ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
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DATE: December 3, 2018

TO: Valerie Pryor, General Manager

FROM: Angela O'Brien, Water Quality Engineer

SUBJECT: Draft 2018 Biennial Water Quality Management Program (WQMP) Report

INTRODUCTION:

This biennial report for Zone 7's Water Quality Management Program (WQMP) has been prepared as specified by Zone 7's 2014 Water Quality Policy. This report includes discussion and outcomes from a joint workshop that was conducted on November 8, 2018 with the Retailers and a representative of the untreated water users (Wente Vineyards).

BACKGROUND:

Zone 7 has a Water Quality Policy for Potable and Non-Potable Water (see Attachment A) that established the WQMP in 2003. The Policy establishes goals to effectively manage various water quality issues and to guide operations and capital improvement planning. The Policy calls for delivered potable water to its M&I Contractors' turnouts to be of a quality that contains no greater than 80% of the applicable State or federal primary Maximum Contaminant Levels (MCLs) and is aesthetically acceptable by meeting all State and federal secondary MCLs. The Policy also calls for Zone 7 to proactively mitigate earthy-musty taste and odor (T&O) events from surface water supplies, optimize its treatment processes to minimize chlorinous odors, and reduce delivered water hardness to "moderately hard", which is defined as 75 to 150 milligrams per liter (mg/L) as calcium carbonate ($CaCO_3$). As for the non-potable water delivered to Zone 7's untreated water turnouts, it should be of a quality that meets the irrigation needs and does not negatively impact vegetation, crops, or soils.

The goals established in the Policy are further refined with water quality targets for the key parameters of concern. Potable water targets were established for "average" conditions; during dry years or emergencies, some targets may not be achieved, but all primary MCLs will be met. Most of the targets are to be met at the turnouts except for a few potable water targets that are based on customer complaints (e.g., appearance and earthy/musty T&O events). Due to operational controls and optimization opportunities, some disinfectant residuals (e.g., total

chlorine and free ammonia) and disinfection byproducts (DBPs) are to be met as water leaves the surface water treatment plants (WTPs).

Non-potable water quality targets were recommended for irrigated turf and vineyards, for both average conditions and short-term applications. The average targets represent supply sources under average water quality conditions that can be applied on a regular basis. The maximum applied targets represent the maximum tolerance levels that the irrigated turf or vineyards can accept on a short-term basis. This may represent either drought years where the surface water quality is degraded, or different supply sources with lower quality used on a temporary basis, such as with recycled water.

Over the last decade, the water quality targets have been reviewed and adjusted as needed. They are also incorporated into various operations plans, planning documents, and design criteria as appropriate. The WQMP also has identified operational modifications, studies, and capital facilities to facilitate meeting these targets. These projects have been implemented, completed, or incorporated into Zone 7's ongoing Capital Improvement Program (CIP) and Asset Management Program (AMP).

The Water Quality Policy was last revised in April 2014 and directs staff to *"conduct a workshop with the M&I Contractors to develop a Water Quality Management Program Report every two years. The workshop will review emerging water quality issues and relevant regulatory and/or technology developments, review status of key parameters of concern in relation to their water quality targets, review water quality policy and need for updates, and review the status of relevant water quality improvement projects/activities. The Report shall include any recommended revisions to the water quality targets and/or recommended projects/activities to assist in meeting the water quality targets. Optimization of system operations will be recommended, where possible, prior to the identification of the need for capital improvements. The Report recommended capital improvements shall be incorporated into Zone 7's biennial update of the Ten-Year Water System CIP."*

DISCUSSION:

Water Quality Policy: Zone 7's 2014 Water Quality Policy was reviewed and there is no recommended revision to the Policy.

Non-Potable Water Quality And Targets: Zone 7 delivers imported State Water Project (SWP) water from the California Department of Water Resources (DWR) via the South Bay Aqueduct (SBA) directly to its untreated water users. Some untreated water users can also receive water from the local Lake Del Valle (LDV) or a blend of LDV and SWP water.

Water quality monitoring data is provided to any interested untreated water users and M&I Contractors on a monthly basis. As indicated on Table 1, Zone 7 met all of its non-potable water quality targets in 2016 and 2017 and no optimization of system operations or capital investment is required to meet these targets. There is also no recommendation to revise any of the non-

potable water quality targets. Any additional discussion is provided under the **Water Quality Issues** section below.

Table 1 - Status of Non-Potable Water Quality Targets

Key Parameters of Concern	Maximum Applied Level Vineyards	Average Target	2016-2017 SBA Water Quality Data¥ Avg	Min	Max	Target Currently Met	Requires Optimization	Requires Capital Investment
Boron (mg/L)	<1	<0.5	0.1	<0.1	0.3	✓		
Chloride (mg/L)	<200	<125	45	8	133	✓		
Emitter Clogging Potential (mEq/L as Ca+Mg§)	3 to 4	3 to 4	1.7	0.5	3.4	✓		
Available Nitrogen from Nitrate (mg/L as N)	-	<10 during summer	0.1	<0.1	0.2	✓		
pH	-	<8.0	7.5	6.8	8.1	✓		
Sodium (mg/L)	<200	<100	32	10	86	✓		
Total Dissolved Solids (TDS) (mg/L)	-	<650	191	65	410	✓		

¥ SBA data is an average of monthly untreated water samples taken from the surface WTPs.
§ mEq/L as Ca+Mg = milliequivalents per liter as calcium and magnesium.

