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COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
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Secretary

DAVID B. STRUHS
Commissioner

*Update to the
May 1997*

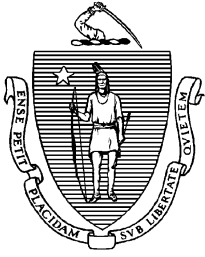
*Massachusetts Drinking Water Standards and Guidelines
for Chemicals in Massachusetts Drinking Waters*

Revision 1.1

Prepared by

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Office of Research and Standards*

OCTOBER 1997



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TO: Interested Parties

FROM: Carol Rowan West, Director, Office of Research and Standards

DATE: *October 1997*

RE: Massachusetts Drinking Water Standards and Guidelines

Attached is a revision (Revision 1.1) to the **May 1997** list of the Massachusetts Drinking Water Standards and Guidelines for Chemicals in Massachusetts Drinking Waters. This revision includes updated USEPA analytical methods which reflect additions, deletions or other changes to these methods. The listed methods are included in the list of standards and guidelines for *informational purposes only* and the final choice of the most appropriate method remains with the individual requesting the analysis. There were no changes to any standards or guidelines in this revision.

Original Text of the May 1997 List

There are no additions or changes to the May 1996 list however, the MCL for 1,4-dichlorobenzene is currently under review and this is explained more fully in Section 4 of this report. For several years, the Massachusetts list has been issued on a semi-annual basis because the amount of new information being issued by the USEPA was so great. Recently, the pace of the issuance of new rules and the development of new standards or guidelines has slowed considerably. Therefore, ORS will be issuing the drinking water list on an **annual basis**. The next update to the list is scheduled for the *Spring of 1998*.

For chemical concentration limits for drinking water to be termed standards, or Massachusetts Maximum Contaminant Levels (MMCL) in Massachusetts, one of two events must occur. Either the promulgated United States Environmental Protection Agency (EPA) standards printed in the Federal Register must be formally adopted by the Division of Water Supply (DWS) at the Department of Environmental Protection (DEP) or the effective date listed in the Federal Register for the MCLs must have passed.

The standards and guidelines may not apply to all contaminant situations, so I urge you to continue to contact the Office of Research and Standards (ORS) with any questions regarding the application or interpretation of this information. Also, when a chemical of interest is not on the list, please contact ORS for guidance. The telephone number for ORS is (617) 292-5570. This list of Standards and Guidelines can be accessed free of charge, 24 hours a day by calling the ORS Bulletin Board at (617) 292-5546. The settings for a 14,400 baud modem are 8 data, 1 stop, no parity. If there are any questions regarding the Bulletin Board, please call Michelle Bornstein at (617) 556-1052. The list can be accessed from the DEP Web Page at <http://www.magnet.state.ma.us/dep>

cc: David B. Struhs, Commissioner
Allan Bedwell, Deputy Commissioner
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Oscar Pancorbo, WES

I. Introduction

The Drinking Water List of Standards and Guidelines is updated on an **annual** basis by the Office of Research and Standards (ORS). It is a convenient compendium of chemical guidance available for drinking water. The list is designed to be used by individuals or groups concerned with the integrity of drinking water, for example, water suppliers, homeowners, environmental groups, government regulators, boards of health, or private consultants.

Under the Safe Drinking Water Act (SDWA), a State may be granted primacy for implementing the provisions of the SDWA. Massachusetts DEP has primacy for implementation. As part of that primacy, DEP is responsible for ensuring the quality of Massachusetts waters.

The Office of Research and Standards is charged with establishing protective public health standards and/or guidelines for chemicals in drinking water. This mission may involve adoption or revision of standards established by the EPA, or ORS may adopt a standard or guideline based on an independent review of primary or secondary data.

II. Standards

The Massachusetts MCLs listed in 310 CMR 22.00 of the drinking water regulations, as well as the promulgated MCLs set by the EPA which have become effective, constitute the Massachusetts Drinking Water Standards, which are listed as MMCLs on the Drinking Water List. The standards are enforced by the Division of Water Supply. The drinking water regulations have been updated to reflect the latest changes in the drinking water standards. The regulations were last promulgated December 31, 1993.

