2016 Report on Water Quality Relative to Public Health Goals

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List of Acronyms and Abbreviations

ACWA	Association of California Water Agencies
BAT	Best Available Technology
DDW	Division of Drinking Water, State Water Resources Control Board
DLR	detection limit for purposes of reporting
EGWD	Elk Grove Water District
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
OEHHA	California Office of Environmental Health Hazard Assessment
PHG	Public Health Goal
pCi/L	picocuries per liter
SCWA	Sacramento County Water Agency
USEPA	United States Environmental Protection Agency
µg/L	micrograms per liter

Background

The California Health and Safety Code Section 116470(b) specifies that public water systems serving more than 10,000 service connections prepare a brief written report every three years that documents detections of any constituents in drinking water that exceed a Public Health Goal (PHG). PHGs are non-enforceable goals established by the California Office of Environmental Health Hazard Assessment (OEHHA). The law also requires that where OEHHA has not adopted a PHG for a constituent, public water systems are to use the Maximum Contaminant Level Goal (MCLG) adopted by the United States Environmental Protection Agency (USEPA). Only constituents that have both a California primary drinking water Maximum Contaminant Level (MCL) and a PHG (or MCLG if no PHG exists) are to be addressed in this report.

This report addresses constituents detected in Elk Grove Water District's (EGWD) drinking water supply during calendar years 2013 through 2015 at a level exceeding an applicable PHG or MCLG and provides the required information for each constituent. The required information includes: the category or type of risk to health that could be associated with each constituent; the numerical public health risk associated with the primary MCL and the PHG or MCLG; the Best Available Technology (BAT) that could be used to reduce the constituent level; and an estimate of the cost to install that treatment.

What are PHGs?

PHGs are set by OEHHA and are non-enforceable goals based solely on public health risk considerations. The practical risk-management factors considered by the USEPA or the State Water Resources Control Board, Division of Drinking Water (DDW) in setting drinking water MCLs are not addressed in setting the PHGs. These practical risk-management factors include: analytical detection capability, treatment technology available, benefit and costs. The PHGs are not enforceable and are not required to be met by any public water system. MCLGs are the federal equivalent to PHGs.

Water Quality Data Considered

Water for the EGWD system is supplied by two water providers, EGWD and Sacramento County Water Agency (SCWA) as follows:

- Service Area 1 – local groundwater from EGWD
- Service Area 2 – local groundwater from SCWA, with periodic surface water from SCWA

Service Area 1 has approximately 8,000 customers and Service Area 2 has approximately 4,300 customers. A map of the service areas is provided below in Figure 1.

The water quality data that was collected from EGWD and SCWA's water system for purposes of determining compliance with drinking water standards was utilized to prepare this report. The results are summarized in the 2015 Consumer Confidence Report (published in 2016), which is available on the District's website (http://www.egwd.org/waterquality.html) and was mailed to all of our customers.

