PASADENA WATER AND POWER

REPORT ON CITY'S WATER QUALITY RELATIVE TO PUBLIC HEALTH GOALS

June 2010

BACKGROUND

The California legislature has established criteria for adopting Maximum Contaminant Levels (MCLs) in drinking water by creating the concept of a Public Health Goal (PHG). A PHG is a health risk assessment, not a proposed drinking water standard. It is the level of a contaminant in drinking water, which is considered not to pose a significant risk to health if consumed for a lifetime. This determination is made without regard to cost or treatability. The California Department of Public Health (CDPH) uses PHGs to identify MCLs that are to be reviewed for possible revision or when setting MCLs for unregulated chemicals.

Provisions of the California Health and Safety Code Section 116470 (b) (Attachment 1) requires that large water utilities (>10,000 service connections) prepare a special report by July 1, 2010 if their water quality measurements have exceeded any PHGs. The law also requires that where California Office of Environmental Health Hazard Assessment (OEHHA) has not adopted a PHG for a contaminant, the water suppliers are to use the Maximum Contaminant Level Goal (MCLG) adopted by the United States Environmental Protection Agency (USEPA). MCLGs are the federal equivalent to PHGs, but are not identical. Only constituents, which have a California primary drinking water standard and for which either a PHG or MCLG has been set are to be addressed in this report. Attachment 2 is a list of all regulated constituents with MCLs and PHGs or MCLGs shown.

There are a few constituents that are routinely detected in water systems at levels usually well below the drinking water standards for which no PHG nor MCLG has yet been adopted by OEHHA or USEPA including Total Trihalomethanes (TTHMs). These will be addressed in future required reports after PHGs or MCLGs have been adopted.

This report provides the following information as specified in the Health and Safety Code (Attachment 1) for any constituent detected in the City of Pasadena's (City) water supply in 2007, 2008, and 2009 at a level exceeding an applicable PHG or MCLG:

- Numerical public health risk associated with the MCL and the PHG or MCLG
- Category or type of risk to health that could be associated with each constituent
- Best Available Treatment Technology that could be used to reduce the constituent level
- Estimate of the cost to install that treatment if it is appropriate and feasible

WHAT ARE PHGs?

- PHGs are set by the California Office of Environmental Health Hazard Assessment (OEHHA), which is part of California EPA.
- PHGs are based solely on public health risk considerations. None of the risk-management factors that are considered by the USEPA or the CDPH in setting drinking water standards are considered in setting the PHGs. These factors include analytical detection capabilities, treatment technology available, benefits and costs.
- PHGs are not enforceable and are not required to be met by any public water system. MCLGs are federal equivalent to PHGs and are set by the USEPA.

WATER QUALITY DATA CONSIDERED

All of the water quality data collected for our water system from 2007, 2008 and 2009 for purposes of determining compliance with drinking water standards was considered. This information was all summarized in our 2007, 2008 and 2009 Annual Consumer Confidence Reports on water quality, which were mailed to all of our customers in June 2007, 2008 and 2009.

Most of the constituents in the water delivered to our customers are reported as ND or "not detected". This generally means that the laboratory report indicated that the compound was not detected, but it could also mean that it was detected at a level less than the State's Detection Level for purposes of Reporting (DLR).

GUIDELINES FOLLOWED

The Association of California Water Agencies (ACWA) formed a workgroup, which prepared guidelines for water utilities to use in preparing the PHG reports. These guidelines were used in the preparation of our report. No general guidelines are available from the state regulatory agencies.

ACWA's workgroup also prepared guidelines for water utilities to use in estimating the costs to reduce a constituent to the MCL. Attachment 3 provides cost estimates for the best treatment technologies, which are available today.

BEST AVAILABLE TREATMENT TECHNOLOGY AND COST ESTIMATES

Both the USEPA and CDPH have adopted what are known as Best Available Technologies (BAT), which are the best known methods of reducing contaminant levels. Capital construction and operation and maintenance (O&M) costs can be estimated for such technologies. However, since many PHGs and MCLGs are set much lower than the MCL, it is not always possible nor feasible to determine what treatment is needed to further reduce a constituent down to or near the PHG or MCLG. For example, USEPA sets the MCLG for potential cancer-causing chemicals at zero. Estimating the costs to reduce a constituent to zero is difficult, if not impossible, because it is not possible to verify by analytical means that the level has been lowered to zero. In some cases, installing treatment to try and further reduce very low levels of one constituent may have adverse effects on other aspects of water quality.

CONSTITUENTS DETECTED THAT EXCEED A PHG OR A MCLG

The following is a discussion of constituents that were detected in one or more of our drinking water sources at levels exceeding the PHG, or if no PHG, above the MCLG. The City, using multiple treatment methods approved by CDPH, consistently delivers safe water at the lowest possible cost to our customers. Constituents that were detected in one or more of our drinking water sources at levels above the MCLs were reduced to acceptable levels. The health risk information for regulated constituents with MCLs, PHGs or MCLGs is provided in Attachment 2.

Trichloroethylene (TCE)

The PHG for TCE is 0.0017 milligrams per liter (mg/L). The MCL or drinking water standard for TCE is 0.005 mg/L. TCE is a volatile organic compound (VOC) that has primarily been released into the environment by industries that use solvents.

