



TECHNICAL MEMORANDUM

Stanislaus Regional Water Authority Surface Water Supply Project Extended Source Water Monitoring Plan

Date: March 15, 2018

To: Stanislaus Regional Water Authority Technical Advisory Committee

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Subject: **Proposed Phase 2 Extended Monitoring Program for SRWA**

1 - INTRODUCTION

The Stanislaus Regional Water Authority (SRWA) has completed the first year (Phase 1) of Tuolumne River sample collection and analysis for characterization of source water for its Surface Water Supply Project (Project). The Phase 1 collection started in October 2016 and concluded in October 2017, with the exception of the required Long-Term 2 Enhanced Surface Water Treatment Rule (LT2) Bin classification parameters which are to be monitored for 24 months. The purpose of the Phase 1 monitoring program was to characterize the water quality of the source water to facilitate process train selection and design criteria selection for the new WTP, and to meet source water monitoring requirements for a new domestic water supply permit. The Phase 1 monitoring program included the following constituents:

- General water characterization parameters
- Title 22 contaminants (organics, inorganics, radionuclides, and DBPs)
- Microbial parameters
- Pesticides and other Synthetic Organic Chemicals (SOCs)
- Additional unregulated constituents

The sample collection schedule, monitoring location and sampling procedures for Phase 1 were discussed in the *Source Water Characterization Sampling Plan for the SRWA Surface Water Supply Project* Technical Memorandum (Trussell Technologies, September 2016), which was submitted to and approved by the California State Resources Water Quality Control Board's Division of Drinking Water (DDW). All water samples were collected by FishBio, who also measured temperature, pH, turbidity, dissolved oxygen, and conductivity in the field at the time of sample collection. All laboratory analyses were performed by Eurofins Eaton Analytical Laboratory (Eurofins), in Pasadena, California.

In order to better understand seasonal trends in water quality which can influence design criteria for SRWA's planned surface water treatment plant (WTP), a scaled down sampling program is proposed for Phase 2, defined as the time between the approval of this plan and the start of construction of the new SRWA WTP. In addition to continued source water characterization, this Phase 2 Extended Source Water Monitoring Plan is expected to fulfill the required Source Water Quality Analysis component of the domestic water supply permit application for the new WTP, contingent upon DDW approval. To fulfill the Source Water Quality Analysis component of the permit application, DDW may require an updated summary report from the monitoring program be submitted to present any changes in source water quality that may have been observed since the completion of the Phase 1 program.

2 - PROPOSED EXTENDED MONITORING PLAN AND SCHEDULE

An overview of the Phase 2 Extended Monitoring Program is provided below in Table 1. The select parameters required for 24 months of monitoring under LT2—*Cryptosporidium*, *E. coli*, and turbidity—will continue through October 2018 when the 24 months of sample collection are complete. Additional monitoring categories proposed for Phase 2 include the following:

- General water quality parameters with significant treatment process design implications (e.g., pH, turbidity, iron, manganese, etc.)
- Parameters with a Title 22 primary or secondary maximum contaminant level
- Microbial parameters that may impact the required level of treatment
- USEPA's fourth Unregulated Contaminant Monitoring Rule (UCMR4) parameters

The UCMR4 list includes 10 cyanotoxins that were monitored separately during Phase 1, as well as two metals, eight pesticides and one pesticide manufacturing byproduct, additional disinfection byproducts, alcohols, semivolatile chemicals, and two indicator parameters (TOC and bromide) that have already been monitored in the source water. USEPA uses the UCMR to collect occurrence data for contaminants known or suspected to exist in source waters and which pose a human health risk. USEPA can require public water systems (PWS) to monitor for as many as 30 contaminants under the UCMR, and the monitoring list is reevaluated every 5 years.

Because monthly LT2 sample collection will continue through October 2018, collection of samples for the additional parameters listed in Table 1 will be collected concurrent with the LT2 samples, but at a reduced schedule from Phase 1 sampling. Once LT2 sampling concludes at the end of 2018, it is proposed that the list of monitored parameters be reduced to only those parameters that have potential for seasonal variability and influence design criteria, and those parameters with State and Federal regulatory limits.

A complete listing of parameters in each of the monitored categories is provided in Attachment A.

Table 1. Proposed Phase 2 Source Water Monitoring Schedule

Parameter	Frequency of Collection	
	Mar 2018 To Oct 2018	Jan 2019 To Start of Construction*
General Water Characteristics (Physical and Chemical)	semi-annual (Spring, Fall)	semi-annual (Winter, Summer)
Select Field and Other General Parameters:		
pH, Temperature, Dissolved Oxygen, Turbidity, Alkalinity, Iron, Manganese, TOC, DOC, UV-254	monthly **	semi-annual (Winter, Summer)
Turbidity (lab)	monthly **	semi-annual (Winter, Summer)
Inorganic chemicals with DDW MCLs	semi-annual (Spring, Fall)	semi-annual (Winter, Summer)
Organic chemicals with DDW MCLs (includes regulated pesticides)	semi-annual (Spring, Fall)	semi-annual (Winter, Summer)
Radionuclides with DDW MCLs	semi-annual (Spring, Fall)	semi-annual (Winter, Summer)
Microbial Parameters:		
Cryptosporidium, Giardia	monthly	--
Total Coliform, E. coli	monthly **	semi-annual (Winter, Summer)
Nitrogen Compounds (NH ₃ , NO ₂ , NO ₃)	semi-annual (Spring, Fall)	--
Select Unregulated Pesticides and SOCs ***	semi-annual (Spring, Fall)	--
Additional Unregulated Parameters with a DDW Notification Level	semi-annual (Spring, Fall)	--
UCMR4 Parameters	Summer, Fall	--