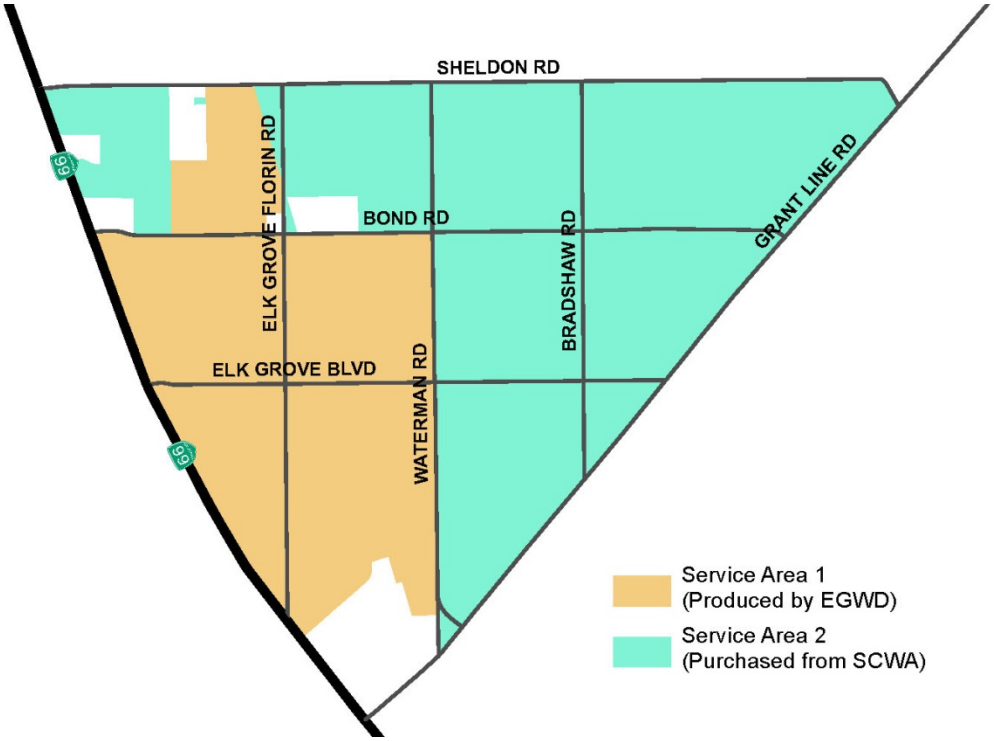

Figure 1. Elk Grove Water District Service Area Boundaries.

Guidelines Followed

The Association of California Water Agencies (ACWA) formed a workgroup to prepare guidelines for water utilities to use in preparing these reports. The ACWA guidelines were updated in 2016 and were utilized in the preparation of this report. No formal guidance for preparing these reports is available from state regulatory agencies.

Best Available Treatment Technology and Cost Estimates

Both the USEPA and DDW have adopted what are known as 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 concentration downward to or near the PHG or MCLG, many of which are set at zero. Estimating the costs to reduce a constituent level to zero is difficult, because it is not possible to verify by analytical means that the level has been lowered to zero. In some cases, installing treatment to further reduce very low levels of one constituent may have adverse effects on other aspects of water quality.

Constituents Detected that Exceed a PHG or MCLG

Table 1 presents the constituents that were detected in EGWD's drinking water system at levels above its PHG, or if no PHG, above the MCLG. These constituents are further discussed in the sections following Table 1.

Table 1. Constituents Detected Above a PHG or MCLG			
Constituent (Units)	PHG (MCLG)	MCL	DLR
Arsenic (µg/L)	0.004	10	2
Chromium, Hexavalent (µg/L)	0.02	10 [a]	1
Gross Alpha (pCi/L)	0	15	3
Uranium (pCi/L)	0.43	20	1
Total Coliform Bacteria	0% Positive Samples Per Month	≤5% Positive Samples Per Month	Not applicable

Notes:
DLR = detection limit for purposes of reporting
MCL = drinking water maximum contaminant level
PHG = public health goal
pCi/L = picocuries per liter of water
µg/L = micrograms per liter of water

[a] On May 31, 2017, the Superior Court of Sacramento County issued a judgment invalidating the hexavalent chromium MCL for drinking water. The court ordered the State Water Resources Control Board to take the necessary actions to delete the hexavalent chromium MCL from the California Code of Regulations and to file with the court by August 15, 2017, proof that it has done so (*California Manufacturers and Technology Association, et al. v. California Department of Public Health, et al.* [Super. Ct. Sacramento County, 2017. No. 34-2014-80001850]). The change became effective with the Office of Administrative Law filing the change with the Secretary of State on September 11, 2017. Thus, as of September 11, 2017, the MCL for hexavalent chromium is no longer in effect. Because the hexavalent chromium MCL was in effect for the data period evaluated herein and there were detected concentrations above the PHG, hexavalent chromium is discussed in this report.

Arsenic

Table 2 summarizes the range and average arsenic concentrations in the EGWD drinking water for Service Areas 1 and 2. The PHG for arsenic is 0.004 micrograms per liter (µg/L). The MCL for arsenic is 10 µg/L. The health risk category associated with arsenic is carcinogenicity. At the PHG, the theoretical cancer risk is 1×10^{-6}. This means the 70-year lifetime cancer risk for drinking water at the PHG is 1 excess case of cancer per 1,000,000 people exposed. At the MCL of 10 µg/L, the theoretical cancer risk is 2.5×10^{-3}. This means the 70-year lifetime cancer risk for drinking water at the MCL is 2.5 excess cases per 1,000 people exposed. The concentrations presented in Table 2 demonstrate that maximum concentrations of arsenic were less than the MCL of 10 µg/L.

Table 2. Water Quality Data Summary for Arsenic			
Constituent	EGWD Service Area 1 (Groundwater)	EGWD Service Area 2 (SCWA Groundwater)	EGWD Service Area 2 (SCWA Surface Water)
Range (µg/L)	ND – 6.2	ND – 6.3	ND – 3.3
Average (µg/L)	2.1	ND	ND
Source: Elk Grove Water District 2015 Consumer Confidence Report.			

The following are identified in California Code of Regulations, Title 22 Section 64447.2 as BATs for reducing arsenic levels in drinking water.

