels. As city officials explained it, "It may seem strange that the average is outside of the range of values (9–20) shown. This is because we are required to report the highest annual running average for the four quarters. It happens that in 2000 the highest annual running average occurred in the first quarter, which must be calculated with 1999 data, but 1999 data is not used to determine the range of values." Sewerage and Water Board of New Orleans, www.swbnola.org/ccr_page4.html.

34 "Quality Water 2001," Sewerage and Water Board of New Orleans, 2002.

35 See note 20.

36 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution or where the water system is aware of the pollution source, the rules require that polluter to be identified.

37 EPA, Index of Watershed Indicators, www.epa.gov/iwi/hucs/08070100/score.html and www.epa.gov/iwi/hucs/08090100/score.html.

38 Ibid.

39 See note 7.

NEWARK, NJ

Newark Earned a Water Quality and Compliance Grade of Fair in 2000 and 2001

The city has serious problems with lead, as well as with trihalomethanes and haloacetic acids.

▶ In both 2000 and 2001, tap water tests revealed **lead** levels that exceed the national action level. Newark says it is installing improved treatment to address this problem. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior.

▶ Newark has made some progress on its problems with **trihalomethanes** (TTHMs) and **haloacetic acids** (HAAs) but still has elevated levels. TTHMs and HAAs are by-products of chlorine disinfection that may cause cancer and possibly birth defects and miscarriages.

Noteworthy

▶ In general, a June 2001 New Jersey Department of Environmental Protection inspection rated Newark's reservoir system "unacceptable," citing such problems as an uncovered finished water reservoir that must be covered to protect it from contamination and a sludge lagoon leaking into the Charlotteburg Reservoir.[1]

Newark's Right-to-Know Reports Earned Failing Grades for 2000 and 2001

▶ The 2000 and 2001 reports complied with many but not all of the EPA's requirements and made no overarching claim that the water is absolutely safe, but they violated federal law by not providing information on the specific levels of arsenic and haloacetic acids.

▶ The reports buried information on the city's exceedance of the EPA action level for lead.

▶ In 2000, the city violated a federal requirement that the report be posted on the Internet.

NEWARK
System Population Served **275,221[2]**
Water Quality and Compliance **2000▶Fair** **2001▶Fair**
Right-to-Know Report—Citizenship **2000▶Failing** **2001▶Failing**
Source Water Protection **Fair**
REPORT CARD

Newark Earned a Source Water Protection Grade of Fair

▶ The EPA's Index of Watershed Indicators (IWI) has ranked the Passaic River Watershed, the city's water supply Watershed, as a 6 on a 1 to 6 scale, with 6 the worst possible rating. Although much of the upstream watershed is protected, significant sections of downstream rivers are degraded by water pollution sources and hazardous waste facilities, and constant development pressure threatens the upstream watershed. In addition, as noted above, Newark's reservoirs are threatened.

KEY CONTAMINANTS IN NEWARK'S WATER

The following contaminants have been found in Newark's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[3]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels
1% in highest month, total coliform positive

2000 Levels
0% in highest month, total coliform positive

2001 Levels
0.4% in highest month, total coliform positive

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. The highest reported level of coliform bacteria in any month in Newark's Wanaque system was 1 percent, measured in 1999. The coliform bacteria finding in Newark is not seen as a serious health risk for healthy consumers; however, the finding of any coliform bacteria in the city's water distribution system is a potential indication that regrowth of bacteria may be occurring in city pipes.

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[4]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels[5]
Wanaque System
24 ppb at the 90th percentile home
Pequannock System
13 ppb at the 90th percentile home

2000 Levels[6]
Wanaque System: 24 ppb at the 90th percentile home
Pequannock System: 11 ppb at the 90th percentile home

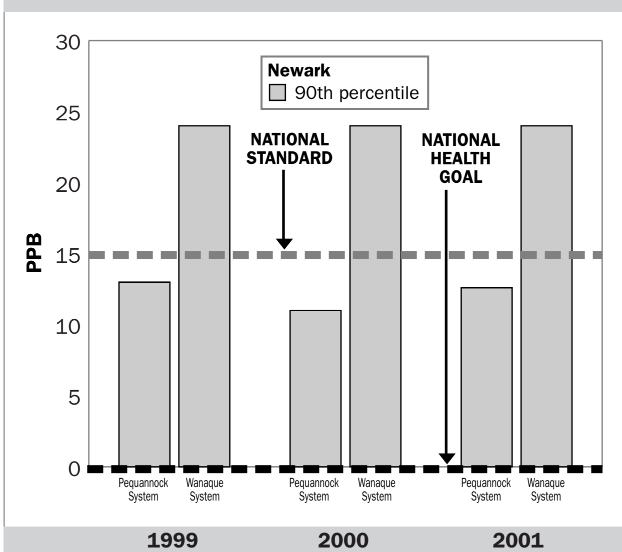
2001 Levels[7]
Wanaque System: 24 ppb at the 90th percentile home
Pequannock System: 12.6 ppb at the 90th percentile home

EXCEEDS ACTION LEVEL

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior, as well as adversely affect blood pressure, red blood cells, and kidney and nervous system function. Newark's continued exceedance of the national action level for lead in the Wanaque system is of serious concern. Newark was required under the EPA's Lead and Copper Rule to have a corrosion control program in place by 1997. But it appears from the city's monitoring that it continues to provide water that corrodes plumbing sufficiently to cause exceedances of the action level. In its right-to-know report, the city asserted that in 2001 it used the corrosion inhibitor sodium silicate in the Pequannock supply zone and that lead levels in the zone, although still elevated in many homes, did not exceed the action level.[8] The same was not true in the Wanaque supply zone, where lead levels were well above the action level.[9] Newark says it installed a satellite feed station to add corrosion inhibitor to the water in that zone in late 2001. The city says that "once the satellite feed station is fully operational," there will be corrosion inhibitors added to the Wanaque water but made no promises that the lead problem will be fully resolved by this step.[10]

In the meantime, Newark points out, "infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show deficits in their attention span and learning abilities. Also, adults who drink this water over many years could develop kidney problems or high blood pressure."[11] Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

LEAD LEVELS



ORGANIC CONTAMINANTS

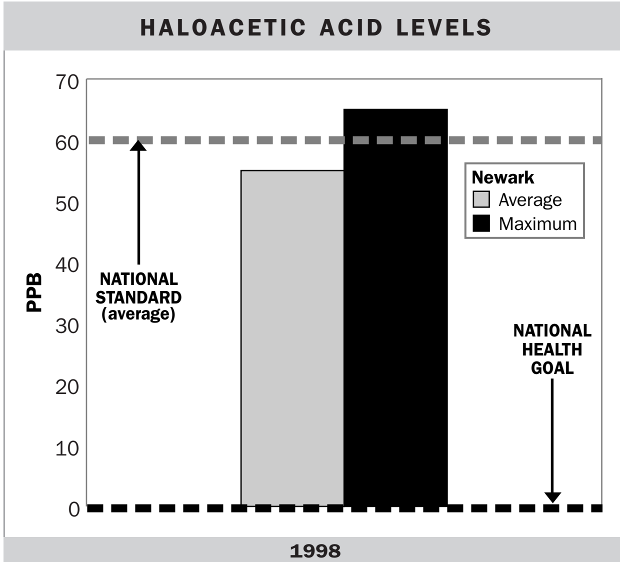
Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[12]

	Average	Maximum
1998 Levels[13]	55 ppb	65 ppb

LEVELS PRESENT HIGH CONCERN



Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Newark's last reported HAA levels are for 1998, and they were just shy of the new national standard. Newark has publicly reported no more data, but if the city switched to ozone disinfection, as it said in 2000 that it planned to do, HAA levels may have been reduced.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

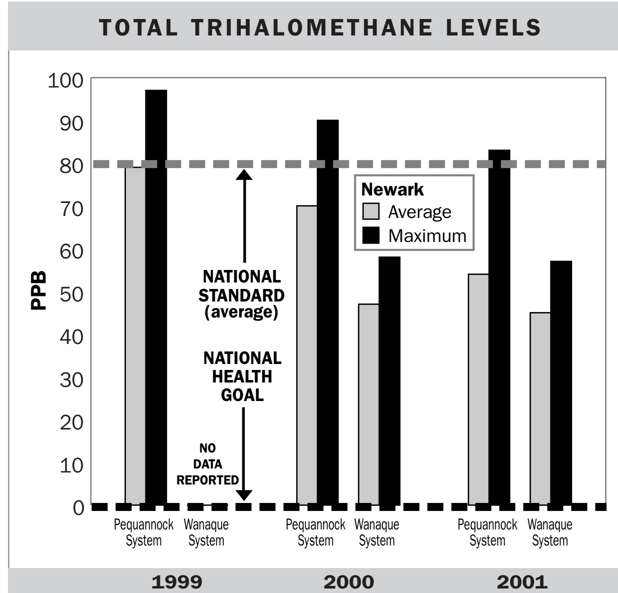
National Health Goal (MCLG)
0—no known fully safe level[14]

1998 Levels
195 ppb spike in September 1998

1999 Levels[15]	Average	Maximum
Pequannock System	79 ppb	97 ppb
2000 Levels	Average	Maximum
Pequannock System	70 ppb	90 ppb
Wanaque System	47 ppb	68 ppb
2001 Levels[16]	Average	Maximum
Pequannock System	54 ppb	83 ppb
Wanaque System	45 ppb	57 ppb[17]

LEVELS PRESENT HIGH CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. TTHM levels have improved steadily



in Newark since 1998 with a particularly marked improvement in 2001, apparently due to the introduction of ozone as a primary disinfectant. The highest TTHM level reported by Newark in 2001 is considerably lower than the previous years' peak. As recently as 1998, a level of 195 ppb was recorded in the city's system. According to at least one scientific study, systems with average TTHM levels more than 75 ppb are associated with miscarriages, and early studies completed in New Jersey indicate some birth defect association with elevated TTHMs.

Newark says in its 2001 right-to-know report that "Newark receives water that meets the yearly MCL average for TTHMs. The New Jersey Drinking Water Supply Commission and Newark have recently modified treatment to further reduce TTHMs and now participate in a statewide study to help further reduce the amount of naturally occurring organics in the watershed. Newark is planning to modify its treatment process to further reduce its TTHMs by the use of ozone as a disinfectant."

NEWARK'S RIGHT-TO-KNOW REPORTS

Newark's Right-to-Know Reports Earned Failing Grades for 2000 and 2001

On the good-citizen side of the ledger:

▶ The 2000 and 2001 reports complied with many, but not all, of the EPA's rules for right-to-know reports and made no overarching claim that the water is absolutely safe.

▶ The reports included required information on "special considerations regarding children, pregnant women, nursing mothers, and others," including specific information on nitrate and lead. However, the lead discussion in that section failed to point out that the water in parts of Newark exceeded the EPA's lead action level. Instead the report stated, "if you are concerned about lead levels in your home water, you may wish to flush your tap for 30 seconds to two minutes before using tap water."

On the could-be-a-better-citizen side of the ledger:

▶ For years, the city violated federal law by failing to post its right-to-know report on the Internet. In letters dated September 2000 and October 2001, the New Jersey Department of Environmental Protection threatened the city with enforcement action.[18] Finally, as of March 2002, the 2000 report was posted on the Web. The 2001 report was posted in a more timely way in 2002,[19] albeit in a location that is difficult to find.[20]

▶ Newark's 2000 and 2001 reports violated federal law by not providing information on the specific level of arsenic detected in the city's water supply in the report's table of contaminants. The 2000 report was completely silent on arsenic. The 2001 report buried in text on pages 5 and 6 the following: "while your drinking water meets the USEPA's standard for arsenic, it does contain low levels of arsenic. . . . In 2001, the level of arsenic was less than 8 ppb in Newark's water." No specific arsenic levels are revealed, contrary to EPA rules, simply an assertion that arsenic levels are *below* 8 ppb. The 2001 report then includes a statement, required by law to be issued to consumers who have more than 5 ppb of arsenic in their drinking water, that the EPA set the arsenic standard at 10 ppb based on a weighing of costs of treatment against health effects and that arsenic is "a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems."

▶ Newark's 2000 and 2001 reports violated federal law by failing to include information on the levels of haloacetic acids found in city water. EPA rules require this information to be disclosed.[21]

▶ Newark's reports buried on page 5 information about its exceedance of the lead action level, obscuring the news in large blocks of single-spaced, small-font type. This presentation sharply contrasts with the far more prominent and rather misleading statement in boldface and all caps on the first page, asserting that, "Newark's drinking water meets or surpasses all federal and state drinking water standards." That statement did not mention that the Pequanock system exceeded the lead action level. The report also failed to acknowledge that Newark had a legal responsibility to reduce lead levels by 1997.

▶ The report violated the EPA's regulations by failing to state the number of tested households that exceeded the lead action level.[22]

▶ The 2001 report did not mention a violation that year of the lead-monitoring rules. The violation is highlighted on the EPA website's list of violations.[23] EPA rules require any violation in the past year to be discussed in the report.[24] (This violation could not be independently confirmed with the state at press time. Although the EPA website generally warns that it may contain errors, it is directly based upon reports filed by New Jersey with the EPA, and under federal law, state reports must be complete and accurate, subject to civil and criminal penalties.)

▶ A table in the report obscured important findings about hazardous contaminants by adding extensive entries for other regulated contaminants that were not of concern and were even not detected. This appears to have been a violation of EPA rules, which specifically prohibit water systems from burying important data in a sea of unimportant information. Specifically, EPA rules provide that "any additional monitoring results, which a community water system chooses to include in its report, must be displayed separately"[25] from the required tables, and "the systems may include such additional information as they deem necessary for public education consistent with, and not detracting from, the purpose of the report."[26]

▶ The format of the report was not user-friendly.

▸ Newark has not translated its reports into Spanish or any other language. According to the 2000 Census, 43 percent of Newark's residents do not speak English at home, and 28 percent of Newark's population speaks Spanish at home. In addition, about 15 percent of the city's population speaks Spanish and speaks English "less than very well." The EPA rules require that systems serving "a large proportion of non-English speaking residents" must provide information on the importance of the report in the relevant language(s) or a phone number or address where citizens can get a translated copy of the report or assistance in their language.[27] Newark does make a passing reference in Spanish in the reports to their importance but fails to provide a phone number for more information in Spanish—a step taken by some cities with significant Spanish-speaking populations. In all, about 7 percent of Newark residents speak "other Indo-European languages" or "Asian and Pacific Island languages" and also speak English "less than very well." This population apparently speaks a multitude of other languages, and although 2000 census data available at press time do not give a clear indication, it may be that no single translation would reach a large percentage of this population.

▸ The reports included no maps showing Newark's source of drinking water and nothing detailing specific sources of pollution in the city's source water. EPA rules require utilities to name known sources of any specific contaminant found in tap water.[28] Even where EPA rules do not require such specific notice about a polluter, or where the polluter cannot be tied with assurance to a particular contaminant, EPA rules encourage water systems to highlight significant sources of contamination in the watershed. It is helpful to citizens to be told what the known or potential pollution sources are in their source water in order to increase awareness of watershed protection.

▸ The reports did not discuss the health effects of certain regulated contaminants found at levels in excess of health goals. For example, the reports did not inform consumers that chlorination by-products, trihalomethanes, and haloacetic acids found at elevated levels in Newark's water are linked to cancer and possibly to reproductive problems. The report acknowledged only that, "in excessive quantities, these by-products may have harmful health effects." While EPA rules do not mandate that such information be provided, it would have helped consumers in protecting their drinking water and in making decisions about the health of their families.

THREATS TO NEWARK'S SOURCE WATER

Newark Earned a Source Water Protection Grade of Fair

The EPA's Index of Watershed Indicators (IWI) has ranked the overall health of the city water supply (the Passaic River Watershed) as a 6—the worst possible rating. In the EPA's words, "The overall IWI score . . . describes the health of the aquatic resources for this watershed. A score of 6 indicates more serious water quality problems—high vulnerability to stressors such as pollutant loadings."[29] While the upper reaches of Newark's Pequannock and Wanaque Watershed supplies are predominantly forested, largely protected, and relatively pristine, sections of these rivers, particularly downstream, are degraded by water pollution sources and waste facilities. In addition, even protected sections of the watershed face enormous development pressures.

Newark's source water, located in Morris, Sussex, and Passaic Counties, comes from the Wanaque and Pequannock Watersheds; they cover 150 square miles of mostly forested lands in north central New Jersey and ultimately flow into the Passaic River. Newark's 14.5-billion-gallon Pequannock supply comes from five upstream reservoirs: Charlottesburg, Echo Lake, Canistear, Clinton, and Oak Ridge. Most of the upper watershed generally has been fairly pristine but is under immense development pressure, and portions of the Pequannock River have been classified by the state as "biologically moderately impaired"—that is, moderately polluted with coliform bacteria, excessive biological oxygen demand, and other water quality problems.[30] In addition, some water pollution discharge permitees and numerous hazardous waste sites are located in the watershed. Yet according to the state Department of Environmental Protection, the "great majority of the land within the Pequannock Watershed is forested and protected for water supply purposes and parklands."[31]

However, the cash-strapped city of Newark has over the past several years proposed a variety of possible development projects in the watershed to raise revenues. While the city contends these projects will not threaten water quality, to date, the schemes generally have been prohibited by state watershed protection laws. According to local press accounts, the state has had to purchase rights to approximately 9,000 of Newark's 33,000 acres of watershed land from 1990 to 2001, at a cost of more than $9 million.[32] For example, in 2000 and 2001, the city-controlled Newark Watershed Conservation and Development Corporation, whose name is emblematic of its schizophrenic approach, proposed to allow music promoter John Scher to build a 25,000-seat amphitheater on city watershed land.[33] The state Attorney General opposed the scheme as a violation of a 1988 state legislative moratorium on development of watershed land.[34] Ultimately, the state paid $1.4 million to buy conservation easements on 795 acres of Newark watershed land to keep the city from developing its open space holdings.[35] In November 2001, Morris County voters approved a $25 million increase in property taxes to pay for land conservation in the area, which includes much of the Newark watershed.[36]

In December 2001, the Newark City Council agreed to sell to the state development rights to an additional 9,300 acres for $9.9 million. The deal transpired, even though Newark Mayor Sharpe James simultaneously had been discussing the possible sale of the system to a private entity in order to raise cash; part of this plan involved opening up remaining portions of the watershed to development.[37] In late 2001 and early 2002, another development scheme was proposed, under which Newark would be allowed to develop some of its watershed property in exchange for the small watershed town of West Milford's right to build an access road through the watershed lands to a proposed golf course, hotel, and conference center.[38] Town officials said they would seek an exemption from a 1988 moratorium on land development and argued that the development would enable them to raise more funds through property taxes.[39] As of June 2002, legislation permitting the sale was adopted by both houses of the state legislature; however, it included a provision that land included in the sale could only be used for water infrastructure and that the moratorium on the sale of watershed lands for development still applied.[40] The West Milford Town Council voted down the golf course proposal in 2002 on a 3–2 vote, but an effort was afoot to put the matter before the voters in a referendum.[41]

The rest of the city's water supply, from the New Jersey Drinking Water Supply Commission (NJDWSC), relies upon the Wanaque River Watershed. The total drainage area of the watershed is 108 square miles, of which the NJDWSC uses only a portion. The NJDWSC gets its water from the 30-billion gallon Wanaque and 7-billion gallon Monksville Reservoirs. In addition, NJDWSC pumps water into the Wanaque Reservoir from the Pompton and Ramapo Rivers, both of which have water quality that is threatened, according to the EPA's IWI. The headwaters of the Wanaque River are in New York State, as a minor tributary to Greenwood Lake, which spans the New Jersey and New York border. The New Jersey part of the watershed lies in West Milford in Passaic County. The 27-mile-long Wanaque River joins up with the Pequannock River in Riverdale Township. Most of the land in the watershed is undeveloped, consisting of vacant lands, reservoirs, parks, and farms.

In late 2002, Newark Mayor Sharpe James put forth yet another proposal to address the watershed. He proposed a "water optimization plan," under which the Newark Watershed and Development Corporation, which oversees watershed land in Morris, Sussex, and Passaic Counties, would reorganize as the Newark Infrastructure Management Corporation (NIMC) to run the watershed and water and sewer utilities. The NIMC would float $90 million in bonds and be responsible for protecting the watershed and running local utilities and then pay millions to Newark through a long-term lease of the watershed.

Recent droughts have put enormous pressure on the state's drinking water systems, including Newark's. During the 1999 drought, the Wanaque Reservoir was low, and the Ramapo could not be pumped because it was too low.[42] By law, the Pompton may not be pumped during summer months, due to flow and water quality impairment problems, and sometimes (during the 1999 drought, for example) these problems meant that the Pompton could not be tapped during other months either.[43]

PROTECTING NEWARK'S DRINKING WATER

The following are approaches to treating Newark's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Newark reported in 2000 and in 2001 that it intends to reduce its relatively high disinfection by-product levels by using ozone as a primary disinfectant. The city could also further reduce these contaminants by using activated carbon and/or by installing ultraviolet light as a primary disinfectant. In addition, although Newark claims never to have found viable *Cryptosporidium* in its water, ozone and ultraviolet light would offer a measure of additional assurance that *Crypto* poses no risk, since these disinfection technologies are far more effective than is chlorine at killing these and certain other resistant parasites. Newark must also take steps to optimize corrosion control to improve lead levels.

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

- **Contact the Newark Water Department (info below), Newark Mayor Sharpe James, and the Newark City Council.** Ask them to insist on watershed protection and to oppose watershed development schemes that could contaminate the city's tap water. Also urge them to fix the city's lead problem, reduce their disinfection by-products, and fix the reservoir problems found in NJ DEP's June 2001 inspection.
- **Get involved in source water assessment and protection** efforts by contacting Karen Feld or Kristin Zams at the Bureau of Safe Drinking Water, New Jersey DEP, 609-292-5550.
- **Learn more from these groups:**
  - David Pringle, New Jersey Environmental Federation, 609-530-1515, www.cleanwateraction.org/njef/index.htm
  - Dena Mottola, NJPIRG 609-394-8155, www.njpirg.org
  - New Jersey Sierra Club 609-924-3141, http://njsierra.enviroweb.org
  - Skylands CLEAN, 973-616-1006, www.skyclean.org/home.html
  - Or contact the Clean Water Network, www.cwn.org

Peer reviewers for the Newark report included David Pringle, Campaign Director, NJ Environmental Federation.