*It is anticipated that the long-term monitoring proposed for 2019 will continue until construction of the WTP begins at or before the start of 2020.

**Monthly monitoring for these parameters is already included for October 2017 – October 2018 as part of the Phase 1 monitoring per LT2.

***"Select Unregulated Pesticides and SOCs includes all high-use pesticides applied to crops within the Lower Tuolumne River watershed, plus constituents measured during prior sampling events, provided that an appropriate analytical method is available.

3 - BUDGET ESTIMATE

The total estimated sampling and analytical costs for the Phase 2 Extended Monitoring Program is \$38,412, as summarized in Table 2. It is assumed that sampling and analysis will continue to be conducted by FishBio and Eurofins, respectively, as subcontractors to West Yost Associates. Trussell Tech will continue coordination between FishBio and Eurofins, as well as data compilation and analysis, and summary report preparation.

Table 2. Estimated Phase 2 Extended Monitoring Program Costs

Service (Provider)	Phase 2 Monitoring Costs*		
	March-October 2018	2019	Total
Sample Collection (FishBio)	-	\$2,012	\$2,012
Laboratory Analysis (Eurofins)	\$23,227	\$8,605	\$31,832
Total Costs	\$23,227	\$10,617	\$33,844

*Includes 5% contingency on each quote from FishBio and Eurofins, plus 10% markup to West Yost.

FishBio will continue to support the project with sample collection and field water quality measurements for the Phase 2 Extended Monitoring Program. The existing Phase 1 contract with FishBio continues through October 2018 to complete the Phase 1 LT2 sampling and FishBio has determined that the additional sampling (Table 1, March-October 2018 monitoring parameters) under Phase 2 can be collected with no additional charge. Beyond October 2018, the second year of Phase 2 monitoring will proceed until the start of construction of the new SRWA WTP—expected by the beginning of 2020. The estimated fee for FishBio sampling services through December 2019 (current anticipated start of WTP construction) is **\$2,013**. This cost includes water quality analysis for the field parameters (i.e., temperature, pH, turbidity, dissolved oxygen, conductivity) at the time of sample collection.

Eurofins will provide courier service from FishBio’s offices in Oakdale, California, as well as laboratory analytical services for Phase 2. The projected analytical fees for Phase 2 include \$27,795 for the additional monitoring through October 2018, then \$8,605 to cover the period of January through December 2019. The total Phase 2 budget for analytical services from Eurofins through December 2019 would be **\$36,400**.



Attachment A - Detailed List of Parameters for Phase 2 Extended Monitoring Program

Table A.1 – Phase 2 Extended Monitoring Through October 2018

Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
General Water Characteristics (Physical and Chemical)						
Alkalinity, total	--	SM 2320B	mg/L	--		m
Ammonia	--	EPA 350.1	mg/L	--		2x/y
Bromide	--	EPA 300.0	µg/l	--		2x/y (on UCMR4 list)
Calcium	--	EPA 200.7	mg/L	--		2x/y
Chloride	sMCL	EPA 300.0	mg/L	250		2x/y
Color	sMCL	SM 2120B	units	15		2x/y
Dissolved Oxygen (Field Measurement)	--	--	mg/L	--		m
Foaming Agents (MBAS)	sMCL	SM 5540C	mg/L	0.5		2x/y
Iron (total and dissolved)	sMCL	EPA 200.8	mg/L	0.3		m
Magnesium	--	EPA 200.7	mg/L	--		2x/y
Manganese (total and dissolved)	sMCL/NL	EPA 200.8	mg/L	0.05/0.5		m
Nitrate (as N)	pMCL	EPA 300.0	mg/L	10		2x/y
Nitrate + Nitrite (as N)	pMCL	addition	mg-N/L	10	--	2x/y
Nitrite (as N)	pMCL	EPA 300.0	mg-N/L	1	0.4	2x/y
Odor-Threshold	sMCL	SM 6040E	units	3		2x/y
Organic Carbon, Total (TOC)	--	SM5310C	mg/L	TT	0.3	m (LT2, UCMR4 overlap)



