City of Santa Cruz Water Department
Water System CA4410010

2022 Public Health Goals Report

Water Quality Relative to Public Health Goals 2019 – 2021

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List of Acronyms	
ACWA	Association of California Water Agencies
BAT	Best Available Technologies
CCR	Consumer Confidence Report
DBP	Disinfection Byproduct
DBPR	Disinfection Byproduct Rule
DDW	State Water Resources Control Board-Division of Drinking Water
DLR	Detection Limit for Reporting
EPA	United States Environmental Protection Agency
GAC	Granular Activated Carbon
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
OEHHA	California Environmental Protection Agency Office of Environmental Health Hazard Assessment
PHG	Public Health Goal
SCWD	City of Santa Cruz Water Department
THM	Trihalomethanes
TTHM	Total Trihalomethanes

List of Data Units	
mg/L	Milligrams per Liter
NA	Not Applicable
ND	Constituent Not Detected
µg/L	Micrograms per Liter

Introduction

Provisions of the California Health and Safety Code (Attachment 1) specify that the City of Santa Cruz Water Department (SCWD), and other water utilities serving more than 10,000 service connections, prepare a Public Health Goal (PHG) Report by July 1st every three years if their water quality measurements have exceeded an established state Public Health Goal (PHG) or federal Maximum Contaminant Level Goal (MCLG). PHGs are non-enforceable, health-based goals established by the California Environmental Protection Agency Office of Environmental Health Hazard Assessment (OEHHA). For regulated contaminants that do not have a California PHG, water utilities use the Maximum Contaminant Level Goal (MCLG) adopted by the United States Environmental Protection Agency (EPA) in preparing these reports.

The goal of the Public Health Goal Report is to provide public water system customers in California access to information about levels of constituents in their drinking water that are identified but are below the Maximum Contaminant Levels (MCLs), which are the enforceable standards water suppliers must not exceed. This Public Health Goal Report must include the numerical public health risk associated with the MCL and PHG or MCLG, the category or type of risk to health that could be associated with each constituent, the best treatment technology available that could be used to reduce the constituent level and an estimate of the cost to install the treatment if appropriate and feasible.

This report provides information regarding constituents that were detected in the SCWD's water supply between years 2019 and 2021 at levels exceeding an applicable PHG or MCLG. In the reporting period addressed herein, seven constituents including arsenic, bromodichloromethane, bromoform, chloroform, dibromochloromethane, hexavalent chromium, and total coliform were detected in SCWD's water supply at concentrations above their respective PHG or MCLG.

This report is required in addition to the extensive public reporting of water quality information that public water systems are required to provide in the federally mandated Consumer Confidence Report (CCR). Hence, SCWD has also prepared the CCR, which covers more water quality data and in greater depth. (see: https://www.cityofsantacruz.com/government/city-departments/water/online-reports-4326)

There are a few other constituents that are routinely detected in water systems at levels usually well below the drinking water standards for which no PHG or MCLG has yet been adopted by the OEHHA) or EPA. These will be addressed in a future required report after a PHG has been adopted.

PHGs, MCLGs, MCLs and DLRs

PHGs and MCLGs are set at a level that has been determined to have no known adverse effect on a person's health, and for many contaminants, are set at or near zero. In setting MCLGs and PHGs, EPA and the State Water Resources Control Board – Division of Drinking Water (DDW) only consider health based risks because state and federal safe drinking water laws require regulators to set MCLGs and PHGs considering only health based information.

In contrast to PHGs and MCLGs, MCLs and treatment technique regulations are enforceable standards that water suppliers must continuously meet. Water suppliers routinely monitor for and implement treatment procedures, system operation, and maintenance practices to continuously produce and deliver water that meets all regulatory requirements in order to meet applicable MCLs and comply with various treatment techniques.

Federal and state safe drinking water laws require regulators to set drinking water standards for chemical contaminants as close to the corresponding PHG/MCLG as is economically and technologically feasible. This means that DDW/EPA set MCLs at a level that takes into consideration several important practical realities such as analytical detection capability, available treatment technology, as well as the results of a cost versus benefits analysis. In some cases, it may not be feasible for DDW or the EPA to set the drinking water standard for a contaminant at the same level as the PHG. This situation may occur because the technology to treat the chemicals may not be available, or the cost of treatment may be very high. DDW considers these factors when developing a drinking water standard.

A constituent's Detection Limit for Reporting (DLR) is the designated minimum level at or above which any analytical result for drinking water must be reported to DDW. A list published by DDW of regulated constituents with the MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants is included as Attachment 2.

How does OEHHA Establish a Public Health Goal?

The process for establishing a PHG for a chemical contaminant in drinking water is very rigorous. OEHHA scientists first compile all relevant scientific information available, which includes studies of the chemical's effects on laboratory animals and studies of humans who have been exposed to the chemical. The scientists use this data from these studies to perform a health risk assessment in which they determine the levels of the contaminant in drinking water that could be associated with various adverse health effects. When calculating a PHG, OEHHA uses all the information it has compiled to identify the level of the chemical in drinking water that would not cause significant adverse health effects in people who drink 2 liters of that water every day for 70 years.

For cancer-causing chemicals, OEHHA typically establishes the PHG at the "one-in-one million" risk level. At that level, not more than one person in a population of one million people drinking the water daily for 70 years would be expected to develop cancer as a result of exposure to that chemical.

What Quality Data Considered

All treated water quality data collected by SCWD in the years 2019, 2020, and 2021 were considered in this analysis. Data is derived from treated water sampling events at the point-of-entry to the distribution system (treated water leaving the water treatment plants) and water samples collected from within the distribution system. These data were also summarized in our annual Water Quality Reports, or CCRs, which are made available electronically to all customers each June, following the reporting year.
(see: https://www.cityofsantacruz.com/government/city-departments/water/online-reports-4326)

Guidelines Followed

This report has been prepared in accordance with the April 2022, Association of California Water Agencies (ACWA) guidance document titled, "Suggested Guidelines for Preparation of Required Reports of Public Health Goals (PHGs) to Satisfy Requirements of California Health and Safety Code Section 116470(b)". Limited guidance has been provided by DDW for the preparation of these reports.

Best Available Treatment Technology and Cost Estimates

Both DDW and EPA adopt what are known as Best Available Technologies (BATs) that are the best-known methods for reducing contaminant levels below the MCL. Costs can usually be estimated for such treatment technologies. However, since many PHGs, and all MCLGs, are set much lower than the MCL, it is not always feasible to determine what treatment is needed to further reduce a contaminant to or near the PHG or MCLG, many of which are set at zero. Estimating the costs to further reduce a contaminant to zero is difficult, if not impossible, because it is not always possible to verify by analytical measurement that the contaminant level has actually been lowered to near zero. In some cases, installing treatment to try and further reduce very low levels of one contaminant may cause adverse effects on other aspects of water quality.

As described below, during the reporting period seven constituents were detected by the SCWD above the applicable PHGs or MCLGs. Cost estimates for reducing these contaminant concentrations to the PHGs are not relevant to this year's report.

Drinking Water Measurement

Table 1 provides context for drinking water measurement units and can be used throughout this report as a reference when interpreting water quality results.