In 2008 and 2009, Pasadena Water and Power (PWP) detected TCE in its Copelin Well at concentrations ranging from 0.0048 – 0.00923 mg/L.

The Sunset Reservoir acts as a blending facility for a total of five wells, which includes Sunset, Copelin, Bangham, Garfield and Villa Wells. Groundwater from these wells is pumped directly into the reservoir where it is blended with imported water purchased from Metropolitan Water District of Southern California (MWD). Because there is no treatment of the groundwater entering the Sunset Reservoir, a small amount of TCE at concentrations ranging from 0.00038 – 0.0008 mg/L can enter the distribution system through the blended supply. At no time did the level of any individual VOC in the blended water exceed the MCL.

The category of health risk associated with TCE, and the reason that a drinking water standard was adopted for it, is that people who drink water containing TCE above the MCL for many years could experience an increased risk of getting cancer. CDPH says that "Drinking water, which meets this standard (the MCL), is associated with little to none of this risk and should be considered safe with respect to TCE." This language is taken from the California Code of Regulations (CCR) Title 22, Section 64468.2. The numerical health risk of ingesting drinking water with TCE at the PHG is $1X10^{-6}$, or one additional theoretical cancer case in one million people drinking two liters of water a day for 70 years.

BAT for TCE to reduce the concentration level below the MCL is either Granular Activated Carbon (GAC) or Packed Aeration Tower (PAT). The estimated cost to install, lease and operate such a treatment system to treat Sunset Well, Bangham Well and Copelin Well at the Sunset Reservoir that would reliably reduce the TCE level to 0.0017 mg/L and would cost $1.80 per 1,000 gallons of treated water using GAC treatment.

Tetrachloroethylene (PCE)

The PHG for tetrachloroethylene (PCE) is 0.00006 mg/L and the California MCL is 0.005 mg/L. PCE is also a volatile organic compound that has been released into the environment by industries that use solvents.

PCE was detected in 2007 to 2009 in Copelin Well and Bangham Well, at concentrations ranging from 0.0027 mg/L to 0.005 mg/L and 0.0005 mg/L to 0.0008 mg/L respectively.

The Sunset Reservoir acts as a blending facility for a total of five wells, which includes Sunset, Copelin, Bangham, Garfield and Villa Wells. Groundwater from these wells is pumped directly into the reservoir where it is blended with imported water purchased from MWD. Because there is no treatment of the groundwater entering the Sunset Reservoir, a small amount of PCE at concentrations ranging from 0.000021 – 0.00055 mg/L can enter the distribution system through the blended supply. All these measurements were at or below California MCL. CDPH says that "Drinking water which meets this standard (the MCL) is associated with little to none of this risk and should be considered safe with respect to PCE." This language is taken from the CCR, Title 22, Section 64468.2. The numerical health risk of ingesting drinking water with PCE at the PHG is $1X10^{-6}$

As with TCE, the BAT for PCE to lower the PHG is either by GAC or PAT. The estimated cost to install, lease and operate such a treatment system to treat Bangham Well and Copelin Well at the Sunset Reservoir that would reduce the PCE level by an estimated 95% using GAC treatment and would cost approximately $1.80 per 1,000 gallons of treated water.

Total Coliform Bacteria

Total coliform bacteria are measured at points in the City's distribution system. No more than 5% of all samples collected in a month can be positive for total coliforms. This defines the MCL. The MCLG is zero positive samples. No PHG exists for total coliform bacteria. The reason for the total coliform drinking water standard is to minimize the possibility of the water containing pathogens, which are organisms that cause waterborne disease. Because total coliform analysis is 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 persons would occur," they indicate that they cannot do so with total coliforms.

During 2007-2009, PWP collected between 129 and 165 samples each month for total coliform analysis. Occasionally, a sample was found to be positive for coliform bacteria, but follow-up actions were taken and check samples were negative. A maximum of 1.5% of these samples were positive in any month in 2007; 0.75% of these samples were positive in any month in 2008; 1.21% of these samples were positive in any month in 2009.

Coliform bacteria are group indicator organisms that are ubiquitous in nature and are not generally considered harmful. They are used because of the ease in monitoring and analysis. If a positive sample is found, it indicates a potential problem that needs to be investigated with follow-up sampling. It is not unusual for a system to have an occasional positive sample. It is difficult, if not impossible; to assure that a water system will never have a positive sample.

PWP is working closely with its regional water supplier, MWD, and has instituted new disinfection procedures to provide for a slightly higher disinfectant residual. MWD's disinfectant is chloramine, a combination of chlorine and ammonia. The City adds chlorine at our wells to ensure that the water served is microbiologically safe. The careful balance of treatment processes used is essential to continue supplying our customers with safe drinking water.

We have taken all of the steps described by CDPH as "best available technology" for coliform bacteria in Section 64447, Title 22 of the California Code of Regulations (CCR). These include: an effective cross-connection control program to protect our wells and the distribution system from coliform contamination; maintenance of a disinfectant residual throughout our system; an effective monitoring and surveillance program; and maintaining positive pressures in our distribution system.

Nitrate

The MCL and PHG for nitrate are set at 45 mg/L. Nitrate in drinking water at levels above the MCL of 45 mg/L is a health risk for infants of less than six months of age. High nitrate levels in drinking water can interfere with the capacity of an infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. However, drinking water that meets the nitrate MCL/PHG is associated with little to no risk and is considered safe for consumption. Nitrate contamination of the groundwater is a result of agricultural and residential use of fertilizers and septic systems.