NEWARK
Anthony DeBarros Newark Water Department Route 23 Newfoundland, NJ 07424 973-733-8016 www.newarkwater.com
WATER UTILITY INFORMATION

NOTES

1 Letter from Joseph Liccese, New Jersey Department of Environmental Protection, to Andrew Pappachen, Newark Water Department, June 29, 2001.

2 Environmental Protection Agency, Safe Drinking Water Information System (SDWIS), Newark report, available online at www.epa.gov/safewater/dwinfo/nj.htm, visited March 13, 2002.

3 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

4 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not

necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

5 City of Newark, Pequannock and Wanaque (NJDWSC) Water Systems, "1999 Annual Water Quality Report" (2000).

6 City of Newark, Pequannock and Wanaque (NJDWSC) Water Systems, "2000 Annual Water Quality Report" (2001).

7 City of Newark, Pequannock and Wanaque (NJDWSC) Water Systems, "2001 Annual Water Quality Report" (2002).

8 Ibid.

9 Ibid.

10 Ibid.

11 Ibid.

12 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

13 Data obtained from EPA's Information Collection Rule database at www.epa.gov/enviro/html/icr/utility/report/NJ0714001961022141731.html.

14 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

15 TTHM levels were gleaned from Newark's 1999 and 2000 Water Quality Reports and from printouts from NJ DEP's Safe Drinking Water computer records, obtained February 16, 2002.

16 The city's 2001 right-to-know report says the high level was 77 ppb in that year. See City of Newark, Pequannock and Wanaque (NJDWSC) Water Systems, "2001 Annual Water Quality Report," (2002). However, a high TTHM level of 83 was reported in a printout from NJDEP's Safe Drinking Water computer records, obtained by NRDC on February 16, 2002.

17 Ibid.

18 Letter from Barker Hammill, NJDEP, to Anthony DeBarros, October 15, 2001; letter from Barker Hammill, NJ DEP, to Anthony DeBarros, September 27, 2000.

19 See www.newarkwater.com.

20 Unlike virtually every other major U.S. water utilities, as of late 2002, Newark provided no link to its reports to the EPA's drinking water website, nor to the American Water Works Association's website. Not even the city of Newark's website links to it, nor was it readily found through Google, Yahoo, or other search engines.

21 See 40 CFR §141.153(d)(1)(iii).

22 See 40 CFR §141.153(d)(4)(vi).

23 The "major" lead and copper rule monitoring violation was recently reported at http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=571818&pwsid=NJ0714001&state=NJ&source=Surface%20water%20&population=275221&sys_num=0. When NRDC visited NJ DEP offices earlier in 2002, that violation did not appear to be noted in the state's computer system.

24 See 40 CFR §141.153(f)(1) & (3).

25 See 40 CFR §141.153(d)(2).

26 See 40 CFR §141.153(h)(5).

27 See 40 CFR §141.153(h)(3).

28 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While the EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution or where the water system is aware of the pollution source, the rules require that polluters be identified.

29 EPA Index of Watershed Indicators, www.epa.gov/iwi/hucs/02030103/score.html, last visited March 25, 2002.

30 EPA Index of Watershed Indicators, www.epa.gov/iwi/303d/02030103_303d.html.

31 NJ DEP, www.state.nj.us/dep/watershedmgt/wma3.

32 Matthew Brown, "West Milford Tract to Be Preserved: State Pays $1.43 Million for Rights to 795 Acres," *The Record*, Bergen County, NJ, p. L1, February 15, 2001.

33 Ibid.

34 Matthew Brown, "State May Scuttle Concert Site Deal: Newark Watershed Could Net $8 Million," *The Record,* Bergen County, NJ, p. L1, November 21, 2000.

35 See note 29.

36 Dan Berman, "Campaign 2001L Voters Approve Over $1 B in Conservation Funding," *Greenwire*, November 9, 2001.

37 Matthew Brown, "Political Row Could Snag City Reservoir Deal," *The Record* (Bergen County, NJ), December 16, 2001, p. l01; Editorial, "Saving a Watershed," *The Record*, Bergen County, NJ, December 26, 2001, p. l06.

38 Matthew Brown, "W. Milford Deal May Invite Development," *The Record*, Bergen County, NJ, January 25, 2002, p. l01.

39 Ibid.

40 Personal communication with David Pringle, New Jersey Environmental Federation, July 1, 2002.

41 Ibid.

42 Ibid.

43 Ibid.

PHILADELPHIA, PA

Philadelphia Earned a Water Quality and Compliance Grade of Fair in Both 2000 and 2001

Philadelphia had no reported violations but had levels of **chlorination by-products** that averaged near the new EPA standard and occasionally spiked above it. In addition, the city had significant **lead** levels, possible medical evidence of waterborne disease, and occasional contamination with pesticides and industrial chemicals.

▶ The Philadelphia Water Department had no recent reported violations of current, pending, or proposed national standards in 1999–2001.[1]

▶ Levels of chlorination by-products, specifically **total trihalomethanes** (TTHMs) and **haloacetic acids** (HAAs), averaged as high as 80 percent of the new national standards and occasionally spiked above those standards. HAAs and TTHMs are by-products of chlorine disinfection and may cause cancer and, potentially, reproductive and other health problems. At levels measured in Philadelphia tap water, TTHMs and HAAs came in well above health goals and are of potential health concern.

▶ **Lead** levels, although not in violation of EPA standards, were found in excess of the health goal and were cause for concern—particularly in Philadelphia schools and homes with young children. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior.

PHILADELPHIA
System Population Served **1,600,000**[2]
Water Quality and Compliance **2000▶Fair** **2001▶Fair**
Right-to-Know Report—Citizenship **2000▶Good** **2001▶Good**
Source Water Protection **Poor**
REPORT CARD

▶ Medical journal studies have reported illnesses in children and the elderly associated with Philadelphia tap water, which may be the result of ***Cryptosporidium*** *(Crypto),* which has been found in the city's source waters. *Crypto* is a waterborne microbial disease-carrying pathogen that presents health concerns, especially to individuals with weakened immune systems. The city has improved its treatment somewhat to try to address these problems.

▶ Chemical spills, runoff, discharges of cancer-causing and other **toxic pollutants,** and **microbial contaminants** periodically contaminate the Schuylkill and Delaware Rivers and sometimes city tap water. Occasionally pollutant levels exceed national health goals but are found at levels below national standards. An effort to inventory and address these pollution problems has begun.

Philadelphia's Right-to-Know Reports Earned a Grade of Good for 2000 and 2001

▶ The reports included much important information and were generally well presented.

▶ The reports could have been more complete in their discussions of sources of pollutants and health threats to consumers.

Philadelphia Earned a Source Water Protection Rating of Poor

▶ The city's water sources are threatened by contamination from treated and untreated sewage, industrial point sources, transportation accidents and spills, urban, suburban, and agricultural runoff, acid mine drainage, and drought. Philadelphia has put a major effort into assessing this pollution and is trying to encourage protection of its source water, but the city does not control its watersheds, and the state does not adequately regulate pollution of these waters.

Noteworthy

▶ As of June 2001, the Philadelphia Water Department's projected capital budget is $150 million per year for drinking water, wastewater, and stormwater expenditures combined.[3] Press accounts reported Philadelphia's drinking water capital improvement budget alone to be $46 million per year.[4] Reported planned capital improvements include rehabilitation of the sampling lines at the Queen Lane Treatment Plant, improvements to operations, including aeration tanks at water pollution control plants, storm flood relief, and replacement of 27 miles of water mains in Philadelphia each year.[5] In correspondence with NRDC, the city's water department forecast future capital budgets of $50 million a year for treatment plant improvements, including drinking water, wastewater, and biosolids recycling, and $25 million per year for drinking water conveyance improvements.[6]

KEY CONTAMINANTS IN PHILADELPHIA'S WATER

The following contaminants have been found in Philadelphia's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Cryptosporidium *and* Giardia

National Standard
Treatment Technique (TT)

Draft Proposed New National Standard[7]
<7.5 organisms/100 liters (average); no additional treatment
7.5–100 organisms/100 liters (average); some additional treatment (>90% *Crypto* kill)
100–300 organisms/100 liters (average); significant additional treatment (>99% *Crypto* kill)
>300 organisms/100 liters (average); advanced treatment (>99.7% *Crypto* kill)

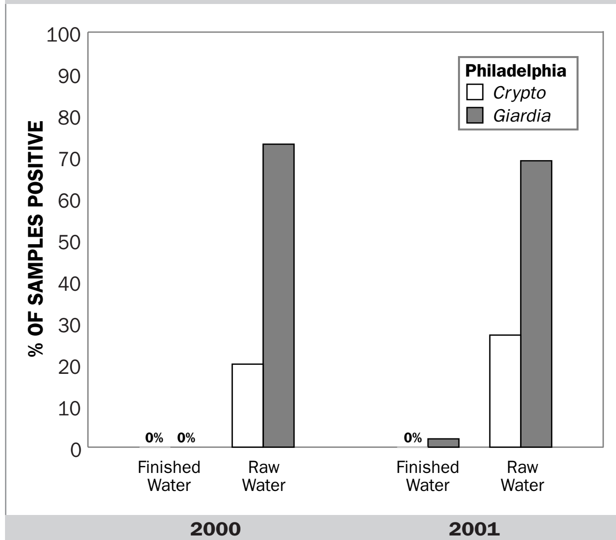
National Health Goal (MCLG)
0—no known fully safe level

National Requirements for *Crypto*
Most large- and medium-size water utilities that use surface water are required to monitor for *Crypto* and report results in their right-to-know reports; they eventually may be required to use advanced treatment if significant levels are found.

2000 Levels[8]
Crypto in finished water: 0% of samples positive (0 of 36)
Crypto in raw water: 20% of samples positive
Giardia in finished water: 0% of samples positive (0 in 36)
Giardia in raw water: 73% of samples positive

2001 Levels[9]
Crypto in finished water: 0% of samples positive (0 of 58)
Crypto in raw water: 27% of samples positive
Giardia in finished water: 2% of samples positive (1 in 58)
Giardia in raw water: 69% of samples positive

***CRYPTOSPORIDIUM* AND *GIARDIA* LEVELS**



National Requirements
All large- and medium-size water utilities that use surface water must monitor for *Crypto* and *Giardia*, report results in their right-to-know reports, and use advanced treatment if significant levels are found.

LEVELS PRESENT HIGH CONCERN

Cryptosporidium (*Crypto*) and *Giardia* are waterborne microbial disease-carrying pathogens that presents health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the elderly, children, and people who have undergone organ transplants. Under a negotiated EPA rule that is out in draft proposed form and is soon scheduled to be proposed formally in *The Federal Register,* water utilities that find significant levels of *Crypto* will have to use more effective treatment to kill the pathogen. Existing rules require *Giardia* control as well. Philadelphia has now joined the EPA-industry "Partnership for Safe Water" and reports that it has been keeping its turbidity levels lower than required by EPA rules in recent years, in an effort to increase the likelihood that *Crypto, Giardia*, and other microbes are filtered out.

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[10]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels
0.4% in highest month, total coliform positive[11]

2000 Levels
0.4% in highest month, total coliform positive[12]

2001 Levels
0.9% in highest month, total coliform positive[13]

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Coliform bacteria are occasionally found in Philadelphia's water but at levels well below the national standard. That said, the presence of any coliform in Philadelphia's distribution system could indicate that regrowth of bacteria may be occuring in the city's aging pipes.

Turbidity

National Standards (TT) (in Nephelometric Turbidity Units, or NTU)
Filtered water
0.5 NTU 95% of the time (through 2001)
0.3 NTU 95% of the time (effective in 2002)
1 NTU 100% of the time (effective in 2002)
Unfiltered water
5 NTU maximum, 100% of the time

2000 Levels
0.14 NTU maximum

2001 Levels
0.083 NTU maximum

LEVELS PRESENT SOME CONCERN

Turbidity is a measure of the cloudiness of water and is used as an indicator that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns. In addition, turbidity can interfere with water disinfection because it can impede the effectiveness of chlorine or other chemical disinfectants.

A team of medical and public health researchers at the Harvard School of Public Health launched an investigation, eventually published in 1997, into the possible health consequences of potential microbiological contamination of drinking water in Philadelphia. They used turbidity as a possible indicator of contamination and a measure of how effectively water treatment plant filters are working. (For example, a spike in turbidity levels can interfere with effective disinfection and can indicate that water filters are performing poorly.) In two peer-reviewed published studies, Schwartz *et al.* found an association between spikes in Philadelphia's turbidity levels and hospital admissions for the elderly and children for acute gastrointestinal illness, which often can be caused by water contamination.[14,15]

The first study, published in 1997, found that although the Philadelphia system was filtered and in compliance with existing federal standards, emergency room visits and admissions of children into Children's Hospital of Philadelphia for gastrointestinal illness spiked after a short lag time following spikes in turbidity levels in city tap water.[16] The Harvard investigators found about a 10 percent increase in emergency room visits for gastrointestinal illness by children three years old or older, and a 6 percent increase in visits by younger children. Actual hospital admissions for gastrointestinal illness increased 31 percent for older children and 13 percent for younger children after turbidity spikes. All associations were statistically significant. A second study by the Harvard team found similar results for elderly Philadelphians, based on 1992 to 1993 water quality data and Medicare records.[17] They found a 9 percent increase in hospital admissions for gastrointestinal illness among people over 65 shortly after a spike in city water turbidity. Again, the increases in illness were statistically significant.

City water department officials dispute the Harvard studies, arguing that the high correlation between turbidity spikes and hospital visits does not demonstrate causality. They also assert they have made subsequent improvements in the water filtration system. Dr. Joel Schwartz of Harvard concluded that "there needs to be more improvement."[18]

INORGANIC CONTAMINANTS

Lead

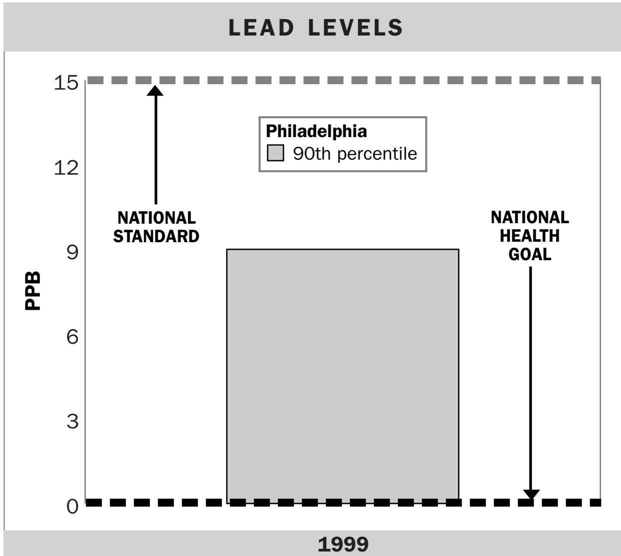
National Standard (TT)
15 ppb (action level, at 90th percentile)[19]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels (most recent reported data)[20]
9 ppb or less at 90th percentile home; 4 out of 59 homes tested exceeded national standard

LEVELS PRESENT HIGH CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous



system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior.[21] Philadelphia reports that it complied with the EPA's action level for lead, but a recent study of lead in drinking water in the city's schools turned up results that are cause for serious concern. In 2000, many schoolchildren in Philadelphia were reportedly exposed to lead levels from some water fountains in excess of 50 ppb—far above the national action level.[22] Apparently school district officials knew of the lead problem years before taking remedial action. In October 2000, school district officials agreed to close down water outlets with high levels and instead provide bottled water. In fact, a study published in the *Journal of Toxicology* concluded that "64.8 percent of Philadelphia school buildings had water containing mean lead levels exceeding current Environmental Protection Agency (EPA) action levels," with 26 percent of buildings having levels greater than 50 ppb—more three times greater than the EPA action level.[23]

Nitrate

National Standard (MCL)
10 ppm (peak standard; if confirmation is taken within 24 hours, then two samples are averaged)

National Health Goal (MCLG)
10 ppm

1999 Levels
4.9 ppm maximum[24]

2000 Levels
4.3 ppm maximum[25]

2001 Levels
4.1 ppm maximum[26]

LEVELS PRESENT SOME CONCERN

Nitrates are the product of fertilizers and human or animal waste and can cause shortness of breath, nausea, vomiting, diarrhea, lethargy, loss of consciousness, and even death in infants.[27] Philadelphia's peak levels reported were about half of the EPA standard.

ORGANIC CONTAMINANTS

Atrazine

National Standard (MCL)
3 ppb (average)

National Health Goal (MCLG)
3 ppb

1999 Levels[28]
No data

2000 Levels[29]
Maximum: 0.20 ppb (no average reported)

2001 Levels[30]
No data

LEVELS PRESENT SOME CONCERN

Atrazine, a pesticide widely used on corn, poses health risks that include damage to major organs, potential reproductive problems, and possibly cancer.[31] Philadelphia's reported average atrazine levels at the tap were lower than those of many Midwestern utilities; based on this available data, these levels are not viewed as a major concern.

Dichloromethane (DCM)

National Standard (MCL)
5 ppb (average)

National Health Goal (MCLG)
0—no known fully safe level

2001 Levels[32]
Maximum: 0.6 ppb

LEVELS PRESENT SOME CONCERN

Dichloromethane—an industrial chemical used as a paint remover, solvent, and cleaning agent, as well as an agricultural fumigant, among other things—can damage the nervous system, liver, and blood and cause cancer.[33] Philadelphia says that in 2001, only one sample was found to contain dichloromethane, at a level well below the national standard, but it is not clear how long the public was exposed to this chemical in tap water. The city reported that "one sample from the Baxter plant was positive for dichloromethane. It is discharge of pharmaceutical and chemical industries in the river."

Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard[34]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels	Average	Maximum
	42 ppb	102.2 ppb

(Individual water treatment plants (WTPs) not listed)[35]

2000 Levels[36]	Average	Maximum
Baxter	35 ppb	46 ppb
Belmont	20 ppb	30 ppb
Queen Lane	24 ppb	24 ppb
2001 Levels[37]	Average	Maximum
Baxter	37 ppb	55 ppb
Belmont	37 ppb	67 ppb
Queen Lane	30 ppb	51 ppb

LEVELS PRESENT HIGH CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems.[38] Philadelphia's levels average as high as 62 percent of the EPA's new average-based standard for HAAs; spike levels occasionally have exceeded the standard.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

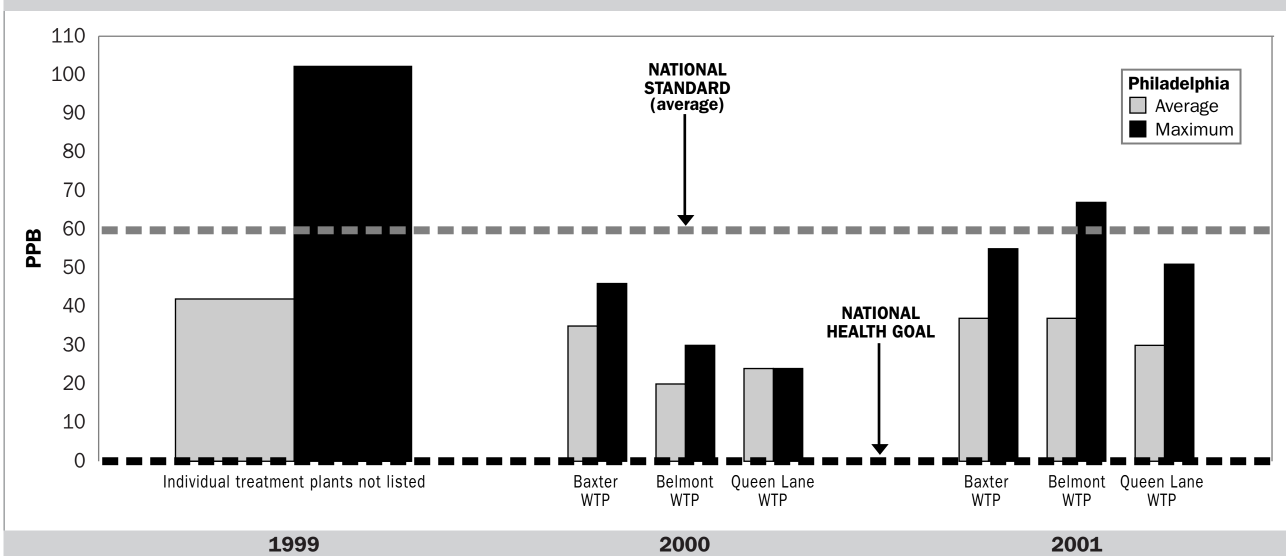
National Health Goal (MCLG)
0—no known fully safe level[39]

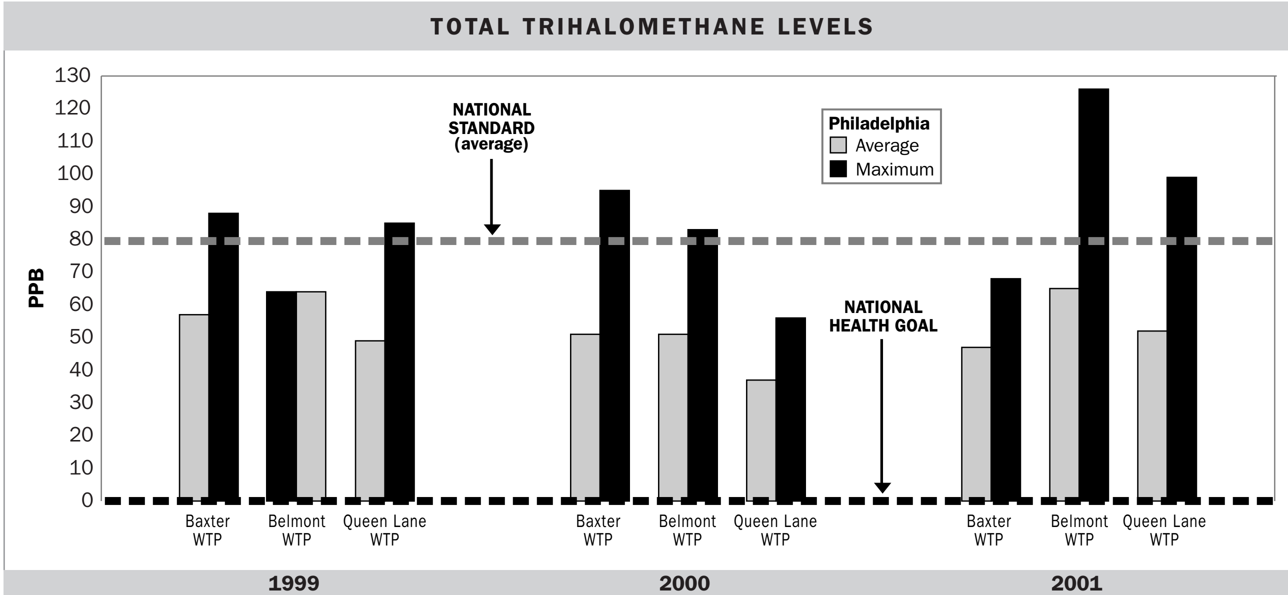
1999 Levels[40]	Average	Maximum
Baxter	57 ppb	88 ppb
Belmont	64 ppb	64 ppb
Queen Lane	49 ppb	85 ppb
2000 Levels[41]	Average	Maximum
Baxter	51 ppb	95 ppb
Belmont	51 ppb	83 ppb
Queen Lane	37 ppb	56 ppb
2001 Levels[42]	Average	Maximum
Baxter	47 ppb	68 ppb
Belmont	65 ppb	126 ppb
Queen Lane	52 ppb	99 ppb

LEVELS PRESENT HIGH CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects.[43] Philadelphia has relatively high levels of TTHMs in its drinking water. Indeed, the city's highest TTHM levels have frequently been above the new standard of 80 ppb. However, these spikes were not violations of national standards because the standards are based on average TTHM levels—and the city's average levels remained below the new national standard of 80 ppb. A 2002 report

HALOACETIC ACID LEVELS





by the Environmental Working Group found that 24 percent of pregnancies, or 5,936 pregnancies, in Philadelphia were exposed to TTHM levels above the EPA's standard—second in the number of pregnancies only to the Maryland suburbs of Washington, D.C.[44] Because some spikes found in Philadelphia were comparable to the levels found in preliminary studies to pose a risk, those in the first three months of pregnancy should exercise caution, according to Dr. David Ozonoff, chair of the Environmental Health Department at Boston University School of Public Health.