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Organic Carbon, Dissolved (DOC)		SM5310C	mg/L	--		m
pH	--	SM 4500-H+ B	--	--		m
pH (Field Measurement)						m
Phosphorus (total as P)	--	SM 4500-PE/ EPA 365.1	mg/L	--		2x/y
Potassium	--	EPA 200.7	mg/L	--		2x/y
Sodium	--	EPA 200.7	mg/L	--		2x/y
Specific Conductance (field measurement)	sMCL	SM 2510B	µS/cm	900		m
Sulfate	sMCL	EPA 300.0	mg/L	250		2x/y
Temperature (field measurement)	--	--	°C	--		m
Total Dissolved Solids (TDS)	sMCL	SM2540C	mg/L	500		2x/y
Total Suspended Solids (TSS)	--	SM2510D	mg/L	--		2x/y
Turbidity	pMCL/sMCL	EPA 180.1	NTU	TT/5		2x/m (LT2)
Turbidity (field measurement)	pMCL/sMCL	EPA 180.1	NTU	TT/5		2x/m (LT2)
UV-254	--	SM 5910	cm ⁻¹	--		m
Inorganic Contaminants with a primary (p) or secondary (s) MCL (not included in general water characteristics)						
Aluminum	pMCL/sMCL	EPA 200.8	mg/L	1/0.2	0.05	2x/y
Antimony	pMCL	EPA 200.8	mg/L	0.006	0.006	2x/y
Arsenic	pMCL	EPA 200.8	mg/L	0.010	0.002	2x/y
Asbestos	pMCL	EPA 100.2	MFL*	7	0.2	2x/y
Barium	pMCL	EPA 200.8	mg/L	1	0.1	2x/y
Beryllium	pMCL	EPA 200.8	mg/L	0.004	0.001	2x/y
Cadmium	pMCL	EPA 200.8	mg/L	0.005	0.001	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Chromium (Total)	pMCL	EPA 200.8	mg/L	0.05	0.01	2x/y
Chromium-6 (Hexavalent)	pMCL	EPA 218.6	mg/L	0.010	0.001	2x/y
Copper	pMCL/sMCL	EPA 200.8	mg/L	1.3/1.0	0.05	2x/y
Cyanide	pMCL	SM4500CN-F	mg/L	0.15	0.1	2x/y
Fluoride	pMCL	SM4500F-C	mg/L	2.0	0.1	2x/y
Lead	pMCL	EPA 200.8	mg/L	0.015	0.005	2x/y
Mercury (inorganic)	pMCL	EPA 245.1	mg/L	0.002	0.001	2x/y
Nickel	pMCL	EPA 200.8	mg/L	0.1	0.01	2x/y
Perchlorate	pMCL	EPA 314.0	mg/L	0.006	0.004	2x/y
Selenium	pMCL	EPA 200.8	mg/L	0.05	0.005	2x/y
Silver	sMCL	EPA 200.8	mg/L	0.1	0.01	2x/y
Thallium	pMCL	EPA 200.8	mg/L	0.002	0.001	2x/y
Zinc	sMCL	EPA 200.8	mg/L	5	0.05	2x/y
* MFL = million fibers per liter; MCL for fibers exceeding 10 µm in length						
Organic Contaminants with a primary or secondary MCL (excludes DBPs)						
1,1,1-Trichloroethane (1,1,1-TCA)	pMCL	EPA 524.2	mg/L	0.200	0.0005	2x/y
1,1,2,2-Tetrachloroethane	pMCL	EPA 524.2	mg/L	0.001	0.0005	2x/y
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	pMCL	EPA 524.2	mg/L	1.2	0.01	2x/y
1,1,2-Trichloroethane (1,1,2-TCA)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
1,1-Dichloroethane (1,1-DCA)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
1,1-Dichloroethylene (1,1-DCE)	pMCL	EPA 524.2	mg/L	0.006	0.0005	2x/y
1,2,3-Trichloropropane (1,2,3-TCP)	pMCL, NL	EPA 524.2	mg/L	5.00E-06	5.00E-06	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
1,2,4-Trichlorobenzene	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
1,2-Dichlorobenzene	pMCL	EPA 524.2	mg/L	0.6	0.0005	2x/y
1,2-Dichloroethane (1,2-DCA)	pMCL	EPA 524.2	mg/L	0.0005	0.0005	2x/y
1,2-Dichloropropane	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
1,3-Dichloropropene ²	pMCL	EPA 524.2	mg/L	0.0005	0.0005	2x/y
1,4-Dichlorobenzene (p-DCB)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
2,3,7,8-TCDD (Dioxin)	pMCL	EPA 1613	mg/L	3.E-08	5. E-09	2x/y
2,4,5-TP (Silvex)	pMCL	EPA 515.4	mg/L	0.05	0.001	2x/y
2,4-Dichlorophenoxyacetic acid (2,4-D) ²	pMCL	EPA 515.4	mg/L	0.07	0.01	2x/y
Alachlor	pMCL	EPA 505	mg/L	0.002	0.001	2x/y
