



Perchlorate in California Drinking Water: Status of Regulations and Monitoring Results

Last Update: April 1, 2003

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No state or federal drinking water standard—also called a maximum contaminant level (MCL)—exists for perchlorate. DHS will be adopting an MCL soon (see [MCL Update](#)).

Until an MCL is in place, DHS uses a 4-microgram per liter ($\mu\text{g}/\text{L}$) advisory [action level](#) to protect consumers from perchlorate's adverse health effects.

Monitoring Update

[Click here for the monitoring update](#)

Drinking Water Vulnerability to Perchlorate

California's [early findings \(1997\)](#) showed perchlorate to be a drinking water contaminant. Since then, 20 states have confirmed perchlorate releases in ground or surface water. Disposal of large volumes of perchlorate has occurred since the 1950s (US EPA, 2002).

Recognizing facilities, processes or products that use or contain perchlorate can be helpful in identifying activities that may affect drinking water supplies.

According to US EPA (2002), perchlorate (an oxidizing anion that originates from the dissolution of ammonium, potassium, magnesium, or sodium salts) is exceedingly mobile in aqueous systems, persisting for many decades under conditions typical for ground and surface water.

Ammonium perchlorate is the primary ingredient in solid propellant for rockets, missiles, and fireworks. Perchlorate salts are used on a large scale as a component of air bag inflators, and also in nuclear reactors and electronic tubes, as additives in lubricating oils, in tanning and finishing leather, as a mordant for fabrics and dyes, in electroplating, in aluminum refining, and in rubber manufacture, and in the production of paints and enamels. Chemical fertilizer has been reported as a potential source of perchlorate contamination, but US EPA, based on new investigations, does not consider it to be an issue for agricultural applications (US EPA, 2002).

Perchlorate is also used in the manufacture of matches, flares, pyrotechnics, ordnance, and explosives, and in analytical chemistry.

For examples of sites with perchlorate contamination, see:

- [State Water Resources Control Board/Department of Toxic Substances Control](#)
- [Los Angeles Regional Water Quality Control Board](#)
- [Santa Ana Regional Water Quality Control Board](#)
- Central Coast Regional Water Quality Control Board reports, courtesy of the [Santa Clara Valley Water District](#)

For information about perchlorate-related activities at the federal level, see the [US EPA Office of Water](#).

MCL Update

Health and Safety Code §116275 [Chapter 425, Statutes of 2002, SB 1822 (Sher)] requires DHS to adopt an MCL for perchlorate by January 1, 2004.

Health and Safety Code §116365(a) requires DHS, while placing primary emphasis on the protection of public health, to establish a contaminant's MCL at a level as close as is technically and economically feasible to its [public health goal \(PHG\)](#). A PHG is the contaminant's concentration in drinking water that does not pose any significant risk to health, derived from a human health risk assessment.

As part of the MCL process, DHS will evaluate the technical and economic feasibility of regulating perchlorate. Technical feasibility includes an evaluation of commercial laboratories' ability to analyze for and detect perchlorate in drinking water, the costs of monitoring, and the costs of treatment required to remove perchlorate. Costs are required by law to be considered whenever MCLs are adopted.

To determine the technical and economic feasibility, DHS will

- receive the perchlorate PHG from the Office of Environmental Health Hazard Assessment ([OEHHA](#))
- select possible draft perchlorate MCL concentrations for evaluation
- evaluate the occurrence data
- evaluate available analytical methods and estimate monitoring costs at various draft MCL concentrations
- estimate population exposures at various draft MCL concentrations of perchlorate
- identify best available technologies for perchlorate treatment
- estimate treatment costs at the possible draft MCL concentrations
- review the costs and associated health benefits (health risk reductions) that result from perchlorate treatment at the possible draft MCL concentrations
- select an MCL for proposal from the possible draft MCL concentrations considered above

Then the proposed MCL moves through the [regulatory process](#).

PHG Update

Health and Safety Code §116275 requires OEHHA to establish a perchlorate PHG by January 1, 2003.

OEHHA released a revised draft PHG of 2- to 6-µg/L PHG, based on the inhibitory effect of perchlorate on the uptake of iodide by the thyroid gland (OEHHA, 2002). The perchlorate [action level page](#) includes information about the derivation of the draft PHG.

References

OEHHA, 2002, [Public Health Goal for Perchlorate in Drinking Water](#), Draft, Office of Environmental Health Hazard Assessment, December.

US EPA, 2002, *Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization*, External Review Draft, National Center for Environmental Assessment (NCEA), NCEA-1-0503, January 16. [Go to [NCEA's perchlorate reports](#)]

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Drinking Water Action Level for Perchlorate

Last Update: March 14, 2003

DHS uses a 4- $\mu\text{g/L}$ action level for [perchlorate in drinking water](#), to protect consumers from its adverse health effects—the inhibition of iodide uptake by the thyroid gland, and the resulting decrease in production of thyroid hormones, which are needed for prenatal and postnatal growth and development, as well as for normal body metabolism. The 4- $\mu\text{g/L}$ concentration corresponds to perchlorate's detection limit for purposes of reporting (DLR).

Detections of perchlorate greater than the action level, like [action levels for other unregulated contaminants](#), require local government notification by the water system, and prompt DHS recommendations for consumer notification. At perchlorate levels greater than 40 $\mu\text{g/L}$, DHS recommends that water system remove the source from service.

DHS first established an action level following its [perchlorate findings in 1997](#) when, in cooperation with the Office of Environmental Health Hazard Assessment (OEHHA), it reviewed US EPA's 1992 and 1995 evaluations of perchlorate. US EPA, as part of its Superfund activities, had developed a "provisional" reference dose (RfD) for perchlorate, based on the chemical's effects on the thyroid gland. DHS established an 18- $\mu\text{g/L}$ action level, which corresponded to the upper value of the 4- to 18- $\mu\text{g/L}$ range that resulted from US EPA's provisional RfD.