Toluene

National Standard (MCL)
1 ppm (1,000 ppb) (average)

National Health Goal (MCLG)
1 ppm (1,000 ppb)

2001 Levels[45]
Maximum: 51 ppb

Toluene—a volatile organic chemical that is a component of gasoline and other petroleum fuels used to produce benzene and urethane, as well as in solvents and thinners—can cause nervous disorders such as spasms and tremors, impairment of speech, hearing, vision, memory, and coordination, as well as liver and kidney damage.[46] According to Philadelphia, a toluene problem occurred when "the Belmont plant experienced a brief chemical spill in the Schuylkill River during the first quarter of 2001. It is discharged from petroleum factories." The levels reportedly found in the city's water supply were significant—more than 50 ppb—but still well below the national standard and health goal.

Vinyl Chloride

National Standard (MCL)
2 ppb (average)

National Health Goal (MCLG)
0—no known fully safe level

2001 Levels[47]
Maximum: 1.1 ppb

LEVELS PRESENT HIGH CONCERN

Vinyl chloride—used in the manufacture of cars, electrical wire insulation and cables, piping, industrial and household equipment, and medical supplies, and also heavily used by the rubber, paper, and glass industries—can potentially damage the nervous system and liver and cause cancer.[48] Philadelphia reported that "one sample from each treatment plant during the last quarter of 2001 was found to have vinyl chloride, which comes from PVC plastic and plastic industry discharges to the river." The levels detected were more than half of the EPA standard and above the 0 health goal. It is not clear how long the exposure lasted.

Other Industrial Chemicals and Pesticides

Other chemicals in Philadelphia tap water include:

▶ **Di-(2-ethylhexyl)phthalate,** a probable carcinogen used in making plastic, was found in 2000 in city tap water at less than 1 ppb—below the 6 ppb national standard but above the national health goal of 0.[49]

LEVELS PRESENT SOME CONCERN

▶ **Hexachlorocyclopentadiene** was found in city tap water at low levels in 2000 and 2001, at less than 1 ppb, compared to the 50 ppb standard.[50, 51, 52] Hexachlorocyclopentadiene—an industrial chemical used to make other chemicals such as pesticides, flame retardants, resins, dyes, pharmaceuticals, and plastics—causes gastrointestinal distress and liver, kidney, and heart damage.

▶ **Pentachlorophenol** was found in 2000 and 2001 at well below the 1 ppb national standard. Pentachlorophenol, used to preserve telephone polls, railroad ties, and other wood, may cause central nervous system and reproductive problems, liver and kidney damage, and cancer. The health goal for pentachlorophenol is 0.[53, 54]

LEVELS PRESENT SOME CONCERN

▶ **Simazine** was found in 2000, at less than 1 ppb. The standard is 4 ppb.[55] Simazine, a widely used weed killer that is the chemical cousin of atrazine (also found in the city's tap water), can damage the testes, kidneys, liver, and thyroid and can cause gene mutations and cancer.

LEVELS PRESENT SOME CONCERN

PHILADELPHIA'S RIGHT-TO-KNOW REPORTS

Philadelphia's Right-to-Know Reports Earned a Grade of Good for 2000 and 2001

On the good-citizen side of the ledger:

▶ The reports provided details about the source water assessment procedure for Philadelphia's drinking water, as well as information on how to get involved or get more information.

▶ The reports were relatively user-friendly. The maps showing sources of drinking water and treatment plant locations were colorful and easy to read.

▶ The reports offered specifics on how the water is treated and provided diagrams.

▶ On the front page, the reports avoided overarching statements reassuring customers that their water is completely safe. Appropriately, Philadelphia's reports were more cautious, stating that "Philadelphia's water is safe and healthy for most people. For people with special health concerns, please see the information" later in the report.[56] (As noted below, the city's website did provide such false assurances, however.)

▶ The reports included on the first page prominent directions in Spanish on how to obtain a copy of the report.

On the could-be-a-better-citizen side of the ledger:

▶ The reports included neither a map nor any detailed narrative noting the specific polluters in the watershed who contributed to the contamination of the water supply. EPA rules require utilities to specifically identify known sources of contaminants in their source water; the reports commonly gave only generalized information on potential sources of contaminants in the city's water, such as "discharge from chemical factories," rather than specifying known polluter(s).[57] Another example: the 2001 report cited contamination of the city's Belmont plant's water with elevated levels of toluene but did not cite the spill's specific culprit.

▶ The reports did not provide information on the health effects of some contaminants found at levels below EPA standards but above EPA health goals, including total trihalomethanes and haloacetic acids. Although not legally required, this information would have assisted local citizens in protecting their health and in fighting for better water protection.

▶ A front-page bold statement referred people with special health concerns to important health information at the end of the report. This information should ideally have been prominently displayed at the beginning of the report.

▶ In apparent response to a *Philadelphia Inquirer* story, based on an Environmental Working Group report on the city's problem with total trihalomethanes (TTHMs), the city's website asks: "Is Our Water Safe to Drink? The Answer is Yes. Absolutely! You Bet!" The water department alleges that the *Inquirer* overstated the risks. NRDC disagrees and concurs with the *Inquirer* and the Environmental Working Group that questions about possible health effects from the city's relatively elevated, albeit legal, TTHM levels are legitimate. The water department's reassurance that the city's water was "absolutely" safe was contradicted by its own statements in its water quality report that vulnerable populations are at special risk from *Crypto,* microbial contaminants, and lead. If this overarching statement assuring absolute safety had appeared in the report itself, Philadelphia's report would have been substantially downgraded.

THREATS TO PHILADELPHIA'S SOURCE WATER

Philadelphia Earned a Source Water Protection Grade of Poor

Spills, discharges, and runoff contaminate Philadelphia's river sources with pollutants, such as pesticides, industrial chemicals, and microbes; this has earned Philadelphia a grade of Poor for source water protection. Philadelphia's drinking water comes from the Schuylkill and Delaware rivers, which are threatened by contamination from treated and untreated sewage, industrial point sources, transportation accidents and spills, urban, suburban, and agricultural runoff, acid mine drainage, and drought.[58, 59] While Philadelphia has made an effort to encourage pollution control in its watersheds, the city has little or no control over most pollution sources in the watersheds feeding these rivers, and state pollution controls in these watersheds are incomplete at best.[60]

As part of the source water assessment process, Philadelphia and the Pennsylvania Department of Environmental Protection say they are taking extra steps to better protect Philadelphia's sources of drinking water. However, as these watershed assessments make clear, and as the Schuylkill Watershed Conservation Plan's extraordinarily comprehensive final report concludes, many additional steps are needed to better protect the city's water sources.[61]

The city's source waters are also threatened by overuse, because the Philadelphia Water Department's customers are not the only people who rely on the Delaware River for their drinking water. In fact, more than 17 million people reportedly depend on Delaware River water for drinking water and other uses.[62]

The EPA's Index of Watershed Indicators (IWI) calculates the overall threat to the two rivers Philadelphia uses for source water as a 6, on a scale of 1 (for low threat) to 6 (for high threat).[63] Philadelphia officials say IWI is outdated and unreliable. Officials say their preliminary reviews have found that the IWI data is "off by at least 30 percent in our watershed."[64] However, the state-sponsored source water assessments in which the city is participating, under the twin umbrellas of the Schuylkill and the Delaware River Source Water Assessment Partnerships, agree that the Schuylkill and Delaware Rivers are threatened by point and nonpoint sources of contamination.[65] We rate the protection of these water sources as Poor based on all available data, not simply the EPA data.

NRDC agrees with the city that a comprehensive, up-to-date, specific, and accurate source water inventory is desperately needed for Philadelphia's source water, and supports the city's and state's significant efforts to undertake a detailed assessment. However, with respect to the overall control of threats to the Delaware and Schuylkill Rivers, available data show significant water quality threats to these rivers and incomplete pollution controls, earning a Poor rating for control of threats in the watersheds.[66]

PROTECTING PHILADELPHIA'S DRINKING WATER

The following are approaches to treating Philadelphia's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Philadelphia gets much of its water from the Delaware River watershed, with headwaters in upstate New York, flowing to reservoirs in the Philadelphia area where particles in the water are allowed to settle. It is then treated locally at one of three treatment plants with chlorine disinfection, flocculation, coagulation, sedimentation, filtration, and fluoridation.[67]

Philadelphia's disinfection by-product levels are high compared to many cities that use surface waters and could possibly be reduced somewhat with additional treatment. For example, enhanced coagulation, activated carbon, and/or the use of an alternative primary disinfectant such as ozone or ultraviolet light could reduce by-product levels further. In addition, although Philadelphia claims never to have found viable *Cryptosporidium* in its *finished* drinking water, it has found it in its source water. Ozone or ultraviolet light disinfection would offer a measure of additional assurance that *Crypto* poses no risk to Philadelphia residents. These disinfection technologies are far more effective at killing these and other resistant parasites than is chlorine, the disinfectant Philadelphia now uses.

From Assessment to Protection

Philadelphia and the state of Pennsylvania at the time of this writing had not yet completed a source water assessment for Philadelphia, which must be done by 2003. The assessment for the Schuylkill River was slated to be done sometime after the final public meetings (held in 2002), and the Delaware River assessment is expected to be completed by July 2003.[68] These assessments will include a determination on the "susceptibility and vulnerability" of Philadelphia's water supplies. The Pennsylvania Department of Environmental Protection and the Philadelphia Water Department report that they intend to undertake "protection implementation" in addition to assessment.

As part of the source water assessment, several ambitious projects are under way, including, "runoff modeling of the entire watershed for 12 different contaminants in a 8,000-square-mile watershed, examination of land use and water quality trends, detailed inventories of the thousands of point sources upstream from intakes, and development of decision and ranking tools to prioritize the various sources for future protection efforts."[69] Other projects include the Belmont Water Intake Protection Project, the Manayunk Canal and Schuylkill River Watershed Improvement Program, and the Schuylkill Center for Environmental Education Student Non-Point Pollution Education Project.[70] In addition, the water department has worked to create local watershed partnerships to analyze and prevent urban runoff and other causes of water contamination.

PHILADELPHIA
Kumar Kishinchand, Commissioner Philadelphia Water Department[71] ARAMark Tower, 1101 Market Street, 3rd Floor 215-685-6300 www.phila.gov/water/index.html
WATER UTILITY INFORMATION

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

- **Attend meetings of the local water supplier,** the Philadelphia Water Department. Check the right-to-know report or call and ask for dates, times, and locations.
- **To get involved in the source water assessment effort,** contact the groups above and Chris Crockett, Philadelphia Water Department, Office of Watersheds, at 215-685-6234, or by e-mail at Chris.Crockett@phila.gov. Information is also available at www.phillywater.org/Delaware/default.htm and at www.phillywater.org/Schuylkill/default.htm.
- **Learn more from these groups:**
  - Clean Water Action in Philadelphia, 215-640-8800 or Philadelphia@cleanwater.org
  - Clean Water Network, www.cwn.org, cleanwater@igc.org.

Peer reviewers for the Philadelphia report included Robert Wendelgass, Clean Water Action.

NOTES

1 Safe Drinking Water Information System, U.S. Environmental Protection Agency database, available online at: http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=546695&pwsid=PA1510001&state=PA&source=Surface%20water%20&population=1600000&sys_num=0, last visited on 04/26/02.

2 Ibid.

3 Personal communication from Richard Roy, City of Philadelphia Water Department, June 4, 2001, p. 4.

4 "Larger Cities Report Capital Improvement Needs," *WaterWorld*, Vol. 17, No. 12: December 2001, p. 1.

5 See note 58. See also personal communication from Richard Roy, City of Philadelphia Water Department, June 4, 2001, p. 4.

6 Letter from Richard Roy, water commissioner, City of Philadelphia, to Erik Olson, NRDC, June 4, 2001.

7 See EPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) Preproposal Draft Regulatory Language for Stakeholder Review, available online www.epa.gov/safewater/mdbp/st2dis.html. The 1, 2, and 2.5 minimum log removal requirements are converted into percentage removals for simplicity. This rule has not been formally proposed in *The Federal Register* but was agreed to by the EPA, NRDC, public health groups, cities, and the water utility industry. See Ibid for the "FACA Stakeholder Agreement in Principle."

8 Philadelphia Water Department. "Drinking Water Quality 2000," available online at www.Philadelphiawater.org/wqr2000/wqr2000.htm, last visited April 15, 2002. Published April 2001.

9 Philadelphia Water Department. "Drinking Water Quality 2001." Available online at: www.Philadelphiawater.org/wqr2001/wqr2001.htm Last visited September 15, 2002. Published April 2002.

10 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

11 Philadelphia Water Department, "Drinking Water Quality 1999," p. 4.

12 See note 8.

13 See note 9.

14 Schwartz, J., Levin, R., and Goldstein, R., "Drinking water turbidity and Gastrointestinal Illness in the Elderly of Philadelphia," *Journal Epidemiol. Community Health* 2000; 54:45-51 45, available online at http://jech.bmjjournals.com/cgi/reprint/54/1/45.pdf.

15 Schwartz, J., Levin, R., and Hodge, K., "Drinking Water Turbidity and Pediatric Hospital Use for Gastrointestinal Illness in Philadelphia," *Epidemiology,* 1997 Nov; 8(6):607-9.

16 Ibid.

17 Schwartz, J., Levin, R., and Goldstein, R., "Drinking Water Turbidity and Gastrointestinal Illness in the Elderly of Philadelphia," *Journal Epidemiol. Community Health* 2000; 54:45-51 45, available online at http://jech.bmjjournals.com/cgi/reprint/54/1/45.pdf.

18 Ibid, quoting Professor Joel Schwartz, Harvard School of Public Health.

19 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

20 See note 11.

21 See EPA, "Consumer Fact Sheets on Lead," www.epa.gov/safewater/Pubs/lead1.html and www.epa.gov/safewater/standard/lead&co1.html, and IRIS summary for lead available online at www.epa.gov/iris/subst/0277.htm.

22 Dabney, Michael, "Families Troubled About Lead in a School's Drinking Water: Health of Children at Bethune Elementary at Issue," *The Philadelphia Tribune*, April 6, 2001.

23 Bryant, S.D., Greenberg, M.; Crof, R., "Lead Contaminated Drinking Water in Philadelphia Schools," Abstract, *Journal of Toxicology: Clinical Toxicology*, No. 5, Vol. 39. p. 552, August 1, 2001.

24 Philadelphia Water Department, "Drinking Water Quality 1999."

25 See note 8.

26 See note 9.

27 See Chapter 5.

28 See note 11.

29 See note 8.

30 See note 9.

31 EPA, "Consumer Fact Sheet: Atrazine," available online at www.epa.gov/safewater/dwh/c-soc/atrazine.html.

32 See note 4.

33 Information derived from EPA, "Consumer Fact Sheet on Dichloromethane," available online at www.epa.gov/safewater/dwh/c-voc/dichloro.html.

34 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

35 Philadelphia Water Department, "Drinking Water Quality 1999," p. 5.

36 See note 8.

37 See note 9.

38 Health effects information on disinfection by-products is summarized from NRDC, "Trouble on Tap" (1995); NRDC, "Bottled Water: Pure Drink or Pure Hype?" (1999), available online at www.nrdc.org/water/drinking/bw/bwinx.asp, and EPA, draft Preamble for Stage 2 Disinfection Byproducts Regulation, available online at www.epa.gov/safewater/mdbp/st2dis-preamble.pdf.

39 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

40 See note 11.

41 See note 8.

42 See note 9.

43 See note 38.

44 Environmental Working Group, "Consider the Source: Farm Runoff, Chlorination By-products, and Human Health," January 2002, Table 1, available online at www.ewg.org/reports/ConsiderTheSource/es.html, last visited April 16, 2002.

45 See note 9.

46 Information derived from EPA, "Consumer Fact Sheet on Toluene," available online at www.epa.gov/safewater/dwh/c-voc/toluene.html.

47 See note 9.

48 Information derived from EPA, "Consumer Fact Sheet on Vinyl Chloride," available online at www.epa.gov/safewater/dwh/c-voc/vinylchl.html.

49 See note 8, and Philadelphia Water Department, "Drinking Water Quality 2000," available online at www.Philadelphiawater.org/wqr2000/wqr2000.htm, last visited Septembe 15, 2002. Published April 2001.

50 EPA, "Consumer Fact Sheet on Hexachlorocyclopentadiene," available online at www.epa.gov/safewater/dwh/c-soc/hexachl2.html.

51 See note 8.

52 See note 9.

53 See note 8.

54 See note 9.

55 See note 8.

56 See note 8.

57 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While the EPA allows reliance upon general lists of potential sources or where the water system is not aware of the specific source of pollution, where the water system is aware of the pollution source, the rules require that polluters be identified.

58 See notes 8 and 9. See also, EPA, Index of Watershed Indicators, available online at www.epa.gov/iwi/hucs/02040203/score.html. See also Enviromapper for Water, note 63.

59 Delaware River Source Water Assessment Partnership, Fact Sheet, available online at www.delawareswa.org, last visited May 5, 2002; Delaware River Source Water Assessment Partnership, Fact Sheet, available online at www.schuylkillswa.org, last visited May 5, 2002.

60 See, *e.g.*, Academy of Natural Sciences, Patrick Center, Natural Lands Trust, and The Conservation Fund, Schuylkill Watershed Conservation Plan (2001), available online at www.schuylkillplan.org/plan1.html.

61 Ibid.

62 Avril, Tom, "Water Worries; Some Reservoir Levels Haven't Been This Low in Decades. And Demand Has Kept Growing. Officials Are Debating Short- and Long-Term Measures," *Philadelphia Inquirer,* December 17, 2001.

63 See, *e.g.*, EPA, Enviromapper for Water, available online at http://map2.epa.gov/scripts/.esrimap?name=iwi2&threshold=6&zoomFactor=2&layersCode=00000100111&IWIColor=0&queryCode=99&fipsCode=37&IndexMap=on&cursorX=177&cursorY=158&Cmd=ZoomInByScalar&CmdOld=ZoomInByScalar&Left=-75.8231509898486&Bottom=39.5885591442952&Right=-74.8856509898486&Top=40.2916841442952&layer_5=5&layer_8=8&layer_9=9&layer_10=10&mapOption=ZoomIn&zoomInScalar=2.0&zoomRadius=0.0&LocationMap=on&zoomOutScalar=2.0&click.x=265&click.y=162

64 Letter from Richard Roy, water commissioner, City of Philadelphia, to Erik Olson, NRDC, dated June 4, 2001.

65 See note 59.

66 Ibid, and see note 62.

67 See note 8.

68 Personal communication with Christopher Crockett, manager, Source Water Protection Program, Philadelphia Water Department, April 18, 2002. See also www.phillywater.org/Delaware/default.htm and www.phillywater.org/Schuylkill/default.htm.

69 Personal communication (e-mail) from Christopher Crockett, Source Water Protection Program, Philadelphia Water Department, April 18, 2002.

70 Water Resource Education Network. Information on local projects in Philadelphia County, available online at http://pa.lwv.org/wren/projects/phila.html, last visited April 26, 2002.

71 See note 8.

PHOENIX, AZ

Phoenix Earned a Water Quality and Compliance Grade of Poor in 2000 and 2001

The city water supply had a number of contaminants approaching national and draft national standards and spikes well above those standards; furthermore, the city violated monitoring standards for a number of contaminants and had a large number of previous violations prompting EPA enforcement and a consent decree in 2000.

▶ **Trihalomethanes,** by-products of chlorine disinfection that may cause cancer and possibly birth defects and miscarriages, averaged just below the new national standard but spiked to levels well above it.

▶ **Arsenic,** a known and potent human carcinogen that is linked to a variety of diseases, spiked to levels above the new national standard.

▶ Levels of **nitrate** approached the national standard. Nitrates are the product of fertilizers and human or animal waste and can cause shortness of breath, nausea, vomiting, diarrhea, lethargy, loss of consciousness, and even death in infants (called "blue baby syndrome").

▶ The industrial chemical **di-(2-ethylhexyl)phthlate (DEHP),** a probable human carcinogen that damages the liver and testes, averaged below the national standard but spiked above it.

▶ **Perchlorate,** a component of rocket fuel that can harm the thyroid and poses special risks to infants and pregnant women, was found at levels above the EPA draft safe level.

PHOENIX
System Population Served **1,200,00[1]**
Water Quality and Compliance **2000▶Poor** **2001▶Poor**
Right-to-Know Report—Citizenship **2000▶Failing** **2001▶Failing**
Source Water Protection **Poor**
REPORT CARD

Noteworthy

▶ The EPA took enforcement action against Phoenix for dozens of monitoring and reporting violations and some contaminant standard violations, including nitrate and DEHP. Phoenix settled in 2000 for $350,000 in penalties, but since then the EPA data indicate numerous additional monitoring and reporting violations. After several requests, state officials said they "lack the resources" to verify whether those dozens of later violations (reported by the state itself to the EPA in 2001–2003) were accurate, though they believe that many of the reported violations did not occur.