In 2007-2009, PWP detected nitrate in Copelin Well once at 45.5 mg/L. The City operates Sunset Reservoir under a nitrate blending plan. This plan includes blending of water from Bangham, Copelin, Sunset, Garfield, and Villa wells with MWD water, which contains very low nitrates. This operation reduces the average concentration of nitrates in the City's distribution system.

The BAT for nitrate removal is ion exchange or reverse osmosis. Of the two, ion exchange is the most cost effective. The estimated costs to install and operate a treatment system that lowers nitrate levels is $3.25 - $4.20 per 1,000 gallons of treated water.

Fluoride

The fluoride MCL set by CDPH is 2.0 mg/L. The PHG is 1.0 mg/L. PWP detected naturally occurring fluoride at concentrations ranging from 0.3 – 1.5 mg/L in five wells. The levels detected were below the MCL at all times. Water from these wells is blended with MWD water with a resulting concentration of fluoride at 0.42 – 1.57 mg/L in our community drinking water.

MWD started fluoridating their water in October 2007 at an average concentration of 0.8 mg/L, which brings the average fluoride content to 0.96 mg/L before it is delivered to the customer. The category of health risk associated with fluoride is tooth mottling.

The BAT for fluoride removal is ion exchange, reverse osmosis, or electrodialysis. Of the three, ion exchange is the most cost effective. The costs to install and operate a treatment system that lowers fluoride levels below PHG is estimated at an annual cost of $38 per customer.

Perchlorate

Both the PHG and the California MCL for perchlorate are set at 0.006 mg/L. Perchlorate's interference with iodide uptake by the thyroid gland can decrease production of thyroid hormones, which are needed for prenatal and postnatal growth and development, as well as for normal metabolism and mental function in adults.

Perchlorate contamination of the groundwater is a result of its use to make rocket fuel, missiles, fireworks and road flares. The City, in collaboration with National Aeronautics and Space Administration (NASA) is building the Monk Hill Well Treatment Plant to bring into service four wells (Windsor, Ventura, Arroyo and Well 52) that have been contaminated with perchlorate. The treatment plant is scheduled for completion by early 2011.

In 2007-2009, PWP detected perchlorate in its Bangham, Copelin and Villa Wells at concentrations ranging from 0.006-0.0132 mg/L. The City operates Sunset Reservoir under a perchlorate blending plan. This plan includes blending water from Garfield, Copelin, Sunset, Bangham and Villa wells with MWD water, which has non detectable levels of perchlorates. This operation reduces the average concentration of perchlorates in the City's distribution system.

The BAT for perchlorate removal is ion exchange. The estimated costs to install and operate a treatment system that lowers perchlorate levels is $1 per 1,000 gallons of treated water.

Lead and Copper

There are no MCLs for lead or copper. Instead, the 90th percentile value of all samples collected by the City from household taps cannot exceed an Action Level of 0.015 mg/L for lead and 1.3 mg/L for copper. The PHG for lead is 0.0002 mg/L. The PHG for copper is 0.30 mg/L.

The category of health risk for lead is damage to the kidneys or nervous system of humans. The category of health risk for copper is gastrointestinal irritation. Numerical health risk data on lead and copper have been provided by OEHHA, the State agency responsible for providing that information. OEHHA determined that the numerical cancer risk was "not applicable because the risk is acute, not carcinogenic.

Based on extensive sampling of customers' homes identified as high risk (new plumbing installed with lead solder) for plumbing materials leaching into tap water, the City's 90th percentile value for lead measured in 2008, was <0.005 mg/L and 0.170 mg/L for copper.

The City's water system and water sources are in full compliance with the Federal and State Lead and Copper Rule. Therefore, we are deemed by CDPH to have "optimized corrosion control" for our system. As a system, which is "optimized," we are required to start the next monitoring cycle for lead and copper by July 2011.

In general, optimizing corrosion control is considered to be the BAT to deal with corrosion issues and with any lead or copper findings. We continue to monitor our water quality parameters that relate to corrosivity, such as the pH, hardness, alkalinity, total dissolved solids, and will take action if necessary to maintain our system in an "optimized corrosion control" condition.

Since we meet the "optimized corrosion control" requirements, it is not necessary or prudent to initiate additional corrosion control treatment as it involves the addition of other chemicals and additional water quality issues could be raised. Therefore, no estimate of cost has been included.

Arsenic

The PHG for arsenic is 0.000004 mg/L. The California MCL for arsenic is 0.01 mg/L. Arsenic is a metallic element and it is both naturally occurring and released into the environment because of its use in agricultural pesticides and in chemicals for timber preservation.

Arsenic was detected in five wells at 0.001 mg/L – 0.002 mg/L. These values are well below the MCL, but exceeded the PHG. These wells are blended with MWD water, which reduced the concentration in the City's distribution system.

The category of health risk associated with arsenic is that people who drink water containing arsenic above the MCL for many years could experience an increased risk of getting cancer. The numerical health risk of ingesting drinking water with arsenic at the PHG is $4X10^{-6}$, or four additional theoretical cancer cases in one million people drinking two liters of water a day for 70 years.

