Consumer Confidence Report

Milwaukee
Water Works

Safe, Abundant Drinking Water.

2017 Consumer Confidence Report

2017 Reporto de confianza del consumidor

The U.S. Environmental Protection Agency (EPA) requires drinking water utilities to provide an annual Consumer Confidence Report to help consumers understand where their drinking water comes from, so they can make informed decisions about their health and protection of the environment.

Milwaukee water complies with all state and federal drinking water standards. The Milwaukee Water Works is known for its extensive water quality monitoring program that reaches beyond basic requirements. The program includes organisms and contaminants, or substances, that are not yet regulated but considered of emerging concern and/or are under study for possible effects on public health.

In this report, you will find:

- Information about the source of your drinking water
- The treatment process that ensures the highest quality water
- Results of water quality testing and compliance with water quality laws and standards
- Additional educational information

Visit http://city.milwaukee.gov/water for more information.

Highlights

- **2017 lead and copper compliance results**
- **Undetected water contaminants Phases 3 and 4**
- **Water quality for homebrewers and hobbyists**
- **Public health guidance**
- **Information on corrosion control and the lead service line replacement program**

Important Information
This report contains important information about your drinking water. Translate it, or speak with someone who understands it.

Información Importante
Este informe contiene información muy importante sobre su agua de beber. Tradúzcalo o hable con alguien que lo entienda bien.

Lug tseem ceeb rua cov siv dlej kws has lug Moob
Ntawm nuav yog cov lug tseem ceeb qha txug kev haus dlej nyob nroog Milwaukee. Yog mej nyeem tsi tau cov lug nuav, thov lwm tug txhais rua mej.

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MILWAUKEE

Milwaukee's Source Water Comes from Lake Michigan

The source of Milwaukee's drinking water is Lake Michigan, a surface water source. As water flows through rivers and lakes and over land surfaces, naturally occurring substances may be dissolved in water. Those substances are called "contaminants." Surface water sources may be highly susceptible to contaminants, especially in areas greatly affected by animal and human activities. The most recent DNR Source Water Assessment for Milwaukee is available online at http://city.milwaukee.gov/water/WaterQuality.

Contaminants, or substances, that may be present in source water include:

- Microbial contaminants, such as viruses, protozoa, and bacteria
- Inorganic contaminants such as salts and metals
- Pesticides and herbicides
- Organic chemical contaminants
- Radioactive contaminants

Since 1993, the Milwaukee Works has invested $508 million in its infrastructure to ensure a reliable supply of pure, safe drinking water. The utility treats Lake Michigan water with ozone as the primary disinfectant. This highly reactive gas destroys illness-causing microorganisms and harmful compounds, removes taste and odor compounds, and reduces the formation of disinfection by-products. In addition to ozone, the utility uses coagulation, sedimentation, biologically active filtration, and chloramine disinfection (*see* treatment process diagram on next page).

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's safe drinking water hotline (800-426-4791). Also, more information at:

http://www.epa.gov/dwstandardsregulations.

Participate in decisions regarding your water

Attend City of Milwaukee Common Council Public Works Committee meetings, which meet at 9:00 a.m. on the first Wednesday of each month in the Milwaukee City Hall, Room 301B, 200 East Wells Street, Milwaukee, WI 53202. You may also attend City of Milwaukee Common Council meetings, which meet in the Milwaukee City Hall, 3rd Floor Common Council Chambers, 200 East Wells Street, Milwaukee, WI 53202. Common Council meeting dates vary. Please contact the City Clerk for the schedule at (414)286-2221, or visit http://city.milwaukee.gov/cityclerk/PublicRecords/Agendas.htm.

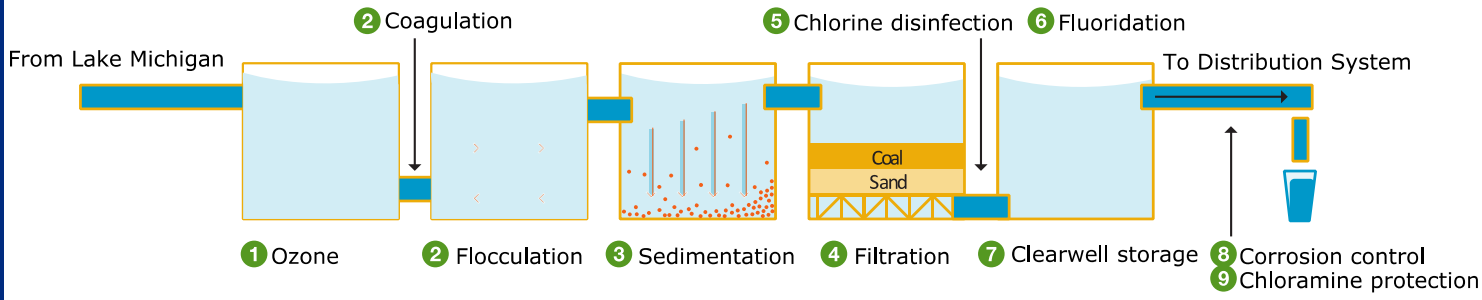
Use Water Wisely — Control Water Costs

As your drinking water provider, we work to control costs by eliminating leaks in the treatment and distribution systems. Leaks inside homes and businesses are the responsibility of the property owner. Leaks waste large amounts of water and sewer charges are based on the amount of water that passes through your water meter, whether you used that water or it was wasted. For example, a leaky toilet can waste about 200 gallons a day down the sewer. Check for leaks throughout your home at least once every season and control costs by fixing leaks. Check your municipal services bill each quarter for water use and compare past bills. Contact our customer service center to receive a worksheet and toilet detection dye packet, or call a professional plumber for help. Learn more at http://city.milwaukee.gov/water/usewaterwisely.

