



ALAMEDA COUNTY WATER DISTRICT

REPORT ON WATER QUALITY RELATIVE TO PUBLIC HEALTH GOALS 2019-2021

June 2022

**Public Hearing
August 11, 2022**

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1.0 PURPOSE OF REPORT

Alameda County Water District (ACWD) staff has prepared this report to inform consumers of constituents in their drinking water that exceeded the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) during calendar years 2019, 2020, and 2021. PHGs are established by California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) and MCLGs are developed by U.S. Environmental Protection Agency (EPA), respectively. This report is different from the annual Water Quality Report (commonly referred to as Consumer Confidence Report) which summarizes the water quality information of constituents detected in your drinking water each year. This report is intended to provide the public with information beyond the annual Water Quality Report and help consumers understand the health risks associated with the constituents that exceeded the PHGs or MCLGs, as well as the best available technology (BAT) and cost estimates to achieve further improvements in water quality above existing treatment capability and regulatory requirements.

1.1 Summary of Regulation

ACWD is subject to the provisions of the California Health and Safety Code 116470(b) which specifies that water utilities with more than 10,000 service connections prepare a special report beginning July 1, 1998, and every 3 years thereafter, if water quality measurements have exceeded any PHGs or MCLGs. Only constituents which have a California primary drinking water standard, and for which either a PHG or MCLG has been set, are to be addressed in the report. It should be noted that there are a few constituents (such as disinfection byproducts) that are routinely detected in the water system at levels below the drinking water standards, but neither PHGs nor MCLGs have yet been adopted; these constituents will be addressed in future reports when PHGs or MCLGs are adopted.

This report provides the information for years 2019, 2020, and 2021 for constituents that were detected in ACWD's finished water at a level exceeding the applicable PHGs or MCLGs. Included in this report is the numerical public health risk associated with the Maximum Contaminant Levels (MCLs), PHGs or MCLGs, the category or type of risk to health that could be associated with each constituent (Appendix A), the BAT 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.

1.2 Background Information

PHGs are non-enforceable goals established by the OEHHA and are based solely on public health risk considerations. OEHHA establishes PHGs at levels that pose little or no anticipated threat to human health. PHGs are set at levels where the potential health risk is considered to be no more than one additional cancer case (beyond what would normally occur) in a population of one million people, assuming consumption of 2 liters of water per day over a 70-year lifetime. In determining PHGs, OEHHA does not consider any of the practical risk-management factors that are considered by the EPA or the California Division of Drinking Water (DDW) in setting drinking water standards such as MCLs. These factors include analytical detection capability, treatment

technology availability, benefits and costs. PHGs are not enforceable but establish goals that public water systems should strive, but are not required, to achieve. MCLGs are the federal equivalent to PHGs and similarly are for non-enforceable standards.

In a few instances, PHGs are set at levels below the Detection Limit for Reporting Purposes (DLR), which are established by DDW for each regulated contaminant. The DLR is designated as the minimum level at or above which any analytical finding of a contaminant in drinking water needs to be quantified and reported to DDW. In those instances where a water sample is found to contain a contaminant at a level less than the DLR, the contaminant is considered to be non-detect and reported as “ND”.

In preparing the following report, all the water quality data collected by ACWD from 2019 to 2021 for the purpose of determining compliance with drinking water standards (data collected for constituents which have California primary drinking water standards) were considered in conjunction with all contaminants that have PHGs or MCLGs. Based on the data collected in 2019, 2020 and 2021, ACWD is required to prepare a report in 2022 and address constituents that were above the PHGs in these years. The data are also summarized in the annual Water Quality Report, which is published on ACWD’s website by July 1 of each year. The 2022 suggested guidelines released by the Association of California Water Agencies were used in the preparation of this report.

2.0 ACWD SYSTEM DESCRIPTION

ACWD has four sources of water supply: 1) water imported from the State Water Project via the South Bay Aqueduct (SBA) which originates from the Sacramento/San Joaquin Delta and/or Lake Del Valle, 2) local groundwater pumped from the Niles Cone Groundwater Basin (Peralta-Tyson and Mowry Wellfields), which is replenished with local rainwater, runoff from the Alameda Creek watershed, and seasonal releases of SBA water, 3) water purchased from the San Francisco Public Utilities Commission (SFPUC) consisting of treated, but unfiltered, water from the Hetch Hetchy Reservoir and augmented by water from the Calaveras or San Antonio Reservoirs which is treated at the Sunol Valley Water Treatment Plant, and 4) desalinated brackish water pumped from six Aquifer Reclamation Program (ARP) wells (Cedar 1&2, Darvon 1&2, Farwell and Bellflower).