The BAT for arsenic removal is either ion exchange or reverse osmosis. Ion exchange is the more cost effective of these two technologies. The estimated cost to install, lease and operate an ion exchange system that reduces arsenic levels is estimated at $1.10 million initial investment and $0.84 per 1000 gallons of treated water.

Uranium

The PHG for uranium is 0.43 picoCuries per liter (pCi/L) and the MCL is 20 pCi/L. Uranium is a metallic element, which is weakly radioactive and naturally occurring in the environment.

PWP conducted monitoring of uranium in water samples collected from its wells. Uranium was detected at 17.0 picoCuries per liter (pCi/L) in Copelin Well in 2008, 13.5 pCi/L for Well 58 in 2007 and 2008, 11 pCi/L for Bangham Well in 2007 and 2008, 3.3 pCi/L in Villa Well in 2007, 2 pCi/L in Woodbury Well in 2007, and 9.8 pCi/L in Well 59 in 2007 and 2008. The levels detected in our system were below the MCL at all times, but were over the PHG's.

OEHHA determined that the numerical cancer risk for uranium at the PHG level is $1x10^{-6.}$ The CDPH, which sets drinking water standards, has determined that uranium is a health concern at certain levels of exposure. This radiological constituent is a naturally occurring contaminant in some groundwater and surface water supplies. Exposure to uranium in drinking water may result in toxic effects to the kidney. This constituent has also been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Constituents that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. CDPH has set the drinking water standard for uranium at 20 pCi/L to reduce the risk of cancer or other adverse health affects that have been observed in laboratory animals.

The BAT identified to treat radiological contaminants is reverse osmosis (RO). The most effective and economical treatment system is to use RO treatment at select plant and surface water connection sites. We have determined that the cost to install and operate a RO removal system to treat the wells and surface water connection in order to meet the PHG levels would be approximately $30 million annually, which includes construction and annual operational cost. This translates into an annual cost of $790 per customer.

Gross Alpha

Although there is no PHG for gross alpha, the MCLG is zero and the MCL is 15 pCi/L. Gross alpha is a radiological compound that is naturally occurring in the environment.

PWP conducted monitoring of gross alpha particles in water samples collected from its wells. Gross alpha was detected in Bangham Well at 11 pCi/L in 2007 and 4.9 pCi/L in 2008, 16 pCi/L in Copelin Well in 2008, 3 pCi/L in Villa Well in 2007, 14 pCi/L and 10.7 pCi/L in Twombly Well in 2007 and 7.9 pCi/L in 2008, 9.8 pCi/L in Wadsworth Well in 2007 and 7 pCi/L in 2008 and 3pCi/L in Woodbury Well in 2007. The City operates Sunset Reservoir under a blending plan. This plan includes blending water from Garfield, Copelin, Sunset, Bangham and Villa wells with MWD water, which has low levels of gross alpha. This operation reduces the average concentration of gross alpha in the City's distribution system. The levels detected in the remaining wells were below the MCL, but were over the zero level identified by USEPA as the MCLG.

Gross alpha has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed to high levels over their lifetimes. Constituents that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. CDPH has set the drinking water standard for gross alpha at 15 pCi/L to reduce the risk of cancer or other adverse health affects that have been observed in laboratory animals.

As described above with uranium, the BAT for gross alpha is RO and is estimated at an annual cost of $790 per customer.

Recommendations for Further Action

The drinking water quality of the City of Pasadena meets all State of California, Department of Public Health and USEPA drinking water standards set to protect public health. To further reduce the levels of the constituents identified in this report that are already significantly below the established health-based MCL's to provide "safe drinking water," additional costly treatment processes would be required. The effectiveness of the treatment processes to provide any significant reductions in constituent levels at these already low values is uncertain. The health protection benefits of these further hypothetical reductions are not at all clear and may not be quantifiable. Therefore, no action is proposed.

Attachment 4 is a list of acronyms.

ATTACHMENTS:

Number 1 Excerpt from California Health and Safety Code: Section 116470(b)
Number 2 List of Regulated Constituents with MCLs, PHGs or MCLGs
Number 3 Cost Estimates for Treatment Technologies
Number 4 Acronyms

DAF/hs

ATTACHMENT 1

CALIFORNIA HEALTH AND SAFETY CODE

Health and Safety Code
Section 116470

116470. (a) As a condition of its operating permit, every public water system shall annually prepare a consumer confidence report and mail or deliver a copy of that report to each customer, other than an occupant, as defined in Section 799.28 of the Civil Code, of a recreational vehicle park. A public water system in a recreational vehicle park with occupants as defined in Section 799.28 of the Civil Code shall prominently display on a bulletin board at the entrance to or in the office of the park, and make available upon request, a copy of the report. The report shall include all of the following information:

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

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

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

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

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

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

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

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

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

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

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

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

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

(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

LIST OF REGULATED CONSTITUENTS with MCLs, PHGs or MCLGs

MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants
Last Update: December 31, 2009

The following table includes:

CDPH's maximum contaminant levels (MCLs)

CDPH's detection limits for purposes of reporting (DLRs)

Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)

