

City of Redwood City

Report on Water Quality Relative to Public Health Goal

BACKGROUND

The City of Redwood City is required by the California Health and Safety Code to prepare a report regarding Public Health Goals. Section 116470 (b), (c), and (f) of the Health and Safety Code (see Attachment A) specifies that on or before July 1, 1998, and every three years thereafter, public water systems serving more than 10,000 service connections shall prepare a report that is intended to inform the public of any California Public Health Goal (PHG) exceedance that occurred within the prior three years.

A PHG is a *non-enforceable* goal established by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA), and is not to be confused with Maximum Contaminant Level (MCL). An MCL is the *enforceable* level of a contaminant that is allowed in drinking water.

Section 116470 of the California Health and Safety Code states that, if, a contaminant was detected by a water supplier between 2004 and 2006, at a level exceeding an applicable PHG, the PHG reports are to provide the information required by the law. The required information includes:

1. The identification of each contaminant detected in drinking water that exceeds the applicable PHG.
2. The MCL and PHG as determined by OEHHA for each contaminant identified.
3. The category or type of risk to health that could be associated with each contaminant identified.
4. The best treatment technology commercially available, if any, that could be used to reduce the contaminant level.
5. An estimate of the cost to utilize that treatment if it is appropriate and feasible.
6. A description of the action, if any, public water systems intend to take to reduce the concentration of the contaminant.

Constituent's that have a California primary drinking water standard and for which a PHG has been set are to be addressed in the report. Attachment B contains the regulated constituent (lead) for which the City of Redwood City exceeded the PHG. Please note that water containing lead is not delivered to consumers through the City water distribution system, but rather, it is a product of constituents leaching from fixtures containing lead within consumer's homes. A more detailed explanation of this occurrence is given later in the report.

The Code further specifies that a public hearing is to be held for the purpose of accepting and responding to public comment on the report. The hearing can be part of any regularly scheduled meeting. Please also note that in subsection (f) the requirement that maximum contaminant level goals (MCLGs) adopted by the U.S. Environmental Protection Agency (USEPA) must be used if a PHG has not been adopted for a regulated contaminant.

PHG/MCLG vs. MCL

PHGs are set by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) and are based solely on public health risk considerations.

MCLs are set by the U.S. Environmental Protection Agency (USEPA) or the California Department of Health Services (CDHS) as the level which is required to be met in water systems. Violations of an MCL can result in a fine, abatement order, or closure of facilities. When the USEPA, or the CDHS, adopts an MCL, they take into account such factors as (1) analytical methodologies; (2) effectiveness of available treatment technologies; and (3) benefits and costs. PHGs and MCLGs are not enforceable and are not required to be met by any public water system.

Water Quality Data Reviewed for this Report

Water quality data collected by the City of Redwood City during 2004, 2005 and 2006 for purposes of determining compliance with drinking water standards were reviewed in order to prepare this PHG report. This data was all summarized in our 2004, 2005, and 2006 Annual Water Quality Reports (also known as Consumer Confidence Reports (CCRs)) that were distributed to all of our customers through direct mail.

Guidelines Followed for Preparation of this Report

The Association of California Water Agencies (ACWA) formed a workgroup which prepared guidelines for water utilities to use in preparing these required reports. The ACWA guidelines were used in the preparation of this report.

Best Available Treatment Technology and Cost Estimates

Both USEPA and CDHS adopt Best Available Technologies (BATs), which are the best known methods of reducing contaminant levels below the MCL. While a BAT may identify a process that can reduce the presence of a contaminant, the cost of implementation can be a major factor in deciding whether or not to adopt the process. For a system that is in compliance with MCL levels, cost considerations must be a factor. Striving to keep contaminants below PHG/MCLG levels must be evaluated with costs in mind.

Costs were estimated for the implementation of BATs for each constituent exceeding a PHG or MCLG. The PHGs and MCLGs are set much lower than the MCL, and it is not always possible or feasible to determine what treatment is needed to further reduce a constituent to, or below, the PHG or MCLG. In some cases, such as when the MCLG or PHG is set at zero, there may not be commercially available technology to reach that level. The issue is further complicated because it is often not possible to verify by analytical means that the contaminant has been totally eliminated. In some cases, installing a treatment technology to try and further reduce very low levels of one constituent may, in turn, have adverse effects on other aspects of water quality. This report presents the required cost estimates to implement the BATs to reduce a contaminant to a level at or below the PHG/MCLG.