Potable Water Quality And Targets: Zone 7 supplies mostly treated surface water to its four major retailers and a few direct customers. The four retailers, which provide water for M&I use, are the City of Pleasanton, the City of Livermore, the Dublin San Ramon Services District (DSRSD), and California Water Service Company (CWS). Groundwater supplies are used only to meet peak demands during summertime or when surface water supplies are limited (approximately 6% in 2016 and 15% in 2017). Zone 7 treats its surface water supplies at its Del Valle Water Treatment Plant (DVWTP) and/or Patterson Pass Water Treatment Plant (PPWTP). Groundwater is pumped through any of its ten wells and chloraminated to maintain consistent disinfectant residual in the distribution system. The highest salts and hardness values in Zone 7's groundwater supplies come from its Mocho Wells which can be treated through Zone 7's Mocho Groundwater Demineralization Plant (MGDP).

Zone 7's delivered water quality monitoring data is summarized in its Monthly Delivered Water Quality Reports and Annual Consumer Confidence Report. Note that Zone 7 continued to meet all of the primary drinking water standards as indicated in the 2016 and 2017 Annual Consumer Confidence Reports[1].

[1] www.zone7water.com/component/content/article/36-public/content/120-consumer-confidence-report

As indicated in Table 2, the average delivered water quality data met the majority of its potable water quality targets of concern in 2016 and 2017, except for geosmin (an earthy/musty T&O-causing compound) and T&O events. There is no recommendation to revise any of the potable water quality targets. There is also no recommendation to add or modify any projects/activities. Additional discussion is provided under the **Water Quality Issues** section below.

Table 2 - Status of Potable Water Quality Targets

Key Parameters of Concern	Water Quality Target[1]	2016-2017 Delivered Water Quality Data*			Target Currently Met	Requires Optimization	Requires Capital Investment
		Avg	Min[2]	Max[2]			
Appearance	Minimize air bubbles/cloudiness events[3]	NA	0	0	✓		
Boron (mg/L)	< 2.0 mg/L at turnouts	0.2	<0.1	0.5	✓		
Chloramines and Nitrification Prevention							
Total Disinfectant Residual (mg/L as Cl_2)	2.0 - 2.5 mg/L from water treatment plants (WTPs), wells will be operated to be as close to this target range as feasible	2.4	2.1	2.8	✓[5]	✓	
Cl_2:NH_3-N	4:1 to 5:1	NA	NA	NA	✓[4]	✓	
Minimize odor	Chloraminate > pH 8.0 for WTPs	8.8	7.6	9.6	✓[5]	✓	
Free Ammonia Residual (mg/L as N)	<0.15 mg/L from WTPs; wells to be operated as close to this target as feasible	0.04	<0.01	0.09	✓	✓	
Nitrite (mg/L as N)	<0.02 mg/L at turnouts	<0.01	<0.01	0.12	✓[5]	✓	
Consistency	Provide consistent chloramine residual	2.4	2.1	2.8	✓[5]	✓	
Chromium VI, Cr6+(µg/L)	<8 µg/L at turnouts**	3	<1	10	✓[6]	✓	?
Corrosion Control	non-corrosive (i.e., Aggressive Index ≥ 12.0)	12.1	11.4	12.6	✓[5]	✓	
	pH leaving WTP at +/- 0.2 units of target	0.2	0.0	0.6	✓[5]	✓	
Disinfection By-Products (DBPs)							
Total Trihalomethanes (TTHMs) (µg/L)	Maximum leaving Surface WTPs <64 µg/L	31	13	58	✓		✓
Five Haloacetic acids (HAA5) (µg/L)	Maximum leaving Surface WTPs <48 µg/L	13	6	23	✓		
N-Nitrosodimethylamine (NDMA) (ng/L)[8]	<10 ng/L at turnouts	3	2	4	✓		

Table 2 Continued…

Key Parameters of Concern	Water Quality Target[1]	2016-2017 Delivered Water Quality Data*			Target Currently Met	Requires Optimization	Requires Capital Investment
		Avg	Min[2]	Max[2]			
Earthy-Musty Taste and Odor (T&O)							
Odor Threshold Concentrations							
2-Methylisoborneol (MIB) (ng/L)	<9 ng/L	1	<1	7	✓	✓	✓
Geosmin (ng/L)	<4 ng/L	8	<1	291		✓	✓
Events[3]	No events	NA	0	3		✓	✓
Salinity & Hardness							
Chloride (mg/L)	<100 mg/L at turnouts	71	31	139	✓[5]	✓	✓
Total Dissolved Solids (TDS) (mg/L)	<500 mg/L at turnouts	304	105	866	✓[5]	✓	✓
Hardness (mg/L as $CaCO_3$)	<150 mg/L as $CaCO_3$ at turnouts	112	34	233	✓[5]	✓	✓

Notes:
NA = Not Applicable/Available
* Online data are used when available and pulled out every 4 hours.
** There is currently no MCL for Cr^{6+}. The previous MCL of 0.010 mg/L was withdrawn on September 11, 2017.
1. Targets are either at the secondary MCLs or 80% of the primary MCLs except for key parameters of concern in the table.
2. 5th percentile and 95th percentile values are used in lieu of minimum and maximum values, respectively, for online data to exclude instrument related spikes and null values.
3. An event is defined as when three or more similar complaints are received in a 7-day period.
4. Ratio is adjusted to meet target free ammonia residual at WTPs.
5. Averages met target.
6. Total chromium data is reported in lieu of Cr^{6+} data. All WTP samples were non-detect.