With the 2002 release of revised US EPA's draft RfD, which corresponded to a perchlorate concentration in drinking water of 1 $\mu\text{g/L}$, DHS concluded that its perchlorate action level needed to be revised downward. Accordingly, on January 18, 2002, DHS reduced the perchlorate action level to 4 $\mu\text{g/L}$, the lower value of the 4- to 18- $\mu\text{g/L}$ range that resulted from the earlier provisional RfD (and, as mentioned above, a value equal to its DLR).

In December 2002, OEHHA released a revised draft perchlorate Public Health Goal (PHG), proposing a concentration of 2 to 6 $\mu\text{g/L}$. OEHHA's PHG, when final, contributes to DHS's development of an [MCL for perchlorate](#). In the meantime, DHS will continue to utilize the 4- $\mu\text{g/L}$ action level.

A comparison of US EPA's assessments and OEHHA's draft PHG is presented in Table 1.

Parameter	USEPA (1992 & 1995)	US EPA (2002) draft	OEHHA (2002) draft
No or lowest observed adverse effect level (NOAEL or LOAEL)(mg/kg/day)	0.14	0.01	0.007
Uncertainty Factor (UF) (product of the following	300-	300	30

factors, e.g., 10 x 10 x 10)	1,000	---	--
— intrahuman variability (among people)	10	3	10
— short-term, not chronic studies	10	3	--
— deficiencies in data	3-10	3	3
— interspecies extrapolation	--	--	--
— LOAEL rather than NOAEL	--	10	--
Reference Dose (RfD) = NOAEL/UF, or LOAEL/UF (mg/kg/day)	0.0001-0.0005	0.00003	0.0002
Relative Source Contribution = the contribution of exposure allocated to drinking water (DW)	--	--	0.8
Corresponding DW concentration ($\mu\text{g/L}$) for adult; assumptions = 2 L/day consumption and body weight of 70-kg (US EPA) and 65-kg pregnant woman (OEHHA)	4 to 18	1	2*to 6
Corresponding DW concentration ($\mu\text{g/L}$) for child; assumptions = 1 L/day consumption and 10-kg body weight	1 to 5	0.3	2
*OEHHA also used a benchmark dose method for calculating the draft PHG, which converged around perchlorate concentrations of 2 $\mu\text{g/L}$ for the pregnant woman, lactating woman, and infant			

References

OEHHA, 2002, [Public Health Goal for Perchlorate in Drinking Water](#), Draft, Office of Environmental Health Hazard Assessment, December.

US EPA, 1992, Provisional Non-cancer and Cancer Toxicity Values for Potassium Perchlorate (CASRN 7778-74-7) (Aerojet General Corp./CA), Memorandum from Joan S. Dollarhide, Superfund Health Risk Technical Support Center, Environmental Criteria and Assessment Office, Office of Research and Development, to Dan Stralka, US EPA Region IX.

US EPA, 1995, Correspondence from Joan S. Dollarhide, National Center for Environmental Assessment, Office of Research and Development, to Mike Girrard, Chairman, Perchlorate Study Group.

US EPA, 2002, *Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization*, External Review Draft, National Center for Environmental Assessment, NCEA-1-0503, January 16, 2002. [Go to [NCEA's perchlorate reports](#)]

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Perchlorate in California Drinking Water: Monitoring Update

Last Update: April 1, 2003

Soon after DHS' [1997 perchlorate findings](#) in drinking water, public water systems began their own monitoring. In 1999, DHS adopted a regulation that added perchlorate to the list of [unregulated chemicals requiring monitoring](#). (Perchlorate's detection limit for purposes of reporting data from [laboratory analyses](#) is 4 µg/L, the same as its [action level](#).)

There are ~4,400 community systems and non-transient non-community systems that have ~12,000 drinking water sources. Of these systems, those that are vulnerable to contamination are subject to the [unregulated contaminant monitoring regulations](#). Systems with fewer than 150 service connections may be exempted from the monitoring requirement.

Since 1997, 1,024 public water systems have reported the results of their perchlorate monitoring, and 83 of them reported detections. Not all of these systems' sources may have been sampled to date. The 1,024 systems serve 28.3 million of the state's 35 million people, or ~81% of the population.

Findings have been primarily in groundwater sources in the counties of Los Angeles, San Bernardino, and Riverside, as well as sources containing water from the Colorado River. Results from 5,592 drinking water sources—which may include both raw and treated sources, distribution systems, blending reservoirs, and other sampled entities—show perchlorate detections reported in 315 sources (see footnote 2 in the following table).

Perchlorate in Drinking Water Sources (Year Initially Found) ^{1,2,3}									
County	1997	1998	1999	2000	2001	2002	2003	Total Sources	No. of Systems
Los Angeles	53	30	15	9	6	12	1	126	37
Orange	0	18	0	0	0	7	1	26	8
Riverside	15	6	5	11	7	10	1	55	8
Sacramento	10	2	0	1	0	0	0	13	3
San Bernardino	34	1	1	7	30	5	0	78	16
Others ⁴	0	1	2	4	8	2	0	17	11
TOTAL	112	58	23	32	51	36	3	315	83

¹ Data are draft (they may change with subsequent updates)

² This table presents [sources with more than one perchlorate detection](#), and does not include agricultural sources, monitoring wells, or more than one representation of the same source (e.g., a source with both raw *and* treated entries is counted as a single source).

³ ...

³ As of April 1, 2003

⁴ Sources from the counties of Tulare (7 sources), Santa Clara (6), Ventura (2), San Diego (1) and Sonoma (1)

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