Atrazine	pMCL	EPA 525.2	mg/L	0.001	0.0005	2x/y
Bentazon	pMCL	EPA 515.4	mg/L	0.018	0.002	2x/y
Benzene	pMCL	EPA 524.2	mg/L	0.001	0.0005	2x/y
Benzo(a)pyrene	pMCL	EPA 525.2	mg/L	0.0002	0.0001	2x/y
Carbofuran	pMCL	EPA 531.2	mg/L	0.018	0.005	2x/y
Carbon Tetrachloride	pMCL	EPA 524.2	mg/L	0.0005	0.0005	2x/y
Chlordane	pMCL	EPA 505	mg/L	0.0001	0.0001	2x/y
cis-1,2-Dichloroethylene	pMCL	EPA 524.2	mg/L	0.006	0.0005	2x/y
Dalapon	pMCL	EPA 515.4	mg/L	0.2	0.01	2x/y
Di(2-ethylhexyl)adipate	pMCL	EPA 525.2	mg/L	0.4	0.005	2x/y
Di(2-ethylhexyl)phthalate (same as Bis (2-ethylhexyl)phthalate ³)	pMCL	EPA 525.2	mg/L	0.004	0.003	2x/y
Dibromochloropropane (DBCP)	pMCL	EPA 551.1	mg/L	0.0002	0.00001	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Dichloromethane (Methylene chloride)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
Dinoseb	pMCL	EPA 515.4	mg/L	0.007	0.002	2x/y
Diquat	pMCL	EPA 549.2	mg/L	0.02	0.004	2x/y
Endothall	pMCL	EPA548.1	mg/L	0.1	0.045	2x/y
Endrin	pMCL	EPA 508	mg/L	0.002	0.0001	2x/y
Ethylbenzene	pMCL	EPA 524.2	mg/L	0.3	0.0005	2x/y
Ethylene Dibromide (EDB)	pMCL	EPA 551.1	mg/L	0.00005	0.00002	2x/y
Glyphosate ²	pMCL	EPA 547	mg/L	0.7	0.025	2x/y
Heptachlor	pMCL	EPA 505	mg/L	0.00001	0.00001	2x/y
Heptachlor Epoxide	pMCL	EPA 505	mg/L	0.00001	0.00001	2x/y
Hexachlorobenzene	pMCL	EPA 505	mg/L	0.001	0.0005	2x/y
Hexachlorocyclopentadiene	pMCL	EPA 505	mg/L	0.05	0.001	2x/y
Lindane	pMCL	EPA 505	mg/L	0.0002	0.0002	2x/y
Methoxychlor	pMCL	EPA 505	mg/L	0.03	0.01	2x/y
Methyl tert butyl ether (MTBE)	pMCL/sMCL	EPA 524.2	mg/L	0.013/0.005	0.003	2x/y
Molinate	pMCL	EPA 525.2	mg/L	0.02	0.002	2x/y
Monochlorobenzene	pMCL	EPA 524.2	mg/L	0.07	0.0005	2x/y
Oxamyl	pMCL	EPA 531.2	mg/L	0.05	0.02	2x/y
Pentachlorophenol	pMCL	EPA 515.4	mg/L	0.001	0.0002	2x/y
Picloram	pMCL	EPA 515.4	mg/L	0.5	0.001	2x/y
Polychlorinated Biphenyls (PCBs)	pMCL	EPA 505	mg/L	0.0005	0.0005	2x/y
Simazine ³	pMCL	EPA 525.2	mg/L	0.004	0.001	2x/y
Styrene	pMCL	EPA 524.2	mg/L	0.1	0.0005	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Tetrachloroethylene (PCE)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
Thiobencarb	pMCL/sMCL	EPA 525.2	mg/L	0.07/0.001	0.001	2x/y
Toluene	pMCL	EPA 524.2	mg/L	0.15	0.0005	2x/y
Total Xylenes	pMCL	EPA 524.2	mg/L	1.750	0.0005	2x/y
Toxaphene	pMCL	EPA 505	mg/L	0.003	0.001	2x/y
trans-1,2-Dichloroethylene	pMCL	EPA 524.2	mg/L	0.01	0.0005	2x/y
Trichloroethylene (TCE)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
Trichlorofluoromethane (Freon 11)	pMCL	EPA 524.2	mg/L	0.15	0.005	2x/y
Vinyl Chloride	pMCL	EPA 524.2	mg/L	0.0005	0.0005	2x/y
Disinfection By-Products						
Haloacetic acids (HAA5)	pMCL	SM 6251B	mg/L	0.060	--	2x/y (on UCMR4 list)
Total Trihalomethanes (TTHMs)	pMCL	EPA 551.1	mg/L	0.080	--	2x/y
Bromate	pMCL	EPA 317.0	mg/L	0.010	0.0010	2x/y
Chlorite	pMCL	EPA 300.0	mg/L	1.0	0.020	2x/y
Radionuclides with an MCL						
Gross Alpha Particle (excluding radon and uranium)	pMCL	EPA 900	pCi/L	15	3	2x/y
Gross Beta Particle	pMCL	EPA 900	mrem/yr	4	4	2x/y
Radium-228 and -226 (combined)	pMCL	GA Method	pCi/L	5	1 for each	2x/y
Strontium-90	pMCL	EPA 905	pCi/L	8	2	2x/y
Tritium	pMCL	EPA 906	pCi/L	20,000	1,000	2x/y
Uranium	pMCL	EPA 200.8	pCi/L	20	1	2x/y
Microbiological						