Units: **Milligrams per liter (mg/L):** a unit expressing the concentration of chemical constituent in solution as weight (milligram) of solute per unit volume (liter) of water; equivalent to one part per million (ppm).
Micrograms per liter (µg/L): equivalent to one part per billion (ppb).
Nanograms per liter (ng/L): equivalent to one part per trillion (ppt).

WATER QUALITY ISSUES: This reporting period included the end of a five-year (2012-2016) drought followed by a near-record statewide precipitation in the Water Year 2017 (October 1, 2016 to September 30, 2017). Water year 2017 snowpack was at 160 percent of average levels on April 1st; however, Water year 2018 had a much lower snowpack with only 60 percent of average on April 1st.[2] As California's climate cycles between wet and dry conditions, Zone 7 must continue its efforts in protecting its existing water sources while seeking new water

[2] www.cdec.water.ca.gov/snow/bulletin120/AprilHistory.pdf

sources. Potential water quality issues could also emerge as Zone 7 develops new wells and searches for alternative water supplies, such as desalination and direct/indirect potable reuse.

A summary of the ongoing and emerging potential water quality issues, status of relevant water quality improvement activities, and any relevant regulatory/technology development identified at local, State, and federal levels since the last WQMP update in August 2016 is provided below:

- **Algal Blooms and Byproducts** – Zone 7's surface water supplies are vulnerable to algal blooms and their byproducts, especially during warm summer months when high concentrations of nutrients combine with abundant sunshine and warm water temperatures. Algae are a concern for untreated water users as algae can plug up irrigation drip emitters and increase diurnal pH swings. Some untreated water users such as Wente Vineyards have sand filters to remove the algae before irrigation.

  Algae are also a concern to Zone 7 as they can increase the demand of treatment chemicals and some algae are known to clog filters (e.g., diatoms) and can significantly impact the performance of the filters and reduce WTP production capacity. Some algae can also produce earthy/musty T&O compounds such as 2-methylisoborneol (MIB) and geosmin. Additionally, some species of blue-green algae (e.g., cyanobacteria) are known to produce harmful toxins (commonly referred to as cyanotoxins).

  A comprehensive Watershed Sanitary Survey for the SWP is conducted by DWR every 5 years and the last Update completed in June 2017 showed that wastewater flow, agricultural drainage, grazing activities and the drought condition could all influence the nutrient concentrations in the SWP. While Zone 7 and DWRs work to manage the nutrient loading to our sources, other monitoring and mitigation measures are also used to prevent algae from proliferating and to treat the algal blooms and their byproducts once they have occurred. For example, Zone 7 is actively monitoring for algal blooms and their byproducts via in-house testing at the WTPs and upstream testing conducted by DWR. When there's a sign of algal bloom, Zone 7 works with DWR to apply copper sulfate or other algaecides to control algal growth in the SBA and other SWP facilities, as needed.

  Currently, Zone 7 can treat some of the algal byproducts using powdered activated carbon (PAC) and chlorine; however, the effectiveness of these treatment methods is limited[3]. Zone 7 recently initiated a full-scale plant testing of a liquid copper product called EarthTec at its PPWTP since mid-June of this year. Although Zone 7 visually observed reduction in algal growth throughout the plant, data so far indicated limited filter performance improvement. It was suspected that the PAC application used to control T&O may have impacted EarthTec's performance. Zone 7 plans to continue testing EarthTec through 2019.

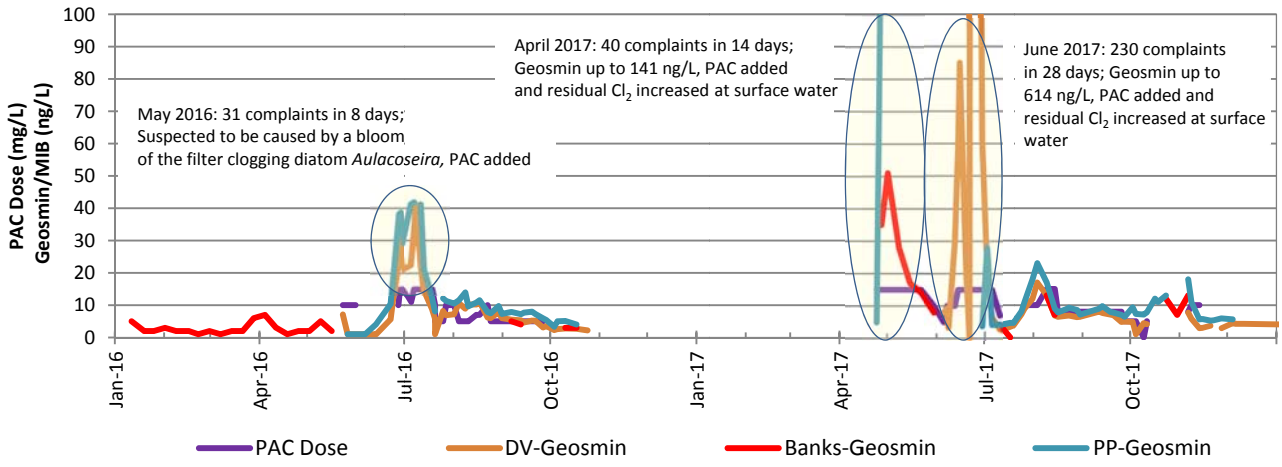
  Ozone is identified by Zone 7 as the best treatment technique for treating T&O compounds as well as cyanotoxins. Zone 7 has completed design for both surface WTPs and began