Table 1: Drinking Water Measurement Units

Units	Units	Equivalence
mg/L = milligrams per liter	ppm = parts per million	1 drop in a hot tub or 1 second in 11.5 days
µg/L = micrograms per liter	ppb = parts per billion	1 drop in an Olympic size swimming pool or 1 second in nearly 32 years

Constituents Detected that Exceed at PHG or a MCLG

Water quality samples collected during the years 2019, 2020, 2021 was considered for this report. None of the 17,229 regulatory treated water samples collected contained levels of regulated constituents that exceeded state or federal compliance standards, highlighting the high quality treated drinking water produced by SCWD. However, seven constituents were detected at levels above the PHG or MCLG. The following is a discussion of these constituents.

Arsenic

Arsenic is a naturally occurring element in the earth's crust and is very widely distributed in the environment. It is found in air, water, soil, rocks and minerals, food, and even living organisms in low concentrations. Arsenic compounds have many uses. Inorganic arsenic compounds are used in industry, most commonly as wood preservative, but also as components of pesticides (particularly herbicides), paints, dyes, and semiconductors. Organic arsenic compounds, which are considered less toxic, are found in small amounts in plants and animals. Erosion of rocks and minerals is believed to be the primary source of naturally occurring arsenic found in drinking water supplies and in soil. Other sources of arsenic

in water and soil include urban runoff, pesticides, fly ash from power plants, treated wood and smelting and mining wastes. Municipal and industrial waste disposal sites may be additional sources of arsenic contamination in water supplies.

The MCL for arsenic is 10 µg/L with a corresponding PHG of 0.004 µg/L. The category of health risk for arsenic is carcinogenicity, or potentially cancer causing. The numerical health risk based on the California PHG for arsenic is 1 in a million. This means one excess cancer case per one million population when 2 liters of the water with an arsenic level of 0.004 µg/L is consumed daily for 70 years.

SCWD collected and analyzed 39 samples for arsenic during 2019-2021, with values that ranged from non-detect (ND) to 1.2 µg/L, with all samples below California's DLR and MCL. Two arsenic samples collected from the Beltz Water Treatment Plant during 2021 were detected above the PHG, with results of 1.1 and 1.2 µg/L. The Beltz Water Treatment Plant is a groundwater treatment plant that utilizes oxidation with chlorine and filtration for water treatment. Historically, arsenic has been detected at the Beltz Treatment Plant due to native groundwater concentrations. A summary of the arsenic results are indicated in Table 2.

For more information on the arsenic PHG setting by OEHAA:
https://oehha.ca.gov/water/public-health-goal/public-health-goal-arsenic-drinking-water

According to Section 64447, Title 22 of the California Code of Regulations, the approved BATs for arsenic treatment are:

- Activated Alumina
- Coagulation/Filtration
- Ion Exchange
- Lime Softening
- Reverse Osmosis
- Electrodialysis
- Oxidation/Filtration

Since the arsenic levels in SCWD treated water are well below the MCL, and the Beltz Water Treatment Plant already uses oxidation and filtration for water treatment, no additional BAT treatment strategies are being considered at this time. The implementation of BAT strategies would significantly increase the operation and maintenance costs as well as an increased cost for each customer. Therefore, no estimate of cost has been included.

Table 2: Summary of Arsenic Results

Constituent	Number of Samples Collected	Number of Samples above PHG	MCL (µg/L)	PHG (µg/L)	Range of Detected Results (µg/L)	Health Risk	Numerical Health Risk at MCL	Numerical Health Risk at PHG
Arsenic	39	2	10	0.004	1.1 – 1.2	Increased risk of cancer	$2.5x10^{-3}$ (2.5 per thousand)	$1x10^{-6}$ (one per million)

Hexavalent Chromium

Hexavalent chromium, also known as chromium 6, is a heavy metal that is commonly found at low levels in drinking water. It occurs naturally in the environment and is present in water from the erosion of chromium deposits found in rocks and soils. It can also be produced by industrial processes, manufacturing activities, leakage, poor storage or inadequate industrial waste disposal practices. Historically, low levels of hexavalent chromium have been detected at both the Beltz and Graham Hill Water Treatment Plants due to native groundwater and surface water concentrations. The hexavalent chromium found in SCWD's source water is naturally occurring and does not come from industrial waste.

Chromium is found in drinking water sources and the environment in two principal forms: trivalent chromium (chromium 3) and hexavalent chromium (chromium 6). Chromium 3 is found naturally in foods at low levels and is an essential human dietary nutrient. Chromium 6 is the more toxic form of chromium. Chromium is used in many products and processes, including stainless steel, textile dyes, wood preservation, leather tanning, and anti-corrosion coatings.

Hexavalent chromium does not have a primary drinking water standard; however, it is regulated under the 0.05 mg/L MCL for total chromium. The total chromium MCL was established to address exposures to hexavalent chromium and trivalent chromium. An MCL of 0.010 mg/L was previously adopted in California for hexavalent chromium on May 28, 2014, but the Superior Court of Sacramento County withdrew it on September 11, 2017. The PHG for hexavalent chromium is 0.00002 mg/L. Total chromium does not have a PHG.

The category of health risk for hexavalent chromium is carcinogenicity, or potentially cancer causing. The numerical health risk based on the California PHG for hexavalent chromium is 1 in a million. This means one excess cancer case per one million population when 2 liters of the water with a hexavalent chromium level of 0.00002 mg/L is consumed daily for 70 years.

SCWD collected and analyzed 13 samples for hexavalent chromium during 2019-2021, with values that ranged from 0.00004 to 0.00018 mg/L, with all results above the PHG. Twenty-five total chromium samples with non-detect results were also collected during the same monitoring period. Twelve of the detected hexavalent results were collected from the Graham Hill Water Treatment and one sample was collected from the Beltz Treatment Plant.

The Graham Hill Water Treatment is a conventional surface water treatment plant that utilizes coagulation, flocculation, sedimentation, filtration, and disinfection for water treatment. As previously mentioned, the Beltz Water Treatment Plant is a groundwater treatment plant that utilizes filtration and oxidation for water treatment. A summary of the hexavalent chromium results are indicated in Table 3.

For more information on the hexavalent chromium PHG setting by OEHAA:
https://oehha.ca.gov/water/public-health-goal-fact-sheet/final-technical-support-document-public-health-goal-hexavalent

According to Section 64447, Title 22 of the California Code of Regulations, the approved BATs for hexavalent chromium treatment are:

- Coagulation/Filtration
- Ion Exchange
- Reverse Osmosis

Since the hexavalent chromium levels in SCWD treated water are extremely low, and the Beltz and Graham Hill Water Treatments already utilize some of the approved BAT's for treatment (coagulation and filtration), no additional BAT treatment strategies are recommended. The implementation of BAT strategies would significantly increase the operation and maintenance costs as well as an increased cost for each customer. Therefore, no estimate of cost has been included.