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
<i>Cryptosporidium</i>	pMCL	EPA 1623	oocysts/L	TT	--	m (LT2)
<i>E. coli</i>	pMCL	SM 9223F	MPN/100mL	TT	--	2x/m (LT2)
<i>Giardia</i>	pMCL	EPA 1623	cysts/L	TT	--	m (LT2)
Total Coliform	pMCL	SM 9223B	MPN/100mL	TT	--	2x/m (LT2)
Applied in Watershed - Unregulated, High-Use Pesticides (>5,000 lbs/yr)						
Chloropicrin	aNL	551.1	mg/L	0.05	--	2x/y
Chlorothalonil	HA (1-day)	525.2	mg/L	0.2	--	2x/y
Methyl Bromide	CCL3, CCL4	524.2	--	--	--	2x/y
Oxyfluorfen	CCL3, CCL4	525.2	--	--	--	2x/y
Paraquat Dichloride	HA (1-day)	549.2	mg/L	0.1	--	2x/y
Pendimethalin	none	525.2	mg/L			2x/y
Additional Unregulated Pesticides Applied in the Watershed, with a Health Advisory Level or Considered for Future Regulation						
Acephate	CCL3, CCL4	LCMS-MS		--	--	2x/y
Carbaryl	aNL	531.2	mg/L	0.7	--	2x/y
Dimethoate	aNL	525.2	mg/L	0.001	--	2x/y
Diuron ³	HA (1-day); CCL4	EPA 532	mg/L	1	--	2x/y
Hexazinone	HA (1-day)	EPA 525.2	mg/L	3	--	2x/y
Methomyl	HA (1-day)	531.2	mg/L	0.3	--	2x/y
Metolachlor ³	UCMR2; HA (1-day)	525.2	mg/L	2	--	2x/y
Permethrin	CCL3, CCL4	525.2		--	--	2x/y
Tebuconazole	CCL3, CCL4	LCMS-MS		--	--	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Thiamethoxam	UCMR3	LCMS-MS		--	--	2x/y
Thiophanate-Methyl	CCL4	LCMS-MS		--	--	2x/y
Ziram	CCL4	630.1		--	--	2x/y
Additional SOCs Reported in Historical Data						
Diazinon	aNL; HA	EPA 525.2	mg/L	0.0012	--	2x/y
Tertiary butyl alcohol (TBA)	NL	EPA 524.2	mg/L	0.012	--	2x/y
Chlorpyrifos (Dursban)	UCMR4; HA	525.2	mg/L	0.03	--	2x/y
EPTC	UCMR1	525.2		--	--	2x/y
Malathion	aNL; HA	525.2	mg/L	0.16	--	2x/y
Trifluralin	HA (1-day)	525.2	mg/L	0.08	--	2x/y
Additional Unregulated Constituents of Interest Related to Dairy, Poultry and Ranch Operations						
17-β-estradiol	UCMR3, List 2	EPA 539	ng/L	--	--	2x/y
17-α-ethynylestradiol	UCMR3, List 2	EPA 539	ng/L	--	--	2x/y
Estriol	UCMR3, List 2	EPA 539	ng/L	--	--	2x/y
Equilin	UCMR3, List 2	EPA 539	ng/L	--	--	2x/y
Erythromycin	CCL3, CCL4	LC-MS-MS	ng/L	--	--	2x/y
Estrone	UCMR3, List 2	EPA 539	ng/L	--	--	2x/y
Testosterone	UCMR3, List 2	EPA 539	ng/L	--	--	2x/y
4-androstene-3,17-dione	UCMR3, List 2	EPA 539	ng/L	--	--	2x/y
UCMR4						
total microcystin	UCMR4	EPA 546	µg/L	--	--	2x/y
microcystin-LA	UCMR4	EPA 544	µg/L	--	--	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
microcystin-LF	UCMR4	EPA 544	µg/L	--	--	2x/y
microcystin-LR	UCMR4	EPA 544	µg/L	--	--	2x/y
microcystin-LY	UCMR4	EPA 544	µg/L	--	--	2x/y
microcystin-RR	UCMR4	EPA 544	µg/L	--	--	2x/y
microcystin-YR	UCMR4	EPA 544	µg/L	--	--	2x/y
nodularin	UCMR4	EPA 544	µg/L	--	--	2x/y
anatoxin-a	UCMR4	EPA 545	µg/L	--	--	2x/y
cylindrospermopsin	UCMR4	EPA 545	µg/L	--	--	2x/y
germanium	UCMR4	EPA 200.8	µg/L	--	--	2x/y
manganese	UCMR4	EPA 200.8	µg/L	--	--	2x/y
alpha-hexachlorocyclohexane	UCMR4	EPA 530	µg/L	--	--	2x/y
chlorpyrifos	UCMR4	EPA 530	µg/L	--	--	2x/y
dimethipin	UCMR4	EPA 530	µg/L	--	--	2x/y
ethoprop	UCMR4	EPA 530	µg/L	--	--	2x/y
oxyfluorfen	UCMR4	EPA 530	µg/L	--	--	2x/y
profenofos	UCMR4	EPA 530	µg/L	--	--	2x/y
tebuconazole	UCMR4	EPA 530	µg/L	--	--	2x/y
total permethrin (cis- & trans-)	UCMR4	EPA 530	µg/L	--	--	2x/y
tribufos	UCMR4	EPA 530	µg/L	--	--	2x/y
HAA5	UCMR4	EPA 552.3 or 557	µg/L	--	--	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
HAA6Br	UCMR4	EPA 552.3 or 557	µg/L	--	--	2x/y
HAA9	UCMR4	EPA 552.3 or 557	µg/L	--	--	2x/y
1-butanol	UCMR4	EPA 541	µg/L	--	--	2x/y
2-methoxyethanol	UCMR4	EPA 541	µg/L	--	--	2x/y
2-propen-1-ol	UCMR4	EPA 541	µg/L	--	--	2x/y
butylated hydroxyanisole	UCMR4	EPA 525.3	µg/L	--	--	2x/y
o-toluidine	UCMR4	EPA 525.3	µg/L	--	--	2x/y
quinoline	UCMR4	EPA 525.3	µg/L	--	--	2x/y
Organic Carbon, Total (TOC)	UCMR4	SM5310C	mg/L	--	--	2x/y
Bromide	UCMR4	EPA 300.0	mg/L	--	--	2x/y