The Milwaukee Water Works is a member of the American Water Works Association, Association of Metropolitan Water Agencies, Water Research Foundation, Wisconsin Section of the AWWA, and Great Lakes Source Water Initiative.

Consumer Confidence Report

Milwaukee Water Works Drinking Water Treatment Process



(1) **Ozone disinfection**: Ozone gas is bubbled through the incoming lake water. Ozone destroys disease-causing microorganisms including *Giardia* and *Cryptosporidium*, controls taste and odor, and reduces the formation of chlorinated disinfection byproducts.

(2) **Coagulation and Flocculation**: Aluminum sulfate is added to the water to neutralize the charge on microscopic particles. The water is then gently mixed to encourage suspended particles to stick together to form "floc."

(3) **Sedimentation**: Sedimentation is the process in which floc settles out and is removed from the water.

(4) **Biologically Active Filtration**: The water is slowly filtered through 24" of anthracite coal and 12" of crushed sand to remove very small particles.

(5) **Chlorine Disinfection**: After filtration, chlorine is added as a secondary disinfectant to provide extra protection from potentially harmful microorganisms.

(6) **Fluoridation**: Fluoride, when administered at low levels, is proven to help prevent tooth decay.

(7) **Clearwell Storage**: Treated water is stored in deep underground tanks and pumped as needed through the distribution.

(8) **Corrosion Control**: A phosphorus compound is added to help control corrosion of pipes. This helps prevent lead and copper from leaching from plumbing into water.

(9) **Chloramine Protection**: Ammonia changes the chlorine to chloramine, a disinfectant that maintains bacteriological protection in the distribution system.

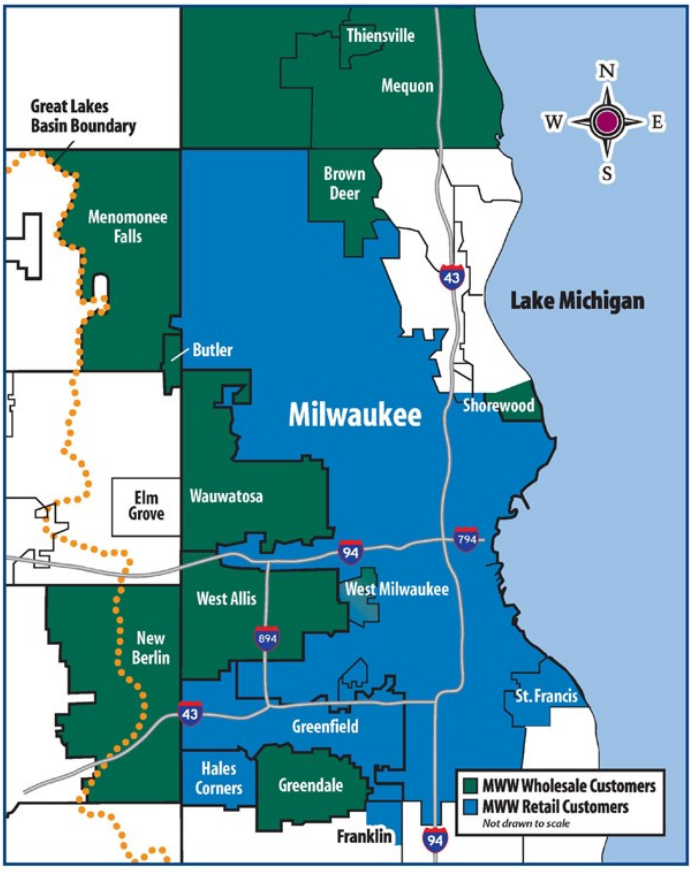
Milwaukee Water Distribution

The City of Milwaukee-owned public utility provides pure, safe water to approximately 865,000 people across 16 communities: Milwaukee, Brown Deer, Butler, a portion of Franklin, Greendale, Greenfield, Hales Corners, Menomonee Falls, Mequon, New Berlin, Shorewood, St. Francis, Thiensville, Wauwatosa, West Allis, and West Milwaukee, as well as the Milwaukee County Grounds. Additionally, Waukesha will receive Milwaukee water beginning in 2023.

The Milwaukee Water Works has expanded water quality monitoring and screening activities to include organisms and contaminants not yet regulated, but may be considered of "emerging concern." The utility tests source and treated distribution water for over 500 contaminants while only 91 are currently regulated by the EPA. The monitoring is conducted as a precaution to ensure safe water, to help increase the understanding of how contaminants may affect public health, and to meet future regulations. Milwaukee Water Works has been recognized as a national leader in water quality monitoring.

This report contains information on all regulated and detected unregulated contaminants. For information on all monitoring visit: http://city.milwaukee.gov/water/WaterQuality/Water-Quality-Monitoring-Program.htm

Milwaukee Water Works Service Area



Detected Contaminants or Substances

In the pages that follow, the tables show the regulated and unregulated contaminants, or substances, detected in Milwaukee's drinking water in 2017. It also includes all contaminants tested for in the most recent (2013) Unregulated Contaminant Monitoring Rule - Phase 3 (UCMR-3) mandatory EPA monitoring program. All contaminants are below the levels allowed by state and federal laws to meet drinking water standards. The tables contain the name of each substance, the highest level allowed by regulation (maximum contaminant level, MCL), the ideal goals for public health (MCLG), the amount detected, the usual sources of such contamination, and the potential health effects. The presence of a substance in drinking water does not necessarily indicate the water poses a health risk. Certain quantities of some substances are essential for good health, but excessive quantities can be hazardous.