Table 3: Summary of Hexavalent Chromium Results

Constituent	MCL (mg/L)	PHG (mg/L)	Range of Detected Results (mg/L)	Health Risk	Numerical Health Risk at MCL	Numerical Health Risk at PHG
Hexavalent Chromium	NA	0.00002	(0.00004 – 0.00018)	Increased risk of cancer	NA	$1x10^{-6}$ (one per million)

Total Coliform Bacteria

Coliform bacteria are organisms that are present in the environment and are not generally considered harmful. Total coliforms are monitored because EPA considers them a useful indicator of other pathogens in drinking water. If a sample tests positive for coliform bacteria, it indicates the possibility of pathogenic organisms in the water and needs to be further investigated. It is not unusual for a water system to have an occasional positive sample result for total coliform. Factors that can produce a positive total coliform test include, but are not limited to, the weather and environmental conditions when samples are taken, and human error associated with the collection methods, sample handling, and test procedures.

The MCL for total coliform is 5%, which means that a maximum of 5% of water sampled per month can be positive for total coliform. The MCLG is 0% of samples per month. Because total coliform bacteria are only a surrogate indicator of the potential presence of pathogens, it is not possible to state a specific numerical health risk. While USEPA normally sets MCLGs "at a level where no known or anticipated adverse effects on person would occur", they indicate that they cannot do so with total coliform bacteria.

During calendar years 2019 through 2021, SCWD was required to collect a minimum of 100 water quality samples per month to meet the monitoring requirement of the Total Coliform Rule and Revised Total Coliform Rule. On average, SCWD collected approximately 115 samples per month, but the actual number varied from month to month. In 2020, the SCWD collected 1,405 compliance samples in the distribution system for total coliform. All months were significantly below the MCL of 5%; however, one sample in March 2020 was reported positive for coliform bacteria. SCWD performed repeat sampling and all secondary samples were negative for total coliform. After a thorough investigation, it was determined that the total coliform positive result was due to improper sampling technique. A summary of the coliform positive sample is indicated in Table 4.

SCWD utilizes chlorine as a primary disinfectant in the treatment process to achieve the requisite microbial inactivation outlined in the Surface Water Treatment Rule to ensure that the water served is microbiologically safe. Before delivery to the distribution system, chlorine is added in carefully controlled amounts to provide the highest level of health protection without causing the water to have undesirable taste and odor or increasing the disinfection byproduct formation potential. This

careful balance of treatment processes is essential to continue supplying our customers with safe drinking water.

SCWD already implements the practices identified by DDW as BATs for coliform bacteria in Section 64447, Title 22 of the California Code of Regulations, including:

- Disinfection using chlorine and maintaining a chlorine residual through the distribution system.
- Monitoring throughout the distribution system to verify the absence of total coliform and the presence of a protective chlorine residual.
- Flushing water mains with low demand to improve water quality.
- Implementing an effective cross-connection control program that prevents the accidental or intentional entry of potentially contaminated water into the drinking water system.
- Maintaining positive pressures in the distribution system.

Table 4: Summary of Total Coliform Results

Month	Number of Samples Collected	Number of Samples Coliform Positive	Percent Positive	Number of Follow-up Sample Coliform Positive
March 2020	134	1	0.75%	0

Trihalomethanes

Trihalomethanes (THMs) are a group of disinfection byproduct (DBP) chemicals commonly found in drinking water. DBPs, such as THMs, form when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic matter in the water. In general, surface water contains a higher organic content than groundwater, therefore, THM formation occurs more frequently in water systems that rely on surface water sources. The four THMs are bromodichloromethane, bromoform, chloroform, and dibromochloromethane.

The MCL for total trihalomethanes (TTHMs) is 0.080 mg/L, representing the highest allowable annual average sum of the concentrations of all four THM's. There is no MCL for the individual THM constituents. In February 2020, OEHAA established the following PHG's for the individual THM constituents: bromodichloromethane (0.00006 mg/L), bromoform (0.0005 mg/L), chloroform (0.0004 mg/L), and dibromochloromethane (0.0001 mg/L).

During calendar years 2019 through 2021, SCWD collected 96 THM samples to meet the monitoring requirement of the Stage 2 Disinfection Byproduct Rule (DBPR). Under the Stage 2 DBPR, quarterly samples are taken from predetermined sample stations located throughout the distribution system. SCWD also voluntarily collects monthly samples from the Stage 2 DBPR sample locations to continuously monitor the distribution system water quality. Two hundred and eighty two THM samples were collected between 2019 and 2021, with all results above their respective PHGs, but below the TTHM MCL of 0.080 mg/L. A summary of the THM results are indicated in Tables 5-8.

For more information on the THM PHG setting by OEHAA:

https://oehha.ca.gov/water/crnr/announcement-publication-public-health-goals-and-technical-support-document

Section 64447, Title 22 of the California Code of Regulations, does not provide BATs for THMs. However, according to the EPA, effective processes for THM control include:

- Oxidation by ozone or chlorine dioxide.
- Oxidation with potassium permanganate.
- Moving the point of chlorination.
- Aeration.
- Clarification by coagulation, settling and filtration, precipitative softening, or direct filtration.
- Adsorption by powdered activated carbon or granular activated carbon.
- Monitoring water age throughout the distribution system.

SCWD utilizes aeration, oxidation with potassium permanganate, clarification by coagulation, settling and filtration, and adsorption by powered activated carbon at the Graham Hill Water Treatment Plant for water treatment. Additional measures, such as storage tank aeration and water main flushing, are used to control THM formation in the distribution system.

Currently, the SCWD is constructing a project at the Graham Hill Water Treatment Plant that will move the point of chlorination to nearer the end of the treatment process. This is expected to have the benefit of reducing DBPs in finished water. Further, a facilities improvement project is currently being developed that will provided additional water treatment for unregulated and regulated constituents such as THMs. The improvements to the Graham Hill Water Treatment Plant will include granular activated carbon, ozonation, and biologically active filtration. It is estimated that the treatment process upgrade being planned now will be complete by 2029.

Bromodichloromethane

The PHG for bromodichloromethane is 0.00006 mg/L. The category of health risk for bromodichloromethane is carcinogenicity, or potentially cancer causing. The numerical health risk based on the California PHG for bromodichloromethane is 1 in a million.

Table 5: Summary of Bromodichloromethane Results

Constituent	MCL (mg/L)	PHG (mg/L)	Range of Detected Results (mg/L)	Health Risk	Numerical Health Risk at MCL	Numerical Health Risk at PHG
Bromodichloromethane	0.080*	0.00006	(0.0014 – 0.023)	Increased risk of cancer	$1.3x10^{-3}$ (1.3 per thousand)*	$1x10^{-6}$ (one per million)

*There is no MCLs for individual trihalomethanes. Total trihalomethanes are the sum of bromochloromethane, bromoform, chloroform, and dibromochloromethane. The health risk will vary with different combinations and ratios of the other trihalomethanes in a particular sample.

Bromoform

The PHG for bromoform is 0.0005 mg/L. The category of health risk for bromoform is carcinogenicity, or potentially cancer causing. The numerical health risk based on the California PHG for bromoform is 1 in a million.

