CITY OF VALLEJO
PUBLIC WORKS DEPARTMENT
WATER DIVISION

July 1, 2016

City of Vallejo – Public Water System 4810007
Report on Vallejo's Water Quality Relative to Public Health Goals

Prepared by: City of Vallejo Laboratory Staff

Purpose: This report was prepared to satisfy the requirements of Section 116470 of the California Health and Safety Code

CITY OF VALLEJO - PUBLIC WATER SYSTEM 4810007

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

Background:

Provisions of the California Health and Safety Code, Section 116470 Consumer Confidence Report, (Attachment No. 1) specify that water systems serving more than 10,000 connections prepare a special report on or before July 1, 2016 if their water quality measurements have exceeded any Public Health Goals (PHGs). PHGs are non-enforceable goals established by the California EPA's Office of Environmental Health Hazard Assessment (OEHHA). The law also requires that where OEHHA has not adopted a PHG for a constituent, the water suppliers are to use the Maximum Contaminant Level Goal (MCLG) adopted by the United States Environmental Protection Agency (USEPA). 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. (Attachment No. 5 is a list of all regulated constituents with the Maximum Contaminant Levels (MCLs) and PHGs or MCLGs.)

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 and Total Haloacetic Acids. These will be addressed in future reports after PHGs are adopted.

If a constituent was detected in the City's water supply between 2013 and 2015 and exceeds an applicable PHG or MCLG, this report provides the information required by law. Included is the numerical public health risk associated with the MCL and the PHG or MCLG, the category or type of risk to health that could be associated with the constituent, the best treatment technology available that could be used to reduce the constituent level, and an estimate of the cost to install 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 Cal-EPA and are based solely on public health considerations, unlike the enforceable MCLs, the highest level of a contaminant that is allowed in drinking water, which are based on a number of factors. None of the practical risk management factors that are considered by the USEPA or the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) in setting drinking water standards (MCLs) are considered in setting the PHGs. These factors include analytical detection capability, treatment technology available, benefits and costs. The PHGs are not enforceable and are not required to be met by any public water system. MCLGs are the federal equivalent of PHGs.

Water Quality Considered:

All of the water quality data collected by the City of Vallejo system between 2013 and 2015 for purposes of determining compliance with drinking water standards was considered. This data was summarized in our 2013, 2014 and 2015 Annual Water Quality Reports. Reports for 2013 and 2014 were mailed directly to all of our customers. In an effort to be environmentally friendly, in 2015, Water Quality Report inserts were mailed to the customers. (Attachment No. 3)

Guidelines Followed:

The Association of California Water Agencies (ACWA) formed a workgroup which prepared guidelines for water utilities to use in preparing these required reports. The ACWA guidelines were used in preparation of this report. No guidance was available from state regulatory agencies. (Attachment No.4)

Best Available Technology and Cost Estimates

Both the USEPA and SWRCB DDW adopt what are known as BATs or Best Available Technologies which are the best known methods of reducing contaminant levels to the MCL. Costs can be estimated for such technologies. However, since many PHGs and all MCLGs are set much lower than the MCL, it is not always possible or feasible to determine what treatment is needed to further reduce a constituent downward to or near the PHG or MCLG, many of which are set at 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. (Attachment No.6)

Constituents Detected That Exceed a PHG or an MCLG:

The following is a discussion of constituents that were detected in our drinking water source at levels above the PHG or MCLG. (Attachment No.5)

Coliform Bacteria:

During 2013, 2014 and 2015; between 154 and 201 samples were collected from the City distribution system each month for coliform analysis. Occasionally, a sample was found to be positive for coliform bacteria but repeat samples were negative and follow up actions were taken. Of these samples, a maximum of 1.49% in 2013, 0.61% in 2014 and 0.64% in 2015 were positive in any month.

The MCL for coliform is 5% positive samples per month and the MCLG is zero. The reason for the coliform drinking water standard is to minimize the possibility of the water containing pathogens which are organisms that cause waterborne disease. Because coliform 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 they cannot do so with coliforms.

Coliform bacteria are indicator organisms that are found everywhere in nature and are not generally considered harmful. They are used because of the ease of monitoring and

analysis. If a positive sample is found, it indicates a potential problem that needs to be investigated and follow up sampling done. It is not at all unusual for a system to have an occasional positive sample. It is difficult, if not impossible; to assure that a system will never have a positive sample.

We add chlorine at our treatment plant to ensure that the water served is microbiologically safe. The chlorine residuals are carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increasing the disinfection by-product level. This careful balance of treatment processes is essential to continue supplying our customers with safe drinking water.

Other equally important measures that we have implemented include: an effective cross-connection control program, maintenance of a chlorine residual throughout the majority of the system, an effective monitoring and surveillance program and maintaining positive pressures in our distribution system. Our system has already taken all of the steps described by SWRCB as "best available technology" for coliform bacteria in Section 64447, Title 22, and California Code of Regulations.

The following tables summarize the contaminants found that exceeded the PHG or MCLG (Table 1) and the health risk categories and cancer risk values associated with those specific contaminants (Table 2).

Table 1: Contaminants in the City of Vallejo water supply found to exceed state Public Health Goals (PHG) or federal Maximum Contaminant Level Goals (MCLG)

Contaminant (units of measure)	PHG (MCLG)	MCL	2013 Range and Avg	2014 Range and Avg	2015 Range and Avg
Total Coliform (Percentage of positive samples)	(Zero)	No more than 5% of monthly samples may be positive	Range = ND – 1.49 %, Avg = ND	Range = ND – 0.61 %, Avg = ND	Range = ND – 0.64 %, Avg = ND

Table 2: Health Risk Categories and Cancer Risk Values for Contaminants with California PHGs or federal MCLGs. Data provided by the California Office of Environmental Health Hazard Assessment

Contaminant	Health Risk Categories[1]	California PHG or federal (MCLG)[2]	Cancer Risk at PHG or (MCLG)[3]	California MCL	Cancer Risk at California MCL
Total Coliform	Can't be established	(zero)	none	No more than 5% of monthly samples may be positive	none

[1]Health risk category based on experimental animal testing data evaluated in the USEPA MCLG document or California MCL document unless otherwise specified.
[2]MCLG = maximum contaminant level goal established by USEPA.
[3]Cancer Risk = theoretical 70-year lifetime excess cancer risk at the statistical confidence limit. Actual cancer risk may be lower or zero. Cancer risk is stated in terms of excess cancer cases per million (or fewer) population, e.g., 1×10^{-6} means one excess cancer case per million people; 5×10^{-5} means five excess cancer cases per 100,000 people.

Fluoride:

During 2013, 2014 and 2015, compliance monitoring of our drinking water showed a range of 0.6 – 1.1 parts per million (ppm). The average for 2013 – 2015 was 1.0 ppm. In many communities, fluoride is added to the drinking water to bring concentrations up to the range 0.7 – 1.2 ppm. As of April 1, 2015, the City of Vallejo acted upon the recommendation from the Department of Health and Human Services (DHHS) to lower the fluoride concentration in drinking water, and now maintains approximately 0.7 ppm.

The MCL for fluoride is 2.0 ppm. The PHG for Fluoride is 1.0 ppm. The PHG for fluoride is intended to be an approximate year-round average. Fluoride is naturally present in drinking water and also voluntarily added for tooth decay prevention. Children who drink water containing fluoride above the state MCL of 2.0 ppm may develop mottled teeth.

Bromate:

The MCL for bromate is 10.0 parts per billion (ppb). The PHG for bromate is 0.1 ppb. Bromate is not commonly found in water, but may be formed as a disinfection byproduct of ozonation and hypochlorite used in water treatment. During 2013, 2014 and 2015, compliance monitoring of our drinking water showed a range of 0 – 2.5 ppb. This is well below the 10.0 ppb MCL, but at times does exceed the PHG of 0.1 ppb.

The category of health risk for bromate is carcinogenic or capable of producing cancer. The numerical cancer risk associated with the California MCL is one excess cancer case per ten thousand people.

The "best available technology" for reducing bromate levels below the MCLG is control or elimination of ozone treatment at the Fleming Hill Water Treatment Plant. However, removing ozone treatment is highly undesirable. Ozone treatment improves the water's taste as well as removes cryptosporidium and viruses, outweighing the minimal amount of bromate in the water.

Radium-226 + Radium-228:

The MCL for the combined radium- 226 and radium- 228 is 5 picocuries per liter (pCi/L). The PHG for radium- 226 is 0.05 pCi/L and radium- 228 is 0.019 pCi/L. There are no individual MCLs. radium is naturally occurring and can be found universally at low concentrations in the air, water, and soil due to radionuclides uranium- 238 and thorium- 232 decaying. Concentrations of radium- 226 and -228 are usually found in surface waters at extremely low concentrations. During 2013 compliance monitoring, results for radium- 226 was 0.39 pCi/L and radium- 228 was 1.78 pCi/L. Results were below the MCL but above the PHG.

Radium- 226 and radium- 228 is carcinogenic or capable of producing cancer. The numerical cancer risk associated with the California MCL for radium- 226 is one excess cancer case per ten thousand people and for radium- 228 the risk is three excess cancer cases per ten thousand people.

The "best available technology" for reducing combined radium- 226 and radium- 228 have been identified as Ion exchange, reverse osmosis and lime softening.

RECOMMENDATIONS FOR FURTHER ACTION:

The drinking water quality of the City system meets all State Water Resources Control Board 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 health-based Maximum Contaminant Levels established 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.

ATTACHMENTS:

- No. 1 Excerpt from California Health & Safety Code: Section 116470
- No. 2 Health Risk Information for Public Health Goal Exceedance Reports
- No. 3 City of Vallejo Water Quality Reports 2013 and 2014 (sent to all water customers) and 2015 Water Quality Report and 2015 Insert (sent to all water customers)
- No. 4 Suggested Guidelines for Preparation of Required Reports on Public Health Goals to satisfy requirements of California Health and Safety Code Section 116470(b)
- No. 5 Table of Regulated Constituents with MCLs, PHGs or MCLGs
- No. 6 Cost estimates for Treatment Technologies
- No. 7 Glossary of Water Quality Terms

ATTACHMENT NO. 1

Health and Safety Code §116470

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(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 NO. 2

Health Risk Information for Public Health Goal Exceedance Reports

Prepared by

Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

February 2016

Under the Calderon-Sher Safe Drinking Water Act of 1996 (the Act), water utilities are required to prepare a report every three years for contaminants that exceed public health goals (PHGs) (Health and Safety Code Section 116470 (b)(2)). The numerical health risk for a contaminant is to be presented with the category of health risk, along with a plainly worded description of these terms. The cancer health risk is to be calculated at the PHG and at the California maximum contaminant level (MCL). This report is prepared by the Office of Environmental Health Hazard Assessment (OEHHA) to assist the water utilities in meeting their requirements.

PHGs are concentrations of contaminants in drinking water that pose no significant health risk if consumed for a lifetime. PHGs are developed and published by OEHHA (Health and Safety Code Section 116365) using current risk assessment principles, practices and methods.

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 a no more than 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 Web site (http://www.oehha.ca.gov). Also, technical fact sheets on most of the chemicals having federal MCLs can be found at http://www.epa.gov/your-drinking-water/table-regulated-drinking-water-contaminants.