ACWD treats the imported SBA water at the 28 million gallons per day (mgd) Water Treatment Plant 2 (WTP2). ACWD’s Blending Facility blends the softer SFPUC water with relatively hard groundwater from the Peralta-Tyson and Mowry Wellfields prior to delivery to the distribution system. The maximum production of the Blending Facility is approximately 45 mgd. ACWD operates the ARP wells to extract and control the movement of brackish water within the Niles Cone Groundwater Basin. Groundwater pumped from the ARP wells is treated to drinking water standards using state-of-the-art reverse osmosis (RO) technology at the Newark Desalination Facility (NDF), which has a maximum capacity of approximately 12.5 mgd. ACWD met water demand from 2019 to 2021 using production from the Blending Facility, WTP2, and the NDF. There are also several SFPUC connections (Durham, Warren, Washington, Central & Cherry, Mission Blvd., Paseo Padre and Sycamore Takeoffs) in Fremont and Newark that may be used to meet emergency and peak summer demands.

Figure 1 below shows the typical water distribution from ACWD's water sources. The customer's location in the Tri-City area determines the source of water received.

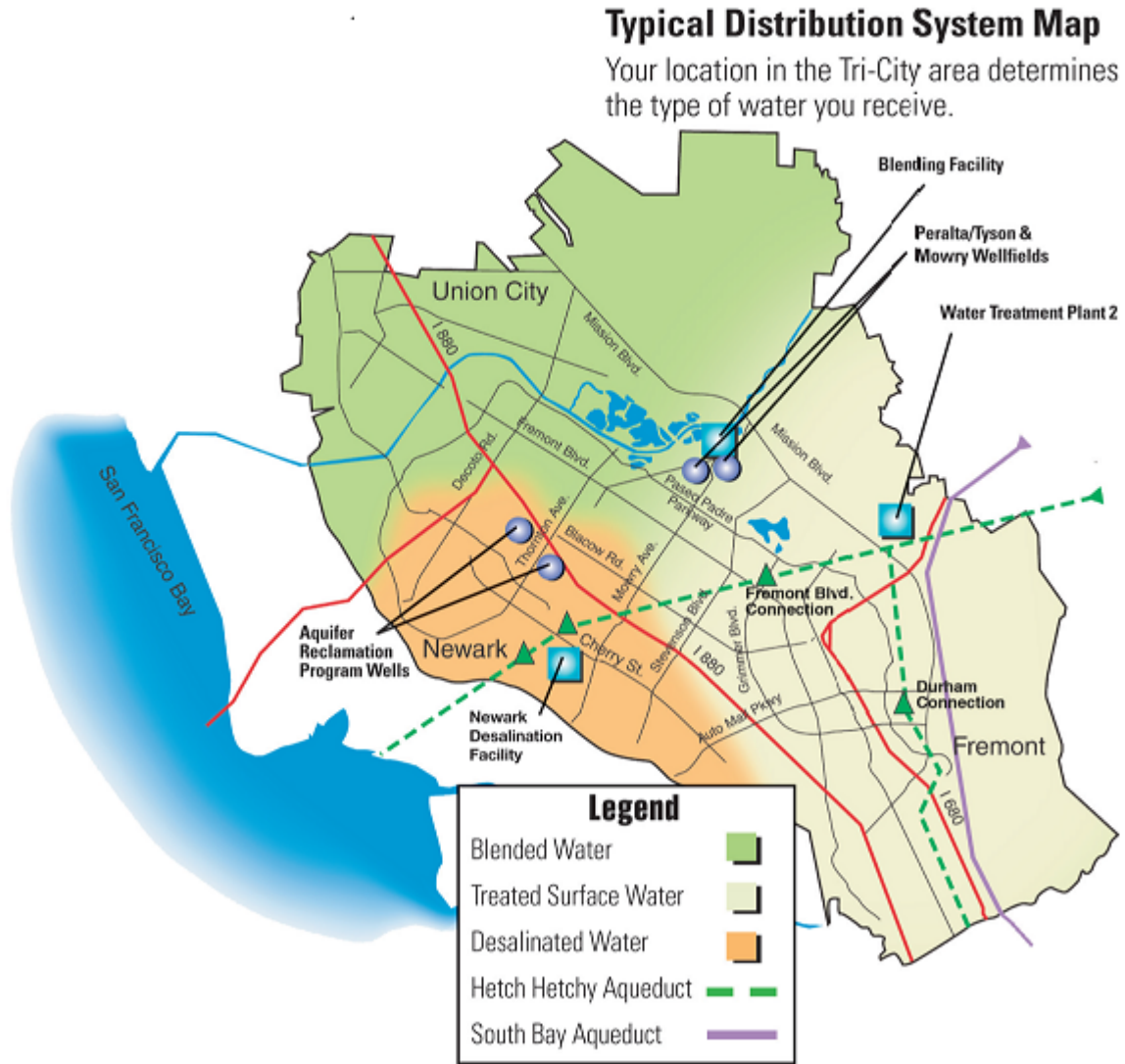


Figure 1. Typical Sources of Water in the Distribution System.

3.0 CONSTITUENTS DETECTED THAT EXCEED PHGs and MCLG

For more than 100 years, ACWD has supplied its customers with high quality drinking water that consistently meets or surpasses all federal and state drinking water standards. ACWD’s annual Water Quality Reports, which are published by July 1 every year, summarize the analytical results conducted on the drinking water from the preceding calendar year. Our 2019, 2020 and 2021 annual Water Quality Reports reflect that very few of the more than 180 substances that we routinely test for were found in our water supply. In the last three years, of more than 100 PHGs and MCLGs currently established, only two constituents, lead and bromate exceeded the PHGs and MCLGs, but were well below the federal and state enforceable standards. Table 1 below summarizes the constituents detected above the PHGs and MCLGs in ACWD water samples collected in 2019 through 2021.

Table 1. Constituents detected above PHGs between 2019 and 2021

Chemicals	Sample Date	Sample Locations	Unit	MCL/[AL] ¹	PHG/[MCLG]	Detections	Notes
Lead	2021	Customer taps	ppb ²	[15]	0.2	5.4 ³	Lead and Copper Rule monitoring is conducted once every 3 years
Bromate	2020 and 2021	WTP2 ⁴ finished water	ppb ²	10	0.1	ND-2.2 ⁵	Range of quarterly RAA results ⁶

¹AL: Action Level. The California DDW requires that the lead concentration in 90 percent of the water samples collected at customer taps not to exceed the AL.

²ppb: Parts per billion or micrograms per liter (µg/L) of water

³The 90 percentile value.

⁴WTP2: Water Treatment Plant No.2

⁵ ND: Non-detect

⁶Compliance with the California MCL for bromate is based on a running annual average (RAA).

The following is a discussion of the two constituents that were detected at levels above the established PHGs and MCLGs during the calendar years of 2020 and 2021. No constituents exceeded the PHGs or MCLGs in 2019.

3.1 Lead

Background

Lead is unusual among drinking water contaminants in that it seldom occurs naturally in water supplies like rivers and lakes. Lead was not detected in the water supplied by ACWD and no known lead service lines exist within the service area. However, lead is introduced to drinking water primarily through internal corrosion of household water plumbing. There is no MCL for lead. Instead, an Action Level (AL) has been established for the 90th percentile value of water samples collected from household taps in the distribution system. The 90th percentile value should not exceed an AL of 15 micrograms per liter (µg/L). The PHG for lead is 0.2 µg/L, which is below the DLR of 5 µg/L.

ACWD has been monitoring lead and copper levels in the distribution system since 1992. In 1994, ACWD completed a Corrosion Control Study, and the Optimal Corrosion Control Treatment which was approved by DDW (previously California Department of Health Service) in February 1996. The USEPA recently adopted the Lead and Copper Rule Revisions (LCRR) in December 2021 which becomes effective in 2024. The LCRR requires water systems such as ACWD to re-evaluate and reoptimize the corrosion control treatment established in 1996, identify and inventory “lead” services with the purpose of removal. The LCRR also includes requirements to test lead levels in drinking water at childcare facilities and schools, and to provide consumers comprehensive information about lead and lead service line removal. Based on the monitoring results, since 1999 ACWD has met and/or surpassed the requirements of the Lead and Copper Rule (LCR) for large water systems. Furthermore, ACWD’s 90th percentile lead monitoring results at household taps were below the ALs. Due to these sampling results, in September 2003 the DDW, per Title 22, CCR, Section 64685 (c) (2), allowed ACWD to reduce LCR household tap sampling from annually to once every three years. Following the approved monitoring schedule, ACWD was not required to conduct LCR household tap sampling in 2019 and 2020. This report includes the results from the 2021 household LCR tap sampling.

Health Risks

Lead is a common, natural and often useful metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery porcelain, and water. More common sources of lead in the home are found in lead-based paint used prior to 1978 that has chipped off walls or window sills, household dust, and soil brought into the home on shoes. Lead is classified as a neurotoxin. The PHG is based on lead’s non-carcinogenic, chronic health effects, which include lead’s neurological effects on children and its hypertensive effect on adults. OEHHA revised the PHG for lead in drinking water from 2 µg/L to 0.2 µg/L on April 2009. The PHG of 0.2 µg/L was determined from a maximum daily intake through water ingestion of 2.86 µg/day, which corresponds to a level of concern for neurobehavioral effects in children. EPA has classified lead as a probable human carcinogen, and established an MCLG of 0 µg/L.

PHG Exceedance for Lead

In 2019, 2020, and 2021, lead levels measured in water leaving ACWD treatment facilities were undetectable. However, compliance monitoring for lead is at household taps of customer homes. Every three years, ACWD collects tap samples from homes built prior to 1986 (before lead-free solder was required to be used in new construction) because these homes have plumbing conditions that are most likely to leach lead into the drinking water. Household tap samples are first-draw 1-liter samples from taps where the water has stood in the pipes for a stagnation period of at least 6 hours (i.e., no toilet flushing, showering, or other use of water). Due to the stagnation period, lead results from household tap samples do not serve as a good representation of what persons may be exposed to under typical conditions; these household tap samples are most likely to have the highest lead levels and represent “worst case” conditions. Samples collected at household taps in 2021 had a 90th percentile value for lead of 5.4 µg/L, which is above the PHG of 0.2 µg /L but below the AL of 15 µg /L (Figure 2).

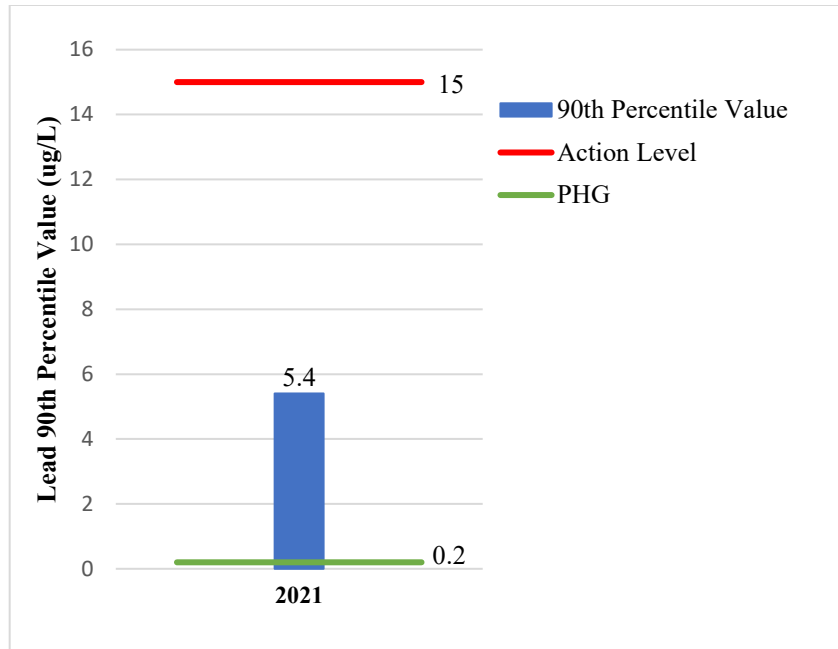


Figure 2. Lead results of samples collected from household taps in 2021

BAT for Lead Control

As previously mentioned, lead enters drinking water primarily through the internal corrosion of household plumbing. In addition, older household plumbing (in homes built prior to 1986) may contain lead-based solder and/or brass fixtures that contribute lead to drinking water. In order to reduce the potential of internal corrosion of household plumbing, in August 1999, ACWD implemented an optimal corrosion control program throughout its service area. Based on the 1994 Corrosion Control Study, adjusting the finished water pH was considered one of the best treatment techniques for ACWD to implement for minimizing household corrosion and reducing lead levels at household taps. Although ACWD is achieving optimal corrosion control and continues to meet the AL for lead, as a provision of the recently adopted LCRR, ACWD will be required to re-evaluate its corrosion control treatment by October 2024 as the LCRR modified allowable corrosion control treatment techniques. Fortunately, pH adjustment remains an allowable corrosion control treatment technique under the LCRR.