CONSTITUENTS DETECTED THAT EXCEED PHG OR MCLG

In reviewing water quality monitoring data collected during 2004, 2005 and 2006, City of Redwood City staff have concluded that a PHG report is required that addresses the following contaminant:

1. lead

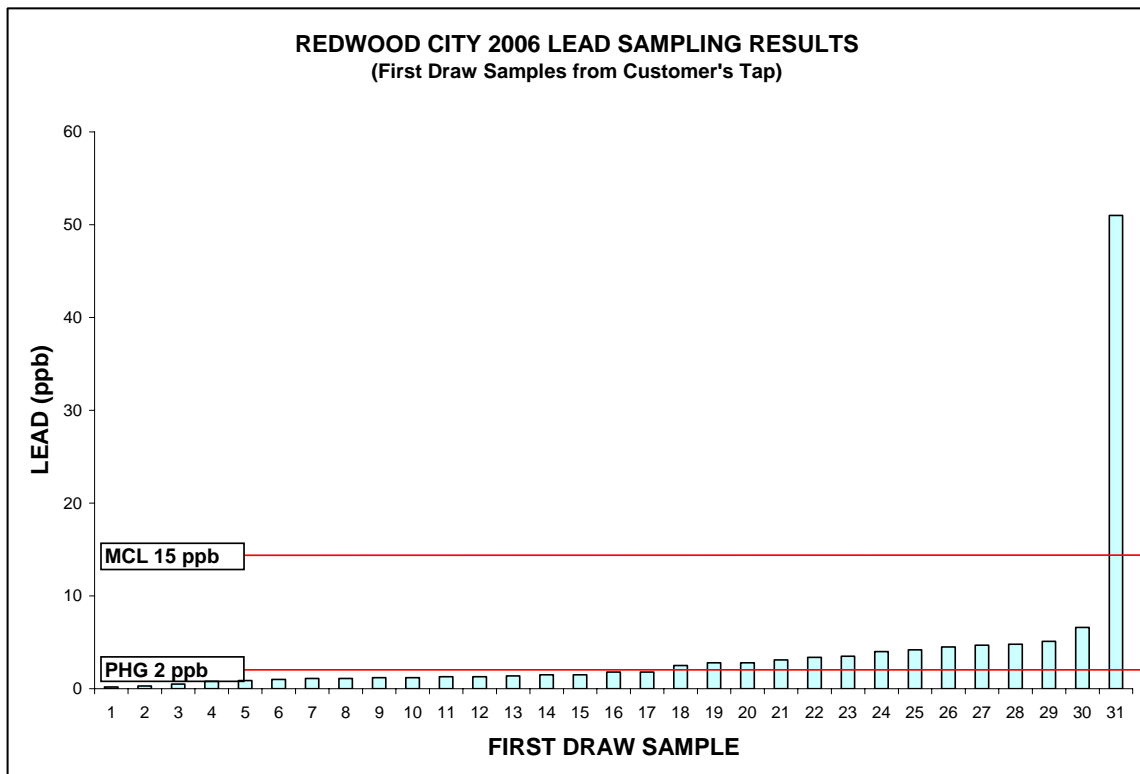
The following section presents a discussion of the contaminant that was detected in customer's homes at levels above the PHG.

LEAD

The PHG for lead is 2 parts per billion (ppb). Lead enters drinking water primarily through leaching of lead-containing materials in household piping. The corrosion of household plumbing systems such as those containing lead-based solder used to join copper pipe, brass and chrome-plated brass faucets, lead pipe connections from homes to the water main, brass/bronze water meters, brass/bronze curb valves, and brass/bronze corporation valves can all contribute to lead leaching

Although the City of Redwood City's water sources are free of lead, several of the homes that participated in the Redwood City's 2004 and 2006 Lead and Copper Sampling had lead levels that exceeded the PHG of 2 ppb. Results from the Lead and Copper sampling represent the worst case conditions for lead levels in the distribution system. These samples are collected under a first-draw condition; which means that water must sit in the customer's piping for 6 hours before it is collected. These samples were taken from homes that are considered to be the highest risk locations. Lead levels at these locations may be higher than others because of the plumbing material used when these homes were built. Many of the samples collected during the Lead and Copper Sampling tested below the PHG for lead. The probable reason for the difference in lead concentration at the individual residences can be attributed to the plumbing components at these residences.