Phoenix's Right-to-Know Reports Earned a Grade of Failing for 2000 and 2001

▶ The reports incorrectly asserted that Phoenix achieved "100 percent regulatory compliance" and unlawfully failed to mention violations.

▶ The city failed to reveal average levels of arsenic, chromium, mercury, and thallium, reporting only the range of levels, making it impossible to know the true levels or to compare them to the EPA's average-based standards. These omissions are in violation of right-to-know report requirements.

▶ Phoenix buried EPA-required warnings about the health effects of the city's elevated arsenic and nitrate levels deep in the report, in an extremely small font as a footnote to a table.

▶ The reports failed to note the specific sources of contaminants.

▶ The reports were very hard to read because they were poorly formatted and used small fonts.

▶ The reports were not fully translated into Spanish, in spite of the fact that Phoenix has a large Spanish-speaking population.

Phoenix Earned a Source Water Protection Rating of Poor

Phoenix admits that groundwater contamination can be a serious local problem. The city's surface water sources are highly susceptible to contaminated agricultural, urban, and suburban runoff, and industrial, municipal, and other pollution sources, including perchlorate from a Nevada waste site.

Noteworthy

▸ Phoenix reported that it projects a five-year drinking water infrastructure investment need of $900 million.[2] Construction has begun on a 16-mile-long, 48-to-54-inch water main (including 6,000 feet of mountain tunnel).[3] A 50-million-gallon-per-day (MGD) "booster" is planned to serve southeast Phoenix at a cost of approximately $75 million.[4] Construction also is planned to start in 2003 for a four MGD reclamation plant and in 2004 for an 80 MGD treatment plant at a cost of $204 million dollars.[5] To supply the rapidly growing north Phoenix area, a 320 MGD water treatment plant is planned at Lake Pleasant, with the first phase ready in 2007.[6]

KEY CONTAMINANTS IN PHOENIX'S WATER

The following contaminants have been found in Phoenix's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[7]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels[8]
Phoenix Municipal Water System: 2.2% in maximum month, total coliform positive
North Valley Water System: 9.1% in maximum month, total coliform positive—*violation*

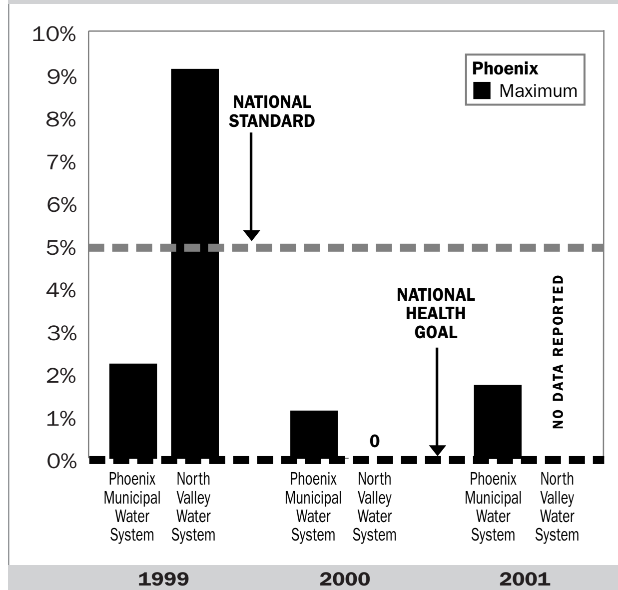
2000 Levels[9]
Phoenix Municipal Water System: 1.1% in maximum month, total coliform positive
North Valley Water System: 0 maximum month, total coliform positive

2001 Levels[10]
Phoenix Municipal Water System: 1.7% in maximum month, total coliform positive
North Valley Water System: data not reported; North Valley reportedly closed in 8/2000

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. The highest reported level of coliform bacteria in any month in Phoenix's system was 9.4 percent, taken in the North Valley Water System in 1999. This level violated the national standard and may have presented a significant health risk to some citizens. No violations of the coliform standard have been reported since 1999. The lower levels (1 to 2 percent) observed in 2000 and 2001 do not present a serious health risk for healthy consumers. Nonetheless, any presence of coliform bacteria in a city's water distribution system is a potential indication that regrowth of bacteria may be occurring in city pipes.

TOTAL COLIFORM BACTERIA LEVELS



INORGANIC CONTAMINANTS

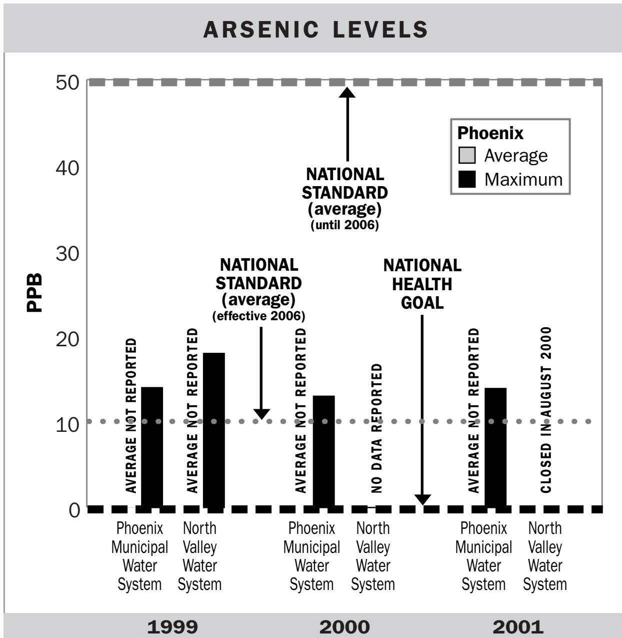
Arsenic

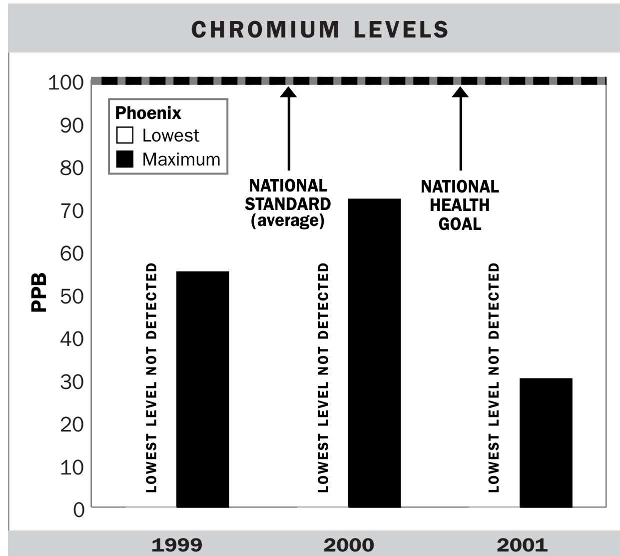
National Standard (MCL)
50 ppb (average) effective through 2005
10 ppb (average) effective in 2006

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels[11]	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	14 ppb
North Valley Water System	not reported (in violation of EPA rules)	18 ppb

2000 Levels[12]	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	13 ppb
North Valley Water System	Data not reported; North Valley reportedly closed in 8/2000	





2001 Levels[13]	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	13.9 ppb
North Valley Water System	data not reported; North Valley reportedly closed in 2000	

Arsenic—the product of mining, industrial processes, past use of arsenic-containing pesticides, and natural leaching or erosion from rock—is a known and potent human carcinogen that has been linked to a variety of other diseases. The National Academy of Sciences has estimated that a person who consumes two liters of water a day containing 10 ppb arsenic has a lifetime fatal total cancer risk of about 1 in 333.[14] But because Phoenix has unlawfully failed to report average arsenic levels for different areas of the city, precise health risk estimates are not possible.

LEVELS PRESENT HIGH CONCERN

Chromium

National Standard (MCL)
100 ppb (average)

National Health Goal (MCLG)
100 ppb

1999 Levels[15]	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	55 ppb

2000 Levels[16]	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	72 ppb

2001 Levels[17]	Average	Maximum
Phoenix Municipal Water System	not reported (in violation of EPA rules)	30 ppb

LEVELS OF SOME CONCERN

Chromium—a naturally occurring metal used in industrial processes, including metal-plating for chrome bumpers, and in making stainless steel, paint, rubber, and wood preservatives—can irritate skin and damage kidney, liver, and nerve tissues. Officials have recently engaged in heated debate over whether states and the EPA should adopt a separate standard for Chromium VI (hexavalent chromium), a form of chromium known to cause cancer when inhaled. The EPA has refused so far to consider it as a carcinogen when it is consumed in tap water. Phoenix does not reveal whether it is aware of Chromium VI levels or average levels for total chromium; this latter omission is in violation of EPA rules.

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[18]

National Health Goal (MCLG)
0—no known fully safe level

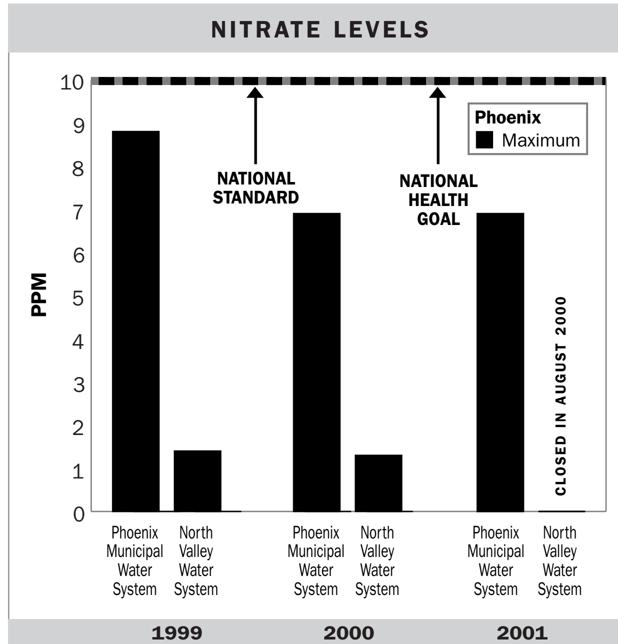
1999 Levels[19]
Phoenix Muncipal Water System: 3 ppb at the 90th percentile home

2000 Levels[20]
Phoenix Municipal Water System: 4 ppb at the 90th percentile home

2001 Levels[21]
Phoenix Municipal Water System: 4 ppb at the 90th percentile home

LEVELS PRESENT SOME CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. Phoenix lead levels are relatively low.



Nitrate

National Standard (MCL)
10 ppm (peak standard; if confirmation is taken within 24 hours, then two samples are averaged)

National Health Goal (MCLG)
10 ppm

1999 Levels[22]	Maximum
Phoenix Municipal Water System	8.8 ppm
North Valley Water System	1.4 ppm
2000 Levels[23]	Maximum
Phoenix Municipal Water System	6.9 ppm
North Valley Water System	1.3 ppm
2001 Levels[24]	Maximum
Phoenix Municipal Water System	6.9 ppm
North Valley Water System	Data not reported; North Valley reportedly closed in 2000

LEVELS PRESENT HIGH CONCERN

Nitrates are the product of fertilizers and human or animal waste and can cause shortness of breath, nausea, vomiting, diarrhea, lethargy, loss of consciousness, and even death in infants (called "blue baby syndrome"). Phoenix's peak levels of nearly 9 ppm in 1999 approached the national standard; even the 7 ppm level in subsequent years was troubling, since there is no margin of safety in the 10 ppm standard. Phoenix warns that nitrate at 10 ppm poses a special "risk for infants less than six months old," that high nitrate levels can cause blue baby syndrome, can occur suddenly after rainfall, and should be taken seriously: for example, the city water supplier notes that "if you are caring for an infant, you should ask for advice from your health care provider" about whether to use city water for the child.[25] The EPA filed an enforcement action against Phoenix alleging that in previous years, the city had violated the nitrate standard; the EPA and Phoenix reached a consent decree in 2000 in which the city agreed to pay a large fine and to take steps to address this and many other alleged violations (see section below on Phoenix's compliance problems).

Perchlorate

National Standard (MCL)
None established

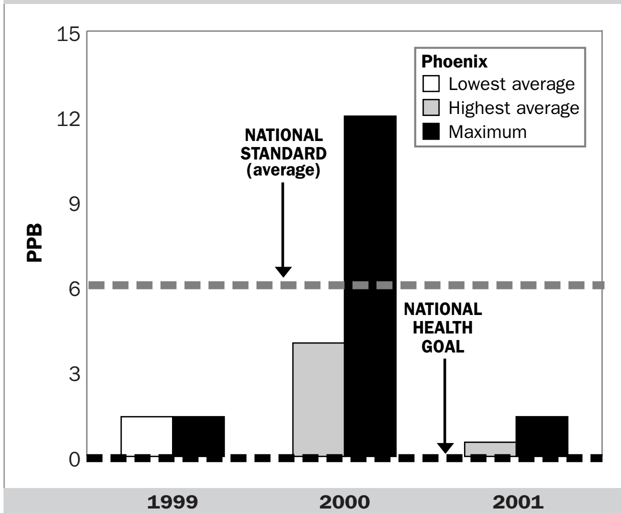
National Draft Safe Level ("Drinking Water Equivalent Level," or DWEL)[26]
1 ppb

2000 Levels[27]
Phoenix Municipal Water System: 5 ppb (two samples)

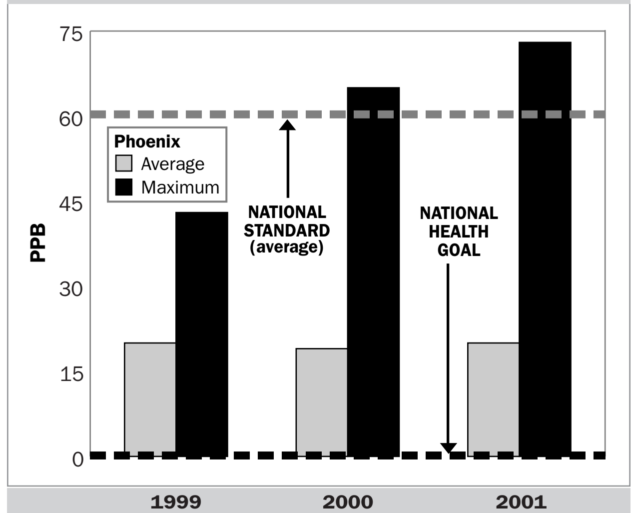
LEVELS PRESENT HIGH CONCERN

Perchlorate, an inorganic contaminant that usually comes from rocket fuel spills or leaks at military facilities, harms the thyroid and may cause cancer. Perchlorate from a Kerr-McGee facility in Nevada has contaminated the Colorado River (which supplies some of Phoenix's water via the Central Arizona Project). It was found in Phoenix tap water at levels up to 5.3 ppb

DI(2-ETHYLHEXYL)PHTHLATE LEVELS



HALOACETIC ACID LEVELS



in 2000—more than five times higher than the recently issued national draft safe level of 1 ppb.[28]

ORGANIC CONTAMINANTS

Di-(2-ethylhexyl)Phthalate

National Standard (MCL)
6 ppb (average)

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels[29]	Average	Maximum
Phoenix Municipal Water System	1.4 ppb	1.4 ppb
2000 Levels[30]	Average	Maximum
Phoenix Municipal Water System	4 ppb	12 ppb
2001 Levels[31]	Average	Maximum
Phoenix Municipal Water System	0.5 ppb	1.4 ppb

LEVELS PRESENT SOME CONCERN

Di-(2-ethylhexyl)phthalate (DEHP)—a plasticizing agent used widely in the chemical and rubber industries and contained in many plastics—is a probable human carcinogen and also causes damage to the liver and testes.[32] DEHP levels in 2000 in Phoenix water are of concern, as they averaged two-thirds of the national standard and spiked to twice the national standard. The EPA alleged that in past years Phoenix distributed water violating the DEHP standard, and in 2000 the EPA and Phoenix signed a consent decree in which Phoenix paid fines and promised to take steps to address this and many other violations (see section below on Phoenix's compliance problems). The lower levels reported in 2001 are promising, but careful monitoring of the situation and identification of the source of the DEHP pollution are warranted.

Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective in 2002; no previous standard

National Health Goal (MCLG)
0—no known fully safe level[33]

1999 Levels[34]	Average	Maximum
Phoenix Municipal Water System	20 ppb	43 ppb
2000 Levels[35]	Average	Maximum
Phoenix Municipal Water System	19 ppb	65 ppb
2001 Levels[36]	Average	Maximum
Phoenix Municipal Water System	20 ppb	73 ppb

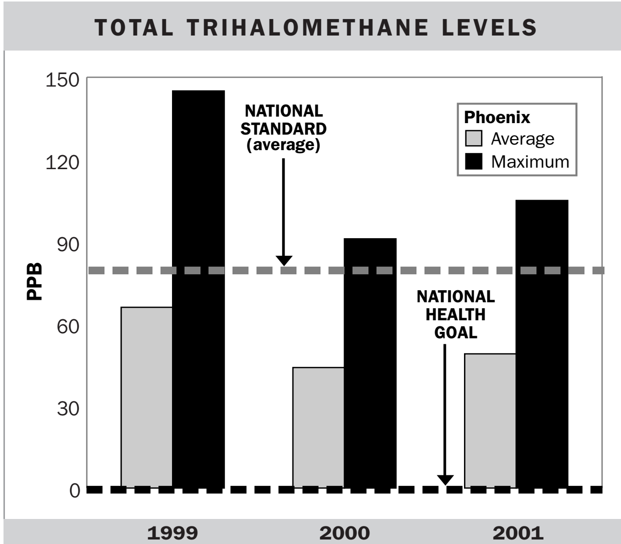
LEVELS PRESENT SOME CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. Haloacetic acids have been found in Phoenix's water at levels that average well below the national standard but above the national health goal. Spikes of HAAs in Phoenix water occasionally exceed the national standard.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)



0—there is no known fully safe level[37]

	Average	Maximum
1999 Levels[38]	Average	Maximum
Phoenix Municipal Water System	66 ppb	145 ppb
2000 Levels[39]	Average	Maximum
Phoenix Municipal	44 ppb	91 ppb
2001 Levels[40]	Average	Maximum
Phoenix Municipal	49 ppb	105 ppb

LEVELS PRESENT HIGH CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects.[41] Phoenix has moderate to relatively high levels of TTHMs in its drinking water. Indeed, the city's highest TTHM levels have frequently spiked above the new national standard; because preliminary studies may indicate health risks even at those spike levels, women in the first three months of pregnancy should exercise caution, according to Dr. David Ozonoff, chair of the Environmental Health Department at Boston University School of Public Health.

PHOENIX'S HISTORY OF WATER QUALITY AND COMPLIANCE VIOLATIONS AND PROBLEMS

The Phoenix Municipal Water System had a long series of significant and minor monitoring and MCL violations between 1993 and 2000.[42]

Monitoring, Reporting, and Standard Violations

In March, April, and May 2000, according to EPA data, the water system incurred a significant filter monitoring violation under the Surface Water Treatment Rule because it failed to take a large percentage of the required samples. On August 31, 2000, a consent decree was filed in the United States District Court of Arizona.[43] As part of it, Phoenix agreed to pay a $350,000 civil penalty to the U.S. EPA and the state of Arizona for falling short of drinking water monitoring, reporting, and contaminant standard requirements during the years 1993–1996; another component of the consent decree was an agreement that the city would complete two projects with Arizona State University in order to improve the quality of Phoenix's drinking water.[44] Previously, in November 1996, Phoenix received notices of violation from the U.S. EPA and the Arizona Department of Environmental Quality, including but not limited to:

- distribution of water that had levels of nitrate and DEHP that violated the MCLS (maximum contaminant levels)
- failure to notify the state drinking water authorities within 24 hours of the violations
- failure to perform increased quarterly nitrate monitoring as required after samples taken on dates in 1993–1996 showed nitrate levels between 5 and 10 ppm
- failure to perform increased quarterly DEHP chemical monitoring after samples taken indicated levels above the national health standard
- failure to notify people drinking Phoenix tap water of the availability of monitoring results for unregulated contaminants, among other public notice violations
- failure to complete groundwater inorganic chemical monitoring for arsenic, barium, cadmium, chromium, fluoride, mercury, and selenium
- violation of asbestos monitoring rules[45]

The consent decree did not resolve violations described in a December 1998 Notice of Violation that the EPA issued to the city of Phoenix.

Additionally, according to EPA records, for five months in 2000, eight months in 1999, and during some months of 1998, 1997, 1996, 1995, and 1993, the Phoenix system did not adequately monitor for total coliform because it failed to take some of the required samples.[46]

These monitoring violations do not appear to be included in the consent decree. Neither are they mentioned in Phoenix's right-to-know reports.

According to data posted by the EPA based upon Arizona state filings with the agency, in 2001–2003 Phoenix violated monitoring and reporting requirements many times for chemicals ranging from nitrates to numerous industrial chemicals.[47] These federal computer records indicate that after the consent decree was reached, Phoenix then violated monitoring and reporting requirements more than 30 times between 2001 and 2003—including failures to monitor for nitrate, 1,2-dichloroethane, paradichlorobenzene, trichloroethylene, and many other contaminants.[48]

After several inquiries from NRDC, state officials told us (in 2002 and again in 2003) that they simply lack the resources to track down and verify the accuracy of the dozens of monitoring violations for Phoenix reported by the state into EPA's computer database from 2001 to 2003.[49] After NRDC requested that Arizona state drinking water officials detail and verify the accuracy of the state's official violation reports (which are required by federal law to be accurate), state officials responded that they suspected that "most or all" of these 2001 to 2003 violations either were incorrectly reported to the EPA or were reported but "corrected" later.

Arizona officials explained that some of the violations were recorded because Phoenix removed from service some "points of entry" (that is, the city stopped using water from certain wells or other sources) and therefore ceased the testing associated with those sources—but had failed to inform the state of the change, triggering a record of violation.[50] This would not explain all the reported violations, but the state said it "lacks the staff and resources" to verify the facts.[51] The state says it is planning to change to a new computer system in order to better track violations.[52] However, it remains troubling that Arizona's largest city, with a multiyear history of EPA violations, continues to have problems complying with basic requirements of the Safe Drinking Water Act and that Arizona has not dedicated the resources to vigorously verify compliance.