[3] Bench-Scale Evaluation of the Potential Destruction of Cyanotoxins with Treatment Technologies Applied to South Bay Aqueduct Water, WQTS, October 2015

construction for DVWTP. The ozone and associated facilities should come online in 2020 at DVWP and in 2022 at PPWTP[4].

There are currently no regulatory limits for these algae and algal byproducts, however, Zone 7 has odor thresholds for MIB and geosmin (<9 ng/L and <4 ng/L, respectively) as well as a target of 'no earthy/musty T&O event' based on no more than three customer complaints in a 7-day period. As shown on Figure 1, there were three T&O events that occurred during 2016-2017. In May 2016, there were 31 complaints in an 8-day period, despite PAC addition. In addition, there were 40 complaints in April 2017 during a 14-day period and 230 complaints in June 2017 during a 28-day period. An increase in chlorine residual and PAC addition were used by Zone 7 as mitigation measures. However, the geosmin levels in 2017 were too great to be treated at the WTPs. The source of the high geosmin levels was traced back to an upstream Dyer Reservoir. Therefore, in addition to the normal copper sulfate that DWR applied to SBA and PP reservoir, Zone 7 purchased another algaecide (PAK27) which is more soluble and faster reacting for DWR to apply at the Dyer Reservoir. The cost of PAK27 was reimbursed by DWR afterwards. The 2017 T&O events highlighted the importance of source water management. Since then, DWR had agreed to cycle the Dyer Reservoir more frequently and to clean and inspect the reservoir on a regular basis.

Figure 1 – Geosmin/MIB and PAC Dose at DVWTP (2016-2017)



For cyanotoxins, USEPA has the following 10-Day Drinking Water Health Advisories for Microcystins and Cylindrospermopsin[5]:

	Children < 6-Years Old	Older Children and Adults
Microcystins (µg/L)	0.3	1.6
Cylindrospermopsin (µg/L)	0.7	3.0

Note that these Health Advisories describe non-regulatory concentrations of contaminants at which adverse health effects are not anticipated to occur over a 10-day exposure duration.

[4] Zone 7 Water Agency, FY 18/19 Capital Improvement Program, Ten-Year Water System Plan, October 2017
[5] www.epa.gov/nutrient-policy-data/guidelines-and-recommendations#health/

DWR has been monitoring for these cyanotoxins in the SWP since 2013. Zone 7 also has been monitoring for Microcystins since late 2015 using a strip test with a detection limit at 0.5 µg/L. So far, no Microcystins have been detected in Zone 7's surface WTP's influent. If there's an increasing trend of algal growth or cyanotoxins in its source water, Zone 7 will increase its monitoring per its Algal Toxin Response Plan.

Zone 7 is also in the process of acquiring a Cyanotoxins Automated Assay System (CAAS). CAAS is an automated, microtiter plate format analyzer for quantitative determination of Anatoxin-a, Cylindrospermopsin, Microcystins, and Saxitoxins. This analyzer will provide a more comprehensive monitoring than the Microcystins strip test currently used by Zone 7. Lower detection limit for Microcystins (0.15 µg/L) is expected after CAAS installation and Zone 7's Algal Toxin Response Plan will be revised to reflect this higher sensitivity.

To collect more occurrence data, USEPA is requiring large water systems with population >10,000 to monitor for 10 cyanotoxins (including Microcystins and Cylindrospermopsin) between 2018 to 2020 per the federal fourth Unregulated Contaminant Monitoring Rule (UCMR4)[6]. Three of Zone 7's retailers (City of Livermore, CWS and DSRSD) have already completed their UCMR4 monitoring in 2018; City of Pleasanton will conduct their UCMR4 monitoring in 2019. As a wholesaler, Zone 7 is not subject to UCMR4 monitoring requirements; however, Microcystins samples were collected at its WTP inlets on the same days as the Retailers for supplemental information. Results so far indicated no detection of the cyanotoxins. If there's any treated water cyanotoxin that exceeds USEPA's HA, a public notification language has already been drafted in cooperation with the retailers.

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

❖ **Salinity and Hardness** – Salinity in the surface water conveyed through the Delta varies depending on the year's hydrological characteristics and releases made to the Delta for the SWP diversions. Typically, DWR manages Delta water quality by either reducing Delta exports or increasing the amount of water flowing into the Delta from upstream reservoirs.