As shown in the following chart, 55% of the samples collected in 2006 tested below the PHG; all but one sample tested below the MCL.



For water samples collected from a customer's tap, there is an action level adopted by the CDHS instead of an MCL. The 90th percentile value for samples collected from appropriate household

taps cannot exceed an Action Level of 15 ppb, as prescribed in Chapter 17.5 of Title 22, California Health and Safety Code. During the 2004 and 2006 Lead and Copper Sampling Redwood City's 90th percentile values for lead were below the 15 ppb maximum.

Why Lead is Regulated

In 1974, Congress passed the Safe Drinking Water Act. This law requires EPA to determine safe levels of chemicals in drinking water which do, or may cause, health problems. These are non-enforceable levels based solely on possible health risks and exposure.

The PHG for lead has been set at 2 parts per billion (ppb) because the EPA believes that this level of protection would not cause any of the potential health problems described below.

Since lead contamination generally occurs from corrosion of household lead pipes, it cannot be directly detected or removed by the water system. Instead, EPA is requiring water systems to control the corrosiveness of their water if the level of lead at home taps exceeds an MCL.

The MCL for lead has been set at 15 ppb because EPA believes, given present technology and resources, this is the lowest level to which water systems can reasonably be required to control this contaminant should it occur in drinking water at their customers home taps.

These drinking water standards and the regulations for ensuring these standards are met are called National Primary Drinking Water Regulations. All public water supplies must abide by these regulations.

The Health Effects of Lead

Lead can cause a variety of adverse health effects when people are exposed to it at levels above the MCL for relatively short periods of time. These effects may include interference with red blood cell chemistry, delays in normal physical and mental development in babies and young children, slight deficits in the attention span, hearing, and learning abilities of children, and slight increases in the blood pressure of some adults.

Long-term effects:

From a lifetime of exposure at levels above the MCL, lead has the potential to cause: stroke; kidney disease; and cancer.

Best Available Technology for Lead Elimination and How It Is Applied by the City of Redwood City

Optimizing corrosion control is considered to be the best treatment technique for minimizing household corrosion and reducing lead and copper levels *at-the-tap* at this time. Currently the San Francisco Public Utilities Commission (SFPUC-the agency that provides all of Redwood City's drinking water) uses sodium hydroxide (NaOH) as the treatment technique for adjusting the pH of the tap water for optimized corrosion control. The City of Redwood City then monitors the pH levels of the water at the entry points and at sites strategically located throughout the City's water distribution system to ensure that the proper pH is maintained.

A recent report completed by the SFPUC reviewing its Corrosion Control Strategy for Lead and Copper Rule Compliance confirmed that pH adjustment remains the best strategy for optimizing corrosion control. The optimal treatment technique, approved by CDHS, is to raise the water to a minimum pH of 8.2; which the SFPUC and the City of Redwood City regularly monitors at entry points and throughout the distribution system. This SFPUC report on Corrosion Control Strategy has been reviewed and approved by the California Department of Health Services.

The City of Redwood City water system is in full compliance with all state and federal regulations, including the Lead and Copper Rule. The system of pH adjustment employed by the SFPUC and the City of Redwood City's monitoring program are considered the best available technology for reducing lead and copper levels at customer taps.

No Additional Action for Lead is Recommended

As required by the CDHS, the SFPUC will continue to practice pH adjustment and the City of Redwood City will continue monitoring the pH levels in the distribution system to demonstrate that the system is maintaining optimal corrosion control conditions. In response to the CDHS regulations, the City of Redwood City will also continue home-tap sampling, and will conduct that monitoring during the year 2009.

No additional action is recommended for the City of Redwood City regarding lead.