Table 6: Summary of Bromoform Results

Constituent	MCL (mg/L)	PHG (mg/L)	Range of Detected Results (mg/L)	Health Risk	Numerical Health Risk at MCL	Numerical Health Risk at PHG
Bromoform	0.080*	0.0005	(ND – 0.023)	Increased risk of cancer	$2x10^{-4}$ (two per ten thousand)*	$1x10^{-6}$ (one per million)

ND=Constituent not detected

*There is no MCLs for individual trihalomethanes. Total trihalomethanes are the sum of bromochloromethane, bromoform, chloroform, and dibromochloromethane. The health risk will vary with different combinations and ratios of the other trihalomethanes in a particular sample.

Chloroform

The PHG for chloroform is 0.0004 mg/L. The category of health risk for chloroform is carcinogenicity, or potentially cancer causing. The numerical health risk based on the California PHG for chloroform is 1 in a million.

Table 7: Summary of Chloroform Results

Constituent	MCL (mg/L)	PHG (mg/L)	Range of Detected Results (mg/L)	Health Risk	Numerical Health Risk at MCL	Numerical Health Risk at PHG
Chloroform	0.080*	0.0004	(0.0006 – 0.046)	Increased risk of cancer	$2x10^{-4}$ (two per ten thousand)*	$1x10^{-6}$ (one per million)

*There is no MCLs for individual trihalomethanes. Total trihalomethanes are the sum of bromochloromethane, bromoform, chloroform, and dibromochloromethane. The health risk will vary with different combinations and ratios of the other trihalomethanes in a particular sample.

Dibromochloromethane

The PHG for dibromochloromethane is 0.0001 mg/L. The category of health risk for dibromochloromethane is carcinogenicity, or potentially cancer causing. The numerical health risk based on the California PHG for dibromochloromethane is 1 in a million.

Table 8: Summary of Dibromochloromethane Results

Constituent	MCL (mg/L)	PHG (mg/L)	Range of Detected Results (mg/L)	Health Risk	Numerical Health Risk at MCL	Numerical Health Risk at PHG
Dibromochloromethane	0.080*	0.0001	(0.0025 – 0.014)	Increased risk of cancer	$8x10^{-4}$ (eight per ten thousand)*	$1x10^{-6}$ (one per million)

*There is no MCLs for individual trihalomethanes. Total trihalomethanes are the sum of bromochloromethane, bromoform, chloroform, and dibromochloromethane. The health risk will vary with different combinations and ratios of the other trihalomethanes in a particular sample.

Recommendations for Further Action

SCWD's drinking water quality meets all DDW and EPA drinking water standards set to protect public health. The levels of constituents identified in this report are already significantly below the MCLs established to provide safe drinking water. Further reductions in these levels would require additional costly treatment processes and the ability of these processes to provide significant additional reductions in constituent levels is uncertain. In addition, the health protection benefits of these possible reductions are not at all clear and may not be quantifiable. Therefore, no additional action beyond continued implementation of BATs is proposed at his time.

Attachment 1

California Health and Safety Code Public Health Goal Reporting Requirements

California Health and Safety Code
Public Health Goal Reporting Requirements

116470. (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.

(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 2

Table of California Regulated Constituents with MCLs, DLRs, and PHGs

MCLs, DLRs, PHGs, for Regulated Drinking Water Contaminants

(Units are in milligrams per liter (mg/L), unless otherwise noted.)

Last Update: September 14, 2021

The following tables includes California's maximum contaminant levels (MCLs), detection limits for purposes of reporting (DLRs), public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA). For comparison, Federal MCLs and Maximum Contaminant Level Goals (MCLGs) (USEPA) are also displayed.

Inorganic Chemicals Table, Chemicals with MCLs in 22 CCR §64431

State Regulated Inorganic Chemical Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Aluminum	1	0.05	0.6	2001	--	--
Antimony	0.006	0.006	0.001	2016	0.006	0.006
Arsenic	0.010	0.002	0.000004	2004	0.010	zero
Asbestos (MFL = million fibers per liter; for fibers >10 microns long)	7 MFL	0.2 MFL	7 MFL	2003	7 MFL	7 MFL
Barium	1	0.1	2	2003	2	2
Beryllium	0.004	0.001	0.001	2003	0.004	0.004
Cadmium	0.005	0.001	0.00004	2006	0.005	0.005
Chromium, Total - OEHHA withdrew the 0.0025-mg/L PHG	0.05	0.01	withdrawn Nov. 2001	1999	0.1	0.1

State Regulated Inorganic Chemical Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Chromium, Hexavalent - 0.01-mg/L MCL & 0.001-mg/L DLR repealed September 2017	--	--	0.00002	2011	--	--
Cyanide	0.15	0.1	0.15	1997	0.2	0.2
Fluoride	2	0.1	1	1997	4.0	4.0
Mercury (inorganic)	0.002	0.001	0.0012	1999 (rev2005)*	0.002	0.002
Nickel	0.1	0.01	0.012	2001	--	--
Nitrate (as nitrogen, N)	10 as N	0.4	45 as NO3 (=10 as N)	2018	10	10
Nitrite (as N)	1 as N	0.4	1 as N	2018	1	1
Nitrate + Nitrite (as N)	10 as N	--	10 as N	2018	--	--
Perchlorate	0.006	0.002	0.001	2015	--	--
Selenium	0.05	0.005	0.03	2010	0.05	0.05
Thallium	0.002	0.001	0.0001	1999 (rev2004)	0.002	0.0005

Copper and Lead Table, 22 CCR §64672.3

Values referred to as MCLs for lead and copper are not actually MCLs; instead, they are called “Action Levels” under the lead and copper rule.

State Regulated Copper and Lead Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Copper	1.3	0.05	0.3	2008	1.3	1.3
Lead	0.015	0.005	0.0002	2009	0.015	zero

Radiological Table, Radionuclides with MCLs in 22 CCR §64441 and §64443

[units are picocuries per liter (pCi/L), unless otherwise state; n/a = not applicable]

State Regulated Radionuclides Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Gross alpha particle activity - OEHHA concluded in 2003 that a PHG was not practical	15	3	none	n/a	15	zero
Gross beta particle activity - OEHHA concluded in 2003 that a PHG was not practical	4 mrem/yr	4	none	n/a	4 mrem/yr	zero
Radium-226	--	1	0.05	2006		
Radium-228	--	1	0.019	2006		
Radium-226 + Radium-	5	--	--	--	5	zero

State Regulated Radionuclides Contaminant	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
228						
Strontium-90	8	2	0.35	2006	--	--
Tritium	"20,000"	"1,000"	400	2006	--	--
Uranium	20	1	0.43	2001	30 µg/L	zero

Organic Chemicals Table, Chemicals with MCLs in 22 CCR §64444

Volatile Organic Chemicals (VOCs)

State Regulated Volatile Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Benzene	0.001	0.0005	0.00015	2001	0.005	zero
Carbon tetrachloride	0.0005	0.0005	0.0001	2000	0.005	zero
1,2-Dichlorobenzene	0.6	0.0005	0.6	1997 (rev2009)	0.6	0.6
1,4-Dichlorobenzene (p-DCB)	0.005	0.0005	0.006	1997	0.075	0.075
1,1-Dichloroethane (1,1-DCA)	0.005	0.0005	0.003	2003	--	--
1,2-Dichloroethane (1,2-DCA)	0.0005	0.0005	0.0004	1999 (rev2005)	0.005	zero