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]	0.002	NA
Aluminum	neurotoxicity and immunotoxicity (harms the nervous and immune systems)	0.6	NA	1	NA
Antimony	digestive system toxicity (causes vomiting)	0.02	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[6] (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: http://oehha.ca.gov/multimedia/green/pdf/GC_Regtext011912.pdf).
[2] mg/L = milligrams per liter of water or parts per million (ppm)
[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] MCL = maximum contaminant level.
[5] NA = not applicable. Risk cannot be calculated. The PHG is set at a level that is believed to be without any significant public health risk to individuals exposed to the chemical over a lifetime.
[6] 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[7])	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)	0.0017	NA	0.018	NA

[7] 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}	0.01	5×10^{-4} (five per ten thousand)
Copper	digestive system toxicity (causes nausea, vomiting, diarrhea)	0.3	NA	1.3 (AL[8])	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

[8] 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
1,2-Dibromo-3-chloropropane (DBCP)	carcinogenicity (causes cancer)	0.0000017 (1.7×10^{-6})	1×10^{-6}	0.0002	1×10^{-4} (one per ten 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)	0.1	NA	0.006	NA
1,2-Dichloro-ethylene, trans	hepatotoxicity (harms the liver)	0.06	NA	0.01	NA
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

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
1,2-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)
Di(2-ethylhexyl) adipate (DEHA)	developmental toxicity (disrupts development)	0.2	NA	0.4	NA
Diethylhexyl-phthalate (DEHP)	carcinogenicity (causes cancer)	0.012	1×10^{-6}	0.004	3×10^{-7} (three per ten million)
Dinoseb	reproductive toxicity (harms the uterus and testis)	0.014	NA	0.007	NA
Dioxin (2,3,7,8-TCDD)	carcinogenicity (causes cancer)	5×10^{-11}	1×10^{-6}	3×10^{-8}	6×10^{-4} (six per ten thousand)
Diquat	ocular toxicity (harms the eye) developmental toxicity (causes malformation)	0.015	NA	0.02	NA
Endothall	digestive system toxicity (harms the stomach or intestine)	0.094	NA	0.1	NA
Endrin	hepatotoxicity (harms the liver) neurotoxicity (causes convulsions)	0.0018	NA	0.002	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
Ethylbenzene (phenylethane)	hepatotoxicity (harms the liver)	0.3	NA	0.3	NA
Ethylene dibromide	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[8])	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)	1 as nitrogen	NA	1 as nitrogen	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	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)	0.5	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)
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)

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
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)
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)	0.07	NA	0.07	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
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
1,1,2-Trichloro-ethane	carcinogenicity (causes cancer)	0.0003	1×10^{-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

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
1,2,3-Trichloro-propane (1,2,3-TCP)	carcinogenicity (causes cancer)	0.0000007 (7×10^{-7})	$1x10^{-6}$	none	NA
1,1,2-Trichloro-1,2,2-trifluoro-ethane (Freon 113)	hepatotoxicity (harms the liver)	4	NA	1.2	NA
Tritium	carcinogenicity (causes cancer)	400 pCi/L	$1x10^{-6}$	20,000 pCi/L	$5x10^{-5}$ (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

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

Chemical	Health Risk Category[1]	U.S. EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ 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)					
Chloroacetic acid	general toxicity (causes body and organ weight changes[8])	0.07	NA	none	NA

[1] Health risk category based on the U.S. EPA MCLG document or California MCL document unless otherwise specified.
[2] MCLG = maximum contaminant level goal established by U.S. 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]	U.S. EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ California MCL
Dichloroacetic acid	carcinogenicity (causes cancer)	0	0	none	NA
Trichloroacetic acid	hepatotoxicity (harms the liver)	0.02	0	none	NA
Bromoacetic acid	NA	none	NA	none	NA
Dibromoacetic acid	NA	none	NA	none	NA
Total haloacetic acids	carcinogenicity (causes cancer)	none	NA	0.06	NA
Disinfection byproducts: trihalomethanes (THMs)					
Bromodichloro-methane (BDCM)	carcinogenicity (causes cancer)	0	0	none	NA
Bromoform	carcinogenicity (causes cancer)	0	0	none	NA
Chloroform	hepatotoxicity and nephrotoxicity (harms the liver and kidney)	0.07	NA	none	NA
Dibromo-chloromethane (DBCM)	hepatotoxicity, nephrotoxicity, and neurotoxicity (harms the liver, kidney, and nervous system)	0.06	NA	none	NA
Total trihalomethanes (sum of BDCM, bromoform, chloroform and DBCM)	carcinogenicity (causes cancer), hepatotoxicity, nephrotoxicity, and neurotoxicity (harms the liver, kidney, and nervous system)	none	NA	0.08	NA

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

Chemical	Health Risk Category[1]	U.S. EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ California MCL
Radionuclides					
Gross alpha particles[9]	carcinogenicity (causes cancer)	0 (^{210}Po included)	0	15 pCi/L[10] (includes ^{226}Ra but not radon and uranium)	up to $1x10^{-3}$ (for ^{210}Po, the most potent alpha emitter
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)

[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://oehha.studio-weeren.com/media/downloads/water/chemicals/phg/grossalphahealth.pdf.

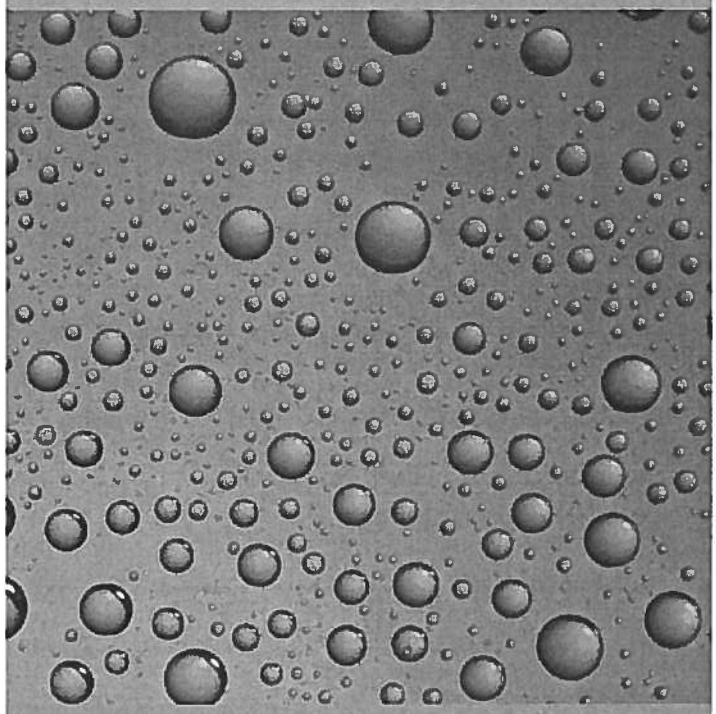
[10] pCi/L = picocuries per liter of water.

ATTACHMENT NO. 3

Annual

Water Quality Report

Water Testing Performed in 2013



City of VALLEJO California

City of Vallejo System, CA4810007

City of Vallejo Lakes System, CA4810021

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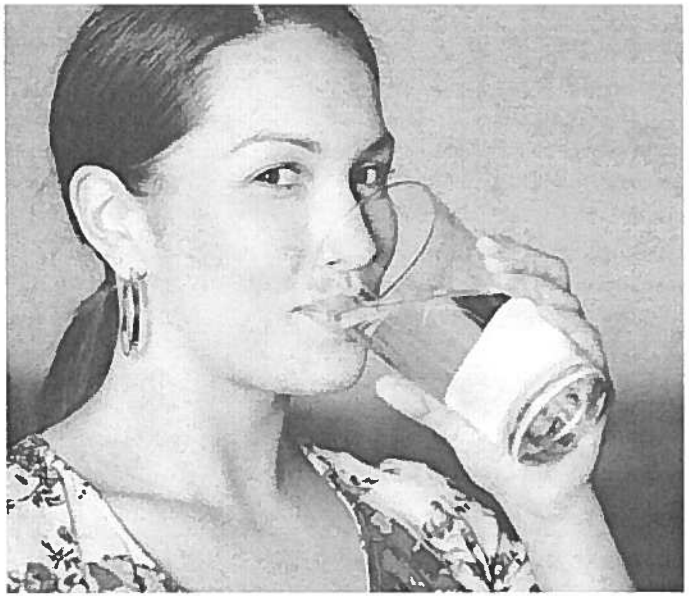


The City of Vallejo welcomes this yearly opportunity to provide our customers with the Annual Water Quality Report. We have included information so you know where your drinking water comes from, how it is treated and how its quality compares to drinking water standards.

This report tells you that in 2013, after testing for more than 100 different constituents, your drinking water met all primary and secondary standards established by the California Department of Public Health and the U.S. Environmental Protection Agency. Primary standards are health related standards whereas secondary standards relate to consumer acceptance of the water supply and govern qualities such as taste, odor and color.

The tables in this report show each constituent found, the level at which they occur, how their level compares with standards and their most likely source. For more information about this report, or for any questions relating to your drinking water, please call Jason Frink, City of Vallejo, Laboratory Supervisor, at (707) 649-3473.

Public Participation

You are invited to participate in our public forum and voice your opinions and concerns about your drinking water. The Vallejo City Council meets on various Tuesdays, throughout the year, at 7:00 p.m. at 555 Santa Clara Street, Vallejo. You may call the City Clerk at (707) 648-4527 for specific meeting dates.

Your Water Treatment Process

The **City of Vallejo** water system and service area receives its finished water from the forty-two million gallons per day Fleming Hill Water Treatment Plant. This conventional treatment facility utilizes a multi-barrier process to ensure compliance with all State and Federal drinking water regulations and standards.

Initially, ozone is added to help remove dissolved organic matter and to aid in downstream processes. The water then flows to mixing basins where coagulants are added and the water is gently agitated so that fine suspended particles come together to form large 'floc' particles that settle out of the water. This process, known as coagulation, flocculation and sedimentation is followed by the addition of more ozone to disinfect and remove unwanted color, taste and odor.

The next step is filtration, where the water flows through multimedia filters consisting of granular activated carbon and sand in order to meet strict standards for clarity and to reduce the levels of microbial contaminants that could be in the untreated source water. Following filtration, the water receives additions of caustic soda, for pH and alkalinity control; fluoride, for the prevention of dental caries; and finally, chlorine to provide microbial protection throughout Vallejo's distribution system. Quality control and assurance is maintained at all times through uniform adherence to standard operating procedures and a meticulous schedule of laboratory analyses.

The **City of Vallejo Lakes System's** Green Valley Water Treatment Plant, which provides water service to the Lakes service area, can treat up to one million gallons a day providing customers with drinking water meeting all drinking water regulations and standards.

First, the MIEX™ pretreatment process removes naturally occurring dissolved organic matter. This treatment, using ion exchange resin, enables us to meet the Disinfectant/Disinfection By-products Rule by sufficiently lowering the levels of total organic carbon, therefore limiting the formation of disinfection by-products such as total trihalomethanes. Total trihalomethanes are chemicals formed over time in the distribution system when dissolved organic matter combines with chlorine. Regulations require we use chlorine to disinfect surface water.

The treatment plant's conventional treatment process uses polymer to promote coagulation, flocculation and sedimentation that remove the majority of soil particles from the water. Then, the water gravity flows through multimedia filters consisting of anthracite and sand so that it will meet clarity standards required to decrease microbial contaminants and to aid the disinfection process. Depending on which water source or blend of sources we are treating (Lakes Madigan and Frey and/or Putah South Canal), we may add soda ash in order to increase alkalinity and pH. The last step of the treatment process adds chlorine to disinfect the water supply and to provide continual protection in the distribution system. This treatment plant does not add fluoride to your water.

A Message From the United States Environmental Protection Agency

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife;

continued on outside panel

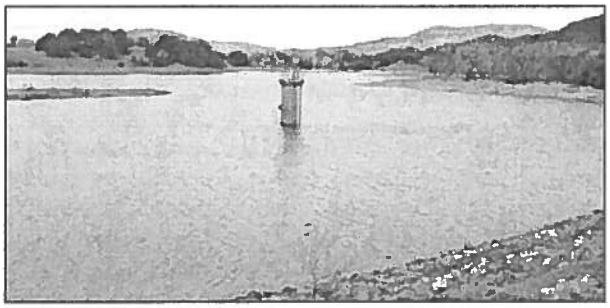
City of Vallejo Annual **Water Quality Report** *Water Testing Performed in 2013*

Environmental Protection Agency continued from inside

- Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming;
- Pesticides and Herbicides, that may come from a variety of sources such as agriculture, urban storm water runoff and residential uses;
- Organic Chemical Contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, agricultural applications and septic systems; and
- Radioactive Contaminants, that can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the California Department of Public Health (Department) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at 1-800-426-4791.



Lake Madigan Source Water for the Lakes Service Area

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hable con alguien que lo entienda bien.

Mahalaga ang impormasyong ito. Mangyaring ipasalin ito.

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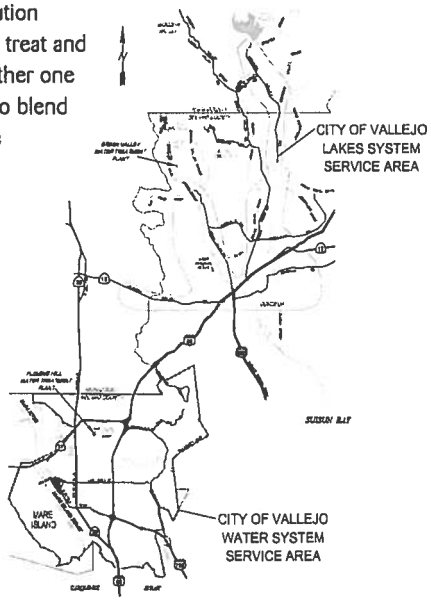
Your Water Sources

The City of Vallejo owns and operates two permitted public water systems for the benefit of our customers in two major service areas. The City of Vallejo Water System and service area provides drinking water to customers within the city limits, to some customers in the unincorporated areas adjacent to City boundaries and to a limited number of customers in the City of American Canyon.

The City of Vallejo Water System customers are fortunate because they enjoy an abundant water supply from two surface water sources. The Solano Project provides source water from Lake Berryessa, transported to our facilities by the Putah South Canal. The City also receives surface water from the State Water Project. This water, from Lake Oroville, travels through the Sacramento River to the State's North Bay Aqueduct pumping facilities. Our source water pumping and distribution facilities enable us to treat and deliver water from either one of these sources or to blend these sources before treatment at the Fleming Hill Water Treatment Plant and distribution to the Vallejo service area. The City of Vallejo Lakes System and service area is a public water system with its own treatment plant and distribution system that delivers drinking water to customers residing in the Green Valley, Old Cordelia, Jameson Canyon, Suisun Valley, Willotta Oaks and Gordon Valley areas.



This system and service area also has water available from two distinct surface water sources. In addition to the Solano Project's Lake Berryessa water delivered from the Putah South Canal by agreement with the Solano Irrigation District, this system treats water from Lakes Frey and Madigan, which are two interconnected lakes owned by the City of Vallejo. The Green Valley Water Treatment Plant can either treat these two sources separately or blend these two sources before treatment and delivery to our customers. In case of emergencies, portions of this system can receive treated water from the City of Fairfield. For a copy of their Annual Water Quality Report, please call (707) 434-6100.

City of Vallejo Annual **Water Quality Report** *Water Testing Performed in 2013*

City of Vallejo Drought Status = Water Conservation

Vallejo water customers are encouraged to voluntarily modify water use habits and adopt higher water efficiency practices in 2014. These are uncertain times with regard to the City's drinking water supply. With California facing serious water shortfalls statewide, Governor Brown has proclaimed a State of Emergency and directed State officials to take all necessary actions to prepare for drought conditions, including limiting lawn watering and car washing, and recommending schools, parks, and golf courses limit their outdoor irrigation, and also asks hotels and restaurants to curtail serving water unless requested by customers.

With California's driest months still ahead, the State Water Resources Control Board, charged with administering California's water rights system, is urging water users to conserve and use water wisely. The Board is closely monitoring water availability and may act to limit or stop diversions of water from one of Vallejo's largest water sources, the Sacramento–San Joaquin River Delta.

The City has detailed water shortage contingency measures incorporated within its local water management plan that will be utilized to update local drought stages as conditions change. Water customers are encouraged to visit www.vallejowater.org for valuable water saving tips, information, and money saving water appliance/fixture rebates. The Solano County Water Agency website located at www.solanosaveswater.org is also a great source for updates regarding the status of local water supplies.

Got Questions? Contact the City of Vallejo Water Conservation Program at (707) 648-5299 or (707) 648-4479

PRIMARY DRINKING WATER STANDARDS - Health Related Standards

PARAMETER/CONSTITUENTS (units of measurement)	STATE MCL	PHG (MCLG)	VALLEJO SERVICE AREA		LAKES SERVICE AREA		MAJOR SOURCES IN DRINKING WATER
			RANGE	AVG	RANGE	AVG	
INORGANICS							
FLUORIDE (ppm)	2	1	0.7 - 1.1	1	0.1 - 0.2	0.1	Water additive or natural minerals
MICROBIAL							
TOTAL COLIFORM (% positive samples)	5% or 1 sample	(0)	ND - 1.5	ND	ND - 1	ND	Naturally present in the environment
For the City of Vallejo Water System, no more than 5% of all samples taken during a single month may be positive for total coliform. For the Lakes System, no more than one sample per month may be positive for total coliform bacteria.							
CLARITY							
TURBIDITY (NTU)	TT = 95% of samples ≤ 0.3 Maximum ≤ 1 TT = % reduction ≥ 80%		100% of samples ≤ 0.3 Maximum = 0.09 99% - 100%	100%	100% of samples ≤ 0.3 Maximum = 0.12 98% - 100%	99%	Soil runoff
Turbidity is a measurement of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our filtration system. MCL compliance is based on all samples taken each month. All samples were in compliance.							
RADIOLOGICAL							
RADIUM 228 (pCi/L)	5	0.019	1.58 - 1.58	1.58	ND	ND	Erosion of natural deposits
City of Vallejo System sampled in 2013 and Lakes System sampled in 2007. The State requires us to monitor for certain substances less than once a year because their concentration does not change frequently.							
DISINFECTANT	MRDL	EPA MRDLG					
CHLORINE, Free Residual as Cl2 (ppm)	4.0*	4*	ND - 1.6	0.9	ND - 1.4	0.5	Disinfectant for water supply
DISINFECTION BY-PRODUCTS							
TRIHALOMETHANES, TOTAL (ppb)	80*	N/A	22 - 97	77	32 - 72	56	Drinking water disinfection
HALOACETIC ACIDS (ppb)	60*	N/A	6 - 16	13.0	5.1 - 15	11	Drinking water disinfection
DISINFECTION BY-PRODUCTS PRECURSOR							
TOTAL ORGANIC CARBON (%Removal Ratio)	TT = Running Annual Average (RAA) ≥ 1*		All RAA ≥ 1 minimum = 1.2		All RAA ≥ 1 minimum = 1.1		Decay of natural organic matter

*Compliance levels for the four parameters listed above are based on a running annual average determined quarterly. This means that every three months, we average all the samples taken during the prior twelve month period. Results for minimum and maximum values are based on single samples.

MONITORING for CRYPTOSPORIDIUM

Beginning in 2006, federal regulations required us to monitor our raw, untreated water sources (the Putah South Canal and the North Bay Aqueduct) for levels of *Cryptosporidium* contamination for two years. *Cryptosporidium* is a microbial parasite commonly found in surface water throughout the U.S. After analyzing twenty-four monthly samples from each source, we did not find *Cryptosporidium* in the North Bay Aqueduct water and the Putah South Canal had low levels in only two samples. Results from this monitoring program demonstrated that currently, our water treatment processes are sufficient to treat the levels of *Cryptosporidium* possibly encountered in our raw water supplies. The filtration process removes *Cryptosporidium*, although commonly used methods cannot guarantee 100% removal. Please refer to the article "Special Health Concerns" for more information regarding *Cryptosporidium*.

Your water system meets all primary and secondary drinking water standards.

PRIMARY STANDARDS–LEAD and COPPER STUDY–Monitoring of Customers' Tap Water

PARAMETER/CONSTITUENTS (units of measurement)	AL	PHG	Vallejo Service Area 90th %, Number of Homes > AL. Results are from 54 homes sampled in 2012		Lakes Service Area 90th %, Number of Homes > AL. Results are from 10 homes sampled in 2011		MAJOR SOURCE IN DRINKING WATER
COPPER (ppm at the 90th Percentile)	1.3	0.3	ND	0	ND	0	Internal corrosion of household plumbing
LEAD (ppb at the 90th Percentile)	15	0.2	ND	0	ND	0	Internal corrosion of household plumbing

Every three years the City is required to sample at the customers' faucets for lead and copper. This monitoring ensures our water is not too corrosive and does not leach unsafe levels of these metals into your drinking water. Compliance measurements are from the 90th percentile (the highest level measured from 90% of the homes sampled). The latest monitoring, for both water systems, did not detect lead or copper from 90% of the homes sampled.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Vallejo is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

SECONDARY DRINKING WATER STANDARDS - Aesthetics Related Standards

PARAMETER/CONSTITUENTS (units of measurement)	STATE MCL	PHG or (MCLG)	VALLEJO SERVICE AREA WATER		LAKES SERVICE AREA WATER		MAJOR SOURCES IN DRINKING WATER
			RANGE	AVG	RANGE	AVG	
CHLORIDE (ppm)	500	none	9 - 23	16	26 - 270	70	Natural minerals
ODOR-THRESHOLD (units)	3	none	ND - 1.4	1	1.0 - 2.0	1.2	Natural organic matter
SPECIFIC CONDUCTANCE (µS/cm)	1,600	none	218 - 487	352	319 -1166	320	Natural minerals
SULFATE (ppm)	500	none	12 - 55	32	9 - 21	15	Natural minerals
TOTAL DISSOLVED SOLIDS (ppm)	1,000	none	136 - 304	220	199 - 729	320	Natural minerals

MONITORING FOR SODIUM and HARDNESS

SODIUM (ppm)	none	none	31	31	53	53	Natural minerals
TOTAL HARDNESS (ppm as $CaCO_3$)	none	none	72 -184	132	22 - 178	130	Natural minerals
TOTAL HARDNESS (grains/gallon as $CaCO_3$)	none	none	4 - 11	8	1 - 10	8	Natural minerals

Special Health Concerns

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

Source Water Assessments and Vulnerability Summaries

Source Water Assessments evaluate the quality of the water used as a drinking water supply for local communities and examine the water's vulnerability to possible contamination from activities within the watershed. Source Water Assessments were completed in 2001 for the Putah South Canal and Lakes Frey and Madigan. The North Bay Aqueduct's (Sacramento Delta) assessment was completed in 2002. The adjacent table summarizes the vulnerability of each water source and provides a contact name if you would like copies of the complete assessments.

Vulnerability Assessments Table

Source	Most Vulnerable Activities	Moderately Vulnerable Activities	Contact
Lakes Frey and Madigan	Illegal body contact* Wild animal access* Agricultural drainage*	Other animal operations Wildfires	Franz Nestlerode City of Vallejo (707) 648-4308
Putah South Canal	Illegal activities/ Dumping Herbicide applications	Road/Streets Storm drain discharge Recreational area	Alex Rabidoux Solano County Water Agency (707) 451-6090
North Bay Aqueduct	Grazing animals* Runoff from grazing land	Runoff from agricultural land	Alex Rabidoux Solano County Water Agency (707) 451-6090

*Associated with detected contaminants

DEFINITION OF TERMS USED IN THIS REPORT

AL-Regulatory Action Level:
The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

MCL-Maximum Contaminant Level:
The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste and appearance of drinking water.

MCLG-Maximum Contaminant Level Goal:
The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. EPA.

MRDL-Maximum Residual Disinfectant Level:
The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG-Maximum Residual Disinfectant Level Goal:
The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

n/a: Not applicable

ND: Not detected

NTU-Nephelometric Turbidity Units:
Particles in water that make it appear cloudy

pCi/L: picoCuries per liter:
A measure of radioactivity

PHG-Public Health Goal:
The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California EPA.

ppb: parts per billion or micrograms per liter (ug/L)

ppm: parts per million or milligrams per liter (mg/L)

Primary Drinking Water Standards:
MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Secondary Drinking Water Standards:
MCLs for aesthetic characteristics of water (such as color, taste, and odor) that may affect the consumer's acceptance of their water supply.

TT-Treatment Technique:
A required process intended to reduce the level of a contaminant in drinking water.

µS/cm-Microsiemens per Centimeter:
A measure of electrical conductivity

City of Vallejo Water Conservation Program

Contact us for information on free water-saving devices and services or rebates to help reduce water use.

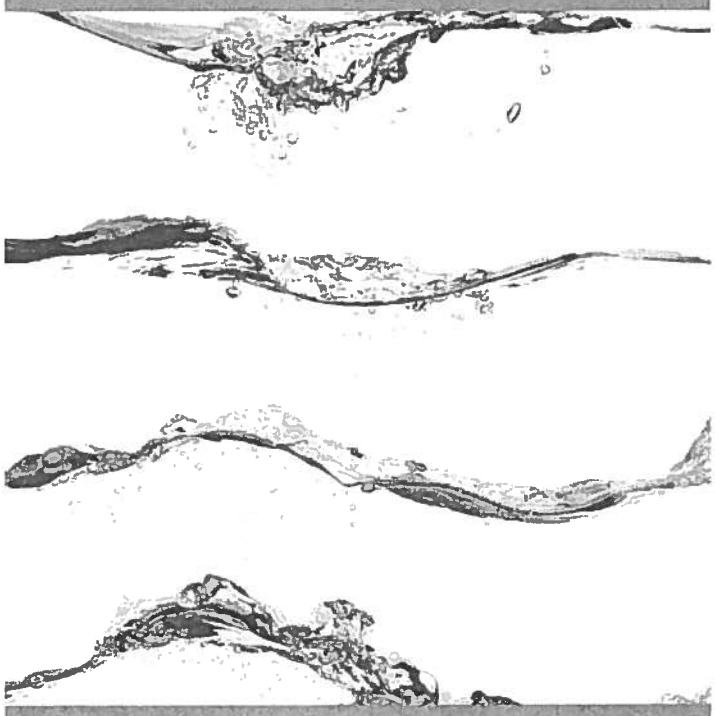
www.vallejowater.org

(707) 648-5299
or
(707) 648-4479

ATTACHMENT NO. 3

Annual Water Quality Report

Water Testing Performed in 2014



City of VALLEJO California

City of Vallejo System, CA4810007

City of Vallejo Lakes System, CA4810021

30073-I-0022

The City of Vallejo welcomes this yearly opportunity to provide our customers with the Annual Water Quality Report. We have included information so you know where your drinking water comes from, how it is treated and how its quality compares to drinking water standards.

This report contains information from water quality testing in 2014 and shows how your water compares with primary and secondary standards established by the State Water Resources Control Board and the U.S. Environmental Protection Agency (USEPA). Primary standards are health related standards whereas secondary standards relate to consumer acceptance of the water supply and govern qualities such as taste, odor and color.

The tables in this report show each constituent found, the level at which they occur, how their level compares with standards and their most likely source. For more information about this report, or for any questions relating to your drinking water, please call Jason Frink, City of Vallejo, Laboratory Supervisor, at (707) 649-3473.

Public Participation

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City Drought Response = Water Conservation

These are uncertain times regarding the City's drinking water supply. The State's overall mandatory water saving target for the City of Vallejo was established at 16% when compared to 2013 residential water consumption. As a result, the city has already activated several water shortage contingency measures, including limiting the number of outdoor watering days to just three days per week. And, because outdoor irrigation can account for up to 70% of all residential water consumption, the City has expanded its landscape rebate programs designed to reduce the use of ornamental turf grasses in neighborhoods. Water customers are encouraged to visit vallejowater.org for valuable water saving tips and money saving water appliance rebates. Due to the drought and increased program participation some rebate programs are out of funds temporarily until July 1, 2015. Contact the Vallejo Water Conservation Program at (707) 648-5299 or (707) 648-4479.

Your Water Treatment Process

The **City of Vallejo** water system and service area receives its finished water from the forty-two million gallons per day Fleming Hill Water Treatment Plant. This conventional treatment facility utilizes a multi-barrier process to ensure compliance with all State and Federal drinking water regulations and standards.

Initially, ozone is added to help remove dissolved organic matter and to aid in downstream processes. The water then flows to mixing basins where coagulants are added and the water is gently agitated so that fine suspended particles come together to form large 'floc' particles that settle out of the water. This process, known as coagulation, flocculation and sedimentation is followed by the addition of more ozone to disinfect and remove unwanted color, taste and odor.

The next step is filtration, where the water flows through multimedia filters consisting of granular activated carbon and sand in order to meet strict standards for clarity and to reduce the levels of microbial contaminants that could be in the untreated source water. Following filtration, the water receives additions of caustic soda, for pH and alkalinity control; fluoride, for the prevention of dental caries; and finally, chlorine to provide microbial protection throughout Vallejo's distribution system. Quality control and assurance is maintained at all times through uniform adherence to standard operating procedures and a meticulous schedule of laboratory analyses.

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First, the MIEX™ pretreatment process removes naturally occurring dissolved organic matter. This treatment, using ion exchange resin, enables us to meet the Disinfectant/Disinfection By-products Rule by sufficiently lowering the levels of total organic carbon, therefore limiting the formation of disinfection by-products such as total trihalomethanes. Total trihalomethanes are chemicals formed over time in the distribution system when dissolved organic matter combines with chlorine. Regulations require we use chlorine to disinfect surface water.

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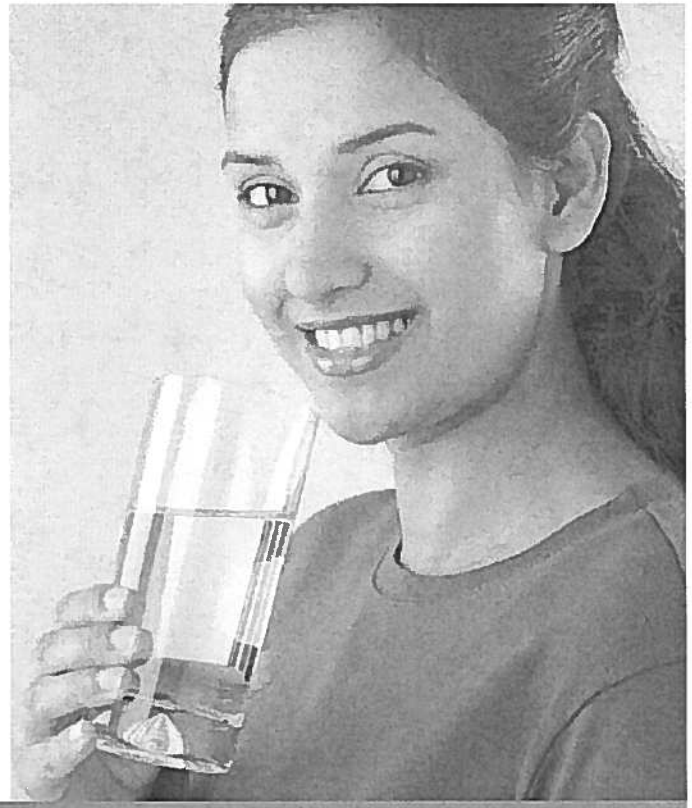
A Message From the United States Environmental Protection Agency

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife;

continued on outside panel



City of Vallejo Annual **Water Quality Report** *Water Testing Performed in 2014*

Environmental Protection Agency continued from inside

- Inorganic Contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming;
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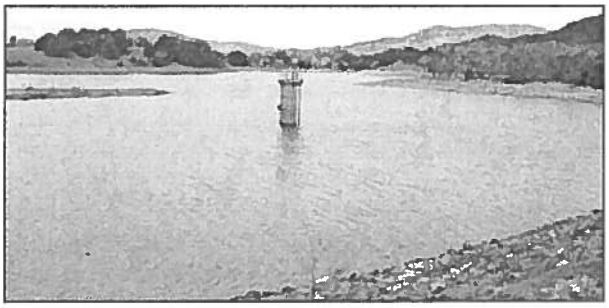

Lake Madigan Source Water for the Lakes Service Area

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hable con alguien que lo entienda bien.

Mahalaga ang impormasyong ito. Mangyaring ipasalin ito.

Printed on Recycled Paper

Your Water Sources

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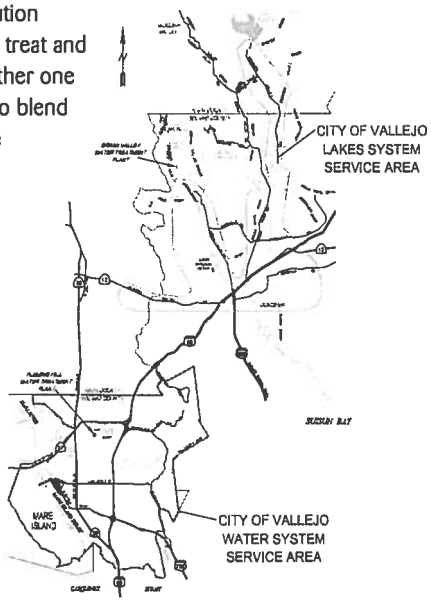
The City of Vallejo Water System customers are fortunate because they receive water supplies from two surface water sources. The Solano Project provides source water from Lake Berryessa, transported to our facilities by the Putah South Canal. The City also receives surface water from the State Water Project. This water, from Lake Oroville, travels through the Sacramento River to the State's North Bay Aqueduct pumping facilities. Our source water pumping and distribution facilities enable us to treat and deliver water from either one of these sources or to blend these sources before treatment at the Fleming Hill Water Treatment Plant and distribution to the Vallejo service area. The City of Vallejo Lakes System and service area is a public water system with its own treatment plant and distribution system that delivers drinking water to customers residing in the Green Valley, Old Cordelia, Jameson Canyon, Suisun Valley, Willotta Oaks and Gordon Valley areas.



This system and service area also has water available from two distinct surface water sources. In addition to the Solano Project's Lake Berryessa water delivered from the Putah South Canal by agreement with the Solano Irrigation District, this system treats water from Lakes Frey and Madigan, which are two interconnected lakes owned by the City of Vallejo. The Green Valley Water Treatment Plant can either treat these two sources separately or blend these two sources before treatment and delivery to our customers. In case of emergencies, portions of this system can receive treated water from the City of Fairfield. For a copy of their Annual Water Quality Report, please call (707) 434-6100.

City of Vallejo Annual **Water Quality Report** *Water Testing Performed in 2014*

PRIMARY DRINKING WATER STANDARDS - Health Related Standards

PARAMETER/CONSTITUENTS (units of measurement)	STATE MCL	PHG (MCLG)	VALLEJO SERVICE AREA RANGE	VALLEJO SERVICE AREA AVG	LAKES SERVICE AREA RANGE	LAKES SERVICE AREA AVG	MAJOR SOURCES IN DRINKING WATER
INORGANICS							
ALUMINUM (ppm)	1	0.6	0.1	0.1	ND	ND	Water treatment processes
FLUORIDE (ppm)	2	1	0.8 - 1.1	1	0.1 - 0.2	0.1	Water additive or natural minerals
MICROBIAL							
TOTAL COLIFORM (% positive samples or number of samples positive) For the City of Vallejo Water System, no more than 5% of all samples taken during a single month may be positive for total coliform. For the Lakes System, no more than one sample per month may be positive for total coliform bacteria.	5% or 1 sample	(0)	ND - 0.6	ND	ND - 9	ND	Naturally present in the environment
CLARITY							
TURBIDITY (NTU) Turbidity is a measurement of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our filtration system. MCL compliance is based on all samples taken each month. All samples were in compliance.	TT = 95% of samples ≤ 0.3 Maximum ≤ 1 TT = % reduction ≥ 80%		100% of samples ≤ 0.3 Maximum = 0.09 99% - 100%	100%	100% of samples ≤ 0.3 Maximum = 0.3 98% - 100%	99%	Soil runoff
RADIOLOGICAL							
RADIUM 228 (pCi/L) City of Vallejo System sampled in 2013 and Lakes System sampled in 2007. The State requires us to monitor for certain substances less than once a year because their concentration does not change frequently.	5	0.019	1.58 - 1.58	1.58	ND	ND	Erosion of natural deposits
DISINFECTANT	MRDL	EPA MRDLG					
CHLORINE, Free Residual as Cl2 (ppm)	4.0*	4*	ND - 1.8	0.8	ND - 2.5	0.5	Drinking water disinfection
DISINFECTION BY-PRODUCTS							
BROMATE (ppb)	10*	0.1	ND - 1.3	ND	n/a	n/a	Drinking water disinfection
TRIHALOMETHANES, TOTAL (ppb)	80*	n/a	22 - 74	69	26 - 88	77	Drinking water disinfection
HALOACETIC ACIDS (ppb)	60*	n/a	2.1 - 16	11	0 - 19	15	Drinking water disinfection
DISINFECTION BY PRODUCTS PRECURSOR							
TOTAL ORGANIC CARBON (%Removal Ratio)	TT = Running Annual Average (RAA) ≥ 1*		All RAA ≥ 1 minimum = 1.9		All RAA ≥ 1 minimum = 2.5		Decay of natural organic matter

*Compliance levels for the five parameters listed above are based on a running annual average determined quarterly. This means that every three months, we average all the samples taken during the prior twelve month period. Results for minimum and maximum values are based on single samples.

MONITORING for CRYPTOSPORIDIUM

Beginning in 2006, federal regulations required us to monitor our raw, untreated water sources (the Putah South Canal and the North Bay Aqueduct) for levels of *Cryptosporidium* contamination for two years. *Cryptosporidium* is a microbial parasite commonly found in surface water throughout the U.S. After analyzing twenty-four monthly samples from each source, we did not find *Cryptosporidium* in the North Bay Aqueduct water and the Putah South Canal had low levels in only two samples. Results from this monitoring program demonstrated that currently, our water treatment processes are sufficient to treat the levels of *Cryptosporidium* possibly encountered in our raw water supplies. The filtration process removes *Cryptosporidium*, although commonly used methods cannot guarantee 100% removal. Please refer to the article "Special Health Concerns" for more information regarding *Cryptosporidium*.

PRIMARY STANDARDS—LEAD and COPPER STUDY—Monitoring of Customers' Tap Water

PARAMETER/CONSTITUENTS (units of measurement)	AL	PHG	Vallejo Service Area 90th %, Number of Homes > AL. Results are from 54 homes sampled in 2012		Lakes Service Area 90th %, Number of Homes > AL. Results are from 12 homes sampled in 2014		MAJOR SOURCES IN DRINKING WATER
COPPER (ppm at the 90th Percentile)	1.3	0.3	ND	0	0.13	0	Internal corrosion of household plumbing
LEAD (ppb at the 90th Percentile)	15	0.2	ND	0	ND	0	Internal corrosion of household plumbing

Every three years the City is required to sample at the cus[illegible]' faucets for lead and copper. This monitoring en[illegible]res our water is not too corrosive and does not leach unsafe levels of these metals into your drinking water. Compliance measuremen[illegible] are from the 90th percentile (the highest level measured from 90% of the homes sampled). The latest monitoring, for both[illegible] water systems did not detect lead or copper from 90% of the homes sampled.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young [illegible]children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The [illegible]City of Vallejo is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbin[illegible] components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing [illegible]up to 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinkin[illegible] water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can [illegible]to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

SECONDARY DRINKING WATER STANDARDS - Aesthetics Related Standards

PARAMETER/CONSTITUENTS (units of measurement)	STATE MCL	PHG or (MCLG)	VALLEJO SERVICE AREA WATER RANGE	VALLEJO SERVICE AREA WATER AVG	LAKES SERVICE AREA WATER RANGE	LAKES SERVICE AREA WATER AVG	MAJOR SOURCES IN DRINKING WATER
ALUMINUM (ppm)	0.2	none	0.1	0.1	ND	ND	Water treatment process
CHLORIDE (ppm)	500	none	8 - 38	16	20 - 104	60	Natural minerals
ODOR-THRESHOLD (units)	3	none	1 - 2	1	1 - 2	1	Natural organic matter
SPECIFIC CONDUCTANCE (µS/cm)	1,600	none	277 - 520	420	347 - 675	550	Natural minerals
SULFATE (ppm)	500	none	25 - 52	41	9 - 17	15	Natural minerals
TOTAL DISSOLVED SOLIDS (ppm)	1,000	none	173 - 325	250	217 - 422	310	Natural minerals

MONITORING FOR SODIUM and HARDNESS

SODIUM (ppm)	none	none	20	20	42	42	Natural minerals
TOTAL HARDNESS (ppm as $CaCO_3$)	none	none	82 -192	132	72 - 190	180	Natural minerals
TOTAL HARDNESS (grains/gallon as $CaCO_3$)	none	none	5 - 11	8	4 - 11	11	Natural minerals

USEPA Unregulated Chemical Monitoring Requirements

Throughout 2014, the USEPA required all large public wate[illegible] syst[illegible] to monitor for additional chemicals not yet regulated. The purpose of this monitoring identifies the occu[illegible]rrence and levels of these chemicals in the public water supply. The USEPA uses this information to determ[illegible] whether these chemicals need to be assessed for health effects and future regulations. This table shows the chemicals found and the levels at which they occur. This monitoring program pertains only to the City of Va[illegible]lo Water System.

CHEMICAL	RANGE	AVG
CHLORATE (ppb)	61 - 240	154
CHROMIUM (ppb)	ND - 0.038	ND
CHROMIUM 6 (ppb)	0.048 - 0.13	0.098
MOLYBDENUM (ppb)	ND - 1.6	ND
STRONTIUM (ppb)	110 - 170	149
VANADIUM (ppb)	1.7 - 3.9	2.3

Special Health Concerns

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

Source Water Assessments and Vulnerability Summaries

Source Water Assessments evaluate the quality of the water used as a drinking water supply for local communities and examine the water's vulnerability to possible contamination from activities within the watershed. Source Water Assessments were completed in 2000 for the Putah South Canal and Lakes Frey and Madigan. The North Bay Aqueduct's Sacramento Delta assessment was completed in 2002. The adjacent table summarizes the vulnerability of each water source and provides a contact name if you would like copies of the complete assessments.

Vulnerability Assessments Table

Source	Most Vulnerable Activities	Moderately Vulnerable Activities	Contact
Lakes Frey and Madigan	Illegal body contact* Wild animal access* Agricultural drainage*	Other animal operations Wildfires	Martin Quenin City of Vallejo (707) 648-4307
Putah South Canal	Illegal activities/ Dumping Herbicide applications	Road/Streets Storm drain discharge Recreational area	Alex Rabidoux Solano County Water Agency (707) 451-6090
North Bay Aqueduct	Grazing animals* Runoff from grazing land	Runoff from agricultural land	Alex Rabidoux Solano County Water Agency (707) 451-6090

*Associated

Lakes System Violation - Notice to Customers

This following information pertains only to customers within the Lakes System service area.

During July 2014, Lakes Water System customers received publication regarding their System's violation for total coliform, a bacteriological standard. Coliforms are bacteria naturally present in the environment and are used as an indicator that other potentially harmful bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.

The City conducted a Level 1 Assessment to determine the cause and remediation necessary to bring the system back into compliance. The violation was short lived and quickly treated by increasing the disinfection level, flushing the distribution system, and resampling.

DEFINITION OF TERMS USED IN THIS REPORT

AL-Regulatory Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Level 1 Assessment: A study of the water system to identify potential problems and determine (if possible) why total coliform have been found in our water system.

MCL-Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste and appearance of drinking water.

MCLG-Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. EPA.

MRDL-Maximum Residual Disinfectant Level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG-Maximum Residual Disinfectant Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

n/a: Not applicable

ND: Not detected

NTU-Nephelometric Turbidity Units: Particles in water that make it appear cloudy

pCi/L: picoCuries per liter: A measure of radioactivity

PHG-Public Health Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California EPA.

ppb: parts per billion or micrograms per liter (ug/L)

ppm: parts per million or milligrams per liter (mg/L)

Primary Drinking Water Standards: MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Secondary Drinking Water Standards: MCLs for aesthetic characteristics of water (such as color, taste, and odor) that may affect the consumer's acceptance of their water supply.

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or

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Environmental Protection Agency continued from inside

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Water Testing Performed in 2015

City of Vallejo System, CA4810007

City of Vallejo Lakes System, CA4810021

30073-I-0024

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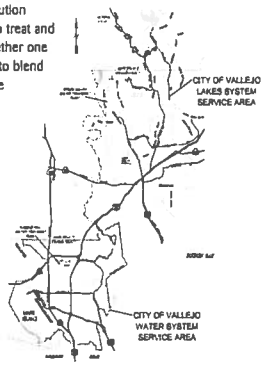

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A Message From the United States Environmental Protection Agency

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife;

continued on outside panel

City of Vallejo Annual **Water Quality Report** *Water Testing Performed in 2015*

PRIMARY DRINKING WATER STANDARDS - Health Related Standards

PARAMETER/CONSTITUENTS (units of measurement)	STATE MCL	PHG (MCLG)				AVG	MG
INORGANICS							
FLUORIDE (ppm)	2	1	0.6 - 1.0	1	0.1 - 0.2	0.1	Water additive or natural minerals
MICROBIAL							
TOTAL COLIFORM (% positive samples or number of samples positive)	5% or 1 sample	(0)	ND - 0.6	ND	ND - 1	ND	Naturally present in the environment
For the City of Vallejo Water System, no more than 5% of all samples taken during a single month may be positive for total coliform. For the Lakes System, no more than one sample per month may be positive for total coliform bacteria.							
CLARITY							
TURBIDITY (NTU)	TT = 95% of samples ≤ 0.3 Maximum ≤ 1 TT = % reduction ≥ 80%		100% of samples ≤ 0.3 Maximum = 0.09 99% - 100%	100%	100% of samples ≤ 0.3 Maximum = 0.07 99% - 100%	99%	Soil runoff
Turbidity is a measurement of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our filtration system. MCL compliance is based on all samples taken each month. All samples were in compliance.							
RADIOLOGICAL							
RADIUM 228 (pCi/L)	5	0.019	1.58 - 1.58	1.58	ND	ND	Erosion of natural deposits
City of Vallejo System sampled in 2013 and Lakes System sampled in 2007. The State requires us to monitor for certain substances less than once a year because their concentration does not change frequently.							
DISINFECTANT	MRDL	LPG MRDLG					
CHLORINE, Free Residual as Cl2 (ppm)	4.0*	4*	ND - 1.4	0.7	ND - 1.4	0.5	Drinking water disinfection
DISINFECTION BY-PRODUCTS							
BROMATE (ppb)	10*	0.1	ND - 2.7	ND	n/a	n/a	Drinking water disinfection
TRIHALOMETHANES, TOTAL (ppb)	80*	n/a	16 - 89	58	21 - 72	49	Drinking water disinfection
HALOACETIC ACIDS (ppb)	60*	n/a	2.8 - 9.9	5	ND - 12	6	Drinking water disinfection
DISINFECTION BY-PRODUCTS PRECURSOR							
TOTAL ORGANIC CARBON (%Removal Ratio)	TT = Running Annual Average (RAA) ≥ 1*		All RAA ≥ 1 minimum = 2.5		All RAA ≥ 1 minimum = 3.1		Decay of natural organic matter

*Compliance levels for the five parameters listed above are based on a running annual average determined quarterly. This means that every three months, we average all the samples taken during the prior twelve month period. Results for minimum and maximum values are based on single samples.

Monitoring for Cryptosporidium

Beginning in 2006, federal regulations required us to monitor our raw, untreated water sources (the Putah South Canal and the North Bay Aqueduct) for levels of *Cryptosporidium* contamination for two years. *Cryptosporidium* is a microbial parasite commonly found in surface water throughout the U.S. After analyzing twenty-four monthly samples from each source, we did not find *Cryptosporidium* in the North Bay Aqueduct water and the Putah South Canal had low levels in only two samples. Results from this monitoring program demonstrated that currently, our water treatment processes are sufficient to treat the levels of *Cryptosporidium* possibly encountered in our raw water supplies. The filtration process removes *Cryptosporidium*, although commonly used methods cannot guarantee 100% removal. Please refer to the article "Special Health Concerns" for more information regarding *Cryptosporidium*.

PRIMARY STANDARDS—LEAD and COPPER STUDY—Monitoring of Customers' Tap Water

PARAMETER/CONSTITUENTS (units of measurement)	AL	PHG	allejo Service Area 9th %, Number of > AL. Results e from 62 homes sampled in 2015		Lakes Service Area 90th %, Number of Homes > AL. Results are from 12 homes sampled in 2014		MAJOR SOURCE IN DRINKING WATER
COPPER (ppm at the 90th Percentile)	1.3	0.3	ND	0	0.13	0	Internal corrosion of household plumbing
LEAD (ppb at the 90th Percentile)	15	0.2	ND	0	ND	0	Internal corrosion of household plumbing

Every three years the City is required to sample at the customers for lead and copper This monitoring ensures our water is not too corrosive and does not leach unsafe levels of these your drinking water. Compliance measurements are from the 90th percentile (the highest level measured from 90% of sampled) The latest monitoring, for both water systems, did not detect lead or copper from 90% of the homes sampled

If present, elevated levels of lead can cause serious health problems, for pregnant women and young children Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Vallejo is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

SECONDARY DRINKING WATER STANDARDS - Aesthetics Related Standards

PARAMETER/CONSTITUENTS (units of measurement)	STATE MCL	PHG or (MCLG)	VALLEJO SERVICE AREA WATER		LAKES SERVICE AREA WATER		MAJOR SOURCES IN DRINKING WATER
			RANGE	AVG	RANGE	AVG	
CHLORIDE (ppm)	500	none	9 - 59	28	12 - 167	57	Natural minerals
ODOR THRESHOLD (units)	3	none	1 - 1.4	1	1.0 - 2.0	1	Natural organic matter
SPECIFIC CONDUCTANCE (µS/cm)	1,600	none	244 - 617	370	279 - 877	470	Natural minerals
SULFATE (ppm)	500	none	39 - 96	45	10 - 18	10	Natural minerals
TOTAL DISSOLVED SOLIDS (ppm)	1,000	none	153 - 386	210	174 - 548	250	Natural minerals
MONITORING FOR SODIUM and HARDNESS							
SODIUM (ppm)	none	none	40	40	41	41	Natural minerals
TOTAL HARDNESS (ppm as $CaCO_3$)	none	none	76 -190	98	20 - 188	160	Natural minerals
TOTAL HARDNESS (grains/gallon as $CaCO_3$)	none	none	4 - 11	6	1 - 11	9	Natural minerals

USEPA Unregulated Contaminants Monitoring Rule Requirements

Between 2013 and 2015, the USEPA required all large public water systems to monitor for additio not yet regulated. The purpose of this monitoring identifies the occurrence and levels of these c public water supply. The USEPA uses this information to determine whether these chemica assessed for health effects and future regulations. This table shows the chemicals found and the they occur. This monitoring program pertains only to the City of Vallejo Water System and occ

CHEMICAL	RANGE	A
CHLORATE (ppb)	61 - 240	154
CHROMIUM (ppb)	ND - 0.038	ND
CHROMIUM 6 (ppb)	0.048 - 0.13	0.098
MOLYBDENUM (ppb)	ND - 1.6	ND
STRONTIUM (ppb)	110 - 170	149
VANADIUM (ppb)	1.7 - 3.9	2.3

Special Health Concerns

Source Water Assessments and Vulnerability Summaries

Source Water communities watershed Frey and 2011 The name If you

Vulnerability Assessments Table

Source			
Lakes Frey and Madigan	Illegal body contact* Wild animal access* Agricultural drainage*	Other animal operations Wildfires	Martin Querin City of Vallejo (707) 648-4307
Putah South anal	Illegal activities/ Dumping Herbicide applications	Road/Streets Storm drain discharge Recreational area	Alex Rabidoux Solano County Water Agency (707) 451-6090
North Bay queduct	Grazing animals* Runoff from grazing land	Runoff from agricultural land	Alex Rabidoux Solano County Water Agency (707) 451-6090

*Associated

Notice to Customers

Pertains to Lakes System Service Area Only

DEFINITION OF TERMS USED IN THIS REPORT

AL-Regulatory Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Level 1 Assessment: A study of the water system to identify potential problems and determine (if possible) why total coliform have been found in our water system.

MCL-Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste and appearance of drinking water.

MCLG-Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. EPA.

MRDL-Maximum Residual Disinfectant Level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG-Maximum Residual Disinfectant Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

n/a: Not applicable

ND: Not detected

NTU-Nephelometric Turbidity Units: Particles in water that make it appear cloudy

pCi/L: picoCuries per liter: A measure of radioactivity

PHG-Public Health Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California EPA.

ppb: parts per billion or micrograms per liter (ug/L)

ppm: parts per million or milligrams per liter (mg/L)

Primary Drinking Water Standards: MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Secondary Drinking Water Standards: MCLs for aesthetic characteristics of water (such as color, taste, and odor) that may affect the consumer's acceptance of their water supply.

TT-Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

µS/cm-Microsiemens per Centimeter: A measure of electrical conductivity

City of Vallejo Water Conservation Program

2015 Water Quality Report

Each year the City of Vallejo provides a Water Quality Report to its customers to inform them about important information regarding water quality.

In an effort to be more environmentally responsible, we are no longer printing large quantities of the report; however, the Report will be available on the city's website by April 1, 2016 at

www.cityofvallejo.net/waterqualityreport2015

If you would like a paper copy of the report, please send an email request with your name & mailing address to email address Jason.Frink@cityofvallejo.net or call 707-648-4314.

30073-I-0024

2015 Water Quality Report

Mahalaga ang impormasyong ito. Mangyaring ipasalin ito.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo o hable con alguien que lo entienda bien.

www.cityofvallejo.net/waterqualityreport2015

707-648-4307

30073-I-0024

ATTACHMENT NO. 4

Association of
California Water Agencies
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March 2016

Suggested Guidelines for Preparation of Required Reports on PUBLIC HEALTH GOALS (PHGs) to satisfy requirements of California Health and Safety Code Section 116470(b)

Background

Public water systems serving more than 10,000 service connections must prepare a brief, written report in plain language by July 1, 2016 that gives information on the "detection" of any contaminants above the Public Health Goals (PHGs) published by the state Office of Environmental Health Hazard Assessment (OEHHA). The report must also list the "detection" of any contaminant above the Maximum Contaminant Level Goals (MCLGs) set by United States Environmental Protection Agency (USEPA) for all other contaminants until such time as OEHHA has published PHGs for those contaminants.

It is emphasized that the report only needs to provide information on the number of contaminants that a water system has found at a level exceeding a PHG or a MCLG.

The purpose of the legislation requiring these reports was to provide consumers with information on levels of contaminants even below the enforceable mandatory Maximum Contaminant Levels (MCLs) so they would be aware of whatever risks might be posed by the presence of these contaminants at levels below the MCLs. Additionally, each water system must provide an estimate of the cost to reduce the contaminant(s) to the PHG (or MCLG if there is no PHG) regardless of how minimal the risk might be.

The following should be considered when preparing the mandated reports:

1. The USEPA and the California State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) establish MCLs at very conservative levels to provide protection to consumers against all but very low to negligible risk. In other words, MCLs are the regulatory definition of what is "safe." Adopted MCLs are still the criteria for being in compliance, not those proposed or possible in the future, and certainly not MCLGs or PHGs.

2. MCLGs and PHGs are often set at very low levels depending on the established health risk, and in the case of USEPA, MCLGs are also set at zero for some

contaminants. Determination of health risk at these low levels is theoretical based on risk assessments with multiple assumptions and mathematical extrapolations. Many contaminants are considered to be carcinogenic and USEPA's policy is to set the applicable MCLGs at zero because they consider no amount of these contaminants to be without risk. It is understood by all that zero is an unattainable goal and cannot be measured by the practically available analytical methods. Note that by regulation, OEHHA cannot set a PHG at zero and must calculate a numerical level to address risk, even though it may be unattainable or impossible to measure.

3. PHGs and MCLGs are not enforceable. The Best Available Technology (BAT) to reach such low levels has not been defined and may not realistically be available. Accurate cost estimates are difficult, if not impossible, and are highly speculative and theoretical. Therefore, they have limited value and may not warrant significant investment of agency time and money.

These reports are unique to California. They are required in addition to the extensive public reporting of water quality information that California water utilities have been doing for many years and in addition to the federally mandated Consumer Confidence Reports (CCRs). Hence, it should be kept in mind that IN ADDITION to this required report, each utility will continue reporting ANNUALLY in great depth on the quality of the water it serves.

The guidance herein is intended to assist water suppliers in completing the required reports in a responsible manner without expending excessive amounts of resources that are better used to comply with the many regulatory mandates designed to ensure safe drinking water.

Guidance on preparing these reports is needed because the legislative language does not spell out all of the detailed answers to questions that arise. Neither the DDW nor OEHHA have issued any guidelines regarding the report. In fact, while OEHHA has a mandate to determine and provide information on "numerical health risk," they otherwise have no involvement or authority regarding the report.

The DDW as the primary enforcing agency of all provisions of the Health and Safety Code relative to drinking water systems has the authority to ensure that public water systems comply with the report requirement. DDW requests that utilities report in writing as to how they have complied with the fundamental requirements of this section, which are:

1) Prepare a brief written report,
2) Hold a public hearing (meeting), and
3) Notify DDW that the meeting was held and the report is available.

Detailed Guidelines:

I. Who must prepare a PHG report?

California Health and Safety (H&S) Code, Section 116470(b) is clear that a system ONLY needs to do a report IF it has at least 10,000 service connections AND IF it exceeds one or more PHGs or MCLGs. Also, a public hearing is NOT required if a report does not have to be prepared.

Utilities that do NOT have to do the report may choose to submit an information item to their governing board advising them that no report is required.

This report is required every three years.

II. Wholesalers (<10,000 service connections) are NOT required to do a PHG report.

DDW has clarified that wholesalers who do not directly serve more than 10,000 service connections are not required to meet the PHG report requirements of California H&S Code, Section 116470(b).

III. Timing, Notification, Meetings

A. Timing and Meeting: The report must be prepared by July 1, 2016. A public hearing, which can be held as part of any regularly scheduled meeting, should be held sometime after July 1 and prior to reporting to DDW. DDW has indicated that the public hearing "should be held within a reasonable time after the report's completion" so the information is current. The purpose of the hearing is to "accept and respond to" public comment. The governing board or council of public water agencies would also likely approve the staff report at that time. This would represent endorsement by the board of the part of the report where any action (or no action) would be proposed regarding reduction of contaminants to levels lower than required for compliance with MCLs.

B. Notification: There is no requirement to send a copy of the report to the public. Public agencies must "notice" public hearings so this hearing would be subject to the normal notice requirements (i.e., number of days advance, publishing in appropriate newspaper, etc.) The notice would appropriately indicate the report is the subject of the hearing and indicate it is available for the public to review or to get a copy upon request.

(NOTE: Investor owned utilities will likely have to schedule a special "meeting" since they are not subject to the same meeting notice requirements and may not have any authority to hold a "public hearing" per se. Their notification of the public could however be similar to public agencies, i.e., publication of legal notice in newspaper of general circulation.)

C. Submission of Reports: DDW does not specifically require that a copy of the report be submitted to them.

IV. Interpretations

A. What contaminants must be covered?

A table of relevant current PHGs, MCLGs, MCLs, and Detection Limits for purposes of Reporting (DLRs) is attached to this guidance as Attachment No. 1.

1. Only contaminants that **have an existing MCL** AND were "detected" at a level that "exceeds" the PHG or, where there is no PHG, the Federal MCLG**,** need to be included in the report. (See guidance below on "detected" and "exceed")

2. All contaminants that, **as of December 31, 2015**, have Primary Drinking Water Standards (PDWS) set by California **AND** have an equivalent PHG or a MCLG. This includes chemical, microbiological and radiological constituents. PDWS may be either MCLs or Treatment Techniques (TT). For example, the Surface Water Treatment Rule (SWTR) is a TT for the following contaminants: *Giardia lamblia*, viruses, *Cryptosporidium*, *Legionella* and heterotrophic bacteria (HPC). A TT is set when it is not possible to reliably analyze for the contaminant of concern (the SWTR) or when it is not feasible or appropriate to set a numerical standard (the Lead & Copper Rule).

3. It does NOT include contaminants such as radon for which USEPA has considered adopting an MCL nor does it include any contaminants DDW plans to regulate in the future.

   It does NOT include contaminants for which there is no final PHG or MCLG as of December 31, 2015 nor does it include any secondary MCLs (i.e., TDS, SO_4, Na, etc).

B. What data are to be used for the report due by July 1, 2016?

1. It is recommended that the data used should be from the 3 consecutive calendar years prior to the year the report is prepared. For example, the 2016 report would be based on the analytical data from samples taken in 2013, 2014, and 2015. The data should be the same as that used by the drinking water agency in determining compliance with DDW requirements. In most cases this would be after blending or treatment. Individual well data would only be used if the well feeds directly to the distribution system.

2. For utilities that purchase water from another agency or from a wholesaler, it is suggested that the same guidance or ground rules be followed as for the CCRs. If the only source for a retail system is treated water from a wholesaler and that water contains a constituent above a PHG or MCLG, the retailer should use its own distribution system monitoring data. For systems with both its own sources of water and purchased water, the retailer should evaluate its own distribution system compliance monitoring and compare the annual average value with the PHG or MCLG.

C. What do the terms "detect" and "exceed" mean in the context of the required report?

1. Keep in mind that there are no regulations that relate to "meeting" or "complying with" PHGs. The logical approach would be to use the same procedures and requirements that the California Title 22 Regulations specify for determining compliance with MCLs. For example, if Title 22 or DDW guidance specifies that the average of a group of samples be compared to the MCL for compliance purposes, the same averaging should be used to compare to the PHG or MCLG. For most constituents (coliform is an exception), compliance with MCLs is measured at the "point of entry" to the distribution system. This means that, for the most part, the analytical results for each well must be evaluated separately and compared to the MCLG or PHG. If wells are blended or treated before delivery to the system, the judgment as to whether there was a "detection exceeding the MCLG or PHG" should be based on the "point of entry" data just as for compliance with MCLs.

2. Be sure to report the PHG (or MCLG) as a number equal to or greater than 1.0 as specified in the State Consumer Confidence Report Guidance for Water Suppliers. It is recommended that all data be converted to

match CCR data. Attachment No. 1 concentration numbers are given as mg/L, unless otherwise noted.

3. Keep in mind that if a utility determines that a constituent has been found at a level exceeding the PHG or MCLG, a cost estimate is mandated. A utility would ordinarily be required to perform a cost estimate only if it is clear that the MCL has been clearly exceeded, not just momentarily, or on one sample. In the same way, only when the PHG/MCLG level is clearly exceeded should a cost estimate be calculated and reported.

4. Significant figures, analytical detection limits, reporting limits, and different methods of determining compliance, all affect the assessment of which constituents were "detected" above the PHG or the MCLG.

5. Results that are reported below the State regulatory Detection Limit for Purposes of Reporting (DLR - See Title 22, CCR, Sections 64432 & 64445.1 and other DDW guidance on compliance reporting) should be treated as 0 (zero) which is accepted DDW practice. USEPA also recommends treating ND as zero.

6. As in all cases of reporting results to the state, the results of analyses should be rounded to reflect the appropriate number of significant figures. (EXAMPLE: For coliform bacteria, the MCLG is 0% samples positive per month which indicates one significant figure. So, if during 2013, a system had a positive sample but the percentage of samples positive for the month was <0.49%, this could be rounded to one significant figure, as the MCLG is expressed, so it would be rounded to 0%.) (SECOND EXAMPLE: For a constituent like PCBs where the MCL is 0.5 ppb and the DLR is 0.5 ppb, how do you determine if you exceeded the MCLG of "zero"? Webster defines "zero" as "having no measurable or otherwise determinable value" which in effect is the DLR. So for PCBs, if the average of results for a given well is less than the DLR, the value would be reported as "zero". Note that by regulation OEHHA cannot set a PHG at zero and must calculate a numerical level to address risk.)

7. In averaging the results for a constituent over a specified period during which some of the data is less than the DLR, the average value obtained should be rounded to the appropriate significant figure before comparing to the PHG or MCLG. (EXAMPLE: If a well were sampled for PCE and 0.6 ppb was found and the resample showed 0.6 ppb, it would constitute a confirmed positive detection. But if 3 additional compliance samples were taken from the well and all had less than 0.5 ppb, which is the DLR,

then averaging the 5 samples would give an average of 0.24 ppb, which would be rounded to zero. So the average from the well does not exceed the PHG of 0.06 ppb and no cost estimate would be needed for this well.)

D. What does the term "best available technology" (BAT) mean as used in this portion of the law?

1. While a specific definition of the term is not in the State Health & Safety Code, the accepted meaning in all other sections is that it refers to a technology to achieve compliance with MCLs. In fact, where "best available technology" is listed or explained (Sections 64447, 64447.2 & 64447.4), the usage is "for achieving compliance with the MCLs." This is also true for BAT specified in federal regulations.

2. However, in Section 116470(b)(4), the term refers to "BAT," if any is available on a commercial basis, to remove or reduce the concentration of the contaminant. Specifically, (b)(5) requires cost estimates of using the technology described in (b)(4) to "reduce the contaminant...to a level at or below the" PHG (or MCLG).

3. Obviously, where MCLGs are set at zero, there may not be commercially available technology to reach a non-detectable level. This should be clearly stated in the report. Since there is little data readily available to "estimate" cost of treatment to achieve absolute zero levels, rough estimates of "BAT" as defined in law might be used with a clearly written caveat that use of this "BAT" may still not achieve the PHG or MCLG and the costs may be significantly higher to do so.

E. How should the report deal with coliform?

The United States Environmental Protection Agency (USEPA) has revised the 1989 Total Coliform Rule (TCR). The Revised Total Coliform Rule (RTCR) offers a meaningful opportunity for greater public health protection beyond the 1989 TCR. The 1989 TCR provisions (listed below) remain effective until March 31, 2016. PWSs and primacy agencies must comply with the requirements of the RTCR beginning April 1, 2016. Information in the 2016 PHG report still follows the current TCR provisions. As such, ACWA will provide information on the new requirements in the 2019 PHG Triennial Report Guidance.

TCR provisions still applicable until April 1, 2016:

1. Keep in mind that the MCL is a monthly percent of positive samples (not to exceed 5%) and no actual numbers of coliform are determined or are

required to be determined. The MCLG of zero (0) is therefore appropriately interpreted as zero percent of samples per month, NOT zero samples positive. (For example, if the system did not exceed 0.5% positive samples in any month, the system would not exceed the MCLG of 0 because anything less than 0.5% would be rounded down to 0, which is consistent with the significant figure of the MCLG.)

2. If it is determined that the system has exceeded the MCLG of zero % for coliform bacteria, the following factors are pertinent to deciding what action, if any, is appropriate to consider and estimate costs for:

   a. Exceeding zero % coliform bacteria in any month, in and of itself, would not normally constitute the need for any treatment or action;
   b. There is no action that could be taken that with any certainty could ensure that the system would always have 0% coliform every single month;
   c. The "best available technology" (to meet the MCL, not the MCLG) is specified by DDW in Title 22, CCR, Section 64447 and for the most part is already followed by many systems;
   d. The one single action that would most likely decrease the possibility of a system having zero % positive coliform would be to significantly increase the disinfectant residual. This would likely result in increased Disinfection Byproducts (DBPs) which have adverse health consequences. This focuses on the risk-tradeoff issue – protection from acute risks versus potential harm from chronic risks. The limits to the amount of disinfectant residual allowed in the distribution system are the maximum residual disinfectant levels (MRDLs) as established by the Disinfectants and Disinfection Byproducts Rule (D/DBPR).
   e. Utilities should point out the positive, proactive steps they take to prevent coliform contamination in the distribution system including such steps as preventive maintenance, main flushing, special monitoring, residual maintenance and testing, cross-connection control, etc.

F. How should the report handle the MCLGs of zero for *Giardia lamblia*, *Cryptosporidium*, *Legionella* and viruses?

1. The MCL for pathogenic micro-organisms is a TT (i.e., the SWTR). No monitoring is mandated for the organisms because there are no standardized methods for testing or the analyses are not timely (like virus testing – 30 days) to provide public health protection.

2. For these reasons, since the intent of the TT (SWTR) is to protect against these pathogens, it can properly be assumed that if the SWTR is met, that the utility has met the MCLG because there is no uniform way to assess possible pathogen levels.

3. For utilities doing voluntary monitoring of pathogens (such as Giardia and Cryptosporidium), the results are appropriately considered research or for operational purposes, and not for compliance purposes.

G. How should the report deal with Lead and Copper?

1. Any lead or copper values below the respective DLR should be reported as zero.

2. For lead from at the tap monitoring, if the 90 percentile lead value is ND or <0.005 mg/l, then you should assume you do not exceed the lead PHG of 0.2 ppb.

3. For copper from at the tap monitoring, if the 90 percentile copper value is not above 300 ppb, then you have not exceeded the copper PHG.

4. While not precisely stated in the regulations, best available technology for Lead and Copper compliance is a TT (in lieu of MCLs) of "optimized corrosion control." For larger systems with >10,000 service connections, this depends on a series of steps involving sampling, reports, studies, etc. If a system meets the requirements of having optimized corrosion control, but still has a 90 percentile lead or copper value above the PHGs, it is not clear what additional steps could be considered, particularly without causing other potential water quality problems. It may be appropriate to explain this in a straight-forward manner rather than putting in "hypothetical" cost figures.

H. Must the report deal with Total Trihalomethanes (TTHMs) or Haloacetic Acids (HAAS)?

No. MCLG/PHG exceedances must be reported only for those contaminants that have a primary drinking water standard in place and an associated MCLG/PHG. Although EPA has adopted MCLGs for some individual THMs and HAAs (such as dibromochloromethane or dichloroacetic acid), there are no MCLs in effect for these individual constituents. Likewise, EPA has adopted standards for the cumulative byproduct groups but there are no MCLGs or PHGs established for the groups. In California, DDW has adopted an MCL for both cumulative byproduct groups, but there are no associated PHGs. (Note: OEHHA published a

draft PHG of 0.8 ppb for total trihalomethanes in September 2010 but it had not been finalized as of December 31, 2015).

However, individual MCLs and MCLGs for bromate and chlorite exist, so they must be included in the report if detected.

I. How should water utilities handle gross alpha and uranium?

When looking at the results of any radionuclide monitoring done in the 3-year period to be covered by the report, there are several things to keep in mind:

As indicated in C.1 of this Guidance, where averaging is done to determine compliance with MCLs, it should also be done in considering PHGs. This is important for radionuclides because compliance is often based on averaging.

Unlike most other constituents, laboratories doing radionuclides report some results that are LOWER than the state DLR. Title 22, 64442 (h)(3)(c) states: "If a sample result is LESS than the DLR in Table 64442, ZERO shall be used to calculate the annual average....." Also, it says for Gross Alpha: ".....1/2 of the DLR shall be used to calculate the annual average."

Where Gross Alpha analyses are used in lieu of analyzing for uranium, Radium 226 or 228, the procedure outlined in Title 22, 64442(f) should be followed. (Note: The 95% confidence limit is often reported by labs as MDA95.)

J. Do utilities have to report detections of Hexavalent Chromium?

Hexavalent chromium has both an MCL of 10 ppb and a PHG of 0.02 ppb in California. This is in addition to the MCL and MCLG for Total Chromium. Water systems should have monitoring data for hexavalent chromium in 2015, which means there will be one year's worth of data to average.

V. Disclosure of Numerical Public Health Risk Associated with PHGs/MCLs and Identification of Category of Risk

H&S Code, Section 116470(b)(2) requires the report to disclose the numerical public health risk associated with both the maximum contaminant level and public health goal for each contaminant detected in drinking water that exceeds the public health goal, and Section 116470(b)(3) requires an identification of the category of risk to public health associated with exposure to the contaminant. In February 2016, OEHHA prepared and published an updated "Health Risk Information for Public Health Goal Exceedance Reports" document. It is included as Attachment No. 2, and can be accessed at http://oehha.ca.gov/water/phg/pdf/2016phgexceedancereport012816.pdf.

V. Cost Estimates

The most difficult aspect of the required report is estimating the cost of treatment. Agencies are urged to keep in mind that because of the advisory nature of the report, the non-enforceable aspect of PHGs and MCLGs, and the highly speculative applicability of technology to achieve "zero" levels, only very preliminary cost estimating is appropriate and necessary.

Remember that a cost estimate is only required for a constituent if you determine that it was "detected" above the PHG or MCLG. If the MCLG is zero and the result (after approximation, averaging, rounding) is less than the DLR, no cost estimate is needed. (Remember that many DLRs are LOWER than the PHG so "detection" above the DLR does not necessarily mean that it is above the PHG.)
The cost estimates should not be low estimates because that would give a mistaken impression that achieving "zero" levels would have a lower price tag when the amount of uncertainty and unknowns would be very high. Given the uncertainties, it might be appropriate to consider reporting a range of costs.

For the 2016 guidance, ACWA is providing a revision of its previous treatment cost information.

Attachment No. 3 to this guidance includes several tables which provide "ranges" of costs for installing and operating several treatment technologies. These data have been gathered from a variety of sources and represent estimates for different size systems, different sources, and different constituents targeted for reduction by the treatment.
Table 1 represents the results of a 2012 ACWA Survey of its member agencies. This has been revised using the average 2015 ENR Cost Index.
Table 2 includes data from several agencies that was gathered separately from the 2012 ACWA survey. This has been revised using the average 2015 ENR Cost Index.
Table 3 is treatment cost data from previous ACWA Guidance documents with the costs updated to 2012. This has been revised using the average 2015 ENR Cost Index.
Table 4 is a summary of a 2011 report for the SWRCB on the cost of treatment to address nitrate. This table is provided for reference only, and has not been updated.
Table 5 is a summary of a Water Research Foundation Project final report on cost of removal technologies for treatment of perchlorate. This table is provided for reference only, and has not been updated.

The law specifies that the report should only "estimate the aggregate cost and the cost per customer of utilizing the technology" to reduce the level down to the PHG. There is no specification of what is to be estimated: Initial construction cost, annualized costs of construction and O&M, or another way of expressing cost. It is suggested that each

utility may do it the way they report other costs. (EXAMPLES: 1. Initial Cost of Construction, including % increases for each of design, planning, CEQA, permitting, contingency, etc =$10 million or $1000 per customer plus an ongoing O&M Cost of $1 million or $100 per customer, forever; 2. Annualized Cost of Construction plus O&M = $2 million or $200 per customer.)

All possible technologies do not have to be evaluated for each constituent to compare costs. For example if GAC and RO are both possible treatment technologies to try to lower the level of a particular contaminant to the "zero" PHG/MCLG level, it is appropriate to specify and estimate costs for the technology that would likely be used, keeping in mind there are significant uncertainties based on a variety of factors. If the utility has multiple contaminants to address in the report, one technology (i.e., RO) may address them all, so a cost estimate for RO only could suffice.

General "order of magnitude" estimates are adequate. It is assumed that ALL costs including capital, land, construction, engineering, planning, environmental, contingency and O&M costs should be included but general assumptions can be made for most of these items.

If a system chooses to do its own cost estimating rather than use the costs in Attachment No. 3, it is recommended that generally available cost estimating guides be used such as from USEPA, WRF, AWWA, ASCE, or textbooks, manuals, journals.

The following is a list of excellent, relatively current references that might be used:

(1) Implementation of Arsenic Treatment Systems, Part 1. Process Selection; Awwa Research Foundation and U.S.E.P.A, Published by AwwaRF and AWWA, 2002,
(2) Implementation of Arsenic Treatment Systems, Part 2: Design Considerations, Operation and Maintenance, Awwa Research Foundation, Published by AwwaRF and AWWA, 2002,
(3) State-of-Science on Perchlorate Treatment Technologies, Final Report for Water Research Foundation project #4359, 2011,
(4) An Assessment of the State of Nitrate Treatment Alternatives, AWWA, June 2011, Chad Siedel and Craig Gorman, Jacobs Engineering Group, Inc.,
(5) Performance and Cost Analysis of Arsenic Treatment in California, October, 2009, JAWRA, UC Davis, Hilkert, Young, Green and Darby.

USEPA includes cost data in the Federal Register for each regulation when it is proposed or adopted. (NOTE: USEPA estimates generally do not consider state-specific concerns and some costs have been known to be underestimated in the past so costs should be increased appropriately and based on utility experience.) The experience of other utilities in your area that have installed treatment to meet MCLs or data reported in journals is valuable as well.

Utilities may also choose to have their engineering consultants prepare these very general cost estimates.

VI. Sample Hypothetical Report

Attachment No. 4 is an attempt to show what a PHG required report might look like for a "hypothetical" water system that serves more than 10,000 service connections and had one or more PHG/MCLG exceedances in the 3-year period ending December 31, 2015. It is NOT the only way the report might be done. The sample is based on these guidelines. If there appears to be a conflict between the sample and the guidelines, the guidelines should be followed.

If you have any questions about these guidelines or any of the attachments, contact Adam Walukiewicz Robin, ACWA, at 916-441-4545.

ATTACHMENT NO. 5

2016 PHG Triennial Report: Calendar Years 2013-2014-2015

MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants

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

Last Update: December 29, 2015

(Reference last update 9/23/2015: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.shtml)

This table includes:

- DDW's maximum contaminant levels (MCLs)
- DDW's detection limits for purposes of reporting (DLRs)
- Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)
- PHGs for NDMA and 1,2,3-Trichloropropane (both are unregulated) are at the bottom of this table
- The federal MCLG for chemicals without a PHG, microbial contaminants, and the DLR for 1,2,3-TCP

Constituent	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	1997
Antimony	--	--	0.0007	2009 draft
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 1999 0.0025 mg/L PHG in Nov 2001	0.05	0.01	(0.100)	
Chromium, Hexavalent (Chromium-6)	0.01	0.001	0.00002	2011
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 N)	10 as N	0.4	45 as NO3 (=10 as N)	1997
Nitrite (as N)	1 as N	0.4	1 as N	1997
Nitrate + Nitrite (as N)	10 as N	0.4	10 as N	1997
Perchlorate	0.006	0.004	0.001	2015
Selenium	0.05	0.005	0.03	2010
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

Constituent	MCL	DLR	PHG or (MCLG)	Date of PHG
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
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	5	--	(zero)	--
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	0.07	2014
Styrene	0.1	0.0005	0.0005	2010
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	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
Xylenes	1.75	0.0005	1.8	1997

Constituent	MCL	DLR	PHG or (MCLG)	Date of PHG
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)				
Alachlor	0.002	0.001	0.004	1997
Atrazine	0.001	0.0005	0.00015	1999
Bentazon	0.018	0.002	0.2	1999 (rev2009)
Benzo(a)pyrene	0.0002	0.0001	0.000007	2010
Carbofuran	0.018	0.005	0.0017	2000
Carbofuran	--	--	0.0007	2015 draft
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	0.0000017	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 (rev2010)
Diquat	0.02	0.004	0.015	2000
Diquat	--	--	0.006	2015 draft
Endrin	0.002	0.0001	0.0018	1999 (rev2008)
Endrin	--	--	0.0003	2015 draft
Endothal	0.1	0.045	0.094	2014
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	0.002	2014
Lindane	0.0002	0.0002	0.000032	1999 (rev2005)
Methoxychlor	0.03	0.01	0.00009	2010
Molinate	0.02	0.002	0.001	2008
Oxamyl	0.05	0.02	0.026	2009
Pentachlorophenol	0.001	0.0002	0.0003	2009
Picloram	0.5	0.001	0.5	1997
Picloram	--	--	0.166	2015 draft
Polychlorinated biphenyls (PCBs)	0.0005	0.0005	0.00009	2007
Simazine	0.004	0.001	0.004	2001
2,4,5-TP (Silvex)	0.05	0.001	0.003	2014
2,3,7,8-TCDD (dioxin)	$3x10^{-8}$	$5x10^{-9}$	$5x10^{-11}$	2010
Thiobencarb	0.07	0.001	0.07	2000
Thiobencarb	--	--	0.042	2015 draft
Toxaphene	0.003	0.001	0.00003	2003

Constituent	MCL	DLR	PHG or (MCLG)	Date of PHG
Chemicals with MCLs in 22 CCR §64533—Disinfection Byproducts				
Total Trihalomethanes	0.080	--		
Total Trihalomethanes	--	--	0.0008	2010 draft
Bromodichloromethane	--	0.0010	(zero)	--
Bromoform	--	0.0010	(zero)	--
Chloroform	--	0.0010	(0.07)	--
Dibromochloromethane	--	0.0010	(0.06)	--
Haloacetic Acids (five) (HAA5)	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 or 0.0010[a]	0.0001	2009
Chlorite	1.0	0.020	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)	
Chemicals with PHGs established in response to DDW requests. These are not currently regulated drinking water contaminants.				
N-Nitrosodimethylamine (NDMA)	--	--	0.000003	2006
1,2,3-Trichloropropane	--	0.000005	0.0000007	2009

Notes:

[a] DDW will maintain a 0.0050 mg/L DLR for bromate to accommodate laboratories that are using EPA Method 300.1. However, laboratories using EPA Methods 317.0 Revision 2.0, 321.8, or 326.0 must meet a 0.0010 mg/L MRL for bromate and should report results with a DLR of 0.0010 mg/L per Federal requirements.

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

** Surface water treatment = TT

ATTACHMENT NO. 6

Table 1
Reference: 2012 ACWA PHG Survey

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated Unit Cost 2012 ACWA Survey Indexed to 2015* ($/1,000 gallons treated)
1	Ion Exchange	Coachella Valley WD, for GW, to reduce Arsenic concentrations. 2011 costs.	1.99
2	Ion Exchange	City of Riverside Public Utilities, for GW, for Perchlorate treatment.	0.96
3	Ion Exchange	Carollo Engineers, anonymous utility, 2012 costs for treating GW source for Nitrates. Design souce water concentration: 88 mg/L NO_3. Design finished water concentration: 45 mg/L NO_3. Does not include concentrate disposal or land cost.	0.72
4	Granular Activated Carbon	City of Riverside Public Utilities, GW sources, for TCE, DBCP (VOC, SOC) treatment.	0.48
5	Granular Activated Carbon	Carollo Engineers, anonymous utility, 2012 costs for treating SW source for TTHMs. Design souce water concentration: 0.135 mg/L. Design finished water concentration: 0.07 mg/L. Does not include concentrate disposal or land cost.	0.34
6	Granular Activated Carbon, Liquid Phase	LADWP, Liquid Phase GAC treatment at Tujunga Well field. Costs for treating 2 wells. Treament for 1,1 DCE (VOC). 2011-2012 costs.	1.47
7	Reverse Osmosis	Carollo Engineers, anonymous utility, 2012 costs for treating GW source for Nitrates. Design souce water concentration: 88 mg/L NO_3. Design finished water concentration: 45 mg/L NO_3. Does not include concentrate disposal or land cost.	0.78
8	Packed Tower Aeration	City of Monrovia, treatment to reduce TCE, PCE concentrations. 2011-12 costs.	0.42
9	Ozonation+ Chemical addition	SCVWD, STWTP treatment plant includes chemical addition + ozone generation costs to reduce THM/HAAs concentrations. 2009-2012 costs.	0.09

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated Unit Cost 2012 ACWA Survey Indexed to 2015* ($/1,000 gallons treated)
10	Ozonation+ Chemical addition	SCVWD, PWTP treatment plant includes chemical addition + ozone generation costs to reduce THM/HAAs concentrations, 2009-2012 costs.	0.19
11	Coagulation/Filtration	Soquel WD, treatment to reduce manganese concentrations in GW. 2011 costs.	0.73
12	Coagulation/Filtration Optimization	San Diego WA, costs to reduce THM/Bromate, Turbidity concentrations, raw SW a blend of State Water Project water and Colorado River water, treated at Twin Oaks Valley WTP.	0.83
13	Blending (Well)	Rancho California WD, GW blending well, 1150 gpm, to reduce fluoride concentrations.	0.69
14	Blending (Wells)	Rancho California WD, GW blending wells, to reduce arsenic concentrations, 2012 costs.	0.56
15	Blending	Rancho California WD, using MWD water to blend with GW to reduce arsenic concentrations. 2012 costs.	0.67
16	Corrosion Inhibition	Atascadero Mutual WC, corrosion inhibitor addition to control aggressive water. 2011 costs.	0.09

*Costs were adjusted from date of original estimates to present, where appropriate, using the Engineering News Record (ENR) annual average building costs of 2015 and 2012. The adjustment factor was derived from the ratio of 2015 Index/2012 Index.

Table 2
Reference: Other Agencies

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated Unit Cost 2012 Other References Indexed to 2015* ($/1,000 gallons treated)
1	Reduction - Coagulation-Filtration	Reference: February 28, 2013, Final Report Chromium Removal Research, City of Glendale, CA. 100-2000 gpm. Reduce Hexavalent Chromium to 1 ppb.	1.58 - 9.95
2	IX - Weak Base Anion Resin	Reference: February 28, 2013, Final Report Chromium Removal Research, City of Glendale, CA. 100-2000 gpm. Reduce Hexavalent Chromium to 1 ppb.	1.62 - 6.78
3	IX	Golden State Water Co., IX w/disposable resin, 1 MGD, Perchlorate removal, built in 2010.	0.50
4	IX	Golden State Water Co., IX w/disposable resin, 1000 gpm, perchlorate removal (Proposed; O&M estimated).	1.08
5	IX	Golden State Water Co., IX with brine regeneration, 500 gpm for Selenium removal, built in 2007.	7.08
6	GFO/Adsorption	Golden State Water Co., Granular Ferric Oxide Resin, Arsenic removal, 600 gpm, 2 facilities, built in 2006.	1.85 -1.98
7	RO	Reference: Inland Empire Utilities Agency : Chino Basin Desalter. RO cost to reduce 800 ppm TDS, 150 ppm Nitrate (as NO3); approx. 7 mgd.	2.43
8	IX	Reference: Inland Empire Utilities Agency : Chino Basin Desalter. IX cost to reduce 150 ppm Nitrate (as NO3); approx. 2.6 mgd.	1.35

9	Packed Tower Aeration	Reference: Inland Empire Utilities Agency : Chino Basin Desalter. PTA-VOC air stripping, typical treated flow of approx. 1.6 mgd.	0.41
10	IX	Reference: West Valley WD Report, for Water Recycling Funding Program, for 2.88 mgd treatment facility. IX to remove Perchlorate, Perchlorate levels 6-10 ppb. 2008 costs.	0.56 - 0.80
11	Coagulation Filtration	Reference: West Valley WD, includes capital, O&M costs for 2.88 mgd treatment facility- Layne Christensen packaged coagulation Arsenic removal system. 2009-2012 costs.	0.37
12	FBR	Reference: West Valley WD/Envirogen design data for the O&M + actual capitol costs, 2.88 mgd fluidized bed reactor (FBR) treatment system, Perchlorate and Nitrate removal, followed by multimedia filtration & chlorination, 2012. NOTE: The capitol cost for the treatment facility for the first 2,000 gpm is $23 million annualized over 20 years with ability to expand to 4,000 gpm with minimal costs in the future. $17 million funded through state and federal grants with the remainder funded by WVWD and the City of Rialto.	1.67 - 1.76

*Costs were adjusted from date of original estimates to present, where appropriate, using the Engineering News Record (ENR) annual average building costs of 2015 and 2012. The adjustment factor was derived from the ratio of 2015 Index/2012 Index.

Table 3
Reference: Updated 2012 ACWA Cost of Treatment Table

COST ESTIMATES FOR TREATMENT TECHNOLOGIES
(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated 2012 Unit Cost Indexed to 2015* ($/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/DBP and bromate regulation, 1998	0.57-1.08
2	Granular Activated Carbon	Reference: Carollo Engineers, estimate for VOC treatment (PCE), 95% removal of PCE, Oct. 1994,1900 gpm design capacity	0.26
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	1.25
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	0.49-0.71
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	2.24
6	Granular Activated Carbon	Reference: Southern California Water Co. - actual data for permanent GAC to remove VOCs (TCE), 2.16 mgd plant capacity, 1998	1.46
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/DBP and bromate regulation, 1998	1.68-3.22
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	3.98
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	2.45
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	2.65
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	2.05
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	6.65

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated 2012 Unit Cost Indexed to 2015* ($/1,000 gallons treated)
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	3.92
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	2.94
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	1.82
16	Reverse Osmosis	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility with RO to remove nitrate, 1990	1.83-3.22
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	1.06
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	0.56
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	0.28
20	Packed Tower Aeration	Reference: Carollo Engineers, for PCE treatment by Ecolo-Flo Enviro-Tower air stripping, 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	0.29
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	0.45-0.74
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	0.55
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	0.13-0.26
24	Ion Exchange	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility - ion exchange to remove nitrate, 1990	0.61-0.80

*Costs were adjusted from date of original estimates to present, where appropriate, using the Engineering News Record (ENR) annual average building costs of 2015 and 2012. The adjustment factor was derived from the ratio of 2015 Index/2012 Index.

ATTACHMENT NO. 6

GLOSSARY OF WATER QUALITY TERMS

Best Available Technology (BAT)	The best available treatment techniques or other means available for achieving compliance with MCL.
Health Risks	Health risks with respect to Public Health Goals are based on long-term exposures to low levels of contaminants as would occur with drinking water, rather than high doses from a single or short-term exposure. The health risk category describes the type of health risk. Types of health risks include chronic toxicity (shortened life span, thyroid effects, liver effects, or kidney effects), acute toxicity (gastrointestinal effects), carcinogenicity (cancer), and reproductive toxicity.
Maximum Contaminant Level (MCL)	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to PHGs as is economically and technologically feasible. Unless stated otherwise, the term MCLin this report refers to primary MCL.
Maximum Contaminant Level Goal (MCLG)	The level of a contaminant in drinking water below which there is no observable adverse effect to human health. MCLGs are similar to California PHGs, but not equivalent. MCLGs are non-enforceable goals established by the U.S. EPA based solely on health considerations for non-carcinogenic constituents. For all carcinogenic constituents (i.e. those chemicals known or suspected of causing cancer) U.S. EPA's policy is to set the MCLG at zero.
Numeric Health Risk	Describes the cancer risk. At the California MCL no cancer risk is calculated from chemicals considered "noncarcinogens." For carcinogens, PHGs are set at a concentration that does not pose any significant risk of cancer; this is usually a one-in-one-million excess cancer risk ($1x10^{-6}$).
One-in-one-million Risk Level	At the "one-in-one-million" risk 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 in the water.
Parts per billion (ppb)	The weight of a chemical dissolved in a volume of water. Equivalent to micrograms per liter (ug/L).
Parts per million (ppm)	The weight of a chemical dissolved in a volume of water. Equivalent to milligrams per liter (mg/L).
Picocuries per liter (pCi/L)	A measure of radiation in a liter of water.
Public Health Goal (PHG)	The concentration of a contaminant in drinking water below which no known or anticipated adverse health effects will occur with an adequate margin of safety. This level is based on estimates that would pose a significant risk to individuals, including the most sensitive subpopulations, consuming water every day over an entire lifetime. PHGs are unique to California and are established by the Office of Environmental Health Hazard Assessment (OEHHA), a subdivision of the California Environmental Protection Agency.

List of Abbreviations and Acronyms

AL	Action Level
BAT	Best Available Treatment
CDHS	California Department of Health Services
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
OEHHA	Office of Environmental Health Hazard Assessment
PHG	Public Health Goal
SWP	State Water Project
TDS	Total Dissolved Solids
THM	Trihalomethanes
USEPA	United States Environmental Protection Agency

ATTACHMENT NO. 7

GLOSSARY OF WATER QUALITY TERMS

Best Available Technology (BAT)	The best available treatment techniques or other means available for achieving compliance with MCL.
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List of Abbreviations and Acronyms

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OEHHA	Office of Environmental Health Hazard Assessment
PHG	Public Health Goal
SWP	State Water Project
TDS	Total Dissolved Solids
THM	Trihalomethanes
	United States Environmental Protection Agency