An Incident Involving Untreated Canal Water

According to a February 2002 article in the *Phoenix New Times*, some Phoenix residents unknowingly drank untreated irrigation water that reached the drinking water system from a home that did not have a backflow protector. The city's water services department reportedly failed to notify the county of the problem until nearly a month after the incident—even though the required notification time frame is 24 hours. The paper reported that the county issued a cease-and-desist order to the city requiring Phoenix to notify people who may have consumed the untreated drinking water; published accounts say the city has done a small mailing to some customers.[53]

The Safe Drinking Water Information System

As noted above, the findings of this report regarding violations have relied in part on data available online via a U.S. EPA database called the Safe Drinking Water Information System (SDWIS-FED). The City of Phoenix Water Services Department has acknowledged that there are discrepancies between the city's drinking water data and the Phoenix data as presented by SDWIS-FED.[54] The discrepancies remain, in spite of queries sent by NRDC to the state and the city, as well as telephone calls from NRDC to EPA Region IX and the Arizona Department of Environmental Quality. As a result, NRDC has cited SDWIS-FED data and a printout of state data obtained from Arizona DEQ as the only data publicly available. It is important to note that the data Arizona reports into SDWIS-FED is required by federal law to be submitted in an accurate and timely manner.

PHOENIX'S RIGHT-TO-KNOW REPORTS

Phoenix's Right-to-Know Reports Earned a Grade of Failing for 2000 and 2001

On the could-be-a-better-citizen side of the ledger:

- The 1999 and 2000 right-to-know reports falsely assert that Phoenix achieved "100 percent regulatory compliance."[55] The reports fail to mention dozens of violations cited by the EPA, including those for which Phoenix had to pay $350,000 in penalties. Failure to disclose monitoring, reporting, or other violations and failure to provide the public with a "clear and readily understandable explanation of the violation" in the right-to-know report are two discrete violations of federal law.[56]

▸ The 2001 right-to-know report failed to disclose all but one of the reported monitoring violations—which is in itself a violation of federal law. The 2001 report also misleadingly stated that Phoenix "met or surpassed all health and safety standards for drinking water," that "all required testing was conducted for all wells, showing total compliance with all standards," and that "Phoenix tested for nearly 200 substances, even though tests are necessary for only about 110 substances."[57] The report did not mention 30 chemical monitoring violations reported by the EPA in 2001, and it failed to note the violations and the $350,000 in penalties paid by Phoenix in the consent decree in 2000.

▸ Phoenix's 2001 report buried deep in the report EPA-required warnings about the health effects of the city's elevated arsenic and nitrate levels, in a small font as a footnote to a table.

▸ The prominent "Table of Detected Contaminants" in the 1999 report failed to note that the North Valley Water System violated the total coliform bacteria health standard—denoting a failure to comply with EPA regulations requiring clear delineation of health standard violations in a table.[58]

▸ The reports failed to state average levels detected for many contaminants, such as arsenic, chromium, mercury, and thallium. Only minimum and maximum levels were provided, rendering it impossible to determine the true level of these contaminants to which citizens were exposed. Federal law requires that averages be provided in the right-to-know report.[59]

▸ Phoenix did not accurately describe the groundwater sources of the city's drinking water, failing to list aquifer names and other information required by federal law.[60]

▸ Phoenix failed to include maps or descriptions of specific contaminant sources (for phthalate, nitrates, perchlorate, *e.g.*) in the city's tap water. EPA rules require utilities to specifically identify known sources of contaminants in source water.[61]

▸ Phoenix did not describe the health effects of many contaminants found at levels above the EPA health goals (such as trihalomethanes, haloacetic acids, and DEHP). Although not legally required, this information would have been useful for Phoenix citizens.

▸ The form of the report was poor. The layout of the text was compact and dense, without graphics, and daunting. The font was very small, thereby making it more difficult to read. The tables of detected regulated and unregulated contaminants used even smaller fonts and were not well organized.

▸ The right-to-know report was not translated into Spanish. According to the 2000 U.S. Census, 32 percent of the Phoenix population speaks a language other than English at home (more than a quarter, 27 percent, of the city population speaks Spanish at home). Fully 15 percent of the city's population speaks Spanish and "speaks English less than very well." EPA rules require that systems serving "a large proportion of non-English speaking residents" must provide information on the importance of the report in the relevant language(s) or a phone number or address where citizens can get a translated copy of the report or assistance in their language.[62] The reports made one small reference in Spanish to their importance and offered a telephone number for more information in Spanish, but a full, readily available Spanish translation is recommended.

THREATS TO PHOENIX'S SOURCE WATER

Phoenix Earned a Source Water Protection Grade of Poor

Surface Water Supplies

Water is a precious commodity in a desert city like Phoenix—the largest city in Arizona and the sixth largest city in the country. Phoenix obtains most of its source water for drinking (more than 90 percent) from the Salt, Verde, and Colorado Rivers.[63, 64] The Colorado River water is channeled to Phoenix through a canal system called the Central Arizona Project (CAP), which serves Tucson and other municipalities. According to CAP, more than 20 million people are drinking Colorado River water every day.[65] The region including Phoenix is one of the fastest growing regions in America; in fact, just in the past decade, the population of Phoenix increased more than 34 percent.[66] Although some may consider this river to be a "renewable" resource, the Colorado River water usage is currently at or beyond full capacity. If development continues at the same rate or in the event of a drought, a large-scale water shortage among Colorado River users would be likely—leaving users to turn to area groundwater supplies, which are already in perilous condition.

Groundwater Supplies

The remaining source water for Phoenix's drinking water, delivered by the North Valley Water Treatment System, comes from groundwater wells. Groundwater levels across Arizona are declining in quantity and quality as a result of overuse; according to CAP authorities, Arizona takes out approximately 2.5 million more gallons of groundwater than can be naturally recharged.[67] In January 2002, the Center for Biological Diversity filed a lawsuit challenging the Arizona water law that allows surface water and groundwater aquifer depletion.[68]

The Lower Salt Watershed: The Salt and Verde Rivers

The U.S. EPA's Index of Watershed Indicators (IWI) has determined that Phoenix's Lower Salt Watershed is of better quality and lower vulnerability than is the Verde, but the upstream Carizo Watershed is ranked as having "more serious" water quality problems.[69] Therefore, the IWI assigned an overall index score of 5 (1 equals low threat and 6 equals highest threat) to the Carizo, a 2 to the downstream Lower Salt Watershed, and a 3 to the Verde Watershed.[70]

Rating Threats to Phoenix Source Waters

Based on our analysis of the data pertaining to area water quality and quantity data, NRDC has rated Phoenix as Poor for its efforts to control threats to source water. The most "prevalent causes" of source water pollution as identified by IWI include low dissolved oxygen, salinity/chlorides, unknown toxic materials, metals, and suspended solids. Sources of these pollutants include changes in the hydrology of the source water, agriculture, and industry. From 1991 to 1999, 50 to 100 percent of the population was served by community water systems with violations or treatment for chemical contaminants. Zero to 5 percent of ambient surface water samples contained chemical levels exceeding one half of the drinking water standard from 1990 to 1998.[71]

Urban runoff occurs when water passes through an urban environment, picking up particles, dirt, and chemicals, and flows into the water resources of the area. Phoenix's watershed and its drinking water sources experience a heavy load of pollutants in urban runoff. The vulnerability indicator of urban runoff potential for Phoenix therefore is high, with 13 percent of the land area having more than 25 percent imperviousness.[72]

The vulnerability indicator of agricultural runoff potential (which is a composite of nitrogen runoff, pesticide runoff, and sediment delivery) is considered to have a moderate level of impact, with a moderate potential for pesticide runoff, nitrogen runoff, and sediment delivery to rivers and streams.[73]

Industrial Wastelands in Phoenix

There are at least 16 toxic sites in Phoenix awaiting cleanup, but resolution is nowhere in sight. *The Arizona Republic* reports that since the inception of the state toxic site cleanup program in 1986, not one of these sites has undergone groundwater or soil remediation. At least two sites have reportedly leached contaminants such as perchloroethylene into groundwater aquifers.[74] Although these contaminated groundwater supplies are not supposed to be used for drinking water purposes, such groundwater contamination contributes to the overall degraded state of Phoenix's aquifers.

Source Water Assessment Program

Arizona drinking water authorities are involved in the Source Water Protection Program (SWAP), which is required by the Safe Drinking Water Act. In its published 67-page Final Draft Source Water Assessment Plan, the Arizona Department of Environmental Quality (ADEQ) contains measures that will allow the department to catalog the source waters for each system in Arizona (including Phoenix) and the land uses close to the source waters. The final plan describes the process that should be used in order to compile the Final Source Water Assessment Reports. In carrying out the SWAP, ADEQ plans to evaluate the risk of each public water system (PWS) from contamination. Once that risk has been determined, land uses close to the particular PWS (in this case, Phoenix) will be reviewed for possible contamination problems.[75]

PROTECTING PHOENIX'S DRINKING WATER

The following are approaches to treating Phoenix's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

The city of Phoenix has five surface water treatment plants (WTP): Verde, Val Vista, Squaw Peak, Deer Valley, and Union Hill.[76] Construction of another water treatment plant, the Lake Pleasant WTP, has been planned. At these plants, water is treated generally with the same measures: sedimentation (slowing the flow of water to let big particles settle), coagulation (addition of a chemical that causes mud and particles to clump and sink to the bottom), filtration (using sand, gravel, and hard anthracite coal), and chlorine disinfection. On average, about 4 percent of the drinking water comes from deep wells; some is reported to be wastewater that had been treated and then injected into the ground and then withdrawn to use as drinking water.

Phoenix Water Services reportedly has a 2001–2006 five-year water capital improvement program in the works, designed around three different areas: reliability/growth, rehabilitation/replacement, and environmental.[77]

Treatment to Reduce Arsenic

The proposed plan budgeted $75 million for arsenic removal. As discussed in the previous section, arsenic levels reported to be present in parts of Phoenix's drinking water were above the new national standard of 10 ppb. Treatment options available to reduce arsenic levels may include using activated alumina, anion exchange, or other technologies at a cost of approximately $20 per household per year, according to EPA estimates for a system of Phoenix's size.

Treatment to Reduce Disinfection By-Products (Such as Trihalomethanes and Haloacetic Acids) and to Eliminate Taste and Odor Problems

Phoenix has relatively high disinfection by-product levels, which could be reduced by using ozone or ultraviolet light as a primary disinfectant. The city could further reduce levels of by-product contaminants by installing granular activated carbon (GAC). GAC would have the enormous benefit of reducing most other organic contaminants and would take care of the musty algae-caused taste and odor problems that many Phoenix residents commonly cite. GAC could eliminate many of the other organic chemicals found in the city's water; other cities have installed this technology at a cost of about $25 per household. Phoenix asserts that the cost of GAC would be about $325 million, plus about $5 to 10 million per year to operate and maintain; the city argues that this would not be worth the expense in order simply to improve taste and odor.[78] However, taste and odor control would be only one benefit of GAC; GAC would also reduce levels of cancer-causing (and possibly miscarriage- and birth defect—inducing) disinfection by-products, as well as other synthetic organic chemical contaminants.

In addition, although Phoenix claims never to have found viable *Cryptosporidium* in its water, ozone and ultraviolet light would offer a measure of additional assurance that *Crypto* would pose no risk to city residents (these disinfection technologies are far more effective at killing these and certain other resistant parasites than is chlorine).

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving

PHOENIX
Phoenix Municipal Water System[79] Maricopa County 5204 East Thomas Road Phoenix, AZ 85018 602-262-7454 www.ci.phoenix.az.us
WATER UTILITY INFORMATION

water in their daily lives and by getting involved in community decision making about water resources.

▶ **Attend meetings of your local water supplier** (contact information below). Ask for dates, times, and locations.

▶ **Get involved with local efforts to ensure safe drinking water** by contacting the Friends of Arizona Rivers, 602-265-4325, and the Center for Biological Diversity, 602-246-4170; www.biologicaldiversity.org/swcbd/

▶ **Get involved in source water assessment and protection efforts.** Find a state government contact by calling the Safe Drinking Water Hotline at 800-426-4791.

▶ **Learn more from the:**

▶ Clean Water Network, www.cwn.org

Peer reviewers for the Phoenix report included Diana Neidle, Consumer Federation of America; Phyllis Rowe, Arizona Consumers Council; Doris Cellarius, Sierra Club Toxics Campaign.

NOTES

1 Safe Drinking Water Information System (SDWIS-FED), U.S. EPA database, available online at: http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=687801&pwsid=WA5377050&state=WA&source=Surface%20water%20&population=595430&sys_num=0 >. Printout, 5/24/01, provided by the city of Phoenix.

2 "Larger Cities Report Capital Improvement Needs," *WaterWorld: Water and Wastewater Technology*, December 2001, available online at www.pennet.com/Articles.

3 Ibid.

4 Ibid.

5 Ibid.

6 Phoenix Water Services Department, "Lake Pleasant Water Treatment Plant: Overview," available online at www.phoenix.gov/LPWTPDBO/overview.html.

7 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

8 Phoenix Water Services Department, "1999 Water Quality Annual Report," table entitled "1999 Distribution System Sampling," available online at www.ci.phoenix.az.us/WATER/qualre99.html, last visited March 25, 2002.

9 Phoenix Water Services Department, "2001 Water Quality Annual Report," available online at www.phoenix.gov/WATER/qualrept.html.

10 Phoenix Water Services Department, "2000 Water Quality Annual Report," table entitled "2000 Distribution System Sampling," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

11 Phoenix Water Services Department, "1999 Water Quality Report," listed in table entitled "1999 Detected Inorganic Substances at Points where water enters the Distribution System," available online at www.ci.phoenix.az.us/WATER/qualre99.html, last visited March 25. 2002.

12 Phoenix Water Services Department, "2000 Water Quality Report," listed in table entitled "2000 Detected Inorganic Substances at Points where water enters the Distribution System," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

13 See note 9.

14 National Academy of Sciences (NAS), National Research Council, *Arsenic in Drinking Water: 2001 Update*, National Academy Press, 2001, available online at www.nap.edu/catalog/10194.html. The accompanying press release, also available on the website, explains the NAS risk calculations. In providing Albuquerque's cancer risk estimate, NRDC has interpolated between the NAS's 10 and 20 ppb risk estimates.

15 See note 11.

16 See note 12.

17 See note 9.

18 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

19 Phoenix Water Services Department, "1999 Water Quality Report," listed in table entitled "1999 Results of Lead and Copper Sampling from Residential Water Taps," available online at www.ci.phoenix.az.us/WATER/qualre99.html, last visited March 25, 2002.

20 Phoenix Water Services Department, "2000 Water Quality Report," listed in table entitled "2000 Results of Lead and Copper Sampling from Residential Water Taps," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

21 See note 9.

22 See note 11.

23 See note 12.

24 See note 9.

25 Phoenix Water Services Department, "2001 Water Quality Annual Report," p. 5, footnote to table, available online at www.phoenix.gov/WATER/qualrept.html.

26 A DWEL is the presumed level of perchlorate that one would need to consume in tap water to reach the Reference Dose—the maximum safe level. See EPA, "Perchlorate," Fact Sheet, available online at www.epa.gov/safewater/ccl/perchlor/perchlo.html.

27 Phoenix Water Services Department, "2000 Water Quality Report," www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

28 See note 26.

29 See note 11.

30 See note 12.

31 See note 9.

32 Agency for Toxic Substances and Disease Registry (ATSDR), *ToxFaqs for Di-(2-ethylhexyl)Phthalate*, available online at www.atsdr.cdc.gov/tfacts9.html, last visited 03/25/02; "EPA Consumer Fact Sheet on Di-(2-ethylhexyl)phthalate," available online at www.epa.gov/safewater/dwh/c-soc/phthalat.html.

33 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

34 See note 11.

35 See note 12.

36 Phoenix Water Services Department, "2001 Water Quality Annual Report," available online at www.phoenix.gov/WATER/qualrept.html.

37 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

38 See note 11.

39 See note 12.

40 See note 36.

41 See note 31.

42 Safe Drinking Water Information System (SDWIS-FED), U.S. EPA database, available online at http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=629736&pwsid=AZ0407025&state=AZ&source=Surface%20water%20&population=1200000&sys_num=0.

43 Notice of Lodging of Consent Decree, Consent Decree, *United States of America and State of Arizona, ex. rel Jacqueline E. Schafer, Director, Arizona Department of Environmental Quality, v. City of Phoenix, Arizona*, United States District Court, District of Arizona, filed August 31, 2000.

44 EPA press release, "Phoenix to Pay Largest Drinking Water Fine in State History," August 31, 2000.

45 Notice of Violation, re: City of Phoenix Water Services Department, PWS ID #07-025, issued by Arizona DEQ on November 18, 1996.

46 See note 42.

47 Ibid.

48 See note 42.

49 Personal communications with Jeff Stuck and John Calkins, Arizona Department of Environmental Quality, September 2002; Personal communications with John Calkins, Arizona Department of Environmental Quality, February and March 2003.

50 Personal communications with John Calkins, Arizona Department of Environmental Quality, February and March 2003.

51 Ibid.

52 Ibid.

53 Silverman, Amy, "Drinking Problem: Unsuspecting Neighbors Recently Tapped Into Contaminated Water," *Phoenix New Times,* February 7, 2002.

54 Letter from Michael Gritzuk, P.E., water services director, City of Phoenix Water Services Department, to Erik Olson, NRDC, June 1, 2001.

55 See, *e.g.*, Phoenix Water Services Department, "2000 Water Quality Annual Report," available online at www.ci.phoenix.az.us/WATER/qualre00.html and Phoenix Water Services Department; *1999 Water Quality Annual Report,* available online at www.ci.phoenix.az.us/WATER/qualre99.html.

56 See 40 C.F.R. §141.153(f), which requires disclosure in the annual right-to-know report (or "consumer confidence report") of all monitoring and reporting violations.

57 See note 9.

58 See 40 C.F.R. §141.153(d)(6), requiring the right-to-know report's table to clearly indicate that a violation occurred.

59 See 40 C.F.R. §141.153(d)(4)(iv), requiring the right-to-know report table to include average level of a contaminant for which compliance with the Maximum Contaminant Level is determined based upon average levels.

60 See 40 C.F.R. § 141.153(b)(1)(ii).

61 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While the EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution or where the water system is aware of the pollution source, the rules require that polluters be identified.

62 See 40 CFR §141.153(h)(3).

63 City of Phoenix Water Services Department website, available online at www.ci.phoenix.az.us/WATER/drink.html, last visited March 25, 2002.

64 Phoenix Water Services Department, "2000 Water Quality Report," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

65 Available online at www.cap-az.com, last visited March 21, 2002.

66 U.S. Census Bureau, *Ranking Tables for Metropolitan Areas: 1990 and 2000*, available online at www.census.gov/population/cen2000/phc-t3/tab01.pdf, last visited March 25, 2002.

67 CAP website, FAQ, available online at www.cap-az.com, last visited March 21, 2002.

68 Center for Biological Diversity website, "Challenge Mounted to Reform Arizona Water Law," February 21, 2002, available online at www.endangeredearth.org/alerts/result-m.asp?index=1078, last visited March 25, 2002.

69 See EPA, IWI Database, available online at www.epa.gov/iwi/hucs/15060104/score.html and www.epa.gov/iwi/hucs/15060103/score.html. This data has not been verified by the city of Phoenix. See letter to Erik Olson of NRDC from Michael Gritzuk, P.E., water services director, City of Phoenix, June 1, 2001, p. 1.

70 Index of Watershed Indicators, U.S. EPA database, available online at www.epa.gov/iwi/hucs/15060203/score.html and www.epa.gov/iwi/hucs/15060202/score.html.

71 Ibid.

72 Ibid.

73 Ibid.

74 Pitzl, Mary Jo, "33 Toxic Sites in Arizona Never Cleaned. State Budget Crisis Could Add to 16-Year Delay," *The Arizona Republic*, March 8, 2002, available online at www.azcentral.com, last visited March 20, 2002.

75 ADEQ printout, from ADEQ website, "WQD: Drinking Water: Monitoring and Assessment: Source Water Assessment Program," available online at www.adeq.state.az.us/environ/water/dw/swap.html.

76 Phoenix Water Services Department, "2000 Water Quality Report," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

77 City Council Report from Michael Gritzuk, P.E., to George W. Britton, deputy city manager, Water Services Department Fiscal Years 2001–2002 to 2005–2006 Water Capital Improvement Program.

78 Phoenix Water Services Department, "2001 Water Quality Annual Report," available online at www.phoenix.gov/WATER/qualrept.html.

79 Phoenix Water Services Department, "2000 Water Quality Annual Report," available online at www.ci.phoenix.az.us/WATER/qualre00.html, last visited March 25, 2002.

SEATTLE, WA

Seattle Public Utilities Earned a Water Quality and Compliance Grade of Poor for 2000 but Improved to Fair in 2001[1]

Although Seattle's watershed controls are among the nation's best, the city exceeded the national action level for lead, had high levels of cancer-causing chlorination by-products (which it reduced in 2001 by installing new treatment), had elevated turbidity levels, and found *Cryptosporidium* in its source waters. Major additional new treatment slated to start in 2004 should significantly improve Seattle's water quality and its grade.

▶ In 2000, water from Seattle's Tolt Water Treatment Plant had levels of **haloacetic acids** (by-products of chlorine disinfection that may cause cancer) that exceeded the new national standard, which went into effect in 2002. A new treatment plant for the Tolt supply started operating in 2001 and brought the levels of these chemicals below the new standard.

▶ In 2000, water from the Tolt treatment plant had elevated levels of **total trihalomethanes,** by-products of chlorine treatment in drinking water linked with cancer, miscarriages, and birth defects. The levels approached, without exceeding, the national standard that went into effect in 2002. Levels decreased significantly once the new Tolt facility started operating in 2001.

▶ Seattle exceeded the national action level for **lead** and subsequently entered into an agreement with the state requiring the city to take steps to control the problem by 2004. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior.

▶ Tolt and Cedar source waters have tested positive for ***Cryptosporidium,*** a waterborne microbial disease-causing organism that presents health concerns, especially to individuals with weakened immune systems. The new Tolt treatment plant, which opened in 2001, uses ozone disinfection and so is likely to kill the *Crypto* in that supply. In 2004, the Cedar supply is supposed to get a new ozone/ultraviolet light plant that should kill *Crypto*.

▶ In the Cedar supply, **turbidity** occasionally peaked at high levels. Turbidity is a measure of the cloudiness of water and is used as an indicator that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns.

SEATTLE
System Population Served **595,430 in Seattle, 1.3 million in metro area[2]**
Water Quality and Compliance **2000▶Poor** **2001▶Fair**
Right-to-Know Report—Citizenship **2000▶Fair** **2001▶Fair**
Source Water Protection **Excellent**
REPORT CARD

Noteworthy

▶ Seattle's water exceeded 1 of 11 criteria established under the Safe Drinking Water Act for judging whether systems using surface water must filter their water. As a result, Seattle negotiated an agreement with the Washington Department of Health to implement additional watershed protection and treatment measures.

Seattle's Right-to-Know Reports Earned a Grade of Fair for 2000 and 2001

▶ The reports generally appeared to comply with EPA rules, included important information about water treatment, and resisted the temptation to describe the city's water as "absolutely safe."

▶ The reports buried the news that Seattle substantially exceeded the national action level for lead.

▶ Seattle prominently made the questionable claim that "No Compounds Were Detected at Above the Allowable Levels"—in spite of the exceedance of the lead action level and the city's failure to meet state watershed protection criteria. This triggered a state "Agreed Order" to build a new treatment plant.

Seattle Earned a Source Water Protection Rating of Excellent

▶ Seattle's two sources of drinking water, the Cedar River and the South Fork of the Tolt River, are not likely to become polluted.

▶ Seattle Public Utilities has undertaken extensive source water protection efforts.

Noteworthy

▶ Seattle says it needs to "invest in the foundation of our water system—the pipes, pumps, and plants that keep safe and reliable water flowing to our homes and businesses."[3] The city says its water system needs $80 to $120 million per year in capital improvements.[4]

▶ Seattle's system has to rehabilitate water mains, construct the Cedar Water Treatment Facility (to reduce threats from *Crypto,* chlorination by-products, and lead), upgrade the automated system used to monitor and control water supply facilities, build improvements to the water distribution system (pump stations, tanks, and standpipes), and complete improvements to the Landsburg Dam on the Cedar River.

▶ Moreover, major investments are expected in safety and security, including implementation of a program to cover reservoirs, complete seismic upgrades for water tanks, enhanced water system security, and installation of a warning system on the Lake Youngs Dam. Also planned are investments to protect the environment through habitat improvements in the Cedar River Watershed and to encourage water conservation.

KEY CONTAMINANTS IN SEATTLE'S WATER

The following contaminants have been found in Seattle's drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Cryptosporidium (Crypto)

National Standard (MCL)
Treatment Technique (TT)

Draft Proposed New National Standard[5]
<7.5 organisms/100 liters (average); no additional treatment
7.5–100 organisms/100 liters (average); some additional treatment (>90% *Crypto* kill)
100–300 organisms/100 liters (average); significant additional treatment (>99% *Crypto* kill)
>300 organisms/100 liters (average); advanced treatment (>99.7% *Crypto* kill)

National Health Goal (MCLG)
0—no known fully safe level

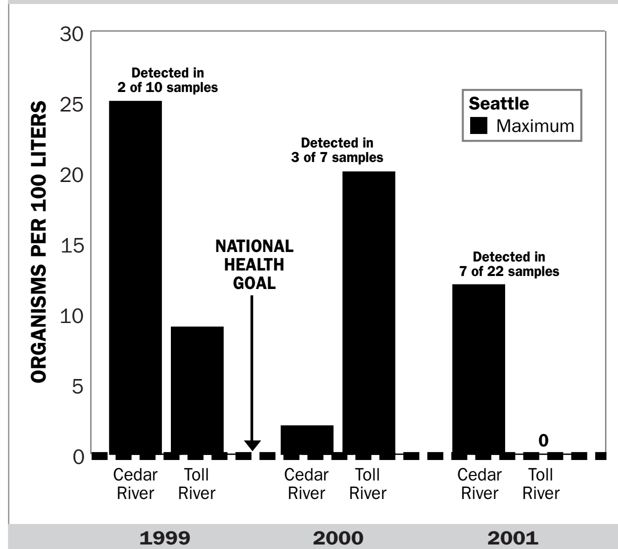
National Requirements
Most large- and medium-size water utilities that use surface water are required to monitor for *Crypto* and report results in their right-to-know reports; they eventually may be required to use advanced treatment if significant levels are found.

1999 Levels[6] Maximum
Cedar River 25 organisms per 100 liters
Tolt River 9 organisms per 100 liters
Detected in 2 of 10 samples; no average levels provided

2000 Levels[7] Maximum
Cedar River 2 organisms per 100 liters
Tolt River 20 organisms per 100 liters
Detected in 3 of 7 samples; no average levels provided

2001 Levels[8] Maximum
Cedar River 12 organisms per 100 liters
Tolt River 0
Detected in 7 of 22 samples; no average levels provided

***CRYPTOSPORIDIUM* LEVELS**



LEVELS PRESENT HIGH CONCERN

Cryptosporidium (*Crypto*) is a waterborne microbial disease-carrying pathogen that presents health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the elderly, children, and people who have undergone organ transplants. Under a negotiated EPA rule that is out in draft proposed form and is soon scheduled to be proposed formally in *The Federal Register,* water utilities that find significant levels of *Crypto* will have to use more effective treatment to kill the pathogen.

Positive samples of *Crypto* were found in Seattle's Tolt and Cedar source waters but at levels that are unlikely to trigger major treatment requirements. The new treatment plant for the Tolt supply, which came online in 2001 using ozone disinfection, is likely to kill most of the *Crypto* in that supply. However, Seattle acknowledges the current treatment for the Cedar supply is not effective at killing *Crypto.* Thus, immunocompromised consumers using the Cedar supply may be at some microbial risk, at least until Seattle's planned new ozone and ultraviolet light treatment plant for this supply comes online, now slated for 2004. Ozone and UV light are likely to kill most *Crypto* from that water supply.

Total Coliform Bacteria

National Standard (MCL)
5% maximum in any month[9]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels
0.3% in highest month, total coliform positive[10]

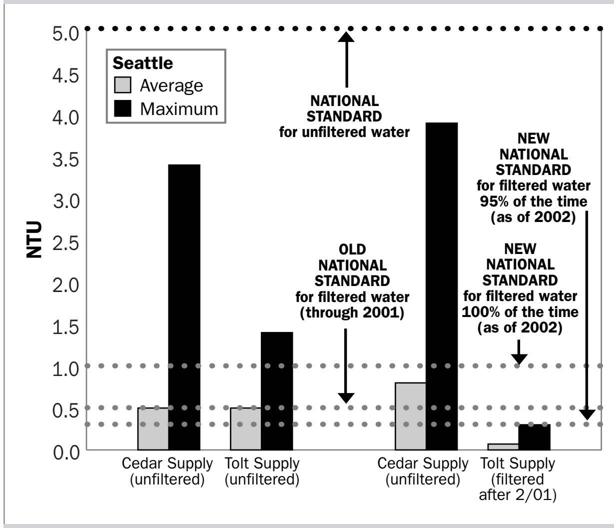
2000 Levels
0.3% in highest month, total coliform positive[11]

2001 Levels
0.9% in highest month, total coliform positive[12]

LEVELS PRESENT SOME CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. The federal standard allows up to 5 percent total coliform–positive samples per month. The health goal for any type of coliform bacteria is 0. The coliform bacteria finding in Seattle of less than 1 percent in peak months is not viewed as serious, though it may indicate that there may be some bacteria regrowth in water mains after water leaves the treatment plant. Some studies suggest that serious regrowth problems may allow disease-causing pathogens to subsist in pipes. Rehabilitation and renewal of the water distribution system will help the Seattle system ensure that bacterial problems in its pipes are addressed and prevented from becoming serious.

TURBIDITY LEVELS



Turbidity (Cloudiness)

National Standards (TT) (in Nephelometric Turbidity Units, or NTU)
Filtered water
0.5 NTU 95% of the time (through 2001)
0.3 NTU 95% of the time (in 2002)
1 NTU 100% of the time (in 2002)
Unfiltered water
5 NTU maximum, 100% of the time
(applies currently to Cedar, and to Tolt *before* the new plant opened in 2/01)

2000 Levels[13]	Average	Maximum
Cedar (unfiltered)	0.5 NTU	3.4 NTU
Tolt (unfiltered)	0.5 NTU	1.4 NTU
2001 Levels[14]	Average	Maximum
Cedar (unfiltered)	0.8 NTU	3.9 NTU
Tolt (filtered as of 2/01)	0.07 NTU	0.3 NTU

LEVELS PRESENT SOME CONCERN

Turbidity is a measure of the cloudiness of water and is used as an indicator that water may be contaminated with *Cryptosporidium* or other pathogens that present human health concerns. In addition, turbidity can interfere with water disinfection because it can impede the effectiveness of chlorine or other chemical disinfectants. The new Tolt plant reportedly is in compliance with EPA standards for turbidity. The unfiltered Cedar supply has had turbidity problems, including spikes that exceeded a new EPA standard for filtered water supplies. Since the Cedar supply is not filtered, a less stringent standard applies, and the spike is not a violation. However, the application of the relaxed standard is predicated on the assumption that the water meets all criteria for avoiding filtration, which the Cedar supply did not. Moreover, Seattle has found *Crypto* and *Giardia* in its source and finished water, precisely the types of pathogens that high turbidity could shield from effective disinfection. The new Cedar supply ultraviolet and ozone treatment plant will reduce this concern when it is completed in 2004, though even the effectiveness of ultraviolet and ozone could be reduced if turbidity levels are high enough.

INORGANIC CONTAMINANTS

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[15]

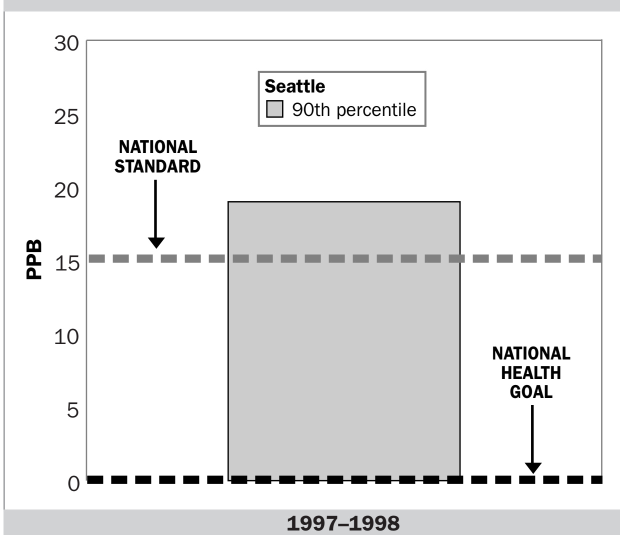
National Health Goal (MCLG)
0—no known fully safe level

1997–1998 Levels (Most Recent Testing Reported)
19 ppb at 90th percentile home;[16] 53 of 390 (14%) homes tested exceeded the national action level

EXCEEDS ACTION LEVEL

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. In recent years, the public water system in Seattle has exceeded the federal drinking water action level for lead (called the Lead and Copper Rule), and a bilateral enforcement agreement has a schedule that it must follow in order to come into complete compliance (see discussion of Seattle's violations history below).[17] The city reports that it will soon install new treatment methods to control corrosion, thus reducing lead at the tap, and that it will also make reservoir improvements. The city "expects to meet the action level in the future" when it renews testing in 2003–2004. Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

LEAD LEVELS



ORGANIC CONTAMINANTS

Haloacetic Acids

National Standard (MCL)
60 ppb (average) effective 2002; no previous standard

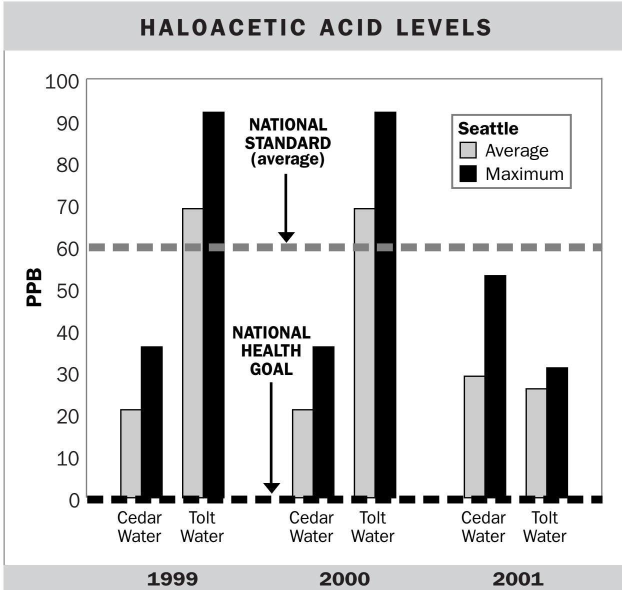
National Health Goal (MCLG)
0—no known fully safe level[18]

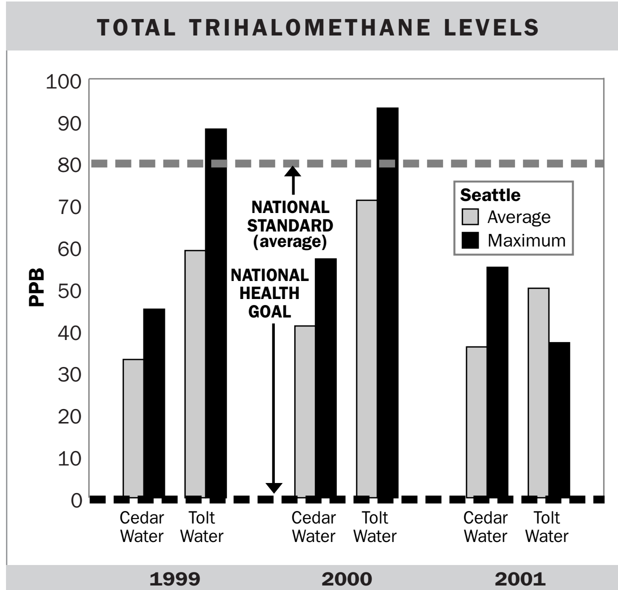
1999 Levels[19]	Average	Maximum
Cedar	21 ppb	36 ppb
Tolt	69 ppb	92 ppb
2000 Levels[20]	Average	Maximum
Cedar	21 ppb	36 ppb
Tolt	69 ppb	92 ppb
2001 Levels[21]	Average	Maximum
Cedar	29 ppb	53 ppb
Tolt	26 ppb	31 ppb

LEVELS PRESENT SOME CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive and other health problems. According to monitoring samples taken in 1997 and 1998 for the Tolt supply, which generally serves areas north of Green Lake, the average level of haloacetic acids exceeded the EPA's new maximum allowable level of 60 ppb, which went into effect later, in January 2002.[22] This reading is the main cause (along with excessive lead) of Seattle's poor drinking water quality and compliance grade for 2000.

The new Tolt treatment facility's state-of-the-art ozone treatment substantially reduced haloacetic acid





levels to less than half of the new standard. The Cedar supply, generally serving areas south of Green Lake, has similar low levels of haloacetic acids.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)
0—no known fully safe level[23]

1999 Levels[24]	Average	Maximum
Cedar	33 ppb	45 ppb
Tolt	59 ppb	88 ppb
2000 Levels[25]	Average	Maximum
Cedar	41 ppb	57 ppb
Tolt	71 ppb	93 ppb
2001 Levels[26]	Average	Maximum
Cedar	55 pbb	36 ppb
Tolt	37 ppb	50 ppb[27]

LEVELS PRESENT HIGH CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. The levels of TTHMs in Cedar water are below the levels linked to miscarriages and fetal development problems; but the Tolt water readings, particularly the 2000 high of 93 ppb, may be of concern, according to Dr. David Ozonoff, director of the Environmental Health Department at Boston University School of Public Health. That said, TTHM levels have been reduced since the new Tolt treatment facility came on line. While exact figures for average TTHMs for the portion of 2001 after the Tolt plant was opened are not available, NRDC's evaluation of preliminary data indicates that the levels likely averaged about 40 ppb in 2001 after the installation of the new plant.[28]

Violations History and Action Level Exceedances

Seattle has had an historic pattern of high levels of lead in tap water in many homes in the city (see lead section above).[29] The city reportedly failed to comply with legal requirements to treat water to reduce corrosivity that would reduce leaching of lead into tap water. In 2001, Seattle Public Utilities (SPU) signed two agreements with the Washington State Department of Health, both legal documents filed in court, that set out schedules for compliance with certain drinking water regulations. First, SPU signed a bilateral compliance agreement that sets out a schedule by which SPU must comply with the EPA's Lead and Copper Rule. This agreement requires SPU to construct new corrosion control facilities, conduct monitoring at residents' taps, and construct a new filtration plant, which Seattle now reportedly has completed, among other things.[30] Second, SPU has signed an agreed order that was executed as a consequence of the Cedar water supply exceeding 1 of 11 criteria required to provide unfiltered drinking water in 1992.[31]

SPU has taken steps to inform the federal government of inaccuracies in the EPA drinking water database, the Safe Drinking Water Information System (SDWIS). As of early 2003, the EPA had yet to act on these reported inaccuracies.[32] In 1998, SPU pointed out that two major violations, a turbidity violation and exceeding requirements necessary for unfiltered water, were not reported in SDWIS. Of the then nine violations (although now, inexplicably, just four are recorded) reported by SDWIS, only two appeared to be accurate, according to SPU.[33]

In addition, a monitoring violation from October 2000 was not reported in SDWIS.[34] SPU failed to collect a daily sample from the Cedar River.[35] The sample was required to assess disinfection effectiveness, and although SPU alleges that the violation was "minor," the public was notified in Seattle's right-to-know report for the year 2000.[36]

SEATTLE'S RIGHT-TO-KNOW REPORTS

Seattle's Right-to-Know Reports Earned a Grade of Fair for 2000 and 2001

On the good-citizen side of the ledger:

- Overall, the reports were colorful, attractively formatted, and generally appeared to comply with the EPA's rules.
- The reports provided a map of the source waters.
- The reports briefly summarized source water assessment and protection efforts.
- The reports described how the city's water is treated.
- The 2000 report included information on some of the health effects of disinfection by-products, although it only noted cancer risks and failed to mention the reproductive effects observed in many studies. The 2001 report did not mention these chemicals' health effects, but the levels of these chemicals had dropped by then, when the new Tolt treatment plant opened.
- Unlike many other cities, Seattle resisted the temptation to say that the city's water is "absolutely safe" or to make other sweeping claims about the complete safety of the water.
- The reports admit that the city is operating under a state bilateral compliance agreement, a legal consent order approved by a court. This order requires Seattle to address the failure to meet the surface water treatment rule criteria and the lead problem by building the new Cedar treatment plant by 2004.

On the could-be-a-better-citizen side of the ledger:

- The reports only obliquely acknowledged, in a section deep into the report, that Seattle substantially exceeded the action level for lead. Indeed, early sections of the reports made no mention of the lead problem.
- Seattle's 2001 report prominently makes a questionable claim that "no compounds were detected above the allowable levels." This would be true if "allowable levels" were defined so narrowly as to include *only* contaminants regulated by EPA's "maximum contaminant levels." But the statement is untrue if one considers Seattle's detection of lead above the action level, or its exceedance of the filtration-avoidance criteria. The EPA's action level for lead was established as part of an enforceable treatment technique. Exceeding the action level alone is not a violation of federal law, although it clearly has adverse health implications; but exceeding an action level and then failing to take required treatment and other steps to fix the problem in a specified time frame is a violation. Seattle has not yet taken those required steps and is under a consent order to do so.
- Seattle's exceedance of the criteria in the state's agreed order on filtration avoidance for the Cedar supply in 2001 is mentioned only parenthetically and is not highlighted in any table.
- While the reports mention the state bilateral enforcement agreement, they state that "there was no public health risk associated" with the city's failure to meet the state requirement that triggered the order. Obviously, the reason for the state order requiring better treatment was to improve public health protection; Seattle later admits that the "new treatment facility will improve public health protection by disinfecting against *Cryptosporidium* . . . ."
- Mandatory special information for people at high risk from drinking water contaminants, such as elderly people and people living with HIV/AIDS, while included in the report, is not prominently displayed. Rather, it is included on the last page of the reports.

▶ The reports include neither maps nor any detailed narrative noting any specific polluters in its watersheds. EPA rules require utilities to name any specific known sources of a contaminant found in their tap water and encourage discussion of information on specific local potential sources of pollution.[37] It may be, however, that Seattle, which has an aggressive source water protection program, concluded that no specific source of pollution could be identified in its watershed.

THREATS TO SEATTLE'S SOURCE WATER

Seattle Earned a Source Water Protection Grade of Excellent

Seattle's drinking water comes from two surface water sources, the Cedar River and the South Fork Tolt River. SPU is the primary owner of the watersheds for these rivers. The Tolt River, whose watershed is entirely owned by SPU, provides drinking water for one-third of the population. The Cedar River, whose watershed is 70 percent owned by SPU and 30 percent owned by the U.S. Forest Service, provides water to the remaining two-thirds of the SPU-served population.[38] The city of Seattle reports that information concerning the vulnerability and condition of these watersheds is not available on the EPA's Index of Watershed Indicators (IWI) database.[39]

Seattle has implemented very extensive source water protection programs. As part of those efforts, Seattle does not permit agricultural, industrial, and recreational activities in the watersheds, and residential use of the watersheds is prohibited.[40] Results from a survey performed by the Washington State Department of Health indicate that the Cedar River and the South Fork Tolt River have a low risk of contamination.[41] Because the drinking water supply comes from surface water sources, it is easily vulnerable to contamination; however, the source waters are not extremely vulnerable as a result of the strong watershed protection program. The city has confirmed that other than possible contamination from wildlife, few or no sources of contamination are in the watershed area.[42] Based upon available information, therefore, NRDC has given Seattle a source water protection rating of Excellent.

Under federal law, Washington state drinking water authorities must complete a Source Water Assessment (SWA) by 2003. The SWA assesses all of the sources of drinking water and the quality of those source waters, and will be an important tool in protecting source water. Protecting drinking water at the source is the most effective way of preventing drinking water contamination.

PROTECTING SEATTLE'S DRINKING WATER

The following are approaches to treating Seattle's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

Cedar River water is treated with screening, chlorination, fluoridation, and corrosion control with the addition of lime.[43] Tolt River water treatment consists of screening, ozonation, coagulation and flocculation, filtration, chlorination, fluoridation, and corrosion control with the addition of lime and carbon dioxide.[44] Seattle has recently worked to decrease high levels of such disinfection by-products as haloacetic acids in its drinking water. Several major treatment projects have already been completed or are in the works. Tolt River water is now filtered at a new treatment facility that became operational in February 2001; a new Cedar River water treatment facility is scheduled to be operational in 2004 and will include state-of-the-art disinfection using ozonation and ultraviolet (UV) light. This facility is required under the agreed order.