ACWD’s Activities to Reduce Levels of Lead at the Tap

In conjunction with the on-going efforts in monitoring and implementing optimized corrosion controls, ACWD has implemented the following programs:

1) Water Meters Replacement Program

Per the Federal Safe Drinking Water Act (SDWA), local building departments need to further reduce lead in homes by requiring the types of materials (pipes, solders, pipe fittings, and fixtures) used for drinking water plumbing to be “lead-free”. The 1986 SDWA amendments included limiting lead content in solders and fluxes to 0.2 percent lead and limiting lead in pipes and pipe

fittings used in drinking water plumbing to no more than 8.0 percent. Furthermore, the State of California has additionally defined “lead-free” to be less than 4 percent lead after August 6, 2002, as it applies to the sale and installation of household plumbing fixtures and fittings. As of January 2011, the maximum allowable lead content in wetted surfaces of pipes, pipe fittings, plumbing fittings and fixtures, as determined by weighted average, is 0.25 percent.

ACWD has installed only “lead-free” meters in all new residential construction since 1999 and has continuously replaced old water meters with “lead-free” meters. This work will continue as ACWD installs lead-free meters for all meter sizes as part of the Advanced Meter Infrastructure (AMI) project, which applies new technology to remote meter reading.

2) ACWD’s Public Education Program

In conjunction with the on-going efforts in monitoring and implementing optimized corrosion control treatment, ACWD also conducts a continuous public education program to inform customers about the health effects of lead through the ACWD website and published materials. Additionally, ACWD suggests consumers who have concerns about lead levels in their drinking water can adopt some simple practices to significantly minimize their lead consumption, such as:

- a) **Flushing The Tap:** When water stands in lead soldered pipes or brass fixtures for several hours or more, the lead may dissolve into drinking water. Water in a faucet that has gone unused for more than six hours may contain lead. The leached lead can be significantly reduced by running the water from the tap for approximately one minute before using it for drinking or cooking. Conserve water whenever possible by using the first-flush to wash dishes or irrigate plants
- b) **Using Cold Water for Cooking, Drinking or Preparing Baby Formula:** Avoid using water from the hot water tap for cooking or drinking. Hot water can dissolve lead more quickly than cold water. If hot water is needed, water can be drawn from the cold tap and heated on the stove or in a microwave.

3) Lead Sampling of Drinking Water in Schools

To comply with the Water Supply Permit Amendment and California Assembly Bill 746, ACWD provided assistance to eligible schools on sample plan preparation, sample collection, and lead-in-water testing between 2017 and 2019.

- a) **Permit Amendment:** In early 2017, DDW issued amendments to the domestic water supply permits to water systems to allow kindergarten through 12th grade schools that are served by a public water system to request assistance from their public water system prior to November 1, 2019 to conduct water sampling for lead and receive technical assistance if an elevated lead sample is found. ACWD provided sampling assistance to eligible schools that requested sampling between 2017 and 2019.
- b) **Assembly Bill 746:** To further safeguard water quality in California’s K-12 public schools, California Assembly Bill 746 (AB 746) published on October 12, 2017, effective January

1, 2018, required water system to test lead levels, by July 1, 2019, in drinking water at all California public, K-12 school sites that were constructed before January 1, 2010. ACWD completed sampling at all eligible schools under AB 746 in 2018.

- c) **USEPA Lead and Copper Rule Revisions:** In 2021, the US EPA revised the federal Lead and Copper Rule and these revisions become effective in 2024. These revisions include provisions for sampling at schools once every 5 years.

4) Lead Service Lines Inventory

As mentioned above, ACWD ensures the use of any pipes, plumbing fitting or fixture, solder, or flux that are “lead free” in the installation or repair of any public water system or any plumbing in a facility providing water for human consumption. Additionally, ACWD completed an inventory and identified materials of service lines from the water-main to the customers water meter under California Health and Safety Code, Section 116885, Senate Bill 1398 and Senate Bill 427, which requires public water systems to identify all “lead” water service lines. ACWD began to inventory and identify service lines between the water meter and customer homes in 2021 as required under the USEPA Lead and Copper Rule Revisions.