Definitions

<	"less than" or not detected
AL	Action level: the concentration of a contaminant which, if exceeded, triggers treatment or other requirement that a water system must follow. Action levels are reported at the 90th percentile for homes at greatest risk.
HAA5	Haloacetic acids: mono-, di- and trichloroacetic acids; mono-, di-, and tribromoacetic acids; bromochloracetic, dibromochloroacetic, and bromodichloracetic acids
HA	Health advisory: An estimate of acceptable drinking water levels for a chemical substance based on health effects information; a health advisory is not a legally enforceable federal standard, but serves as technical guidance to assist federal, state, and local officials.
-log[H^+]	pH measurements are expressed as the negative base 10 logarithm of the hydrogen ion concentration
Median	The middle value of the entire data set.
µg/L	microgram per liter or parts per billion
MCL	Maximum contaminant level: The highest level of a contaminant allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MCLG	Maximum contaminant level goal: 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.
MRDL	Maximum residual disinfectant level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for the control of microbial contaminants.
MRDLG	Maximum residual disinfectant level goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contamination.
mg/L	milligram per liter or parts per million
NA	Not applicable
ng/L	nanogram per liter or parts per trillion
NR	Not regulated
NTU	Nephelometric turbidity unit (a unit to measure turbidity)
pCi/L	picocuries per liter: a measure of radioactivity. Pico = 10^{-12}
RAA	Running annual average: the average of four quarterly samples collected in one year
TT	Treatment technique: a required process intended to reduce the level of a contaminant in drinking water
TTHMs	Trihalomethanes: chloroform, bromodichloromethane, and bromoform
Turbidity	Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms may include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.

Primary Drinking Water Standards

The EPA has set National Primary Drinking Water Regulations that set water quality standards for contaminants, or substances, in public drinking water. These standards are referred to as maximum contaminant levels (MCLs), which are established to protect public health, and are legally enforceable above the allowed MCL. For information on EPA ground and drinking water primary standards, visit: http://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

Substance	Ideal Goals (MCLG)	Highest Level Allowed (MCL)	Median Value	Highest Level Detected	Source(s) of Contaminant	Health Effects
Alicarb Sulfoxide (µg/L)		4	0.3	0.3		
Arsenic (µg/L)	0	10	0.4	0.5	Erosion of natural deposits; orchard runoff; glass and electronics production waste runoff	Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of cancer
Atrazine (µg/L)	3	3	0.03	0.03	Runoff from herbicide used on row crops	Some people who drink water containing atrazine well in excess of the MCL over many years could experience problems with their cardiovascular system or reproductive difficulties
Barium (mg/L)	2	2	0.019	0.019	Drilling waste discharge; metal refineries discharge; erosion of natural deposits	Some people who drink water containing barium in excess of the MCL over many years could experience an increase in their blood pressure
Bromate (µg/L)	0	10	3	9	By-product of drinking water disinfection	Some people who drink water containing bromate in excess of the MCL over many years have an increased risk of cancer
Chlorate (µg/L)	NA	NR	117	205	By-product of drinking water disinfection	Affects red blood cells oxygen carrying capacity, affects thyroid function
Chlorine, Total (mg/L) (Chloramines)	MRDLG = 4	MRDL = 4	1.54	1.84	Water additive used to control microbes	Some people who use water containing chloramines well in excess of the MCL over many years could experience irritating effects to their eyes and nose. Some people who drink water containing chloramines in excess of the MRDL could experience stomach discomfort or anemia
Chlorite (mg/L)	0.8	1	0.003	0.007	By-product of drinking water disinfection	Some infants and young children who drink water containing chlorite in excess of the MCL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing chlorite in excess of the MCL. Some people may experience anemia.
Chromium, Hexavalent (µg/L)	NA	NR	0.19	0.2	Natural deposits and manufacturing	Effects on the liver, kidney, gastrointestinal, and immune systems
Chromium, Total (µg/L)	100	100	0.6	0.6	Discharge from steel and pulp mills; erosion of natural deposits	Some people who drink water containing chromium well in excess of the MCL over many years could experience allergic dermatitis

Primary Drinking Water Standards (continued)

Substance	Ideal Goals (MCLG)	Highest Level Allowed (MCL)	Median Value	Highest Level Detected	Source(s) of Contaminant	Health Effects
Copper (mg/L)	AL = 1.3	AL =1.3	0.004	0.006	Corrosion of household plumbing systems; erosion of natural deposits	Copper is an essential nutrient, but some people who drink water containing copper in excess of the action level over a relatively short amount of time could experience gastrointestinal distress. Some people who drink water containing copper in excess of the action level over many years could suffer liver or kidney damage. People with Wilson's Disease should consult their personal physician.
Fluoride (mg/L)	4.0	4.0	0.58	0.73	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories	Some people who drink water containing fluoride in excess of the MCL over many years could get bone disease, including pain and tenderness of bones. Fluoride in drinking water at half of the MCL or more may cause mottling of children's teeth, usually in children less than 9 years old. Mottling, also known as dental fluorosis, may include brown staining and/or pitting of the teeth, and occurs only in developing teeth before they erupt the gums
Haloacetic Acids (9), Total (µg/L)	NA	60	4.2	9	Byproduct of drinking water disinfection	Some people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of cancer
Individual Haloacetic Acids						
Bromochloroacetic Acid			0.9	1.2		
Bromodichloroacetic Acid			1	2.1		
Chlorodibromoacetic Acid			<0.9	1.2		
Dibromoacetic Acid			0.6	0.7		
Dichloroacetic Acid			1.2	2.1		
Monobromoacetic Acid			0.9	1.0		
Trichloroacetic Acid			1.0	1.7		
Heterotrophic Plate Count (HPC)	NA	TT	Met requirement	Met requirement	Naturally present in the environment; runoff from fertilizer use; leeching from septic tanks sewage; erosion of natural deposits	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water.