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

	State MCL	DLR	PHG or (MCLG)	Date of PHG
Chemicals with MCLs in 22 CCR §64431—Inorganic Chemicals				
Aluminum	1	0.05	0.6	2001
Antimony	0.006	0.006	0.02[a]	1997
Arsenic	0.010	0.002	0.000004	2004
Asbestos (MFL = million fibers per liter; for fibers >10 microns long)	7 MFL	0.2 MFL	7 MFL	2003
Barium	1	0.1	2	2003
Beryllium	0.004	0.001	0.001	2003
Cadmium	0.005	0.001	0.00004	2006
Chromium, Total - OEHHA withdrew the 0.0025-mg/L PHG	0.05	0.01	withdrawn Nov. 2001	1999
Chromium-6 - MCL to be established - currently regulated under the total chromium MCL	--	*0.001*	*0.00006*[b]	
Cyanide	0.15	0.1	0.15	1997
Fluoride	2	0.1	1	1997
Mercury (inorganic)	0.002	0.001	0.0012	1999 (rev2005)*
Nickel	0.1	0.01	0.012	2001
Nitrate (as NO3)	45	2	45	1997
Nitrite (as N)	1 as N	0.4	1 as N	1997
Nitrate + Nitrite	10 as N	--	10 as N	1997
Perchlorate	0.006	0.004	0.006	2004
Selenium	0.05	0.005	(0.05)	--
Thallium	0.002	0.001	0.0001	1999 (rev2004)
Copper and Lead, 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				
Copper	1.3	0.05	0.3	2008
Lead	0.015	0.005	0.0002	2009
Radionuclides with MCLs in 22 CCR §64441 and §64443—Radioactivity				
[units are picocuries per liter (pCi/L), unless otherwise stated; n/a = not applicable]				
Gross alpha particle activity - OEHHA concluded in 2003 that a PHG was not practical	15	3	(zero)	n/a

MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants
Last Update: December 31, 2009

	State MCL	DLR	PHG or (MCLG)	Date of PHG
Gross beta particle activity - OEHHA concluded in 2003 that a PHG was not practical	4 mrem/yr	4	(zero)	n/a
Radium-226	--	1	0.05	2006
Radium-228	--	1	0.019	2006
Radium-226 + Radium-228 (addressed together as one MCL)	5	--	--	--
Strontium-90	8	2	0.35	2006
Tritium	20,000	1,000	400	2006
Uranium	20	1	0.43	2001
Chemicals with MCLs in 22 CCR §64444—Organic Chemicals				
(a) Volatile Organic Chemicals (VOCs)				
Benzene	0.001	0.0005	0.00015	2001
Carbon tetrachloride	0.0005	0.0005	0.0001	2000
1,2-Dichlorobenzene	0.6	0.0005	0.6	1997 (rev2009)
1,4-Dichlorobenzene (p-DCB)	0.005	0.0005	0.006	1997
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)
1,1-Dichloroethylene (1,1-DCE)	0.006	0.0005	0.01	1999
cis-1,2-Dichloroethylene	0.006	0.0005	0.1	2006
trans-1,2-Dichloroethylene	0.01	0.0005	0.06	2006
Dichloromethane (Methylene chloride)	0.005	0.0005	0.004	2000
1,2-Dichloropropane	0.005	0.0005	0.0005	1999
1,3-Dichloropropene	0.0005	0.0005	0.0002	1999 (rev2006)
Ethylbenzene	0.3	0.0005	0.3	1997
Methyl tertiary butyl ether (MTBE)	0.013	0.003	0.013	1999
Monochlorobenzene	0.07	0.0005	0.2	2003
Styrene	0.1	0.0005	(0.1)[c]	
1,1,2,2-Tetrachloroethane	0.001	0.0005	0.0001	2003
Tetrachloroethylene (PCE)	0.005	0.0005	0.00006	2001
Toluene	0.15	0.0005	0.15	1999
1,2,4-Trichlorobenzene	0.005	0.0005	0.005	1999
1,1,1-Trichloroethane (1,1,1-TCA)	0.2	0.0005	1	2006
1,1,2-Trichloroethane (1,1,2-TCA)	0.005	0.0005	0.0003	2006
Trichloroethylene (TCE)	0.005	0.0005	0.0017	2009
Trichlorofluoromethane (Freon 11)	0.15	0.005	0.7	1997
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2	0.01	4	1997
Vinyl chloride	0.0005	0.0005	0.00005	2000
Xylenes	1.75	0.0005	1.8	1997
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)				
Alachlor	0.002	0.001	0.004	1997
Atrazine	0.001	0.0005	0.00015	1999

MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants
Last Update: December 31, 2009