The MMCLs listed in 310 CMR 22.00 apply to water which is delivered to any user of a public water system as defined in 310 CMR 22.02. Please refer to the regulations for more specific definitions and applications. Private residential wells are not subject to the requirements of 310 CMR 22.00. However, these drinking water standards are often used to evaluate private residential contamination, especially in Federal Superfund and M.G.L Chapter 21E activities.

III. Guidelines

The Office of Research and Standards of the DEP issues guidance for chemicals other than those with Massachusetts MCLs in drinking water. Standards promulgated by the EPA but not yet effective may be included on the Guidelines list.

ORS derives guidelines and recommends or revises EPA Health Advisories (HA) and Proposed Maximum Contaminant Levels (PMCLs) after review and evaluation of all available data for a particular chemical. All new health advisory guidelines are evaluated on an on-going, case-by-case basis and may be incorporated into the list.

ORS uses methodology similar to that used by the EPA's Office of Water (OW) when setting guidelines for chemicals in drinking water. Concentrations of chemicals having evidence of carcinogenicity are minimized as much as feasible, therefore, guidelines are set at a target risk of one in one million or the lowest practical quantitation limit for EPA classified group A or B carcinogens. Class C carcinogens are individually evaluated for a decision regarding whether to set the guidelines on cancer effects.

To derive guidance for potential non-carcinogenic effects for a chemical, ORS applies a percentage (usually 20%) to published or derived route-specific reference doses and then uses standard exposure

assumptions to convert the dose to a drinking water concentration. This practice allows for the possibility of human exposures from sources other than drinking water.

The standards and guidelines published in this list are derived for the specific circumstances associated with drinking water. The assumptions used in establishing the numbers are therefore specific to drinking water situations and discretion must be exercised when using the guidance for situations other than contaminated drinking water. Please refer any questions regarding the proper use of the numbers issued in this list to the Office of Research and Standards at 617-292-5570.

A more detailed description of the methodology used by ORS to derive water guidance can be found in Guide to the Regulation of Toxic Chemicals In Massachusetts Waters (ORS 1990), available through the two State Bookstores:

State Bookstore
Room 116
Boston, MA 02133
617-727-2834

State Bookstore
21 Elm Street
Springfield, MA 01103
413-784-1376

IV. Changes for the Spring 1997 Drinking Water Standards and Guidelines Lists

1. The Maximum Contaminant Level (MCL) for 1,4-dichlorobenzene is currently under review by ORS because of US EPA's reexamination of the carcinogenicity studies for this compound. A change in the MCL may be issued in the future.

V. References

1. Office of Research and Standards, 1990. *Guide to the Regulation of Toxic Chemicals in Massachusetts Waters*. Department of Environmental Protection. Boston, MA.

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Massachusetts Drinking Water Standards

Substance	CASRN	MMCL mg/l	EPA Analytical Methods*
◁ Acrylamide	79061	Treatment Technique	N/A
Alachlor	15972608	0.002	505, 507, 508.1, 525.2
Antimony	7440360	0.006	200.8, 200.9
Arsenic	7440382	0.05	200.7, 200.8, 200.9
¥ Asbestos	1332214	7 million fibers/liter	TEM
Atrazine	1912249	0.003	505, 507, 508.1, 525.2
Barium	7440393	2	200.7, 200.8
Benzene	71432	0.005	502.2, 524.2
Benzo(a)pyrene	50328	0.0002	525.2, 550, 550.1
Beryllium	7440417	0.004	200.7, 200.8, 200.9
Cadmium	7440439	0.005	200.7, 200.8, 200.9
Carbofuran	1563662	0.04	531.1
Carbon Tetrachloride	56235	0.005	502.2, 524.2, 551
Chlordane	57749	0.002	505, 508, 508.1, 525.2
Chlorobenzene	108907	0.1	502.2, 524.2
Chromium (total)	7440473	0.1	200.7, 200.8, 200.9
Copper	7440508	1.3 (Action Level)	200.7, 200.8, 200.9,
Cyanide	57125	0.2	335.4
2,4-D (2,4-Dichlorophenoxyacetic acid)	94757	0.07	515.1, 515.2, 555
Dalapon	75990	0.2	515.1, 552.1
1,2-Dibromo-3-chloropropane (DBCP)	96128	0.0002	504.1, 551
1,2-Dichlorobenzene (o-DCB)	95501	0.6	502.2, 524.2
# 1,4-Dichlorobenzene (p-DCB)	106467	0.005	502.2, 524.2

* The analytical methods are listed for **informational purposes only**. The choice of the most appropriate method for a particular analyte in drinking water rests with the individual requesting the analysis.

The MCL for 1,4-Dichlorobenzene is currently under review by ORS and a change may be issued.

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(cont'd)

Substance	CASRN	MMCL mg/l	EPA Analytical Methods*
1,2-Dichloroethane	107062	0.005	502.2, 524.2
1,1-Dichloroethylene	75354	0.007	502.2, 524.2
1,2-Dichloroethylene(cis)	156592	0.07	502.2, 524.2
1,2-Dichloroethylene(trans)	156605	0.1	502.2, 524.2
Dichloromethane	75092	0.005	502.2, 524.2
1,2-Dichloropropane	78875	0.005	502.2, 524.2
Di(2-ethylhexyl)-adipate	103231	0.4	506, 525.2
Di(2-ethylhexyl)-phthalate	117817	0.006	506, 525.2
Dinoseb	88857	0.007	515.1, 515.2, 555
Diquat	85007	0.02	549.1
Endothall	145733	0.1	548.1
Endrin	72208	0.002	505, 508, 508.1, 525.2
◀ Epichlorohydrin	106898	Treatment Technique	N/A
Ethylbenzene	100414	0.7	502.2, 524.2
Ethylene Dibromide (EDB)	106934	0.00002	504.1, 551
Fluoride	7782414	4	300.0
Glyphosate	1071536	0.7	547
Heptachlor	76448	0.0004	505, 508, 508.1, 525.2
Heptachlor Epoxide	1024573	0.0002	505, 508, 508.1, 525.2
Hexachlorobenzene	118741	0.001	505, 508, 508.1, 525.2
Hexachlorocyclopentadiene	77474	0.05	505, 508, 508.1, 525.2
Lead	7439921	0.015 (Action Level)	200.8, 200.9
Lindane	58899	0.0002	505, 508, 508.1, 525.2
Mercury	7439976	0.002	200.8, 245.1, 245.2
Methoxychlor	72435	0.04	505, 508, 508.1, 525.2

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(cont'd)

Substance	CASRN	MMCL mg/l	EPA Analytical Methods*
Nitrate (As N)	14797558	10	300.0, 353.2,
Nitrate/Nitrite (total)	N/A	10	353.2
Nitrite (As N)	14797650	1	300.0, 353.2
Oxamyl (Vydate)	23135220	0.2	531.1
PCBs (Polychlorinated Biphenyls)	1336363	0.0005	505, 508, 508A
Pentachlorophenol	87865	0.001	515.1, 515.2, 525.2, 555
Picloram	1918021	0.5	515.1, 515.2, 555
Selenium	7782492	0.05	200.8, 200.9
Simazine	122349	0.004	505, 507, 508.1, 525.2
Styrene	100425	0.1	502.2, 524.2
2,3,7,8-TCDD (Dioxin)	1746016	3×10^{-8}	1613
Tetrachloroethylene	127184	0.005	502.2,, 524.2, 551
Thallium	7440280	0.002	200.8, 200.9
Toluene	108883	1	502.2, 524.2
Total Trihalomethanes (for chlorinated supplies only)	N/A	0.1	502.2, 524.2, 551
Including: Chloroform	67663	N/A	502.2, 524.2, 551
Chlorodibromomethane	124481	N/A	502.2, 524.2, 551
Bromodichloromethane	75274	N/A	502.2, 524.2, 551
Bromoform	75252	N/A	502.2, 524.2, 551
Toxaphene	8001352	0.003	505, 508, 525.2
2,4,5-TP (Silvex)	93721	0.05	515.1, 515.2, 555
1,2,4-Trichlorobenzene	120821	0.07	502.2, 524.2
1,1,1-Trichloroethane	71556	0.2	502.2, 524.2, 551
1,1,2-Trichloroethane	79005	0.005	502.2, 524.2
Trichloroethylene	79016	0.005	502.2, 524.2, 551
Vinyl Chloride	75014	0.002	502.2, 524.2

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(cont'd)

Substance	CASRN	MMCL mg/l	EPA Analytical Methods *
Turbidity	N/A	refer to 310 CMR 22.08	180.1 , 2130B Standard Methods
Xylenes (total)	1330207	10	502.2, 524.2
Coliform Bacteria	N/A	refer to 310 CMR 22.05	N/A
Radium (226 + 228)	7440144	5 pCi/l	903.1, 904
Gross Alpha Radiation	N/A	15 pCi/l	900.0
Beta Particle and Photon Radioactivity	N/A	concentration which produces an annual dose of 4 millirem/yr	900.0

* The analytical methods are listed for **informational purposes only**. The choice of the most appropriate method for a particular analyte in drinking water rests with the individual requesting the analysis.

¥ For fibers greater than 10 microns.

◀ No numerical MCL is provided for these compounds. If detected, a treatment technique is specified.

N/A Not applicable

Substance	CASRN	ORSG mg/l	EPA Analytical Methods*
Acetone	67641	3.0	524.2
◊ Aldicarb	116063	0.003	531.1
◊ Aldicarb Sulfone	1646884	0.002	531.1
◊ Aldicarb Sulfoxide	1646873	0.004	531.1
Bromomethane	74839	0.01	502.2, 524.2
** Chloroform	67663	0.005	502.2, 524.2, 551
Dichlorodifluoromethane	75718	1.4	502.2, 524.2
1,1-Dichloroethane	75343	0.07	502.2, 524.2
1,3-Dichloropropene	542756	0.0005	502.2, 524.2
1,4-Dioxane	123911	0.05	524.2
Ethylene Glycol	107211	14	524.2
Methyl Ethyl Ketone	78933	0.35	524.2
Methyl Isobutyl Ketone	108101	0.35	524.2
Methyl Tertiary Butyl Ether	1634044	0.07	524.2
Metolachlor	51218452	0.1	507, 508.1, 525.2
* Nickel	7440020	0.1	200.7, 200.8, 200.9
▲ Radon-222	14859677	10,000 pCi/l	Liquid Scintillation
Λ Sodium	7440235	20	200.7
Tetrahydrofuran	109999	1.3	524.2
Trichlorotrifluoroethane (FREON 113)	76131	210	524.2
Uranium	7440611	10 pCi/l	908.0, 908.1

- * The analytical methods are listed for **informational purposes only**. The choice of the most appropriate method for a particular analyte rests with the individual requesting the analysis.
- ** This guideline applies to non-chlorinated water supplies. For chlorinated drinking water supplies, please contact the Division of Water Supply.
- ◊ The MCLs for aldicarb, aldicarb sulfone and aldicarb sulfoxide have been stayed.
- ♣ The MCL for Nickel has been remanded and is no longer effective.
- ▲ Exceedance of this guideline indicates that air sampling for Radon-222 should be done.
- Λ All detections of sodium must be reported. Please refer to 310 CMR 22.06A for the specific requirements. The sodium guideline of 20 mg/l is based on an eight (8) ounce serving.