- Activated alumina
- Coagulation/filtration
- Ion Exchange

- Lime softening
- Reverse Osmosis
- Electrodialysis
- Oxidation/filtration

From the above list, further engineering feasibility and review would be necessary to make a determination regarding which treatment method would be most appropriate to implement. For the purposes of this report, the cost evaluation was conducted using ion exchange, given that ion exchange is also a BAT for hexavalent chromium (also addressed in this report).

Within EGWD Service Area 1, of the eight drinking water supply wells that are owned and operated by the EGWD, five have detected concentrations of arsenic above the PHG and it is assumed that these five wells would have ion exchange as the treatment method. The annualized capital and operations and maintenance (O&M) cost is estimated to be $1.5 million per year, which would be an increased cost for each customer in Service Area 1 of approximately $190 per year. This cost is based on the maximum production at these five wells during 2013–2015 of 751 million gallons and a unit cost for ion exchange provided in the ACWA guidance document of $1.99 per one thousand gallons requiring treatment.

The SCWA water purchased for EGWD Service Area 2 also had detections of arsenic above the PHG. It is estimated that the cost per customer for SCWA to implement a BAT would be similar to that described above for Service Area 1.

Hexavalent Chromium

Table 3 summarizes the range and average hexavalent chromium concentrations in the EGWD drinking water for Service Areas 1 and 2. The PHG for hexavalent chromium is 0.02 µg/L. The MCL for hexavalent chromium is 10 µg/L. The health risk category associated with hexavalent chromium is carcinogenicity. At the PHG, the theoretical cancer risk is 1×10^{-6}, which means the 70-year lifetime cancer risk for drinking water at the PHG is 1 excess case of cancer per 1,000,000 people exposed. At the MCL of 10 µg/L, the theoretical cancer risk is 5×10^{-4}, which means the 70-year lifetime cancer risk for drinking water at the MCL is 5 excess cases per 10,000 people exposed. The concentrations presented in Table 3 demonstrate that maximum concentrations of hexavalent chromium were less than the MCL of 10 µg/L.

Table 3. Water Quality Data Summary for Hexavalent Chromium

Constituent	EGWD Service Area 1 (Groundwater)	EGWD Service Area 2 (SCWA Groundwater)	EGWD Service Area 2 (SCWA Surface Water)
Range (µg/L)	ND – 6.2	ND – 8.9	ND
Average (µg/L)	3.9	1.4	ND

Source: Elk Grove Water District 2015 Consumer Confidence Report.

The following are identified in California Code of Regulations, Title 22 Section 64447.2 as BATs for reducing hexavalent chromium levels in drinking water.

- Coagulation/filtration

- Ion Exchange
- Reverse Osmosis

As discussed for arsenic, further engineering feasibility and review would be necessary to make a determination regarding which would be most appropriate to implement. Hexavalent chromium was detected at concentrations above the PHG in three of the five EGWD wells serving Service Area 1 that also had arsenic detections above its applicable PHG. Thus, for the purposes of this report, the cost evaluation was conducted using ion exchange, given that ion exchange is also a BAT for arsenic.

The annualized capital and O&M cost is estimated to be $1.1 million per year, which would be an increased cost for each customer in Service Area 1 of approximately $140 per year. This cost is based on the maximum production at the three wells during 2013–2015 of 557 million gallons and a unit cost for ion exchange provided in the ACWA guidance document of $1.99 per one thousand gallons requiring treatment.

The SCWA water purchased for EGWD Service Area 2 also had detections of hexavalent chromium above the PHG. It is estimated that the cost per customer for SCWA to implement a BAT for hexavalent would be similar to that described above for Service Area 1.

Radionuclides

Radionuclides detected in the EGWD water system include gross alpha and uranium. These radionuclides were only detected in SCWA groundwater that supplies Service Area 2. **Table 4** summarizes the range and average radionuclide levels in the EGWD drinking water for Service Areas 1 and 2.

The health risk and costs for treatment to reduce levels of these radionuclides are addressed separately for each constituent below.

Table 4. Water Quality Data Summary for Radionuclides

Constituent	EGWD Service Area 1 (Groundwater)	EGWD Service Area 2 (SCWA Groundwater)	EGWD Service Area 2 (SCWA Surface Water)
Gross Alpha			
Range (pCi/L)	ND	ND – 6.1	ND
Average (pCi/L)	ND	ND	ND
Uranium			
Range (pCi/L)	ND	ND – 6.7	ND
Average (pCi/L)	ND	ND	ND

Source: Elk Grove Water District 2015 Consumer Confidence Report.