As California came out of the last drought, there was a general decrease in salinity in the SWP water in 2017. As indicated in Table 1, salinity indicators such as chloride and TDS in the SBA water met its non-potable water target during the 2016-2017 reporting period. However, these salts cannot be removed by Zone 7's surface WTPs; therefore, it is imperative that Zone 7 continues to work with DWR regarding its Delta operation and future improvements to the Delta conveyance system to manage its salinity.

Zone 7's groundwater generally contains more salts and minerals and is "harder" than its surface water supplies. The highest chloride levels, TDS and hardness values in Zone 7's groundwater supplies come from Mocho Well No. 3 and 4; these levels have been increasing over the past few years (>140 mg/L chloride, >600 mg/L TDS, >400 mg/L hardness, respectively). Zone 7 manages salt loading to its groundwater supplies via artificial recharge with low TDS surface water, groundwater pumping and demineralization per its Salt

[6] www.epa.gov/dwucmr/fourth-unregulated-contaminant-monitoring-rule/

Management Program (SMP); This SMP has a current salt export goal of about 4,000 tons per year and a future salt export of about 6,000 tons per year at build-out.[7]

Demineralization is also used by Zone 7 to assist in meeting its delivered water salinity and hardness goals. Zone 7's MGDP was constructed in 2009 to assist in achieving the current salt export goal per year. This plant uses a reverse-osmosis (RO) membrane filtration technology with a maximum permeate capacity of about 6 million gallons per day (MGD). RO permeate is extremely soft (less than 10 mg/L) and corrosive, therefore, it is blended with other water supplies such as untreated groundwater or treated distribution system water to meet Zone 7's corrosion control, salinity and hardness targets.

Note that Zone 7 had to minimize MGDP operation in recent years due to the drought. Therefore, in 2016 Zone 7 only exported 183 tons of salt from the Valley via brine from the MGDP. Since 2017 was a wet year, Zone 7 was able to operate MGDP more and increased its salt export to about 949 tons[8]. The design and construction of a second groundwater demineralization plant that would remove up to another 3,000 tons of salt per year is still in Zone 7's CIP to be in service by 2029.

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

❖ **Chloramines/Nitrification Prevention –** Zone 7 and its retailers use chloramines to control microbial growth in their disinfection systems. Monochloramine is the combined chlorine formed when ammonia is added to chlorinated water at ~5:1 chlorine-to-ammonia weight ratio. When the chlorine-to-ammonia ratio is less than 3:1 or when ammonia is added at pH <8, some undesirable di- and tri- chloramines that cause chlorinous odors can form. This is not an issue at the surface WTPs due to better control systems and their treated water pH is already being adjusted to about 8.5 to 9 for corrosion control. However, the pH at the wells is not adjusted and their natural pH is about 7.5.

The presence of a trace amount of detectable free ammonia is actually desirable as it indicates the proper dosing of hypochlorite and aqueous ammonia to form monochloramines. However, any excess free ammonia added or decomposed from chloramines becomes a food source for nitrifying bacteria that produce nitrite and nitrate. The MCLs for nitrite and nitrate are 1 mg/L-N and 10 mg/L-N, respectively. Since nitrification can occur rapidly and lead to degradation of the water quality, including loss of total chlorine residual and potential violation of the Total Coliform Rule, Zone 7 has several water quality targets for chloramines and nitrification prevention:

- 2.0 - 2.5 mg/L total chlorine residual leaving the wells and WTPs;
- 4:1 to 5:1 total chlorine-to-ammonia weight ratio;
- Chloraminate above pH 8.0 at WTPs to reduce chlorinous odor;
- <0.15 mg/L-N of free ammonia leaving WTPs;

[7] www.zone7water.com/36-public/content/158-salt-management-plan-2004
[8] www.zone7water.com/36-public/content/76-groundwater-management-program-annual-report

- <0.02 mg/L-N of nitrite at Retailers turnouts;
- Provide consistent chloramine residual at all wells and WTPs.

Chemical feeds and residuals are carefully monitored and controlled at all Zone 7's facilities. Existing monitoring include continuous online pH, total chlorine, monochloramines and free ammonia at Zone 7's WTPs. The wells are more challenging for Zone 7 to control because, unlike the surface WTPs, the wells are not operated 24/7 since they are only operated as needed to meet peak demand. Also, chemicals at the wells can degrade as they age with exposure to the environment (sunlight, warm temperature, etc.) which can affect the chemical dosing control strategy. Therefore, due to infrequent operation of the wells, Zone 7 operators would grab a free ammonia sample during the day if the well is running and adjust the chemical feeds as needed. Zone 7's laboratory staff also conducts weekly total chlorine and twice-a-month nitrite monitoring at selected turnouts. As indicated in Table 2, Zone 7 has met all its targets for chloramines and nitrification prevention.

Some of the Retailers are preventing nitrification by cycling or mixing their treated water tanks to reduce their water age. City of Pleasanton has more nitrification issues and is currently looking into installing mixers or adding chlorine booster stations next year.