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Secondary Maximum Contaminant Levels

Chemicals	Status	SMCLs (mg/L)
Aluminum	F	0.05 to 0.2
Chloride	F	250
Color	F	15 Color Units
Copper	F	1
Corrosivity	F	non-corrosive
Fluoride	F	2
Foaming Agents	F	0.5
Iron	F	0.3
Manganese	F	0.05
Odor	F	3 threshold odor numbers
pH	F	6.5 - 8.5
Silver	F	0.10
Sulfate	F	250*
Total dissolved solids (TDS)	F	500
Zinc	F	5

Status Codes: F - final

* An MCL of 500 mg/l has been proposed by USEPA (Federal Register 12/20/94).

Glossary

Absorbed Dose: The amount of a chemical that enters the systemic circulation of an organism.

Absorption: The uptake of chemicals from any physiological surface into another physiological space, e.g., the movement of a chemical from the stomach into the general circulation.

Acute Exposure: An exposure which lasts for a period of time less than or equal to twenty-four hours.

Ambient: Environmental or surrounding conditions.

Bioaccumulation: The retention and concentration of a substance by an organism.

CASRN: Chemical Abstract Service Registry Number. Each chemical is assigned a unique number for cataloging purposes.

Chronic Exposure: In animals, multiple exposures for a period of time greater than three months. In humans, the time period is seven years or greater.

CMR: Code of Massachusetts Regulations. These are regulations of the Commonwealth of Massachusetts, promulgated by administrative agencies of the Commonwealth, outlining the rules of conduct for specific agencies.

Dose: The quantity of a chemical to which an organism is exposed.

Dose-Response Relationship: The quantitative relationship between the exposure to a chemical and the degree of biological effects.

ELCR: Excess Lifetime Cancer Risk. This refers to the estimate of the probability that exposure to chemicals, under specific conditions, will result in cancer above natural background cancer rates.

Hazard Index: The ratio of the average daily dose of a chemical in mg/kg/d, to its reference dose in mg/kg/d.

Inorganic Chemicals: Chemicals which do not contain the carbon atom.

IRIS: Integrated Risk Information System. This is a database of toxicity information and regulatory levels, maintained by the U.S. EPA.

LC50 : The concentration of a chemical in air or water which causes death in 50 % of the test organisms in a given study. This value is not a constant.

LD50 : The dose of a chemical taken by mouth or absorbed by the skin which causes death in 50 % of the test organisms in a given study. This value is not a constant.

LOAEL: Lowest Observed Adverse Effects Level. The lowest dose of a chemical in a study or group of studies, that produces a statistically or biologically significant increase in the frequencies or severity of adverse effects between an exposed population and a control group.

MCL: Maximum Contaminant Level. This is a value, established by the EPA, which represents the acceptable level of a chemical in drinking water under specified conditions. Cost and feasibility are taken into consideration when deriving the MCL as well as health considerations.

MDL: Method Detection Limit. This is the minimum concentration of a substance that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

MMCL: Massachusetts Maximum Contaminant Level. This is a drinking water standard promulgated in the Drinking Water Regulations (310 CMR 22.00) issued by the Division of Water Supply of the DEP.

NOAEL: No Observed Adverse Effect Level. This is a dose of a chemical at which there were no statistically or biologically significant increases in the frequencies or severity of adverse effects seen between the exposed population and its appropriate control group.

Organic Chemicals: Chemicals which contain the carbon atom.

ORSG: Office of Research and Standards Guideline. This is the concentration of a chemical in drinking water, at or below which, adverse, non-cancer health effects are unlikely to occur after chronic (lifetime) exposure. In addition, this concentration generally has an associated excess lifetime cancer risk of less than or equal to one in one million for chemicals that act as carcinogens. The guidelines are intended to provide an adequate margin of safety for threshold-type effects and a low cancer risk. The numbers, when exceeded, would not necessarily result in non-cancer adverse health effects but serve as indicators of the potential need for further action to be decided by the Division of Water Supply.

PQL: Practical Quantitation Limit. This refers to the lowest concentrations of analytes in specific media that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions.

Reference Dose (RfD): The RfD is an estimate, with uncertainty spanning perhaps an order of magnitude, of a daily exposure to the human population (including sensitive subgroups) that is likely to be without deleterious health effects during a lifetime.