Footnotes:

¹ m=monthly; q=quarterly, 2x/m=twice per month; 2x/y=twice per year; quarterly samples collected Mar, Jun, Sep; 2x/y samples collected Mar, Sep unless otherwise noted in Table 1.

² Also a high-use pesticide in this watershed.

³ Also reported in historical data.

TT = Treatment Technique

pMCL = Primary Maximum Contaminant Level

sMCL = Secondary Maximum Contaminant Level

NL = DDW Notification Level

aNL = DDW Archived Notification Level

UCMR = Unregulated Contaminant Monitoring Rule

CCL = EPA's Contaminant Candidate List

HA = EPA Health Advisory Level



Table A.2 - Phase 2 Extended Monitoring January 2019 Through Start of WTP Construction (assumed December 2019)

Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
General Water Characteristics (Physical and Chemical)						
Alkalinity, total	--	SM 2320B	mg/L	--		2x/y
Bromide	--	EPA 300.0	µg/l	--		2x/y
Calcium	--	EPA 200.7	mg/L	--		2x/y
Chloride	sMCL	EPA 300.0	mg/L	250		2x/y
Color	sMCL	SM 2120B	units	15		2x/y
Dissolved Oxygen (Field Measurement)	--	--	mg/L	--		2x/y
Foaming Agents (MBAS)	sMCL	SM 5540C	mg/L	0.5		2x/y
Iron (total and dissolved)	sMCL	EPA 200.8	mg/L	0.3		2x/y
Magnesium	--	EPA 200.7	mg/L	--		2x/y
Manganese (total and dissolved)	sMCL/NL	EPA 200.8	mg/L	0.05/0.5		2x/y
Odor-Threshold	sMCL	SM 6040E	units	3		2x/y
Organic Carbon, Total (TOC)	--	SM5310C	mg/L	TT	0.3	2x/y
Organic Carbon, Dissolved (DOC)	--	SM5310C	mg/L	--		2x/y
pH	--	SM 4500-H+ B	--	--		2x/y
pH (Field Measurement)	--					2x/y
Phosphorus (total as P)	--	SM 4500-PE/ EPA 365.1	mg/L	--		2x/y
Potassium	--	EPA 200.7	mg/L	--		2x/y
Sodium	--	EPA 200.7	mg/L	--		2x/y
Specific Conductance (field measurement)	sMCL	SM 2510B	µS/cm	900		2x/y
Sulfate	sMCL	EPA 300.0	mg/L	250		2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Temperature (field measurement)	--	--	°C	--		2x/y
Total Dissolved Solids (TDS)	sMCL	SM2540C	mg/L	500		2x/y
Total Suspended Solids (TSS)	--	SM2510D	mg/L	--		2x/y
Turbidity	pMCL/sMCL	EPA 180.1	NTU	TT/5		2x/y
Turbidity (field measurement)	pMCL/sMCL	EPA 180.1	NTU	TT/5		2x/y
UV-254	--	SM 5910	cm ⁻¹	--		2x/y
Inorganic Contaminants with a primary (p) or secondary (s) MCL (not included in general water characteristics)						
Aluminum	pMCL/sMCL	EPA 200.8	mg/L	1/0.2	0.05	2x/y
Antimony	pMCL	EPA 200.8	mg/L	0.006	0.006	2x/y
Arsenic	pMCL	EPA 200.8	mg/L	0.010	0.002	2x/y
Asbestos	pMCL	EPA 100.2	MFL*	7	0.2	2x/y
Barium	pMCL	EPA 200.8	mg/L	1	0.1	2x/y
Beryllium	pMCL	EPA 200.8	mg/L	0.004	0.001	2x/y
Cadmium	pMCL	EPA 200.8	mg/L	0.005	0.001	2x/y
Chromium (Total)	pMCL	EPA 200.8	mg/L	0.05	0.01	2x/y
Chromium-6 (Hexavalent)	pMCL	EPA 218.6	mg/L	0.010	0.001	2x/y
Copper	pMCL/sMCL	EPA 200.8	mg/L	1.3/1.0	0.05	2x/y
Cyanide	pMCL	SM4500CN-F	mg/L	0.15	0.1	2x/y
Fluoride	pMCL	SM4500F-C	mg/L	2.0	0.1	2x/y
Lead	pMCL	EPA 200.8	mg/L	0.015	0.005	2x/y
Mercury (inorganic)	pMCL	EPA 245.1	mg/L	0.002	0.001	2x/y
Nickel	pMCL	EPA 200.8	mg/L	0.1	0.01	2x/y
Perchlorate	pMCL	EPA 314.0	mg/L	0.006	0.004	2x/y
Selenium	pMCL	EPA 200.8	mg/L	0.05	0.005	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Silver	sMCL	EPA 200.8	mg/L	0.1	0.01	2x/y
Thallium	pMCL	EPA 200.8	mg/L	0.002	0.001	2x/y
Zinc	sMCL	EPA 200.8	mg/L	5	0.05	2x/y
* MFL = million fibers per liter; MCL for fibers exceeding 10 µm in length						
Organic Contaminants with a primary or secondary MCL (excludes DBPs)						
1,1,1-Trichloroethane (1,1,1-TCA)	pMCL	EPA 524.2	mg/L	0.200	0.0005	2x/y
1,1,2,2-Tetrachloroethane	pMCL	EPA 524.2	mg/L	0.001	0.0005	2x/y
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	pMCL	EPA 524.2	mg/L	1.2	0.01	2x/y
1,1,2-Trichloroethane (1,1,2-TCA)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