State Regulated Volatile Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
1,1-Dichloroethylene (1,1-DCE)	0.006	0.0005	0.01	1999	0.007	0.007
cis-1,2-Dichloroethylene	0.006	0.0005	0.013	2018	0.07	0.07
trans-1,2-Dichloroethylene	0.01	0.0005	0.05	2018	0.1	0.1
Dichloromethane (Methylene chloride)	0.005	0.0005	0.004	2000	0.005	zero
1,2-Dichloropropane	0.005	0.0005	0.0005	1999	0.005	zero
1,3-Dichloropropene	0.0005	0.0005	0.0002	1999 (rev2006)	--	--
Ethylbenzene	0.3	0.0005	0.3	1997	0.7	0.7
Methyl tertiary butyl ether (MTBE)	0.013	0.003	0.013	1999	--	--
Monochlorobenzene	0.07	0.0005	0.07	2014	0.1	0.1
Styrene	0.1	0.0005	0.0005	2010	0.1	0.1
1,1,2,2-Tetrachloroethane	0.001	0.0005	0.0001	2003	0.1	0.1
Tetrachloroethylene (PCE)	0.005	0.0005	0.00006	2001	0.005	zero

State Regulated Volatile Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Toluene	0.15	0.0005	0.15	1999	1	1
1,2,4-Trichlorobenzene	0.005	0.0005	0.005	1999	0.07	0.07
1,1,1-Trichloroethane (1,1,1-TCA)	0.200	0.0005	1	2006	0.2	0.2
1,1,2-Trichloroethane (1,1,2-TCA)	0.005	0.0005	0.0003	2006	0.005	0.003
Trichloroethylene (TCE)	0.005	0.0005	0.0017	2009	0.005	zero
Trichlorofluoromethane (Freon 11)	0.15	0.005	1.3	2014	--	--
"1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)"	1.2	0.01	4	1997 (rev2011)	--	--
Vinyl chloride	0.0005	0.0005	0.00005	2000	0.002	zero
Xylenes	1.750	0.0005	1.8	1997	10	10

Non-Volatile Synthetic Organic Chemicals (SOCs)

State Regulated Non-Volatile Synthetic Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Alachlor	0.002	0.001	0.004	1997	0.002	zero

State Regulated Non-Volatile Synthetic Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Atrazine	0.001	0.0005	0.00015	1999	0.003	0.003
Bentazon	0.018	0.002	0.2	1999 (rev2009)	--	--
Benzo(a)pyrene	0.0002	0.0001	0.000007	2010	0.0002	zero
Carbofuran	0.018	0.005	0.0007	2016	0.04	0.04
Chlordane	0.0001	0.0001	0.00003	1997 (rev2006)	0.002	zero
Dalapon	0.2	0.01	0.79	1997 (rev2009)	0.2	0.2
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00001	0.000003	2020	0.0002	zero
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07	0.01	0.02	2009	0.07	0.07
Di(2-ethylhexyl)adipate	0.4	0.005	0.2	2003	0.4	0.4
Di(2-ethylhexyl)phthalate (DEHP)	0.004	0.003	0.012	1997	0.006	zero
Dinoseb	0.007	0.002	0.014	1997	0.007	0.007

State Regulated Non-Volatile Synthetic Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
				(rev2010)		
Diquat	0.02	0.004	0.006	2016	0.02	0.02
Endothal	0.1	0.045	0.094	2014	0.1	0.1
Endrin	0.002	0.0001	0.0003	2016	0.002	0.002
Ethylene dibromide (EDB)	0.00005	0.00002	0.00001	2003	0.00005	zero
Glyphosate	0.7	0.025	0.9	2007	0.7	0.7
Heptachlor	0.00001	0.00001	0.000008	1999	0.0004	zero
Heptachlor epoxide	0.00001	0.00001	0.000006	1999	0.0002	zero
Hexachlorobenzene	0.001	0.0005	0.00003	2003	0.001	zero
Hexachlorocyclopentadiene	0.05	0.001	0.002	2014	0.05	0.05
Lindane	0.0002	0.0002	0.000032	1999 (rev2005)	0.0002	0.0002
Methoxychlor	0.03	0.01	0.00009	2010	0.04	0.04
Molinate	0.02	0.002	0.001	2008	--	--
Oxamyl	0.05	0.02	0.026	2009	0.2	0.2

State Regulated Non-Volatile Synthetic Organic Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Pentachlorophenol	0.001	0.0002	0.0003	2009	0.001	zero
Picloram	0.5	0.001	0.166	2016	0.5	0.5
Polychlorinated biphenyls (PCBs)	0.0005	0.0005	0.00009	2007	0.0005	zero
Simazine	0.004	0.001	0.004	2001	0.004	0.004
Thiobencarb	0.07	0.001	0.042	2016	--	--
Toxaphene	0.003	0.001	0.00003	2003	0.003	zero
1,2,3-Trichloropropane	0.000005	0.000005	0.0000007	2009	--	--
2,3,7,8-TCDD (dioxin)	3x10-8	5x10-9	5x10-11	2010	3x10-8	zero
2,4,5-TP (Silvex)	0.05	0.001	0.003	2014	0.05	0.05

Disinfection Byproducts Table, Chemicals with MCLs in 22 CCR §64533

State Regulated Disinfection Byproducts Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Total Trihalomethanes	0.080	--	--	--	0.080	--

State Regulated Disinfection Byproducts Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
Bromodichloromethane	--	0.0010	0.00006	2020	--	zero
Bromoform	--	0.0010	0.0005	2020	--	zero
Chloroform	--	0.0010	0.0004	2020	--	0.07
Dibromochloromethane	--	0.0010	0.0001	2020	--	0.06
Haloacetic Acids (five) (HAA5)	0.060	--	--	--	0.060	--
Monochloroacetic Acid	--	0.0020	--	--	--	0.07
Dichloroacetic Adic	--	0.0010	--	--	--	zero
Trichloroacetic Acid	--	0.0010	--	--	--	0.02
Monobromoacetic Acid	--	0.0010	--	--	--	--
Dibromoacetic Acid	--	0.0010	--	--	--	--
Bromate	0.010	0.0050**	0.0001	2009	0.01	zero
Chlorite	1.0	0.020	0.05	2009	1	0.8

Chemicals with PHGs established in response to DDW requests. These are not currently regulated drinking water contaminants.

State Regulated Disinfection Byproducts Contaminants	State MCL	State DLR	State PHG	State Date of PHG	Federal MCL	Federal MCLG
N-Nitrosodimethylamine (NDMA)	--	--	0.000003	2006	--	--

*OEHHA's review of this chemical during the year indicated (rev20XX) resulted in no change in the PHG.

**The DLR for Bromate is 0.0010 mg/L for analysis performed using EPA Method 317.0 Revision 2.0, 321.8, or 326.0.

Attachment 3

Health Risk Information for Public Health Goal Exceedance Reports February 2022

Public Health Goals

Health Risk Information for Public Health Goal Exceedance Reports

February 2022

Pesticide and Environmental Toxicology Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

Health Risk Information for Public Health Goal Exceedance Reports

Prepared by

Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

February 2022

NEW for the 2022 Report: New in this document are an updated Public Health Goal (PHG) for 1,2-dibromo-3-chloropropane (DBCP) and newly established PHGs for the trihalomethanes bromodichloromethane, bromoform, chloroform, and dibromochloromethane.