Primary Drinking Water Standards (continued)

Substance	Ideal Goals (MCLG)	Highest Level Allowed (MCL)	Median Value	Highest Level Detected	Source(s) of Contaminant	Health Effects
Nitrate, as Nitrogen (mg/L)	10	10	0.33	0.44	Runoff from fertilizer use; leeching from septic tanks sewage; erosion of natural deposits	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. Females who are or may become pregnant should not consume water with nitrate concentrations that exceed the MCL. There is some evidence of an association between exposure to high nitrate levels in drinking water during the first weeks of pregnancy and certain birth defects
Nitrate and Nitrite, Total, as Nitrogen (mg/L)		10	0.330	0.442	Runoff from fertilizer use; leeching from septic tanks sewage; erosion of natural deposits	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. Females who are or may become pregnant should not consume water with nitrate concentrations that exceed the MCL. There is some evidence of an association between exposure to high nitrate levels in drinking water during the first weeks of pregnancy and certain birth defects
Nitrite, as Nitrogen (mg/L)		1	0.002	0.013	Runoff from fertilizer use; leeching from septic tanks sewage; erosion of natural deposits	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome
Perchlorate (µg/L)	NA	Regulation pending	0.12	0.12	Byproduct of drinking water disinfection	Inhibits the absorption of iodine by the thyroid glands, leading to developmental and learning disabilities in children
Selenium (µg/L)	50	50	0.5	0.5	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines	Selenium is an essential nutrient. However, some people who drink water containing selenium in excess of the MCL over many years could experience hair or fingernail loss, numbness in fingers or toes, or problems with their circulation
Strontium (µg/L)		NR	110	110	Natural deposits	Effects on bone growth in children

Primary Drinking Water Standards (continued)

Substance	Ideal Goals (MCLG)	Highest Level Allowed (MCL)	Median Value	Highest Level Detected	Source(s) of Contaminant	Health Effects
Radionuclides (pCi/L) (2015)					Erosion of natural deposits	Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of cancer
Individual Radionuclides						
Alpha emitters (Gross Alpha Particles, excluding Ra + U)		15	1.86 ± 2.00	3.42 ± 1.99	Erosion of natural deposits	Increased risk of cancer
Gross Alpha Particles	NR		2.03 ± 2.0	3.6 ± 2.0	Erosion of natural deposits	Increased risk of cancer
Beta/photon emitters (Gross Beta Particles)		50	3.9 ± 1.9	4.0 ± 1.9	Decay of natural and manmade deposits	Certain minerals are radioactive and may emit a form of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of cancer
Radium 226		5	0.16 ± 0.16	0.20 ± 0.18		Increased risk of cancer
Radium 228		5	1.05 ± 0.58	1.4 ± 0.7		Increased risk of cancer
Radium, combined (226 + 228)		5	1.20 ± 0.60	1.51 ± 0.71	Erosion of natural deposits	Some people who drink water containing radium 226 or 228 in excess of the MCL over many years may have an increased risk of cancer
Uranium (µg/L)	0	30	<0.0010	<0.0010	Erosion of natural deposits	Some people who drink water containing uranium in excess of the MCL over many years may have an increase risk of cancer or kidney toxicity
Trihalomethanes, Total (µg/L)	NA	80	6.9	17	Byproduct of drinking water disinfection	Some people who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of cancer
Individual Trihalomethanes						
Bromodichloromethane			2.4	5.9		
Bromoform			0.4	0.6		
Chloroform			2.2	7.2		
Dibromochloromethane			1.7	3.4		
Turbidity (NTU)	NA	<0.3 (95% of the time)	0.02	0.24 (1-day maximum)	Soil runoff	Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches

Monitoring of Microorganisms

In conjunction with the Milwaukee Health Department, Milwaukee Water Works monitors a number of microbiological organisms in both Lake Michigan source water and plant effluent water. These microorganisms are part of the National Primary Drinking Water Standards and are subject to maximum contaminant levels (MCLs) and MCL goals (MCLGs). For public water systems, the MCL is zero. **No microorganisms—including *Cryptosporidium, Giardia*, Reovirus, and Enterovirus—were detected in Lake Michigan source water or treated Milwaukee drinking water in 2017**.

Cryptosporidium

Cryptosporidium is a microscopic protozoan that, when ingested, can result in diarrhea, fever, and other gastrointestinal symptoms. The Milwaukee Water Works and Milwaukee Health Department consider *Cryptosporidium* detection a priority, and since 1993, have continued to test Lake Michigan source water and treated water for *Cryptosporidium*. *Cryptosporidium* is found in many surface water sources (lakes, rivers, streams) and comes from human and animal wastes in the watershed. **The risk of *Cryptosporidium* infection from drinking water has been reduced to extremely low levels by an effective treatment combination (*see* page 3), which places Milwaukee Water Works in the Bin 1 classification (lowest risk) for *Cryptosporidium* treatment requirements set by the DNR.**

The Milwaukee Water Works provides a brochure based on EPA and CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium*. Obtain a copy from our Customer Service Center, (414) 286-2830, or at http://city.milwaukee.gov/water/WaterQuality and scroll down to Resource Links, choose "Information for persons with weakened immune systems."

Information for those with compromised immune systems and/or vulnerable populations

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons, such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA and Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available at http://www.cdc.gov/parasites/crypto/audience-immune-compromised.html and at http://www.cdc.gov/parasites/water.html and from the EPA's safe drinking water hotline at 800-426-4791.

Partnering to Improve and Optimize Source Water Security, Water System Operations, and Public Health Protection in the Greater Milwaukee and the Great Lakes Regions

Partnership for Safe Water: The Partnership for Safe Water is an alliance between the American Water Works Association, Environmental Protection Agency, Association of State Drinking Water Administrators, Association of Metropolitan Water Agencies, National Association of Water Companies, and Water Research Foundation. The Partnership is a self-assessment program to help public water utilities optimize water treatment and distribution in their communities. It is a comprehensive program that, while voluntary, requires multiple steps for completion and annual reporting. The Milwaukee Water Works is currently in Phase III of its water distribution self assessment, which began in 2015 and will conclude in 2018. Learn more at https://www.awwa.org/resources-tools/water-and-wastewater-utility-management/partnership-for-safe-water.aspx.

Blue Accounting: The goal of Blue Accounting is to protect source waters to assure a safe and sustainable supply of drinking water for its citizens. Blue Accounting is a binational group between the United States and Canada that includes municipalities from eight states and two provinces. Together, members of the workgroup will share data and progress on metrics related to nutrient impacts, management strategies and planning, spill prevention and response, contaminants of emerging concern, and binational consistency. Beginning in 2018, Milwaukee Water Works will become a Showcase Community for Blue Accounting for work its done in protecting and monitoring Lake Michigan. Find more information at http://www.blueaccounting.org.

Inter-Agency Clean Water Advisory Council (IACWAC): The Milwaukee IACWAC was endorsed by the Milwaukee Common Council in 1994 and charged with the overall coordination of water quality issues in the community. It is a multi-agency team tasked with addressing topics such as water quality and treatment, public health concerns, and early warning surveillance and communication systems in the event of a contamination or disease outbreak. The IACWAC has been highlighted by the EPA as a leading example of partnerships and "guide for water utilities." IACWAC continues to expand to address emerging public health concerns. Learn more about IACWAC at http://city.milwaukee.gov/water/WaterQuality/PublicHealth.

Secondary Drinking Water Standards

The EPA has also established National Secondary Drinking Water Regulations that set non-mandatory standards for potential water-quality substances. These secondary substances are not currently considered a risk to human health, but instead, act as guidelines for drinking water aesthetics such as taste, odor, and color. For more information on EPA secondary standards, visit: https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals.

Substance	Ideal Goals (MCLG)	Highest Level Allowed (MCL)	Median Value	Highest Level Detected	Source(s) of Contaminant	Health Effects
Aluminum (mg/L)	0.2	0.05-0.20	0.042	0.045	Water treatment additive, natural deposits	None in drinking water, aesthetic quality of water.
Chloride (mg/L)	250	250	14.7	21.5	Natural deposits and road salts	None in drinking water, aesthetic quality of water.
Copper (mg/L)	AL = 1.3	AL = 1.3	0.004	0.006	*See* Primary Drinking Water Standards	
Fluoride (mg/L)	4.0	4.0	0.58	0.73	*See* Primary Drinking Water Standards	
Iron (µg/L)	300	300	123	126	Natural deposits	None in drinking water, aesthetic quality of water.
Manganese (µg/L)		50	0.3	0.3	Natural deposits	None in drinking water, aesthetic quality of water.
Odor (threshold odor number)		3	1	1	Naturally present in the environment	None in drinking water, aesthetic quality of water.
pH (-log[H^+])	NA	6.5 - 8.5	7.64	7.79	Naturally present in the environment	NA
Silver (µg/L)		50	0.3	0.3	Naturally present in the environment	Skin discoloration; graying of the white part of the eyes
Sulfate (mg/L)		500	26.5	27	Natural deposits	None in drinking water, aesthetic quality of water.
Total Dissolved Solids (mg/L)	500	500	179	204	Aggregate of dissolved minerals	None in drinking water, aesthetic quality of water.

Notice to Parents of Infants Six Months of Age or Younger

According to the CDC, the proper amount of fluoride, from infancy and at all ages throughout life, helps prevent and control tooth decay (cavities). Therefore, the Milwaukee Water Works, following public health recommendations, maintains a level of fluoride in our drinking water that is both safe and effective. The following is an advisory regarding fluoride and young infants:

The American Academy of Pediatrics recommends exclusive breastfeeding for the first six months of a child's life, followed by continued breastfeeding as complementary foods are introduced, for optimal short– and long-term health advantages. Go to http://pediatrics.aappublications.org/content/129/3/e827 for more information.

As of August 31, 2012, Milwaukee water is fluoridated at a level not to exceed 0.7 mg/L. According to the CDC, for infants up to six months of age, if tap water is fluoridated or has substantial natural fluoride (0.7 mg/L or higher) and is being used to dilute infant formula, a parent may consider using a low-fluoride alternative water source. Bottled water known to be low in fluoride is labeled as purified, deionized, demineralized, distilled, or prepared by reverse osmosis. Ready-to-feed (no-mix) infant formula typically has little fluoride and may be preferable at least some of the time. If breastfeeding is not possible, parents should consult a pediatrician about an appropriate infant formula option. Parents should be aware that there may be an increased chance of mild dental fluorosis if the child is exclusively consuming infant formula reconstituted with fluoridated water. Dental fluorosis is a term that covers a range of visible changes to the enamel surface of the tooth. For more information on dental fluorosis and the use of fluoridated drinking water in infant formula, go to http://www.cdc.gov/fluoridation.

Unregulated Contaminants Monitoring Rule-Phase 3

The Unregulated Contaminant Monitoring Rule (UCMR) was established by the EPA as part of the Safe Drinking Water Act of 1996. Every five years, in compliance with the EPA, Milwaukee Water Works collects data on potential contaminants that are not yet regulated but are known, or anticipated, to occur in public water systems. These data help the EPA determine if future regulations are needed for contaminants of concern. The next round of UCMR (Phase 4) will take place between 2018-2020. Learn more at http://www.epa.gov/dwucmr.