1,1-Dichloroethane (1,1-DCA)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
1,1-Dichloroethylene (1,1-DCE)	pMCL	EPA 524.2	mg/L	0.006	0.0005	2x/y
1,2,3-Trichloropropane (1,2,3-TCP)	pMCL, NL	EPA 524.2	mg/L	5.00E-06	5.00E-06	2x/y
1,2,4-Trichlorobenzene	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
1,2-Dichlorobenzene	pMCL	EPA 524.2	mg/L	0.6	0.0005	2x/y
1,2-Dichloroethane (1,2-DCA)	pMCL	EPA 524.2	mg/L	0.0005	0.0005	2x/y
1,2-Dichloropropane	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
1,3-Dichloropropene ²	pMCL	EPA 524.2	mg/L	0.0005	0.0005	2x/y
1,4-Dichlorobenzene (p-DCB)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
2,3,7,8-TCDD (Dioxin)	pMCL	EPA 1613	mg/L	3.E-08	5. E-09	2x/y
2,4,5-TP (Silvex)	pMCL	EPA 515.4	mg/L	0.05	0.001	2x/y
2,4-Dichlorophenoxyacetic acid (2,4-D) ²	pMCL	EPA 515.4	mg/L	0.07	0.01	2x/y
Alachlor	pMCL	EPA 505	mg/L	0.002	0.001	2x/y
Atrazine	pMCL	EPA 525.2	mg/L	0.001	0.0005	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Bentazon	pMCL	EPA 515.4	mg/L	0.018	0.002	2x/y
Benzene	pMCL	EPA 524.2	mg/L	0.001	0.0005	2x/y
Benzo(a)pyrene	pMCL	EPA 525.2	mg/L	0.0002	0.0001	2x/y
Carbofuran	pMCL	EPA 531.2	mg/L	0.018	0.005	2x/y
Carbon Tetrachloride	pMCL	EPA 524.2	mg/L	0.0005	0.0005	2x/y
Chlordane	pMCL	EPA 505	mg/L	0.0001	0.0001	2x/y
cis-1,2-Dichloroethylene	pMCL	EPA 524.2	mg/L	0.006	0.0005	2x/y
Dalapon	pMCL	EPA 515.4	mg/L	0.2	0.01	2x/y
Di(2-ethylhexyl)adipate	pMCL	EPA 525.2	mg/L	0.4	0.005	2x/y
Di(2-ethylhexyl)phthalate (same as Bis (2-ethylhexyl)phthalate ³)	pMCL	EPA 525.2	mg/L	0.004	0.003	2x/y
Dibromochloropropane (DBCP)	pMCL	EPA 551.1	mg/L	0.0002	0.00001	2x/y
Dichloromethane (Methylene chloride)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
Dinoseb	pMCL	EPA 515.4	mg/L	0.007	0.002	2x/y
Diquat	pMCL	EPA 549.2	mg/L	0.02	0.004	2x/y
Endothall	pMCL	EPA548.1	mg/L	0.1	0.045	2x/y
Endrin	pMCL	EPA 508	mg/L	0.002	0.0001	2x/y
Ethylbenzene	pMCL	EPA 524.2	mg/L	0.3	0.0005	2x/y
Ethylene Dibromide (EDB)	pMCL	EPA 551.1	mg/L	0.00005	0.00002	2x/y
Glyphosate ²	pMCL	EPA 547	mg/L	0.7	0.025	2x/y
Heptachlor	pMCL	EPA 505	mg/L	0.00001	0.00001	2x/y
Heptachlor Epoxide	pMCL	EPA 505	mg/L	0.00001	0.00001	2x/y
Hexachlorobenzene	pMCL	EPA 505	mg/L	0.001	0.0005	2x/y
Hexachlorocyclopentadiene	pMCL	EPA 505	mg/L	0.05	0.001	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Lindane	pMCL	EPA 505	mg/L	0.0002	0.0002	2x/y
Methoxychlor	pMCL	EPA 505	mg/L	0.03	0.01	2x/y
Methyl tert butyl ether (MTBE)	pMCL/sMCL	EPA 524.2	mg/L	0.013/0.005	0.003	2x/y
Molinate	pMCL	EPA 525.2	mg/L	0.02	0.002	2x/y
Monochlorobenzene	pMCL	EPA 524.2	mg/L	0.07	0.0005	2x/y
Oxamyl	pMCL	EPA 531.2	mg/L	0.05	0.02	2x/y
Pentachlorophenol	pMCL	EPA 515.4	mg/L	0.001	0.0002	2x/y
Picloram	pMCL	EPA 515.4	mg/L	0.5	0.001	2x/y
Polychlorinated Biphenyls (PCBs)	pMCL	EPA 505	mg/L	0.0005	0.0005	2x/y
Simazine ³	pMCL	EPA 525.2	mg/L	0.004	0.001	2x/y
Styrene	pMCL	EPA 524.2	mg/L	0.1	0.0005	2x/y
Tetrachloroethylene (PCE)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
Thiobencarb	pMCL/sMCL	EPA 525.2	mg/L	0.07/0.001	0.001	2x/y
Toluene	pMCL	EPA 524.2	mg/L	0.15	0.0005	2x/y
Total Xylenes	pMCL	EPA 524.2	mg/L	1.750	0.0005	2x/y
Toxaphene	pMCL	EPA 505	mg/L	0.003	0.001	2x/y
trans-1,2-Dichloroethylene	pMCL	EPA 524.2	mg/L	0.01	0.0005	2x/y
Trichloroethylene (TCE)	pMCL	EPA 524.2	mg/L	0.005	0.0005	2x/y
Trichlorofluoromethane (Freon 11)	pMCL	EPA 524.2	mg/L	0.15	0.005	2x/y
Vinyl Chloride	pMCL	EPA 524.2	mg/L	0.0005	0.0005	2x/y
Disinfection By-Products with primary MCL						
Haloacetic acids (HAA5)	pMCL	SM 6251B	mg/L	0.060	--	2x/y
Total Trihalomethanes (TTHMs)	pMCL	EPA 551.1	mg/L	0.080	--	2x/y