Background: Under the Calderon-Sher Safe Drinking Water Act of 1996 (the Act), public water systems with more than 10,000 service connections are required to prepare a report every three years for contaminants that exceed their respective PHGs.[1] This document contains health risk information on regulated drinking water contaminants to assist public water systems in preparing these reports. A PHG is the concentration of a contaminant in drinking water that poses no significant health risk if consumed for a lifetime. PHGs are developed and published by the Office of Environmental Health Hazard Assessment (OEHHA) using current risk assessment principles, practices and methods.[2]

The water system's report is required to identify the health risk category (e.g., carcinogenicity or neurotoxicity) associated with exposure to each regulated contaminant in drinking water and to include a brief, plainly worded description of these risks. The report is also required to disclose the numerical public health risk, if available, associated with the California Maximum Contaminant Level (MCL) and with the PHG for each contaminant. This health risk information document is prepared by OEHHA every three years to assist the water systems in providing the required information in their reports.

[1] Health and Safety Code Section 116470(b)
[2] Health and Safety Code Section 116365

Numerical health risks: Table 1 presents health risk categories and cancer risk values for chemical contaminants in drinking water that have PHGs.

The Act requires that OEHHA publish PHGs based on health risk assessments using the most current scientific methods. As defined in statute, PHGs for non-carcinogenic chemicals in drinking water are set at a concentration "at which no known or anticipated adverse health effects will occur, with an adequate margin of safety." For carcinogens, PHGs are set at a concentration that "does not pose any significant risk to health." PHGs provide one basis for revising MCLs, along with cost and technological feasibility. OEHHA has been publishing PHGs since 1997 and the entire list published to date is shown in Table 1.

Table 2 presents health risk information for contaminants that do not have PHGs but have state or federal regulatory standards. The Act requires that, for chemical contaminants with California MCLs that do not yet have PHGs, water utilities use the federal Maximum Contaminant Level Goal (MCLG) for the purpose of complying with the requirement of public notification. MCLGs, like PHGs, are strictly health based and include a margin of safety. One difference, however, is that the MCLGs for carcinogens are set at zero because the US Environmental Protection Agency (US EPA) assumes there is no absolutely safe level of exposure to such chemicals. PHGs, on the other hand, are set at a level considered to pose no *significant* risk of cancer; this is usually no more than a one-in-one-million excess cancer risk (1×10^{-6}) level for a lifetime of exposure. In Table 2, the cancer risks shown are based on the US EPA's evaluations.

For more information on health risks: The adverse health effects for each chemical with a PHG are summarized in a PHG technical support document. These documents are available on the OEHHA website (https://oehha.ca.gov/water/public-health-goals-phgs).

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Alachlor	carcinogenicity (causes cancer)	0.004	NA[5,6]	0.002	NA
Aluminum	neurotoxicity and immunotoxicity (harms the nervous and immune systems)	0.6	NA	1	NA
Antimony	hepatotoxicity (harms the liver)	0.001	NA	0.006	NA
Arsenic	carcinogenicity (causes cancer)	0.000004 (4×10^{-6})	1×10^{-6} (one per million)	0.01	2.5×10^{-3} (2.5 per thousand)
Asbestos	carcinogenicity (causes cancer)	7 MFL[7] (fibers >10 microns in length)	1×10^{-6}	7 MFL (fibers >10 microns in length)	1×10^{-6} (one per million)
Atrazine	carcinogenicity (causes cancer)	0.00015	1×10^{-6}	0.001	7×10^{-6} (seven per million)

[1] Based on the OEHHA PHG technical support document unless otherwise specified. The categories are the hazard traits defined by OEHHA for California's Toxics Information Clearinghouse (online at: https://oehha.ca.gov/media/downloads/risk-assessment//gcregtext011912.pdf).
[2] mg/L = milligrams per liter of water or parts per million (ppm)
[3] Cancer Risk = Upper bound estimate of excess cancer risk from lifetime exposure. Actual cancer risk may be lower or zero. 1×10^{-6} means one excess cancer case per million people exposed.
[4] MCL = maximum contaminant level.
[5] NA = not applicable. Cancer risk cannot be calculated.
[6] The PHG for alachlor is based on a threshold model of carcinogenesis and is set at a level that is believed to be without any significant cancer risk to individuals exposed to the chemical over a lifetime.
[7] MFL = million fibers per liter of water.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Barium	cardiovascular toxicity (causes high blood pressure)	2	NA	1	NA
Bentazon	hepatotoxicity and digestive system toxicity (harms the liver, intestine, and causes body weight effects[8])	0.2	NA	0.018	NA
Benzene	carcinogenicity (causes leukemia)	0.00015	1×10^{-6}	0.001	7×10^{-6} (seven per million)
Benzo[a]pyrene	carcinogenicity (causes cancer)	0.000007 (7×10^{-6})	1×10^{-6}	0.0002	3×10^{-5} (three per hundred thousand)
Beryllium	digestive system toxicity (harms the stomach or intestine)	0.001	NA	0.004	NA
Bromate	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.01	1×10^{-4} (one per ten thousand)
Cadmium	nephrotoxicity (harms the kidney)	0.00004	NA	0.005	NA
Carbofuran	reproductive toxicity (harms the testis)	0.0007	NA	0.018	NA

[8] Body weight effects are an indicator of general toxicity in animal studies.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Carbon tetrachloride	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.0005	5×10^{-6} (five per million)
Chlordane	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.0001	3×10^{-6} (three per million)
Chlorite	hematotoxicity (causes anemia) neurotoxicity (causes neurobehavioral effects)	0.05	NA	1	NA
Chromium, hexavalent	carcinogenicity (causes cancer)	0.00002	1×10^{-6}	none	NA
Copper	digestive system toxicity (causes nausea, vomiting, diarrhea)	0.3	NA	1.3 (AL[9])	NA
Cyanide	neurotoxicity (damages nerves) endocrine toxicity (affects the thyroid)	0.15	NA	0.15	NA
Dalapon	nephrotoxicity (harms the kidney)	0.79	NA	0.2	NA
Di(2-ethylhexyl) adipate (DEHA)	developmental toxicity (disrupts development)	0.2	NA	0.4	NA

[9] AL = action level. The action levels for copper and lead refer to a concentration measured at the tap. Much of the copper and lead in drinking water is derived from household plumbing (The Lead and Copper Rule, Title 22, California Code of Regulations [CCR] section 64672.3).