	State MCL	DLR	PHG or (MCLG)	Date of PHG
Bentazon	0.018	0.002	0.2	1999 (rev2009)
Benzo(a)pyrene	0.0002	0.0001	0.000004[d]	1997
Carbofuran	0.018	0.005	0.0017	2000
Chlordane	0.0001	0.0001	0.00003	1997 (rev2006)
Dalapon	0.2	0.01	0.79	1997 (rev2009)
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00001	1.7E-06	1999
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07	0.01	0.02	2009
Di(2-ethylhexyl)adipate	0.4	0.005	0.2	2003
Di(2-ethylhexyl)phthalate (DEHP)	0.004	0.003	0.012	1997
Dinoseb	0.007	0.002	0.014	1997
Diquat	0.02	0.004	0.015	2000
Endrin	0.002	0.0001	0.0018	1999 (rev2008)
Endothal	0.1	0.045	0.58	1997
Ethylene dibromide (EDB)	0.00005	0.00002	0.00001	2003
Glyphosate	0.7	0.025	0.9	2007
Heptachlor	0.00001	0.00001	0.000008	1999
Heptachlor epoxide	0.00001	0.00001	0.000006	1999
Hexachlorobenzene	0.001	0.0005	0.00003	2003
Hexachlorocyclopentadiene	0.05	0.001	0.05	1999
Lindane	0.0002	0.0002	0.000032	1999 (rev2005)
Methoxychlor	0.03	0.01	0.03	1999
Molinate	0.02	0.002	0.001	2008
Oxamyl	0.05	0.02	0.026	2009
Pentachlorophenol (PCP)	0.001	0.0002	0.0003	2009
Picloram	0.5	0.001	0.5	1997
Polychlorinated biphenyls (PCBs)	0.0005	0.0005	0.00009	2007
Simazine	0.004	0.004	0.004	2001
2,4,5-TP (Silvex)	0.05	0.001	0.025	2003
2,3,7,8-TCDD (dioxin)	3×10^{-8}	5×10^{-9}	(0)[e]	
Thiobencarb	0.07	0.001	0.07	2000
Toxaphene	0.003	0.001	0.00003	2003
Chemicals with MCLs in 22 CCR §64533—Disinfectant Byproducts				
Total Trihalomethanes[f]	0.08	--	--	--
Bromodichloromethane	--	0.0005	(zero)	
Bromoform	--	0.0005	(zero)	
Chloroform	--	0.0005	(0.07)	
Dibromochloromethane	--	0.0005	(0.06)	
Total Haloacetic Acids	0.06	--	--	--
Monochloroacetic acid		0.002	(0.07)	
Dichloroacetic acid		0.001	(zero)	
Trichloroacetic acid		0.001	(0.02)	
Bromoacetic acid		0.001	--	
Dibromoacetic acid		0.001	--	

MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants
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	State MCL	DLR	PHG or (MCLG)	Date of PHG
Bromate	0.010	0.005	0.0001	2009
Chlorite	1	0.02	0.05	2009
Microbiological Contaminants (TT = Treatment Technique)				
Coliform % positive samples	%	5		(zero)
Cryptosporidium**		TT		(zero)
Giardia Lamblia		TT		(zero)
Legionella		TT		(zero)
Viruses		TT		(zero)

a. A draft CA PHG of 0.0007 mg/L was published in 2009

b. For informational purposes only--no action needed at this time

c. A draft CA PHG of 0.0005 mg/L was published in 2008

d. A draft CA PHG of 0.000013 mg/L was published in 2009

e. A draft CA PHG of $1x10^{-9}$ mg/L was published in 2007

f. Draft CA PHGs for individual trihalomethanes were published in 2009

* OEHHA's review of this chemical during the year indicated (rev200X) resulted in no change in the PHG.

** Surface water systems only

MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants
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The following table includes:

CDPH's maximum contaminant levels (MCLs)

CDPH's detection limits for purposes of reporting (DLRs)

Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)

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

	State MCL	DLR	PHG or (MCLG)	Date of PHG
Chemicals with MCLs in 22 CCR §64431—Inorganic Chemicals				
Aluminum	1	0.05	0.6	2001
Antimony	0.006	0.006	0.02[a]	1997
Arsenic	0.010	0.002	0.000004	2004
Asbestos (MFL = million fibers per liter; for fibers >10 microns long)	7 MFL	0.2 MFL	7 MFL	2003
Barium	1	0.1	2	2003
Beryllium	0.004	0.001	0.001	2003
Cadmium	0.005	0.001	0.00004	2006
Chromium, Total - OEHHA withdrew the 0.0025-mg/L PHG	0.05	0.01	withdrawn Nov. 2001	1999
Chromium-6 - MCL to be established - currently regulated under the total chromium MCL	--	*0.001*	*0.00006*[b]	
Cyanide	0.15	0.1	0.15	1997
Fluoride	2	0.1	1	1997
Mercury (inorganic)	0.002	0.001	0.0012	1999 (rev2005)*
Nickel	0.1	0.01	0.012	2001
Nitrate (as NO3)	45	2	45	1997
Nitrite (as N)	1 as N	0.4	1 as N	1997
Nitrate + Nitrite	10 as N	--	10 as N	1997
Perchlorate	0.006	0.004	0.006	2004
Selenium	0.05	0.005	(0.05)	--
Thallium	0.002	0.001	0.0001	1999 (rev2004)
Copper and Lead, 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				
Copper	1.3	0.05	0.3	2008
Lead	0.015	0.005	0.0002	2009
Radionuclides with MCLs in 22 CCR §64441 and §64443—Radioactivity				
[units are picocuries per liter (pCi/L), unless otherwise stated; n/a = not applicable]				
Gross alpha particle activity - OEHHA concluded in 2003 that a PHG was not practical	15	3	(zero)	n/a

MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants
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	State MCL	DLR	PHG or (MCLG)	Date of PHG
Gross beta particle activity - OEHHA concluded in 2003 that a PHG was not practical	4 mrem/yr	4	(zero)	n/a
Radium-226	--	1	0.05	2006
Radium-228	--	1	0.019	2006
Radium-226 + Radium-228 (addressed together as one MCL)	5	--	--	--
Strontium-90	8	2	0.35	2006
Tritium	20,000	1,000	400	2006
Uranium	20	1	0.43	2001
Chemicals with MCLs in 22 CCR §64444—Organic Chemicals				
(a) Volatile Organic Chemicals (VOCs)				
Benzene	0.001	0.0005	0.00015	2001
Carbon tetrachloride	0.0005	0.0005	0.0001	2000
1,2-Dichlorobenzene	0.6	0.0005	0.6	1997 (rev2009)
1,4-Dichlorobenzene (p-DCB)	0.005	0.0005	0.006	1997
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)
1,1-Dichloroethylene (1,1-DCE)	0.006	0.0005	0.01	1999
cis-1,2-Dichloroethylene	0.006	0.0005	0.1	2006
trans-1,2-Dichloroethylene	0.01	0.0005	0.06	2006
Dichloromethane (Methylene chloride)	0.005	0.0005	0.004	2000
1,2-Dichloropropane	0.005	0.0005	0.0005	1999
1,3-Dichloropropene	0.0005	0.0005	0.0002	1999 (rev2006)
Ethylbenzene	0.3	0.0005	0.3	1997
Methyl tertiary butyl ether (MTBE)	0.013	0.003	0.013	1999
Monochlorobenzene	0.07	0.0005	0.2	2003
Styrene	0.1	0.0005	(0.1)[c]	
1,1,2,2-Tetrachloroethane	0.001	0.0005	0.0001	2003
Tetrachloroethylene (PCE)	0.005	0.0005	0.00006	2001
Toluene	0.15	0.0005	0.15	1999
1,2,4-Trichlorobenzene	0.005	0.0005	0.005	1999
1,1,1-Trichloroethane (1,1,1-TCA)	0.2	0.0005	1	2006
1,1,2-Trichloroethane (1,1,2-TCA)	0.005	0.0005	0.0003	2006
Trichloroethylene (TCE)	0.005	0.0005	0.0017	2009
Trichlorofluoromethane (Freon 11)	0.15	0.005	0.7	1997
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2	0.01	4	1997
Vinyl chloride	0.0005	0.0005	0.00005	2000
Xylenes	1.75	0.0005	1.8	1997
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)				
Alachlor	0.002	0.001	0.004	1997
Atrazine	0.001	0.0005	0.00015	1999

MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants
Last Update: December 31, 2009

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Dalapon	0.2	0.01	0.79	1997 (rev2009)
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Di(2-ethylhexyl)adipate	0.4	0.005	0.2	2003
Di(2-ethylhexyl)phthalate (DEHP)	0.004	0.003	0.012	1997
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Endrin	0.002	0.0001	0.0018	1999 (rev2008)
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Molinate	0.02	0.002	0.001	2008
Oxamyl	0.05	0.02	0.026	2009
Pentachlorophenol (PCP)	0.001	0.0002	0.0003	2009
Picloram	0.5	0.001	0.5	1997
Polychlorinated biphenyls (PCBs)	0.0005	0.0005	0.00009	2007
Simazine	0.004	0.004	0.004	2001
2,4,5-TP (Silvex)	0.05	0.001	0.025	2003
2,3,7,8-TCDD (dioxin)	$3x10^{-8}$	$5x10^{-9}$	(0)[e]	
Thiobencarb	0.07	0.001	0.07	2000
Toxaphene	0.003	0.001	0.00003	2003
Chemicals with MCLs in 22 CCR §64533—Disinfectant Byproducts				
Total Trihalomethanes[f]	0.08	--	--	--
Bromodichloromethane	--	0.0005	(zero)	
Bromoform	--	0.0005	(zero)	
Chloroform	--	0.0005	(0.07)	
Dibromochloromethane	--	0.0005	(0.06)	
Total Haloacetic Acids	0.06	--	--	--
Monochloroacetic acid		0.002	(0.07)	
Dichloroacetic acid		0.001	(zero)	
Trichloroacetic acid		0.001	(0.02)	
Bromoacetic acid		0.001	--	
Dibromoacetic acid		0.001	--	

MCLs, DLRs and PHGs for Regulated Drinking Water Contaminants
Last Update: December 31, 2009

	State MCL	DLR	PHG or (MCLG)	Date of PHG
Bromate	0.010	0.005	0.0001	2009
Chlorite	1	0.02	0.05	2009
Microbiological Contaminants (TT = Treatment Technique)				
Coliform % positive samples	%	5		(zero)
Cryptosporidium**		TT		(zero)
Giardia Lamblia		TT		(zero)
Legionella		TT		(zero)
Viruses		TT		(zero)

a. A draft CA PHG of 0.0007 mg/L was published in 2009

b. For informational purposes only--no action needed at this time

c. A draft CA PHG of 0.0005 mg/L was published in 2008

d. A draft CA PHG of 0.000013 mg/L was published in 2009

e. A draft CA PHG of $1x10^{-9}$ mg/L was published in 2007

f. Draft CA PHGs for individual trihalomethanes were published in 2009

* OEHHA's review of this chemical during the year indicated (rev200X) resulted in no change in the PHG.