Once these new treatment plants are both in place, Seattle will have among the most advanced treatment plants in the United States. One improvement that should be considered in Seattle is the use of activated carbon and enhanced coagulation to eliminate the organic chemicals found in the city's water, including disinfection by-product precursors. Other cities have installed this technology at a cost of about $25 per household per year.

SEATTLE

Seattle Public Utilities[45]
710 Second Avenue
Seattle, WA 98104-1713
206-615-0827
www.cityofseattle.net/util/services/WaterQuality

WATER UTILITY INFORMATION

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

- **Attend meetings of the local water supplier,** Seattle Public Utilities. Check the website, the right-to-know report, or call and ask for dates, times, and locations. Ask about the progress of its Source Water Assessment Program (SWAP), which should be completed by 2003.
- **Get involved in source water assessment and protection efforts** by contacting the utility or find a state government contact by calling the Safe Drinking Water Hotline at 800-426-4791.
- **Learn more from these groups:**
  - WashPIRG, www.washpirg.org
  - Washington Physicians for Social Responsibility, www.wpsr.org
  - Washington Toxics Campaign, www.watoxics.org
  - Clean Water Network, www.cwn.org

Peer reviewers of the Seattle report included Ivy Sager-Rosenthal, WashPIRG, and Dr. Tim Takaro, Washington Physicians for Social Responsibility.

NOTES

1 Seattle earned a grade of Poor in 2000 because the haloacetic acid levels reported in Seattle's 2000 and 1999 right-to-know reports exceed the standard that went into effect in January 2002. Seattle reported low levels of other contaminants, but under NRDC's grading method applied to all water systems covered in this report, Seattle can earn no better than a Poor grade if its water in 2000 or 2001 exceeded the new standard. Had a contaminant level exceeded the standard in effect at the time, Seattle's water would have earned a failing grade.

2 Safe Drinking Water Information System (SDWIS-Fed), U.S. Environmental Protection Agency database, available online at http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=687801&pwsid=WA5377050&state=WA&source=Surface%20water%20&population=595430&sys_num=0, last visited September 7, 2001.

3 See Seattle Public Utilties, "Frequently Asked Questions," www.ci.seattle.wa.us/util/services/rates/2003FAQsWater.htm (which is summarized in this section).

4 Ibid.

5 See EPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) Preproposal Draft Regulatory Language For Stakeholder Review, available online at www.epa.gov/safewater/mdbp/st2dis.html. The 1, 2, and 2.5 minimum log removal requirements are converted into percentage removals for simplicity. This rule has not been formally proposed in *The Federal Register*, but was agreed to by the EPA, NRDC, public health groups, cities, and the water utility industry. See Ibid for the "FACA Stakeholder Agreement in Principle."

6 Seattle Public Utilities, "Drinking Water Quality Annual Report," p. 3, June 2000.

7 Seattle Public Utilities, "Drinking Water Quality Annual Report," p. 8, June 2001.

8 Seattle Public Utilities, "Drinking Water Quality Annual Report," p. 4, May 2002.

9 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

10 Seattle Public Utilities, "Drinking Water Quality Annual Report," p. 5, June 2000.

11 Seattle Public Utilities, "Drinking Water Quality Annual Report," p. 5, June 2001.

12 Seattle Public Utilities, "Drinking Water Quality Annual Report," p. 2, May 2002.

13 See note 7.

14 See note 8.

15 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

16 Seattle Public Utilities, "Drinking Water Quality Annual Report," p. 4, June 2000.

17 Bilateral Compliance Agreement for Seattle Public Utilities, Compliance with the Lead and Copper Rule, states "SPU exceeded the 15 ug/L lead action level at the 90th percentile sample during both rounds of customer tap monitoring in 1992. The results were 18.8 mg/L and 20.0 ug/L (p.1)," May 2001.

18 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

19 See note 10.

20 See note 11.

21 See note 12.

22 See note 10.

23 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

24 See note 10.

25 See note 11.

26 See note 12.

27 The trihalomethanes average for 2001 is a running annual average based on 2000–2001 data, so some of the samples that averaged to get the 50 ppb level were from 2000, before the Tolt treatment plant was online and before TTHM levels were reduced.

28 See "Seattle Public Utilities: 2001 Annual Analysis of Cedar & Tolt Water Supplies, Samples Collected May 22, 2001," and "Seattle Public Utilities: 2002 Annual Analysis of Cedar & Tolt Water Supplies, Samples Collected April 30, 2002," available online at www.cityofseattle.net/util/services/waterquality.

29 In 1992, Seattle exceeded the action level for lead, with levels as high as 20 ppb (Bilateral Compliance Agreement, May 2001). Other problems have been detected. For example, in 1998, KIRO-TV Investigations, a local TV news channel, tested lead levels in 10 Seattle-area public schools' drinking fountains during spring break recess. KIRO concluded that 3 of the 10 schools had lead levels in excess of 15 ppb, which are high levels of concern (website announcement, KIRO-TV, Seattle, 1998, provided by WDOH).

30 Bilateral Compliance Agreement between Seattle Public Utilities and Washington State Department of Health, Subject: Compliance with the Lead and Copper Rule, signed May 2001.

31 Agreed Order, Docket No. 94-015, State of Washington, Department of Health, 12/22/99.

32 See EPA SDWIS, http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=687801&pwsid=WA5377050&state=WA&source=Surface%20water%20&population=619300&sys_num=0, last visited February 2003.

33 Memorandum regarding "SDWIS Data Inaccuracies," from Julie Hutchins, Seattle Public Utilities, to Fran Haertel, US EPA OGWDW, October 13, 1998.

34 See notes 2 and 32.

35 Letter from Lynn Kirby, Water Quality Engineer, SPU, to Robert James, Regional Engineer, NW Drinking Water Operations, January 2, 2001.

36 See note 11.

37 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator." While the EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution where the water system is aware of the pollution source, the rules require that polluters be identified.

38 See note 12.

39 Letter from Lyn Faas, regulatory compliance manager, SPU, to Erik Olson, NRDC, June 6, 2001.

40 Ibid. See also SPU, "Cedar River Watershed," www.ci.seattle.wa.us/util/cedarwatershed, and SPU, "South Fork Tolt River," www.ci.seattle.wa.us/util/watershed/tolt/default.htm.

41 See note 12.

42 See Ibid, and notes 39 and 40.

43 See note 11.

44 See notes 10–12.

45 See note 12.

WASHINGTON, D.C.

Report does not include Northern Virginia suburbs purchasing D.C. water.

Washington, D.C., Earned a Water Quality and Compliance Grade of Poor in 2000 and Fair in 2001

▶ From 1998 to 2000, Washington's water had high levels of **total trihalomethanes** (TTHMs) and **haloacetic acids** (HAAs), contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water, which are linked with cancer and, potentially, to miscarriages and birth defects. TTHM levels exceeded the national standard that went into effect in 2002.[1] HAA levels approached, without exceeding, the national standard that went into effect in 2002. Levels of both of these classes of chemicals decreased in 2001 as a result of new treatment approaches.

▶ In 2000, Washington's **lead** levels were just below the national action level. Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. Although tests in 2001 showed better results, lead levels in the city's tap water may be a continuing cause for concern.

▶ Washington, D.C., has a disturbing history of violations of the **coliform** and **turbidity** rules, with a string of serious violations from 1993 to 1996 that triggered several boil-water alerts. Total coliform bacteria (microbial contaminants) and turbidity (cloudiness) are potential indicators that disease-causing organisms may be present in tap water. Thereafter, aggressive action to control bacteria and turbidity brought levels down. Since 1999, coliform has been trending upward again during peak months, though Washington, D.C., reportedly has not violated the national standards since 1996.

▶ **Cyanide**—a known poison that is the by-product of mining, metal and other manufacturing processes and chlorination treatment of some wastewaters—can cause weight loss, rapid breathing, tremors, and thyroid and nerve damage at below-fatal doses. Periodically, it and such chemicals are spilled, dumped, or permitted to run off into the Potomac River and subsequently enter the water system, possibly presenting health concerns.

WASHINGTON, D.C.
System Population Served **595,000[2]**
Water Quality and Compliance **2000▶Poor** **2001▶Fair**
Right-to-Know Report—Citizenship **2000▶Fair** **2001▶Fair**
Source Water Protection **Fair**
REPORT CARD

Washington's Right-to-Know Reports Earned a Grade of Fair for 2000 and 2001

▶ The Washington, D.C., Water and Sewer Authority's (WASA) right-to-know reports included information on health effects of certain contaminants found at levels below enforceable national standards, an explanation of how the water is treated, information about lead, suggestions on how citizens can reduce it in their tap water, and warnings for vulnerable populations.

▶ The reports also included prominent, unqualified, and misleading statements about the water's safety.

▶ The report also included a misleading assertion about *Cryptosporidium.*

Noteworthy

▶ Washington's drinking water infrastructure is in serious need of modernization. The distribution system and treatment plants are aged and the technology outdated. Drinking water quality issues can result when the infrastructure is not well maintained. In part to upgrade the much-outdated drinking water infrastructure, WASA is implementing a $1.6 billion capital improvement plan.[3] This includes more than $600 million in planned upgrades and rehabilitation of the water treatment and distribution system for the city, plus hundreds of millions in upgrades for the wastewater system. Serious investment will require changes in how the U.S. Army Corps of Engineers incurs debt and will require WASA to raise significant new funds.

Washington Earned a Source Water Protection Rating of Fair

▸ The watershed for the Potomac River, Washington's source for drinking water, does not contain much heavy industry, but the river is vulnerable to contamination from urban and agricultural runoff and from such point source pollution as upstream sewage treatment plants.

KEY CONTAINMINANTS IN WASHINGTON'S WATER

The following contaminants have been found in Washington, D.C.'s, drinking water supply. For more information on health threats posed by specific contaminants, see Chapter 5.

MICROBIOLOGICAL CONTAMINANTS

Cryptosporidium (Crypto)

National Standard (MCL)
Treatment Technique (TT)

Draft Proposed New National Standard[4]
<7.5 organisms/100 liters (average); no additional treatment
7.5–100 organisms/100 liters (average); some additional treatment (>90% *Crypto* kill)
100–300 organisms/100 liters (average); significant additional treatment (>99% *Crypto* kill)
>300 organisms/100 liters (average); advanced treatment (>99.7% *Crypto* kill)

National Health Goal (MCLG)
0—no known fully safe level

National Requirements
Most large- and medium-size water utilities that use surface water are required to monitor for *Crypto* and report results in their right-to-know reports; they eventually may be required to use advanced treatment if significant levels are found.

	Average	Maximum
1997–1998 Levels in Source Water	2 organisms per 100 liters	23 organisms per 100 liters

(Most recent detailed data publicly reported)[5]
Detected in 2 of 18 monthly samples

LEVELS PRESENT SOME CONCERN

Cryptosporidium (*Crypto*) is a waterborne microbial disease that presents human health concerns, especially to individuals with weakened immune systems, including HIV/AIDS patients, the elderly, children, and people who have undergone organ transplants. When water utilities find significant levels of *Crypto*, draft EPA rules will eventually require them to use better treatment. Washington, D.C., has a history of *Cryptosporidium* concerns. In December 1993, the EPA issued a boil-water alert for the area after drinking water suddenly became too cloudy, an indication that *Cryptosporidium* or other disease-causing organisms might be getting through the treatment plant.[6] The alert continued for several days, affecting more than 1 million residents. According to data the Washington Aqueduct submitted to the EPA and other data obtained by NRDC, *Cryptosporidium* has been detected several times in Washington's source water (prior to treatment).[7, 8] It is not clear whether *Crypto* has been tested for or found in Washington's *finished* drinking water, but it is unlikely since methodological problems make it extremely difficult to find *Crypto* at the relatively low levels at which it would be anticipated to occur in finished tap water.

Total Coliform Bacteria

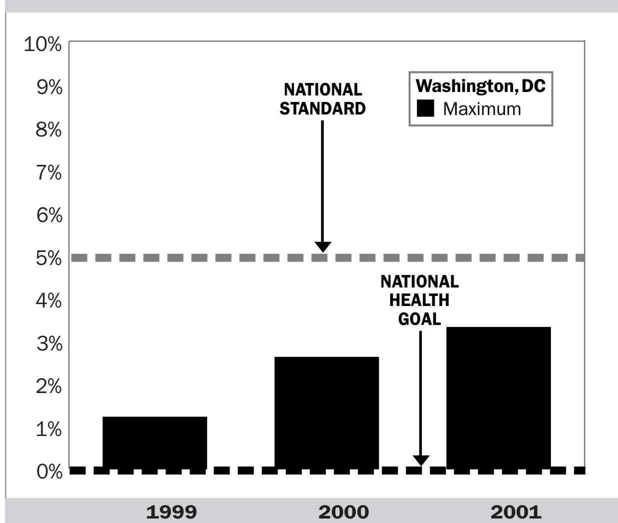
National Standard (MCL)
5% maximum in any month[9]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels
1.2% in highest month, total coliform positive[10]

2000 Levels
2.6% in highest month, total coliform positive[11]

TOTAL COLIFORM BACTERIA LEVELS



2001 Levels
3.3% in highest month, total coliform positive[12]

LEVELS PRESENT HIGH CONCERN

Total coliform bacteria are microbial contaminants whose presence is a potential indicator that disease-causing organisms may be present in tap water. Although Washington's levels are below the EPA's standard, any readings of total coliform bacteria could be a sign that vulnerable populations may experience infections. The continued finding of coliform in pipes indicates that the District likely still has bacterial regrowth problems in its distribution system—possible cause for concern because of Washington's history of violations of the total coliform rule and turbidity requirements. Violations from 1993 to 1996 triggered several boil water alerts. In response to EPA administrative orders in the mid-1990s, the D.C. Water and Sewer Authority and the Army Corps of Engineers took aggressive action to control bacteria and turbidity, and coliform levels dropped. However, since 1999, the levels of coliform during peak months are showing a troubling trend upward, from 1.2 percent of samples testing positive for coliform during the highest month of 1999, up to 2.6 percent in 2000, and up again to 3.3 percent in 2001. The EPA standard prohibits 5 percent coliform positives during any month. The water may be creeping back into a problem area, a potential indication that past bad habits of deferred maintenance and poor management of the distribution system may be returning as the spotlight on the problem has faded.

INORGANIC CONTAMINANTS

Cyanide

National Standard (MCL)
200 ppb (average)

National Health Goal (MCLG)
200 ppb

2000 Levels[13]
Not reported as detected

2001 Levels[14]
50 ppb maximum

LEVELS PRESENT SOME CONCERN

Cyanide—a known poison that is the by-product of mining, metal and other manufacturing processes and chlorination treatment of some wastewaters—can cause weight loss, rapid breathing, tremors, and thyroid and nerve damage at below-fatal doses.[15] WASA does not describe any specific source of the cyanide in the city's tap water, but both Maryland and Pennsylvania are among the top six states for release of cyanide into water and onto land.[16] It is cause for concern that such a substantial level of cyanide suddenly occurred in the city's water. If cyanide contamination incidents recur, it would be important that a source be identified and addressed, and/or that improved treatment is installed to remove this chemical from tap water supplies.

Lead

National Standard (TT)
15 ppb (action level, at 90th percentile)[17]

National Health Goal (MCLG)
0—no known fully safe level

1999 Levels[18]
12 ppb at 90th percentile home; 3 of 55 homes tested exceeded national standard

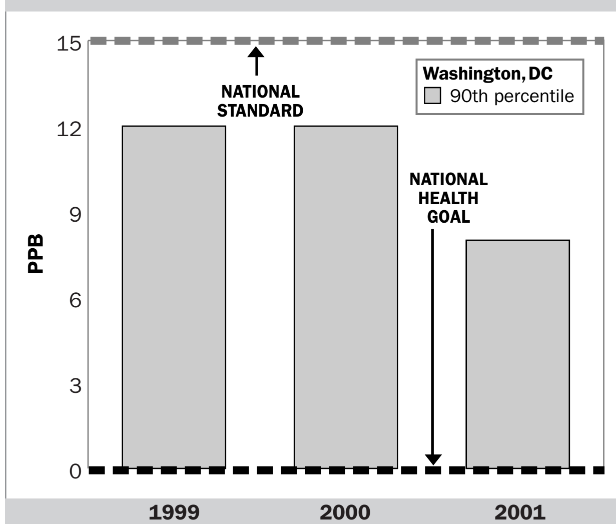
2000 Levels[19]
12 ppb at 90th percentile home; 3 of 55 homes tested exceeded national standard

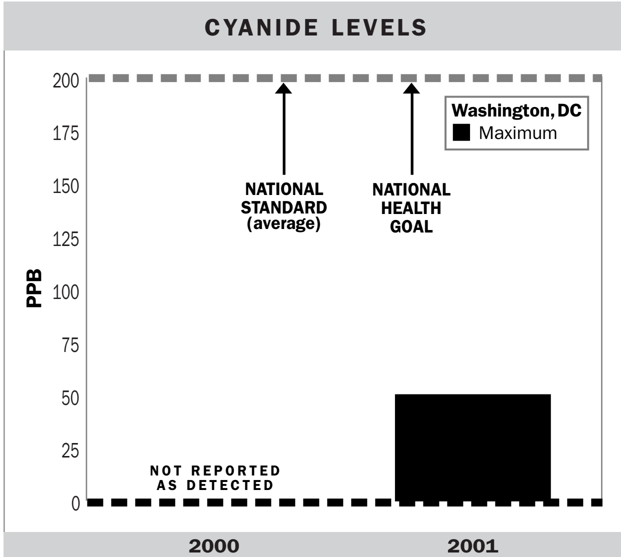
2001 Levels[20]
8 ppb at 90th percentile home; 4 of 50 homes tested exceeded national standard

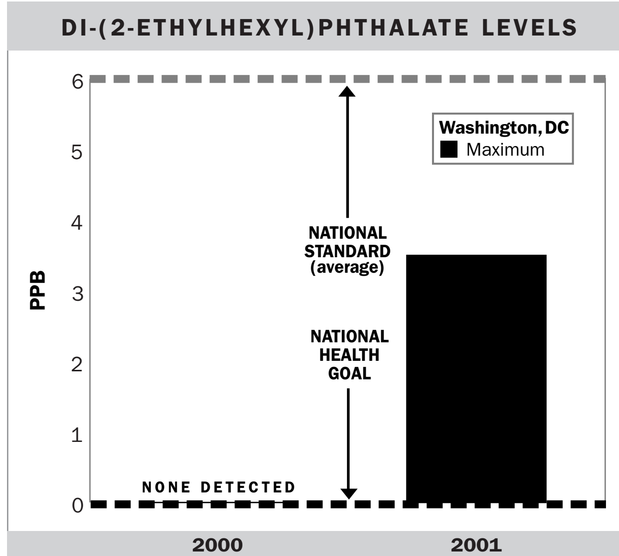
LEVELS PRESENT HIGH CONCERN

Lead—which enters drinking water supplies from the corrosion of pipes or faucets—can adversely affect blood pressure, red blood cells, and kidney

LEAD LEVELS







and nervous system function and, especially in infants and children, cause permanent brain damage, decreased intelligence, and problems with growth, development, and behavior. Under the EPA's Lead and Copper Rule, Washington is required to reduce lead levels at the tap by going to the source: it treats the water to reduce its ability to corrode pipes and impede its ability to leach lead into tap water. For many years, Washington, D.C., had not complied with the requirement; in fact, it remains unclear, from records provided to NRDC in response to Freedom of Information Act requests, whether the city is now in full compliance.[21] While past levels approached the national action level, lead levels apparently dropped in 2001.

Consumers, particularly those with infants or young children, may want to test their water for lead; to find a laboratory, contact the Drinking Water Hotline, 800-426-4791. Or consumers may choose to flush faucets of lead by running water for approximately one minute before ingestion. (Excess water may be saved for plants or other uses.)

ORGANIC CONTAMINANTS

Di-(2-Ethylhexyl)Phthalate (DEHP)

National Standard (MCL)
6 ppb (average)

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels
0 detected

2001 Levels	Lowest	Average	Maximum
	nondetected	reported	3.5 ppb

LEVELS PRESENT SOME CONCERN

Di-(2-ethylhexyl)phthalate—a plasticizing agent used widely in the chemical and rubber industries and contained in many plastics—is a probable human carcinogen and also causes damage to the liver and testes. DEHP was found in 2001 in city tap water at levels below the EPA standard but above the national health goal of 0. The source of DEHP in Washington's tap water is not known, but its appearance at more than half the standard is troubling. The source should be found if it continues to be detected, or treatment must be adjusted to remove it.

Haloacetic Acids

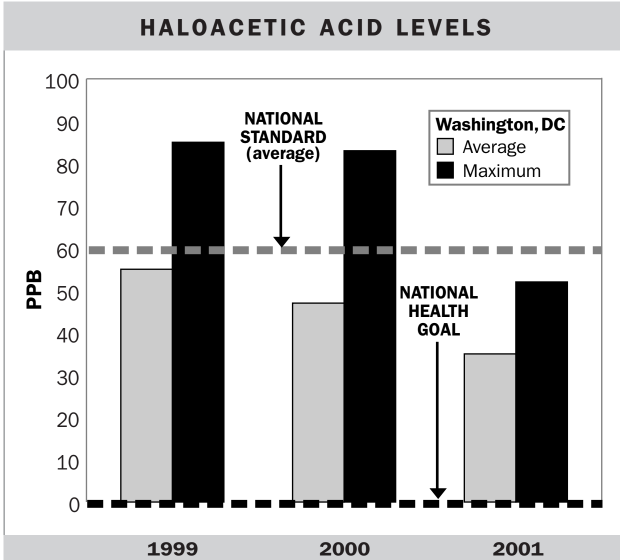
National Standard (MCL)
60 ppb (average) effective 2002; no previous standard

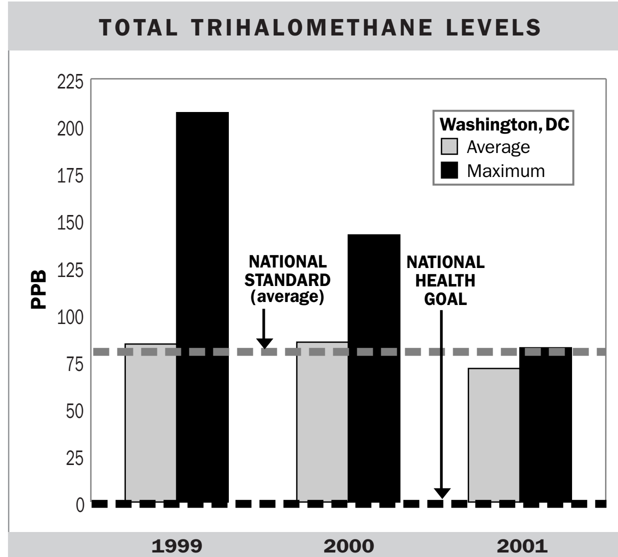
National Health Goal (MCLG)
0—there is no known fully safe level[22]

1999 Levels	Average[23] 55 ppb	Maximum 85 ppb
2000 Levels	Average[24] 47 ppb	Maximum 83 ppb
2001 Levels	Average[25] 35 ppb	Maximum 52 ppb

LEVELS PRESENT HIGH CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially, reproductive





and other health problems. Washington HAA levels peaked above the EPA standard for haloacetic acids in 2000. Levels came down with the switch to chloramines.