What Consumers Can do to Decrease Lead Exposure

Listed below are some steps consumers can take to reduce exposure to lead:

- Have your water tested for lead.
- Find out whether your pipes contain lead or lead solder.
- Run your water for 15-30 seconds or until it becomes cold before using it for drinking or cooking. This flushes any standing lead from the pipes.
- Don't cook with or drink water from the hot water tap; lead dissolves more easily into hot water.
- **Do not boil your water to remove lead.** Excessive boiling water makes the lead more concentrated – the lead remains when the water evaporates.

SUMMARY AND CONCLUSION

The drinking water for the City of Redwood City meets all standards established by California Department of Health Services and USEPA to protect public health. No additional treatment is recommended at this time to lower the levels of lead. There are no clear benefits to be derived from expensive efforts to further reduce the levels of this contaminant for it is well below the level of concern and elimination may be impossible. Therefore, no actions are proposed for lead.

Attachments:

1. Excerpt from California Health & Safety Code: Section 116470 (b), (c), (d), (e), and (f)
2. Table of Regulated Constituent with MCL and PHG

Attachment A

Excerpt from California Health & Safety Code,
116470 (b) – (f)

NOTE: This publication is meant to be an aid to the staff of the CDHS Drinking Water Program and cannot be relied upon by the regulated community as the State of California's representation of the law. The published codes are the only official representation of the law. Refer to the published codes whenever specific citations are required.

Health and Safety Code §116470

(a) As a condition of its operating permit, every public water system shall annually prepare a consumer confidence report and mail or deliver a copy of that report to each customer, other than an occupant, as defined in Section 799.28 of the Civil Code, of a recreational vehicle park. A public water system in a recreational vehicle park with occupants as defined in Section 799.28 of the Civil Code shall prominently display on a bulletin board at the entrance to or in the office of the park, and make available upon request, a copy of the report. The report shall include all of the following information:

(1) The source of the water purveyed by the public water system.

(2) A brief and plainly worded definition of the terms "maximum contaminant level," "primary drinking water standard," and "public health goal."

(3) If any regulated contaminant is detected in public drinking water supplied by the system during the past year, the report shall include all of the following information:

(A) The level of the contaminant found in the drinking water, and the corresponding public health goal and primary drinking water standard for that contaminant.

(B) Any violations of the primary drinking water standard that have occurred as a result of the presence of the contaminant in the drinking water and a brief and plainly worded statement of health concerns that resulted in the regulation of that contaminant.

(C) The public water system's address and phone number to enable customers to obtain further information concerning contaminants and potential health effects.

(4) Information on the levels of unregulated contaminants, if any, for which monitoring is required pursuant to state or federal law or regulation.

(5) Disclosure of any variances or exemptions from primary drinking water standards granted to the system and the basis therefor.

(b) On or before July 1, 1998, and every three years thereafter, public water systems serving more than 10,000 service connections that detect one or more contaminants in drinking water that exceed the applicable public health goal, shall prepare a brief written report in plain language that does all of the following:

(1) Identifies each contaminant detected in drinking water that exceeds the applicable public health goal.

(2) Discloses the numerical public health risk, determined by the office, associated with the maximum contaminant level for each contaminant identified in paragraph (1) and the numerical public health risk determined by the office associated with the public health goal for that contaminant.

(3) Identifies the category of risk to public health, including, but not limited to, carcinogenic, mutagenic, teratogenic, and acute toxicity, associated with exposure to the contaminant in drinking water, and includes a brief plainly worded description of these terms.

(4) Describes the best available technology, if any is then available on a commercial basis, to remove the contaminant or reduce the concentration of the contaminant. The public water system may, solely at its own discretion, briefly describe actions that have been taken on its own, or by other entities, to prevent the introduction of the contaminant into drinking water supplies.

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(5) Estimates the aggregate cost and the cost per customer of utilizing the technology described in paragraph (4), if any, to reduce the concentration of that contaminant in drinking water to a level at or below the public health goal.

(6) Briefly describes what action, if any, the local water purveyor intends to take to reduce the concentration of the contaminant in public drinking water supplies and the basis for that decision.

(c) Public water systems required to prepare a report pursuant to subdivision (b) shall hold a public hearing for the purpose of accepting and responding to public comment on the report. Public water systems may hold the public hearing as part of any regularly scheduled meeting.