Parameter	List	Method	Units	DDW MCL/NL	DDW DLR	Collection Frequency ¹
Bromate	pMCL	EPA 317.0	mg/L	0.010	0.0010	2x/y
Chlorite	pMCL	EPA 300.0	mg/L	1.0	0.020	2x/y
Radionuclides with an MCL						
Gross Alpha Particle (excluding radon and uranium)	pMCL	EPA 900	pCi/L	15	3	2x/y
Gross Beta Particle	pMCL	EPA 900	mrem/yr	4	4	2x/y
Radium-228 and -226 (combined)	pMCL	GA Method	pCi/L	5	1 for each	2x/y
Strontium-90	pMCL	EPA 905	pCi/L	8	2	2x/y
Tritium	pMCL	EPA 906	pCi/L	20,000	1,000	2x/y
Uranium	pMCL	EPA 200.8	pCi/L	20	1	2x/y
Microbiological						
<i>E. coli</i>	pMCL	SM 9223F	MPN/100mL	TT	--	2x/y
Total Coliform	pMCL	SM 9223B	MPN/100mL	TT	--	2x/y
¹ m=monthly; q=quarterly, 2x/m=twice per month; 2x/y=twice per year; 2x/y samples collected Jan, July unless otherwise noted in Table 1. ² Also a high-use pesticide in this watershed. ³ Also reported in historical data. TT = Treatment Technique pMCL = Primary Maximum Contaminant Level sMCL = Secondary Maximum Contaminant Level NL = DDW Notification Level aNL = DDW Archived Notification Level UCMR = Unregulated Contaminant Monitoring Rule CCL = EPA's Contaminant Candidate List HA = EPA Health Advisory Level						