** Surface water systems only

ATTACHMENT 3

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

ATTACHMENT NO. 3

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated 2007* Unit Cost ($/1,000 gallons treated)
1	Granular Activated Carbon	Reference: Malcolm Pirnie estimate for California Urban Water Agencies, large surface water treatment plants treating water from the State Water Project to meet Stage 2 D/DB and bromate regulation, 1998	0.46 - 0.8784
2	Granular Activated Carbon	Reference: Carollo Engineers, estimate for VOC treatment (PCE), 95% removal of PCE, Oct. 1994,1900 gpm design capacity	0.21
3	Granular Activated Carbon	Reference: Carollo Engineers, est. for a large No. Calif surf. water treatment plant (90 mgd capacity) treating water from the State Water Project, to reduce THM precursors, ENR construction cost index = 6262 (San Francisco area) - 1992	1.017
4	Granular Activated Carbon	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility for VOC and SOC removal by GAC, 1990	0.394 - 0.5783
5	Granular Activated Carbon	Reference: Southern California Water Co. - actual data for "rented" GAC to remove VOCs (1,1-DCE), 1.5 mgd capacity facility, 1998	1.823
6	Granular Activated Carbon	Reference: Southern California Water Co. - actual data for permanent GAC to remove VOCs (TCE), 2.16 mgd plant capacity, 1998	1.178
7	Reverse Osmosis	Reference: Malcolm Pirnie estimate for California Urban Water Agencies, large surface water treatment plants treating water from the State Water Project to meet Stage 2 D/DB and bromate regulation, 1998	1.367 -2.616
8	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 1.0 mgd plant operated at 40% of design flow, high brine line cost, May 1991	3.224
9	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 1.0 mgd plant operated at 100% of design flow, high brine line cost, May 1991	1.984
10	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 10.0 mgd plant operated at 40% of design flow, high brine line cost, May 1991	2.15
11	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 10.0 mgd plant operated at 100% of design flow, high brine line cost, May 1991	1.66
12	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 1.0 mgd plant operated at 40% of design capacity, Oct. 1991	5.394
13	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 1.0 mgd plant operated at 100% of design capacity, Oct. 1991	3.19
14	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 10.0 mgd plant operated at 40% of design capacity, Oct. 1991	2.39
15	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 10.0 mgd plant operated at 100% of design capacity, Oct. 1991	1.48
16	Reverse Osmosis	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility with RO to remove nitrate, 1990	1.485 - 2.616
17	Packed Tower Aeration	Reference: Analysis of Costs for Radon Removal... (AWWARF publication), Kennedy/Jenks, for a 1.4 mgd facility operating at 40% of design capacity, Oct. 1991	0.86
18	Packed Tower Aeration	Reference: Analysis of Costs for Radon Removal... (AWWARF publication), Kennedy/Jenks, for a 14.0 mgd facility operating at 40% of design capacity, Oct. 1991	0.46
19	Packed Tower Aeration	Reference: Carollo Engineers, estimate for VOC treatment (PCE) by packed tower aeration, without off-gas treatment, O&M costs based on operation during 329 days/year at 10% downtime, 16 hr/day air stripping operation, 1900 gpm design capacity, Oct. 1994	0.22

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated 2007* Unit Cost ($/1,000 gallons treated)
20	Packed Tower Aeration	Reference: Carollo Engineers, for PCE treatment by Ecolo-Flo Enviro-Tower air strippin without off-gas treatment, O&M costs based on operation during 329 days/year at 10% downtime, 16 hr/day air stripping operation, 1900 gpm design capacity, Oct. 1994	0.24
21	Packed Tower Aeration	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility packed tower aeration for VOC and radon removal, 1990	0.3680 - 0.6046
22	Advanced Oxidation Processes	Reference: Carollo Engineers, estimate for VOC treatment (PCE) by UV Light, Ozone, Hydrogen Peroxide, O&M costs based on operation during 329 days/year at 10% downtime, 24 hr/day AOP operation, 1900 gpm capacity, Oct. 1994	0.45
23	Ozonation	Reference: Malcolm Pirnie estimate for CUWA, large surface water treatment plants using ozone to treat water from the State Water Project to meet Stage 2 D/DBP and bromate regulation,*Cryptosporidium* inactivation requirements,1998	0.1051 - 0.2080
24	Ion Exchange	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility ion exchange to remove nitrate, 1990	0.4995 - 0.6441

Note:

*Costs were adjusted from date of original estimates to present, where appropriate, using Engineering News Record (ENR) construction indices for Los Angeles and San Francisco.

ATTACHMENT 4

ACRONYMS

Public Health Goal Report Acronyms:

ACWA	Association of California Water Agencies
BAT	Best Available Technology
CCR	California Code of Regulations
CDPH	California Department of Public Health
DLR	Detection Level for Purposes of Reporting
GAC	Granular Activated Carbon
PHG	Public Health Goal
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/L	milligrams per liter
MWD	Metropolitan Water District of Southern California
OEHHA	California EPA Office of Environmental Health Hazard Assessment
O&M	Operation and Maintenance
PCE	Tetrachloroethylene
pCi/L	picoCuries per liter
PTA	Packed Tower Aeration
RO	Reverse Osmosis
TCE	Trichloroethylene
TTHM	Total Trihalomethanes
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound