MesaWater DISTRICT©

2022 Public Health Goals Report

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Prepared by: Trussell
CREATING THE FUTURE OF WATER

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About Mesa Water District

Mesa Water District (Mesa Water®) is an independent special district governed by a publicly elected five-member Board of Directors, that provides water service to 110,000 residents in an 18-square-mile service area that includes most of Costa Mesa, a portion of Newport Beach and John Wayne Airport.

This year, Mesa Water is celebrating its 10th anniversary of providing 100% local, reliable, clean, safe water – the only water district in Orange County to fulfill water demand entirely from local groundwater supplies.

Mesa Water is committed to efficiency, transparency and fiscal responsibility. It is one of Orange County's most efficient water agencies, based on expenditures per capita according to an annual study by Raftelis Financial Consultants. An award-winning agency, Mesa Water holds AAA credit ratings from both Fitch and S&P Global Ratings – the highest achievable by an organization.

1 Introduction

California Health and Safety Code §116470(b) requires California public water systems with more than 10,000 service connections to prepare a publicly available report every three years addressing the following:

(a) detection of any contaminant in drinking water at a level exceeding its respective public heath goal (PHG),
(b) discussion of public health risks associated with the detected PHG contaminants,
(c) description of best available technology for reducing the concentration of the detected contaminants, and
(d) aggregate cost estimates for using the technologies identified in part (c) to bring drinking water levels below the PHG.

Mesa Water has approximately 24,406 service connections serving 110,000 people. This document serves as the 2022 PHG Report for Mesa Water and has been prepared to address the requirements from the California Health and Safety Code (§116470), based on water quality analyses for samples collected during calendar years 2019 through 2021.

2 Background Information

2.1 Public Health Goals, Maximum Contaminant Levels, and Maximum Contaminant Level Goals

Public Health Goals (PHGs) are developed by the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) for every contaminant with a primary drinking water standard or any contaminant the State is proposing to regulate with a primary drinking water standard, as required under California Health and Safety Code §116365. Each PHG is defined as the level where the drinking water contaminant does not pose any significant risk to human health. This level is based on risk assessments prepared by OEHHA that consider the most current principles, practices, and methods used by experienced public health professionals. PHGs are recommended, non-enforceable targets and public water systems are not required to achieve these levels in the drinking water supplied to customers. Where OEHHA has not adopted a PHG for a constituent, the established maximum contaminant level goal (MCLG) adopted by the United States Environmental Protection Agency (USEPA) is reported instead.

The State Water Resources Control Board Division of Drinking Water (DDW) considers PHGs when revising or developing a maximum contaminant level (MCL) for drinking water contaminants. The MCL is an enforceable regulatory limit defined as the highest level of a contaminant that is allowed in drinking water. MCLs are set as closely as is technically and economically feasible to the PHGs. DDW is required to take treatment technologies and the cost of compliance into account when establishing an MCL. Each MCL is reviewed at least once every five years.

2.2 Water Quality Data

Mesa Water uses local groundwater as the primary source of drinking water, which is pumped from the Orange County groundwater basin via Mesa Water's seven wells. Five wells pump water from the local clear-water basin. An additional two wells, that are part of the Mesa Water Reliability Facility (MWRF), pull from a deeper, amber-colored water basin. The water has an amber tint which comes from ancient redwood trees that grew along the Orange County coast more than 100,000 years ago. The trees decayed under the surface of the earth and colored the water in the deep aquifer. Using state-of-the-art nanofiltration technology at the MWRF, the amber organic color is removed and the clear water is added to our water supply. This water meets all water quality standards. If needed, imported water from the Metropolitan Water District of Southern California (Metropolitan) is used as an emergency backup water supply for Mesa Water.

This report is based on water quality analyses performed during calendar years 2019, 2020, and 2021 for Mesa Water's source waters and drinking water system. The water quality data is also summarized in Mesa Water's Water Quality Reports (also known as Consumer Confidence Reports) for 2020 through 2022, which are made available to customers by July 1 of each year.

2.3 Best Available Technologies (BATs) and Cost Estimates

USEPA and DDW adopt what are known as best available technologies, or BATs, which are the best-known methods of reducing contaminant levels to the MCL. Since PHGs and MCLGs are typically set much lower than the MCL, determining the type of treatment that is needed to further reduce a contaminant to the PHG or MCLG is not always possible or feasible. For example, if the PHG or MCLG are below the existing detection limit for the purpose of reporting (DLR), which is the statutory level at which a constituent can be measured for a drinking water. Estimating costs to further reduce a constituent below an unknown level is difficult, if not impossible, because it is not possible to verify this reduction by analytical means. Installing treatment technologies to further reduce low levels of one constituent may in some cases have adverse effects on other aspects of water quality. As such, the cost estimates used in this report do not account for these unintended consequence and are highly speculative and theoretical.