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

❖ **Hexavalent Chromium (Cr VI or Cr^{6+})** – Cr^{6+} is a carcinogen and a reproductive toxicant for both males and females. Cr^{6+} is currently regulated under the 50-µg/L California MCL and the 100-µg/L federal MCL for total chromium. USEPA is still in the process of re-assessing the health risks associated with chromium exposure and currently has no regulatory timeline on its website.[9] California was the only State that had adopted a drinking water MCL of 10 µg/L for Cr^{6+} that took effect on July 1, 2014, but the MCL was rescinded on September 11, 2017 due to insufficient economic feasibility study of meeting that MCL.[10] DDW has adopted its 2018 regulatory priorities which include developing methods to evaluate economic feasibility for Cr^{6+} and other future MCLs.[11] DDW will conduct economic feasibility workshop in early 2019 and expects to have a draft of their recommendation ready for public comment in the summer of 2019 and a final MCL established six to nine months later.

With the regulations currently under review, some California water systems are postponing installation of conventional ion exchange treatment facilities and experimenting with other promising new technologies. For example, Soquel Creek Water District and Coachella Valley Water District both had successfully completed testing the use of stannous chloride to reduce Cr^{6+} to the relatively harmless Cr^{3+} which can then be filtered out if needed[12, 13] This treatment method is substantially less expensive and is now approved by DDW.

[9] www.epa.gov/dwstandardsregulations/chromium-drinking-water
[10] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chromium6.html
[11] www.waterboards.ca.gov/board_info/agendas/2018/feb/022018_2.pdf
[12] www.cvwd.org/383/Stannous-Chloride-Demonstration-Project
[13] www.soquelcreekwater.org/water-quality/chromium-6

Although the Cr^{+6} MCL is no longer in effect, Zone 7 is keeping its delivered water quality target at <8-µg/L (80% of the previous MCL) at its turnouts. Zone 7 has some wells with Cr^{+6} near or slightly above 10 µg/L; these wells are Stoneridge and COL 1, 2 and 5. The Mocho and Hopyard wells are currently <7 µg/L and are not expected to require treatment. Zone 7 currently blends COL 5 well with the other COL wells to meet its 8-µg/L target. Stoneridge well is currently slightly below the target but blending with lower Cr^{6+} water (e.g., surface water, Mocho wells, or treated water from the MGDP) might be needed in the future.

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

❖ **Corrosion Control/Lead and Copper in Drinking Water** – Since the lead contamination in Flint, Michigan, came to light in 2016, USEPA and California have been busy trying to address this public health concern, especially for children since there is no known safe level of lead in a child's blood.[14] Lead and copper rarely occurs naturally in water sources, but may become present when water passes through older plumbing fixtures or solder containing lead that connects plumbing. Exposure to lead and copper may cause health problems ranging from stomach distress to brain damage.

Lead and copper in drinking water is currently regulated under the Lead and Copper Rule (LCR) which was promulgated in 1991. The LCR requires systems to collect tap samples from sites served by the system that are more likely to have plumbing materials containing lead. If more than 10 percent of tap water samples exceed the lead action level of 15 ppb or the copper action level of 1300 ppb, then water systems are required to take additional actions to control corrosion. Zone 7 and all its retailers are currently on a reduced monitoring frequency under the LCR due to low detection of lead and copper in their systems. Zone 7's retailers have always met the lead action level. One of Zone 7's direct customers, the VA Hospital, had detected high levels of lead in the past due to internal plumbing corrosion issues. Zone 7 is actively working with the VA Hospital to install, monitor and properly maintain their onsite filters.

Since 1991, the LCR has undergone various revisions. USEPA's current plan for long-term revisions includes provisions to ensure effectiveness of corrosion control treatment (CCT) and additional actions when CCT alone is not effectiveness (e.g., complete lead service line replacement).[15] Zone 7's CCT for its surface WTPs is via pH adjustment with sodium hydroxide. This CCT technique is called carbonate passivation where the pipe materials are incorporated into a metal/hydroxide/carbonate film that protects the pipe. This technique is most suitable for low hardness and alkalinity water where a water system does not want to drastically alter the water chemistry to the point that calcium carbonate precipitation will occur.

To maintain optimal CCT, Zone 7 uses either the Aggressiveness Index (AI) or the Calcium Carbonate Precipitation Potential (CCPP) to calculate a target pH for each WTP on a weekly

[14] www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water
[15] www.epa.gov/dwstandardsregulations/lead-and-copper-rule-long-term-revisions

basis; the WTPs then adjust the pH as necessary. Water with AI ≥12 or CCPP>0 is generally considered non-corrosive. The CCPP in Zone 7's surface water is generally > 0 while the CCPP in Zone 7's groundwater is much higher, between 20 to 30. When the minerals are removed at Zone 7's MGDP, the demineralized water becomes corrosive and is typically blended with untreated groundwater along with adjusting the pH to a target CCPP of 4 to 10 before introducing to the transmission system.

In September 2017, Zone 7 completed an assessment of its current corrosion control practices which were found to be adequate at this time.[16] To be conservative, Zone 7 has since raised its operational goal for AI to 12.2 from 12.0.

Schools that are served by a public water system are not required to test their water for lead under the current LCR. In early 2017, DDW issued amendments to the domestic water supply permits to approximately 1,200 community water systems so that schools could request assistance from their public water system to conduct water sampling for lead and receive technical assistance if an elevated lead sample is found. To further safeguard water quality in California's public schools, California passed the Assembly Bill (AB) 746 in October 2017, which became effective January 1, 2018. This Bill requires community 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. More recently, in September 2018, California signed into law AB 2370 to require testing for lead at day care facilities and DDW must adopt regulations to implement AB 2370 by January 1, 2021. Our retailers have already begun testing for its public schools when requested.

Thousands of schools in California have already been tested for lead in its drinking water[17], with some taking conservative actions. For example, three California School Districts (San Diego, Oakland and Berkeley) have adopted internal action levels for lead in school drinking water that are more stringent than federal action level of 15 ppb. San Diego and Oakland School Districts adopted a lead action level of 5 ppb while Berkeley Public Schools adopted a lead action level of 1 ppb; the limit recommended by the American Academy of Pediatrics. The San Diego Unified School District also indicates its goal is to lower its action level to 1 ppb by 2020.[18]

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

❖ **Disinfection By-Products (DBPs) and Precursors –** DBPs are formed when naturally occurring precursors such as Total Organic Carbon (TOC) and bromide react with disinfectants such as chlorine and ozone. DBPs such as Trihalomethanes (THMs) are formed when precursors in the water react with chlorine during water treatment. DBPs can be minimized through source control (e.g., reduction of salinity and organic loading in the Delta) and removal of organic precursors and DBPs themselves in the treatment plant.

[16] www.zone7water.com/images/pdf_docs/water_quality/corrosion_control_assessment.pdf
[17] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/leadsamplinginschools.htm
[18] www.edsource.org/2018/under-local-pressure-california-school-districts-adopt-lower-lead-limits-for-water/602930

In October 2018, California Office of Environmental Health Hazard Assessment (OEHHA) released a draft document for public review describing its proposed Public Health Goals (PHGs) for four regulated THMs.[19] The proposed PHGs are 0.4 parts per billion (ppb) for chloroform, 0.5 ppb for bromoform, 0.06 ppb for bromodichoromethane, and 0.1 ppb for dibromochloromethane. Similar to the PHGs, USEPA has a MCL goal (MCLG) set for each of these compounds. California's proposed PHGs for chloroforms and dibromochloromethane are much lower than USEPA's MCLGs (70 ppb and 60 ppb, respectively) while the proposed PHGs for bromoform and bromodichoromethane are higher than the existing MCLGs of zero.

Note that PHGs are not regulatory requirements and are based solely on protection of public health without regard to cost impacts or other factors. California is required to set its MCLs for drinking water as close to the corresponding PHG as is economically and technically feasible. Currently, California and USEPA have a MCL of 80 ppb for the total of these four THMs.

Applying ozone at treatment plants will reduce both coagulant and chlorine demand, thus reduce typical chlorination DBPs. However, ozonation can create other DBPs such as formaldehyde and other aldehydes, carboxylic acids, hydrogen peroxide, bromate, bromomethanes, brominated acetic acids, brominated acetonitriles and ketones.[20] Zone 7 will be using raw water pH adjustment via carbonic acid and chloramination ahead of the ozone to control bromate formation at both surface WTPs. Also, biofiltration will be used to control other ozonated byproducts as part of the ozone projects at both plants.

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

❖ **Microplastics** – Microplastics are small plastic pieces that are less than five millimeters (mm) in length which can enter and pollute the environment according to the U.S. National Oceanic and Atmospheric Administration (NOAA).[21] Some plastic is manufactured as microplastics and washed down drains, while larger plastic debris degrades into micro-sized particles over time with exposure to sun and water. Some plastics called "microbeads" are intentionally designed to be small for use in many health and beauty products (e.g., tooth pastes, facial cleaners, etc.). Microbeads first appeared in personal care products about fifty years ago, with plastics increasingly replacing natural ingredients. U.S. banned manufacturing and selling of rinse-off cosmetics and non-prescription drugs containing microbeads by July 2019 via the Microbeads-Free Waters Act of 2015. However, there are many more products containing microbeads such as detergents, sandblasting materials and cosmetics that can be left on the skin.

[19] www.oehha.ca.gov/water/crnr/announcement-availability-draft-technical-support-document-proposed-public-health-goals
[20] Alternative Disinfectants and Oxidants Guidance Manual, EPA, April 1999
[21] www.oceanservice.noaa.gov/facts/microplastics.html#transcript

Microfibers, another type of microplastics, are derived from synthetic textiles and slough off during daily use and machine washing of clothing (such as fleece jackets, etc.). Most microfibers released in water are between 0.1–0.8 mm in size.

