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

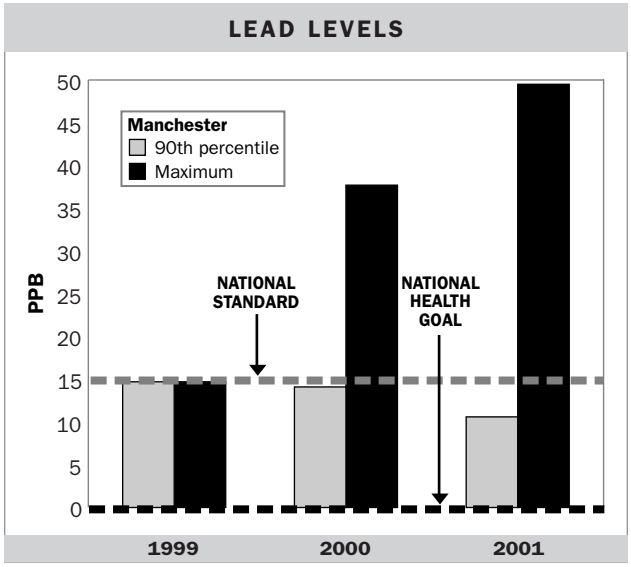
1999 Levels[8]
14.7 ppb at 90th percentile home
Maximum: 14.7

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 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

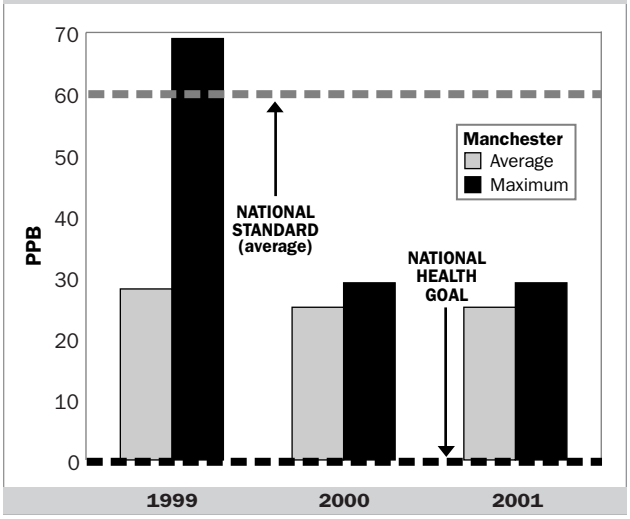
National Health Goal (MCLG)
0—no known fully safe level[11]

1999 Levels[12]	Average 28 ppb	Maximum 69 ppb
2000 Levels[13]	Average 25 ppb	Maximum 29 ppb
2001 Levels[14]	Average 25 ppb	Maximum 29 ppb

LEVELS PRESENT SOME CONCERN

Haloacetic acids (HAAs), by-products of chlorine disinfection, may cause cancer and, potentially,

HALOACETIC ACID LEVELS



reproductive and other health problems. Manchester's levels averaged less than half the new EPA standard.

Total Trihalomethanes

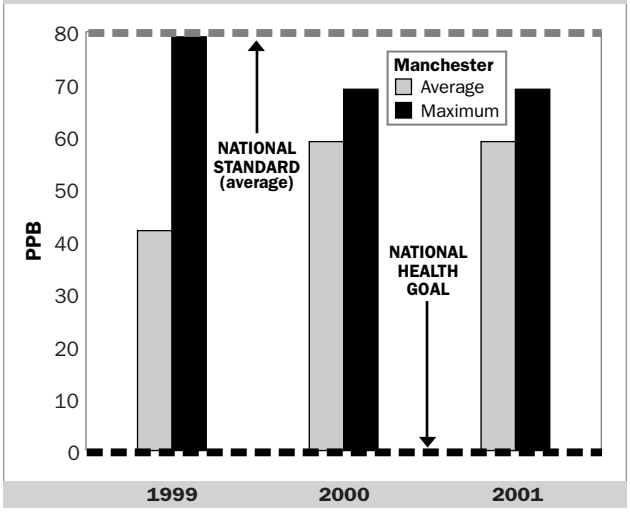
National Standard (MCL)
100 ppb (average) effective through 2001
80 ppb (average) effective in 2002

National Health Goal (MCLG)
0—no known fully safe level[15]

1999 Levels[16]	Average	Maximum
	42 ppb	79 ppb
2000 Levels[17]	Average	Maximum
	59 ppb	69 ppb
2001 Levels[17]	Average	Maximum
	59 ppb	69 ppb

LEVELS PRESENT HIGH CONCERN

TOTAL TRIHALOMETHANE LEVELS



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)

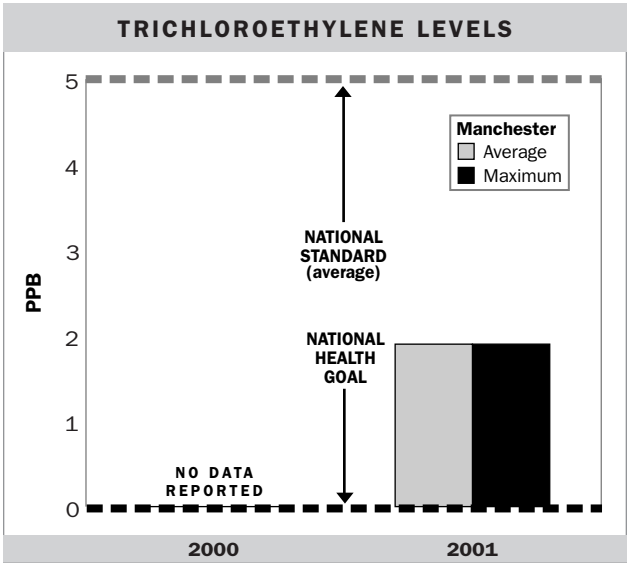
National Health Goal (MCLG)
0—no known fully safe level

2000 Levels[19]
None reported

2001 Levels[20]	Average	Maximum
	1.9 ppb	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=1110000001111101011&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 con-

tact 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.