2.4 Reporting Guidelines

The Association of California Water Agencies (ACWA) formed a workgroup to prepare suggested guidelines for water utilities to use in preparing PHG reports. The 2022 ACWA guidelines, which include annualized capital and operational and maintenance (O&M) treatment cost estimates for BATs indexed to 2021 costs, were used in preparation of this report. OEHHA has provided health risk information for PHG reports, which includes health risk categories and numerical health risks based on lifetime exposure for each contaminant with a PHG.

3 Contaminants Exceeding PHGs or MCLGs

This section covers the requirements set forth by Sections 116470(b)(1) through 116470(b)(5) of the California Health and Safety Code. This includes a discussion of the following:

(1) Identification of each contaminant detected in drinking water that exceeds the PHG,
(2) Disclosure of the numerical public health risks determined by OEHHA associated with the MCL and PHG of each detected contaminant,
(3) Identification of the category of risk to public health for each detected contaminant,
(4) Description of any commercially available BATs to remove or reduce the concentration of the contaminants to a level at or below the PHG or MCLG,
(5) Estimate of the aggregate cost and cost per customer of utilizing the BATs.

The following subsections discuss contaminants that were detected at one or more locations within the Mesa Water drinking water system at levels that exceeded the applicable PHGs or MCLGs. This information is summarized in Table A at the end of this report.

3.1 Arsenic

Arsenic is a naturally occurring element present in rocks and sediments. It can enter drinking water through natural deposits or as a result of industrial activities. The PHG for arsenic is 0.004 µg/L (micrograms per liter), which is significantly below the current DLR defined by DDW for arsenic at 2 µg/L. Arsenic was measured above the PHG at two of Mesa Water's groundwater wells. The concentration of arsenic from all wells ranged from non-detect (ND) to 2.3 µg/L. These values are well below the MCL of 10 µg/L.

The health risk category for arsenic is carcinogenicity, meaning it is a substance capable of causing cancer. The numerical health risk associated with the PHG is 1 excess case of cancer in 1,000,000 people (1×10^{-6}). The risk associated with the MCL is 2.5 excess cases of cancer in 1,000 people (2.5×10^{-3}).

The BATs for removal of arsenic in water for large water systems include activated alumina, coagulation/filtration, ion exchange, lime softening, oxidation/filtration, and reverse osmosis. Ion exchange was used to estimate the cost to reduce arsenic concentrations to below the PHG (effectively, below the DLR of 2 µg/L based on DDW-approved methods) in the two local groundwater wells with detections above the PHG, however there is no information available to indicate that any of the BAT methods can reduce arsenic concentrations to this level. Numerous factors may influence the actual cost of reducing arsenic to the PHG. The total estimated cost to reduce arsenic levels, based on the average well water production during 2019 through 2021, is $3,940,000 per year, or $162 per service connection per year.

3.2 Bromate

Bromate is a byproduct of drinking water disinfection processes, formed when water containing naturally occurring bromide ions react with ozone. The PHG for bromate is 0.1 µg/L, and the DLR is 1 µg/L. Bromate was measured above the PHG in treated surface water purchased from Metropolitan. The bromate concentration in the purchased water ranged from below the DLR (ND) to 8.1 µg/L, with a highest running annual average of 2 µg/L. This is well below the 10 µg/L MCL for bromate.

The health risk category for bromate is carcinogenicity. The numerical health risk associated with the PHG is 1 excess case of cancer in 1,000,000 people (1×10^{-6}). The risk associated with the MCL is 1 excess case of cancer in 10,000 people (1×10^{-4}).

Bromate is a disinfection byproduct that can be formed with ozonation of water containing bromide. The imported water supplied from Metropolitan is treated with ozonation, and the most cost-effective means of reducing the bromate levels below the PHG (effectively, below the DLR of 1 µg/L based on DDW-approved methods) is likely through improved control of the ozone treatment process to further limit bromate formation. Once formed, the BAT for removal of bromate in water is reverse osmosis. Although Mesa Water maintains several emergency connections for accessing imported

water, the high costs of reverse osmosis treatment make it more effective to limit this treatment option to a single imported water location. The total estimated cost to reduce bromate levels in purchased Metropolitan water, based on the maximum annual imported volume for the 2019-2021 period, ranges from $2,370,000 to $3,840,000 per year, or $97 to $157 per service connection per year. Numerous factors may influence the actual cost of reducing bromate levels to the PHG, particularly the need to provide on-demand treatment for multiple emergency imported water connections.