- a) **Senate Bill 1398:** This Bill requires all public water systems (PWS) to compile and submit an inventory of known partial or total lead service lines and service lines of unknown material to DDW by July 1, 2018. The inventory must include all user service lines that are active and those that are reasonably expected to become active in the future. ACWD has no known lead service lines. By July 1, 2018, ACWD confirmed the materials of 69,835 service lines out of approximately 82,000 service lines. No lead service lines were discovered.
- b) **Senate Bill 427:** In addition to the requirement from Senate Bill 1398, Senate Bill 427 required PWS to submit information on the existence or absence of lead service lines in the distribution system and provide a timeline for the replacement of known lead service lines and replacement of service lines of unknown material, to DDW by July 1, 2020. ACWD investigated all existing records and conducted field inspections to determine the materials for the 12,165 service lines with unknown materials that were identified in 2018, and no lead service lines were discovered.
- c) **USEPA Lead and Copper Rule Revisions:** In 2021, the US EPA revised the federal Lead and Copper Rule, which requires PWS to submit an inventory of known partial or total lead service lines and service lines of unknown material by October 2024. The service lines defined by the USEPA includes the portion of the service line from the water main to the customer’s home. In 2021, ACWD began compiling the inventory of the service line materials from the water main to the customer’s home, appending to the service line inventory developed between 2018 and 2020 under SB 1398 and SB 427. ACWD expects to complete the inventory in conjunction with the AMI Project.

3.2 Bromate

Background

When bromide (Br^-) is present in the source water at significant concentrations, formation of bromate (BrO_3^-) upon ozonation is a concern. Since bromate is a byproduct of the ozonation disinfection process, its formation is unique to WTP2 which is ACWD's only treatment plant using ozone. At this treatment plant, bromide in source water reacts with ozone used for disinfection and controlling taste and odor compounds. Water from the SBA periodically experiences high levels of bromide, and ACWD has monitored bromide levels in raw SBA water for many years.

After pre-chloramination was implemented in 2011 to minimize bromate formation during the ozonation process, bromate was undetectable in the WTP2 finished water between 2011 and 2013. However, low levels of bromate were detected when bromide levels in SBA source water were elevated between 2020 and 2021. Figure 3 shows the average and range of bromide levels in 2019, 2020 and 2021. As bromide levels may vary in different water sources and exhibit seasonal fluctuation, the average bromide levels in 2021 were nearly three times the bromide levels in 2019. Since bromide is a major precursor of bromate formation, the increased levels of bromide resulted in detections of bromate (ND – 2.2 $\mu\text{g/L}$) at low levels in the finished water between 2020 and 2021. In 2019, bromate levels were under the analytical detection limit and were considered non-detect. Bromate compliance is based on a running annual average (RAA) of the average of last 12 monthly samples, computed quarterly. The PHG of bromate is 0.1 $\mu\text{g/L}$ which is below the DLR of 1 $\mu\text{g/L}$.