Total Trihalomethanes

National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)
0—no known fully safe level[26]

1999 Levels	Average[27] 84 ppb	Maximum 207 ppb
2000 Levels	Average[28] 85 ppb	Maximum 142 ppb
2001 Levels	Average[29] 71 ppb	Maximum 82 ppb

LEVELS PRESENT HIGH CONCERN

Total trihalomethanes (TTHMs)—contaminants that result when chlorine is used to treat drinking water and then interacts with organic matter in the water—are linked with cancer and, potentially, to miscarriages and birth defects. The high levels of TTHMs in Washington's water remain a concern. Washington switched to chloramines as a secondary disinfectant in 2001 in order to reduce TTHM and HAA levels. While average levels have been brought modestly below the new EPA standard, spike levels sometimes still exceed the new standard (which is based on an average, so there appears to be no threat of a violation). According to Dr. David Ozonoff, director of the Environmental Health Department at Boston University School of Public Health, however, D.C.'s past spike levels of TTHMs well over 100 ppb were a potential concern for pregnant women and their babies, and a careful eye should be kept on spikes in the future, though it appears that the switch to chloramines may have reduced those peak levels substantially.

RADIOACTIVE CONTAMINANTS

Gross Alpha Radiation

National Standard (MCL)
15 pCi/L (average)

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels (most recent reported)	Range 1.0–1.8 pCi/L	Maximum 1.8 pCi/L

Gross Beta Radiation

National Standard (MCL)
50 pCi/L (average)

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels (Most recent reported)	Range 2.5–4.7 pCi/L	Maximum 4.7 pCi/L

Tritium

National Standard (MCL)
20,000 pCi/L (average)

National Health Goal (MCLG)
0—no known fully safe level

2000 Levels (most recent reported)	Range 650–1,570 pCi/L	Maximum 1,570 pCi/L

LEVELS PRESENT SOME CONCERN

All of the radioactive contaminants found in D.C. tap water cause cancer, and no known level of exposure to any of them is considered safe. None of the radioactive contaminant readings violated national standards, although they all occurred at levels above EPA health goals. Alpha emitters generally get into tap water from erosion of radioactive minerals into source water. Beta emitters can also be naturally occurring or can result from human use of radioactive elements in nuclear or other industries. According to the EPA, tritium can form naturally at low levels or from human activities that involve the use of concentrated radioactive materials—production of electricity, nuclear weapons, nuclear medicines used in therapy and diagnosis, and various commercial products including smoke detectors and television sets.[30] Release into the environment is usually "the result of improper waste storage, leaks, or transportation accidents."[31]

The District's Past History of Serious Violations of Drinking Water Standards

The District of Columbia Water and Sewer Authority has a long history of health-based and monitoring violations for total coliform bacteria and occasionally for turbidity. In 1996, Washington, D.C., tap water contained high levels of coliform and had at least four violations of federal drinking water standards.[32]

The city has issued at least three boil-water advisories; in NRDC's judgment, more were warranted by additional violations—two for fecal coliform levels and one for turbidity. The water provided by the Corps of Engineers to WASA violated the turbidity MCL in July and December 1993; the latter triggered the first city-wide boil-water order. Before 1996, local officials had been warned repeatedly by the EPA to modify procedures for reducing coliform contamination. The District had at least one city-wide violation of the total coliform bacteria standard in 1996 and many positive samples of fecal coliform. The District also incurred at least two city-wide violations of fecal coliform in October and November of 1995. Overall, the federal standard for total coliform in tap water was exceeded eight times from 1991 to 1993, according to the Army Corps of Engineers, which sells water to WASA.[33] On most, if not all, of these occasions, D.C. issued no boil-water advisory.

After a review of Washington Aqueduct drinking water data in 1994, the Corps found that on at least 32 occasions after a positive coliform sample was detected, the required repeat sampling was delayed by several days rather than conducted within 24 hours of sample detection, as legally required.[34] Eventually, WASA entered into a consent decree in January 1997 after the EPA issued an administrative order as a result of repeated problems with coliform contamination. WASA prepared a remediation plan for the water distribution system, a requirement under the consent decree.[35]

Apparently, WASA's and the Army Corps' joint efforts to reduce the coliform and turbidity problems have been fairly successful. However, the trend toward more coliform in the peak months in D.C. tap water exhibited over the past three years is cause for concern. While apparently no violations have been reported, WASA will need to redouble its efforts to ensure that the system does not fall back into disrepair.

WASHINGTON'S RIGHT-TO-KNOW REPORTS

Washington's Right-to-Know Reports Earned a Grade of Fair for 2000 and 2001

On the good-citizen side of the ledger:

- They included a helpful map showing the locations of source water and treatment plants, as well as some information on health effects of certain contaminants found at levels below EPA's enforceable standards. For example, brief information on the carcinogenicity of trihalomethanes is provided, although no information is given on possible reproductive effects.
- The reports solicited public input into utility decisions, invited public participation in the source water assessment, including detailed information on how to get involved, discussed a cross-connection control program, and provided information on community meetings and board meetings in which citizens can participate.
- The reports included a diagram and explanation of how the water is treated.

- The reports included information about lead and highlighted how citizens can reduce it in their tap water.
- Information for vulnerable populations was placed in a prominent box on page 2 of the 2000 report and on page 5 of the 2001 report.
- The reports revealed levels (and likely sources) of certain unregulated contaminants in tap water, such as sulfate and nickel.
- The reports contained information in Spanish and Korean on how to obtain translated copies of the report, and cassette recordings of the report are available on demand.
- The reports are available online in English and Spanish and were distributed in the advertisement section of the *Washington Post*. For customers who do not receive the *Post,* WASA mailed the reports directly.[36]

On the could-be-a-better-citizen side of the ledger:

- The cover pages of the 1999, 2000, and 2001 right-to-know reports included prominent and unqualified statements of safety: "Your Drinking Water is Safe!" These statements were misleading because the city's water contains contaminants, including TTHMs, HAAs, and lead, at levels in excess of health goals, posing health risks and, in some cases, occurring at levels nearly at EPA standards. Under NRDC's grading system, any water system that makes such a prominent unqualified safety claim can earn no grade better than Fair because such claims could dissuade immunocompromised or other vulnerable people from reading further, thus missing important information that can greatly affect their health. But for this prominent assertion, Washington's right-to-know reports would have earned at least a Good.
- The 2000 and 2001 reports incorrectly claimed, "Tests of the source water prior to treatment have not found cryptosporidium." While apparently in 2001 no *Cryptosporidium* was found, *Crypto* has been detected on several occasions in D.C.'s source (raw) water in the past.
- The reports did not include information on specific polluters in the watershed. EPA rules require utilities to name any specific known sources of a contaminant found in tap water.[37]
- The reports also did not provide information on the health effects of some contaminants found at levels below EPA standards but above EPA health goals—haloacetic acids and phthalate, for example. Although not legally required, this information would have assisted citizens in protecting their health and fighting for better protection of their water.

THREATS TO WASHINGTON'S SOURCE WATER

Washington, D.C., Earned a Source Water Protection Rating of Fair

The D.C. Water and Sewer Authority purchases surface water from the Washington Aqueduct, which is operated by the Army Corps of Engineers.[38] The aqueduct takes water from the Potomac River at two locations, Great Falls and Little Falls, Maryland. The EPA's Index of Watershed Indicators (IWI) has determined that the Potomac River watershed has less serious contamination problems, but that it is highly vulnerable to contamination. Therefore, the index scores Washington's source water with an overall rating of 4 on a scale of 1 to 6, with 6 as the worst possible grade. NRDC has given Washington, D.C., a source water protection grade of Fair.

The index lists no significant sources of drinking water impairment for the Potomac River, but WASA and other area drinking water authorities have identified contamination sources. There is little or no heavy industry in the Potomac watershed upstream of the Washington, D.C., intakes. However, potential nonpoint sources of fecal coliform bacteria that have been identified, including failing septic systems, contamination from wastewater treatment plants, combined sewer overflows, pet waste, wildlife, direct deposit of livestock waste in streams, runoff from pasture and feedlots, and runoff from manure applied to crop land.[39] In addition, other sources of impairment may include total toxics, pathogens, and other nonpoint sources of pollution such as runoff.[40]

The Potomac River Watershed is highly susceptible to contamination by urban runoff, pollution that occurs when water passes through an urban environment, picking up particles, dirt, and chemicals and flows into the water resources of the area. According to IWI data, in 1990, the most recent year for which data is available, 27 percent of the watershed's land area is more than a quarter (or 25 percent) impervious to rainwater.[41] Washington's watershed, and consequently its drinking water sources, is likely to experience a heavy loading of pollutants as a result of urban runoff. Based upon available data, therefore, NRDC has rated Washington as having fair source water protection.

In addition, the Potomac River is likely to be affected by agricultural runoff.[42] The vulnerability indicator of agricultural runoff potential—a composite of nitrogen runoff, pesticide runoff, and sediment delivery—shows a moderate level of potential impact, with a moderate potential for nitrogen, pesticide, and sediment delivery from farm fields to rivers and streams.

The District is currently developing a source water assessment program in conjunction with state governments and partnership organizations. Federal law requires the assessment to be completed by 2003. This process involves identifying protection areas surrounding drinking water intakes, identifying and cataloging significant contaminants in these protection areas, determining the susceptibility of the drinking water supply system to the pollutants in the protection area, and providing the public with the results of the study.[43]

PROTECTING WASHINGTON'S DRINKING WATER

The following are approaches to treating Washington's drinking water and information on how residents can help protect their local water.

Treatment Options Available for Contaminants of Greatest Concern

The Army Corps of Engineers operates the Dalecarlia and McMillan treatment plants, both of which are located in Washington, D.C. Raw water served to the District of Columbia and Fairfax and Arlington Counties currently undergoes a process of presedimentation, mixing, sedimentation, filtration, primary disinfection with chlorine and chloramines, lime, and fluoride to disinfect the water it provides to the public.[44] In November 2000, the Corps switched to chloramines as a secondary disinfectant to drinking water, as a way to modestly reduce the high level of disinfection by-products in the tap water.[45]

Chloramine disinfection is not a foolproof solution to the problem, however, because it still contributes to the formation of such disinfection by-products as TTHMs. In addition, people undergoing kidney dialysis are at risk if their drinking water is not pretreated to remove chloramines before consumption. Ultraviolet light disinfection, ozone, or reverse-osmosis water treatment would reduce the by-product levels. Granular activated carbon (GAC) and other treatments could also substantially reduce by-products and virtually eliminate many of the organic chemicals found in the city's water; other cities have installed GAC technology at a cost of about $25 per household.

Capital Improvement Program for Washington

Washington's drinking water infrastructure is in need of modernization. The distribution system and treatment plants are aged and the technology outdated. Maintenance issues are a problem as well. The Dalecarlia Reservoir, used to collect water prior to treatment, was left largely unattended for more than 40 years, and large quantities of debris and sludge accumulate on the filters. Finished water storage facilities were not cleaned for decades.[46]

To upgrade the city's water and wastewater infrastructure, WASA is implementing a $1.6 billion capital improvement plan.[47] In addition, the D.C. Department of Health set out a plan that outlined priority projects for fiscal year 2002. The top prospective priority projects include controlling combined sewer overflows, primary and secondary treatment upgrades, a security plan, and filtration and disinfection facility upgrades, to name a few.[48]

WASA's capital improvements program will rehabilitate, replace and extend water mains, storage facilities, and pumping stations in order to provide service to new developments, maintain an adequate water supply, fire protection, protect the quality of the water, and upgrade the meter system. Highlights include:[49]

- water pumping facilities—$77.3 million
- water storage facilities—$42.5 million
- water distribution system—$229.0 million for:
  - valve replacements

- cross connection elimination
- dead end elimination
- main extension and replacement
- large diameter water main rehabilitation
- distribution/transmission mains
- cleaning and lining large diameter water mains
- small diameter water main rehabilitation

▶ ongoing water projects—$ 44.3 million

- extension of water mains to service new developments
- repair of water main breaks
- replacement of valves and fire hydrants
- minor water main rehabilitation work

▶ DPW water program—$ 30.2 million (assistance in rehabilitation, replacement and extension of water mains)

▶ water service area management—$28.8 million (engineering program management, planning, and design for the capital improvements)

▶ metering—$40.0 million

▶ Washington aqueduct—$147.3 million (DCWASA's share only), plus

- possible residuals/solids recovery
- possible backwash treatment project

How Individuals Can Protect Source Water

Citizens can help protect the city's drinking water by working to protect its sources—both by conserving water in their daily lives and by getting involved in community decision making about water resources.

WASHINGTON, D.C.

Libby Lawson
District of Columbia Water and Sewer Authority[50]
WASA Public Affairs Office
5000 Overlook Avenue, SW
Washington, D.C. 20032
202-787-2200
www.dcwasa.com

Washington Aqueduct
U.S. Army Corps of Engineers
5900 MacArthur Boulevard, NW
Washington, D.C. 20315-0220
202-764-2753
http://washingtonaqueduct.nab.usace.army.mil/

WATER UTILITY INFORMATION

▶ **Attend meetings of the local water supplier,** the District of Columbia Water and Sewer Authority. Check the right-to-know report or call the supplier for specifics.

▶ **Get involved in source water assessment and protection** efforts by contacting the Interstate Commission on the Potomac River Basin, 301-984-1908.

▶ **Learn more from these groups:**

- Clean Water Action, www.cleanwater.org
- NRDC, www.nrdc.org

Peer reviewers for the Washington, D.C. report included Paul Schwartz, Clean Water Action/DC; and Andy Fellows, Clean Water Action/DC.

NOTES

1 Under NRDC's grading system, water systems that violate a final standard that is fully enforceable get a Failing grade. On the other hand, a system that violates a final standard that is not yet enforceable (there is a three-to five-year lag from the date of issuance until a new standard is enforceable) earns a Poor. This admittedly tough grade is earned, in NRDC's view, because large cities have plenty of advance knowledge that standards are being issued years before they are finalized and are well aware of the health risks posed by high levels of the contaminants. They cannot plead ignorance and often can take simple steps-as Washington did in this case by simply switching chemical disinfectants at a low cost—to avoid the health problem. See the chapter on the NRDC grading system for more details.

2 Safe Drinking Water Information System (SDWIS-Fed). U.S. Environmental Protection Agency database, available online at http://oaspub.epa.gov/enviro/sdw_report.first_table?report_id=538014&pwsid=DC0000002&state=DC&source=Purchased%20surface%20water%20&population=595000&sys_num=0, last visited February 2003.

3 Washington, D.C., Water and Sewer Authority, *2000 Drinking Water Quality Report*, available online at www.dcwasa.com.

4 See EPA, Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) Preproposal Draft Regulatory Language for Stakeholder Review, posted at www.epa.gov/safewater/mdbp/st2dis.html The 1, 2, and 2.5 minimum log removal requirements are converted into percentage removals for simplicity. This rule has not been formally proposed in *The Federal Register* but was agreed to by the EPA, NRDC, public health groups, cities, and the water utility industry. See Ibid for the "FACA Stakeholder Agreement in Principle."

5 See www.epa.gov/enviro/html/icr/utility/report/D.C.0000001960620094921.html. The Army Corps of Engineers' Washington Aqueduct states in its annual water quality reports for 1999 and 2000 that "EPA does not require that finished water be tested if the *raw* water does not have concentrations that exceed 10 oocysts per liter. Washington Aqueduct tests the raw water regularly and results are substantially below that threshold." This clearly suggests that some *Crypto* (albeit at less than 10 oocysts/liter) were detected. See note 8 below.

6 D'Vera Cohn and Amy Goldstein, "Water Parasite Tests Due Today; Early End to Alert Possible; Human Error May Have Aggravated Emergency," *The Washington Post,* December 10, 1993.

7 See www.epa.gov/enviro/html/icr/utility/report/D.C.0000001960620094921.html.

8 NRDC obtained monitoring data collected for the Washington Aqueduct, which serves as the wholesale water supplier for WASA, under the Freedom

of Information Act from EPA's Region 3. These data and the ICR data cited above show that *Crypto* has been found in Washington's source water in past years. However, *Crypto* apparently was not found in raw water in 2001. See Army Corps of Engineers, Washington Aqueduct, Annual Report of Water Analysis, 2001, available online at http://washingtonaqueduct.nab.usace.army.mil/AnnualReports/2001WaterAnalysisReport.pdf.

9 Note that the contaminant levels are presented as a percentage. Total coliform is regulated as a percentage of positive samples that are present in water. The national health standard of 5 percent means that if more than 5 percent of the utility's total coliform samples test positive, then the national health standard has been violated. To say that a sample tests positive is to say that there are total coliform bacteria present in the sample. Therefore, for compliance purposes, the utilities provide the percentage of total coliform samples that tested positive.

10 WASA, "1999 Drinking Water Quality Report," available online at www.dcWASA.com.

11 See note 3.

12 WASA, "2001 Drinking Water Quality Report," available online at www.dcwasa.com.

13 See note 3.

14 See note 12.

15 EPA, "Consumer Fact Sheet: Cyanide," available online at www.epa.gov/safewater/dwh/c-ioc/cyanide.html.

16 Ibid.

17 The action level standard for lead is different from the standard for most other contaminants. Water utilities are required to take many samples of lead in the tap water at homes they serve, including some "high-risk" homes judged likely to have lead in their plumbing or fixtures. If the amount of lead detected in the samples is more than 15 ppb at the 90th percentile (which means that 90 percent of the samples have 15 ppb or less), then the amount is said to exceed the action level. Under the complex EPA lead rule, a water system that exceeds the action level is not necessarily in violation. If a system exceeds the action level, additional measures such as chemical treatment to reduce the water's corrosivity (ability to corrode pipes and thus its ability to leach lead from pipes) must be taken. If this chemical treatment does not work, the water system may have to replace lead portions of its distribution system if they are still contributing to the lead problem.

18 See note 10.

19 See note 3.

20 See note 12.

21 These data were obtained under the Freedom of Information Act from EPA, Region 3.

22 Some of the haloacetic acids have national health goals of 0 and others have nonzero goals. For the sake of simplicity and understandability, since there is a single haloacetic acid standard, and because it is essentially chemically impossible under normal conditions in tap water to create one regulated haloacetic acid without creating the others at some level, we have listed the national health goal as 0.

23 See note 7.

24 See note 3.

25 See note 9.

26 Total trihalomethanes (TTHMs) consist of a sum of the levels of four closely related chemicals—chloroform, dibromochloromethane, bromoform, and bromodichloromethane—which occur together at varying ratios when water is chlorinated. The latter two TTHMs have health goals of 0. The EPA promulgated and then withdrew (after a court decision) a 0 health goal for chloroform and has not yet issued a new goal for chloroform. Dibromochloromethane has a health goal of 60 ppb. Since water systems generally report only the combined TTHM level, and since it is essentially chemically impossible to create one trihalomethane in tap water without some level of the others, we list the health goal for TTHMs as 0.

27 See note 7.

28 See note 3.

29 See note 9.

30 EPA, "Implementation Guidance for the Radionuclides Rule," at page IV-8 (draft, January 2002), available online at www.epa.gov/safewater/rads/fullradsimpguide.pdf.

31 Ibid.

32 Memorandum from Carol M. Browner, administrator of the U.S. EPA, to W. Michael McCabe, Region III Administrator, October 1996.

33 Memorandum from Rodger Rudolph, chief, Water Supply Management Branch, U.S. Army Environmental Hygiene Agency, to Army Corps of Engineers, Washington Aqueduct. May 23, 1994, p. 3.

34 Memorandum from Rodger Rudolph, chief, Water Supply Management Branch, U.S. Army Environmental Hygiene Agency, to Army Corps of Engineers, Washington Aqueduct. May 23, 1994, p. 2.

35 *Remediation Plan, Water Distribution System, EPA Administrative Order III-96-001-DS.* District of Columbia Water and Sewer Authority. January 23, 1997.

36 Phone conversation with Seema Bhat, with WASA. July 31, 2001.

37 See EPA regulations at 40 C.F.R. §141.153(d)(4)(ix), which provide that the right-to-know report must include "the likely source(s) of detected contaminants to the best of the operator's knowledge. Specific information about the contaminants may be available in sanitary surveys and source water assessments, and should be used when available to the operator." While the EPA allows reliance upon general lists of potential sources where the water system is not aware of the specific source of pollution, where the water system is aware of the pollution source, the rules require that polluter to be identified.

38 Washington Aqueduct, US Army Corps of Engineers. Brochure explaining water treatment process.

39 Materials provided during District of Columbia Source Water Assessment Informational Meeting, September 6, 2001. Hosted by the Metropolitan Council of Governments.

40 D.C. Report on Water Quality. January 2001.

41 Index of Watershed Indicators, U.S. EPA database. Available online at www.epa.gov/iwi. Visited March 12, 2002.

42 Ibid.

43 Materials provided during District of Columbia Source Water Assessment Informational Meeting. September 6, 2001. Hosted by the Metropolitan Council of Governments.

44 See note 3.

45 Informational brochure provided to NRDC in September 2001 by the Washington Aqueduct, Department of the Army, US Army Corps of Engineers. See also WASA, 2000 Drinking Water Quality Report.

46 Cohn, D'Vera and Eric Lipton, "Costly Repairs Piling Up for Water System." *The Washington Post*, July 28, 1996; see also, Sanitary Survey for Washington Aqueduct.

47 See note 3.

48 Department of Health and District of Columbia Water and Sewer Authority, *District of Columbia FY 2002 Construction Grants Project Priority List for Water Pollution Control Projects,* July 30, 2001.

49 See, D.C. WASA, Capital Improvement Program: Water Distribution, available online at www.dcwasa.com/about/cip/water_distribution.cfm.

50 See note 3.