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Di(2-ethylhexyl) phthalate (DEHP)	carcinogenicity (causes cancer)	0.012	1×10^{-6}	0.004	3×10^{-7} (three per ten million)
1,2-Dibromo-3-chloropropane (DBCP)	carcinogenicity (causes cancer)	0.000003 ($3x10^{-6}$)	1×10^{-6}	0.0002	7×10^{-5} (seven per hundred thousand)
1,2-Dichloro-benzene (*o*-DCB)	hepatotoxicity (harms the liver)	0.6	NA	0.6	NA
1,4-Dichloro-benzene (*p*-DCB)	carcinogenicity (causes cancer)	0.006	1×10^{-6}	0.005	8×10^{-7} (eight per ten million)
1,1-Dichloro-ethane (1,1-DCA)	carcinogenicity (causes cancer)	0.003	1×10^{-6}	0.005	2×10^{-6} (two per million)
1,2-Dichloro-ethane (1,2-DCA)	carcinogenicity (causes cancer)	0.0004	1×10^{-6}	0.0005	1×10^{-6} (one per million)
1,1-Dichloro-ethylene (1,1-DCE)	hepatotoxicity (harms the liver)	0.01	NA	0.006	NA
1,2-Dichloro-ethylene, cis	nephrotoxicity (harms the kidney)	0.013	NA	0.006	NA
1,2-Dichloro-ethylene, trans	immunotoxicity (harms the immune system)	0.05	NA	0.01	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Dichloromethane (methylene chloride)	carcinogenicity (causes cancer)	0.004	1×10^{-6}	0.005	1×10^{-6} (one per million)
2,4-Dichloro-phenoxyacetic acid (2,4-D)	hepatotoxicity and nephrotoxicity (harms the liver and kidney)	0.02	NA	0.07	NA
1,2-Dichloro-propane (propylene dichloride)	carcinogenicity (causes cancer)	0.0005	1×10^{-6}	0.005	1×10^{-5} (one per hundred thousand)
1,3-Dichloro-propene (Telone II®)	carcinogenicity (causes cancer)	0.0002	1×10^{-6}	0.0005	2×10^{-6} (two per million)
Dinoseb	reproductive toxicity (harms the uterus and testis)	0.014	NA	0.007	NA
Diquat	ocular toxicity (harms the eye) developmental toxicity (causes malformation)	0.006	NA	0.02	NA
Endothall	digestive system toxicity (harms the stomach or intestine)	0.094	NA	0.1	NA
Endrin	neurotoxicity (causes convulsions) hepatotoxicity (harms the liver)	0.0003	NA	0.002	NA
Ethylbenzene (phenylethane)	hepatotoxicity (harms the liver)	0.3	NA	0.3	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Ethylene dibromide (1,2-Dibromoethane)	carcinogenicity (causes cancer)	0.00001	1×10^{-6}	0.00005	5×10^{-6} (five per million)
Fluoride	musculoskeletal toxicity (causes tooth mottling)	1	NA	2	NA
Glyphosate	nephrotoxicity (harms the kidney)	0.9	NA	0.7	NA
Heptachlor	carcinogenicity (causes cancer)	0.000008 (8×10^{-6})	1×10^{-6}	0.00001	1×10^{-6} (one per million)
Heptachlor epoxide	carcinogenicity (causes cancer)	0.000006 (6×10^{-6})	1×10^{-6}	0.00001	2×10^{-6} (two per million)
Hexachloroben-zene	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.001	3×10^{-5} (three per hundred thousand)
Hexachloro-cyclopentadiene (HCCPD)	digestive system toxicity (causes stomach lesions)	0.002	NA	0.05	NA
Lead	developmental neurotoxicity (causes neurobehavioral effects in children) cardiovascular toxicity (causes high blood pressure) carcinogenicity (causes cancer)	0.0002	$<1\times10^{-6}$ (PHG is not based on this effect)	0.015 (AL[9])	2×10^{-6} (two per million)

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Lindane (γ-BHC)	carcinogenicity (causes cancer)	0.000032	1×10^{-6}	0.0002	6×10^{-6} (six per million)
Mercury (inorganic)	nephrotoxicity (harms the kidney)	0.0012	NA	0.002	NA
Methoxychlor	endocrine toxicity (causes hormone effects)	0.00009	NA	0.03	NA
Methyl tertiary-butyl ether (MTBE)	carcinogenicity (causes cancer)	0.013	1×10^{-6}	0.013	1×10^{-6} (one per million)
Molinate	carcinogenicity (causes cancer)	0.001	1×10^{-6}	0.02	2×10^{-5} (two per hundred thousand)
Monochloro-benzene (chlorobenzene)	nephrotoxicity (harms the kidney)	0.07	NA	0.07	NA
Nickel	developmental toxicity (causes increased neonatal deaths)	0.012	NA	0.1	NA
Nitrate	hematotoxicity (causes methemoglobinemia)	45 as nitrate	NA	10 as nitrogen (=45 as nitrate)	NA
Nitrite	hematotoxicity (causes methemoglobinemia)	3 as nitrite	NA	1 as nitrogen (=3 as nitrite)	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Nitrate and Nitrite	hematotoxicity (causes methemoglobinemia)	10 as nitrogen[10]	NA	10 as nitrogen	NA
N-nitroso-dimethyl-amine (NDMA)	carcinogenicity (causes cancer)	0.000003 (3×10^{-6})	1×10^{-6}	none	NA
Oxamyl	general toxicity (causes body weight effects)	0.026	NA	0.05	NA
Pentachloro-phenol (PCP)	carcinogenicity (causes cancer)	0.0003	1×10^{-6}	0.001	3×10^{-6} (three per million)
Perchlorate	endocrine toxicity (affects the thyroid) developmental toxicity (causes neurodevelop-mental deficits)	0.001	NA	0.006	NA
Picloram	hepatotoxicity (harms the liver)	0.166	NA	0.5	NA
Polychlorinated biphenyls (PCBs)	carcinogenicity (causes cancer)	0.00009	1×10^{-6}	0.0005	6×10^{-6} (six per million)
Radium-226	carcinogenicity (causes cancer)	0.05 pCi/L	1×10^{-6}	5 pCi/L (combined $Ra^{226+228}$)	1×10^{-4} (one per ten thousand)

[10] The joint nitrate/nitrite PHG of 10 mg/L (10 ppm, expressed as nitrogen) does not replace the individual values, and the maximum contribution from nitrite should not exceed 1 mg/L nitrite-nitrogen.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Radium-228	carcinogenicity (causes cancer)	0.019 pCi/L	1×10^{-6}	5 pCi/L (combined $Ra^{226+228}$)	3×10^{-4} (three per ten thousand)
Selenium	integumentary toxicity (causes hair loss and nail damage)	0.03	NA	0.05	NA
Silvex (2,4,5-TP)	hepatotoxicity (harms the liver)	0.003	NA	0.05	NA
Simazine	general toxicity (causes body weight effects)	0.004	NA	0.004	NA
Strontium-90	carcinogenicity (causes cancer)	0.35 pCi/L	1×10^{-6}	8 pCi/L	2×10^{-5} (two per hundred thousand)
Styrene (vinylbenzene)	carcinogenicity (causes cancer)	0.0005	1×10^{-6}	0.1	2×10^{-4} (two per ten thousand)
1,1,2,2-Tetrachloro-ethane	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.001	1×10^{-5} (one per hundred thousand)
2,3,7,8-Tetra-chlorodibenzo-*p*-dioxin (TCDD, or dioxin)	carcinogenicity (causes cancer)	5×10^{-11}	1×10^{-6}	3×10^{-8}	6×10^{-4} (six per ten thousand)