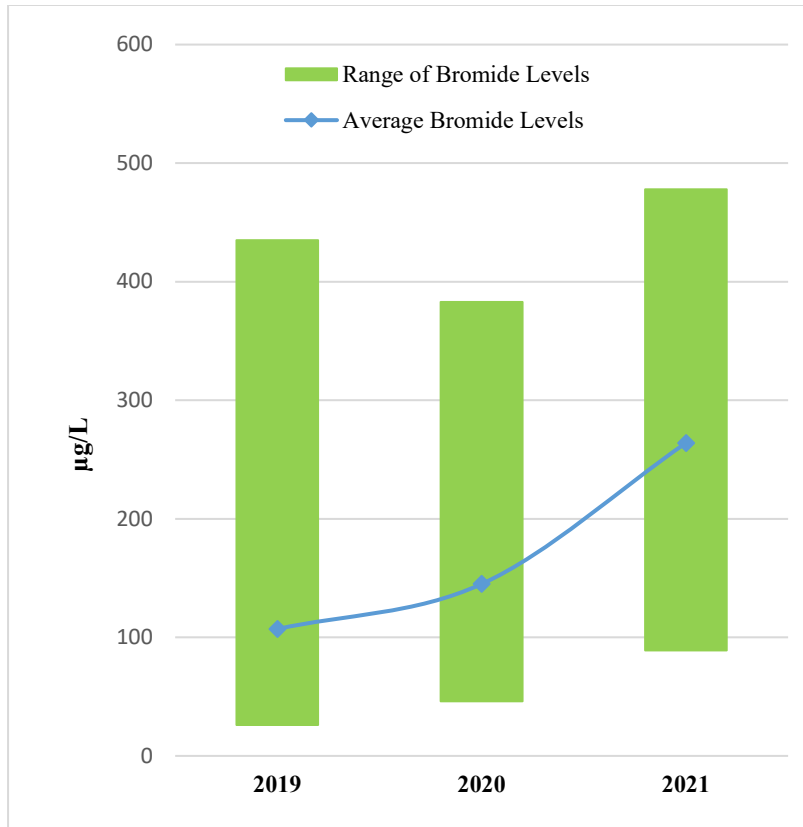


Figure 3. 2019-2021 Bromide Levels in Source Water

Health Risks

EPA classifies bromate as a Group B2 carcinogen (or "probable human carcinogen"). The MCL for bromate is set at 10 µg/L, based on the practical quantification limit. People who drink water containing bromate above the MCL throughout their lifetime (70 years) could experience an increased risk of getting cancer. For a PHG of 0.1 µg/L, the theoretical excess cancer risk is one in a million. The EPA MCLG for bromate in drinking water is set at 0 µg/L, based on carcinogenicity.

PHG Exceedance for Bromate

ACWD is in full compliance with the state and federal drinking water standard for bromate, but has detected bromate above the PHG level of 0.1 µg/L between 2020 and 2021. As indicated in Figure 4, the RAA reported from 2019-2021 ranged from non-detect to 2.2 µg/L, which was well below the MCL of 10 µg/L. As previously discussed, the bromate formation has increased slightly because of the elevated bromide levels in source water. Although lowering the dose of ozone may reduce the level of bromate, a lower ozone dose would not be as effective at removing taste and odor compounds in source water, and most importantly meeting disinfection requirements of drinking water.

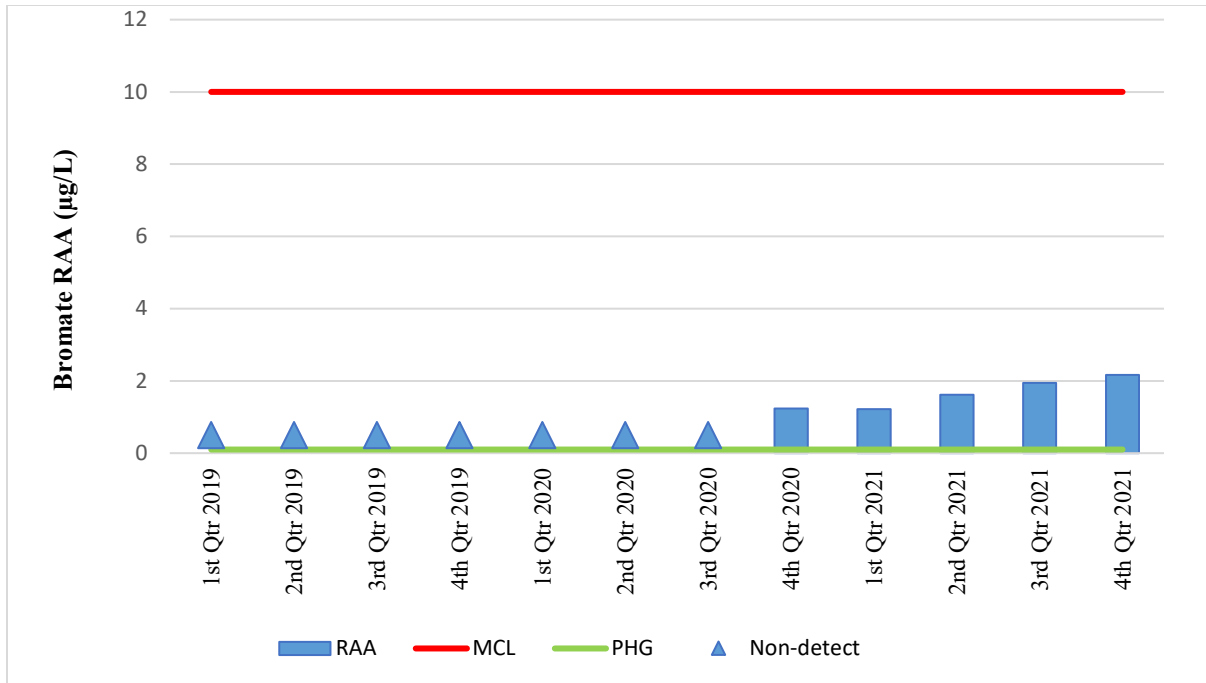


Figure 4. 2019 – 2021 Bromate Running Annual Average for WTP2

BAT for Bromate Control

The DDW and EPA consider “control of ozone treatment process to reduce production of bromate” as the BAT for bromate control. ACWD has implemented several strategies for bromate reduction, including pH suppression and chloramination ahead of ozonation. The WTP2 finished water had detected low levels of bromate in 2020 and 2021 due to elevated bromide in source waters, the control strategies still demonstrated their ability to treat challenging source water and to maintain bromate concentrations well below the MCL. In light of these results, ACWD will continue to implement the control strategies for bromate control. The following section will further explain ACWD’s bromate control strategies.