3.3 Gross Alpha Particle Activity (Gross Alpha)

Radionuclides are naturally occurring elements that can be found in natural deposits and have unstable nuclei that spontaneously decay, releasing radiation. Gross alpha is a measure of the overall radioactivity in water attributed to alpha particles. OEHHA has not established a PHG for gross alpha, concluding in its 2003 review that a PHG was not practical. The MCLG is zero, the DLR is 3, and the MCL is 15 pCi/L (picocuries per liter). Of eight measurements analyzed from 2019 through 2021 and representing six Mesa Water groundwater wells, seven were below the DLR (ND) for gross alpha, and there was only one detection at a concentration of 3.8 pCi/L, which is well below the MCL.

The health risk category for gross alpha is carcinogenicity. The numerical health risk associated with an MCLG of zero is zero. The health risk associated with the MCL is 1 excess case of cancer in 1,000 people (1×10^{-3}).

The BAT to treat gross alpha is reverse osmosis, but this will be expensive to implement at a single groundwater well location. Since reverse osmosis will also remove other radionuclides and contaminants, the cost of implementing this treatment in a centralized facility is discussed in Section 3.6.

3.4 Gross Beta Particle Activity (Gross Beta)

Gross beta is a measure of the overall radioactivity in water attributed to a total 168 individual beta particles and photon emitters. OEHHA has not established a PHG for gross beta, concluding in its 2003 review that a PHG was not practical. The MCLG is zero, the DLR is 4 pCi/L, and the MCL is 4 mrem/year (millirem per year). OEHHA has judged a level of 50 pCi/L to be equivalent to the MCL. Gross beta was measured above the PHG in treated surface water purchased from Metropolitan. The gross beta concentration in the purchased water ranged from below the DLR (ND) to 7 pCi/L, with all values well below the MCL.

The health risk category for gross beta is carcinogenicity. The numerical health risk associated with an MCLG of zero is zero. The health risk associated with the MCL is 2 excess cases of cancer in 1,000 people (2×10^{-3}).

The BATs for removal of gross beta in water are ion exchange and reverse osmosis. Numerous factors may influence the actual costs of reducing gross beta levels to the

MCLG of zero (effectively, below the DLR of 4 pCi/L based on DDW-approved methods). The total estimated cost of reducing gross beta levels using ion exchange is $1,920,000 per year or $79 per service connection per year. As discussed in Section 3.2, this treatment is assumed to be limited to a single location and would thus require limiting the use of emergency imported water supplies to a single turnout. The costs to reduce gross beta using reverse osmosis in a centralized facility, which will also reduce other contaminant concentrations, is discussed in Section 3.6.

3.5 Combined Radium

Radium is a naturally occurring radionuclide that enters drinking water through runoff and leaching of natural deposits. The most common isotopes of radium are radium-226 and radium-228. Although radium-226 and radium-228 have individual PHGs, they do not have individual MCLs, instead having a combined radium-226/228 MCL of 5 pCi/L. Radium-228, which has a PHG of 0.019 pCi/L, was detected in treated surface water purchased from Metropolitan. Radium-226 was not detected. The combined radium concentration in the purchased water ranged from below the DLR (ND) to 2 pCi/L.

The health risk category for radium-228 is carcinogenicity. The numerical health risk associated with the PHG is 1 excess case of cancer in 1,000,000 people (1×10^{-6}). The health risk associated with the MCL is 3 excess cases of cancer in 10,000 people (3×10^{-4}).

The BATs for removal of radium in water are ion exchange, reverse osmosis, and lime softening. The total estimated cost of reducing radium levels using ion exchange is $1,920,000 per year or $79 per service connection per year. Numerous factors may influence the actual costs of reducing radium-228 levels to the PHG (effectively, below the DLR of 1 pCi/L based on DDW-approved methods), including the type of ion exchange resin required. As discussed in Sections 3.2 and 3.4, this treatment is assumed to be limited to a single location and would thus require limiting the use of emergency imported water supplies to a single turnout. The costs to reduce combined radium using reverse osmosis in a centralized facility is discussed in Section 3.6.

3.6 Uranium

Uranium is a naturally occurring radionuclide in natural deposits that is introduced into drinking water through erosion. The PHG for uranium is 0.43 pCi/L, and the DLR is 1 pCi/L. Uranium was measured above the PHG at four of Mesa Water's groundwater wells, including one of the wells that supplies the MWRF. The concentration of uranium at these wells ranged from below the DLR (ND) to 2.8 pCi/L. Uranium was also detected in treated surface water purchased from Metropolitan at a range of ND to 3 pCi/L. These values are well below the MCL of 20 pCi/L.