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Tetrachloro-ethylene (perchloro-ethylene, or PCE)	carcinogenicity (causes cancer)	0.00006	1×10^{-6}	0.005	8×10^{-5} (eight per hundred thousand)
Thallium	integumentary toxicity (causes hair loss)	0.0001	NA	0.002	NA
Thiobencarb	general toxicity (causes body weight effects) hematotoxicity (affects red blood cells)	0.042	NA	0.07	NA
Toluene (methylbenzene)	hepatotoxicity (harms the liver) endocrine toxicity (harms the thymus)	0.15	NA	0.15	NA
Toxaphene	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.003	1×10^{-4} (one per ten thousand)
1,2,4-Trichloro-benzene	endocrine toxicity (harms adrenal glands)	0.005	NA	0.005	NA
1,1,1-Trichloro-ethane	neurotoxicity (harms the nervous system), reproductive toxicity (causes fewer offspring) hepatotoxicity (harms the liver) hematotoxicity (causes blood effects)	1	NA	0.2	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
1,1,2-Trichloro-ethane	carcinogenicity (causes cancer)	0.0003	$1x10^{-6}$	0.005	2×10^{-5} (two per hundred thousand)
Trichloro-ethylene (TCE)	carcinogenicity (causes cancer)	0.0017	1×10^{-6}	0.005	3×10^{-6} (three per million)
Trichlorofluoro-methane (Freon 11)	accelerated mortality (increase in early death)	1.3	NA	0.15	NA
1,2,3-Trichloro-propane (1,2,3-TCP)	carcinogenicity (causes cancer)	0.0000007 (7×10^{-7})	$1x10^{-6}$	0.000005 (5×10^{-6})	7×10^{-6} (seven per million)
1,1,2-Trichloro-1,2,2-trifluoro-ethane (Freon 113)	hepatotoxicity (harms the liver)	4	NA	1.2	NA
Trihalomethanes: Bromodichloro-methane	carcinogenicity (causes cancer)	0.00006	$1x10^{-6}$	0.080*	1.3×10^{-3} (1.3 per thousand)[11]
Trihalomethanes: Bromoform	carcinogenicity (causes cancer)	0.0005	$1x10^{-6}$	0.080*	2×10^{-4} (two per ten thousand)[12]

* For total trihalomethanes (the sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane). There are no MCLs for individual trihalomethanes.

[11] Based on 0.080 mg/L bromodichloromethane; the risk will vary with different combinations and ratios of the other trihalomethanes in a particular sample.

[12] Based on 0.080 mg/L bromoform; the risk will vary with different combinations and ratios of the other trihalomethanes in a particular sample.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Trihalomethanes: Chloroform	carcinogenicity (causes cancer)	0.0004	$1x10^{-6}$	0.080*	2×10^{-4} (two per ten thousand)[13]
Trihalomethanes: Dibromochloro-methane	carcinogenicity (causes cancer)	0.0001	$1x10^{-6}$	0.080*	8×10^{-4} (eight per ten thousand)[14]
Tritium	carcinogenicity (causes cancer)	400 pCi/L	$1x10^{-6}$	20,000 pCi/L	5×10^{-5} (five per hundred thousand)
Uranium	carcinogenicity (causes cancer)	0.43 pCi/L	1×10^{-6}	20 pCi/L	5×10^{-5} (five per hundred thousand)
Vinyl chloride	carcinogenicity (causes cancer)	0.00005	1×10^{-6}	0.0005	1×10^{-5} (one per hundred thousand)
Xylene	neurotoxicity (affects the senses, mood, and motor control)	1.8 (single isomer or sum of isomers)	NA	1.75 (single isomer or sum of isomers)	NA

* For total trihalomethanes (the sum of bromodichloromethane, bromoform, chloroform, and dibromochloromethane). There are no MCLs for individual trihalomethanes.
[13] Based on 0.080 mg/L chloroform; the risk will vary with different combinations and ratios of the other trihalomethanes in a particular sample.
[14] Based on 0.080 mg/L dibromochloromethane; the risk will vary with different combinations and ratios of the other trihalomethanes in a particular sample.

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

Chemical	Health Risk Category[1]	US EPA MCLG[2] (mg/L)	Cancer Risk[3] at the MCLG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Disinfection byproducts (DBPs)					
Chloramines	acute toxicity (causes irritation) digestive system toxicity (harms the stomach) hematotoxicity (causes anemia)	4[5,6]	NA[7]	none	NA
Chlorine	acute toxicity (causes irritation) digestive system toxicity (harms the stomach)	4[5,6]	NA	none	NA
Chlorine dioxide	hematotoxicity (causes anemia) neurotoxicity (harms the nervous system)	0.8[5,6]	NA	none	NA
Disinfection byproducts: haloacetic acids (HAA5)					
Monochloroacetic acid (MCA)	general toxicity (causes body and organ weight changes[8])	0.07	NA	none	NA

[1] Health risk category based on the US EPA MCLG document or California MCL document unless otherwise specified.
[2] MCLG = maximum contaminant level goal established by US EPA.
[3] Cancer Risk = Upper estimate of excess cancer risk from lifetime exposure. Actual cancer risk may be lower or zero. 1×10^{-6} means one excess cancer case per million people exposed.
[4] California MCL = maximum contaminant level established by California.
[5] Maximum Residual Disinfectant Level Goal, or MRDLG.
[6] The federal Maximum Residual Disinfectant Level (MRDL), or highest level of disinfectant allowed in drinking water, is the same value for this chemical.
[7] NA = not available.
[8] Body weight effects are an indicator of general toxicity in animal studies.

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

Chemical	Health Risk Category[1]	US EPA MCLG[2] (mg/L)	Cancer Risk[3] at the MCLG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Dichloroacetic acid (DCA)	Carcinogenicity (causes cancer)	0	0	none	NA
Trichloroacetic acid (TCA)	hepatotoxicity (harms the liver)	0.02	NA	none	NA
Monobromoacetic acid (MBA)	NA	none	NA	none	NA
Dibromoacetic acid (DBA)	NA	none	NA	none	NA
Total haloacetic acids (sum of MCA, DCA, TCA, MBA, and DBA)	general toxicity, hepatotoxicity and carcinogenicity (causes body and organ weight changes, harms the liver and causes cancer)	none	NA	0.06	NA
Radionuclides					
Gross alpha particles[9]	carcinogenicity (causes cancer)	0 (^{210}Po included)	0	15 pCi/L[10] (includes radium but not radon and uranium)	up to $1x10^{-3}$ (for ^{210}Po, the most potent alpha emitter)

[9] MCLs for gross alpha and beta particles are screening standards for a group of radionuclides. Corresponding PHGs were not developed for gross alpha and beta particles. See the OEHHA memoranda discussing the cancer risks at these MCLs at http://www.oehha.ca.gov/water/reports/grossab.html.

[10] pCi/L = picocuries per liter of water.

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

Chemical	Health Risk Category[1]	US EPA MCLG[2] (mg/L)	Cancer Risk[3] at the MCLG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Beta particles and photon emitters[9]	carcinogenicity (causes cancer)	0 (^{210}Pb included)	0	50 pCi/L (judged equiv. to 4 mrem/yr)	up to $2x10^{-3}$ (for ^{210}Pb, the most potent beta-emitter)