ACWD’s Activities to Reduce Bromate

Bromate formation and control during ozonation has been extensively studied since the early 1990s when bromate was implicated as an ozonation byproduct and potential carcinogen. The general consensus from the earlier studies was that pH suppression was the most consistent and reliable method for maintaining bromate levels below the regulatory standard. Since early 2002, ACWD has successfully controlled bromate formation using pH suppression via the addition of carbon dioxide ahead of ozonation. By reducing the pH, ACWD had been able to maintain the plant effluent bromate concentration at less than the MCL of 10 µg/L.

However, using pH-adjustment for bromate control has its limitations when bromide levels are high in the source water. Between 2007 and 2009, ACWD conducted bench and plant scale studies to evaluate the pre-chloramination strategy for effective bromate control. The results of the studies demonstrated that pre-chloramination ahead of ozonation is a highly-effective bromate control

strategy. Compared to the pH suppression strategy, pre-chloramination was proven to be capable of reducing bromate formation by 81%. Furthermore, the effectiveness of pre-chloramination is not significantly impacted by normal variations in raw water bromide. No significant adverse effects were found on other plant processes and in the distribution system monitoring sites. In light of these results, ACWD has continuously employed pre-chloramination since 2011.

4.0 RECOMMENDATIONS

The drinking water served by ACWD meets all DDW and EPA drinking water standards. From 2019 to 2021, the only constituents detected above their PHGs or MCLG were lead and bromate.

4.1 Lead

In light of the USEPA Lead and Copper Rule Revisions (LCRR) promulgated in 2021, ACWD will be re-evaluating its corrosion control program as the LCRR has modified allowable corrosion control treatment techniques. Since the primary lead source is from the plumbing fixtures at customer's premises, it is recommended that ACWD maintain the existing optimal corrosion control program that effectively reduces the potential corrosion of lead levels at household taps and consider maintaining pH adjustment when re-evaluating its corrosion control treatment technique. ACWD will continue the public education program and outreach efforts to minimize customer's exposure to lead in drinking water. Since ACWD continues to meet the Action Level for lead and employs the optimized corrosion control treatment, no cost analysis for additional treatment is recommended.

4.2 Bromate

The data from 2019 to 2021 demonstrates that pre-chloramination ahead of ozonation is a highly-effective bromate control strategy. ACWD will continue to employ pre-chloramination as the key bromate control strategy, supplemented with pH suppression as applicable, to reduce the bromate levels at WTP2. The non-detectable 2019 bromate results demonstrated that pre-chloramination ahead of ozonation is a highly effective bromate control strategy to complement pH suppression. Since ACWD has employed the BAT for bromate control, no cost analysis is recommended. ACWD will continue to optimize treatment by implementing pre-chloramination to reduce the RAA of bromate to as close as to the PHG as practically possible at WTP2.

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APPENDIX A

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

The following table was adapted from the Office of Environmental Health Hazard Assessment's Table 1, "Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals"

Chemical	Health Risk Category ¹	California ² PHG (mg/L)	Cancer Risk ³ @ PHG	California MCL ⁴ (mg/L)	Cancer Risk @ California MCL
Lead	Developmental neurotoxicity (causes neurobehavioral effects in children) cardiovascular toxicity (causes high blood pressure carcinogenicity (causes cancer)	0.0002	<1x10 ⁻⁶ (PHG is not based on this effect)	0.015 (AL) ⁵	2x10 ⁻⁶ (two per million)
Bromate	Carcinogenicity (causes cancer)	0.0001	1x10 ⁻⁶	0.01	1x10 ⁻⁴ (one per ten thousand)

¹ Health risk category based on experimental animal testing data evaluated in the OEHHA PHG technical support document unless otherwise specified.

² mg/L = milligrams per liter of water or parts per million (ppm) (PHGs are expressed here in milligrams per liter for consistency with the typical unit used for MCLs and MCLGs.)

³ Cancer Risk = theoretical 70-year lifetime excess cancer risk at the statistical upper 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., 1x10⁻⁶ means one excess cancer case per million people; 5x10⁻⁵ means five excess cancer cases per 100,000 people.

⁴ MCL = maximum contaminant level.

⁵ AL = Action Level