The health risk category for uranium is carcinogenicity. The theoretical health risk associated with the PHG is 1 excess case of cancer in 1,000,000 (1×10^{-6}). The health risk associated with the MCL is 5 excess cases of cancer in 100,000 people (5×10^{-5}).

The BAT for removal of uranium in water is reverse osmosis. Since uranium is present in both local groundwater and purchased water, centralized treatment would likely be required. This form of treatment would also reduce the concentrations of contaminants identified in Sections 3.1 to 3.5. The estimated cost to reduce all identified contaminant levels using reverse osmosis, based on the average annual total water production, ranges from $13,000,000 to $20,400,000 per year, or $534 to $837 per service connection per year. This cost estimate does not include construction of pipelines that would be necessary to connect the impacted sources (wells and imported water connections) supplying a centralized facility.

4 Recommendations for Further Action

Drinking water delivered by Mesa Water is safe and meets or exceeds all state and federal drinking water standards set to protect public health. Mesa Water conducts over 30,000 water quality annually to ensure our water meets rigorous drinking water standards.

To further reduce the levels of the constituents identified in this report, all of which are well below the health-based MCL, additional costly treatment processes would be required. The effectiveness of the identified best-available treatment processes to provide any significant reductions in constituent levels at these already low values is uncertain and may not realistically be possible. The health protection benefits of these hypothetical reductions are unclear and may not be quantifiable. Therefore, no further action is proposed.

For additional information, please contact Kaying Lee, Mesa Water District Water Quality and Compliance Supervisor at 949.207.5491, or write to Mesa Water District, 1965 Placentia Ave, Costa Mesa, California 92627.

Table A. Summary of information related to contaminants exceeding PHGs in water delivered by Mesa Water, including concentration levels, health risk information, and estimated treatment costs

Parameter	Unit	PHG or (MCLG)	MCL	DLR	Concentration Groundwater	Concentration Surface Water	Category of Risk	Cancer Risk at PHG or MCLG	Cancer Risk at MCL	Best Available Technologies	Aggregate Cost Per Year	Cost Per Connection Per Year
INORGANIC CHEMICALS												
Arsenic	µg/L	0.004	10	2	ND - 2.3	NA	Carcinogen	1×10^{-6}	2.5×10^{-3}	AA, C/F, IX, LS, O/F, RO	$3,940,000 (IX)	$162 (IX)
Bromate	µg/L	0.1	10	1	NA	ND - 8.1	Carcinogen	1×10^{-6}	1×10^{-4}	RO	$2,370,000 - $3,840,000	$97 - $157
RADIOACTIVITY												
Gross Alpha Particle Activity	pCi/L	(0)	15	3	ND – 3.8	NA	Carcinogen	0	1×10^{-3}	RO	Note 1	Note 1
Gross Beta Particle Activity	pCi/L	(0)	50[2]	4	NA	ND - 7	Carcinogen	0	2×10^{-3}	IX, RO	$1,920,000 (IX)	$79 (IX)
Combined Radium-226/228	pCi/L	0.019[3]	5	NA[4]	NA	ND - 2	Carcinogen	1×10^{-6} [3]	3×10^{-4} [3]	IX, RO, LS	$1,920,000 (IX)	$79 (IX)
Uranium	pCi/L	0.43	20	1	ND - 2.8	ND - 3	Carcinogen	1×10^{-6}	5×10^{-5}	RO	Note 1	Note 1
ALL CONTAMINANTS[1]	--	--	--	--	--	--	--	--	--	**RO**	**$13,000,000 - $20,400,000**	**$534 - $837**

1 – Estimated cost to remove all contaminants by RO, assuming entire production volume is treated in a centralized facility.
2 – Judged equivalent to 4 mrem/year per OEHHA 2022 Health Risk Information for PHG Exceedance Reports.
3 – Based on the PHG for Radium-228. Combined radium-226/228 does not have a PHG but has an MCLG of zero. The cancer risk at an MCLG of zero is zero.
4 – Combined radium does not have a DLR but radium 226 and radium 228 have individual DLR of 1 pCi/L.

NOTES
PHG = Public Health Goal
MCLG = Maximum Contaminant Level Goal
MCL = Maximum Contaminant Level
DLR = Detection Limit for Purposes of Reporting
NA = Not Applicable
µg/L = micrograms per liter or parts per billion
pCi/L = picocuries per liter
mrem = millirem

TREATMENT/CONTROL TECHNOLOGIES
AA = activated alumna
C/F = coagulation/filtration
IX = ion exchange
LS = lime softening
O/F = oxidation/filtration
RO = reverse osmosis