(d) The department shall not require a public water system to take any action to reduce or eliminate any exceedance of a public health goal.

(e) Enforcement of this section does not require the department to amend a public water system's operating permit.

(f) Pending adoption of a public health goal by the Office of Environmental Health Hazard Assessment pursuant to subdivision (c) of Section 116365, and in lieu thereof, public water systems shall use the national maximum contaminant level goal adopted by the United States Environmental Protection Agency for the corresponding contaminant for purposes of complying with the notice and hearing requirements of this section.

(g) This section is intended to provide an alternative form for the federally required consumer confidence report as authorized by 42 U.S.C. Section 300g-3(c).

Attachment B

Environmental Protection Agency
National Primary Drinking Water Standards

EPA National Primary Drinking Water Standards

	Contaminant	MCL or TT ¹ (mg/L) ²	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Acrylamide	TT ⁸	Nervous system or blood problems;	Added to water during sewage/wastewater increased risk of cancer treatment	zero
OC	Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha particles	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
IOC	Arsenic	0.010 as of 1/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
OC	Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
R	Beta particles and photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
OC	Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04
OC	Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl ₂)	MRDL=4.0 ¹	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes	MRDLG=4 ¹

LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT1 (mg/L) ²	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl ₂)	MRDL=4.0 ¹	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG=4 ¹
D	Chlorine dioxide (as ClO ₂)	MRDL=0.8 ¹	Anemia; infants & young children: nervous system effects	Water additive used to control microbes	MRDLG=0.8 ¹
DBP	Chlorite	1.0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection	0.8
OC	Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
IOC	Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1
IOC	Copper	TT7; Action Level = 1.3	Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	1.3
M	<i>Cryptosporidium</i>	TT3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
IOC	Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0.2
OC	2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07
OC	Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2
OC	1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	zero
OC	o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
OC	p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
OC	1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
OC	cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
OC	trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
OC	Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC	1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	Di(2-ethylhexyl) adipate	0.4	Weight loss, live problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC	Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC	Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007
OC	Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	zero
OC	Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC	Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1

LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT1 (mg/L) ²	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC	Epichlorohydrin	TT8	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC	Ethylbenzene	0.7	Liver or kidneys problems	Discharge from petroleum refineries	0.7
OC	Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
IOC	Fluoride	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
M	<i>Giardia lamblia</i>	TT3	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP	Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a ⁶
OC	Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC	Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M	Heterotrophic plate count (HPC)	TT3	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	n/a
OC	Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05
IOC	Lead	TT7; Action Level = 0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	zero
M	<i>Legionella</i>	TT3	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero
OC	Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002
IOC	Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0.002
OC	Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04
IOC	Nitrate (measured as Nitrogen)	10	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.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
IOC	Nitrite (measured as Nitrogen)	1	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.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1

LEGEND

D Disinfectant	IOC Inorganic Chemical	OC Organic Chemical
DBP Disinfection Byproduct	M Microorganism	R Radionuclides

	Contaminant	MCL or TT ¹ (mg/L) ²	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
OC	Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines	0.05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004
OC	Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
OC	Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms (including fecal coliform and <i>E. coli</i>)	5.0% ⁴	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present ⁵	Coliforms are naturally present in the environment as well as feces; fecal coliforms and <i>E. coli</i> only come from human and animal fecal waste.	zero
DBP	Total Trihalomethanes (TTHMs)	0.10 0.080 after 12/31/03	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a ⁶
OC	Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
OC	1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.20
OC	1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
OC	Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero
M	Turbidity	TT ³	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing micro-organisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	n/a
R	Uranium	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero

LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT ¹ (mg/L) ²	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero
M	Viruses (enteric)	TT ³	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

NOTES

1 Definitions

- 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 and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—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 contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- *Giardia lamblia*: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- *Legionella*: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, for systems servicing >10,000, and January 14, 2005, for systems servicing <10,000, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

4 No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli* if two consecutive TC-positive samples, and one is also positive for *E. coli*/fecal coliforms, system has an acute MCL violation.

5 Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

6 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

7 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

8 Each water system must certify, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05% dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent).

LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

National Secondary Drinking Water Standards

National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L