UCMR-3 Assessment Monitoring (2013)	Median Value	Highest Level Detected	Source of Contaminants	Health Effects
Chromium (µg/L)	0.3	0.3	Natural deposits, manufacturing	Chromium (III) is an essential element in humans, with a daily intake of 50 to 200 µg/d recommended for adults.
Cobalt (µg/L)	<1.0	<1.0	Natural deposits.	Possible fetal development, possible human carcinogen
Molybdenum (µg/L)	1.0	1.1	Natural deposits.	Toxic to animals at very high concentrations.
Strontium (mg/L)	0.12	0.12	Natural deposits.	Effects on bone growth in children
Vanadium (µg/L)	0.3	0.3	Natural deposits, manufacturing	Gastrointestinal symptoms
Chromium, Hexavalent (µg/L)	0.20	0.25	Natural deposits, manufacturing	Effects on the liver, kidney, gastrointestinal and immune systems.
Chlorate (µg/L)	0.06	0.10	Byproduct of drinking water disinfection	Affects red blood cells oxygen carrying capacity, affects on thyroid function.
1,4-Dioxane (µg/L)	<0.07	<0.07	Manufacturing of paints and solvents	Likely to be carcinogenic
Bromochloromethane (µg/L)	<0.06	<0.06	Byproduct of drinking water disinfection, Fire extinguishing agent	Maybe toxic to kidneys, lungs, liver, respiratory tract, skin, eyes and central nervous system.
Bromomethane (µg/L)	<0.2	<0.2	Fumigant	Increased cancer risk
1,3-Butadiene (µg/L)	<0.1	<0.1	Plastic manufacturing	Increased cancer risk
Chlorodifluoromethane (µg/L)	<0.08	<0.08	Refrigerant	Cardiac effects
Chloromethane (µg/L)	<0.2	<0.2	Byproduct of drinking water disinfection, manufacturing	Central nervous system effects
1,1-Dichloroethane (µg/L)	<0.03	<0.03	Plastic manufacturing	Increased cancer risk
1,2,3-Trichloropropane (µg/L)	<0.03	<0.03	Solvents, pesticide manufacturing	Increased cancer risk
Perfluorobutanesulfone acid (PFBS) (µg/L)	<0.09	<0.09	Waterproofing, textile manufacturing	Effects on blood, liver and kidneys
Perfluoroheptanoic acid (PFHpA) (µg/L)	<0.01	<0.01	Waterproofing, textile manufacturing	Effects on blood, liver and kidneys
Perfluorohexanesulfonic acid (PFHxS) (µg/L)	<0.03	<0.03	Waterproofing, textile manufacturing	Effects on blood, liver and kidneys
Perfluorononanoic acid (PFNA) (µg/L)	<0.02	<0.02	Waterproofing, textile manufacturing	Effects on blood, liver and kidneys
Perfluorooctane sulfonate (PFOS) (µg/L)	<0.04	<0.04	Waterproofing, textile manufacturing	Effects on blood, liver and kidneys
Perfluorocatanoic acid (PFOA) (µg/L)	<0.02	<0.02	Waterproofing, textile manufacturing	Effects on blood, liver and kidneys

Unregulated Contaminants Monitoring Rule-Phase 3 (continued)

UCMR-3 Screening Monitoring (2013)	Median Value	Highest Level Detected	Source of Contaminants	Health Effects
4-Androstene-3, 17-dione (ng/L)	<0.3	<0.3	Hormone	Endocrine disruptor
Equilin (ng/L)	<4.0	<4.0	Hormone	Endocrine disruptor
17 beta Estradiol (ng/L)	<0.4	<0.4	Hormone	Endocrine disruptor
Estriol (ng/L)	<0.8	<0.8	Hormone	Endocrine disruptor
Estrone (ng/L)	<2.0	<2.0	Hormone	Endocrine disruptor
17 alpha-ethynyl estradiol (ng/L)	<0.9	<0.9	Hormone	Endocrine disruptor
Testosterone (ng/L)	<0.1	<0.1	Hormone	Endocrine disruptor

Unregulated Contaminants Monitoring Rule-Phase 4 (UCMR-4)

Milwaukee Water Works is conducting the monitoring for UCMR-4 in 2018. The tables below list the unregulated contaminants included and the sampling schedule. Monitoring results provide a meaningful basis for whether future regulatory actions need to take place in order to protect public health. For information, go to http://www.epa.gov/dwucmr/fourth-unregulated-contaminant-monitoring-rule.

Ten Cyanotoxins
Microcystin-LR
Microcystin-RR
Microcystin-LA
Microcystin-LF
Microcystin-LY
Microcystin-YR
Total Microcystin
Nodularin
Anatoxin-a
Cylindrospermopsin

Three Alcohols
1-butanol
2-methoxyethanol
2-propen-1-ol

Three Brominated Haloacetic Acid (HAA) Groups
HAA5
HAA6Br
HAA9

Eight Pesticides and One Pesticide Manufacturing Byproduct
Alpha-hexachlorocyclohexane
Chlorpyrifos
Dimethipin
Ethoprop
Oxyfluorfen
Profenofos
Tebuconazole
Total Permethrin (cis- and trans-)
Tribufos

Three Other Semi-volatile Chemicals
1-butanol
2-methoxyethanol
2-propen-1-ol

Two Metals
Germanium
Manganese

Two Indicators
Total Organic Carbon (TOC)
Bromide

UCMR-4 Schedule

Substance	Year	Jan	Feb	Mar	Apr	May	Jun		Jul		Aug		Sep		Oct	Nov	Dec
10 Cyanotoxins	2018						X	X	X	X	X	X	X	X			
20 Chemicals			X			X					X					X	
2 Indicators			X			X					X					X	

Other Monitored Substances

Milwaukee Water Works measures hundreds of substances that are not regulated by local, state, or federal regulations. When any substance is detected, it is reported. These substances have no regulatory or contaminant level guidelines. Therefore, these data are presented as a "range" of values detected. A complete list of all undetected contaminants, or substances, tested for can be found at http://www.milwaukee.gov/ImageLibrary/Groups/WaterWorks/files/UndetectedChemicalContaminants-TreatedWater.pdf