Route of Exposure: The pathway by which a chemical comes in contact with an organism (e.g., ingestion, inhalation, dermal contact, injection).

SMCL: Secondary Maximum Contaminant Level. These standards are developed to protect the aesthetic qualities of drinking water and are not health based and are not legally enforceable.

Subacute Exposure: In animals, it is a period of exposure less than or equal to thirty days. In humans, it is a period of time less than or equal to fourteen days.

Subchronic Exposure: In animals, it is a period of exposure of at least thirty days but less than 90 days. In humans, it is an exposure period of greater than two weeks but less than seven years.

Threshold Dose: The lowest dose of a chemical at which a specified measurable effect is observed.

Table I
US EPA Analytical Methods for Organic
Compounds in Drinking Water

Method Number	Title
502.2	Volatile Organic Compounds in Water By Purge and Trap Capillary Column Gas Chromatography with Photoionization and Electrolytic Conductivity Detectors in Series
504.1	1,2-Dibromoethane (EDB) , 1,2-Dibromo-3- Chloropropane (DBCP) and 1,2,3-Trichloropropane (1,2,3-TCP) in Water by Microextraction and Gas Chromatography
505	Analysis of Organohalide Pesticides and Commercial Polychlorinated Biphenyl Products in Water by Micro-Extraction and Gas Chromatography
507	Determination of Nitrogen- and Phosphorus-Containing Pesticides in Water by Gas Chromatography with a Nitrogen-Phosphorus Detector
508	Determination of Chlorinated Pesticides in Water by Gas Chromatography with An Electron Capture Detector
508.1	Determination of Chlorinated Pesticides, Herbicides and Organohalides in Water Using Liquid-Solid Extraction and Electron Capture Gas Chromatography
508A	Screening for Polychlorinated Biphenyls by Perchlorination and Gas Chromatography
515.1	Determination of Chlorinated Acids in Water by Gas Chromatography with an Electron Capture Detector
515.2	Determination of Chlorinated Acids in Water Using Liquid-Solid Extraction and Gas Chromatography with Electron Capture Detection
524.2	Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry
525.2	Determination of Organic Compounds in Drinking Water by Liquid-Solid Extraction and Capillary Column Gas Chromatography/Mass Spectrometry
531.1	Measurement of N-Methylcarbamoxyloximes and N-Methylcarbamates in Water by Direct Aqueous Injection and HPLC with Post Column Derivatization
547	Determination of Glyphosphate in Drinking Water by Direct- Aqueous- Injection HPLC, Post-Column Derivatization, and Fluorescence Detection

Method Number	Title
548.1	Determination of Endothall in Drinking Water by Ion Exchange Extraction, Acidic Methanol, Methylation Gas Chromatography/Mass Spectrometry
549.1	Determination of Diquat and Paraquat in Drinking Water by Liquid-Solid Extraction and HPLC with Ultraviolet Detection
551	Determination of Chlorination Disinfection Byproducts and Chlorinated Solvents in Drinking Water by Liquid-Liquid Extraction and Gas Chromatography with Electron Capture Detection
555	Determination of Chlorinated Acids in Water by High Performance Liquid Chromatography with a Photodiode Array Ultraviolet Detector
1613	Tetra through Octa Chlorination Dioxins and Furans by Isotope Dilution High Resolution Gas Chromatography/ High Resolution Mass Spectrometry (HRGC/HRMS)

Table II
US EPA Analytical Methods for Inorganic
Compounds in Drinking Water

Method Number	Title
200.7	Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry
200.8	Determination of Trace Elements in Water and Wastes by Inductively Coupled Plasma -Mass Spectrometry
200.9	Determination of Trace Elements by Stabilized Temperature Graphite Furnace Atomic Absorption Spectrometry
245.1	Determination of Mercury in Water by Cold Vapor Atomic Absorption Spectrometry
TEM	Transmission Electron Microscopy
300.0	Determination of Inorganic Anions by Ion Chromatography

See 310 CMR 22.06 for further information on Analytical Methodology.