Gross Alpha

Gross alpha is a measurement of the overall radioactivity of naturally occurring substances present in water due to radioactive elements breaking down. These can include radium 226, radium 228, and uranium. OEHHA has not established a PHG for gross alpha; the federal MCLG is 0 picocuries per liter of water (pCi/L) due to classification of gross alpha particles as carcinogens. The cancer risk at 0 pCi/L is zero. At the MCL of 15 pCi/L, the theoretical cancer risk is 1×10^{-3}, which means the 70-year lifetime

cancer risk for drinking water at the PHG is 1 excess case of cancer per 1,000 people exposed. The concentrations presented in Table 4 demonstrate that maximum levels of gross alpha were less than the MCL of 15 pCi/L.

The California Code of Regulations, Title 22 Section 64447.3 identifies reverse osmosis as the BAT for reducing gross alpha particle levels in drinking water. The wells in which gross alpha particles were detected are SCWA wells serving EGWD Service Area 2. The annualized capital and operations and maintenance (O&M) cost is estimated to be $2.8 million per year, which would be an increased cost for each customer in Service Area 2 of approximately $660 per year. This cost is based on 886 million gallons and a unit cost for reverse osmosis provided in the ACWA guidance document of $3.22 per one thousand gallons requiring treatment.

Uranium

Uranium is a naturally occurring element present in varying amounts in water, soil, and rock. The PHG for uranium is 0.43 pCi/L. The MCL for uranium is 20 pCi/L. The health risk category associated with uranium is carcinogenicity. At the PHG, the theoretical cancer risk is 1×10^{-6}, which means the 70-year lifetime cancer risk for drinking water at the PHG is 1 excess case of cancer per 1,000,000 people exposed. At the MCL of 20 pCi/L, the theoretical cancer risk is 5×10^{-5}, which means the 70-year lifetime cancer risk for drinking water at the MCL is 5 excess cases per 100,000 people exposed. The concentrations presented in Table 4 demonstrate that maximum concentrations were less than the MCL of 20 pCi/L.

The following are identified in California Code of Regulations, Title 22 Section 64447.3 as BATs for reducing uranium levels in drinking water.

- Coagulation/filtration
- Ion Exchange
- Lime softening
- Reverse Osmosis

The wells in uranium was detected are SCWA wells serving EGWD Service Area 2. For purposes of developing annualized costs, reverse osmosis is selected as the treatment method, because this is also the method for addressing gross alpha particles detected in SCWA wells. As described above for gross alpha, the annualized capital and O&M cost for reverse osmosis is estimated to be $2.8 million per year, or approximately $660 per year per customer in Service Area 2.

Total Coliform Bacteria

The MCL for total coliform bacteria is 5% positive samples of all samples per month. There is no PHG for total coliform bacteria; the MCLG is 0% positive samples per month. Coliform bacteria are an indicator organism that are ubiquitous in nature and are not generally considered harmful; they are used because of the ease in monitoring and analysis. The reason for the total coliform bacteria drinking water MCL is to minimize the possibility of the water containing potentially harmful pathogens that cause waterborne disease. 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 get a positive sample. Because coliform is only a surrogate indicator of the potential presence of pathogens, it is not possible to state a specific numerical health risk.

In 2015, five distribution system samples tested positive for total coliform bacteria in a single month. EGWD immediately resampled in accordance with drinking water regulations. All resamples were negative for total coliform bacteria and chlorine residuals were always detectable.

California Code of Regulations, Title 22, Section 64447 lists the following BATs for achieving compliance with the total coliform MCLs:

- Protection of wells from coliform contamination by appropriate placement and construction;
- Maintenance of a disinfectant residual throughout the distribution system;
- Proper maintenance of the distribution system; and
- Filtration and/or disinfection of approved surface water, in compliance with Section 64650, or disinfection of groundwater.

The EGWD implements the above BATs for total coliform bacteria. EGWD adds chlorine at it water sources to assure that the water served is microbiologically safe. The chlorine residual levels are carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increasing the disinfection byproduct level. This careful balance of treatment processes is essential to continue supplying our customers with safe drinking water. Other equally important measures that the EGWD has implemented include: an effective cross-connection control program, maintenance of a disinfectant residual throughout the water distribution system, an effective monitoring and surveillance program, and maintaining positive pressures in the distribution system. Surface water from SCWA is treated using conventional filtration and disinfection. Because BAT measures are fully implemented by EGWD, no estimated cost for further treatment is provided.

Recommendations for Further Action

The drinking water quality of the EGWD meets all DDW 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 MCLs 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 at this time.