Substances (other)	Range of values detected	Source of Contaminant	Health Effects
Acesulfame-K (µg/L)	0.04 - 0.05	Artificial sweetener	None proposed for human
Ammonia, as N (mg/L)	0.12 - 0.36	Disinfection with chloramines; wastes; fertilizers and natural processes	None proposed for human but toxic for aquatic life
Boron (µg/L)	22 - 23	Naturally occurring; borax mining and refining; boric acid manufacturing	Stomach, liver, kidney or central nervous system problems
Bromide (µg/L)	14 - 49	Naturally occurring	None from drinking water
Bromochloroacetonitrile (µg/L)	0.9 - 1.3	Byproduct of drinking water disinfection	Increased risk of cancer
Calcium (mg/L)	34	Naturally occurring	None from drinking water
Chloropicrin (ng/L)	0.3 - 0.9	Fungicide, herbicide, insecticide and nematicide	Eye/nose irritation; stomach discomfort
Cotinine (ng/L)	1	Metabolic byproduct of tobacco smoking	None from drinking water
Deethylatrazine (µg/L)	0.01 - 0.02	Herbicide	None from drinking water
Dibromoacetonitrile (µg/L)	0.3 - 1.7	Byproduct of drinking water disinfection	Eye/nose irritation
Dichloroacetonitrile (µg/L)	0.3 - 0.9	Byproduct of drinking water disinfection	Increased risk of cancer
Lithium (µg/L)	2.1	Naturally occurring	Affects to thyroid function
Magnesium (mg/L)	12	Naturally occurring	None from drinking water
Molybdenum (µg/L)	0.9 - 1.0	Natural deposits.	Toxic to animals at very high concentrations.
Nickel (µg/L)	0.4 -0.5	Naturally occurring	None from drinking water
Perfluorooctane sulfonate (PFOS) (ng/L)	<2.0 - 2.0	Waterproofing, textile manufacturing	Effects on blood, liver and kidneys
Perfluorocatanoic acid (PFOA) (ng/L)	<2.0 - 2.1	Waterproofing, textile manufacturing	Effects on blood, liver and kidneys
o-Phosphate as PO_4 (mg/L)	0.11 - 2.52	Byproduct of drinking water treatment	None from drinking water
Phosphorus as P (mg/L)	0.61 - 0.65	Naturally occurring	None from drinking water
Potassium (mg/L)	1.4 - 1.4	Naturally occurring	None from drinking water
Rubidium (µg/L)	1.1	Naturally occurring	None from drinking water
Silica (mg/L)	2.0 - 2.1	Naturally occurring	None from drinking water
Sodium (mg/L)	9.3 - 9.6	Natural deposits and road salt	None from drinking water
Sucralose (ng/L)	<25 - 46	Artificial sweetener	None from drinking water
Titanium (µg/L)	0.6 - 0.7	Natural deposits	None from drinking water

Other Monitored Substances (continued)

Substances (other)	Range of values detected	Source of Contaminant	Health Effects
Total Organic Carbon (mg/L)	1.36 - 1.96	Naturally present in the environment	Total organic carbon has no health effects. However, total organic carbon provides a medium for the formation of disinfection byproducts. Their byproducts include trihalomethanes and haloacetic acids. Drinking water containing these byproducts in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an in-
Trichloroacetonitrile (µg/L)	0.2 - 0.5	Byproduct of drinking water disinfection	Increased risk of cancer
1,1,1-Trichloropropanone (µg/L)	0.2 - 1.2	Byproduct of drinking water disinfection	Increased risk of cancer
Tris(chloropropyl) phosphate (µg/L)	0.01	Flame retardant	Possible carcinogen, reproductive effects
Uranium (µg/L)	0.3	Natural deposits	Increased risk of cancer, kidney toxicity
Vanadium (µg/L)	<0.3 - 0.3	Natural deposits, manufacturing	Gastrointestinal symptoms

Lead and Copper

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Milwaukee Water Works is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 3 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Additional information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the EPA at http://www.epa.gov/safewater/lead.

Guidelines regarding lead

- Occupants of buildings where lead service lines are present should adequately flush water lines after prolonged periods of stagnation to reduce potential lead hazards, but the use of NSF/ANSI Standard 53 certified lead filters is the most thorough means of lead-water safety.
- At-risk populations of women and children living in buildings where lead service lines are present, including women who are pregnant, may become pregnant (woman ages 15-45) or are breastfeeding, and children up to the age of 6, should drink and cook only with water that has been filtered with an NSF/ANSI Standard 53 lead certified filter.
- If using water directly from the faucet (without a filter), only cold water that has been well-flushed for a minimum of 3 minutes should be used. Not running your water for the recommended length of time may increase your risk of lead exposure.

To learn more about lead, visit Lead Safe Milwaukee at http://city.milwaukee.gov/LeadSafeMKE.

Lead-Safe Milwaukee
SAFE PAINT SAFE WATER SAFE KIDS

The Milwaukee Water Works, Water Quality Section publication on Lead Service Lines available in 2017 AWWA Journal

In January 2017, the Journal of American Water Works Association published research findings about lead and drinking water sampling in Milwaukee. The overarching goal of this program was to protect residents' health and keep the public informed about lead in water. This standard continues in the LSL replacement program, which began January 1st, 2017.