There have been studies that show that over 90% of microplastics are removed during the wastewater treatment process through sedimentation and filtration, but what doesn't get removed can end up in downstream water bodies and possibly sources of supply for drinking water. One recent study found microfibers in 83% of 159 tap water samples from around the world and in 94% of the U.S. tap waters sampled.[22] Therefore, further research on the occurrence and toxicological relevance of microplastics is needed. More research is also needed on the removal of microplastics by various water treatment processes, particularly for sizes smaller than 300 µm.[23]

Water suppliers in California will be the first in the nation required to test for microplastics in drinking water under the Senate Bill (SB) 1422 passed in October 2018.[24] The Bill orders DDW to adopt a definition of microplastics by July 2020 and within a year establish a standard methodology to test drinking water. Four years of testing, reporting, and disclosure to the public would also be required. DDW may implement these requirements through the adoption of a policy handbook that is not subject to the requirements of Administrative Procedures Act (California Government Code, Chapter 3.5, Sections 11340 - 11361).

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

❖ **Per- and poly fluorinated alkyl substances (PFAS**) – PFAS exposure through drinking water has become an increasing concern due to the tendency of PFASs to accumulate in groundwater. PFAS are a group of man-made compounds used in a wide-range of products designed to be waterproof, stain‑resistant, non‑stick, or fire retardant since the 1940s. PFAS exposure is associated with a host of health impacts, including various cancers and reproductive and immune system problems. There are thousands of PFAS compounds and USEPA has developed a laboratory method for measuring 18 PFAS in drinking water (EPA Method 537.1)[25] while commercial laboratories can typically analyze for approximately 6 to 30 compounds.

PFOA (perfluoro-octanoic acid) and PFOS (perfluro-octane sulfonic acid) are the most well-known PFAS compounds and have been the primary focus of regulatory attention. The manufacture and import of PFOA has been phased out in U.S. as part of USEPA's PFOA Stewardship program launched in 2006.[26] In May 2016, USEPA issued a lifetime Health Advisory of 70 parts per trillion (ppt) for PFOA and PFOS, either singly or combined.[27]

[22] www.orbmedia.org/stories/Invisibles_plastics/
[23] www.epa.gov/trash-free-waters/epa-reports
[24] www.leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1422
[25] www.epa.gov/newsreleases/epa-releases-new-tools-test-and-treat-additional-pfas-including-genx-drinking-water
[26] www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program#mfg
[27] www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf

USEPA also placed both PFPA and PFOS on its fourth Contaminant Candidate List (CCL4)[28] in 2016 for future regulatory consideration. In July 2018, California DDW established drinking water Notification Levels of 14 ppt for PFOA and 13 ppt for PFOS, and a combined PFOA/PFOS drinking water response level of 70 ppt.[29] Water systems are not required to monitor for contaminants with Notification or Response Levels; However, if they do monitor, and a contaminant exceeds a Notification Level, they are required to notify DDW, and if a constituent exceeds a Response Level, they are recommended to take the source out of service or provide treatment.[30]

Six PFAS (PFOS, PFOA, PFNA, PFHxS, PFHpA and PFBS) were included in USEPA's Third Unregulated Contaminant Monitoring Rule (UCMR3). These PFAS were not detected in our treated water when Zone 7 and its retailers conducted monitoring under the UCMR3 during 2013-2015.

Other recent USEPA activities on PFAS included a National Leadership Summit in May 2018 and development of a PFAS Management Plan as well as expanding existing Method 537 to include other PFAS.

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

❖ **1,2,3-Trichloropropane (1,2,3-TCP**) – This man-made carcinogenic chemical found in hazardous waste sites has been detected in some drinking water wells in California since the 1990's. It is a chlorinated hydrocarbon used as an industrial solvent, cleaning and degreasing agent, paint remover, and also is associated with pesticide products since 1940s. Although TCP was banned from use in soil fumigants in the 1990s and many pesticide containing TCP were either taken off the market or reformulated, much of it had leached into groundwater over the decades and contaminated many drinking water wells. In 1999, DDW established a 5 ppt drinking water notification level for 1,2,3-TCP after its discovery at a southern California Superfund hazardous waste site. In 2001, DDW included it as an "Unregulated Contaminant for which Monitoring is Required". In 2009, California established a 0.0007 ppb PHG for 1,2,3-TCP.

Effective December 14, 2017, DDW established the MCL for 1,2,3-TCP in drinking water at 5 ppt; Initial quarterly monitoring is required for one year which begins in the first quarter of 2018. There is no federal MCL for 1,2,3-TCP, but it is on USEPA's CCL4. Based on DDW data from 2007 to 2017, 395 active and standby public water supply wells (of 5,863 wells sampled) had at least one detection above the CA MCL. Most wells with detections above the CA MCL occurred in Kern, Fresno and Los Angeles counties. [31]

[28] www.epa.gov/ccl/contaminant-candidate-list-4-ccl-4-0
[29] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/PFOA_PFOS.html
[30] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/NotificationLevels.html
[31] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/123TCP.html

Zone 7 has been monitoring for 1,2,3-TCP for more than a decade and has not detected it in any of its drinking water sources. Zone 7 will continue to monitor 1,2,3-TCP per regulatory requirement.

RECOMMENDATION:

- ***There's no recommendation to add or modify any projects/activities at this time.***

SUMMARY OF RECOMMENDATIONS:

- ❖ No revision to the Water Quality Policy.
- ❖ No revision to the potable and non-potable water targets.
- ❖ No addition or modification to any water quality improvement projects/activities.

ATTACHMENT:

- Attachment A – 2014 Water Quality Policy for Potable and Non-Potable Water