Access to AWWA article: http://www.awwa.org/publications/journal-awwa/abstract/articleid/63106515

Information on LSL replacement: http://www.milwaukee.gov/water/WaterQuality/Lead-Awareness-and-Drinking-Water-Safety.htm

Lead Copper Rule Compliance Results for 2017

In 2017, in compliance with the US EPA and Wisconsin DNR, Milwaukee Water Works tested 50 tier 1 sites for lead and copper. Milwaukee tier 1 sites consist of single family homes with lead service lines. In order to remain in compliance with EPA regulations, 90th percentile levels must be below 15 µg/L (ppb) for lead and 1300 µg/L (ppb) for copper. In addition, Milwaukee Water Works collects ancillary water quality parameters in compliance with DNR lead and copper sampling. These values are also listed below and all fall within the normal, acceptable range for drinking water according to the National Primary and Secondary Drinking Water Regulations set forth by the EPA. For more information on the EPA Lead Copper Rule, visit http://www.epa.gov/dwreginfo/lead-and-copper-rule.

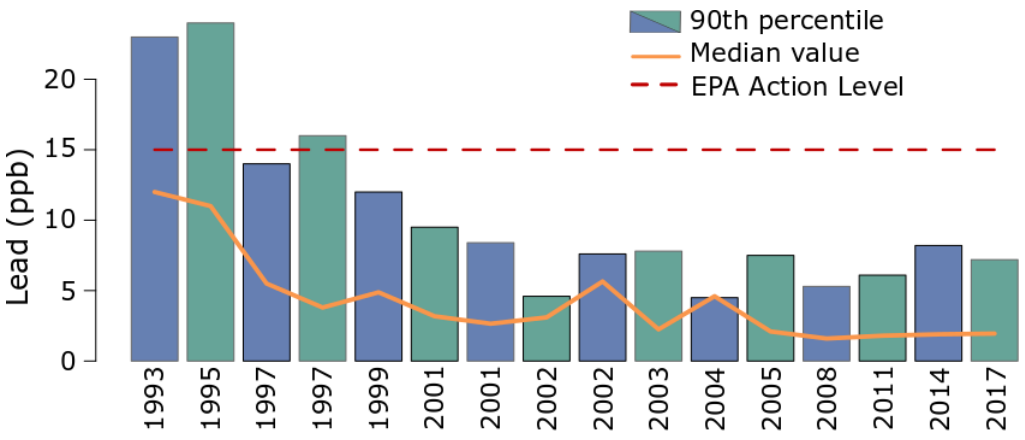
Lead and Copper (2017)	Action Level	90th percentile	Highest Detected	Number of Sites at Action Level	Number of Sites Exceeding Action Level
Copper (µg/L)	1300	**46.0**	110	0	0
Lead (µg/L)	15.0	**7.2**	130	1	2

Water Quality Parameters (2017)	Minimum	Mean	Median	Maximum
Alkalinity, Total (mg/L)	102	104	103	112
Hardness, Total (mg/L)	130	135	140	140
Conductivity (µmhos/cm)	310	318	320	320
Chloride (mg/L)	14.0	14.9	15.0	16.0
Sulfate (mg/L)	25.0	27.7	28.0	30.0
Phosphorus (mg P/L)	0.53	0.60	0.60	0.71
Calcium (mg/L)	34.0	34.8	35.0	37.0
Iron (mg/L)	0.02	0.05	0.04	0.10
Magnesium (mg/L)	11.0	12.0	12.0	12.0
Aluminum (µg/L)	36.0	94.8	82.0	240
Manganese (µg/L)	0.14	1.03	0.79	3.30

Optimized Corrosion Control Treatment (OCCT) and Lead

In 1991, the US EPA introduced the Lead Copper Rule (LCR) as a means to regulate lead and copper in drinking water. In compliance with this rule, and under the direction of the EPA and Wisconsin DNR, Milwaukee Water Works implemented corrosion control in 1996 to reduce lead and copper in tap water. Optimized corrosion control is achieved by adding orthophosphate, which coats the pipes and significantly reduces lead and copper from leaching into tap water.

Since the addition of corrosion control in 1996, lead levels have decreased by more than 50% in Milwaukee. Shown below are the 90th percentile and median lead levels from Milwaukee LCR compliance sampling beginning in 1993. Note the drop in lead levels after optimized corrosion control treatment began in 1996.



Water Quality Basics for Milwaukee Homebrewers and Hobbyists

Milwaukee's water quality makes for happy fish and tasty homebrew. We offer this information for hobbyists who use tap water for brewing beer and coffee, steeping tea, filling aquariums, photofinishing, cooking, baking and every other activity that requires consistently pure, high-quality water. These data reflect water quality monitoring results from January 1 – December 31, 2017. Find more information at http://city.milwaukee.gov/water/WaterQuality.

Typical Values for Milwaukee Water

Parameter	Unit	Median value	Range
Alkalinity (as $CaCO_3$)	mg L^{-1}	103	97-116
Calcium	mg L^{-1}	34	34-34
Chlorine*	mg L^{-1}	1.54	1.30-1.84
Conductivity	µS	308	288-353
Fluoride	mg L^{-1}	0.58	0.09-0.73
Hardness (as total $CaCO_3$)	mg L^{-1}	135	131-152
Hardness	mM (gpg)	0.1 (7.9)	0.1 (7.9)
Iron	mg L^{-1}	0.123	0.119-0.126
Nitrate (as nitrogen)	mg L^{-1}	0.33	0.22-0.44
pH	-log[H^+]	7.64	7.38-7.79
Potassium	mg L^{-1}	1.4	1.4-1.4
Sodium	mg L^{-1}	9.45	9.30-9.60
Temperature	°F (°C)	47.3 (8.5)	36.3-72.1 (2.4-22.3)
Total dissolved solids	mg L^{-1}	179	167-204

Definitions

mg L^{-1} = milligrams per liter = ppm = parts per million

µS cm^{-1} = micro Siemens per centimeter

gpg = grains per gallon; mM = millimolar = millimoles per liter

-log[H^+] = negative base 10 logarithm of hydrogen ion concentration

*As total chloramine residual